# SEDAR

Southeast Data, Assessment, and Review

## SEDAR 31

## **Gulf of Mexico Red Snapper**

Stock Assessment Report

June 2013

SEDAR
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# SEDAR

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## SECTION I: Introduction

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# Section I: Introduction

## Contents

# 1. Introduction

## 1.1 SEDAR Process Description

SouthEast Data, Assessment, and Review (SEDAR) is a cooperative Fishery Management Council process initiated in 2002 to improve the quality and reliability of fishery stock assessments in the South Atlantic, Gulf of Mexico, and US Caribbean. The improved stock assessments from the SEDAR process provide higher quality information to address fishery management issues. SEDAR emphasizes constituent and stakeholder participation in assessment development, transparency in the assessment process, and a rigorous and independent scientific review of completed stock assessments.

SEDAR is managed by the Caribbean, Gulf of Mexico, and South Atlantic Regional Fishery Management Councils in coordination with NOAA Fisheries and the Atlantic and Gulf States Marine Fisheries Commissions. Oversight is provided by a Steering Committee composed of NOAA Fisheries representatives: Southeast Fisheries Science Center Director and the Southeast Regional Administrator; Regional Council representatives: Executive Directors and Chairs of the South Atlantic, Gulf of Mexico, and Caribbean Fishery Management Councils; and Interstate Commission representatives: Executive Directors of the Atlantic States and Gulf States Marine Fisheries Commissions.

SEDAR is organized around three workshops. First is the Data Workshop, during which fisheries, monitoring, and life history data are reviewed and compiled. Second is the Assessment process, which is conducted via a workshop and several webinars, during which assessment models are developed and population parameters are estimated using the information provided from the Data Workshop. Third and final is the Review Workshop, during which independent experts review the input data, assessment methods, and assessment products. The completed assessment, including the reports of all 3 workshops and all supporting documentation, is then forwarded to the Council SSC for certification as 'appropriate for management' and development of specific management recommendations.

SEDAR workshops are public meetings organized by SEDAR staff and the lead Council. Workshop participants are drawn from state and federal agencies, non-government organizations, Council members, Council advisors, and the fishing industry with a goal of including a broad range of disciplines and perspectives. All participants are expected to contribute to the process by preparing working papers, contributing, providing assessment analyses, and completing the workshop report.

SEDAR Review Workshop Panels consist of a chair, three reviewers appointed by the Center for Independent Experts (CIE), and one or more SSC representatives appointed by each council having jurisdiction over the stocks assessed. The Review Workshop Chair is appointed by the council having jurisdiction over the stocks assessed and is a member of that council's SSC. Participating councils may appoint representatives of their SSC, Advisory, and other panels as observers.

# 2. Gulf of Mexico Red Snapper Management History

## 2.1. Fishery Management Plan and Amendments

*Original GMFMC FMP*:

The Reef Fish Fishery Management Plan was implemented in November 1984. The regulations, designed to rebuild declining reef fish stocks, included: (1) prohibitions on the use of poisons or explosives to fish for reef fish; (2) prohibitions on the use of fish traps, roller trawls, and powerhead-equipped spear guns within an inshore stressed area; (3) a minimum size limit of 12 inches fork length for red snapper with the exceptions that headboats were exempted until 1987, each angler could keep 5 undersize fish, and vessels fishing with trawls were exempt from the minimum size limit; and, (4) data reporting requirements.

*GMFMC FMP Amendments affecting red snapper fisheries and harvest*:

| Description of Action | FMP/Amendment | Effective Date |
|---|---|---|
| Set a red snapper 13-inch total length (TL) minimum size limit, 7-fish recreational bag limit with a 2 bag limit allowance for qualified for-hire vessels out over 24 hours, and 3.1 million-pound commercial quota. Future allocations to be based on the 1979-1987 historical catch ratio of 51% commercial, 49% recreational. Prohibit the sale of undersized red snapper and delete the allowance to keep 5 undersized red snapper; established a framework procedure for specification of total allowable catch (TAC); established commercial reef fish vessel permit; set overfished threshold and optimum yield (OY) biomass level at 20 percent spawning stock biomass per recruit (SSBR), and established a goal to rebuild overfished stocks to above this level by January 1, 2000. | Amendment 1 | 1990 |
| Replaced 20 percent SSBR target with 20 percent spawning potential ratio (SPR), and changed the target date for rebuilding red snapper to January 1, 2007. | Amendment 3 | 1991 |
| Established a moratorium on the issuance of new reef fish permits for a maximum period of three | Amendment 4 | 1992 |

| | | |
|---|---|---|
| years; established an allowance for permit transfers | | |
| Continued a red snapper endorsement system that had been created via emergency rule through 2004; commercial reed fish vessels with a red snapper endorsement were allowed a 2,000 pound trip limit, and other commercial reef fish vessels were limited to a 200 pound trip. Require all permitted reef fish vessels to abide by trip limits regardless of where the red snapper were caught; allowed the trip limits to be changed under the framework procedure for specification of TAC | Amendment 6 | 1993 |
| Incrementally raised size limit from 13" to 16" TL over 5 years, created an Alabama special management zone (SMZ) and a framework procedure for future specification of SMZs. Required that finfish be landed head and tails intact | Amendment 5 | 1994 |
| Established reef fish dealer permitting and record keeping. | Amendment 7 | 1994 |
| Extended the reef fish permit moratorium and red snapper endorsement system through December 31, 1995 and allowed collections of commercial landings data for initial allocation of individual transferable quota (ITQ) shares. Established historical captain status for purposes of ITQ allocation. | Amendment 9 | 1994 |
| Attempted to establish an ITQ system, which was then repealed by Congress | Amendment 8 | 1995 |
| Implemented a new commercial reef fish permit moratorium for no more than five years or until December 31, 2000, permitted dealers can only buy reef fish from permitted vessels and permitted vessels can only sell to permitted dealers, established a charter and headboat reef fish permit, and changed the target date for rebuilding red snapper to January 2009. | Amendment 11 | 1996 |
| Extended the red snapper endorsement system through the remainder of 1996 and, if necessary, | Amendment 13 | 1996 |

| | | |
|---|---|---|
| through 1997 | | |
| NMFS disapproved proposed provisions that would have reduced the commercial red snapper minimum size limit from 15" to 14" TL and eliminated a scheduled increase in the commercial size limit to 16" in 1998. | Amendment 12 | 1997 |
| Initiated a 10-year phase-out on the use of fish traps in the EEZ from February 7, 1997 to February 7, 2007, after which fish traps would be prohibited. | Amendment 14 | 1997 |
| Prohibited harvest of reef fish from traps other than permitted reef fish traps, stone crab traps, or spiny lobster traps. Established 2-tier red snapper license system (Class 1 & 2). Comm. season split, with 2/3 of quota allocated for Feb 1 opening and remaining quota for Sept 1 opening | Amendment 15 | 1998 |
| Extended the commercial reef fish permit moratorium for another five years, from its previous expiration date of December 31, 2000 to December 31, 2005 | Amendment 17 | 2000 |
| Prohibited vessels with commercial harvests of reef fish aboard from also retaining fish caught under recreational bag and possession limits. | Amendment 18A | 2006 |
| Established two marine reserve areas off the Tortugas area and prohibits fishing for any species and anchoring by fishing vessels inside the two marine reserves. | Amendment 19 | 2002 |
| Established a 3-year moratorium on the issuance of new charter and headboat vessel permits in the recreational for hire fisheries in the Gulf EEZ. Allowed transfer of permits. Required vessel captains/owners to participate in data collection efforts. | Amendment 20 | 2002 |
| Continues the Madison-Swanson and Steamboat Lumps marine reserves for an additional 6 years, until July 2010. Modified the fishing restrictions within the reserves to allow surface trolling during May – October. | Amendment 21 | 2004 |
| Established status determination criteria and biological reference points to be compliant with | Amendment 22 | 2005 |

| | | |
|---|---|---|
| the Sustainable Fisheries Act. Revised the rebuilding plan to be compliant with the SFA, and revised the rebuilding target date to 2032. It also established bycatch reporting methodologies for the reef fish fishery. | | |
| Extended the commercial reef fish permit moratorium indefinitely. Established a permanent limited access system for the commercial fishery for Gulf reef fish. Permits issued under the limited access system are renewable and transferable. | Amendment 24 | 2005 |
| Extended the recreational for-hire reef fish permit moratorium indefinitely. Established a limited access system on for-hire reef fish and CMP permits. Permits are renewable and transferable in the same manner as currently prescribed for such permits. | Amendment 25 | 2006 |
| Established an individual fishing quota (IFQ) system for the commercial red snapper fishery. | Amendment 26 | 2007 |
| Set TAC at 5.0 mp between 2008 and 2010. The commercial sector will receive a quota of 2.55 mp, with the remaining quota of 2.45 mp going to the recreational sector. Also reduced the commercial size limit to 13" TL, reduced the recreational bag limit to two fish with a 16" TL minimum size limit, asset a zero bag limit for captain and crew aboard a for-hire vessel, and set the recreational fishing season from June 1 – September 30. In addition, all commercial and recreational reef fish fisheries will be required to use non-stainless steel circle hooks when using natural baits, as well as venting tools and dehooking devices. | Amendment 27 | 2008 |

*GMFMC Regulatory Amendments:*

**March 1991**:
Reduced the red snapper TAC from 5.0 million pounds to 4.0 million pounds to be allocated with a commercial quota of 2.04 million pounds and a 7-fish recreational daily bag limit (1.96 million pound allocation) beginning in 1991.

**October 1992**:
Raised the 1993 red snapper TAC from 4.0 million pounds to 6.0 million pounds to be allocated with a commercial quota of 3.06 million pounds and a recreational allocation of 2.94 million pounds (to be implemented by a 7-fish recreational daily bag limit). The amendment also changed the target year to achieve a 20 percent red snapper SPR from 2007 to 2009, based on the Plan provision that the rebuilding period may be for a time span not exceeding 1.5 times the potential generation time of the stock and an estimated red snapper generation time of 13 years (Goodyear 1992).

**October 1993**:
Implemented January 1, 1994- set the opening date of the 1994 commercial red snapper fishery as February 10, 1994, and restricted commercial vessels to landing no more than one trip limit per day.
Commercial quota set at 3.06 mp, recreational quota set at 2.94 mp.

**October 1994**:
Retained the 6 million pound red snapper TAC and commercial trip limits and set the opening date of the 1995 commercial red snapper fishery as February 24, 1995; however, because the recreational sector exceeded its 2.94 million pound red snapper allocation each year since 1992, this regulatory amendment reduced the daily bag limit from 7 fish to 5 fish, and increased the minimum size limit for recreational fishing from 14 inches to 15 inches a year ahead of the scheduled automatic increase.

**December 1995**:
Raised the red snapper TAC from 6 million pounds to 9.12 million pounds, with 4.65 million pounds allocated to the recreational sector. Recreational size and bag limits remained at 5 fish and 15 inches total length. The recovery target date to achieve 20 percent SPR was extended to the year 2019, based on new biological information that red snapper live longer and have a longer generation time than previously believed. Commercial red snapper season was set to open on February 28.

**March 1996**:
An addendum to the 1995 regulatory amendment split the 1996 and 1997 commercial red snapper quotas into two seasons each, with the first season opening on February 1 with a 3.06 million pound quota, and the second season opening on September 15 with the remainder of the annual quota.

**March 1997**:
Changed the opening date of the second 1997 commercial red snapper season from September 15 to September 2 at noon and closed the season on September 15 at noon; thereafter the

commercial season was opened from noon of the first day to noon of the fifteenth day of each month until the 1997 quota was reached. The recreational season would be closed when landings were projected to exceed the recreational allocation.

**November 1997**:
Canceled a planned increase in the red snapper minimum size limit to 16 inches that had been implemented through Amendment 5, and retained the 15-inch minimum size limit.

**February 1998**:
Proposed maintaining the status quo red snapper TAC of 9.12 million pounds, but set a zero bag limit for the captain and crew of for-hire recreational vessels in order to extend the recreational red snapper quota season. The NMFS provisionally approved the TAC, releasing 6 million pounds, with release of all or part of the remaining 3.12 million pounds to be contingent upon the capability of shrimp trawl bycatch reduction devices (BRDs) to achieve better than a 50 percent reduction in juvenile red snapper shrimp trawl mortality. The zero bag limit for captain and crew of for-hire recreational vessels was not implemented. Following an observer monitoring program of shrimp trawl BRDs conducted during the Summer of 1998, NMFS concluded that BRDs would be able to achieve the reduction in juvenile red snapper mortality needed for the red snapper recovery program to succeed, and the 3.12 million pounds of TAC held in reserve was released on September 1, 1998.

**December 1998**:
Proposed to maintain the status quo red snapper TAC of 9.12 million pounds; reduce the recreational bag limit for red snapper to 4 fish for recreational fishermen and zero fish for captain and crew of for-hire vessels; set the opening date of the recreational red snapper fishing season to March 1; reduce the minimum size limit for red snapper to 14 inches total length for both the commercial and recreational fisheries; and change the opening criteria for the second commercial red snapper fishing season from the first 15 days to the first 10 days of each month beginning September 1, until the sub-allocation is met or the season closes on December 31.

**February 2000:**
Maintained the status quo red snapper TAC of 9.12 million pounds for the next two years, pending an annual review of the assessment; increase the red snapper recreational minimum size limit from 15 inches to 16 inches total length; set the red snapper recreational bag limit at 4 fish; reinstate the red snapper recreational bag limit for captain and crew of recreational for-hire vessels; set the recreational red snapper season to be April 15 through October 31, subject to revision by the Regional Administrator to accommodate reinstating the bag limit for captain and crew, set the commercial red snapper Spring season to open on February 1 and be open from noon on the 1st until noon on the 10th of each month until the Spring sub-quota is reached; set the commercial red snapper Fall season to open on October 1 and be open from noon on the 1st

to noon on the 10th of each month until the remaining commercial quota is reached,; retain the red snapper commercial minimum size limit at status quo 15 inches total length; and allocate the red snapper commercial season sub-quota at 2/3 of the commercial quota, with the Fall season sub-quota as the remaining commercial quota.

**2010 Regulatory Amendment:**
Increased red snapper total allowable catch from 5.0 million pounds (MP) to 6.945 MP. Based on the current 51% commercial and 49% recreational allocation of red snapper, the proposed total allowable catch increase would adjust the commercial and recreational quotas from 2.55 and 2.45 MP to 3.542 and 3.403 MP, respectively. The commercial sector is under an individual fishing quota program and has maintained landings within their quota in recent years.

**2011 Regulatory Amendment:**
Increases the red snapper total allowable catch from 6.945 million pounds (MP) to 7.185 MP. Based on the current 51% commercial and 49% recreational allocation of red snapper, the increase in total allowable catch will adjust the commercial and recreational quotas from 3.542 and 3.403 MP to 3.66 MP and 3.525 MP in 2011. The commercial sector is under an individual fishing quota program and has maintained landings within their quota in recent years.

**2012 Regulatory Amendment:**
Eliminates the fixed October 1 through December 31 closed season for recreational red snapper fishing. Increases the commercial and recreational quotas from 3.66 and 3.525 MP to 4.121 MP and 3.959 MP in 2012. In addition, increases the 2013 commercial and recreational quotas to 4.432 MP and 4.258 MP. Contingent upon the 2012 ABC of 8.080 MP not being exceeded. The commercial sector is under an individual fishing quota program and has maintained landings within their quota in recent years.

## 2.2. Emergency and Interim Rules

**Emergency- 1992**:
Opened commercial red snapper fishery from April 3 - May 14 with a 1000 lb. trip limit due to the season closing in only 53 days. Effective 4/3/92

**Emergency- 1992**:
Created commercial red snapper 2000 lb and 200 lb endorsements for 1993. Effective 12/30/92 - 3-30-93.

**Emergency- 1992**:
Closed the commercial red snapper fishery from 12-30-92 to 2-15-93.

**Emergency- 1998**:
Reduced recreational bag limit of red snapper from 5 fish per person to 4 fish per person. Reopened the recreational red snapper fishery in January 1999. Effective 6/29/99 to 12/26/99.

**Interim- 1999**:
Increased recreational minimum size limit to 18" TL. Closed the recreational fishery in the EEZ on 8/29/1999. Effective 6/4/99 to 8/29/99.

**Interim- 1999**:
Changed 2000 recreational season from April 24 to October 1. Reinstated the 4-fish bag limit for captain and crew. Reduced the opening of the spring commercial season from 15 to 10 days. Effective 1/19/00 to 12/16/00.

**Interim- 2007**:
Reduced catch quota to 6.5 mp (commercial: 3.315; recreational 3.185). Reduced bag limits to 2 fish/person/day, and prohibited captains and crew of for-hire vessels from keeping the recreational bag limit. Reduced size limit for commercial vessels from 15" to 13" TL (effective 4/2/07). Established a target for the reduction of red snapper bycatch mortality in the shrimp fishery. Effective 5/2/07.

## 2.3. Control Date Notices

Control date notices are used to inform fishermen that a license limitation system or other method of limiting access to a particular fishery or fishing method is under consideration. If a program to limit access is established, anyone not participating in the fishery or using the fishing method by the published control date may be ineligible for initial access to participate in the fishery or to use that fishing method. However, a person who does not receive an initial eligibility may be able to enter the fishery or fishing method after the limited access system is established by transfer of the eligibility from a current participant, provided the limited access system allows such transfer. Publication of a control date does not obligate the Council to use that date as an initial eligibility criteria. A different date could be used, and additional qualification criteria could be established. The announcement of a control date is primarily intended to discourage entry into the fishery or use of a particular gear based on economic speculation during the Council's deliberation on the issues. The following summarizes control dates that have been established for the Reef Fish FMP. A reference to the full *Federal Register* notice is included with each summary.

**November 1, 1989**:
Anyone entering the commercial reef fish fishery in the Gulf and South Atlantic after November 1, 1989, may not be assured of future access to the reef fish resource if a management regime is developed and implemented that limits the number of participants in the fishery [54 FR 46755].

**November 18, 1998**:
The Council is considering whether there is a need to impose additional management measures limiting entry into the recreational-for-hire (i.e., charter vessel and headboat) fisheries for reef fish and coastal migratory pelagic fish in the EEZ of the Gulf and, if there is a need, what management measures should be imposed. Possible measures include the establishment of a limited entry program to control participation or effort in the recreational-for-hire fisheries for reef fish and coastal migratory pelagic [63 FR 64031] (In Amendment 20 to the Reef Fish FMP, a qualifying date of March 29, 2001, was adopted).

**July 12, 2000**:
The Council is considering whether there is a need to limit participation by gear type in the commercial reef fish fisheries in the exclusive economic zone of the Gulf and, if there is a need, what management measures should be imposed to accomplish this. Possible measures include modifications to the existing limited entry program to control fishery participation, or effort, based on gear type, such as a requirement for a gear endorsement on the commercial reef fish vessel permit for the appropriate gear. Gear types which may be included are longlines, buoy gear, handlines, rod-and-reel, bandit gear, spear fishing gear, and powerheads used with spears [65 FR 42978].

**October 15, 2004**:
The Council is considering the establishment of an individual fishing quota program to control participation or effort in the commercial grouper fisheries of the Gulf. If an individual fishing quota program is established, the Council is considering October 15, 2004, as a possible control date regarding the eligibility of catch histories in the commercial grouper fishery [69 FR 67106].

**December 31, 2008**:
The Council voted to establish a control date for all Gulf commercial reef fish vessel permits. The control date will allow the Council to evaluate fishery participation and address any level of overcapacity. The establishment of this control date does not commit the Council or NOAA Fisheries Service to any particular management regime or criteria for entry into this fishery. Fishermen would not be guaranteed future participation in the fishery regardless of their entry date or intensity of participation in the fishery before or after the control date under consideration. Comments were requested by close of business April 17, 2009 [74 FR 11517].

**January 1, 2012**:
This notice announces that the Gulf of Mexico Fishery Management Council (Council) is considering creating additional restrictions limiting participation in the Red Snapper Individual Fishing Quota (IFQ) Program. If such management measures are implemented, the Council is considering January 1, 2012, as a possible control date. Anyone entering the program after the control date will not be assured of future access should a management regime that limits participation in the program be prepared and implemented [76 FR 74038].

## 2.4. Management Program Specifications

**Table 2.4.1. General Management Information**

**Gulf of Mexico**

| | |
|---|---|
| Species | Red Snapper |
| Management Unit | Gulf of Mexico (East and West) |
| Management Unit Definition | Gulf of Mexico EEZ |
| Management Entity | Gulf of Mexico Fishery Management Council |
| Management Contacts<br>SERO / Council | Steven Atran, Dr. Carrie Simmons<br>Sue Gerhart |
| Current stock exploitation status | Not undergoing overfishing, but is overfished (2009 SEDAR 7 Update Assessment) |
| Current spawning stock biomass status | 1.78 million Pounds (2009 SEDAR 7 Update Assessment, using data through 2008) |

**Table 2.4.2. Specific Management Criteria**

| Criteria | Gulf of Mexico - Current (2009) | | Gulf of Mexico - Proposed | |
|---|---|---|---|---|
| | Definition | Value | Definition | Value |
| MSST | $(1-M)*SSB_{MSY}$: M=0.10 | 9.14 mp | SEDAR 31 | SEDAR 31 |
| MFMT | $F_{SPR26\%}$ | 0.53 | SEDAR 31 | SEDAR 31 |
| MSY | $F_{MSY}$ | 0.53 | SEDAR 31 | SEDAR 31 |
| $F_{MSY}$ | $F_{SPR26\%}$ | 0.53 | SEDAR 31 | SEDAR 31 |
| OY | Equilibrium Yield @ $F_{OY}$ | 13.35 mp | SEDAR 31 | SEDAR 31 |
| $F_{OY}$ | 75% of $F_{MSY}$ | 0.39 | $F_{OY}$ = 65%,75%, 85% $F_{MSY}$ | SEDAR 31 |
| M | n/a | 0.10 | M | SEDAR 31 |

*NOTE: "Proposed" columns are for indicating any definitions that may exist in FMPs or amendments that are currently under development and should therefore be evaluated in the current assessment. "Current" is those definitions in place now. Please clarify whether landings parameters are 'landings' or 'catch' (Landings + Discard). If 'landings', please indicate how discards are addressed.*

**Stock Rebuilding Information**

The original rebuilding plan for Gulf of Mexico red snapper was established in Reef Fish Amendment 1 in 1990, and has been revised numerous times. In 2001, the Council submitted a regulatory amendment to NMFS to revise the rebuilding plan to make it compliant with the provisions of the Sustainable Fisheries Act. In particular, this required an adjustment of the rebuilding target and a recalculation of the maximum rebuilding time. Previously the maximum rebuilding target had been to 20% SPR within 1 ½ generations times. Based on a starting date of 1990, and a generation time of 19.6 years (calculated in a 1996 stock assessment), this resulted in a rebuilding target date of 2019. Under the Sustainable Fisheries Act, both the rebuilding target stock level and time frame were changed. Stocks were now required to be rebuilt to a level capable of sustaining maximum sustainable yield with a time frame of 10 years or less. If stocks could not be rebuilt within 10 years, then the maximum rebuilding time was to be based on the time to rebuild in the absence of fishing mortality plus 1 generation time. For red snapper, rebuilding in the absence of fishing mortality to a sustainable yield of $F_{26\%\ SPR}$ (as a proxy for $F_{MSY}$) was estimated to take 12 years. Based on a new starting date of 2000, the 12 years plus 19.6 years generation time resulted in a new target date of 2032.

The 2001 regulatory amendment was not accepted by NMFS because it lacked an environmental impact assessment. In its place, the current version of the rebuilding plan was established in Reef Fish Amendment 22, which was implemented in 2005, but maintained the 2000 – 2032 rebuilding period established in the rejected regulatory amendment. The preferred alternative (Alternative 2) specified the following:

> Maintain TAC at 9.12 mp wwt, end overfishing between 2009 and 2010, and rebuild red snapper by 2032. Review and adjust this policy, as necessary, through periodic assessments. Monitor annual landings to ensure quota is not exceeded.

**Table 2.4.3. Stock projection information**

*(This provides the basic information necessary to bridge the gap between the terminal year of the assessment and the year in which any changes may take place or specific alternative exploitation rates should be evaluated)*

*Gulf of Mexico*

| Requested Information | Value |
|---|---|
| First Year of Management | 2013 |

| | |
|---|---|
| Projection Criteria during interim years should be based on (e.g., exploitation or harvest) | Fixed Exploitation |
| Projection criteria values for interim years should be determined from (e.g., terminal year, avg of X years) | Average of previous 3 years |

*Fixed Exploitation would be $F=F_{MSY}$ (or $F<F_{MSY}$) that would rebuild overfished stock to $B_{MSY}$ in the allowable timeframe. Modified Exploitation would be allow for adjustment in $F<=F_{MSY}$, which would allow for the largest landings that would rebuild the stock to $B_{MSY}$ in the allowable timeframe. Fixed harvest would be maximum fixed harvest with $F<=F_{MSY}$ that would allow the stock to rebuild to $B_{MSY}$ in the allowable timeframe.

Projections:

Project future stock conditions and develop rebuilding schedules if warranted, including estimated generation time. Develop stock projections in accordance with the following:

A) If stock is overfished:
   $F=0$, $F_{Current}$, $F_{MSY}$, $F_{OY}$
   $F=F_{Rebuild}$ (max that permits rebuild in allowed time)
B) If stock is undergoing overfishing:
   $F= F_{Current}$, $F_{MSY}$, $F_{OY}$
C) If stock is neither overfished nor undergoing overfishing:
   $F= F_{Current}$, $F_{MSY}$, $F_{OY}$
D) If data limitations preclude classic projections (i.e. A, B, C above), explore alternate models to provide management advice

**Table 2.4.4. Quota Calculation Details**
If the stock is managed by quota, please provide the following information

| | |
|---|---|
| Current Quota Value (2012) | 8.08 mp |
| Next Scheduled Quota Change | 2013 |
| Annual or averaged quota ? | Annual |
| If averaged, number of years to average | n/a |
| Does the quota include bycatch/discard ? | Not specified |

## 2.5. Management and Regulatory Timeline

The following tables provide a timeline of Federal management actions by fishery.

**Table 2.5.1. Annual Commercial Red Snapper Regulatory Summary**

| | Fishing Year | Size Limit | Possession Limit | Open date | Close date |
|---|---|---|---|---|---|
| 1990 | All year | 13" TL | 3.1 mp quota | n/a | n/a |
| 1991 | 236 days | " | 2.04 mp quota | Jan 1 | Sept 22 |
| 1992 | 95 days | " | 2.04 mp + Emergency | Jan 1, Apr 14 | Feb 22, May 15 |
| 1993 | 94 days | " | 3.06 mp quota | Feb 15 | May 19 |
| 1994 | 77 days | 14" TL | " | Feb 10 | Dec 31 |
| 1995 | 52 days | 15" TL | " | Feb 24, Nov 1 | Apr 14, Nov 2 |
| 1996 | 87 days | " | 4.65 mp quota | Feb 1, Sep 15 | Apr 5, Oct 6 |
| 1997 | 73 days | " | " | Feb 1, Sep 2 | Mar 25, Sep 21 |
| 1998 | 72 days | " | " | " | Mar 14, Oct 1 |
| 1999 | 70 days | " | " | " | Mar 17, Sep 26 |
| 2000 | 66 days | " | " | " | Mar 9, Sep 29 |
| 2001 | 79 days | " | " | " | Mar 28, Sep 24 |
| 2002 | 91 days | " | " | " | Apr 5, Sep 28 |
| 2003 | 94 days | " | " | " | Apr 8, Sep 28 |
| 2004 | 105 days | " | " | " | Apr 10, Oct 5 |
| 2005 | 131 days | " | " | " | Apr 21, Oct 22 |
| 2006 | 126 days | " | " | " | Jul 6 |
| 2007 | 365 IFQ | 13" TL | 3.315 mp | | |
| 2008 | " | " | 2.55 mp | | |
| 2009 | " | " | " | | |
| 2010 | " | " | 3.542 mp | | |
| 2011 | " | " | 3.664 mp | | |

**Table 2.5.2. Annual Recreational Red Snapper Regulatory Summary**

| | # Fishing Days | Size Limit | Bag Limit | Open date | Close date |
|---|---|---|---|---|---|
| Pre-1990 | 365 | 13" TL | No bag limit | Jan 1 | Dec 31 |
| 1990 | " | " | 7 fish/person/day | " | " |
| 1991 | " | " | " | " | " |
| 1992 | " | " | " | " | " |
| 1993 | " | " | " | " | " |
| 1994 | " | " | " | " | " |
| 1995 | " | 15" TL | 5 fish/person/day | " | " |
| 1996 | " | " | " | " | " |
| 1997 | 330 | " | " | " | Nov 27 |
| 1998 | 272 | " | 4 fish/person/day | " | Sep 30 |
| 1999 | 240 | " | " | " | Aug 29 |
| 2000 | 194 | 16" TL | " | Apr 21 | Oct 31 |
| 2001 | " | " | " | " | " |
| 2002 | " | " | " | " | " |
| 2003 | " | " | " | " | " |
| 2004 | " | " | " | " | " |
| 2005 | " | " | " | " | " |
| 2006 | " | " | " | " | " |
| 2007 | " | " | 2 fish/person/day | Apr 26 | Oct 31 |
| 2008 | 65 | " | " | Jun 1 | Aug 4 |
| 2009 | 75 | " | " | " | Aug 15 |
| 2010 | 53 | " | " | " | Jul 23 |
| 2011 | 49 | " | " | " | Jul 19 |

## 3. Assessment History and Review

Management of red snapper in the U.S. Gulf of Mexico began in 1984 with the implementation of the Gulf of Mexico Fishery Management Council Reef Fish Fishery Management Plan (Goodyear 1995). At that time, no formal assessment of the population dynamics of Gulf of Mexico red snapper had been conducted. However, early studies did include analyses of yield per recruit (Waters and Huntsman 1984); and the fitting of production models to historical catch and effort data over restricted geographical regions (Gazey and Gallaway 1980).

Routine assessments of Gulf of Mexico red snapper began in the mid-1980s. These early assessments first sought to describe the biological and biometric characteristics of red snapper (Parrack 1986b) as well as trends in catch, effort, catch per unit effort and catch at size (Cummings and Chewning 1986, Parrack and McClellan 1986). Management advice, including estimates of fishing mortality and spawning stock biomass were developed using age-structured virtual population analyses (VPA) and other techniques. The results indicated important declines in stock production, as well as adult and recruiting population sizes during 1979-1985.

Similar annual assessments of Gulf of Mexico red snapper that used VPA and yield per recruit analyses to develop management advice were conducted by Goodyear (e.g. 1987, 1988, 1992, 1993, 1994, 1995), Phares and Goodyear (1990a, 1990b), Schirripa and Legault (1997) and Schirripa (1998). These assessments share similar outcomes, that fishing mortality by directed fisheries was higher than recommended, that spawning potential ratio was a small fraction of unfished levels, and that shrimp bycatch should be reduced significantly to facilitate the recovery to target levels with a high probability (>50%) of success. These assessments also introduced forecasts of future yield and spawning potential ratio under various management scenarios, including catch quotas and elimination of shrimp discard mortality (e.g. Goodyear 1995).

In 1999, the red snapper stock assessment was transitioned to new stock assessment method, an age structure assessment program (ASAP, Legault and Restrepo 1998). Like previous VPA models used to assess red snapper, ASAP was based on separating fishing effects by different gears into year and age components. However, the ASAP model represented an advancement because it allowed for changes in selectivity and catchability over time, and did not require gear specific catch at age for all years. The data inputs, model parameterization and results are thoroughly described in Schirripa and Legault (1999). Like previous assessments of red snapper, the 1999 ASAP assessment model indicated that the stock was undergoing overfishing relative to all F references considered ($F_{MSY}$, $F_{MAX}$, $F_{SPR20\%}$, $F_{0.1}$). The stock was also overfished relative to the SPR corresponding the MSY (SPR20%). During that assessment, analyses were also conducted to determine which combinations of reductions in directed fishing and/or shrimp bycatch would allow stock recovery before 2019 (to SPR20%) or 2034 (to SPR26%).

Several population models were used to assess the status of red snapper in 2005 (SEDAR 7), including VPA, ASAP, CATCHEM and Stock Reduction Analysis (SRA). The ASAP model had been used in the most recent assessment (Schirripa and Legault 1999), but exhibited instability when used to address the very long time series (1872-2003) and to a lesser extent with the shorter time series (1962-2003 and 1984-2003). A newly developed program CATCHEM was created, in part, to enable use of the historical time series information, and to be able to model fish discarded due to a minimum size internally as opposed to the external manner in which discard estimates have been made in past red snapper assessments (as part of the probabilistic aging procedure). Ultimately, the SEDAR 7 RW panel recommended the use of CATHEM to develop management advice for red snapper. A full description of the CATCHEM model can be found in SEDAR7 Assessment Workshop (SEDAR 2005) or in Porch (2007). Briefly, the CATCHEM algorithm is a statistical catch-at-age model that was applied to information on red snapper populations in U.S. waters during the years from 1872 to 2004.

Like previous assessments, the 2005 CATCHEM model also indicated the stock was overfished, and undergoing overfishing. Projections indicated that the existing TAC of 9.12 million lbs was sustainable with a severe reduction in shrimp bycatch, but the spawning stock was expected to remain well below $S_{MSY}$ (current-shrimp effort). On the other hand, the spawning stock was projected to recover to the $S_{MSY}$\{current-shrimp effort\} reference in less than ten years in the absence of any directed harvest. Other combinations of reductions in directed fishing and/or shrimp bycatch were expected to allow recovery to SPR26% by 2032.

The SEDAR 7 assessment was updated using CATCHEM in 2009. A description of that assessment can be found in SEDAR (2009). The Update Review panel and the GMFMC SSC recommended the use of the AS3 model, as described in SEDAR (2009) to develop management advice. According to that model the stock was overfished (SSB /MSST = 0.19) and undergoing overfishing (F/MFMT = 1.9). An unexpected and severe reduction in shrimp effort occurred following the 2005 assessment due to hurricane damage and economic factors (i.e. 75% reduction from 2001-2003 levels). In fact, the reduction in shrimp effort in 2008 was even greater than what was called for in the red snapper rebuilding plan. Therefore, additional reductions in shrimp effort were no longer necessary to rebuild the red snapper stock. In fact, the projections used to develop the overfishing limit (OFL) and acceptable catch target (ACT) assumed that shrimp effort would rebuild to some extent.

***A chronological list of selected stock assessment documents pertaining to Gulf of Mexico red snapper.***


- Gazey, W. and B. J. Gallaway. 1980. Population dynamics of the red snapper (*Lutjanus campechanus*) in the northwestern Gulf of Mexico. Progress report to NMFS, SEFC, Galveston Laboratory, Galveston, Texas. Contract NA 80-GA-C-00057. 27 p.

- Waters, J. and G. Huntsman. 1984. Incorporating catch and release mortality into yield-per-recruit analyses of minimum size limits. A summary of work performed for the Gulf of Mexico Fishery Management Council, 35 p.

- Cummings, N. C. and T. W. Chewning. 1986. Recent catch and catch per unit of effort of the Gulf of Mexico red snapper and grouper fisheries. NOAA, NMFS. SEFC, Miami Laboratory, Coastal Res. Div. CRD. Prepared for Gulf of Mexico Fishery Management Council, March 1986. 36 p.

- Parrack, N. C. and D. B. McClellan. 1986. Trends in Gulf of Mexico Red Snapper Population Dynamics, 1979-85. National Marine Fisheries Service, Southeast Fisheries Science Center, Miami Laboratory, Miami CRD-86/87-4.

- Parrack, N. C. 1986b. Review and update of Gulf of Mexico red snapper biometrics:1. Length-weight relations, 2. length-length conversions. National Marine Fisheries Service, Southeast Fisheries Science Center, Miami Laboratory, Miami CRD-86/87-3.

- Goodyear, C.P. 1987. Recent trends in the red snapper fishery of the Gulf of Mexico. National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, Miami CRD-87/88-16.

- Goodyear, Phillip C. 1988. Recent trends in the Red Snapper Fishery of the Gulf of Mexico. CRD 87/88-16 CRD.

- Goodyear, Phillip C. and Patricia Phares. 1990. Status of Red Snapper stocks of the Gulf of Mexico Report for 1990. CRD 89/90-05 CRD.

- Goodyear, Phillip C. and Patricia Phares. 1990. Addendum Status of Red Snapper stocks of the Gulf of Mexico Report for 1990. CRD 89/90-05A CRD.

- Goodyear, C. Phillip. 1992. Red Snapper in U.S. Waters of the Gulf of Mexico.MIA-91/92-70, 156 p. MIA.

- Goodyear, C. Phillip. 1993. Red Snapper in U.S. Waters of the Gulf of Mexico 1992 Assessment Update. MIA-92/93-76, 125 p. MIA.

- Goodyear, C. Phillip. 1994. Red Snapper in U.S. Waters of the Gulf of Mexico.MIA 93/94-63, 160 p. MIA.

- Goodyear, C. Phillip. 1995. Red Snapper in U.S. Waters of the Gulf of Mexico.MIA-95/96-05, 171 p. MIA.

- Goodyear, C. Phillip. 1996. An Update of Red Snapper Harvest in U.S. Waters of the Gulf of Mexico. MIA-95/96-60, 21 p. MIA.

- Schirripa, Michael J. and Christopher M. Legault. 1997. Status of Red Snapper in U.S. Waters of the Gulf of Mexico: Updated Through 1996. MIA-97/98-05, 40 p. MIA.

- Schirripa, Michael J. 1998. Status of the Red Snapper in U.S. Waters of the Gulf of Mexico: Updated Through 1997. SFD-97/98-30, 85 p. SFD.

- Legault, Christopher M. and Victor R. Restrepo. 1998. A Flexible Forward Age-Structured Assessment Program. SFD-98/99-16, 15 p. SFD.

- Schirripa, Michael J. and Christopher M. Legault. 1999. Status of Red Snapper in the U.S. Gulf of Mexico: Updated Through 1998. SFD-99/00-75, 86 p. SFD.

- SEDAR 2005. Southeast Data, Assessment, and Review: Stock Assessment Report of SEDAR 7: Gulf of Mexico Red Snapper. SEDAR 7. One Southpark Circle #306, Charleston, SC 29414

- Porch CE. 2007. An assessment of the red snapper fishery in the U.S. Gulf of Mexico using a spatially-explicit age-structured model. In: Patterson WF, Cowan JH Jr, Fitzhugh GR, Nieland DL (eds) Red Snapper ecology and fisheries in the US Gulf of Mexico. American Fisheries Society, Symposium 60, Bethesda, Maryland, pp 355–384.

- SEDAR 2009. Stock Assessment of Red Snapper in the Gulf of Mexico. SEDAR Assessment Update. Report of the Update Assessment Workshop, Miami, Florida, August 24–28, 2009.

# 4. Regional Maps

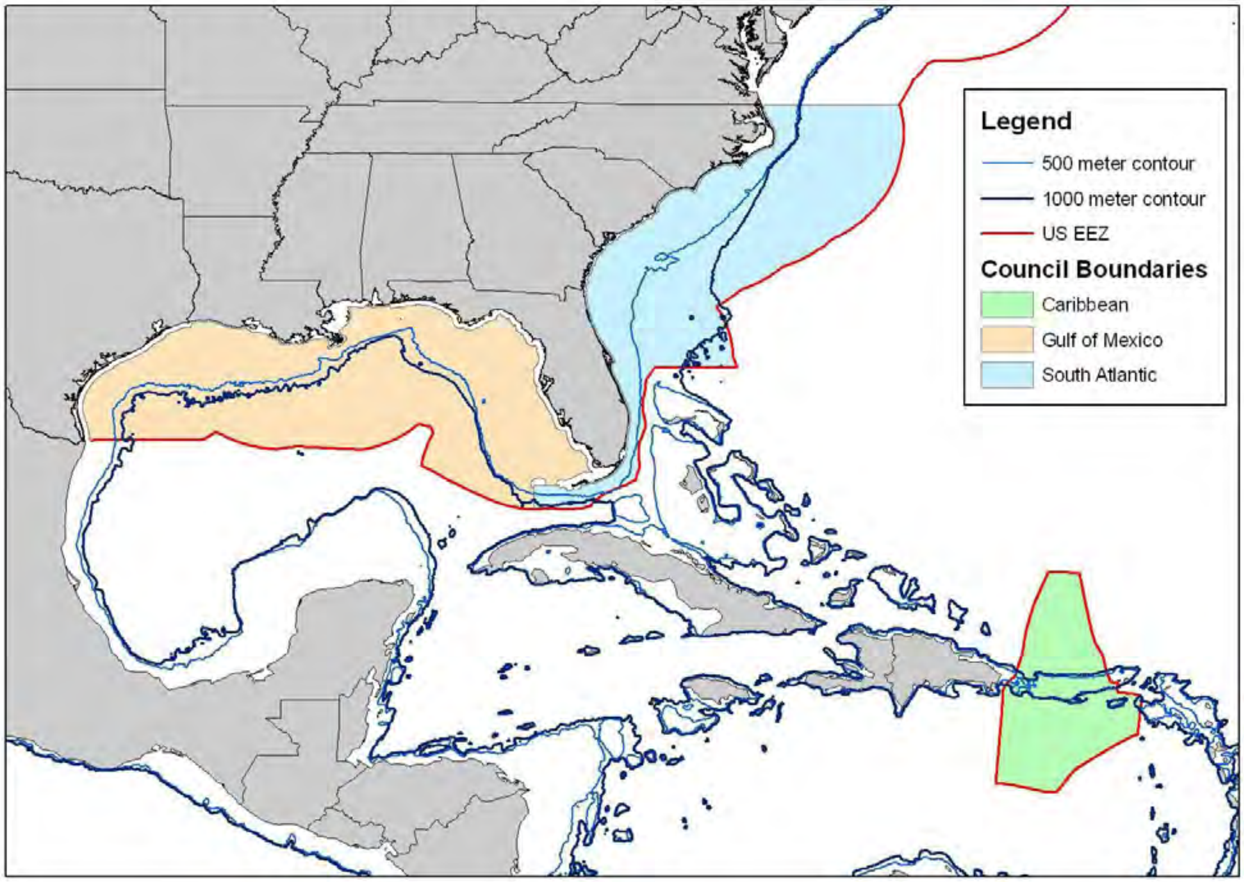



Figure 4.1: South Atlantic, Gulf of Mexico, and Caribbean Fishery Management Council boundaries, and United States EEZ.

# 5. Assessment Summary Report

The Summary Report provides a broad but concise view of the salient aspects of the 2012 Gulf of Mexico red snapper stock assessment (SEDAR 31). It recapitulates: (a) the information available to and prepared by the Data Workshop (DW); (b) the application of those data, development and execution of one or more assessment models, and identification of the base-run model configuration by the Assessment Workshop (AW); and (c) the findings and advice determined during the Review Workshop (RW).

**Executive Summary**

The SEDAR 31 benchmark assessment for Gulf of Mexico red snapper (Lutjanus campechanus) was conducted through a Data Workshop (August 20-24, 2012; Pensacola, FL), Assessment Workshop (January 28 - February 1, 2013; Miami, FL), eight assessment webinars (February 21 - April 18, 2013), and a Review Workshop (April 29 - May 3, 2013; Gulfport, MS).

The RW Panel was presented outputs and results of the SEDAR 31 Gulf of Mexico red snapper stock assessment. The assessment model used was Stock Synthesis (SS3), a highly flexible, integrated analysis, statistical catch-at-age model. The RW Panel concluded that the data used in the assessment were generally sound and robust. Likewise, data generally were applied properly and uncertainty in data inputs was appropriately acknowledged. Numerous sensitivity analyses and exploration of alternative scenarios were also presented during the AW. However, due to the timeline on which the assessment material was provided to the RW Panel, the adequacy of the documentation, and the completeness of the assessment at the end of the RW, the RW Panel RW Panel determined that it could not either accept or reject the findings of this assessment. More complete documentation, to be reviewed and approved by a group similar to the AW Panel would be required. Notwithstanding these concerns, the RW Panel was very impressed with the performance of the Analytical Team (AT). It was clear that the AT had put considerable thought into the development of the assessment model, which by necessity is very complex. Unfortunately, in the absence of an acceptable quantitative stock assessment, the RW Panel could not determine stock status in relation to reference points.

**Stock Status and Determination Criteria**

Phase plots of the base run put forth by the AT and related sensitivities are provided in Figures 5.22 and 5.23. Determinations of stock status and proxies for MSY were not provided in the AW Report or determined during the RW. The AT did provide information about proxies for MSY midway through the RW which were discussed generally: the use of a marginal F when calculating a proxy for MSY and whether a %spawning potential ratio (%SPR) proxy for MSY should be based on the assumed steepness in the assessment model, or some other value.

The marginal F approach accounts for the reality that fishing effort for all fleets cannot be controlled, specifically the shrimp fishery effort and closed season effort. F for other fisheries is scaled up proportionally to find the F corresponding to the appropriate %SPR, conditioned on the assumed shrimp and closed season effort series. The RW Panel agreed with the AT that this is a reasonable approach. The AT also showed how yield would change in response to changes in fisheries that are not specifically regulated for red snapper bycatch.

Regarding whether the percent reduction in SPR should be based on the steepness assumed in the model (thereby using an MSY proxy consistent with the model used to derive the abundance time series), given that 1) the steepness value is assumed, 2) there is limited contrast in spawner biomass time series for estimating the spawner-recruit parameters, 3) recruitment for the entire stock has decreased during the last two years and was low even though spawner abundance has been increasing, and 4) there is evidence of a more complex population structure than is being modeled, the RW Panel suggested that there may not be strong enough evidence to warrant a change from the %SPR values currently being used or from the default value. See Figures 5.16, 5.20, and 5.21 for a comparison of these values.

**Stock Identification and Management Unit**

The management unit for Gulf of Mexico red snapper extends from the United States–Mexico border in the west through the northern Gulf waters and west of the Dry Tortugas and the Florida Keys (waters within the Gulf of Mexico Fishery Management Council boundaries). This stock assessment assumes there are two sub-units of the red snapper stock within this region, separated roughly by the Mississippi River. This determination is consistent with SEDAR 7 (2005) and the 2009 SEDAR 7 Update, and was supported through evaluation of all data presented at the SEDAR 31 DW. Currently, the Council manages these sub-stocks as one unit, but the option of eastern and western management units remains. However, the convention of assessing eastern and western sub-units separately is preserved in this assessment.

**Assessment Methods**

The primary assessment model selected for the Gulf of Mexico red snapper stock evaluation assessment was Stock Synthesis (SS) (Methot 2010) version 3.24j (beta). Descriptions of SS algorithms and options are available in the SS user's manual (Methot 2010) and at the NOAA Fisheries Toolbox website (http://nft.nefsc.noaa.gov/). SS is an integrated statistical catch-at-age model which is widely used for stock assessments in the United States and throughout the world. SS takes relatively unprocessed input data and incorporates many of the important processes (mortality, selectivity, growth, etc.) that operate in conjunction to produce observed catch, size and age composition and CPUE indices. In addition, SS can incorporate time series of environmental data. Because many of these inputs are correlated, the concept behind SS is that they should be modeled together, which helps to ensure that uncertainties in the input data are properly accounted for in the assessment. SS has the ability to incorporate an early, data poor time period for which only catch data are available and a more recent, data-rich time-period for which indices of abundance and length and age-length or age composition data are available.

The r4ss software (www.cran.r-project.org/web/packages/r4ss/index.html) was utilized extensively to develop various graphics for the SS outputs and also was used to summarize various SS output files and to conduct the parametric bootstrap. The SS parametric bootstrap procedure was the approach used to characterize the uncertainty in final model estimates and projections of future catches for a variety of alternative scenarios recommended by the AW Panel. This tool is based on parametric bootstrap analyses used with SS (Methot 2011).

**Assessment Data**

The SS model was fitted to landings, discards, age composition observations, and indices of abundance. Annual landings from the commercial (Figs. 5.2 and 5.3) and recreational (Figs. 5.4

and 5.5) fishing sectors were input into the model, with commercial landings in metric tons and recreational landings in numbers of thousands of fish. Discards from the commercial and recreational fishing fleets were input as thousands of fish. Annual estimates of red snapper bycatch from the shrimp fishery (as dead discards in thousands of fish) were estimated (Figure 5.14); however, there was a large amount of uncertainty in these annual estimates. As a result, the estimated annual median across the entire time series was used in conjunction with an annual time series of shrimp effort to allow the model to estimate shrimp bycatch. Standardized indices of relative abundance from both fishery-dependent and -independent data sources were included in the model (Figs. 5.6 - 5.14). The fishery-dependent indices came from the commercial handline fleet (Figure 5.6), recreational private/for hire (Figure 5.7), and recreational headboat (Figure 5.8) sectors. Fishery-independent indices came from the NMFS bottom longline survey (Figure 5.9), the SEAMAP reef fish video survey (Figure 5.10), the SEAMAP plankton survey (Figure 5.11), and the SEAMAP bottom trawl survey (Figs. 5.12 and 5.13). Finally, age composition data were available from both fishery-dependent and -independent sources. Fishery-dependent age composition data came from the commercial handline and longline fleets, shrimp fishery bycatch, and the recreational headboat and charter/for hire fleets. Fishery-independent age composition data came from the SEAMAP bottom trawl survey, SEAMAP reef fish video survey, NMFS bottom longline survey, and the combined remotely operated vehicle (ROV) survey. All age composition distributions were from direct aging of fish by measuring otoliths, except observations from the combined ROV survey, the SEAMAP reef fish video survey, commercial shrimp bycatch, and the SEAMAP bottom trawl survey. The combined ROV survey and SEAMAP reef fish video survey age observations were converted to ages from length distributions using an age-length key. The age-length keys that were used to make these conversions were compiled using all direct aging data across all years for each area (east and west of the Mississippi River). The shrimp bycatch and SEAMAP groundfish trawl survey age composition data were developed through visual inspection of modes in length composition data.

**Release Mortality**

A meta-analysis was used to estimate discard mortality rates for Gulf of Mexico red snapper Figure 5.1). Data used in this meta-analysis were compiled from 11 studies that produced 70 distinct estimates. There are multiple estimates from some studies because they produced estimates for multiple fishing depths and/or seasons in which data were collected. Separate discard mortality relationships were developed for each sector (i.e., commercial and recreational). No venting was assumed to occur prior to 2008 (i.e., when venting became mandatory), and venting was assumed to occur from 2008 onward. An average seasonal effect was assumed in the relationships. For the commercial sector, average depths at which discards occurred for each gear (handline or long line), region (eastern or western Gulf), and season (open or closed) were calculated using commercial observer program data. Consistent with how commercial discards have been treated in other parts of the assessment, discards from trips with IFQ allocation were considered open season discards, while discards from trips with no IFQ allocation were considered closed season discards (Table 5.2). For the recreational sector, average depths at which discards occurred for each region (eastern or western Gulf) and season (open or closed) were calculated using self-reported data from the iSnapper program (Table 5.3). Average depths iSnapper data were similar to depths reported by recreational fishers at the AW.

Table 5.1. Average depths and associated discard mortality rates for commercial discards of red snapper in the Gulf of Mexico.

| **Gear** | **Handline** | | | | **Longline** | | | |
|---|---|---|---|---|---|---|---|---|
| **Region** | **East** | | **West** | | **East** | | **West** | |
| **Season** | **Closed** | **Open** | **Closed** | **Open** | **Closed** | **Open** | **Closed** | **Open** |
| Average Depth (m) | 42 | 45 | 84 | 53 | 66 | 62 | 132 | 104 |
| Disc Mort - no venting | 0.74 | 0.75 | 0.87 | 0.78 | 0.82 | 0.81 | 0.95 | 0.91 |
| Disc Mort - venting | 0.55 | 0.56 | 0.74 | 0.60 | 0.66 | 0.64 | 0.88 | 0.81 |

Table 5.2. Average depths and associated discard mortality rates for recreational discards of red snapper in the Gulf of Mexico.

| **Gear** | **Recreational** | | | |
|---|---|---|---|---|
| **Region** | **East** | | **West** | |
| **Season** | **Closed** | **Open** | **Closed** | **Open** |
| Average Depth (m) | 33 | 34 | 36 | 35 |
| Disc Mort - no venting | 0.21 | 0.21 | 0.22 | 0.22 |
| Disc Mort - venting | 0.10 | 0.10 | 0.11 | 0.10 |

**Catch Trends**

Exploitation by the commercial sector has long been dominated by the handline fleet (Figure 5.2) in both the eastern and western Gulf. Commercial longline fishing pressure (Figure 5.3) was substantial at times, but only for short time periods across the longer time series. The recreational sector has long had the ability to remove large quantities of fish from both the eastern and western Gulf (Figs 5.4, 5.5). Recreational landings have decreased in recent years, and the recreational fishing season has become increasingly brief from 1997 (330 days) to 2011 (49 days). According to MRIP, recreational landings are highest in Alabama and Florida, followed by Louisiana, Texas, and Mississippi.

**Fishing Mortality Trends**

Exploitation rate (catch in numbers including discards / total numbers) was used as the proxy for annual fishing mortality rate in this assessment. Predicted annual fishing mortality rates are presented in Figure 5.19 (top panel) for the SS base model configuration (steepness = 0.99 and $\sigma_R = 0.3$). This represents the fishing mortality level on the most vulnerable age class (the most vulnerable age class varies with changes in the relative effort and selectivity patterns of the various fisheries). Predicted annual fishing mortality estimates (all fleets combined, top panel plot) shows flat and low levels of F through the late 1940s. From the early 1950s through the mid-1970s, steady increasing trend in F are predicted. Since the mid-1970s estimated total annual F's have continued to decline.

Figure 5.19 (bottom panel) presents instantaneous fishing mortality by year and fleet. An increasing trend in fishing mortality was observed for the handline fleet in the east beginning in the early 1880s as the fishery developed, which lasted until the early 1900s. Fishing mortality remained variable without trend until the late 1950s, when after which a significant increase in fishing mortality was observed for the handline fleet in both the east and the west. Fishing mortality declined in the early 1970s until the mid-1980s, after which an increase in fishing mortality was observed for the recreational fleet.

**Stock Abundance and Biomass Trends**

Predicted total biomass and spawning biomass are presented in Figures 5.17 and 5.18 for the base model configuration (steepness = 0.99, $\sigma_R = 0.3$) Total biomass and spawning biomass show a steady declining trend from the late 1880s through the early 1900s, followed by a flat trend up to the 1940s. Predicted SS total biomass showed strong declines starting in the 1940s and lasting through the late 1970s. Increases in total and spawning stock biomass are predicted by SS beginning in the late 1980s. This trend is also consistent across both areas.

SS predicted the mean age of Gulf of Mexico red snapper to be approximately 3.5 in the unfished state in 1872. The population mean age showed a steady decline until around 1910, after which it remained stable at around age 2, until the early 1940s, when average age slightly increased, followed by a sharp drop around 1960. Since 1972, average age fluctuated between about 0.5 and 0.9, until 2004 when it started increasing again. The decline in mean age in the earliest years of the time series corresponds with increasing landings and the development of the commercial handline fishery. The sharp decline in mean age that began in the early 1960s corresponds to the increasing popularity of red snapper by recreational anglers.

**Scientific Uncertainty**

Uncertainty in parameter estimates was quantified by computing asymptotic standard errors for each parameter. Asymptotic standard errors are calculated by inverting the Hessian matrix (i.e., the matrix of second derivatives) after the model fitting process. Asymptotic standard errors provide a minimum estimate of uncertainty in parameter values.

Uncertainty in parameter estimates was further investigated using a parametric bootstrap approach. Bootstrapping is a standard technique used to estimate confidence intervals for model parameters or other quantities of interest. In SS, there is a built-in option to create bootstrapped data-sets. This feature performs a parametric bootstrap using the error assumptions and sample sizes from the input data to generate new observations about the fitted model expectations. The model was refit to 1000 bootstrapped data-sets and the distribution of the parameter estimates was used to represent the uncertainty in the parameters and derived quantities of interest.

Uncertainty in data inputs and model configuration assumptions was examined through various sensitivity analyses. In all, 15 separate SS3 sensitivity model runs were completed, and included data exclusions and reweighting runs conducted to evaluate a) sensitivity to parameter inputs (steepness), b) sensitivity to data inputs (M level, discard mortality, age error, data inclusions), and c) model component weighting. Over the course of the stock assessment, many additional sensitivity analyses were explored. Those runs that best explored the sensitivity of key model parameters and/or demonstrated discord (or agreement) in model estimates between runs were presented. Table 5.3 describes the SS Base Model run and all the alternative sensitivity analyses made for the stock assessment.

Table 5.3. Description of the base model run and alternative sensitivity runs for Gulf of Mexico red snapper.

| **Run** | **Name** | **Sensitivity Type** | **Description** |
|---|---|---|---|
| 1 | Base Model | Base Model | Fixed von Bertalanffy growth, fixed M for ages zero and one, and Lorenzen at age natural mortality for ages two and older, scaled to age three, age specific fecundity, steepness was fixed at 0.99, time varying virgin stock parameter ($R_0$) was estimated for two different time blocks (recent, 1984-2011 and historical, 1872-1983), model was spatially structured into two areas (east and west), one stock recruitment relationship was estimated and the distribution of recruitment between areas was estimated |

| | | | |
|---|---|---|---|
| | | | assuming the historical period as described in section 3.1.3, recruitment deviations were estimated from 1899 to the present, discards were input as discards (thousands of fish for all fleets, one super period for shrimp bycatch fishery and annual for the other fisheries), time varying selectivity, retention, and discard blocks as described in section 3.1.3. |
| 2 | M High | Natural Mortality Sensitivity | Set age zero M to 3.5 and age one M to 2.0, all other model inputs configured as Base Model |
| 3 | M Low | Natural Mortality Sensitivity | Set age zero M to 1.0 and age one M to 0.6, all other model inputs configured as Base Model |
| 4 | Density Dependent M | Natural Mortality Sensitivity | Set shrimp selectivity for age zero = 1.0 (i.e. fully selected) and selectivity = 0.0 for all other ages, all other model inputs configured as Base Model |
| 5 | Steepness = 0.8 | Steepness | Steepness = 0.8, all other model inputs configured as Base Model. |
| 6 | $\sigma R = 0.6$ | Steepness | Assumed the Beverton-Holt spawner recruit equation sigma R parameter equals 0.6, all other model inputs configured as Base Model |
| 7 | Time Varying Steepness | Steepness | Two time blocks assumed for steepness parameter, 1872 through 1983, and 1984 through 2011 |
| 8 | Plus 20% discard mortality | Data Inputs | Base model discard mortality modified by adding 20% to base model run level all other model inputs configured as Base Model |
| 9 | Minus 20% discard mortality | Data Inputs | Incorporate vector of reader precision at age, all other model inputs configured as Base Model |
| 10 | Incorporate Age Reader Error | Data Inputs | Removal of 1972 SEAMAP Fall Groundfish Survey index data values, all other model inputs configured as Base Model |
| 11 | Start Year 1964 | Data Inputs | Assume start year of model equal to 1964 all other model inputs configured as Base Model |
| 12 | Exclude 1972 SEAMAP index | Index Exclusion | Removal of 1972 SEAMAP Fall Groundfish Survey index data values, all other model inputs configured as Base Model |
| 13 | Exclude Fishery Dependent Indices | Data Inputs | Remove fishery dependent indices, all other model inputs configured as Base Model |
| 14 | Incorporate Oil Rig Mortality | Data Inputs | Incorporate oil rig removal mortality all other model inputs configured as Base Model |
| 15 | Age composition Weighting | Model Weighting | Increase weighting of age composition by capping the sample sizes at 1000, all other model inputs configured as Base Model |

| | | | |
|---|---|---|---|
| 16 | Index CV 0.1 | Model Weighting | Increase weight of indices by assuming indices error is 0.1, all other model inputs configured as Base Model |

Retrospective analyses were conducted to look for systematic bias in estimates of key model output quantities over time. For these analyses, the base model was refit while sequentially dropping the last four years of data from the assessment (i.e., 2011, 2010-2011, 2009-2011, and 2008-2011). Analyses could only be extended back to 2007, because closed season age composition data were not available prior to 2007.

**Significant Assessment Modifications**
The greatest change between this assessment of red snapper and the most recent past assessment (2009 SEDAR 7 Update) was the transition in modeling environments from CATCHEM to Stock Synthesis. Other substantial modifications include the integration of depth-related discard mortality rates by sector, integration of the Marine Recreational Information Program into the recreational landings data, examinations of episodic mortality events and other environmental covariates such as the *Deepwater Horizon* oil spill, and the utilization of remotely operated vehicle (ROV) and handheld mobile device (iSnapper) derived indices of abundance.

**Sources of Information**
The contents of this summary report were taken from the SEDAR 31 Gulf of Mexico Data, Assessment, and Review Workshop reports and addenda.

## Figures

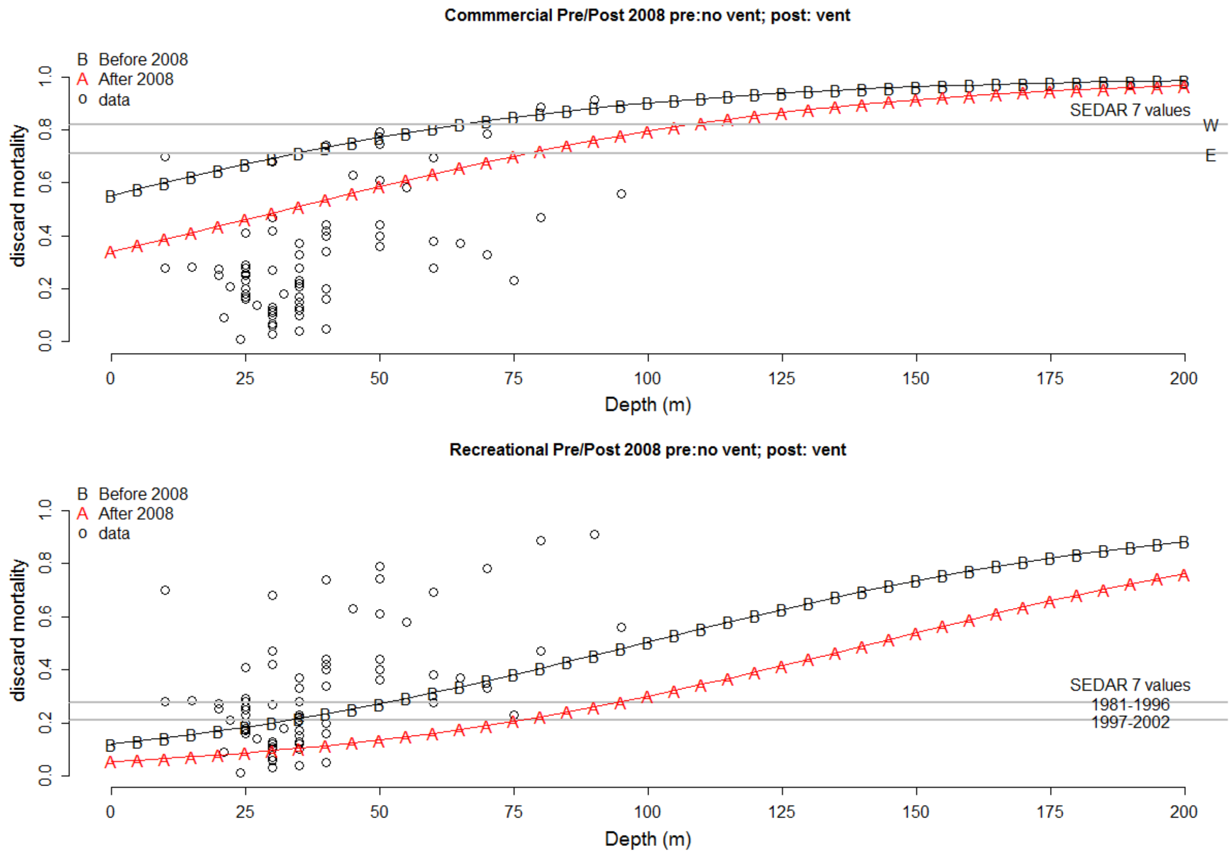



Figure 5.1. Discard mortality-depth relationships for commercial (top panel) and recreational (bottom panel) sectors. These relationships assume an average season effect, and that no venting occurred prior to 2008 (B) and venting occurred from 2008 onward (A). The open circles represent estimates of discard mortality from the studies included in the meta-analysis. The reference lines show the discard mortality rates used in the SEDAR 7 Gulf of Mexico Red Snapper assessment.

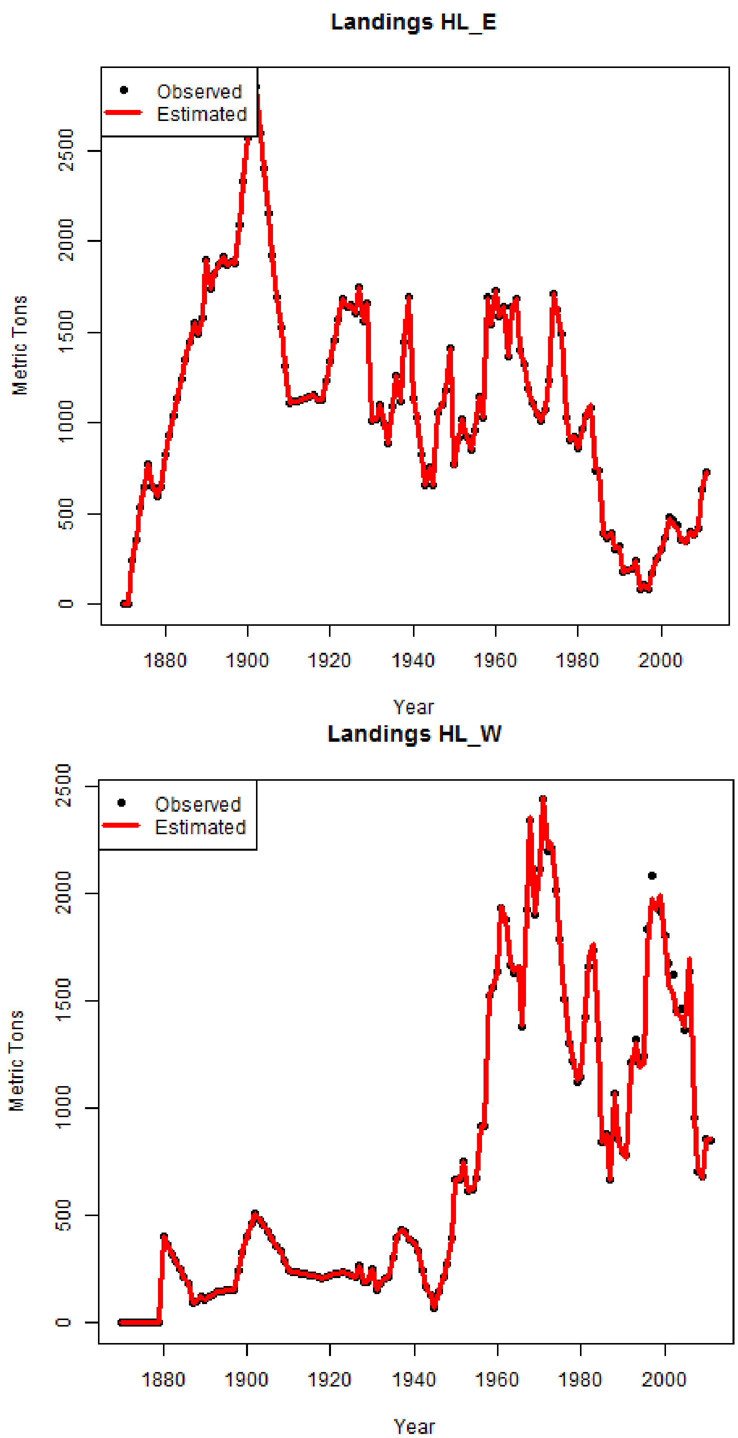



Figure 5.2. Observed (black dots) and estimated landings (red line) of Red Snapper for the commercial handline fishery in the eastern (top) and western (bottom) Gulf of Mexico, 1872-2011.

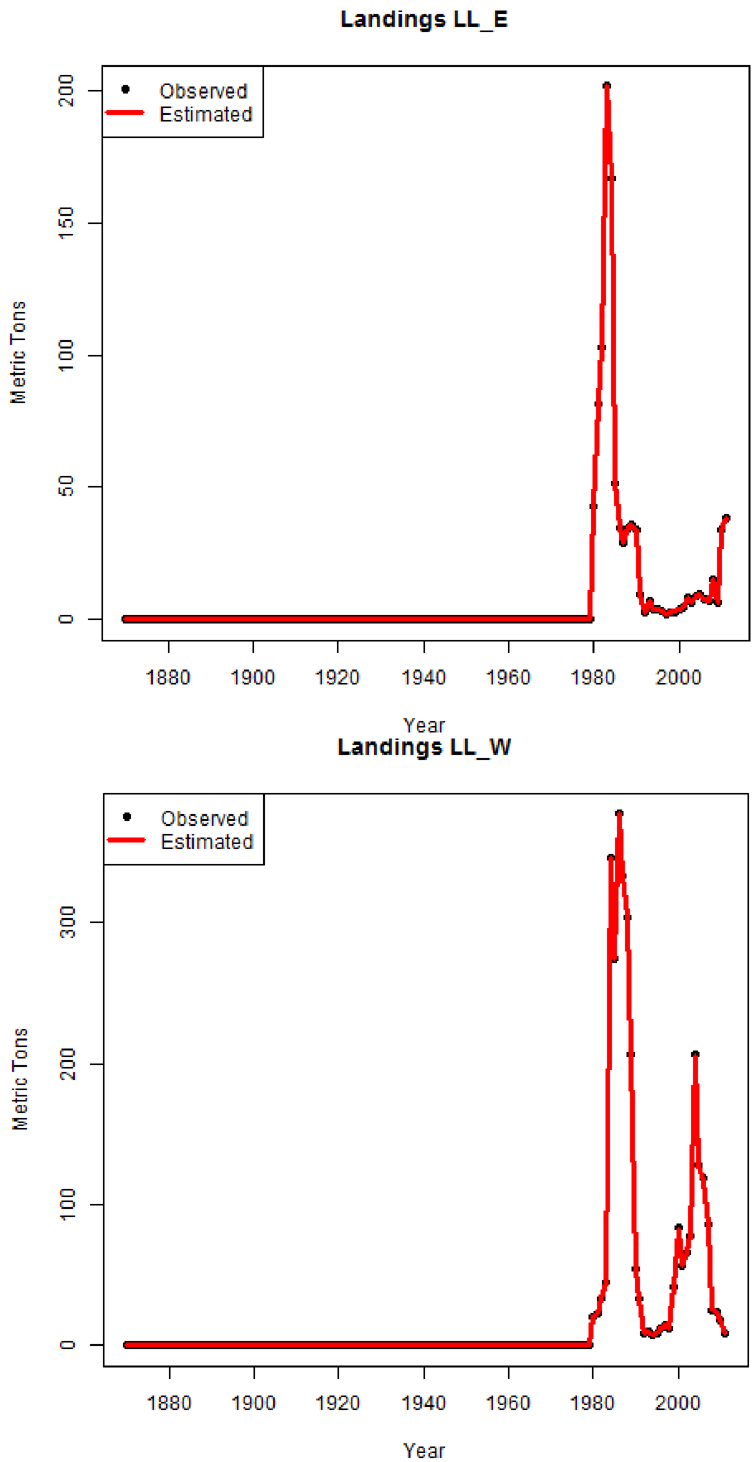



Figure 5.3. Observed (black dots) and estimated landings (red line) of Red Snapper for the commercial longline fishery in the eastern (top) and western (bottom) Gulf of Mexico, 1872-2011.

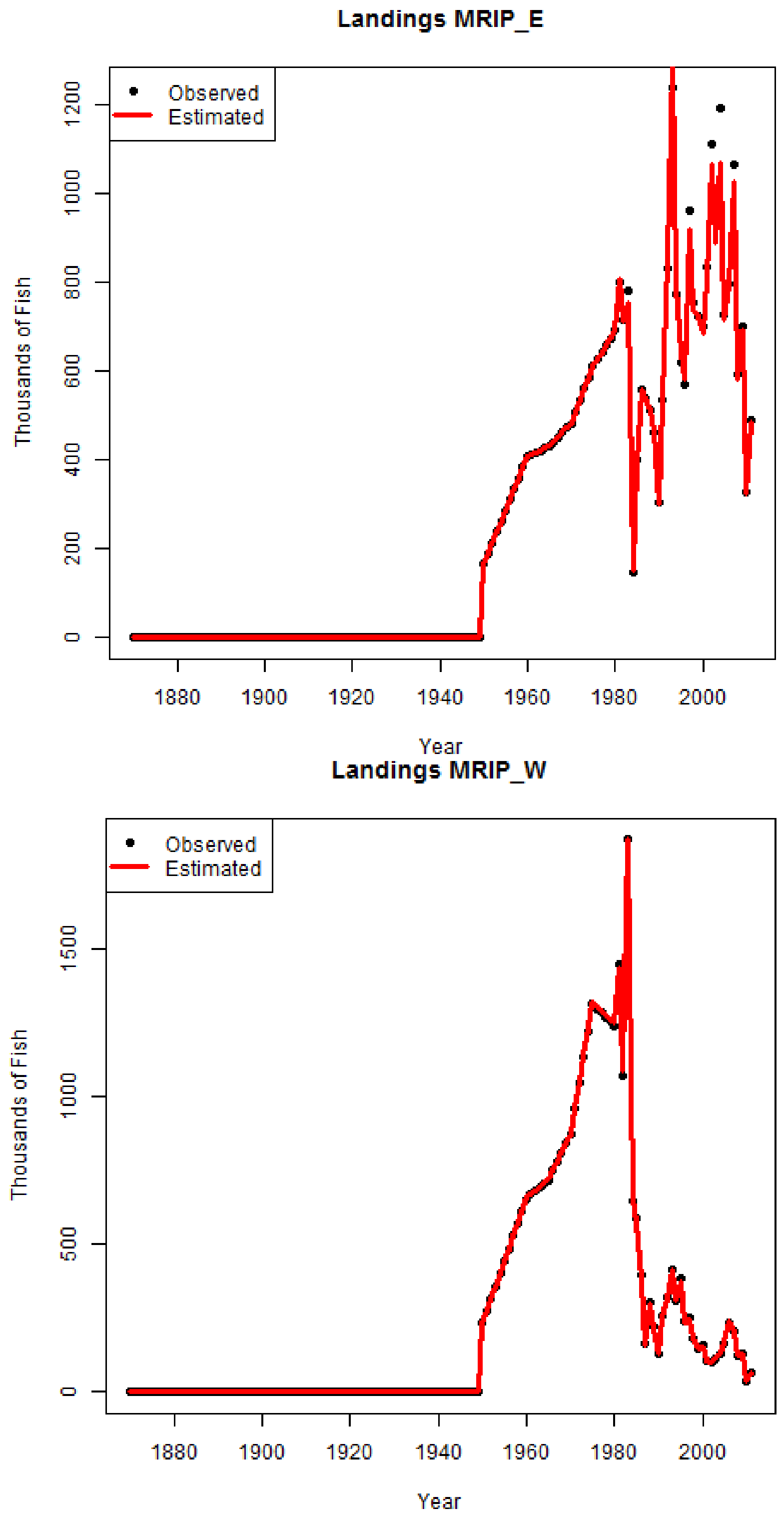



Figure 5.4. Observed (black dots) and estimated landings (red line) of red snapper for the private recreational fishery in the eastern (top) and western (bottom) Gulf of Mexico, 1872-2011.

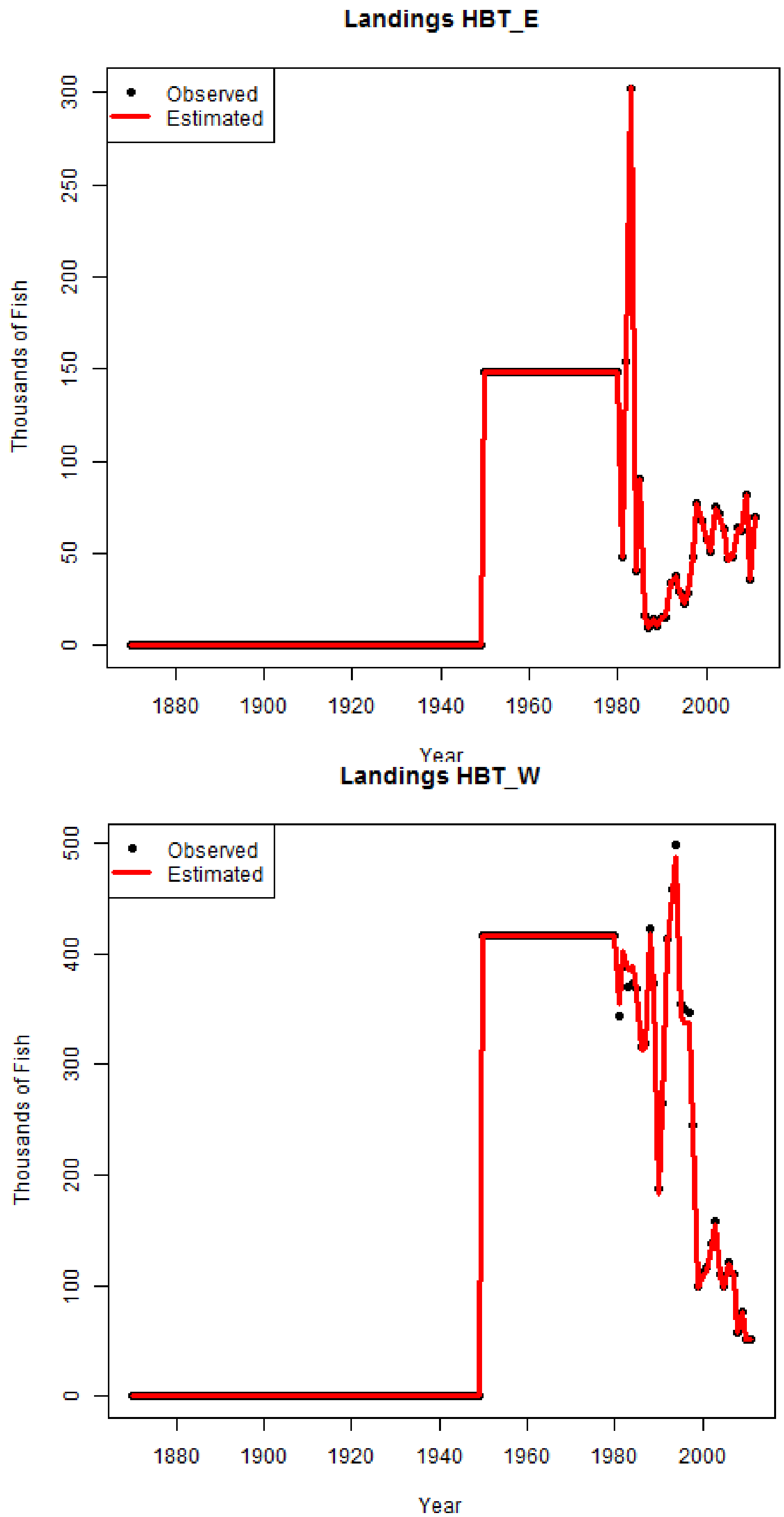



Figure 5.5. Observed (black dots) and estimated landings (red line) of Red Snapper for the recreational headboat fishery in the eastern (top) and western (bottom) Gulf of Mexico, 1872-2011.

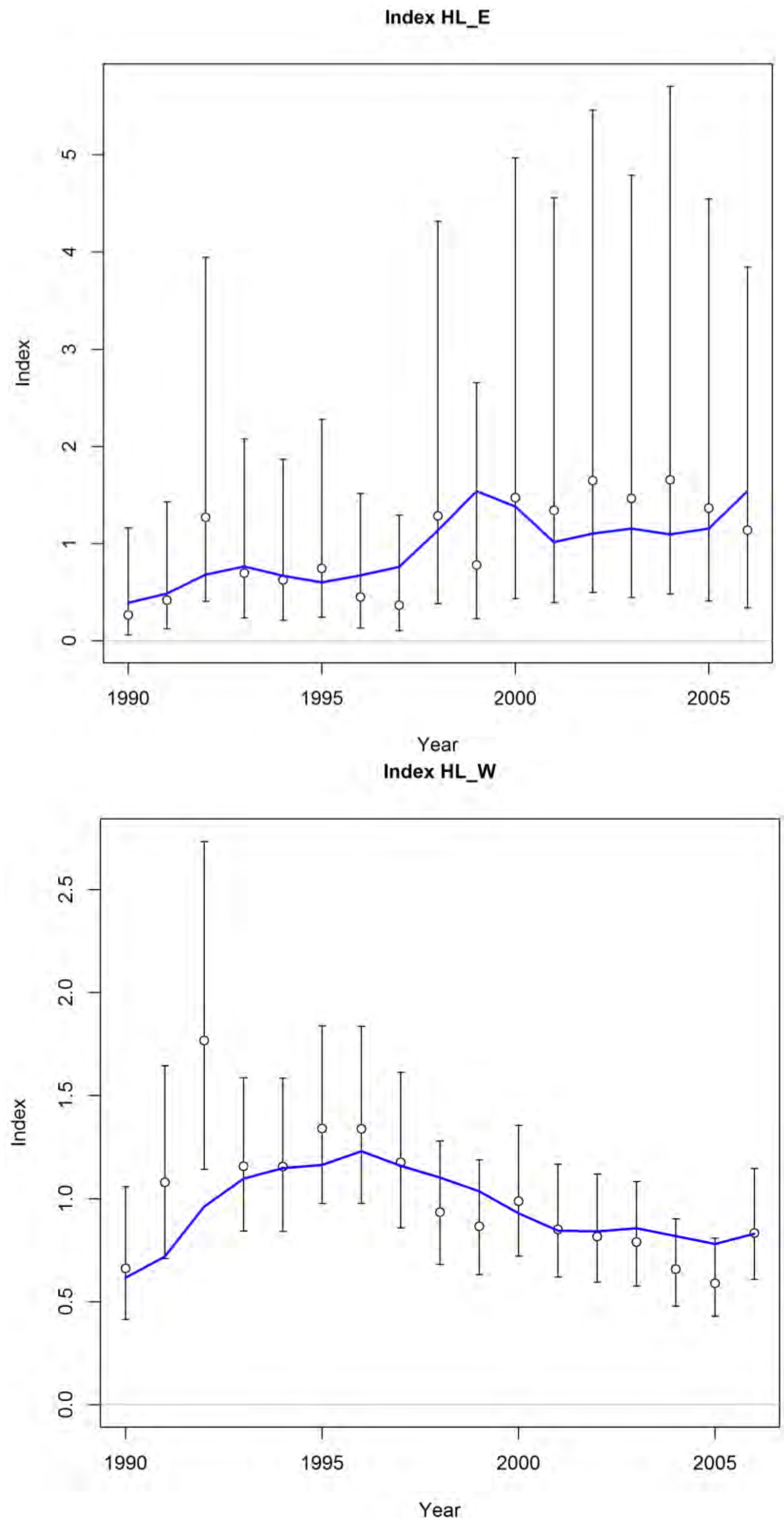
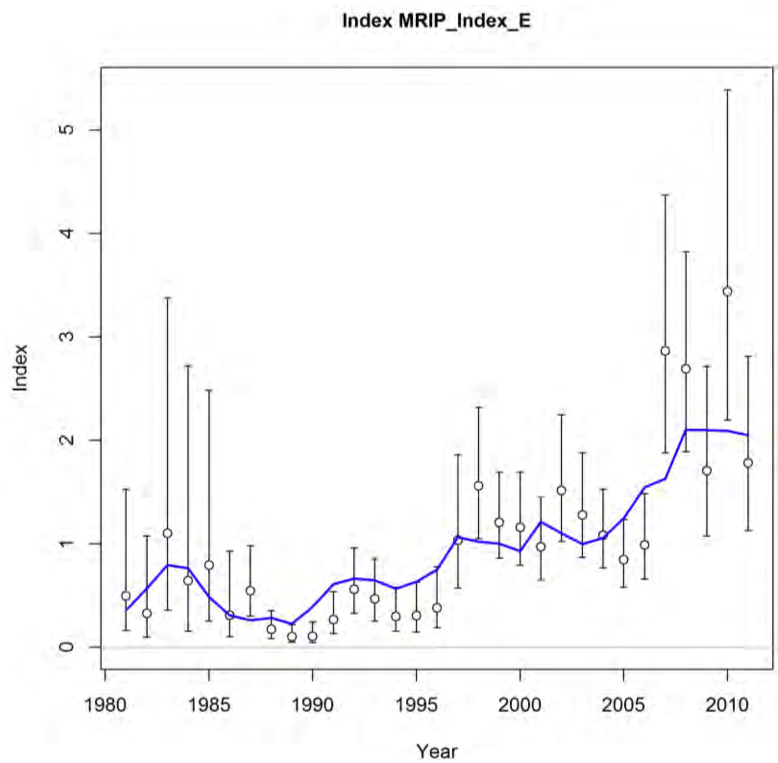



Figure 5.6. Observed and predicted vertical line standardized index of abundance for Red Snapper in the eastern (top) and western (bottom) Gulf of Mexico, 1990-2011.



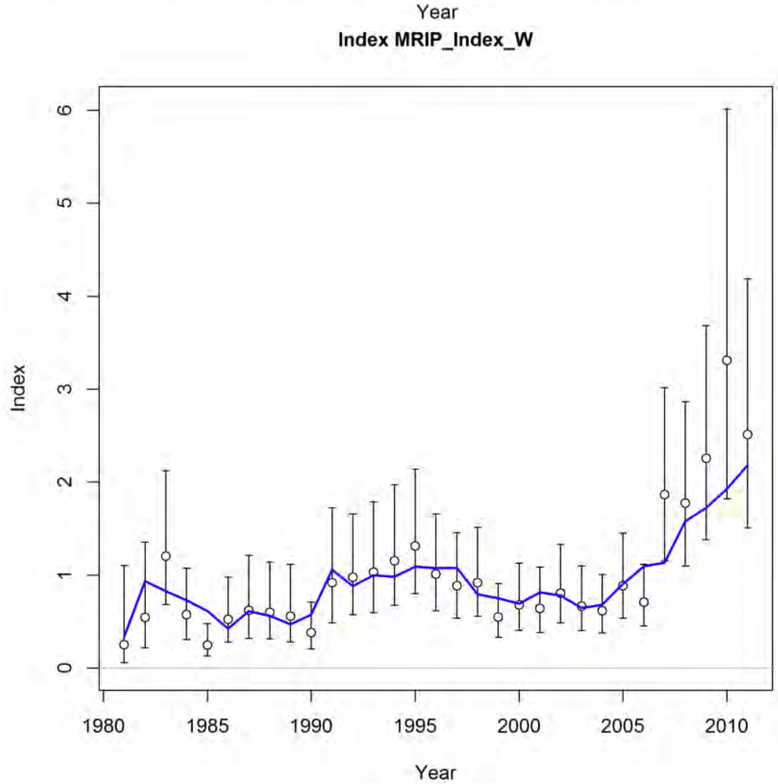




Figure 5.7. Observed and predicted private recreational fishery (MRIP) standardized index of abundance for Red Snapper in the eastern (top) and western (bottom) Gulf of Mexico, 1981-2011.

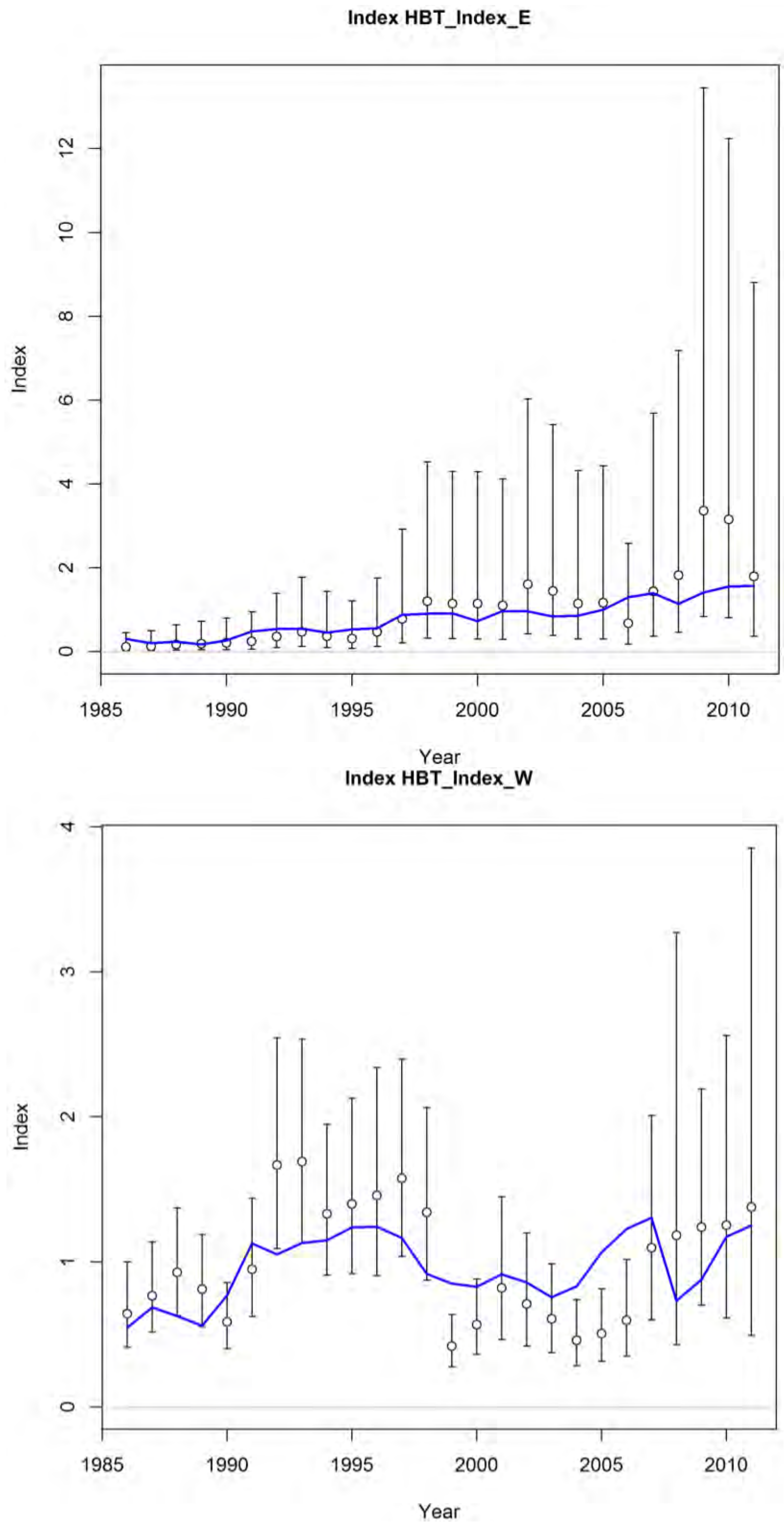



Figure 5.8. Observed and predicted recreational headboat fishery standardized index of abundance for Red Snapper in the eastern (top) and western (bottom) Gulf of Mexico, 1986-2011.

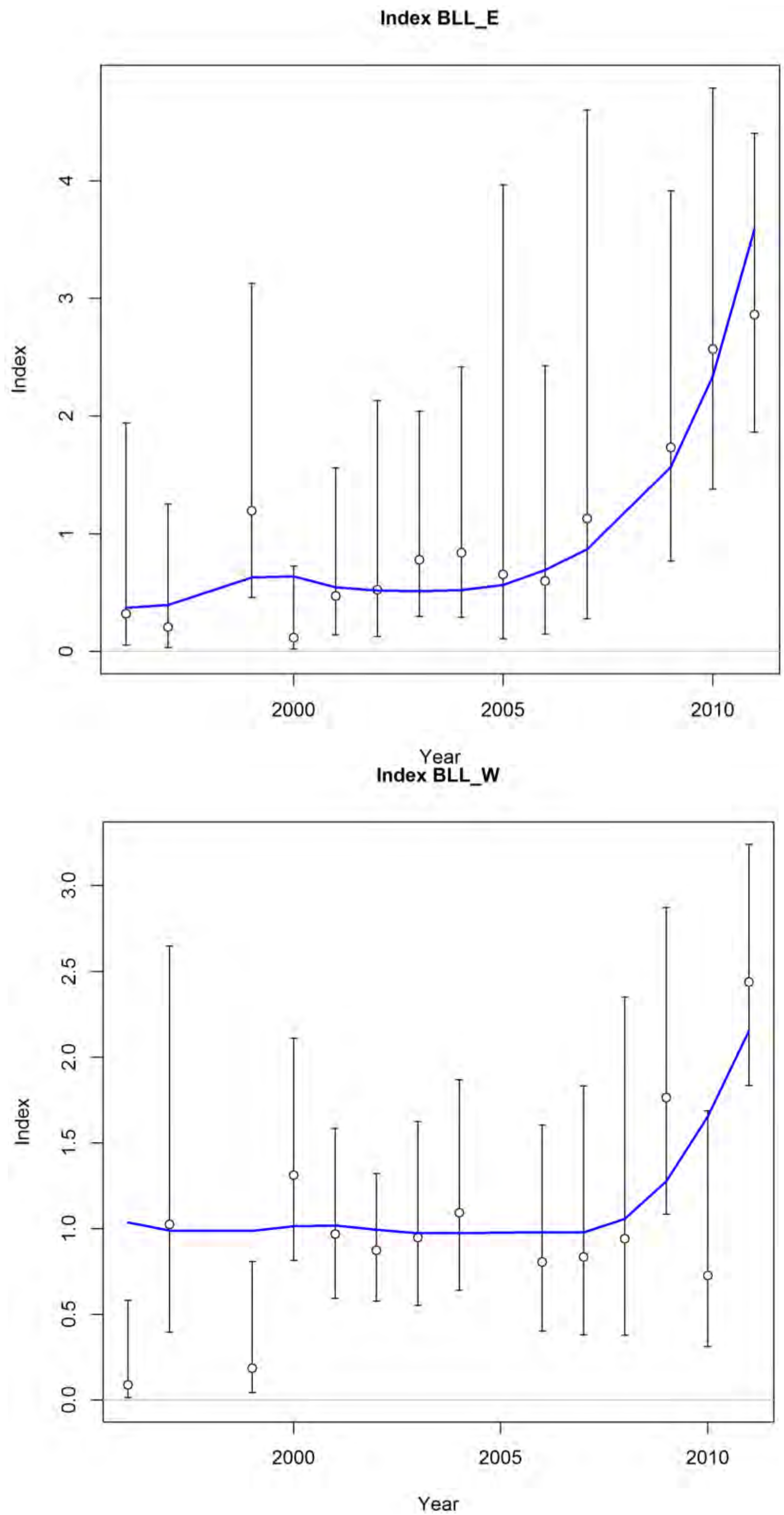



Figure 5.9. Observed and predicted index of abundance for Red Snapper in the eastern (top) and western (bottom) Gulf of Mexico from the NMFS bottom longline survey, 1996-2011.

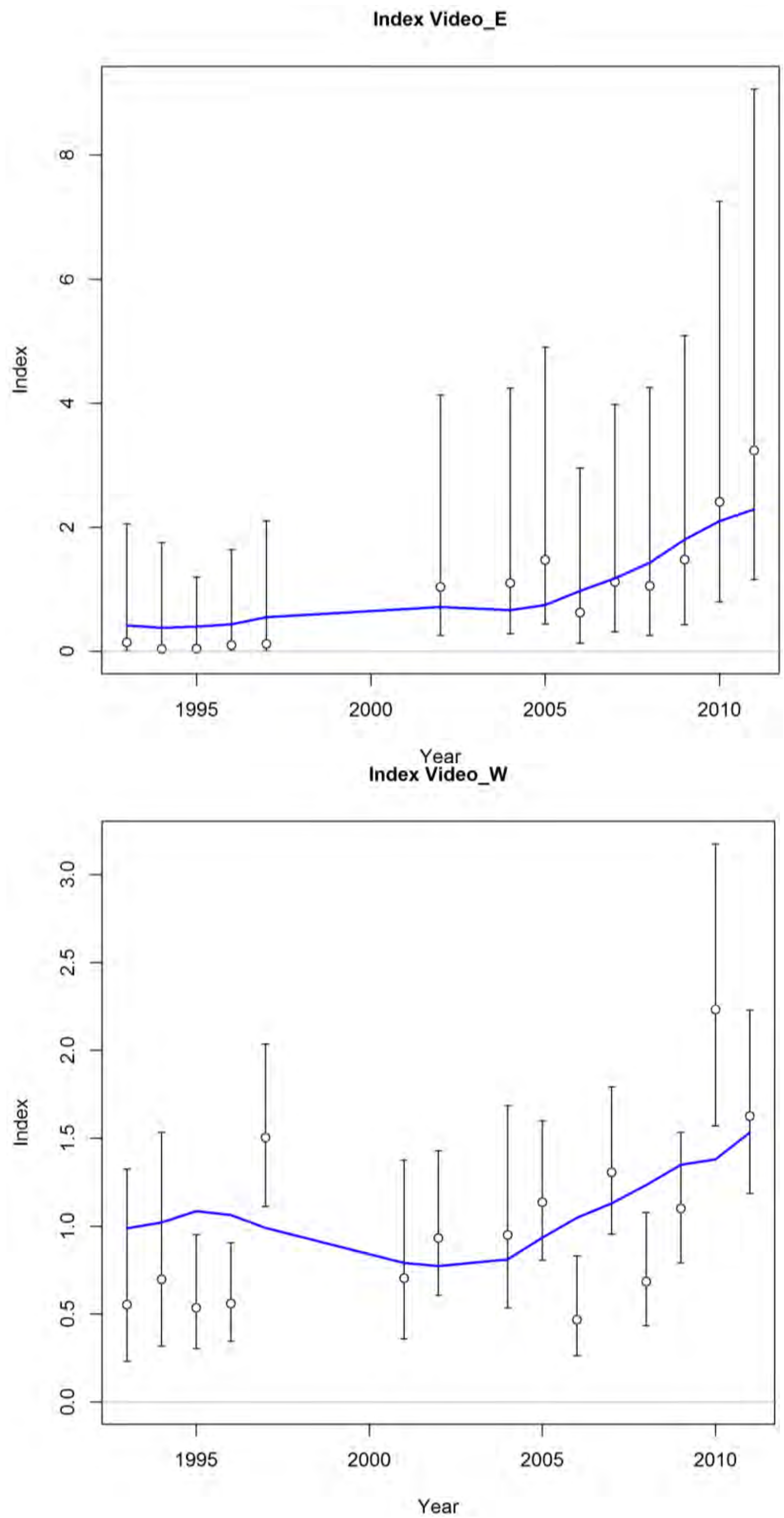



Figure 5.10. Observed and predicted index of abundance for Red Snapper in the eastern (top) and western (bottom) Gulf of Mexico from the SEAMAP reef fish video survey, 1993-2011.

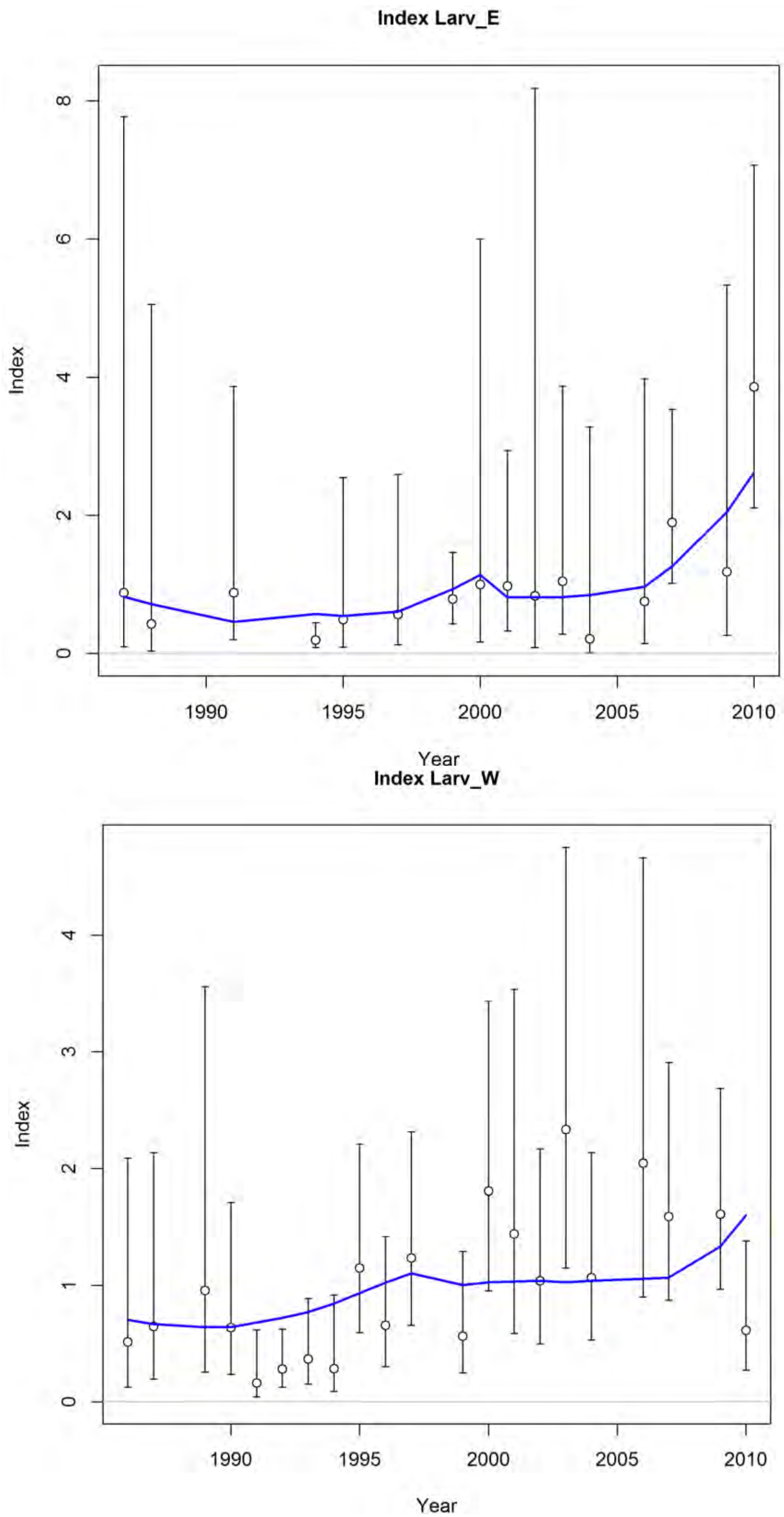



Figure 5.11. Observed and predicted index of abundance for larval Red Snapper in the eastern (top) and western (bottom) Gulf of Mexico from the SEAMAP Fall Plankton Survey, 1986-2011.

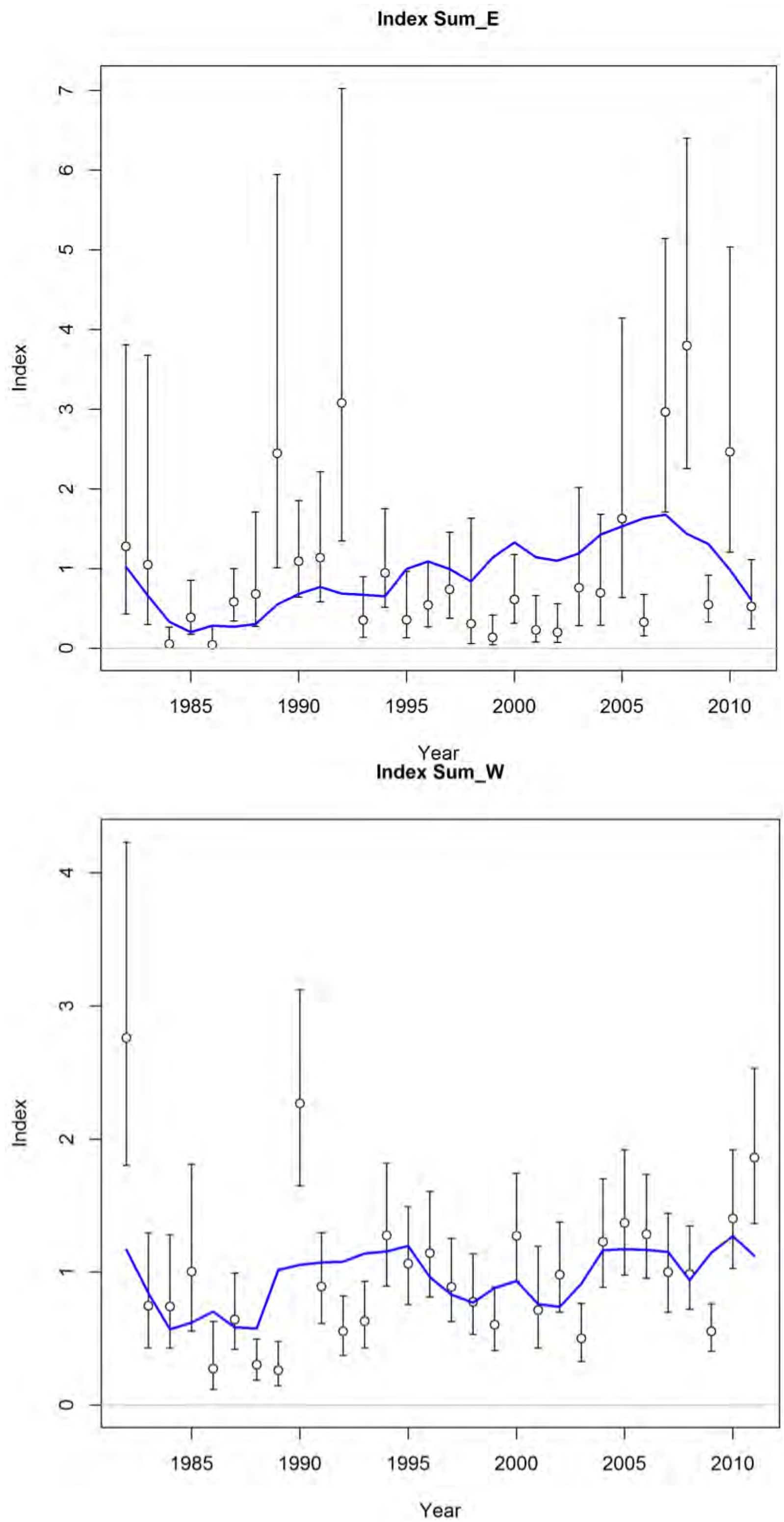



Figure 5.12. Observed and predicted index of abundance for Red Snapper in the eastern (top) and western (bottom) Gulf of Mexico from the SEAMAP groundfish summer survey, 1982-2011.

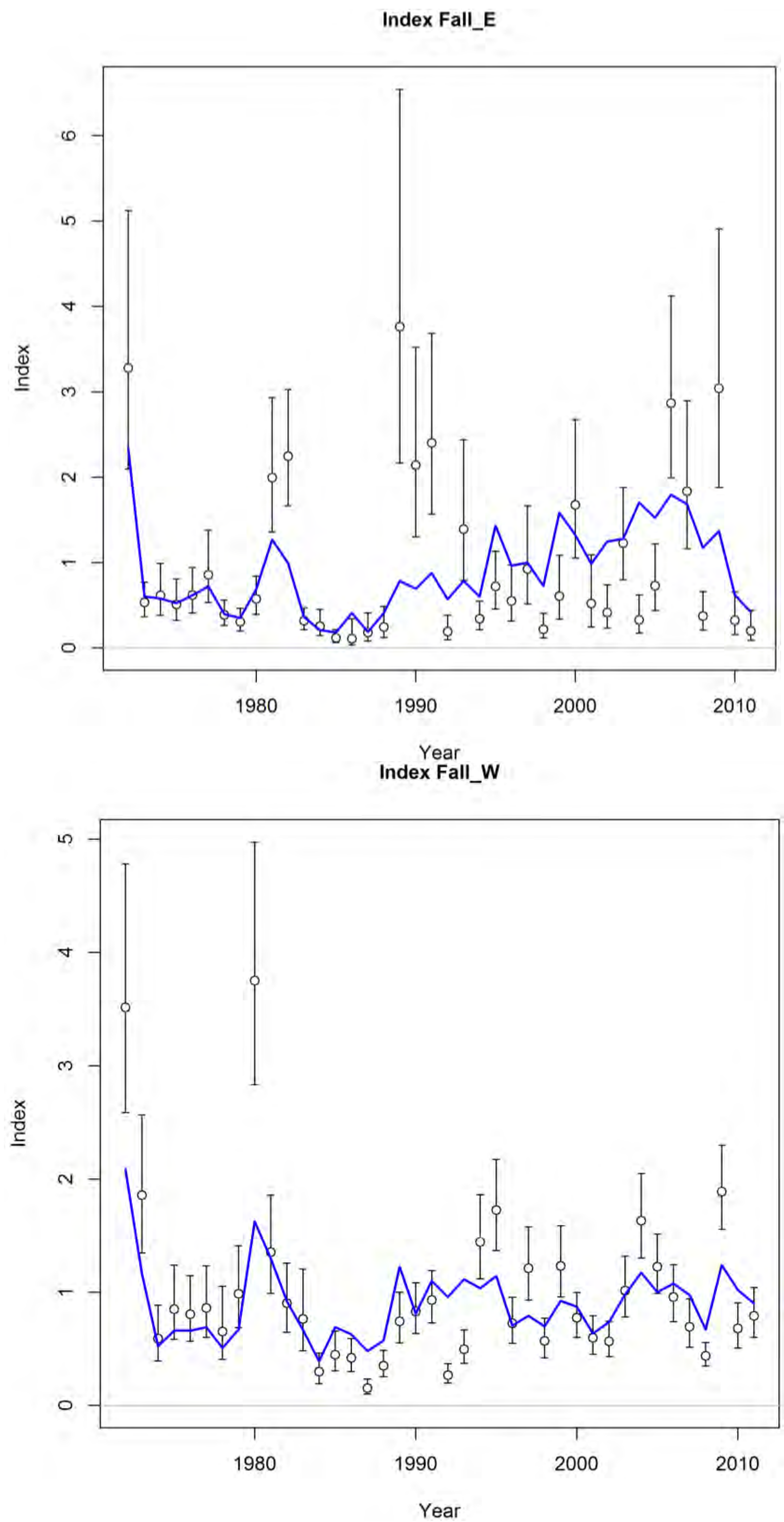



Figure 5.13. Observed and predicted index of abundance for Red Snapper in the eastern (top) and western (bottom) Gulf of Mexico from the SEAMAP groundfish fall survey, 1972-2011.

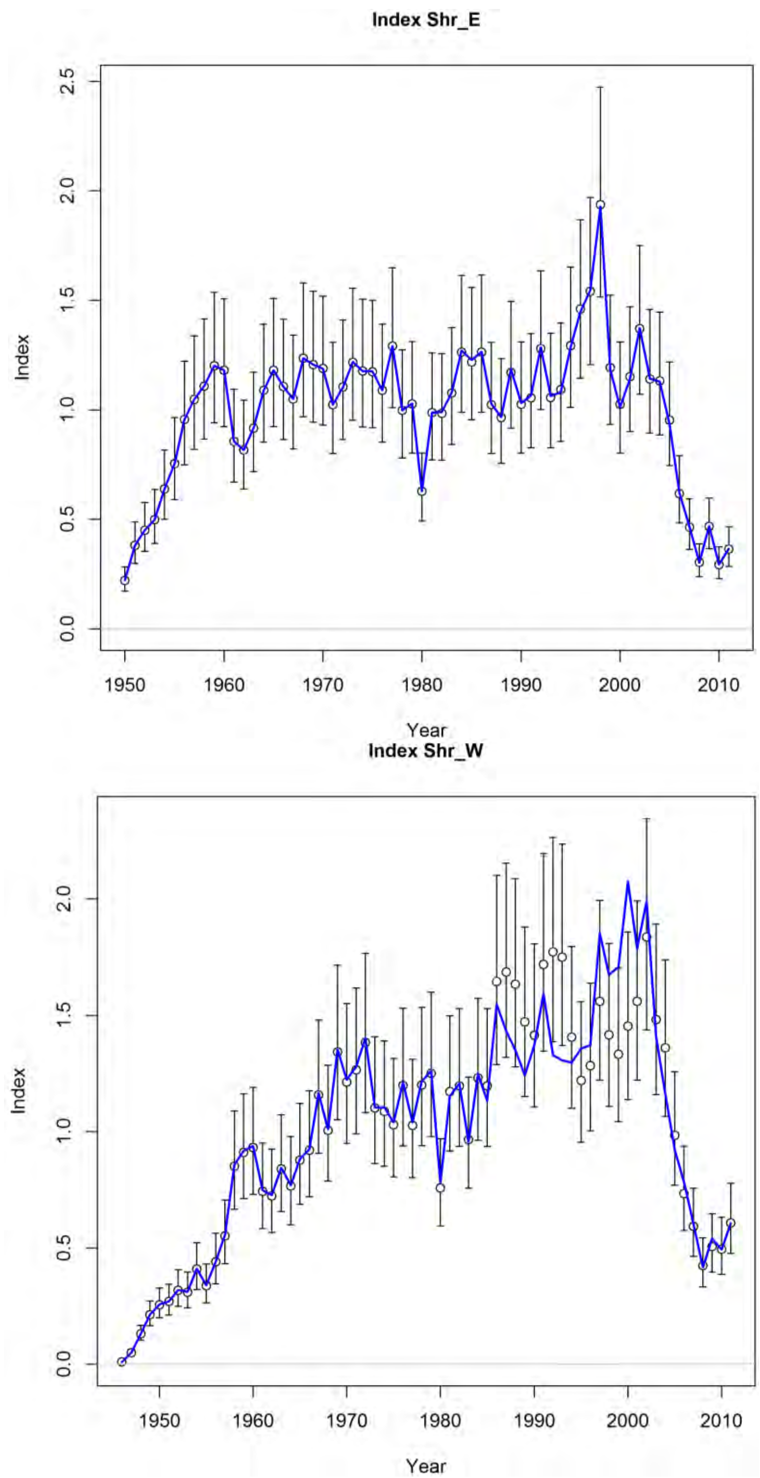



Figure 5.14. Observed and predicted index of fishing effort for the shrimp fishery in the eastern (top, 1950-2011) and western (bottom, 1946-2011) Gulf of Mexico.

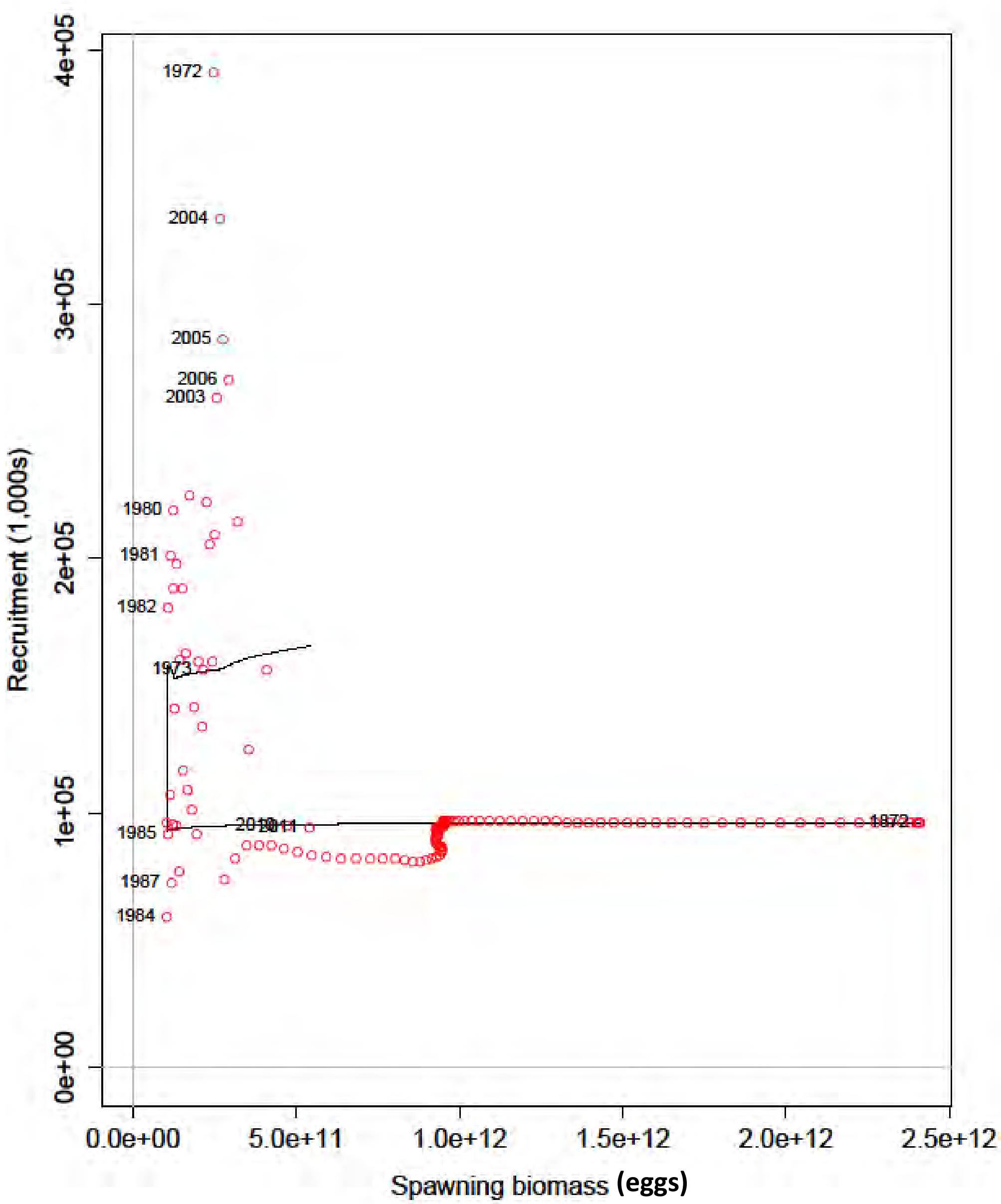



Figure 5.15. Predicted stock-recruitment relationship for Gulf of Mexico Red Snapper from SS base model configuration (steepness = 0.99, σR = 0.3). Plotted are predicted annual recruitments from SS (circles) and expected recruitment from the stock recruit relationship (black line). Labels are included on the first year, last year, and years with natural log deviations > 0.5.

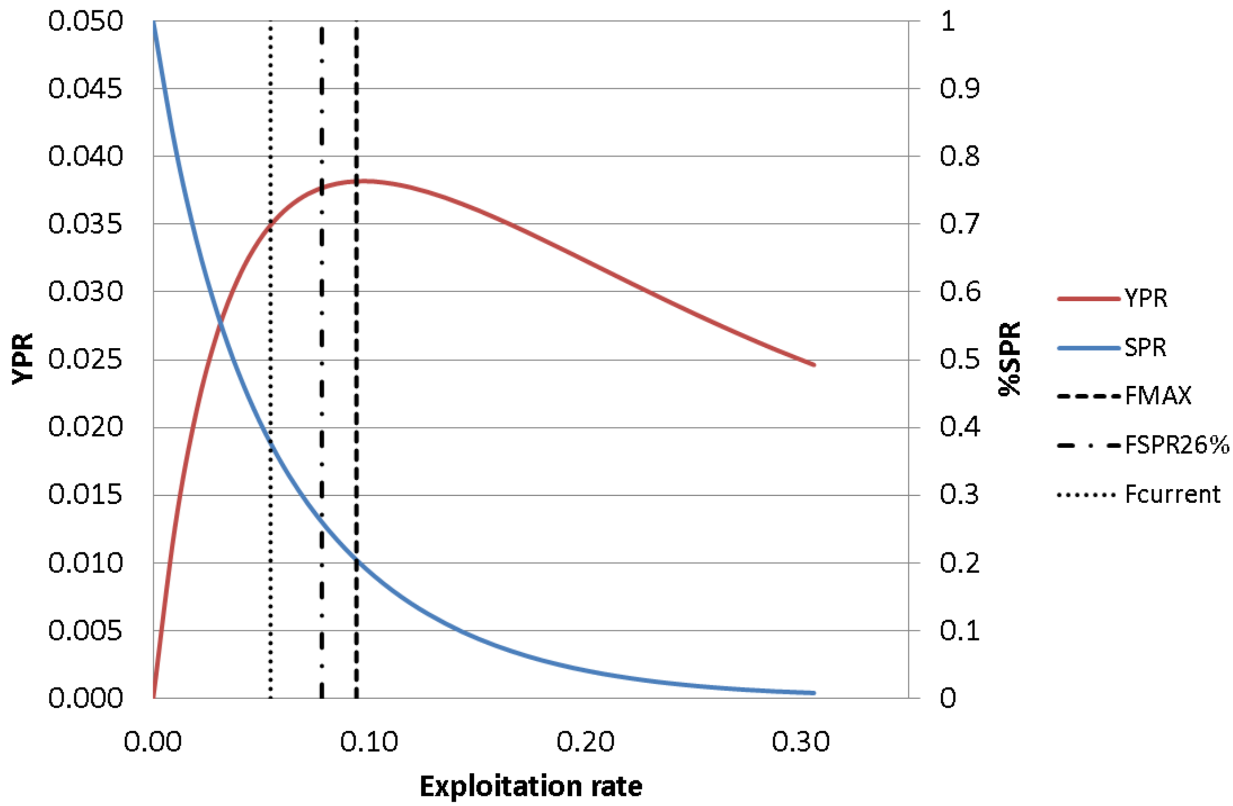



Figure 5.16. Yield per recruit (red line, in metric tons) and equilibrium spawning potential ratio (blue line) as a function of exploitation rate for Gulf of Mexico Red Snapper from the base model configuration (steepness = 0.99, σR = 0.3). Vertical lines represent $F_{MAX}$ (0.094), $F_{SPR26\%}$ (0.078), and $F_{Current}$ (0.054).

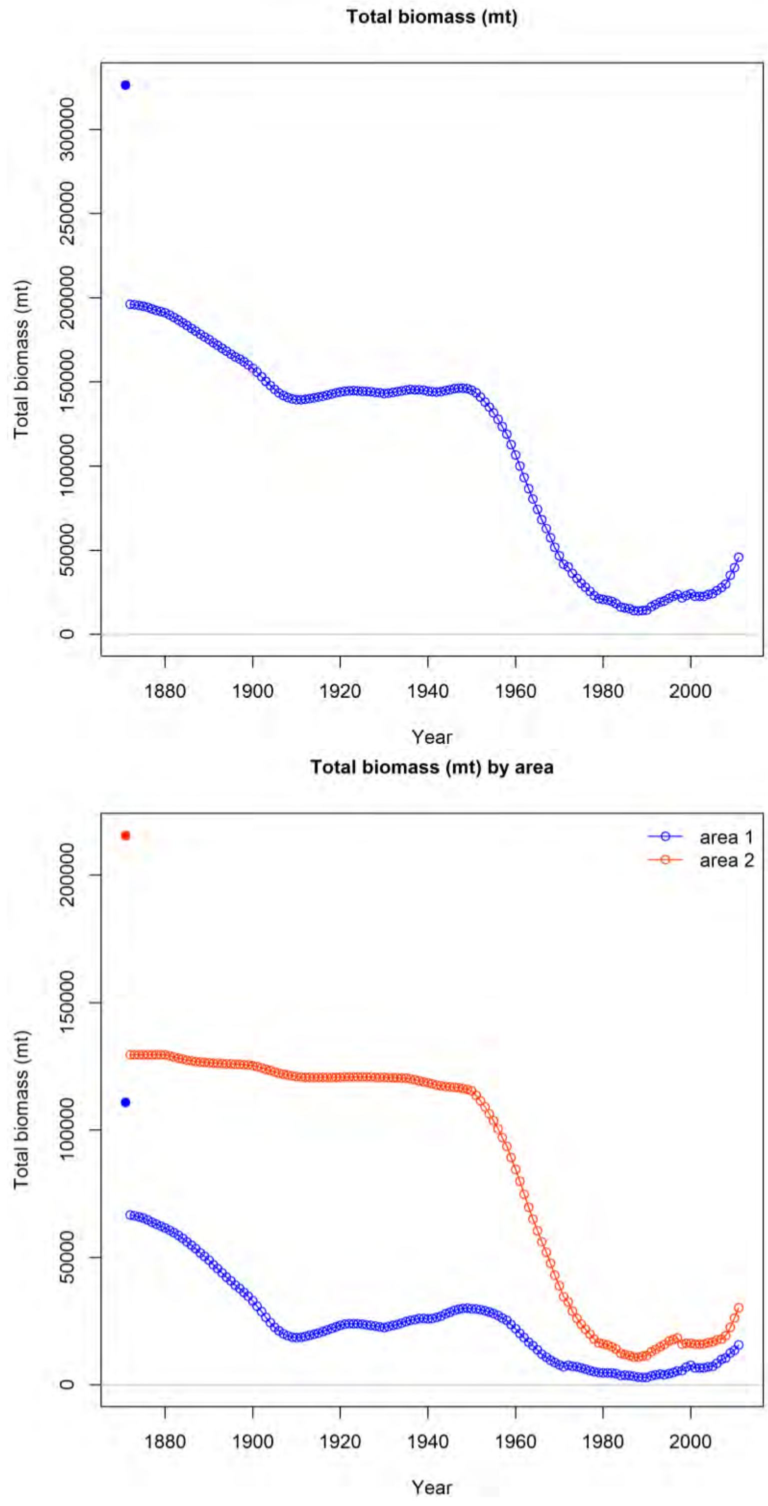



Figure 5.17. SS predicted total biomass for Gulf of Mexico Red Snapper from the base model run. The top panel represents east and west combined and bottom panel represents east and west separate.

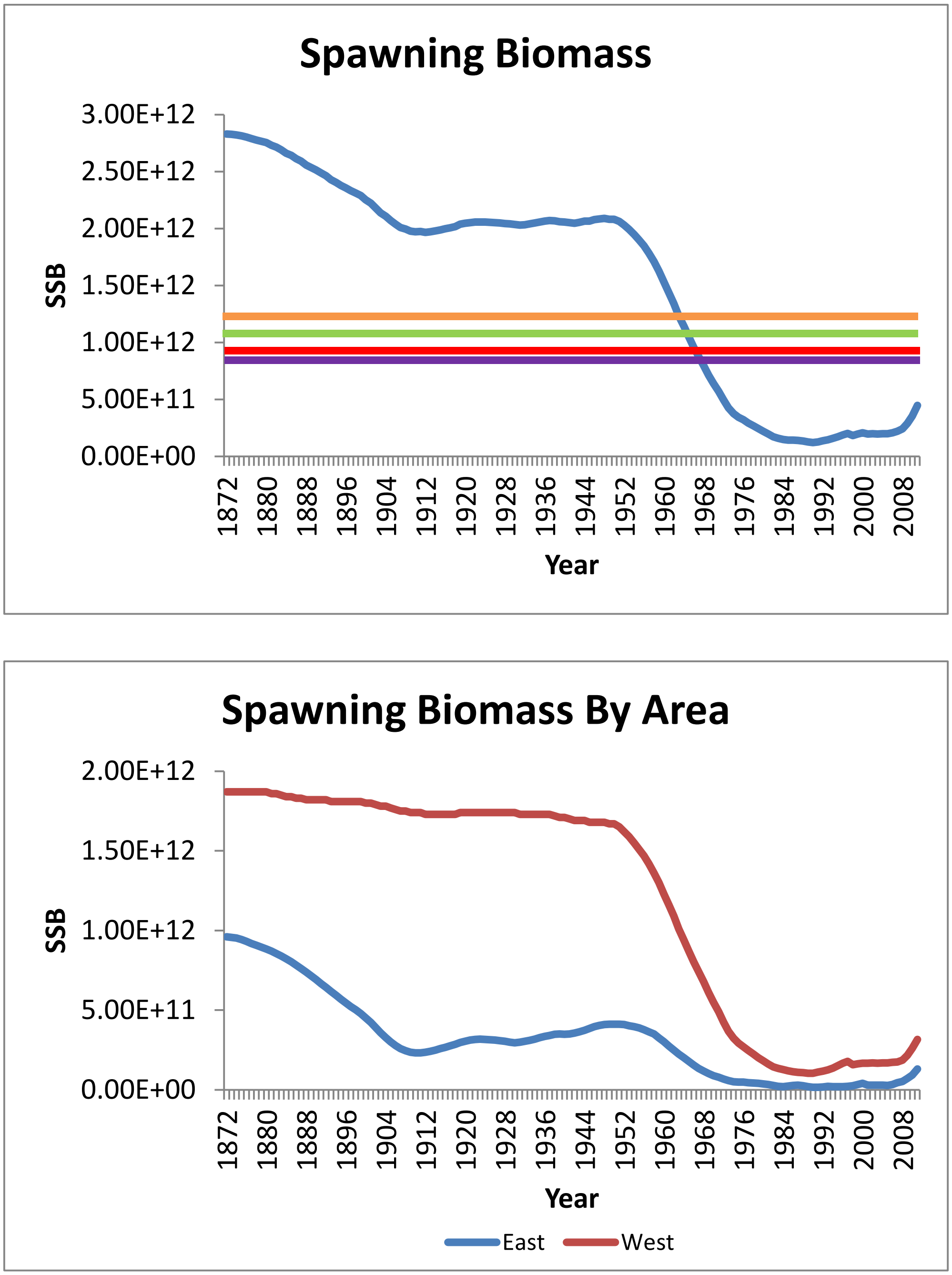



Figure 5.18. Spawning biomass (in number of eggs) for Gulf of Mexico Red Snapper from the base model run. The top panel represents east and west combined and bottom panel represents east and west separate. In the top panel, the colored horizontal lines refer to the following: orange- $SSB_{SPR26\%}$; green- MSST @ SPR 26%; red- $SSB_{MAX(SPR20\%)}$; MSST @ MAX (SPR 20%).

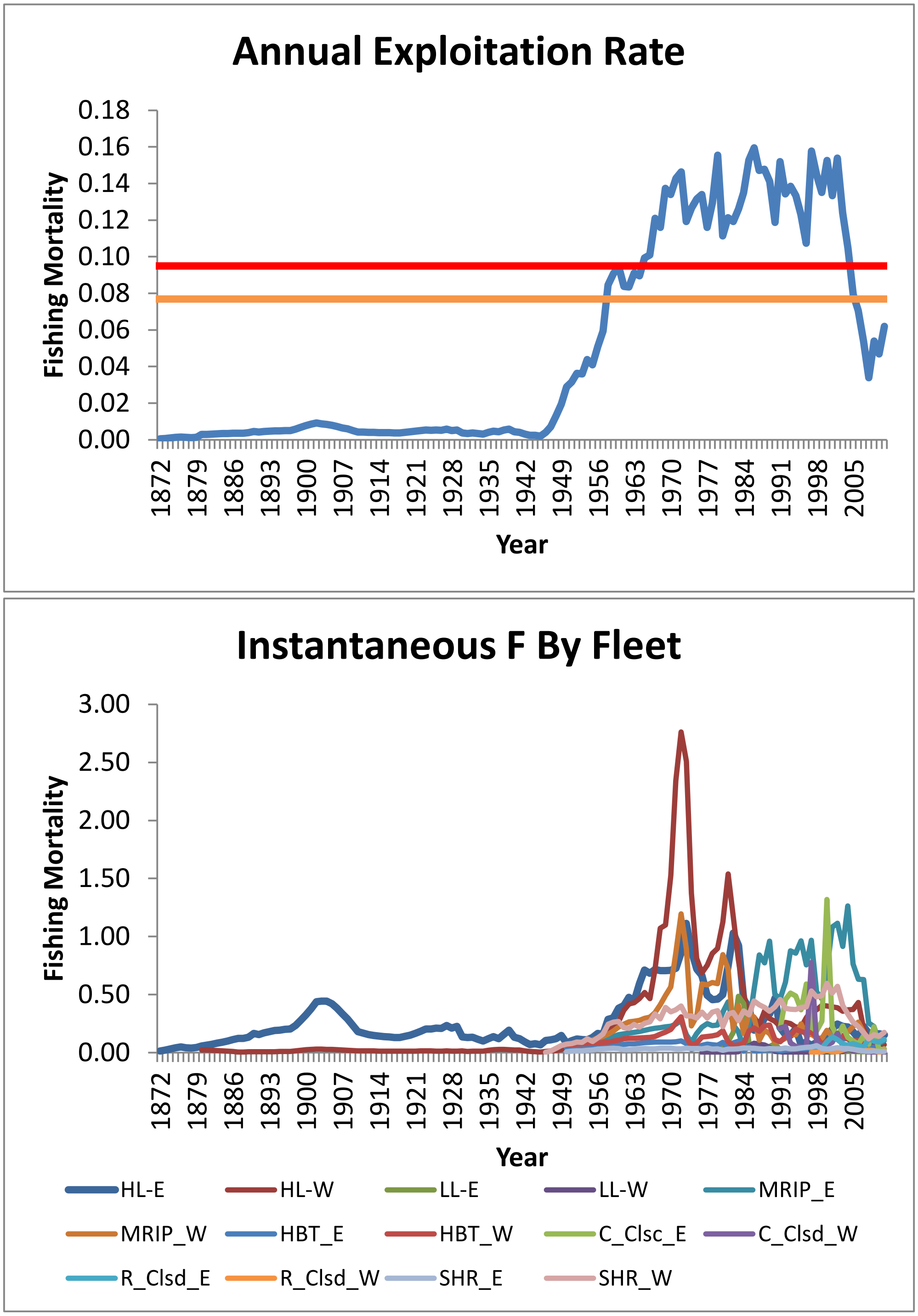



Figure 5.19. Predicted fishing mortality for Gulf of Mexico Red Snapper from SS for the base model configuration. This represents the fishing mortality level on the most vulnerable age class for each fleet. The top panel is annual exploitation rate and the bottom panel is fleet specific continuous fishing mortality. In the top panel, the colored horizontal lines refer to the following: red- MFMT @ MAX (SPR 20%); orange- MFMT @ SPR 26%.

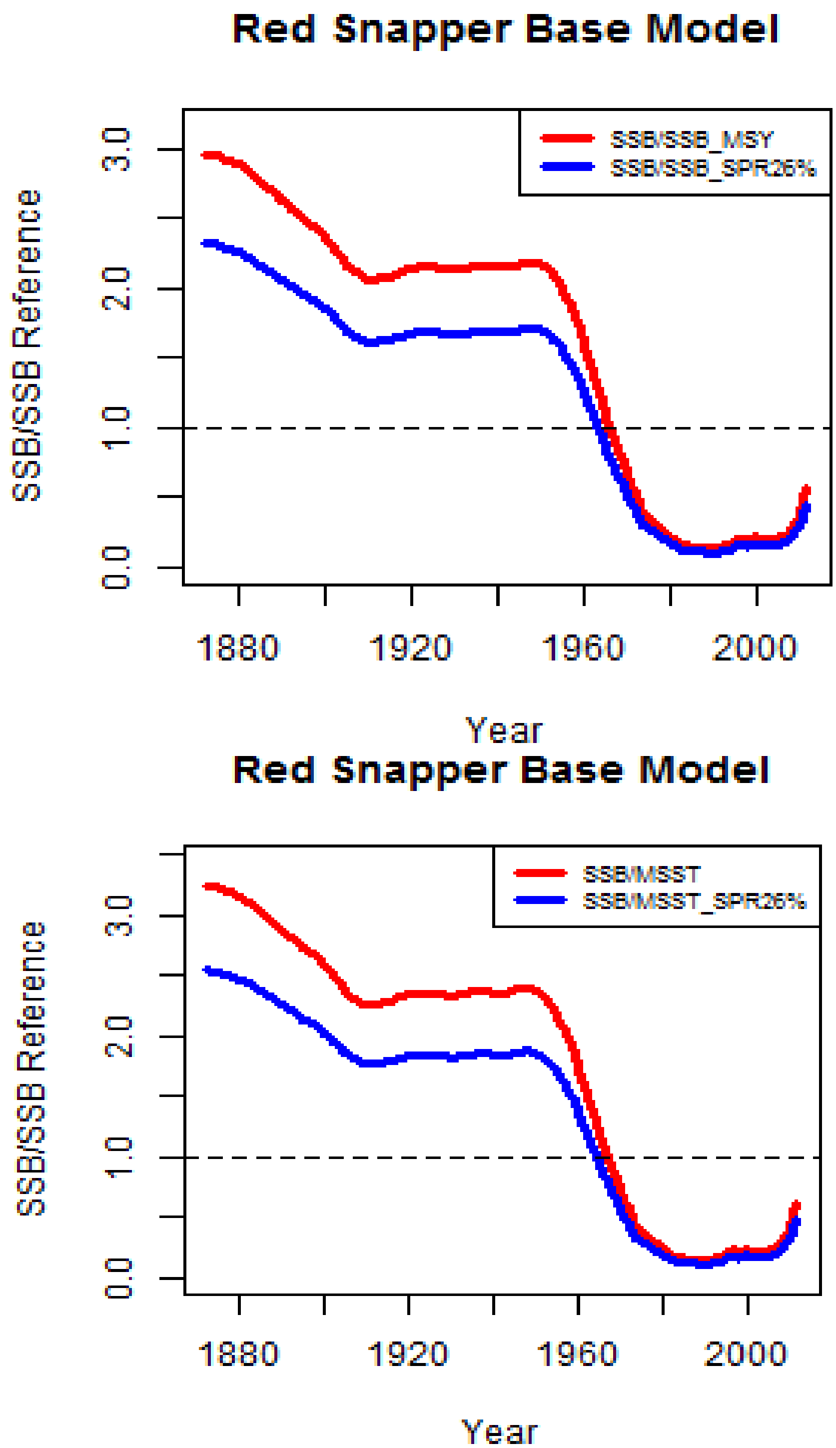



Figure 5.20. Estimated Red Snapper spawning stock biomass benchmarks for two scenarios (MSST at $F_{MAX}$ and MSST at $F_{26\%SPR}$).

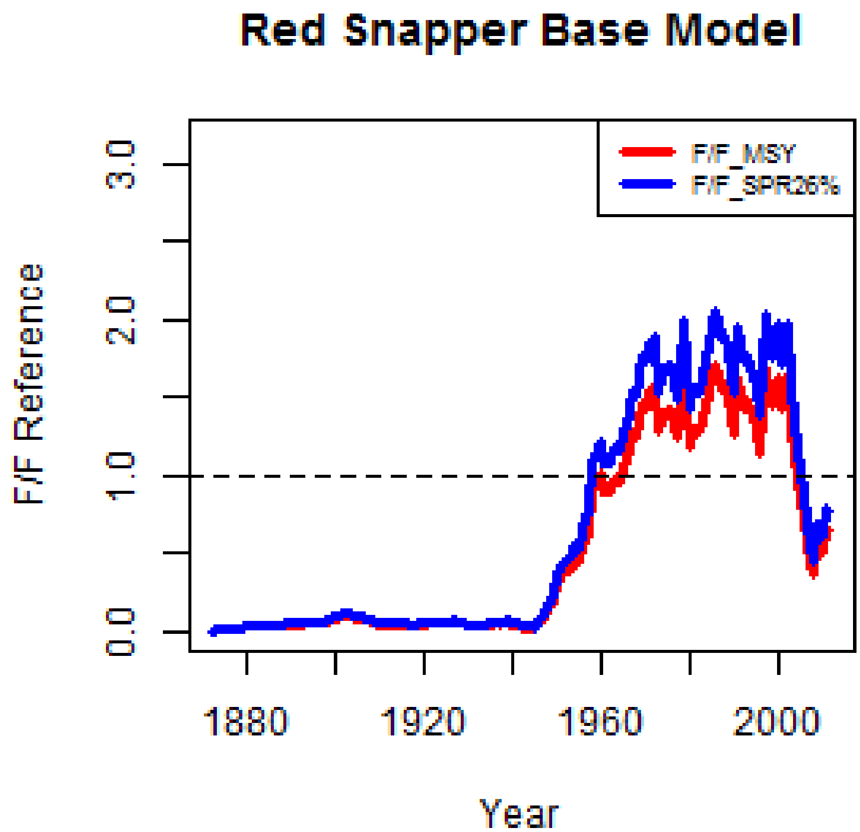



Figure 5.21. Estimated Red Snapper fishing mortality benchmarks for two MSRA scenarios (MSST at $F_{MAX}$ and MSST at $F_{26\%SPR}$).

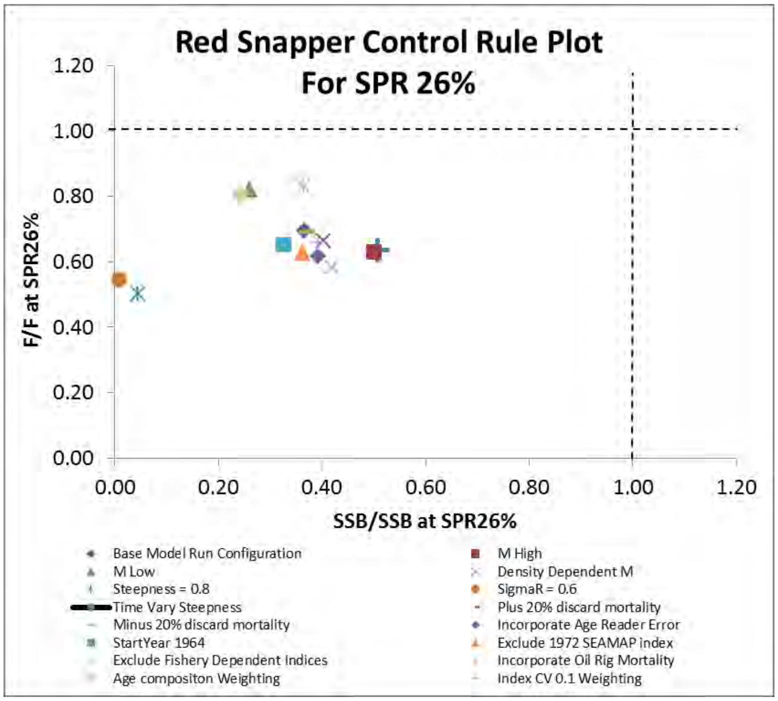



Figure 5.22. Gulf of Mexico Red Snapper control rule plot for the base SS model and 15 alternative sensitivity SS runs under the SPR26% status definition.

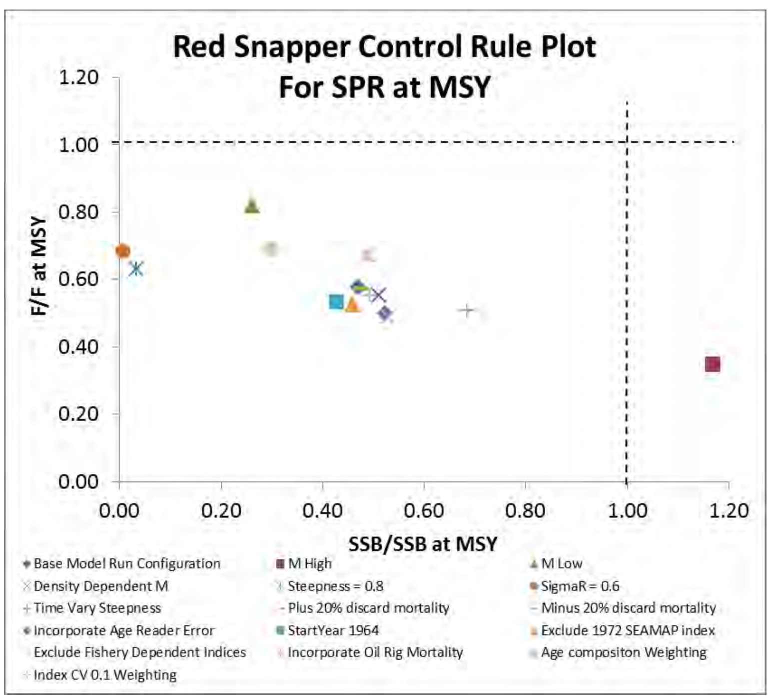



Figure 5.23. Gulf of Mexico Red Snapper control rule plot for the base SS model and 15 alternative sensitivity SS runs under the $SPR_{MSY} = SPR_{MAX}$ status definition.

## 6. SEDAR Abbreviations

| | |
|---|---|
| ABC | Acceptable Biological Catch |
| ACCSP | Atlantic Coastal Cooperative Statistics Program |
| ADMB | AD Model Builder software program |
| ALS | Accumulated Landings System; SEFSC fisheries data collection program |
| ASMFC | Atlantic States Marine Fisheries Commission |
| B | stock biomass level |
| BMSY | value of B capable of producing MSY on a continuing basis |
| CFMC | Caribbean Fishery Management Council |
| CIE | Center for Independent Experts |
| CPUE | catch per unit of effort |
| EEZ | exclusive economic zone |
| F | Fishing mortality (instantaneous) |
| FMSY | Fishing mortality to produce MSY under equilibrium conditions |
| FOY | Fishing mortality rate to produce Optimum Yield under equilibrium |
| FXX% SPR | Fishing mortality rate resulting in retaining XX% of the maximum spawning production under equilibrium conditions |
| FMAX | Fishing mortality that maximizes the average weight yield per fish recruited to the fishery |
| $F_0$ | Fishing mortality close to, but slightly less than, Fmax |
| FL FWCC | Florida Fish and Wildlife Conservation Commission |
| FWRI | (State of) Florida Fisheries and Wildlife Research Institute |
| GA DNR | Georgia Department of Natural Resources |
| GLM | General Linear Model |
| GMFMC | Gulf of Mexico Fishery Management Council |
| GSMFC | Gulf States Marine Fisheries Commission |
| GULF FIN | GSMFC Fisheries Information Network |
| M | natural mortality (instantaneous) |
| MARMAP | Marine Resources Monitoring, Assessment, and Prediction |
| MFMT | Maximum Fishing Mortality Threshold, a value of F above which overfishing is deemed to be occurring |
| MRFSS | Marine Recreational Fisheries Statistics Survey; combines a telephone survey of households to estimate number of trips with creel surveys to estimate catch and effort per trip |
| MRIP | Marine Recreational Information Program |
| MSST | Minimum Stock Size Threshold, a value of B below which the stock is deemed to be overfished |
| MSY | maximum sustainable yield |
| NC DMF | North Carolina Division of Marine Fisheries |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanographic and Atmospheric Administration |
| OY | Optimum Yield |
| SAFMC | South Atlantic Fishery Management Council |
| SAS | Statistical Analysis Software, SAS Corporation |
| SC DNR | South Carolina Department of Natural Resources |
| SEDAR | Southeast Data, Assessment and Review |

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|---|---|
| SEFSC | Southeast Fisheries Science Center, National Marine Fisheries Service |
| SERO | Southeast Regional Office, National Marine Fisheries Service |
| SPR | Spawning Potential Ratio, stock biomass relative to an unfished state of the stock |
| SSB | Spawning Stock Biomass |
| SSC | Science and Statistics Committee |
| TIP | Trip Incident Program; biological data collection program of the SEFSC and Southeast States. |
| Z | total mortality, the sum of M and F |

# SEDAR

## Southeast Data, Assessment, and Review

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## SEDAR 31
## Section II: Data Workshop Report

# **Gulf of Mexico Red Snapper**

## December 2012

SEDAR
4055 Faber Place Drive, Suite 201
North Charleston, SC 29405

## Table of Contents

# 1. Introduction

## 1.1 Workshop Time and Place

The SEDAR 31 Data Workshop for Gulf of Mexico Red Snapper (*Lutjanus campechanus*) was held August 20-24, 2012 in Pensacola, Florida.

## 1.2 Terms of Reference

1. Review stock structure and unit stock definitions, considering whether changes are required.
2. Review, discuss, and tabulate available life history information.
   - Evaluate age, growth, natural mortality, and reproductive characteristics
   - Provide appropriate models to describe growth, maturation, and fecundity by age, sex, or length as applicable
   - Evaluate the adequacy of available life-history information for conducting stock assessments and recommend life history information for use in population modeling, with particular emphasis on density-dependence
3. Recommend discard mortality rates.
   - Review available research and published literature
   - Consider research directed at red snapper as well as similar species from other areas
   - Provide estimates of discard mortality rate by fishery, gear type, depth, and other feasible or appropriate strata
   - Include thorough rationale for recommended discard mortality rates
   - Provide justification for any recommendations that deviate from the range of discard mortality provided in the last benchmark or other prior assessment
4. Provide measures of population abundance that are appropriate for stock assessment.
   - Consider and discuss all applicable fishery dependent and independent data sources
   - Document all programs evaluated; address program objectives, methods, coverage, sampling intensity, and other relevant characteristics
   - Provide maps of fishery and survey coverage
   - Develop fishery and survey CPUE indices by appropriate strata (e.g., age, size, area, and fishery) and include measures of precision and accuracy; rank indices with regard to their suitability for use in assessment modeling
   - Discuss the degree to which available indices adequately represent fishery and population conditions
   - Recommend which data sources are considered appropriate for use in assessment modeling
   - Complete the SEDAR index evaluation worksheet for each index considered
5. Characterize commercial and recreational catch, including both landings and discards in both pounds and number.
   - Evaluate and discuss the adequacy of available data for accurately characterizing harvest and discard by fishery sector or gear
   - Provide length and age distributions if feasible, and maps of fishery effort and harvest

- Provide maps of fishery effort and harvest

6. Evaluate the mortality rate of red snapper due to explosive rig removals, and whether such mortality is significant for inclusion in the assessment.
7. Describe any environmental covariates or episodic events that would be reasonably expected to affect population abundance.
8. Provide any information available about demographics and socioeconomics of fishermen, especially as they may relate to fishing effort.
9. Provide recommendations for future research, including guidance on sampling design, intensity, and appropriate strata and coverage.
10. Prepare the Data Workshop report providing complete documentation of workshop actions and decisions (Section II of the SEDAR assessment report).
    - Develop a list of tasks to be completed following the workshop
    - Review and describe any ecosystem consideration(s) that should be included in the stock assessment report

## 1.3 List of Participants

**Data Workshop Panel**

| | | | |
|---|---|---|---|
| Jason Adriance | LDWF | Robert Allman | NMFS |
| Neil Baertlein | SEFSC | Beverly Barnett | NMFS |
| Nancy Brown-Peterson | USM | Matthew Campbell | NMFS |
| Ching-Ping Chih | SEFSC | Dave Donaldson | GSMFC |
| Barbara Dorf | TPWD | Gary Fitzhugh | NMFS |
| Claudia Friess | OC | Benny Gallaway | LGL Consulting |
| Adyan Rios | SEFSC | Gary Graham | Texas Sea Grant |
| Wade Griffin | TAMU | John Ward | Economist |
| Walter Ingram | NMFS | David Krebs | Fisherman |
| Brian Linton | SEFSC | Joanne Lyczkowski-Shultz | NMFS |
| John Mareska | AL DNR | Kevin McCarthy | SEFSC |
| James Nance | NMFS | Mike Thierry | Fisherman |
| Adam Pollack | NMFS | Clay Porch | SEFSC |
| Steven Saul | SEFSC | Beverly Sauls | FWRI |
| Stephen Szedlmayer | Auburn | Vivian Matter | SEFSC |

**Council and Agency Staff**

| | | | |
|---|---|---|---|
| Ryan Rindone | SEDAR | Charlotte Schiaffo | GMFMC |
| Jessica Stephen | SERO | Patrick Davis | SEFSC |

**Data Workshop Observers**

| | | | |
|---|---|---|---|
| Helen Takade-Hammacher | EDF | Ted Switzer | FWRI |
| Matthew Vincent | Virginia Tech | John Winter | SEFSC |
| Bob McMichael | FWRI | Will Patterson | DISL |
| Shannon Cass-Calay | SEFSC | Marcus Drymon | DISL |

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|---|---|---|---|
| Sean Powers | DISL | Doug DeVries | NMFS |
| Stephanie Freed | FWRI | Joe Powers | LSU |
| Donnie Waters | Fisherman | Wayne Werner | Fisherman |
| Bob Zales II | Fisherman | Dave Gloeckner | SEFSC |
| Hannah Trowbridge | NMFS | David Walker | Fisherman |
| Russell Underwood | Fisherman | Mike Whitfield | Fisherman |
| Brian Gauvin | Photographer | Kerry Hurst | KC Fisheries Inc |
| Glenn Brooks | Fisherman | Glenn Brooks, Jr. | Fisherman |
| Carlos Llull | FWC | Terri Menzel | FWC |
| Jill Broome | FWC | Ian Rehrig | FWC |
| Troy Frady | Fisherman | | |

## 1.4 List of Data Workshop Working Papers

| Document Number | Title | Authors |
|---|---|---|
| **Data Workshop Documents** | | |
| SEDAR31-DW01 | Relative abundance of juvenile red snapper, *Lutjanus campechanus* in the northern Gulf of Mexico | Parsons |
| SEDAR31-DW02 | Brief overview on Gulf of Mexico Red Snapper IFQ Program | Stephen |
| SEDAR31-DW03 | Working Paper for Red Snapper Data Workshop (SEDAR 31) | Cowan, Boswell, Simonsen, Saari, and Kulaw |
| SEDAR31-DW04 | Recreational Survey Data for Red snapper in the Gulf of Mexico | Matter |
| SEDAR31-DW05 | Red snapper (*Lutjanus campechanus*) otolith ageing summary for collection years 2009-2011 | Allman, Barnett, Trowbridge, Goetz, and Evou |
| SEDAR31-DW06 | An Update to the Age Composition, Growth, and Density-Dependent Mortality in Juvenile Red Snapper Estimated from Observer Data from the Gulf of Mexico Penaeid Shrimp Fishery | Gazey, Gallaway, and Cole |
| SEDAR31-DW07 | Expanded Annual Stock Assessment Survey 2011: Red Snapper Reproduction | Fitzhugh, Lang, and Lyon |
| SEDAR31-DW08 | SEAMAP Reef Fish Video Survey: Relative Indices of Abundance of Red Snapper | Campbell, Rademacher, Felts, Noble, Felts, and Salisbury |
| SEDAR31-DW09 | Index of Abundance for Pre-Fishery Recruit Red Snapper from Florida Headboat Observer Data | O'Hop and Sauls |
| SEDAR31-DW10 | Length frequency distributions for red snappers in the Gulf of Mexico from 1984-2011 | Chih |
| SEDAR31-DW11 | A Summary of Data on the Size Distribution and Release Condition of Red Snapper Discards from Recreational Fishery Surveys in the Gulf of | Sauls |

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| | Mexico | |
| SEDAR31-DW12 | A comparison of the size and age of red Snapper, *Lutjanus campechanus*, to the age of artificial reefs in the northern Gulf of Mexico | Syc and Szedlmayer |
| SEDAR31-DW13 | Use of Ultrasonic Telemetry to Estimate Natural and Fishing Mortality of Red Snapper | Topping and Szedlmayer |
| SEDAR31-DW14 | Fine-scale Movements and Home Ranges of Red Snapper *Lutjanus campechanus* Around Artificial Reefs in the Northern Gulf of Mexico | Piraino and Szedlmayer |
| SEDAR31-DW15 | Spatio-temporal dynamics in red snapper reproduction on the West Florida Shelf, 2008-2011 | Lowerre-Barbieri, Crabtree, Switzer, and McMichael |
| SEDAR31-DW16 | Spatial distribution and occurrence of red snapper, *Lutjanus campechanus*, sampled off the Louisiana coast during nearshore trawl sampling efforts | Adriance and Sweda |
| SEDAR31-DW17 | Summary report of the red snapper (Lutjanus campechanus) catch during the 2011 congressional supplemental sampling program (CSSP) | Campbell, Pollack, Henwood, Provaznik, and Cook |
| SEDAR31-DW18 | On the comparisons of regional differences in the growth of red snappers from the Gulf of Mexico | Chih |
| SEDAR31-DW19 | Abundance Indices of Red Snapper Collected in NMFS Bottom Longline Surveys in the northern Gulf of Mexico | Ingram and Pollack |
| SEDAR31-DW20 | Red Snapper Abundance Indices from SEAMAP Groundfish Surveys in the Northern Gulf of Mexico | Pollack, Ingram, and Foster |
| SEDAR31-DW21 | Examining delayed mortality in barotrauma afflicted red snapper using acoustic telemetry and hyperbaric experimentation | Stunz and Curtis |
| SEDAR31-DW22 | Release mortality in the red snapper fishery: a synopsis of three decades of research | Campbell, Driggers, and Sauls |
| SEDAR31-DW23 | Release Mortality Estimates for Recreational Hook-and-Line Caught Red Snapper Derived from a Large-Scale Tag-Recapture Study in the Eastern Gulf of Mexico | Sauls |
| SEDAR31-DW24 | Fisheries-independent data for red snapper from reef-fish surveys on the West Florida Shelf, 2008-2011 | Switzer, Keenan, and McMichael |
| SEDAR31-DW25 | Estimated Conversion Factors for Adjusting MRFSS Gulf of Mexico Red Snapper Catch Estimates and Variances in 1981-2003 to MRIP Estimates and Variances | Rios, Matter, Walter, Farmer, and Turner |
| SEDAR31-DW26 | Developing a survey methodology for sampling | Moser, Pollack, |

| | | |
|---|---|---|
| | red snapper, *Lutjanus campechanus*, at oil and gas platforms in the northern Gulf of Mexico | Ingram, Gledhill, Henwood, and Driggers |
| SEDAR31-DW27 | Red Snapper (*Lutjanus campechanus*) larval indices of relative abundance from SEAMAP fall plankton surveys, 1986 to 2010 | Pollack, Hanisko, Lyczkowski- Shultz, Jones, and Ingram |
| SEDAR31-DW28 | Red Snapper Findings from the NMFS Panama City Laboratory Trap & Camera Fishery-Independent Survey – 2004-2011 | DeVries, Ingram, Gardner, and Raley |
| SEDAR31-DW29 | Artificial Structure and Hard-Bottom Spatial Coverage in the Gulf of Mexico | Mueller |
| SEDAR31-DW30 | Shrimp Fishery Bycatch Estimates for Gulf of Mexico Red Snapper, 1972-2011 | Linton |
| SEDAR31-DW31 | Calculated red snapper discards in the Gulf of Mexico commercial vertical line and bottom longline fisheries: preliminary results | McCarthy |
| SEDAR31-DW32 | Observer reported size distribution of Gulf of Mexico red snapper from the commercial vertical line and bottom longline fisheries | McCarthy |
| SEDAR31-DW33 | Using a Censored Regression Modeling Approach to Standardize Red Snapper Catch per Unit Effort Using Recreational Fishery Data Affected by a Bag Limit | Saul and Walter |

| **Reference Documents** | | |
|---|---|---|
| SEDAR31-RD01 | SEDAR 7 Stock Assessment Report | SEDAR |
| SEDAR31-RD02 | 2009 SEDAR 7 Update Assessment Report | SEDAR |
| SEDAR31-RD03 | Red Snapper 2011 Projections Update | SEFSC |
| SEDAR31-RD04 | Estimation of Fisheries Impacts Due to Underwater Explosives Used to Sever and Salvage Oil and Gas Platforms in the U.S. Gulf of Mexico | Minerals Management Service |
| SEDAR31-RD05 | Age Composition, Growth, and Density-Dependent Mortality in Juvenile Red Snapper Estimated from Observer Data from the Gulf of Mexico Penaeid Shrimp Fishery | Gazey, Gallaway, Cole, and Fournier |
| SEDAR31-RD06 | A Life History Review for Red Snapper in the Gulf of Mexico with an Evaluation of the Importance of Offshore Petroleum Platforms and Other Artificial Reefs | Gallaway, Szedlmayer, and Gazey |
| SEDAR31-RD07 | Addressing Time-Varying Catchability | SEDAR |

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| SEDAR31-RD08 | Fishery-Independent Catch of Young-of-the-Year Red Snapper in the Texas Territorial Sea, 1985–2007 | Dorf and Fisher |
| SEDAR31-RD09 | Red Snapper Management History | GMFMC |
| SEDAR31-RD10 | Home range and movement patterns of red snapper (*Lutjanus campechanus*) on artificial reefs | Topping and Szedlmayer |
| SEDAR31-RD11 | Genetic variation and spatial autocorrelation among young-of-the-year red snapper (*Lutjanus campechanus*) in the northern Gulf of Mexico | Saillant, Bradfield, and Gold |
| SEDAR31-RD12 | Determining policy-efficient management strategies in fisheries using data envelopment analysis (DEA) | Griffin and Woodward |
| SEDAR31-RD13 | Red Snapper Larval Transport in the Northern Gulf of Mexico | Johnson, Perry, Lyczkowski-Shultz, and Hanisko |
| SEDAR31-RD14 | Estimation of the Source of Red Snapper Recruits to West Florida and South Texas with Otolith Chemistry: Implications for Stock Structure and Management | Patterson, Cowan, Barnett, and Sluis |
| SEDAR31-RD15 | Trends in Gulf of Mexico Red Snapper Population Dynamics, 1979-85 | Parrack and McClellan |
| SEDAR31-RD16 | Effects of habitat complexity and predator exclusion on the abundance of juvenile red snapper | Piko and Szedlmayer |
| SEDAR31-RD17 | Survival and movement of hatchery-reared red snapper on artificial habitats in the northern Gulf of Mexico | Chapin, Szedlmayer, and Phelps |
| SEDAR31-RD18 | A Life History Review for Red Snapper in the Gulf of Mexico with an Evaluation of the Importance of Offshore Petroleum Platforms and Other Artificial Reefs | Gallaway, Szedlmayer, and Gazey |
| SEDAR31-RD19 | The use of otolith shape analysis for ageing juvenile red snapper, *Lutjanus campechanus* | Beyer and Szedlmayer |
| SEDAR31-RD20 | Validation of annual periodicity in otoliths of red snapper, *Lutjanus campechanus* | Szedlmayer and Beyer |
| SEDAR31-RD21 | The Artificial Habitat as an Accessory for Improving Estimates of Juvenile Reef Fish Abundance in Fishery Management | Szedlmayer |

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|---|---|---|
| SEDAR31-RD22 | Home range and movement patterns of red snapper (*Lutjanus campechanus*) on artificial reefs | Topping and Szedlmayer |
| SEDAR31-RD23 | Site fidelity, residence time and movements of red snapper *Lutjanus campechanus* estimated with long-term acoustic monitoring | Topping and Szedlmayer |
| SEDAR31-RD24 | Proximity Effects of Larger Resident Fishes on Recruitment of Age-0 Red Snapper in the Northern Gulf of Mexico | Mudrak and Szedlmayer |
| SEDAR31-RD25 | Estimates of Historic Recreational Landings of Spanish Mackerel in the South Atlantic Using the FHWAR Census Method | Brennan and Fitzpatrick |
| SEDAR31-RD26 | Declining Size at Age Among Red Snapper in the Northern Gulf of Mexico off Louisiana, USA: Recovery or Collapse? | Nieland, Wilson, and Fischer |
| SEDAR31-RD27 | Examination of Red Snapper Fisheries Ecology on the Northwest Florida Shelf (FWC-08304): Final Report | Patterson, Tarnecki, and Neese |
| SEDAR31-RD28 | Site Fidelity, Movement, and Growth of Red Snapper: Implications for Artificial Reef Management | Strelcheck, Cowan, and Patterson |
| SEDAR31-RD29 | Factors Affecting Catch and Release (CAR) Mortality in Fish: Insight into CAR Mortality in Red Snapper and the Influence of Catastrophic Decompression | Rummer |
| SEDAR31-RD30 | Effect of Circle Hook Size on Reef Fish Catch Rates, Species Composition, and Selectivity in the Northern Gulf of Mexico Recreational Fishery | Patterson, Porch, Tarnecki, and Strelcheck |
| SEDAR31-RD31 | Effect of trawling on juvenile red snapper (*Lutjanus campechanus*) habitat selection and life history parameters | Wells, Cowan, Patterson, and Walters |
| SEDAR31-RD32 | Habitat use and the effect of shrimp trawling on fish and invertebrate communities over the northern Gulf of Mexico continental shelf | Wells, Cowan, and Patterson |
| SEDAR31-RD33 | Site Fidelity and Movement of Reef Fishes Tagged at Unreported Artificial Reef Sites off NW Florida | Addis, Patterson, and Dance |
| SEDAR31-RD34 | Fish Community and Trophic Structure at Artificial Reef Sites in the Northeastern Gulf of Mexico | Dance, Patterson, and Addis |

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| SEDAR31-RD35 | A Review of Movement in Gulf of Mexico Red Snapper: Implications for Population Structure | Patterson |
| SEDAR31-RD36 | Size selectivity of sampling gears targeting red snapper in the northern Gulf of Mexico | Wells, Boswell, Cowan, and Patterson |
| SEDAR31-RD37 | Delineating Juvenile Red Snapper Habitat on the Northern Gulf of Mexico Continental Shelf | Patterson, Wilson, Bentley, Cowan, Henwood, Allen, and Dufrene |
| SEDAR31-RD38 | Habitat- and Region-Specific Reproductive Biology of Female Red Snapper (*Lutjanus campechanus*) in the Gulf of Mexico | Kulaw |
| SEDAR31-RD39 | Comparison of the Age and Growth of Red Snapper (*Lutjanus campechanus*) Amongst Habitats and Regions in the Gulf of Mexico | Saari |
| SEDAR31-RD40 | Oil Platforms and Red Snapper Movement and Behavior | McDonough |
| SEDAR31-RD41 | Reconstructed time series of shrimp trawl effort in the Gulf of Mexico and the associated bycatch of red snapper from 1948 to 1972 | Porch and Turner |
| SEDAR31-RD42 | Individual-based modeling of an artificial reef fish community: Effects of habitat quantity and degree of refuge | Campbell, Rose, Boswell, and Cowan |
| SEDAR31-RD43 | Literature Search and Data Synthesis of Biological Information for Use in Management Decisions Concerning Decommissioning of Offshore Oil and Gas Structures in the Gulf of Mexico | Versar, Inc. |
| SEDAR31-RD44 | The Environmental Effects of Underwater Explosions with Methods to Mitigate Impacts | Keevin and Hempen |
| SEDAR31-RD45 | Connections between Campeche Bank and Red Snapper Populations in the Gulf of Mexico via modeled larval transport | Johnson, Perry, and Lyczkowski-Shultz |
| SEDAR31-RD46 | The commercial landings of red snapper in the Gulf of Mexico from 1872 to 1962 | Porch, Turner, and Schirripa |
| SEDAR31-RD47 | Estimates of Historical Red Snapper Recreational Catch Levels Using US Census Data and Recreational Survey Information | Scott |
| SEDAR31-RD48 | MRFSS/MRIP Calibration Workshop: Ad-hoc Working Group Report | Salz, Miller, Williams, Walter, Drew, and Bray |

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| SEDAR31-RD49 | Survival of Red Grouper (*Epinephelus morio*) and Red Snapper (*Lutjanus campechanus*) Caught on J-Hooks and Circle Hooks in the Florida Recreational and Recreational-for-Hire Fisheries | Burns and Froeschke |
| SEDAR31-RD50 | Circle Hook Requirements in the Gulf of Mexico: Application in Recreational Fisheries and Effectiveness for Conservation of Reef Fishes | Sauls and Ayala |

# 2 Life History

## 2.1 Overview

The life history workgroup (LHW) reviewed and discussed data collected since the last Gulf of Mexico red snapper stock assessment in 2004 and offered recommendations. Updated information was examined on age, growth, reproduction, genetics, otolith chemistry, mortality, habitat and movement. A summary of the data presented, discussed and recommendations made is presented below.

### *2.1.1 Life History Workgroup Members*

Jason Adriance- Gulf Reef fish SSC
Robert Allman-NMFS, Panama City, FL, (leader)
Beverly Barnett-NMFS, Panama City, FL, (rapporteur)
Nancy Brown-Peterson- University of Southern Mississippi
Gary Fitzhugh- NMFS, Panama City, FL
Benny Gallaway- LGL Ecological Research Associates, Inc.
Joanne Lyczkowski-Shultz- NMFS, Pascagoula, MS
John Mareska- Gulf Reef fish SSC
Steve Szedlmayer- Auburn University
Matt Vincent- Virginia Tech University

### *2.1.2 The LHW group addressed the following topics*

1. Stock definitions and any evidence for changes to current east-west stock boundaries
2. Habitat Requirements
3. Natural mortality
4. Age
5. Growth
6. Reproduction
7. Movement and Migration
8. Conversion factors
9. Episodic events
10. Mortality due to oil and natural gas platform removals

## 2.2 Stock Definitions

The LHW continued to support the two stock model (East and West of the Mississippi River) for Gulf of Mexico red snapper. While there is some evidence that suggests this boundary line should be shifted to the east, the group did not feel there was enough compelling evidence to support moving the boundary line at this time. The LHW noted the recent genetic, otolith chemistry and oceanographic results are advancing our understanding that red snapper is clearly demonstrating metapopulation structure. The LHW emphasized that further studies need to be conducted to examine critical source populations (likely local) to gain better understanding of the metapopulation structure. Supporting evidence for the two stock model, as well as evidence for existing metapopulation structure, are described below.

### *2.2.1 Genetic results*

Spatial heterogeneity of red snapper was found to exist for two cohorts sampled in 2004 and 2005 (Saillant et al. 2010 SEDAR 31-RD-11). This is a significant result since it provides the first evidence of non-random spatial distribution of red snapper genotypes (Saillant et al. 2010 SEDAR 31-RD11). Significant positive autocorrelation (*r*) of microsatellite genotypes was found for red snapper collected from geographic scales of ~50 – 100 km indicating significant spatial genetic heterogeneity (Saillant et al. 2010 SEDAR 31-RD-11). These findings provide evidence that red snapper exhibit independent demographic assemblages at small geographic spatial scales (Saillant et al. 2010 SEDAR 31-RD11). Results from this study further support the findings that red snapper demonstrate a metapopulation stock-structure model proposed by Pruett et al. (2005) and Saillant and Gold (2006).

### *2.2.2 Otolith constituent analysis*

Patterson et al. (2010 SEDAR 31-RD-14) expanded on previously conducted otolith chemistry work to address three primary objectives: 1) estimate source(s) recruits to the west Florida shelf; 2) estimate connectivity between south Texas and northeast Mexico; and 3) estimate mixing rates east and west of the Mississippi River. Microconstituent analysis for three cohorts (2005, 2006, and 2007) provided good discrimination among four northern Gulf of Mexico nursery regions (EG = East Gulf; NCG = North Central Gulf; NWG = Northwest Gulf; and SWG = Southwest Gulf) and one region in Mexico (MEX1) (Patterson et al. 2010 SEDAR 31-RD- 14). The boundary used to separate NCG from NWG was longitude 89.0$^{o}$W and the boundary used to separate NWG from SWG was longitude 94.5$^{o}$W (Patterson et al. 2008). The boundary between NCG and EG was Cape San Blas, Florida, 85.1$^{o}$W. There was noted concern about the lack of discrimination between the NWG and NCG nursery regions in all three cohort-specific models. Misclassifications occurred by assigning NWG to NCG, and vice versa (Patterson et al. 2010 SEDAR 31-RD- 14). Sluis et al. (2012) suggested that similarities in chemical signatures may be the result of persistent hydrological and oceanographic processes. It is also important to note that the only regions successfully sampled during each of the three years were the SWG, NWG, and NCG regions (Patterson et al. 2010 SEDAR 31-RD- 14). Samples from EG were collected in 2005 and 2007(Patterson et al. 2010 SEDAR 31-RD- 14). Samples from MEX1 were collected in 2006 and 2007 (Patterson et al. 2010 SEDAR 31-RD- 14). Consequently, the only year for which all five regions were sampled was in 2007 (Patterson et al. 2010 SEDAR 31-RD-14). Patterson et al. (2010 SEDAR 31-RD-14) attempted to jointly model all three year classes to determine if a multi-year class model would allow nursery origins to be estimated for years that all regions had not been successfully sampled. However, the low classification (49%) for this multi-year-class model suggests that this approach would not be feasible (Patterson et al. 2010 SEDAR 31-RD-14). Red snapper age-0 chemical signatures have consistently shown significant differences among year-classes and regions supporting the need for age-0 samples to be collected and analyzed for each year-class and region (Patterson et al. 2010 SEDAR 31-RD-14; Patterson et al. 2008 Sluis et al. 2012).

Nursery region signatures were applied to sub-adult and adult signatures using maximum likelihood estimates (MLE) in order to assign nursery origin. The source of recruits to the EG was estimated as being derived primarily from local recruitment with the secondary source estimated as coming from the NCG and NWG (Patterson et al. 2010 SEDAR 31-RD-14). However, it is unclear as to the contribution, if any, that the NWG may have provided to the EG since the nursery chemical signatures from the NWG were similar to those of the NCG (Patterson et al. 2010 SEDAR 31-RD-14). Interestingly, tagging data further supports the NCG as a source of recruits to the EG and confirms a finding identified during the previous assessment (Addis et al. 2007 SEDAR 31-RD-33). Another trend that was noted was the NWG as a significant source of recruits to the NWG, SWG and NCG regions for the three years examined (Patterson et al. 2010 SEDAR 31-RD-14). Again, uncertainty remains in the connectivity between the NWG and NCG due to the similarities of the chemical signatures from these two regions (Patterson et al. 2010 SEDAR 31-RD-14). Regardless, results found in Patterson et al. (2010 SEDAR 31-RD-14) are consistent with a study conducted by Saillant and Gold (2006) which estimated the NWG as having an effective genetic population size of at least an order of magnitude greater than either the NCG or SWG regions (Saillant and Gold 2006), which further substantiates the importance of the NWG not only as a local source of recruits, but also as a significant source of recruits to other regions.

The possibility of recruits coming from Mexico (particularly Campeche Bank) to the US fishery has been an ongoing area of interest and investigation. Results for the contribution of MEX1 (Tamaulipas-Veracruz shelf) fish to south Texas indicate that MEX1 does not provide a significant source of recruits to south Texas or other western US Gulf regions despite the fact that MEX1 had distinct chemical signatures resulting in one of the highest LDF (linear discriminant function) classification accuracies in 2006 and 2007 (Patterson et al. 2010 SEDAR 31-RD-14). Samples were collected from Campeche Bank (MEX2) about three months later than in other regions in 2006 and 2007. Although individual fish were not aged, lengths were larger than age-0 fish collected from other regions suggesting a possible age discrepancy (Patterson et al. 2010 SEDAR 31-RD-14). Furthermore, some element: Ca and stable isotopes resulted in extreme values further suggesting a possible age disparity (Patterson et al. 2010 SEDAR 31-RD-14). As a result, MEX2 was excluded from further analyses (Patterson et al. 2010 SEDAR 31-RD-14). Consequently, the connection between Campeche and south Florida still remains an open question regarding application of otolith chemistry .

### *2.2.3 Models of Larval Transport*

Johnson et al. (2009) shows that there is an oceanographic mechanism to transport red snapper larvae from the western to eastern Gulf during the summer spawning period with eastward flow greatest in July. While there is evidence of a larval transport pathway around the Mississippi delta, the primary pathway is in deeper waters beyond the shelf break raising some uncertainty about successful settlement on the shelf east of the Mississippi River. Conversely, there is evidence for on-shelf exchange from east to west, occurring near the end of the spawning season ( September and October). By dropping simulated larvae into locations for 654 SEAMAP stations positive for red snapper larvae, Johnson et al. were able to map drift points (21 d forward, 11 d backward). The result was that most of the continental shelf from DeSoto Canyon westward (primarily western Mississippi Bight and Louisiana-Texas shelf) has the possibility of receiving larvae. The likelihood of transport to the west Florida shelf was much lower. The main topographic impediments to alongshore flow are the Mississippi River, DeSoto Canyon and the Apalachicola peninsula with the Apalachicola peninsula being most significant (Johnson et al. 2012).

To address the potential Mexican connection, Johnson et al. (2012) modeled possible advection of red snapper larvae from Campeche Bank. They found that retention of simulated larvae was high (67-73%) for model runs based upon 4 years (2003, 2005, 2008, 2010) of oceanographic data. In general there was very little likelihood for recruitment to other regions, although perhaps high enough for genetic homogenization. An estimate of 1.6% of the simulated larvae entered the Florida current with some potential for advection to the SW Florida shelf and Atlantic coast.

A significant synthesis by Johnson et al. (2012) notes that "depleted areas such as peninsular Florida are not likely to be enhanced by larval advection from either the more abundant northwestern population (Johnson et al. 2009) or Campeche Bank."

The LHW noted that while there are a lack of recruits coming from the Tamaulipas-Veracruz shelf (MEX1) to south Texas based on otolith chemistry, there may be a pathway for larval advection if egg production is sufficient. Zavala-Hidalgo (2003) developed a high resolution numerical model of the western Gulf and report an upshelf coastal confluence zone near 26. $5^{0}$ N (Statistical Grid 21) from May-August. The LHW notes this model covers an area of Mexican waters mainly west of investigation by Johnson et al (2012) and may be of interest for future monitoring and investigation.

## 2.3 Habitat Requirements

Spawning season for red snapper occurs April – October in US Gulf waters with peak fraction in spawning markers noted to occur late June – mid July (Fitzhugh et al. 2012 SEDAR 31-DW-07) Rooker et al. (2004)sampled red snapper larvae at Freeport Rocks Bathymetric High and found that larvae remained in the plankton for approximately 4 weeks . Fish settle out of the plankton about mid-June and continue recruiting to benthic habitat until mid-September (Szedlmayer and Conti 1999). Newly settled recruits can be found on multiple habitat types such as sand, mud, and shell rubble (Rooker et al. 2004). In the Fall, fish recruit to more structured habitats such as shell ridges, rock outcroppings, sand banks and artificial reefs (SEDAR 31-RD01). Parsons (SEDAR31-DW01) reported a significant relationship between relative abundance of juveniles and capture depth in early to late fall with higher catch rates in shallower waters compared to deeper waters. Syc and Szedlmayer (SEDAR 31-DW12) reported juvenile red snapper (approximately age-1) on newly deployed artificial reefs. Changes in diet also occur during the ontogenetic habitat shift resulting in an increase of benthic fauna and fish prey types (McCawley and Cowan 2007; Szedlmayer and Lee 2004). Diet was also reported as varying with diel cycles (Ouzts and Szedlmayer 2003). NMFS long-line surveys suggest that larger, older red snapper become more independent of structured habitat, being found more often on the open continental shelf (SEDAR31-RD01). Furthermore, landings from large, tournament-winning fish in Texas caught on mud bottoms with very small (< 1 $m^2$) structured relief (< 0.5 m) support this same conclusion (Landre, personal observation).

## 2.4 Natural Mortality

The models to be used for analysis of red snapper in SEDAR 31 will be CATCHEM_AD and Stock Synthesis (Porch 2007, Methot 2010). These models have the capacity to accept a distribution of informative priors, and estimate M within the model. That capacity reduces some of the need to specify a single estimate for M. However, other analytical methods that are intended to be run in the assessment process do require a specified value of M, or have difficulty in resolving M in some circumstances. Therefore, providing a good estimate of M for those cases will help evaluate the relative performance of the various models.

### *2.4.1 Age-0 and Age-1*

During the 2009 update assessment, natural mortality and means of parameterizing the assessment models were discussed and a decision was made to increase M to 2.0 (age-0) and 1.2 (age-1) (SEDAR31-RD02). New results were reviewed since the 2009 update, including three studies completed in no-trawl zones (Table 1) wherein estimates of Z could be assumed to approximate M (Wells et al. 2008 SEDAR31 RD32, Gallaway et al. 2009 SEDAR31-RD18, Szedlmayer 2011 SEDAR 31-RD21). The LHW noted similar results from these studies which provide further support for increasing estimates of M (particularly for age-0 in the range 2.0-3.4, Table 1) with the caveat that M at age-0 is likely density-dependent (see below).

Two presentations to the LHW on natural mortality in the juvenile stage were based upon broad regional results of trawl surveys and observer data. B. Gallaway presented a density dependent model of growth and survival applied to observer estimates of red snapper bycatch in the western Gulf shrimp fishery (introduced in Gazey et al. 2008 SEDAR31-RD05). Best fit results were age-0 Z = 2.2, and age-1 Z = 1.3 (Table 1). J. Walter presented preliminary new results of an earlier analysis in 2009 (Brooks et al. SEDAR31-RD02): Mortality was estimated via decline in numbers at age (based on size modes) between summer and fall SEAMAP surveys. Estimation accounted for survey trawl size-selectivity in age-0 and age-1 fish. Preliminary early estimates for age-0 M ranged from 2.65-5.6 and age-1 M from 2.01-3.6. This analysis will continue to be refined for the Assessment Workshop.

While the reviewed studies collectively suggest convergence of estimates and an increase in the age-0 estimate of M, the study authors generally acknowledged the potential for biased high estimates in some cases due to unaccounted emigration at particular sizes or juvenile stages. Szedlmayer (2011 SEDAR31-RD21) suggested emigration may be discounted in an Alabama study given a lack of correlation between diver estimates of age-0 red snapper density on artificial reefs and broad scale trawling results. That is, no spill-over effect was detected via trawling which suggests any emigration from reefs is minimal. The LHW noted this is challenging research and there is a need to expand studies to more habitats and regions and better understand survival in early life history as a function of habitat type and density (see recommendations).

### *2.4.2 Older age classes*

The LHW reviewed estimates of total disappearance (Z) and natural mortality (M) from catch curves and various equations (Table 2). From these functions the LHW developed a table of estimated M values as informative priors for the assessment (Table 3). Natural mortality (M) estimates ranged from 0.05 to 1.29. Calculated values of M fall into three groups based upon selected life history correlates. As expected, lowest values were generated from equations utilizing longevity of red snapper (>50 years; Alverson and Carney, Hoenig, and Hewitt and Hoenig). Equations that accounted for productivity in early life history (fast initial growth, relative early age of maturation) return higher estimates of M (Beverton and Holt, Pauly, Ralston, and Jensen) (Table 3, Figure 1).

Disappearance rates (Z) were obtained through catch curve analysis following Murphy (1997) for regression and Chapman-Robson approaches assuming steady state conditions. Numbers at age data from various fishing sectors for the period 2009-2011 were examined using peak-age and right truncation criteria (Murphy 1997, Table 4). Estimates of Z ranged from 0.1222 to 1.064. Values of Z were highest (> 1.0) among handline sectors (commercial and recreational) in the eastern Gulf. Higher values have been recently reported by Patterson et al. 2010 from the northeastern Gulf (1.24 – 1.31; artificial and natural reef respectively) which reflect a large degree of fishing mortality and possible emigration (e.g. ontogenetic movement to deeper water).

Lowest values of Z (about 0.1) were evident from long-line gear (fishery-dependent and – independent sources) from the western Gulf which is in accordance with older red snapper age structure in the west and susceptibility of oldest ages at deepest depths to longline gear. The true value of Z should be considered as an upper limit of M, since with no fishing and no emigration Z=M. The true value of M is rarely determined because it should be calculated from an unfished population, which requires sampling a population before the onset of fishing. However, the LHW learned that some areas of the Gulf outer shelf may have experienced relatively low fishing effort historically (e.g., shrimp grids 20 and 21; Kit Doncaster and Gary Graham Pers. Comm.). These areas have high proportions of red snapper aged > 20 years (see Age section) and would likely return the lowest values of Z which approach longevity-based estimates of M. Given the longline results, estimates of M based upon longevity (e.g. Hoenig regression based estimate for fish = 0.075) may be a reasonable prior for oldest ages (Figure 1).

Notwithstanding low natural maturity rate in red snapper due to longevity >50 years, and high rates in ages-0 and -1, there is evidence that M may be of some intermediate value in ages > 1 consistent with the idea that M declines rapidly with age. Topping and Szedlmayer (2011 SEDAR31-10) provide some direct evidence for this. Using telemetry, M for red snapper >500 mm TL (predominately thought to be age 3), was estimated at 0.12 to 0.22 when catch (F) was accounted for (Table 1).

The Data Workshop panel supported the approach to incorporate declining natural mortality rate with age as in the previous assessment (Figure 2). However, there is more information that natural mortality is higher among earlier ages (particularly age-0 but also ages 1-3) than previously estimated. Conversely, M may be lower at oldest ages (<0.1) due to longevity estimates. The panel noted that while the Lorenzen approach (1996) for age-variable mortality has been used in assessments of other species (an example for red snapper is shown in Figure 2) another type of function may be appropriate to account for higher expected mortality of age-1 to age 3+ red snapper. This analysis will continue going forward to the Assessment Workshop.

### *2.4.3 Density Dependence in Mortality*

The potential for density dependence in mortality of juvenile red snapper was raised in SEDAR-7 (update 2009) and was also recently presented as a greater issue for fisheries in general (Lorenzen 2008). Therefore, one of the terms of reference for SEDAR 31 was to further examine the evidence for density dependent mortality in early life history.

B. Gallaway presented the Gazey et al. (2008 SEDAR 31-RD5) modeling approach to the LHW updated to July 2012. The model incorporates growth and mortality to explain observed size red snapper juvenile distributions over time from the shrimp fishery observer data. Despite a 74% reduction in shrimp effort to date, there is no evidence for an increase in the red snapper recruitment index (based on standardized by-catch abundance). This provides strong inference that some other population regulatory mechanism is in effect. The most parsimonious model fit incorporated VBGF and density-dependent mortality.

J. Walter presented preliminary results to the LHW of an updated analysis of SEAMAP trawl survey data which similarly models changes in numbers at length (hence age) (Brooks et al. SEDAR31-RD02). In this approach, the most parsimonious model fits also included density-dependence modeled as a power function of abundance.

Given the evidence highlighted by the modeling efforts, the Data Workshop panel recommends incorporation of density dependence in age-0 mortality into assessment model runs. Notably, a paper is in press which outlines a modeling approach to simultaneously account for density-dependent mortality and bycatch in age-0 red snapper (Forrest et al. in press). The panel recognized this work will continue through the Assessment Workshop.

The LHW also discussed alternative interpretations of an apparent density dependent effect in early mortality. These included the possibility of density-independent increases in M and the possibility of supplemental recruitment to account for the lack of a significant stock-recruit signal (see stock delineation section). Further investigation (modeling, research) into possible alternatives are recommended (below).

### *2.4.4 Comments on Adequacy of Data for Assessment Analyses*

Natural Mortality: The LHW recommends model sensitivity runs using M as age-fixed values (age-0 and age-1, age>1) and as an age-variable value (Lorenzen M or other approach). As in earlier SEDARs, the LHW believes an age-variable approach is more realistic and thus the preferred approach.

Review the data for bycatch reduction (BRD) efficiency. Point estimates of efficiency may better inform model fit of density dependence by accounting for possible confounding BRD effect (e.g. Gallaway and Cole 1999).

### *2.4.5 Recommendations*

1. Review the evidence for density dependence in older ages (e.g. ages 2-3). Incorporate full age model of recruitment to examine density-dependent effect.

2. Site and habitat specific comparisons from more regions of the Gulf are needed for estimation of age-0 and age-1 mortality, accounting for shelf characteristics (e.g., width, slope, depth) in tests of density-dependent variation in M and emigration.

3. Broader understanding of habitat value and areal estimates of habitat (distribution—areas of trawlable vs. untrawlable bottom; more refined maps Gulf-wide etc) are needed to further inform the habitat limitation hypothesis for density dependence.

4. Assess the impact of potential predation/competition for taxa of particular interest (lionfish, marine catfish, sciaenids, and red grouper). As well, investigate alternative population regulatory mechanisms including potential sources of density-independent increases in mortality and distant sources of recruitment (but see stock delineation section).

5. Evaluate the potential for sea-bottom restoration or other means to expand habitat and increase survival for post-settlement red snapper.

## 2.5 Age

Numerous studies have used otoliths to age red snapper and provide basic information on growth and annulus formation (Futch and Bruger, 1976; Bortone and Hollingsworth, 1980; Nelson and Manooch, 1982; Wilson and Nieland, 2001; Manooch and Potts, 1997; Patterson et al., 2001). The age of red snapper has been directly validated to at least 38 years using bomb radio carbon $^{14}C$ and longevity estimates exceed 50 years (Baker and Wilson, 2001). Additionally, red snapper otolith reader interpretation and the repeatability of age estimates (i.e., precision) have been examined (Allman et al., 2005).

A total of 24,669 red snapper otoliths were aged for SEDAR 31 by NOAA Fisheries Panama City laboratory (N= 17,305; Allman et al. 2012 SEDAR31-DW05) and Gulf States Marine Fisheries Commission (N= 7,364). Otoliths were from fishery dependent and independent sources covering sampling years 2009 through 2011 and covered all gulf states (Table 5 & 6). The Gulf States Marine Fisheries Commission held annual otolith workshops to standardize ageing methods and estimates of reader precision were determined from a red snapper otolith reference collection which was aged annually by all gulf state ageing red snapper and NOAA Fisheries Panama City. We considered an average percent reader error (APE) of 5% as a reference point for a moderately long-lived difficult species to age species such as red snapper (Morison et al. 1998; Campana et al. 2001). APE's for Gulf of Mexico laboratories ageing the red snapper reference collection ranged from 2.2% to 5.6%.

A comparison of age distributions by fishing mode indicated differences by fishing mode and by sampling year. Red snapper collected from 2009 through 2011 ranged from young-of-the-year (<1 year) to 55 years. The smallest youngest individuals were collected from fishery independent survey trawls (mean 1.9 yr) and traps (mean 3.7), while the largest, oldest individuals were collected from the commercial and fishery independent long-lines (mean 5.6 and 8.9 yr. respectively). Age distributions were similar between the eastern and western gulf for commercial hand-line, fishery independent hand-line and the recreational fishery. However, the commercial long-line and fishery independent long-line survey yielded older fish in the western gulf. Saari (2011 SEDAR31-RD39) also noted differences in the age structure of the recreational fishery with the eastern gulf consisting of younger individuals compared to the central and western gulf.

There was some indication of strong year-classes in the directed fisheries and fishery-independent surveys. The commercial hand-line fishery and fishery-independent hand-line survey showed evidence of a strong 2006 year-class with a relatively large percentage of 3 year olds in 2009 (31% and43%, respectively) followed by 4 year olds in 2010 (34% and 34% respectively) and 5 year olds in 2011 (30% and 29% respectively; Fig. 3) This pattern was consistent in the eastern and western gulf in the commercial hand-line fishery, but there were too few data points in the western gulf for fishery-independent hand-line survey for comparison. To a lesser degree there was also some evidence in the recreational and commercial long-line fisheries and was consistent in the eastern and western gulf (Fig. 4). Both the recreational and commercial long-line fisheries also showed some evidence of a strong 2005 year class. Generally, the influence of these strong year classes can be followed for 2 or 3 consecutive years. Saari (2011 SEDAR31-RD39) also found evidence of consistent gulf-wide strong year- classes (2004, 2005 and 2006) in the recreational fishery.

The LHW also examined the frequency of older red snapper (20+ years) from the entire Panama City dataset (1991-2011) by statistical grid (Kutkuhn 1962; Figure 5). We noted a higher frequency of older red snapper in grid 3 (SW Florida) and grids 20 and 21(South Texas) (Fig. 6). This was somewhat independent of gear type, that is, other regions of the gulf with similar or lower percentages of long-line sampled fish did not have the high number of older red snapper (Table 7). These results highlight the need for fishery independent surveys (e.g. long-line survey) to cover the edges of the U.S. fishery (South Texas, South Florida), as well as the northern gulf. The LHW discussed potential differences in the periodicity of opaque zone formation in otoliths. Szedlmayer and Beyer (2011 SEDAR31-RD20) found that opaque zone formation occurred later (late summer to early winter) in OTC marked mark-recapture fish compared to studies which used marginal increment analysis (late winter to early summer; Patterson et al. (2001); Wilson and Nieland (2001); Allman et al. (2005)). It was noted that this could affect the ageing macro used to advance ages by 1 year. Szedlmayer and Beyer (2011 SEDAR31-RD20) posited that the later opaque zone formation could be related to spawning and not slower winter growth. The LHW group discussed that differences may be due to interpretation of otolith edge type and that late formation of the opaque zone was sometimes noted in marginal increment analysis. Additionally, the Szedlmayer laboratory found that 27% of laboratory reared age 1 fish (<200 mm) had 2 opaque zones. The LHW discussed whether the choice of section to age affected interpretation; Gulf States and NOAA primarily use the dorsal side (Vanderkooy and Guindon-Tisdel 2003). The LHW noted 2 papers have measured the distance from the core to the first annulus in red snapper and both used the dorsal side and found similar results (Allman et al. 2005; Fischer et al. 2010).

### *2.5.1 Recommendations*

1. Cross-reference trip tickets and log book data to Biological Sampling Database to complete spatial records (depth, grid, etc.) to allow for increased analysis of spatial demographics.

2. The LHW recommended that existing otolith archives (e.g., NOAA) be used to further investigate interpretation of increment formation based on section orientation, sample source (location), season and year. This could be conducted as a graduate student project in collaboration with agency personnel.

3. Interested Academic representatives (e.g. Auburn University, University of S. Florida) should be included at Gulf States Marine Fisheries Commission sponsored otolith workshops (e.g., May 2013) to review age determinations and promote standardization.

4. Based upon the results of Szedlmayer and Beyer (2011 SEDAR31-RD20), further investigation of longevity is warranted. More recent catches of older fish should allow a direct comparison to $^{14}C$ coral chronologies established during the nuclear testing period and extend the age that can be directly validated (beyond 38 years in the earlier study by Baker and Wilson 2001).

## 2.6 Growth

Several studies addressing red snapper growth between differing habitat types and regions have been completed in the Gulf of Mexico since the last benchmark assessment. While not a universal finding, there is evidence of increased growth on artificial habitats for young adults, but size or complexity of the habitat may be an important factor. Cowan et al. (2012 SEDAR31-DW03) noted significant differences in TL and TW von Bertalanffy growth models between shelf-edge banks and standing oil and gas platforms off Louisiana with a significantly larger estimate of $L\infty$ for the standing platforms, but no difference in growth coefficients (k) observed between habitats. Saari (2011 SEDAR31-RD39) also reported that red snapper sampled from shelf-edge banks were significantly smaller at ages 3, 4 and 5 than those from standing and toppled oil and gas platforms. Size-at-age was also significantly different between standing and toppled platforms for ages 3, 4 and 5, but no consistent pattern was found. Saari's (2011 SEDAR31-RD39) analysis included only red snapper from 3 to 6 years old due to insufficient sample size of red snapper above or below those ages. In a 2007 study utilizing conventional tagging methods and subsequent returns, Strelcheck et al. (2007 SEDAR31-RD28) reported faster growth rates at large experimental artificial reefs compared to smaller artificial reefs off of Alabama and slower growth on sites supporting lower reef fish biomass. In a study comparing natural and artificial habitats, Patterson et al. (2010 SEDAR31-RD27), found no significant differences in growth rates between natural reef and artificial reef areas in the northeastern Gulf of Mexico in red snapper ranging from 1 to 9 years of age.

Temporal differences in growth have been examined for red snapper. Neiland et al. (2007 SEDAR31-RD26) demonstrated significant declines in size-at-age for red snapper from the commercial fishery off Louisiana for ages 2-6 over time (1999-2004). They hypothesized that declines in growth over time may to be due to density-dependent effects, possible from the recovery of an overfished population, or conversely, due to minimum size limits resulting in selection for slower growing individuals. In contrast, Patterson et al. (2010) compared the von Bertalanffy growth function distributions of residuals to those of an earlier study (Patterson et al. 2001) and noted nearly identical residual distributions, thus indicating that growth has not changed in 10 years and that variability in red snapper size-at-age is similar today to what it was estimated to be historically.

Updated age data (from 2009 to 2011, N = 23,785, Table 5, Fig 7) and resulting VBGF analyses were reviewed by the LHW. All von Bertalanffy growth models were size-modified for the effects of minimum size limits (Diaz et al. 2004) and estimates were made by fishery, region, sex, fishery by region and sex by region (Table 8). Comparisons were made using a likelihood ratio test for coincident curves (Kimura 1980; Haddon 2001) (Table 9). All growth curves were significantly different but were informed by high sample sizes ($p < 0.001$). For instance, there is evidence for sexually dimorphic growth and small differences were found in $L_{inf}$ between males (847 mm max TL) and females (889 mm max TL: Fig. 8).

New studies and data sets allowed further examination of regional differences in growth. Saari (2011 SEDAR31-RD39) examined regional growth differences in the recreational fishery and found that small, fast-growing individuals dominated South Texas, Northwest Florida and Central Florida catches and larger, slower-growing individuals dominated Alabama and Louisiana catches. This was consistent with earlier findings that fish from Texas grow faster and reach a smaller maximum size than fish from Alabama and Louisiana (Fischer et al. 2004). Likewise, the 2009-2011 dataset supported a finding of generally higher growth in the eastern Gulf (greater size at age, Fig. 9). However, evidence for reproductive and mortality traits suggest more spatially complex demographic patterns may exist and further examination of sub-regional growth differences is warranted (Table 10). The LHW discussions raised the need for more caution in interpretation of growth based upon opportunistic sampling; often typical of fishery-dependent sources. Appropriate statistical weighting may need to be conducted as part of the analysis (Chih 2012 SEDAR31-DW18; see recommendations).

### *2.6.1 Recommendations*

1. A general recommendation of the LHW is to expand design-based fishery-independent sampling to elucidate regional (i.e., eastern and western GOM) and sub-regional differences in the demographics of red snapper.

2. A further recommendation is to increase random, representative sampling of the catch in order to avoid clustering effects and non-representative sampling which could lead to spurious differences in growth rates. Alternatively, and for localized- or small-scale studies, corrections for length limits and appropriate weighting may need to be utilized to treat data gaps, missing ages and adjust for selectivity (see Chih 2012 SEDAR31-DW18).

## 2.7 Reproduction

Additional, unpublished data on red snapper reproduction is available since the 2009 red snapper update. Most significantly, the 2011 Congressional Supplemental Sampling Program (CSSP) allowed Gulf-wide, synoptic sampling of red snapper during the April through October reproductive season, resulting in 1,002 females for histological analysis (992 for age and histology) and 50 samples for fecundity analysis. Reproductive samples from Florida in 2009 (Lowerre-Barbieri et al. 2012 SEDAR31-DW15, n=237 females) and from oil platforms in Louisiana in summer 2009 and 2010 (Cowan et al. 2012 SEDAR31-DW03, n=337 females) provide additional recent reproductive data that complement the CSSP survey.

Results from the CSSP survey are based predominately on frozen ovarian samples, although there was a fresh vs. frozen histological and fecundity comparison for some samples. Although histological quality of frozen samples compromises the histological preparation, oocyte stages and spawning markers could be identified. Some concerns regarding the effects of freezing and desiccation on the accuracy of fecundity estimates from frozen samples remain, as there was a tendency to overestimate batch fecundity from the frozen samples.

### *2.7.1 Maturity*

Additional data confirms the previously reported 1:1 sex ratio in red snapper. For maturity estimates, only data from the peak reproductive season (June-August) were considered. The 2009 update presented information that some age one females can reach sexual maturity, but the youngest female with spawning markers was age 2 (Cook et al. 2009). The recent data confirms that some female red snapper reach sexual maturity at age 2. However, CSSP data suggests that the percentage of females reaching maturity has decreased for ages 2-6 when compared to the 2004 assessment and the 2009 update. (Figure 1).

The CSSP data supported the difference in age-at-maturity between the east and west Gulf suggested in the 2004 SEDAR. Fish from Louisiana (west Gulf) had a lower percentage of maturity for ages 4-6 compared to fish from the eastern Gulf (Florida and Alabama). Similar results were seen in Cowan et al. (2012 SEDAR 31-DW03); female red snapper around natural banks in Louisiana reached 50% maturity at age 5, while those around platforms reached 50% maturity at age 4.

### *2.7.2 Spawning Frequency*

Spawning frequency was evaluated in the CSSP study by the percentage of females containing spawning markers (hydrated oocytes or new POFs, accounting for a 34 h period of potential spawning). At the peak of the spawning season, 60% of the females had spawning markers Gulfwide, indicating a high spawning frequency.

New reproductive data confirms data from the 2004 SEDAR that spawning frequency increases with increasing age. Gulfwide, only 18% of age 2 females had spawning markers, while >50% of fish age 8 and older had spawning makers (Figure 4) (Fitzhugh et al. 2012 SEDAR31-DW07). At

Louisiana offshore structures, fish ages 6-8 spawned every 3 to 7 days, while age 3 fish spawned every 12-17 days (Cowan et al. 2012 SEDAR31-DW03).

### *2.7.3 Duration and Spatial Differences in Spawning Intensity*

The spawning season (determined by the presence of actively spawning females, or females with spawning markers (ovaries containing hydrated oocytes or new postovulatory follicles-POF) extends from May – October Gulf-wide (CSSP data, Figure 2); actively spawning females were found off Florida from June through September, although spawning capable females were found from March through October. CSSP results suggest a 168 day spawning season, a slight increase over the 151 day season determined in the 2004 SEDAR. However, peak spawning throughout the Gulf occurs from June through mid-September (107 days).

There is evidence for spatial differences in spawning. A higher percentage of females captured by long line were found with spawning markers compared to those collected in shallower areas by vertical lines (Fitzhugh et al. 2012 SEDAR31-DW07). Within similar depth zones, there appears to be differences among habitats, as the highest percentage of spawning capable females were found on toppled platforms in Louisiana, while the lowest percentage were found on standing platform structures (Cowan et al. 2012 SEDAR31-DW03). Finally, the percentage of females with spawning markers was lower in the eastern Gulf compared to the western Gulf; in particular, fish from the west Florida shelf exhibited the lowest percentage of spawning markers (25%) based on the CSSP collections (Fitzhugh et al. 2012 SEDAR31-DW07) (Table 10). A greater percentage of actively spawning fish in Florida were captured off the Panhandle as compared to west of Tampa Bay (Lowerre-Barbieri et al. 2012 SEDAR31-DW15, Fitzhugh et al 2012 SEDAR31-DW07). Spawning fraction on the AL-MS shelf (39%) was similar to the Florida Panhandle (35%) during the CSSP survey (Table 10). In the western Gulf, sub-regional patterns are becoming more evident as well. The highest spawning fractions were associated with the outer shelf of central-western Louisiana (48%) and south Texas (46%) in contrast to the Louisiana delta (25%) and north Texas (28%) (Table 10). These regional reproductive results may correlate with spatial patterns of size/age composition (see section on stock composition).

Duration of the spawning season also appears to be positively correlated with age. Red snapper ages 7 and older show evidence of spawning markers one month prior to age 2-3 fish, and the percentage of age 2-3 fish with spawning markers declines a month prior to that of older fish (Fitzhugh et al. 2012 SEDAR31-07), suggesting that young fish have a markedly reduced spawning season compared to older fish (Figure 3). Similar results were seen in Florida, where age 2 fish appear to have a shorter spawning season than older fish (Lowerre-Barbieri et al. 2012 SEDAR 31-DW15).

### *2.7.4 Batch Fecundity*

An additional 88 batch fecundity estimations have been done since the 2004 SEDAR. Relative batch fecundity ranges from 27-142 eggs/g fish weight over the time of collections (Table 11). Relative batch fecundity is preferable for comparisons as it tends to normalize the effect of size. However, variability among annual means are high and the broad range in relative batch fecundity does not show any strong trends. Fecundity values from the recent CSSP survey tend to be lower than earlier values, but it is unclear if this is due to methodology of using frozen samples, impacts of Deepwater Horizon, seasonal and/or small sample size effects in some years or if this is an actual trend of decreasing fecundity. There may be fecundity differences across the Gulf, as CSSP data showed lowest relative fecundity from Florida (40 eggs/g) and highest fecundity from the western Gulf (Texas; 70 eggs/g) similar to the pattern in spawning fraction.

Previous SEDAR assessments have used batch fecundity at age for entry into the model. Recent CSSP fecundity estimates show the expected increase in fecundity with age, despite lower overall fecundity measurements (Figure 5). It is anticipated that inclusion of new batch fecundity measurements into the model will not alter the currently used batch fecundity at age relationship.

### *2.7.5 Recommendations*

1. Spawning marker fraction and batch fecundity should be included in the models as an estimate of spawning potential, and age and season should be included as variables in the regression. Spawning marker fraction is a better metric than maturity.
2. New fecundity estimates should be added to the existing fecundity at age regression.
3. Future surveys should collect ovarian samples fixed in formalin for histology analysis, spawning marker fraction analysis and age/size at maturity analysis.
4. Additional fecundity collections are necessary from all areas of the Gulf.
5. Additional research is necessary to further clarify regional reproductive and demographic differences.

### *2.7.6 Summary*

1. The sex ratio is 1:1
2. First age at maturity is 2 years. However, there appears to be a recent trend for increasing age at maturity.
3. Red snapper from eastern Gulf have a lower age at maturity than those from the western Gulf.
4. Spawning occurs from May through September, peak spawning June – August.
5. Regional differences may occur in which highest spawning fractions are found off south Texas and central-western Louisiana and lowest fractions found off west Florida.
6. Similarly, spawning season of Florida fish appears shorter than that of fish from the northcentral and northwestern Gulf.
7. A high percentage of red snapper have spawning markers during the peak spawning season, indicating a relatively high spawning frequency.
8. Spawning frequency and the percentage of spawning markers increases with increasing age.
9. Older fish have a longer spawning season than younger fish.
10. Fecundity increases with increasing age.

## 2.8 Movement and Migration

### *2.8.1 Transformation*

After a short period in the pelagic environment as larvae, red snapper metamorphosis and settlement to benthic habitats (Szedlmayer and Conti 1999; Rooker et al. 2004). Age-0 red snapper begin to use reefs shortly after they settle out of the plankton and move to available low-relief, structured habitat (Workman and Foster, 1994; Szedlmayer and Howe, 1997; Szedlmayer and Conti, 1999; Szedlmayer and Lee, 2004; Patterson et al. 2005; Wells et al. 2008; Gallaway et al. 2009). These new recruits quickly outgrow their initial benthic habitats and search for larger structured habitats by fall after the spawning season (Szedlmayer and Conti, 1999; Szedlmayer and Lee, 2004; Wells et al. 2008; Szedlmayer, 2011).

### *2.8.2 Post settlement*

Recent studies have suggested that even the newest settlers will move to structured habitats if available, i.e., habitat with an absence of potential predators (Szedlmayer and Lee 2004; Piko and Szedlmayer 2007; Mudrak and Szedlmayer 2012). In fact, it may be that individuals that don't find structured shelter shortly after settlement will be subject to excessive predation mortality, shrimp trawl mortality, reduced growth and subsequent poor survival, and make little contribution to subsequent year classes. It then appears that young recruits that have located low relief structure will stay on these structures for their first and second years (Gallaway et al 1999; Gallaway et al 2009; Szedlmayer 2011; Mudrak and Szedlmayer 2012). In turn, the presence of these older age-1 and age-2 red snapper, through predation and competitive exclusion, may limit the immigration of new age-0 recruits to particular locations (Bailey et al., 2001; Piko and Szedlmayer, 2007; Gallaway et al., 2009; Mudrak and Szedlmayer, 2012).

### *2.8.3 Age-2 and older*

After about age-2 red snapper appear to be able to better fend for themselves and move to larger more extensive structured habitats that may in fact have extensive resident predators, but as larger age-2 and 3 fish they are better able to escape predators (Gallaway et al. 2009). At this point and for the next couple of years, red snapper studies have reported different patterns of movements and residency around structured habitats. Several studies suggest a relative lack of residence, with some individuals showing long distance emigrations (Patterson et al. 2001; Patterson and Cowan 2003; Westmeyer et al. 2007; Addis et al. 2012) while other studies suggest relatively high site fidelity and with small home ranges (Szedlmayer, 1997; Szedlmayer and Schroepfer, 2005; Schroepfer and Szedlmayer 2006; Strelcheck et al. 2007; Topping and Szedlmayer, 2011a; Topping and Szedlmayer 2011b; Piraino and Szedlmayer 2012). Diamond et al. (2007) suggested both patterns are consistent with red snapper movement behavior but potentially influenced by many external variables. There are many caveats with tagging studies. Conventional tagging has the most difficulty with estimation of tag loss, non-reporting by fishers, and incorrect locations of recapture reported by private fishers. Telemetry methods have consistent problems with low sample sizes and difficulty with estimation of long distance movement. However, from a combination of these tagging studies it might be suggested that red snapper may show high site fidelity in the short term (i.e., 1-2 years) while greater movement and lower site fidelity might be predicted on a longer term basis.

It has been suggested that larger older red snapper show less attachment to reef structure and show greater movements over open habitats (see habitat section). This scenario is principally supported by long-line studies over extensive open habitats that showed very few large old red snapper in the eastern Gulf of Mexico, but substantially greater catches from the western Gulf of Mexico (Mitchell et al. 2004). The suggestion being that larger older red snapper move to the western Gulf of Mexico. However, in contrast many larger older red snapper have been observed and continue to be collected from reef areas in the northeastern Gulf of Mexico (Orange Beach Red snapper tournament, Orange Beach, AL), but typical reef habitats from this area are difficult or impossible to sample with long-line gear. Actual mark and recapture data is almost non-existent for these large older red snapper and could potentially greatly help in this relatively unknown later life stage of red snapper.

Despite the different patterns of movement behavior observed by different studies, they are somewhat consistent in suggesting that as a whole, stocks don't show major long distance migrations and are for the most part self-replenishing, i.e., eastern compared to western Gulf stocks.

### *2.8.4 Recommendations*

1. More information is needed to understand movement of young and older adult red snapper across along shore barriers. In particular the LHW recommends a large scale tagging study focused west and east of the Mississippi River.

2. Telemetry versus tagging approaches need to be expanded and evaluated according to shelf characteristics; e.g. cross compared in areas with little natural hard bottom habitat (yet high artificial reefs) versus areas with relatively high areal coverage of hard bottom and with more dispersed artificial reefs.

3. The LHW recommends a workshop or research symposia be convened to synthesize results and assess methodology for estimating red snapper movements and home range.

## 2.9 Conversion factors

Length and weight conversions in English units for SEDAR 7 (SEDAR 31-RD01) were repeated from Schirripa and Legault (1999). Most of these conversions have been updated using the combined Panama City Laboratory and Gulf States (2009-2011) dataset. The Florida Fish and Wildlife (2007-2011) dataset was used for length conversions to maximum total length and the Panama City Laboratory dataset (1994-1996, 2000 and 2008) used for weight to weight conversions.

### *2.9.1 Length conversions*

During the workshop it was noted that total length was recorded differently depending on sampling program. Usually either a maximum total length (Max TL; pinching the caudal fin to maximum length; Kahn et al. 2004) or natural total length (Nat TL) was recorded. For consistency, Max TL was selected as the standard measure of total length for SEDAR 31. Nat TL, fork length (FL) and standard length (SL) were converted to Max TL using a 2007-2011 dataset from the Florida Fish and Wildlife Research Institute in which Max TL, Nat TL, FL and SL were measured for each red snapper. Nat TL (inches) was converted to Max TL (inches) using the regression equation shown in Equation 1 [$R^2$ = 0.99 (N= 1,866)], FL (inches) was converted to Max TL (inches) using the regression equation shown in Equation 2 [$R^2$ = 0.99 (N= 1,883)] and SL (inches) was converted to Max TL (inches) using the regression equation shown in Equation 3 [$R^2$ = 0.97 (N= 1,797).

Max TL (in) = 0.1325 + Nat TL (in)*1.022 (1)

Max TL (in) = 0.3868 + FL (in)*1.058 (2)

Max TL (in) = 2.0303 + SL (in)*1.162 (3)

*Length to weight conversions*

Max TL inches to whole weight (WW) pounds were converted using the Panama City dataset 2009-2011 fitted to the model of Equation 4 [$R^2$ = 0.97 (N = 6,089)]. FL inches to whole weight (WW) pounds were converted using the model of Equation 5 [$R^2$ = 0.98 (N= 5,063)].

WW (lbs) = 4.47E-04 * Max TL (in) ^ 2.994 (4)

WW (lbs) = 6.90E-04 * FL (in) ^ 2.968 (5)

Commercial landings are most often reported in gutted condition. Therefore, Max TL and FL conversions to gutted weight (GW) were needed for analyses. The Panama City Laboratory data set was used to establish the relation between Max TL and GW as shown in Equation 6 [$R^2$ = 0.97 (N = 6,514)] and FL and GW in Equation 7 [$R^2$ = 0.98 (N = 3,686)].

GW (lbs) = 4.63E-04 * Max TL (in) ^ 3.009 (6)

GW (lbs) = 5.69E-04 * FL (in) ^ 3.012 (7)

The conversion of Max TL to GW (equation 6) reported was similar to the equation given in Schirripa and Legault (1999), but it was noted that the Max TL to GW conversions (equation 6) were greater than WW conversions (equation 4). Therefore, equation 4 may underestimate WW. This may be due to the size distributions used for the equations, since the GW conversion equation was estimated using larger commercial fish (typically gutted at sea), while WW conversions were estimated using smaller recreational and fishery-independent survey fish.

### *2.9.2 Weight conversions*

The Panama City laboratory had a small sample set (N= 217) of red snapper with both GW and WW recorded. The GW (lbs) was converted to WW (lbs) using the regression in shown Equation 8 [$R^2$ =0.99] and WW (lbs) was converted to GW (lbs) using regression in Equation 9.

WW (lbs) = 1.11*GW (lbs) – 0.264 (8)

GW (lbs) = 0.89*WW(lbs) +0.2837 (9)

It is noteworthy that the slope of equation 8 was the same as the conversion factor (1.11) for GW to WW given in Schirripa and Legault (1999) from an unknown data source.

### *2.9.3 Recommendations*

1. The LHW recommends that maximum total length be used as the standard measure for SEDAR 31.

2. In order to reduce measurement error in the future, the LHW recommends that port agent, observers and field scientists record maximum total length for red snapper.

3. To increase the sample size for weight conversions the LHW recommends that both WW and GW be taken over a range of red snapper sizes.

## 2.10 Episodic Events

Gulf of Mexico red snapper populations are often impacted by a variety of episodic environmental perturbations of varying temporal and spatial scales. In the northern Gulf of Mexico, the seasonal occurrence of hypoxia can potentially effect red snapper populations. Although we are not aware of large-scale mortality of red snapper in association with summer hypoxic events, reductions in dissolved oxygen concentrations greatly reduce habitat quality. In Alabama, catch-per-unit-effort of juvenile (age-0 and age-1) red snapper within trawl samples declined significantly from July to August, likely in association with bottom dissolved oxygen concentrations that were 0 ppm (Szedlmayer and Shipp 1994). Further, an examination of essential fish habitat for juvenile red snapper indicated that recent increases in the real extent of hypoxia in the northern Gulf of Mexico may have reduced habitat carrying capacity for juvenile red snapper by an average of 19% (Gallaway et al. 1999). Hypoxia can also impact older red snapper, although the occurrence of offshore oil platforms within areas impacted by hypoxia may provide some vertical refugia (Stanley and Wilson 2004). In addition to direct effects on red snapper, hypoxia may alter the dynamics of shrimp trawl fishery and, subsequently, the quantity of bycatch-related mortality of juvenile red snapper. Macal (2002) found that shrimping effort off of Louisiana shifted offshore during years of extensive hypoxia, potentially increasing the overlap between shrimping effort and juvenile red snapper populations and associated bycatch mortality. It is important to note, however, that these potential impacts may be offset by recent reductions in overall shrimping effort.

Other environmental perturbations in addition to hypoxia have the potential to affect red snapper populations. Hurricanes can also affect red snapper populations, although hurricane-related impacts appear to relate primarily to movement and site fidelity of red snapper. In a study on artificial reefs in the north-central Gulf of Mexico, the occurrence of Hurricane Opal in 1995 greatly increased not only the probability that red snapper would move away from their original tagging location, but also significantly influenced the distance of red snapper movement (Patterson et al. 2001). Periodic upwelling events and associated reductions in temperature and increases in nutrients have been documented to contribute to mass mortality of fishes and macroinvertebrates, potentially in association with the development of near-anoxic conditions (Collard and Lugo- Fernández 1999; Collard et al. 2000). Temperature reductions also appear to contribute to seasonally-dynamic movement patterns (Topping and Szedlmayer (2011a SEDAR31-RD22). Large- scale pollution events such as the Deep Water Horizon oil spill, can result in impacts that are both direct (e.g., acute –phase mortality) and indirect (e.g., bioaccumulation through the food web) (Sumaila et al. 2012). In order to improve the stock assessment process of incorporating additional non-fishing mortality data, SEDAR is conducting a Gulf of Mexico SEDAR Episodic Events Workshop November 13-15, 2012.

## 2.11 Oil and Gas Platform Removal

There are estimated to be approximately 4,000 oil and gas platforms in the Gulf of Mexico (Keevin and Hempen 1997 SEDAR31-RD44; Kaiser and Pulsipher 2007). Every year some are taken out of service or removed and new platforms are added to production. Versar (2008 SEDAR31-RD31) indicated the number of platforms removed through 2020 will far exceed the number of new ones. Estimates as of 2009, indicate 140 are removed annually with 60 percent of these removals conducted by the use of explosive charges (Herbst personal communication). These structures have been shown to be used as habitat for many species of fishes. Impacts of removals to marine fishes may be significant, with an estimated 515 red snapper killed per each platform removed via explosives (Gitschlag et al. 2000 SEDAR31-RD04). Numerous methodologies exist to mitigate impacts, such as tactics to displace fish away from structures prior to ignition of crippling charges (Keevin and Hempen 1997) . Keevin and Hempen (1997 SEDAR31-RD44) discuss impacts to fishes due to the pressure wave of the explosion and fishes with large swim bladders tended to be more vulnerable to internal damage. Due to this effect, surface estimates of mortality are not sufficient and estimating those fish that sink must be obtained. However, for red snapper Gitschlag et al. (2000 SEDAR31-04) found that even when mortality was doubled, impacts were estimated to be small, well within the variation of current assessments.

Providing information on fish mortality during platform removals to management agencies is not a priority of the Bureau of Environmental Safety and Enforcement because reliable estimates of red snapper abundances would be limited to surface counts (Herbst personal communication). Future cooperation is encouraged in order to include these data into assessments.

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## 2.13 Tables

Table 1. Recent mortality studies – early life history.

| Study | Z<br>Age 0 | Age 1 | Age >1 | M<br>Age 0 | Age 1 | Age >1 | Comments |
|---|---|---|---|---|---|---|---|
| Wells et al. 2008<br>Max likelihood<br>Catch curve | <br>6.2-8.8<br>2.6-9.1 | | | | | | Age 120-199 d extrapolated to 1 yr. Ala. untrawled sand/shell habitat. Authors caution emigration/gear bias and extrapolation to annual estimate. |
| Gazey et al. 2008<br>Model | 2.2 peak prob. (0.686-3.151) | 1.3 peak prob. (0.397-1.825) | | | | | Repeated from 2009 update. Best model VBGF with dens. dep. mortality. West Gulf data. Potential emigration bias. |
| Gallaway et al. 2009<br>Catch curve | 2.6 | | | 2.0 | 1.2 | | Ala. Untrawled artificial habitat, Ave. for 3 yr. classes, Potential emigration bias, best-M inferred several studies. |
| Szedlmayer 2011<br>Catch curve | 3.4 | | | 3.4 | | | Age > 60 d. Ala. Diver counts on untrawled artificial reef. (Z=2.7 first 3 months, 0.7 next 9 months). Potential emigration bias but no evidence for spillover: Author suggests best approximation for M. |
| Topping and Szedlmayer 2011, SEDAR31-DW13<br>Telemetry | | | 0.43-0.5 | | | 0.12-0.22 | Ala. artificial and natural reefs, red snapper >500 mm TL (age-3 expected dom. age), (F=0.3-0.38). Potential effect of sample size and length of study. |
| Books et al.<br>SEDAR31-RD02<br>RE model est.<br>RE model dens. dep. | <br><br>3.3-3.7 | <br><br>1.6-2.25 | | <br><br>3.3-3.7<br>2.6-3.5 | <br><br>0.76-1.4<br>0.6-1.3 | | Repeated from 2009 update, Table 8. Gulf-wide. Low q for age 0, potential emigration bias. Analysis continues for 2012 results |

Table 2. Equations for estimating natural mortality (M).

| Method | Parameters | Authors & Parameter Explanations | Equation |
|---|---|---|---|
| Alverson & Carney | k, tmax | Quinn & Deriso (1999): | M = 3k/(exp(0.38*tmax*k)-1) |
| Beverton & Holt | k, am | Beverton and Holt (1956; $a_m$ = age at 50% maturity) | M = 3k/(exp($a_m$*k)-1) |
| $Hoenig_{(fish)}$ | tmax | Hoenig (1983; for fish) | M=exp(1.46 - 1.01*ln(tmax)) |
| $Hoenig_{(all\ taxa)}$ | tmax | Hoenig (1983; fish plus other taxa) | M=exp(1.44-0.982*ln(tmax)) |
| Pauly | Linf, k, T | Quinn & Deriso (1999): | M=exp(-0.0152+0.6543*ln(k)-0.279*ln(Linf, cm)+0.4634*lnT(°C)) |
| | | Pauly (1980): | M = 10^(-0.0066-0.279*(log(Linf))+0.6543*log(K)+0.4634*Log(T)) |
| Pauly Method II (snappers and groupers) | Linf, k, T | Pauly and Binohlan (1996) | M=10^(-0.0636-0.279*(log(Linf)+0.6543*log(k)+0.4634*log(T)) |
| | | | T=Average annual Sea Temperature at depth |
| Ralston | k | Ralston (1987) | M=0.0189 + 2.06*k |
| Ralston (geometric mean) | k | Ralston (1987) | M=-0.0666+2.52*k |
| Ralston Method II | k | Pauly and Binohlan (1996) | M=-0.1778+3.1687*k |
| Lorenzen Age-Specific | W at age | Lorenzen (1996; ocean) | M=3.69*W^(-0.305) |
| Jensen | k | Jensen (1996) | M = 1.5*K |
| Alagaraja | tmax, survivorship to tmax | Alagaraja (1984) | M=-ln[S(tmax)]/tmax; derived from S(tmax)=exp(-M*tmax) |
| Rule of thumb | tmax | Hewitt and Hoenig (2005) | M = 2.996/tmax |

Table 3. Estimates of natural mortality from equations in Table 2, based upon permutations of recent age data and resulting changes in oldest observed age and von Bertalanffy growth functions (VBGF). VBGF fits were corrected for age truncation due to commercial and recreational size limits (Diaz et al. 2004). Water temperature based upon annual mean estimate at bottom from the U.S. Gulf shelf (Johnson et al. 1995, DeVries 2006).

| Data Source | Observed Max Age (years) | Number of Fish Aged | VBGF Linf (mm) | VBGF k | Water Temp. (°C) | Age at 50% Mat. | Alverson & Carney | Beverton & Holt | **Hoenig (fish)** | Hoenig (all taxa) | Pauly | Pauly Method II (snappers and groupers) | Ralston | Ralston (geometric mean) | Ralston Method II | Jensen | Hewitt & Hoenig | Alagaraja (1% survival) | Alagaraja (5% survival) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009-2011 age data | 55 | 23785 | 848.48 | 0.22 | 22 | 2 | 0.0068 | 1.1957 | 0.0752 | 0.0825 | 0.4422 | 0.3878 | 0.4696 | 0.4848 | 0.5155 | 0.3282 | 0.0545 | 0.0837 | 0.0545 |
| 2009-2011 east male age data | 30 | 2538 | 961.07 | 0.17 | 22 | 2 | 0.0871 | 1.2622 | 0.1387 | 0.1496 | 0.3591 | 0.3150 | 0.3648 | 0.3565 | 0.3542 | 0.2519 | 0.0999 | 0.1535 | 0.0999 |
| 2009-2011 east female age data | 17 | 2502 | 1022.15 | 0.15 | 22 | 2 | 0.2802 | 1.2927 | 0.2462 | 0.2613 | 0.3210 | 0.2815 | 0.3180 | 0.2993 | 0.2823 | 0.2178 | 0.1762 | 0.2709 | 0.1762 |
| 2009-2011 west male age data | 35 | 2844 | 834.31 | 0.23 | 22 | 2 | 0.0329 | 1.1773 | 0.1187 | 0.1286 | 0.4632 | 0.4062 | 0.4993 | 0.5211 | 0.5611 | 0.3498 | 0.0856 | 0.1316 | 0.0856 |
| 2009-2011 west female age data | 44 | 2948 | 879.16 | 0.21 | 22 | 2 | 0.0198 | 1.2091 | 0.0942 | 0.1027 | 0.4241 | 0.3719 | 0.4482 | 0.4586 | 0.4826 | 0.3126 | 0.0681 | 0.1047 | 0.0681 |

Table 4. Values for Z from unweighted catch curve regression and Chapman-Robson method using criteria of peak age and right truncation of numbers-at-age.

| Data source | Z, regression | Z, Chapman-Robson | N for age classes with ≥ 5 obs. | Age classes |
|---|---|---|---|---|
| CM HL east | 1.032 | 0.8081 | 2610 | 4-8 yrs |
| CM LL east | 0.808 | 0.5922 | 1249 | 4-9 yrs |
| Rec HL east | 1.064 | 0.8700 | 426 | 4-7 yrs |
| FI LL east | 0.7801 | 0.7106 | 103 | 6-9 yrs |
| | | | | |
| CM HL west | 0.901 | 0.7443 | 3773 | 4-11 yrs |
| CM LL west | 0.1461 | 0.1222 | 231 | 5-15 yrs |
| Rec HL west | 1.058 | 0.8718 | 948 | 5-9 yrs |
| FI LL west | 0.1292 | 0.1981 | 405 | 7-24 yrs |

Table 5. Otoliths sampled and otoliths assigned an age (in parentheses) by NOAA Fisheries-Panama City Laboratory and Gulf States from the major sectors during years 2009 through 2011. Panama City Laboratory sub-sampling was only conducted for the commercial hand-line sectors for Florida Panhandle and Louisiana. Sub-sampling was based upon yearly, bi-monthly waves (i.e., wave 1 = January/February; wave 2 = March/April; wave 3 = May/June; wave 4 = July/August; wave 5 = September/October; and wave 6 = November/December).

| | **2009** | **2010** | **2011** | **TOTAL** |
|---|---|---|---|---|
| **COMMERCIAL** | | | | |
| Hand-line | 3,664 (3,544) | 3,327 (3,277) | 4,149 (4,121) | **11,140 (10,942)** |
| Long-line | 983 (937) | 430 (417) | 395 (391) | **1,808 (1,745)** |
| Spear | | 1 (1) | | **1 (1)** |
| Unknown | 134 (134) | 177 (177) | 20 (20) | **331 (331)** |
| Vertical Long- line | 1 (1) | 124 (124) | | **125 (125)** |
| **Sub-Total** | **4,782 (4,616)** | **4,059 (3,996)** | **4,564 (4,532)** | **13,405 (13,144)** |
| **RECREATIONAL** | | | | |
| Charter Party | 769 (766) | 204 (203) | 1,291 (1,289) | **2,264 (2,258)** |
| Headboat | 665 (635) | 529 (522) | 965 (937) | **2,159 (2,094)** |
| Private | 409 (408) | 511 (511) | 194 (194) | **1,114 (1,113)** |
| **Sub-Total** | **1,843 (1,809)** | **1,244 (1,236)** | **2,450 (2,420)** | **5,537 (5,465)** |
| **TOURNAMENT** | | | | |
| Hand-line | | | 40 (40) | **40 (40)** |
| Spear | | | 16 (16) | **16 (16)** |
| **Sub-Total** | | | **56 (56)** | **56 (56)** |
| **FISHERY INDEPENDENT** | | | | |
| Hand-line | 378 (375) | 1,155 (1,130) | 1,812 (1,801) | **3,345 (3,306)** |
| Long-line | 78 (76) | 53 (51) | 765 (749) | **896 (876)** |
| Trap | 465 (458) | 101 (99) | 178 (174) | **744 (731)** |
| Trawl | 157 (153) | 307 (305) | 11 (11) | **475 (469)** |
| Vertical Long-line | | 178 (178) | 33 (33) | **211 (211)** |
| **Sub-Total** | **1,078 (1,062)** | **1,794 (1,763)** | **2,799 (2,768)** | **5,671 (5,593)** |
| **TOTAL** | **7,703 (7,487)** | **7,097 (6,995)** | **9,869 (9,776)** | **24,669 (24,258)** |

Table 6. Otoliths sampled and otoliths assigned an age (in parentheses) by NOAA Fisheries-Panama City Laboratory and Gulf States from the major sectors by state during years 2009 through 2011. Panama City Laboratory sub-sampling was only conducted for the commercial hand-line sectors for Florida Panhandle and Louisiana. Sub-sampling was based upon yearly, bi-monthly waves (i.e., wave 1 = January/February; wave 2 = March/April; wave 3 = May/June; wave 4 = July/August; wave 5 = September/October; and wave6=November/December).

| | ALABAMA | FLORIDA | LOUISIANA | MISSISSPPI | TEXAS | TOTAL |
|---|---|---|---|---|---|---|
| **COMMERCIAL** | | | | | | |
| Hand-line | 253 (248) | 4,644 (4,548) | 2,295 (2,254) | 334 (332) | 3,614 (3,560) | **11,140 (10,942)** |
| Long-line | | 1,510 (1,456) | 32 (32) | | 266 (257) | **1,808 (1,745)** |
| Spear | | 1 (1) | | | | **1 (1)** |
| Unknown | | 4 (4) | 327 (327) | | | **331 (331)** |
| Vertical Long-line | | 125 (125) | | | | **125 (125)** |
| **Sub-Total** | **253 (248)** | **6,284 (6,134)** | **2,654 (2,613)** | **334 (332)** | **3,880 (3,817)** | **13,405 (13,144)** |
| **RECREATIONAL** | | | | | | |
| Charter Party | 813 (813) | 507 (504) | 666 (666) | 33 (32) | 245 (243) | **2,264 (2,258)** |
| Headboat | 190 (167) | 455 (444) | 481 (468) | | 1,033 (1,015) | **2,159 (2,094)** |
| Private | 129 (128) | 39 (39) | 583 (583) | 32 (32) | 331 (331) | **1,114 (1,113)** |
| **Sub-Total** | **1,132 (1,108)** | **1,001 (987)** | **1,730 (1,717)** | **65 (64)** | **1,609 (1,589)** | **5,537 (5,465)** |
| **TOURNAMENT** | | | | | | |
| Hand-line | | 40 (40) | | | | **40 (40)** |
| Spear | | 16 (16) | | | | **16 (16)** |
| **Sub-Total** | | **56 (56)** | | | | **56 (56)** |
| **FISHERY INDEPENDENT** | | | | | | |
| Hand-line | 66 (66) | 2,006 (1,975) | 831 (825) | | 442 (440) | **3,345 (3,306)** |
| Long-line | 73 (72) | 127 (127) | 369 (357) | | 327 (320) | **896 (876)** |
| Trap | | 571 (558) | 102 (102) | | 71 (71) | **744 (731)** |
| Trawl | 18 (17) | 85 (84) | 156 (154) | | 216 (214) | **475 (469)** |
| Vertical Long-line | 6 (6) | 159 (159) | 20 (20) | | 26 (26) | **211 (211)** |
| **Sub-Total** | **163 (161)** | **2,948 (2,903)** | **1,478 (1,458)** | | **1,082 (1,071)** | **5,671 (5,593)** |
| **TOTAL** | **1,548 (1,517)** | **10,289 (10,080)** | **5,862 (5,788)** | **399 (396)** | **6,571 (6,477)** | **24,669 (24,258)** |

Table 7. Total number of red snapper aged by Panama city Laboratory for years 1991 – 2011 for each NMFS shrimp statistical grid (Kutkuhn 1962), including the total number of red snapper aged for gear type = long-line and total # of red snapper that were aged to be 20+ years old. Dark gray fill = grids for which long-line gear had a relatively high percent frequency of samples aged. Light gray fill = grids for which long-line gear and 20+ year old red snapper had a percent frequency greater than 15 percent but smaller than 30 percent frequency. Blank = shrimp statistical grids for which no grid was assigned due to lack of sufficient information.

| Shrimp Statistical Grid | Total # of Aged Fish | Total # of 20+ Years | % Frequency of 20+ Years | Total # of Aged Fish for Long-line Gear | % Frequency of Long-line Gear |
|---|---|---|---|---|---|
| 1 | 64 | | | | 0.000% |
| 2 | 238 | 2 | 0.840% | 218 | 91.597% |
| 3 | 146 | 5 | 3.425% | 123 | 84.247% |
| 4 | 645 | 5 | 0.775% | 286 | 44.341% |
| 5 | 1,457 | 10 | 0.686% | 989 | 67.879% |
| 6 | 1,880 | 3 | 0.160% | 899 | 47.819% |
| 7 | 321 | | | 31 | 9.657% |
| 8 | 3,107 | 1 | 0.032% | 249 | 8.014% |
| 9 | 1,809 | 3 | 0.166% | 33 | 1.824% |
| 10 | 4,426 | 22 | 0.497% | 137 | 3.095% |
| 11 | 2,236 | 9 | 0.403% | 164 | 7.335% |
| 12 | 501 | 2 | 0.399% | | 0.000% |
| 13 | 2,679 | 14 | 0.523% | 396 | 14.782% |
| 14 | 3,435 | 30 | 0.873% | 643 | 18.719% |
| 15 | 2,006 | 23 | 1.147% | 415 | 20.688% |
| 16 | 3,390 | 50 | 1.475% | 381 | 11.239% |
| 17 | 2,224 | 43 | 1.933% | 225 | 10.117% |
| 18 | 2,881 | 26 | 0.902% | 243 | 8.435% |
| 19 | 555 | 9 | 1.622% | 50 | 9.009% |
| 20 | 1,548 | 73 | 4.716% | 557 | 35.982% |
| 21 | 3,544 | 77 | 2.173% | 1,065 | 30.051% |
| Blank | 24,410 | 100 | | 1,099 | |
| **Total** | **63,502** | **507** | | **8,203** | |

Table 8. Summary of von Bertalanffy growth parameters (Linf = asymptotic length, k = growth coefficient, $t_0$ = size at time zero), sigma (global variance parameter), and negative log-likelihood from the size-modified von Bertalanffy growth model for red snapper (2009-2011). Commercial size-limit = 330.2 mm and recreational size-limit = 406.4. All lengths are in maximum total length (mm). CM HL = commercial hand line, CM LL =commercial long-line, REC = recreational. EAST = Florida, Alabama and Mississippi, WEST = Louisiana and Texas.

| Region | Mode & Gear | Sex | n | Linf | k | to | sigma | nLL |
|---|---|---|---|---|---|---|---|---|
| ALL | ALL | ALL | 23,785 | 848.4797 | 0.2188 | -0.0611 | 79.0628 | 135235.00 |
| ALL | CM HL | ALL | 10,890 | 814.0920 | 0.2214 | -0.1402 | 74.8917 | 60951.90 |
| ALL | CM LL | ALL | 1,744 | 787.9280 | 0.2814 | -0.1479 | 65.9517 | 9739.25 |
| ALL | REC | ALL | 5,114 | 780.8090 | 0.2886 | -0.0010 | 76.3411 | 28716.80 |
| ALL | ALL | MALE | 5,382 | 847.4239 | 0.2256 | -0.0465 | 80.0254 | 30680.00 |
| ALL | ALL | FEMALE | 5,450 | 889.5321 | 0.2011 | -0.0827 | 83.5110 | 31275.20 |
| | | | | | | | | |
| | | | | | | | | |
| EAST | ALL | ALL | 8,354 | 887.8340 | 0.2066 | -0.0010 | 76.1314 | 46624.00 |
| EAST | CM HL | ALL | 5,090 | 934.2734 | 0.1843 | -0.0010 | 75.1549 | 28293.20 |
| EAST | CM LL | ALL | 1,455 | 799.6480 | 0.2828 | -0.0786 | 64.0740 | 8080.04 |
| EAST | REC | ALL | 1,809 | 820.7583 | 0.2323 | -0.0010 | 81.0256 | 9968.87 |
| EAST | ALL | MALE | 2,538 | 961.0663 | 0.1679 | -0.4532 | 71.7103 | 14198.90 |
| EAST | ALL | FEMALE | 2,502 | 1022.1548 | 0.1452 | -0.5759 | 76.5227 | 14147.00 |
| | | | | | | | | |
| | | | | | | | | |
| WEST | ALL | ALL | 9,394 | 797.8550 | 0.2431 | -0.1487 | 79.8890 | 53345.50 |
| WEST | CM HL | ALL | 5,800 | 806.2735 | 0.1879 | -0.9697 | 72.3472 | 32534.40 |
| WEST | CM LL | ALL | 289 | 831.4622 | 0.2032 | -0.2090 | 61.4247 | 1595.54 |
| WEST | REC | ALL | 3,305 | 778.1142 | 0.2790 | -0.5071 | 70.6705 | 18553.90 |
| WEST | ALL | MALE | 2,844 | 834.3052 | 0.2332 | -0.0010 | 86.8095 | 16425.50 |
| WEST | ALL | FEMALE | 2,948 | 879.1609 | 0.2084 | -0.0010 | 89.1393 | 17092.30 |

Table 9. Region, fishery and sex, size-modified von Bertalanffy growth curves were compared using a likelihood ration test for coincident curves. CM HL = commercial hand line, CM LL =commercial long-line, REC = recreational. EAST = Florida, Alabama and Mississippi, WEST = Louisiana and Texas.

| Comparison | Likelihood Ratio | P value |
|---|---|---|
| East vs. West | 1125.07 | 1.18E-246 |
| East vs. All data | 8896.16 | 0.00E+00 |
| West vs. All data | 8738.53 | 0.00E+00 |
| | | |
| CM Hand-line | | |
| East vs. West | 710.95 | 1.24E-156 |
| East vs. All CM HL | 3906.39 | 0.00E+00 |
| West vs. All CM HL | 3641.16 | 0.00E+00 |
| | | |
| CM Long-line | | |
| East vs. West | 2360.28 | 0.00E+00 |
| East vs. All CM LL | 271.75 | 4.72E-61 |
| West vs. All CM LL | 522.79 | 1.05E-115 |
| | | |
| Recreational | | |
| East vs. West | 1123.77 | 2.25E-246 |
| East vs. All REC | 1913.95 | 0.00E+00 |
| West vs. All REC | 1443.63 | 0.00E+00 |
| | | |
| Male vs. Female | 103.41 | 2.72E-24 |
| Male vs. All data | 7983.68 | 0.00E+00 |
| Female vs. All data | 7979.83 | 0.00E+00 |
| | | |
| Female | | |
| East vs. West | 473.19 | 6.47E-105 |
| East vs. All Females | 1984.89 | 0.00E+00 |
| West vs. All Females | 1781.17 | 0.00E+00 |
| | | |
| Male | | |
| East vs. West | 369.71 | 2.16E-82 |
| East vs. All Males | 1955.39 | 0.00E+00 |
| West vs. All Males | 1776.86 | 0.00E+00 |

Table 10. Fraction of females bearing histological spawning markers by region and statistical grid during 2011 Gulf-wide CSSP survey (re-drawn with further break down by grid from Table 2 in Fitzhugh et al. (2012 SEDAR 31-DW07).

| | Statistical grids | N females | Fraction with spawning markers |
|---|---|---|---|
| W FL shelf | 3-7 | 60 | 0.25 |
| FL panhandle | 8-9 | 125 | 0.35 |
| AL-MS | 10-12 | 80 | 0.39 |
| E LA | 13-14 | 100 | 0.27 |
| W LA | 15-17 | 328 | 0.48 |
| N TX | 18-19 | 152 | 0.28 |
| S TX | 20-21 | 157 | 0.46 |

Table 11. Relative batch fecundity of red snapper, 1991 – 2012.

| Year | Relative Batch Fecundity | S.D | N | Location | Source |
|---|---|---|---|---|---|
| 1991 | 84 | 47 | 9 | FL | PC Lab |
| 1992 | 64 | 50 | 12 | FL | PC Lab |
| 1993 | 63 | 61 | 42 | FL | PC Lab |
| 1994 | 73 | 59 | 52 | FL, AL, LA | PC Lab |
| 1998 | 56 | 86 | 54 | Gulf-wide | PC Lab |
| 1999 | 111 | 69 | 52 | Gulf-wide | PC Lab |
| 1999 | 96 | 71 | 41 | AL, LA | USA |
| 1999 | 67 | 40 | 21 | AL | Szedlmayer and Furman |
| 2000 | 108 | 116 | 14 | Gulf-wide | PC Lab |
| 2000 | 108 | 87 | 125 | AL, LA | USA |
| 2001 | 94 | 66 | 14 | Gulf-wide | PC Lab |
| 2001 | 142 | 115 | 53 | AL, LA | USA |
| 2002 | 106 | 69 | 12 | Gulf-wide | PC Lab |
| 2004 | 27 | 27 | 6 | Tortugas, FL | Brown-Peterson et al. |
| 2009 | 107 | | 8 | LA | Cowan et al. |
| 2011 | 49 | 40 | 50 | Gulf-wide | CSSP |
| 2012 | 126 | 35 | 4 | FL | PC Lab |

## 2.14 Figures

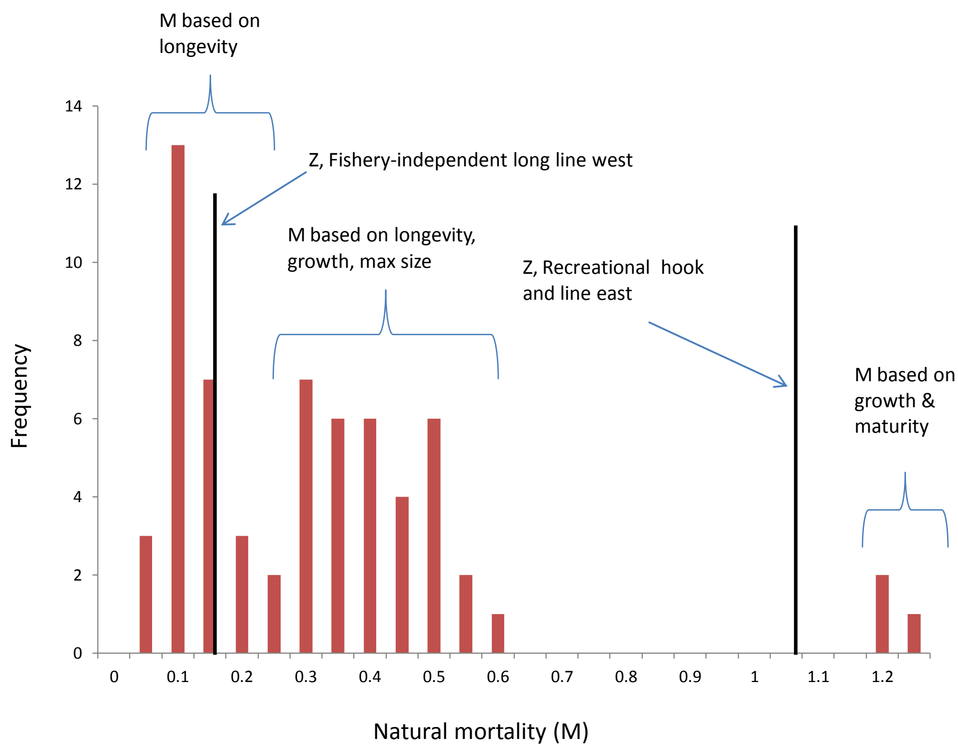


Figure 1. Bar chart of natural mortality estimates shown for graphical purposes; note that estimates from life history equations are not independent, rather they are based upon permutations of age and growth data (see Table 3). For comparison, Z values (black lines) are shown for highest and lowest regression estimates (see Table 4).

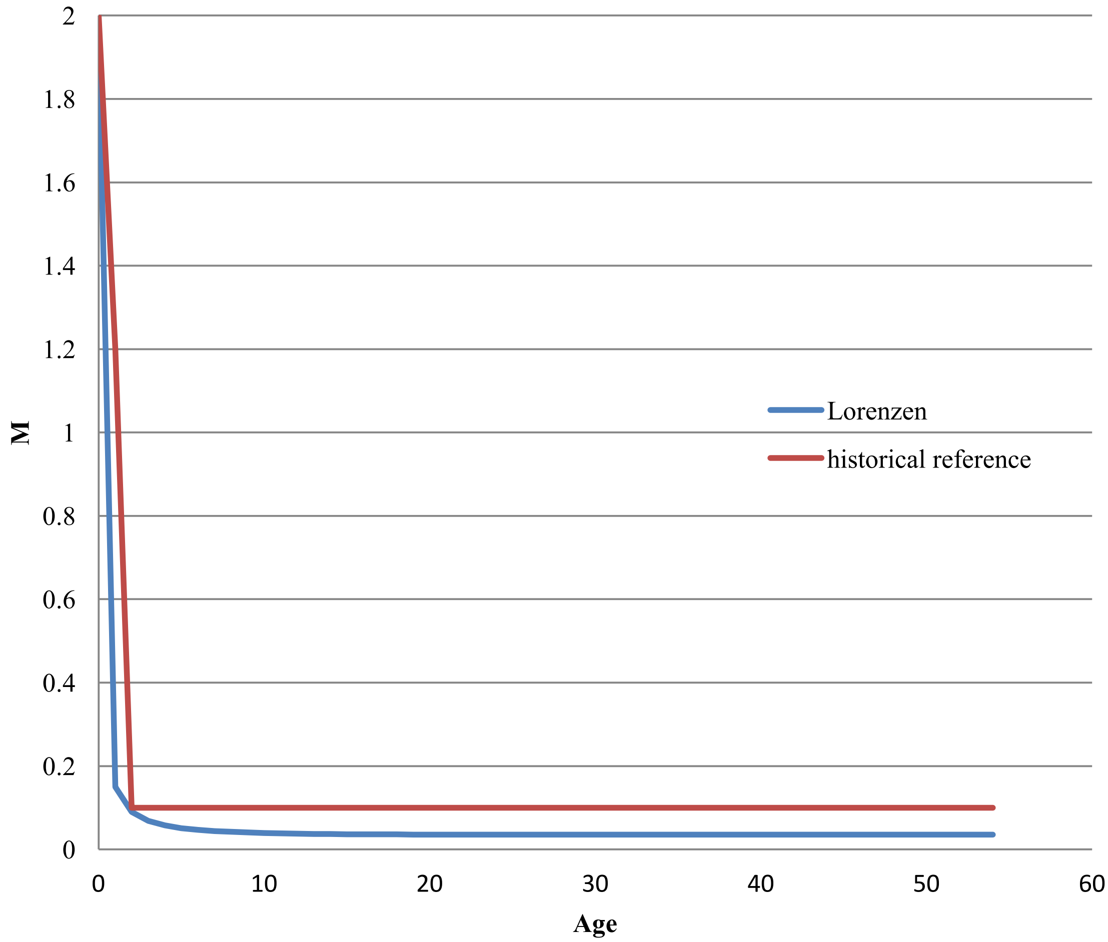


Figure 2. Values for natural mortality used in the 2009 assessment update (in red); age-0 = 2.0, age-1 = 1.2, ages > 1 = 0.1. For purposes of comparison, a Lorenzen fit is shown (in blue) scaled to $t_{max}$ = 50 years.

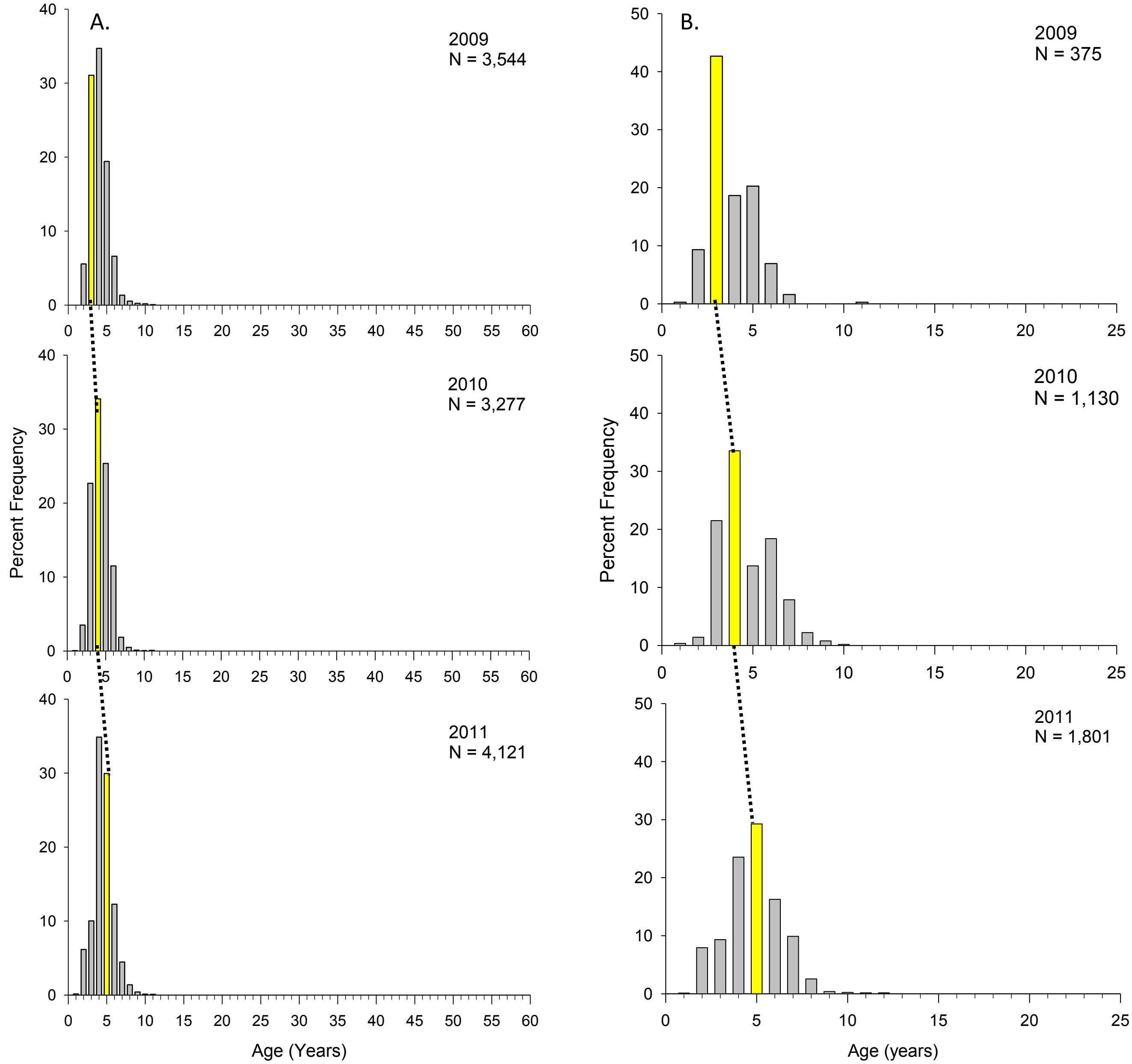


Figure 3. Red snapper age frequency distributions 2009 to 2011 for the commercial hand-line fishery (A) and fishery-independent hand-line survey (B). Yellow bars and dotted lines represent 2006 year class.

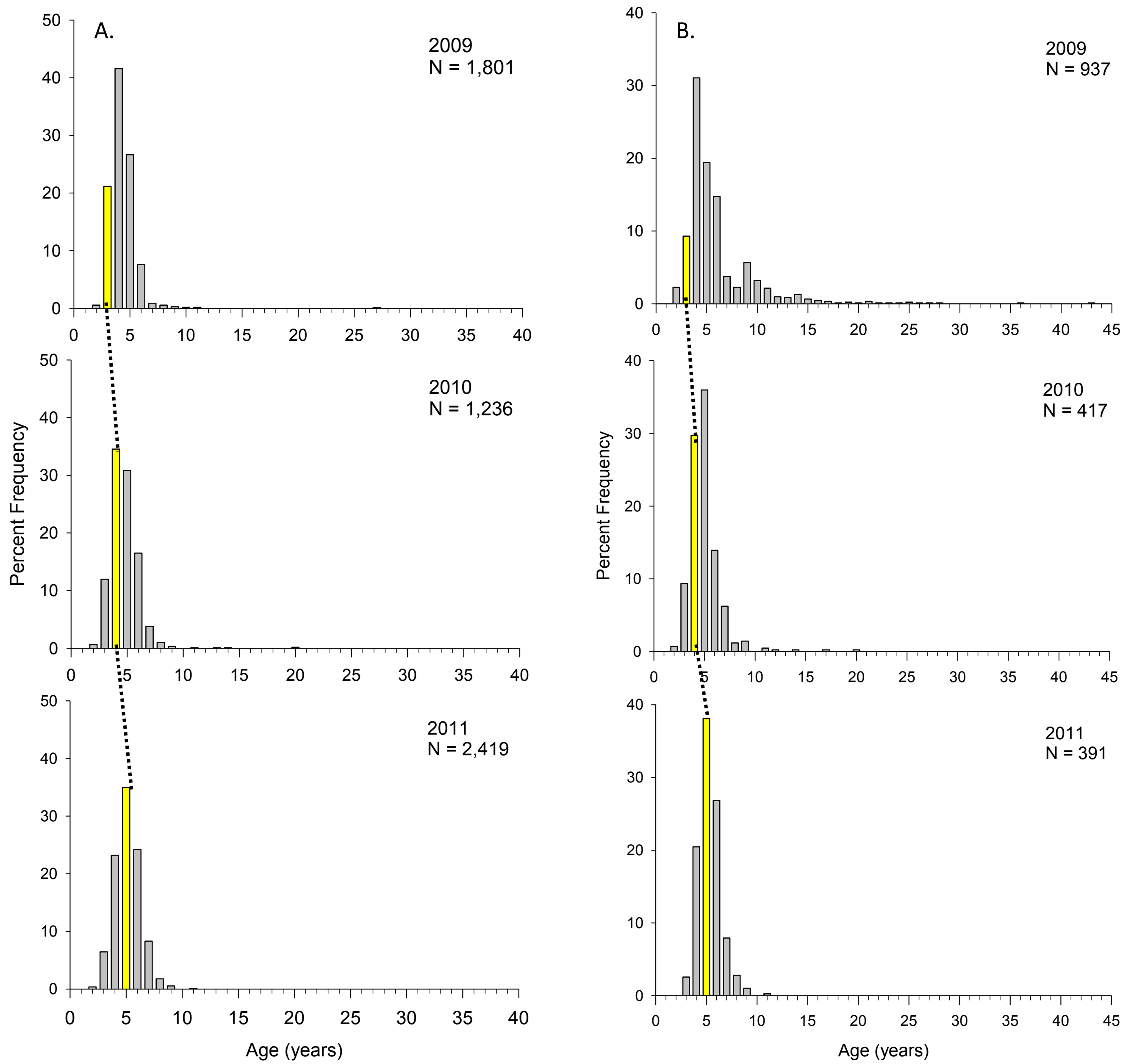


Figure 4. Red snapper age frequency distribution 2009 to 2011 for the recreational hand-line fishery (A) and the commercial long-line fishery (B). Yellow bars and dotted lines represent 2006 year class.

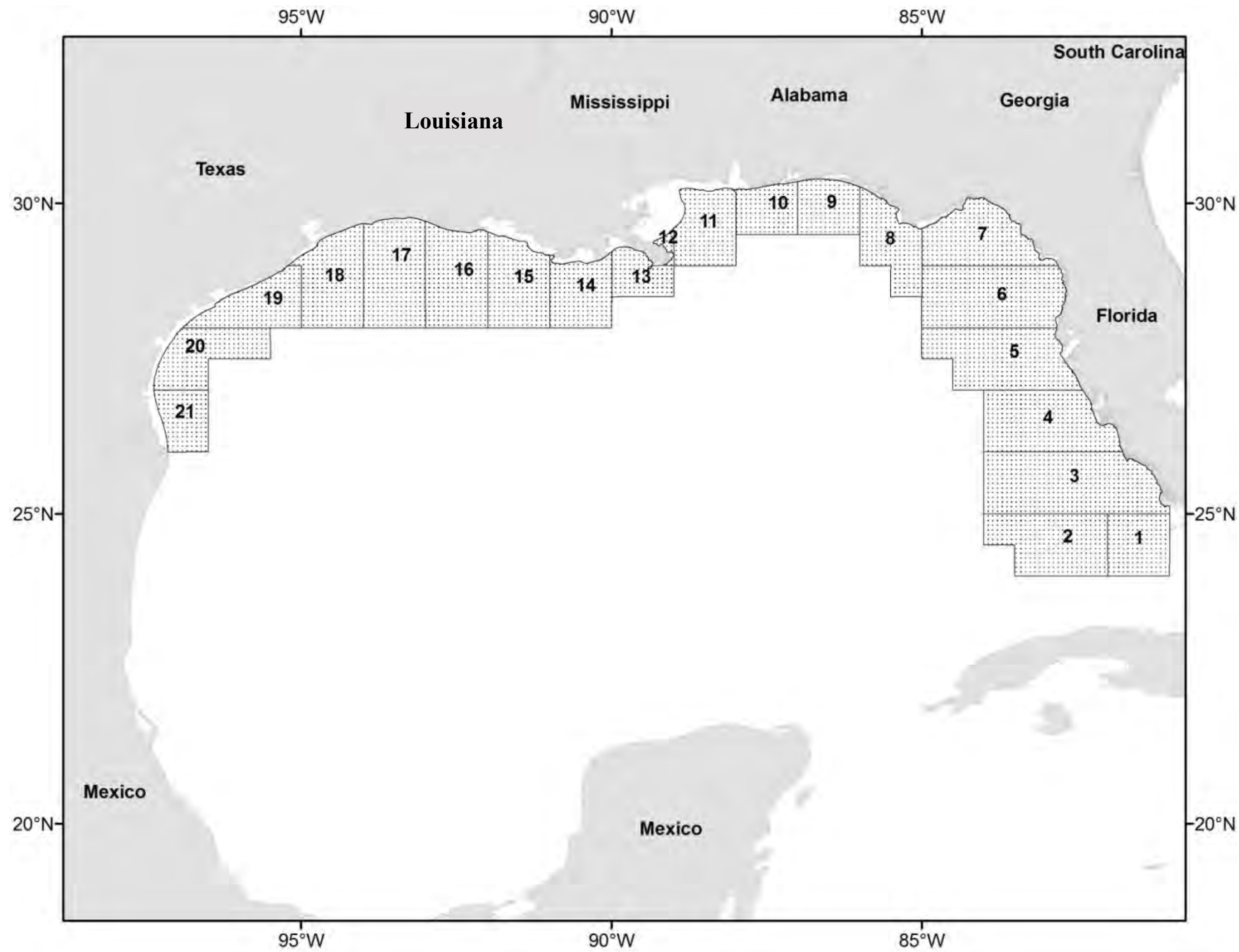


Figure 5. Map of Northern Gulf of Mexico indicating statistical subareas 1 – 21.

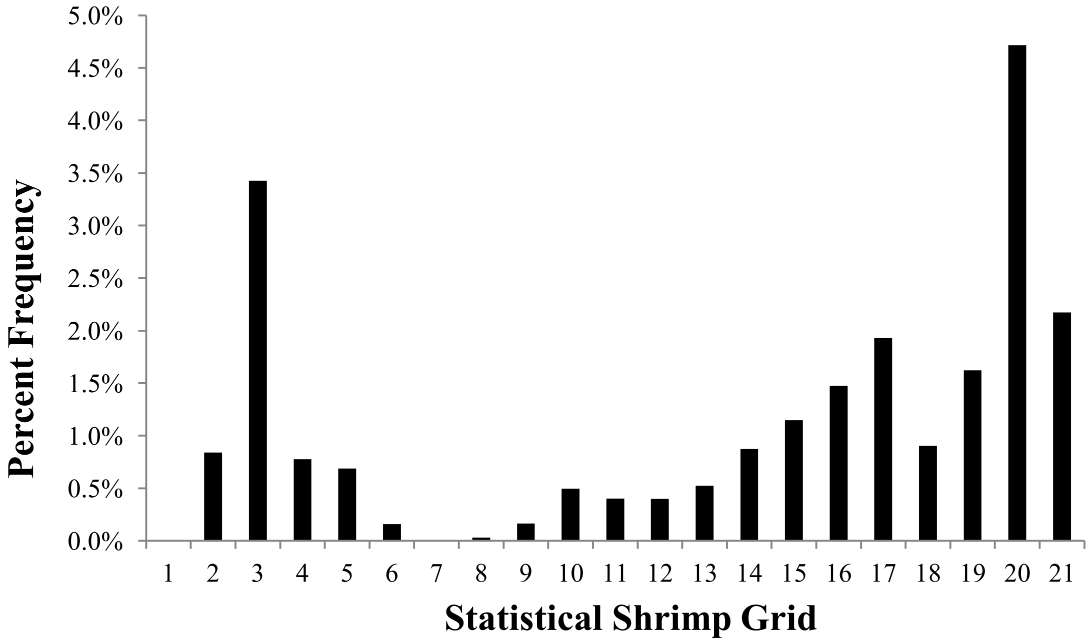


Figure 6. Percent frequency of red snapper age 20 years and older by statistical shrimp grid (1991-2011).

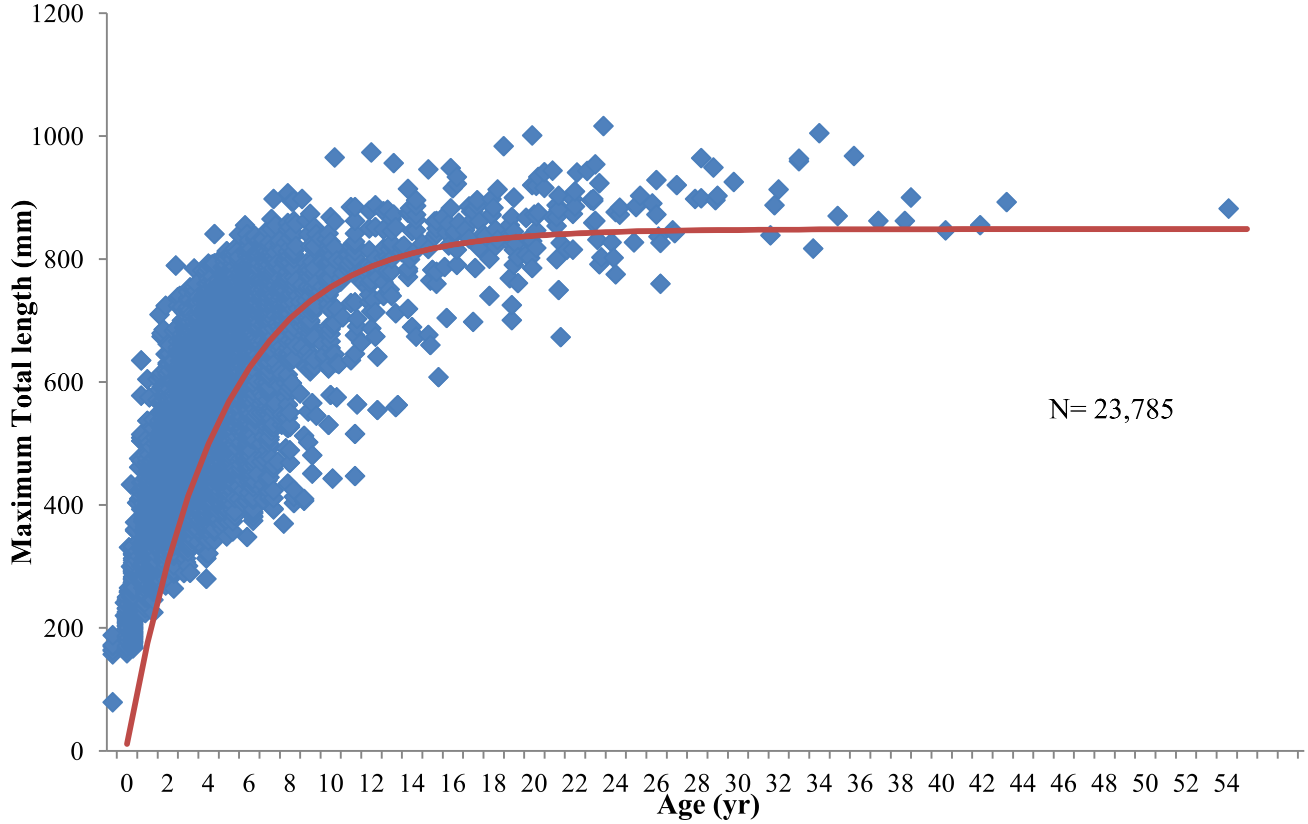


Figure 7. Size-modified von Bertalanffy growth curve developed for Gulf of Mexico red snapper from fishery dependent and independent collections.

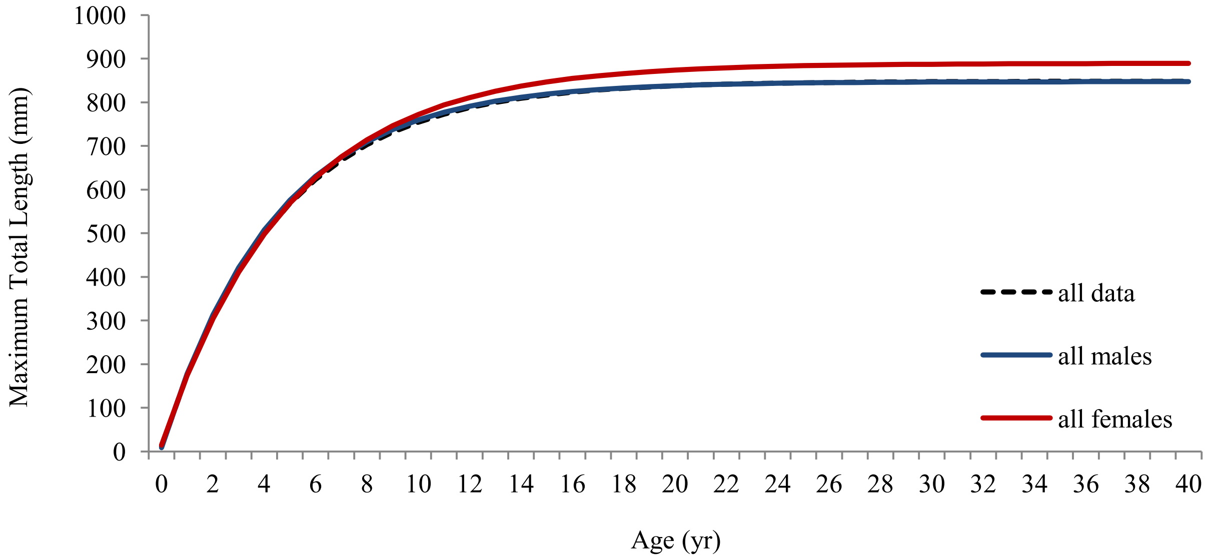


Figure 8. Size-modified, sex specific von Bertalanffy growth curves for Gulf of Mexico red snapper.

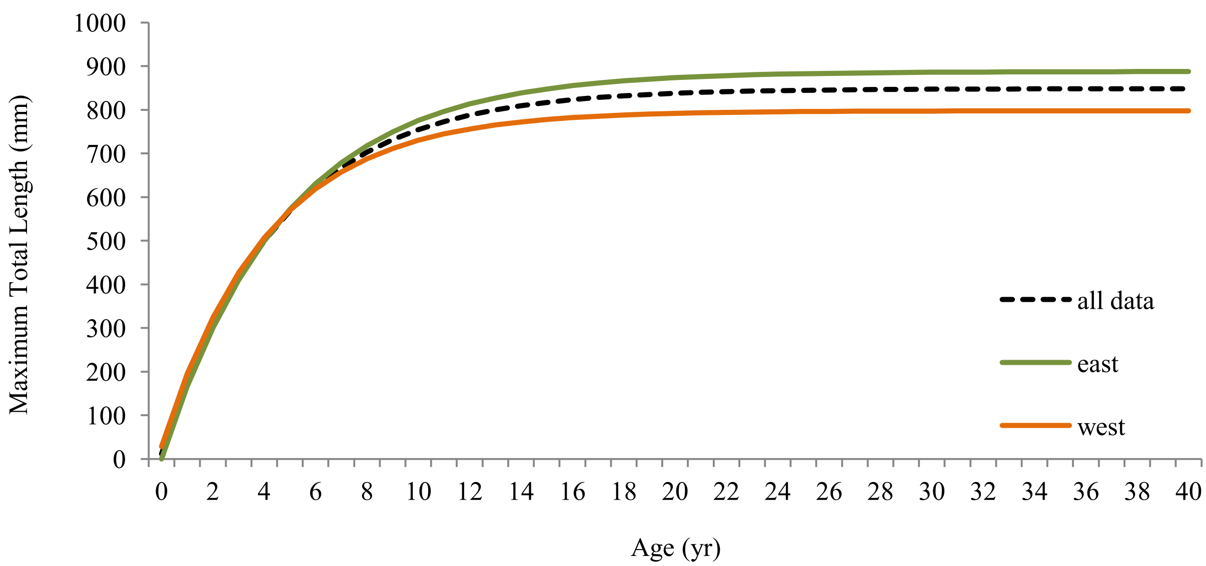


Figure 9. Size-modified, region specific von Bertalanffy growth curves for Gulf of Mexico red snapper corrected.

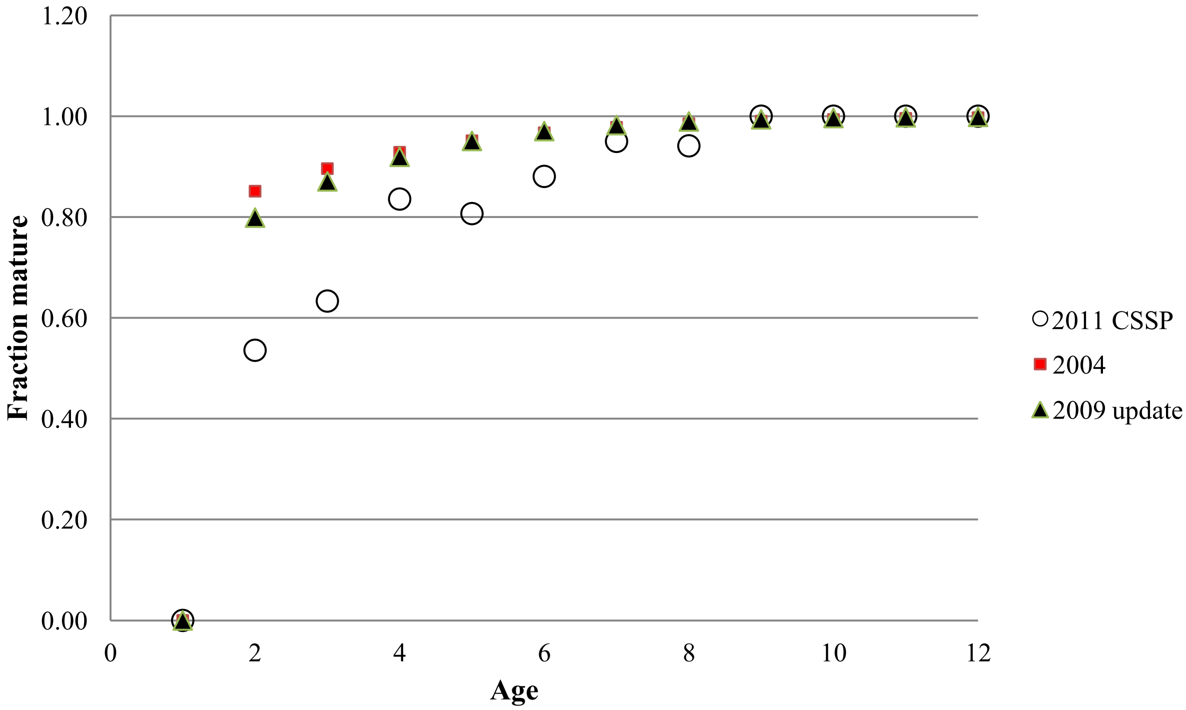


Figure 10. Fitted points (solid symbols) for female age-at-maturity are shown for previous assessments; 2004 and update in 2009 (n=2371 females). Estimated fraction mature aggregated at age are shown (open circles) for the 2011 CSSP project (n=433 females). Age 12 is a plus group for CSSP data.

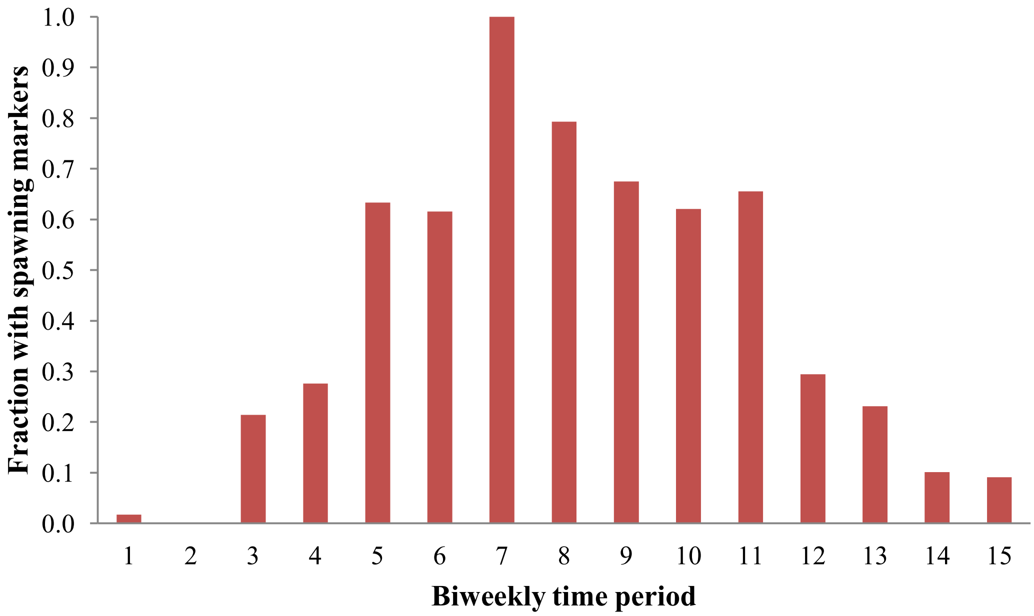


Figure 11. Seasonal reproductive development of female red snapper summarized by biweekly time period during the 2011 CSSP survey (N = 992, biweekly dates range from April-October, see Fitzhugh et al. 2012). Note that time period 7 is represented by small sample size (n= 2).

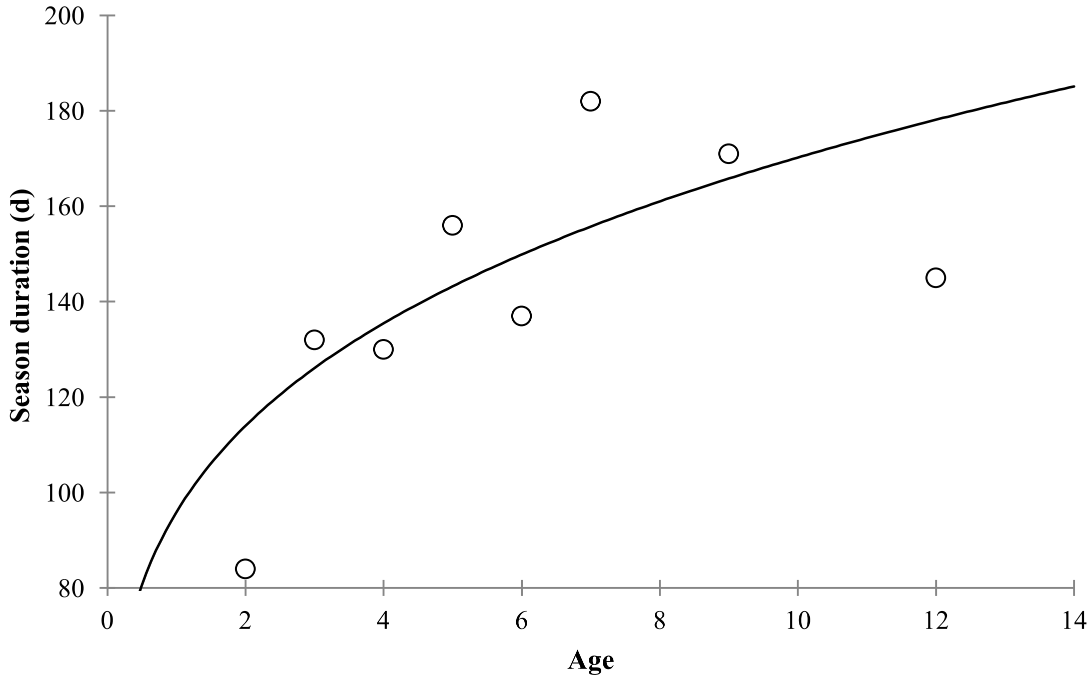


Figure 12. Non-linear weighted regression of the spawning season duration in days by age. Duration determined based upon the earliest and latest appearance of spawning markers by age. Due to sample size, ages 8-10 were aggregated and oldest ages aggregated as plus group, age 11+. Duration = 95.895 $(Age)^{0.249}$. $R^2$=0.47 (from Fitzhugh et al. 2012 SEDAR31-DW07).

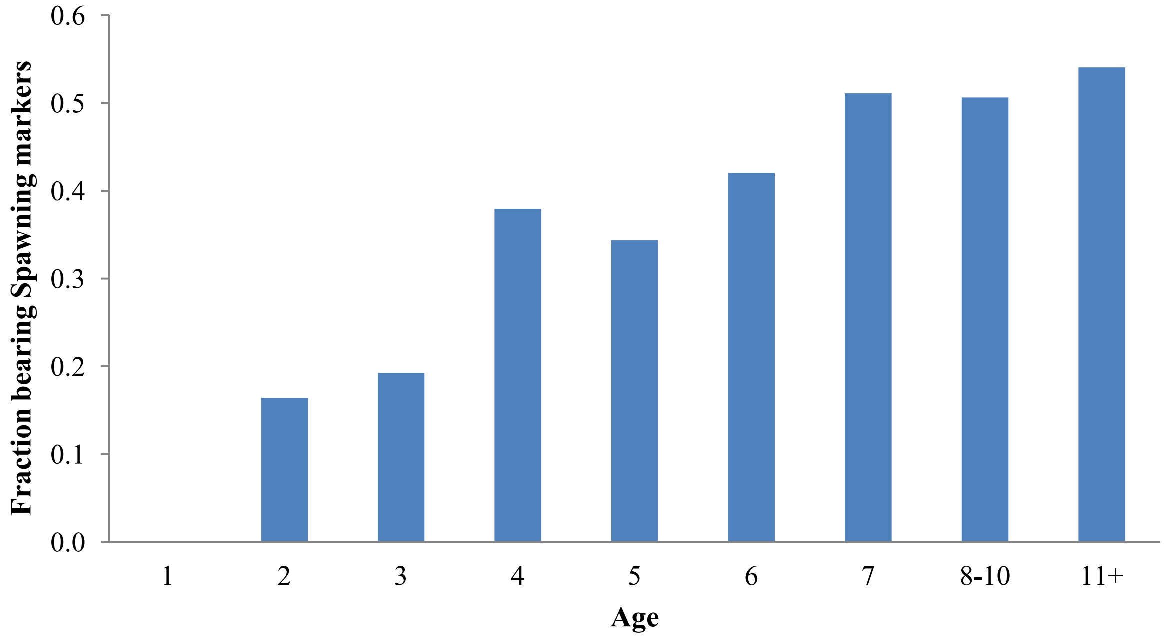


Figure 13. Fraction of females histologically assessed bearing spawning markers (H, POF stage, from Fitzhugh et al. 2012).

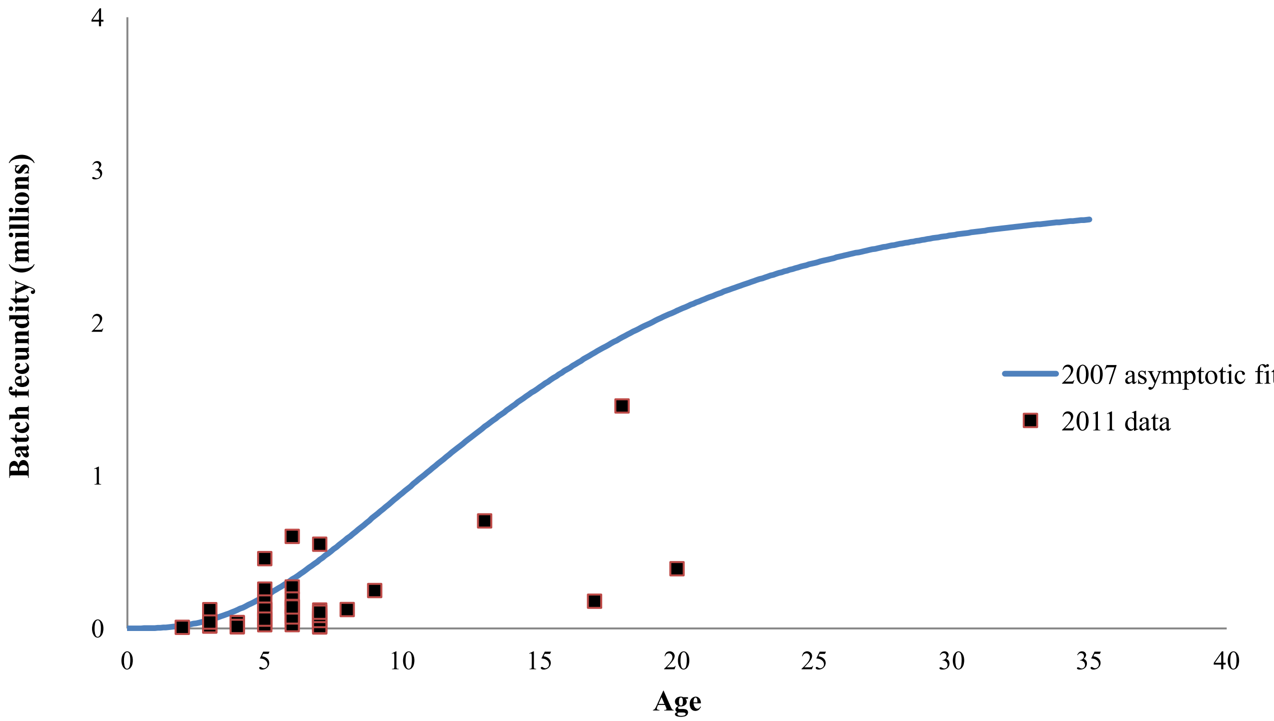


Figure 14. Batch fecundity by age from females in late hydration from the 2011 CSSP survey (from Fitzhugh et al. 2012). For comparison, the asymptotic age-batch fecundity relationship is shown (Porch et al. 2007) based upon a larger batch fecundity data set.

# 3 Commercial Fishery Statistics

## 3.1 Overview

Commercial landings of red snapper for the U.S. Gulf of Mexico were constructed using data housed in the NOAA's Southeast Fisheries Science Center's Accumulated Landings System (ALS) from 1964 through 2011. For landings between 1880 and 1963, previously constructed historical landings were used. In constructing the 1964-2011 time series, port of landing was used to assign water body when water body was not present. For missing or unclassified gears, proportions from the Coastal Fisheries Logbook Program (CFLP) were used when available. Florida General Canvass gear proportions were applied to Florida landings. Total annual landings from the IFQ program were used for years 2007-2011. These landings were used to reapportion 2007-2011 ALS landings across strata.

Discards were calculated for the directed fishery using CFLP discard logbook data, as well as from the reef fish observer program. In addition to the directed fishery discards, shrimp bycatch estimates of red snapper were calculated using observer data and estimated shrimping effort.

Length frequency distributions were constructed for red snapper in the years 1984-2011 using available TIP length data. Length frequencies were provided by year, region (East GoM, West GoM), and gear (longline, handline). Length frequency distributions were also constructed from observer data from 2006-2011. This allowed for investigation of discard lengths by year and by IFQ allocation. Age frequency distributions were constructed by year, region, and gear. A comparison of the age lengths with the length data was done to assess bias in otolith sampling.

### *3.1.1 Participants in SEDAR 31 Data Workshop Commercial Workgroup*

Neil Baertlein, NMFS Miami (group leader)
Ching-Ping Chih, NMFS Miami
David Donaldson, GMFMC
David Gloeckner, NMFS Miami
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Wade Griffin, Texas A&M University
David Krebs, Commercial Fisherman
Brian Linton, NMFS Miami (lead assessment scientist)
Jim Nance, NMFS Galveston
Jessica Stephen, NMFS SERO
Donnie Waters, Commercial Fisherman
Wayne Werner, Commercial Fisherman

Other contributors: Shannon Calay, Kevin McCarthy, Refik Orhun, Benny Gallaway

### *3.1.2 Issues Discussed at the Data Workshop*

Issues the workgroup addressed in terms of commercial landings included historical landings, boundaries, gears, and IFQ reported landings. For red snapper discards and bycatch the workgroup discussed estimates created from self-reported logbooks, directed fishery observers, and shrimping bycatch. Size composition discussions included the representativeness of lengths sampled from observers and dockside sampling, as well as from otoliths obtained from dockside samples.

### 3.2 Review of Working Papers

The workgroup considered data and analyses presented from five data workshop working papers.

**SEDAR31-DW02**: This document provides an overview of the Gulf of Mexico Red Snapper IFQ program as well as a description of the data collected by the IFQ office at NOAA's Southeast Regional Office. The group recommended the total landings be used for the years 2007 through 2011.

**SEDAR31-DW10**: This document provides length frequency distributions for commercial and recreational red snapper landings in the Gulf of Mexico.

**SEDAR31-DW30**: This document provides shrimp bycatch estimations for red snapper in the Gulf of Mexico as well as the Bayesian model used to construct estimations. The group recommended using the 3-depth zone model for bycatch estimations.

**SEDAR31-DW31:** A detailed summary of the methods used to calculate total commercial discards from self-reported logbooks and observed trips.

**SEDAR31-DW32:** A detailed summary of the methods used to produce red snapper size frequency histograms of discarded and landed (kept) fish using data collected by commercial fisheries observers

### 3.3 Commercial Landings

Commercial landings were compiled from the ALS from 1964-2011. Red snapper landings are provided in Table 3.1 by year, gear (longline, handline+) and region (Eastern and Western Gulf of Mexico). Landings for 'handline+' in the eastern Gulf of Mexico were also separated by southern and northern sub-regions in Table 3.2. As recognized in the 2004 SEDAR 7 DW report, there are several situations where the landings data may not have the desired level of resolution. The following issues were identified:

1. Only annual data are available for 1962 – 1977
2. In 1962 and 1963, significant proportions of landings, 99.89% and 18.26%, respectively, are only reported as water body code 5000 (Gulf of Mexico), without the distinction to eastern or western Gulf
3. For Florida, gear and fishing area are <u>not</u> available for monthly data for 1977 - 1984
4. For Louisiana, gear and fishing area are <u>not</u> available for 1990 - 1999

5. For Texas, an unusually large of allocations of red snapper landings are assigned to shrimp trawl gear for 1978 - 1983
6. For Texas, gear and fishing area are not available for 1990 - 2011.

There is a lack of resolution for the 1962 - 1977 period, however there was no need to distribute the annual percentages by gear and fishing area by month for this time period.

For the landings on the west coast of Florida during the period 1977 - 1996, data on the allocation of landings gear and fishing area are available from the Florida general canvass data which has annual landings data by gear and water body from 1976 to 1996. Proportions from the annual general canvass were applied to the monthly ALS data to provide the desired resolution for the landings time series. The annual Florida general canvass landings data were used from 1977 – 1989 to allocate gear and statistical area to the landings.

To supply gears and areas for the Louisiana data, CFLP data were used to apportion landings accordingly.

Landings in Texas from 1978 to 1983 were classified as gear code ‘0’ or ‘215’ (unclassified gear or shrimp trawl). No vertical (hand or electric) or longline gear was present for TX landings. To account for the missing gears, apportioning of Texas landings by gear for 1978 through 1984 was performed by using proportions. See section 3.3.4 for further discussion.

To supply gears and areas for the Texas landings beginning in 1990, CFLP data were used to apportion landings accordingly.

In summary, for landings 1990 and later the gear allocations available in the general canvass (trip ticket) data were retained and the gear allocations from the CFLP were used for Louisiana (1990 - 1999, the Louisiana trip ticket data without gear designations for 2000 - 2003) and for Texas landings.

Further details regarding the data in ALS and General Canvass can be found Appendix A.

### *3.3.1 Historical Landings*

In SEDAR7, historical landings of red snapper were constructed from 1880-1962 using various data sources. Landings data were by port, but were assigned to region based upon several historical references. Further detail can be found in SEDAR7-AW22 (Porch). A table of the historical landings can be found in Table 3.3.

**Decision 1:** Use Historical landings (1880-1963) as constructed in 2004 (Porch).

### *3.3.2 Boundaries*

Gulf of Mexico landings are spatially distributed using the statistical areas 1 to 21, reaching from statistical area 1 in the Florida Keys to statistical area 21 bordering Mexico, see Figure 3.1.

Statistical areas 1-12 are assigned to the eastern Gulf stock, statistical areas 13-21 are assigned to the western Gulf stock. The ‘handline+’ landings in the eastern Gulf are further distinguished into a southeastern component, statistical areas 1- 7, and a northeastern component, statistical areas 8- 12.

The CFLP landings are reported by statistical area 1-21. ALS landings are reported by water body. When available, water body code is converted to statistical areas using the first two digits of the water body codes. When ALS water body is not available, county of landing is used to assign the nearest statistical area.

The Gulf of Mexico and South Atlantic stock boundary lays in areas 1 and 2. The Gulf of Mexico landings from areas 1 and 2 are taken from water bodies north of highway U.S. 1 in the Florida Keys and north of the boundary line that extends from Key West to the Dry Tortugas. Waters west of the Dry Tortugas are considered to be the Gulf of Mexico.

> **Decision 2:** The workgroup’s decision was to maintain the region boundaries as defined in SEDAR7.
> - Eastern Gulf of Mexico: Statistical areas 1-12
> - Western Gulf of Mexico: Statistical areas 13-21

### *3.3.4 Gears*

Gears were assigned in the same fashion as done in SEDAR7 by using two gear types, long line and ‘handline+’, which is hand line and all other gears. The codes for these gear types are in ALS, Florida General Canvass data, and the CFLP and can be found in Tables 3.4 and 3.5.

Landings in Texas from 1978 to 1983 were classified as gear code ‘0’ or ‘215’ (unclassified gear or shrimp trawl). No vertical (hand or electric) or longline gear was present for TX landings. To account for the missing gears, apportioning of Texas landings by gear for 1979 through 1983 was performed by using proportions presented in Parrack and McClellan, 1986. Proportions used were an annual accumulative of proportions by age and gear for the western Gulf of Mexico (Table 3.6) Proportions for 1978 were not available and as best estimate the proportions from 1979 were also used for 1978.

> **Decision 3:** Use landings provided in 1986 document (Parrack and McClellan, 1986) to apportion TX landings in 1978-1983.

### *3.3.5 IFQ Landings*

The red snapper Individual Fishing Quota program (RS-IFQ) is an online system where all transactions (share, allocation, and landing transfers) are recorded immediately upon entry by RS-IFQ participants. Landing transactions contain the following information: shareholder, vessel, and dealer name, landing date/time, landing location, species and pounds landed, and a landing confirmation number. Landings transactions cannot be completed for more pounds than are allocated to the vessel at the time of the landing and are not completed until approved by both the dealer and shareholder. The RS-IFQ program records all weights in gutted pounds, but these analyses all landings were converted to whole weight by multiplying by 1.11. Individual landings were summed for annual total pounds landed. Please refer to the Data Workshop working document SEDAR31-DW02 for further details about the RS-IFQ program.

In the IFQ years (2007 and later) commercial landings were based on ALS and IFQ reporting, rather than just ALS. IFQ landings reported were more likely to be accurate and, with the exception of 2009, possessed a higher landings total. The range in landings disparities between ALS and IFQ ranged from -0.37% to 3.27%. For the assessment, ALS data are assigned to gear and statistical area (and thereby region) using logbook proportions of the landings (rather than dealer information). To maintain this resolution in ALS data, ALS landings were adjusted across strata using the percent difference between ALS and IFQ landings (Table 3.7). The resulting total ALS landings for 2007 through 2011 would then reflect that of IFQ.

> **Decision 4:** Use total IFQ landings from 2007 through 2011. Apply the differences between ALS and IFQ to ALS data across all strata.

## 3.4 Discards and Bycatch

Red snapper discards in the Gulf of Mexico were calculated from data collected by the CFLP's self-reported discard logbook and NOAA Fisheries Gulf of Mexico reef fish observer program. In addition to these directed fisheries discards, estimates of red snapper bycatch from the commercial shrimping fleet were also generated.

### *3.4.1 Discards from Finfish Directed Fisheries*

Full details of the methods of discard calculation can be found in SEDAR31-DW31.

Yearly red snapper discards calculated using self-reported discard rates, uncorrected for possible under reporting are provided in Tables 3.8 (vertical line) and 3.9 (bottom longline). Discards totals were in close agreement to those calculated for the 2009 red snapper assessment update. Minor differences were likely due to removal of duplicate records and correction of erroneous records in the data base. In addition, where discard rates were calculated as a mean rate across multiple years; those rates changed with additional years of data. Very low calculated discards for "IFQ west" were driven by decreasing reported effort over time and low discard rates reported, especially during 2009-11.

The vertical line fishery accounted for the majority of red snapper discards, by one to two orders of magnitude per year/region/season stratum, compared to the bottom longline fishery. The disparity in discards among gears was also found during the years of management through IFQs. Yearly discards calculated using observer reported discard rates are shown in Table 3.10. Those observer discard rate based calculations resulted in higher total vertical line discards than did the calculations using self-reported discard rates; often four to five times higher. The 2007-2008 eastern Gulf longline self-reported discards were higher than the observer reported discards, perhaps due to low observer coverage. Calculated discards of eastern Gulf longline vessels were similar using observer and self-reported data. Observer coverage was higher during those years.

Western Gulf longline calculated discards were low using discard rates from either data set. No observer data were available from the western Gulf longline fishery during 2006-2007.

Total discards calculated using data filtered to remove records reporting “no discards” are included in Tables 3.11 (vertical line) and 3.12 (bottom longline). Also included are total discards calculated with “no discards” records included. Not surprisingly, with “no discards” records excluded (i.e., removal of some zero discard records) total calculated discards were usually greater than those calculated prior to filtering the data set. In two cases, calculated discards were unchanged following removal of “no discards” records (e.g., west closed season vertical line). For vertical line in the western Gulf of Mexico, differences in total discards within strata following exclusion of “no discards” records were relatively small; less than 10 percent in all but two cases and often less than five percent. In the eastern Gulf of Mexico, vertical line calculated discards were usually more than 10 percent higher with the exclusion of “no discards” records. In four strata, calculated discards were more than 15 percent greater after data filtering.

The bottom longline fishery reported fewer red snapper discards than the vertical line fishery. Exclusion of “no discards” records resulted in proportionally much higher calculated red snapper discards in the bottom longline fishery. In some cases (e.g., IFQ west), discards calculated with “no discards” records excluded were two orders of magnitude greater than discards calculated with “no discards”. Total discards calculated for the longline fishery were much lower than vertical line fishery discards, however, even with “no discards” records excluded from the calculations.

> **Decision 5:** Wait for recommendations from the external review of the observer program. Depending on recommendations, recalculation of logbook and observer discard estimates may be necessary. The workgroup will discuss any changes and present recommendations to the panel in a future webinar.

*Remaining Tasks:*
-Waiting for results from external review of directed fishery discard analyses. Forthcoming review may suggest an improved method of discard calculation. Additional work will be discussed via Webinar.

### *3.4.2 Bycatch from the Shrimp Fishery*

Shrimp bycatch estimates for Gulf of Mexico red snapper were generated using the same approach developed by Scott Nichols in the SEDAR 7 Gulf of Mexico red snapper assessment (Nichols 2004a, 2004b). The primary data on CPUE in the shrimp fishery came from a series of shrimp observer programs, which began in 1972 and extend to the current shrimp observer program. Additional CPUE data were obtained from the SEAMAP groundfish survey. Point estimates and associated standard errors of shrimp effort were generated by the NMFS Galveston Lab using their SN-pooled model (Nance 2004). Most CPUE data were reported in fish per net-hour, while the shrimp effort data were reported in vessel-days. Therefore, data from the Vessel Operating Units File were needed to estimate the average number of nets per vessel for the shrimp fishery to convert total shrimp effort to net-hours. A detailed description of the data and methods used to produce the shrimp bycatch estimates can be found in Linton (2012).

Model 02 from Nichols (2004a) was used to estimate shrimp bycatch. Two model runs were made using different depth zone stratifications: 1) a three depth zone run (0 fm – 10 fm, 10 fm – 30 fm, 30+ fm), and 2) a two depth zone run (0 fm – 10 fm, 10+ fm). The shrimp bycatch estimation model was fit using WinBUGS version 1.4.3. Markov Chain Monte Carlo (MCMC) methods were used to estimate the marginal posterior distributions of key parameters and derived quantities. Convergence of the MCMC chains was determined by visual inspection of trace plots, marginal posterior density plots, and Gelman-Rubin statistic (Brooks and Gelman 1998) plots.

**Decision 6:** Using age compositions from observer data to define 0 and 1year red snapper in shrimp estimates.

**Decision 7:** The three depth zone run was chosen to provide shrimp bycatch estimates for the assessment, because this run incorporates finer spatial resolution in the data. In particular, the three depth zone run includes the 10 fm to 30 fm zone where the majority of red snapper (i.e., approximately 80% according to observer program data) are thought to be caught by the shrimp fishery.

The MCMC chains demonstrated good convergence properties. Convergence diagnostics for the local terms precision (1/variance) parameter are presented in Figure 3.2 as an example. Region-specific annual estimates of shrimp bycatch from the three depth zone run are presented in Figure 3.3 and Tables 3.13 and 3.14. Marginal posterior densities of the annual shrimp bycatch estimates all showed varying degrees of right-skew. In the eastern Gulf, CVs of the annual estimates ranged from 0.10-2.03 with a mean CV of 1.22. In the western Gulf, CVs of the annual estimates ranged from 0.08-2.29 with a mean CV of 0.91. Trimester-based estimates of shrimp bycatch were also produced, and are available for use in the assessment.

Shrimp effort is used as an index of shrimp fishing mortality in the assessment, in addition to its use in the estimation of shrimp bycatch. Shrimp effort estimates by region and depth zone are presented in Figure 3.4.

**Decision 8:** Shrimp effort for depths greater than 10 fm was chosen to provide an index of shrimp fishing mortality in the assessment, because effort from these depths is thought to best represent the fishing pressure experienced by red snapper in the shrimp fishery. This decision is in keeping with decisions made for SEDAR 7 and the 2009 Gulf of Mexico red snapper update assessment.

Shrimp effort for depths greater than 10 fm is presented in Table 3.15.

## 3.5 Commercial Effort

The distribution of directed commercial effort in trips by year was compiled from the Coastal Fisheries Logbook Program for 1992-2011 and supplied here for informational purposes. These data are presented in Figures 3.5-3.7.

Maps of the total estimated shrimping effort are also supplied for informational purposes and can be found in Figures 3.8-3.10.

## 3.6 Biological Sampling

Length distributions were provided from commercial landings provided in the Trip Interview Program (TIP) database and the Gulf Fisheries Information Network (FIN). The length distributions were presented by year, gear, and region. Length distributions constructed from the reef fish observer program were also provided from 2006-2011. The observer data allowed for comparison of size distributions between discarded and kept fish. The impact of available IFQ allocation on fishing behavior was also discussed by the workgroup. Age distributions were also developed by year, gear, and region. A comparison between lengths from otolith samples and the complete length dataset was performed to determine representativeness of otolith sampling.

### *3.6.1 Length Distribution of Commercial Landings*

Length samples for commercial fisheries were obtained from the Trip Interview Program (TIP) database and the Gulf Fisheries Information Network (FIN) database. All commercial data were grouped into four strata (handline east (HE), handline west (HW), longline east (LE) and longline west (LW)). The eastern Gulf and western Gulf were defined based on Gulf shrimp grids (grids 1 to 12 for the eastern Gulf and 13 to 21 for the western Gulf). Length samples were assigned by fishing area to different strata. When a fishing area was not available, landing area was used. Length frequencies were calculated for each year and season (4 month periods) for each stratum. Length samples were first grouped into 1 inch bins (e.g., if $1 \leq$ length $< 2$ then length=1). Length frequencies for handline samples collected from the eastern Gulf were further weighted by landings from the northeastern and southeastern Gulf. The southeastern Gulf was defined as grids 1 to 7, and the northeastern Gulf was defined as grids 8-12. All length values in the original data sets were converted to total length by using the equations listed in the SEDAR7 final assessment report.

Full details of the analyses can be found in SEDAR-31-DW10. Plots of the length distributions by gear and region can be found in Figures 3.11-3.14.

> **Decision 9:** Accept length compositions by year, gear, and region produced from TIP and FIN.

*Remaining Tasks:*
- In the process of comparing these length distributions with the age-length distributions it was discovered that several updated data files had recently become available. Length distributions will be reconstructed with the updated files.

### *3.6.2 Size Frequency Data from Commercial Fisheries Observers*

A detailed summary of the methods used to produce red snapper size frequency histograms of discarded and landed (kept) fish using data collected by commercial fisheries observers is available in working paper SEDAR31 DW32.

The available observer reported red snapper size and disposition data were used to construct size frequency histograms of discarded and kept fish for each region and gear. Regions were defined as Gulf of Mexico statistical areas 1-12 (east) and 13-21 (west). Gears included vertical lines (handline and electric/hydraulic reels) and bottom longlines. No attempt was made to account for the fraction of fish that was not measured (e.g., if 70% of discarded fish within a stratum were measured while 95% of kept fish were measured in the same stratum, no adjustment was made for that difference in sampling fraction).

Prior to 2007, observer data were available for the period July-December, 2006. During those months, the commercial fishery was subject to seasonal closures. Data collected during 2006 were stratified by season (open and closed), region, and gear and size frequency histograms constructed for each stratum.

In addition to region/gear stratification, observer data from the period 2007-2011 were further stratified by the amount of red snapper Individual Fishing Quota allocation available to the observed vessel. Allocation categories were defined by dividing the data (number of measured fish) into roughly equal groups. In each region/gear stratum, a "no allocation" stratum was defined. All region/gear/allocation strata are defined in Table 3.16.

Finally, yearly changes in the size frequency of discarded and kept red snapper were examined. Histograms were produced following stratification of the data by year, region, and gear. Data were not stratified by the amount of red snapper allocation available to each vessel.

Sample sizes of observed fish are provided within each figure. The number of trips with red snapper observed are included in Table 3.17 (sample sizes in 2006), Tables 3.18A-3.18B (trips by gear, region, and red snapper allocation), and Tables 3.19A-3.19B (trips by gear, year, and region).

Size frequency histograms of observed red snapper discards and kept fish are provided in the figures listed below. In some strata data could not be presented due to confidentiality restrictions and have been identified in the figure captions.

It is likely that data entry errors and mismatching of data sets while merging observer data with red snapper allocation data resulted in the incorrect assignment to allocation category of a very few trips (e.g., kept fish observed on trips with no red snapper allocation). SEFSC and SERO staff will work to resolve those data issues and new size frequency histograms will be constructed.

A higher fraction of observed kept red snapper were measured (usually >90%) than were observed discarded red snapper (typically 70-90%). The working group recognized that the histograms should be adjusted to account for that fraction of the observed red snapper that were not measured.

**Decision 10:** Accept discard length compositions from reef fish observer data.

*Remaining Tasks:*
-Redefine allocation bins based upon fisher and assessment scientist input.
-Correct data entry errors and data set merge problems to properly assign the few trips that were likely misassigned to an incorrect allocation category.
-Account for the proportion of fish not measured when constructing frequency histograms.
-Construct new size frequency histograms from the observer data once the above issues have been resolved.

### *3.6.3 Age Distribution*

To explore the possibility of non-representative sampling of fish chosen for otolith analysis, the working group requested the length distribution of all available samples be compared to the length distribution of the samples selected for otolith analysis. It was expected the two length distributions would be very similar if the otolith samples were a representative subsample of the total observed fish. In both cases, the length distributions were weighted by the landings as previously described. The resulting length compositions can be found in Appendix B.

The working group concluded there was evidence of non-representative sampling prior to 2000 in all fisheries. The Panama City lab reported that some of these early samples were taken to construct an age length key, rather than to construct a growth curve. After 2000, scientific samplers were directed to obtain a representative sample by length for otolith analysis.

The length frequency comparisons (see Appendix B) indicate that this objective was met in most cases.

**Decision 11:** Otolith samples from 2000 forward mostly appear to be representative, correspond with changes in sampling protocols.

*Remaining Tasks:*
-Address non-representative age samples.

## 3.7 Comments on Adequacy of Data for Assessment Analyses

Overall the workgroup felt the landings were adequate for assessment analyses. The landings time series ran from 1880-2011. There was some uncertainty in the landings provided for 1880-1963 as reported landings were inconsistent and derived from port of landing. The regional boundaries set and the landings by gear group were agreed upon by the workgroup. Total IFQ landings used for 2007 through 2011 were also agreed upon as adequate.

Discard and bycatch estimations were also adequate, but possessed a lesser level certainty than the landings. The total discards calculated from logbook and observer data may be recalculated based upon results from an external review of the observer program and discard calculation methods. There is also a higher level of uncertainty in the discards for 1990 through 2001 as these estimates are based upon an average discard rate from 2002 through 2006. If the external review of the observer sampling is found adequate, calculated discards for 2007-2011 from the observer data would likely be preferable. Bycatch estimates from the shrimp fishery were considered adequate. A three depth zone model run was performed, which was recommended over previous 2-depth zone runs as it provided finer spatial resolution. These estimations were performed using a well established methodology.

Most length distributions appeared to be adequate however some strata were not adequate as sample sizes were small. This was especially the case for longline samples in the western Gulf. Length distributions of discarded fish from samples obtained from the observer program appeared to be adequate. However, these will be revisited pending an external review of the program. Upon a comparison with the length compositions age distributions appeared to be adequate from 2000-2011. This trend is in agreement with a shift in the dockside sampling protocol.

## 3.8 Research Recommendations for Red Snapper

**Landings**
1. Revisit how the historical landings were constructed.
2. Explore ways to ensure that IFQ and trip ticket landings match.
3. Apportion landings accordingly in ALS for TX landings with missing gear.

**Discard**
1. Add species to discard logbook form.
2. Provide better instructions on how to complete the discard logbook.
3. Consider and use relevant input from external review of observer program.
4. Social and economic impacts on fisher behavior in terms of fish discards.
5. Better determine available allocation to vessels on a given trip.

**Length/Age**
1. Standardize length and age data formats from various data sources.
2. Build age databases with Trip ID number for FL and FIN data.
3. Evaluate how to handle catch at age of non-representative age samples.

## 3.9 Literature Cited

Linton, B. 2012. Shrimp fishery bycatch estimates for Gulf of Mexico red snapper, 1972-2011. SEDAR31-DW30.

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Porch, Clay E. Turner, S.C., and M.J. Schirripa. 2004. The commercial landings of red snapper in the Gulf of Mexico from 1872 to 1962. SEDAR7-AW22.

## 3.10 Tables

**Table 3.1** Red snapper landings in the Gulf of Mexico for 1964-2011.

| | Eastern | | Western | | | |
|---|---|---|---|---|---|---|
| Year | Handline+ | Longline | Handline+ | Longline | Total | Source |
| 1964 | 3,606,670 | | 3,590,301 | | 7,196,971 | ALS |
| 1965 | 3,712,564 | | 3,646,081 | | 7,358,645 | ALS |
| 1966 | 3,098,765 | | 3,041,229 | | 6,139,994 | ALS |
| 1967 | 2,906,944 | | 4,230,951 | | 7,137,895 | ALS |
| 1968 | 2,617,546 | | 5,160,886 | | 7,778,432 | ALS |
| 1969 | 2,441,942 | | 4,187,460 | | 6,629,402 | ALS |
| 1970 | 2,309,454 | | 4,652,728 | | 6,962,182 | ALS |
| 1971 | 2,223,569 | | 5,366,029 | | 7,589,598 | ALS |
| 1972 | 2,374,322 | | 4,841,776 | | 7,216,098 | ALS |
| 1973 | 2,713,032 | | 4,867,197 | | 7,580,229 | ALS |
| 1974 | 3,767,565 | | 4,433,800 | | 8,201,365 | ALS |
| 1975 | 3,576,624 | | 3,932,964 | | 7,509,588 | ALS |
| 1976 | 3,288,126 | | 3,325,599 | 1,074 | 6,614,799 | ALS |
| 1977 | 2,263,749 | | 2,873,097 | | 5,136,847 | ALS |
| 1978 | 1,996,352 | | 2,694,000 | | 4,690,352 | ALS |
| 1979 | 2,037,895 | | 2,472,483 | | 4,510,378 | ALS |
| 1980 | 1,895,748 | 94,005 | 2,516,508 | 44,054 | 4,550,316 | ALS |
| 1981 | 2,127,655 | 179,859 | 3,143,304 | 49,261 | 5,500,079 | ALS |
| 1982 | 2,291,907 | 226,574 | 3,661,535 | 71,617 | 6,251,633 | ALS |
| 1983 | 2,387,540 | 445,023 | 3,820,146 | 98,736 | 6,751,444 | ALS |
| 1984 | 1,631,916 | 368,449 | 2,906,413 | 762,672 | 5,669,450 | ALS |
| 1985 | 1,623,772 | 114,339 | 1,846,043 | 604,890 | 4,189,043 | ALS |
| 1986 | 859,831 | 75,897 | 1,933,384 | 831,375 | 3,700,486 | ALS |
| 1987 | 796,819 | 63,474 | 1,474,284 | 734,038 | 3,068,614 | ALS |
| 1988 | 857,959 | 76,666 | 2,355,109 | 670,131 | 3,959,865 | ALS |
| 1989 | 673,086 | 78,572 | 1,891,961 | 454,743 | 3,098,362 | ALS |
| 1990 | 697,614 | 74,787 | 1,757,789 | 120,421 | 2,650,611 | ALS |
| 1991 | 395,176 | 20,704 | 1,724,713 | 72,592 | 2,213,185 | ALS |
| 1992 | 406,493 | 5,689 | 2,674,497 | 19,820 | 3,106,498 | ALS |
| 1993 | 436,981 | 15,235 | 2,901,388 | 20,291 | 3,373,894 | ALS |
| 1994 | 527,124 | 7,958 | 2,671,460 | 15,809 | 3,222,351 | ALS |
| 1995 | 172,740 | 8,459 | 2,735,403 | 17,506 | 2,934,108 | ALS |
| 1996 | 233,980 | 7,587 | 4,044,133 | 27,362 | 4,313,063 | ALS |
| 1997 | 184,411 | 4,627 | 4,589,501 | 31,418 | 4,809,958 | ALS |
| 1998 | 379,399 | 5,514 | 4,267,523 | 27,224 | 4,679,660 | ALS |
| 1999 | 548,422 | 6,474 | 4,230,449 | 90,572 | 4,875,917 | ALS |
| 2000 | 665,284 | 8,619 | 3,979,683 | 183,538 | 4,837,125 | ALS |
| 2001 | 797,925 | 10,130 | 3,692,770 | 124,453 | 4,625,279 | ALS |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2002 | 1,048,705 | 18,125 | 3,565,962 | 146,195 | 4,778,986 | ALS |
| 2003 | 1,019,257 | 13,853 | 3,204,247 | 171,270 | 4,408,627 | ALS |
| 2004 | 950,935 | 19,353 | 3,225,236 | 455,829 | 4,651,354 | ALS |
| 2005 | 792,010 | 21,121 | 3,000,323 | 282,789 | 4,096,244 | ALS |
| 2006 | 760,327 | 16,335 | 3,611,689 | 260,652 | 4,649,003 | ALS |
| 2007 | 875,240 | 15,727 | 2,103,261 | 188,503 | 3,182,731 | IFQ Corr 2007 |
| 2008 | 834,499 | 34,124 | 1,559,132 | 55,848 | 2,483,603 | IFQ Corr 2008 |
| 2009 | 918,874 | 14,627 | 1,498,298 | 51,766 | 2,483,565 | IFQ Corr 2009 |
| 2010 | 1,397,647 | 75,510 | 1,880,858 | 38,193 | 3,392,209 | IFQ Corr 2010 |
| 2011 | 1,613,106 | 84,286 | 1,878,310 | 18,850 | 3,594,552 | IFQ Corr 2011 |

**Table 3.2** Red snapper landings for 1964-2011 in the Eastern Gulf of Mexico for Handline and other non-longline gears.

| Year | Northeastern handline+ | Southeastern handline+ | Total | Source |
|---|---|---|---|---|
| 1964 | 1,758,520 | 1,848,150 | 3,606,670 | ALS |
| 1965 | 1,915,030 | 1,797,534 | 3,712,564 | ALS |
| 1966 | 1,531,449 | 1,567,316 | 3,098,765 | ALS |
| 1967 | 1,748,659 | 1,158,285 | 2,906,944 | ALS |
| 1968 | 1,440,724 | 1,176,822 | 2,617,546 | ALS |
| 1969 | 1,408,310 | 1,033,632 | 2,441,942 | ALS |
| 1970 | 1,303,461 | 1,005,993 | 2,309,454 | ALS |
| 1971 | 1,366,094 | 857,475 | 2,223,569 | ALS |
| 1972 | 1,472,114 | 902,208 | 2,374,322 | ALS |
| 1973 | 1,904,386 | 808,646 | 2,713,032 | ALS |
| 1974 | 1,861,812 | 1,905,753 | 3,767,565 | ALS |
| 1975 | 1,905,105 | 1,671,519 | 3,576,624 | ALS |
| 1976 | 1,695,350 | 1,592,776 | 3,288,126 | ALS |
| 1977 | 1,322,907 | 940,843 | 2,263,749 | ALS |
| 1978 | 1,222,205 | 774,147 | 1,996,352 | ALS |
| 1979 | 1,261,112 | 776,784 | 2,037,895 | ALS |
| 1980 | 1,275,269 | 620,479 | 1,895,748 | ALS |
| 1981 | 1,535,436 | 592,220 | 2,127,655 | ALS |
| 1982 | 1,730,710 | 561,197 | 2,291,907 | ALS |
| 1983 | 1,924,502 | 463,038 | 2,387,540 | ALS |
| 1984 | 1,181,640 | 450,276 | 1,631,916 | ALS |
| 1985 | 1,160,061 | 463,711 | 1,623,772 | ALS |
| 1986 | 712,324 | 147,506 | 859,831 | ALS |
| 1987 | 682,028 | 114,790 | 796,819 | ALS |
| 1988 | 746,347 | 111,612 | 857,959 | ALS |
| 1989 | 590,936 | 82,149 | 673,086 | ALS |
| 1990 | 550,348 | 147,266 | 697,614 | ALS |

| | | | | |
|---|---|---|---|---|
| 1991 | 362,700 | 32,475 | 395,176 | ALS |
| 1992 | 389,891 | 16,601 | 406,493 | ALS |
| 1993 | 381,940 | 55,041 | 436,981 | ALS |
| 1994 | 487,422 | 39,702 | 527,124 | ALS |
| 1995 | 153,815 | 18,925 | 172,740 | ALS |
| 1996 | 222,101 | 11,879 | 233,980 | ALS |
| 1997 | 171,928 | 12,483 | 184,411 | ALS |
| 1998 | 353,122 | 26,277 | 379,399 | ALS |
| 1999 | 477,638 | 70,784 | 548,422 | ALS |
| 2000 | 600,899 | 64,385 | 665,284 | ALS |
| 2001 | 716,515 | 81,410 | 797,925 | ALS |
| 2002 | 954,913 | 93,792 | 1,048,705 | ALS |
| 2003 | 918,807 | 100,450 | 1,019,257 | ALS |
| 2004 | 814,322 | 136,614 | 950,935 | ALS |
| 2005 | 624,364 | 167,646 | 792,010 | ALS |
| 2006 | 574,995 | 185,332 | 760,327 | ALS |
| 2007 | 754,895 | 120,346 | 875,240 | IFQ Corr 2007 |
| 2008 | 703,784 | 130,715 | 834,499 | IFQ Corr 2008 |
| 2009 | 681,668 | 237,206 | 918,874 | IFQ Corr 2009 |
| 2010 | 1,014,881 | 382,766 | 1,397,647 | IFQ Corr 2010 |
| 2011 | 1,178,568 | 434,538 | 1,613,106 | IFQ Corr 2011 |

**Table 3.3** Reconstructed historical landings as described in SEDAR7-AW-22

| Red Snapper landings from U.S. waters | | |
|---|---|---|
| **Year** | **East** | **West** |
| 1880 | 1,824,641 | 891,034 |
| 1881 | 2,052,381 | 801,943 |
| 1882 | 2,282,108 | 711,859 |
| 1883 | 2,509,861 | 634,313 |
| 1884 | 2,737,622 | 556,765 |
| 1885 | 2,965,390 | 478,225 |
| 1886 | 3,195,145 | 400,672 |
| 1887 | 3,422,926 | 203,970 |
| 1888 | 3,277,425 | 212,884 |
| 1889 | 3,483,431 | 269,327 |
| 1890 | 4,192,327 | 242,531 |
| 1891 | 3,822,273 | 269,541 |
| 1892 | 4,010,384 | 293,175 |
| 1893 | 4,132,232 | 311,969 |
| 1894 | 4,227,631 | 324,863 |
| 1895 | 4,125,291 | 333,838 |
| 1896 | 4,167,613 | 340,888 |
| 1897 | 4,138,252 | 340,642 |
| 1898 | 4,612,379 | 544,671 |
| 1899 | 5,146,576 | 722,625 |
| 1900 | 5,674,141 | 889,976 |
| 1901 | 6,027,029 | 1,020,372 |
| 1902 | 6,283,575 | 1,126,034 |
| 1903 | 5,722,123 | 1,059,802 |
| 1904 | 5,286,731 | 1,011,726 |
| 1905 | 4,756,040 | 940,928 |
| 1906 | 4,240,944 | 867,673 |
| 1907 | 3,743,104 | 791,605 |
| 1908 | 3,363,251 | 735,773 |
| 1909 | 2,890,857 | 632,940 |
| 1910 | 2,436,701 | 538,109 |
| 1911 | 2,455,472 | 527,520 |
| 1912 | 2,473,439 | 517,874 |
| 1913 | 2,491,078 | 508,475 |
| 1914 | 2,507,351 | 498,829 |
| 1915 | 2,522,773 | 489,183 |
| 1916 | 2,537,294 | 478,596 |
| 1917 | 2,479,260 | 468,950 |
| 1918 | 2,492,553 | 459,305 |
| 1919 | 2,718,931 | 471,382 |
| 1920 | 2,954,424 | 483,458 |
| 1921 | 3,198,932 | 496,724 |
| 1922 | 3,452,171 | 508,800 |
| 1923 | 3,707,316 | 520,876 |
| 1924 | 3,621,389 | 503,176 |
| 1925 | 3,627,316 | 485,474 |
| 1926 | 3,532,334 | 467,525 |

| | | |
|---|---|---|
| 1927 | 3,857,579 | 585,907 |
| 1928 | 3,444,187 | 426,871 |
| 1929 | 3,658,800 | 417,093 |
| 1930 | 2,233,495 | 553,559 |
| 1931 | 2,249,781 | 342,794 |
| 1932 | 2,416,037 | 411,305 |
| 1933 | 2,184,361 | 447,623 |
| 1934 | 1,964,863 | 464,740 |
| 1935 | 2,411,025 | 675,130 |
| 1936 | 2,773,983 | 871,388 |
| 1937 | 2,458,439 | 946,575 |
| 1938 | 3,180,371 | 935,330 |
| 1939 | 3,732,701 | 854,469 |
| 1940 | 2,496,953 | 815,871 |
| 1941 | 2,271,791 | 737,892 |
| 1942 | 1,818,353 | 544,639 |
| 1943 | 1,446,274 | 371,388 |
| 1944 | 1,670,030 | 279,690 |
| 1945 | 1,455,205 | 153,741 |
| 1946 | 2,319,802 | 323,401 |
| 1947 | 2,432,194 | 478,181 |
| 1948 | 2,598,682 | 595,421 |
| 1949 | 3,108,401 | 869,794 |
| 1950 | 1,693,118 | 1,476,048 |
| 1951 | 2,016,917 | 1,477,540 |
| 1952 | 2,245,040 | 1,654,176 |
| 1953 | 2,026,470 | 1,358,592 |
| 1954 | 1,883,191 | 1,365,982 |
| 1955 | 2,106,652 | 1,492,039 |
| 1956 | 2,520,865 | 2,017,420 |
| 1957 | 2,261,891 | 2,013,517 |
| 1958 | 3,724,587 | 3,357,390 |
| 1959 | 3,407,851 | 3,431,602 |
| 1960 | 3,816,825 | 3,601,182 |
| 1961 | 3,504,256 | 4,248,967 |
| 1962 | 3,612,712 | 4,131,601 |
| 1963 | 3,174,817 | 3,509,846 |

**Table 3.4** ALS gear code grouping.

| NMFS Code | Description | Group |
|---|---|---|
| 614 | Long Line, Vertical | Longline |
| 675 | Lines Long Set With Hooks | Longline |
| 676 | Lines Long, Reef Fish | Longline |
| 677 | Lines Long, Shark | Longline |
| 600 | Troll & Hand Lines Cmb | Handline+ |
| 610 | Lines Hand, Other | Handline+ |
| 611 | Rod and Reel | Handline+ |
| 612 | Reel, Manual | Handline+ |
| 613 | Reel, Electric or Hydraulic | Handline+ |
| 616 | Rod and Reel, Electric (Hand) | Handline+ |
| 215 | Otter Trawl Bottom, Shrimp | Handline+ |
| * | All other codes | Handline+ |

**Table 3.5** CFLP gear code grouping.

| Logbook Gear | Description | Group |
|---|---|---|
| L | Longline | Longline |
| H | Hand line | Handline+ |
| E | Electric | Handline+ |
| T | Trap | Handline+ |
| * | All other codes | Handline+ |

**Table 3.6** Proportions by gear presented in 1986 paper (Parrack and McClellan) used for apportioning 1978-1983 landings by gear.

Appendix.

Table 3. Proportion (cumulative) of annual red snapper (Lutjanus campechanus) catches by gear and age group for the western Gulf of Mexico stock.

**Commercial Rod & Reel**

AGE

| YEAR | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 79 | 0.0012 | 0.1199 | 0.2392 | 0.2723 | 0.2828 | 0.2864 | 0.2865 | 0.2895 | 0.2952 | 0.2952 | 0.2952 | 0.2952 | 0.2952 | 0.2952 | 0.2953 | 0.2953 |
| 80 | 0.0001 | 0.0397 | 0.1083 | 0.1809 | 0.1990 | 0.1994 | 0.2009 | 0.2026 | 0.2036 | 0.2046 | 0.2046 | 0.2046 | 0.2046 | 0.2046 | 0.2047 | 0.2049 |
| 81 | 0.0001 | 0.0042 | 0.0438 | 0.1142 | 0.1492 | 0.1538 | 0.1573 | 0.1573 | 0.1573 | 0.1574 | 0.1580 | 0.1581 | 0.1585 | 0.1585 | 0.1586 | 0.1586 |
| 82 | 0.0003 | 0.0522 | 0.1102 | 0.1513 | 0.2254 | 0.2349 | 0.2414 | 0.2418 | 0.2418 | 0.2429 | 0.2431 | 0.2431 | 0.2431 | 0.2432 | 0.2432 | 0.2433 |
| 83 | 0.0362 | 0.2177 | 0.2338 | 0.2339 | 0.2340 | 0.2356 | 0.2372 | 0.2554 | 0.2555 | 0.2555 | 0.2934 | 0.2935 | 0.2935 | 0.2936 | 0.2936 | 0.2936 |
| 84 | 0.0025 | 0.1487 | 0.2925 | 0.3501 | 0.3554 | 0.3811 | 0.3941 | 0.3941 | 0.3985 | 0.4268 | 0.4280 | 0.4288 | 0.4289 | 0.4289 | 0.4290 | 0.4290 |
| 85 | 0.0001 | 0.0776 | 0.2079 | 0.2554 | 0.2822 | 0.3010 | 0.3186 | 0.3211 | 0.3252 | 0.3455 | 0.3570 | 0.3570 | 0.3572 | 0.3572 | 0.3573 | 0.3573 |

**Commercial Trawl**

AGE

| YEAR | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 79 | 0.0002 | 0.0090 | 0.0159 | 0.0171 | 0.0176 | 0.0176 | 0.0179 | 0.0181 | 0.0183 | 0.0184 | 0.0184 | 0.0184 | 0.0184 | 0.0184 | 0.0184 | 0.0184 |
| 80 | 0.0000 | 0.0031 | 0.0058 | 0.0095 | 0.0097 | 0.0098 | 0.0098 | 0.0100 | 0.0100 | 0.0102 | 0.0102 | 0.0102 | 0.0102 | 0.0102 | 0.0102 | 0.0102 |
| 81 | 0.0000 | 0.0004 | 0.0034 | 0.0077 | 0.0099 | 0.0101 | 0.0104 | 0.0104 | 0.0104 | 0.0104 | 0.0104 | 0.0104 | 0.0104 | 0.0104 | 0.0104 | 0.0104 |
| 82 | 0.0000 | 0.0013 | 0.0030 | 0.0055 | 0.0064 | 0.0068 | 0.0071 | 0.0071 | 0.0072 | 0.0077 | 0.0078 | 0.0078 | 0.0078 | 0.0078 | 0.0078 | 0.0078 |
| 83 | 0.0021 | 0.0127 | 0.0136 | 0.0136 | 0.0136 | 0.0137 | 0.0138 | 0.0149 | 0.0149 | 0.0149 | 0.0171 | 0.0171 | 0.0171 | 0.0171 | 0.0171 | 0.0171 |
| 84 | 0.0003 | 0.0090 | 0.0161 | 0.0193 | 0.0197 | 0.0217 | 0.0220 | 0.0220 | 0.0225 | 0.0243 | 0.0244 | 0.0244 | 0.0245 | 0.0245 | 0.0245 | 0.0245 |
| 85 | 0.0000 | 0.0044 | 0.0096 | 0.0114 | 0.0125 | 0.0135 | 0.0141 | 0.0142 | 0.0146 | 0.0156 | 0.0161 | 0.0161 | 0.0161 | 0.0161 | 0.0161 | 0.0161 |

**Commercial Bottom Longline**

AGE

| YEAR | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 | 0.0000 | 0.0053 | 0.0094 | 0.0121 | 0.0122 | 0.0124 | 0.0124 | 0.0124 | 0.0126 | 0.0130 | 0.0130 | 0.0131 | 0.0131 | 0.0131 | 0.0131 | 0.0131 |
| 81 | 0.0000 | 0.0037 | 0.0090 | 0.0206 | 0.0263 | 0.0271 | 0.0278 | 0.0279 | 0.0280 | 0.0280 | 0.0280 | 0.0280 | 0.0280 | 0.0280 | 0.0280 | 0.0280 |
| 82 | 0.0003 | 0.0020 | 0.0045 | 0.0079 | 0.0091 | 0.0099 | 0.0106 | 0.0110 | 0.0119 | 0.0134 | 0.0138 | 0.0138 | 0.0138 | 0.0141 | 0.0143 | 0.0145 |
| 83 | 0.0061 | 0.0367 | 0.0395 | 0.0396 | 0.0396 | 0.0399 | 0.0400 | 0.0427 | 0.0500 | 0.0500 | 0.0507 | 0.0507 | 0.0507 | 0.0507 | 0.0507 | 0.0507 |
| 84 | 0.0006 | 0.0135 | 0.0257 | 0.0385 | 0.0386 | 0.0454 | 0.0455 | 0.0455 | 0.0459 | 0.0579 | 0.0584 | 0.0585 | 0.0585 | 0.0585 | 0.0585 | 0.0585 |
| 85 | 0.0001 | 0.0210 | 0.0435 | 0.0617 | 0.0668 | 0.0696 | 0.0702 | 0.0706 | 0.0795 | 0.0930 | 0.0934 | 0.0930 | 0.0930 | 0.0931 | 0.0931 | 0.0932 |

**Commercial Other**

AGE

| YEAR | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 85 | 0.0000 | 0.0002 | 0.0004 | 0.0005 | 0.0005 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0007 | 0.0007 | 0.0007 | 0.0007 | 0.0007 | 0.0007 |

**Table 3.7** Comparison of landings in ALS and IFQ databases. Final totals from IFQ landings were used. Percentage difference was applied to ALS landings across strata.

| Year | ALS | IFQ | Diff. (lbs) | Diff. (%) |
|---|---|---|---|---|
| 2007 | 3,081,955 | 3,182,731 | 100,776 | 3.27% |
| 2008 | 2,464,662 | 2,483,603 | 18,941 | 0.77% |
| 2009 | 2,501,837 | 2,483,565 | (18,272) | -0.73% |
| 2010 | 3,328,451 | 3,392,209 | 63,758 | 1.92% |
| 2011 | 3,565,259 | 3,594,552 | 29,292 | 0.82% |

**Table 3.8** Calculated red snapper discards for vertical line gear from self reported logbooks.

| Year | East open season | East closed season | West open season | West closed season |
|---|---|---|---|---|
| 1990 | 133,336 | | 513,291 | |
| 1991 | 222,762 | 97,969 | 783,451 | 94,438 |
| 1992 | 56,712 | 272,327 | 261,768 | 162,617 |
| 1993 | 46,291 | 194,610 | 298,582 | 74,272 |
| 1994 | 45,560 | 300,107 | 303,044 | 48,373 |
| 1995 | 35,084 | 292,159 | 300,971 | 46,224 |
| 1996 | 70,458 | 406,998 | 759,844 | 49,649 |
| 1997 | 63,919 | 309,097 | 642,199 | 75,036 |
| 1998 | 82,149 | 323,831 | 753,786 | 75,451 |
| 1999 | 92,221 | 396,469 | 713,691 | 59,700 |
| 2000 | 127,549 | 213,319 | 627,137 | 74,537 |
| 2001 | 115,499 | 204,549 | 725,673 | 58,987 |
| 2002 | 171,371 | 139,016 | 729,981 | 163,220 |
| 2003 | 152,134 | 336,173 | 644,390 | 37,335 |
| 2004 | 70,463 | 165,902 | 607,907 | 42,021 |
| 2005 | 126,063 | 116,561 | 831,849 | 30,515 |
| 2006 | 100,183 | 82,239 | 424,546 | 17,504 |
| | **IFQ East** | | **IFQ West** | |
| 2007 | 222,957 | | 98,321 | |
| 2008 | 280,914 | | 86,129 | |
| 2009 | 434,561 | | 10,825 | |
| 2010 | 204,267 | | 6,145 | |
| 2011 | 220,596 | | 13,269 | |

**Table 3.9** Calculated red snapper discards for longline gear from self reported logbooks.

| Year | East open season | East closed season | West open season | West closed season |
|---|---|---|---|---|
| 1990 | 6,317 | | 711 | |
| 1991 | 7,651 | 8,712 | 2,140 | 90 |
| 1992 | 1,848 | 15,607 | 336 | 160 |
| 1993 | 1,268 | 19,452 | 709 | 307 |
| 1994 | 1,497 | 22,876 | 1,042 | 415 |
| 1995 | 971 | 19,225 | 1,387 | 773 |
| 1996 | 1,454 | 20,012 | 1,136 | 564 |
| 1997 | 1,398 | 25,284 | 671 | 349 |
| 1998 | 1,097 | 23,012 | 691 | 424 |
| 1999 | 1,453 | 22,324 | 2,325 | 794 |
| 2000 | 1,289 | 17,523 | 1,760 | 590 |
| 2001 | 1,180 | 16,929 | 1,036 | 405 |
| 2002 | 1,408 | 8,643 | 1,577 | 540 |
| 2003 | 1,307 | 4,798 | 3,401 | 656 |
| 2004 | 1,690 | 27,990 | 5,174 | 569 |
| 2005 | 1,424 | 9,676 | 4,518 | 476 |
| 2006 | 1,851 | 5,889 | 4,058 | 334 |
| | IFQ East | | IFQ West | |
| 2007 | 72,116 | | 355 | |
| 2008 | 70,187 | | 302 | |
| 2009 | 37,792 | | 390 | |
| 2010 | 20,689 | | 217 | |
| 2011 | 29,525 | | 202 | |

**Table 3.10** Calculated red snapper discards from observer program.

| Year | East vertical line | East longline | East longline* | West vertical line | West longline |
|---|---|---|---|---|---|
| 2006 | 440,784 | 9,222 | | 463,912 | |
| 2007 | 613,590 | 34,048 | | 384,168 | |
| 2008 | 353,038 | 4,268 | 12,644 | 424,410 | 527 |
| 2009 | 856,207 | 32,298 | | 32,501** | 754 |
| 2010 | 497,910 | 14,187 | | 469,714 | 483 |
| 2011 | 265,467 | 20,817 | | 201,740 | 450 |

*includes nonrandomly selected eastern Gulf longline trips during 2008.
**low west vertical line total discards in 2009 due to very low observed discard rate (0.01 vs. 0.1-0.2 fish/hook hour observed during other years). Few sets were observed during 2009. The highest discard rate, 0.22 red snapper/hook hour, also occurred in a year (2010) with few sets observed.

**Table 3.11** Total vertical line gear discards compared with "no discard" reports removed from the analyses.

| Year | East open season | | East closed season | | West open season | | West closed season | |
|---|---|---|---|---|---|---|---|---|
| | continuity | "no discards" excluded | continuity | "no discards" excluded | continuity | "no discards" excluded | continuity | "no discards" excluded |
| 1990 | 133,336 | 160,529 | | | 513,291 | 514,832 | | |
| 1991 | 222,762 | 283,019 | 97,969 | 110,132 | 783,451 | 789,015 | 94,438 | 94,552 |
| 1992 | 56,712 | 70,130 | 272,327 | 306,349 | 261,768 | 268,014 | 162,617 | 163,905 |
| 1993 | 46,291 | 51,412 | 194,610 | 222,746 | 298,582 | 316,531 | 74,272 | 77,583 |
| 1994 | 45,560 | 51,153 | 300,107 | 341,137 | 303,044 | 314,558 | 48,373 | 51,525 |
| 1995 | 35,084 | 38,470 | 292,159 | 338,125 | 300,971 | 313,774 | 46,224 | 50,618 |
| 1996 | 70,458 | 75,826 | 406,998 | 468,420 | 759,844 | 780,752 | 49,649 | 53,995 |
| 1997 | 63,919 | 70,864 | 309,097 | 357,005 | 642,199 | 665,234 | 75,036 | 80,294 |
| 1998 | 82,149 | 95,073 | 323,831 | 369,511 | 753,786 | 780,944 | 75,451 | 80,691 |
| 1999 | 92,221 | 104,236 | 396,469 | 451,302 | 713,691 | 735,395 | 59,700 | 65,489 |
| 2000 | 127,549 | 142,410 | 213,319 | 245,565 | 627,137 | 650,846 | 74,537 | 81,421 |
| 2001 | 115,499 | 131,998 | 204,549 | 234,182 | 725,673 | 749,238 | 58,987 | 64,550 |
| 2002 | 171,371 | 178,383 | 139,016 | 144,089 | 729,981 | 729,981 | 163,220 | 163,848 |
| 2003 | 152,134 | 168,982 | 336,173 | 461,119 | 644,390 | 678,232 | 37,335 | 42,437 |
| 2004 | 70,463 | 77,097 | 165,902 | 195,082 | 607,907 | 615,041 | 42,021 | 44,474 |
| 2005 | 126,063 | 135,848 | 116,561 | 126,734 | 831,849 | 848,414 | 30,515 | 31,865 |
| 2006 | 100,183 | 106,061 | 82,239 | 94,408 | 424,546 | 434,172 | 17,504 | 17,504 |

| Year | IFQ East | | IFQ West | |
|---|---|---|---|---|
| | continuity | "no discards" excluded | continuity | "no discards" excluded |
| 2007 | 222,957 | 249,901 | 98,321 | 105,229 |
| 2008 | 280,914 | 321,773 | 86,129 | 94,040 |
| 2009 | 434,561 | 491,041 | 10,825 | 11,047 |
| 2010 | 204,267 | 249,282 | 6,145 | 7,228 |
| 2011 | 220,596 | 251,164 | 13,269 | 13,713 |

**Table 3.12** Total longline gear discards compared with "no discard" reports removed from the analyses.

| Year | East open season | | East closed season | | West open season | | West closed season | |
|---|---|---|---|---|---|---|---|---|
| | continuity | "no discards" excluded | continuity | "no discards" excluded | continuity | "no discards" excluded | continuity | "no discards" excluded |
| 1990 | 6,317 | 9,785 | | | 711 | 830 | | |
| 1991 | 7,651 | 11,759 | 8,712 | 8,996 | 2,140 | 2,521 | 90 | 133 |
| 1992 | 1,848 | 2,891 | 15,607 | 16,170 | 336 | 400 | 160 | 235 |
| 1993 | 1,268 | 1,955 | 19,452 | 44,553 | 709 | 851 | 307 | 452 |
| 1994 | 1,497 | 2,330 | 22,876 | 54,211 | 1,042 | 1,248 | 415 | 611 |
| 1995 | 971 | 1,522 | 19,225 | 35,527 | 1,387 | 1,635 | 773 | 1,139 |
| 1996 | 1,454 | 2,206 | 20,012 | 34,621 | 1,136 | 1,398 | 564 | 832 |
| 1997 | 1,398 | 2,177 | 25,284 | 48,846 | 671 | 818 | 349 | 515 |
| 1998 | 1,097 | 1,701 | 23,012 | 49,086 | 691 | 834 | 424 | 625 |
| 1999 | 1,453 | 2,283 | 22,324 | 48,548 | 2,325 | 2,979 | 794 | 1,170 |
| 2000 | 1,289 | 2,019 | 17,523 | 29,246 | 1,760 | 2,137 | 590 | 869 |
| 2001 | 1,180 | 1,833 | 16,929 | 27,449 | 1,036 | 1,261 | 405 | 596 |
| 2002 | 1,408 | 2,214 | 8,643 | 9,026 | 1,577 | 1,889 | 540 | 795 |
| 2003 | 1,307 | 2,054 | 4,798 | 5,638 | 3,401 | 4,289 | 656 | 966 |
| 2004 | 1,690 | 2,658 | 27,990 | 28,535 | 5,174 | 6,574 | 569 | 839 |
| 2005 | 1,424 | 2,239 | 9,676 | 17,841 | 4,518 | 5,853 | 476 | 701 |
| 2006 | 1,851 | 2,911 | 5,889 | 6,427 | 4,058 | 5,174 | 334 | 492 |
| | IFQ East | | | | IFQ West | | | |
| | continuity | "no discards" excluded | | | continuity | "no discards" excluded | | |
| 2007 | 72,116 | 100,630 | | | 355 | 10,196 | | |
| 2008 | 70,187 | 97,939 | | | 302 | 9,924 | | |
| 2009 | 37,792 | 52,734 | | | 390 | 5,343 | | |
| 2010 | 20,689 | 28,869 | | | 217 | 2,925 | | |
| 2011 | 29,525 | 41,200 | | | 202 | 4,175 | | |

**Table 3.13** Summary statistics of marginal posterior densities of annual estimates of shrimp bycatch in the eastern Gulf of Mexico.

| year | mean | sd | MC error | 2.50% | 25.00% | median | 75.00% | 97.50% | sample |
|---|---|---|---|---|---|---|---|---|---|
| 1972 | 19.25 | 23.85 | 0.311 | 3.775 | 8.197 | 12.85 | 21.69 | 75.13 | 20000 |
| 1973 | 2.027 | 2.75 | 0.03642 | 0.3012 | 0.7503 | 1.27 | 2.261 | 8.628 | 20000 |
| 1974 | 1.223 | 1.878 | 0.02554 | 0.1684 | 0.4234 | 0.7311 | 1.339 | 5.395 | 20000 |
| 1975 | 1.294 | 0.5437 | 0.00723 | 0.6701 | 0.9588 | 1.188 | 1.495 | 2.538 | 20000 |
| 1976 | 1.969 | 3.886 | 0.03859 | 0.2672 | 0.6363 | 1.108 | 2.066 | 8.885 | 20000 |
| 1977 | 1.831 | 1.469 | 0.01598 | 0.797 | 1.182 | 1.517 | 2.046 | 4.716 | 20000 |
| 1978 | 0.4079 | 0.6179 | 0.00861 | 0.07556 | 0.16 | 0.2574 | 0.4486 | 1.625 | 20000 |
| 1979 | 1.714 | 2.411 | 0.04985 | 0.2767 | 0.6791 | 1.133 | 1.967 | 6.658 | 20000 |
| 1980 | 0.669 | 0.9862 | 0.009861 | 0.1659 | 0.3039 | 0.45 | 0.7305 | 2.478 | 20000 |
| 1981 | 2.125 | 3.732 | 0.04465 | 0.3924 | 0.8016 | 1.283 | 2.233 | 8.891 | 20000 |
| 1982 | 2.221 | 2.584 | 0.03751 | 0.5385 | 1.057 | 1.59 | 2.52 | 7.752 | 20000 |
| 1983 | 1.974 | 3.901 | 0.04389 | 0.277 | 0.6971 | 1.203 | 2.147 | 8.241 | 20000 |
| 1984 | 1.444 | 2.307 | 0.03193 | 0.2084 | 0.5124 | 0.8648 | 1.554 | 6.309 | 20000 |
| 1985 | 1.169 | 1.815 | 0.02057 | 0.1655 | 0.4207 | 0.7153 | 1.282 | 4.908 | 20000 |
| 1986 | 0.3596 | 0.4643 | 0.006637 | 0.05219 | 0.1381 | 0.2345 | 0.4136 | 1.418 | 20000 |
| 1987 | 0.5431 | 0.938 | 0.009909 | 0.07644 | 0.2014 | 0.3388 | 0.6014 | 2.174 | 20000 |
| 1988 | 0.6322 | 0.8407 | 0.01131 | 0.09348 | 0.2402 | 0.4092 | 0.7226 | 2.548 | 20000 |
| 1989 | 1.202 | 2.177 | 0.02376 | 0.1386 | 0.3841 | 0.6785 | 1.317 | 5.575 | 20000 |
| 1990 | 3.734 | 6.136 | 0.06735 | 0.4921 | 1.258 | 2.225 | 4.129 | 16.25 | 20000 |
| 1991 | 3.146 | 5.046 | 0.0621 | 0.4105 | 1.091 | 1.897 | 3.466 | 13.29 | 20000 |
| 1992 | 1.628 | 1.269 | 0.01369 | 0.4944 | 0.8949 | 1.286 | 1.932 | 4.785 | 20000 |
| 1993 | 1.397 | 2.831 | 0.02449 | 0.1878 | 0.4313 | 0.7529 | 1.434 | 6.636 | 20000 |
| 1994 | 2.21 | 4.194 | 0.03874 | 0.3977 | 0.7246 | 1.155 | 2.142 | 10.75 | 20000 |
| 1995 | 2.868 | 4.762 | 0.04986 | 0.3269 | 0.8751 | 1.566 | 3.01 | 13.83 | 20000 |
| 1996 | 2.284 | 4.239 | 0.04132 | 0.2485 | 0.6648 | 1.2 | 2.342 | 11 | 20000 |
| 1997 | 3.259 | 6.09 | 0.05837 | 0.3679 | 0.9947 | 1.793 | 3.392 | 15.03 | 20000 |
| 1998 | 1.769 | 0.8451 | 0.01031 | 0.9693 | 1.329 | 1.611 | 2.004 | 3.418 | 20000 |
| 1999 | 2.912 | 4.771 | 0.05609 | 0.429 | 1.07 | 1.799 | 3.201 | 12.03 | 20000 |
| 2000 | 3.249 | 5.109 | 0.04627 | 1.027 | 1.598 | 2.183 | 3.309 | 11.78 | 20000 |
| 2001 | 2.417 | 0.6724 | 0.006984 | 1.665 | 2.049 | 2.308 | 2.635 | 3.759 | 20000 |
| 2002 | 2.2 | 0.2276 | 0.001853 | 1.819 | 2.041 | 2.178 | 2.333 | 2.706 | 20000 |
| 2003 | 1.317 | 0.3537 | 0.003055 | 1.008 | 1.165 | 1.265 | 1.39 | 1.902 | 20000 |
| 2004 | 1.498 | 0.5234 | 0.004625 | 1.114 | 1.283 | 1.402 | 1.559 | 2.519 | 20000 |
| 2005 | 0.975 | 1.351 | 0.01374 | 0.248 | 0.4157 | 0.6152 | 1.02 | 4.037 | 20000 |
| 2006 | 2.186 | 1.371 | 0.01726 | 0.805 | 1.362 | 1.855 | 2.602 | 5.458 | 20000 |
| 2007 | 1.427 | 1.016 | 0.01094 | 0.6364 | 0.9604 | 1.229 | 1.629 | 3.377 | 20000 |
| 2008 | 0.1911 | 0.1089 | 0.00149 | 0.109 | 0.1406 | 0.1653 | 0.2065 | 0.4346 | 20000 |
| 2009 | 0.3791 | 0.1443 | 0.00145 | 0.2067 | 0.2913 | 0.3514 | 0.43 | 0.7124 | 20000 |
| 2010 | 0.2245 | 0.1612 | 0.001311 | 0.1376 | 0.1684 | 0.1917 | 0.2294 | 0.5283 | 20000 |
| 2011 | 0.3637 | 0.1669 | 0.002056 | 0.2177 | 0.2811 | 0.3299 | 0.4008 | 0.6982 | 20000 |

**Table 3.14** Summary statistics of marginal posterior densities of annual estimates of shrimp bycatch in the western Gulf of Mexico.

| year | mean | sd | MC error | 2.50% | 25.00% | median | 75.00% | 97.50% | sample |
|---|---|---|---|---|---|---|---|---|---|
| 1972 | 208.7 | 404 | 5.459 | 24.21 | 63.02 | 112.9 | 213.1 | 1007 | 20000 |
| 1973 | 18.62 | 14.61 | 0.184 | 5.838 | 10.47 | 14.82 | 21.9 | 54.44 | 20000 |
| 1974 | 20.4 | 10.23 | 0.1438 | 9.72 | 14.36 | 18.12 | 23.47 | 44.65 | 20000 |
| 1975 | 14.09 | 22.25 | 0.2987 | 1.783 | 4.612 | 8.205 | 15.18 | 63.03 | 20000 |
| 1976 | 31.12 | 6.725 | 0.07137 | 21.18 | 26.52 | 30.05 | 34.54 | 46.98 | 20000 |
| 1977 | 12.33 | 5.305 | 0.05381 | 7.729 | 9.912 | 11.44 | 13.55 | 21.6 | 20000 |
| 1978 | 7.612 | 4.151 | 0.05795 | 3.688 | 5.376 | 6.706 | 8.698 | 16.68 | 20000 |
| 1979 | 38.59 | 58.3 | 1.292 | 4.846 | 13.23 | 23.55 | 43.37 | 162.6 | 20000 |
| 1980 | 27.69 | 9.538 | 0.1038 | 16.28 | 21.55 | 25.66 | 31.25 | 51.13 | 20000 |
| 1981 | 84.86 | 126.9 | 1.39 | 26.76 | 40.16 | 54.87 | 84.94 | 327 | 20000 |
| 1982 | 46.25 | 106.1 | 1.014 | 6.581 | 14.69 | 24.64 | 46.61 | 211.5 | 20000 |
| 1983 | 31.5 | 51.49 | 0.6613 | 4.46 | 10.8 | 18.46 | 33.72 | 138.2 | 20000 |
| 1984 | 23.13 | 42.21 | 0.5253 | 3.022 | 7.666 | 13.4 | 24.97 | 101.3 | 20000 |
| 1985 | 17.87 | 28.15 | 0.3362 | 2.551 | 6.333 | 10.86 | 19.4 | 75.14 | 20000 |
| 1986 | 10.11 | 21.36 | 0.2358 | 1.34 | 3.432 | 5.984 | 10.9 | 43.29 | 20000 |
| 1987 | 21.24 | 35.53 | 0.4085 | 2.857 | 7.282 | 12.44 | 22.71 | 92.75 | 20000 |
| 1988 | 17.12 | 28.18 | 0.3177 | 2.218 | 5.813 | 10.11 | 18.53 | 73.62 | 20000 |
| 1989 | 18.24 | 30.51 | 0.3897 | 2.39 | 6.269 | 10.79 | 19.61 | 79.98 | 20000 |
| 1990 | 70.75 | 127.9 | 1.41 | 9.02 | 23.38 | 40.82 | 75.64 | 313.6 | 20000 |
| 1991 | 71.59 | 156.1 | 1.601 | 9.324 | 23.92 | 41.61 | 77.99 | 308.2 | 20000 |
| 1992 | 33.55 | 12.48 | 0.1078 | 21.93 | 27.71 | 31.72 | 36.82 | 55.59 | 20000 |
| 1993 | 35.51 | 4.969 | 0.04401 | 27.51 | 32.03 | 34.92 | 38.3 | 46.98 | 20000 |
| 1994 | 35.99 | 8.982 | 0.08234 | 26.69 | 31.57 | 34.75 | 38.73 | 52.27 | 20000 |
| 1995 | 49.98 | 11.16 | 0.1103 | 33.61 | 42.37 | 48.22 | 55.53 | 76.27 | 20000 |
| 1996 | 54.1 | 68.45 | 0.6661 | 17.88 | 27.89 | 37.76 | 56.23 | 194.8 | 20000 |
| 1997 | 31.48 | 17.72 | 0.2344 | 13.85 | 20.99 | 27.08 | 36.36 | 75.43 | 20000 |
| 1998 | 61.38 | 24.65 | 0.2293 | 32.4 | 45.42 | 56.13 | 71.02 | 122.4 | 20000 |
| 1999 | 26.87 | 13.12 | 0.1796 | 15.95 | 20.43 | 23.98 | 29.16 | 55.74 | 20000 |
| 2000 | 13.7 | 6.137 | 0.07398 | 8.906 | 10.85 | 12.32 | 14.59 | 27.01 | 20000 |
| 2001 | 26.98 | 13.42 | 0.1489 | 17.94 | 21.5 | 24.16 | 28.21 | 53.54 | 20000 |
| 2002 | 22.48 | 2.771 | 0.02428 | 17.86 | 20.51 | 22.21 | 24.12 | 28.73 | 20000 |
| 2003 | 31.51 | 6.308 | 0.04975 | 21.95 | 27.08 | 30.61 | 34.88 | 46.4 | 20000 |
| 2004 | 30.63 | 12.72 | 0.1235 | 20.56 | 24.73 | 27.99 | 32.73 | 56.22 | 20000 |
| 2005 | 20.52 | 38.35 | 0.3439 | 5.255 | 8.376 | 12.22 | 20.65 | 84.94 | 20000 |
| 2006 | 13.22 | 6.846 | 0.09009 | 6.484 | 9.327 | 11.63 | 15.03 | 29.28 | 20000 |
| 2007 | 7.043 | 1.34 | 0.01857 | 5.413 | 6.292 | 6.837 | 7.496 | 9.911 | 20000 |
| 2008 | 2.727 | 0.2139 | 0.001907 | 2.366 | 2.586 | 2.714 | 2.852 | 3.154 | 20000 |
| 2009 | 3.795 | 0.7306 | 0.005286 | 2.508 | 3.288 | 3.736 | 4.246 | 5.372 | 20000 |
| 2010 | 2.978 | 1.136 | 0.009457 | 2.154 | 2.521 | 2.785 | 3.149 | 5.009 | 20000 |
| 2011 | 6.314 | 0.6983 | 0.005826 | 5.057 | 5.831 | 6.273 | 6.751 | 7.794 | 20000 |

**Table 3.15** Gulf of Mexico shrimp effort (days fished) for depths greater than 10 fm.

| Year | East | West | Gulfwide |
|---|---|---|---|
| 1972 | 24,338 | 72,350 | 96,688 |
| 1973 | 26,828 | 57,689 | 84,518 |
| 1974 | 25,950 | 56,919 | 82,869 |
| 1975 | 25,878 | 53,859 | 79,737 |
| 1976 | 24,005 | 62,661 | 86,667 |
| 1977 | 28,444 | 53,672 | 82,116 |
| 1978 | 21,984 | 62,809 | 84,793 |
| 1979 | 22,626 | 65,484 | 88,110 |
| 1980 | 13,852 | 39,688 | 53,539 |
| 1981 | 21,746 | 61,312 | 83,058 |
| 1982 | 21,669 | 62,621 | 84,290 |
| 1983 | 23,736 | 50,568 | 74,303 |
| 1984 | 27,849 | 64,404 | 92,253 |
| 1985 | 26,876 | 62,592 | 89,468 |
| 1986 | 27,859 | 86,109 | 113,968 |
| 1987 | 22,574 | 88,206 | 110,780 |
| 1988 | 21,283 | 85,452 | 106,734 |
| 1989 | 25,798 | 76,977 | 102,774 |
| 1990 | 22,599 | 74,000 | 96,599 |
| 1991 | 23,260 | 89,911 | 113,171 |
| 1992 | 28,202 | 92,730 | 120,932 |
| 1993 | 23,293 | 91,600 | 114,893 |
| 1994 | 24,093 | 73,573 | 97,667 |
| 1995 | 28,500 | 63,856 | 92,356 |
| 1996 | 32,200 | 67,133 | 99,333 |
| 1997 | 33,958 | 81,666 | 115,624 |
| 1998 | 42,667 | 74,103 | 116,771 |
| 1999 | 26,291 | 69,751 | 96,042 |
| 2000 | 22,593 | 76,096 | 98,689 |
| 2001 | 25,378 | 81,591 | 106,969 |
| 2002 | 30,191 | 96,078 | 126,269 |
| 2003 | 25,164 | 77,521 | 102,684 |
| 2004 | 24,957 | 71,209 | 96,166 |
| 2005 | 21,018 | 51,477 | 72,495 |
| 2006 | 13,626 | 38,425 | 52,051 |
| 2007 | 10,233 | 31,001 | 41,234 |
| 2008 | 6,690 | 22,238 | 28,928 |
| 2009 | 10,304 | 26,469 | 36,773 |
| 2010 | 6,463 | 25,891 | 32,354 |
| 2011 | 8,049 | 31,822 | 39,870 |

**Table 3.16** Red snapper allocation categories by region and gear.

| Region | Vertical line | Longline |
|---|---|---|
| **East** | No allocation<br>1-2,582 pounds<br>2,583-7,048 pounds<br>7,049-16,762 pounds<br>>16,762 pounds | No allocation<br>1-688 pounds<br>689-3,436 pounds<br>>3,436 pounds |
| **West** | No allocation<br>1-3,909 pounds<br>3,910-19,807 pounds<br>19,808-61,124 pounds<br>>61,124 pounds | No allocation<br>1-17,908 pounds<br>17,909-28,810 pounds<br>>28,810 pounds |

**Table 3.17** Number of trips with observed red snapper by gear, region, and red snapper season during 2006. There was no observer coverage of bottom longline trips in the western Gulf of Mexico during 2006.

| Gear | Red snapper season | East | West |
|---|---|---|---|
| Bottom longline | Closed | 6 | N/A |
| | Open | 6 | |
| Vertical line | Closed | 8 | Confidential data |
| | Open | 12 | 10 |

**Table 3.18** Number of trips with observed red snapper by gear, region, and red snapper allocation in pounds.

**A.** Bottom longline.

| Red snapper allocation | East | West |
|---|---|---|
| 0 | 51 | N/A |
| 1-688 | 49 | |
| 689-3,436 | 39 | |
| >3,436 | 44 | |
| 0 | N/A | Confidential data |
| 1-17,908 | | 5 |
| 17,909-28,810 | | Confidential data |
| >28,810 | | 4 |

**B.** Vertical line.

| Red snapper allocation | East | West |
|---|---|---|
| 0 | 87 | N/A |
| 1-2,582 | 104 | |
| 2,582-7,048 | 43 | |
| 7,048-16,762 | 22 | |
| >16,762 | 40 | |
| 0 | N/A | 14 |
| 1-3,909 | | 19 |
| 3,910-19,807 | | 15 |
| 19,808-61,124 | | 14 |
| >61,124 | | 10 |

**Table 3.19** Number of trips with observed red snapper by gear, year, and region.

**A.** Bottom longline.

| Year | East | West |
|---|---|---|
| 2006 | 10 | |
| 2007 | 8 | |
| 2008 | Confidential data | Confidential data |
| 2009 | 22 | 4 |
| 2010 | 42 | 4 |
| 2011 | 71 | 4 |

**B.** Vertical line.

| Year | East | West |
|---|---|---|
| 2006 | 21 | 11 |
| 2007 | 73 | 17 |
| 2008 | 31 | 15 |
| 2009 | 33 | 5 |
| 2010 | 40 | 6 |
| 2011 | 75 | 12 |

## 3.11 Figures

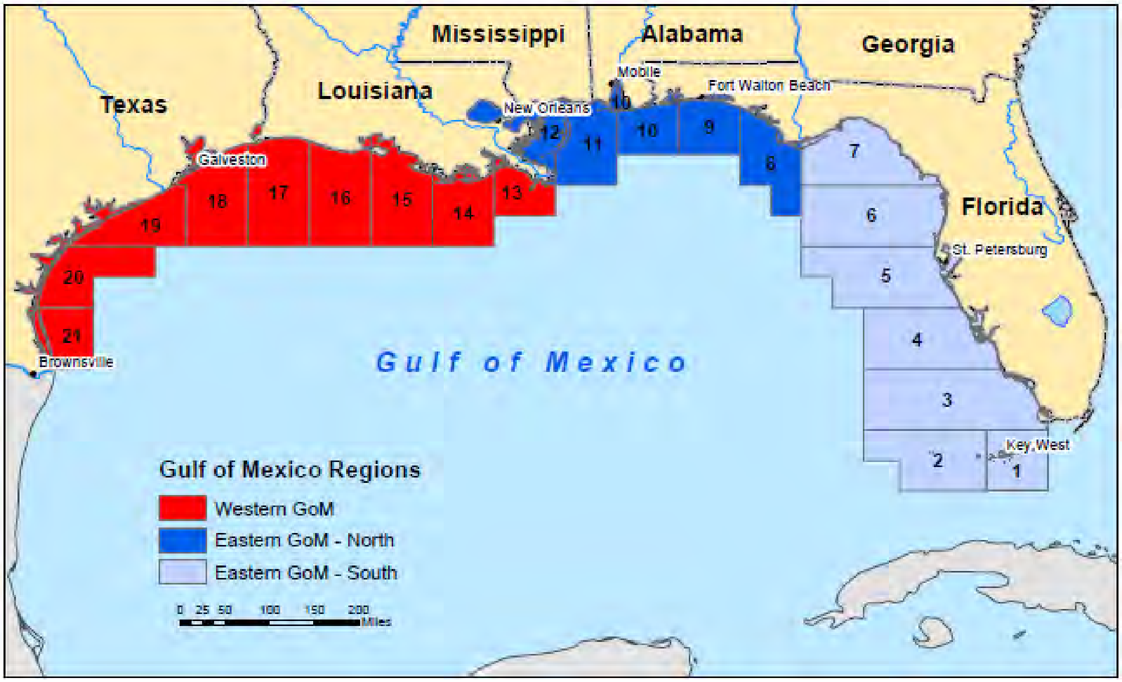



**Figure 3.1** Regions defined for commercial landings. North and South Eastern subregions are used only for 'handline+' landings.

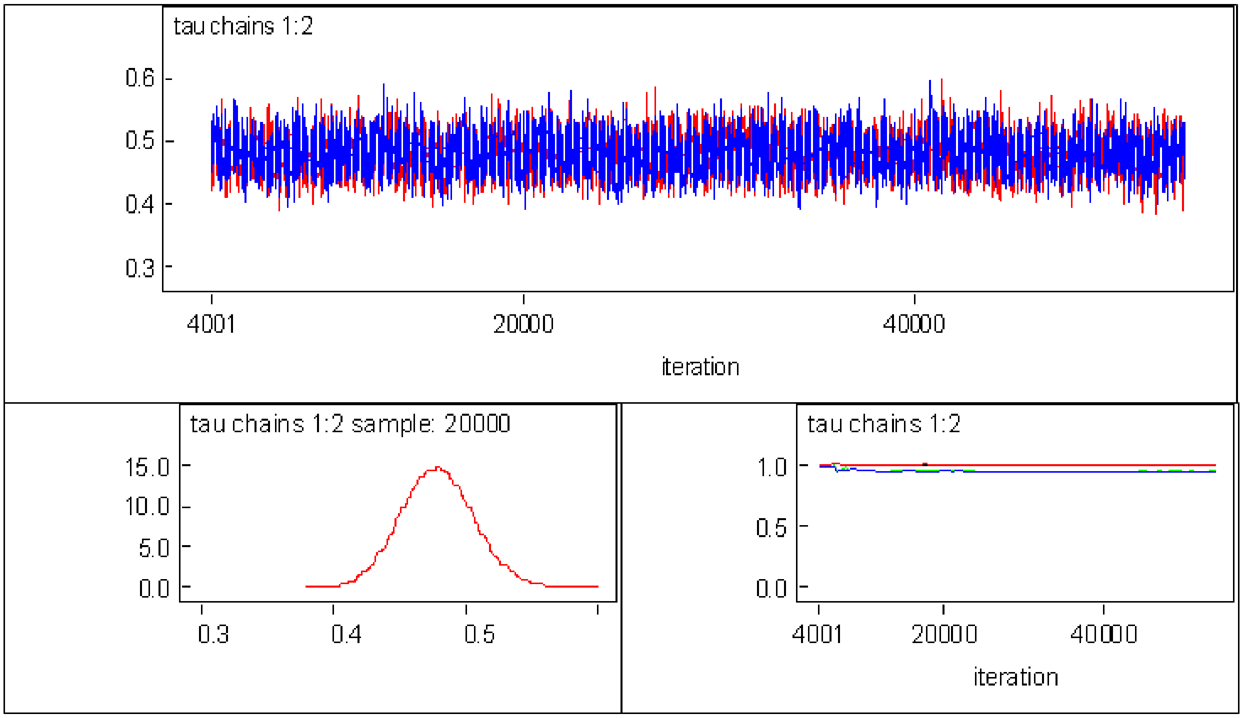



**Figure 3.2** MCMC diagnostics for the local terms precision (1/variance) parameter. Diagnostics include trace plot (top panel), marginal posterior density plot (bottom left panel), and Gelman-Rubin convergence statistic plot (bottom right) as produced by WinBUGS.

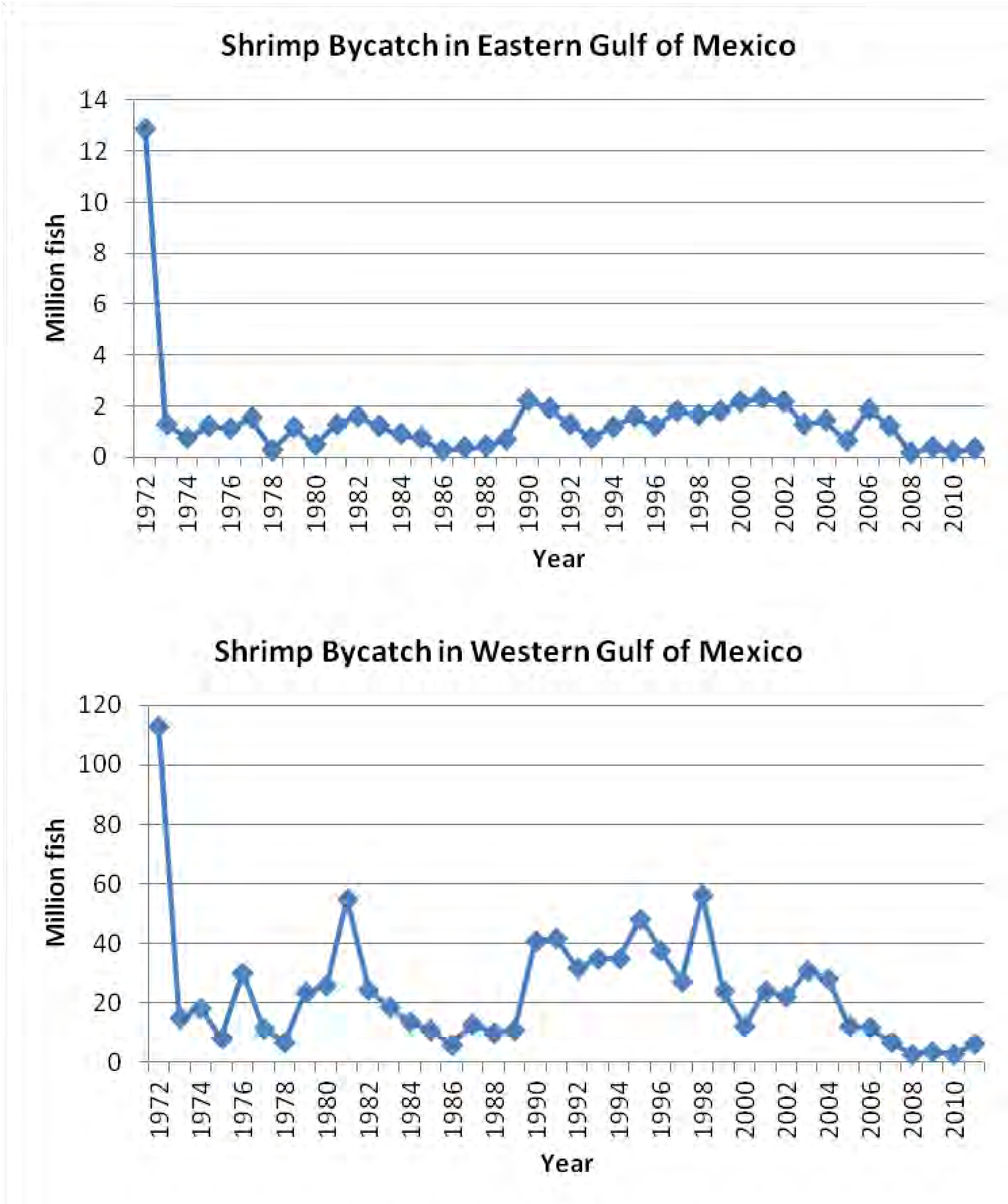



**Figure 3.3** Annual estimates of shrimp bycatch (million fish) in the eastern (top panel) and western (bottom panel) Gulf of Mexico.

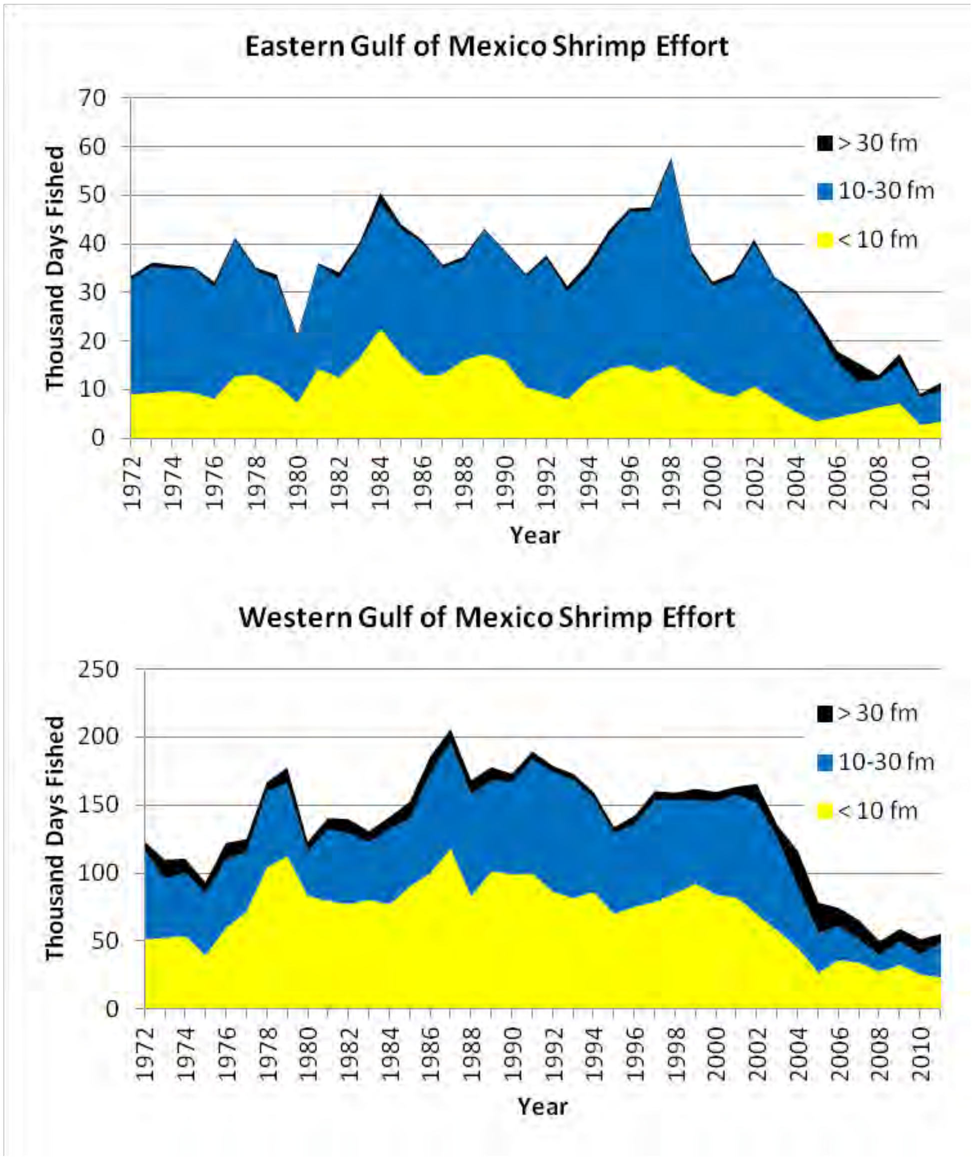



**Figure 3.4** Gulf of Mexico shrimp effort (thousand days fished) by region and depth zone. Regions include eastern (top panel) and western Gulf (bottom panel). Depth zones include inside 10 fm, 10 fm to 30 fm, and outside 30 fm.

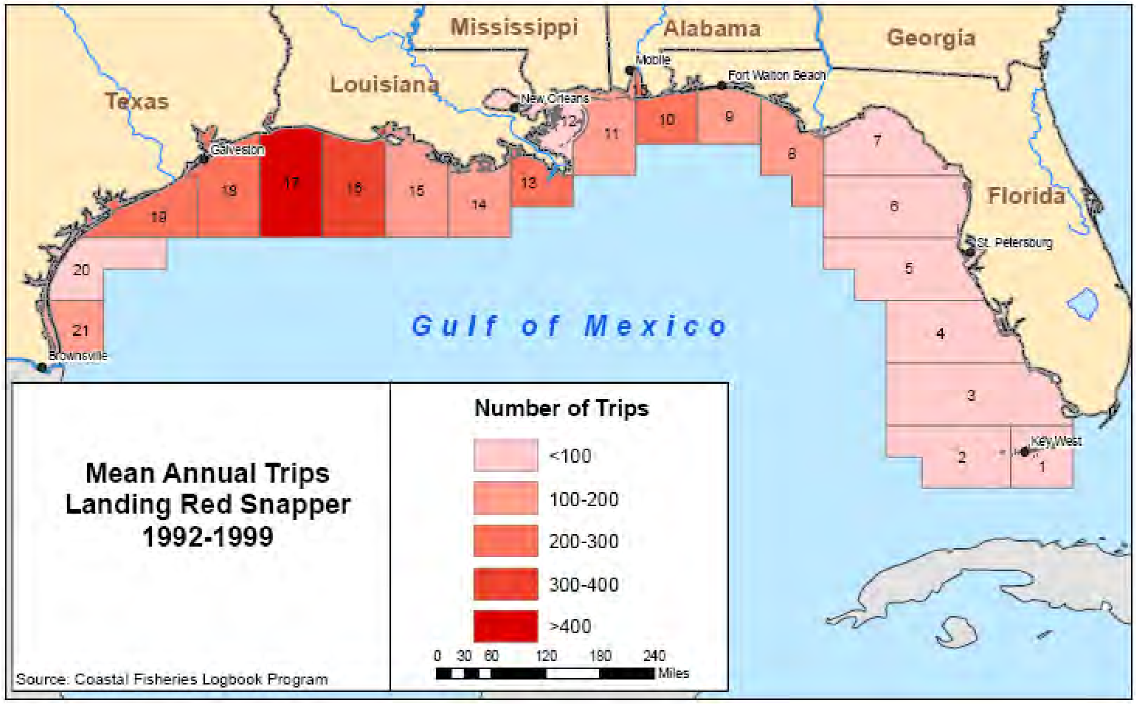



**Figure 3.5** Map of red snapper effort as reported to the Coastal Fisheries Logbook Program 1992-1999

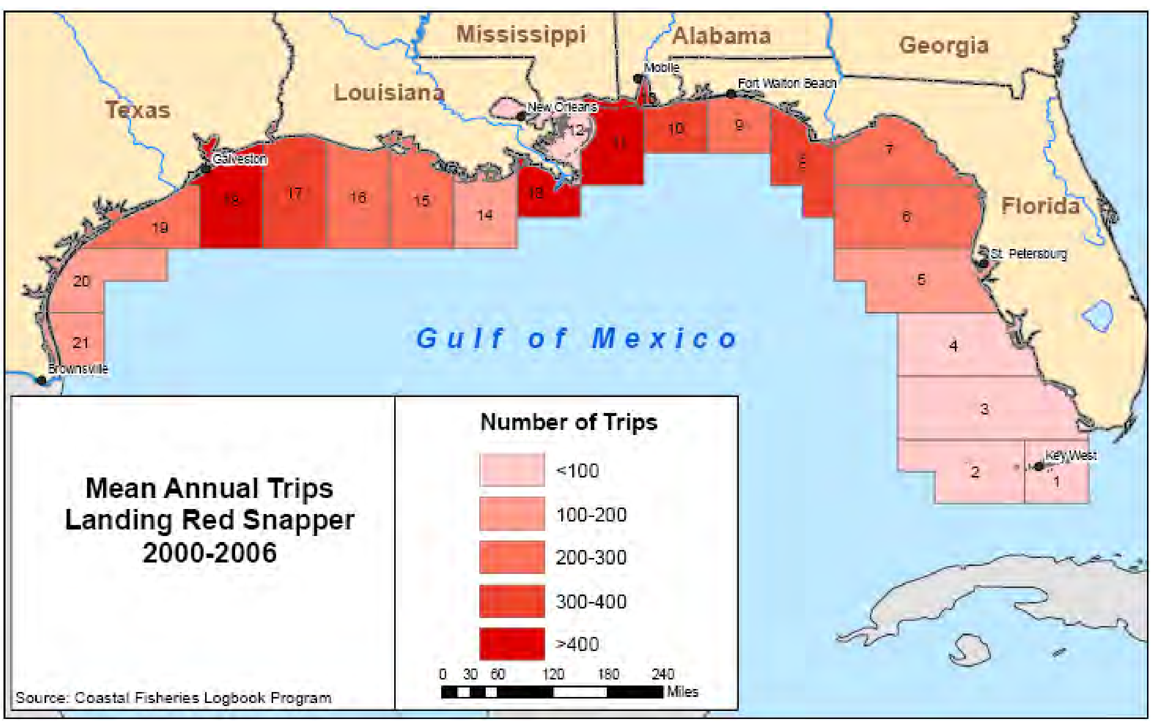



**Figure 3.6** Map of red snapper effort as reported to the Coastal Fisheries Logbook Program 2000-2006

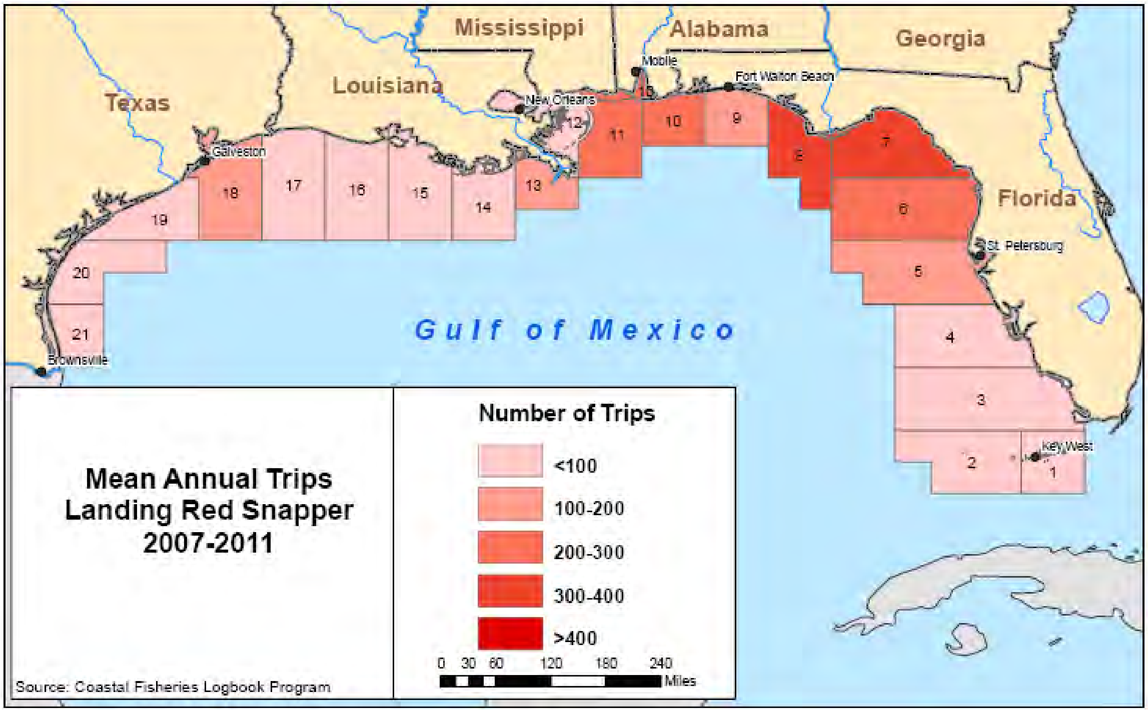



**Figure 3.7** Map of red snapper effort as reported to the Coastal Fisheries Logbook Program 2007-2011

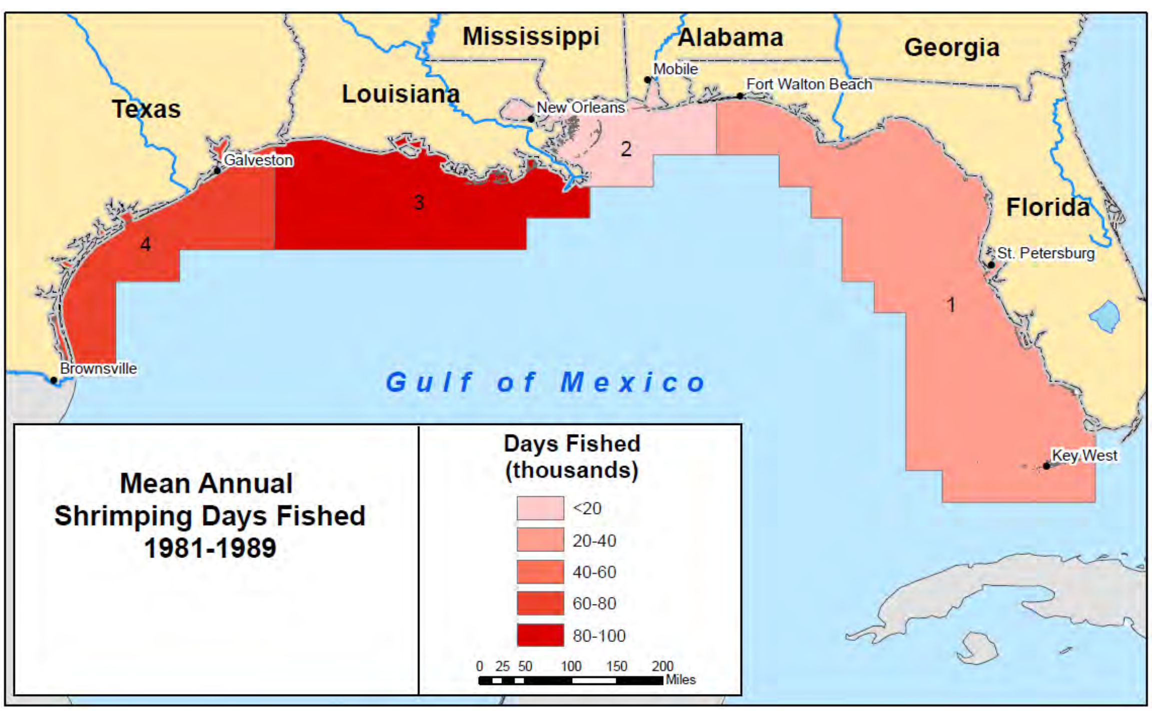



**Figure 3.8** Map of estimated shrimping effort 1981-1989.

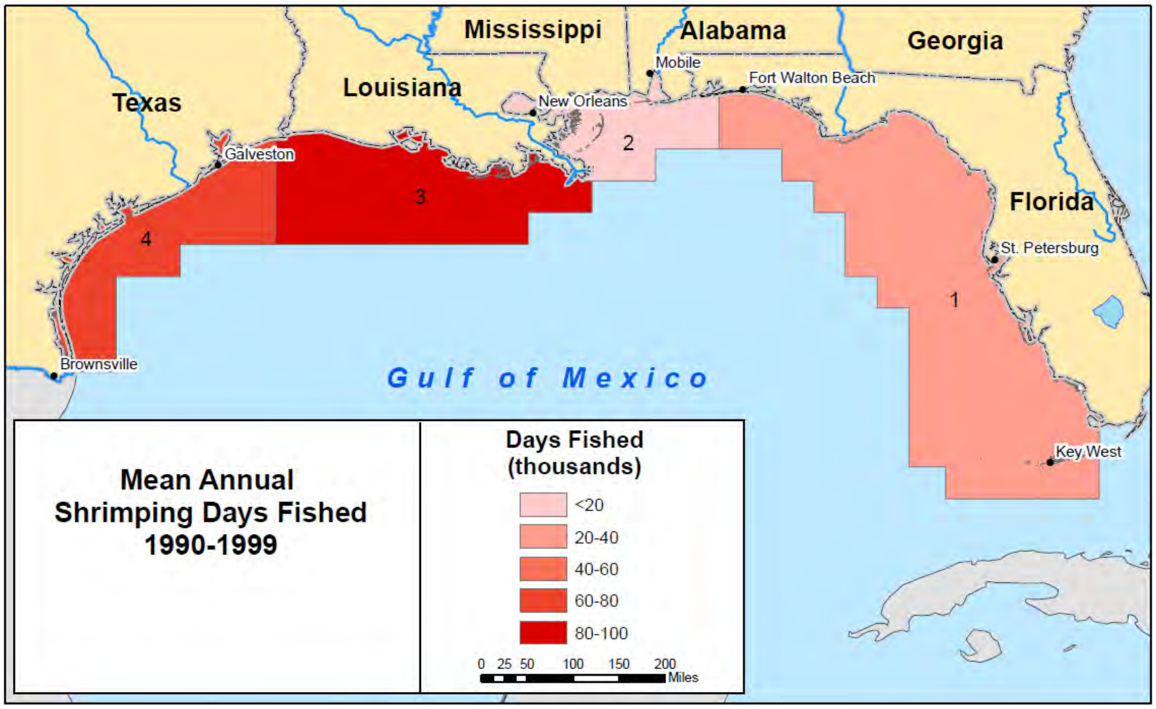



**Figure 3.9** Map of estimated shrimping effort 1990-1999.

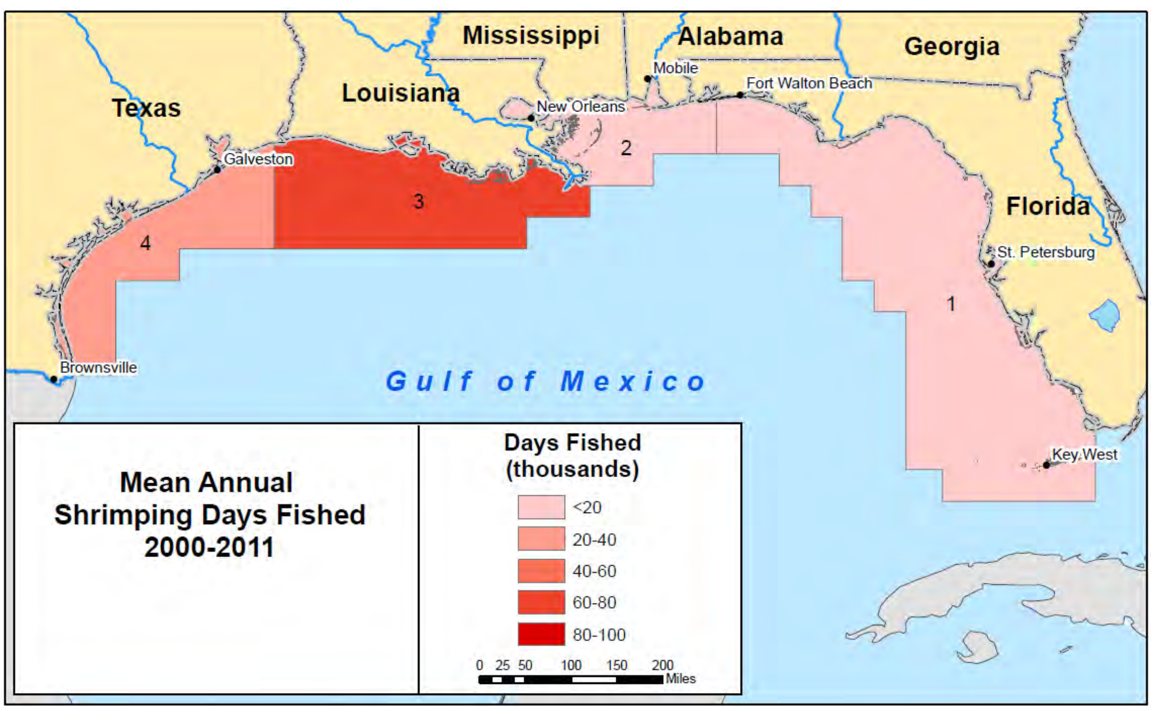



**Figure 3.10** Map of estimated shrimping effort 2000-2011.

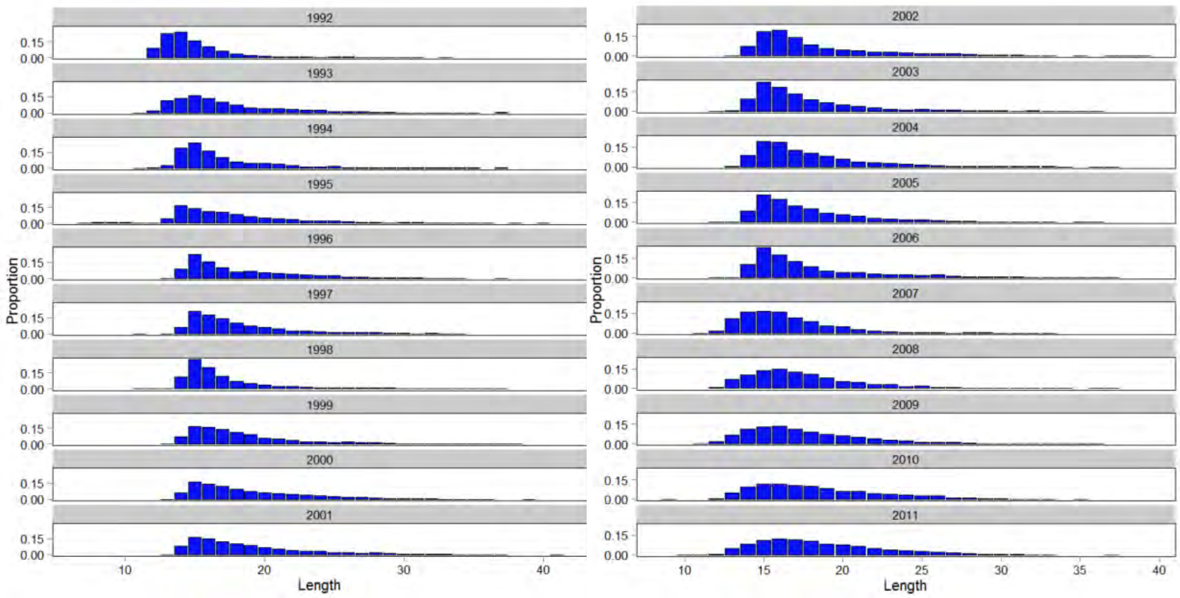



**Figure 3.11** Length frequency distributions of length samples collected from commercial handline fisheries located in the eastern Gulf of Mexico (HE) from 1992 to 2011.

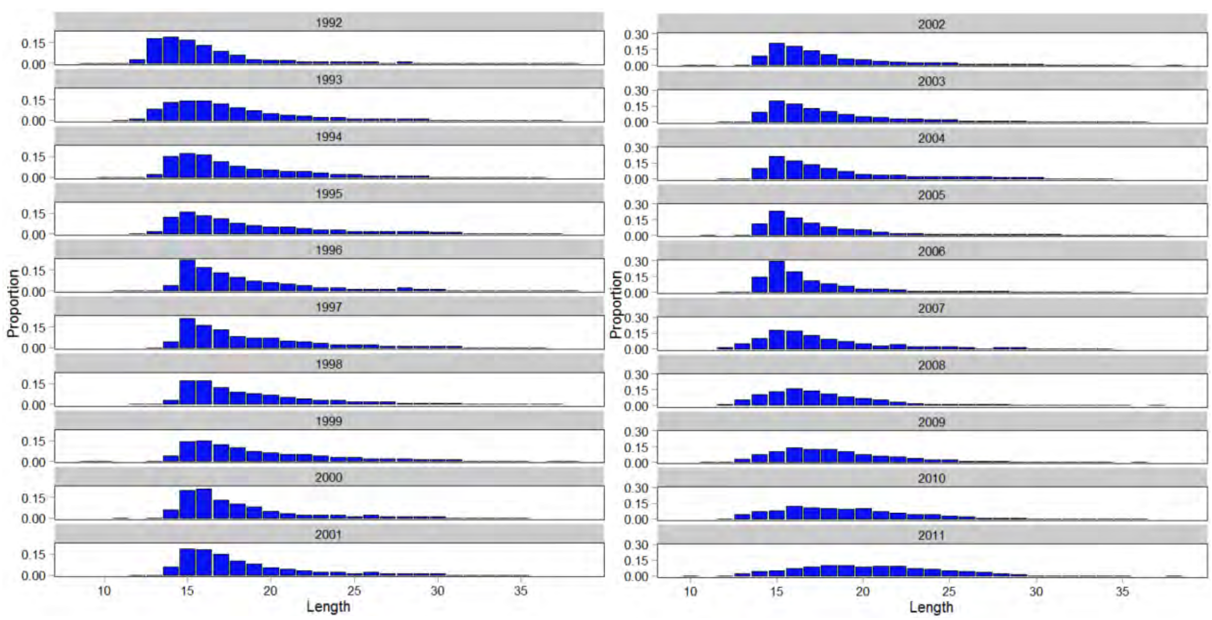



**Figure 3.12** Length frequency distributions of length samples collected from commercial handline fisheries located in the western Gulf of Mexico (HW) from 1992 to 2011.

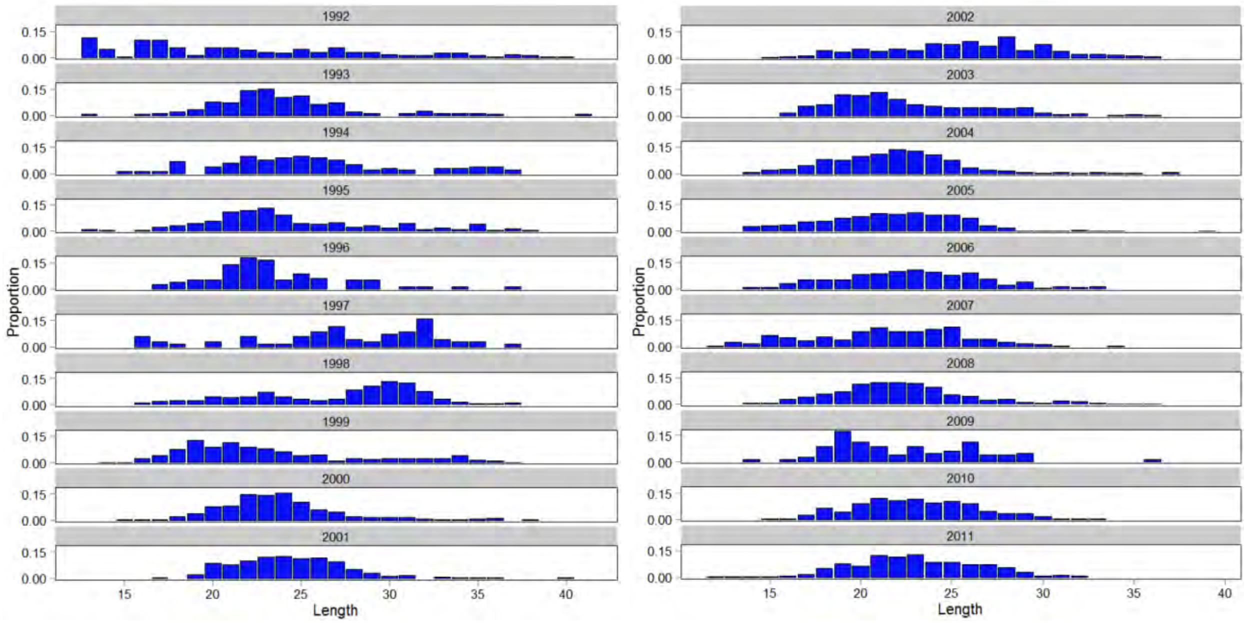



**Figure 3.13** Length frequency distributions of length samples collected from commercial longline fisheries located in the eastern Gulf of Mexico (LE) from 1992 to 2011.

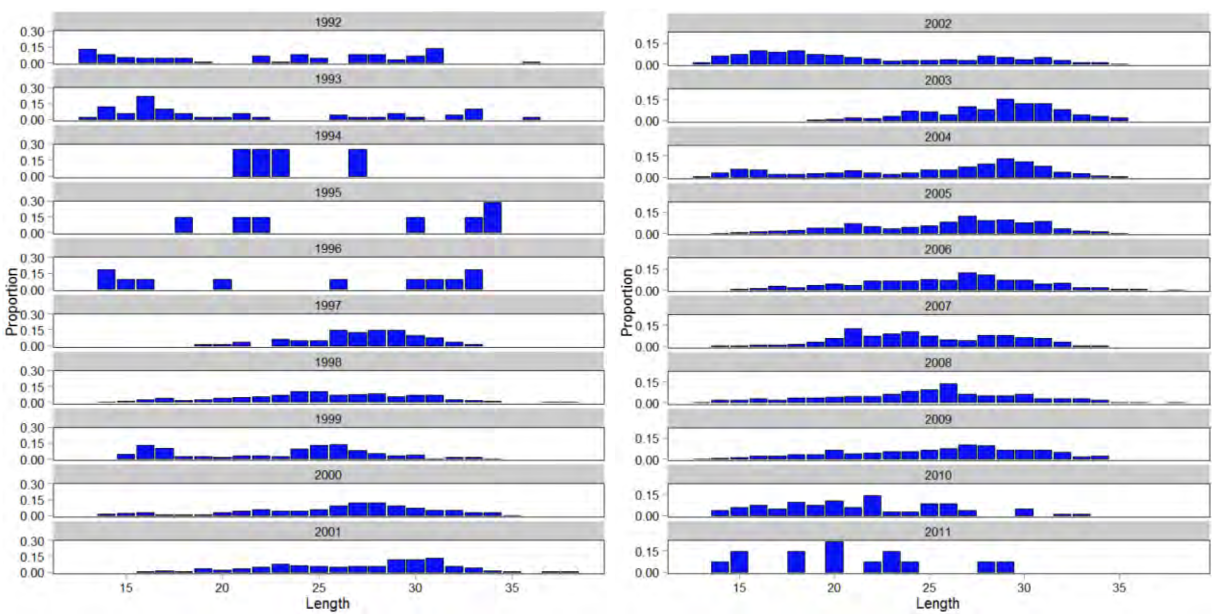



**Figure 3.14** Length frequency distributions of length samples collected from commercial longline fisheries located in the western Gulf of Mexico (LW) from 1992 to 2011.

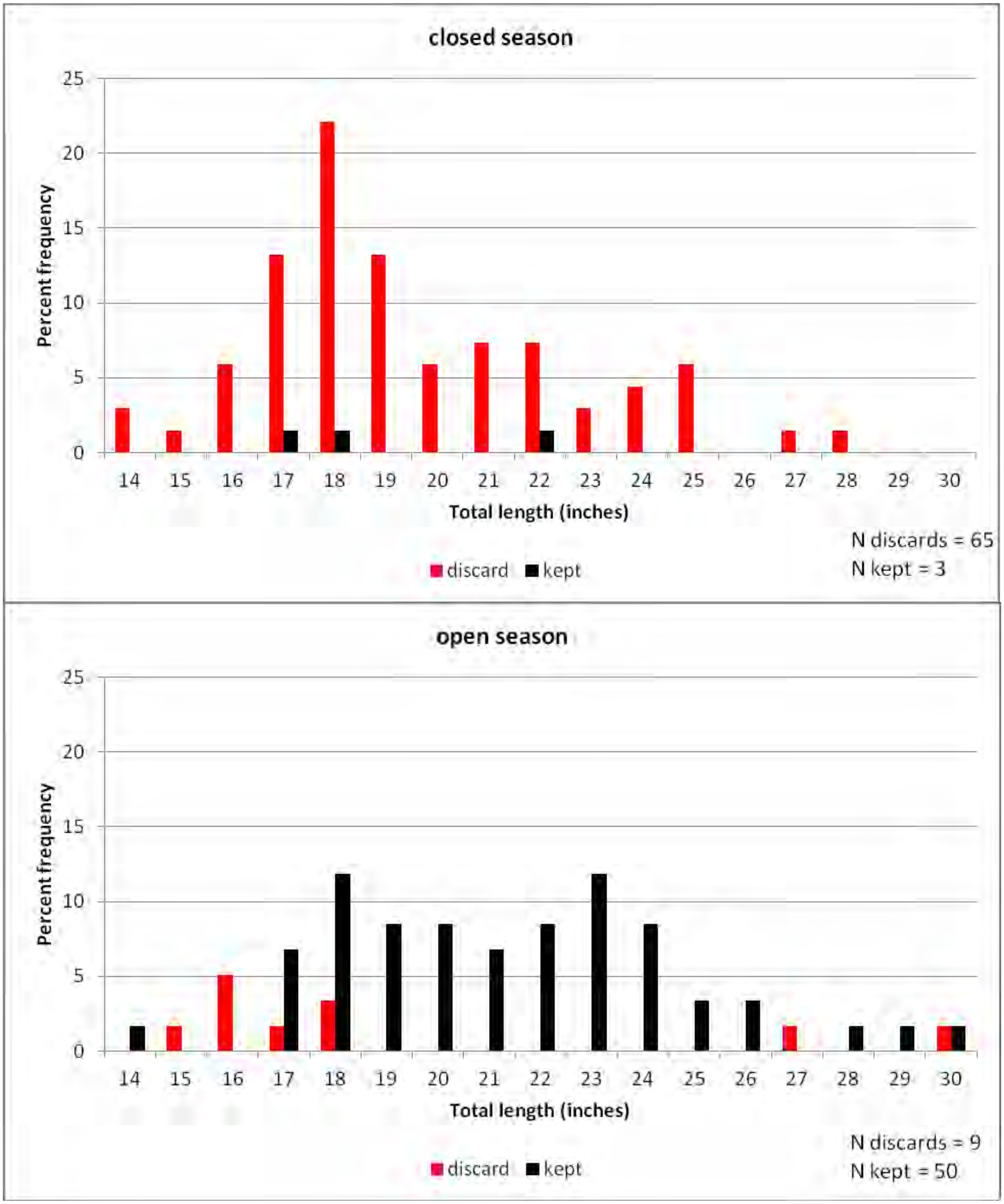



**Figure 3.15** Commercial bottom longline eastern Gulf of Mexico 2006 observed red snapper size composition. Sizes are in inches total length, where bins are one inch; e.g., 15 = 15-15.99 inches.

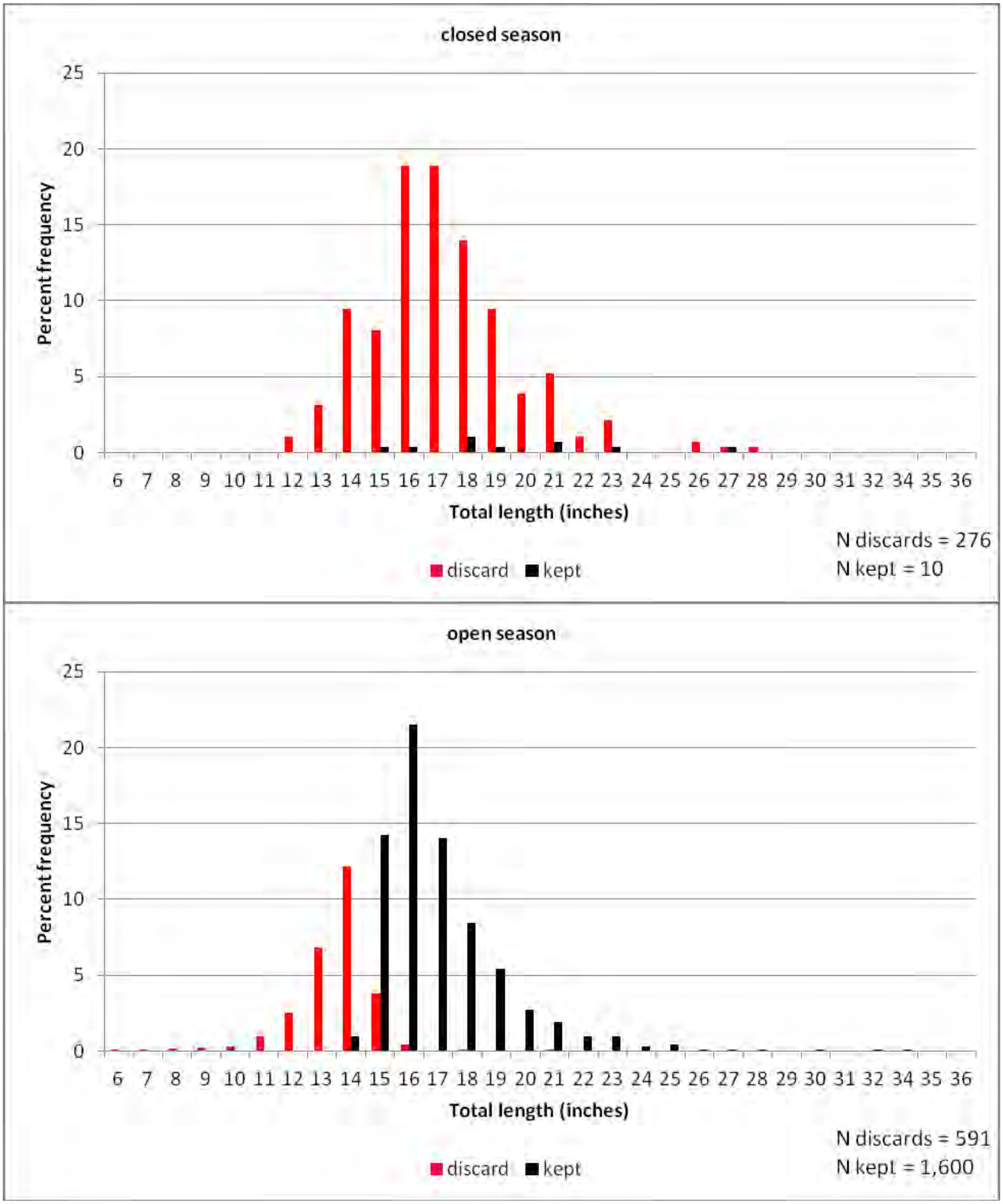



**Figure 3.16** Commercial vertical line eastern Gulf of Mexico 2006 observed red snapper size composition. Sizes are in inches total length, where bins are one inch; e.g., 15 = 15-15.99 inches.

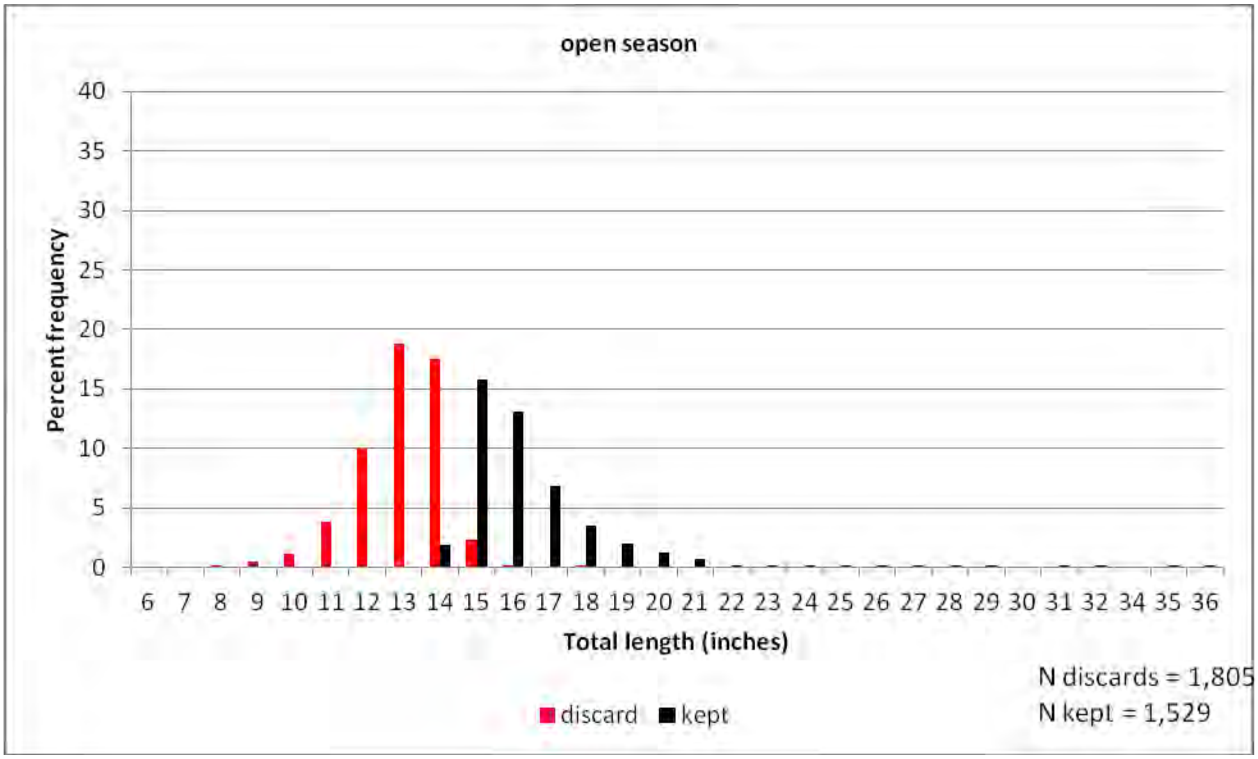



**Figure 3.17** Commercial vertical line western Gulf of Mexico 2006 observed red snapper size composition. Sizes are in inches total length, where bins are one inch; e.g., 15 = 15-15.99 inches. Data collected during the closed season cannot be shown due to confidentiality restrictions.

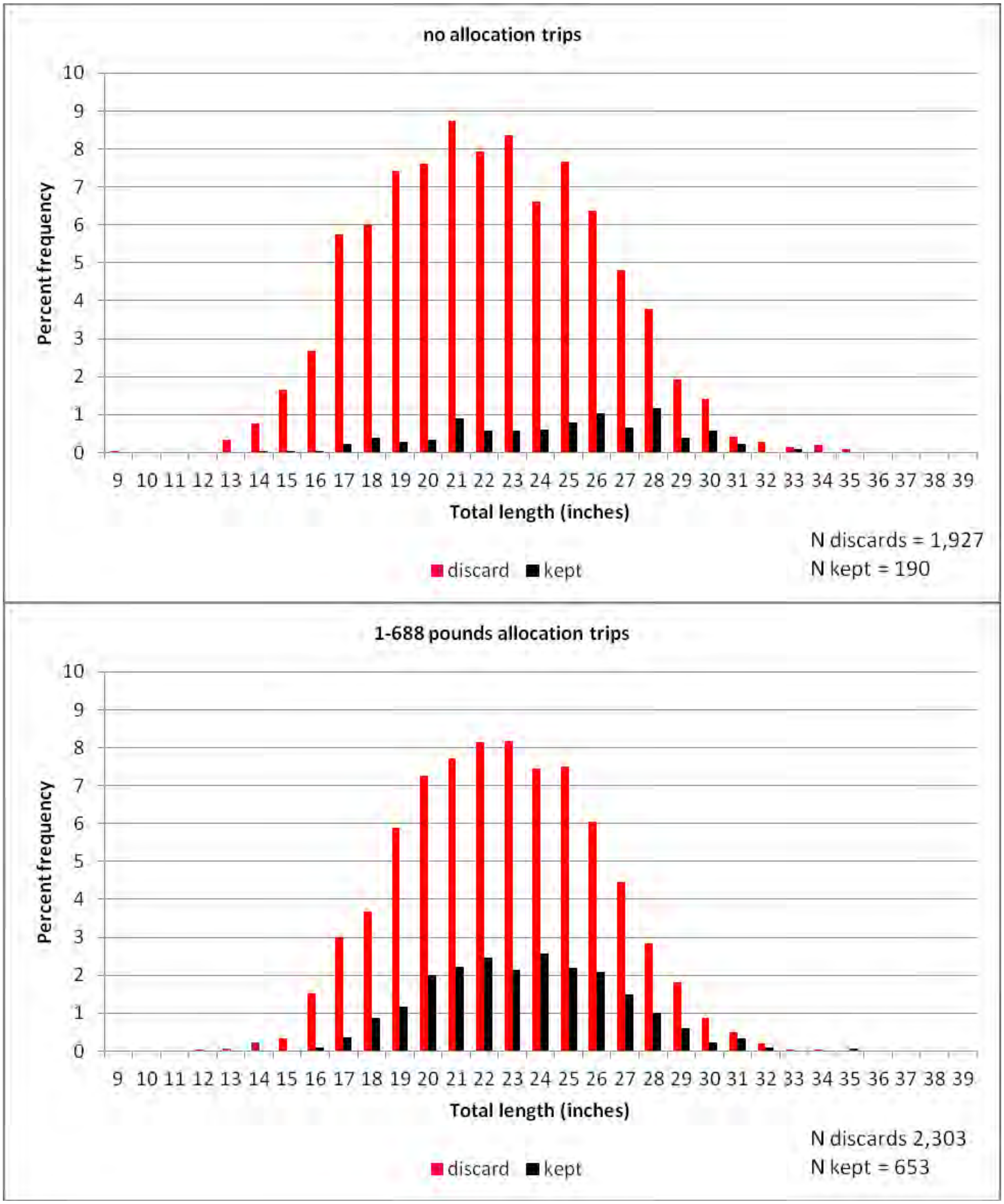



**Figure 3.18** Commercial bottom longline eastern Gulf of Mexico observed red snapper size composition by red snapper allocation. Sizes are in inches total length, where bins are one inch; e.g., 15 = 15-15.99 inches.

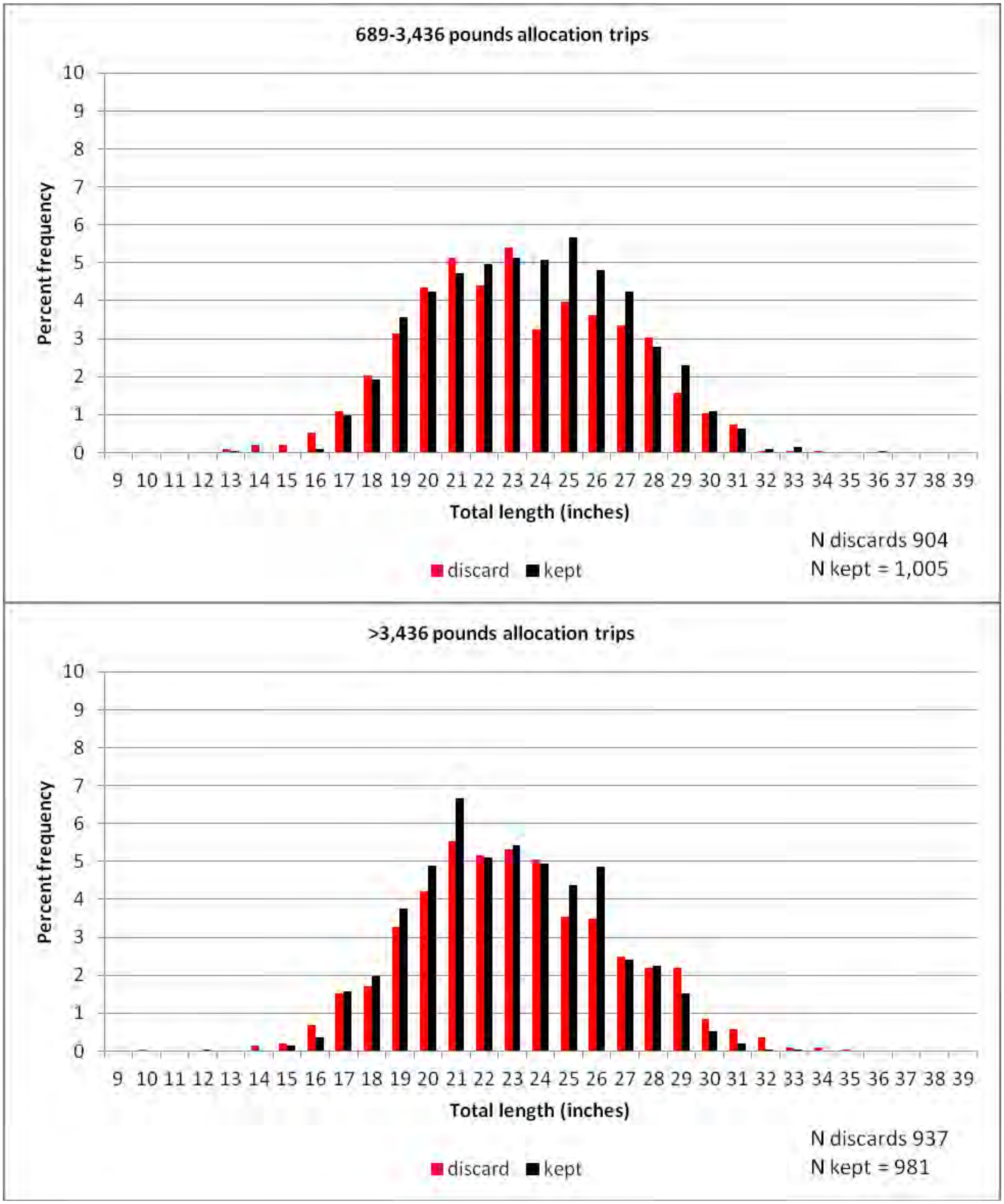



**Figure 3.18** Commercial bottom longline eastern Gulf of Mexico observed red snapper size composition by red snapper allocation, continued.

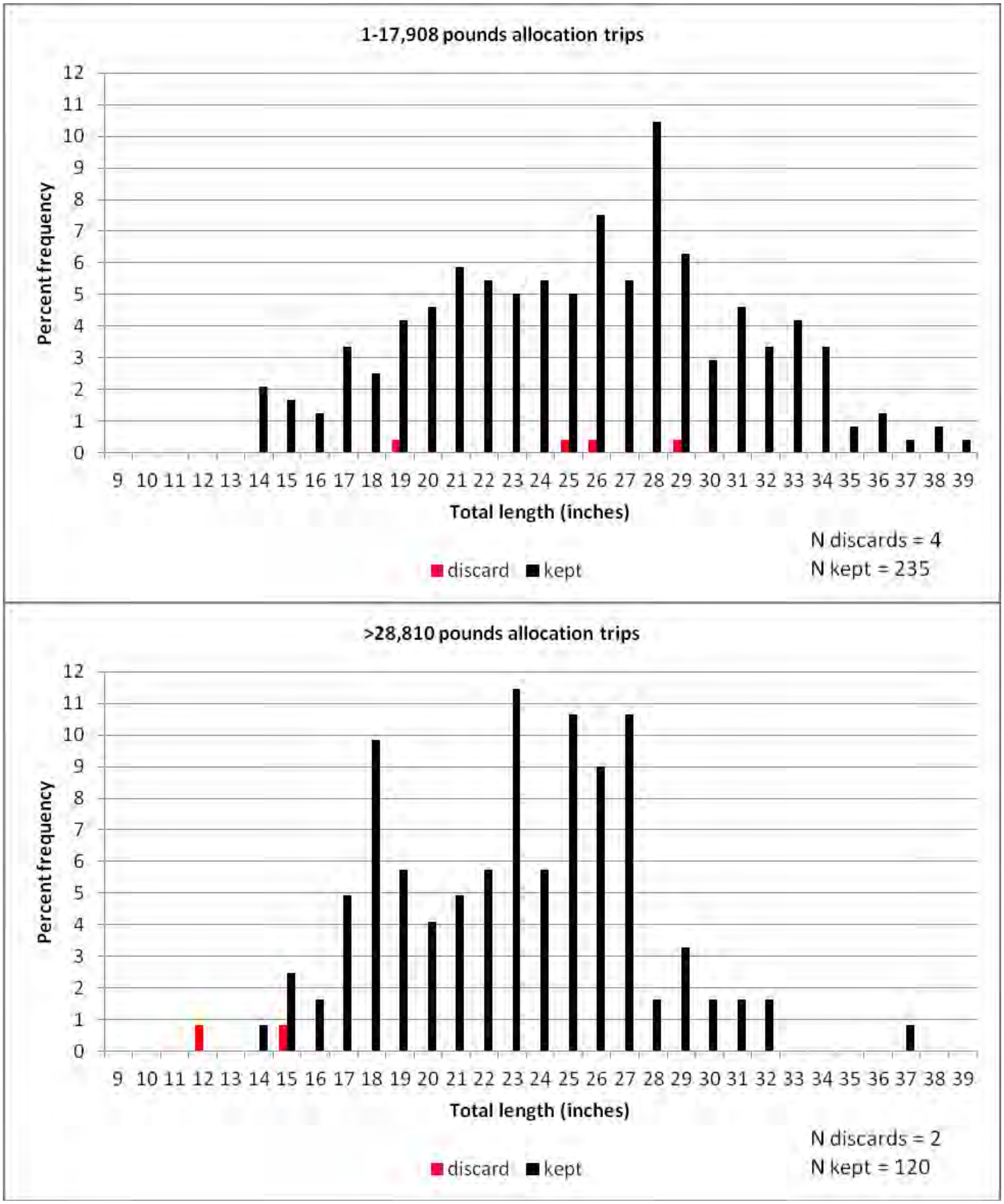



**Figure 3.19** Commercial bottom longline western Gulf of Mexico observed red snapper size composition by red snapper allocation. Sizes are in inches total length, where bins are one inch; e.g., 15 = 15-15.99 inches. Data from trips with no allocation and from trips with 17,909-28,810 pounds of allocation cannot be shown due to confidentiality restrictions.

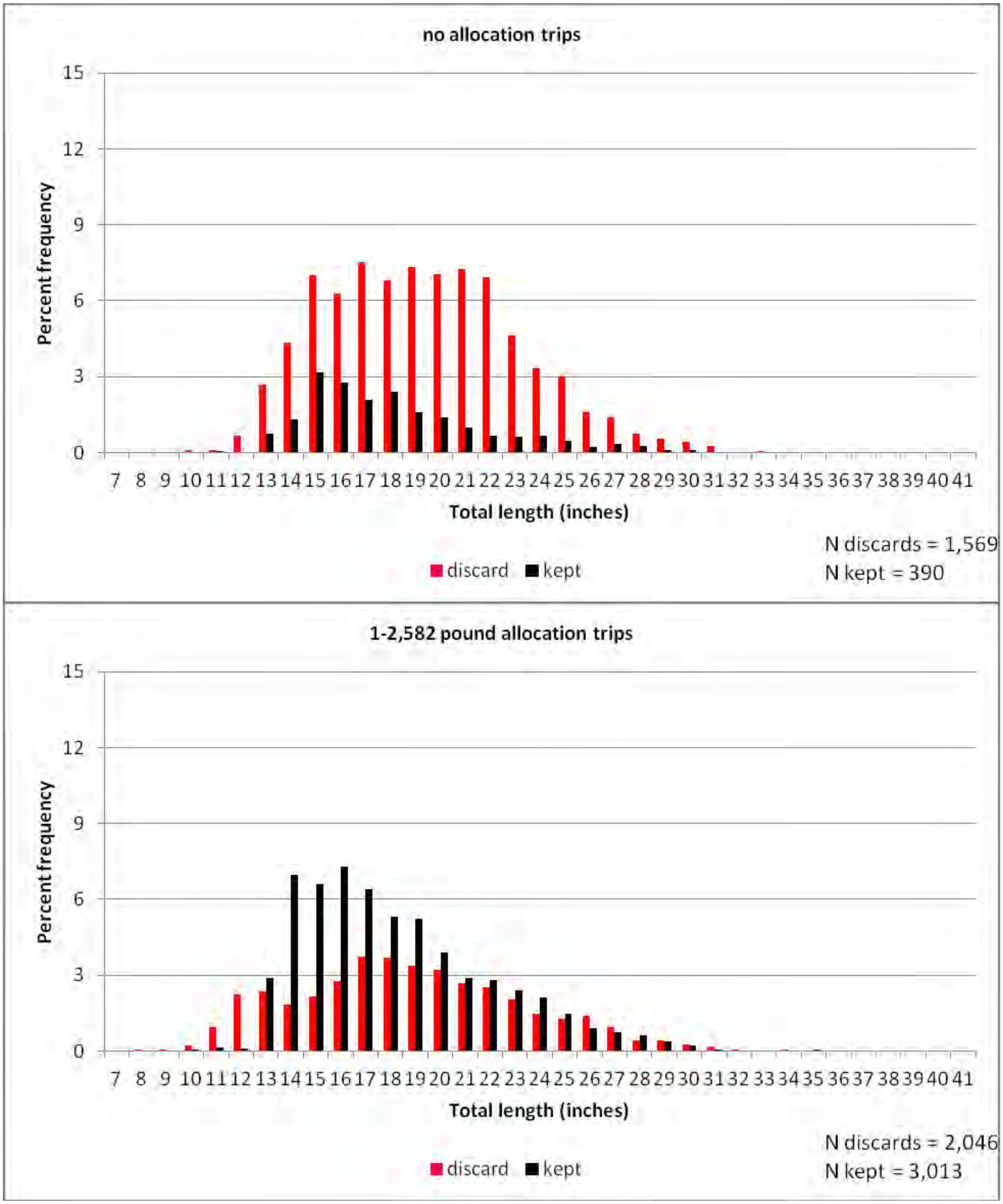



**Figure 3.20** Commercial vertical line eastern Gulf of Mexico observed red snapper size composition by red snapper allocation. Sizes are in inches total length, where bins are one inch; e.g., 15 = 15-15.99 inches.

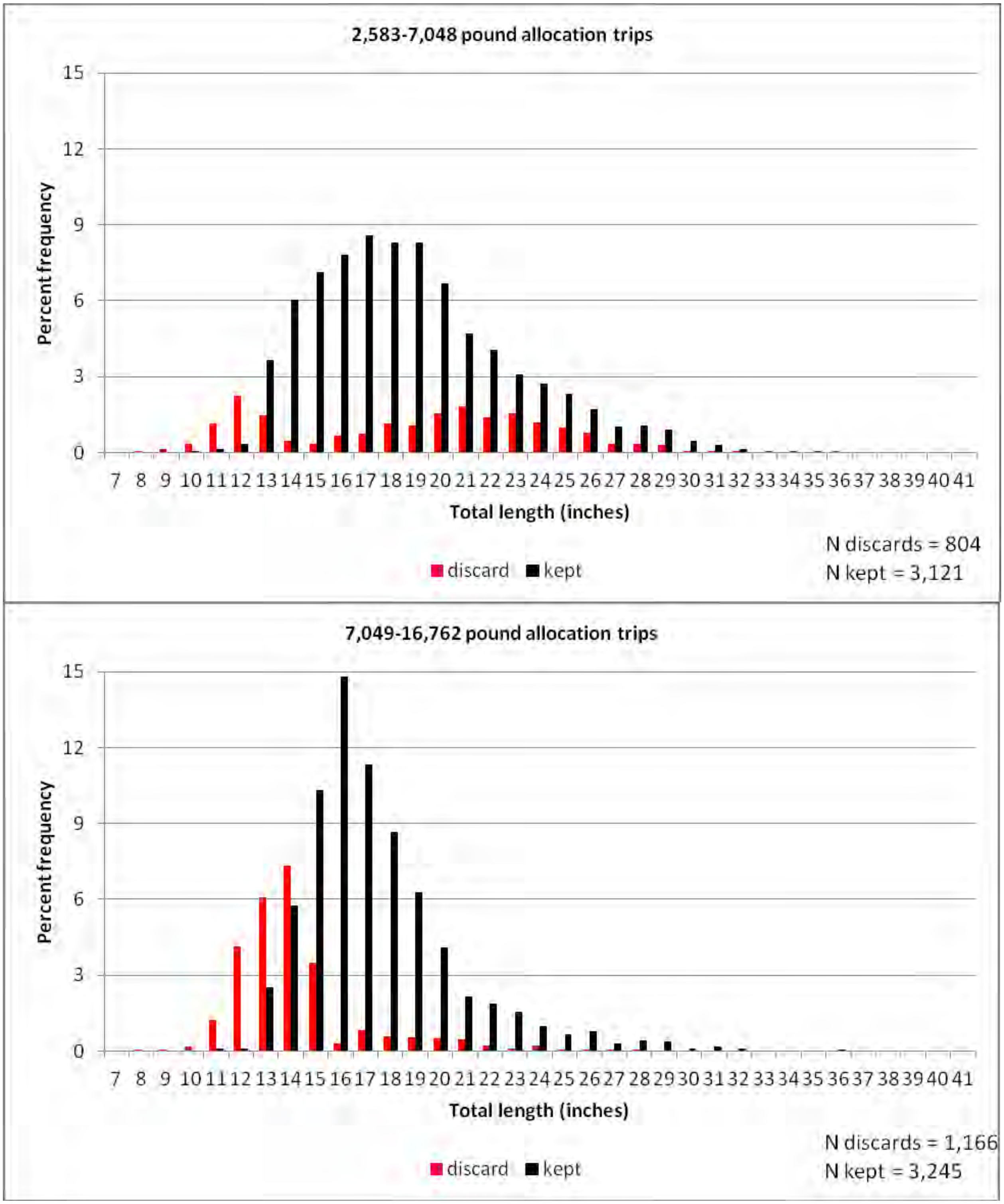



**Figure 3.20** Commercial vertical line eastern Gulf of Mexico observed red snapper size composition by red snapper allocation, continued.

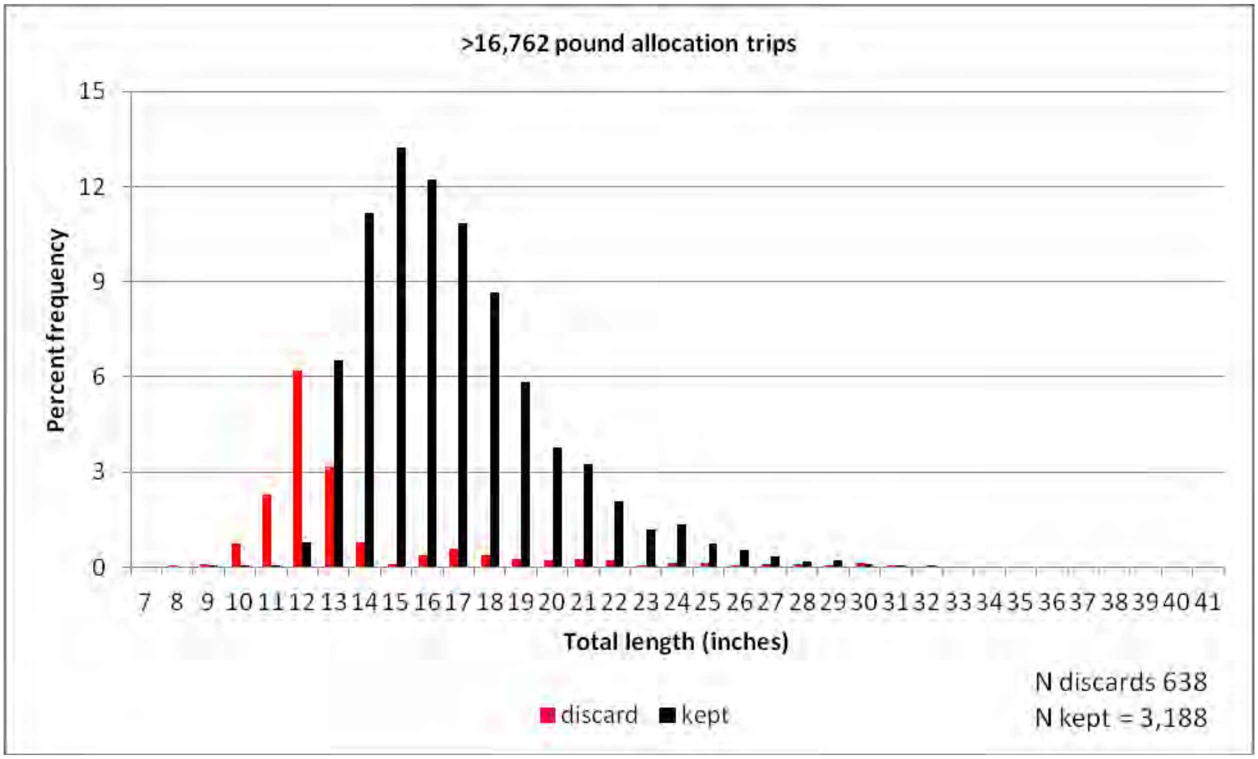



**Figure 3.20** Commercial vertical line eastern Gulf of Mexico observed red snapper size composition by red snapper allocation, continued.

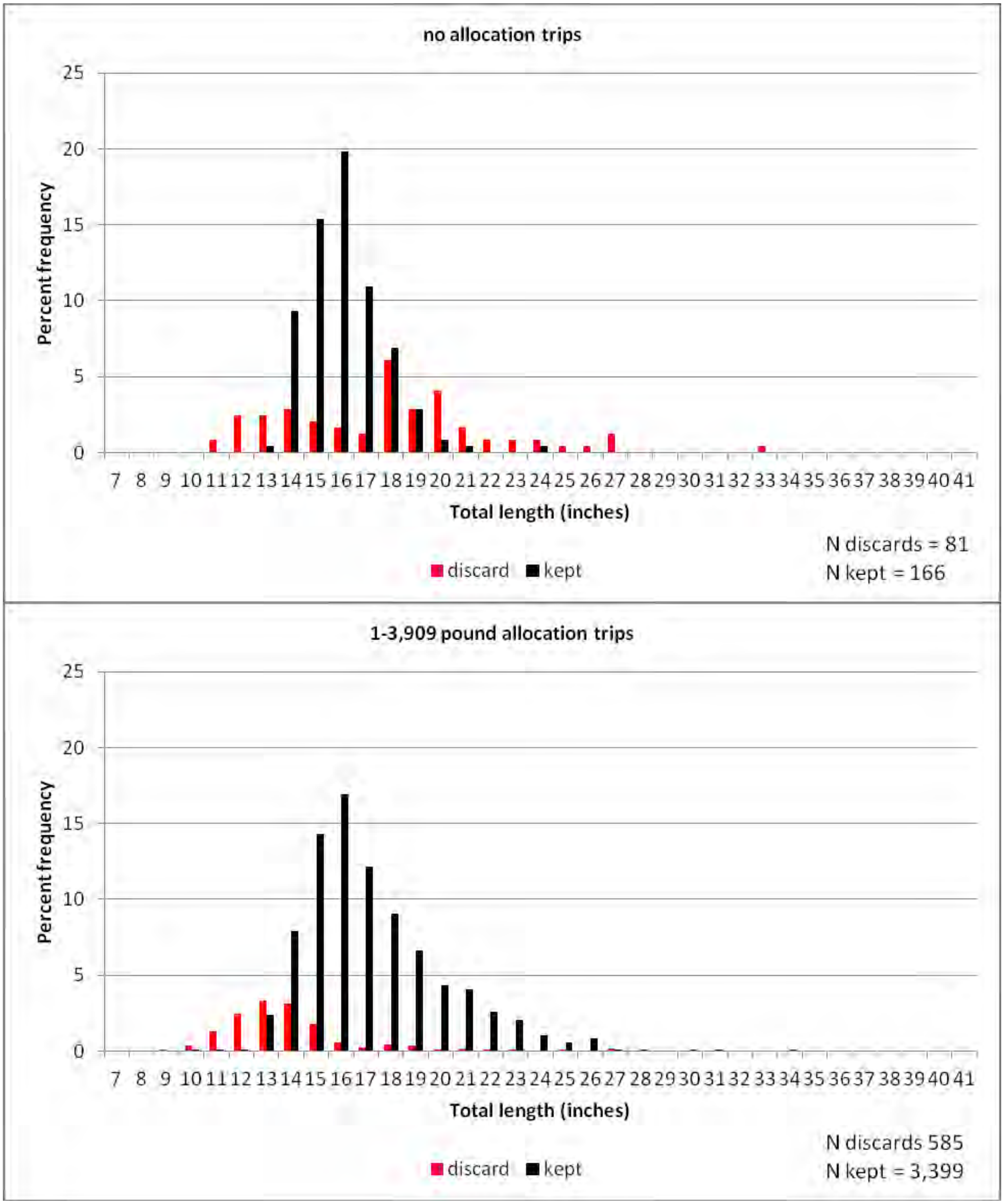



**Figure 3.21** Commercial vertical line western Gulf of Mexico observed red snapper size composition by red snapper allocation. Sizes are in inches total length, where bins are one inch; e.g., 15 = 15-15.99 inches.

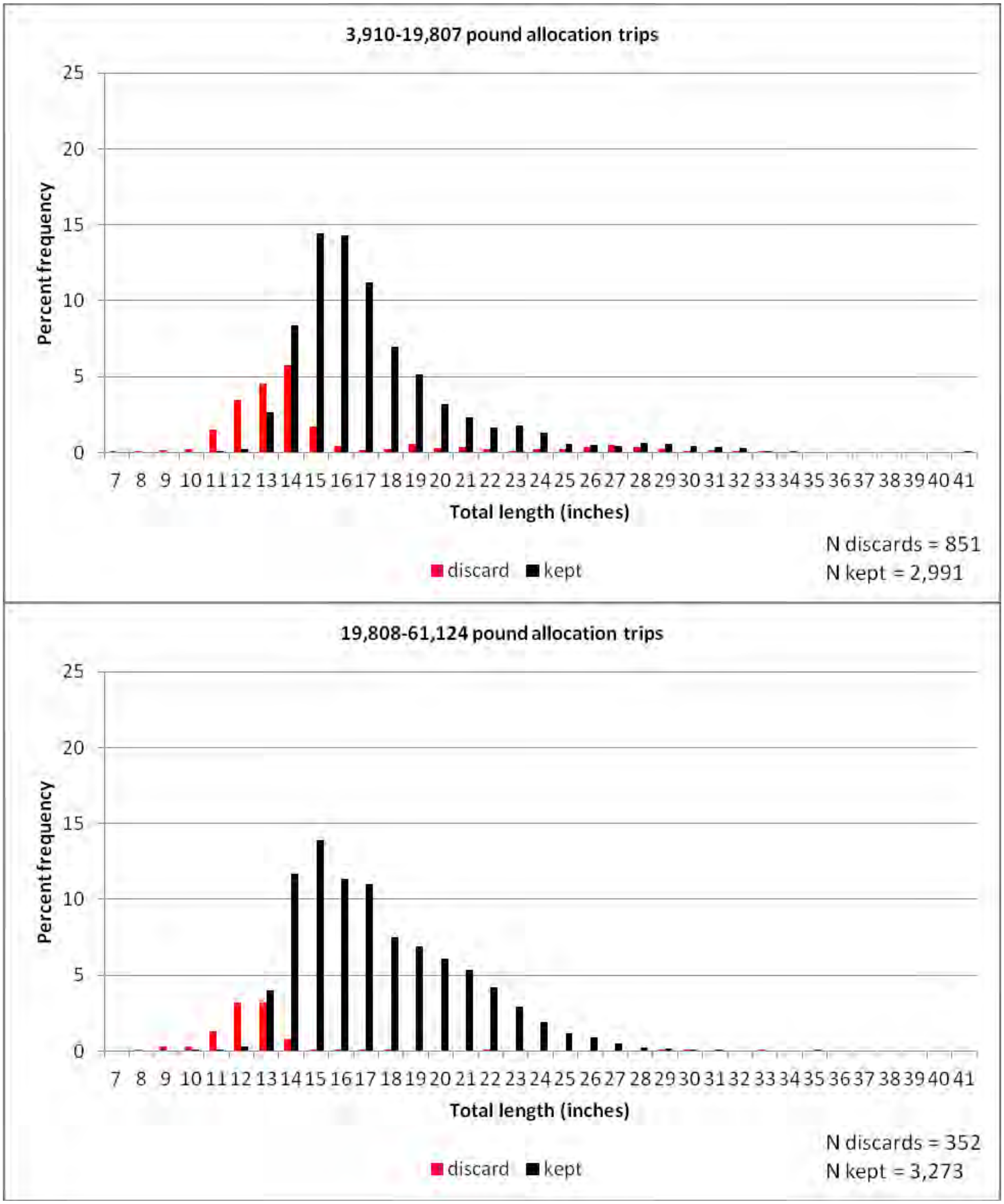



**Figure 3.21** Commercial vertical line western Gulf of Mexico observed red snapper size composition by red snapper allocation, continued.

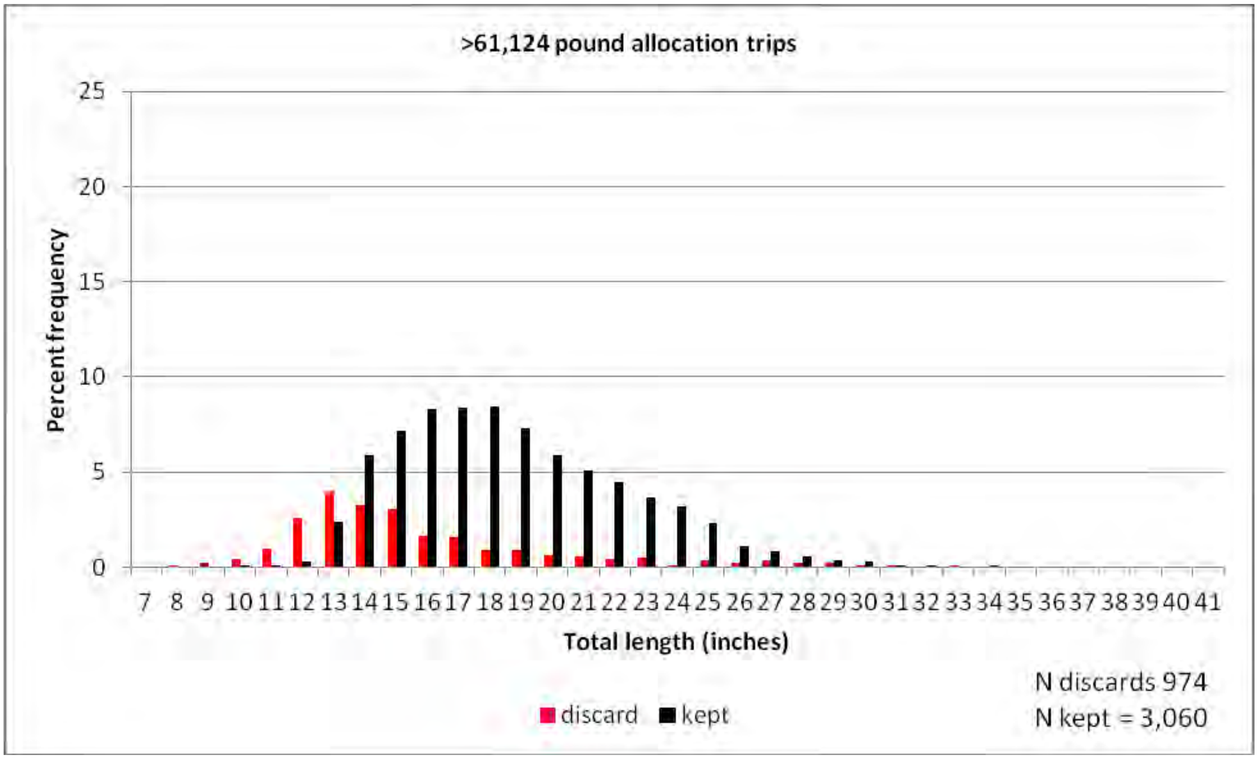



**Figure 3.21** Commercial vertical line western Gulf of Mexico observed red snapper size composition by red snapper allocation, continued.

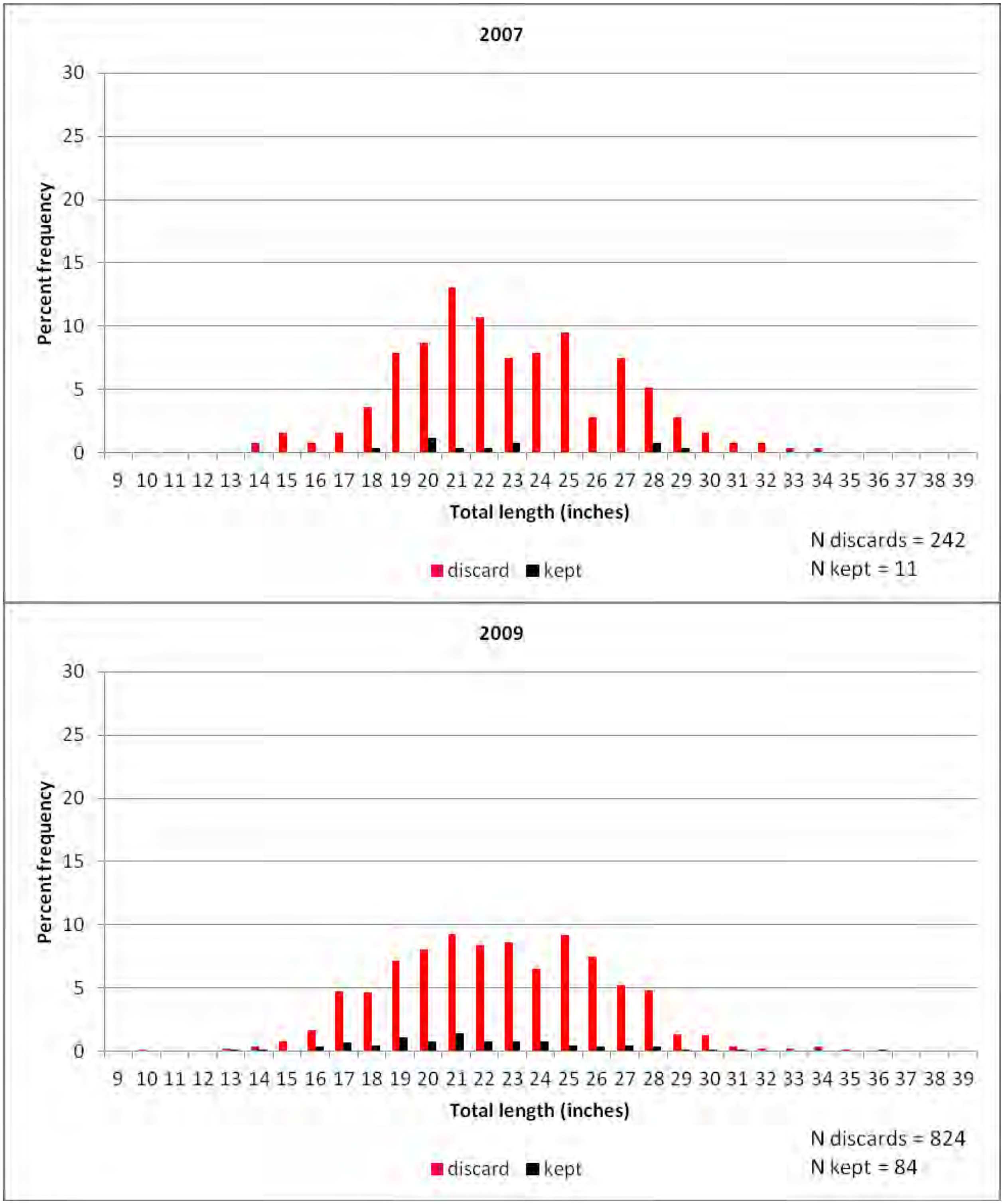



**Figure 3.22** Commercial bottom longline eastern Gulf of Mexico observed red snapper size composition by year. Sizes are in inches total length, where bins are one inch; e.g., 15 = 15-15.99 inches. Data from 2008 cannot be shown due to confidentiality restrictions.

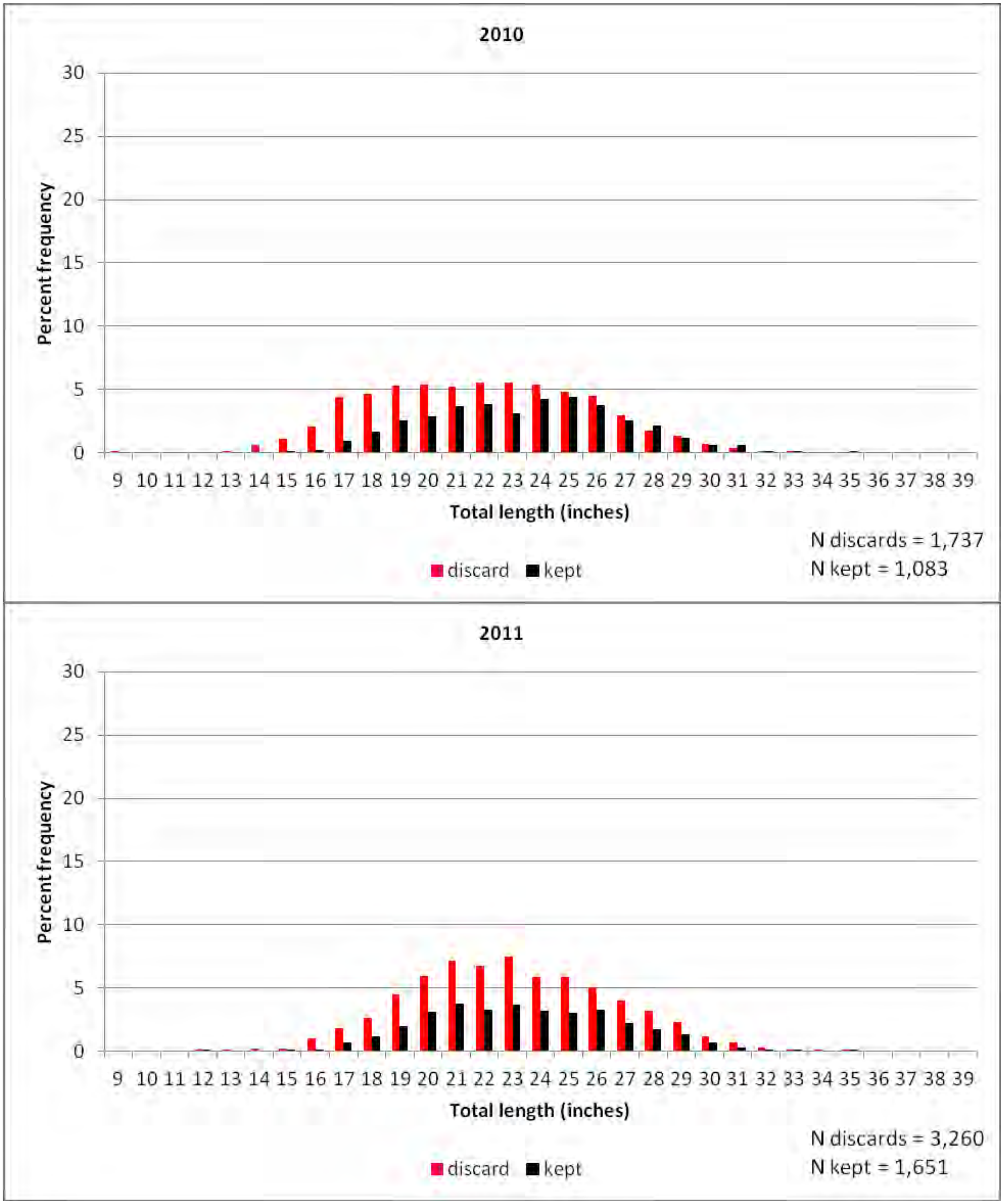



**Figure 3.22** Commercial bottom longline eastern Gulf of Mexico observed red snapper size composition by year, continued.

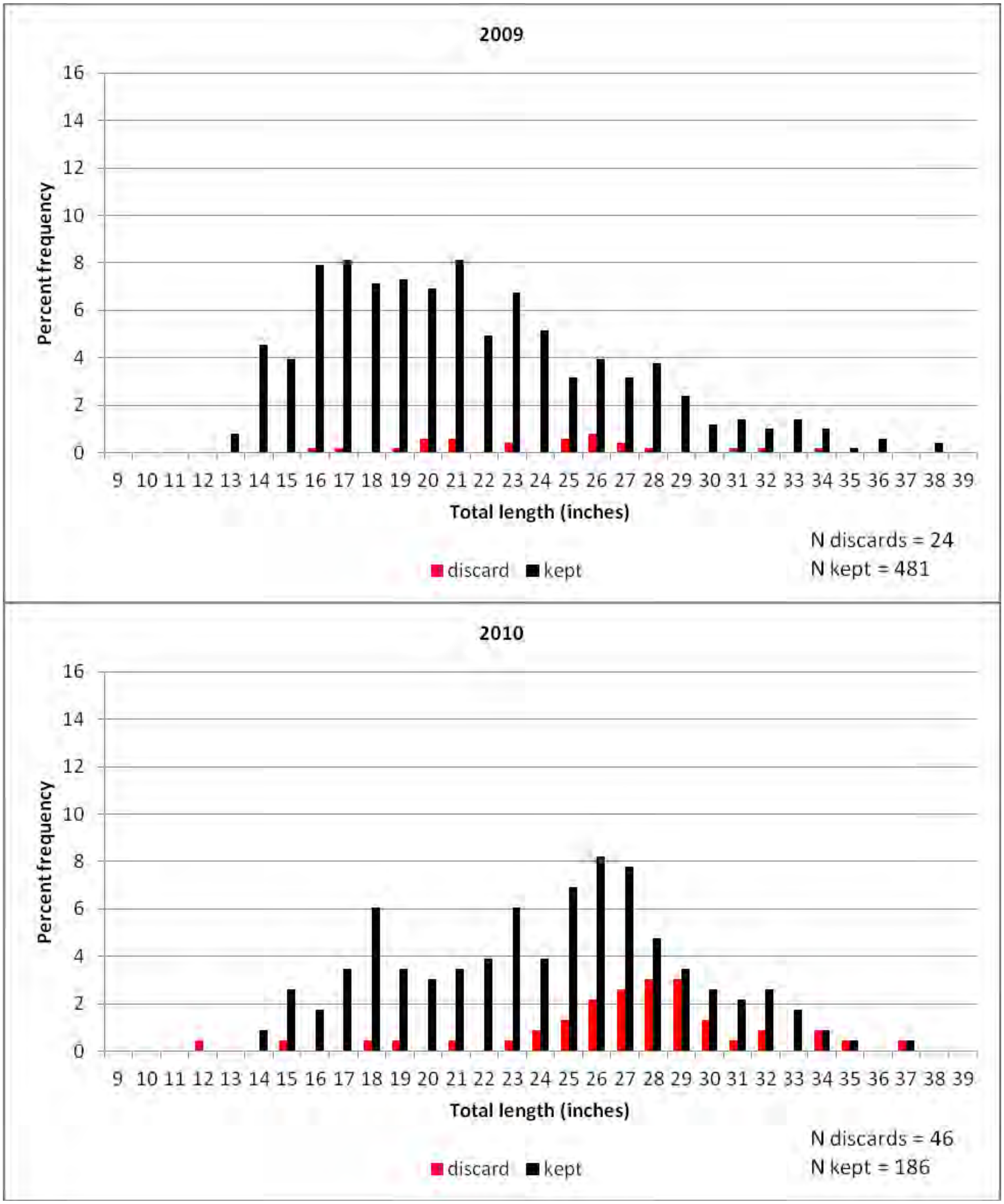



**Figure 3.23** Commercial bottom longline western Gulf of Mexico observed red snapper size composition by year. No western Gulf of Mexico bottom longline trips had observers onboard during 2007. Data from 2008 cannot be shown due to confidentiality restrictions. Sizes are in inches total length, where bins are one inch; e.g., 15 = 15-15.99 inches.

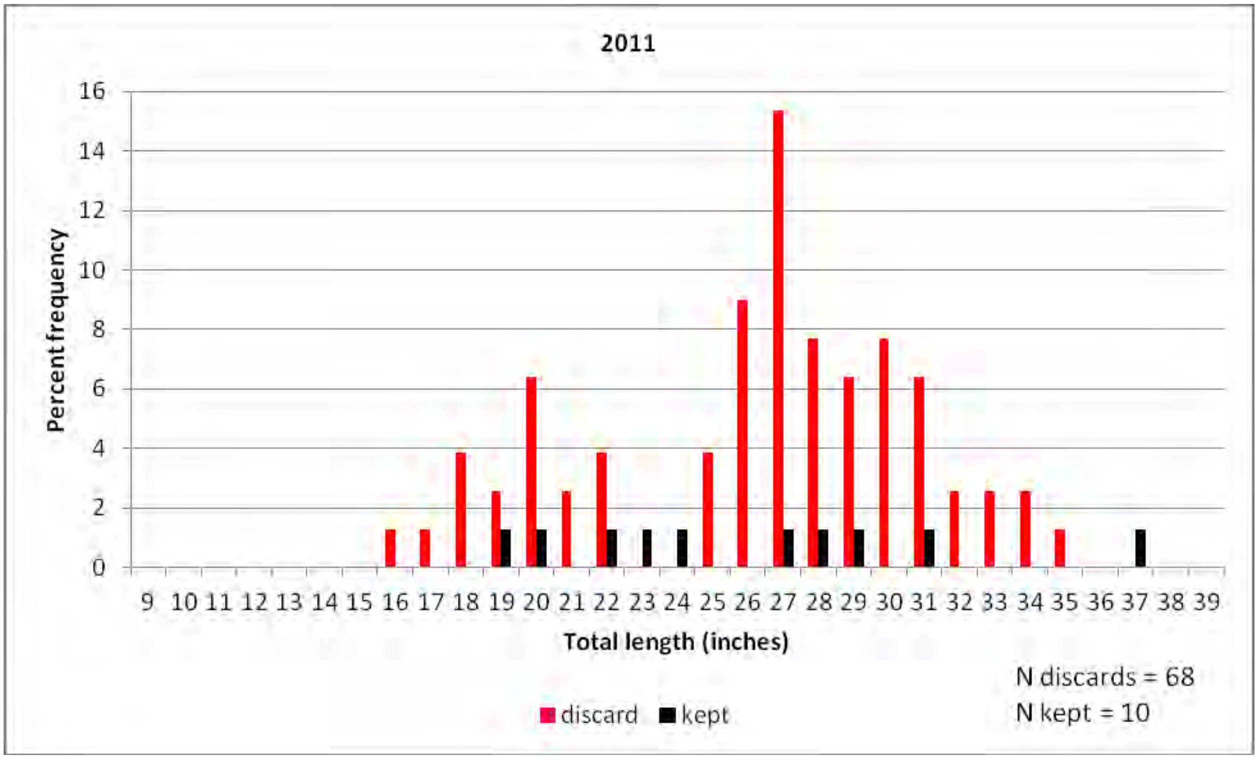



**Figure 3.23** Commercial bottom longline western Gulf of Mexico observed red snapper size composition by year, continued.

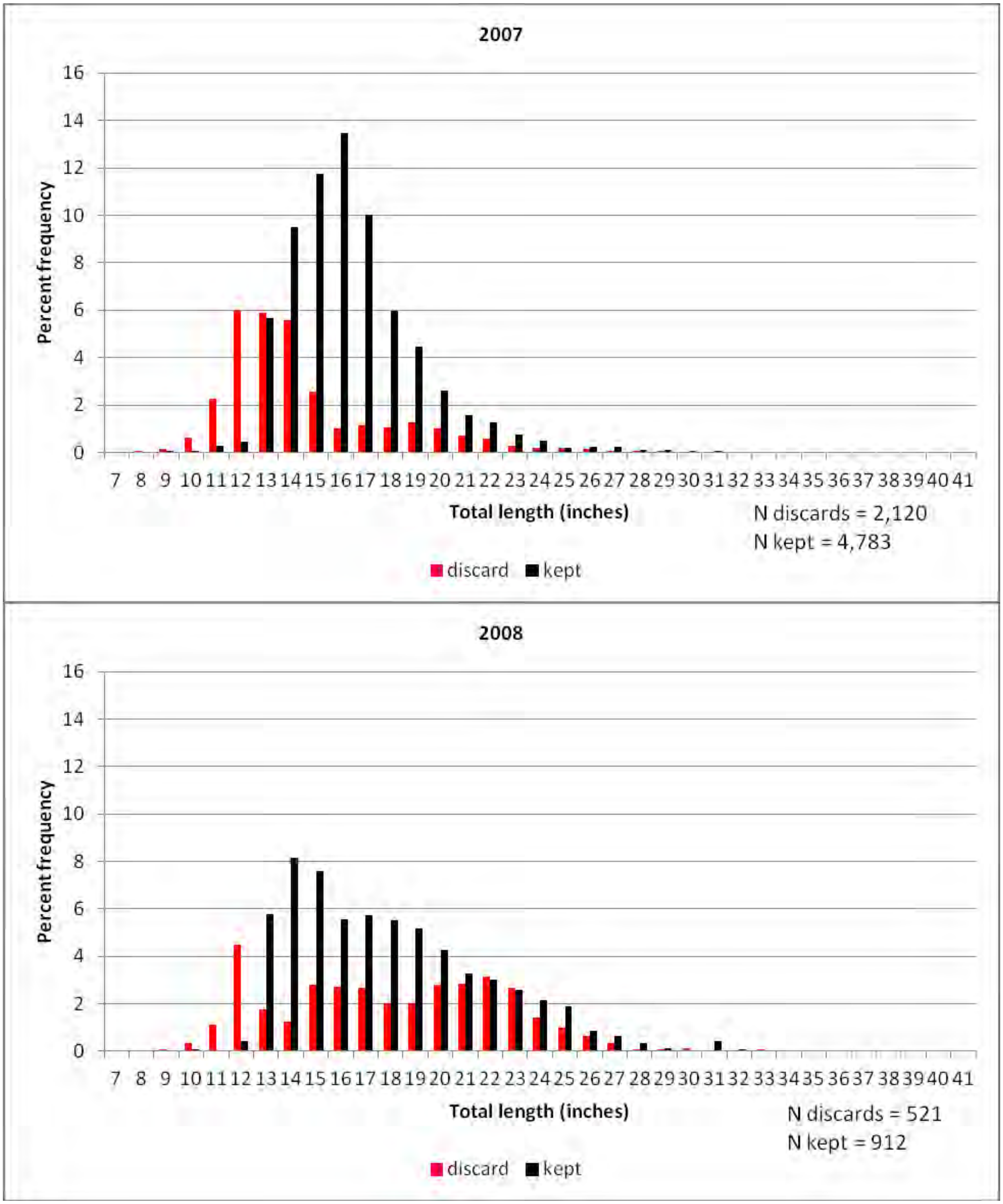



**Figure 3.24** Commercial vertical line eastern Gulf of Mexico observed red snapper size composition by year. Sizes are in inches total length, where bins are one inch; e.g., 15 = 15-15.99 inches.

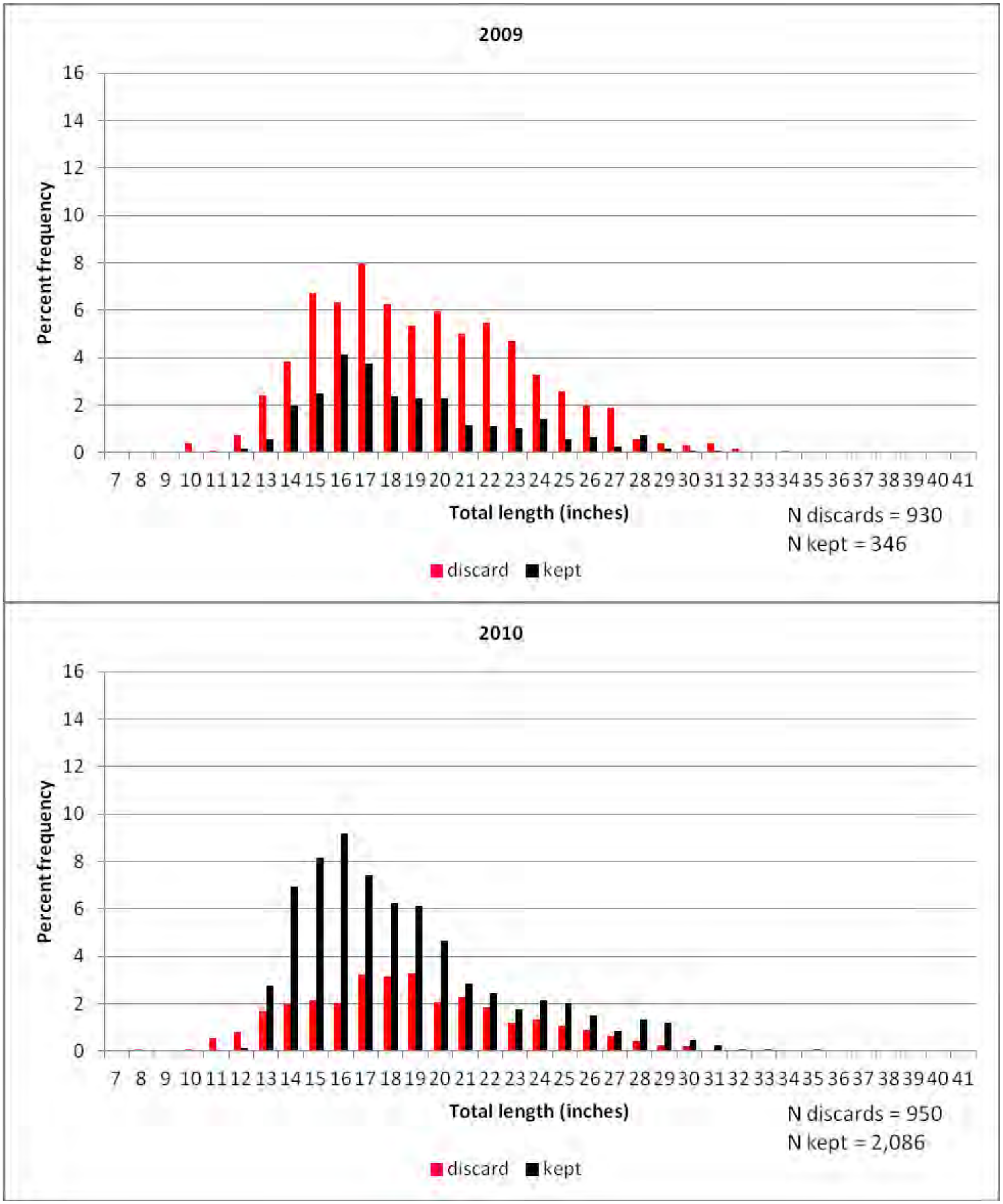



**Figure 3.24** Commercial vertical line eastern Gulf of Mexico observed red snapper size composition by year, continued.

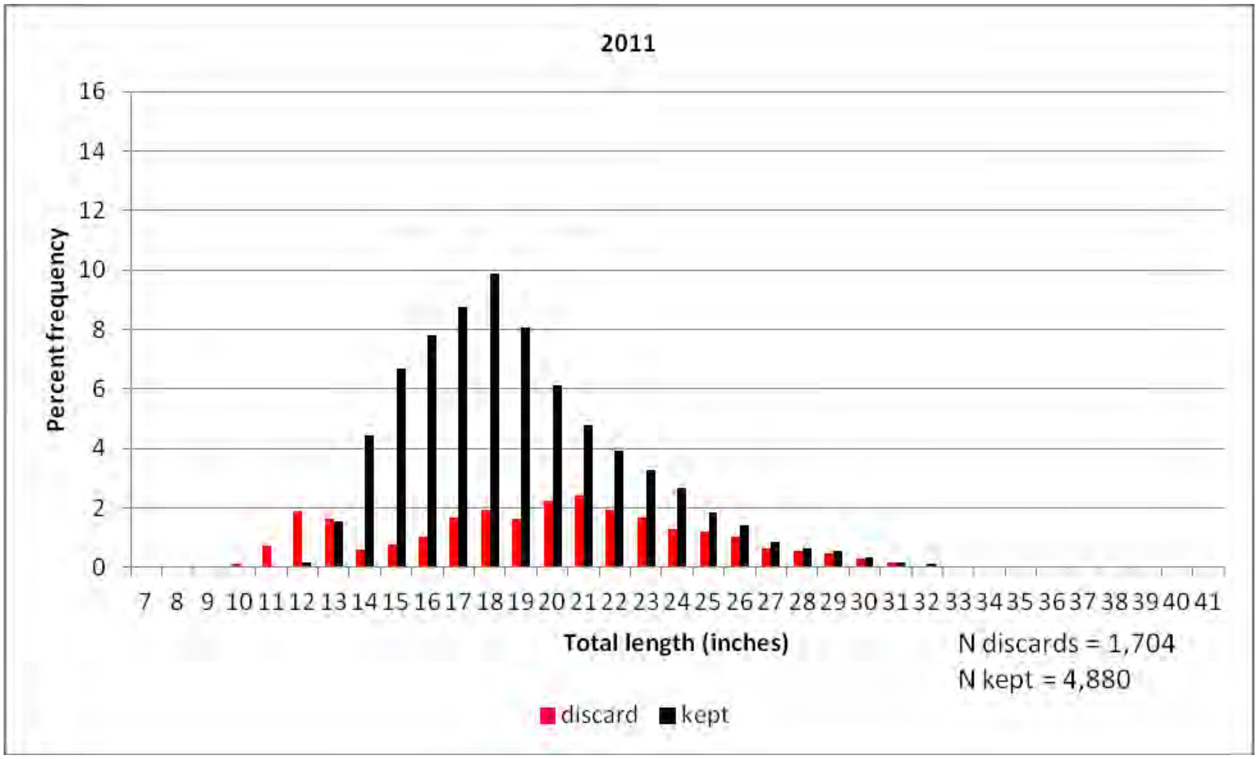



**Figure 3.24** Commercial vertical line eastern Gulf of Mexico observed red snapper size composition by year, continued.

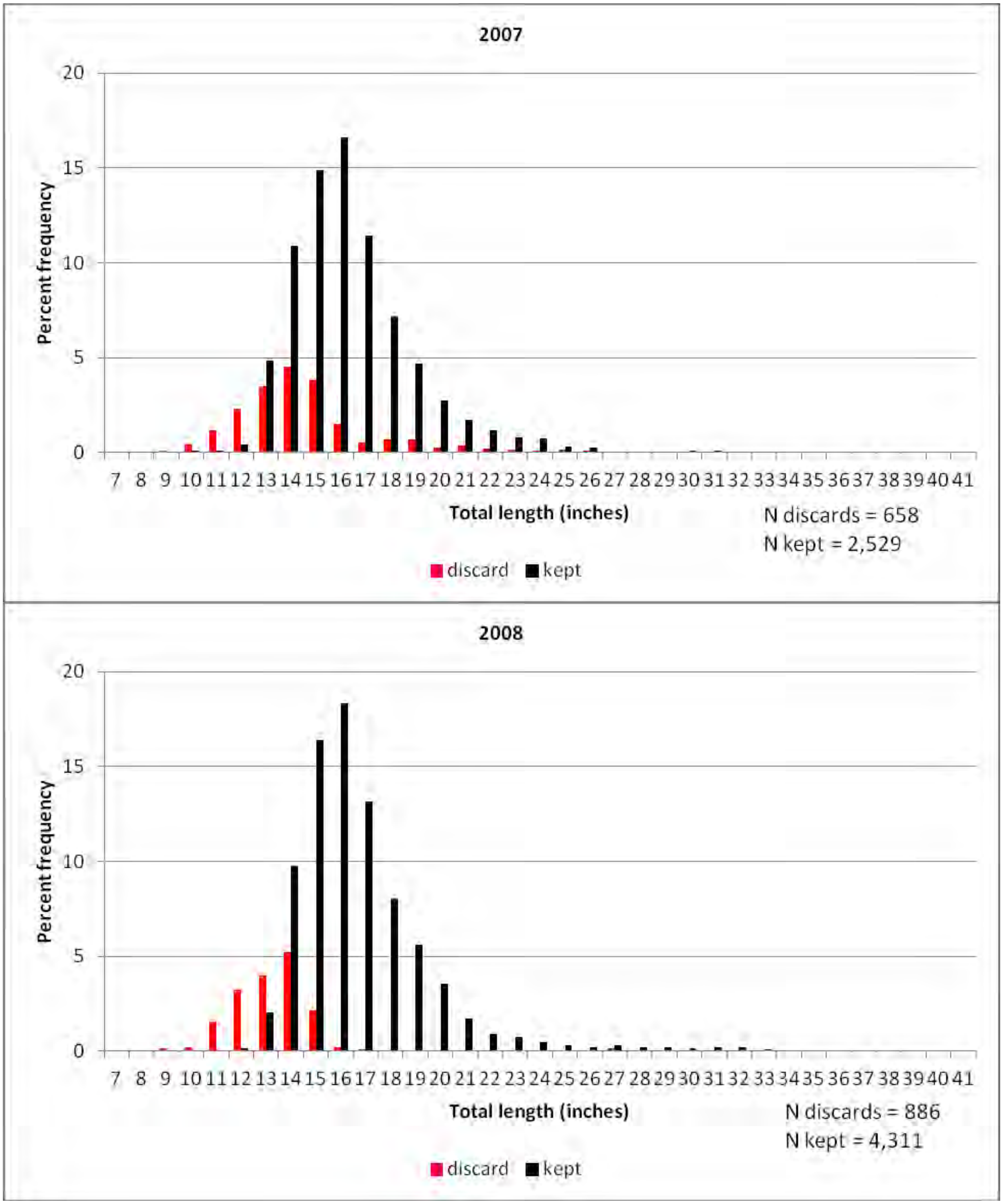



**Figure 3.25** Commercial vertical line western Gulf of Mexico observed red snapper size composition by year. Sizes are in inches total length, where bins are one inch; e.g., 15 = 15-15.99 inches.

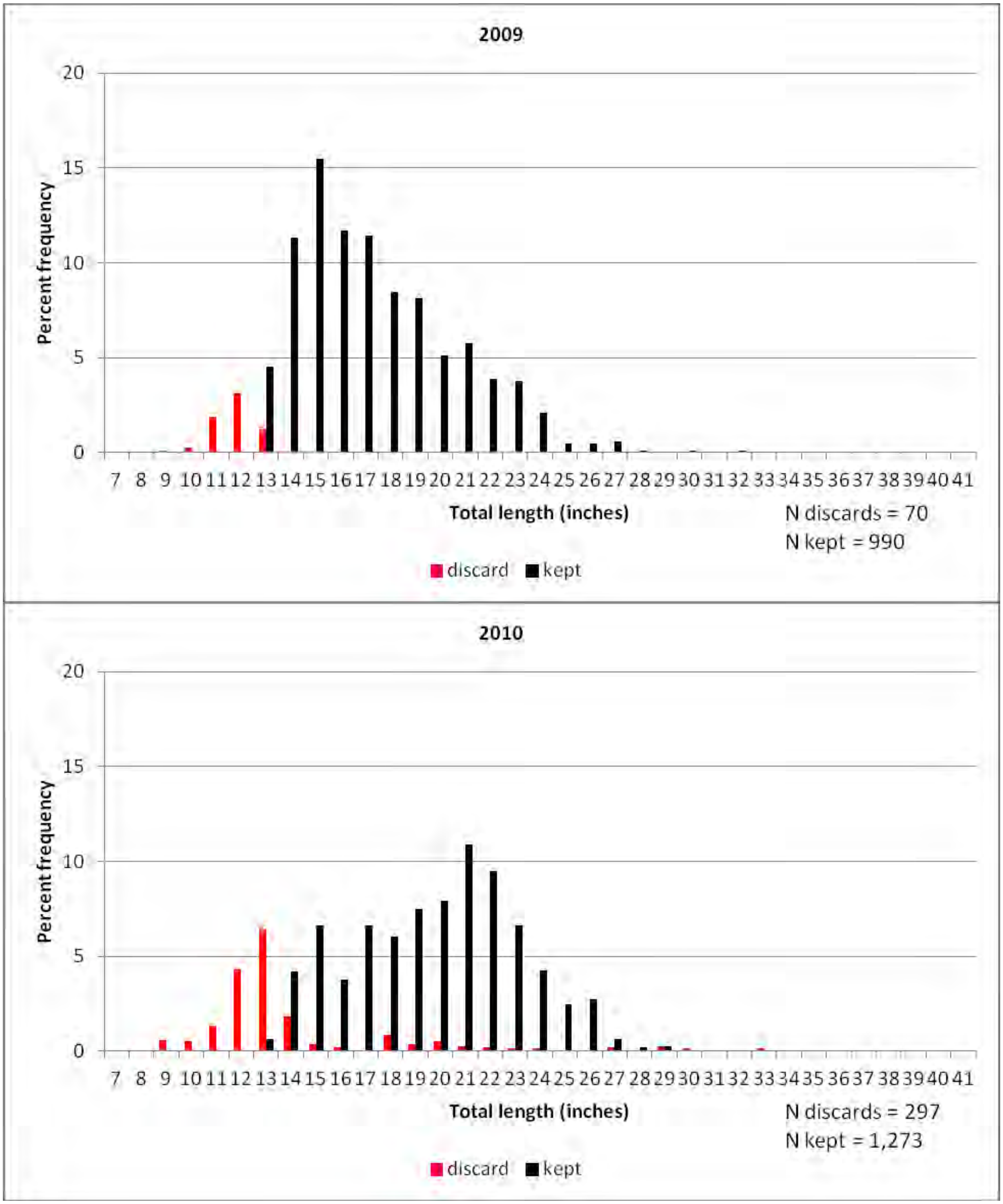



**Figure 3.25** Commercial vertical line western Gulf of Mexico observed red snapper size composition by year, continued.

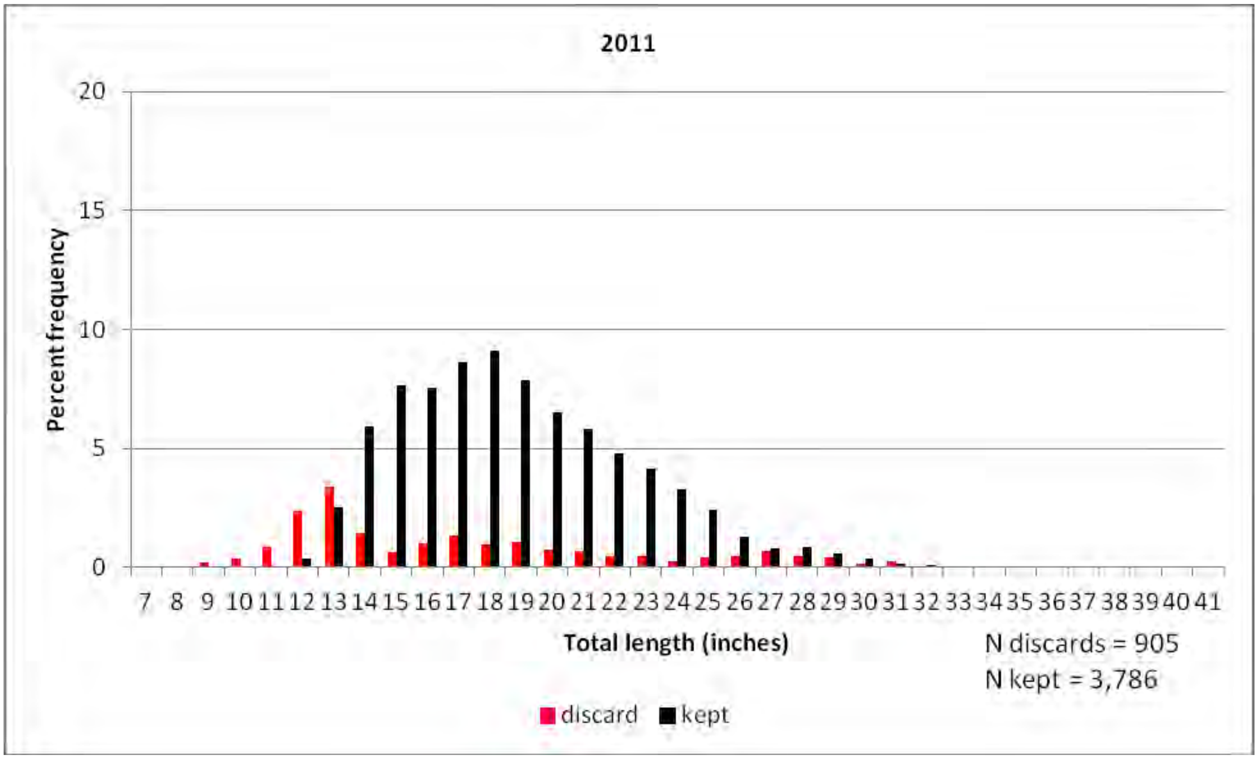



**Figure 3.25** Commercial vertical line western Gulf of Mexico observed red snapper size composition by year, continued.

## 3.12 **Appendix A:** Description of databases used for Commercial Landings (Section 3.3):

**NMFS SECPR Accumulated Landings System(ALS)**

Information on the quantity and value of seafood products caught by fishermen in the U.S. has been collected starting in the late1800s (first year varies by species). Fairly serious collection activity began in the 1920s. The data set maintained by the Southeast Fisheries Science Center (SEFSC) in the SECPR Oracle database server is a continuous data set that begins in 1962.

In addition to the quantity and value, information on the gear used to catch the fish, the area where the fishing occurred and the distance from shore are also recorded. Because the quantity and value data are collected from seafood dealers, the information on gear and fishing location are estimated and added to the data by data collection specialists. In some states, these ancillary data are not available.

Commercial landings statistics have been collected and processed by various organizations during the 1962-to-present period that the SECPR databases cover. During the 16 years from 1962 through 1978, these data were collected by port agents employed by the Federal government and stationed at major fishing ports in the southeast. The program was run from the Headquarters Office of the Bureau of Commercial Fisheries in Washington DC. Data collection procedures were established by Headquarters and the data were submitted to Washington for processing and computer storage. In 1978, the responsibility for collection and processing were transferred to the SEFSC.

In the early 1980s, the NMFS and the state fishery agencies within the Southeast began to develop a cooperative program for the collection and processing of commercial fisheries statistics. With the exception of two counties, one in Mississippi and one in Alabama, all of the general canvass statistics are collected by the fishery agency in the respective state and provided to the SEFSC under a comprehensive Cooperative Statistics Program (CSP).

The purpose of this documentation is to describe the current collection and processing procedures that are employed for the commercial fisheries statistics maintained in the SECPR databases.

1960 - Late 1980s
=================

Although the data processing and database management responsibility were transferred from the Headquarters in Washington DC to the SEFSC during this period, the data collection procedures remained essentially the same. Trained data collection personnel, referred to as fishery reporting specialists or port agents, were stationed at major fishing ports throughout the Southeast Region. The data collection procedures for commercial landings included two parts.

The primary task for the port agents was to visit all seafood dealers or fish houses within their assigned areas at least once a month to record the pounds and value for each species or product type that were purchased or handled by the dealer or fish house. The agents summed the landings and value data and submitted these data in monthly reports to their area supervisors. All of the monthly data were submitted in essentially the same form.

The second task was to estimate the quantity of fish that were caught by specific types of gear and the location of the fishing activity. Port agents provided this gear/area information for all of the landings data that they collected. The objective was to have gear and area information assigned to all monthly commercial landings data.

There are two problems with the commercial fishery statistics that were collected from seafood dealers. First, dealers do not always record the specific species that are caught and second, fish or shellfish are not always purchased at the same location where they are unloaded, i.e., landed.

Dealers have always recorded fishery products in ways that meet their needs, which sometimes make it ambiguous for scientific uses. Although the port agents can readily identify individual species, they usually were not at the fish house when fish were being unloaded and thus, could not observe and identify the fish.

The second problem is to identify where the fish were landed from the information recorded by the dealers on their sales receipts. The NMFS standard for fisheries statistics is to associate commercial statistics with the location where the product was first unloaded, i.e., landed, at a shore-based facility. Because some products are unloaded at a dock or fish house and purchased and transported to another dealer, the actual 'landing' location may not be apparent from the dealers' sales receipts. Historically, communications between individual port agents and the area supervisors were the primary source of information that was available to identify the actual unloading location.

Cooperative Statistics Program
==============================

In the early 1980s, it became apparent that the collection of commercial fisheries statistics was an activity that was conducted by both the Federal government and individual state fishery agencies. Plans and negotiations were initiated to develop a program that would provide the fisheries statistics that are needed for management by both Federal and state agencies. By the mid- 1980s, formal cooperative agreements had been signed between the NMFS/SEFSC and each of the eight coastal states in the southeast, Puerto Rico and the US Virgin Islands.

Initially, the data collection procedures that were used by the states under the cooperative agreements were essentially the same as the historical NMFS procedures. As the states developed their data collection programs, many of them promulgated legislation that authorized their fishery agencies to collect fishery statistics. Many of the state statutes include mandatory data submission by seafood dealers.

Because the data collection procedures (regulations) are different for each state, the type and detail of data varies throughout the Region. The commercial landings database maintained in SEFIN contains a standard set of data that is consistent for all states in the Region.

A description of the data collection procedures and associated data submission requirements for each state follows.

Florida
=======

Prior to 1986, commercial landings statistics were collected by a combination of monthly mail submissions and port agent visits. These procedures provided quantity and value, but did not provide information on gear, area or distance from shore. Because of the large number of dealers, port agents were not able to provide the gear, area and distance information for monthly data. This information, however, is provided for annual summaries of the quantity and value and known as the Florida Annual Canvas data (see below).

Beginning in 1986, mandatory reporting by all seafood dealers was implemented by the State of Florida. The State requires that a report (ticket) be completed and submitted to the State for every trip. Dealers have to report the type of gear as well as the quantity (pounds) purchased for each species. Information on the area of catch can also be provided on the tickets for individual trips. As of 1986 the ALS system relies solely on the Florida trip ticket data to create the ALS landings data for all species other than shrimp.

Alabama
=======

Data collection in Alabama is voluntary and is conducted by state and federal port agents that visit dealers and docks monthly. Summaries of the total landings (pounds) and value for species or market category are recorded. Port agents provide information on gear and fishing area from their knowledge of the fisheries and interaction with fishermen and dealers. As of mid- 2000, the State of Alabama required fishermen and dealers to report all commercial landings data through a trip ticket system. As of 2001 the ALS system relies solely on the Alabama trip ticket data to create the ALS landings data for Alabama.

Mississippi
===========

Data collection in Mississippi is voluntary and is conducted by state and federal port agents that visit dealers and docks monthly. Summaries of the total landings (pounds) and value for species or market category are recorded. Port agents provide information on gear and fishing area from their knowledge of the fisheries and interaction with fishermen and dealers.

Louisiana
===========

Prior to 1993, commercial landings statistics were collected in Louisiana by Federal port agents following the traditional procedures established by the NMFS. Monthly summaries of the quantity and value were collected from each dealer in the state. The information on gear, area and distance from shore were added by the individual port agents.

Beginning in January 1993, the Department of Wildlife and Fisheries, State of Louisiana began to enforce the states' mandatory reporting requirement. Dealers have to be licensed by the State and are required to submit monthly summaries of the purchases that were made for individual species or market categories. With the implementation of the State statute, Federal port agents did not participate in the collection of commercial fishery statistics.

Since the implementation of the State program, information on the gear used, the area of catch and the distance from shore has not been added to the landings statistics (1992-1999). In 1998 the State of Louisiana required fishermen and dealers to report all commercial landings data through a trip ticket system. These data contain detailed landings information by trip including gear, area of capture and vessel information. As of 2000, the ALS system relies solely on the Louisiana trip ticket data to create the ALS landings data for Louisiana.

Texas
=====

The State has a mandatory reporting requirement for dealers licensed by the State. Dealers are required to submit monthly summaries of the quantities (pounds) and value of the purchases that were made for individual species or market categories.

Information on gear, area and distance from shore are added to the state data by SEFSC personnel. Furthermore, landings of species that are unloaded in Texas, but transported to locations in other states are added to the commercial landings statistics by SEFSC personnel.

**NMFS SECPR Annual Canvas Data for Florida**

The Florida Annual Data files from 1976 – 1996 represent annual landings by county (from dealer reports) which are broken out on a percentage estimate by species, gear, area of capture, and distance from shore. These estimates are submitted by Port agents, which were assigned responsibility for the particular county, from interviews and discussions from dealers and fishermen collected throughout the year. The estimates are processed against the annual landings totals by county on a percentage basis to create the estimated proportions of catch by the gear, area and distance from shore. (The sum of percentages for a given Year, State, County, Species combination will equal 100.)

Area of capture considerations: ALS is considered to be commercial landings data base which reports where the marine resource was landed. With the advent of some State trip ticket programs as the data source the definition is more loosely applied. As such one cannot assume reports from the ALS by State or county will accurately inform you of Gulf vs. South Atlantic vs. Foreign catch. To make that determination you must consider the area of capture.

## 3.13 **Appendix B:** Description of methods and results for age distributions (Section 3.6.3)

Otolith observations were obtained from several sources:

***Data Sources***

1) Panama City Laboratory:
    a. File 1: rs_ps_tip_9102.sas7bdat
    b. File 2: rs_ps_tip_0308.sas7bdat
    c. File 3: rs_pc_tip_0910.sas7bdat
    d. File 4: 2009-2010 red snapper age data PCLAB.xls
    e. File 5: 2009 & 2010 red snapper age additions PCLAB.xls
2) GulfFIN/Panama City:
    a. File 6: GOM_RS0308FINAL.xls (from Gregg Bray)
    b. File 7: RSnapper2011 with PC fields.xls
    c. File 8: GulfStates_RSnapperDataSet_2012 SEDAR 31.xls
3) FWRI/Panama City:
    a. File 9: 2009-2010 red snapper age data PCLAB.xls
    b. File 10: 2009 & 2010 red snapper age additions PCLAB.xls
    c. File 11: FWRI_Lcamp_2009_2010_2011.xls

The recreational landings by region and mode (**Table 1**) and the northeast and southeast GOM commercial HL landings (**Table 2**) were obtained from the SEFSC FSD group. The landings were used when combining modes or regions (i.e. REC: HB + "PR+CB" and COMHL: NE + SE) to weight the raw catch-at-age matrices.

***Construction of the Dataset:***

The Trip Interview Program (TIP) location and gear variables were merged with the Panama City Laboratory data to fill missing gear, area fished, latitude, longitude and county landed information.

The dataset was restricted in the following manner:

1) Included years 1991-2011
2) Included modes: Commercial, Private Boat, Headboat, Charter Boat
3) Included gears: Handline and Longline.
4) Observations determined to be "non-random" (e.g. obtained from quota-sampling) were deleted.
5) Observations determined to be "Biased" (e.g. stratified) were deleted.
6) Data were deleted if the variables biological age, gear or mode were missing.
7) Data were deleted if no location was provided.

The final dataset contained ~98,000 age observations from Age-0 to Age-57.

***Assignment of Region:***

For the PC LAB/TIP dataset, the variable "REGION" was assigned using the following hierarchy:

1) REGION = Area Fished (Panama City, **Fig. 1**)
    a. Statistical Grids 1-7 = "Southeast"
    b. Statistical Grids 8-12 = "Northeast"
    c. Statistical Grids 13-21 = "West"
2) if REGION unassigned then Area Fished (TIP, **Fig. 1**)
    a. Statistical Grids 1-7 = "Southeast"
    b. Statistical Grids 8-12 = "Northeast"
    c. Statistical Grids 13-21 = "West"
3) if REGION unassigned then Latitude/Longitude (PC LAB or TIP **Fig. 2**)
    a. if Longitude < 85ºW then region = "Southeast"
    b. if Longitude ≥ 85ºW and < 89ºW then region = "Northeast"
    c. if Longitude ≥ 89ºW and < 90ºW then:
        i. if Latitude > 29ºN then region = "Northeast"
        ii. if Latitude ≤ 29ºN then region = "West"
    d. if Longitude ≥ 90ºW then region = "West"
4) if REGION unassigned then Location Landed (Panama City, **Fig. 3**)
    a. All TX counties, region = "West"
    b. LA counties from "Plaquemines" westward, region = "West"
    c. LA counties east of (and not including) "Plaquemines", region = "Northeast"
    d. All MS and AL counties, region = "Northeast"
    e. FL counties from "Gulf" westward, region = "Northeast"
    f. FL counties from "Franklin" eastward and southward, region = "Southeast"
5) if REGION unassigned then County Landed (TIP, **Fig. 3**)
    a. All TX counties, region = "West"
    b. LA counties from "Plaquemines" westward, region = "West"
    c. LA counties east of (and not including) "Plaquemines", region = "Northeast"
    d. All MS and AL counties, region = "Northeast"
    e. FL counties from "Gulf" westward, region = "Northeast"
    f. FL counties from "Franklin" eastward and southward, region = "Southeast"
6) if REGION unassigned then State Landed (Panama City)
    a. States TX and LA, region = "West"
    b. States MS, AL, FL = "Northeast"
    c. ***Note:*** The only gear/mode requiring the NE/SE split is the Commercial Handline. It was not necessary to use "State Landed" to assign the location of any CM HL samples. Therefore, the only compromise associated with this method is the all samples from LA are assigned to the west. This seems an appropriate compromise if no other location variables are available.
7) if REGION unassigned then delete: Deletes 90 samples with no location info.

***Weighting Observed Catch-at-Age by Landings:***

The current structure for CATCHEM requires the following input matrices:

1) COM HL East (NE + SE)
2) COM HL West
3) COM LL East
4) COM LL West

5) REC East (HB + "PR&CB)
6) REC West (HB + "PR&CB)

Of these, items 1, 5 and 6 require calculating combined matrices weighted by the landings (by region or mode). To do so, the following equation was used:

if $L_{r1,y} + L_{r2,y} > 0$ then: $$Weighted\ PAA_{a,y} = \frac{(PAA_{r1,a,y} * L_{r1,y}) + (PAA_{r2,a,y} * L_{r2,y})}{L_{r1,y} + L_{r2,y}}$$

else Weighted PAA = 0

where *PAA* is the proportion at age, *L* is the landings, *r1* and *r2* are the regions (or modes) to be combined, *a* is the age and *y* is the year.

The effective sample sizes for items 1, 5 and 6 were also adjusted using the landings weights (consistent with SEDAR 7 and the 2009 update). The equation is as follows:

if $N_{r1}$ and $N_{r2} \neq 0$ then: $$Eff\ N = (L_{r1,y} + L_{r2,y})^2 \Big/ \left(\frac{L_{r1,y}^{\ 2}}{N_{r1,y}} + \frac{L_{r2,y}^{\ 2}}{N_{r2,y}}\right)$$

else if $N_{r1}$ or $N_{r2} = 0$ then replace 0 with 1.0 then use equation above
else if $N_{r1}$ and $N_{r2} = 0$ then Eff N = 0

where *L* is the landings, *r1* and *r2* are the regions or modes to be combined and *y* is the year.

The direct observed catch-at-age matrices are summarized in **Tables 3-5**. The results were compared to a 2011 update of the direct observed age composition in **Figs. 4-9**. The working group noted that the results were nearly identical to those previously reported. The recent proportion catch-at-age (from direct observed age composition), by gear and mode, is summarized in **Fig. 10**. In most cases, the fisheries landed older fish in 2010 and 2011 than in 2009. The exception is the commercial longline fishery in the western gulf, however very few samples are available in 2011 for this fishery (n = 84).

To explore the possibility of non-representative sampling of fish chosen for otolith analysis, the working group requested that the length distribution of all available samples be compared to the length distribution of the samples selected for otolith analysis. It was expected that the two length distributions would be very similar if the otolith samples were a representative subsample of the total observed fish. In both cases, the length distributions were weighted by the landings as previously described. The resulting length compositions are illustrated in **Figs 11-16**.

The working group concluded that there was evidence of non-representative sampling prior to 2000 in all fisheries. The Panama City lab reported that that some of these early samples were taken to construct an age length key, rather than to construct a growth curve. After 2000, scientific samplers were directed to obtain a representative sample by length for otolith analysis. The length frequency comparisons indicate that this objective was met in most cases.

Some disparity in the length distributions was noted in the recreational fisheries during 2009-2011 and in the western gulf commercial longline fishery in 2002. After further explorations of the data it was noted that the length composition dataset was lacking revised and additional observations made available during the 2009 update assessment, and for a 2011 SERO request. These additional samples will be included in a revised analysis which will be completed prior to the assessment workshop.

**Table 1.** Recreational Landings used to weight the otolith observations by modes (HB, PR+CB). For the mode PR+CB, all modes besides HB were combined. These data were prepared by V. Matter (SEFSC).

| Sum of ab1 | Gulf | new_moden | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | East | | | East Total | West | | | West Total | Grand Total |
| YEAR | Cbt | Hbt | Priv | | Cbt | Hbt | Priv | | |
| 1981 | 77,922 | 47,780 | 722,891 | 848,594 | 109,814 | 344,252 | 1,336,640 | 1,790,705 | 2,639,299 |
| 1982 | 313,304 | 153,823 | 401,094 | 868,222 | 623,249 | 388,247 | 447,698 | 1,459,195 | 2,327,417 |
| 1983 | 492,178 | 301,790 | 289,223 | 1,083,191 | 420,687 | 370,500 | 1,450,635 | 2,241,822 | 3,325,014 |
| 1984 | 66,608 | 40,842 | 79,096 | 186,546 | 442,359 | 373,218 | 207,057 | 1,022,634 | 1,209,180 |
| 1985 | 147,160 | 90,234 | 252,973 | 490,367 | 394,950 | 368,605 | 194,638 | 958,193 | 1,448,560 |
| 1986 | 451,143 | 16,364 | 107,323 | 574,830 | 114,717 | 316,090 | 282,516 | 713,322 | 1,288,153 |
| 1987 | 331,869 | 9,685 | 206,133 | 547,687 | 91,514 | 319,348 | 73,198 | 484,060 | 1,031,747 |
| 1988 | 364,052 | 13,832 | 145,441 | 523,325 | 22,496 | 423,024 | 279,185 | 724,705 | 1,248,030 |
| 1989 | 227,433 | 10,797 | 235,086 | 473,316 | 31,366 | 372,473 | 187,926 | 591,765 | 1,065,081 |
| 1990 | 130,541 | 15,539 | 174,590 | 320,670 | 59,069 | 187,006 | 69,907 | 315,982 | 636,651 |
| 1991 | 245,168 | 15,580 | 287,919 | 548,667 | 207,619 | 264,686 | 46,881 | 519,186 | 1,067,853 |
| 1992 | 250,388 | 33,873 | 580,573 | 864,834 | 148,516 | 413,056 | 169,971 | 731,543 | 1,596,377 |
| 1993 | 689,379 | 37,275 | 545,697 | 1,272,351 | 162,487 | 458,772 | 253,524 | 874,784 | 2,147,135 |
| 1994 | 380,993 | 28,998 | 391,839 | 801,830 | 90,920 | 497,738 | 220,979 | 809,637 | 1,611,467 |
| 1995 | 373,953 | 23,078 | 243,530 | 640,562 | 120,536 | 354,550 | 265,585 | 740,671 | 1,381,233 |
| 1996 | 370,778 | 28,388 | 199,791 | 598,957 | 59,699 | 349,266 | 182,185 | 591,151 | 1,190,108 |
| 1997 | 614,151 | 48,439 | 347,630 | 1,010,220 | 68,573 | 347,424 | 180,314 | 596,311 | 1,606,530 |
| 1998 | 585,798 | 76,759 | 168,530 | 831,088 | 31,710 | 244,738 | 149,113 | 425,562 | 1,256,649 |
| 1999 | 347,340 | 67,432 | 374,542 | 789,315 | 22,574 | 98,699 | 123,445 | 244,718 | 1,034,032 |
| 2000 | 418,248 | 57,640 | 279,733 | 755,621 | 25,605 | 111,410 | 131,986 | 269,001 | 1,024,622 |
| 2001 | 396,680 | 51,289 | 436,450 | 884,418 | 20,666 | 116,358 | 86,900 | 223,924 | 1,108,342 |
| 2002 | 572,951 | 75,121 | 535,340 | 1,183,411 | 49,923 | 138,475 | 52,169 | 240,567 | 1,423,979 |
| 2003 | 476,542 | 71,021 | 491,036 | 1,038,598 | 44,255 | 157,905 | 68,339 | 270,498 | 1,309,097 |
| 2004 | 513,146 | 63,482 | 677,476 | 1,254,104 | 82,732 | 110,329 | 46,443 | 239,504 | 1,493,608 |
| 2005 | 371,453 | 46,791 | 353,210 | 771,454 | 79,730 | 99,988 | 86,457 | 266,175 | 1,037,629 |
| 2006 | 394,258 | 47,882 | 399,388 | 841,528 | 96,436 | 121,177 | 139,781 | 357,395 | 1,198,923 |
| 2007 | 471,983 | 63,603 | 592,196 | 1,127,783 | 63,965 | 110,314 | 142,470 | 316,749 | 1,444,532 |
| 2008 | 266,355 | 61,986 | 325,283 | 653,623 | 30,592 | 57,569 | 90,161 | 178,322 | 831,946 |
| 2009 | 204,625 | 81,590 | 493,710 | 779,925 | 32,693 | 75,998 | 98,944 | 207,635 | 987,560 |
| 2010 | 71,264 | 35,943 | 255,749 | 362,956 | 7,674 | 51,514 | 29,199 | 88,387 | 451,343 |
| 2011 | 144,158 | 69,187 | 344,762 | 558,106 | 11,516 | 50,656 | 55,964 | 118,136 | 676,243 |
| Grand Total | 10,761,821 | 1,786,044 | 10,938,234 | 23,486,099 | 3,768,643 | 7,693,385 | 7,150,212 | 18,612,240 | 42,098,339 |

**Table 2.** GOM commercial handline landings used to weight the otolith observations by region. These data were prepared by R. Orhun (SEFSC).

| **2011 Norestriction file** | | | geargroup2 | | | | | |
|---|---|---|---|---|---|---|---|---|
| YEAR | East Gulf handline+ | East Gulf longline | East Gulf Total | West Gulf handline+ | West Gulf longline | West Gulf Total | Grand Total | Source |
| 1991 | 395,176 | 20,704 | 415,880 | 1,724,713 | 72,592 | 1,797,305 | 2,213,185 | ALS |
| 1992 | 406,493 | 5,689 | 412,181 | 2,674,497 | 19,820 | 2,694,317 | 3,106,498 | ALS |
| 1993 | 436,981 | 15,235 | 452,215 | 2,901,388 | 20,291 | 2,921,679 | 3,373,894 | ALS |
| 1994 | 527,124 | 7,958 | 535,082 | 2,671,460 | 15,809 | 2,687,269 | 3,222,351 | ALS |
| 1995 | 172,740 | 8,459 | 181,199 | 2,735,403 | 17,506 | 2,752,909 | 2,934,108 | ALS |
| 1996 | 233,980 | 7,587 | 241,568 | 4,044,133 | 27,362 | 4,071,495 | 4,313,063 | ALS |
| 1997 | 184,411 | 4,627 | 189,038 | 4,589,501 | 31,418 | 4,620,920 | 4,809,958 | ALS |
| 1998 | 379,399 | 5,514 | 384,914 | 4,267,523 | 27,224 | 4,294,747 | 4,679,660 | ALS |
| 1999 | 548,422 | 6,474 | 554,896 | 4,230,449 | 90,572 | 4,321,021 | 4,875,917 | ALS |
| 2000 | 665,284 | 8,619 | 673,904 | 3,979,683 | 183,538 | 4,163,221 | 4,837,125 | ALS |
| 2001 | 797,925 | 10,130 | 808,055 | 3,692,770 | 124,453 | 3,817,223 | 4,625,279 | ALS |
| 2002 | 1,048,705 | 18,125 | 1,066,830 | 3,565,962 | 146,195 | 3,712,156 | 4,778,986 | ALS |
| 2003 | 1,019,257 | 13,853 | 1,033,110 | 3,204,247 | 171,270 | 3,375,517 | 4,408,627 | ALS |
| 2004 | 950,935 | 19,353 | 970,288 | 3,225,236 | 455,829 | 3,681,066 | 4,651,354 | ALS |
| 2005 | 792,010 | 21,121 | 813,131 | 3,000,323 | 282,789 | 3,283,113 | 4,096,244 | ALS |
| 2006 | 760,327 | 16,335 | 776,662 | 3,611,689 | 260,652 | 3,872,341 | 4,649,003 | ALS |
| 2007 | 875,240 | 15,727 | 890,967 | 2,103,261 | 188,503 | 2,291,764 | 3,182,731 | IFQ Corr 2007 |
| 2008 | 834,499 | 34,124 | 868,623 | 1,559,132 | 55,848 | 1,614,980 | 2,483,603 | IFQ Corr 2008 |
| 2009 | 918,874 | 14,627 | 933,502 | 1,498,298 | 51,766 | 1,550,063 | 2,483,565 | IFQ Corr 2009 |
| 2010 | 1,397,647 | 75,510 | 1,473,157 | 1,880,858 | 38,193 | 1,919,052 | 3,392,209 | IFQ Corr 2010 |
| 2011 | 1,613,106 | 84,286 | 1,697,392 | 1,878,310 | 18,850 | 1,897,160 | 3,594,552 | IFQ Corr 2011 |

| YEAR | handline+ NE handline+ | handline+ SE handline+ | Grand Total | Source |
|---|---|---|---|---|
| 1991 | 362,700 | 32,475 | 395,176 | ALS |
| 1992 | 389,891 | 16,601 | 406,493 | ALS |
| 1993 | 381,940 | 55,041 | 436,981 | ALS |
| 1994 | 487,422 | 39,702 | 527,124 | ALS |
| 1995 | 153,815 | 18,925 | 172,740 | ALS |
| 1996 | 222,101 | 11,879 | 233,980 | ALS |
| 1997 | 171,928 | 12,483 | 184,411 | ALS |
| 1998 | 353,122 | 26,277 | 379,399 | ALS |
| 1999 | 477,638 | 70,784 | 548,422 | ALS |
| 2000 | 600,899 | 64,385 | 665,284 | ALS |
| 2001 | 716,515 | 81,410 | 797,925 | ALS |
| 2002 | 954,913 | 93,792 | 1,048,705 | ALS |
| 2003 | 918,807 | 100,450 | 1,019,257 | ALS |
| 2004 | 814,322 | 136,614 | 950,935 | ALS |
| 2005 | 624,364 | 167,646 | 792,010 | ALS |
| 2006 | 574,995 | 185,332 | 760,327 | ALS |
| 2007 | 754,895 | 120,346 | 875,240 | IFQ Corr 2007 |
| 2008 | 703,784 | 130,715 | 834,499 | IFQ Corr 2008 |
| 2009 | 681,668 | 237,206 | 918,874 | IFQ Corr 2009 |
| 2010 | 1,014,881 | 382,766 | 1,397,647 | IFQ Corr 2010 |
| 2011 | 1,178,568 | 434,538 | 1,613,106 | IFQ Corr 2011 |

**Table 3**. Landings (in numbers), proportion-at-age, number of observations (N) and effective sample size (EFF N) for the recreational fishery (HB + "PR&CB").

***A) REC EAST***

| Fishery | year | Landings | Age0 | Age1 | Age2 | Age3 | Age4 | Age5 | Age6 | Age7 | Age8 | Age9 | Age10 | Age11 | Age12 | Age13 | Age14 | age 15+ | N | EFF N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REC_HL_E | 1991 | 548,667 | 0.000 | 0.012 | 0.647 | 0.294 | 0.035 | 0.012 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 85 | 84 |
| REC_HL_E | 1992 | 864,834 | 0.000 | 0.181 | 0.295 | 0.396 | 0.094 | 0.023 | 0.007 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 410 | 362 |
| REC_HL_E | 1993 | 1,272,351 | 0.000 | 0.081 | 0.475 | 0.274 | 0.112 | 0.043 | 0.005 | 0.010 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 642 | 409 |
| REC_HL_E | 1994 | 801,830 | 0.000 | 0.070 | 0.346 | 0.333 | 0.145 | 0.071 | 0.030 | 0.003 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 667 | 426 |
| REC_HL_E | 1995 | 640,562 | 0.003 | 0.196 | 0.232 | 0.249 | 0.160 | 0.085 | 0.043 | 0.008 | 0.005 | 0.013 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.005 | 374 | 374 |
| REC_HL_E | 1996 | 598,957 | 0.019 | 0.141 | 0.569 | 0.173 | 0.031 | 0.010 | 0.009 | 0.019 | 0.000 | 0.028 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 218 | 111 |
| REC_HL_E | 1997 | 1,010,220 | 0.000 | 0.000 | 0.733 | 0.110 | 0.088 | 0.018 | 0.051 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 153 | 62 |
| REC_HL_E | 1998 | 831,088 | 0.001 | 0.016 | 0.351 | 0.498 | 0.114 | 0.014 | 0.004 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1615 | 1322 |
| REC_HL_E | 1999 | 789,315 | 0.000 | 0.003 | 0.218 | 0.436 | 0.307 | 0.026 | 0.008 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 1429 | 1407 |
| REC_HL_E | 2000 | 755,621 | 0.000 | 0.040 | 0.492 | 0.337 | 0.112 | 0.014 | 0.000 | 0.002 | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | 647 | 583 |
| REC_HL_E | 2001 | 884,418 | 0.000 | 0.077 | 0.565 | 0.252 | 0.085 | 0.014 | 0.003 | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 603 | 431 |
| REC_HL_E | 2002 | 1,183,411 | 0.003 | 0.044 | 0.258 | 0.410 | 0.176 | 0.062 | 0.027 | 0.016 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 2248 | 2196 |
| REC_HL_E | 2003 | 1,038,598 | 0.000 | 0.014 | 0.268 | 0.439 | 0.202 | 0.038 | 0.020 | 0.010 | 0.004 | 0.001 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 | 6585 | 5068 |
| REC_HL_E | 2004 | 1,254,104 | 0.000 | 0.040 | 0.324 | 0.358 | 0.173 | 0.057 | 0.023 | 0.011 | 0.006 | 0.002 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 | 0.002 | 4087 | 3810 |
| REC_HL_E | 2005 | 771,454 | 0.000 | 0.012 | 0.324 | 0.432 | 0.135 | 0.064 | 0.022 | 0.005 | 0.002 | 0.001 | 0.001 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 5380 | 4904 |
| REC_HL_E | 2006 | 841,528 | 0.000 | 0.015 | 0.396 | 0.394 | 0.112 | 0.041 | 0.027 | 0.009 | 0.002 | 0.001 | 0.000 | 0.001 | 0.001 | 0.000 | 0.001 | 0.001 | 3921 | 3914 |
| REC_HL_E | 2007 | 1,127,783 | 0.000 | 0.013 | 0.305 | 0.492 | 0.139 | 0.026 | 0.011 | 0.004 | 0.005 | 0.001 | 0.002 | 0.002 | 0.002 | 0.000 | 0.000 | 0.000 | 806 | 666 |
| REC_HL_E | 2008 | 653,623 | 0.000 | 0.009 | 0.413 | 0.377 | 0.165 | 0.026 | 0.010 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 490 | 421 |
| REC_HL_E | 2009 | 779,925 | 0.002 | 0.001 | 0.086 | 0.329 | 0.362 | 0.167 | 0.038 | 0.009 | 0.003 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1292 | 697 |
| REC_HL_E | 2010 | 362,956 | 0.000 | 0.000 | 0.058 | 0.286 | 0.385 | 0.174 | 0.063 | 0.024 | 0.008 | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1906 | 1699 |
| REC_HL_E | 2011 | 558,106 | 0.000 | 0.000 | 0.028 | 0.161 | 0.323 | 0.304 | 0.129 | 0.034 | 0.015 | 0.004 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1181 | 1106 |

***B) REC WEST***

| Fishery | year | Landings | Age0 | Age1 | Age2 | Age3 | Age4 | Age5 | Age6 | Age7 | Age8 | Age9 | Age10 | Age11 | Age12 | Age13 | Age14 | age 15+ | N | EFF N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REC_HL_W | 1991 | 519,186 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 |
| REC_HL_W | 1992 | 731,543 | 0.000 | 0.021 | 0.349 | 0.464 | 0.086 | 0.029 | 0.029 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.022 | 513 | 79 |
| REC_HL_W | 1993 | 874,784 | 0.000 | 0.074 | 0.587 | 0.251 | 0.067 | 0.015 | 0.003 | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1128 | 739 |
| REC_HL_W | 1994 | 809,637 | 0.000 | 0.028 | 0.436 | 0.278 | 0.178 | 0.064 | 0.013 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 388 | 7 |
| REC_HL_W | 1995 | 740,671 | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 10 | 3 |
| REC_HL_W | 1996 | 591,151 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 |
| REC_HL_W | 1997 | 596,311 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 |
| REC_HL_W | 1998 | 425,562 | 0.000 | 0.039 | 0.238 | 0.323 | 0.228 | 0.105 | 0.038 | 0.020 | 0.004 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 | 924 | 914 |
| REC_HL_W | 1999 | 244,718 | 0.000 | 0.000 | 0.119 | 0.402 | 0.336 | 0.098 | 0.030 | 0.010 | 0.005 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 193 | 193 |
| REC_HL_W | 2000 | 269,001 | 0.000 | 0.019 | 0.694 | 0.139 | 0.044 | 0.037 | 0.039 | 0.017 | 0.002 | 0.003 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 | 0.005 | 247 | 6 |
| REC_HL_W | 2001 | 223,924 | 0.000 | 0.014 | 0.219 | 0.178 | 0.151 | 0.110 | 0.137 | 0.096 | 0.014 | 0.014 | 0.014 | 0.027 | 0.000 | 0.000 | 0.000 | 0.027 | 73 | 4 |
| REC_HL_W | 2002 | 240,567 | 0.000 | 0.065 | 0.372 | 0.340 | 0.119 | 0.040 | 0.027 | 0.020 | 0.005 | 0.003 | 0.000 | 0.000 | 0.000 | 0.003 | 0.004 | 0.003 | 774 | 521 |
| REC_HL_W | 2003 | 270,498 | 0.000 | 0.010 | 0.329 | 0.308 | 0.177 | 0.098 | 0.028 | 0.017 | 0.024 | 0.003 | 0.001 | 0.001 | 0.001 | 0.002 | 0.002 | 0.001 | 944 | 377 |
| REC_HL_W | 2004 | 239,504 | 0.000 | 0.077 | 0.466 | 0.220 | 0.141 | 0.032 | 0.027 | 0.014 | 0.012 | 0.003 | 0.000 | 0.003 | 0.000 | 0.001 | 0.003 | 0.002 | 1187 | 637 |
| REC_HL_W | 2005 | 266,175 | 0.000 | 0.034 | 0.423 | 0.247 | 0.126 | 0.093 | 0.037 | 0.016 | 0.008 | 0.002 | 0.004 | 0.006 | 0.001 | 0.001 | 0.001 | 0.002 | 1433 | 1003 |
| REC_HL_W | 2006 | 357,395 | 0.000 | 0.015 | 0.399 | 0.407 | 0.101 | 0.034 | 0.022 | 0.010 | 0.003 | 0.005 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.003 | 1465 | 1102 |
| REC_HL_W | 2007 | 316,749 | 0.000 | 0.030 | 0.293 | 0.422 | 0.189 | 0.036 | 0.017 | 0.005 | 0.002 | 0.003 | 0.001 | 0.002 | 0.000 | 0.000 | 0.000 | 0.001 | 1075 | 459 |
| REC_HL_W | 2008 | 178,322 | 0.000 | 0.008 | 0.178 | 0.491 | 0.263 | 0.049 | 0.006 | 0.001 | 0.001 | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 726 | 599 |
| REC_HL_W | 2009 | 207,635 | 0.000 | 0.004 | 0.079 | 0.252 | 0.370 | 0.220 | 0.044 | 0.011 | 0.002 | 0.006 | 0.005 | 0.001 | 0.000 | 0.000 | 0.001 | 0.005 | 856 | 798 |
| REC_HL_W | 2010 | 88,387 | 0.000 | 0.000 | 0.004 | 0.172 | 0.364 | 0.349 | 0.077 | 0.024 | 0.009 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 443 | 227 |
| REC_HL_W | 2011 | 118,136 | 0.000 | 0.001 | 0.026 | 0.103 | 0.254 | 0.348 | 0.182 | 0.069 | 0.013 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 | 1083 | 952 |

**Table 4**. Landings (in lbs), proportion-at-age, number of observations (N) and effective sample size (EFF N) for the commercial handline fishery.

***A) COM HL EAST (NE+SE)***

| Fishery | year | Landings | Age0 | Age1 | Age2 | Age3 | Age4 | Age5 | Age6 | Age7 | Age8 | Age9 | Age10 | Age11 | Age12 | Age13 | Age14 | age 15+ | N | EFF N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CM_HL _E | 1991 | 395,175 | 0.000 | 0.138 | 0.678 | 0.092 | 0.057 | 0.023 | 0.011 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 87 | 61 |
| CM_HL _E | 1992 | 406,492 | 0.000 | 0.024 | 0.704 | 0.156 | 0.105 | 0.000 | 0.002 | 0.002 | 0.002 | 0.005 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 137 | 128 |
| CM_HL _E | 1993 | 436,981 | 0.000 | 0.031 | 0.402 | 0.422 | 0.084 | 0.028 | 0.019 | 0.000 | 0.000 | 0.000 | 0.006 | 0.000 | 0.000 | 0.000 | 0.000 | 0.006 | 153 | 151 |
| CM_HL _E | 1994 | 527,124 | 0.000 | 0.000 | 0.410 | 0.271 | 0.195 | 0.069 | 0.049 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.003 | 148 | 136 |
| CM_HL _E | 1995 | 172,740 | 0.000 | 0.080 | 0.469 | 0.332 | 0.083 | 0.024 | 0.000 | 0.000 | 0.000 | 0.000 | 0.012 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 92 | 89 |
| CM_HL _E | 1996 | 233,980 | 0.000 | 0.000 | 0.667 | 0.222 | 0.111 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 9 | 10 |
| CM_HL _E | 1997 | 184,411 | 0.000 | 0.000 | 0.022 | 0.035 | 0.004 | 0.004 | 0.002 | 0.000 | 0.932 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 32 | 1 |
| CM_HL _E | 1998 | 379,399 | 0.000 | 0.000 | 0.084 | 0.472 | 0.225 | 0.128 | 0.016 | 0.021 | 0.005 | 0.000 | 0.000 | 0.000 | 0.005 | 0.000 | 0.000 | 0.043 | 177 | 152 |
| CM_HL _E | 1999 | 548,422 | 0.000 | 0.002 | 0.196 | 0.372 | 0.237 | 0.093 | 0.057 | 0.026 | 0.012 | 0.002 | 0.004 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 509 | 509 |
| CM_HL _E | 2000 | 665,284 | 0.000 | 0.005 | 0.256 | 0.363 | 0.278 | 0.070 | 0.016 | 0.006 | 0.005 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 985 | 850 |
| CM_HL _E | 2001 | 797,925 | 0.000 | 0.023 | 0.173 | 0.340 | 0.247 | 0.130 | 0.048 | 0.015 | 0.008 | 0.008 | 0.004 | 0.002 | 0.000 | 0.000 | 0.000 | 0.005 | 1215 | 1163 |
| CM_HL _E | 2002 | 1,048,705 | 0.000 | 0.012 | 0.471 | 0.290 | 0.137 | 0.042 | 0.039 | 0.005 | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | 1077 | 601 |
| CM_HL _E | 2003 | 1,019,257 | 0.000 | 0.016 | 0.344 | 0.360 | 0.183 | 0.048 | 0.022 | 0.009 | 0.002 | 0.002 | 0.001 | 0.003 | 0.001 | 0.000 | 0.000 | 0.009 | 1160 | 629 |
| CM_HL _E | 2004 | 950,936 | 0.001 | 0.029 | 0.306 | 0.359 | 0.201 | 0.062 | 0.017 | 0.010 | 0.008 | 0.000 | 0.001 | 0.002 | 0.004 | 0.000 | 0.000 | 0.001 | 1002 | 1001 |
| CM_HL _E | 2005 | 792,010 | 0.000 | 0.004 | 0.287 | 0.338 | 0.175 | 0.140 | 0.032 | 0.012 | 0.003 | 0.004 | 0.001 | 0.001 | 0.000 | 0.002 | 0.001 | 0.001 | 1170 | 818 |
| CM_HL _E | 2006 | 760,327 | 0.001 | 0.013 | 0.304 | 0.359 | 0.134 | 0.100 | 0.048 | 0.018 | 0.006 | 0.003 | 0.001 | 0.001 | 0.001 | 0.002 | 0.000 | 0.009 | 1299 | 1127 |
| CM_HL _E | 2007 | 875,241 | 0.000 | 0.074 | 0.423 | 0.386 | 0.090 | 0.018 | 0.006 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 1266 | 1094 |
| CM_HL _E | 2008 | 834,499 | 0.000 | 0.070 | 0.301 | 0.408 | 0.160 | 0.060 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 906 | 233 |
| CM_HL _E | 2009 | 918,874 | 0.000 | 0.020 | 0.334 | 0.373 | 0.189 | 0.060 | 0.017 | 0.003 | 0.000 | 0.002 | 0.001 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 1345 | 1282 |
| CM_HL _E | 2010 | 1,397,647 | 0.000 | 0.004 | 0.141 | 0.377 | 0.314 | 0.124 | 0.030 | 0.006 | 0.003 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1876 | 1709 |
| CM_HL _E | 2011 | 1,613,106 | 0.000 | 0.010 | 0.149 | 0.235 | 0.336 | 0.188 | 0.061 | 0.015 | 0.005 | 0.001 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 2435 | 1701 |

****** Note: The unexpectedly large value at Age 8 in 1997 is caused by having only one otolith observation in 1997 in the NE Com HL. The small EFF N (1) indicates that the model will strongly downweight the proportion-at-age in 1997 due to the small sample size.***

***B) COM HL WEST***

| Fishery | year | Landings | Age0 | Age1 | Age2 | Age3 | Age4 | Age5 | Age6 | Age7 | Age8 | Age9 | Age10 | Age11 | Age12 | Age13 | Age14 | age 15+ | N | EFF N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CM_HL_W | 1991 | 1,724,713 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 |
| CM_HL_W | 1992 | 2,674,497 | 0.000 | 0.005 | 0.575 | 0.173 | 0.107 | 0.051 | 0.051 | 0.019 | 0.000 | 0.009 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.009 | 214 | 214 |
| CM_HL_W | 1993 | 2,901,388 | 0.000 | 0.023 | 0.340 | 0.442 | 0.137 | 0.029 | 0.017 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.009 | 344 | 344 |
| CM_HL_W | 1994 | 2,671,460 | 0.000 | 0.037 | 0.314 | 0.304 | 0.237 | 0.057 | 0.022 | 0.014 | 0.006 | 0.002 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.006 | 507 | 507 |
| CM_HL_W | 1995 | 2,735,403 | 0.000 | 0.000 | 0.227 | 0.412 | 0.155 | 0.155 | 0.041 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.010 | 0.000 | 0.000 | 97 | 97 |
| CM_HL_W | 1996 | 4,044,133 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 |
| CM_HL_W | 1997 | 4,589,501 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 |
| CM_HL_W | 1998 | 4,267,523 | 0.000 | 0.009 | 0.056 | 0.449 | 0.255 | 0.135 | 0.035 | 0.027 | 0.018 | 0.005 | 0.004 | 0.001 | 0.001 | 0.000 | 0.000 | 0.005 | 1085 | 1085 |
| CM_HL_W | 1999 | 4,230,449 | 0.000 | 0.001 | 0.159 | 0.411 | 0.254 | 0.105 | 0.048 | 0.012 | 0.005 | 0.003 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | 1818 | 1818 |
| CM_HL_W | 2000 | 3,979,683 | 0.000 | 0.006 | 0.293 | 0.358 | 0.181 | 0.091 | 0.045 | 0.017 | 0.003 | 0.003 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.001 | 1055 | 1055 |
| CM_HL_W | 2001 | 3,692,770 | 0.000 | 0.007 | 0.159 | 0.317 | 0.243 | 0.145 | 0.076 | 0.027 | 0.015 | 0.006 | 0.002 | 0.001 | 0.000 | 0.001 | 0.000 | 0.002 | 1003 | 1003 |
| CM_HL_W | 2002 | 3,565,962 | 0.006 | 0.050 | 0.358 | 0.272 | 0.159 | 0.075 | 0.046 | 0.018 | 0.006 | 0.002 | 0.003 | 0.001 | 0.000 | 0.001 | 0.000 | 0.004 | 2533 | 2533 |
| CM_HL_W | 2003 | 3,204,247 | 0.000 | 0.008 | 0.188 | 0.405 | 0.209 | 0.092 | 0.042 | 0.030 | 0.011 | 0.004 | 0.001 | 0.004 | 0.002 | 0.002 | 0.000 | 0.004 | 1319 | 1319 |
| CM_HL_W | 2004 | 3,225,236 | 0.000 | 0.002 | 0.156 | 0.379 | 0.256 | 0.100 | 0.047 | 0.031 | 0.011 | 0.007 | 0.003 | 0.001 | 0.001 | 0.001 | 0.001 | 0.003 | 1757 | 1757 |
| CM_HL_W | 2005 | 3,000,323 | 0.000 | 0.020 | 0.211 | 0.282 | 0.223 | 0.113 | 0.057 | 0.030 | 0.016 | 0.011 | 0.005 | 0.005 | 0.005 | 0.006 | 0.005 | 0.010 | 2267 | 2267 |
| CM_HL_W | 2006 | 3,611,689 | 0.000 | 0.002 | 0.343 | 0.364 | 0.135 | 0.085 | 0.041 | 0.012 | 0.008 | 0.006 | 0.003 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 2659 | 2659 |
| CM_HL_W | 2007 | 2,103,261 | 0.000 | 0.004 | 0.232 | 0.445 | 0.161 | 0.058 | 0.052 | 0.023 | 0.010 | 0.003 | 0.004 | 0.002 | 0.001 | 0.001 | 0.001 | 0.003 | 1438 | 1438 |
| CM_HL_W | 2008 | 1,559,132 | 0.000 | 0.006 | 0.237 | 0.374 | 0.251 | 0.076 | 0.025 | 0.012 | 0.009 | 0.003 | 0.002 | 0.002 | 0.000 | 0.000 | 0.000 | 0.002 | 1201 | 1201 |
| CM_HL_W | 2009 | 1,498,298 | 0.000 | 0.004 | 0.174 | 0.379 | 0.276 | 0.125 | 0.026 | 0.007 | 0.004 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | 2094 | 2094 |
| CM_HL_W | 2010 | 1,880,858 | 0.000 | 0.001 | 0.071 | 0.284 | 0.372 | 0.207 | 0.050 | 0.009 | 0.002 | 0.002 | 0.001 | 0.002 | 0.000 | 0.001 | 0.001 | 0.002 | 1997 | 1997 |
| CM_HL_W | 2011 | 1,878,310 | 0.000 | 0.005 | 0.106 | 0.255 | 0.324 | 0.200 | 0.073 | 0.022 | 0.010 | 0.002 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.001 | 1665 | 1665 |

**Table 5**. Landings (in lbs), proportion-at-age, number of observations (N) and effective sample size (EFF N) for the commercial longline fishery.

***A) COM LL EAST***

| Fishery | year | Landings | Age0 | Age1 | Age2 | Age3 | Age4 | Age5 | Age6 | Age7 | Age8 | Age9 | Age10 | Age11 | Age12 | Age13 | Age14 | age 15+ | N | EFF N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CM_LL_E | 1991 | 20,704 | 0.000 | 0.083 | 0.667 | 0.083 | 0.083 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.083 | 0.000 | 12 | 12 |
| CM_LL_E | 1992 | 5,689 | 0.000 | 0.000 | 0.000 | 0.267 | 0.067 | 0.333 | 0.067 | 0.133 | 0.000 | 0.000 | 0.067 | 0.000 | 0.000 | 0.000 | 0.000 | 0.067 | 15 | 15 |
| CM_LL_E | 1993 | 15,235 | 0.000 | 0.000 | 0.133 | 0.200 | 0.367 | 0.100 | 0.033 | 0.067 | 0.000 | 0.000 | 0.033 | 0.000 | 0.000 | 0.033 | 0.000 | 0.033 | 30 | 30 |
| CM_LL_E | 1994 | 7,958 | 0.000 | 0.000 | 0.125 | 0.375 | 0.250 | 0.125 | 0.000 | 0.000 | 0.125 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8 | 8 |
| CM_LL_E | 1995 | 8,459 | 0.000 | 0.000 | 0.053 | 0.421 | 0.421 | 0.053 | 0.000 | 0.000 | 0.053 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 19 | 19 |
| CM_LL_E | 1996 | 7,587 | 0.000 | 0.000 | 0.000 | 0.000 | 0.333 | 0.500 | 0.167 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 6 | 6 |
| CM_LL_E | 1997 | 4,627 | 0.000 | 0.100 | 0.200 | 0.400 | 0.200 | 0.100 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 10 | 10 |
| CM_LL_E | 1998 | 5,514 | 0.000 | 0.000 | 0.000 | 0.040 | 0.240 | 0.400 | 0.240 | 0.080 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 25 | 25 |
| CM_LL_E | 1999 | 6,474 | 0.000 | 0.000 | 0.020 | 0.363 | 0.304 | 0.196 | 0.088 | 0.000 | 0.020 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.010 | 102 | 102 |
| CM_LL_E | 2000 | 8,619 | 0.000 | 0.000 | 0.012 | 0.107 | 0.238 | 0.238 | 0.179 | 0.083 | 0.036 | 0.024 | 0.024 | 0.000 | 0.012 | 0.000 | 0.012 | 0.036 | 84 | 84 |
| CM_LL_E | 2001 | 10,130 | 0.000 | 0.000 | 0.022 | 0.099 | 0.308 | 0.352 | 0.165 | 0.022 | 0.022 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.011 | 91 | 91 |
| CM_LL_E | 2002 | 18,125 | 0.000 | 0.027 | 0.077 | 0.191 | 0.197 | 0.219 | 0.137 | 0.044 | 0.027 | 0.016 | 0.011 | 0.000 | 0.000 | 0.000 | 0.005 | 0.049 | 183 | 183 |
| CM_LL_E | 2003 | 13,853 | 0.000 | 0.005 | 0.076 | 0.239 | 0.168 | 0.223 | 0.102 | 0.066 | 0.046 | 0.015 | 0.010 | 0.005 | 0.000 | 0.010 | 0.010 | 0.025 | 197 | 197 |
| CM_LL_E | 2004 | 19,353 | 0.000 | 0.004 | 0.123 | 0.261 | 0.340 | 0.170 | 0.040 | 0.020 | 0.008 | 0.000 | 0.012 | 0.000 | 0.000 | 0.000 | 0.004 | 0.020 | 253 | 253 |
| CM_LL_E | 2005 | 21,121 | 0.000 | 0.000 | 0.032 | 0.173 | 0.338 | 0.341 | 0.092 | 0.017 | 0.000 | 0.003 | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 | 346 | 346 |
| CM_LL_E | 2006 | 16,335 | 0.000 | 0.000 | 0.025 | 0.223 | 0.332 | 0.223 | 0.124 | 0.045 | 0.010 | 0.000 | 0.000 | 0.000 | 0.005 | 0.010 | 0.000 | 0.005 | 202 | 202 |
| CM_LL_E | 2007 | 15,727 | 0.000 | 0.036 | 0.099 | 0.260 | 0.265 | 0.197 | 0.085 | 0.040 | 0.013 | 0.004 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 223 | 223 |
| CM_LL_E | 2008 | 34,124 | 0.000 | 0.002 | 0.086 | 0.251 | 0.357 | 0.158 | 0.051 | 0.025 | 0.018 | 0.012 | 0.006 | 0.006 | 0.002 | 0.006 | 0.004 | 0.014 | 487 | 487 |
| CM_LL_E | 2009 | 14,627 | 0.000 | 0.004 | 0.088 | 0.392 | 0.268 | 0.196 | 0.020 | 0.008 | 0.016 | 0.000 | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.004 | 250 | 250 |
| CM_LL_E | 2010 | 75,510 | 0.000 | 0.000 | 0.008 | 0.090 | 0.361 | 0.378 | 0.113 | 0.035 | 0.013 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 635 | 635 |
| CM_LL_E | 2011 | 84,286 | 0.000 | 0.000 | 0.013 | 0.111 | 0.353 | 0.332 | 0.141 | 0.032 | 0.016 | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 377 | 377 |

***B) COM LL WEST***

| Fishery | year | Landings | Age0 | Age1 | Age2 | Age3 | Age4 | Age5 | Age6 | Age7 | Age8 | Age9 | Age10 | Age11 | Age12 | Age13 | Age14 | age 15+ | N | EFF N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CM_LL_W | 1991 | 72,592 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 |
| CM_LL_W | 1992 | 19,820 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 |
| CM_LL_W | 1993 | 20,291 | 0.000 | 0.034 | 0.931 | 0.034 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 29 | 29 |
| CM_LL_W | 1994 | 15,809 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 |
| CM_LL_W | 1995 | 17,506 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 |
| CM_LL_W | 1996 | 27,362 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 |
| CM_LL_W | 1997 | 31,418 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0 |
| CM_LL_W | 1998 | 27,224 | 0.000 | 0.000 | 0.009 | 0.087 | 0.127 | 0.193 | 0.063 | 0.054 | 0.063 | 0.054 | 0.069 | 0.051 | 0.045 | 0.045 | 0.027 | 0.111 | 332 | 332 |
| CM_LL_W | 1999 | 90,572 | 0.000 | 0.000 | 0.263 | 0.539 | 0.118 | 0.066 | 0.000 | 0.013 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 76 | 76 |
| CM_LL_W | 2000 | 183,538 | 0.000 | 0.000 | 0.003 | 0.023 | 0.055 | 0.168 | 0.194 | 0.159 | 0.110 | 0.041 | 0.038 | 0.041 | 0.023 | 0.017 | 0.006 | 0.122 | 345 | 345 |
| CM_LL_W | 2001 | 124,453 | 0.000 | 0.000 | 0.000 | 0.017 | 0.061 | 0.240 | 0.179 | 0.117 | 0.078 | 0.073 | 0.039 | 0.039 | 0.028 | 0.022 | 0.017 | 0.089 | 179 | 179 |
| CM_LL_W | 2002 | 146,195 | 0.000 | 0.012 | 0.095 | 0.068 | 0.125 | 0.068 | 0.104 | 0.083 | 0.053 | 0.059 | 0.047 | 0.045 | 0.030 | 0.036 | 0.033 | 0.142 | 337 | 337 |
| CM_LL_W | 2003 | 171,270 | 0.000 | 0.000 | 0.000 | 0.004 | 0.004 | 0.039 | 0.039 | 0.135 | 0.116 | 0.073 | 0.073 | 0.081 | 0.066 | 0.046 | 0.050 | 0.274 | 259 | 259 |
| CM_LL_W | 2004 | 455,829 | 0.000 | 0.000 | 0.024 | 0.150 | 0.064 | 0.068 | 0.092 | 0.088 | 0.079 | 0.074 | 0.052 | 0.061 | 0.049 | 0.040 | 0.034 | 0.126 | 674 | 674 |
| CM_LL_W | 2005 | 282,789 | 0.000 | 0.000 | 0.003 | 0.046 | 0.118 | 0.155 | 0.118 | 0.128 | 0.082 | 0.079 | 0.043 | 0.043 | 0.072 | 0.036 | 0.020 | 0.056 | 304 | 304 |
| CM_LL_W | 2006 | 260,652 | 0.000 | 0.000 | 0.002 | 0.022 | 0.054 | 0.103 | 0.153 | 0.137 | 0.085 | 0.107 | 0.067 | 0.071 | 0.040 | 0.038 | 0.026 | 0.095 | 496 | 496 |
| CM_LL_W | 2007 | 188,503 | 0.000 | 0.000 | 0.006 | 0.043 | 0.085 | 0.211 | 0.179 | 0.100 | 0.088 | 0.060 | 0.068 | 0.017 | 0.031 | 0.011 | 0.028 | 0.071 | 351 | 351 |
| CM_LL_W | 2008 | 55,848 | 0.000 | 0.003 | 0.029 | 0.087 | 0.102 | 0.148 | 0.163 | 0.119 | 0.105 | 0.081 | 0.026 | 0.035 | 0.012 | 0.009 | 0.017 | 0.064 | 344 | 344 |
| CM_LL_W | 2009 | 51,766 | 0.000 | 0.000 | 0.007 | 0.048 | 0.111 | 0.103 | 0.081 | 0.074 | 0.181 | 0.111 | 0.074 | 0.033 | 0.026 | 0.044 | 0.022 | 0.085 | 271 | 271 |
| CM_LL_W | 2010 | 38,193 | 0.000 | 0.000 | 0.095 | 0.214 | 0.190 | 0.226 | 0.107 | 0.036 | 0.024 | 0.036 | 0.012 | 0.012 | 0.012 | 0.012 | 0.000 | 0.024 | 84 | 84 |
| CM_LL_W | 2011 | 18,850 | 0.000 | 0.000 | 0.000 | 0.214 | 0.286 | 0.214 | 0.143 | 0.071 | 0.071 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 14 | 14 |

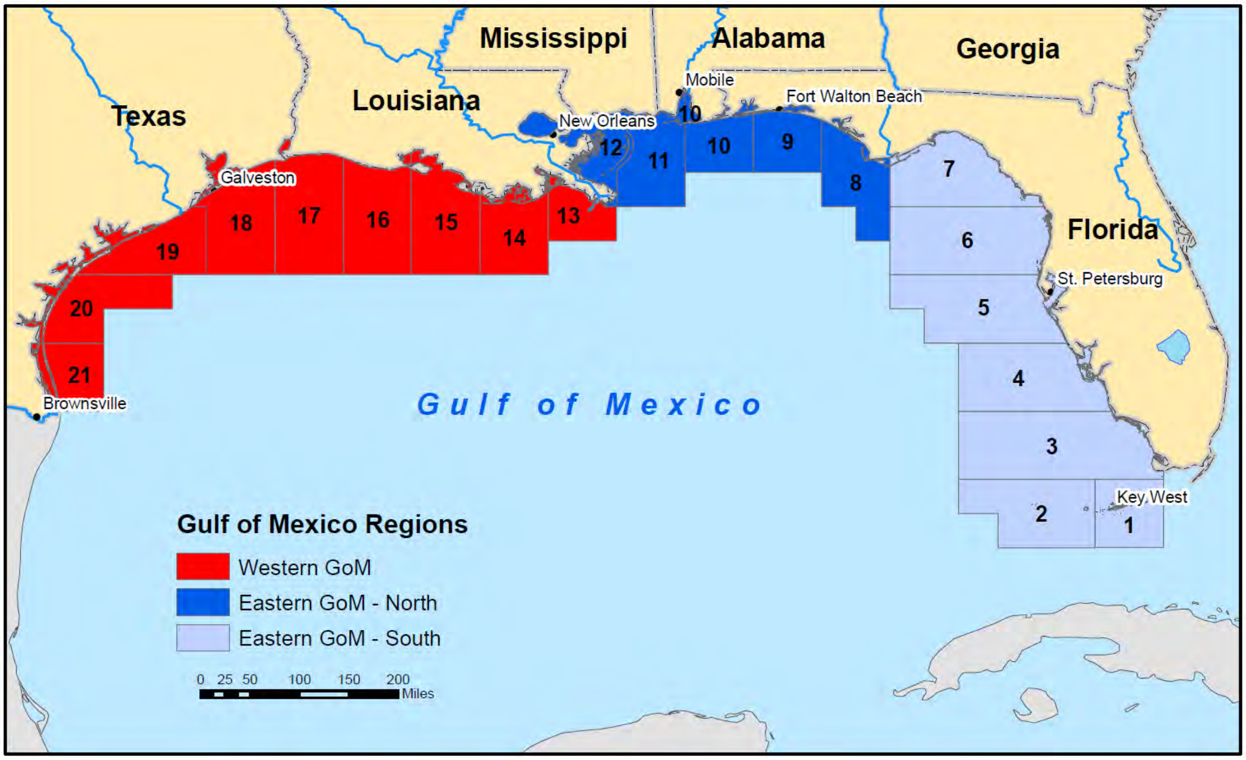



**Figure 1.** Statistical grids (fishing areas) used to define "REGION".

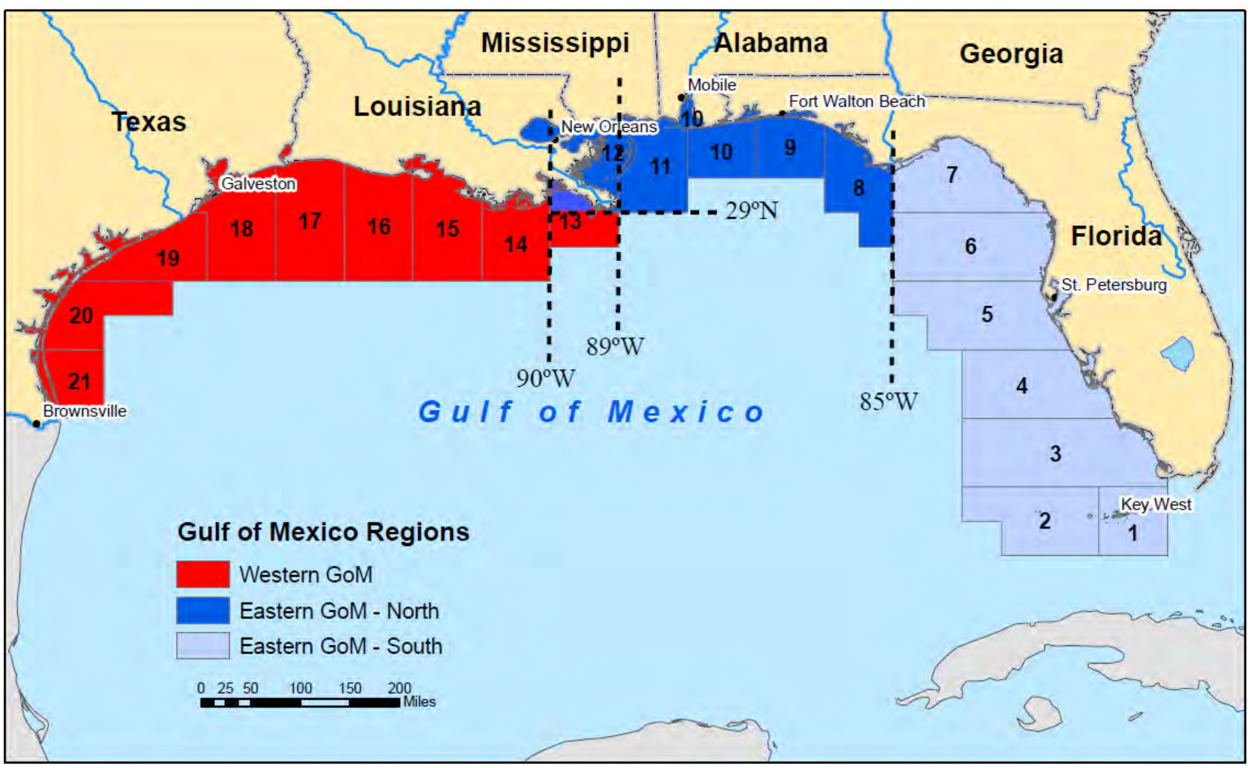



**Figure 2.** The use of longitude and latitude to define "REGION".

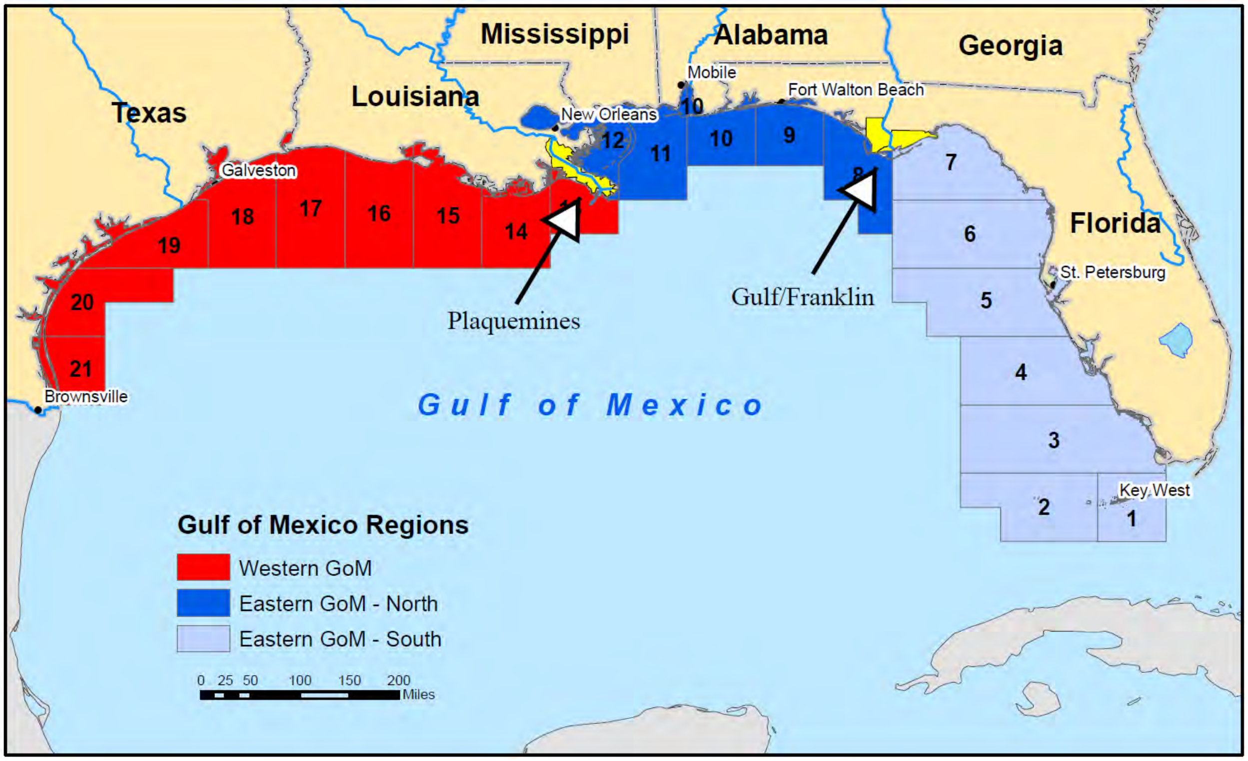



**Figure 3.** The use of “Location” and “County Landed” to define “REGION”.

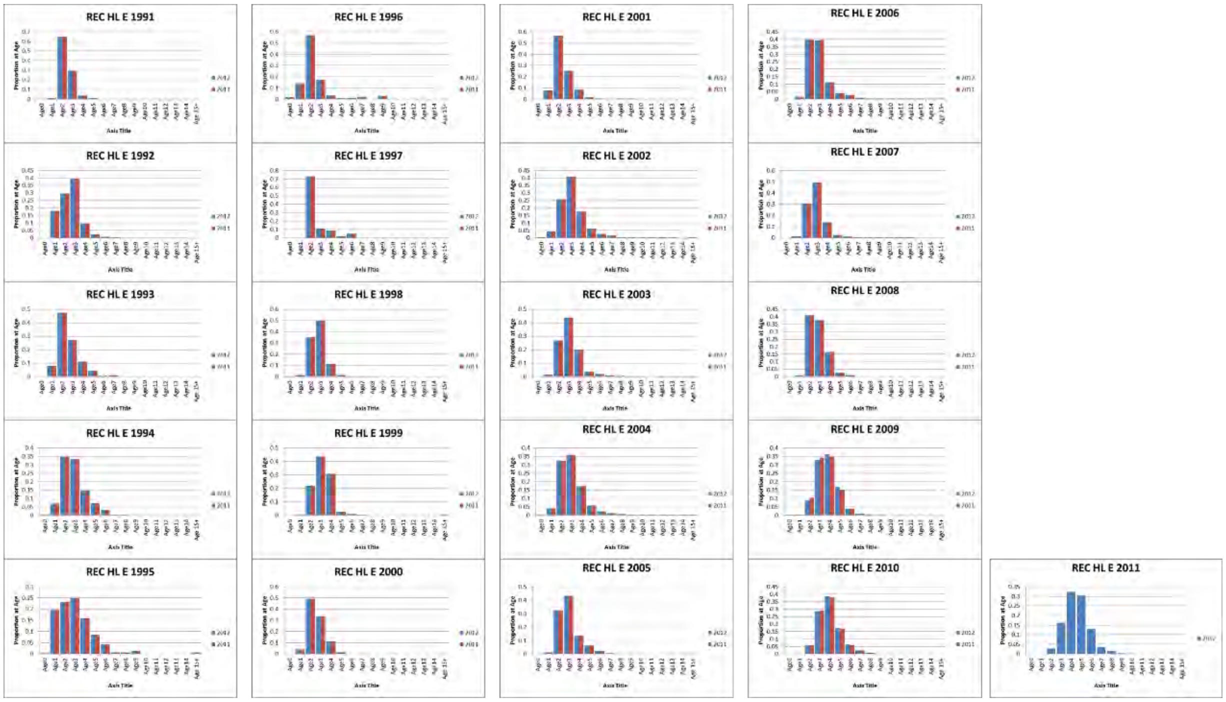


**Figure 4.** ***REC EAST***: Comparison of 2011 direct age composition (red) and the age composition developed for the 2012 red snapper data workshop (blue).

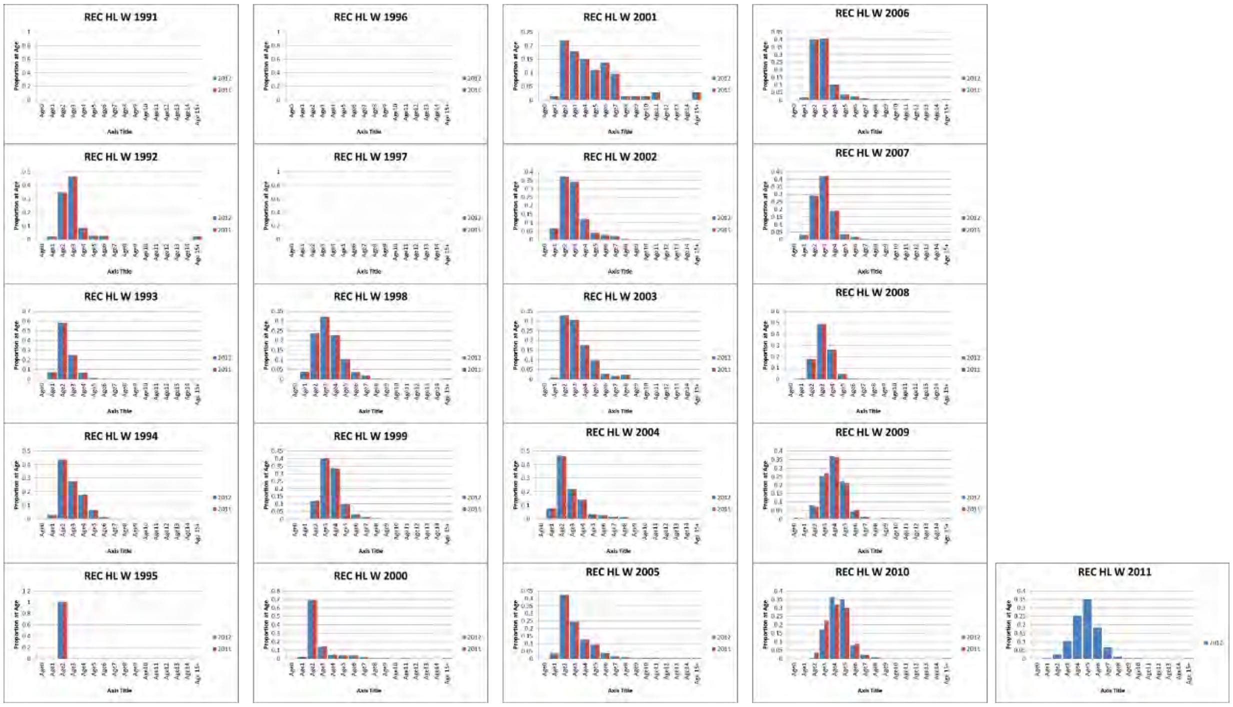



**Figure 5. *REC WEST***: Comparison of 2011 direct age composition (red) and the age composition developed for the 2012 red snapper data workshop (blue).

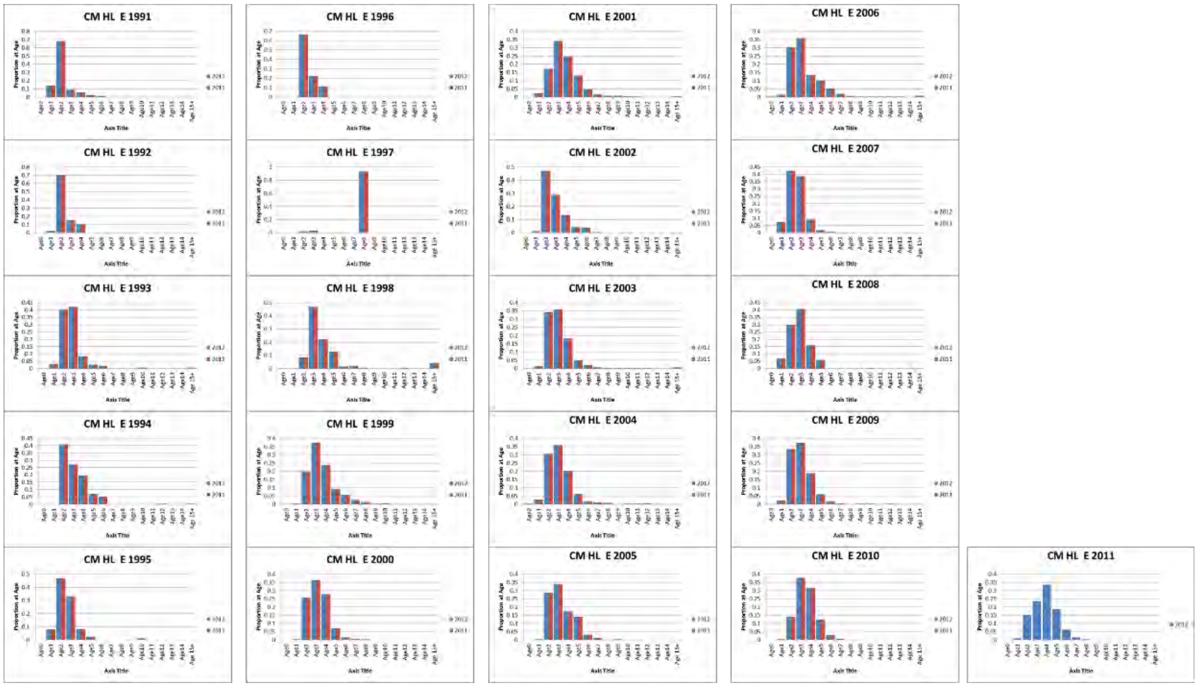


**Figure 6.** ***COM HL EAST***: Comparison of 2011 direct age composition (red) and the age composition developed for the 2012 red snapper data workshop (blue).

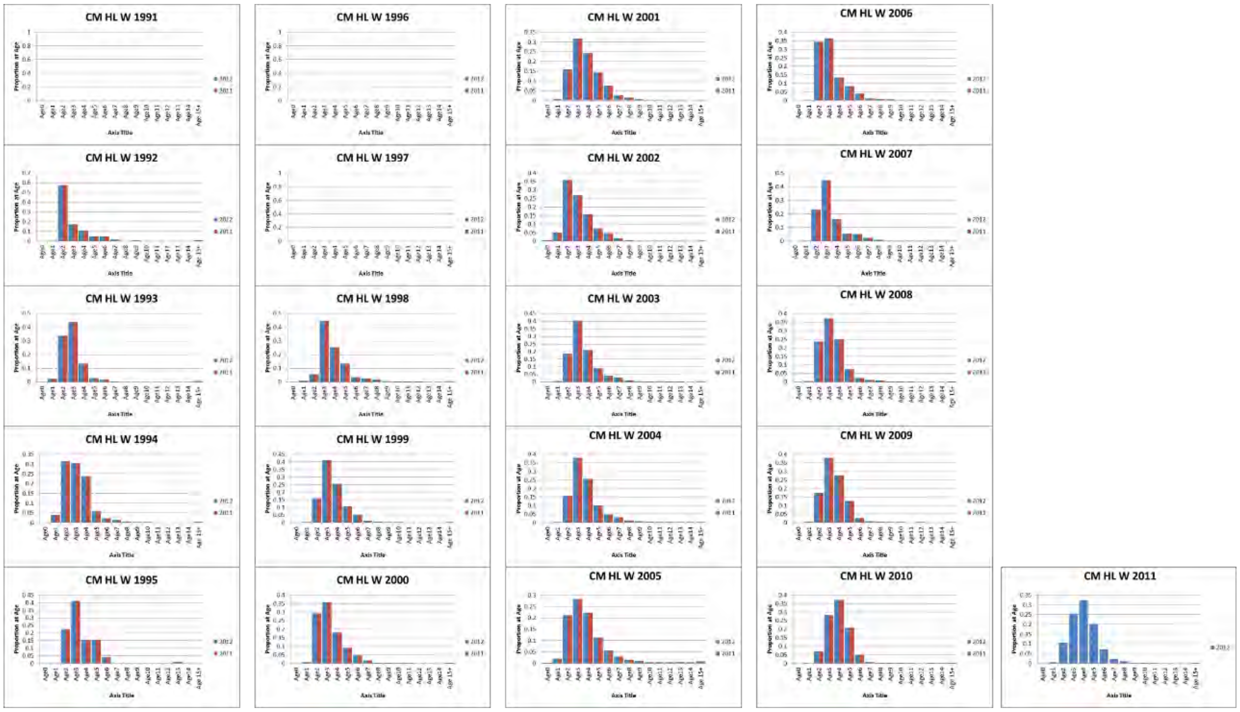


**Figure 7.** ***COM HL WEST***: Comparison of 2011 direct age composition (red) and the age composition developed for the 2012 red snapper data workshop (blue).

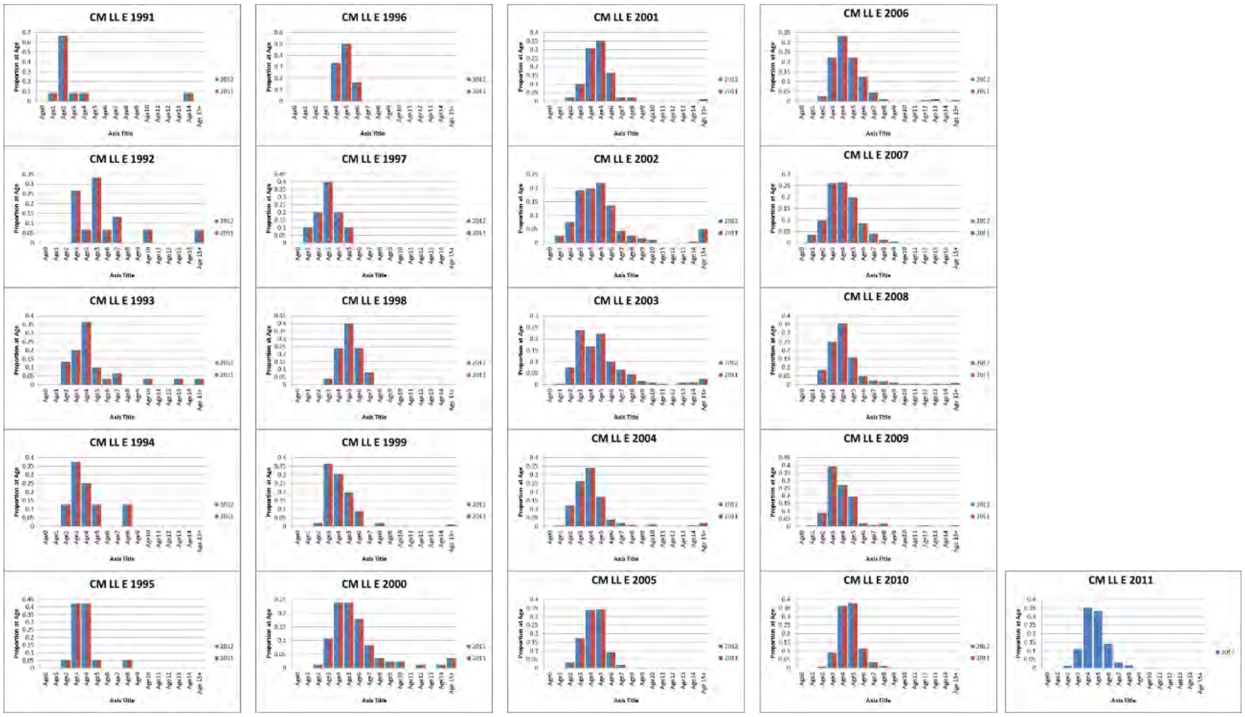



**Figure 8.** ***COM LL EAST***: Comparison of 2011 direct age composition (red) and the age composition developed for the 2012 red snapper data workshop (blue).

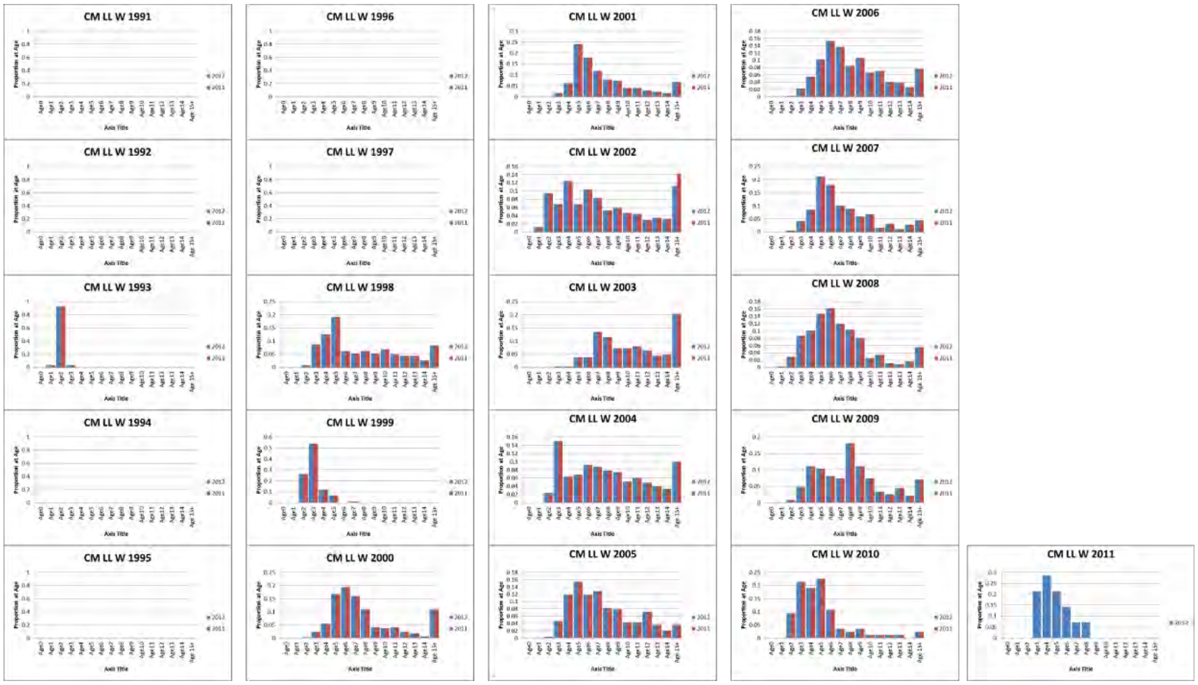


**Figure 9.** ***COM LL WEST***: Comparison of 2011 direct age composition (red) and the age composition developed for the 2012 red snapper data workshop (blue).

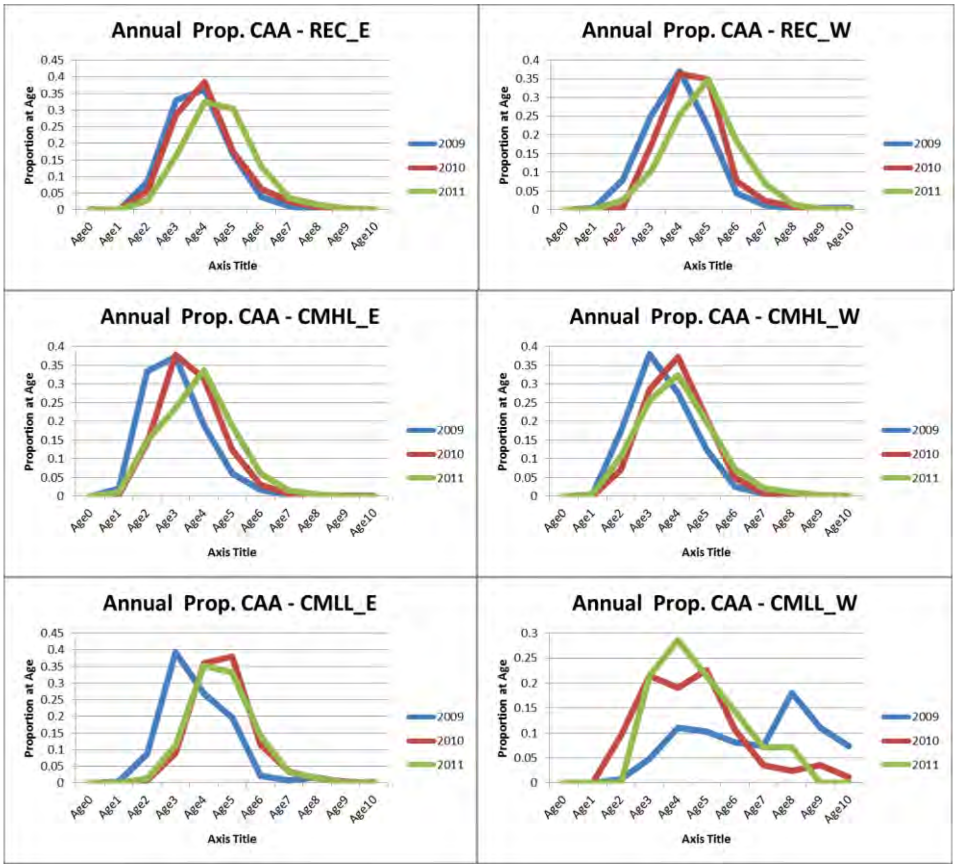



**Figure 10**. Recent direct observed age composition developed for the 2012 red snapper data workshop.

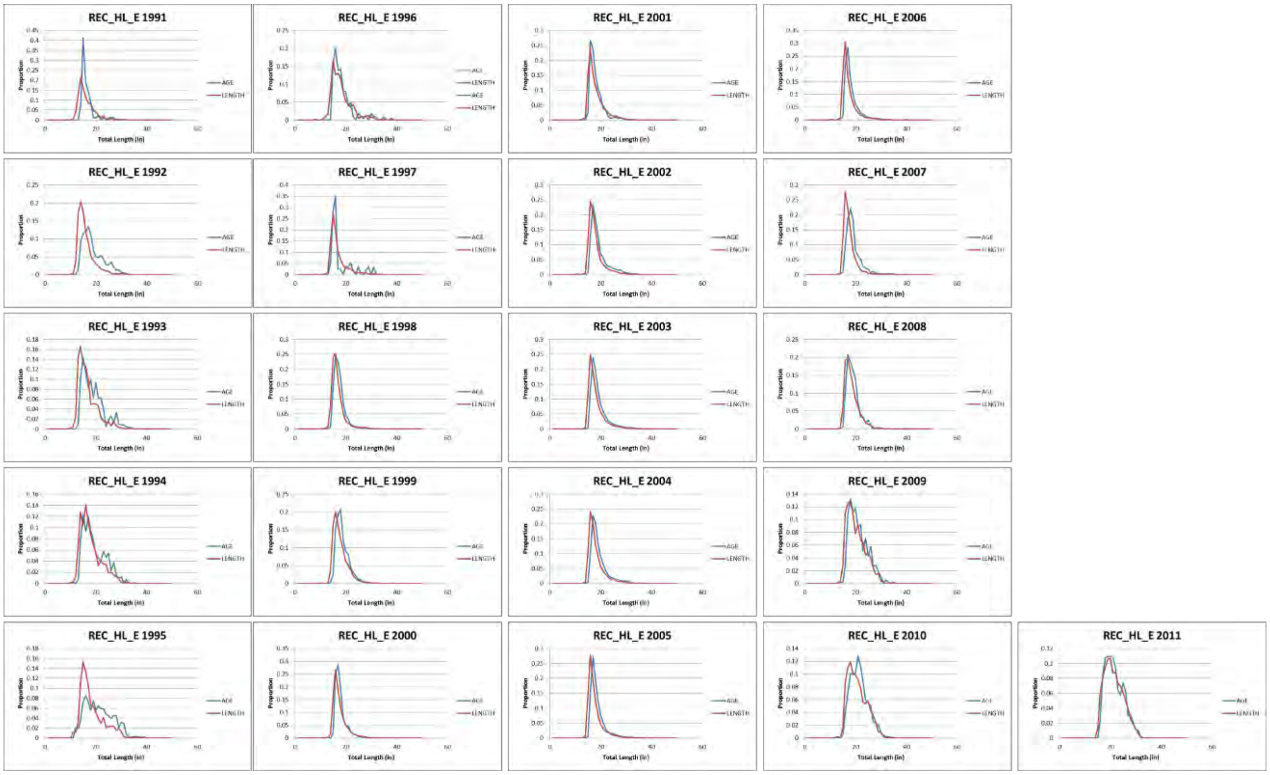



**Figure 11**. ***REC East:*** Comparison of the length distribution of all available samples versus those selected for otolith analysis.

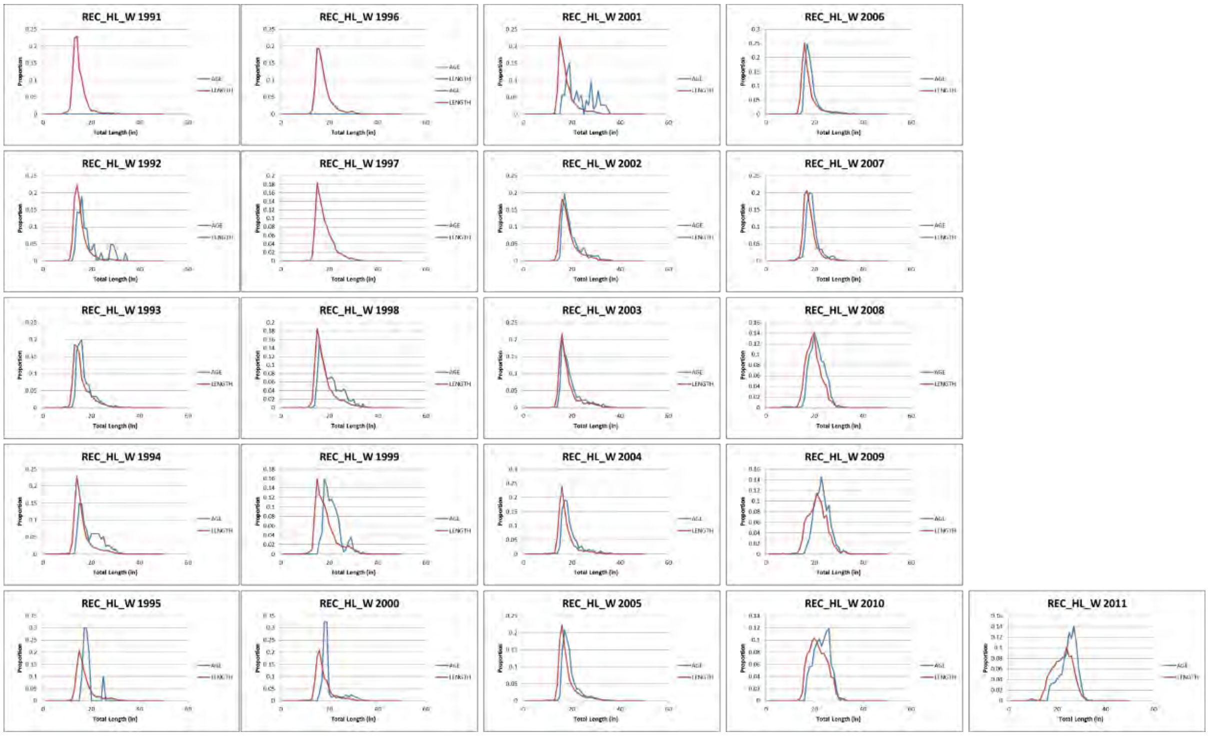



**Figure 12**. ***REC West:*** Comparison of the length distribution of all available samples versus those selected for otolith analysis.

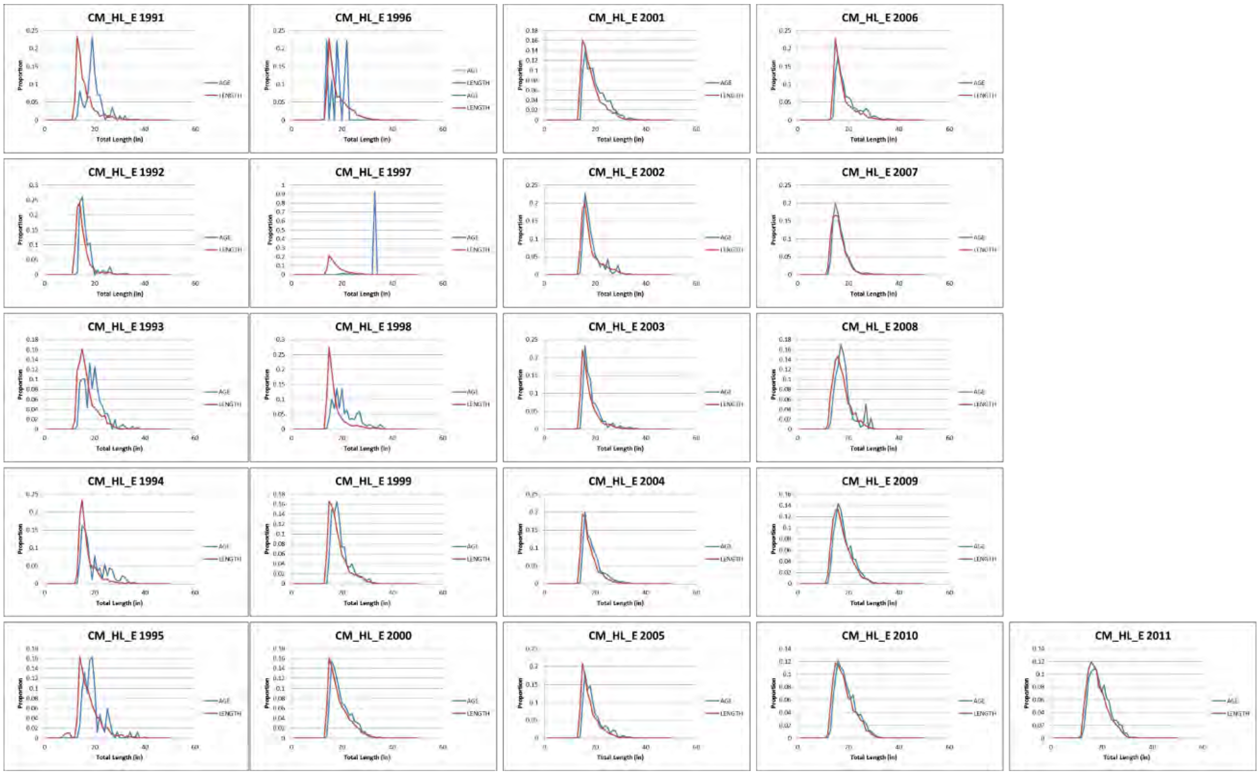



**Figure 13**. ***COM HL East:*** Comparison of the length distribution of all available samples versus those selected for otolith analysis.

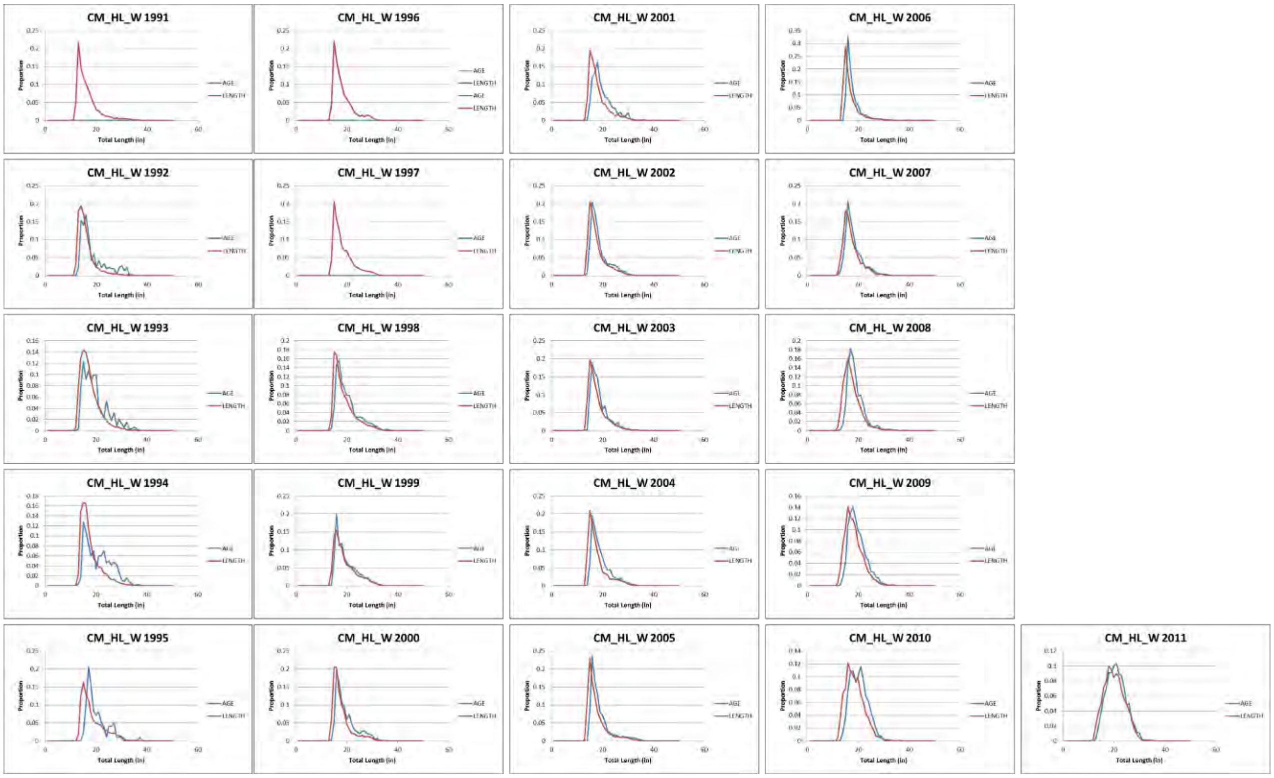



**Figure 14**. ***COM HL West:*** Comparison of the length distribution of all available samples versus those selected for otolith analysis.

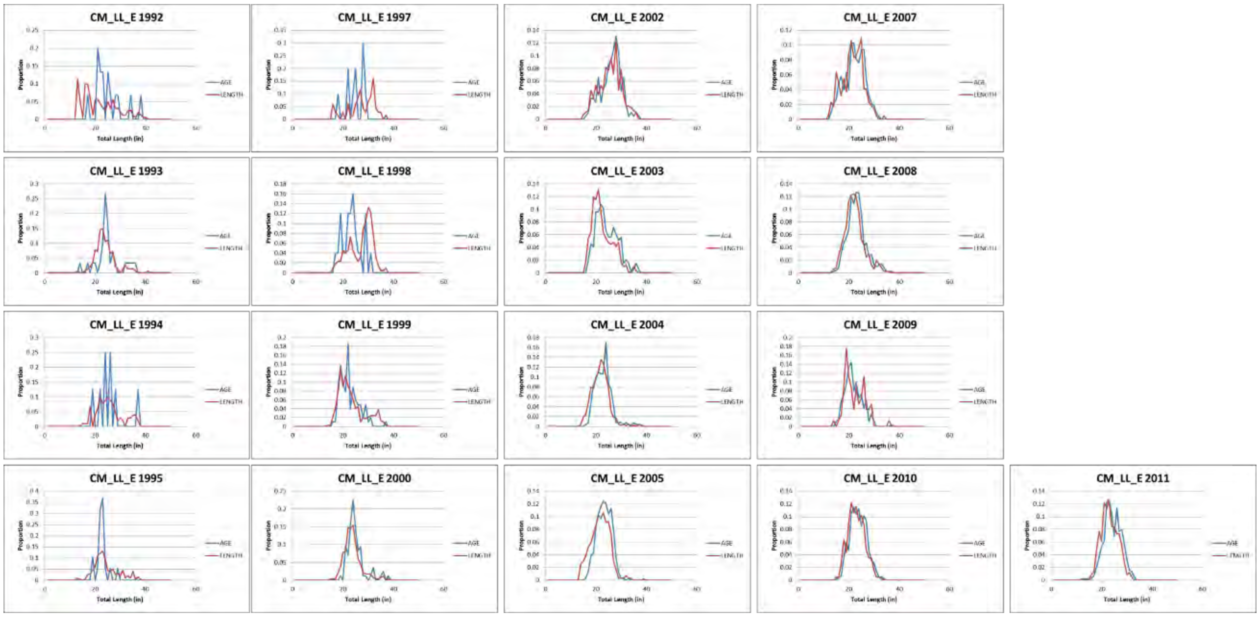



**Figure 15**. ***COM LL East:*** Comparison of the length distribution of all available samples versus those selected for otolith analysis.

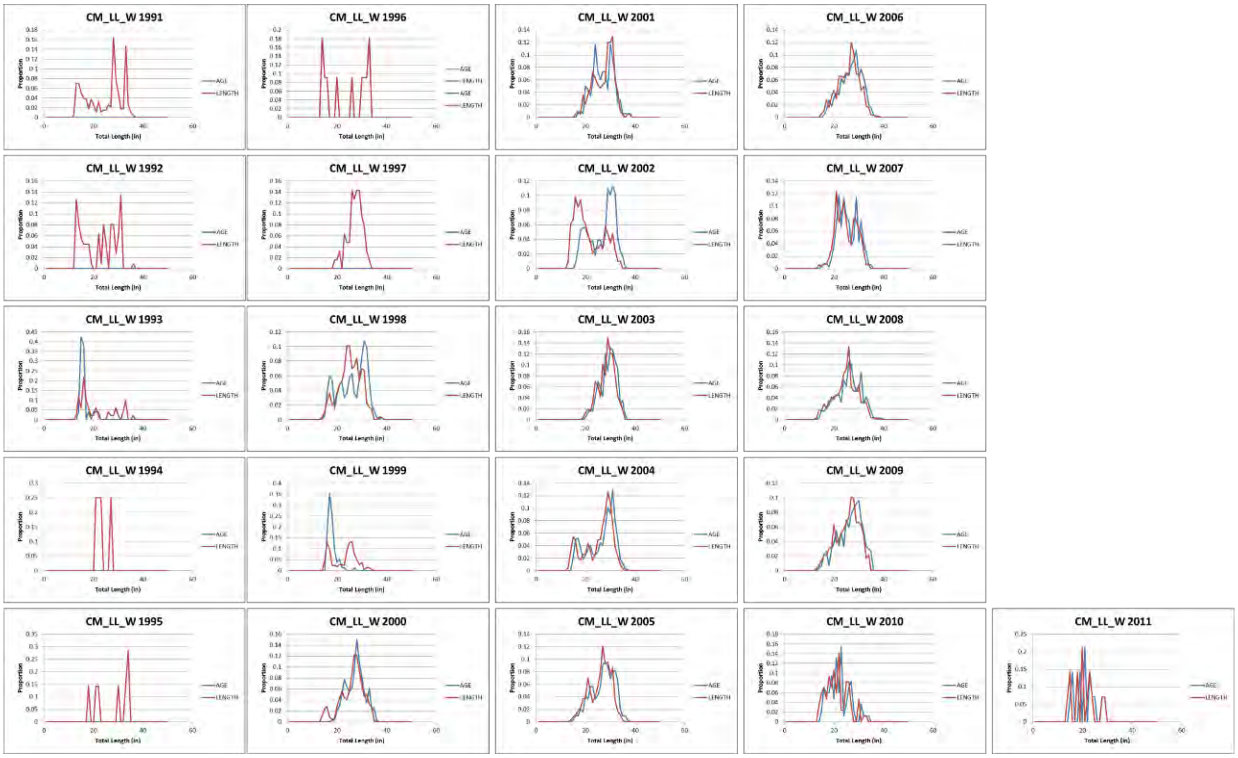



**Figure 16**. ***COM LL West:*** Comparison of the length distribution of all available samples versus those selected for otolith analysis.

# 4 Recreational Fishery Statistics

## 4.1 Overview

Recreational landings and discards of red snapper in the eastern and western Gulf of Mexico were compiled for the period 1981-2011 from federal and state databases. Sampling intensities of fish lengths by recreational fishing mode, Gulf region, and year were considered, and length frequency distributions were developed by year for east and west Gulf of Mexico red snapper. A summary of the issues discussed and data presented at the data workshop is included here.

### *4.1.1 Recreational Workgroup Members*

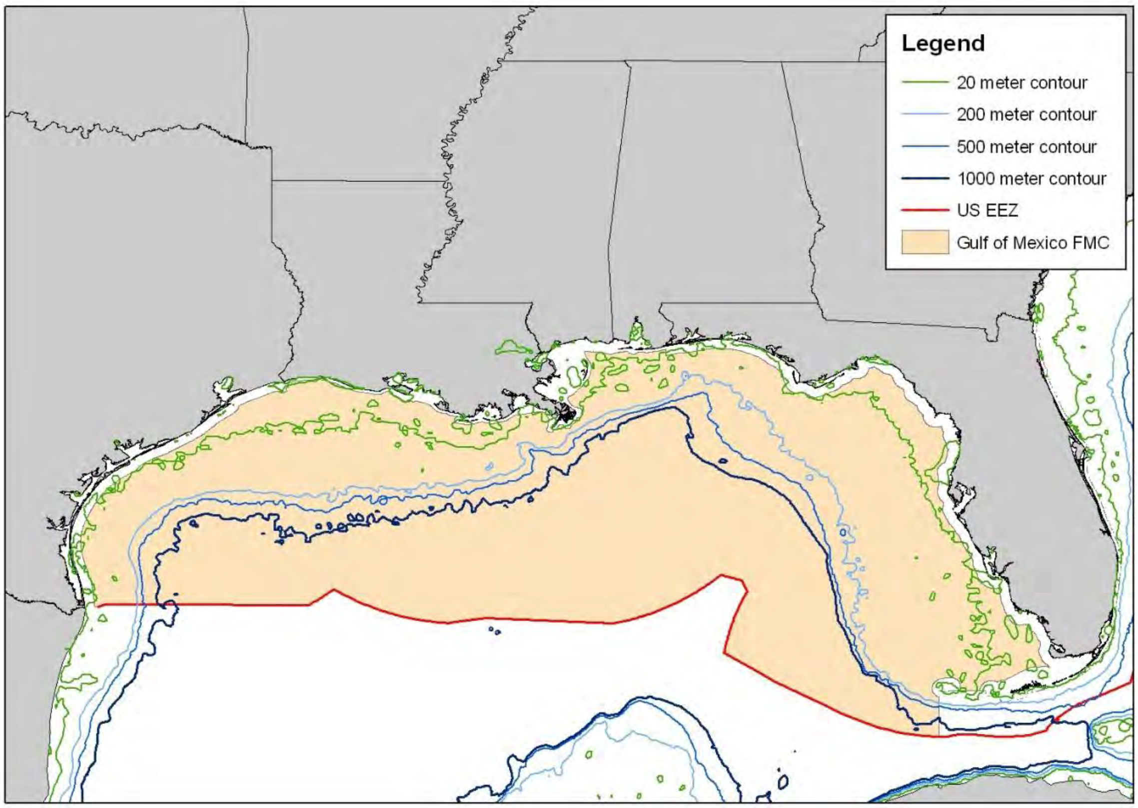
Barbara Dorf, Gulf SSC
Vivian Matter, NOAA Fisheries, Miami, FL
Adyan Rios, NOAA Fisheries, Miami, FL (leader)
Beverly Sauls, FL FWC, St. Petersburg, FL
Mike Thierry, Gulf Red Snapper AP
John Ward, Gulf SSC

### *4.1.2 Issues Discussed at the Data Workshop*

The Workgroup discussed several issues that needed to be resolved before data could be compiled. The issues are listed below and are described in more detail in the following sections.

1) Calibration of Marine Recreational Fisheries Statistics Survey charterboat estimates (1981-1997).
2) Calibration of Marine Recreational Fisheries Statistics Survey estimates to Marine Recreational Information Program estimates (1981-2003).
3) Incorporating estimates of variance from the Texas Parks and Wildlife Department.
4) Use of shore mode estimates.
5) Adjustments and substitutions (1981-1985).
6) Estimating recreational landings in weight.
7) Estimating historical recreational landings (pre-1981).
8) Estimating discards for the Southeast Region Headboat Survey.
9) Estimating discards for the Texas Parks and Wildlife Department.

### *4.1.3 Gulf of Mexico Fishery Management Council Jurisdictional Boundaries*




## 4.2 Review of Working Papers

The workgroup reviewed four working papers.

**SEDAR31-DW4,** *Recreational Survey Data for Red snapper in the Gulf of Mexico. Vivian M. Matter.*

This working paper presents recreational survey data for red snapper in the Gulf of Mexico from the Marine Recreational Fisheries Statistics Survey (MRFSS), the Marine Recreational Information Program (MRIP), the NMFS Southeast Region Headboat Survey (SRHS), and the Texas Parks and Wildlife Department (TPWD) survey. Issues addressed include the use of shore mode estimates, the calibration of MRFSS charterboat estimates back in time, 1981-1985 adjustments and substitutions, calibration of MRFSS estimates for 1981-2003 to MRIP estimates, estimating discards from the SRHS and TPWD, variance estimates from TPWD, and estimating recreational landings in weight from the surveys.

**SEDAR31-DW11,** *A Summary of Data on the Size Distribution and Release Condition of Red Snapper Discards from Recreational Fishery Surveys in the Gulf of Mexico. Beverly Sauls.*

This working paper presents a summary of available information on the size, release condition, and disposition of red snapper collected by trained observers since 2005 during at-sea surveys on for-hire vessels in the Gulf of Mexico. Additionally, a summary of information collected from a self-recruited volunteer angler catch card program is provided and compared to information collected from at-sea observer surveys.

**SEDAR31-DW25,** *Estimated Conversion Factors for Adjusting MRFSS Gulf of Mexico Red Snapper Catch Estimates and Variances in 1981-2003 to MRIP Estimates and Variances. Adyan Rios, Vivian M. Matter John F. Walter, Nicholas Farmer, and Stephen C. Turner.*

Ratio estimators were developed to appropriately adjust estimates from the Marine Recreational Fisheries Statistics Survey (MRFSS) to estimates from the Marine Recreational Information Program (MRIP). This working paper presents the adjusted catch and variances of red snapper in the Gulf of Mexico between 1981 and 2003.

**SEDAR31-DW10,** *Length frequency distributions for red snappers in the Gulf of Mexico from 1984-2011. Ching-Ping Chih.*

This working paper presents changes in length frequency distributions of samples collected from recreational fisheries in each the east and west Gulf of Mexico from 1992 to 2011.

## 4.3 Recreational Landings

A map and figures summarizing all recreational landings of red snapper in the Gulf of Mexico are provided in Figure 4.11.1.

### *4.3.1 Marine Recreational Fisheries Statistics Survey (MRFSS) and Marine Recreational Information Program (MRIP)*

*Introduction*

The Marine Recreational Fisheries Statistics Survey (MRFSS) and the Marine Recreational Information Program (MRIP) provide a long time series of estimated catch per unit effort, total effort, landings, and discards for six two-month periods (waves) each year. MRFSS/MRIP provides estimates for three recreational fishing modes: shore-based fishing (SH), private and rental boat fishing (PR), and for-hire charter and guide fishing (CH). When the survey first began in Wave 2 (Mar/Apr), 1981, headboats were included in the for-hire mode, but were excluded after 1985 to avoid overlap with the Southeast Region Headboat Survey (SRHS) conducted by the NMFS Beaufort, NC lab.

The MRFSS/MRIP survey covers coastal Gulf of Mexico states from Florida to Louisiana. The state of Texas was included in the survey from 1981-1985, although not all modes and waves were covered. The state of Florida is sampled as two sub-regions. The east Florida sub-region includes counties adjacent to the Atlantic coast from Nassau County south through Miami-Dade County, and the west Florida sub-region includes Monroe County (Florida Keys) and counties adjacent to the Gulf of Mexico. Separate estimates are generated for each Florida sub-region, and those estimates may be post-stratified into smaller regions based on proportional sampling.

The MRFSS/MRIP design incorporates three complementary survey methods for estimating catch and effort. Catch data are collected through angler interviews during dockside intercept surveys of recreational fishing trips after they have been completed. Effort data are collected using two telephone surveys. The Coastal Household Telephone Survey (CHTS) uses random digit dialing of coastal households to obtain detailed information about the previous two months of recreational fishing trips from the anglers. The weekly For-Hire Survey interviews charterboat operators (captains or owners) to obtain the trip information with only one-week recall period. Effort estimates from the two telephone surveys are aggregated to produce total effort estimates by wave. Catch rates from dockside intercept surveys are combined with estimates of effort from telephone interviews to estimate total landings and discards by wave, mode, and area fished (inland, state, and federal waters). Catch estimates from early years of the survey are highly variable with high proportional standard errors (PSE's), and sample size in the dockside intercept portion have been increased over time to improve precision of catch estimates. Full survey documentation and ongoing efforts to review and improve survey methods are available at: http://www.st.nmfs.gov/st1/recreational.

Survey methods for the for-hire fishing mode have seen the most improvement over time. Catch rate data have improved through increased sample quotas and additional sampling (requested and funded by the states) to the intercept portion of the survey. It was also recognized that the random household telephone survey was intercepting relatively few anglers in the for-hire fishing mode and the For-Hire Telephone Survey (FHS) was developed to estimate effort in the for-hire mode. The new method draws a random sample of known for-hire charter and guide vessels each week and vessel operators are called and asked directly to report their fishing activity. The FHS was pilot tested in the Gulf of Mexico in 1998 and officially adopted in 2000. The FHS does not consider the estimates during pilot years as official estimates, however, FHS data for these years have been used in past SEDARs (e.g. SEDAR 7 red snapper, SEDAR 16 king mackerel, etc). As a result of the Deepwater Horizon oil spill in April 2010, the MRFSS/MRIP For-Hire Survey increased sampling rates of charterboat vessel operators from 10% to 40% from May, 2010 through June 2011.

*Calibration of traditional MRFSS charterboat estimates*

Conversion factors have been estimated to calibrate the traditional MRFSS charterboat estimates with the FHS for 1986-1997 in the Gulf of Mexico (SEDAR7-AW-03). The relationship between the old charterboat method estimates of angler trips and the FHS estimates of angler trips was used to estimate the conversion factors. Since these factors are based on effort, they can be applied to all species' landings. In the Gulf of Mexico, the period of 1981-1985 could not be calibrated with the same ratios developed for 1986+ because in the earlier 1981-1985 time period, MRFSS considered charterboat and headboat as a single combined mode. Thus, in order to properly calibrate the estimates from 1981-1985, headboat data from the Southeast Region Head-boat Survey (SRHS) were included in the analysis. To calibrate the MRFSS combined charterboat and headboat mode effort estimates in 1981-1985, conversion factors were estimated using 1986-1990 effort estimates from both modes, in equivalent effort units, an angler trip (SEDAR28-DW-12). These calibration factors were applied to the charterboat estimates and are tabulated in SEDAR31-DW-04.

*MRIP weighted estimates and the calibration of MRFSS estimates*
The Marine Recreational Information Program (MRIP) was implemented in 2004. The MRIP was developed to generate more accurate recreational catch rates by re-designing the MRFSS sampling protocol to address potential biases including port activity and time of day. Revised catch and effort estimates, based on this improved estimation method, were released on January 25, 2012. These estimates are available for the Atlantic and Gulf Coasts for 2004 through 2011.

Since new MRIP estimates are available for a portion of the recreational time series that the MRFSS covers, conversion factors between the MRFSS estimates and the MRIP estimates were developed in order to maintain one consistent time series for the recreational catch estimates. Ratio estimators, based on the ratios of the means, were developed for Gulf of Mexico red snapper to hind-cast catch and variance estimates by fishing mode. In order to apply the charterboat ratio estimator back in time to 1981, charterboat landings were isolated from the combined cbt/hbt mode for 1981-1985. The MRFSS to MRIP calibration process is detailed in SEDAR31-DW25.

*Calculating landings estimates in weight*
The MRFSS and the MRIP surveys use different methodologies for estimating landings in weight. In order to maintain consistency over the entire time frame, the Southeast Fisheries Science Center (SEFSC) has developed a standardized approach for calculating average weight that can be applied to the MRIP (or MRIP adjusted) landings in number for all years. This method has been used in the past for filling in MRFSS weight estimates when they were missing (I.e. when there was an estimate of landings in number but not in weight due to missing weight samples in a given strata). The SEFSC method uses the MRFSS/MRIP sample data to obtain an average weight using the following hierarchy: species, region, year, state, mode, wave, and area (SEDAR22-DW16). The minimum number of weights used at each level of substitution is 30 fish, except for the final species level, where the minimum is 1 fish. In cases where the sample data include a length but not a weight, the length-weight equation from SEDAR 7 was used to convert those lengths to weights (W=0.000662*(L^2.9970) where W is whole weight in pounds and L is fork length in inches). Average weights were then multiplied by the landings estimates in numbers to obtain estimates of landings in weight. These estimates are provided in pounds whole weight.

*1981, wave 1*
MRFSS began in 1981, wave 2. In the Gulf of Mexico, catch for 1981 wave 1 was estimated by determining the proportion of catch in wave 1 to catch in all other waves for 1982-1984 by fishing mode and area. These proportions were then used to estimate wave 1 in 1981 from the estimated catches in other waves of that year. This methodology is consistent with past SEDARs (e.g. SEDAR 10 gag grouper and SEDAR 12 Gulf red grouper).

*Texas*
Texas data from the MRFSS is only available from 1981-1985 and is sporadic, not covering all modes and waves. For these reasons, Texas boat mode estimates from the MRFSS were not included. Instead, TPWD data, which covers charter and private modes, were used to fill in theses modes prior to the start of the TPWD survey in May 1983. This methodology is consistent with past SEDARs (e.g. SEDAR 16 king mackerel, SEDAR 28 Spanish mackerel).

*Shore mode*
The workgroup discussed the validity of the shore mode estimates generated by MRFSS/MRIP. The intercept data that led to these estimates mainly came from Monroe County, FL and places where one would not expect to intercept red snapper. These red snapper intercepts were most likely the result of misclassification. The workgroup recommended that all shore mode estimates be excluded.

MRIP landings in numbers of fish and in whole weight in pounds by Gulf region are presented in Table 4.10.1. CVs associated with estimated landings in numbers are also shown.

### *4.3.2 Southeast Region Headboat Survey*

*Introduction*
The Southeast Region Headboat Survey (SRHS) estimates landings and effort for headboats in the Gulf of Mexico. The SRHS began in the Gulf of Mexico in 1986 and extends from Naples, FL to South Padre Island, TX. The South Atlantic and Gulf of Mexico Headboat Surveys generally include 70-80 vessels participating in each region annually. The Headboat Survey incorporates two components for estimating catch and effort. (1) Information about the size of fishes landed are collected by port samplers during dockside sampling, where fish are measured to the nearest mm and weighed to the nearest 0.01 kg. These data are used to generate mean weights for all species by area and month. Port samplers also collect otoliths for ageing studies during dockside sampling events. (2) Information about total catch and effort are collected via the logbook, a form filled out by vessel personnel and containing total catch and effort data for individual trips. The logbooks are summarized by vessel to generate estimated landings by species, area, and time strata. The SRHS does not generate variances of the landings estimates.

The Headboat Survey was inconsistent in LA in 2002-2006. There were no trip reports collected in LA in 2002. Trip reports from 2001 were used (by the HBS) as a substitute to generate estimates numbers caught (though there are some minor differences between the resulting estimates for the two years). In 2003, there were only a few trip reports but they were still used to generate the estimates. From 2004 to 2006 there were no trip reports or fish sampled, and no substitutes were used, so there are no estimates or samples from 2004 to 2006 due to funding issues and Hurricane Katrina. However, the MRFSS/MRIP For-Hire Survey included the LA headboats in their charter mode estimates for these years thereby eliminating this hole in the headboat mode estimates.

The SRHS began operating in Mississippi (area 28) in 2010. Headboat data for red snapper from the Dry Tortugas, FL and west (areas 18-28) were included as part of Gulf of Mexico.
*Texas headboat estimates 1981-1985*

Headboat landings estimates by mode from 1981-1985 come from the MRFSS/MRIP survey for all states except Texas. The standard method used in past SEDARs (e.g. SEDAR 28 Spanish mackerel and cobia) is to use the average Texas headboat mode estimates from SRHS from 1986-1988 to fill in the missing years.

SRHS landings in numbers of fish and in whole weight in pounds by Gulf region are presented in Table 4.10.2.

### *4.3.3 Texas Parks and Wildlife Department*

*Introduction*

The TPWD Sport-boat Angling Survey was implemented in May 1983 and samples fishing trips made by sport-boat anglers fishing in Texas marine waters. All sampling takes place at recreational boat access sites. The raw data include information on catch, effort and length composition of the catch for sampled boat-trips. These data are used by TPWD to generate recreational catch and effort estimates. The survey is designed to estimate landings and effort by high-use (May 15-November 20) and low-use seasons (November 21-May 14). SEFSC personnel disaggregated the TPWD seasonal estimates into waves (2 month periods) using the TPWD intercept data. This was done to make the TPWD time series compatible with the MRFSS/MRIP time series. TPWD surveys private and charterboat fishing trips. While TPWD samples all trips (private, charterboat, ocean, bay/pass), most of the sampled trips are associated with private boats fishing in bay/pass, as these trips represent most of the fishing effort. Charterboat trips in ocean waters are the least encountered in the survey.

*Producing landings estimates in weight*

In the TPWD survey, landings estimates are produced only in number of fish. In addition, the TPWD sample data does not provide weights, only lengths of the intercepted fish. Because TPWD length samples are measured as maximum possible total lengths, a TPWD length-weight equation for red snapper ($W=10^{(-5.242 + (3.145*\log10(L)))}$ where W is gutted weight in grams and L is maximum total length in mm) was used to convert lengths to weights (Green and Campbell 2005). The SEFSC method (described above) was applied to the TPWD landings to obtain estimated landings in weight.

*1981-1983 Texas estimates*

The TPWD survey began with the high-use season in 1983 (May15, 1983). Texas charter and private mode estimates do not exist from the start of 1981 to May of 1983. Averages from TPWD 1983-1985 by mode and wave were used to fill in the missing estimates.

*2011 incomplete year*

Data from 2011 is only through the 2011 TPWD high-use season (November 20th). Comparing seasonal estimates to wave estimates for 2000-2010, revealed that relatively few landings came from Nov 21-Dec 31. As such, the workgroup recommended that 2011 be accepted as a complete year.

*Variances*
Recently, TPWD has provided NMFS with standard errors associated with their seasonal estimates. Although the variances derived from these standard errors apply only to the seasonal TPWD seasonal and do not match up exactly to the TPWD wave estimates, this information provides a measure of the uncertainty of the TPWD estimates. The workgroup recommended using these TPWD variances.

TPWD landings in numbers of fish and in whole weight in pounds for Texas are presented in Table 4.10.3. CVs associated with estimated landings in numbers are also shown.

### *4.3.4 Estimating Historical Recreational Landings*

The historic time period for red snapper landings in the Gulf of Mexico is defined as pre-1981, and prior to the start of the Marine Recreational Fisheries Statistics Survey (MRFSS). The recreational workgroup was tasked with evaluating potential sources and methods to compile landings of red snapper prior to the available time series of MRFSS/MRIP estimated landings. The workgroup reviewed the following two methods for estimating historical landings:

1) Coastal Census Method outlined in SEDAR31-RD46.
2) The U.S. Fish and Wildlife Service, National Survey of Fishing, Hunting and Wildlife-Associated Recreation (FHWAR) Survey Method outlined in SEDAR31-RD25.

*Coastal Census Method*
The coastal census method by Scott (SEDAR31-RD46) was used to estimate historical catch of red snapper in SEDAR 7. This method uses general linear models (GLMs) by Gulf region using data from 1981-2003 (Figure 4.11.2). The variables in each GLM include state, human population from coastal counties, fishing mode, and year class strength from SEAMAP surveys.

The workgroup rejected this method for three reasons. (1) The workgroup was not comfortable carrying back an average value of year class strength for all years prior to 1987. (2) The workgroup considered coastal counties as an arbitrary selection of counties. (3) The workgroup was uneasy with the choice of human population as a proxy for recreational red snapper landings.

*FHWAR Survey Method*
The FHWAR Survey Method by Brennan and Fitzpatrick (SEDAR31-RD25) was used to estimate historical catch of Spanish mackerel and cobia in SEDAR 28. The FHWAR method uses the FHWAR survey data of total US anglers, total US anglers by region, and total saltwater days to estimate regional saltwater effort. Total saltwater effort is then multiplied by an average CPUE calculated from the early years of MRFSS/MRIP data for each region. Due to an incomplete spatial overlap of available landings and effort data for red snapper during 1981-1985, the FHWAR method was modified to estimate landings by Gulf region and to use average estimates of CPUE calculated from 1986-1990 (Figure 4.11.3).

The workgroup had two main concerns associated with the FHWAR Survey Method. (1) The workgroup concluded that the effort estimates, based on national ratios to determine total saltwater historical effort, did not accurately capture the emergence of the offshore headboat fishery in the Gulf of Mexico. (2) The workgroup found it inappropriate to use an average CPUE over the entire historical time series, as CPUE is known to have changed due to factors such as technological advances and changes in fleet behavior. Participants at the data workshop agreed that the FHWAR Method was preferable to the Coastal Census Method, but also that further improvements to this method should be explored.

*Additional Methods to Be Explored*

The workgroup recommended that its members continue to explore existing and new methods for estimating historical landings of red snapper in the Gulf of Mexico. In order to accurately get at historical effort for the headboat fishery, suggestions included tracking consumables (gas, ice, bait) to develop price indices along the coast. Another suggestion was to compile trip frequency, and average trip information for the Gulf of Mexico headboat fishery from available literature, similar to what was done for red grouper in 2006 by Walter (SEDAR12-DW15).

## 4.4 Recreational Discards

A map and figures summarizing all recreational discards of red snapper in the Gulf of Mexico are provided in Figure 4.11.4.

### *4.4.1 MRFSS/MRIP discards*

Discarded live fish are reported by the anglers interviewed by the MRIP/MRFSS, so both the identity and quantities reported are unverified. Furthermore, discarded fish sizes are unknown for all fishing modes sampled by the MRFSS/MRIP. As such, lengths and weights of discarded fish are not estimated by the survey.

To characterize the size distribution of live discarded fishes, at-sea sampling of headboat discards was initiated was initiated in Alabama in 2004 and expanded to FLW in 2005 as part of the improved for-hire survey.

MRFSS/MRIP estimates of live released fish (B2 fish) were adjusted in the same manner as the landings (i.e. using charterboat calibration factors, MRIP adjustment, substitutions, etc. described above in section 4.3.1).

MRIP discards in numbers of fish and associated CVs by Gulf region are presented in Table 4.10.4.

### *4.4.2 Headboat Logbook Discards*

The Southeast Region Headboat Survey logbook form was modified in 2004 to include a category to collect self-reported discards for each reported trip. This category is described on the form as the number of fish by species released alive and number released dead. Port agents instructed each captain on criteria for determining the condition of discarded fish. A fish is considered “released alive” if it is able to swim away on its own. If the fish floats off or is obviously dead or unable to swim, it is considered “released dead”. These self-reported data are currently not validated within the Headboat Survey.

The SRHS discard ratios were compared with the At-Sea Observer Data discard ratios in order to assess the validity of these discard estimates. In Alabama and West Florida, the observer data discard ratios were far greater than those reported by the SRHS for 2004-2007.

A recommendation for estimating SHRS discard ratios was presented and approved at the post-data workshop webinar. The recommendation was to use discard rates from SRHS headboats with consistent patterns of reporting for 2004-2011, and to scale the resulting rates using observer data. To hind-cast headboat rates for 1981-2003, the recommendation was to use data from MRIP as a proxy. The MRIP proxy will be developed from the mode or modes (charterboat, private, or both) whose discard rates have the strongest positive correlation to the 2004-2011 headboat discard rates. After obtaining a full time series of headboat discard rates for each region (east and west) and by open/closed seasons, the rates will be applied to landings to obtain total discards. These discard rates and resulting discards will be tabulated in an assessment working paper.

### *4.4.3 Headboat At-Sea Observer Survey Discards*

Observer surveys of recreational headboats provide detailed information of recreational catch, and in particular of recreational discards. Observer surveys were conducted in Alabama from 2004 to 2007, and in West Florida from 2005-2007 and 2009-2011. For each survey, headboat vessels were randomly selected throughout each year in each state. Trained biologists then boarded the selected vessels, with permission from a vessel's captain, and observed anglers as they fished. The data collected included number and species of landed and discarded fish, size of landed and discarded fish, and the release condition of discarded fish (FL only). Observers also recorded length of the trip, area fished (inland, state, and federal waters) and, in Florida, the minimum and maximum depth fished. In the Florida Keys (sub-region 3) some vessels that ran trips longer than 24 hours were also sampled to collect information on trips that fish farther from shore and for longer periods of time, primarily in the vicinity of the Dry Tortugas.

### *4.4.4 Texas Parks and Wildlife Department Discards*

The TPWD recreational survey does not estimate discards. The recreational workgroup evaluated available data and recommended that the MRFSS/MRIP discard ratios from Louisiana by year and mode (charter and private) be applied to the TPWD landings to estimate discards from Texas.

Discards in numbers of fish for Texas are presented in Table 4.10.5.

## 4.5 Biological Sampling

Length samples from recreational landings were obtained from the Marine Recreational Fisheries Statistics Survey, the Southeast Region Headboat Survey, the Texas Parks and Wildlife Department, the Fisheries Information Network, and the Trip Interview Program. Additionally, length data were available from observer programs operating in Florida, Alabama, and Louisiana. The years of observer coverage and the number of trips observed are described in Sauls (SEDAR-DW11).

### *4.5.1 Sampling Intensity*

Sampling proportions of recreational landings by all modes combined are presented in Ping (SEDAR31-DW10).

*MRFSS/MRIP Biological Sampling*
The MRFSS/MRIP angler intercept survey includes the sampling of fish lengths from the harvested (landed, whole condition) catch. Up to 15 of each species landed per angler interviewed are measured to the nearest mm along a center line (defined as tip of snout to center of tail along a straight line, not curved over body). In those fish with a forked tail, this measure would typically be referred to as a fork length, and in those fish that do not have a forked tail it would typically be referred to as a total length with the exception of some fishes that have a single, or few, caudal fin rays that extend further. Weights are typically collected for the same fish measured although weights are preferred when time is constrained. Ageing structures and other biological samples are not collected during MRFSS/MRIP assignments because of concerns over the introduction of bias to survey data collection.

The number of red snapper measured or weighed in the Gulf of Mexico (FLW-TX) from MRFSS/MRIP by year, mode, and state are summarized in Table 4.10.6. The number of angler trips with measured or weighed red snapper in the Gulf of Mexico (FLW-TX) in the MRFSS/MRIP charter fleet and private-rental mode are summarized in Matter (SEDAR31-DW04).

*Headboat Survey Biological Sampling*
Lengths were collected from 1986 to 2011 by headboat dockside samplers in the Gulf of Mexico, in all of the coastal Gulf states except Mississippi, where sampling started in 2010. Weights are typically collected for the same fish measured during dockside sampling. Also, biological samples (scales, otoliths, spines, stomachs and gonads) are collected routinely and processed for aging, diet studies, and maturity studies. Number of red snapper measured for length in the headboat fleet by year is presented in Table 4.10.7. Numbers of trips from which red snapper were measured are summarized in Matter (SEDAR31-DW04).

*Texas Parks and Wildlife Department Biological Sampling*
The TPWD Sport-boat Angling Survey samples fishing trips made by sport-boat anglers fishing in Texas marine waters. All sampling takes place at recreational boat access sites. Length composition of the catch for sampled boat-trips has been collected since the high-season of 1983 (mid-May). Total length is measured by compressing the caudal fin lobes dorsoventrally to obtain the maximum possible total length. Weights of sampled fish are not recorded.

The number of red snapper measured in the TPWD charter and private-rental modes are summarized by year in Table 4.10.8. The number of trips with measured red snapper in the TPWD charter and private-rental modes are summarized in Matter (SEDAR31-DW04).

*Observer Programs*
Numbers of sampled red snapper on observed headboat trips in Florida and Alabama, and on observed charterboat trips in Florida are presented in Sauls (SEDAR31-DW11). Biological samples such as scales, otoliths, spines, stomachs and gonads, are not typically collected as part of this protocol.

#### *4.5.2 Length Distributions*

Length freq histograms from SEDAR31-DW10 are reproduced in Figures 4.11.5 and 4.11.6.

*Recreational Landings*
Length frequencies from recreational landings were calculated by year (1992 to 2011), by season (4 month period), and by Gulf region. These recreational length data were grouped by Gulf region (east and west). The eastern Gulf included Florida, Alabama and Mississippi, and the western Gulf included Louisiana and Texas. Detailed methods and proportions of each length by year and region are available in Ping (SEDAR31-DW10).

Changes in length frequency distributions were analyzed to examine the possible changes in selectivity-on-size. Changes in length frequency distributions appear to coincide with changes in fishing regulations and fishing behavior. Noticeable differences were found in the length frequency distributions of recreational length samples collected after 2007, when the bag limits per person per boat was cut from 4 to 2. These differences may indicate a change in selectivity-on-size due to the changes in fishing regulations (SEDAR31-DW10).

*Observer Programs*
Length frequency histograms for harvested and discarded red snapper by year for Florida headboats, Florida charterboats, Alabama headboats, and Texas charterboats are presented in Sauls (SEDAR31-DW11).

Length frequency distributions from observed headboat data in Florida also showed an increase in the proportion of larger fish caught in 2009-2011 compared to 2005-2007 (SEDAR31-DW11).

#### *4.5.3 Recreational Catch-at-Age*

Catch-at-age matrices were developed from direct observed age composition. The methods and resulting matrices are reported in Appendix B. A summary of the findings associated with the age composition of recreational red snapper sampled in the Gulf of Mexico follows.

Catch at age matrices developed in 2012 were nearly identical to those previously reported. However, a comparison of length composition of fish chosen for otolith analysis to that of the lengths of all samples revealed evidence of non-representative sampling prior to 2000, and missing length composition data during 2009-2011. A revised analysis will be completed prior to the assessment workshop to include additional length composition data (Appendix B).

## 4.6 Recreational Effort

Total recreational effort is summarized below by survey. Effort is summarized for all marine fishing by mode, regardless of what was caught. A map and figures summarizing MRFSS/MRIP and TPWD effort in angler trips are included in Figure 4.11.7. A map and figures summarizing SRHS effort in angler days are included in Figure 4.11.8.

### *4.6.1 MRFSS/MRIP Effort*

Effort estimates for the recreational fishery survey are produced via telephone surveys of both anglers (private/rental boats and shore fishers) and for-hire boat operators (charterboat anglers, and in early years, party or charter anglers). The methods have changed during the full time series (see section 4.3 for descriptions of survey method changes and adjustments to survey estimates for uniform time-series of catch estimates). Angler trip estimates are tabulated in Table 4.10.9 by year and Gulf region. An angler-trip is a single day of fishing in the specified mode, not to exceed 24 hours. Both Texas and shore mode effort estimates have been excluded from the MRFSS/MRIP estimates since these strata were excluded from the landings estimates of red snapper.

### *4.6.2 Headboat Effort*

Headboats report catch and effort data for each trip via the SHRS logbooks. A vessel's captain or designated crew member completes a logbook form for each trip. The form details the total number and weight of all the species kept, along with the total number of fish discarded for each species. Numbers of anglers on a given trip represents the measure of effort reported in the SRHS logbooks. Numbers of anglers are standardized, depending on the type of trip (length in hours), by converting number of anglers to "angler days" (e.g., 40 anglers on a half-day trip would yield 40 * 0.5 = 20 angler days). This standardization assumes that all anglers fished the entire time. Angler days are summed by month for individual vessels. Each month, port agents collect these logbook trip reports and check for accuracy and completeness. Although reporting via the logbooks is mandatory, compliance is not 100% and is variable by location. To account for non-reporting, a correction factor is developed based on sampler observations, angler numbers from office books and all available information. This information is used to provide estimates of total catch by month and area, along with estimates of effort.

Estimated headboat angler days are tabulated in Table 4.10.10. Estimated headboat angler days have decreased in the Gulf of Mexico in recent years. The most obvious factor which impacted the headboat fishery in both the Atlantic and Gulf of Mexico was the high price of fuel. This coupled with the economic down, turn starting in 2008, has resulted in a marked decline in angler days in the Gulf of Mexico headboat fishery. Reports from industry staff, captains\owners, and port agents indicated fuel prices, the economy and fishing regulations are the factors that most affected the amount of trips, number of passengers, and overall fishing effort. Also important to note, is the decrease in effort in the Gulf of Mexico in 2010, the year of the Deepwater Horizon oil spill.

### *4.6.3 Texas Parks and Wildlife Effort*

The TPWD survey is designed to estimate landings and effort by high-use (May 15-November 20) and low-use seasons (November 21-May 14). Only private and charterboat fishing modes are surveyed. Most of the sampled trips are from private boats fishing in bay/pass because these represent most of the fishing effort, but all trips (private, charterboat, ocean, bay/pass) are sampled. Charterboat trips in ocean waters are the least encountered in the survey. Estimates of TPWD angler trips are shown in Table 4.10.11 by year, season, and mode.

## 4.7 Tasks to Be Completed

1) Task: Estimate headboat discards using methods described in Section 4.4.2.
   Responsibility: Vivian Matter, NOAA Fisheries
   Expected Completion Date: To be tabulated in an Assessment Workshop working paper.
2) Task: Explore existing and new methods for estimating historical recreational landings.
   Responsibility: Adyan Rios, NOAA Fisheries
   Expected Completion Date: To be developed into an Assessment Workshop working paper.

## 4.8 Research Recommendations

1) Evaluate the technique used to apply sample weights to landings. Investigate the SEFSC Method by analyzing the order of variables in the hierarchy and the minimum number of fish used. Furthermore, evaluate alternative methods, including a meta-analysis of the existing information from difference sources, areas, states, surveys, etc. that could be performed.
2) Develop methods to identify angler preference and targeted effort. Require a reef fish stamp for anglers targeting reef fish, pelagic stamp for migratory species, and deep-water complex stamp for deep-water species. The program would be similar to the federal duck stamp required of hunters and could help managers identify what anglers were fishing for.
3) Continue and expand fishery dependent at sea observer surveys to collect discard information. This would help to validate self-reported headboat discard rates.
4) Track Texas commercial and recreational discards.
5) Estimate variances associated with the headboat program.
6) Evaluate existing and new methods to estimate historical landings. Hind-casting of red snapper landings is complicated by a lack of reliable historical effort data. To get at estimating historical effort, analysts could track consumables (gas, ice, bait) to develop price indices.
7) Investigate how CPUE changes over time due to technological advances and changes in fishing practices.

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## 4.10 Tables

**Table 4.10.1.** Gulf of Mexico (FLW-LA) red snapper landings (numbers of fish and whole weight in pounds) from MRIP by year and Gulf region. Estimates from 1981-2003 have been adjusted to MRIP numbers. *CVs for 1981-1985 only reflect the private mode CVs, since charter and headboat mode CVs are unavailable.

| | East | | | West | | | Total Gulf | | |
|---|---|---|---|---|---|---|---|---|---|
| YEAR | Number | CV_num | Weight (lbs) | Number | CV_num | Weight (lbs) | Number | CV_num | Weight (lbs) |
| 1981 | 848,594 | 0.46* | 1,456,721 | 1,384,112 | 0.55* | 2,778,388 | 2,232,706 | 0.38* | 4,235,109 |
| 1982 | 868,222 | 0.50* | 1,716,769 | 1,052,602 | 0.23* | 1,672,942 | 1,920,824 | 0.26* | 3,389,710 |
| 1983 | 1,083,191 | 0.17* | 1,947,352 | 1,834,671 | 0.35* | 2,630,776 | 2,917,863 | 0.23* | 4,578,128 |
| 1984 | 186,546 | 0.28* | 405,824 | 651,177 | 0.18* | 2,352,335 | 837,723 | 0.15* | 2,758,159 |
| 1985 | 490,367 | 0.21* | 942,058 | 517,021 | 0.14* | 1,367,201 | 1,007,388 | 0.13* | 2,309,259 |
| 1986 | 558,466 | 0.24 | 1,881,787 | 269,493 | 0.32 | 496,234 | 827,960 | 0.19 | 2,378,021 |
| 1987 | 538,002 | 0.30 | 1,089,945 | 117,316 | 0.49 | 217,516 | 655,318 | 0.26 | 1,307,461 |
| 1988 | 509,493 | 0.27 | 1,185,811 | 248,104 | 0.32 | 817,542 | 757,597 | 0.21 | 2,003,354 |
| 1989 | 462,519 | 0.44 | 1,008,082 | 194,983 | 0.48 | 566,098 | 657,502 | 0.34 | 1,574,180 |
| 1990 | 305,131 | 0.29 | 783,510 | 103,483 | 0.68 | 204,773 | 408,613 | 0.28 | 988,283 |
| 1991 | 533,087 | 0.23 | 1,200,588 | 214,000 | 0.69 | 735,422 | 747,087 | 0.26 | 1,936,010 |
| 1992 | 830,961 | 0.18 | 2,115,316 | 283,851 | 0.31 | 832,673 | 1,114,812 | 0.15 | 2,947,989 |
| 1993 | 1,235,076 | 0.18 | 3,423,992 | 369,889 | 0.34 | 1,219,021 | 1,604,965 | 0.16 | 4,643,013 |
| 1994 | 772,832 | 0.16 | 2,632,008 | 224,480 | 0.34 | 902,448 | 997,312 | 0.15 | 3,534,456 |
| 1995 | 617,484 | 0.23 | 1,962,004 | 288,724 | 0.38 | 1,149,264 | 906,208 | 0.20 | 3,111,268 |
| 1996 | 570,569 | 0.23 | 2,362,141 | 156,415 | 0.51 | 606,334 | 726,984 | 0.21 | 2,968,474 |
| 1997 | 961,781 | 0.21 | 3,458,577 | 168,344 | 0.34 | 820,190 | 1,130,124 | 0.18 | 4,278,766 |
| 1998 | 754,329 | 0.08 | 2,331,406 | 114,799 | 0.38 | 509,110 | 869,127 | 0.09 | 2,840,516 |
| 1999 | 721,883 | 0.11 | 2,797,578 | 91,976 | 0.33 | 557,182 | 813,858 | 0.11 | 3,354,760 |
| 2000 | 697,981 | 0.11 | 2,449,054 | 104,877 | 0.39 | 682,569 | 802,858 | 0.11 | 3,131,624 |
| 2001 | 833,129 | 0.12 | 3,499,414 | 58,959 | 0.59 | 217,017 | 892,088 | 0.12 | 3,716,430 |
| 2002 | 1,108,290 | 0.09 | 4,247,380 | 49,195 | 0.32 | 289,474 | 1,157,486 | 0.09 | 4,536,854 |
| 2003 | 967,577 | 0.12 | 3,839,526 | 74,244 | 0.33 | 416,761 | 1,041,822 | 0.12 | 4,256,287 |
| 2004 | 1,190,622 | 0.13 | 4,396,367 | 88,405 | 0.15 | 316,965 | 1,279,027 | 0.12 | 4,713,332 |
| 2005 | 724,663 | 0.10 | 2,753,276 | 110,503 | 0.19 | 471,898 | 835,166 | 0.09 | 3,225,174 |
| 2006 | 793,646 | 0.10 | 2,640,826 | 172,934 | 0.17 | 598,502 | 966,580 | 0.08 | 3,239,328 |
| 2007 | 1,064,180 | 0.09 | 3,524,483 | 159,638 | 0.20 | 587,047 | 1,223,818 | 0.08 | 4,111,530 |
| 2008 | 591,637 | 0.09 | 2,520,422 | 84,311 | 0.27 | 516,408 | 675,949 | 0.09 | 3,036,829 |
| 2009 | 698,335 | 0.13 | 3,132,241 | 97,250 | 0.24 | 639,081 | 795,585 | 0.12 | 3,771,321 |
| 2010 | 327,013 | 0.16 | 1,614,967 | 6,676 | 0.68 | 55,687 | 333,689 | 0.16 | 1,670,654 |
| 2011 | 488,919 | 0.13 | 3,176,492 | 31,349 | 0.36 | 303,813 | 520,269 | 0.12 | 3,480,305 |

**Table 4.10.2** Gulf of Mexico red snapper landings (number of fish) from the SRHS by year and Gulf region.

| | East | | West | | Total Gulf | |
|---|---|---|---|---|---|---|
| YEAR | Number | Weight (lbs) | Number | Weight (lbs) | Number | Weight (lbs) |
| 1981 | | | 335,366 | 416,165 | 335,366 | 416,165 |
| 1982 | | | 335,366 | 416,165 | 335,366 | 416,165 |
| 1983 | | | 335,366 | 416,165 | 335,366 | 416,165 |
| 1984 | | | 335,366 | 416,165 | 335,366 | 416,165 |
| 1985 | | | 335,366 | 416,165 | 335,366 | 416,165 |
| 1986 | 16,364 | 37,848 | 316,090 | 372,639 | 332,454 | 410,487 |
| 1987 | 9,685 | 26,297 | 319,348 | 384,743 | 329,033 | 411,040 |
| 1988 | 13,832 | 32,800 | 423,024 | 581,356 | 436,856 | 614,156 |
| 1989 | 10,797 | 23,828 | 372,473 | 962,612 | 383,270 | 986,440 |
| 1990 | 15,539 | 35,760 | 187,006 | 342,552 | 202,545 | 378,312 |
| 1991 | 15,580 | 35,161 | 264,686 | 448,511 | 280,266 | 483,672 |
| 1992 | 33,873 | 77,211 | 413,056 | 872,851 | 446,929 | 950,062 |
| 1993 | 37,275 | 84,344 | 458,772 | 1,300,045 | 496,047 | 1,384,389 |
| 1994 | 28,998 | 83,818 | 497,738 | 1,441,631 | 526,736 | 1,525,449 |
| 1995 | 23,078 | 74,911 | 354,550 | 1,282,712 | 377,628 | 1,357,623 |
| 1996 | 28,388 | 84,397 | 349,266 | 1,324,382 | 377,654 | 1,408,779 |
| 1997 | 48,439 | 120,636 | 347,424 | 1,183,775 | 395,863 | 1,304,411 |
| 1998 | 76,759 | 184,095 | 244,738 | 940,650 | 321,497 | 1,124,745 |
| 1999 | 67,432 | 195,966 | 98,699 | 503,001 | 166,131 | 698,967 |
| 2000 | 57,640 | 177,839 | 111,410 | 585,448 | 169,050 | 763,287 |
| 2001 | 51,289 | 167,617 | 116,358 | 405,868 | 167,647 | 573,486 |
| 2002 | 75,121 | 217,585 | 138,475 | 607,217 | 213,596 | 824,802 |
| 2003 | 71,021 | 222,142 | 157,905 | 569,754 | 228,926 | 791,897 |
| 2004 | 63,482 | 190,118 | 110,329 | 503,158 | 173,811 | 693,276 |
| 2005 | 46,791 | 146,482 | 99,988 | 379,855 | 146,779 | 526,337 |
| 2006 | 47,882 | 125,533 | 121,177 | 450,704 | 169,059 | 576,238 |
| 2007 | 63,603 | 173,753 | 110,314 | 313,252 | 173,917 | 487,004 |
| 2008 | 61,986 | 185,243 | 57,569 | 222,709 | 119,555 | 407,952 |
| 2009 | 81,590 | 314,558 | 75,998 | 491,335 | 157,588 | 805,893 |
| 2010 | 35,943 | 145,448 | 51,514 | 284,079 | 87,457 | 429,527 |
| 2011 | 69,187 | 320,646 | 50,656 | 309,916 | 119,843 | 630,563 |

**Table 4.10.3** Texas red snapper landings (number of fish and whole weight in pounds) from TPWD by year. CVs are taken from the TPWD seasonal estimates.

| | West | | |
|---|---|---|---|
| YEAR | Number | CV_num | Weight (lbs) |
| 1981 | 71,227 | | 151,411 |
| 1982 | 71,227 | | 151,411 |
| 1983 | 71,785 | 0.31 | 89,287 |
| 1984 | 36,091 | 0.37 | 66,690 |
| 1985 | 105,806 | 0.48 | 298,260 |
| 1986 | 127,739 | 0.83 | 180,456 |
| 1987 | 47,396 | 0.54 | 85,627 |
| 1988 | 53,577 | 0.57 | 87,243 |
| 1989 | 24,309 | 0.42 | 38,807 |
| 1990 | 25,493 | 0.41 | 42,996 |
| 1991 | 40,500 | 0.36 | 73,611 |
| 1992 | 34,636 | 0.24 | 83,061 |
| 1993 | 46,123 | 0.37 | 124,665 |
| 1994 | 87,419 | 0.31 | 247,943 |
| 1995 | 97,397 | 0.28 | 318,581 |
| 1996 | 85,470 | 0.26 | 313,608 |
| 1997 | 80,543 | 0.28 | 290,105 |
| 1998 | 66,025 | 0.36 | 267,721 |
| 1999 | 54,043 | 0.35 | 192,878 |
| 2000 | 52,714 | 0.34 | 174,773 |
| 2001 | 48,607 | 0.31 | 157,517 |
| 2002 | 52,897 | 0.28 | 187,823 |
| 2003 | 38,349 | 0.28 | 133,651 |
| 2004 | 40,770 | 0.32 | 133,493 |
| 2005 | 55,684 | 0.26 | 202,327 |
| 2006 | 63,284 | 0.37 | 209,284 |
| 2007 | 46,797 | 0.28 | 169,573 |
| 2008 | 36,442 | 0.41 | 174,935 |
| 2009 | 34,387 | 0.27 | 197,680 |
| 2010 | 30,197 | 0.39 | 177,228 |
| 2011 | 36,131 | 0.41 | 195,121 |

**Table 4.10.4** Gulf of Mexico (FLW-LA) red snapper discards (numbers of fish) from MRIP by year and Gulf region. Estimates from 1981-2003 have been adjusted to MRIP numbers. *CVs for 1981-1985 only reflect the private mode CVs, since charter and headboat mode CVs are unavailable.

| | East | | West | | Total Gulf | |
|---|---|---|---|---|---|---|
| YEAR | Discards | CV | Discards | CV | Discards | CV |
| 1981 | 51,548 | 0.88* | 10,037 | 1.01* | 61,586 | 0.75* |
| 1982 | 16,659 | 0.76* | 14,344 | 0.26* | 31,003 | 0.42* |
| 1983 | 479 | 1.98* | 3,585 | 0.00* | 4,064 | 0.23* |
| 1984 | 25,159 | 1.52* | 0 | 0.00* | 25,159 | 1.52* |
| 1985 | 15,349 | 0.99* | 45,856 | 1.35* | 61,204 | 1.04* |
| 1986 | 39,599 | 0.54 | 5,036 | 0.78 | 44,635 | 0.49 |
| 1987 | 62,666 | 0.48 | 7,844 | 1.25 | 70,509 | 0.45 |
| 1988 | 64,040 | 0.51 | 147,211 | 0.81 | 211,251 | 0.59 |
| 1989 | 168,435 | 0.65 | 114,579 | 0.72 | 283,014 | 0.48 |
| 1990 | 424,721 | 0.57 | 172,929 | 0.83 | 597,650 | 0.47 |
| 1991 | 769,651 | 0.32 | 256,574 | 0.64 | 1,026,225 | 0.29 |
| 1992 | 847,379 | 0.20 | 214,942 | 0.38 | 1,062,321 | 0.18 |
| 1993 | 900,495 | 0.25 | 259,803 | 0.43 | 1,160,298 | 0.22 |
| 1994 | 709,312 | 0.25 | 282,222 | 0.49 | 991,534 | 0.23 |
| 1995 | 393,610 | 0.38 | 408,644 | 0.48 | 802,254 | 0.31 |
| 1996 | 878,667 | 0.28 | 100,060 | 0.84 | 978,727 | 0.27 |
| 1997 | 1,796,061 | 0.24 | 103,049 | 0.46 | 1,899,110 | 0.23 |
| 1998 | 933,276 | 0.10 | 105,271 | 0.44 | 1,038,546 | 0.10 |
| 1999 | 1,268,605 | 0.12 | 228,956 | 0.34 | 1,497,561 | 0.12 |
| 2000 | 1,433,219 | 0.15 | 127,605 | 0.52 | 1,560,824 | 0.14 |
| 2001 | 1,934,396 | 0.13 | 54,550 | 0.50 | 1,988,947 | 0.13 |
| 2002 | 2,280,040 | 0.14 | 43,270 | 0.38 | 2,323,310 | 0.13 |
| 2003 | 1,973,629 | 0.14 | 184,735 | 0.43 | 2,158,364 | 0.13 |
| 2004 | 2,413,011 | 0.12 | 274,135 | 0.23 | 2,687,146 | 0.11 |
| 2005 | 1,849,815 | 0.12 | 339,593 | 0.20 | 2,189,408 | 0.11 |
| 2006 | 2,393,573 | 0.10 | 429,127 | 0.17 | 2,822,700 | 0.09 |
| 2007 | 2,959,674 | 0.10 | 284,832 | 0.23 | 3,244,506 | 0.09 |
| 2008 | 1,845,033 | 0.12 | 262,197 | 0.28 | 2,107,231 | 0.11 |
| 2009 | 1,947,812 | 0.12 | 195,482 | 0.20 | 2,143,294 | 0.11 |
| 2010 | 1,426,636 | 0.16 | 6,779 | 0.73 | 1,433,415 | 0.16 |
| 2011 | 1,412,941 | 0.14 | 108,302 | 0.42 | 1,521,243 | 0.13 |

**Table 4.10.5** Texas red snapper discards (numbers of fish) from TPWD by year.

| | West |
|---|---|
| YEAR | Discards |
| 1981 | 514 |
| 1982 | 619 |
| 1983 | 86 |
| 1984 | 0 |
| 1985 | 47,238 |
| 1986 | 236 |
| 1987 | 7,619 |
| 1988 | 34,329 |
| 1989 | 15,429 |
| 1990 | 26,652 |
| 1991 | 86,464 |
| 1992 | 24,753 |
| 1993 | 30,631 |
| 1994 | 95,673 |
| 1995 | 149,909 |
| 1996 | 39,742 |
| 1997 | 50,180 |
| 1998 | 60,634 |
| 1999 | 131,464 |
| 2000 | 64,560 |
| 2001 | 42,833 |
| 2002 | 62,256 |
| 2003 | 133,373 |
| 2004 | 229,890 |
| 2005 | 185,774 |
| 2006 | 169,427 |
| 2007 | 82,617 |
| 2008 | 118,428 |
| 2009 | 73,095 |
| 2010 | 19,754 |
| 2011 | 120,537 |

**Table 4.10.6** Number of red snapper measured or weighed in the Gulf of Mexico in the MRFSS/MRIP by year, mode, and state.

| | Cbt | | | | | Hbt | | | | | Priv | | | | | | Grand |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR | LA | MS | AL | FLW | All | TX | LA | AL | FLW | All | TX | LA | MS | AL | FLW | All | Total |
| 1981 | 22 | | 62 | 20 | 104 | | 10 | 22 | 13 | 45 | | 35 | | 53 | 68 | 156 | 305 |
| 1982 | 5 | 10 | 40 | 29 | 84 | | 134 | 33 | 25 | 192 | | 153 | 7 | 14 | 63 | 237 | 513 |
| 1983 | 424 | | 118 | 86 | 628 | | 416 | 28 | 127 | 571 | | 129 | 5 | 3 | 7 | 144 | 1,343 |
| 1984 | 214 | | 3 | 38 | 255 | | 26 | 2 | 19 | 47 | | 52 | 1 | 14 | 6 | 73 | 375 |
| 1985 | 40 | | 36 | 3 | 79 | 79 | 62 | 2 | 15 | 158 | 25 | 30 | 1 | 2 | 9 | 67 | 304 |
| 1986 | 354 | 16 | 105 | 61 | 536 | | | | | | | 52 | 1 | 7 | 10 | 70 | 606 |
| 1987 | 230 | 10 | 242 | 219 | 701 | | | | | | | 22 | 3 | 59 | 117 | 201 | 902 |
| 1988 | 6 | 42 | 246 | 65 | 359 | | | | | | | 68 | 17 | 1 | 24 | 110 | 469 |
| 1989 | 20 | 27 | 125 | 17 | 189 | | | | | | | 64 | | 5 | 11 | 80 | 269 |
| 1990 | 83 | 14 | 136 | 17 | 250 | | | | | | | 23 | 7 | 42 | 9 | 81 | 331 |
| 1991 | 281 | 42 | 646 | 51 | 1,020 | | | | | | | 5 | 46 | 146 | 2 | 199 | 1,219 |
| 1992 | 312 | 250 | 1,290 | 220 | 2,072 | | | | | | | 68 | 216 | 331 | 14 | 629 | 2,701 |
| 1993 | 125 | 98 | 314 | 257 | 794 | | | | | | | 62 | 53 | 155 | 29 | 299 | 1,093 |
| 1994 | 118 | 33 | 328 | 116 | 595 | | | | | | | 68 | 46 | 136 | 17 | 267 | 862 |
| 1995 | 145 | 5 | 197 | 58 | 405 | | | | | | | 58 | 22 | 83 | 15 | 178 | 583 |
| 1996 | 108 | 36 | 133 | 61 | 338 | | | | | | | 48 | 33 | 61 | 14 | 156 | 494 |
| 1997 | 89 | 11 | 530 | 670 | 1,300 | | | | | | | 25 | 97 | 88 | 7 | 217 | 1,517 |
| 1998 | 186 | 13 | 1,288 | 1,632 | 3,119 | | | | | | | 18 | 53 | 74 | 14 | 159 | 3,278 |
| 1999 | 37 | 65 | 3,626 | 3,686 | 7,414 | | | | | | | 117 | 56 | 579 | 123 | 875 | 8,289 |
| 2000 | 86 | 66 | 2,908 | 4,762 | 7,822 | | | | | | | 14 | 5 | 354 | 85 | 458 | 8,280 |
| 2001 | 10 | 80 | 2,786 | 3,585 | 6,461 | | | | | | | 8 | 5 | 387 | 105 | 505 | 6,966 |
| 2002 | 237 | 154 | 2,729 | 4,404 | 7,524 | | | | | | | | 22 | 545 | 78 | 645 | 8,169 |
| 2003 | 308 | 57 | 2,229 | 4,139 | 6,733 | | | | | | | 1 | 30 | 300 | 83 | 414 | 7,147 |
| 2004 | 356 | 15 | 1,719 | 3,757 | 5,847 | | | | | | | 7 | | 326 | 89 | 422 | 6,269 |
| 2005 | 185 | | 1,471 | 3,674 | 5,330 | | | | | | | 18 | 1 | 138 | 62 | 219 | 5,549 |
| 2006 | 588 | 15 | 1,062 | 2,880 | 4,545 | | | | | | | 31 | 5 | 74 | 128 | 238 | 4,783 |
| 2007 | 552 | | 983 | 3,402 | 4,937 | | | | | | | 51 | 4 | 81 | 254 | 390 | 5,327 |
| 2008 | 70 | 4 | 284 | 1,563 | 1,921 | | | | | | | 29 | 8 | 79 | 152 | 268 | 2,189 |
| 2009 | 88 | | 305 | 534 | 927 | | | | | | | 57 | 37 | 112 | 53 | 259 | 1,186 |
| 2010 | | 4 | 197 | 822 | 1,023 | | | | | | | 30 | | 72 | 122 | 224 | 1,247 |
| 2011 | 41 | 11 | 235 | 736 | 1,023 | | | | | | | 17 | 1 | 154 | 111 | 283 | 1,306 |
| Grand Total | 5,320 | 1,078 | 26,373 | 41,564 | 74,335 | 79 | 648 | 87 | 199 | 1,013 | 25 | 1,360 | 782 | 4,475 | 1,881 | 8,523 | 83,871 |

**Table 4.10.7** Number of red snapper measured or weighed in the Gulf of Mexico in the SRHS by year and state.

| YEAR | TX | LA | AL/FLW | All states |
|---|---|---|---|---|
| 1986 | 6,015 | 237 | 163 | 6,415 |
| 1987 | 5,565 | 413 | 192 | 6,170 |
| 1988 | 4,048 | 553 | 196 | 4,797 |
| 1989 | 5,033 | 1,278 | 286 | 6,597 |
| 1990 | 3,547 | 716 | 333 | 4,596 |
| 1991 | 2,478 | 944 | 497 | 3,919 |
| 1992 | 5,877 | 2,001 | 683 | 8,561 |
| 1993 | 5,399 | 1,658 | 385 | 7,442 |
| 1994 | 5,790 | 855 | 1,316 | 7,961 |
| 1995 | 7,024 | 1,303 | 441 | 8,768 |
| 1996 | 4,201 | 1,060 | 496 | 5,757 |
| 1997 | 2,185 | 1,814 | 1,142 | 5,141 |
| 1998 | 4,359 | 2,198 | 2,158 | 8,715 |
| 1999 | 1,340 | 1,945 | 884 | 4,169 |
| 2000 | 473 | 2,723 | 1,136 | 4,332 |
| 2001 | 1,022 | 1,513 | 654 | 3,189 |
| 2002 | 1,440 | 945 | 1,250 | 3,635 |
| 2003 | 992 | 1,016 | 1,089 | 3,097 |
| 2004 | 808 | | 544 | 1,352 |
| 2005 | 822 | 194 | 303 | 1,319 |
| 2006 | 658 | 109 | 481 | 1,248 |
| 2007 | 535 | 233 | 1,280 | 2,048 |
| 2008 | 259 | 142 | 1,223 | 1,624 |
| 2009 | 611 | 255 | 947 | 1,813 |
| 2010 | 797 | | 708 | 1,505 |
| 2011 | 689 | 279 | 737 | 1,705 |
| Grand Total | 71,967 | 24,384 | 19,524 | 115,875 |

**Table 4.10.8** Number of red snapper measured or weighed in the state of Texas in the TPWD by year and mode.

| YEAR | Cbt | Priv | All modes |
|---|---|---|---|
| 1983 | 19 | 369 | 388 |
| 1984 | 6 | 393 | 399 |
| 1985 | 84 | 613 | 697 |
| 1986 | 6 | 363 | 369 |
| 1987 | 35 | 450 | 485 |
| 1988 | 25 | 448 | 473 |
| 1989 | 9 | 326 | 335 |
| 1990 | 7 | 371 | 378 |
| 1991 | 15 | 504 | 519 |
| 1992 | 66 | 642 | 708 |
| 1993 | 28 | 826 | 854 |
| 1994 | 48 | 1,120 | 1,168 |
| 1995 | 47 | 1,898 | 1,945 |
| 1996 | 89 | 1,501 | 1,590 |
| 1997 | 79 | 1,424 | 1,503 |
| 1998 | 111 | 1,204 | 1,315 |
| 1999 | 95 | 704 | 799 |
| 2000 | 101 | 1,011 | 1,112 |
| 2001 | 126 | 856 | 982 |
| 2002 | 144 | 934 | 1,078 |
| 2003 | 145 | 935 | 1,080 |
| 2004 | 133 | 879 | 1,012 |
| 2005 | 147 | 1,073 | 1,220 |
| 2006 | 203 | 1,342 | 1,545 |
| 2007 | 257 | 935 | 1,192 |
| 2008 | 157 | 733 | 890 |
| 2009 | 155 | 903 | 1,058 |
| 2010 | 86 | 611 | 697 |
| 2011 | 69 | 887 | 956 |
| Grand Total | 2,492 | 24,255 | 26,747 |

**Table 4.10.9** Gulf of Mexico (FLW-TX) estimated number of **angler trips** for MRFSS (1981-2003) and MRIP (2004-2011) by year and Gulf region. TX angler trip estimates have been excluded. Shore mode angler trip estimates have been excluded.

| YEAR | East | West | Total Gulf |
|---|---|---|---|
| 1981 | 6,085,559 | 992,986 | 7,078,545 |
| 1982 | 4,676,602 | 1,606,279 | 6,282,881 |
| 1983 | 5,493,444 | 1,786,898 | 7,280,342 |
| 1984 | 6,714,199 | 1,339,849 | 8,054,048 |
| 1985 | 6,280,179 | 1,338,503 | 7,618,682 |
| 1986 | 6,674,808 | 1,974,776 | 8,649,584 |
| 1987 | 7,204,841 | 1,859,711 | 9,064,552 |
| 1988 | 8,977,342 | 2,280,703 | 11,258,045 |
| 1989 | 7,482,360 | 1,754,103 | 9,236,464 |
| 1990 | 6,268,723 | 1,373,917 | 7,642,640 |
| 1991 | 7,787,797 | 1,748,850 | 9,536,647 |
| 1992 | 7,858,050 | 1,984,866 | 9,842,916 |
| 1993 | 7,710,287 | 2,119,075 | 9,829,362 |
| 1994 | 8,316,214 | 1,928,957 | 10,245,170 |
| 1995 | 8,190,613 | 2,400,669 | 10,591,282 |
| 1996 | 8,069,748 | 2,271,727 | 10,341,474 |
| 1997 | 8,923,703 | 2,363,251 | 11,286,954 |
| 1998 | 7,777,364 | 1,922,209 | 9,699,572 |
| 1999 | 7,732,807 | 2,048,764 | 9,781,571 |
| 2000 | 9,723,508 | 2,816,590 | 12,540,098 |
| 2001 | 10,349,484 | 2,764,039 | 13,113,524 |
| 2002 | 10,054,340 | 2,344,977 | 12,399,317 |
| 2003 | 11,402,447 | 3,398,922 | 14,801,369 |
| 2004 | 12,510,631 | 3,964,532 | 16,475,162 |
| 2005 | 11,369,702 | 2,906,178 | 14,275,879 |
| 2006 | 11,468,139 | 2,988,229 | 14,456,369 |
| 2007 | 12,532,422 | 3,299,482 | 15,831,904 |
| 2008 | 12,326,691 | 3,687,302 | 16,013,994 |
| 2009 | 10,906,116 | 3,359,031 | 14,265,147 |
| 2010 | 10,131,111 | 3,133,817 | 13,264,928 |
| 2011 | 10,191,640 | 3,454,320 | 13,645,959 |
| Grand Total | 271,190,868 | 73,213,512 | 344,404,380 |

**Table 4.10.10** Gulf of Mexico estimated number of **angler days** from SRHS by year and Gulf region.

| YEAR | East | West | Total Gulf |
|---|---|---|---|
| 1986 | 240,077 | 62,459 | 302,536 |
| 1987 | 217,049 | 69,725 | 286,774 |
| 1988 | 195,948 | 78,087 | 274,035 |
| 1989 | 208,325 | 66,256 | 274,581 |
| 1990 | 213,906 | 65,042 | 278,948 |
| 1991 | 174,312 | 66,342 | 240,654 |
| 1992 | 184,802 | 86,129 | 270,931 |
| 1993 | 207,898 | 92,160 | 300,058 |
| 1994 | 204,562 | 113,429 | 317,991 |
| 1995 | 182,410 | 100,962 | 283,372 |
| 1996 | 154,913 | 102,840 | 257,753 |
| 1997 | 149,442 | 91,215 | 240,657 |
| 1998 | 185,331 | 85,504 | 270,835 |
| 1999 | 176,117 | 66,261 | 242,378 |
| 2000 | 159,331 | 63,347 | 222,678 |
| 2001 | 157,243 | 61,583 | 218,826 |
| 2002 | 141,831 | 73,173 | 215,004 |
| 2003 | 144,211 | 81,068 | 225,279 |
| 2004 | 158,430 | 64,990 | 223,420 |
| 2005 | 130,233 | 59,857 | 190,090 |
| 2006 | 124,049 | 75,794 | 199,843 |
| 2007 | 136,880 | 66,286 | 203,166 |
| 2008 | 130,176 | 44,133 | 174,309 |
| 2009 | 142,438 | 54,005 | 196,443 |
| 2010 | 111,516 | 47,371 | 158,887 |
| 2011 | 158,796 | 49,170 | 207,966 |
| Grand Total | 4,390,226 | 1,887,188 | 6,277,414 |

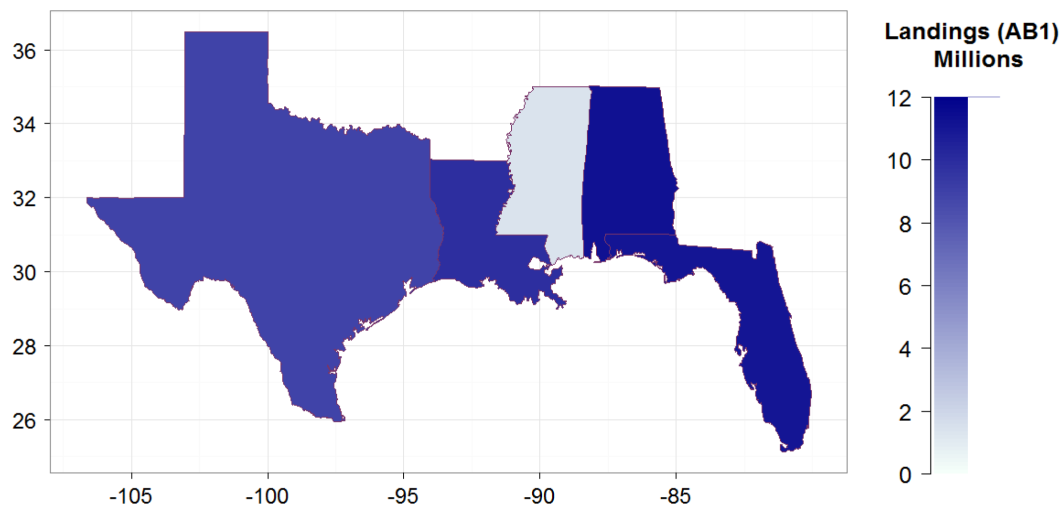
**Table 4.10.11** Texas estimated number of **angler trips** from TPWD by year and season (High-May 15th -Nov 20th; Low- Nov 21st-May 14th).

| YEAR | High | Low | Total |
|---|---|---|---|
| 1983 | 669,126 | | 669,126 |
| 1984 | 559,713 | 175,608 | 735,321 |
| 1985 | 611,251 | 261,821 | 873,072 |
| 1986 | 576,966 | 353,576 | 930,542 |
| 1987 | 775,656 | 361,874 | 1,137,530 |
| 1988 | 729,324 | 340,276 | 1,069,600 |
| 1989 | 714,053 | 243,593 | 957,645 |
| 1990 | 650,895 | 220,197 | 871,092 |
| 1991 | 675,614 | 225,488 | 901,102 |
| 1992 | 765,954 | 264,420 | 1,030,374 |
| 1993 | 721,964 | 328,451 | 1,050,415 |
| 1994 | 792,955 | 392,843 | 1,185,798 |
| 1995 | 727,097 | 426,173 | 1,153,270 |
| 1996 | 800,241 | 377,200 | 1,177,440 |
| 1997 | 775,724 | 324,887 | 1,100,611 |
| 1998 | 759,292 | 326,636 | 1,085,927 |
| 1999 | 887,954 | 432,612 | 1,320,566 |
| 2000 | 828,750 | 494,748 | 1,323,498 |
| 2001 | 791,628 | 359,044 | 1,150,672 |
| 2002 | 748,641 | 358,148 | 1,106,789 |
| 2003 | 762,020 | 369,633 | 1,131,654 |
| 2004 | 750,642 | 375,916 | 1,126,558 |
| 2005 | 702,874 | 358,604 | 1,061,479 |
| 2006 | 724,252 | 432,478 | 1,156,730 |
| 2007 | 720,176 | 337,594 | 1,057,770 |
| 2008 | 679,629 | 377,775 | 1,057,404 |
| 2009 | 708,020 | 327,473 | 1,035,493 |
| 2010 | 701,791 | 285,532 | 987,323 |
| 2011 | 743,213 | 382,188 | 1,125,401 |
| Grand Total | 21,055,415 | 9,514,789 | 30,570,204 |

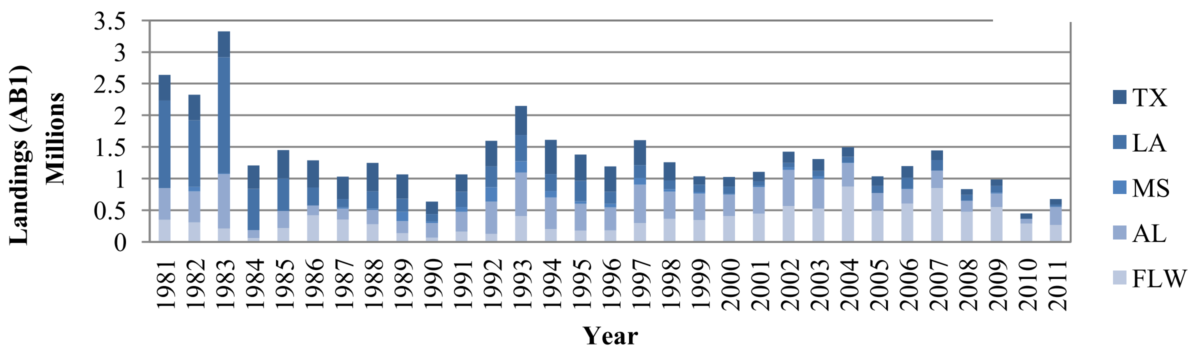
## 4.11 Figures

**Figure 4.11.1:** Gulf of Mexico estimated number of red snapper landings from MRFSS/MRIP, TPWD, and SRHS (1981-2011) by state (a), by state and year (b), and by state and mode (c).

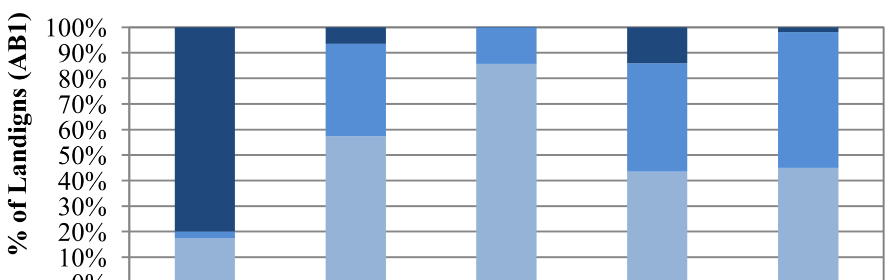
a) **AB1 Red Snapper by State 1981-2011**




b) **AB1 Red Snapper by State and Year 1981-2011**




c) **AB1 Red Snapper by State and Mode 1981-2011**




| Landings (AB1) | TX | LA | MS | AL | FLW |
|---|---|---|---|---|---|
| Hbt | 7,057,522 | 635,863 | 1,263 | 1,578,822 | 205,959 |
| Cbt | 219,008 | 3,549,635 | 186,216 | 4,729,989 | 5,845,617 |
| Priv | 1,544,057 | 5,606,155 | 1,122,831 | 4,860,447 | 4,954,956 |

**Figure 4.11.2** Estimates of historical recreational catch of red snapper in the Gulf of Mexico by region using the coastal census method. Solid lines represent reported catch while dashed lines represent estimated catch. Catch for the east Gulf are shown in light blue, while landings for the west Gulf are shown in dark blue.

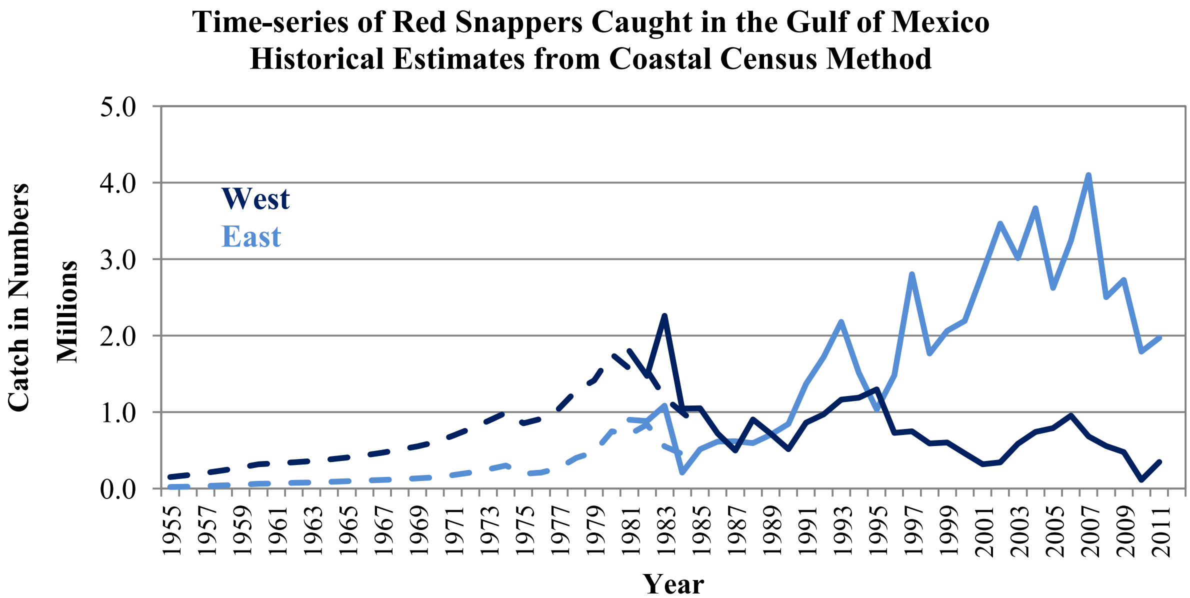


**Figure 4.11.3** Estimates of historical recreational landings of red snapper in the Gulf of Mexico by region using the modified FHWAR method. Solid lines represent reported landings while dashed lines represent estimated landings. Landings for the east Gulf are shown in dark blue, while landings for the west Gulf are shown in light blue.

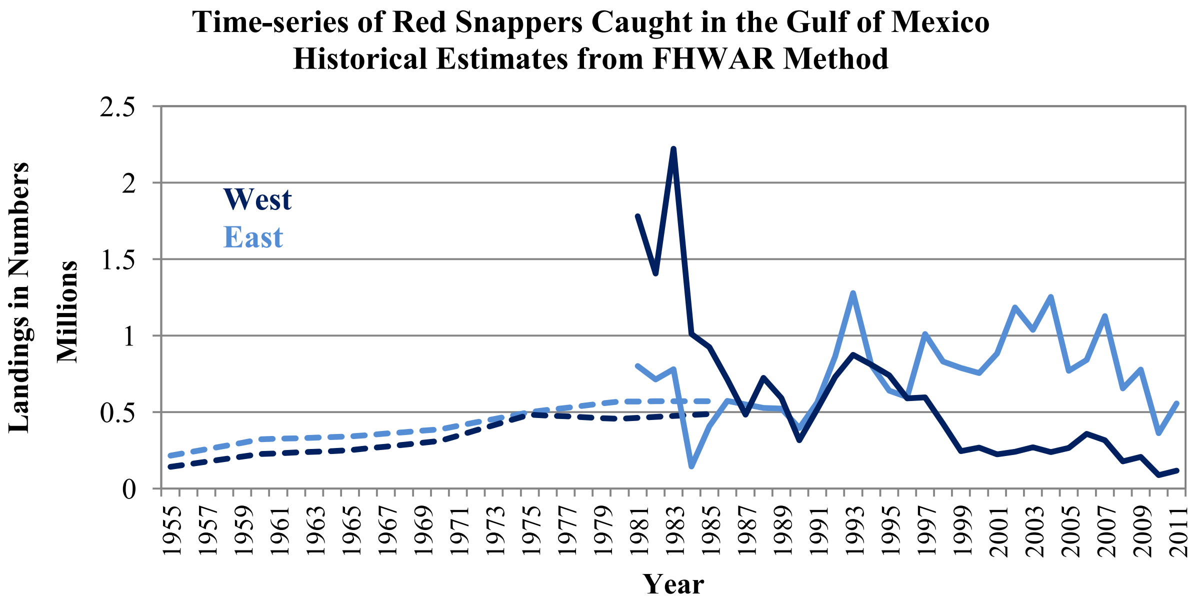
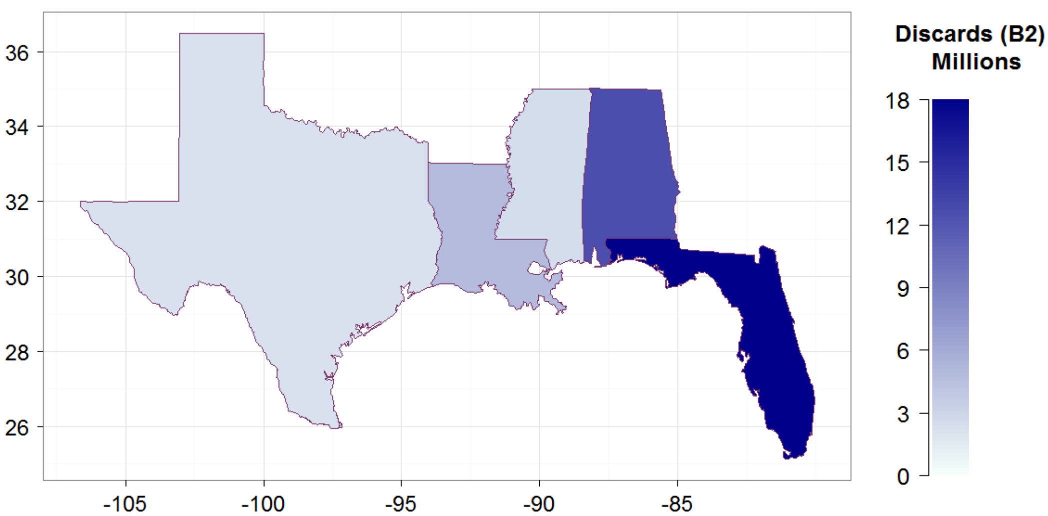
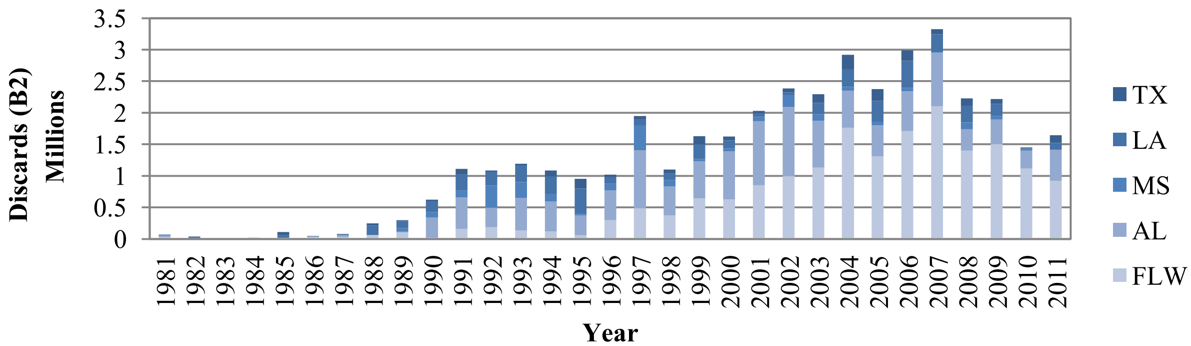


**Figure 4.11.4:** Gulf of Mexico estimated number of red snapper discards from MRFSS/MRIP and TPWD (1981-2011) by state (a), by state and year (b), and by state and mode (c). SRHS discard not yet included.

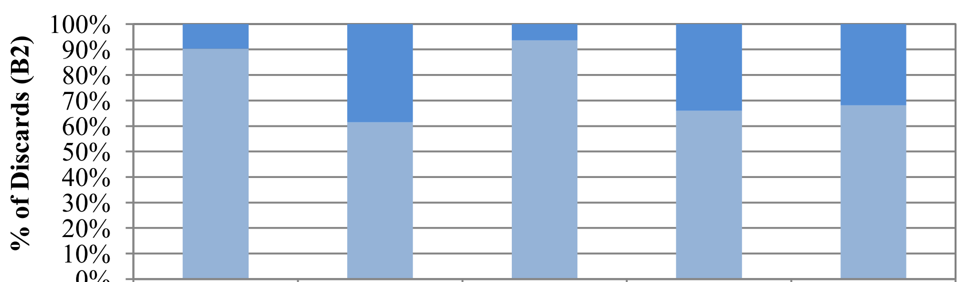
a) **B2 Red Snapper by State 1981-2011**




b) **B2 Red Snapper by State and Year 1981-2011**




c) **B2 Red Snapper by State and Mode 1981-2011**




| Discards (B2) | TX | LA | MS | AL | FLW |
|---|---|---|---|---|---|
| Hbt* | - | 1,182 | - | 118 | 3,912 |
| Cbt | 205,099 | 1,845,297 | 155,741 | 4,298,628 | 5,807,485 |
| Priv | 1,899,617 | 2,945,071 | 2,252,836 | 8,314,608 | 12,402,163 |

*Hbt (1981-1985 only)

**Figure 4.11.5a:** Length frequency distributions of length samples collected from recreational fisheries located in the eastern Gulf of Mexico (RE) from 1992 to 2001.

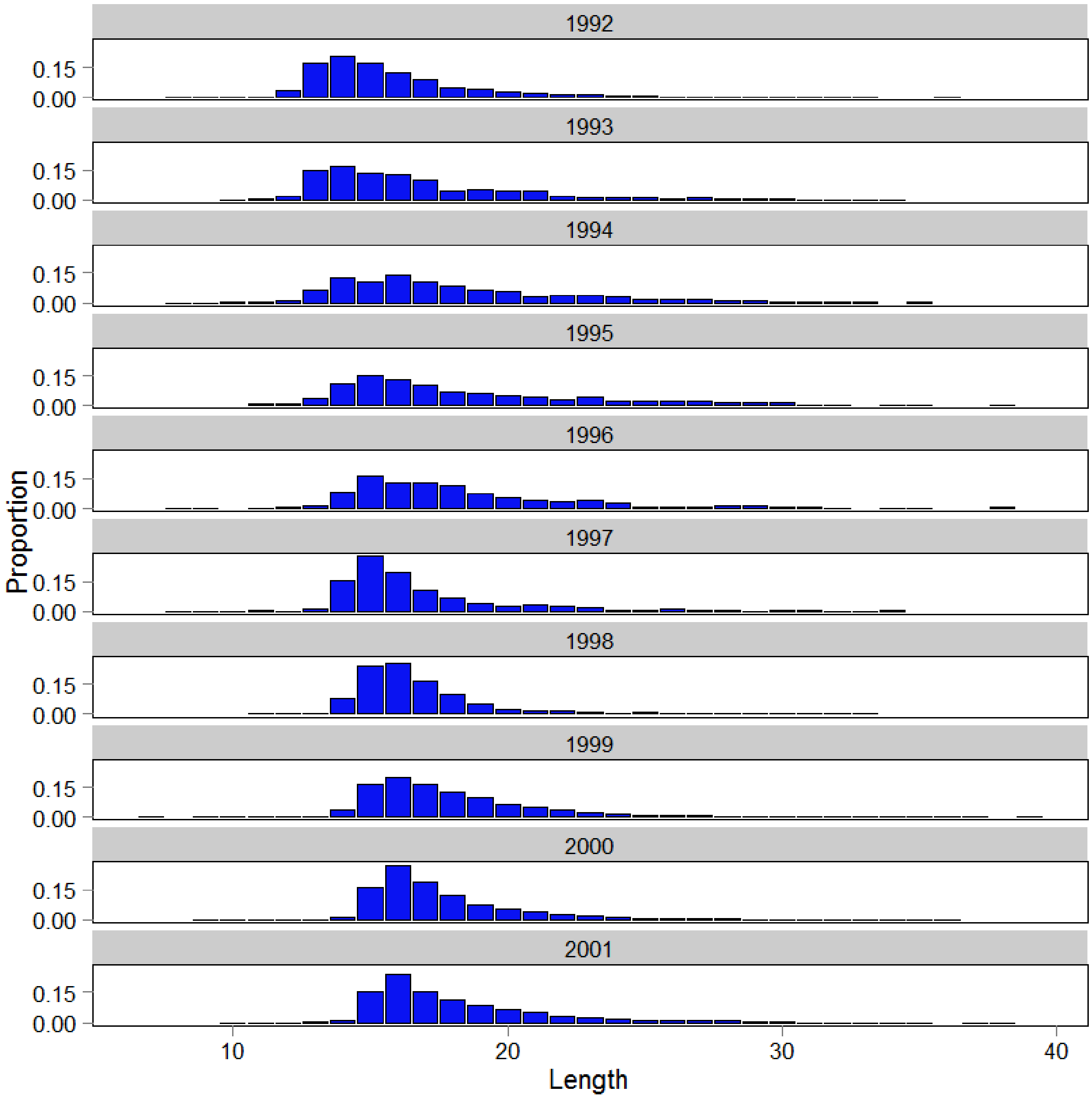


**Figure 4.11.5b**: Length frequency distributions of length samples collected from recreational fisheries located in the eastern Gulf of Mexico (RE) from 2002 to 2011.

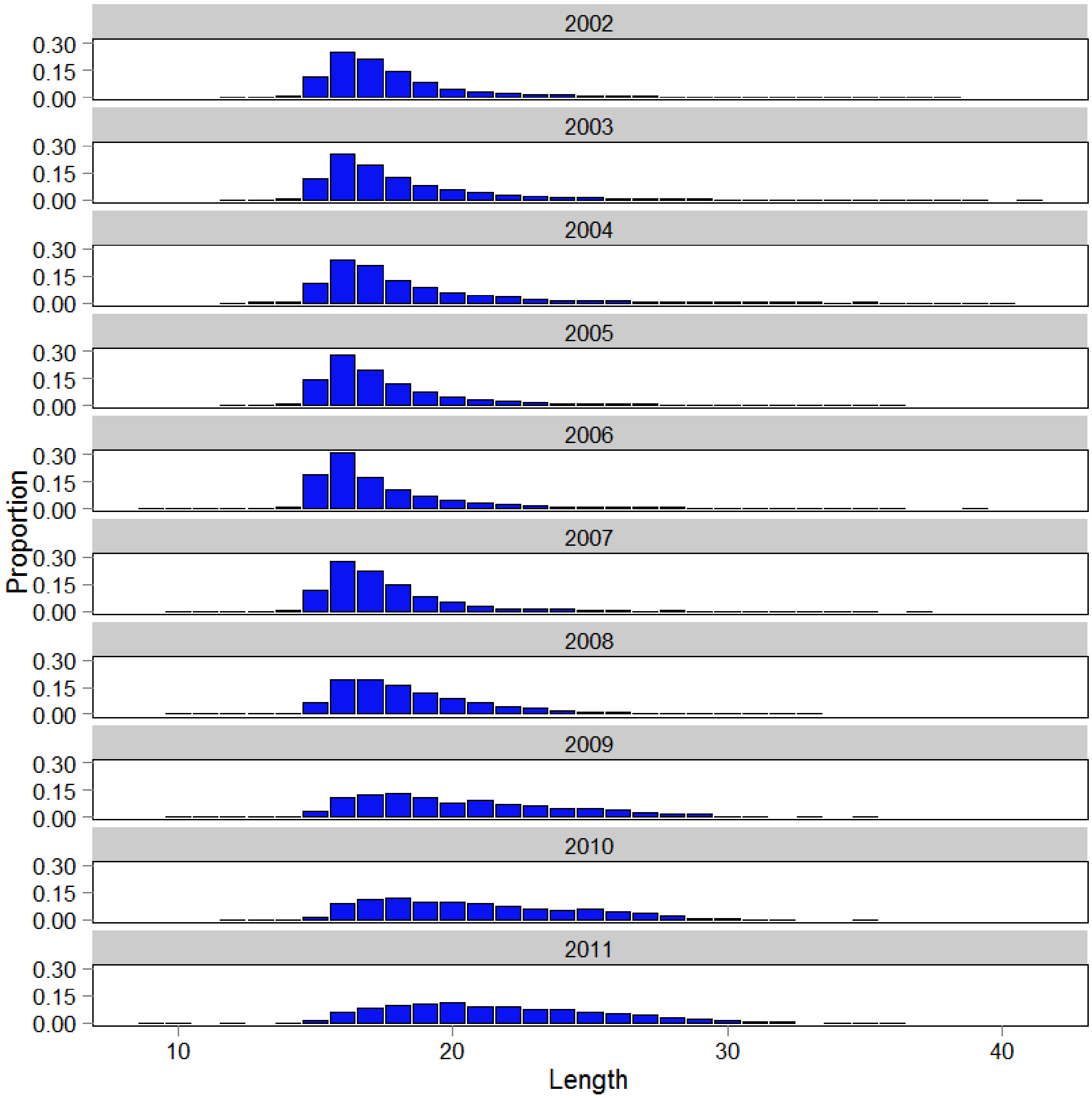


**Figure 4.11.6a**: Length frequency distributions of length samples collected from recreational fisheries located in the western Gulf of Mexico (RW) from 1992 to 2001.

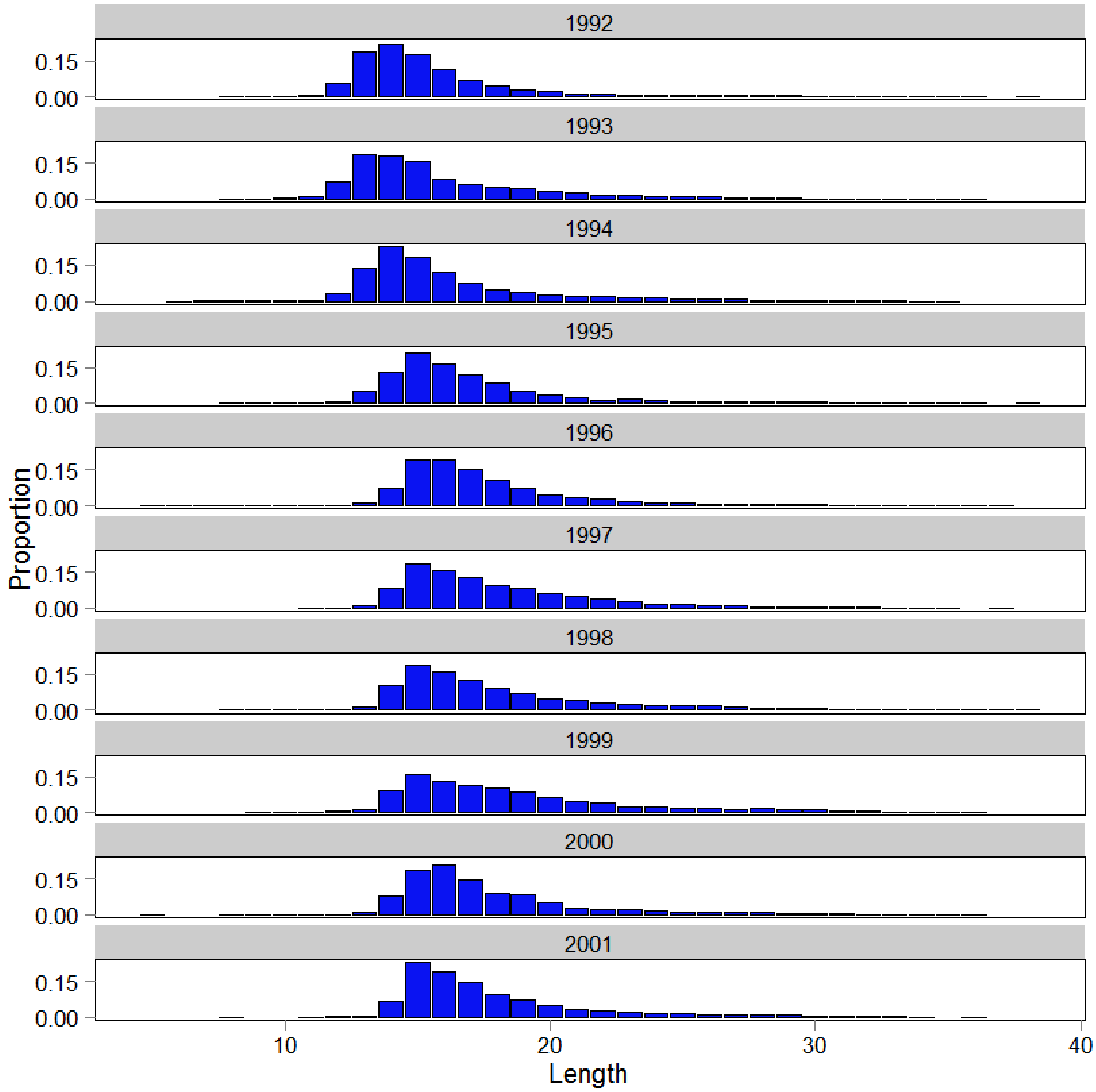


**Figure 4.11.6b**: Length frequency distributions of length samples collected from recreational fisheries located in the western Gulf of Mexico (RW) from 2002 to 2011.

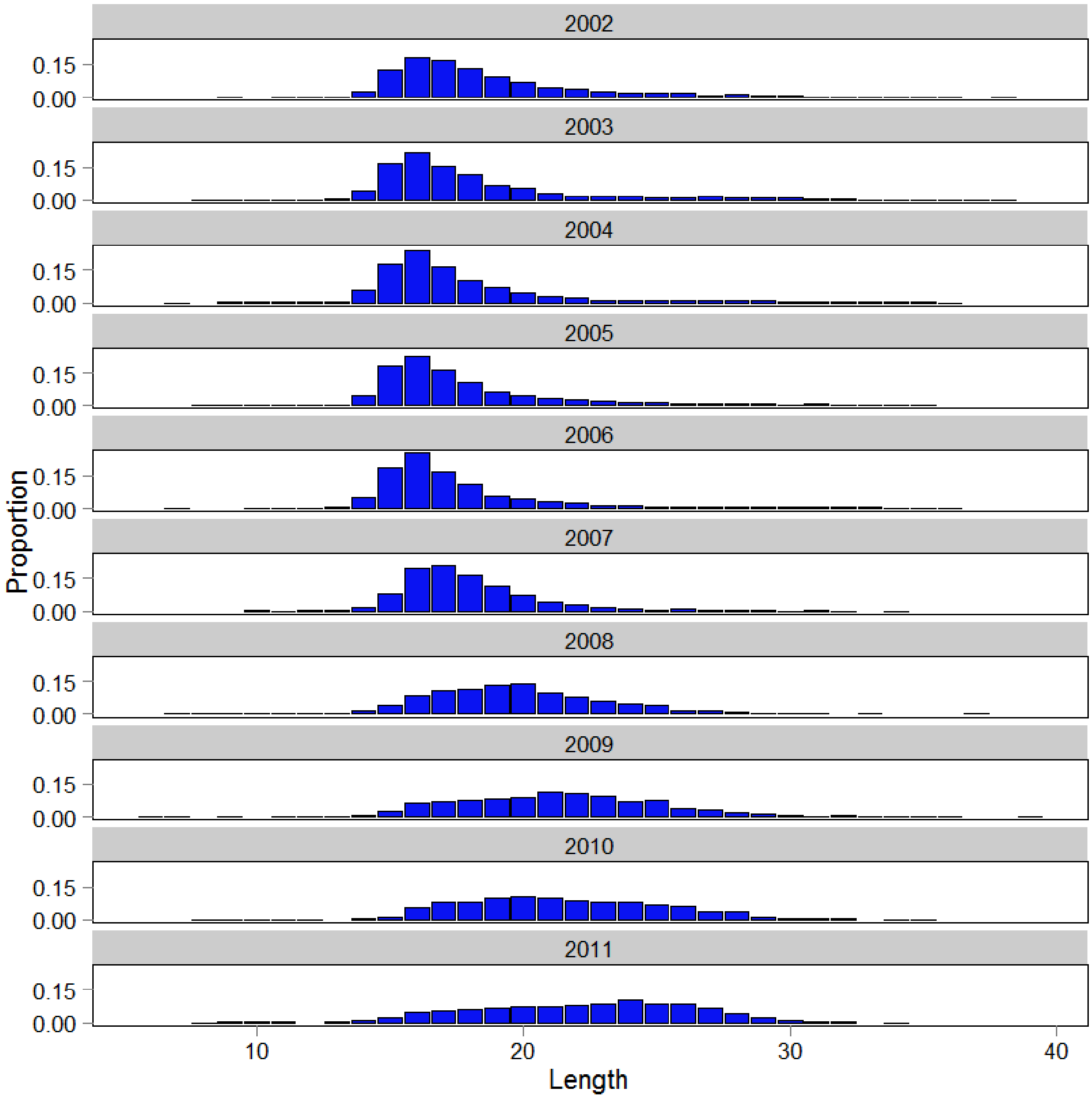
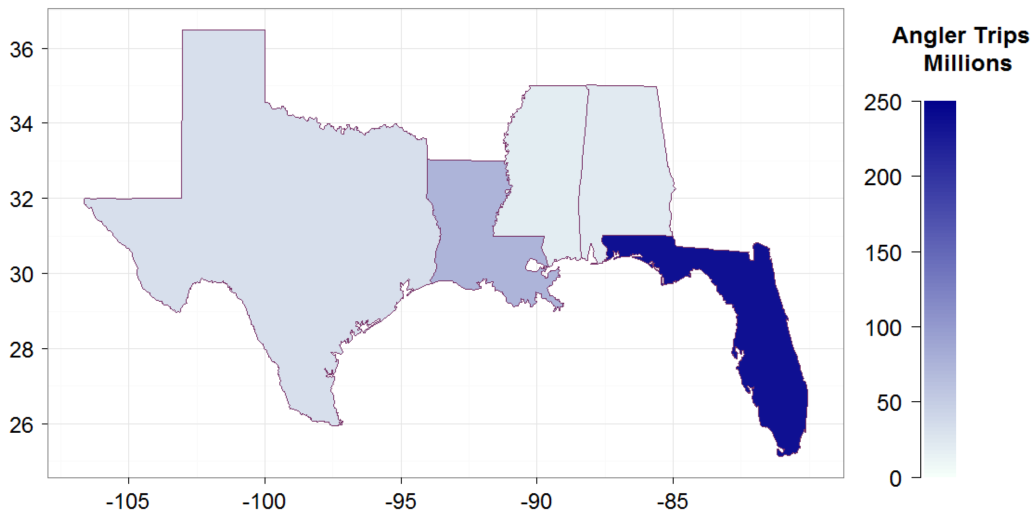
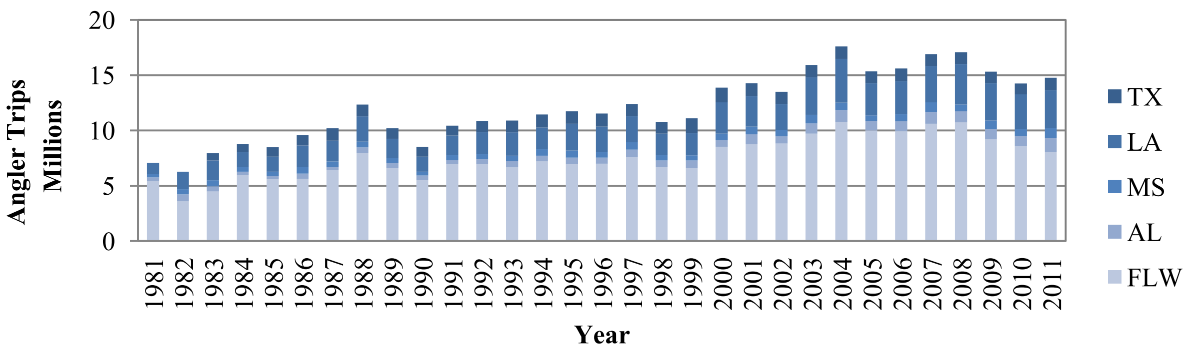


**Figure 4.11.7:** Gulf of Mexico estimated number of angler trips from MRFSS/MRIP (1981-2011) and TPWD (1983-2011) by state (a), by state and year (b), and by state and mode (c).

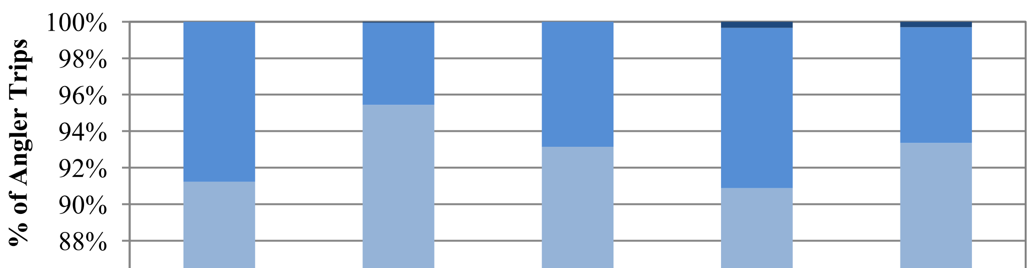
a) **Angler Trips by State 1981-2011**




b) **Angler Trips by State and Year 1981-2011**




c) **Angler Trips by State and Mode 1981-2011**

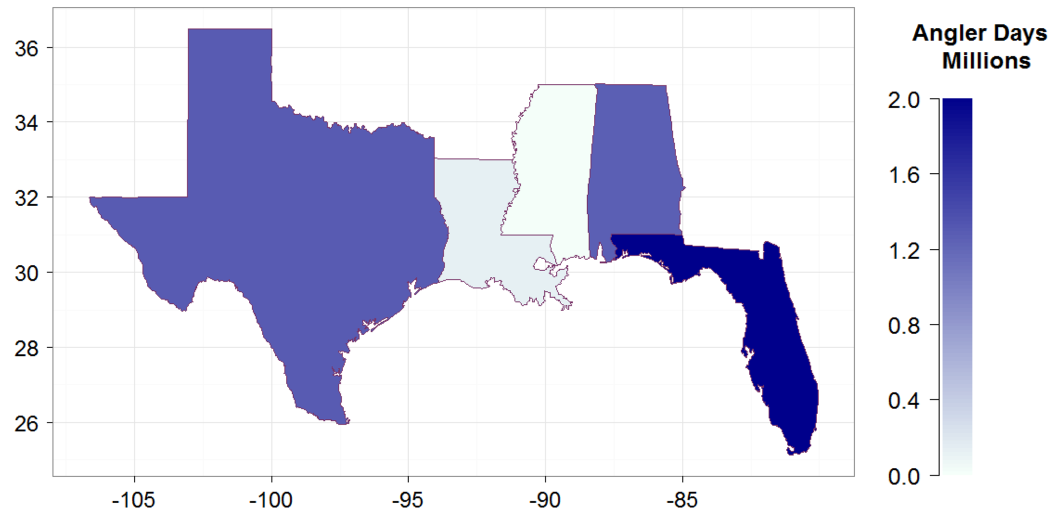



| Angler Trips | TX* | LA | MS | AL | FLW |
|---|---|---|---|---|---|
| Hbt* | - | 43,262 | - | 69,072 | 714,752 |
| Cbt | 2,680,830 | 3,284,955 | 1,191,846 | 1,764,970 | 14,822,758 |
| Priv | 27,889,374 | 69,885,295 | 16,211,174 | 18,274,733 | 218,141,562 |

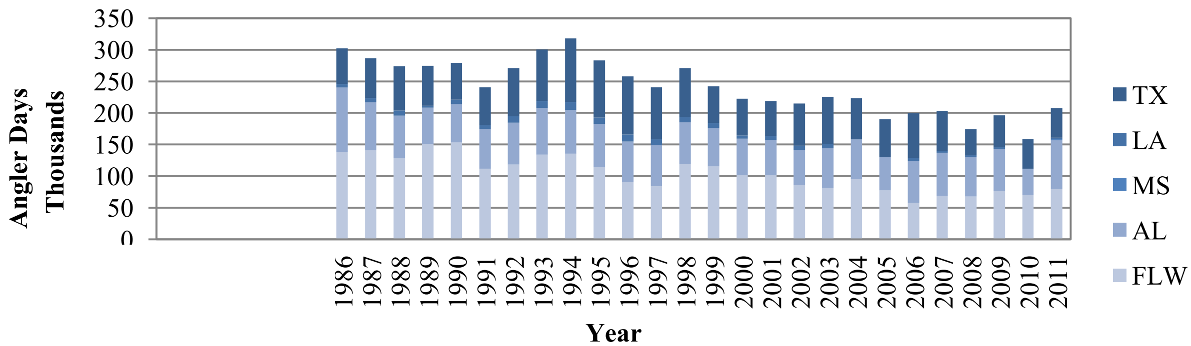
*Hbt (1981-1985); TX (1983-2011)

**Figure 4.11.8:** Gulf of Mexico estimated number of angler days from SRHS (1986-2011) by state (a), by state and year (b), and by state and mode (c).

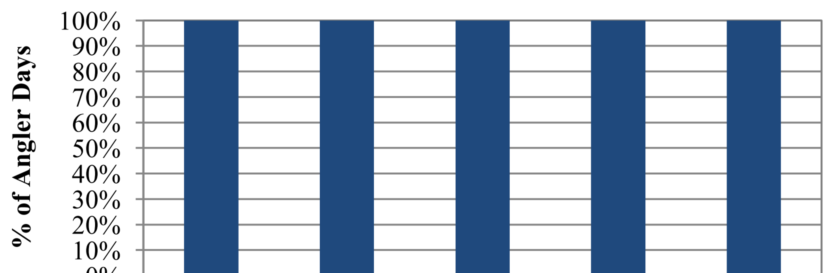
a) **Angler Days by State 1986-2011**




b) **Angler Days by State and Year 1986-2011**




c) **Angler Days by State and Mode 1986-2011**




| Angler Days | TX | LA | MS | AL | FLW |
|---|---|---|---|---|---|
| Hbt | 1,730,485 | 156,703 | 2,269 | 1,687,062 | 2,700,895 |
| Cbt | - | - | - | - | - |
| Priv | - | - | - | - | - |

# 5. Measures of Population Abundance

## 5.1 Overview

Analytical results of numerous data sets were presented to the Index Working Group (IWG) of both fishery-dependent and fishery-independent origin. These data sets are listed in Table 5.1.1 along with brief descriptions. Also, a simplified chart, depicting spatial coverage of each data set is included in Figure 5.1.1. Five fishery-independent and three fishery-dependent indices of abundance are recommended for use in the assessment by the IWG. They are:

<u>Fishery-independent</u>
NMFS bottom longline survey
NMFS SEAMAP trawl survey
SEAMAP reef fish survey
FWC Reef fish survey
NMFS Panama City trap and camera survey

<u>Fishery-dependent</u>
MRFSS/TPW private recreational and charter survey
NMFS headboat survey
Commercial handline survey

Other indices were considered and not recommended for use in the assessment by the IWG.

**Group Membership**

IWG members included, Walter Ingram, Adam Pollack Clay Porch, Neil Baertlein, Kevin McCarthy, Steve Saul, Claudia Friess, Beverly Sauls, Meaghan Bryan, Theodore Switzer, and Robert McMichael. and included other DW participants as needed for discussions throughout the week.

## 5.2 Review of Working Papers

The following working papers were reviewed:

## 5.3 Fishery Independent Indices

### *5.3.1 SEAMAP Groundfish Survey (SEDAR 31-DW-20)*

The Southeast Fisheries Science Center (SEFSC) Mississippi Laboratories has conducted standardized groundfish surveys under the Southeast Area Monitoring and Assessment Program (SEAMAP) in the Gulf of Mexico (GOM) since 1987. SEAMAP is a collaborative effort between federal, state and university programs, designed to collect, manage and distribute fishery independent data throughout the region. The primary objective of this trawl survey is to collect data on the abundance and distribution of demersal organisms in the northern Gulf of Mexico (GOM). This survey, which is conducted semi-annually (summer and fall), provides an important source of fisheries independent information on many commercially and recreationally important species throughout the GOM. The purpose of this section to provide a review of the red snapper indices presented during the Data Workshop.

A full review of the survey design and methodologies are described in SEDAR31-DW20. Due to the large number of indices presented (40+), this section will only present the ones that were recommended for use in the assessment, but will discuss all indices in section 5.3.1.6. All other indices and related information can be found in the document prepared for the Data Workshop (SEDAR31-20).

### *5.3.1.1 Methods of Estimation*

**Data Filtering Techniques**

Based upon the limited sampling that has taken place in shrimp statistical zones 3-9 (Table 5.3.1.1 and Table 5.3.1.2), it was decided to limit the data for this analysis to only zones 10-21 (note that zone 12 is completely outside of the depth range of this survey (5 to 60 fathoms), therefore it is not sampled). For this assessment, the decision was made to split the stock into east and west sub-stocks. Therefore, the western sub-stock was composed of statistical zones 13-21 and the eastern sub-stock was composed of statistical zones 10 and 11.

**Standardization**

Delta-lognormal modeling methods were used to estimate relative abundance indices for red snapper (Lo *et al*. 1992). The main advantage of using this method is allowance for the probability of zero catch (Ortiz *et al*. 2000). The index computed by this method is a mathematical combination of yearly abundance estimates from two distinct generalized linear models: a binomial (logistic) model which describes proportion of positive abundance values (i.e. presence/absence) and a lognormal model which describes variability in only the nonzero abundance data (Lo *et al*. 1992).

The submodels of the delta-lognormal model were built using a backward selection procedure based on type 3 analyses with an inclusion level of significance of $\alpha = 0.05$. Binomial submodel performance was evaluated using AIC, while the performance of the lognormal submodel was evaluated based on analyses of residual scatter and QQ plots in addition to AIC.

**Submodel Variables (Eastern Gulf)**

Year: 1987-2011
Depth Zone: <10 fathoms, 10-30 fathoms, >30 fathoms
Time of Day: Day, Night

**Submodel Variables (Western Gulf – Extended Time Series)**

Year: 1987-2011
Area: Primary (statistical zones 13-16), Secondary (statistical zones 17-21),
Depth Zone: <10 fathoms, 10-30 fathoms, >30 fathoms
Time of Day: Day, Night

**Annual Abundance Indices**

For a full review of the backward selection procedure for each submodel and diagnostic plots, refer to SEDAR31-DW20.

For the WGOM abundance index for red snapper (summer survey), year, area and depth zone were retained in the binomial submodel, while year, time of day, area and depth were retained in the lognormal submodel. The AIC for the binomial and lognormal submodels were 22,239.1 and 5,574.8, respectively. The diagnostic plots for the binomial and lognormal submodels indicated the distribution of the residuals is approximately normal.

For the WGOM abundance index for red snapper (fall survey), year, time of day, area and depth zone were retained in both the binomial and the lognormal submodels. The AIC for the binomial and lognormal submodels were 32,539.5 and 12,410.8, respectively. The diagnostic plots for the binomial and lognormal submodels indicated the distribution of the residuals is approximately normal.

For the EGOM abundance index for red snapper (summer survey), year, time of day and depth zone were retained in both the binomial and lognormal submodels. The AIC for the binomial and lognormal submodels were 6,477.5 and 1,018.4, respectively. The diagnostic plots for the binomial and lognormal submodels indicated the distribution of the residuals is approximately normal.

For the EGOM abundance index for red snapper (fall survey), year, time of day and depth zone were retained in both the binomial and lognormal submodels. The AIC for the binomial and lognormal submodels were 11,674.6 and 4,108.1, respectively. The diagnostic plots for the binomial and lognormal submodels indicated the distribution of the residuals is approximately normal.

### *5.3.1.2 Sampling Intensity*

A total of 6,335 were sampled from 1982- 2011 during the Summer SEAMAP Groundfish survey (Table 5.3.1.1 and Figure 5.3.1.1). While, 9,596 stations were sampled from 1972- 2011 during the Fall SEAMAP Groundfish survey (Table 5.3.1.2 and Figure 5.3.1.2).

### *5.3.1.3 Size/Age Data*

The sizes of red snapper represented in this index are presented in Table 5.3.1.3 and Figures 5.3.1.3 – 5.3.1.4. For surveys prior to 1987, there was no length data available.

#### *5.3.1.4 Catch Rates*

Standardized catch rates are presented in Tables 5.3.1.4 - 5.3.1.7 and Figures 5.3.1.5 – 5.3.1.8.

#### *5.3.1.5 Uncertainty and Measures of Precision*

Annual CVs of catch rates are presented in Tables 5.3.1.4 - 5.3.1.7.

#### *5.3.1.6 Comments on Adequacy for Assessment*

The SEAMAP Groundfish Survey was recommended for inclusion in the stock assessment model for red snapper. These indices characterized long running, start dates of 1982 and 1972 for the summer and fall respectively, fishery independent surveys. The surveys have undergone some changes in methodology over time, along with an expansion of the area sampled; however, the model was able to account for these differences with the addition of variables. The final interactions of the model recommended for use were the long time series with separate indices for the summer and fall surveys, along with a split into east and west gulf. However, if the combination index with Dauphin Island is accepted, we would recommend using that in place of the eastern gulf indices. The decision to split the indices into summer and fall centered on the age structure of each survey, with the summer representative of age 1 fish and the fall representative of age 0 fish.

For the rest of the indices presented in SEDAR31-DW20, the following is a brief discussion on why the indices were not selected for use based upon discussion at the Data Workshop. Based on the work of the life history group and the decision to split the stock into eastern and western components, no full gulf indices were considered for use. In addition, it was decided that the stock assessment model was more capable of estimating changes in the indices with regard to selectivity; therefore the indices that had incorporated the selectivity factor in calculating catch were not recommended. The age specific indices were initially recommended for use; however, with the inclusion of the early part of the time series (pre-1987), it was no longer possible to separate the catch by age. Given the two options, using the longer time series was more desirable than using the age specific indices, especially since the stock assessment model would be able to utilize the catch structure of the groundfish data.

### *5.3.2 SEAMAP Fall Plankton Survey (SEDAR 31-DW-27)*

The Southeast Area Monitoring and Assessment Program (SEAMAP) is a collaborative effort between federal, state and university programs, designed to collect, manage and distribute fishery independent data throughout the region. This program has supported collection and analysis of ichthyoplankton samples from resource surveys in the Gulf of Mexico (GOM) since 1982 with the goal of producing a long-term database on the early life stages of fishes. These surveys are the only Gulf-wide survey of U.S. continental shelf and coastal waters during the red snapper (*Lutjanus campechanus*) spawning season. The occurrence and abundance of red snapper larvae captured during SEAMAP surveys in the Gulf of Mexico have been used to reflect trends in relative spawning stock size of red snapper since 2004.

A full review of the survey design and methodologies are described in SEDAR31-DW27.

#### *5.3.2.1 Methods of Estimation*

**Data Filtering Techniques**

The intended sample design for SEAMAP surveys calls for bongo sample to be taken at each site (SEAMAP station) in the systematic grid. However, over the years additional samples have been taken using SEAMAP gear and collection methods at locations other than designated SEAMAP stations. Some locations were also sampled more than once during a survey year. This year to year variability in spatial coverage during SEAMAP resource surveys was addressed by limiting observations to samples taken at SEAMAP stations that were sampled during at least 14 years of the survey time series (Figure 5.3.2.1). In instances where more than one sample was taken at a SEAMAP station, the sample closest to the central position of the systematic grid location was selected for inclusion in the data set. When SEAMAP stations were sampled by more than one vessel during the survey, priority was given to samples taken by the National Marine Fisheries Service (and not the state) vessel. Only samples from the 1986-1997, 1999-2004, 2006-2007 and 2009-2010 SEAMAP Fall Plankton surveys taken in accordance with the sample design from stations sampled during at least 14 years (60%) of the time series were used to calculate the red snapper larval indices and summaries presented in this report. The three 'missing' fall plankton survey years were 1998, 2005 and 2008 when the surveys were cancelled or severely curtailed due to tropical storms.

**Standardization**

Delta-lognormal modeling methods were used to estimate relative abundance indices for 10.5 day old larval red snapper (Lo *et al*. 1992). The main advantage of using this method is allowance for the probability of zero catch (Ortiz *et al.* 2000). The index computed by this method is a mathematical combination of yearly abundance estimates from two distinct generalized linear models: a binomial (logistic) model which describes proportion of positive abundance values (i.e. presence/absence) and a lognormal model which describes variability in only the nonzero abundance data (Lo *et al*. 1992). Due to low catches in the eastern GOM, the final model was based only on the binominal model.

The submodels of the delta-lognormal model were built using a backward selection procedure based on type 3 analyses with an inclusion level of significance of $\alpha = 0.05$. Binomial submodel performance was evaluated using AIC, while the performance of the lognormal submodel was evaluated based on analyses of residual scatter and QQ plots in addition to AIC.

**Submodel Variables (Eastern Gulf)**

Year: 1986-2010
Area: Mississippi/Alabama (statistical zones 10-11), Florida (statistical zones 1-9)
Start Depth: Depth at the start of the tow
Time of Day: Day, Night

**Submodel Variables (Western Gulf)**

Year: 1986-2010
Area: Texas (statistical zones 18-21), West Delta (statistical zones 13-17),
Start Depth: Depth at the start of the tow
Time of Day: Day, Night

**Annual Abundance Indices**

For a full review of the backward selection procedure for each submodel and diagnostic plots, refer to SEDAR31-DW27.

For the EGOM abundance index of larval red snapper year, time of day and subregion were retained in the model. Akaike's Information Criteria (AIC) for the model was 6337.5. The diagnostic plots for the model indicated the distribution of the residuals is approximately normal. For the WGOM abundance index of larval red snapper adjusted to 10.5 days old, year and time of day were retained in the binomial submodel, while year, time of day and subregion were retained in the lognormal submodel. The AIC for the binomial and lognormal submodels were 5277.0 and 542.8, respectively. The diagnostic plots for the binomial and lognormal submodels indicated the distribution of the residuals is approximately normal.

### *5.3.2.2 Sampling Intensity*

A total of 1,153 and 1,085 stations were sampled in the eastern and western GOM, respectively (Figure 5.3.2.1).

### *5.3.2.3 Size/Age Data*

The sizes of larval red snapper captured during the SEAMAP Fall Plankton Survey are presented in Figures 5.3.2.2, while the ages of the larval red snapper used in the indices (3.75 – 9.25 mm) are presented in Figure 5.3.2.3.

### *5.3.2.4 Catch Rates*

Standardized catch rates are presented in Tables 5.3.2.1 and 5.3.2.2 and Figures 5.3.2.4 and 5.3.2.5.

### *5.3.2.5 Uncertainty and Measures of Precision*

Annual CVs of catch rates are presented in Tables 5.3.2.1 and 5.3.2.2.

### *5.3.2.6 Comments on Adequacy for Assessment*

The SEAMAP Fall Plankton Survey was recommended for use in the assessment model. This survey represented a long, fishery independent time series, with no change in methodology. Additionally, it was the only survey that characterizes larval red snapper. The final versions of the abundance indices recommended for use were the age adjusted index for the western GOM that included all larvae between 3.75 and 9.25 mm, and the frequency of occurrence model for the eastern GOM. The frequency of occurrence model was chosen over the delta-lognormal index due to extremely low catches and occurrence of red snapper in the eastern GOM. The group agreed that back-calculating of ages was appropriate, especially since high mortality rates existed in the larval data and by back-calculating it brought the index closer to the number of larvae hatched.

### *5.3.3 NMFS Bottom Longline (SEDAR 31-DW-19)*

Based on the recommendations from the IWG, two standardized indices (Eastern GOM and Western GOM) were developed using NMFS bottom longline survey data.

#### *5.3.3.1 Methods, Gears, and Coverage*

The Southeast Fisheries Science Center (SEFSC) Mississippi Laboratories has conducted standardized bottom longline surveys in the Gulf of Mexico, Caribbean, and Western North Atlantic since 1995. The objective of these surveys is to provide fisheries independent data for stock assessment purposes for as many species as possible. These surveys are conducted annually in U.S. waters of the Gulf of Mexico (GOM) and/or the Atlantic Ocean, and they provide an important source of fisheries independent information on large coastal sharks, snappers and groupers from the GOM and Atlantic. In 2011, an Expanded Stock Assessment Survey was conducted where high levels of survey effort were maintained from April through October. For this analysis, only data collected during the same time period as the annual survey were used to increase sample size. Results from analyses of data collected on red snapper during this survey are presented below in order to aid in the current assessment of this stock in the GOM.

**Data Filtering**

Survey data collected between 9 and 366m in the US GOM were used for index development.

**Standardization**

CPUE indices for both the Eastern GOM and the Western GOM were modeled using a delta-lognormal approach with a backward selection procedure in both submodels.

**Model Input**

The GLIMMIX and MIXED procedures in SAS (v. 9.1, 2004) were used to develop the binomial and lognormal submodels, respectively. Similar covariates were tested for inclusion for both submodels: water depth [three depth categories: shallow (9 – 55 m), medium (55 – 183 m), and deep (183 – 366 m)], survey region [two regions in the GOM: Eastern Gulf (east of 89.15$^{o}$ west longitude) and Western Gulf (west of 89.15$^{o}$ west longitude)] and year. A backward selection procedure was used to determine which variables were to be included into each submodel based on type 3 analyses with a level of significance for inclusion of $\alpha = 0.05$. If year was not significant then it was forced into each submodel in order to estimate least-squares means for each year, which are *predicted annual population margins (i.e.,* they estimate the marginal annual means as if over a balanced population). Catch per unit effort (CPUE) was defined as number of fish per 100 hook-hours.

**Diagnostics**

The distribution of residuals for both submodels was approximately normal.

#### *5.3.3.2 Sampling Intensity and Time Series*

The time series of data between 1996 and 2011 were used to develop abundance indices for red snapper for the GOM. Number of stations per year ranged between 50 and 597.

#### *5.3.3.3 Size/Age data*

A total of 723 red snapper from the NMFS BLL survey were aged. Ages ranged from 1 to 44 years with a mode around 5-6 years.

#### *5.3.3.4 Catch Rates*

Index results are shown in Table 5.3.3.1 and Figure 5.3.3.1 for the Western GOM and in Table 5.3.3.2 and Figure 5.3.3.2 for the Eastern GOM.

#### *5.3.3.5 Uncertainty and Measures of Precision*

Coefficients of variation (CV) were in the range of 0.22-1.16 over the entire time series for the Eastern GOM index. Coefficients of variation (CV) were in the range of 0.15-1.24 over the entire time series for the Western GOM index.

#### *5.3.3.6 Comments on Adequacy for Assessment*

The index work group recommends that the assessment panel consider the use of indices from both the Eastern GOM and the Western GOM.

### *5.3.4 SEAMAP Reef Fish Video Survey (SEDAR 31-DW-08)*

The primary objective of the annual Southeast Area Monitoring and Assessment Program (SEAMAP) reef fish video survey is to provide an index of the relative abundances of fish species associated with topographic features (e.g. reefs, banks, and ledges) located on the continental shelf of the Gulf of Mexico (GOM) from Brownsville, TX to the Dry Tortugas, FL. Secondary objectives include quantification of habitat types sampled (video and side-scan), and collection of environmental data throughout the survey. Because the survey is conducted on topographic features the species assemblages targeted are typically classified as reef fish (e.g. red snapper, *Lutjanus campechanus*), but occasionally fish more commonly associated with pelagic environments are observed (e.g. hammerhead shark, *Sphyrna lewini*). The survey has been executed from 1992-1997, 2001-2002, and 2004-2011 and historically takes place from May – August. The 2001 survey was abbreviated due to ship scheduling, during which, the only sites that were completed were located in the western Gulf of Mexico. Types of data collected on the survey include diversity, abundance (minimum count), fish length, habitat type, habitat coverage, and bottom topography. The size of fish sampled with the video gear is species specific however red snapper sampled over the history of the survey had fork lengths ranging from 146 – 917 mm, and mean annual fork lengths ranging from 370.6 – 593.1 mm. Age and reproductive data cannot be collected with the camera gear but beginning with the 2012 survey, a vertical line component will be coupled with the video drops to collect hard parts, fin clips, and gonads.

#### *5.3.4.1 Methods of Estimation*

**Data Filtering Techniques**

Various limitations either in design, implementation, or performance of gear causes limitations in calculating minimum counts and are therefore dropped from the design-based indices development and analysis as follows. In 1992, each fish was counted every time it came into view over the entire record time and the total of all these counts was the maximum count. Maximum count methodologies are not preferred and the 1992 video tapes were destroyed during Hurricane Katrina and cannot be re-viewed, so 1992 data is excluded from analyses (unknown number of stations). The 2001 survey was abbreviated due to ship scheduling, during which, the only sites that were completed were located in the western GOM. Because of the spatial imbalance associated with data gathered in 2001, that entire year has been dropped (80 total sites). Stratum 1 (South Florida) and stratum 7 (S. Texas) are blocks that contain very little reef and were not consistently chosen for sampling and were also dropped (184 total sites). Occasionally tapes are unable to be read (i.e. organisms cannot be identified to species) for the following reasons including: 1) camera views are more than 50% obstructed, 2) sub-optimal lighting conditions, 3) increased backlighting, 4) increased turbidity, 5) cameras out of focus, 6) cameras failed to film. In all of these cases the station is flagged as 'XX' in the data set and dropped (190 total sites). Sites that did not receive a stratum assignment are also dropped (62). By these criteria the data set is reduced in design based estimates from 4707 down to 4228 sites analyzed. Model based runs all available data.

An ad hoc group evaluating the efficacy of combining a set of less extensive reef fish video surveys (NMFS-PC, DISL, and FWRI) identified an issue associated with estimating length using lasers, versus the stereo video from NMFS-PC data. Laser data appears to potentially be underestimating size significantly. It is unclear at this point if this is a measurement issue associated with parallelism of the laser mounting, or if this is associated with fish behavior relative to the camera gear (e.g. smaller fish swarming closer to the gear). At this point the NMFS-MS lab survey has no comparison data available to reassure the working group that this survey does not suffer from the same issue. The group is therefore recommending that the length composition data that was estimated using lasers is excluded from analysis until it can be determined if length is also underestimated in this survey as well.

**Gear and Deployment**

The SEAMAP reef fish survey has employed several camcorders in underwater housings since 1992. Sony VX2000 DCR digital camcorders mounted in Gates PD150M underwater housings were used from 2002 to 2005 and Sony PD170 camcorders during the years 2006 and 2007. In 2008 a stereo video camera system was developed and assembled at the NMFS Mississippi Laboratories Stennis Space Center Facility and has been used in all subsequent surveys. The stereo video unit consists of a digital stereo still camera head, digital video camera, CPU, and hard drive mounted in an aluminum housing. All of the camcorder housings we have used were rated to a maximum depth of 150 meters while the stereo camera housings are rated to 600 meters. Stereo cameras are mounted orthogonally at a height of 50 cm above the bottom of the pod and the array is baited with squid during deployment.

At each sampling site the stereo video unit is deployed for 40 minutes total, however the cameras and CPU delay filming for 5 minutes to allow for descent to the bottom, and settling of suspended sediment following impact. Once turned on, the cameras film for approximately 30 minutes before shutting off and retrieval of the array. During camera deployment the vessel drifts away from the site and a CTD cast executed, collecting water depth, temperature, conductivity, and transmissivity from the surface to the maximum depth. Seabird units are the standard onboard NOAA vessels however the model employed was vessel/cruise dependent.

**Video tape viewing**

One video tape from each station is selected for viewing out of four possible. If all four video cameras face reef fish habitat and are in focus, tape selection is random. Videos are viewed for twenty minutes starting from the time when the view clears from suspended sediment. Viewers identify, and enumerate all species to the lowest taxonomic level during the 20 minute viewable segment. From 1993-2007 the time when each fish entered and left the field of view was recorded a procedure referred to as time in - time out (TITO) and from these data a minimum count was calculated. The minimum count is the maximum number of individuals of a selected taxon in the field of view at one instance. Each 20 minute video is evaluated to determine the highest minimum count observed during a 20 minute recording. The 2008-2011 digital video allows the viewer to record a frame number or time stamp of the image when the maximum number of individuals of a species occurred, along with the number of taxon identified in the image but does not use the TITO method. Both the TITO and current viewing procedure result in the minimum count estimator of relative abundance. Minimum count methodology is preferred because it prevents counting the same fish more than once.

**Fish Length Measurement**

Beginning in 1995 fish lengths were measured from video using lasers attached on the camera system with known geometry. However, the frequency of hitting targets with the laser is low and precluded estimating size frequency distributions. Additionally, the same fish can be measured more than once at a given station. So, the lengths measured provide the range of sizes observed. The stereo cameras used in 2008-2010 allow size estimation from fish images. The Vision Measurement System (Geometrics Inc.) was used to estimate size of red snapper. We estimated a length frequency distribution by weighting station length frequencies by station Minimum Counts.

**Standardization**

Delta-lognormal modeling methods were used to estimate relative abundance indices for red snapper (Lo *et al*. 1992). The main advantage of using this method is allowance for the probability of zero catch (Ortiz *et al.* 2000). The index computed by this method is a mathematical combination of yearly abundance estimates from two distinct generalized linear models: a binomial (logistic) model which describes proportion of positive abundance values (i.e. presence/absence) and a lognormal model which describes variability in only the nonzero abundance data (Lo *et al*. 1992).

The submodels of the delta-lognormal model were built using a backward selection procedure based on type 3 analyses with an inclusion level of significance of $\alpha = 0.05$. Binomial submodel performance was evaluated using AIC, while the performance of the lognormal submodel was evaluated based on analyses of residual scatter and QQ plots in addition to AIC.

*Submodel variables*

Year: The survey has been executed from 1992-1997, 2001-2002, and 2004-2011
Region: East and west of the Mississippi River delta, 89.15 west longitude.
Depth: 10 – 200 meters.

### *5.3.4.2 Sampling Intensity, Catch Rates and Measures of Precision*

A total of 4,407 stations were sampled from over the history of the survey (Table 5.3.4.1). Standardized catch rates by region are presented in Tables and Figures 5.3.4.1 (west) and 5.3.4.2 (east).

Annual CVs of catch rates are presented in Tables 5.3.4.1 (west) and 5.3.4.2 (east).

### *5.3.4.3 Size/Age Data*

Length frequency data gathered in this survey are constructed from survey data are presented by year for the years 2008-2011 in Figures 5.3.4.3 – 5.3.4.10, and descriptive stats shown in Table 5.3.4.3.

### *5.3.4.4 Comments on Adequacy for Assessment*

Assessment scientists evaluated the abundance indices and coefficient of variation output and advised the working group that the model based runs were most appropriate for use in the assessment models, therefore those runs are presented in this report, however, all of the runs are available in the working document that was provided prior to the workshop (Campbell et al. DW-08).

An ad hoc group evaluating the efficacy of combining a set of less extensive reef fish video surveys (NMFS-PC, DISL, and FWRI) identified an issue associated with estimating length using lasers, versus the stereo video from NMFS-PC data. Laser data appears to potentially be underestimating size. It is unclear at this point if this is a measurement issue associated with parallelism of the laser mounting, or if this is associated with fish behavior relative to the camera gear (e.g. smaller fish swarming closer to the gear). At this point the NMFS-MS lab survey has no comparison data available to reassure the working group that this survey does not suffer from the same issue. The group is therefore recommending that the length composition data that was estimated using lasers is excluded from analysis until it can be determined if length is also underestimated in this survey as well.

### *5.3.5 Reef-fish Surveys on the West Florida Shelf (SEDAR 31-DW-24)*

#### *5.3.5.1. Overview*

Reef fishes, including red snapper, support extensive commercial and recreational fisheries along the West Florida Shelf (WFS). Historically, the assessment and management of reef fishes in the Gulf of Mexico has relied heavily on data from fisheries-dependent sources, although limitations and biases inherent to these data are admittedly a major source of uncertainty in current stock assessments. The accuracy of harvest estimates, particularly on the recreational side, has been challenged in recent years. Additionally, commercial, headboat, and recreational landings data are restricted to harvestable-sized fish, and thus are highly influenced by regulatory changes (i.e., size limits, recreational bag limits, and seasonal closures). These limitations render it difficult to forecast potential stock recovery associated with strong year classes entering the fishery. There has been a renewed emphasis in recent years to increase the availability of fisheries-independent data on reef fish populations in the Gulf of Mexico that reflect the status of fish populations as a whole, rather than just the portion of the population taken in the fishery. To meet the emerging needs of fisheries-independent data for reef fishes, the Florida Fish and Wildlife Conservation Commission (FWC) has been working collaboratively with scientists from the National Marine Fisheries Service (NMFS) to expand regional monitoring capabilities and provide timely fisheries-independent data for a variety of state- and federally-managed reef fishes. Results are summarized from a fisheries-independent reef fish survey initiated by FWC in 2008 to complement ongoing NMFS surveys of reef habitats along the shelf break (NMFS – Pascagoula) and in the northeastern Gulf of Mexico (NMFS – Panama City).

#### *5.3.5.2. Survey Design, Sampling Methods, and Analyses:*

The FWC reef fish survey includes a portion of the WFS bounded by $26^{o}$ and $28^{o}$ N latitude and depths from 10 – 110 m (Figure 5.3.5.1). The boundaries of the WFS sampling universe were chosen to compliment ongoing NMFS reef-fish surveys. To assure adequate spatial coverage of sampling effort, the WFS survey area is subdivided into four sampling zones comprised of two NMFS statistical zones (Tampa Bay: NMFS statistical zone 5; Charlotte Harbor: NMFS statistical zone 4) and two depth zones (Nearshore: 10 – 37 m; Offshore: 37 – 110 m). Prior to conducting exploratory sampling in 2008, the WFS survey area was subdivided into 1km x 1km sampling units. Results from 2008 indicated that 1km x 1km spatial scale was too large in relation to the small-scale habitat features characteristic of the WFS; accordingly, from 2009 onward the WFS survey area was subdivided into 0.1nm x 0.3 nm sampling units. Overall sampling effort (annual goal of n = 200 sampling units) was proportionally allocated among the four sampling zones based on habitat availability (TBN: Tampa Bay Nearshore; TBO: Tampa Bay Offshore; CHN: Charlotte Harbor Nearshore; CHO: Charlotte Harbor Offshore), and specific sampling units were selected randomly within each sampling zone.

Very little is known regarding the fine-scale distribution of reef habitat throughout much of the WFS, and due to anticipated cost and time requirements, mapping the entire WFS survey area was not feasible prior to initiating the WFS reef fish survey. For the 2008 reef fish survey, the identification of sampling units with an increased probability of containing reef habitat (and inclusion in the sampling frame for the reef-fish survey) was based on bottom rugosity calculated from 100m-resolution interpolated bathymetry data. An examination of results from the 2008 survey indicated that a high proportion of sampling effort occurred at sites with no reef habitat (i.e., unconsolidated sediment). Accordingly, the sampling universe was updated in 2009 to include habitat information provided by commercial fishermen as well as published literature. Further, we implemented an adaptive strategy where a three-pass acoustic survey was conducted covering an area of 1nm to the east and west of the pre-selected sampling unit prior to sampling.

In 2009 and part of 2010, the acoustic survey was conducted using the research vessel echo sounder, while for part of 2010 and all of 2011 the acoustic survey was conducted using an L3-Klein 3900 side scan sonar. Based on results from these acoustic surveys, sampling effort was relocated to a nearby sampling unit should evidence of reef habitat be identified.

At each sampling station, two types of sampling gears were utilized: stationary underwater camera arrays (SUCA) and chevron traps. Gear deployments and collection and processing of field data followed established NMFS protocols. At each station, 1-2 SUCAs were deployed that consisted of a pair of stereo imaging system (SIS) units positioned at an angle of 180º from one another to maximize the total field of view. Each SIS unit consisted of an underwater housing containing a digital camcorder to record video and a pair of stereo cameras to capture still images at a rate of one per second. Each SUCA was baited (generally Atlantic mackerel) and deployed for thirty minutes to assure that twenty minutes of continuous video and stereo images were recorded. Video data from one SIS per SUCA deployment were processed to quantify the relative abundance of red snapper observed (MaxN, or the maximum number of red snapper observed on a single video frame). In addition, 1-4 chevron traps were baited (generally Atlantic mackerel) and deployed for ninety minutes prior to retrieval; all red snapper collected were identified, enumerated, and measured. All individual gear deployments (SUCA and chevron traps) were spaced a minimum of 100 m apart. In addition to data on red snapper, geographic coordinates, depth, physiochemical conditions (e.g., temperature, salinity, dissolved oxygen, pH), and time of day were recorded at each specific sampling site.

Preliminary examination of semivariograms for red snapper indicated that the 100m spacing resulted in observations that were generally independent. Nevertheless, all data from a given sampling site were first averaged to avoid potential pseudoreplication. For each year and sampling zone, frequency of occurrence as well as mean (± SE) relative abundance of red snapper was calculated across stations for both SUCA and chevron trap data. For SUCA videos, relative abundance was calculated as the average MaxN, whereas for chevron traps, relative abundance was calculated as the average number of red snapper per trap set. For chevron trap data only, annual size-frequency distributions were also calculated.

### *5.3.5.3. Results / Discussion*

From 2008 – 2011, a total of 484 stations were sampled; all stations were sampled with chevron traps, whereas only 457 stations were sampled using SUCA (Tables 5.3.5.1 and 5.3.5.2). The reduced number of stations sampled using SUCA was attributable to instances where the cameras malfunctioned or weather conditions prevented sampling. Due to weather and mechanical issues, planned effort of n = 200 sampling stations was only achieved in 2011; from 2008 – 2010 total sampling effort varied from 73 – 117 stations. Although all four spatial zones were sampled each year, allocation of completed sampling effort varied significantly; accordingly, data were summarized independently for each zone.

Analyses of SUCA (Figures 5.3.5.2 and 5.3.5.3) and chevron trap data (Figures 5.3.5.4 and 5.3.5.5) indicated that red snapper were never observed within the Charlotte Harbor – Nearshore zone, and only rarely observed in the Tampa Bay – Nearshore zone. In the offshore zones, red snapper were generally more frequently observed off Tampa Bay in both SUCA and chevron traps. Overall there has been a marked increase in both the frequency of occurrence and relative abundance of red snapper in both the Tampa Bay – Offshore and Charlotte Harbor – Offshore zones (Figures 5.3.5.2 – 5.3.5.5). The one notable exception to this trend is the frequency of occurrence and relative abundance of red snapper from chevron traps in the Charlotte Harbor – Offshore zone (Figures 5.3.5.4 and 5.3.5.5). In 2009, red snapper were collected at exceptionally high abundances (n > 25 red snapper per station) at two stations. Insufficient length data were available from the SUCA to make any meaningful comparisons, but red snapper collected in chevron traps ranged from 150 – 500 mm SL, although most individuals ranged from 300 – 450 mm SL (Figure 5.3.5.6). No marked changed in size frequency were evident through time.
It is apparent that red snapper are becoming common in the offshore waters (20 – 60 fa) off the WFS, as they were observed at nearly 30% of all stations off of Tampa Bay and 20% of all stations off of Charlotte Harbor in 2011. At present, it is impossible to reconcile whether the increasing trends through time result from increased abundance of red snapper, increased survey efficiency, or a combination of the two. Survey efficiency has undoubtedly increased through time, and the proportion of stations sampled that actually contained reef habitat has increased significantly. A more appropriate examination of trends through time would require detailed post-stratification where sites that did not contain reef habitat were excluded from these analyses.

At present we do not have sufficient habitat data for prior survey years (especially 2008 and 2009) to satisfactorily post-stratify these data, although ongoing mapping efforts targeting previously-sampled stations will improve our ability to post-stratify data in the future.

### *5.3.5.4. Comments on Adequacy for Assessment*

There was discussion within the IWG of combining all video indices into one index. However, the NMFS Video Survey is conducted on offshore banks throughout the Gulf, while the other video surveys, including this one, were conducted closer to shore. Therefore, a combined video index utilizing both the Panama City NMFS and the FWRI Video Survey Data was suggested, and will be presented at the Assessment Workshop.

### *5.3.6. NMFS Panama City Laboratory Trap & Camera Survey (SEDAR 31-DW-28)*

#### *5.3.6.1. Survey History and Overview*

In 2002 the Panama City NMFS lab began development of a fishery-independent trap survey (PC survey) of natural reefs on the inner shelf of the eastern Gulf of Mexico off Panama City, FL, with the primary objective of establishing an age-based annual index of abundance for young (age 0-3), pre-recruit gag, scamp, and red grouper. Secondary objectives included examining regional catch, recruitment, demographic, and distribution patterns of other exploited reef fish species. The chevron trap is efficient at capturing a broad size range of several species of reef fish (Nelson et. al.1982, Collins 1990), and has been used by the South Atlantic MARMAP program for over 20 yr (McGovern et. al. 1998). Initially the PC survey used the same trap configuration and soak time used by MARMAP (McGovern et. al. 1998), but an in-house study in 2003 indicated that traps with a throat entrance area 50% smaller than that in the MARMAP traps were much more effective at meeting our objective of capturing sufficient numbers of all three species of grouper. Video data from our study and consultations with fishermen suggested that the presence of larger red grouper in a trap tended to deter other species from entering. Beginning in 2004, the 50% trap throat size became the standard. That same year the survey was expanded east of Panama City to Apalachee Bay off the Big Bend region of Florida (Figure 5.3.6.1), an area separated from the shelf off Panama City by Cape San Blas - an established hydrographic and likely zoogeographic boundary (Zieman and Zieman 1989).

Beginning in 2005, the collection of visual (stationary video) data was added to the survey to provide insight on trap selectivity, more complete information on community structure, relative abundance estimates on species rarely or never caught in the trap, and additional, independent estimates of abundance on species typically caught in the traps. Video sampling was only done in Apalachee Bay that first year, but was expanded to the entire survey in 2006. Also in 2005 the target species list was expanded to include the other exploited reef fishes common in the survey area , i.e., red, vermilion, gray, and lane snapper; gray triggerfish, red porgy, white grunt, black seabass, and hogfish. From 2005 through 2008 each site was sampled with the camera array followed immediately by a single trap. Beginning in 2009 trap effort was reduced ~50%, with one deployed at about every other video site, starting with the first site of the day. This was done so the number of video samples, and thereby the accuracy and precision of the video abundance estimates, could be increased. Camera arrays are much less selective and provide abundance estimates for many more species than traps, and those estimates are usually much less biased. All sampling has occurred between May and early October, but primarily during June through September. At each site, a CTD cast was made to collect temperature, salinity, oxygen, and turbidity profiles.

The survey sampling design was systematic through 2009 because of a very limited sample site universe, but was changed to stratified random in 2010 after side scan sonar surveys that year yielded an order of magnitude increase in that universe. To ensure uniform geographic and bathymetric coverage, 2-stage sampling is used. Five by five minute blocks, stratified by depth zone (< and >30 m) and geographical location, and known to contain reef sites, are randomly chosen first, then 2 sites a minimum of 300 m apart within each selected block (Figure 5.3.6.2). Depth coverage was ~8-30 m during 2004-07, and since then was steadily expanded to ~8 – 47 m (Figure 5.3.6.3). Sampling effort has also increased since 2004. Sample sizes were 59 in 2004 (33 W: 26 E), 101 in '05 (24 W: 77 E), 113 in '06 (25 W: 89 E), 86 in '07 (29 W: 57 E), , 98 in '08 (31 W: 66 E), , 143 in '09 (48 W: 97 E), , 162 in '10 (53 W: 109 E), , and 170 in '11 (65 W: 115 E). In 2004 and 2005 some sites were sampled twice: 9 in 04 and 23 in 05; thereafter each site was only sampled once in a given year.

### *5.3.6.2. Methods*

Sampling is conducted only during daytime from 1 hr after sunrise until 1 hr before sunset. Chevron traps, identical to that used in the MARMAP program (McGovern et al. 1998) except for 50% smaller throat opening, are baited each set with 3 previously frozen Atlantic mackerel *Scomber scombrus,* and soaked for 1.5 hr. Traps are fished as close as possible to the exact location sampled by the camera array that day. All trap-caught fish are identified, counted and measured to maximum total and fork length (FL only for gray triggerfish and TL only for black seabass). Both sagittal otoliths are collected from 4-5 randomly subsampled specimens of all snappers (gray, lane, red, and vermilion), groupers (gag, red, and scamp), black seabass, red porgy, hogfish, white grunt, and gray triggerfish (first dorsal spine for the latter).

During 2005 – 2008, visual data were collected using a stationary camera array composed of 4 high definition (HDEF), digital video cameras mounted orthogonally 30 cm above the bottom of an aluminum frame. From 2007 to 2009, parallel lasers (100 mm spacing) mounted above and below each camera were used to estimate the sizes of fish which crossed the field of view perpendicular to the camera. In 2009 and 2010, one of the HDEF cameras was replaced with a stereo imaging system (SIS) consisting of two high resolution black and white still cameras mounted 8 cm apart, one digital video (mpeg) color camera, and a computer to automatically control these cameras as well as store the data. The SIS provides images from which fish measurements can be obtained with the Vision Measurement System (VMS) software. Beginning in 2011, a second SIS facing 180º from the other SIS was added, reducing the number of HDEFs to two; both SIS's were also upgraded with HDEF, color mpeg cameras.

When only HDEF cameras were used (through 2008), soak time for the array was 30 min to allow sediment stirred up during camera deployment to dissipate and ensure tapes with an unoccluded view of at least 20 min duration (Gledhill and David 2003). With the addition of stereo cameras in 2009, soak time was increased to 45 min to allow sufficient time for the hard drive in the SIS to shut down before retrieval. Prior to 2009, tapes of the 4 HDEF cameras were scanned, with the one with the best view of the habitat analyzed in detail. If none was obviously better, one was randomly chosen. In 2009 only the 3 HDEF video cameras were scanned and the one with the best view of the reef was analyzed. Starting in 2010, all 4 cameras – the HDEFs and the SIS MPEGs, which have virtually the same fields of view (64 vs. 65º) – were scanned, and again, the one with the best view of the habitat was analyzed. Twenty min of the tape were viewed, beginning when the cloud of sediment disturbed by the landing of the array has dissipated. All fish captured on videotape were identified to the lowest discernible taxon. Data on habitat type and reef morphometrics were also recorded. If the quality of the mpeg video derived from the SIS was less than desirable (a common problem), fish identifications were confirmed on the much higher quality and concurrent stereo still frames. The estimator of abundance was the maximum number of a given species in the field of view at any time during the 20 min analyzed (= min count; Gledhill and Ingram 2004), and VMS measurements were only taken from a still frame showing the min count of a given species to eliminate the possibility of measuring the same fish more than once. Even for deployments where the SIS did not provide a good view of the reef habitat, the files were examined to obtain fish measurements using VMS, and again, those measurements were only taken from a still frame showing the min count of a given species. In contrast, when using the scaling lasers on the array to obtain length data, there was no way to eliminate the possibility of double measuring a given fish, although this was probably not a serious problem, as usable laser hits were typically rare for any one sample.

Because of the significant differences in both species composition and abundance for many reef fishes east and west of Cape San Blas, especially in the inner and mid-shelf depths sampled by the Panama City survey, many of the results presented herein are shown separately for the two areas.

Censored data sets were used in deriving the indices of relative abundance from video data. Prior to 2010, the year we began using side scan sonar to locate reefs, lack of knowledge of reef habitat locations east of the Cape necessitated making a much higher proportion of “exploratory” camera and trap drops there versus west of the Cape. To compensate, more overall effort was expended in the east. Some of these “exploratory” sample sites turned out to be sand, mostly sand, or very marginal reef habitat at best, yielding little or no reef fish data. In addition, the gear occasionally missed the intended reef site. Inclusion of data from those sites would have reduced the precision of the abundance estimates and confounded any analyses. For that reason, video data – both habitat classification and fish counts – from all sites were screened, and those with no evidence that hard or live bottom was in close proximity, as well as sites where the view was obscured for some reason (poor visibility, bad camera angle), were censored (excluded) from calculations of relative abundance. As a result of this screening, of video samples east of the Cape, only 31 of 41 in 2005, 47 of 89 in 2006, 23 of 57 in 2007, 56 of 66 in 2008, 62 of 97 in 2009, 95 of 109 in 2010, and 99 of 115 in 2011 met the reef and visibility criteria and were retained. In contrast, west of the Cape, 24 of 25 sites in 2006, 29 of 29 in 2007, 29 of 31 in 2008, 42 of 47 in 2009, 52 of 53 in 2010, and 57 of 64 in 2011 were retained for analyses.

**Standardization**

The delta-lognormal index of relative abundance as described by Lo *et al*. (1992) was estimated. For a full review of the backward selection procedure for each submodel and diagnostic plots, refer to SEDAR31-DW28.

The month effect was dropped from the binomial submodel based on type 3 analyses. However, with the variable removal there was a corresponding increase in AIC, but due to the high insignificance of the month variable, it was left out of the model. For the lognormal submodel for nonzero observation of red snapper, the water depth variable was dropped from the model, and there was a corresponding decrease in the AIC value.

### *5.3.6.4. Results*

Red snapper distribution and abundance on the inner and mid shelf have consistently and noticeably differed east and west of Cape San Blas since the Panama City survey began in 2004/5 (Tables 5.3.6.1 and 5.3.6.2, Figures 5.3.6.4 and 5.3.6.5)(DeVries et al. 2008, 2009). Red snapper has been, by far, the most commonly encountered exploited reef fish west of Cape San Blas (the Cape) every year, occurring in 47 – 88 % of trap catches and 91 – 100 % of video samples (Table 5.3.6.1, Figure 5.3.6.6). In contrast, east of the Cape, red snapper have been much less common, especially during 2004-08, when they occurred in 0-8 % of trap sets and 9-26 % of video samples. Since 2009, up through 2011, those numbers have been considerably higher: 20-36 % for traps and 26-46 % for video (Table 5.3.6.1, Figure 5.3.6.4). Some of the increase reflects 1) the difference in the distribution of depths sampled in each area, e.g., only a small proportion of sites <20 m have been sampled west of the Cape, while in the east through 2009, very few sites >20 m were sampled; as well as 2) the expansion of sampling to deeper depths over time (Figure 5.3.6.3). Figure 5.3.6.4 clearly shows that red snapper east of Cape San Blas were rarely observed in depths <20 m. Although the sampling depth differences and changes likely explain some of the increases in occurrence, it also appears to reflect an expansion of the population into Apalachee Bay, as occurrence increased noticeably even in shallow (<20 m) areas, especially an area in northwest Apalachee Bay in 2009 (Figure 5.3.6.5).

Overall modal size of red snapper taken in traps was fairly stable 2005-2007, ranging from 300 to 350 mm TL, then steadily increased through 2011, when it was 375 to 425 mm TL (Figure 5.3.6.7). Along with this increase in modal size, the lower (left hand) tail of the distribution also shifted, increasing from around 200-225 mm in 2005 to about 325 mm in 2011. Part of this shift may reflect the expansion of the sampling depth range west of the Cape during those years, as a comparison of size structure in depths < and > 30 m (Figure 5.3.6.8) clearly showed smaller average sizes in shallower depths. However, the shift in size structure co-occurred with increasingly restrictive management measures and mirrored the steady increases in average sizes (and catch rates) of recreationally harvested fish in the area, which suggests it shows a real trend in the population and is not just an artifact of changes in sampling depths.

Not surprisingly, a comparison of size data from trap catches with that from stereo images indicated that the traps do select against most red snapper >650 mm TL, although fish that large appear to be uncommon in the survey area based on the few stereo measurements obtained (Figure 5.3.6.9). For the most part, in 2011, west of the Cape, the size distributions were surprisingly similar between the two gears, except for the rare large fish detected only with the video gear. Earlier (2007-09) size data from scaling lasers suggested traps were selecting against the smallest individuals, perhaps an inhibiting effect of larger, more aggressive fish entering the trap first. In 2009, unexpectedly, the distribution of the laser measurements was shifted to the left (smaller) of that from the stereo data, with an obviously smaller mode; while the distributions of the trap fish and that from the stereo images, like in 2011, were very similar. Given the problem of potentially measuring the same fish more than once with lasers, length data from stereo images taken from a frame with no more than the min count of that site is likely to be more unbiased.

Age structure in trap catches during 2005-2007 was dominated by 2 and 3 yr olds, with an obvious mode at age 2 ; one and four yr olds were uncommon, except for age ones in 2005 (Figure 5.3.6.10). In 2008 and 2009, two and three yr olds still dominated the age structure; and in 2008, for the first time, four yr olds were quite common and a few fish to age 8 were caught. The 2006 and 2007 year classes, equating to the 2 and 3 yr old modal group in 2009, continued to dominate the age structure as 3 and 4 yr olds in 2010 and 4 and 5 yr olds in 2011, suggesting these two year classes were fairly strong. In 2010, age ones were no longer present, and by 2011, as the distribution continued to shift to older ages, age 2 fish were also virtually nonexistent.

#### *5.3.6.5. Video indices of abundance*

Figure 5.3.6.11 and Table 5.3.6.3 summarize indices of red snapper developed from the Panama City video data, 2005-2011, using a delta-lognormal model. The index, scaled to a mean of one over the time series, peaked in 2009; and based on the age frequency data from trap catches (Figure 5.3.6.9), the fish were primarily from the 2006 and 2007 year classes. The index declined in 2010 and 2011, perhaps as the influence of the apparently strong 06 and 07 cohorts waned. Diagnostics for each of the submodels in the index development and QQ plots can be found in reference document SEDAR31-DW-28.

#### *5.3.6.6. Comments on Adequacy for Assessment*

There was discussion within the IWG of combining all video indices into one index. However, the NMFS Video Survey is conducted on offshore banks throughout the Gulf, while the other video surveys, including this one, were conducted closer to shore. Therefore, a combined video index utilizing both the Panama City NMFS and the FWRI Video Survey Data was suggested, and will be presented at the Assessment Workshop.

### *5.3.7. Other Fishery-Independent Datasets*

Data was presented by the Dauphin Island Sea Lab concerning bottom longline and trawling off the Alabama coast. It was discussed that these data should be analyzed and possibly combined with NMFS survey data to produce joint indices. These analyses will be conducted and presented during the Assessment Workshop.

## 5.4 Fishery Dependent Indices

### *5.4.1. Fishery Dependent Recreational Surveys (SEDAR 31-DW-33)*

The recreational fisheries in the Gulf of Mexico are surveyed by three programs:

- Marine Recreational Fishery Statistics Survey (MRFSS) conducted by the NOAA Fisheries (NMFS).
- Texas Marine Sport-Harvest Monitoring Program by the Texas Parks and Wildlife Department (TPWD).

- Headboat Survey (HBS) conducted by NMFS, Southeast Fisheries Science Center, Beaufort, NC.

These three surveys together provide information on catch in numbers, fishing effort, and length and weight samples. The MRFSS and the TPWD survey are both sampling-based, while the Headboat Survey is a census of headboats using logbooks provided to all headboats to report total landings per trip and fishing effort. MRFSS was conducted in TX through 1985, after which the Texas Parks and Wildlife Department covered surveying efforts. In addition, starting in 1986, MRFSS no longer covered headboats in the Gulf of Mexico and instead this sector of the recreational fishery was covered by the Headboat Survey. MRFSS provides information on participation, effort, and species-specific catch. Data are collected to provide catch and effort estimates in two-month periods ("waves") for each recreational fishing mode (shore fishing, private/rental boat, charterboat, or headboat/charterboat combined) and area of fishing (inshore, state Territorial Seas, U.S. Exclusive Economic Zone) in each Gulf of Mexico state (except Texas). Total catch information is collected by MRFSS on fish landed whole and observed by the interviewers ("Type A"), fish reported as killed by the fishers ("Type B1") and fish reported as released alive by the fishers ("Type B2"). Similar to MRFSS, the Texas Parks and Wildlife survey also, provides information on participation, effort and species-specific landings however no discards are reported in this dataset.

#### *5.4.1.1 Methods of Estimation*

**Data Filtering Techniques**

The Stephens and MacCall approach (2004) was used to select trips that fished in the same habitat and could have caught red snapper. Data was split east and west of the Mississippi River in order to generate indices for the eastern and western Gulf of Mexico. In addition, indices were estimated separately for the private boat/for hire and headboat sectors of the recreational fishery. For the headboat survey, based on the working group's recommendation, the data was subset such that only data collected during red snapper open seasons was used in the analysis. The reason for this was because fishing effort that took place outside of the red snapper fishing season would not have targeted red snapper, and any red snapper caught incidentally would have been discarded and not recorded in the headboat survey.

**Standardization**

Two different ways of standardizing CPUE for the recreational red snapper fishery were explored. One used a Delta lognormal approach, which models the presence or absence of encountering the species on that trip as zero or one using a binomial model, separately from the positive observations of actual CPUE using a lognormal model. The second approach also used a Delta model however a censored lognormal regression model was used to model the positive observations of CPUE. The reason for using this model was to capture the effect of the bag limit on CPUE, which had become increasingly strict over the time series. The working group recommended the use of the censored approach to standardizing CPUE because of its ability to account for the bag limit effect which, if not accounted for, would otherwise give the artificial perception that abundance had decreased unnecessarily over the time series.

The main advantage of using the Delta method is to allow for the probability of zero catch (Ortiz *et al.* 2000). The index computed by this method is a mathematical combination of yearly abundance estimates from two distinct generalized linear models: a binomial (logistic) model which describes proportion of positive abundance values (i.e. presence/absence) and a censored lognormal model which describes variability in only the nonzero abundance data (Lo *et al.* 1992). The sub-models of the delta-lognormal model were built using a forward selection procedure based on type 3 analyses based on reduction of AIC and a reduction in deviance of greater than one percent.

**Submodel Variables**

*Headboat*

Year: 1986-2011
Month: 1-12
Headboat Areas: 16(west coast of Florida), 18(Dry Tortugas Gulf waters), 20(South West Florida), 21(Naples-Crystal River), 22(Florida Middle Grounds), 23(NW Florida and Alabama), 24(Louisiana), 25(NE Texas Sabne-Freeport), 26(Central Texas Port Aransas), 27(South Texas Port Isabel)
Number of Anglers (Binomial Component only): 10, 20, 30, 40, 50, 60, 70, 80 or 90 where 90 is a plus group

*MRFSS/Texas Parks and Wildlife Survey*

Year: 1981-2011 for private/for hire, and 1986-2011 for headboat
Wave (groupings of every two months): 1-6
Area: Inshore waters, state waters, federal waters
State: Florida, Alabama, Mississippi, Louisiana, Texas
Number of Anglers (Binomial Component only): 1- 10, where 10 is a plus group

**Annual Abundance Indices**

Tables with the final annual indices and coefficient of variations can be found in Tables 5.4.1.1 and 5.4.1.2. Please see the working paper SEDAR 31-DW-33 for fit diagnostics and additional synthesis of the model results including final model selection tables for the binomial component and censored lognormal regression component with the factors that were included in the models.

### *5.4.1.2 Sampling Intensity*

Tables of sample sizes across strata can be found in working document SEDAR 31-DW-33.

### *5.4.1.3 Size/Age Data*

Please see SEDAR 31-DW-10.

#### *5.4.1.4 Catch Rates*

Standardized catch rates are presented in Tables 5.4.1.1 and 5.4.1.2 and Figure 5.4.1.1.

#### *5.4.1.5 Uncertainty and Measures of Precision*

Annual CVs of catch rates are presented in Tables 5.4.1.1 and 5.4.1.2.

#### *5.4.1.6 Comments on Adequacy for Assessment*

The working group recommended the use of the censored approach to standardizing CPUE using red snapper data from the recreational fishery. The group felt that the censored approach was able to account for the bag limit effect which would otherwise give the artificial perception that abundance had decreased over the time series. After reviewing the resulting recreational indices, the working group recommended that the both the for/hire and headboat indices be used in the assessment for both the eastern and western Gulf of Mexico. These indices were decided to be included in the assessment because they cover a long time series, the entire spatial domain of the stock, and provide the stock assessment model with a source of information about the recreational sector of the red snapper fishery.

### *5.4.2. Commercial Fishery Catch Rates (SEDAR7-DW-47 and SEDAR7-AW-9)*

Indices constructed for the 2009 Gulf of Mexico red snapper assessment included data for the period 1990 (beginning of self-reported logbook program) through 2006 (final year in which red snapper management measures did not include Individual Fishing Quotas, IFQs). Fisher behavior has reportedly changed from that characteristic of a derby fishery to one in which red snapper are not specifically targeted. No accepted method has been demonstrated by which catch and effort data from the pre-IFQ and IFQ years can be integrated into a single index of abundance. Research funds have been obtained by SEFSC to address this issue, but that project is ongoing. For the period 1990-2006, the indices constructed for the 2009 update assessment have been provided for use in the current assessment. Methods and results of those analyses are provided below.

#### *5.4.2.1. Commercial Handline*

Data from the National Marine Fisheries Service reef fish logbook program were used to construct separate abundance indices of red snapper for the eastern and western Gulf of Mexico (divided at the Mississippi River). Indices included the years 1990-2006. Unlike the 2004 assessment, the current assessment model was able to accommodate changes in minimum size limits, therefore, the CPUE time series was not truncated to include only those years of consistent minimum size limits. After 2006 an Individual Fishing Quota (IFQ) system was established for red snapper. Catch and effort data for those years were not included in the analyses because under the IFQ system, fishing behavior and catchability may have changed from earlier years. Such a change prevents the direct comparison of CPUEs in 2007-2011 with CPUEs of earlier years.

The index constructed from eastern Gulf of Mexico (GOM) data used the Stephens and MacCall (2004) method for identifying trips with fishing effort in red snapper habitat. Construction of the western GOM index of abundance initially used the Stephens and MacCall (2004) approach for trip selection, however, this resulted in greater than 90% positive trips. A lognormal model was used because a delta-lognormal model is not appropriate with such a high proportion of positive trips.

The utility of the commercial catch rates as indices of population abundance was of some concern because of the potential effect of trip limits on the results. Over much of the time series, vessels were limited by permit to either 2,000 or 200 pounds of landed red snapper per trip. In the western GOM, a large percentage of trips met or exceeded the trip limit (48.5% of 2,000 pound permitted trips; 39.1% of 200 pound permitted trips; 5.4% of trips with no permit). Of those trips that met or exceeded the trip limit, red snapper accounted for more than 50% of the landings in 99% of the 2,000 pound permitted trips, 90% of the 200 pound permitted trips, and 100% of the non permitted trips. If a trip limit was reached in the western GOM, in nearly all cases the trip ended once the limit was reached and the effort may reasonably be assumed to have been directed at red snapper; i.e., effort was not shifted to other species. If effort were shifted to other species, the available logbook data could not be apportioned among multiple targeted species for a single trip. In addition, effort was calculated as hook hours fished on each trip, therefore, CPUE could be properly calculated for red snapper even though the trip limit was reached. Changes in abundance would be reflected by changes in catch per hour. If effort had been defined as landings per trip, trip limits would have affected CPUE calculations because CPUE would have had an insufficiently defined time component. Longer (or shorter) trips would not be accounted for in CPUE calculations if “trip” were the measure of effort.

In the eastern GOM, a smaller percentage of trips met or exceeded the trip limits than was reported in the western GOM. Approximately 22.5% of 2,000 pound permitted trips, 32.2% of 200 pound permitted trips, and 0.07% of non permitted trips met or exceeded the trip limit. Of the trips that met or exceeded the trip limit, 96% of 2,000 pound permitted trips, 63% of 200 pound permitted trips, and 100% of non permitted trips reported landings of more than 50% red snapper. Although 37% of the 200 pound permitted trips reported landings of less than 50% red snapper, those trips accounted for only 5.6% of the total trips included in the analysis. Trip limits likely had little effect on index construction in the eastern GOM. Indices were also constructed with only those trips reporting red snapper landings below the trip limit and are compared with indices constructed using the full data set in Figures 5.4.2.1 (eastern GOM) and 5.4.2.2 (western GOM). Only minor differences between the indices were apparent.

Catch rate was calculated in weight of fish per hook-hour. Seven factors were tested for their possible affects on the proportion of positive trips (east only) and catch rate. Factors were: year, red snapper season (open or closed; only open season data used in the west), area fished, permit type (2,000 pound, 200 pound, or none), days at sea, season of the year (Jan-Apr, May-Aug, Sep-Dec), and number of crew.

A forward stepwise regression procedure was used to determine the set of fixed factors and interaction terms that explained a significant portion of the observed variability. Each potential factor was added to the null model sequentially and the resulting reduction in deviance per degree of freedom was examined. The factor that caused the greatest reduction in deviance per degree of freedom was added to the base model if the factor was significant based upon a Chi-Square test ($p<0.05$), and the reduction in deviance per degree of freedom was ≥1%. This model then became the base model, and the process was repeated, adding factors and interactions individually until no factor or interaction met the criteria for incorporation into the final model.

Once a set of fixed factors was identified, the influence of the YEAR*FACTOR interactions were examined. YEAR*FACTOR interaction terms were included in the model as random effects. Selection of the final mixed model was based on the Akaike's Information Criterion (AIC), Schwarz's Bayesian Criterion (BIC), and a chi-square test of the difference between the –2 log likelihood statistics between successive model formulations (Littell et al. 1996).

*Final models in the eastern Gulf of Mexico:*

Binomial model on proportion positive trips

PPT = RS Season + Subregion + Year + Permit + Days at Sea + RS Season*Year + RS Season*Permit + Subregion*Days at Sea + Year*Days at Sea

Lognormal on CPUE of successful trips

Log(CPUE) = Days at Sea + Red Snapper Season + Year + Permit + Crew + Red Snapper Season*Year + Days at Sea*Year + Days at Sea*Permit+ Year*Permit

*Final model in the western Gulf of Mexico:*

Lognormal on CPUE of successful trips

Log(CPUE) = Days at Sea + Area Fished + Year + Permit + Crew + Area*Permit + Area*Year + Area*Crew + Year*Crew+ Days at Sea*Area

Standardization methods followed those used in the 2004 red snapper assessment where indices of abundance were constructed using the delta-lognormal approach of Lo et al. (1992) in the eastern GOM. The western index was constructed using a lognormal analysis. Indices are provided in Table 5.4.2.1 and Figures 5.4.2.1 – 5.4.2.2.

### *5.4.3 Index of Abundance for Pre-Fishery Recruit Red Snapper from Florida Headboat Observer Data (SEDAR 31-DW-09)*

**Fishery**

Recreational hook-and-line fishing on head boats

**Geographic Region**

Sampled vessels operated from northwest Florida to the central west coast of Florida (Figure 5.4.3.1).

**Time Period Covered**

2005 through 2007 and June 2009 to present.

**Data Collection Methods**

Head boats in each of two regions (Figure 5.4.3.1) were randomly selected each week throughout the year for observer coverage. All head boats operating in the two regions voluntarily permitted observers on scheduled trips. Single day trips took place in nearshore and offshore fishing areas (Figure 5.4.3.1) and ranged from 4 to 15 hours in duration. Multi-day trips were sampled as a separate strata in the central west coast region, and these trips were greater than 24 hours in duration and took place farther offshore (Figure 5.4.3.1). One to two observers were scheduled per sampled trip and each observer selected a set of 5 to 10 anglers that they could visually observe. For more detailed methods, see Sauls and Cermak (2012). .

**Variables Recorded**

For each trip sampled, the following variables were collected consistently throughout the time-series:

- Day, month and year
- Region (northwest Florida, central west Florida)
- Trip type (single-day, multi-day)
- Trip duration
- Minimum and maximum depths fished
- Area fished the majority of time (state territorial seas, federal EEZ)
- Number of anglers on board
- Number of anglers observed

For each fish caught by an observed angler, the following variables were collected consistently throughout the time series:

- Species
- Disposition (harvested, released alive, released dead)
- Length (in mm) at the midline was recorded before fish were released or harvested, as time permitted, for all managed species. Red snapper were given high priority, and almost all red snapper were measured before they were released.

**Size Composition of Red Snapper**

Figure 5.4.3.2 shows length frequencies for all red snapper observed during June and July by year for 1 cm length bins. Total length in mm was calculated as: 1.89 + 1.06* fork length in mm, and converted to cm. Length frequencies for sublegal sizes (pre-fishery recruits) are included in bins for 40cm (39.5-40.4 cm) and lower. The months of June and July were consistently open to harvest each year during the time series. Other months were excluded since the duration of the harvest season varied each year (Table 5.4.3.1), which could influence length frequencies for observed fish if vessels target legal sized fish during the harvest season and/or avoid red snapper by-catch during the non-harvest season.

**Data Exclusions**

Head boat vessel operators throughout the Gulf of Mexico have been required by NMFS to report harvested red snapper on logbook trip reports since the 1980's. The logbook time-series covers a larger geographic region that overlaps temporally and spatially with this data source. Therefore, harvested fish are excluded from this analysis, but could be included if the NMFS logbook is not used as an index for SEDAR 31. In 2005, space was provided on the logbook data sheet to record red snapper discards. Comparisons between individual logbook trip reports and at-sea observer data indicate that self-reported logbook data for numbers of red snapper harvested are reliable, but that discards may be under reported and are frequently omitted on logbook trip reports (Sauls and Brennan, unpublished data). Therefore, self-reported logbook data may not be a reliable data source for constructing a pre-fishery recruit index. This analysis explores the utility of head boat at-sea observer data from Florida for constructing an index of abundance for pre-fishery recruits in the eastern Gulf of Mexico.

There was a reduction in the length of the red snapper harvest season over the course of this time series, and an interruption in funding prevented trips from being sampled every month or every year (Table 5.4.3.1). Temporal changes in the recreational harvest season could affect CPUE if vessels change their fishing areas and methods to target legal-size red snapper when the season is open. Since small red snapper may be more abundant in state waters than in federal waters, the spatial coverage of the harvest season was also important. We identified two months where the red snapper season was consistently open in both federal and state jurisdictions during all years 2005 to 2012. Size limits and bag limits also remained unchanged from 2005 to 2012. Head boat trips were consistently sampled during June and July each year from 2005 to 2012, except 2008. Therefore, we chose the months of June and July to construct an index of abundance. During years when harvest closed mid-way during the month of July, only trips sampled during the portion of the month open to harvest were included in the index (excluded trips after July 24, 2010; July 18, 2011; and July 16, 2012). The year 2010 should be viewed with caution due to spatial shifts in effort following the Deepwater Horizon disaster, when portions of the study area were closed to all fishing during a large portion of June and July.

**Data Reduction Techniques**

The proportions of head boat trips with releases of undersized red snapper ranged from roughly 40% and 60% in June and July overall (Figure 5.4.3.3), but the proportions of trips with releases were much greater in the NW FL region (60-100%) than in the TB region (7-31%). Undersized releases of red snapper were observed by at-sea samplers only in head boat catches (Figures 5.4.3.4-5.4.3.5) from average water depths of 50' or deeper (average of minimum and maximum depths for 2005-2007 and 2009-2011). Releases of undersized red snapper tended to be in deeper waters in the TB region compared to the NW FL region. Trips where water depths fished were greater than or equal to 50' in both regions were chosen for analyses from the NW FL and TB regions. The proportion of trips with undersized releases of red snapper appears related to water depth fished (Figure 5.4.3.4), and suggests that the average depth fished may be a useful covariate in the binomial sub-model. However, the rates of releases of undersized red snapper by anglers appear more complex, and changes over time in the NW FL region (Figure 5.4.3.5).

While it may be a useful covariate in the model for trips with undersized releases, interaction terms may be necessary to handle this covariate when examining release rates.

A suitable method for selecting a universe of trips to evaluate (i.e., all trips which could have caught undersized red snapper – zeros as well as positives) has not been developed yet, but possibly could be done using clustering techniques (e.g., Shertzer and Williams 2008) or other selection procedures (e.g., Stephens and MacCall 2004). Species caught on trips with undersized red snapper were tabulated by frequency of occurrence, and those occurring on 10% or more of the trips with releases of undersized red snapper were analyzed. The Stephens and MacCall (2004) logistic selection method was attempted using data from NW FL and TB regions, but produced unsatisfactory results and in fact failed to converge successfully using more than one species (in this case, vermilion snapper) and more than a single region. There was little difference between using the occurrence of vermilion snapper to select NW FL trips for the analyses and using the samples from water depths greater than or equal to 50' as described in the preceding section. For the combined NW FL and TB regions, the species assemblages in the two regions caught with undersized red snapper were sufficiently different to cause the logistic selection analyses to be unhelpful. Therefore, all of the trips (with and without releases of undersized red snapper) from the NW FL and TB region from water depths fished of 50' or greater were used without the logistic selection criteria for identifying potential "zero" trips based upon species assemblages.

**Model Standardization**

There was one index produced for released undersized red snapper for the combined NW FL and TB regions. Trips with the average number of released undersized red snapper (zero and positive trips) were selected by region, year, month, and average water depth fished. Region, year, and month were used as classification variables, and average water depth fished was used as a potential covariate in the analyses. No interaction terms were included in the model formulations (for a discussion of the use of interaction terms in CPUE standardizations, see SEDAR 2008, S15A Mutton Snapper Review Workshop Consensus Report Section 2.1).

A general linear model [GENMOD procedure (SAS Institute Inc. 2008)] using a forward stepwise selection technique was used to estimate trends in the average number of released undersized red snapper per angler-trip. Two types of model probability distributions were used: binomial (with a logit link function) and gamma (with a log link function) (McCullagh and Nelder 1989). The binomial sub-model analyzed the presence or absence of released undersized red snapper by anglers on a trip, and the gamma sub-model analyzed the average releases of undersized red snapper per angler-trip on positive trips. The forward selection process analyzed the null model (no class variables chosen), and then each class variable or covariate added singly in the sub-model. If the GLM successfully converged, the reduction in deviance from the null model was assessed for each of these runs, and the class variable with the largest percentage reduction in deviance, a significant $\chi^2$ (Chi-square) value, and a lower corrected Akaike Information Criterion (AICc) than other class variables or covariate was selected for the sub-models. The next series of sub-model runs included the variable selected in the previous series along with each of the remaining variables or covariate (one at a time), and each of the resulting two-variable sub-models were assessed for sub-model convergence, the largest percentage reduction in deviance from the null model and significance criteria ($\chi^2$, AICc) as before. This process continued until the percentage reduction in deviance became less than some desired level or until neither variable nor covariate added was significant. For these model runs, a 1% reduction in deviance from the null model was the selected level of acceptance for a suite of class variables. If there were cases when the variable of interest (in this case, year was important) failed to be selected, it would have been included in the sub-model statement so that a year effect could be estimated. However, both of the sub-models included year using the criteria described. Annual values (and associated coefficients of variation) were estimated using the least squares mean method (SAS Institute Inc. 2008) for the year effect.

**Model Diagnostics**

The results of the analyses from the forward stepwise selection of variables for the linear models, the diagnostic plots (standardized residuals by year, q-q plot, and standardized residuals versus the fitted distribution) and scaled index values (index values scaled to their means) over time can be found in reference document SEDAR31-DW-09.

**Model Results**

The adjusted average undersized red snapper release rates (numbers per angler-trip), coefficient of variation (as a percentage of the mean), and the scaled index values are in Tables 5.4.3.2-5.4.3.3. A comparison of the adjusted means (rescaled by the n-weighted mean of the series) is in Figure 5.4.3.6. Nominal average undersized red snapper release rates (simple arithmetic and log-transformed means) and adjusted means (Figure 5.4.3.7).

#### *5.4.3.2. Comments on Adequacy for Assessment*

**This index was not recommended for use by the Indices Workgroup because the survey area is limited to the eastern Gulf and overlaps with the headboat index discussed in section 5.4.1 of this report. However, it should be noted that this index was developed using sub-legal sized discards to avoid overlap with the headboat survey, since the headboat index in 5.4.1 only includes red snapper that were legal harvest size. It is possible to update this pre-fishery recruit index to include the 2012 sample year in time for the Assessment Workshop if this index was to be considered for use. During the Data Workshop, the Indices Workgroup was asked to re-work this index to include red snapper of all size classes and evaluate the potential for using this index in place of the NMFS headboat index for the Eastern Gulf. The index was re-constructed, but was not reviewed by the Index Workgroup in time for inclusion in this report. A working paper for this re-worked index can be submitted for consideration during the Assessment Workshop if requested.**

## 5.5. Research Recommendations made by Members of the IWG

The following are research recommendations that could improve the utility (precision) of the SEAMAP larval index for red snapper.

1. Expand the use of molecular genetics to identify the smallest and most abundant snapper larvae in SEAMAP samples that cannot be positively identified as red snapper because diagnostic morphological characters are not yet developed.
2. Begin directed sampling for fish eggs on SEAMAP summer trawl and fall plankton surveys using vertical nets hauls. The protocols for fish egg sampling have been established by NMFS/SWFSC scientists and are in use on the west coast. Fish egg collections are easy to make and take little additional sampling time. The eggs in these samples would have to be identified genetically but the protocols for genetic identification of red snapper eggs have been worked out by Frank Hernandez and Keith Bayha at DISL. The results of their MARFIN funded project using CUFES samples from our SEAMAP Fall Plankton surveys are impressive and significant. They produced maps of red snapper egg (i.e. spawning) distribution over the entire Gulfwide survey area. Estimates of egg abundance data coupled with the updated reproduction parameters (spawning frequency and fecundity) generated by NMFS scientists at the Panama City Lab could eventually be used to produce an actual spawning biomass estimate for red snapper.
3. Continue aging red snapper larvae from SEAMAP samples to improve the age-length relationship (key). This should improve the precision of the SEAMAP larval abundance index that is now based on a single age class of larvae across years.
4. Produce a SEAMAP larval index based on the abundance of red snapper larvae captured during SEAMAP summer shrimp/groundfish surveys (past and present). This survey has for a number of years now been expanded to include the entire northern Gulf of Mexico shelf. I don't need to remind you that the data from summer months (i.e. during peak red snapper spawning months) could be a far better indication of spawning production than data from the end of season from which the current SEAMAP larval index is derived.
5. Explore the utility of a larval red snapper index based on a comprehensive modeling approach that includes all SEAMAP stations (regardless of how many times they have been sampled over the time series) and both sampling gears, i.e. neuston and bongo samples. There are other likely explanatory variables (one for sure is salinity) that could ultimately improve the index.

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## 5.7 Tables

Table 5.1.1. Datasets Reviewed for Indices Development.

| *Series* | *Author* | *Reference* | *Data Source* | *Area* | *Years* | *Season* | *Biomass/Number* | *Fishery Type* | *Standardization* | *Selectivity Info* | *Age Range* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NMFS BLL | Ingram and Pollack | SEDAR31-DW-19 | NMFS BLL Survey Data | FL-TX | 1996-2011 | Aug-Sept | Number per 100 hook-hours | Independent | Delta-lognormal | Age frequency | 1-43 |
| NMFS SEAMAP Trawl Survey | Pollack et al. | SEDAR31-DW-20 | NMFS SEAMAP Trawl Survey Data | AL-TX | 1987-2011 | Summer and Fall | Number per trawl-hour | Independent | Delta-lognormal | Length and Age | Primarily Age-0 and Age-1 |
| SEAMAP Reef Fish Video | Campbell et al. | SEDAR31-DW-08 | SEAMAP Reef Fish Video Survey Data | FL-TX | 1993-1997, 2001-2002, 2004-2011 | May-Aug | Video min count | Independent | Delta-lognormal | Length frequency (consistently 2005 onwards) | Primarily 2-7 |
| FWC Reef Fish | Switzer et al. | SEDAR31-DW-24 | FWC Reef Fish Survey Data | FL | 2008-2011 | June-Sept | Video min count; number per trap | Independent | none | Length and Age | Primarily 1-6 |
| NMFS Panama City | DeVries et al. | SEDAR31-DW-28 | NMFS Panama City Trap and Camera Data | FL | 2004-2011 (trap); 2005-2011 (video) | May-Oct | Video min count | Independent | Delta-lognormal | Length and Age frequency (2005-2011) | Primarily 1-6 |
| Larval | Pollack et al. | SEDAR31-DW-27 | SEAMAP Fall Plankton Survey Data | FL-TX | 1986-2010 | Late Summer, early Fall | number under 10 m2 sea surface | Independent | Delta-lognormal | Length and Age | Age-0 |
| MRFSS and TPWD | Saul and Walter | SEDAR31-DW-33 | MRFSS and TPWD data | FL-LA | 1981-2011 | Year-round | Number per angler-hour | Dependent | Censored lognormal | None | 2-43 |
| FWC Recreational Hook-and-Line on Head Boats | O'Hop and Sauls | SEDAR31-DW-09 | Recreational hook-and-line fishing on head boats | FL | 2005-2007 and June 2009-present | June-July | Number of undersized red snapper released by head boat anglers per trip | Dependent | GLM | Length Frequency | Pre-fishery recruits |
| Headboat | Saul and Walter | SEDAR31-DW-33 | MRFSS and TPWD Survey data | FL-TX | 1986-2011 | Year-round | Number per angler-hour | Dependent | Censored lognormal | None | 2-43 |
| Commercial Handline | McCarthy and Cass-Calay | SEDAR7-DW-47 and SEDAR7-AW-9 | NMFS Reef Fish logbook program | FL-TX | 1990-2006 | Year-round | Weight of fish per hook-hour | Dependent | Delta-lognormal and lognormal | None | 2-43 |
| Headboat Observer | O'Hop and Sauls | SEDAR31-DW-9 | NMFS Headboat Observer data | FL | 2005-2007 and June 2009-2011 | June-July | Number of released fish per angler-trip | Dependent | Delta-Gamma | None | 2-43 |

Table 5.3.1.1. Number of stations sampled by shrimp statistical zone during the Summer SEAMAP groundfish survey from 1982-2011.

| | Shrimp Statistical Zone | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | Total |
| 1982 | | | | | | | | | 14 | 22 | 24 | 26 | 8 | 1 | 11 | 30 | 10 | 3 | 23 | *172* |
| 1983 | | | | | | | 5 | 19 | 8 | 13 | | 6 | 16 | 19 | 25 | 24 | 21 | 5 | 17 | *178* |
| 1984 | | | | | | | | | 13 | 16 | 10 | 16 | 16 | 22 | 17 | 15 | 23 | 28 | 14 | *190* |
| 1985 | | | | | | | | | 10 | 26 | 5 | 7 | 8 | 10 | 7 | 7 | 12 | 11 | 10 | *113* |
| 1986 | | | | | | | | | 14 | 21 | 2 | 5 | 14 | 8 | 11 | 8 | 11 | 14 | 6 | *114* |
| 1987 | | | | | | | | | 30 | 66 | 6 | 20 | 19 | 25 | 20 | 16 | 25 | 28 | 19 | *274* |
| 1988 | | | | | | | | | 19 | 49 | 5 | 4 | 3 | 19 | 24 | 14 | 25 | 28 | 23 | *213* |
| 1989 | | | | | | | | | 23 | 30 | | 3 | 18 | 25 | 7 | 15 | 20 | 29 | 24 | *194* |
| 1990 | | | | | | | | | | 68 | 11 | 20 | 15 | 23 | 16 | 20 | 23 | 24 | 20 | *240* |
| 1991 | | | | | | | | | | 46 | 12 | 24 | 13 | 23 | 22 | 24 | 18 | 23 | 26 | *231* |
| 1992 | | | | | | | | | 1 | 45 | 2 | 20 | 24 | 20 | 25 | 12 | 31 | 26 | 20 | *226* |
| 1993 | | | | | | | | | | 45 | 10 | 19 | 17 | 24 | 19 | 14 | 29 | 24 | 22 | *223* |
| 1994 | | | | | | | | | | 61 | 6 | 17 | 22 | 25 | 17 | 20 | 22 | 26 | 22 | *238* |
| 1995 | | | | | | | | | | 44 | 10 | 16 | 18 | 22 | 23 | 13 | 27 | 26 | 21 | *220* |
| 1996 | | | | | | | | | | 46 | 14 | 12 | 19 | 22 | 18 | 17 | 21 | 26 | 25 | *220* |
| 1997 | | | | | | | | | | 44 | | 12 | 16 | 22 | 23 | 10 | 28 | 26 | 26 | *207* |
| 1998 | | | | | | | | | | 35 | 2 | 14 | 21 | 25 | 18 | 14 | 22 | 36 | 17 | *204* |
| 1999 | | | | | | | | | | 44 | 7 | 20 | 19 | 20 | 23 | 13 | 25 | 32 | 20 | *223* |
| 2000 | | | | | | | | | | 45 | 2 | 19 | 15 | 19 | 27 | 8 | 29 | 31 | 21 | *216* |
| 2001 | | | | | | | | | | 36 | 7 | 18 | 18 | 13 | 3 | 10 | 9 | 17 | 21 | *152* |
| 2002 | | | | | | | | | | 44 | 11 | 14 | 21 | 27 | 19 | 15 | 25 | 29 | 22 | *227* |
| 2003 | | | | | | | | | | 44 | 9 | 10 | 8 | 2 | 17 | 20 | 22 | 26 | 23 | *181* |
| 2004 | | | | | | | | | | 39 | 11 | 18 | 17 | 20 | 25 | 21 | 19 | 25 | 21 | *216* |
| 2005 | | | | | | | | | | 32 | 10 | 9 | 11 | 16 | 21 | 5 | 28 | 22 | 27 | *181* |
| 2006 | | | | | | | | | | 45 | 11 | 21 | 12 | 20 | 23 | 17 | 23 | 31 | 18 | *221* |
| 2007 | | | | | | | | | | 41 | | 6 | 15 | 22 | 23 | 7 | 29 | 32 | 21 | *196* |
| 2008 | | | 1 | 8 | 11 | 6 | 11 | 8 | 11 | 43 | 24 | 19 | 27 | 23 | 22 | 17 | 24 | 21 | 29 | *305* |
| 2009 | | | 35 | 21 | 29 | 15 | 16 | 18 | 24 | 67 | 25 | 20 | 36 | 39 | 46 | 53 | 33 | 29 | 23 | *529* |
| 2010 | | 31 | 26 | 21 | 24 | 10 | 12 | 14 | 14 | 22 | 5 | 20 | 16 | 21 | 33 | 34 | 27 | 27 | 19 | *376* |
| 2011 | 11 | 24 | 22 | 20 | 29 | 2 | 14 | 11 | 8 | 16 | 7 | 14 | 17 | 24 | 29 | 29 | 18 | 21 | 13 | *329* |
| Total | *11* | *55* | *84* | *70* | *93* | *33* | *58* | *70* | *189* | *1195* | *248* | *449* | *499* | *601* | *614* | *522* | *679* | *726* | *613* | *6809* |

Table 5.3.1.2. Number of stations sampled by shrimp statistical zone during the Fall SEAMAP groundfish survey from 1972-2011.

| | Shrimp Statistical Zone | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | Total |
| 1972 | | | | | | | | | 10 | 55 | 27 | 41 | 34 | 17 | | | | | | *184* |
| 1973 | | | | | | | | 11 | 17 | 98 | 34 | 71 | 39 | 2 | | | | | | *272* |
| 1974 | | | | | | | | | 12 | 92 | 35 | 73 | 31 | | | | | | | *243* |
| 1975 | | | | | | | | | | 93 | 33 | 80 | 35 | 32 | 7 | | | | | *280* |
| 1976 | | | | | | | | | | 108 | 42 | 79 | 56 | 22 | | | | | | *307* |
| 1977 | | | | | | | | | | 97 | 31 | 76 | 38 | | | | | | | *242* |
| 1978 | | | | | | | | | 36 | 101 | 32 | 67 | 58 | 25 | | | | | | *319* |
| 1979 | | | | | | | | | | 109 | 35 | 72 | 55 | 2 | | | | | | *273* |
| 1980 | | | | | | | | | 24 | 85 | 22 | 70 | 32 | | | | | | | *233* |
| 1981 | | | | | | | | | 21 | 85 | 33 | 66 | 49 | 25 | | | | | | *279* |
| 1982 | | | | | | | | | 21 | 102 | 41 | 72 | 37 | | | | | | | *273* |
| 1983 | | | | | | | | | 17 | 82 | 35 | 63 | 25 | | | | | | | *222* |
| 1984 | | | | | | | | | | 82 | 32 | 64 | 47 | 1 | | | | | | *226* |
| 1985 | | | | | | | | | 30 | 59 | 17 | 27 | 51 | 32 | 10 | 20 | 20 | 19 | 19 | *304* |
| 1986 | | | | | | | 20 | 10 | 21 | 19 | 7 | 15 | 14 | 27 | 35 | 26 | 23 | 22 | 21 | 260 |
| 1987 | | | | | | | | | 16 | 28 | 15 | 14 | 16 | 17 | 15 | 15 | 15 | 18 | 3 | *172* |
| 1988 | | | | | | | | | 8 | 28 | 7 | 22 | 17 | 18 | 26 | 19 | 21 | 31 | 20 | *217* |
| 1989 | | | | | | | | | | 43 | 12 | 19 | 17 | 22 | 20 | 17 | 22 | 25 | 26 | *223* |
| 1990 | | | | | | | | | | 52 | 14 | 12 | 23 | 22 | 19 | 18 | 22 | 19 | 27 | *228* |
| 1991 | | | | | | | | | | 46 | 6 | 24 | 14 | 20 | 25 | 24 | 19 | 25 | 22 | *225* |
| 1992 | | | | | | | | | | 33 | 7 | 23 | 14 | 25 | 18 | 17 | 27 | 30 | 18 | *212* |
| 1993 | | | | | | | | | | 72 | 10 | 19 | 17 | 26 | 18 | 16 | 25 | 28 | 18 | *249* |
| 1994 | | | | | | | | | | 50 | 9 | 16 | 21 | 25 | 20 | 21 | 23 | 24 | 20 | *229* |
| 1995 | | | | | | | | | | 40 | 10 | 17 | 18 | 24 | 19 | 14 | 26 | 30 | 19 | *217* |
| 1996 | | | | | | | | | | 45 | 9 | 18 | 19 | 17 | 28 | 13 | 25 | 29 | 24 | *227* |
| 1997 | | | | | | | | | | 44 | 10 | 17 | 20 | 26 | 19 | 18 | 23 | 22 | 24 | *223* |
| 1998 | | | | | | | | | | 44 | 10 | 22 | 14 | 34 | 11 | 15 | 24 | 29 | 22 | *225* |
| 1999 | | | | | | | | | | 42 | 10 | 17 | 18 | 29 | 18 | 12 | 28 | 29 | 22 | *225* |
| 2000 | | | | | | | | | | 43 | 10 | 14 | 22 | 20 | 26 | 12 | 30 | 25 | 21 | *223* |
| 2001 | | | | | | | | | | 21 | 10 | 17 | 19 | 26 | 20 | 14 | 27 | 28 | 23 | *205* |
| 2002 | | | | | | | | | 1 | 51 | 10 | 13 | 22 | 22 | 23 | 14 | 26 | 30 | 21 | *233* |
| 2003 | | | | | | | | | 1 | 76 | 9 | 16 | 21 | 24 | 22 | 20 | 23 | 25 | 23 | *260* |
| 2004 | | | | | | | | | | 43 | | 11 | 18 | 17 | 27 | 14 | 24 | 30 | 21 | *205* |
| 2005 | | | | | | | | | | 44 | 11 | 20 | 16 | 33 | 18 | 14 | 23 | 24 | 27 | *230* |
| 2006 | | | | | | | | | 1 | 47 | 7 | 22 | 14 | 18 | 28 | 13 | 23 | 32 | 19 | *224* |
| 2007 | | | | | | | | | | 31 | 9 | 20 | 17 | 18 | 28 | 17 | 20 | 18 | 26 | *204* |
| 2008 | | | | 15 | 14 | 4 | 4 | 3 | 4 | 35 | 18 | 28 | 34 | 42 | 46 | 44 | 19 | 36 | 20 | *366* |
| 2009 | | | 20 | 21 | 25 | 10 | 21 | 13 | 12 | 48 | 12 | 23 | 23 | 30 | 49 | 47 | 31 | 36 | 22 | *443* |
| 2010 | | | 9 | 27 | 27 | 18 | 16 | 11 | 14 | 16 | 7 | 15 | 18 | 26 | 31 | 29 | 18 | 19 | 14 | *315* |
| 2011 | | | | | | | 9 | 11 | 6 | 14 | 6 | 15 | 16 | 27 | 31 | 28 | 21 | 19 | 15 | *218* |
| Total | | | *29* | *63* | *66* | *32* | *70* | *59* | *272* | *2303* | *694* | *1390* | *1069* | *793* | *657* | *531* | *628* | *702* | *557* | *9915* |

Table 5.3.1.3. Summary of the red snapper length data collected during Summer (top) and Fall (bottom) SEAMAP groundfish surveys conducted between 1987 and 2011.

| Survey Year | Number of Stations | Number Collected | Number Measured | Minimum Fork Length (mm) | Maximum Fork Length (mm) | Mean Fork Length (mm) | Standard Deviation |
|---|---|---|---|---|---|---|---|
| 1987 | 274 | 464 | 222 | 100 | 304 | 170 | 46 |
| 1988 | 213 | 215 | 185 | 87 | 365 | 177 | 51 |
| 1989 | 194 | 240 | 184 | 31 | 423 | 145 | 56 |
| 1990 | 240 | 1312 | 775 | 42 | 760 | 159 | 38 |
| 1991 | 231 | 528 | 463 | 22 | 357 | 177 | 52 |
| 1992 | 226 | 465 | 334 | 31 | 774 | 158 | 54 |
| 1993 | 223 | 542 | 372 | 32 | 279 | 147 | 35 |
| 1994 | 238 | 904 | 555 | 39 | 378 | 153 | 38 |
| 1995 | 220 | 733 | 575 | 14 | 739 | 160 | 67 |
| 1996 | 220 | 1397 | 658 | 30 | 860 | 154 | 65 |
| 1997 | 207 | 768 | 502 | 29 | 636 | 163 | 44 |
| 1998 | 204 | 408 | 386 | 51 | 785 | 156 | 58 |
| 1999 | 223 | 375 | 352 | 25 | 776 | 169 | 89 |
| 2000 | 216 | 742 | 674 | 18 | 778 | 143 | 72 |
| 2001 | 152 | 174 | 172 | 31 | 339 | 147 | 63 |
| 2002 | 227 | 641 | 496 | 11 | 675 | 171 | 69 |
| 2003 | 181 | 312 | 286 | 13 | 830 | 162 | 70 |
| 2004 | 216 | 1248 | 568 | 30 | 752 | 157 | 45 |
| 2005 | 181 | 787 | 616 | 18 | 796 | 165 | 62 |
| 2006 | 221 | 598 | 576 | 20 | 324 | 151 | 57 |
| 2007 | 196 | 777 | 777 | 32 | 651 | 169 | 47 |
| 2008 | 305 | 954 | 952 | 24 | 648 | 175 | 71 |
| 2009 | 529 | 496 | 490 | 18 | 710 | 156 | 80 |
| 2010 | 376 | 707 | 659 | 29 | 811 | 191 | 92 |
| 2011 | 329 | 885 | 881 | 46 | 719 | 166 | 66 |
| Total Number of Years | Total Number of Stations | Total Number Collected | Total Number Measured | | | Overall Mean Fork Length (mm) | |
| 25 | 6042 | 16,672 | 12,710 | | | 163 | |

| Survey Year | Number of Stations | Number Collected | Number Measured | Minimum Fork Length (mm) | Maximum Fork Length (mm) | Mean Fork Length (mm) | Standard Deviation |
|---|---|---|---|---|---|---|---|
| 1987 | 172 | 327 | 164 | 50 | 606 | 154 | 83 |
| 1988 | 217 | 818 | 507 | 42 | 777 | 131 | 61 |
| 1989 | 223 | 2118 | 1077 | 40 | 852 | 109 | 45 |
| 1990 | 228 | 2090 | 1332 | 25 | 670 | 125 | 54 |
| 1991 | 225 | 2782 | 1782 | 36 | 407 | 118 | 41 |
| 1992 | 212 | 784 | 633 | 50 | 374 | 137 | 57 |
| 1993 | 249 | 1893 | 1288 | 20 | 680 | 128 | 63 |
| 1994 | 229 | 4807 | 1670 | 33 | 625 | 120 | 62 |
| 1995 | 217 | 4080 | 1886 | 32 | 630 | 114 | 48 |
| 1996 | 227 | 1935 | 1471 | 30 | 605 | 128 | 55 |
| 1997 | 223 | 3222 | 1616 | 40 | 549 | 117 | 46 |
| 1998 | 225 | 1614 | 1027 | 30 | 806 | 109 | 45 |
| 1999 | 225 | 2532 | 1869 | 37 | 453 | 112 | 39 |
| 2000 | 223 | 2047 | 1562 | 29 | 742 | 127 | 50 |
| 2001 | 205 | 2063 | 1239 | 40 | 780 | 126 | 61 |
| 2002 | 233 | 1609 | 1254 | 16 | 767 | 103 | 49 |
| 2003 | 260 | 3240 | 1867 | 31 | 750 | 103 | 38 |
| 2004 | 205 | 4964 | 2088 | 32 | 740 | 120 | 44 |
| 2005 | 230 | 3742 | 2239 | 33 | 754 | 128 | 53 |
| 2006 | 224 | 2900 | 1831 | 31 | 403 | 116 | 46 |
| 2007 | 204 | 2881 | 2825 | 31 | 365 | 101 | 37 |
| 2008 | 366 | 1239 | 1213 | 28 | 760 | 145 | 79 |
| 2009 | 443 | 5737 | 5346 | 26 | 692 | 115 | 38 |
| 2010 | 315 | 1645 | 1591 | 33 | 700 | 123 | 58 |
| 2011 | 218 | 1807 | 1813 | 31 | 805 | 125 | 69 |
| Total Number of Years | Total Number of Stations | Total Number Collected | Total Number Measured | | | Overall Mean Fork Length (mm) | |
| 25 | 5998 | 62,876 | 41,190 | | | 118 | |

Table 5.3.1.4. Indices of abundance for red snapper collected during SEAMAP groundfish surveys (WGOM / Summer) developed using the delta-lognormal model for 1982-2011. The nominal frequency of occurrence, the number of samples (*N*), the DL Index (number per trawl-hour), the DL indices scaled to a mean of one for the time series, the coefficient of variation on the mean (CV), and lower and upper confidence limits (LCL and UCL) for the scaled index are listed.

| Survey Year | Frequency | *N* | DL Index | Scaled Index | CV | LCL | UCL |
|---|---|---|---|---|---|---|---|
| 1982 | 0.34559 | 136 | 9.68293 | 2.76042 | 0.22061 | 1.78495 | 4.26899 |
| 1983 | 0.21805 | 133 | 2.61778 | 0.74628 | 0.28670 | 0.42538 | 1.30926 |
| 1984 | 0.18012 | 161 | 2.60053 | 0.74136 | 0.28423 | 0.42455 | 1.29457 |
| 1985 | 0.31169 | 77 | 3.52033 | 1.00358 | 0.30842 | 0.54919 | 1.83391 |
| 1986 | 0.15190 | 79 | 0.96477 | 0.27504 | 0.44280 | 0.11800 | 0.64109 |
| 1987 | 0.26404 | 178 | 2.26203 | 0.64486 | 0.22291 | 0.41514 | 1.00171 |
| 1988 | 0.26207 | 145 | 1.07137 | 0.30543 | 0.25298 | 0.18560 | 0.50263 |
| 1989 | 0.17730 | 141 | 0.92607 | 0.26401 | 0.31031 | 0.14396 | 0.48414 |
| 1990 | 0.46512 | 172 | 7.95389 | 2.26750 | 0.16406 | 1.63679 | 3.14125 |
| 1991 | 0.33514 | 185 | 3.12870 | 0.89193 | 0.19231 | 0.60927 | 1.30574 |
| 1992 | 0.31667 | 180 | 1.94602 | 0.55477 | 0.20208 | 0.37183 | 0.82772 |
| 1993 | 0.33146 | 178 | 2.22018 | 0.63293 | 0.19775 | 0.42780 | 0.93642 |
| 1994 | 0.37853 | 177 | 4.47239 | 1.27499 | 0.18215 | 0.88836 | 1.82990 |
| 1995 | 0.41477 | 176 | 3.72633 | 1.06230 | 0.17465 | 0.75109 | 1.50247 |
| 1996 | 0.41379 | 174 | 4.01042 | 1.14329 | 0.17530 | 0.80733 | 1.61907 |
| 1997 | 0.43558 | 163 | 3.11888 | 0.88913 | 0.17733 | 0.62536 | 1.26416 |
| 1998 | 0.34911 | 169 | 2.72386 | 0.77652 | 0.19625 | 0.52638 | 1.14552 |
| 1999 | 0.32961 | 179 | 2.12056 | 0.60453 | 0.19842 | 0.40807 | 0.89559 |
| 2000 | 0.49123 | 171 | 4.46720 | 1.27351 | 0.16076 | 0.92526 | 1.75285 |
| 2001 | 0.27586 | 116 | 2.50799 | 0.71498 | 0.26630 | 0.42358 | 1.20684 |
| 2002 | 0.39891 | 183 | 3.44222 | 0.98131 | 0.17436 | 0.69421 | 1.38714 |
| 2003 | 0.36496 | 137 | 1.75783 | 0.50112 | 0.21809 | 0.32562 | 0.77122 |
| 2004 | 0.44068 | 177 | 4.30779 | 1.22807 | 0.16742 | 0.88066 | 1.71253 |
| 2005 | 0.49324 | 148 | 4.80496 | 1.36980 | 0.17343 | 0.97081 | 1.93278 |
| 2006 | 0.51136 | 176 | 4.51050 | 1.28586 | 0.15285 | 0.94885 | 1.74256 |
| 2007 | 0.41935 | 155 | 3.51267 | 1.00140 | 0.18718 | 0.69091 | 1.45141 |
| 2008 | 0.41262 | 206 | 3.45699 | 0.98552 | 0.16042 | 0.71650 | 1.35556 |
| 2009 | 0.29605 | 304 | 1.94707 | 0.55507 | 0.16259 | 0.40183 | 0.76675 |
| 2010 | 0.44279 | 201 | 4.92609 | 1.40433 | 0.16030 | 1.02122 | 1.93117 |
| 2011 | 0.49419 | 172 | 6.52496 | 1.86014 | 0.15891 | 1.35636 | 2.55103 |

Table 5.3.1.5. Indices of abundance for red snapper collected during SEAMAP groundfish surveys (WGOM / Fall) developed using the delta-lognormal model for 1972-2011. The nominal frequency of occurrence, the number of samples (*N*), the DL Index (number per trawl-hour), the DL indices scaled to a mean of one for the time series, the coefficient of variation on the mean (CV), and lower and upper confidence limits (LCL and UCL) for the scaled index are listed.

| Survey Year | Frequency | *N* | DL Index | Scaled Index | CV | LCL | UCL |
|---|---|---|---|---|---|---|---|
| 1972 | 0.61345 | 119 | 47.4707 | 3.51592 | 0.15792 | 2.56869 | 4.81245 |
| 1973 | 0.52740 | 146 | 25.0846 | 1.85789 | 0.16533 | 1.33776 | 2.58024 |
| 1974 | 0.38129 | 139 | 7.9569 | 0.58932 | 0.20911 | 0.38964 | 0.89135 |
| 1975 | 0.33690 | 187 | 11.4657 | 0.84921 | 0.19477 | 0.57731 | 1.24916 |
| 1976 | 0.37186 | 199 | 10.8937 | 0.80684 | 0.18064 | 0.56383 | 1.15460 |
| 1977 | 0.42069 | 145 | 11.6182 | 0.86050 | 0.18419 | 0.59718 | 1.23994 |
| 1978 | 0.25275 | 182 | 8.8133 | 0.65276 | 0.24733 | 0.40096 | 1.06268 |
| 1979 | 0.39024 | 164 | 13.3094 | 0.98576 | 0.18418 | 0.68412 | 1.42041 |
| 1980 | 0.70161 | 124 | 50.6640 | 3.75243 | 0.14446 | 2.81506 | 5.00193 |
| 1981 | 0.50289 | 173 | 18.2883 | 1.35452 | 0.16175 | 0.98220 | 1.86799 |
| 1982 | 0.50000 | 150 | 12.1770 | 0.90189 | 0.17042 | 0.64296 | 1.26508 |
| 1983 | 0.36585 | 123 | 10.3043 | 0.76319 | 0.23672 | 0.47842 | 1.21744 |
| 1984 | 0.34028 | 144 | 4.0200 | 0.29774 | 0.22518 | 0.19083 | 0.46453 |
| 1985 | 0.33023 | 215 | 6.0595 | 0.44880 | 0.19678 | 0.30391 | 0.66275 |
| 1986 | 0.45789 | 190 | 5.6679 | 0.41980 | 0.17552 | 0.29630 | 0.59476 |
| 1987 | 0.45313 | 128 | 2.0813 | 0.15415 | 0.21132 | 0.10148 | 0.23415 |
| 1988 | 0.53039 | 181 | 4.7575 | 0.35236 | 0.16542 | 0.25367 | 0.48945 |
| 1989 | 0.56667 | 180 | 10.0273 | 0.74267 | 0.15299 | 0.54788 | 1.00672 |
| 1990 | 0.65714 | 175 | 11.1991 | 0.82946 | 0.13710 | 0.63135 | 1.08975 |
| 1991 | 0.68156 | 179 | 12.5597 | 0.93024 | 0.12582 | 0.72399 | 1.19523 |
| 1992 | 0.53073 | 179 | 3.6303 | 0.26888 | 0.16068 | 0.19538 | 0.37003 |
| 1993 | 0.57062 | 177 | 6.7122 | 0.49714 | 0.14943 | 0.36932 | 0.66920 |
| 1994 | 0.65363 | 179 | 19.4755 | 1.44245 | 0.13080 | 1.11166 | 1.87168 |
| 1995 | 0.73446 | 177 | 23.2818 | 1.72437 | 0.11811 | 1.36269 | 2.18204 |
| 1996 | 0.61878 | 181 | 9.7908 | 0.72515 | 0.14138 | 0.54732 | 0.96078 |
| 1997 | 0.64045 | 178 | 16.3524 | 1.21114 | 0.13438 | 0.92683 | 1.58267 |
| 1998 | 0.55249 | 181 | 7.6931 | 0.56979 | 0.15470 | 0.41892 | 0.77499 |
| 1999 | 0.68132 | 182 | 16.6575 | 1.23374 | 0.12875 | 0.95468 | 1.59438 |
| 2000 | 0.68156 | 179 | 10.4400 | 0.77324 | 0.12927 | 0.59772 | 1.00029 |
| 2001 | 0.58696 | 184 | 8.0699 | 0.59770 | 0.14481 | 0.44808 | 0.79728 |
| 2002 | 0.59669 | 181 | 7.6371 | 0.56564 | 0.13997 | 0.42810 | 0.74736 |
| 2003 | 0.65574 | 183 | 13.7058 | 1.01512 | 0.13468 | 0.77636 | 1.32731 |
| 2004 | 0.78395 | 162 | 22.0336 | 1.63192 | 0.11631 | 1.29423 | 2.05772 |
| 2005 | 0.77957 | 186 | 16.5295 | 1.22426 | 0.10863 | 0.98582 | 1.52037 |
| 2006 | 0.66477 | 176 | 12.9572 | 0.95967 | 0.13277 | 0.73672 | 1.25010 |
| 2007 | 0.56647 | 173 | 9.3984 | 0.69610 | 0.15516 | 0.51132 | 0.94764 |
| 2008 | 0.61672 | 287 | 5.9126 | 0.43792 | 0.12049 | 0.34444 | 0.55676 |
| 2009 | 0.73260 | 273 | 25.5069 | 1.88917 | 0.10018 | 1.54693 | 2.30713 |
| 2010 | 0.59322 | 177 | 9.1741 | 0.67948 | 0.14864 | 0.50556 | 0.91322 |
| 2011 | 0.65169 | 178 | 10.6889 | 0.79168 | 0.14083 | 0.59817 | 1.04778 |

Table 5.3.1.6. Indices of abundance for red snapper collected during SEAMAP groundfish surveys (EGOM / Summer) developed using the delta-lognormal model for 1982-2011. The nominal frequency of occurrence, the number of samples (*N*), the DL Index (number per trawl-hour), the DL indices scaled to a mean of one for the time series, the coefficient of variation on the mean (CV), and lower and upper confidence limits (LCL and UCL) for the scaled index are listed.

| Survey Year | Frequency | *N* | DL Index | Scaled Index | CV | LCL | UCL |
|---|---|---|---|---|---|---|---|
| 1982 | 0.19444 | 36 | 2.8888 | 1.09250 | 0.54008 | 0.39718 | 3.00503 |
| 1983 | 0.28571 | 21 | 2.1433 | 0.81056 | 0.58033 | 0.27594 | 2.38097 |
| 1984 | 0.06897 | 29 | 0.2171 | 0.08210 | 1.16402 | 0.01290 | 0.52262 |
| 1985 | 0.27778 | 36 | 1.4967 | 0.56601 | 0.46155 | 0.23503 | 1.36310 |
| 1986 | 0.05714 | 35 | 0.1757 | 0.06645 | 1.20597 | 0.00999 | 0.44213 |
| 1987 | 0.21875 | 96 | 2.0033 | 0.75761 | 0.31616 | 0.40865 | 1.40459 |
| 1988 | 0.16176 | 68 | 1.5787 | 0.59705 | 0.44054 | 0.25716 | 1.38619 |
| 1989 | 0.26415 | 53 | 4.1722 | 1.57783 | 0.37850 | 0.75899 | 3.28007 |
| 1990 | 0.38235 | 68 | 3.2224 | 1.21863 | 0.27355 | 0.71210 | 2.08546 |
| 1991 | 0.34783 | 46 | 3.3646 | 1.27244 | 0.34726 | 0.64797 | 2.49872 |
| 1992 | 0.28261 | 46 | 7.0297 | 2.65851 | 0.38679 | 1.25984 | 5.60995 |
| 1993 | 0.20000 | 45 | 1.1508 | 0.43519 | 0.48819 | 0.17262 | 1.09715 |
| 1994 | 0.32787 | 61 | 2.6490 | 1.00182 | 0.31533 | 0.54120 | 1.85445 |
| 1995 | 0.18182 | 44 | 1.0238 | 0.38718 | 0.51995 | 0.14555 | 1.02992 |
| 1996 | 0.26087 | 46 | 1.9485 | 0.73688 | 0.41160 | 0.33403 | 1.62560 |
| 1997 | 0.34091 | 44 | 2.0989 | 0.79375 | 0.36108 | 0.39411 | 1.59867 |
| 1998 | 0.08571 | 35 | 0.6920 | 0.26170 | 0.85004 | 0.05988 | 1.14377 |
| 1999 | 0.11364 | 44 | 0.5000 | 0.18907 | 0.68469 | 0.05471 | 0.65341 |
| 2000 | 0.31111 | 45 | 2.0417 | 0.77212 | 0.37570 | 0.37331 | 1.59700 |
| 2001 | 0.13889 | 36 | 0.8554 | 0.32350 | 0.65950 | 0.09725 | 1.07606 |
| 2002 | 0.11364 | 44 | 0.8130 | 0.30746 | 0.66342 | 0.09188 | 1.02885 |
| 2003 | 0.20455 | 44 | 1.8220 | 0.68906 | 0.47948 | 0.27742 | 1.71150 |
| 2004 | 0.23077 | 39 | 1.9260 | 0.72836 | 0.47421 | 0.29591 | 1.79280 |
| 2005 | 0.30303 | 33 | 4.5320 | 1.71392 | 0.43577 | 0.74441 | 3.94612 |
| 2006 | 0.22222 | 45 | 1.2538 | 0.47415 | 0.45943 | 0.19761 | 1.13769 |
| 2007 | 0.56098 | 41 | 7.5152 | 2.84208 | 0.26799 | 1.67837 | 4.81268 |
| 2008 | 0.42593 | 54 | 11.7878 | 4.45790 | 0.28388 | 2.55457 | 7.77933 |
| 2009 | 0.27473 | 91 | 1.8817 | 0.71162 | 0.28979 | 0.40327 | 1.25575 |
| 2010 | 0.37838 | 37 | 4.6645 | 1.76404 | 0.36729 | 0.86601 | 3.59328 |
| 2011 | 0.29167 | 24 | 1.8788 | 0.71051 | 0.52792 | 0.26357 | 1.91531 |

Table 5.3.1.7. Indices of abundance for red snapper collected during SEAMAP groundfish surveys (EGOM / Fall) developed using the delta-lognormal model for 1972-2011. The nominal frequency of occurrence, the number of samples (*N*), the DL Index (number per trawl-hour), the DL indices scaled to a mean of one for the time series, the coefficient of variation on the mean (CV), and lower and upper confidence limits (LCL and UCL) for the scaled index are listed.

| Survey Year | Frequency | *N* | DL Index | Scaled Index | CV | LCL | UCL |
|---|---|---|---|---|---|---|---|
| 1972 | 0.67692 | 65 | 43.6574 | 3.27439 | 0.22927 | 2.08227 | 5.14903 |
| 1973 | 0.51304 | 115 | 7.1767 | 0.53826 | 0.18783 | 0.37090 | 0.78114 |
| 1974 | 0.40385 | 104 | 8.4347 | 0.63262 | 0.24490 | 0.39040 | 1.02512 |
| 1975 | 0.44086 | 93 | 6.9768 | 0.52328 | 0.22225 | 0.33729 | 0.81181 |
| 1976 | 0.45370 | 108 | 8.4324 | 0.63245 | 0.20645 | 0.42032 | 0.95164 |
| 1977 | 0.43299 | 97 | 11.6354 | 0.87268 | 0.24406 | 0.53942 | 1.41182 |
| 1978 | 0.45985 | 137 | 5.2682 | 0.39512 | 0.18587 | 0.27331 | 0.57123 |
| 1979 | 0.39450 | 109 | 4.1681 | 0.31261 | 0.21558 | 0.20412 | 0.47878 |
| 1980 | 0.49541 | 109 | 7.7914 | 0.58437 | 0.19938 | 0.39373 | 0.86733 |
| 1981 | 0.59434 | 106 | 26.9305 | 2.01984 | 0.19221 | 1.38000 | 2.95634 |
| 1982 | 0.71545 | 123 | 29.9358 | 2.24525 | 0.15134 | 1.66170 | 3.03372 |
| 1983 | 0.50505 | 99 | 4.3068 | 0.32302 | 0.19694 | 0.21867 | 0.47716 |
| 1984 | 0.34146 | 82 | 3.5334 | 0.26501 | 0.29985 | 0.14737 | 0.47657 |
| 1985 | 0.21348 | 89 | 1.6241 | 0.12181 | 0.30546 | 0.06703 | 0.22137 |
| 1986 | 0.12500 | 40 | 1.5295 | 0.11472 | 0.66374 | 0.03427 | 0.38407 |
| 1987 | 0.25000 | 44 | 2.5507 | 0.19130 | 0.43068 | 0.08384 | 0.43653 |
| 1988 | 0.36111 | 36 | 3.3413 | 0.25060 | 0.37730 | 0.12081 | 0.51983 |
| 1989 | 0.67442 | 43 | 49.8205 | 3.73664 | 0.28304 | 2.14463 | 6.51041 |
| 1990 | 0.71698 | 53 | 27.7674 | 2.08261 | 0.26237 | 1.24307 | 3.48916 |
| 1991 | 0.76087 | 46 | 31.7855 | 2.38397 | 0.22842 | 1.51852 | 3.74269 |
| 1992 | 0.42424 | 33 | 2.5964 | 0.19473 | 0.33867 | 0.10074 | 0.37641 |
| 1993 | 0.50000 | 72 | 18.8373 | 1.41283 | 0.29898 | 0.78693 | 2.53656 |
| 1994 | 0.52000 | 50 | 4.6211 | 0.34659 | 0.24565 | 0.21358 | 0.56242 |
| 1995 | 0.62500 | 40 | 9.6240 | 0.72182 | 0.24339 | 0.44675 | 1.16627 |
| 1996 | 0.52174 | 46 | 7.3109 | 0.54834 | 0.28379 | 0.31427 | 0.95672 |
| 1997 | 0.48889 | 45 | 12.2807 | 0.92108 | 0.30546 | 0.50684 | 1.67387 |
| 1998 | 0.45455 | 44 | 2.9987 | 0.22491 | 0.30515 | 0.12383 | 0.40848 |
| 1999 | 0.53488 | 43 | 7.9702 | 0.59778 | 0.28922 | 0.33912 | 1.05372 |
| 2000 | 0.65909 | 44 | 21.8594 | 1.63950 | 0.23221 | 1.03672 | 2.59275 |
| 2001 | 0.61905 | 21 | 6.8914 | 0.51687 | 0.38283 | 0.24669 | 1.08292 |
| 2002 | 0.44231 | 52 | 5.6057 | 0.42044 | 0.30216 | 0.23279 | 0.75935 |
| 2003 | 0.64935 | 77 | 16.4241 | 1.23184 | 0.22272 | 0.79331 | 1.91280 |
| 2004 | 0.41860 | 43 | 4.4729 | 0.33548 | 0.31992 | 0.17969 | 0.62634 |
| 2005 | 0.68182 | 44 | 9.7321 | 0.72993 | 0.24780 | 0.44796 | 1.18938 |
| 2006 | 0.89583 | 48 | 37.8969 | 2.84234 | 0.18441 | 1.97167 | 4.09750 |
| 2007 | 0.77419 | 31 | 24.5363 | 1.84027 | 0.24935 | 1.12604 | 3.00753 |
| 2008 | 0.51282 | 39 | 4.9821 | 0.37367 | 0.27418 | 0.21809 | 0.64023 |
| 2009 | 0.80000 | 60 | 40.5835 | 3.04384 | 0.23536 | 1.91311 | 4.84287 |
| 2010 | 0.53333 | 30 | 4.7111 | 0.35335 | 0.36541 | 0.17406 | 0.71730 |
| 2011 | 0.40000 | 20 | 2.7178 | 0.20384 | 0.44724 | 0.08677 | 0.47884 |

Table 5.3.2.1. Indices of abundance for larval red snapper collected during the Fall SEAMAP Plankton Survey (Eastern Gulf of Mexico) developed using a frequency of occurrence model for 1986-2010. The nominal frequency of occurrence, the number of samples (*N*), the Index, the indices scaled to a mean of one for the time series, the coefficient of variation on the mean (CV), and lower and upper confidence limits (LCL and UCL) for the scaled index are listed.

| Survey Year | Frequency | *N* | Index | Scaled Index | CV | LCL | UCL |
|---|---|---|---|---|---|---|---|
| 1986 | 0.00000 | 53 | 0 | 0 | | | |
| 1987 | 0.03509 | 57 | 0.06373 | 0.88099 | 1.56081 | 0.09549 | 8.12799 |
| 1988 | 0.03125 | 32 | 0.0312 | 0.43127 | 1.96039 | 0.03498 | 5.31755 |
| 1989 | 0.00000 | 34 | 0 | 0 | | | |
| 1990 | 0.00000 | 39 | 0 | 0 | | | |
| 1991 | 0.04651 | 43 | 0.06353 | 0.87824 | 0.87899 | 0.19339 | 3.9884 |
| 1992 | 0.00000 | 46 | 0 | 0 | | | |
| 1993 | 0.00000 | 50 | 0 | 0 | | | |
| 1994 | 0.01639 | 61 | 0.01426 | 0.19707 | 0.43662 | 0.08547 | 0.45441 |
| 1995 | 0.03448 | 58 | 0.03547 | 0.49037 | 1.01435 | 0.09119 | 2.63703 |
| 1996 | 0.00000 | 61 | 0 | 0 | | | |
| 1997 | 0.03390 | 59 | 0.04109 | 0.56798 | 0.90692 | 0.12062 | 2.67463 |
| 1998 | | | | | | | |
| 1999 | 0.05085 | 59 | 0.05716 | 0.79011 | 0.3223 | 0.42134 | 1.48165 |
| 2000 | 0.06780 | 59 | 0.07255 | 1.00289 | 1.1405 | 0.16158 | 6.22461 |
| 2001 | 0.05085 | 59 | 0.07069 | 0.97717 | 0.61022 | 0.31717 | 3.0106 |
| 2002 | 0.05128 | 39 | 0.06033 | 0.83394 | 1.69951 | 0.08109 | 8.5768 |
| 2003 | 0.06667 | 60 | 0.07549 | 1.04349 | 0.75188 | 0.27356 | 3.98035 |
| 2004 | 0.02439 | 41 | 0.0153 | 0.21148 | 2.46211 | 0.01291 | 3.46467 |
| 2005 | | | | | | | |
| 2006 | 0.05085 | 59 | 0.05459 | 0.75466 | 1.02735 | 0.13819 | 4.12123 |
| 2007 | 0.09677 | 62 | 0.13728 | 1.89767 | 0.32556 | 1.00584 | 3.58022 |
| 2008 | | | | | | | |
| 2009 | 0.06452 | 62 | 0.08567 | 1.18421 | 0.8961 | 0.25501 | 5.4991 |
| 2010 | 0.15000 | 60 | 0.27912 | 3.85845 | 0.31648 | 2.07995 | 7.15771 |

Table 5.3.2.2. Indices of abundance for larval red snapper collected during the Fall SEAMAP Plankton Survey (Western Gulf of Mexico) adjusted to 10.5 days old developed using the delta-lognormal model for 1986-2010. The nominal frequency of occurrence, the number of samples ($N$), the DL Index (number under 10 $m^2$ sea surface), the DL indices scaled to a mean of one for the time series, the coefficient of variation on the mean (CV), and lower and upper confidence limits (LCL and UCL) for the scaled index are listed.

| Survey Year | Frequency | $N$ | DL Index | Scaled Index | CV | LCL | UCL |
|---|---|---|---|---|---|---|---|
| 1986 | 0.08163 | 49 | 1.72024 | 0.51313 | 0.81893 | 0.12245 | 2.15016 |
| 1987 | 0.07273 | 55 | 2.16447 | 0.64563 | 0.67184 | 0.19048 | 2.18833 |
| 1988 | 0.00000 | 28 | | | | | |
| 1989 | 0.14286 | 28 | 3.19923 | 0.95429 | 0.75494 | 0.24908 | 3.65609 |
| 1990 | 0.19355 | 31 | 2.13106 | 0.63567 | 0.53839 | 0.23175 | 1.74360 |
| 1991 | 0.09677 | 31 | 0.54755 | 0.16333 | 0.76633 | 0.04194 | 0.63598 |
| 1992 | 0.12727 | 55 | 0.94156 | 0.28085 | 0.42395 | 0.12455 | 0.63331 |
| 1993 | 0.12727 | 55 | 1.23128 | 0.36727 | 0.47201 | 0.14978 | 0.90062 |
| 1994 | 0.07273 | 55 | 0.95695 | 0.28544 | 0.65262 | 0.08672 | 0.93952 |
| 1995 | 0.23636 | 55 | 3.84496 | 1.14690 | 0.34376 | 0.58781 | 2.23774 |
| 1996 | 0.16364 | 55 | 2.19804 | 0.65564 | 0.40881 | 0.29868 | 1.43922 |
| 1997 | 0.25926 | 54 | 4.13821 | 1.23437 | 0.32949 | 0.64952 | 2.34583 |
| 1998 | | | | | | | |
| 1999 | 0.14545 | 55 | 1.89683 | 0.56580 | 0.43937 | 0.24420 | 1.31093 |
| 2000 | 0.27273 | 55 | 6.06269 | 1.80842 | 0.33602 | 0.94017 | 3.47848 |
| 2001 | 0.14894 | 47 | 4.83119 | 1.44108 | 0.48318 | 0.57652 | 3.60214 |
| 2002 | 0.22222 | 54 | 3.48667 | 1.04003 | 0.38893 | 0.49097 | 2.20311 |
| 2003 | 0.29630 | 54 | 7.83030 | 2.33567 | 0.37476 | 1.13118 | 4.82272 |
| 2004 | 0.22222 | 54 | 3.57389 | 1.06604 | 0.36625 | 0.52433 | 2.16741 |
| 2005 | | | | | | | |
| 2006 | 0.23077 | 52 | 6.86608 | 2.04806 | 0.43882 | 0.88480 | 4.74069 |
| 2007 | 0.29630 | 54 | 5.32629 | 1.58876 | 0.31580 | 0.85753 | 2.94353 |
| 2008 | | | | | | | |
| 2009 | 0.30909 | 55 | 5.39710 | 1.60988 | 0.26593 | 0.95443 | 2.71545 |
| 2010 | 0.14815 | 54 | 2.05759 | 0.61375 | 0.43108 | 0.26878 | 1.40148 |

Table 5.3.3.1. Indices of abundance for red snapper collected during NMFS Bottom Longline Surveys (West GOM). *Frequency* listed is nominal frequency, *N* is the number of bottom longline stations, *Index* is the abundance index in CPUE units, *Scaled Index* is the index scaled to a mean of one over the time series, *CV* is the coefficient of variation on the index value, and *LCL* and *UCL* are 95% confidence limits.

| *Survey Year* | *Frequency* | *N* | *Index* | *Scaled Index* | *CV* | *LCL* | *UCL* |
|---|---|---|---|---|---|---|---|
| 1996 | 0.03125 | 32 | 0.04902 | 0.08784 | 1.23704 | 0.01279 | 0.60334 |
| 1997 | 0.08247 | 97 | 0.57197 | 1.02482 | 0.51420 | 0.38899 | 2.69992 |
| 1999 | 0.02500 | 80 | 0.10384 | 0.18605 | 0.86676 | 0.04163 | 0.83144 |
| 2000 | 0.25926 | 108 | 0.73217 | 1.31184 | 0.24629 | 0.80741 | 2.13141 |
| 2001 | 0.18519 | 135 | 0.54078 | 0.96893 | 0.25505 | 0.58646 | 1.60084 |
| 2002 | 0.22152 | 158 | 0.48713 | 0.87281 | 0.21362 | 0.57205 | 1.33169 |
| 2003 | 0.19048 | 105 | 0.52859 | 0.94709 | 0.28012 | 0.54659 | 1.64105 |
| 2004 | 0.19608 | 102 | 0.61010 | 1.09313 | 0.27837 | 0.63297 | 1.88783 |
| 2006 | 0.15584 | 77 | 0.44889 | 0.80429 | 0.36356 | 0.39753 | 1.62723 |
| 2007 | 0.14754 | 61 | 0.46597 | 0.83488 | 0.41770 | 0.37437 | 1.86188 |
| 2008 | 0.22222 | 27 | 0.52562 | 0.94176 | 0.49310 | 0.37045 | 2.39418 |
| 2009 | 0.27059 | 85 | 0.98404 | 1.76314 | 0.25283 | 1.07171 | 2.90065 |
| 2010 | 0.15094 | 53 | 0.40471 | 0.72512 | 0.45197 | 0.30615 | 1.71749 |
| 2011 | 0.24823 | 282 | 1.36087 | 2.43831 | 0.14600 | 1.82365 | 3.26014 |

Table 5.3.3.2. Indices of abundance for red snapper collected during NMFS Bottom Longline Surveys (East GOM). *Frequency* listed is nominal frequency, *N* is the number of bottom longline stations, *Index* is the abundance index in CPUE units, *Scaled Index* is the index scaled to a mean of one over the time series, *CV* is the coefficient of variation on the index value, and *LCL* and *UCL* are 95% confidence limits.

| *Survey Year* | *Frequency* | *N* | *Index* | *Scaled Index* | *CV* | *LCL* | *UCL* |
|---|---|---|---|---|---|---|---|
| 1996 | 0.01923 | 52 | 0.01989 | 0.31973 | 1.15337 | 0.05080 | 2.01230 |
| 1997 | 0.01389 | 72 | 0.01282 | 0.20605 | 1.15578 | 0.03265 | 1.30017 |
| 1999 | 0.03546 | 141 | 0.07450 | 1.19741 | 0.52048 | 0.44974 | 3.18801 |
| 2000 | 0.00775 | 129 | 0.00738 | 0.11866 | 1.15853 | 0.01875 | 0.75093 |
| 2001 | 0.02128 | 141 | 0.02927 | 0.47048 | 0.67350 | 0.13846 | 1.59867 |
| 2002 | 0.03175 | 63 | 0.03259 | 0.52371 | 0.81883 | 0.12500 | 2.19419 |
| 2003 | 0.02857 | 175 | 0.04855 | 0.78021 | 0.52186 | 0.29237 | 2.08204 |
| 2004 | 0.02740 | 145 | 0.05216 | 0.83827 | 0.58298 | 0.28416 | 2.47288 |
| 2005 | 0.02000 | 50 | 0.04068 | 0.65377 | 1.15303 | 0.10392 | 4.11311 |
| 2006 | 0.03448 | 58 | 0.03715 | 0.59708 | 0.81796 | 0.14268 | 2.49862 |
| 2007 | 0.02778 | 72 | 0.07019 | 1.12808 | 0.82008 | 0.26879 | 4.73448 |
| 2009 | 0.07368 | 95 | 0.10785 | 1.73327 | 0.43416 | 0.75495 | 3.97940 |
| 2010 | 0.12632 | 95 | 0.15987 | 2.56944 | 0.32563 | 1.36175 | 4.84820 |
| 2011 | 0.08571 | 315 | 0.17819 | 2.86383 | 0.22206 | 1.84665 | 4.44132 |

Table 5.3.4.1. West GOM red snapper Lo and standardized index of abundance by year for model based runs for the SEAMAP Reef Fish Video Survey.

| *Survey Year* | *Frequency* | *N* | *Lo Index* | *Scaled Index* | *CV* | *LCL* | *UCL* |
|---|---|---|---|---|---|---|---|
| 1993 | 0.17021 | 47 | 0.32502 | 0.55434 | 0.46715 | 0.22797 | 1.34800 |
| 1994 | 0.22222 | 45 | 0.40985 | 0.69902 | 0.41710 | 0.31378 | 1.55724 |
| 1995 | 0.22892 | 83 | 0.31509 | 0.53741 | 0.29894 | 0.29936 | 0.96476 |
| 1996 | 0.23392 | 171 | 0.32834 | 0.55999 | 0.24919 | 0.34276 | 0.91490 |
| 1997 | 0.54135 | 133 | 0.88256 | 1.50526 | 0.15520 | 1.10561 | 2.04936 |
| 2001 | 0.28889 | 45 | 0.41267 | 0.70384 | 0.35269 | 0.35486 | 1.39599 |
| 2002 | 0.38144 | 97 | 0.54674 | 0.93250 | 0.22054 | 0.60306 | 1.44191 |
| 2004 | 0.30000 | 50 | 0.55731 | 0.95052 | 0.29913 | 0.52927 | 1.70702 |
| 2005 | 0.38235 | 136 | 0.66606 | 1.13601 | 0.17575 | 0.80148 | 1.61017 |
| 2006 | 0.20588 | 136 | 0.27406 | 0.46743 | 0.29992 | 0.25990 | 0.84069 |
| 2007 | 0.39241 | 158 | 0.76710 | 1.30833 | 0.16188 | 0.94846 | 1.80474 |
| 2008 | 0.28467 | 137 | 0.40156 | 0.68489 | 0.23416 | 0.43146 | 1.08718 |
| 2009 | 0.35028 | 177 | 0.64564 | 1.10117 | 0.17019 | 0.78538 | 1.54394 |
| 2010 | 0.53333 | 105 | 1.30970 | 2.23376 | 0.18087 | 1.56025 | 3.19800 |
| 2011 | 0.40367 | 109 | 0.95308 | 1.62553 | 0.16231 | 1.17741 | 2.24421 |

Table 5.3.4.2. East GOM red snapper Lo and standardized index of abundance by year for model based runs for the SEAMAP Reef Fish Video Survey.

| *Survey Year* | *Frequency* | *N* | *Lo Index* | *Scaled Index* | *CV* | *LCL* | *UCL* |
|---|---|---|---|---|---|---|---|
| 1993 | 0.05785 | 121 | 0.01032 | 0.14507 | 2.28759 | 0.00970 | 2.17045 |
| 1994 | 0.02062 | 97 | 0.00288 | 0.04046 | 6.26370 | 0.00087 | 1.89067 |
| 1995 | 0.04444 | 180 | 0.00302 | 0.04240 | 4.16360 | 0.00140 | 1.28472 |
| 1996 | 0.06623 | 151 | 0.00720 | 0.10113 | 2.56188 | 0.00588 | 1.73942 |
| 1997 | 0.03049 | 164 | 0.00861 | 0.12102 | 2.71622 | 0.00655 | 2.23463 |
| 2002 | 0.15294 | 170 | 0.07411 | 1.04138 | 0.80026 | 0.25499 | 4.25291 |
| 2004 | 0.20000 | 150 | 0.07826 | 1.09977 | 0.77984 | 0.27708 | 4.36508 |
| 2005 | 0.19636 | 275 | 0.10491 | 1.47423 | 0.67608 | 0.43216 | 5.02901 |
| 2006 | 0.08865 | 282 | 0.04482 | 0.62979 | 0.92859 | 0.13010 | 3.04874 |
| 2007 | 0.15710 | 331 | 0.07977 | 1.12090 | 0.72005 | 0.30775 | 4.08259 |
| 2008 | 0.10753 | 279 | 0.07523 | 1.05708 | 0.80929 | 0.25563 | 4.37123 |
| 2009 | 0.13356 | 292 | 0.10527 | 1.47920 | 0.69914 | 0.41887 | 5.22366 |
| 2010 | 0.25000 | 240 | 0.17141 | 2.40863 | 0.61045 | 0.78150 | 7.42349 |
| 2011 | 0.27746 | 346 | 0.23050 | 3.23892 | 0.56357 | 1.13300 | 9.25916 |

Table 5.3.4.3. Red snapper lengths (fork lengths in mm) measured by laser from video tapes (1995-2007) and by stereo still cameras (2008-2010) for the SEAMAP Reef Fish Video Survey.

| | East Gulf | | | | | West Gulf | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | N | Minimum | Maximum | Mean | SE | N | Minimum | Maximum | Mean | SE |
| 1995 | 0 | - | - | - | - | 9 | 430.0 | 766.0 | 582.33 | 38.09 |
| 1996 | 0 | - | - | - | - | 110 | 214.0 | 860.0 | 449.62 | 10.64 |
| 1997 | 134 | 236.0 | 758.0 | 406.52 | 9.56 | 0 | - | - | - | - |
| 2001 | 0 | - | - | - | - | 13 | 400.0 | 725.0 | 593.15 | 27.19 |
| 2002 | 0 | - | - | - | - | 195 | 245.0 | 917.0 | 506.83 | 8.16 |
| 2004 | 1044 | 207.0 | 915.0 | 417.97 | 3.25 | 0 | - | - | - | - |
| 2005 | 259 | 146.0 | 790.0 | 476.37 | 6.69 | 191 | 200.0 | 733.0 | 446.62 | 7.59 |
| 2006 | 103 | 183.0 | 752.0 | 412.33 | 14.90 | 63 | 276.0 | 668.0 | 442.63 | 13.16 |
| 2007 | 389 | 190.0 | 874.0 | 386.77 | 5.06 | 273 | 213.0 | 868.0 | 443.60 | 8.13 |
| 2008 | 24 | 284.2 | 834.0 | 459.93 | 27.59 | 23 | 287.7 | 721.9 | 470.06 | 26.34 |
| 2009 | 27 | 275.0 | 583.0 | 370.63 | 13.48 | 120 | 253.0 | 545.0 | 375.46 | 6.34 |
| 2010 | 72 | 290.6 | 798.6 | 514.81 | 13.03 | 71 | 271.4 | 742.5 | 415.60 | 11.91 |
| 2011 | 122 | 294.69 | 865.55 | 512.07 | 9.64 | 45 | 205.69 | 735.59 | 468.08 | 31.34 |

Table 5.3.5.1. Summary of annual stationary underwater camera array (SUCA) sampling effort by spatial zone from 2008 – 2011 for the FWC reef fish survey. Values represent total number of sampling stations, while values in parentheses represent the total number of individual gear deployments (1 – 2 arrays deployed per station).

| Region | 2008 | 2009 | 2010 | 2011 | Total |
|---|---|---|---|---|---|
| TBN | 5 (10) | 25 (34) | 16 (24) | 56 (122) | 102 (190) |
| TBO | 18 (33) | 33 (66) | 25 (50) | 49 (72) | 125 (221) |
| CHN | 20 (38) | 28 (43) | 23 (46) | 35 (60) | 106 (187) |
| CHO | 24 (48) | 30 (60) | 29 (56) | 41 (55) | 124 (219) |
| Total | 67 (129) | 116 (203) | 93 (176) | 181 (309) | 457 (817) |

Table 5.3.5.2. Summary of chevron trap sampling effort by spatial zone from 2008 – 2011 for the FWC reef fish survey. Values represent total number of sampling stations, while values in parentheses represent the total number of individual gear deployments (1 – 4 chevron traps deployed per station).

| Region | 2008 | 2009 | 2010 | 2011 | Total |
|---|---|---|---|---|---|
| TBN | 8 (32) | 25 (84) | 18 (60) | 63 (141) | 114 (317) |
| TBO | 18 (72) | 33 (132) | 26 (78) | 49 (70) | 126 (352) |
| CHN | 21 (84) | 29 (102) | 23 (69) | 35 (40) | 108 (295) |
| CHO | 26 (104) | 30 (120) | 31 (93) | 49 (65) | 136 (382) |
| Total | 73 (292) | 117 (438) | 98 (300) | 196 (316) | 484 (1346) |

Table 5.3.6.1. Annual % frequencies of occurrence of red snapper in trap and video samples east and west of Cape San Blas, and total number of sites sampled for the PC NMFS video survey. Data from all sites were included for trap estimates; censored data sets were used to calculate video frequencies.

| | Chevron trap | | | | Video | | | |
|---|---|---|---|---|---|---|---|---|
| | Total sites sampled | | % Freq. Occur. | | Total sites sampled | | % Freq. Occur. | |
| Year | East | West | East | West | East | West | East | West |
| 2004 | 53 | 33 | 3.8 | 63.6 | | | | |
| 2005 | 77 | 24 | 6.5 | 87.5 | 31 | | 9.7 | |
| 2006 | 89 | 25 | 7.9 | 88.0 | 47 | 24 | 25.5 | 95.8 |
| 2007 | 57 | 26 | 7.0 | 69.2 | 29 | 23 | 13.8 | 100.0 |
| 2008 | 51 | 29 | 0 | 86.2 | 56 | 29 | 8.9 | 96.6 |
| 2009 | 53 | 30 | 35.8 | 86.7 | 62 | 42 | 45.2 | 100.0 |
| 2010 | 53 | 17 | 18.9 | 47.1 | 95 | 52 | 46.3 | 92.3 |
| 2011 | 50 | 32 | 20.0 | 84.4 | 99 | 57 | 26.3 | 91.2 |

Table 5.3.6.2. Mean annual video min counts, standard errors, and sample sizes of red snapper east and west of Cape San Blas, 2005-2011 for the PC NMFS video survey. Estimates calculated using censored data sets (see Methods).

| | Total sites sampled | | Mean nominal min count | | Standard error | |
|---|---|---|---|---|---|---|
| Year | East | West | East | West | East | West |
| 2005 | 31 | | 0.129 | | 0.077 | |
| 2006 | 47 | 24 | 0.830 | 7.583 | 0.581 | 1.103 |
| 2007 | 29 | 23 | 0.345 | 10.348 | 0.974 | 1.537 |
| 2008 | 56 | 29 | 0.089 | 6.345 | 0.428 | 0.826 |
| 2009 | 62 | 42 | 1.452 | 10.452 | 0.723 | 1.375 |
| 2010 | 95 | 52 | 1.305 | 6.942 | 0.409 | 0.915 |
| 2011 | 99 | 57 | 0.515 | 5.491 | 0.318 | 0.672 |

Table 5.3.6.3. PC Video abundance indices for red snapper. *Frequency* listed is nominal frequency, *N* is the number of video stations, *Index* is the abundance index in CPUE units, *Scaled Index* is the index scaled to a mean of one over the time series, *CV* is the coefficient of variation on the index value, and *LCL* and *UCL* are 95% confidence limits.

| *Survey Year* | *Frequency* | *N* | *Index* | *Scaled Index* | *CV* | *LCL* | *UCL* |
|---|---|---|---|---|---|---|---|
| 2005 | 0.09677 | 31 | 2.60619 | 0.68621 | 0.60876 | 0.22324 | 2.10931 |
| 2006 | 0.49296 | 71 | 5.12543 | 1.34953 | 0.18824 | 0.92917 | 1.96005 |
| 2007 | 0.51923 | 52 | 4.50183 | 1.18533 | 0.26125 | 0.70902 | 1.98164 |
| 2008 | 0.38824 | 85 | 2.54182 | 0.66926 | 0.26481 | 0.39762 | 1.12648 |
| 2009 | 0.67308 | 104 | 5.70097 | 1.50107 | 0.12231 | 1.17641 | 1.91532 |
| 2010 | 0.62585 | 147 | 3.90904 | 1.02925 | 0.15843 | 0.75121 | 1.41020 |
| 2011 | 0.50633 | 158 | 2.20034 | 0.57935 | 0.18720 | 0.39970 | 0.83974 |

Table 5.4.1.1. Index values, upper confidence limits, lower confidence limits, and coefficient of variation for the recommended censored regression fit private/for hire mode index for red snapper for Fishery Dependent Recreational Surveys.

| | EASTERN GULF | | | | WESTERN GULF | | | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **Index** | **UCI** | **LCI** | **CV** | **Index** | **UCI** | **LCI** | **CV** |
| 1981 | 0.498 | 1.562 | 0.159 | 0.621 | 0.253 | 1.136 | 0.056 | 0.870 |
| 1982 | 0.328 | 1.101 | 0.098 | 0.665 | 0.546 | 1.383 | 0.216 | 0.491 |
| 1983 | 1.101 | 3.453 | 0.351 | 0.622 | 1.206 | 2.147 | 0.677 | 0.295 |
| 1984 | 0.645 | 2.801 | 0.149 | 0.845 | 0.574 | 1.090 | 0.302 | 0.329 |
| 1985 | 0.793 | 2.537 | 0.248 | 0.635 | 0.250 | 0.484 | 0.129 | 0.340 |
| 1986 | 0.308 | 0.950 | 0.100 | 0.611 | 0.526 | 0.991 | 0.279 | 0.325 |
| 1987 | 0.545 | 0.996 | 0.298 | 0.308 | 0.621 | 1.228 | 0.314 | 0.351 |
| 1988 | 0.172 | 0.358 | 0.082 | 0.381 | 0.599 | 1.156 | 0.310 | 0.338 |
| 1989 | 0.103 | 0.223 | 0.047 | 0.403 | 0.560 | 1.131 | 0.277 | 0.363 |
| 1990 | 0.106 | 0.248 | 0.045 | 0.445 | 0.381 | 0.719 | 0.202 | 0.326 |
| 1991 | 0.267 | 0.544 | 0.131 | 0.368 | 0.918 | 1.748 | 0.482 | 0.330 |
| 1992 | 0.560 | 0.971 | 0.323 | 0.280 | 0.977 | 1.678 | 0.569 | 0.275 |
| 1993 | 0.465 | 0.866 | 0.250 | 0.319 | 1.032 | 1.810 | 0.589 | 0.286 |
| 1994 | 0.299 | 0.589 | 0.152 | 0.349 | 1.155 | 1.995 | 0.669 | 0.278 |
| 1995 | 0.305 | 0.637 | 0.146 | 0.381 | 1.312 | 2.164 | 0.795 | 0.254 |
| 1996 | 0.381 | 0.790 | 0.184 | 0.376 | 1.010 | 1.674 | 0.609 | 0.257 |
| 1997 | 1.033 | 1.882 | 0.567 | 0.307 | 0.886 | 1.471 | 0.533 | 0.258 |
| 1998 | 1.559 | 2.338 | 1.040 | 0.205 | 0.921 | 1.529 | 0.555 | 0.258 |
| 1999 | 1.207 | 1.707 | 0.854 | 0.174 | 0.552 | 0.922 | 0.331 | 0.261 |
| 2000 | 1.158 | 1.704 | 0.787 | 0.195 | 0.680 | 1.141 | 0.406 | 0.263 |
| 2001 | 0.972 | 1.464 | 0.645 | 0.207 | 0.643 | 1.098 | 0.377 | 0.272 |
| 2002 | 1.517 | 2.265 | 1.015 | 0.203 | 0.804 | 1.343 | 0.482 | 0.261 |
| 2003 | 1.277 | 1.892 | 0.861 | 0.199 | 0.667 | 1.111 | 0.401 | 0.259 |
| 2004 | 1.083 | 1.539 | 0.763 | 0.177 | 0.616 | 1.018 | 0.373 | 0.255 |
| 2005 | 0.845 | 1.242 | 0.575 | 0.194 | 0.884 | 1.466 | 0.533 | 0.257 |
| 2006 | 0.988 | 1.497 | 0.652 | 0.210 | 0.711 | 1.126 | 0.449 | 0.233 |
| 2007 | 2.866 | 4.410 | 1.863 | 0.218 | 1.866 | 3.049 | 1.142 | 0.249 |
| 2008 | 2.690 | 3.849 | 1.880 | 0.181 | 1.775 | 2.892 | 1.089 | 0.248 |
| 2009 | 1.708 | 2.745 | 1.063 | 0.240 | 2.256 | 3.722 | 1.368 | 0.254 |
| 2010 | 3.439 | 5.433 | 2.177 | 0.232 | 3.308 | 6.082 | 1.799 | 0.312 |
| 2011 | 1.781 | 2.840 | 1.117 | 0.236 | 2.512 | 4.226 | 1.493 | 0.265 |

Table 5.4.1.2. Index values, upper confidence limits, lower confidence limits, and coefficient of variation for the recommended censored regression fit headboat mode index for red snapper for Fishery Dependent Recreational Surveys.

| | EASTERN GULF | | | | WESTERN GULF | | | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **Index** | **UCI** | **LCI** | **CV** | **Index** | **UCI** | **LCI** | **CV** |
| 1986 | 0.114 | 0.468 | 0.028 | 0.802 | 0.642 | 1.012 | 0.407 | 0.230 |
| 1987 | 0.125 | 0.512 | 0.030 | 0.803 | 0.768 | 1.150 | 0.514 | 0.203 |
| 1988 | 0.166 | 0.660 | 0.042 | 0.780 | 0.929 | 1.382 | 0.624 | 0.201 |
| 1989 | 0.188 | 0.749 | 0.047 | 0.782 | 0.812 | 1.198 | 0.551 | 0.196 |
| 1990 | 0.204 | 0.817 | 0.051 | 0.787 | 0.587 | 0.864 | 0.399 | 0.195 |
| 1991 | 0.243 | 0.980 | 0.060 | 0.791 | 0.949 | 1.451 | 0.621 | 0.215 |
| 1992 | 0.359 | 1.426 | 0.090 | 0.781 | 1.667 | 2.566 | 1.083 | 0.218 |
| 1993 | 0.468 | 1.822 | 0.120 | 0.766 | 1.691 | 2.557 | 1.119 | 0.209 |
| 1994 | 0.372 | 1.474 | 0.094 | 0.780 | 1.331 | 1.962 | 0.903 | 0.196 |
| 1995 | 0.313 | 1.245 | 0.079 | 0.782 | 1.400 | 2.146 | 0.913 | 0.216 |
| 1996 | 0.468 | 1.810 | 0.121 | 0.761 | 1.457 | 2.363 | 0.898 | 0.245 |
| 1997 | 0.783 | 3.005 | 0.204 | 0.756 | 1.577 | 2.418 | 1.029 | 0.216 |
| 1998 | 1.200 | 4.653 | 0.309 | 0.763 | 1.343 | 2.082 | 0.867 | 0.222 |
| 1999 | 1.149 | 4.411 | 0.299 | 0.757 | 0.421 | 0.643 | 0.275 | 0.214 |
| 2000 | 1.145 | 4.406 | 0.297 | 0.758 | 0.567 | 0.892 | 0.361 | 0.229 |
| 2001 | 1.100 | 4.237 | 0.285 | 0.759 | 0.821 | 1.464 | 0.460 | 0.296 |
| 2002 | 1.602 | 6.194 | 0.414 | 0.761 | 0.711 | 1.212 | 0.417 | 0.272 |
| 2003 | 1.443 | 5.569 | 0.374 | 0.760 | 0.609 | 0.999 | 0.371 | 0.251 |
| 2004 | 1.147 | 4.433 | 0.297 | 0.761 | 0.459 | 0.748 | 0.282 | 0.248 |
| 2005 | 1.165 | 4.556 | 0.298 | 0.769 | 0.507 | 0.823 | 0.312 | 0.246 |
| 2006 | 0.680 | 2.647 | 0.174 | 0.767 | 0.598 | 1.029 | 0.348 | 0.276 |
| 2007 | 1.440 | 5.857 | 0.354 | 0.797 | 1.098 | 2.035 | 0.593 | 0.316 |
| 2008 | 1.819 | 7.386 | 0.448 | 0.796 | 1.185 | 3.333 | 0.421 | 0.554 |
| 2009 | 3.357 | 13.831 | 0.815 | 0.807 | 1.240 | 2.217 | 0.693 | 0.297 |
| 2010 | 3.152 | 12.583 | 0.789 | 0.784 | 1.253 | 2.599 | 0.604 | 0.377 |
| 2011 | 1.798 | 9.101 | 0.355 | 0.964 | 1.376 | 3.939 | 0.481 | 0.564 |

Table 5.4.2.1. Vertical line standardized index of abundance and CVs for red snapper (1990-2006) in the Gulf of Mexico.

| YEAR | Eastern GOM Standardized Index | CV (Index) | Western GOM Standardized Index | CV (Index) |
|---|---|---|---|---|
| 1990 | 0.265945 | 0.8731 | 0.66143 | 0.2429 |
| 1991 | 0.420385 | 0.69 | 1.08012 | 0.2171 |
| 1992 | 1.268586 | 0.631 | 1.76699 | 0.2252 |
| 1993 | 0.698897 | 0.6026 | 1.15677 | 0.1623 |
| 1994 | 0.626484 | 0.6033 | 1.15504 | 0.1625 |
| 1995 | 0.745558 | 0.6196 | 1.3402 | 0.1624 |
| 1996 | 0.4489 | 0.6860 | 1.3387 | 0.1622 |
| 1997 | 0.3675 | 0.7141 | 1.1762 | 0.1621 |
| 1998 | 1.2883 | 0.6803 | 0.9335 | 0.1621 |
| 1999 | 0.7796 | 0.6920 | 0.8658 | 0.1623 |
| 2000 | 1.4717 | 0.6859 | 0.9879 | 0.1624 |
| 2001 | 1.3417 | 0.6899 | 0.8514 | 0.1623 |
| 2002 | 1.6504 | 0.6720 | 0.8156 | 0.1624 |
| 2003 | 1.4638 | 0.6646 | 0.7899 | 0.1624 |
| 2004 | 1.6566 | 0.6993 | 0.6571 | 0.1624 |
| 2005 | 1.3668 | 0.6758 | 0.5891 | 0.1625 |
| 2006 | 1.1386 | 0.6858 | 0.8341 | 0.1628 |

Table 5.4.3.1. Months when head boat trips were sampled and recreational red snapper harvest was either closed the entire month (X), open during any portion of the month in both state and federal waters adjacent to Florida (O), or open only in state waters (S). No trips were sampled during 2008 or the first half of 2009 due to funding. (Recreational hook-and-line fishing on head boats)

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2005 | X | X | X | O | O | O | O | O | O | O | X | X |
| 2006 | X | X | X | O | O | O | O | O | O | O | X | X |
| 2007 | X | X | X | S | S | O | O | O | S | S | X | X |
| 2008 | | | | | | | | | | | | |
| 2009 | | | | | | O | O | O | X | X | X | X |
| 2010* | X | X | X | X | X | O | O | X | X | O | O | X |
| 2011 | X | X | X | X | X | O | O | X | X | X | X | X |
| 2012 | X | X | X | X | X | O | O | ONGOING | | | | |

*Portions of federal EEZ and state territorial seas in northwest Florida closed to fishing during June through August due to Deepwater Horizon.

Table 5.4.3.2. Index from delta-gamma model of rates of undersized red snapper released by head boat anglers per trip from trips where average depth fished was 50 feet or deeper. The proportion positives were obtained by the binomial sub-model, and the positives from the product of the binomial and gamma sub-model estimates. Monte Carlo simulations were used to estimate the means, standard errors, and cv values for the delta-gamma model. (Recreational hook-and-line fishing on head boats)

| Year | proportion positives | n (all) | n (positives) | Mean | Std Error | Lower | Upper | CV (%) |
|---|---|---|---|---|---|---|---|---|
| 2005 | 0.866 | 19 | 13 | 0.674 | 0.234 | 0.423 | 1.179 | 34.71 |
| 2006 | 0.758 | 15 | 7 | 0.799 | 0.388 | 0.219 | 1.168 | 48.53 |
| 2007 | 0.603 | 8 | 6 | 0.768 | 0.449 | 0.289 | 1.623 | 58.41 |
| 2008 | | | | | | | | |
| 2009 | 0.579 | 27 | 16 | 0.461 | 0.191 | 0.180 | 0.885 | 41.53 |
| 2010 | 0.461 | 24 | 12 | 0.296 | 0.141 | 0.120 | 0.675 | 47.70 |
| 2011 | 0.227 | 24 | 9 | 0.042 | 0.026 | 0.015 | 0.095 | 61.01 |
| total | | 117 | 63 | | | | | |

Table 5.4.3.3. Index re-scaled to grand mean from the n-weighted annual means. (Recreational hook-and-line fishing on head boats)

| Year | n (positives) | Mean | Std Error | Lower | Upper | CV (%) |
|---|---|---|---|---|---|---|
| 2005 | 13 | 1.402 | 0.487 | 0.881 | 2.454 | 34.71 |
| 2006 | 7 | 1.664 | 0.807 | 0.456 | 2.432 | 48.53 |
| 2007 | 6 | 1.598 | 0.934 | 0.602 | 3.377 | 58.41 |
| 2008 | | | | | | |
| 2009 | 16 | 0.960 | 0.399 | 0.374 | 1.841 | 41.53 |
| 2010 | 12 | 0.616 | 0.294 | 0.249 | 1.405 | 47.70 |
| 2011 | 9 | 0.088 | 0.054 | 0.030 | 0.198 | 61.01 |

## 5.8 Figures

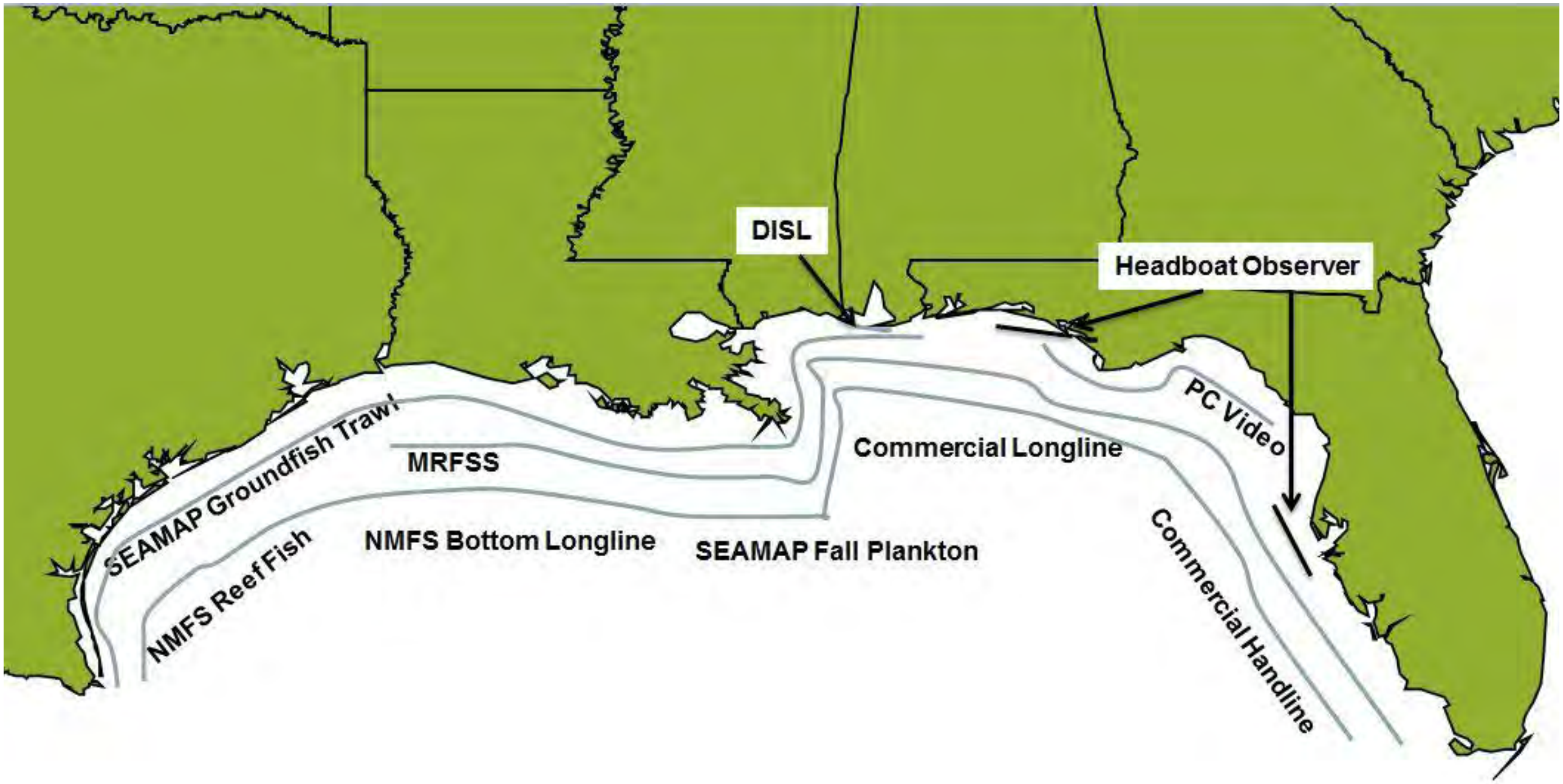



Figure 5.1.1. Spatial coverage of datasets used to develop indices.

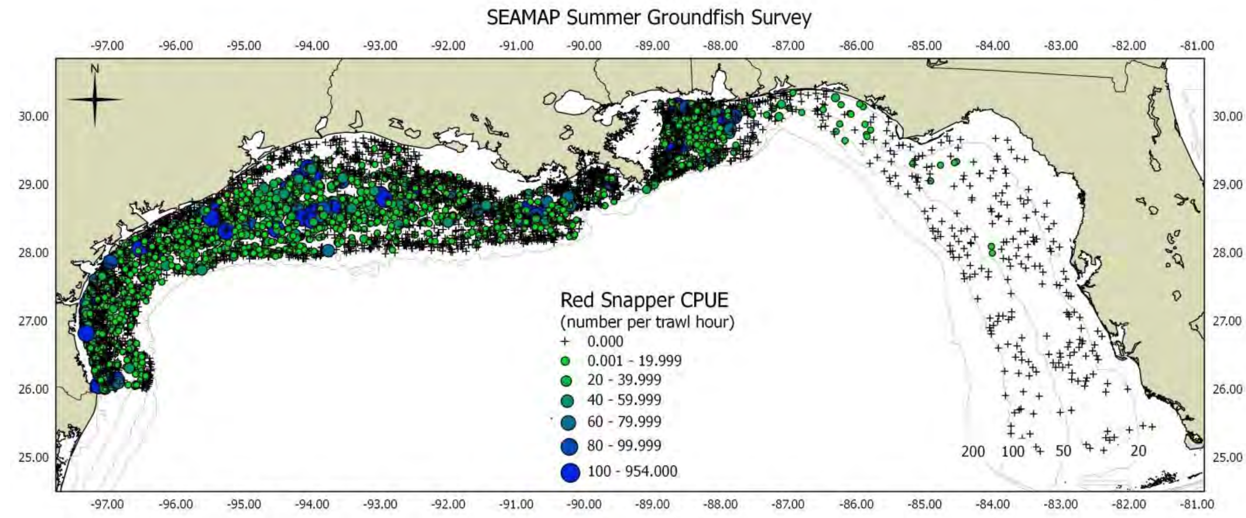



Figure 5.3.1.1. Stations sampled from 1982 to 2011 during the Summer SEAMAP Groundfish Survey with the CPUE for red snapper.

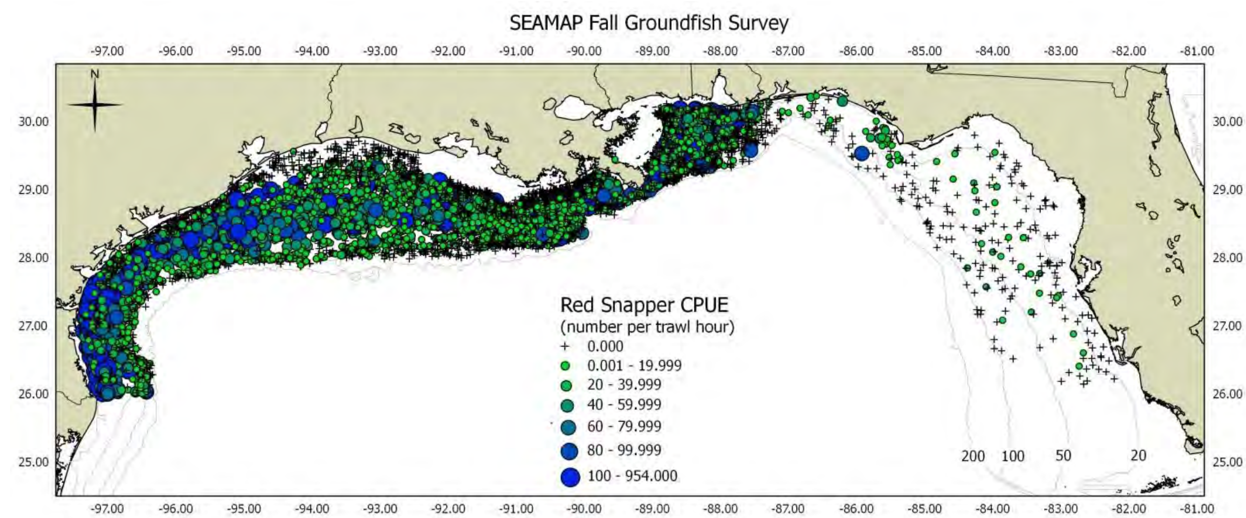



Figure 5.3.1.2. Stations sampled from 1972 to 2011 during the Fall SEAMAP Groundfish Survey with the CPUE for red snapper.

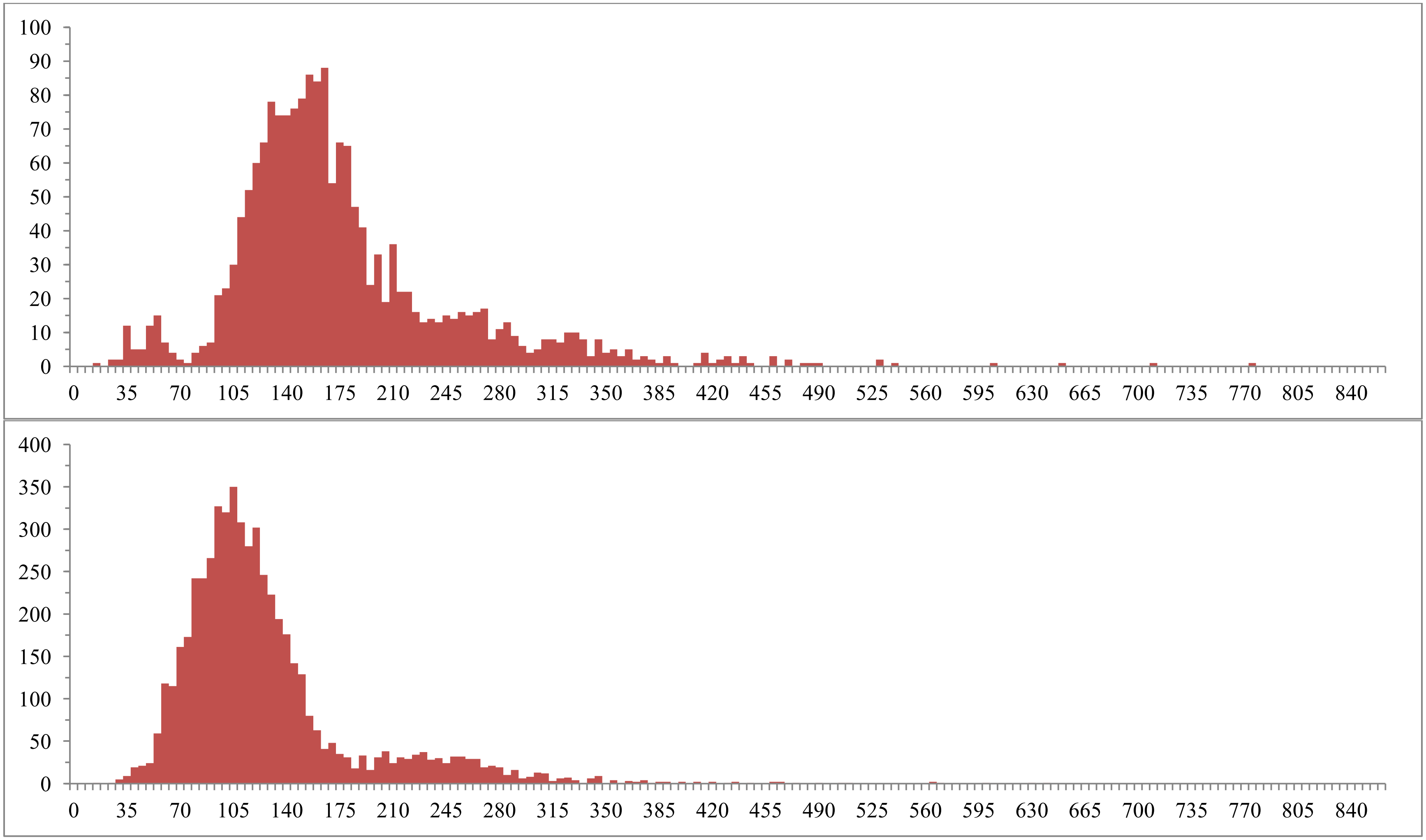



Figure 5.3.1.3. Length frequency histograms for red snapper captured in the eastern Gulf of Mexico during the Summer (top) and Fall (bottom) SEAMAP Groundfish surveys from 1987-2010.

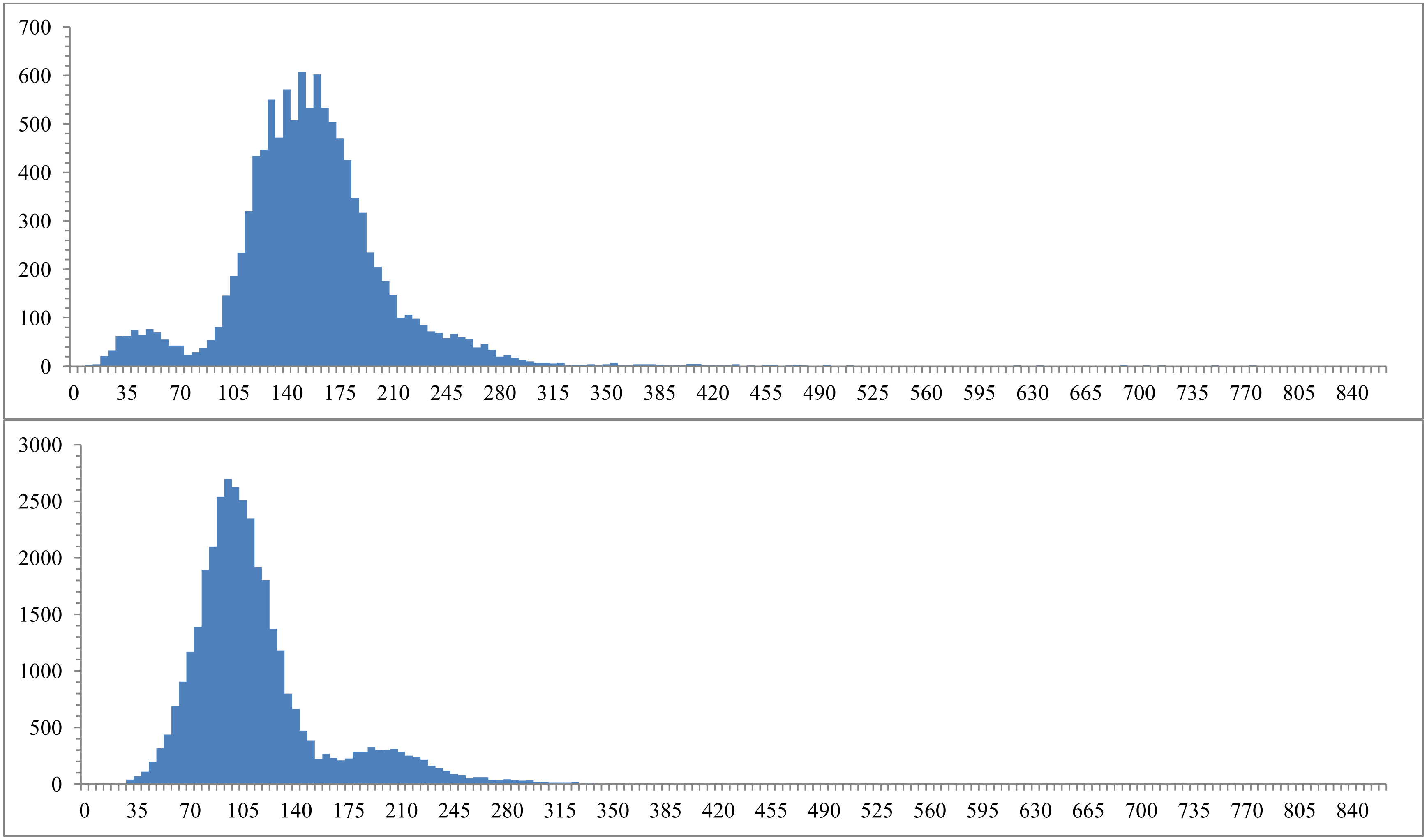



Figure 5.3.1.4. Length frequency histograms for red snapper captured in the western Gulf of Mexico during the Summer (top) and Fall (bottom) SEAMAP Groundfish surveys from 1987-2010.

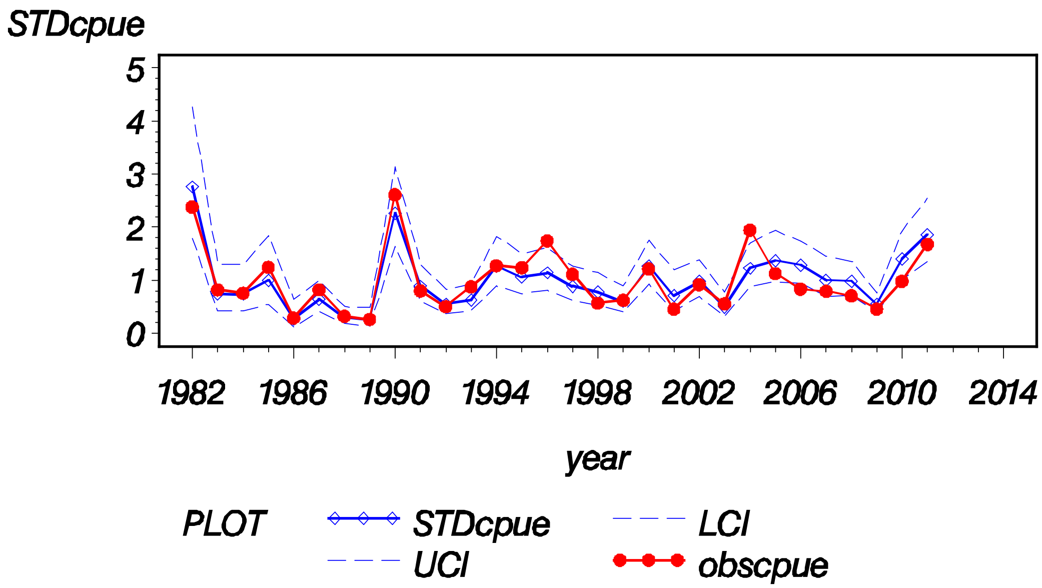



Figure 5.3.1.5. Annual index of abundance for red snapper (WGOM / Summer) from the SEAMAP Groundfish Survey from 1982 – 2011.

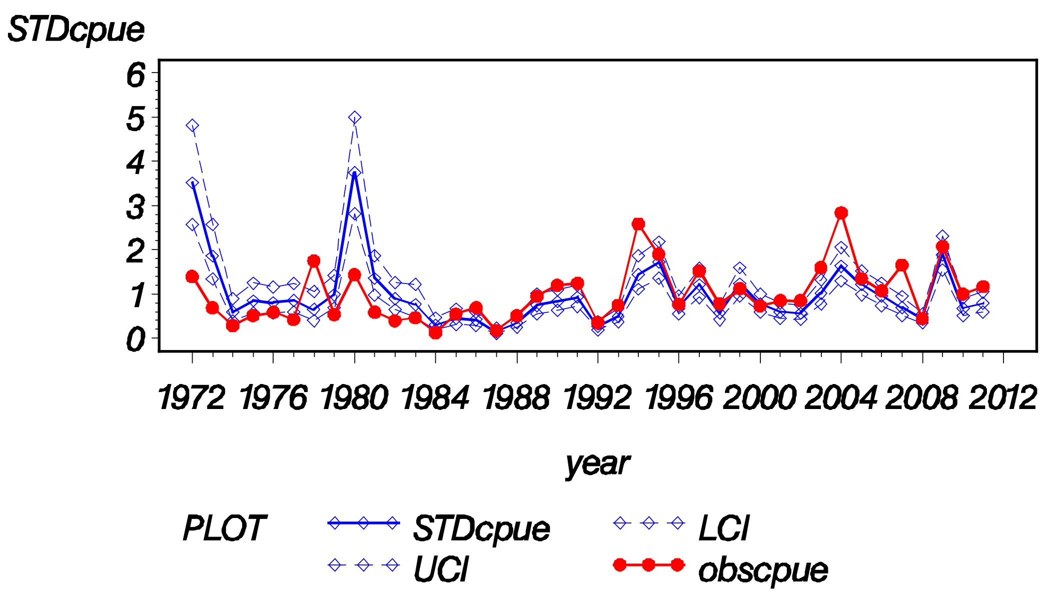



Figure 5.3.1.6. Annual index of abundance for red snapper (WGOM / Fall) from the SEAMAP Groundfish Survey from 1972 – 2011.

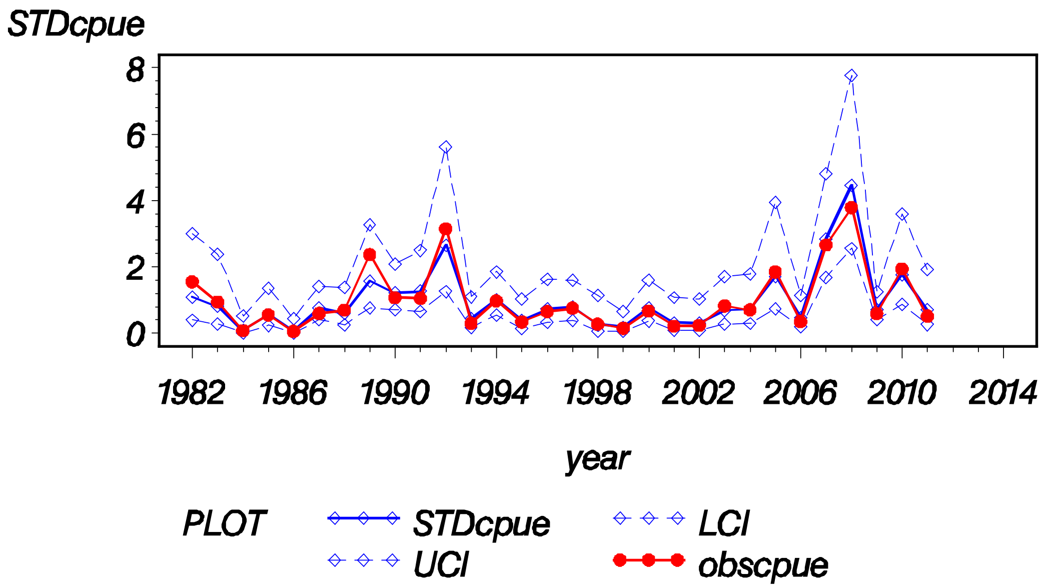



Figure 5.3.1.7. Annual index of abundance for red snapper (EGOM / Summer) from the SEAMAP Groundfish Survey from 1982 – 2011.

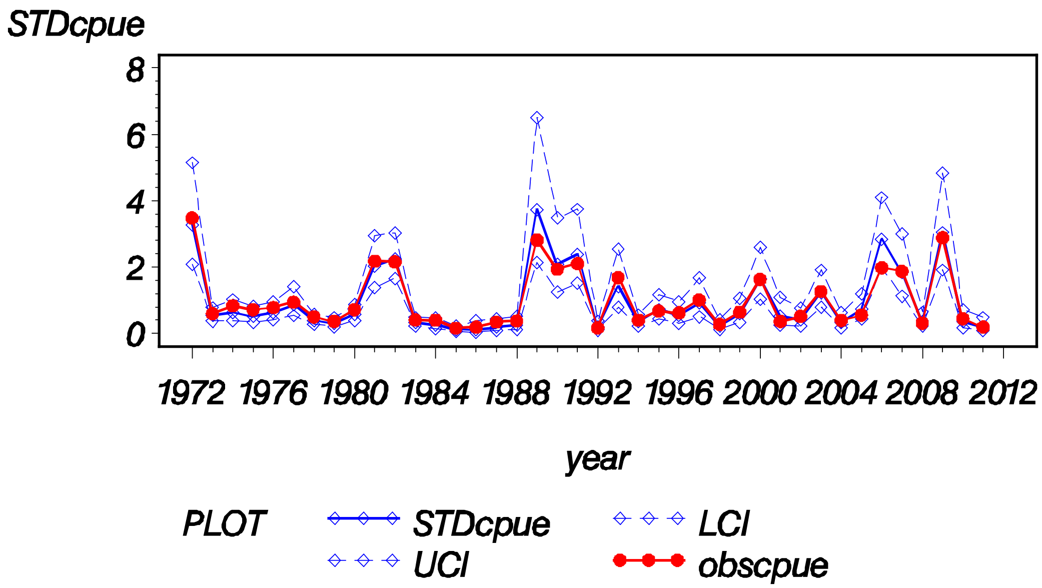



Figure 5.3.1.8. Annual index of abundance for red snapper (EGOM / Fall) from the SEAMAP Groundfish Survey from 1972 – 2011.

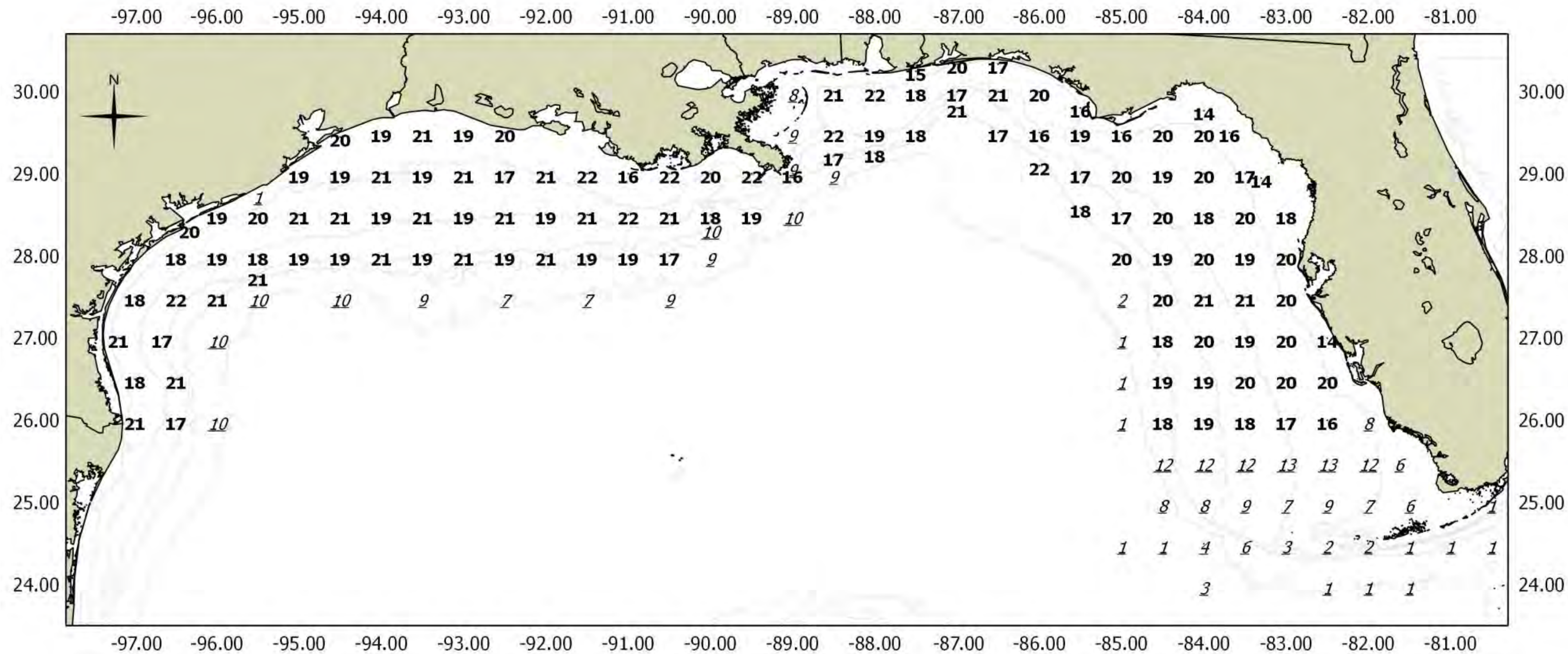



Figure 5.3.2.1. Number of samples taken at each SEAMAP B-number location from 1986-2010 during the SEAMAP Fall Plankton Survey. Bold numbers represent locations that were sampled at least 14 times (60%) during the survey and were included in analysis while those underlined and in italics were not included in the analysis.

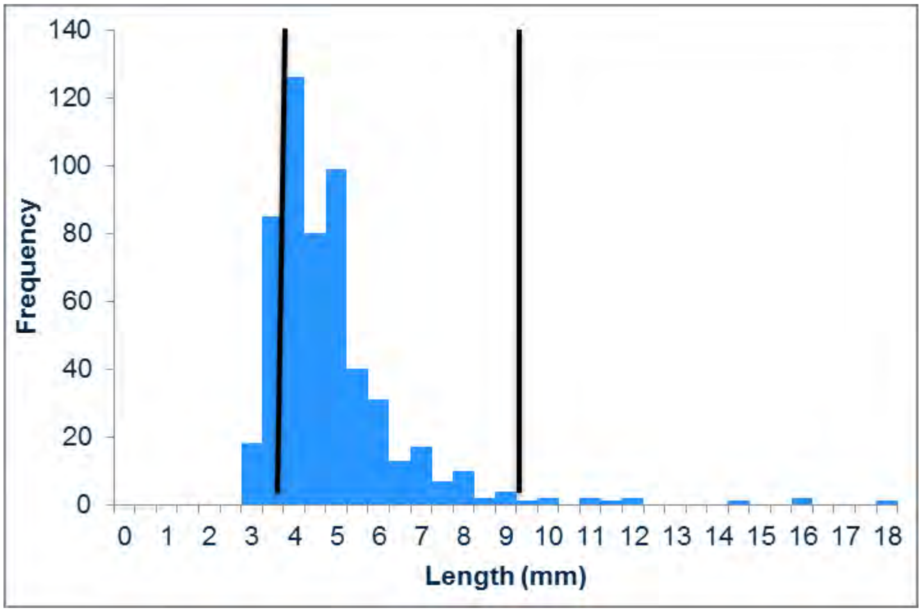



Figure 5.3.2.2. Length frequency histogram displaying catch sizes of larval red snapper caught during SEAMAP Fall Plankton surveys. Area between the black bars represent the larval red snapper used in the indices (3.75 – 9.25 mm).

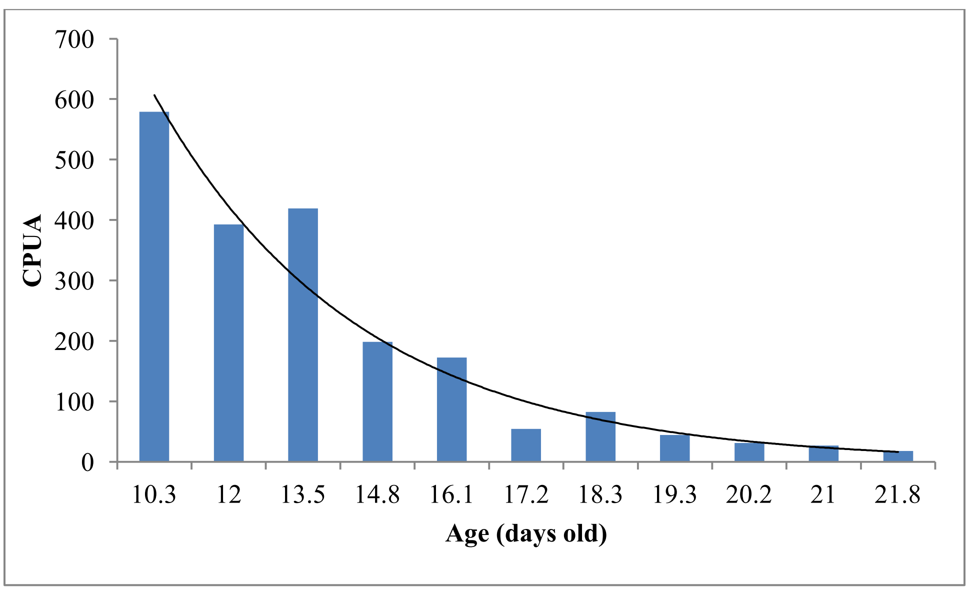



Figure 5.3.2.3. Age distribution (age of the size class midpoint) of the larval red snapper catch and the resulting daily loss rate curve (Z = 0.1503).

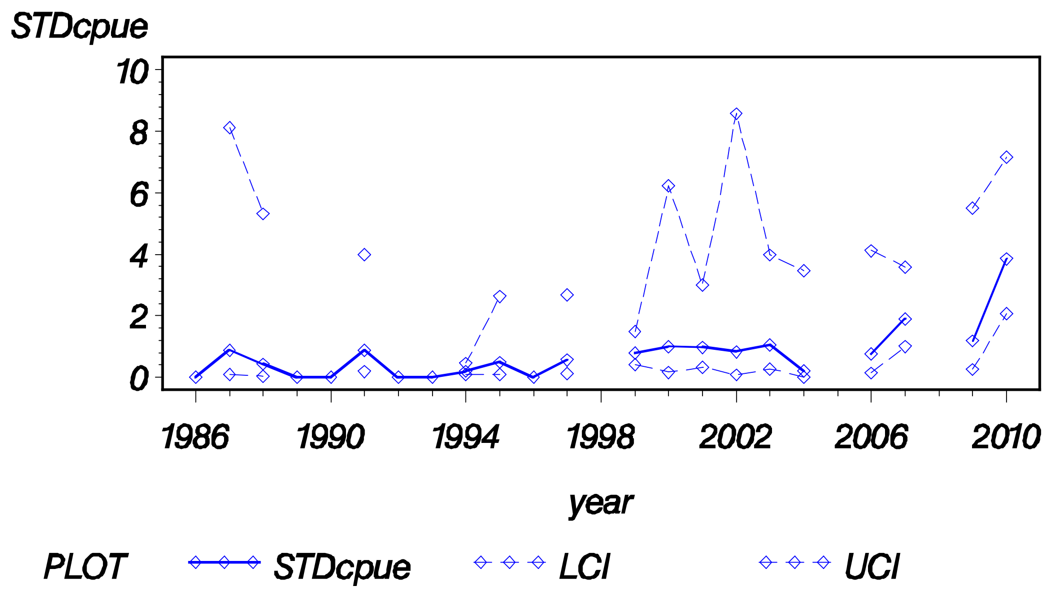



Figure 5.3.2.4. Annual index of abundance for larval red snapper (Eastern Gulf of Mexico) from the SEAMAP Fall Plankton Survey from 1986 – 2010.

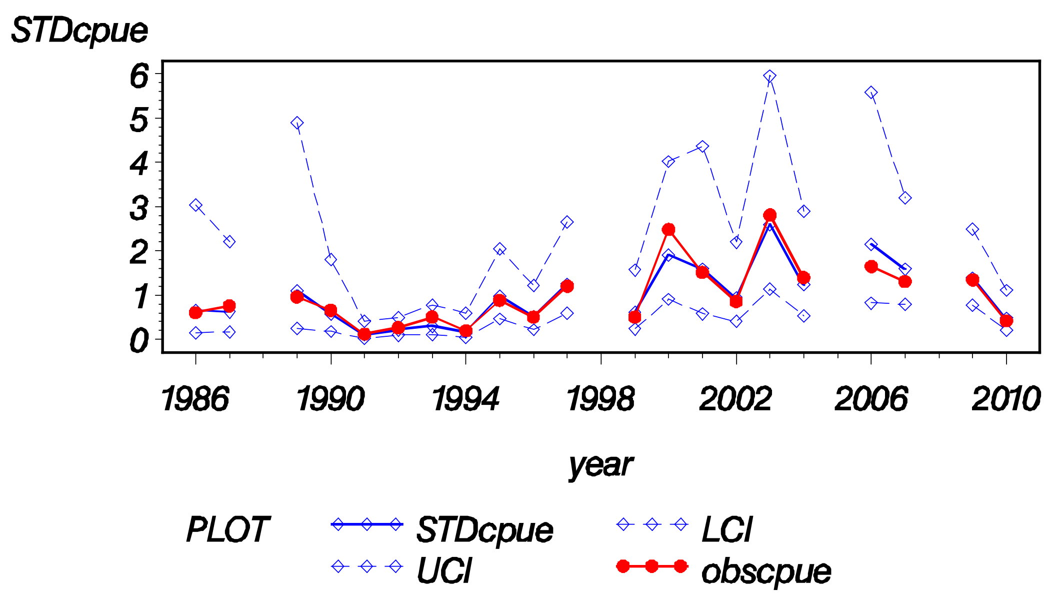



Figure 5.3.2.5. Annual index of abundance for larval red snapper adjusted to 10.5 days old (Western Gulf of Mexico) from the SEAMAP Fall Plankton Survey from 1986 – 2010.

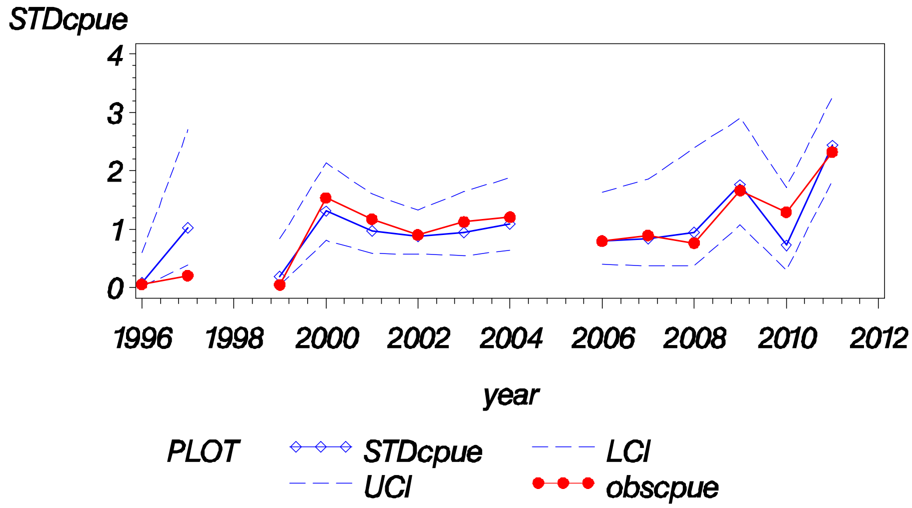



Figure 5.3.3.1. West Gulf abundance indices for red snapper collected during Bottom Longline Surveys. STDcpue is the index scaled to a mean of one over the time series. Obscpue is the average nominal CPUE, and LCI and UCI are 95% confidence limits.

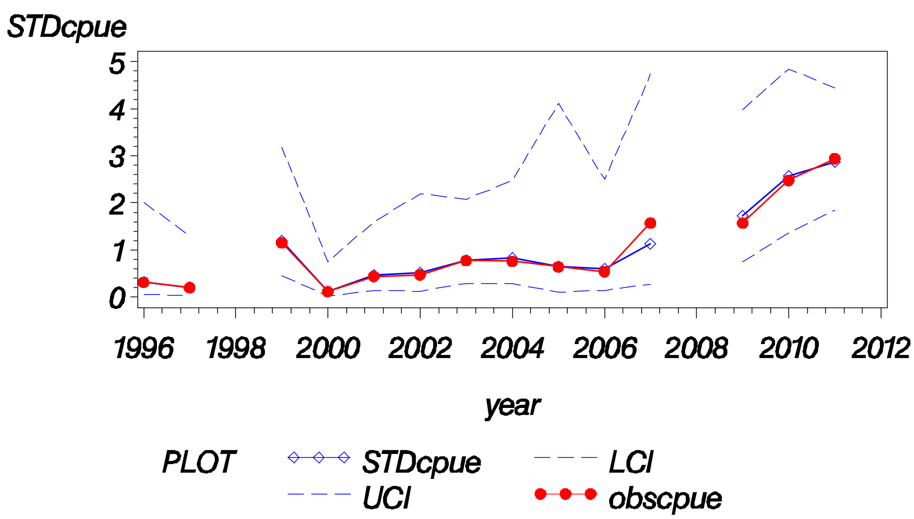



Figure 5.3.3.2. East Gulf abundance indices for red snapper collected during Bottom Longline Surveys. STDcpue is the index scaled to a mean of one over the time series. Obscpue is the average nominal CPUE, and LCI and UCI are 95% confidence limits.

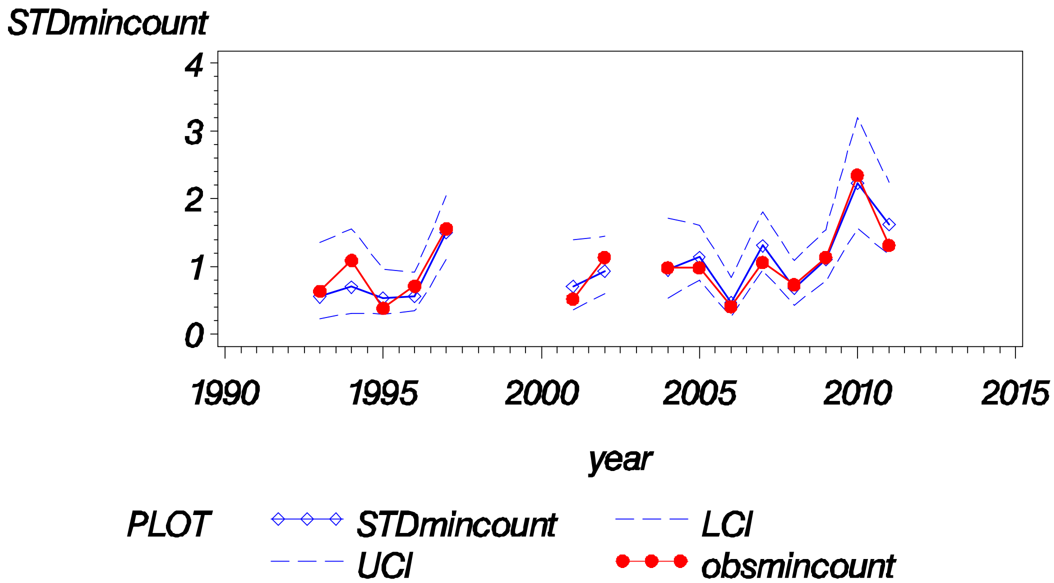



Figure 5.3.4.1. Model based west GOM standardized versus observed mincounts for SEAMAP Reef Fish Video Surveys.

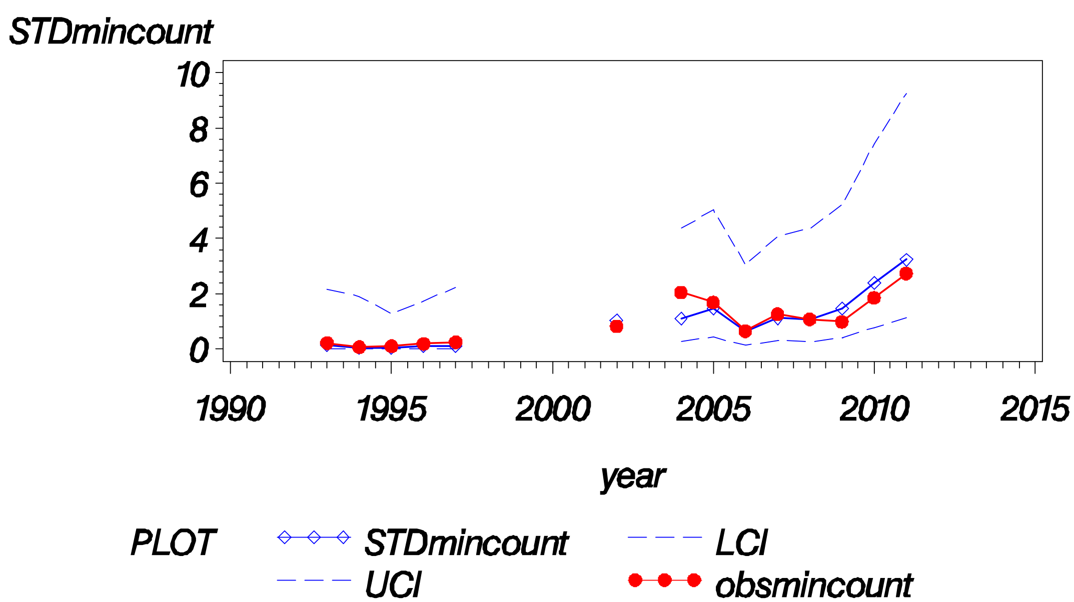



Figure 5.3.4.2. Model based east GOM standardized versus observed mincounts for SEAMAP Reef Fish Video Surveys.

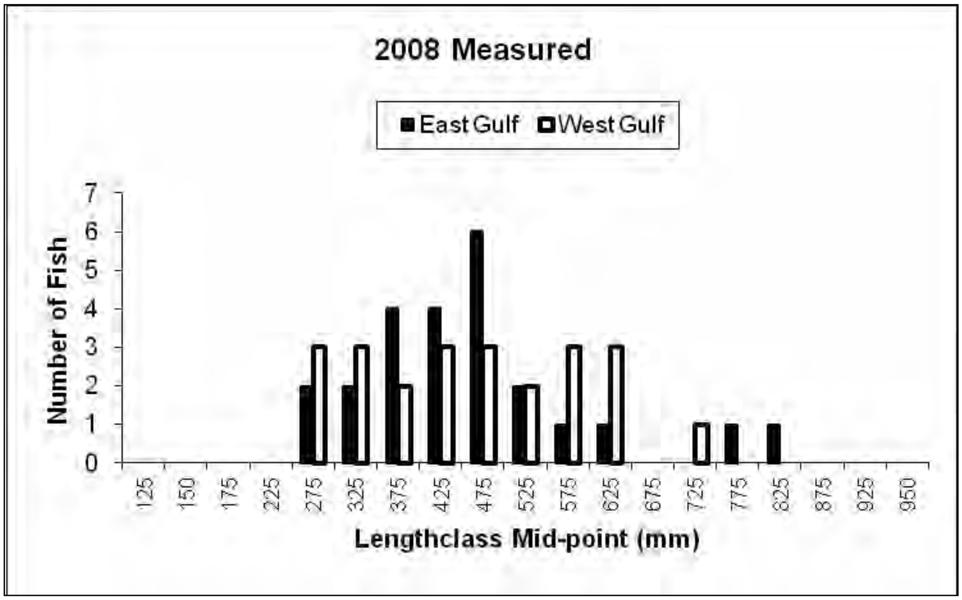



Figure 5.3.4.3. Red snapper length frequency of fish measured with stereo cameras in 2008 for SEAMAP Reef Fish Video Surveys.

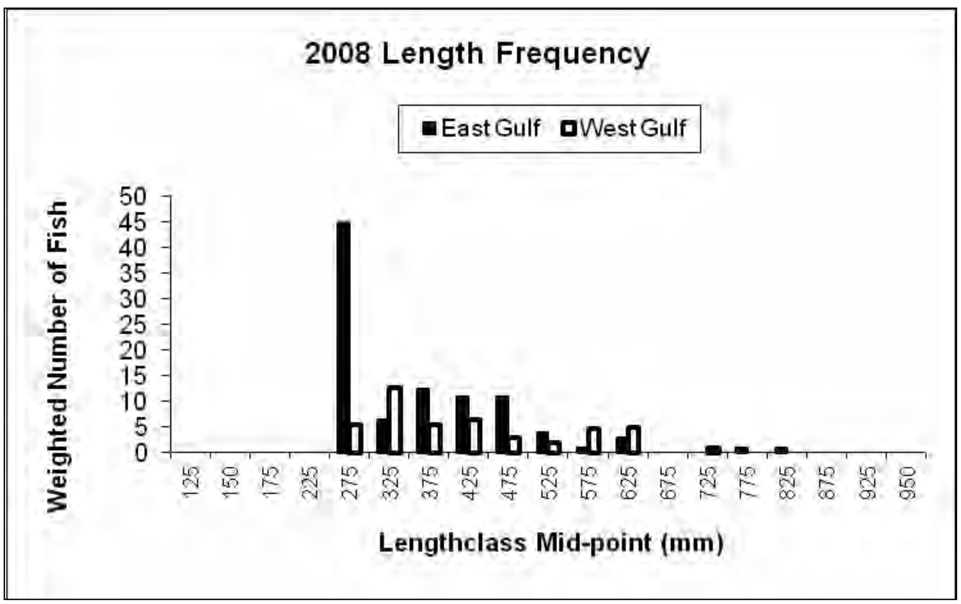



Figure 5.3.4.4. Red snapper length frequency distribution (weighted by minimum counts at each site) from fish measured with stereo cameras in 2008 for SEAMAP Reef Fish Video Surveys.

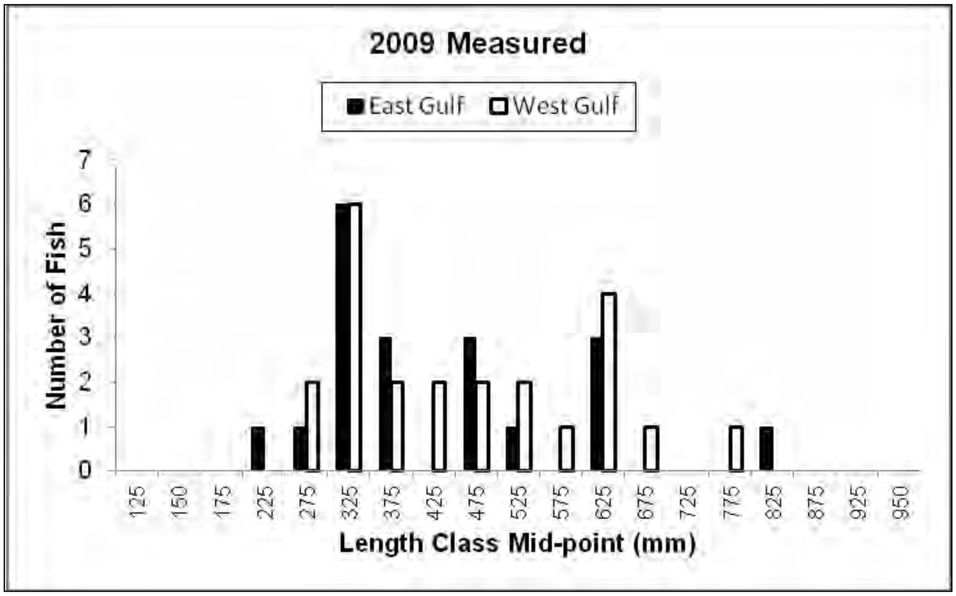



Figure 5.3.4.5. Red snapper length frequency of fish measured with stereo cameras in 2009 for SEAMAP Reef Fish Video Surveys.

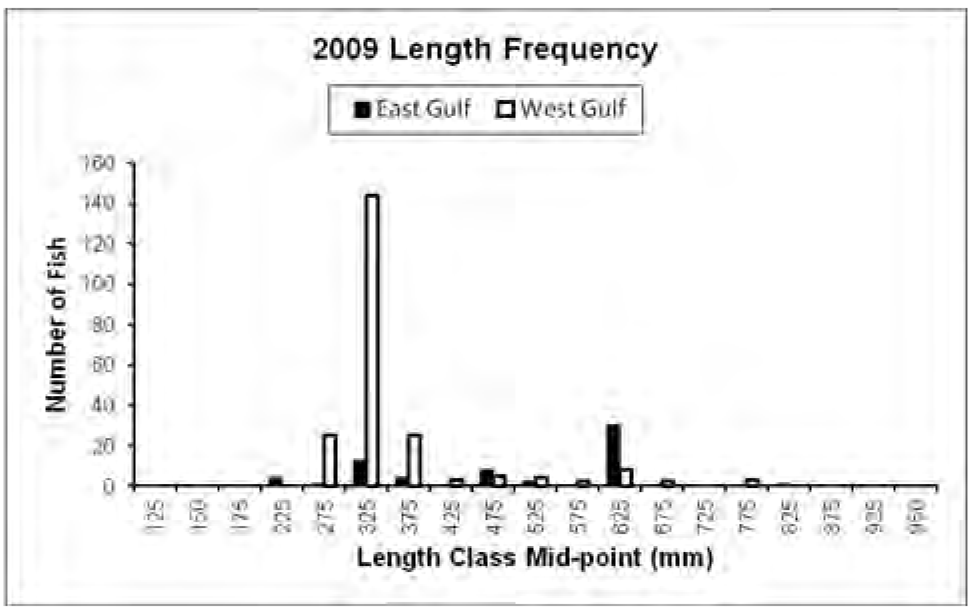



Figure 5.3.4.6. Red snapper length frequency distribution (weighted by minimum counts at each site) from fish measured with stereo cameras in 2009 for SEAMAP Reef Fish Video Surveys.

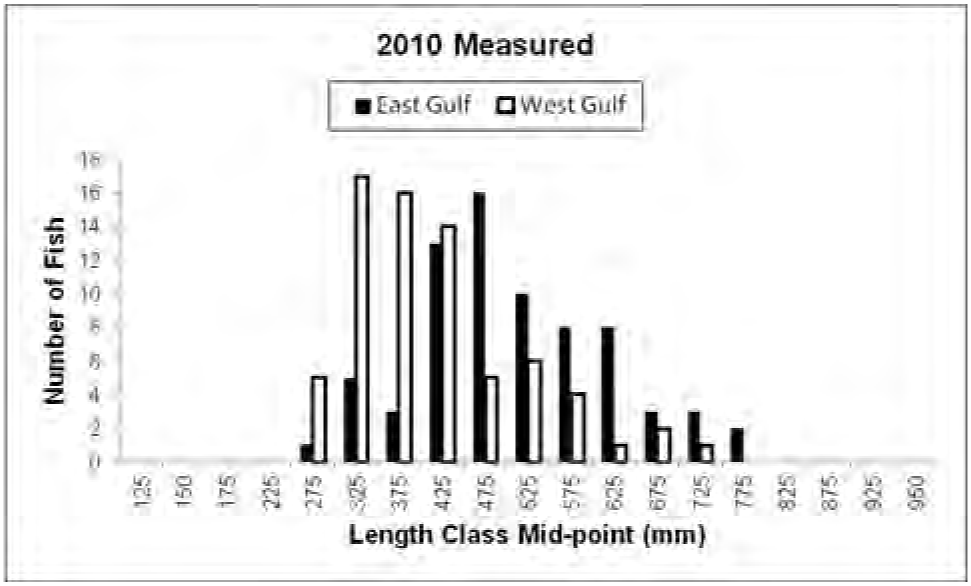



Figure 5.3.4.7. Red snapper length frequency of fish measured with stereo cameras in 2010 for SEAMAP Reef Fish Video Surveys.

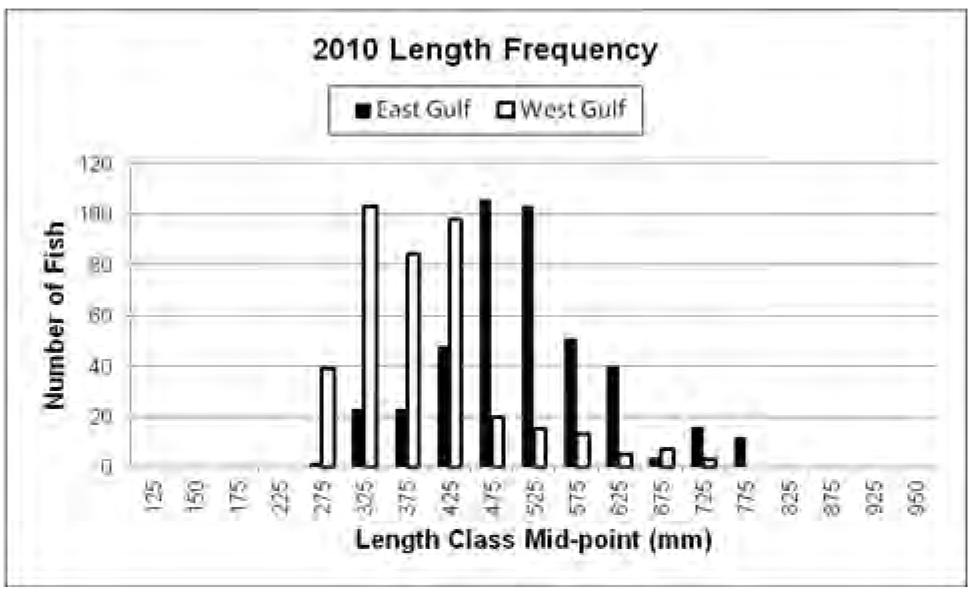



Figure 5.3.4.8. Red snapper length frequency distribution (weighted by minimum counts at each site) from fish measured with stereo cameras in 2010 for SEAMAP Reef Fish Video Surveys.

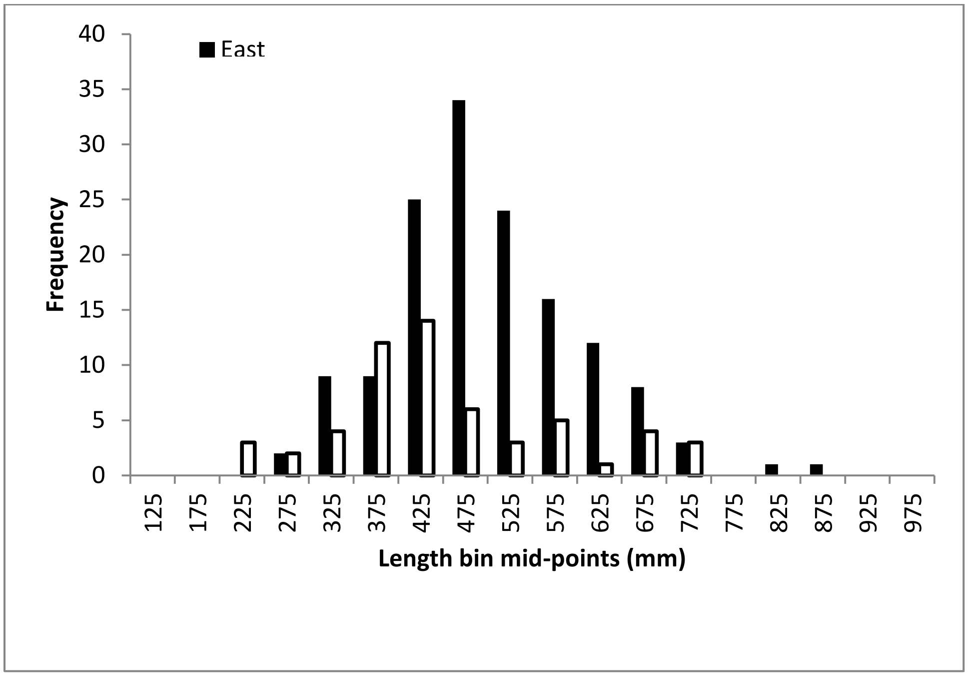



Figure 5.3.4.9. Red snapper length frequency of fish measured with stereo cameras in 2011 for SEAMAP Reef Fish Video Surveys.

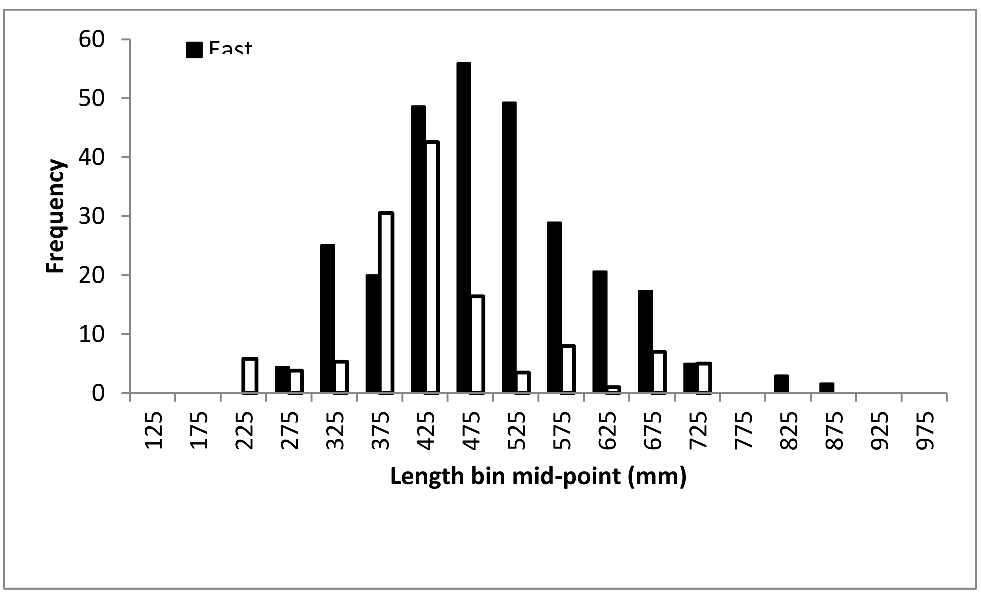



Figure 5.3.4.10. Red snapper length frequency distribution (weighted by minimum counts at each site) from fish measured with stereo cameras in 2011 for SEAMAP Reef Fish Video Surveys.

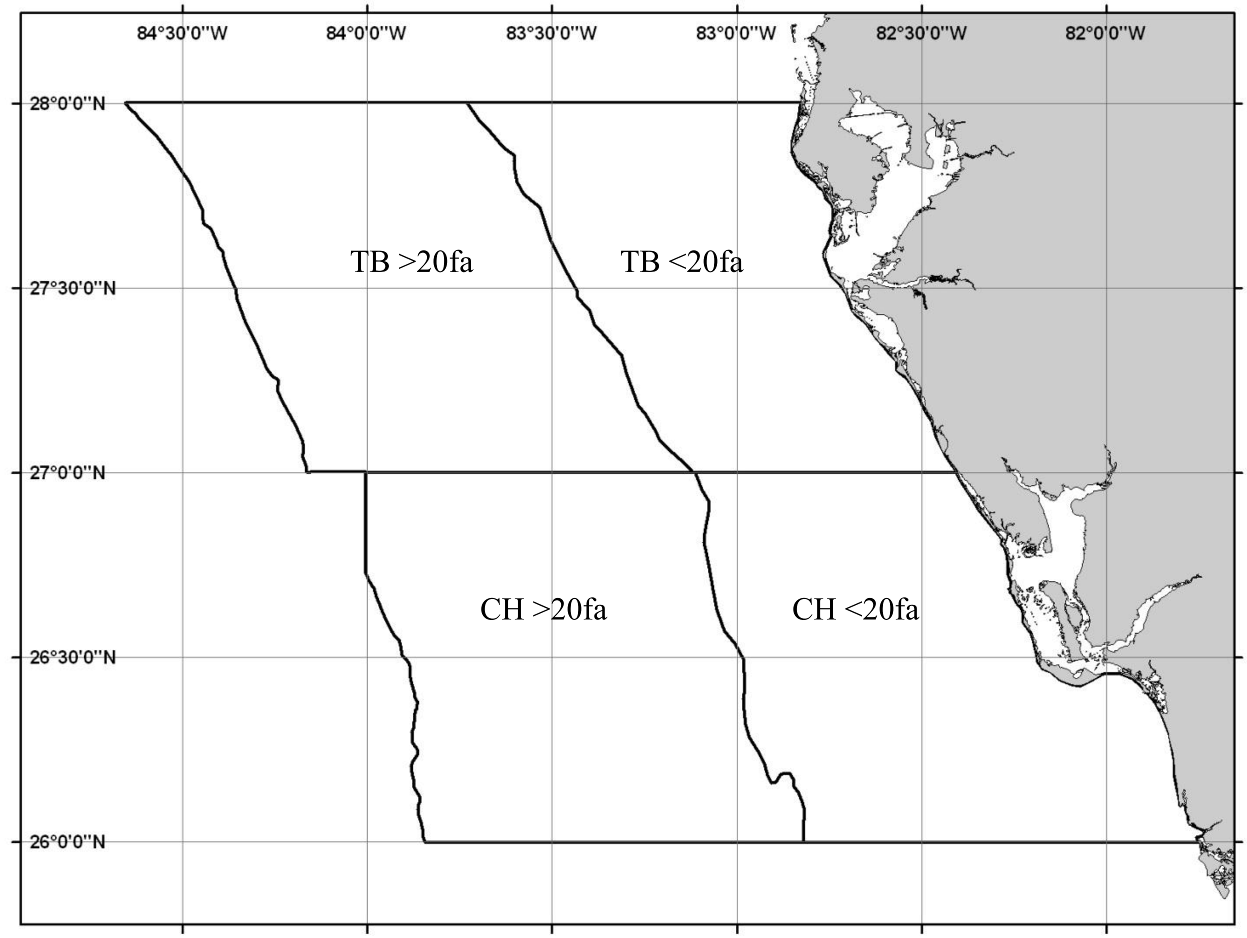



Figure 5.3.5.1. The West Florida Shelf survey area. The 20fa (37m) contour separates nearshore (i.e., TBN and CHN) and offshore (TBO and CHO) sampling zones. The sampling area includes waters 10m – 110m. (FWC Video Survey)

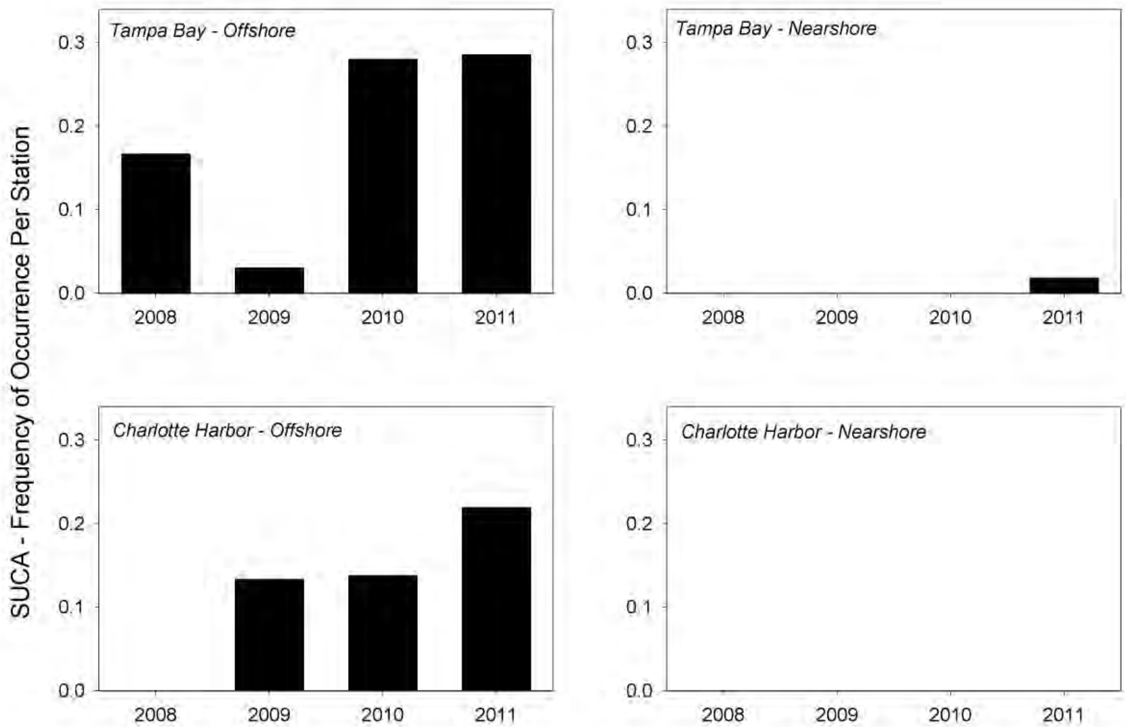



Figure 5.3.5.2. Annual frequency of occurrence of red snapper observed during stationary underwater camera array (SUCA) surveys by spatial zone from 2008 – 2011. (FWC Video Survey)

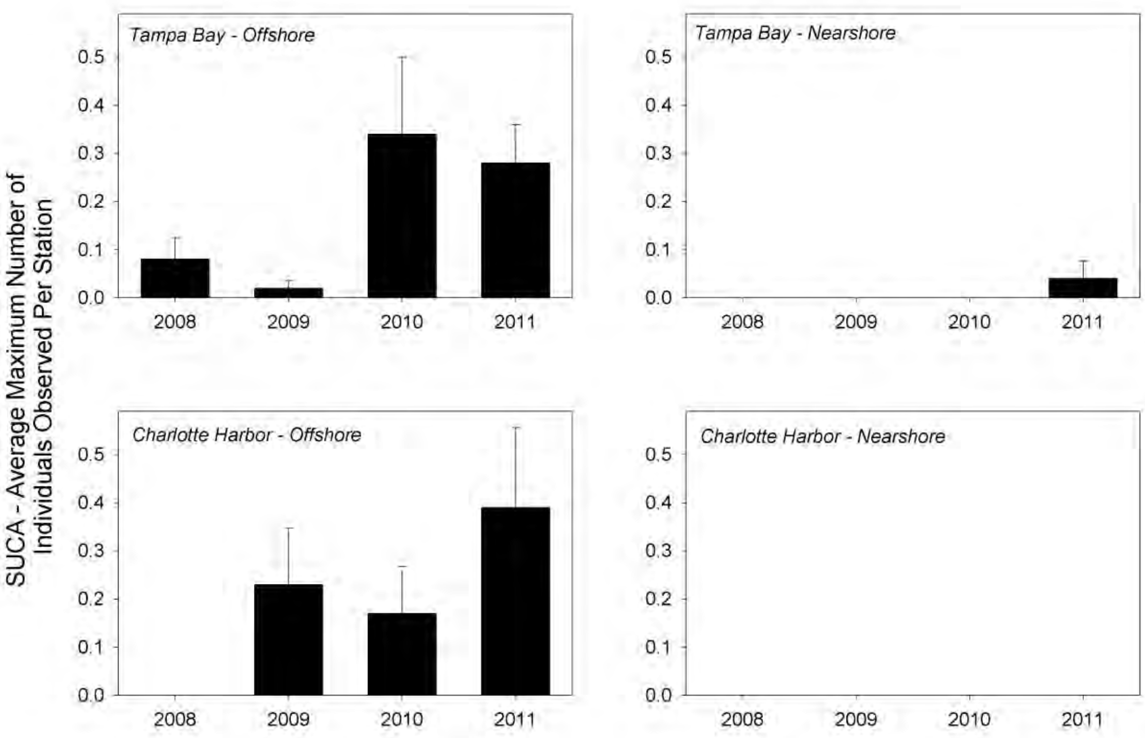



Figure 5.3.5.3. Mean (± SE) annual relative abundance of red snapper observed during stationary underwater camera array (SUCA) surveys by spatial zone from 2008 – 2011. (FWC Video Survey)

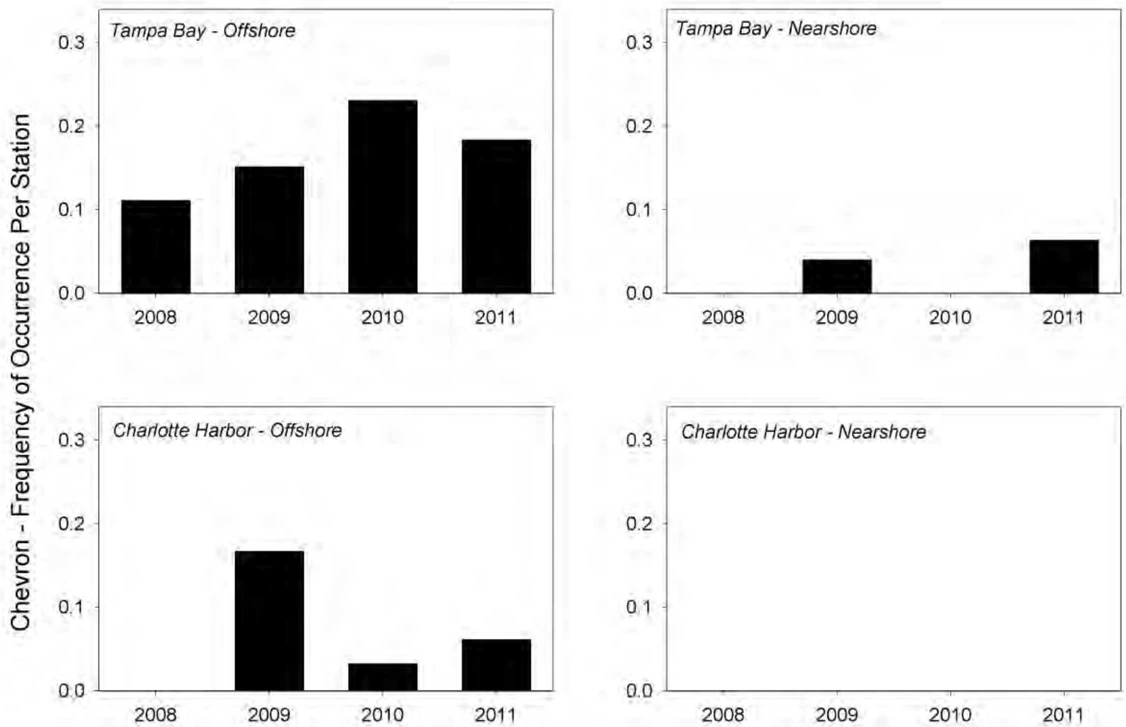



Figure 5.3.5.4. Annual frequency of occurrence of red snapper collected during chevron trap surveys by spatial zone from 2008 – 2011. (FWC Video Survey)

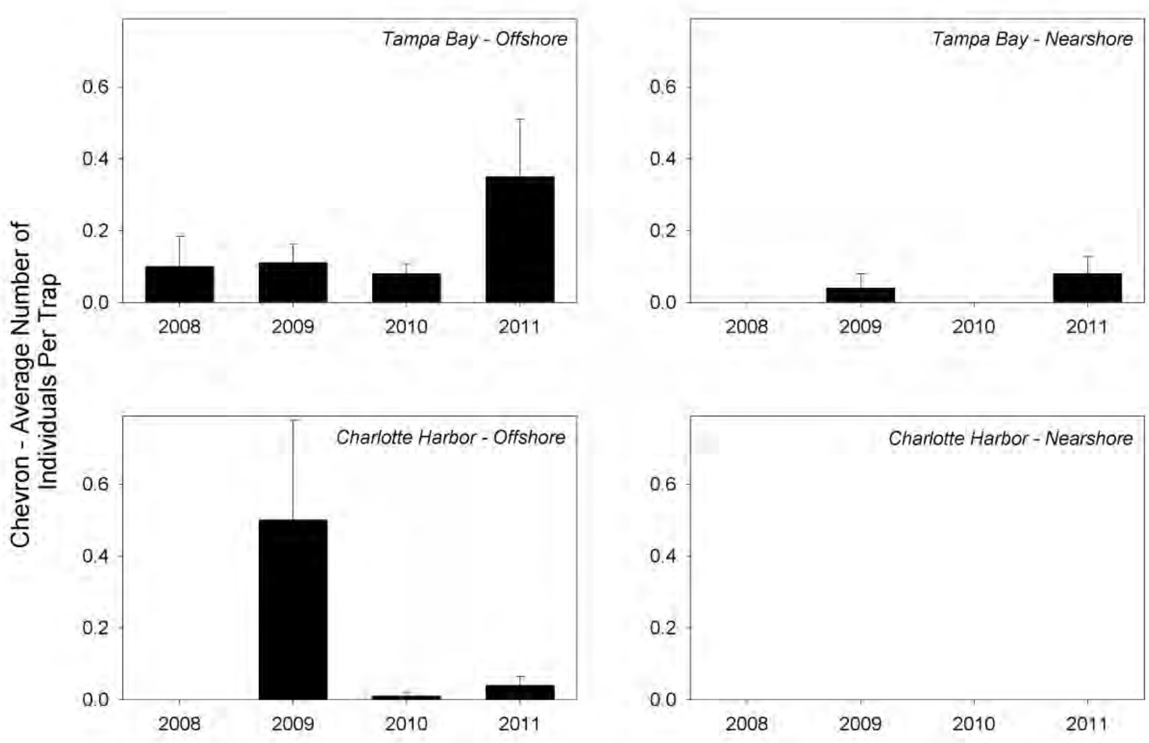



Figure 5.3.5.5. Mean (± SE) annual relative abundance of red snapper collected during chevron trap surveys by spatial zone from 2008 – 2011. (FWC Video Survey)

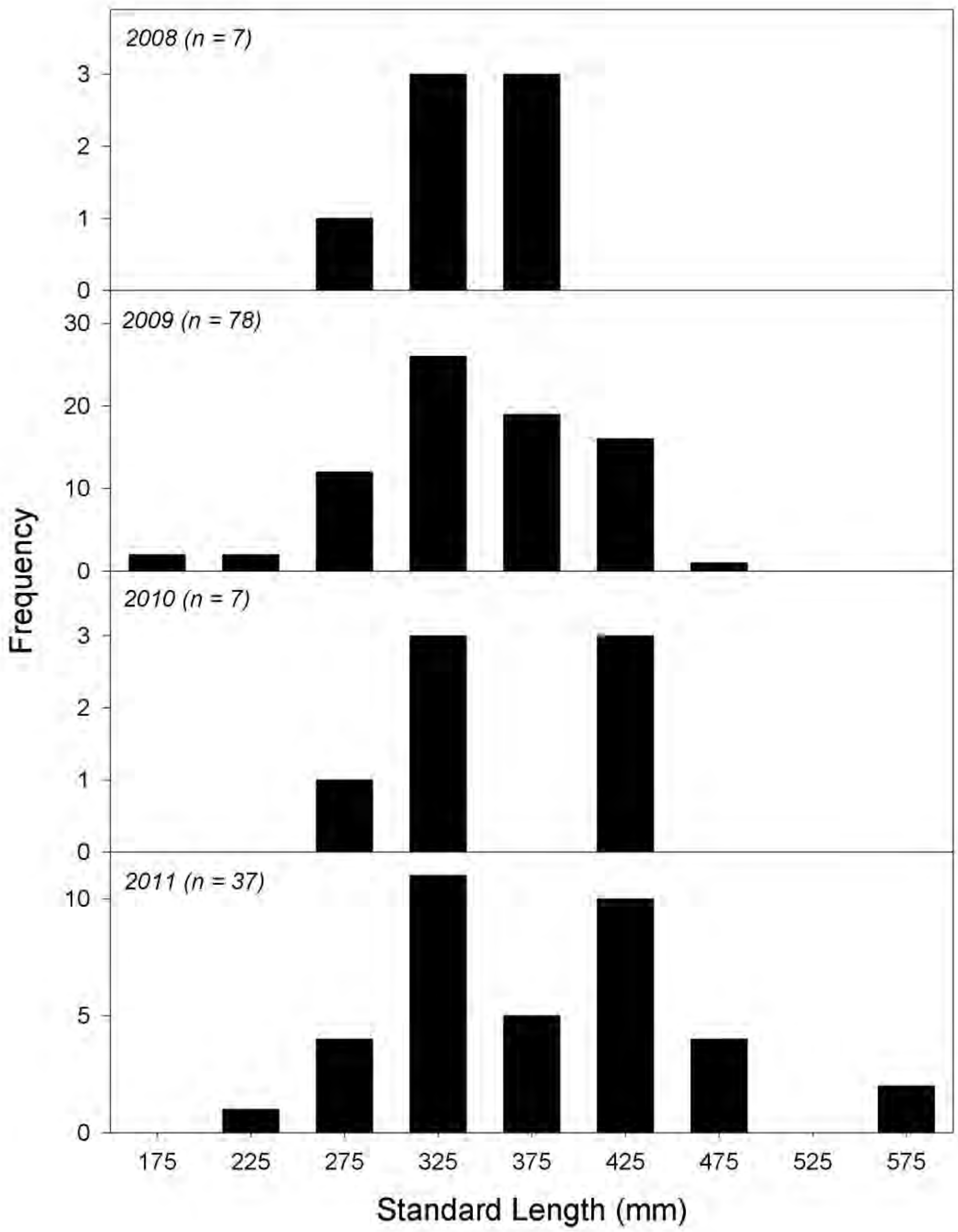



Figure 5.3.5.6. Annual size-frequency distribution of red snapper collected during chevron trap surveys by spatial zone from 2008 – 2011. (FWC Video Survey)

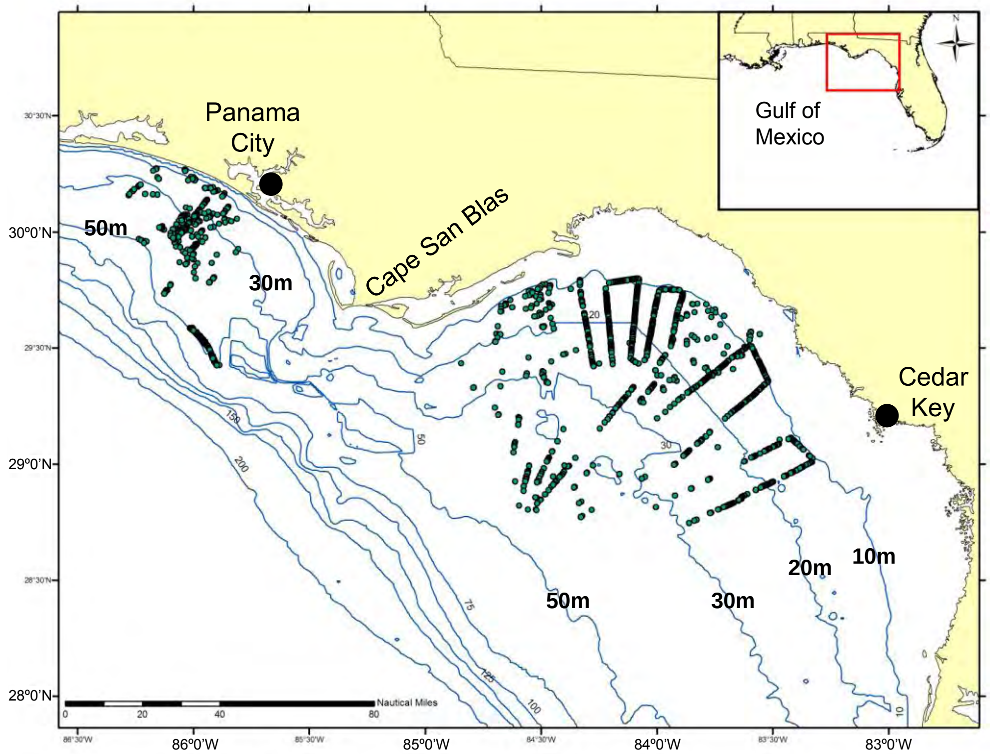



Figure 5.3.6.1. Locations of all natural reefs in the sampling universe of the Panama City NMFS reef fish video survey as of March 2012. Total sites: 2359, 722 west of and 1637 east of Cape San Blas.

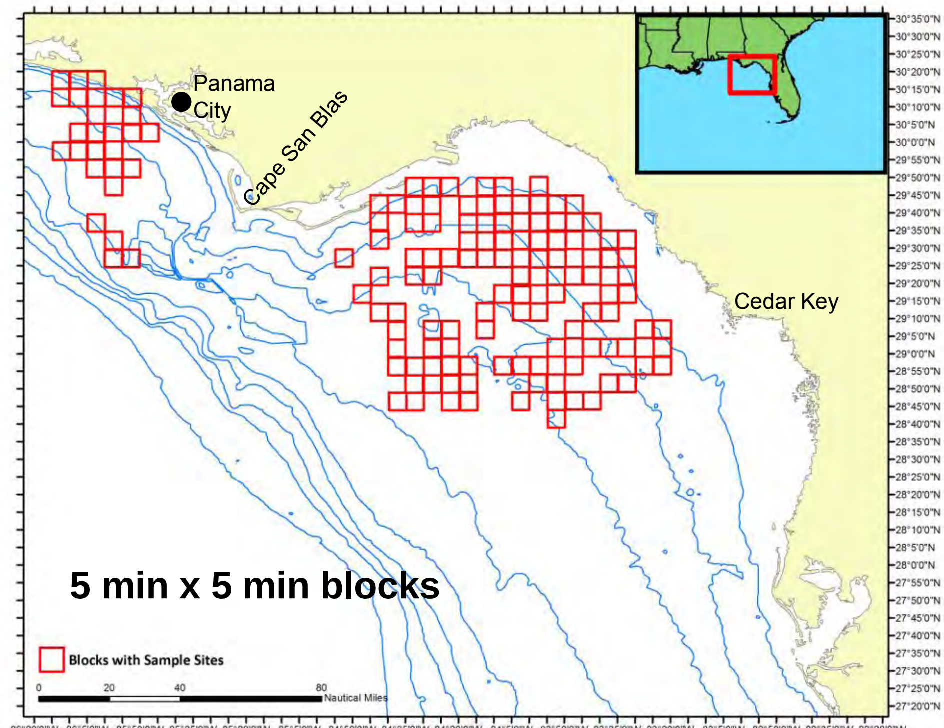



Figure 5.3.6.2. Sampling blocks, as of 2012, of the Panama City reef fish survey.

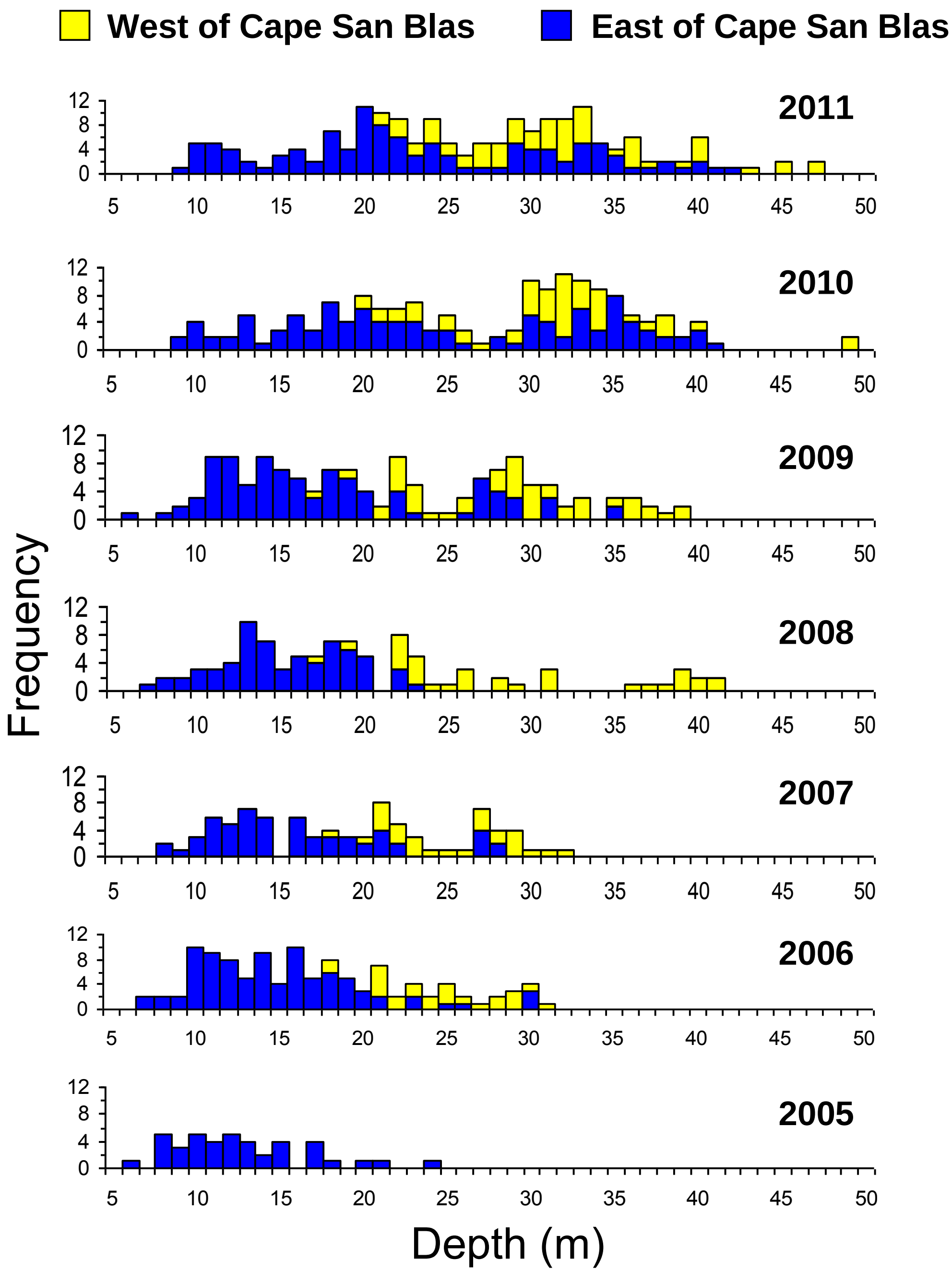



Figure 5.3.6.3. Annual depth distribution of Panama City reef fish survey video sample sites east and west of Cape San Blas, 2005-2011.

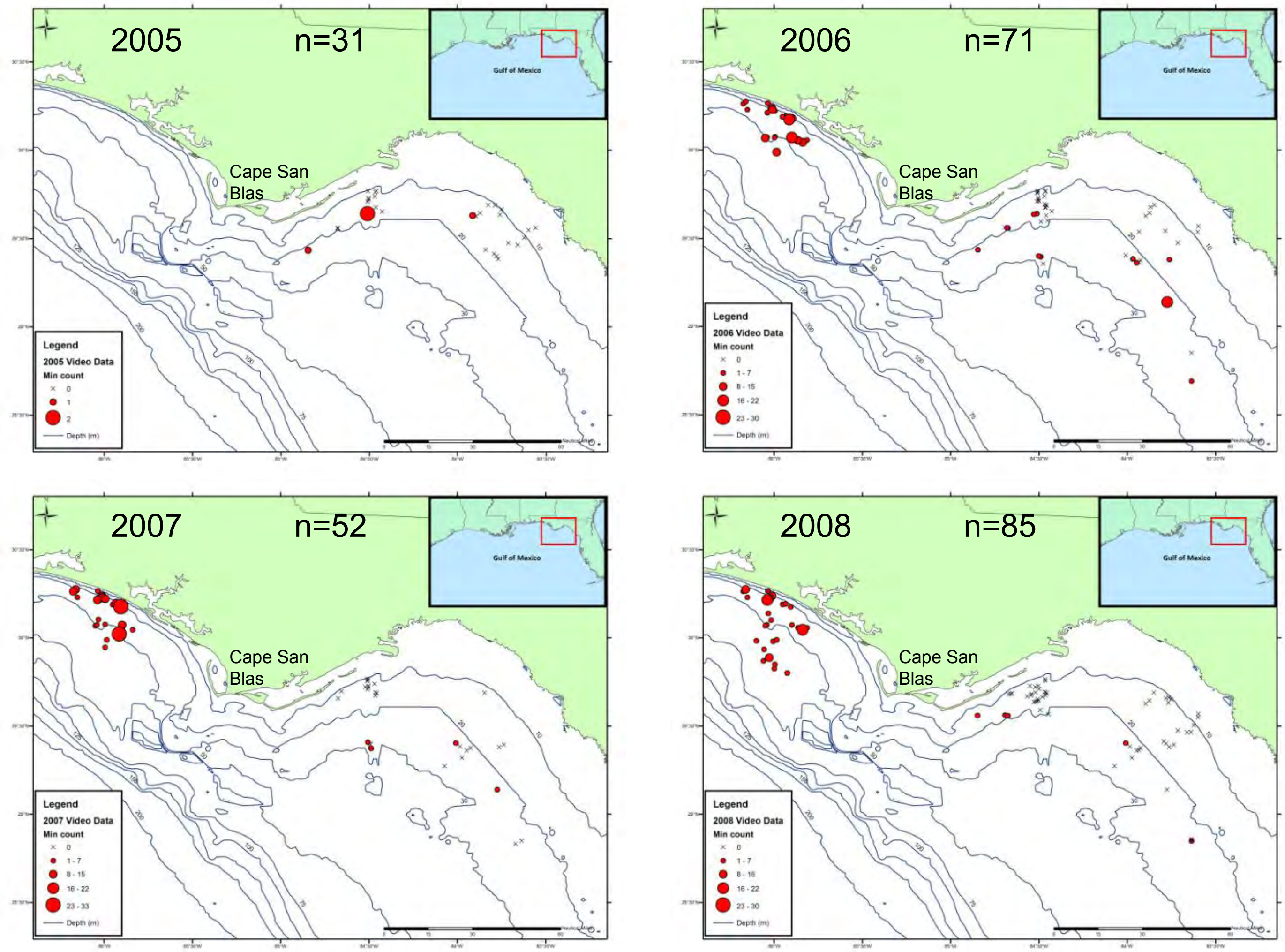



Figure 5.3.6.4. Annual distribution and relative abundance (min counts) of red snapper observed in the Panama City NMFS reef fish survey, 2005-2008, with stationary, high definition video cameras. Sites sampled with video gear, but where no red snapper were observed, are indicated with an X. Sample sizes refer to the total number of sites surveyed.

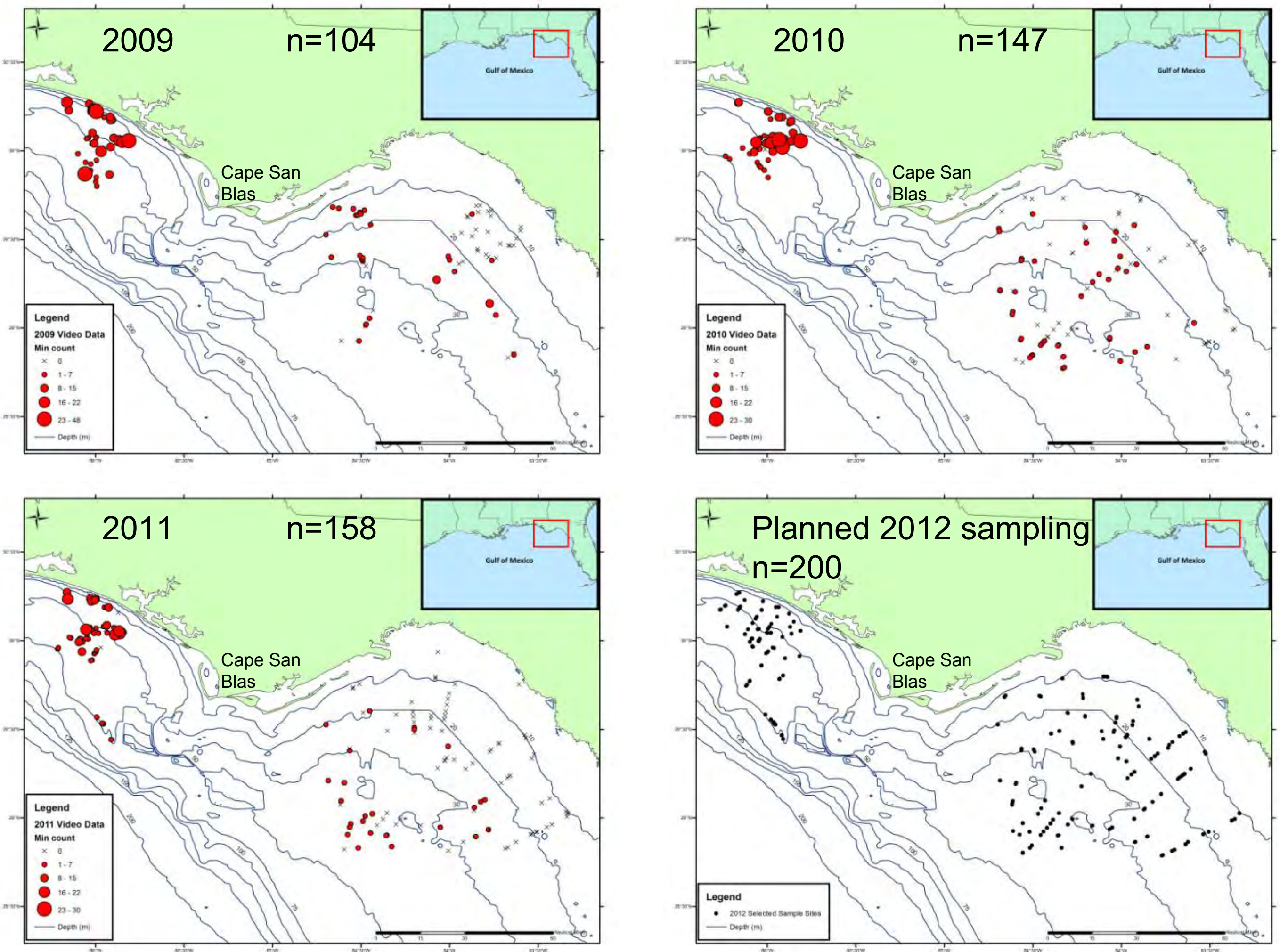



Figure 5.3.6.5. Annual distribution and relative abundance (min counts) of red snapper observed in the Panama City NMFS reef fish survey, 2009-2011, with stationary, high definition video or mpeg cameras. Sites sampled with video gear, but where no red snapper were observed, are indicated with an X. Sample sizes refer to the total number of sites surveyed.

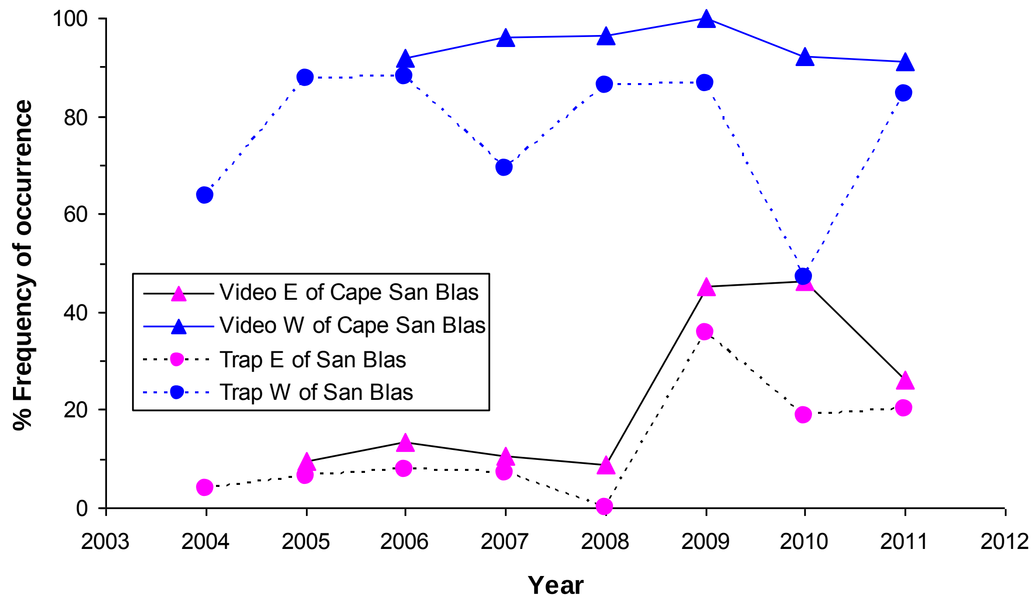



Figure 5.3.6.6. Annual percent frequency of occurrence of red snapper in video and trap samples east and west of Cape San Blas, 2005-2011. All data was included for trap estimates; censored data sets were used to calculate video frequencies.

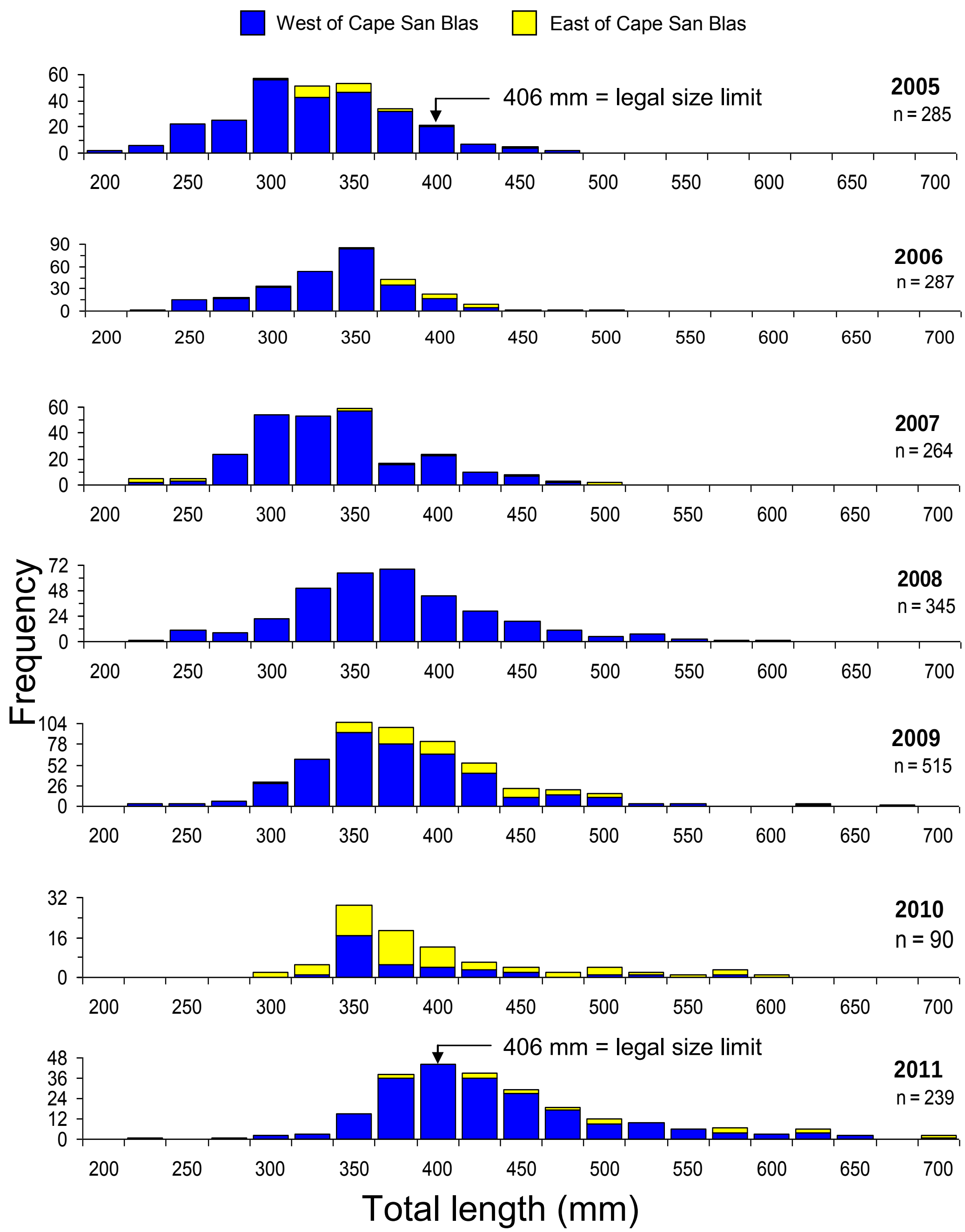



Figure 5.3.6.7. Annual size structure of trap-caught red snapper east and west of Cape San Blas, 2005-2011, in the NMFS Panama City reef fish survey.

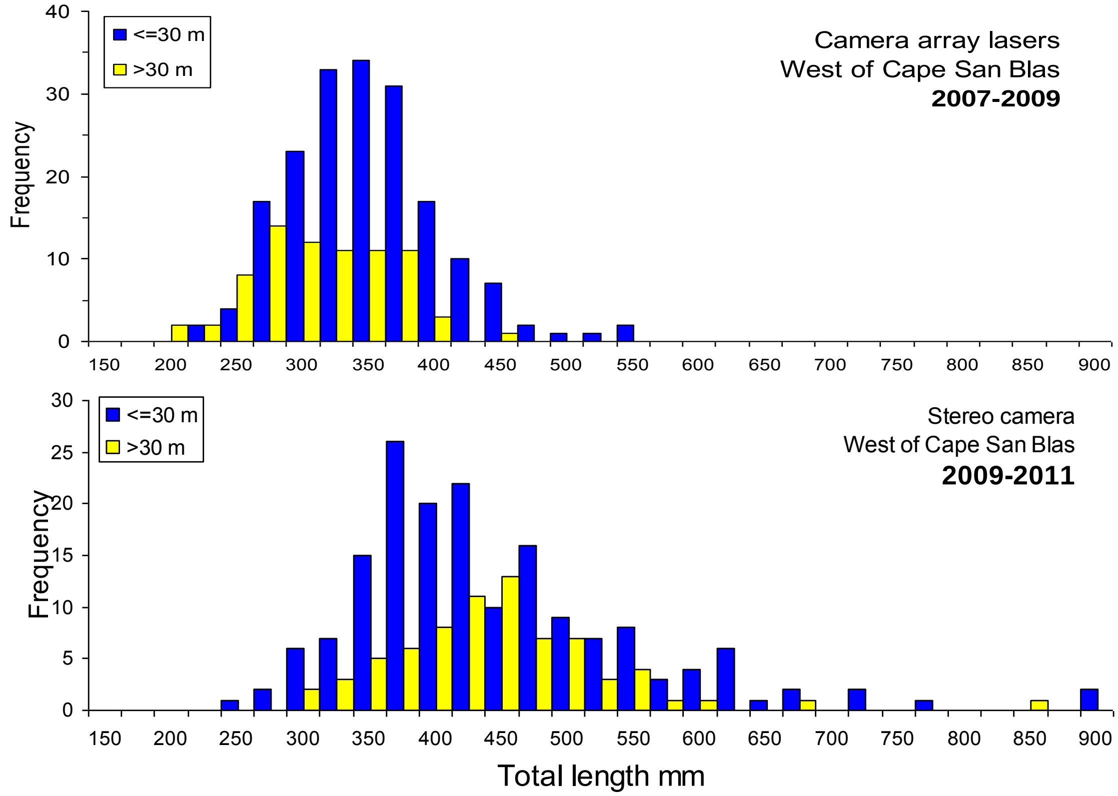



Figure 5.3.6.8. Size structure of red snapper by depth zone (<=30m and >30m) observed west of Cape San Blas based on scaling lasers, 2007-2009, and from stereo camera images, 2009-2011. NMFS Panama City reef fish survey.

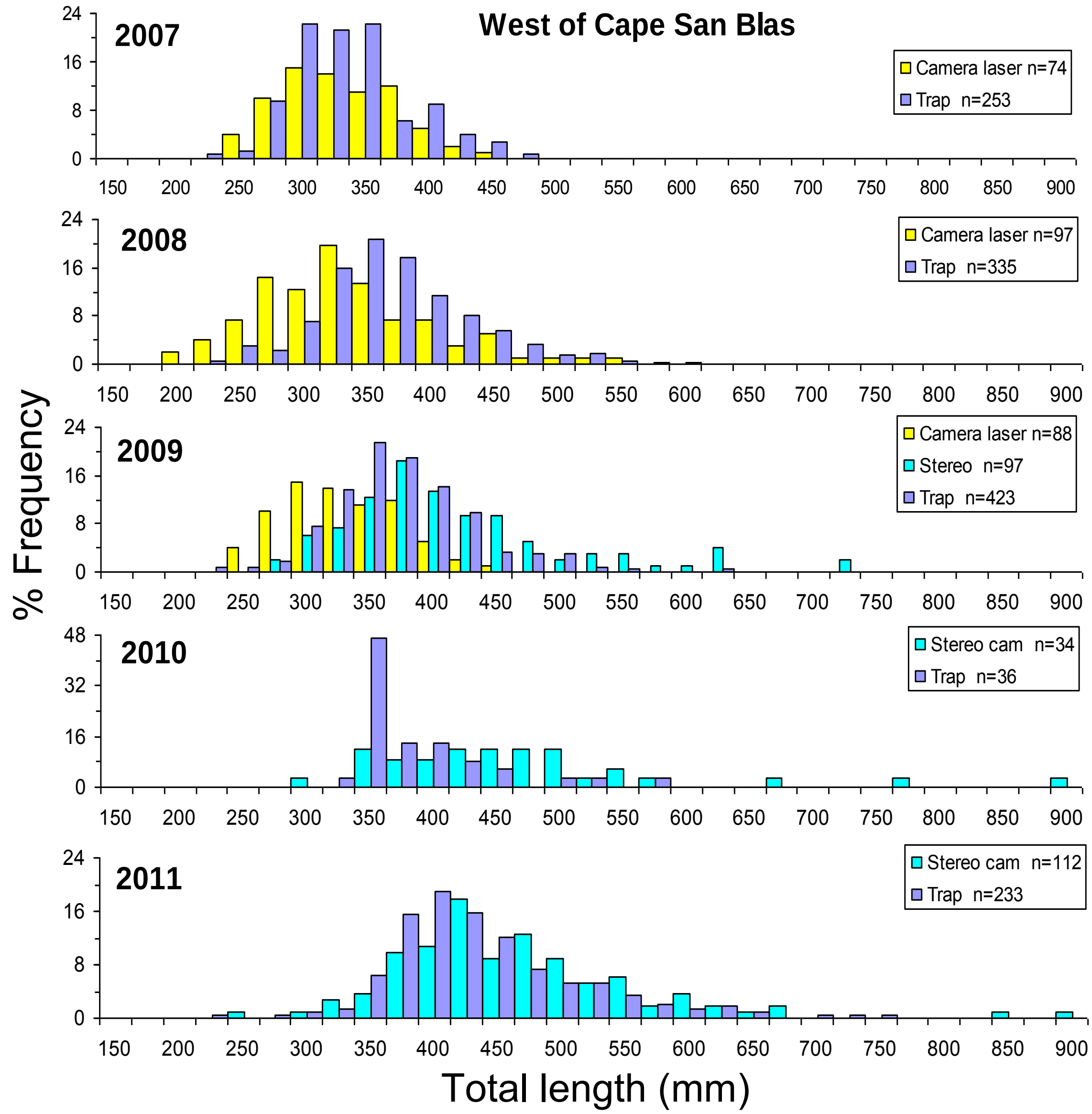



Figure 5.3.6.9. Annual size distributions of red snapper west of Cape San Blas, 2007-2011 collected in chevron traps or measured in high definition video or stereo still images. NMFS Panama City reef fish survey.

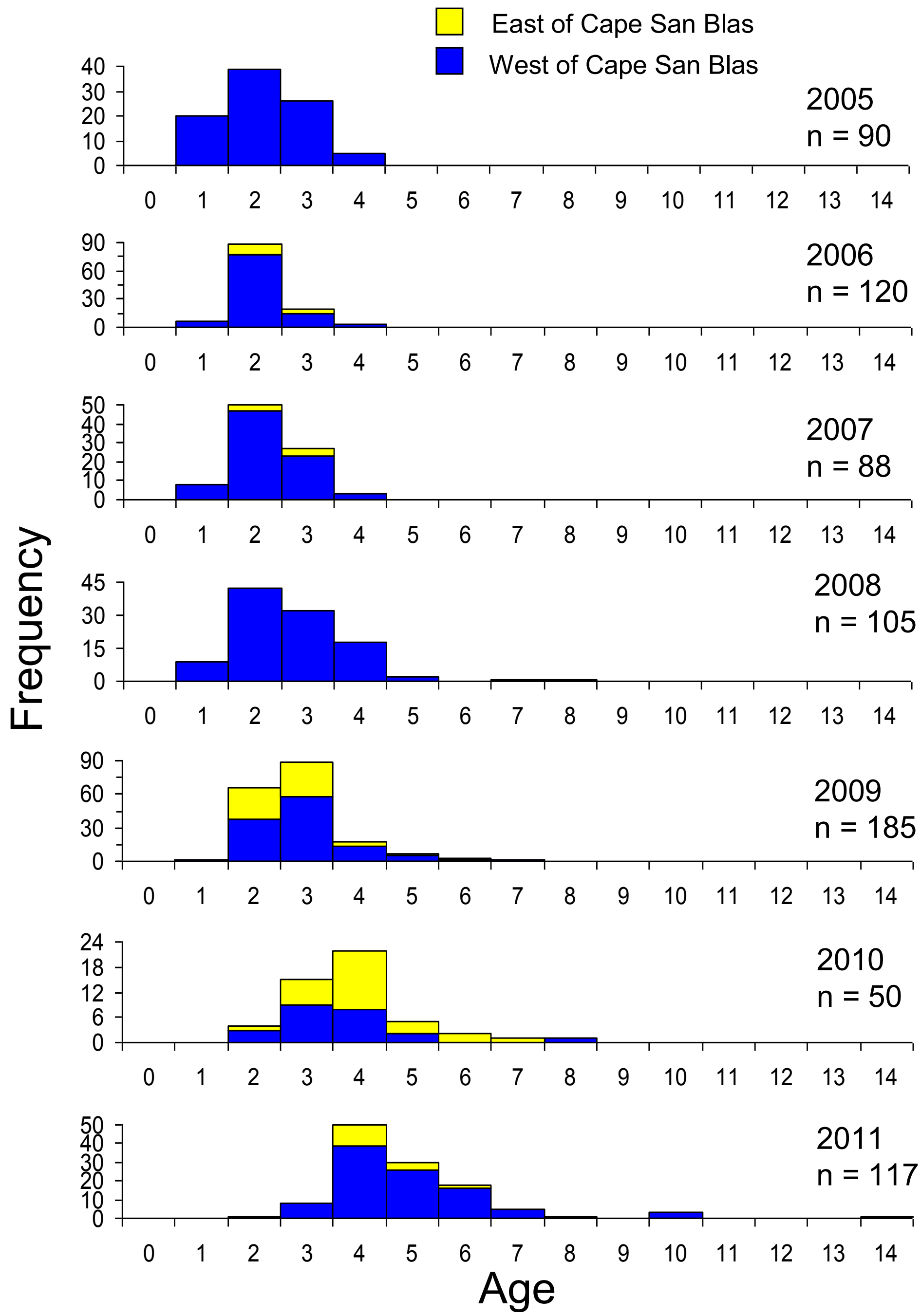



Figure 5.3.6.10. Annual age structure of trap-caught red snapper, 2005-2011, east and west of Cape San Blas. NMFS Panama City reef fish survey.

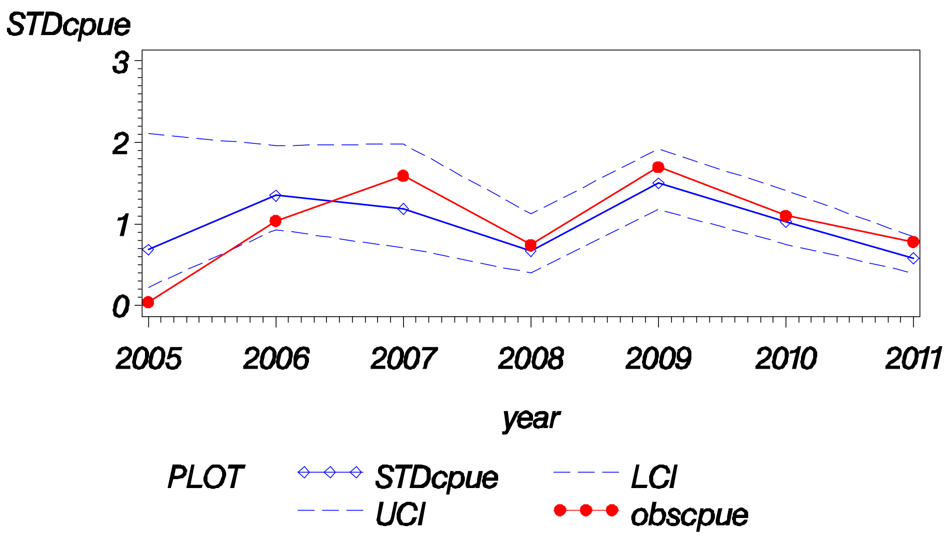



Figure 5.3.6.11. NMFS Panama City Video abundance indices for red snapper. STDcpue is the index scaled to a mean of one over the time series. Obscpue is the average nominal CPUE, and LCI and UCI are 95% confidence limits.

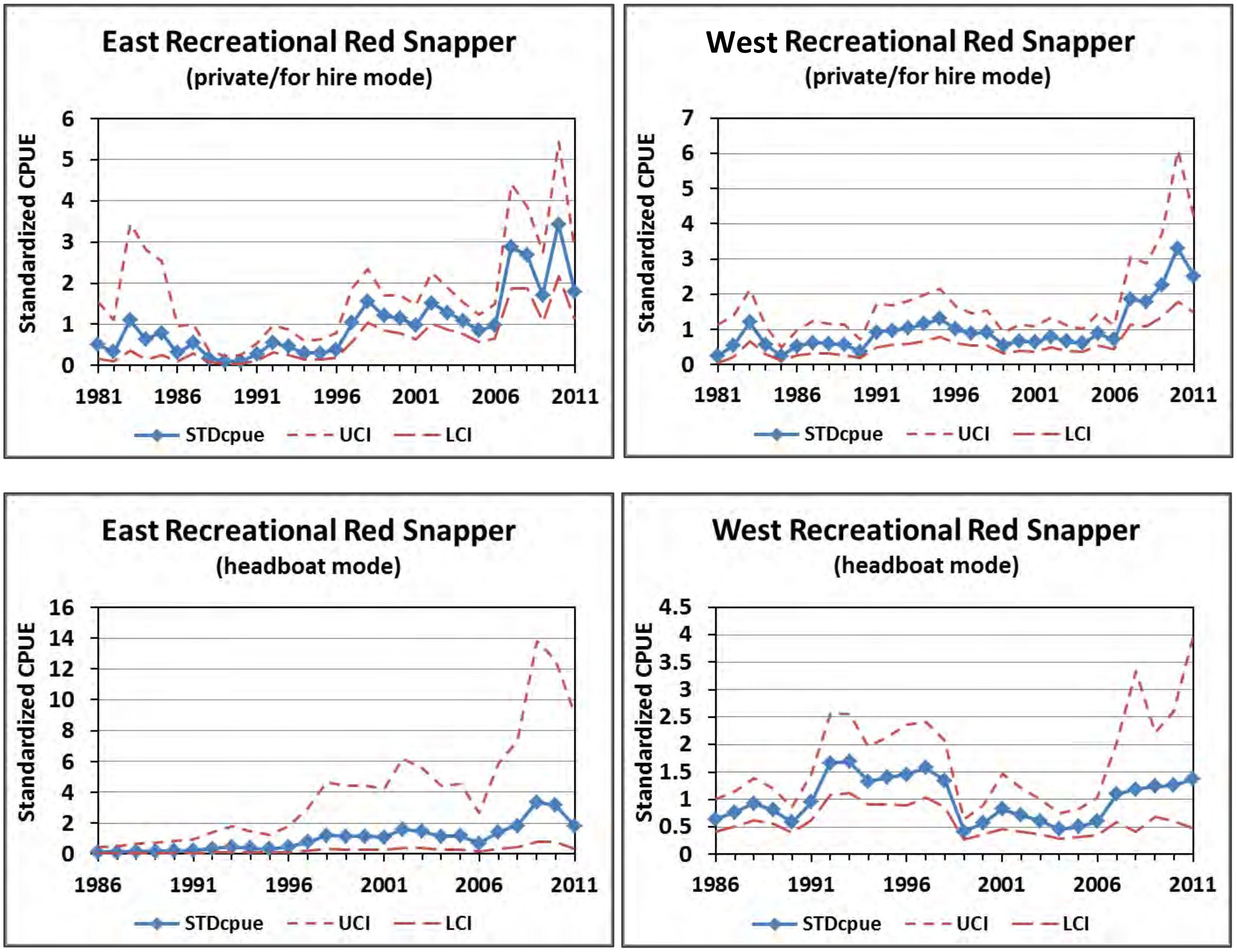



Figure 5.4.1.1. Censored standardized recreational indices of abundance for red snapper from the private/for hire and headboat mode for the east and west GOM.

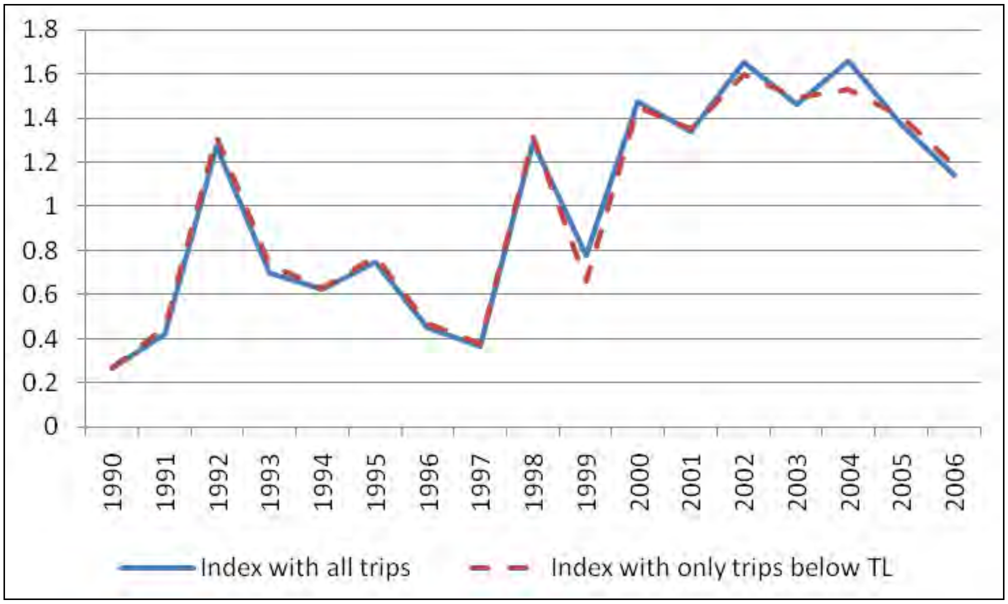



Figure 5.4.2.1. Eastern Gulf of Mexico vertical line index constructed with and without trips meeting or exceeding trip limits.

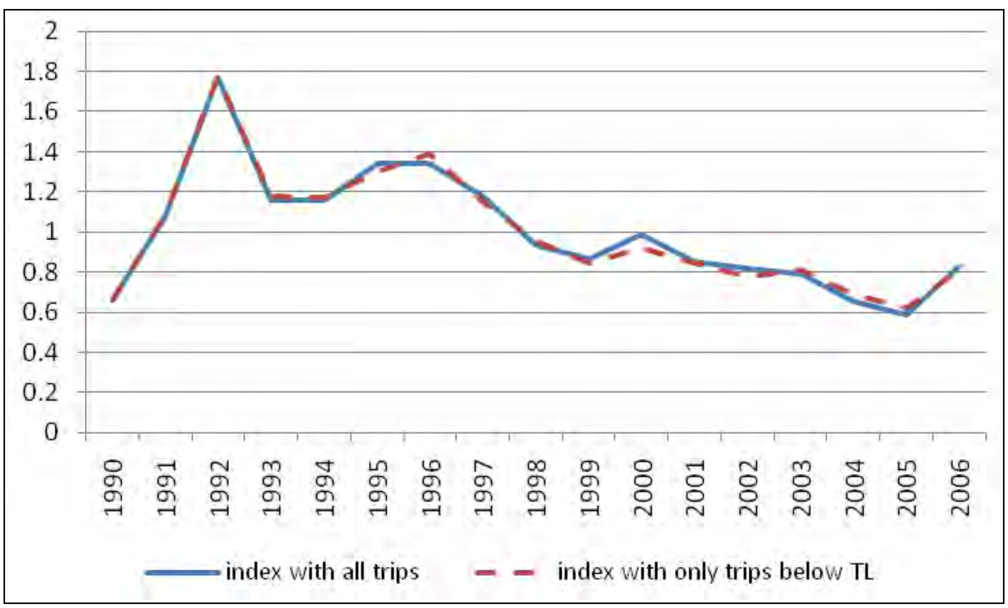



Figure 5.4.2.2. Western Gulf of Mexico vertical line index constructed with and without trips meeting or exceeding trip limits.

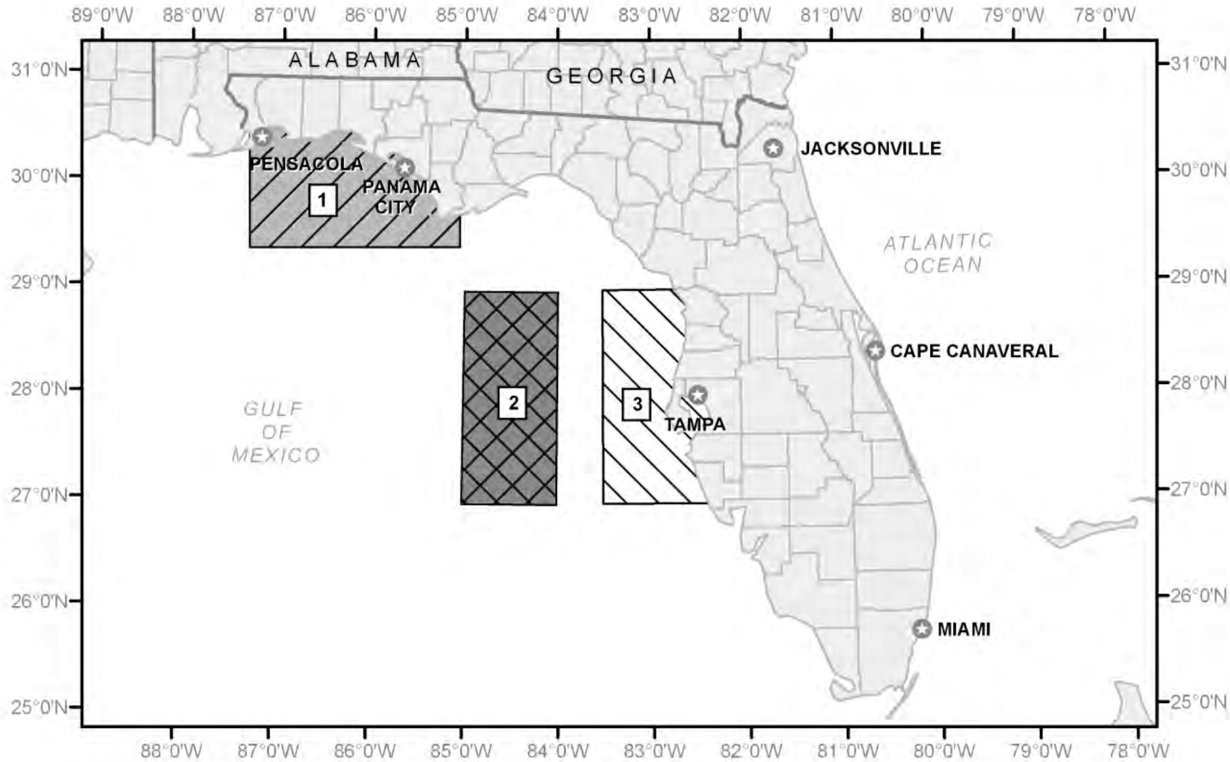



Figure 5.4.3.1. Study areas for Florida headboat observer program in the Gulf of Mexico. Box 1 represents the area where half-day and full-day trips originating from the northwestern panhandle region (NW FL) took place, Box 2 represents the area where multi-day trips originating from the central west region adjacent to Tampa Bay (TB) took place, and Box 3 represents the area where half-day and full-day trips originating from the TB region took place.

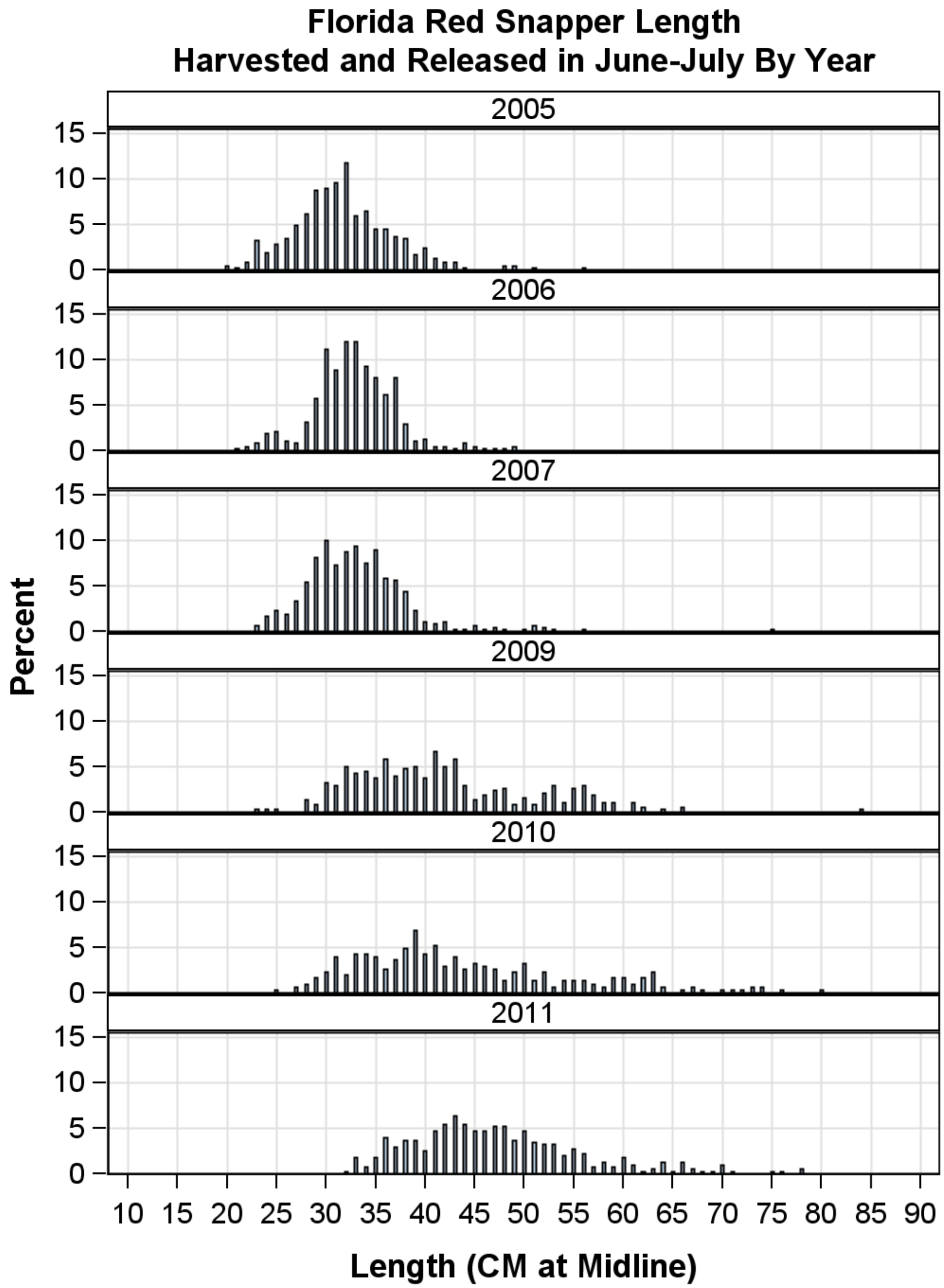
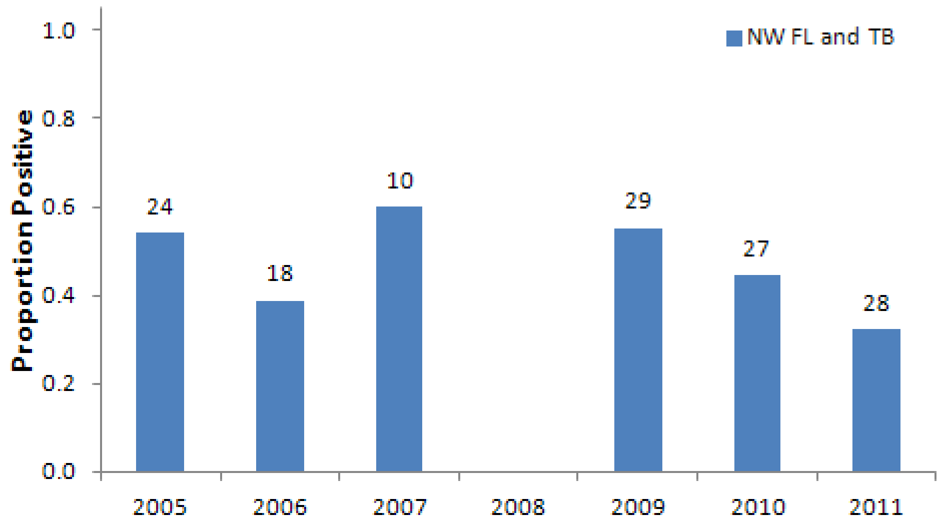



Figure 5.4.3.2. Length frequencies (cm total length) of all red snapper (harvested and released) observed on Florida head boats during the months of June and July. Length bins for 40cm and less are sublegal size classes.

**a.) Regions combined.**




**b.) By region.**

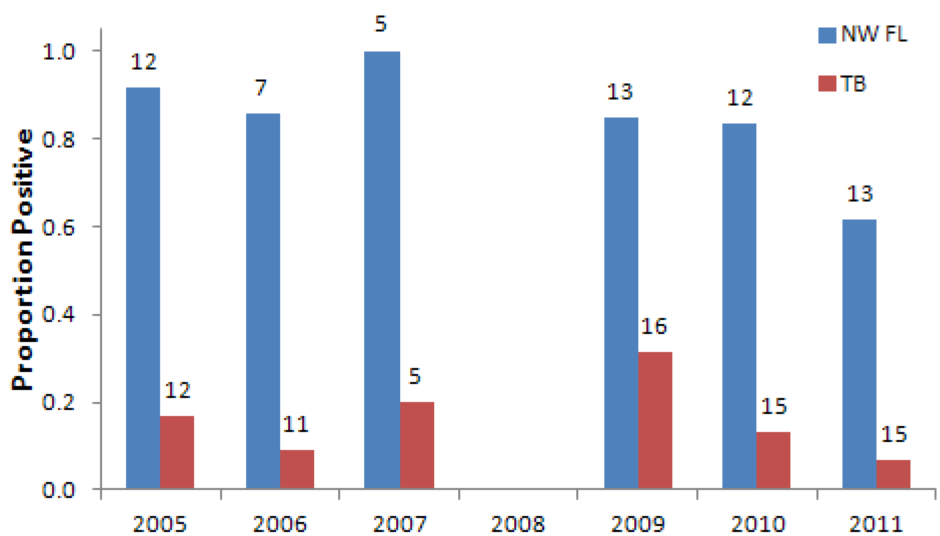
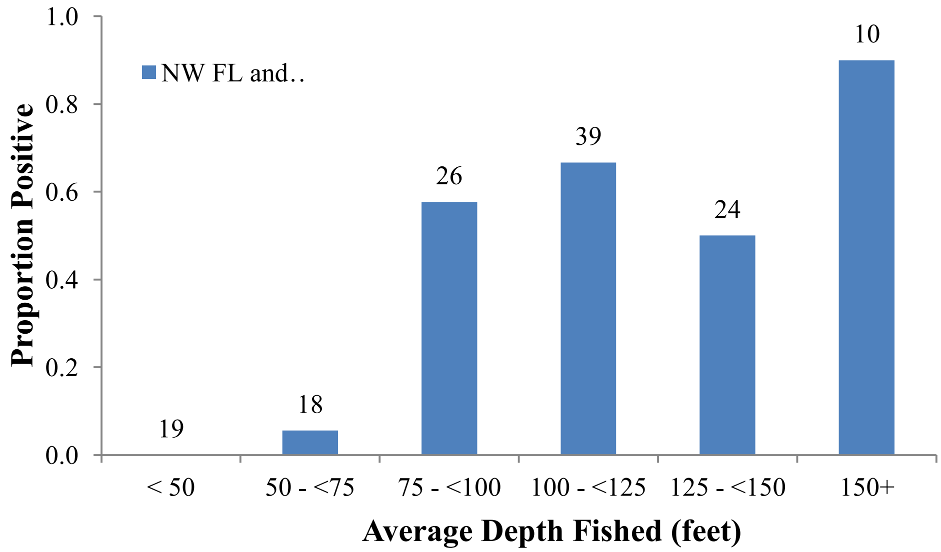



Figure 5.4.3.3. Proportion of trips with releases of undersized red snapper. a.) For the combined regions; and b.) For each region. Sample sizes are shown above the columns.

a.) **Regions combined.**




b.) **By region.**

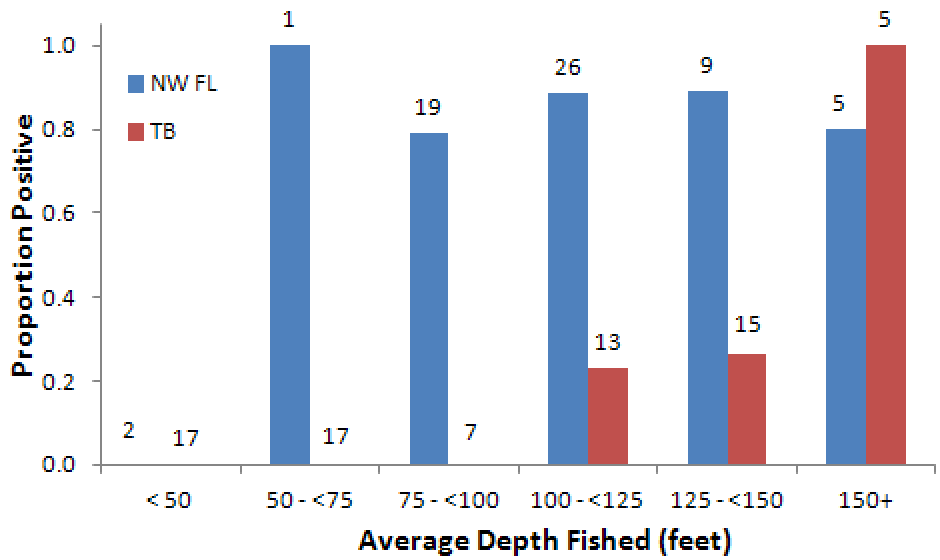
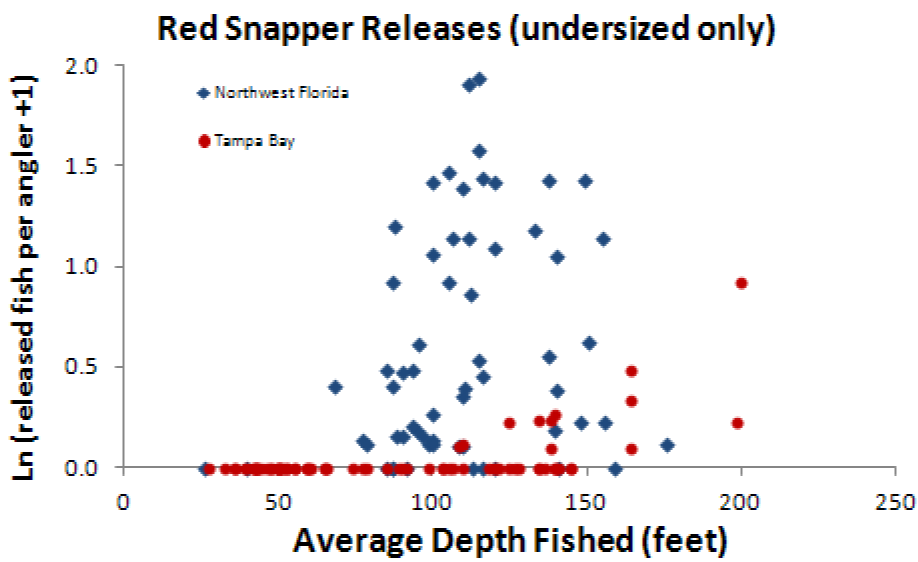



Figure 5.4.3.4. Proportion of trips with releases of undersized red snapper a.) for the combined regions by average water depth; and b.) in each region by average water depth. Sample sizes are shown above the columns.

**a.) Released fish rates by region**




**b.) NW Florida release rates by year, with trend lines**

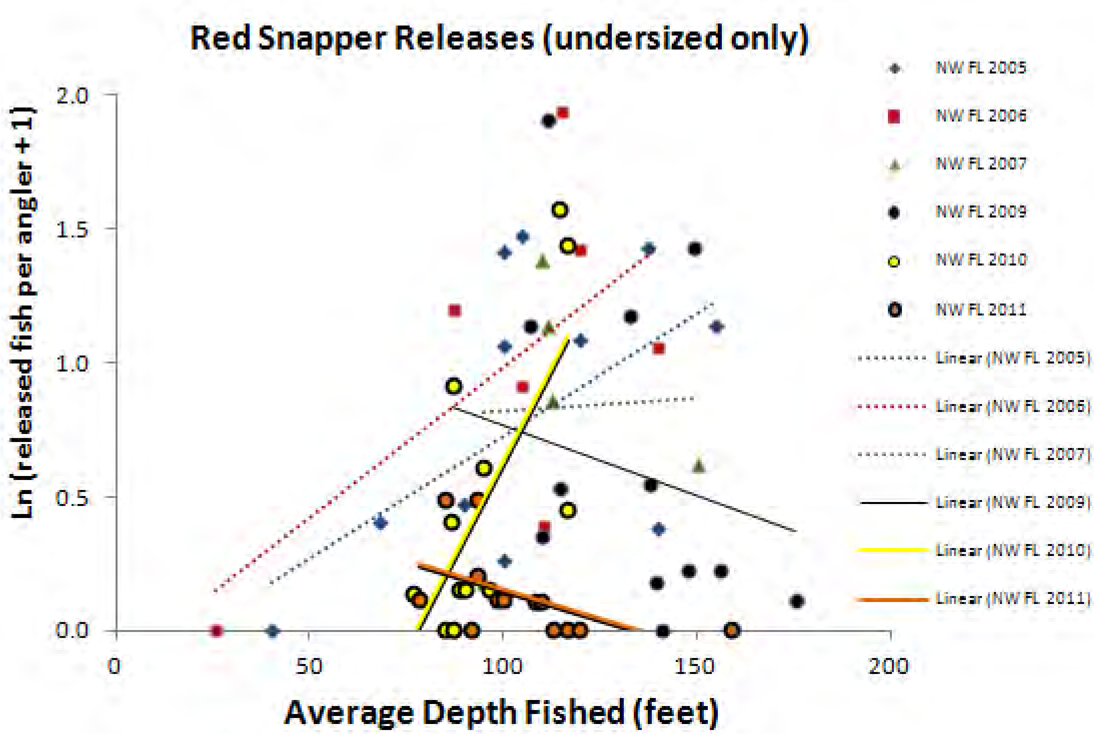



Figure 5.4.3.5. Release rates per angler-trip by average depth fished (in feet) . a.) By region; b.) for the northwest Florida region only, with linear trend lines by year.

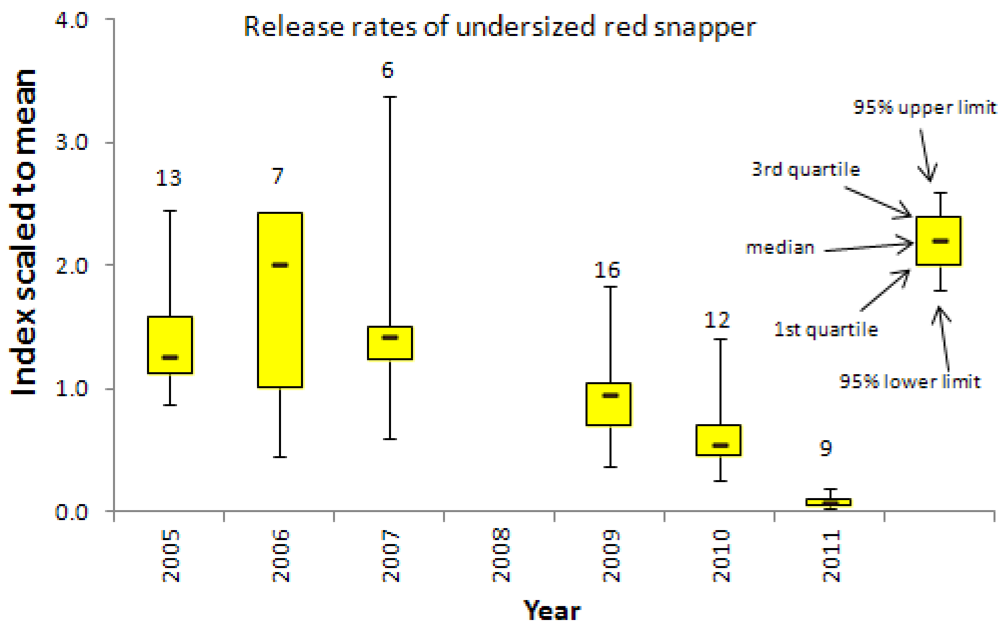



Figure 5.4.3.6. Scaled index for the combined binomial and gamma sub-models for Florida at-sea sampled undersized red snapper releases from head boats in NW FL and TB, 2005-2011. Sample sizes for the positives (gamma sub-model) are shown above the index values. The median values are indicated by the horizontal bars in the shaded boxes representing the 1st and 3rd quartiles. The whiskers extending above and below the boxes are the 95% upper and lower confidence limits, respectively.

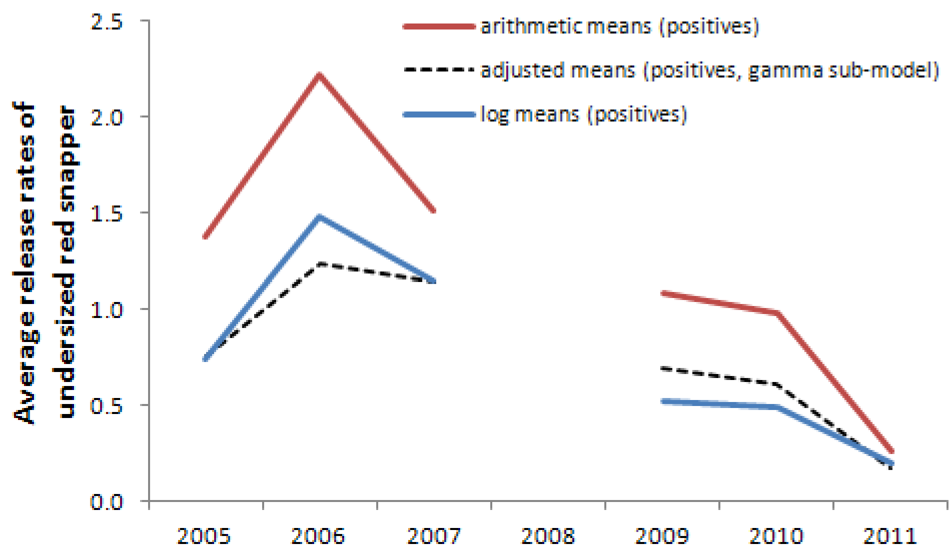



Figure 5.4.3.7. Unscaled arithmetic (positives), log-transformed (positives), and adjusted (gamma sub-model only) means for the combined regions.

# 6 Ad-Hoc Discard Mortality Rate Working Group

## 6.1 Group Membership

| | |
|---|---|
| Matthew Campbell (Leader) | NMFS |
| Beverly Sauls | FL FWC |
| William Driggers | NMFS |
| Barbara Dorf | TPWD |

## 6.2 Background

Red snapper have been utilized as a fishery resource in the Gulf of Mexico (GOM) for over a century and are considered to be one of the most economically important fisheries in the region (Strelcheck and Hood 2007). The first regulations managing the fishery were put in place in 1984 in response to the overfished status of the stock (see Hood et al. 2007 and GMFMC 2012 for a comprehensive management history). In general, both commercial and recreational regulations have focused on reducing total catch by implementing annual time closures, which in turn generates regulatory discards in the off season. Additionally, resource managers implemented minimum size regulations that increased the number regulatory discards. In both cases the fact that regulatory discards are a byproduct necessitates tracking the rate at which fish are discarded, as well as eventual fate following release.

The intent behind catch-and-release (CAR) regulations is to reduce fishing mortality for immature age groups of fish, allow those age groups to grow and mature to reproductive ages, and help preserve age structure in a population. Despite the intent of CAR fishing regulations, for many species stress of capture leads to increased frequency of barotraumas and reduced reflex responses, the synergistic effects of which often results in increased release mortality and renders those regulations ineffective (Davis 2007, Campbell et al. 2010a). Stressors experienced by fishes during CAR fishing can include hook trauma, physical overexertion, barotrauma, rapid thermal change, air exposure, and physical handling (Davis et al. 2001, Rummer and Bennett 2005, Nieland 2007, Jarvis and Lowe 2008). These CAR fishing stressors can also translate into long-term, sub-lethal, negative consequences for individuals and potentially for populations, such as reduced growth and fecundity (Woodley and Peterson 2003, Ryer et al. 2004, Davis 2007). The effects of CAR fishing can be particularly problematic for marine species such as red snapper (*Lutjanus campechanus*) that inhabit relatively deep water and possess a physoclistous gas bladder.

Reported percent discard mortality in the red snapper fishery ranges from 0 to 100% (SEDAR7 2005, Campbell et al. 2012) depending on fishery sector (e.g. recreational and commercial), gear types deployed, capture depth, water temperature, exposure to thermoclines, handling time, and air exposure (Table 6.1, Figure 6.1). Due to the wide range in reported mortality rates and the convoluted nature of interacting factors, a comprehensive evaluation of pertinent research is needed. The focus of the report is to review the status of our knowledge regarding discard mortality in the red snapper fishery with the intent of identifying critical unresolved issues.

The bulk of the currently available research has been focused on the recreational sector which most of this report will reference. Recently, discard observers have been placed on board commercial vessels in part to estimate release mortality for that sector, and to which a section of this report is dedicated.

## 6.3 Methods of Estimation

### *6.3.1 Surface Observations*

The most common mortality estimation method is surface observation of release activity. Estimates derived using this method are among the most conservative, show high variation among surveys, and report considerable regional differences (Table 6.1, Figures 6.1, 6.2 and 6.3). Surface observation experiments have used two categorization systems. Type-1 surface observation methods classify release activity into four categories: (1) swam down, (2) erratic swimming at the surface with eventual submersion, (3) erratic swimming at the surface without submersion, and (4) floating (Patterson 2001). Type-2 surface release observation methods use slightly different categories: (1) swam down, (2) erratic swimming, (3) floating, and (4) dead (Dorf 2003, Campbell 2010a). While these two systems track erratic swimmers slightly differently, both of these methods consider erratic swimming fish to be mortalities regardless if the erratic swimming fish submerged. The main difference between these two particular studies is that the Patterson (2001) study vented 100% of the fish, while Dorf (2003) the deckhands handling the fish vented only 40% of the fish.

High variation reported among surface observation surveys could be attributable to season, depth, region, or venting practices (Table 6.1, Figures 6.1, 6.2 and 6.3). Dorf (2003) reported the highest release mortality estimates among surface observation studies however data was collected exclusively during the summer on fishery dependent surveys, station depth ranged from 10-95 m, and only 37.2% of the fish were vented. Patterson et al. (2001) reported lower estimates from data collected quarterly on scientific research cruises, station depth ranged from 21 – 30 m, and 100% of the fish were vented. The pattern of higher estimates reported from western GOM data appear to be related to venting methodology or rate rather than true regional differences in red snapper stocks (Figures 6.1 and 6.2). The Dorf (2003) study might better reflect the reality at that time in the fishery as it measures compliance to venting as a practice, conversely a scientific study that carefully vents 100% of the fish might not reflect what is actually happening day to day in the fishery. Currently there is no information regarding the frequency of venting either in the recreational or commercial red snapper fishery, and secondarily we have no idea of how that may have changed over time and across regions.

Surface observations are useful due to low operational costs, minimal equipment requirements, and the ease with which large sample sizes can be generated. Limitations of the method center on its observational nature. For instance, unsuccessful submergence is only a proxy of mortality, release behavior is subjective, observations are immediate (<1 minute), and subsurface observations are rare. Surface observations also ignore issues associated with CAR fishing such as hooking injuries, thermal stress, and barotrauma that could result in mortality over hours to days (Campbell et al. 2010a). In spite of the stated limitations, surface release activity data should always be collected during surveys. If the method is used to formulate release mortality estimates then clarification is needed in regards to classifying erratically swimming fish, and tag-and-recapture methods should be utilized to evaluate misclassification rates from each unique release activity group.

### *6.3.2 Cage studies*

Cage studies were the first to address delayed mortality, and where comparisons are possible, generally result in higher release mortality estimates within a given depth group (Table 6.1). Like surface observations, this group of studies tends to show a lot of variability about the associated mortality estimates, most of which appears to be related to study specific issues. It should be noted that all of the aforementioned cage studies were performed in Texas and/or Louisiana with cages suspended from oil production platforms, therefore regional differences (east versus west) cannot be discerned and effects of day to day activities on oil platforms may be of concern (e.g. release of drilling muds or petro-chemicals near captive fish).

The first cage study was performed by Parker (1985), unfortunately this frequently cited paper was an internal report that the authors have been unable to obtain, and the two estimates were derived from samples of 14 and 44 fish (Table 6.1). Render and Wilson (1994) reported 20% release mortality from their cage, which is the second highest mortality reported from the < 20 m depth group, and from which the only higher estimate was Dorf (2003) who used the least conservative surface release methodology (type-2). Diamond and Campbell (2009) generated mortality estimates from a cage study that in their associated depth groups, and among all studies combined, are among the highest reported (Table 6.1, Figure 6.1). The Diamond and Campbell (2009) study was confounded by three important factors including high surface water temperatures during summer sampling (~ 32.2 - 33.3 C), fish were placed in cages at the surface for extended periods before descent (waiting for scuba diving intervals to expire), and fish included in the experiment had blood drawn from them which could have influenced mortality rates. While cage studies show high mortality estimates, sample size and methodology appear to cloud the overall picture coming from these sources.

The primary advantage of a cage study is the ability to track survival over extended periods, which gives insight into the long term effects of CAR trauma that the immediate observational estimates cannot produce. Cage studies are biased because they exclude predatory interactions, prevent foraging, can cause additional injury (e.g. abrasions), and disrupt normal behaviors, all of which interact in unknown ways relative to the fate of the released fish. Cage studies are useful in shedding light on the delayed mortality question, but they do not replicate post-release conditions occurring in the fishery about which mortality estimates need to be most reflective.

### *6.3.3 Hyperbaric Chamber Simulations*

Hyperbaric chambers have been used to simulate the effect of depth and temperature to evaluate CAR fishing stress and estimate mortality associated with those stressors (Rummer and Bennett 2005, Burns et al. 2004, Campbell et al. 2010b). Rummer and Bennett (2005) euthanized all fish following barotrauma simulation so that necropsies could be performed and therefore report no mortality estimate. Campbell et al. (2010b) reported no mortality but had two issues that likely influenced this result, including short acclimation periods in chambers and simulation water temperatures reflected winter/spring conditions. Burns et al. (2004) report mortality estimates, but do not report sample sizes, nor do they report simulation water temperatures. Both Burns et al. (2004) and Campbell et al. (2010b) treated fish for ectoparasites, culled sick fish from the experiments, frequently report no mortalities, and during summer months fish experienced high mortalities during collection and therefore summer collecting was discontinued. Unnatural conditions experienced by fish during chamber experiments, culling of unhealthy fish, and extremely low reported mortalities likely preclude the use of resultant estimates in evaluating release mortality rates of red snapper.

#### *6.3.4 Passive and acoustic tagging*

The primary advantage of both acoustic and passive tag-and-recapture studies is that they can produce both immediate and delayed mortality estimates. Recaptured fish can also be used to evaluate the accuracy of surface activity proxies of mortality used in surface observation studies. Tag and recapture studies are also beneficial because they collect additional data on movement, growth, behavior and habitat preferences.

Diamond et al. (2011) utilized acoustic tagging methodology and estimated some of the highest release mortality estimates reported (winter - 40%, and summer - 79%). Furthermore, Diamond reported a strong seasonal component, in which there was low survival in summer and higher survival in winter. However, this study derived mortality estimates from a low sample size (~ 40 total fish), and required surgery to implant tags which could have biased the results. Acoustic tagging requires that the researcher tracks fish using a hydrophone, or that hydrophones are set up in a pre-defined area to evaluate fish activity. Similar to issues with surface observation methods, eventual fate of a subject cannot be assumed once a fish has moved beyond detection, and this particular nuance is especially problematic at low sample sizes.

Passive tagging studies that are dependent upon participants in commercial and recreational fisheries for recapture reports are sensitive to the spatial and temporal distributions of effort in a fishery, and such effects must be accounted for in models that estimate mortality. Passive tagging surveys also have larger initial sample sizes than acoustic tag studies, but frequently suffer from low recapture rates. Three passive tagging studies were available for examination, and all were conducted in the eastern Gulf of Mexico. Patterson et al. (2001) and Patterson and Addis (unpublished data) derived mortality estimates from surface release observations which were covered in an earlier section. The third study estimated the proportion of tagged fish that suffered mortality after initial capture and release through the use of a composite score to compare recapture rates between groups of red snapper released under optimum conditions, versus red snapper exposed to one or more impairments. Methods for this study are detailed in a working paper submitted for this data workshop (Sauls 2012). Estimates of release mortality from these three studies ranged from 10% to 30%, and increased with increasing depth and temperature. In the future, it might be useful to combine data from multiple studies and reassess older tagging information when an acceptable model is developed.

## 6.4 Depth Effect

Regardless of study methodology or region, a consistent trend among mortality data is a positive correlation between depth and mortality (Table 6.1, Figure 6.1). The eastern GOM estimates showed a linear response from 20 to 40 m (Figure 6.2), and the western GOM estimates showed a steeper linear increase and estimate higher mortality through 40 m after which the response asymptotes (Figure 6.3). The linear relationship that is evident in both the eastern and western GOM from 20 to 40 m indicates the effect of capture depth on released fish appears to function similarly regardless of region. Furthermore the deep water (> 40 m) estimates from the western GOM data are strongly influenced by the less conservative type-2 surface observation methodology in which only 40% of fish were vented, as well as several studies that used methods that might artificially inflate mortality rates.
Extreme estimates in the western GOM come from a cage study and an acoustic tagging study (Diamond and Campbell 2009, Diamond et al. 2011). Diamond and Campbell (2009) report a significant depth effect but had compounding issues associated with the effects of high surface water temperatures and extreme handling situations as discussed earlier. The Diamond et al. (2011) acoustic tagging study showed high mortality rates from deep water, but reported difficulty in having enough fish survive in the summer to conduct the experiment and derived mortality estimates from a small sample size (n ~ 40). If these two experiments are treated as outliers, the functional form appears to strengthen because there is variation about estimates from those particular depths (i.e. the relationship tightens). High surface release estimates from deep water arise from the Dorf study of headboat discards, and as has been pointed out, only 40% of those fish were vented. Extreme estimates in the eastern GOM at 45 and 65 m are associated with the Burns et al. (2004) hyperbaric study, of which there is no published information about the simulated water temperatures during the experiment or sample sizes used to calculate the estimates. It should be noted that these are the only two mortality estimates for fish captured in relatively deep water (>40 m) from the eastern GOM.

The relationship between depth and mortality is most likely associated with injuries sustained during decompression, including gas bladder overexpansion/rupture, esophageal eversion, cloacal prolapse, exophthalmia, and gas infusion into vital organs (Rummer and Bennett 2005, Hannah 2008). Barotrauma injuries do not necessarily result in death, particularly as measured by surface release observation (immediate); however, data from studies estimating delayed mortality would suggest the opposite (Diamond and Campbell 2009, Diamond et al. 2011). In lieu of finding ways to reduce release frequency in the fishery several techniques have been explored to potentially reduce the negative impacts of capture so that release survival improves, including venting and bottom release devices.

## 6.5 Thermal stress

Mortality shows a strong relationship to season with lowest estimates from winter, intermediate in fall and spring, and highest in summer (Table 6.1, Figure 6.4 and 6.5). There appears to be a strong regional effect with western GOM estimates approximately double the estimates from the east in an equivalent season; however, these regional components are in part due to the differences between type-1 and type-2 surface release observation methods. If season is a proxy for water temperature, the data then suggest a positive linear relationship between water temperature and mortality, particularly from eastern GOM estimates. Western GOM estimates show a similar decrease in mortality from summer to fall, but unfortunately there is a paucity of data collected during the spring and winter. As such, there may be a linear relationship, but currently there is not enough data collected on a quarterly basis (i.e. encompassing all seasons).

Sub-lethal types of responses show similar relationships with water temperature. Impairment in red snapper, as measured by an index score of barotrauma and reflex responses, increased with increasing water temperature (Diamond and Campbell 2009, Campbell et al. 2010a, Campbell et al. 2010b). Furthermore, impairment in at least two of those studies was linked to increased immediate release mortality as measured by release activity proxies of mortality (type-1 surface observation methods). Additionally, tagging data has shown lowest returns from fish tagged during summer and highest from fish tagged during the winter (Sauls 2012, Diamond et al. 2011). Finally, two separate hyperbaric chamber experiments reported inability to keep fish alive that were collected during the summer and had to postpone trips later in the year for cooler weather (Burns 2004, Campbell 2010a). Most investigations have well-defined depth treatments but have vaguely defined seasonal classifications, while some report months, and only one reported specific water temperatures and thermocline strength. The amount of attention paid to thermal stress is disappointing given that season appears to be a strong indicator of eventual fate, temperature is easily measured in the field, and temperature is easily controlled in a laboratory.

## 6.6 Hook Type Effects

As catch-and-release studies have become available, new management focus has been placed on gear requirements intended to minimize release mortality. The realized benefits of such gear requirements are also dependent on the methods of execution and the degree of compliance within the fishery (Sauls and Ayala 2012). In 2008, the GMFMC adopted the preferred management alternative in Amendment 27 to the Reef Fish Fishery Management Plan, which required recreational anglers fishing in federal waters to use non–stainless steel circle hooks when catching reef fishes with natural bait (50 CFR 622.41). A circle hook was defined by regulation as "a fishing hook designed and manufactured so that the point is turned perpendicularly back to the shank to form a generally circular, or oval, shape." A minimum hook size to potentially reduce by-catch of undersized red snapper was also considered as an alternative management option but was not adopted. Florida matched federal regulations for state territorial seas in the Gulf of Mexico, with the added specification that a circle hook must have 0° of offset (Florida Administrative Code §68B-14.005). Louisiana matched federal regulations in state waters, Texas requires circle hooks when fishing for red snapper with recreational gear, and Alabama and Mississippi do not require circle hooks in state waters (Wilson and Diaz, 2012).

At the time when regulations were being considered in the Gulf of Mexico, studies to evaluate the potential benefits of circle hook use for reef fishes were limited, but was supported by a comprehensive meta-analysis, which reviewed 43 studies for 25 species (including freshwater and non-reef fish marine species) and concluded that mortality rates were reduced by approximately 50% overall when circle hooks are used compared with J hooks (Cooke and Suski

2004). Circle hooks had a greater tendency to set in the lip or jaw, resulting in fewer internal injuries for the majority of species studied. Two studies have been published since 2008 on the effectiveness of circle hooks specifically for reducing red snapper release mortalities. Sauls and Ayala (2012) observed red snapper caught with circle hooks and J hooks within the recreational fishery and reported a significant 63.5% reduction in potentially lethal hooking injuries for red snapper caught with circle hooks (6.3% potentially lethal injuries, versus 17.1% with J hooks). In contrast, Burns and Froeschke (2012) implied that survival of red snapper was reduced by circle hooks, citing significantly lower tag return rates for red snapper caught with circle hooks (8.1%) compared to J hooks (12.5%). However, the authors did not account for potential differences in tag reporting rates between study areas in the eastern Gulf of Mexico where the majority of fish tagged were originally captured with circle hooks, and the South Atlantic, where more fish were captured with J hooks. Tag reporting rates could potentially vary significantly between these two regions due to varied degrees of fishing effort and different regulations for harvest seasons, size limits and bag limits. Therefore, it is unclear whether the difference in tag return rates was due to varied probabilities for recapture among regions.

## 6.7 Venting and Bottom Release Devices

As of 2008, venting is required in the Gulf of Mexico red snapper fishery. Venting has been advocated as a conservation approach that may alleviate some of the negative consequences associated with barotrauma; however, a metadata analysis on the efficacy of venting in promoting survival suggests the effect is negligible (Wilde 2009). For red snapper studies specifically analyzed in Wilde (2009), there are mixed results one having shown positive effects of venting on survival (Gitschlag and Renaud 1994), two are neutral (Render and Wilson 1994, Render and Wilson 1994, and one negative (Burns 2004). Results of surface release observation studies show that venting clearly enhances submergence capability (Patterson 2001, Dorf 2003); however, those studies estimate immediate release mortality as a proxy about which the error in classification is largely unknown (i.e. many fish who submerge succumb to trauma after submergence). Given mixed results across a variety of experiment types, the committee recommends no changes in regards to venting regulations particularly in light of the fact that venting at least enhances the released fishes ability to submerge and return to protective habitat. More research on the topic is needed, with emphasis on the effects of capture depth, water temperature during the survey, and the interaction between those variables.

Recent efforts have focused less on venting and more on bottom-release devices, two of which have been experimentally tested. The concept of using bottom release devices is similar to venting in that the intent is to reverse the effects of swim bladder expansion, but instead of deflating the bladder by puncture it is deflated by recompression at depth. Diamond et al. (2011) tested a Shelton Fish Descender™ (SFD) which operates off of a standard reel, and is composed of a reverse barbless hook attached in line with a weight below the hook (details of the device can be found online). Tag returns in the experiment showed nearly identical frequency of recapture between surface-released fish (vented) and those released at depth using the SFD, suggesting that bottom release does not improve survival over conventional venting methods. Stunz and Curtis (2012) have been testing a Boga-Grip™ device that releases fish at a preset depth via a pressure sensitive clamp (details of the device can be found online). Results are showing that fish released using the Boga-Grip device are more likely to survive than those which were vented and released at the surface. At this point it is difficult to discern why these two experiments showed opposing trends, thus more experimentation is needed and no recommendation is given at this time in regards to bottom release devices.

### 6.8 Commercial Sector Release Mortality

A previous report on commercial vertical line (bandit gear) release mortality showed that mortality increased with increasing capture depth and reported 64% of those released fish died (Nieland et al. 2007). Commercial fishermen participating in the group discussion during SEDAR 31 expressed concern that these old rates were reflective of the derby style fishing that took place in the past and not necessarily reflective of the current fishery, which appears to be supported by recently gathered fishery observer data.

Gulf of Mexico commercial reef fish fishery observers reported discard survival data were used to model instantaneous (at the vessel) discard mortality on vertical line and bottom longline trips. Vertical line gear included handline and electric/hydraulic reel (bandit rig) gear. Mortality associated with commercial vertical line gear was modeled separately from discard mortality associated with bottom longline gear.

Fishery observer data have been collected from the Gulf of Mexico reef fish fishery since July, 2006. Data include fishing location, gear fished, depth of water, species caught, and the disposition (kept, discarded dead, discarded alive, kept for bait, unknown) of each fish. Only records with discarded fish of the 15 most frequently observed species, by gear and including red snapper, were retained in the analyses. The proportion of live discards was modeled using generalized linear models (GLM; GENMOD; Version 8.02 of the SAS System for Windows © 2000. SAS Institute Inc., Cary, NC, USA). For each GLM analysis, a type-3 model was fit, a binomial error distribution was assumed, and the logit-link was selected. The response variable was proportion of live discards. Factors in the model included species, region (Gulf of Mexico west of the Mississippi River; southeast Gulf = statistical areas 1-7; and northeast Gulf = statistical areas 8-12); and depth (modeled as a continuous variable).

Proportions of live discards from bottom longline vessels are provided in Figure 6.6. Approximately 71% of red snapper were reported as discarded alive. In the vertical line fishery, 77% of red snapper were reported as discarded alive (Figure 6.7). For both gears, survival of red snapper was intermediate across the range of instantaneous (at release) survival calculated for the 15 most frequently observed species.

During working group discussions there was some confusion about what is actually being measured: immediate mortality as the fish are pulled on to the vessel versus mortality once a fish is released. Commercial fishers from both the eastern and western Gulf of Mexico and from the vertical line and bottom longline fisheries were unanimous in their opinion that immediate survival estimates of red snapper as they come on to the vessel were too low. Discussion with reef fish observer program personnel revealed that discard survival had often not been determined until the fish had been measured, and in some cases the fish were kept in baskets for significant periods of time until they were measured. The working group was concerned that such delays in discarding fish may have resulted in additional mortality that might not otherwise have occurred during normal commercial fishing operations. In other words, the estimate developed from observer data should be made directly from observations about which fishing crew exclusively handled released fish and under normal commercial fishing operations. Furthermore the estimate needs to be reflective of survival upon release not on how many fish come aboard the vessel alive.

## 6.9 Developing a Functional Response

At the request of the assessment group, the release mortality group investigated methods to develop a functional response that would use a meta-data approach that incorporates all of these data sets. Regardless of study methodology or region, a consistent trend among mortality data is a positive correlation between depth and mortality (Table 6.1, Figure 6.1). To test this we performed a linear regression testing the effect of depth on mortality. When including all of the data points, there is a significant relationship ($p<0.001$); however, the fit was poor ($r^2 = 0.276$). Taking the log of depth then testing for a linear relationship showed significant slope and the fit was improved ($r^2 = 0.309$). Further analysis of the SAS fit diagnostics, such as leverage tests and Cook's D, identified outliers in the data. The outliers identified were associated with estimates associated with the Diamond and Campbell cage study (highest in depth group), the summer estimate from the Diamond acoustic study (highest in depth group), Burns hyperbaric chamber studies (0 mortality in 3 of 4 groups), and from estimates derived from winter sampling (lowest estimates in respective depth groups). These same studies were also identified in group discussion as having unusual responses relative to other studies, the issues of which are discussed in those sections. Removal of those outliers, followed by testing for a linear relationship between log transformed depth and mortality, resulted in a significant relationship ($F=36.21$, $p<0.001$), improved fit ($r^2 = 0.475$), and resulted in the following relationship $y = 28.789 * \ln(depth) - 79.654$ (Figures 6.8 and 6.9). Another approach to this process would be to weight each respective estimate from each study by sample size or by variance; unfortunately many of the studies don't report depth specific sample sizes for each estimate reported, so at the time of this report that approach could not be performed. Other suggested models include: 1) meta-analysis general linear mixed effects model, 2) generalized least squares model, and 3) full information maximum likelihood model. Those particular models are in the process of being implemented but were not ready in time for inclusion in the data workshop report.

## 6.10 Comments and Recommendations

*Recreational*

Regional differences identified in previous reports and in this report were shown to be more truly related to methodology rather than region (e.g. type-2 surface release methodology, Diamond and Campbell cage study). Low estimates from surface release mortality studies are often associated with studies that vented 100% of the fish, whereas the highest estimates are from studies that evaluated discards aboard headboats that inconsistently vented fish. Low estimates of release mortality from surface observation studies may or may not be representative of what actually took place in the fishery, and high estimates directly measured from the fishery in which venting was an inconsistent practice are likely more representative of reality. However, at this point there is no way to distinguish the rate at which vessels were venting, how that practice has changed through time, nor how best to apply that in the assessment model. In lieu of using separate point estimates for the east and west regions (as has been done in the past), it is recommended that the assessment uses the depth-mortality relationship developed in section 6.8 regardless of region and that produces confidence intervals about those depth specific estimates.

*Commercial*
The working group recommends that discard mortality should not be calculated using the commercial reef fish observer data. Due to the small number of studies pertaining to commercial fishing release mortality rates, it is advised that either historical rates are applied in the model or that the depth related release mortality model, developed from recreational data, is applied to the commercial fishery. Furthermore, changes in how the fishery has been prosecuted need to be accounted for.

*Circle hooks*
There is sufficient evidence in the literature, and in red snapper specific literature, that leads us to the conclusion that circle hooks significantly reduce the frequency of gut hooking and lead to improved survival at release.

*Venting and bottom release devices*
Literature gathered on the topic show mixed results relative to survival. More research is needed on the efficacy of venting, with emphasis on the effects of capture depth, water temperature during the survey, and the interaction between those variables. Secondarily, information about how often venting is used in the recreational fishery would be very beneficial. At this point there have been only two experiments involving bottom release devices, and they showed opposite trends. More experimentation is needed and no recommendation is given at this time in regards to bottom release devices.

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## 6.12 Tables

Table 6.1. List of studies conducted in the Gulf of Mexico reporting release mortality estimates by 5 meter depth groups.

| Depth range (m) | Season | Release Mortality | *N* | Method | Study | Region |
|---|---|---|---|---|---|---|
| < 20 | None* | 0.00 | - | Hyperbaric | Burns et al. (2004) MARFIN | Panama City, FL |
| 21-25 | None | 21.00 | 14 | Cage+SCUBA | Parker (1985, unpublished) | Daytona, FL |
| | Quarterly † | 20.00 | 282 | Cage | Render and Wilson (1994) | Louisiana |
| | Fall | 1.00 | 140 | Surf obs | Gitschlag and Renaud (1994) | Galveston, TX |
| | Quarterly † | 9.00 | 2932 | Surf obs | Patterson et al. (2001) | AL coast |
| | None* | 0.00 | - | Hyperbaric | Burns et al. (2004) MARFIN | Panama City, FL |
| | Summer | 41.00 | 3851 | Surf obs | Dorf (2003) | Texas ports |
| 26-30 | none | 11.00 | 44 | Cage+SCUBA | Parker (1985, unpublished) | Galveston, TX |
| | Fall | 10.00 | 31 | Surf obs | Gitschlag and Renaud (1994) | Galveston, TX |
| | Quarterly † | 14.00 | 2932 | Surf obs | Patterson et al. (2001) | AL coast |
| | None* | 0.00 | - | Hyperbaric | Burns et al. (2004) MARFIN | Panama City, FL |
| | Summer and fall † | 53.00 | 115 | Cage | Diamond and Campbell (2009) | Port Aransas, TX |
| | Summer | 47.00 | 3851 | Surf obs | Dorf (2003) | Texas ports |
| | Summer and fall † | 27.00 | 137 | Surf obs | Campbell et al. (2010a) | Corpus Christi, TX |
| | Winter | 3.00 | 138 | Surf obs | Patterson (personal comm.)φ | Pensacola, FL |
| | Spring | 6.40 | 31 | Surf obs | Patterson (personal comm.)φ | Pensacola, FL |
| | Summer | 7.00 | 52 | Surf obs | Patterson (personal comm.) φ | Pensacola, FL |
| | Fall | 12.00 | 221 | Surf obs | Patterson (personal comm.)φ | Pensacola, FL |
| 31-35 | Quarterly † | 18.00 | 2932 | Surf obs | Patterson et al. (2001) | AL Coast |
| | Summer | 15.00 | 3851 | Surf obs | Dorf (2003) | Texas ports |
| | Winter | 4.00 | 375 | Surf obs | Patterson (personal comm.) φ | Pensacola, FL |
| | Spring | 10.00 | 196 | Surf obs | Patterson (personal comm.) φ | Pensacola, FL |
| | Summer | 13.00 | 264 | Surf obs | Patterson (personal comm.) φ | Pensacola, FL |
| | Fall | 17.00 | 563 | Surf obs | Patterson (personal comm.) φ | Pensacola, FL |
| | | | | | | Page 1 of 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 36-40 | Fall | 44.00 | 61 | Surf obs | Gitschlag and Renaud (1994) | Galveston, TX |
| | Summer | 40.00 | 3851 | Surf obs | Dorf (2003) | Texas ports |
| | Winter | 5.00 | 65 | Surf obs | Patterson (personal comm.)[φ] | Pensacola, FL |
| | Spring | 16.00 | 107 | Surf obs | Patterson (personal comm.)[φ] | Pensacola, FL |
| | Summer | 16.00 | 44 | Surf obs | Patterson (personal comm.)[φ] | Pensacola, FL |
| | Fall | 20.00 | 60 | Surf obs | Patterson (personal comm.)[φ] | Pensacola, FL |
| 41-45 | None* | 40.00 | - | Hyperbaric | Burns et al. (2004) MARFIN | Panama City, FL |
| | Summer and fall † | 71.00 | 97 | Cage | Diamond and Campbell (2009) | Port Aransas, TX |
| | Summer | 63.00 | 3851 | Surf obs | Dorf (2003) | Texas ports |
| 46-50 | Fall | 36.00 | 55 | Cage | Gitschlag and Renaud (1994) | Galveston, TX |
| | Summer and fall † | 69.00 | 110 | Cage | Diamond and Campbell (2009) | Port Aransas, TX |
| | Summer | 61.00 | 3851 | Surf obs | Dorf (2003) | Texas ports |
| | Summer | 79.00 | 24 | Acoustic tags | Diamond et al. (2011) MARFIN | Corpus Christi, TX |
| | Winter | 40.00 | 20 | Acoustic tags | Diamond et al. (2011) MARFIN | Corpus Christi, TX |
| 51-55 | Summer | 58.00 | 3851 | Surf obs | Dorf (2003) | Texas ports |
| 56-60 | None* | 45.00 | - | Hyperbaric | Burns et al. (2004) MARFIN | Panama City, FL |
| | Summer | 38.00 | 3851 | Surf obs | Dorf (2003) | Texas ports |
| | Summer and fall † | 27.00 | 282 | Surf obs | Campbell et al. (2010a) | Corpus Christi, TX |
| 61-65 | Summer | 37.00 | 3851 | Surf obs | Dorf (2003) | Texas ports |
| 66-70 | Summer | 33.00 | 3851 | Surf obs | Dorf (2003) | Texas ports |
| 71-75 | Summer | 23.00 | 3851 | Surf obs | Dorf (2003) | Texas ports |
| 76-80 | Summer | 47.00 | 3851 | Surf obs | Dorf (2003) | Texas ports |
| >81 | Summer | 56.00 | 3851 | Surf obs | Dorf (2003) | Texas ports |

* No temperatures reported for experiment, however fish could only be collected during cold months

Page 2 of 2

† indicates an experiment that sampled in more than one season but only produces a single estimate

[φ] Estimate calculated from data published in Addis and Patterson (2007).

## 6.13 Figures

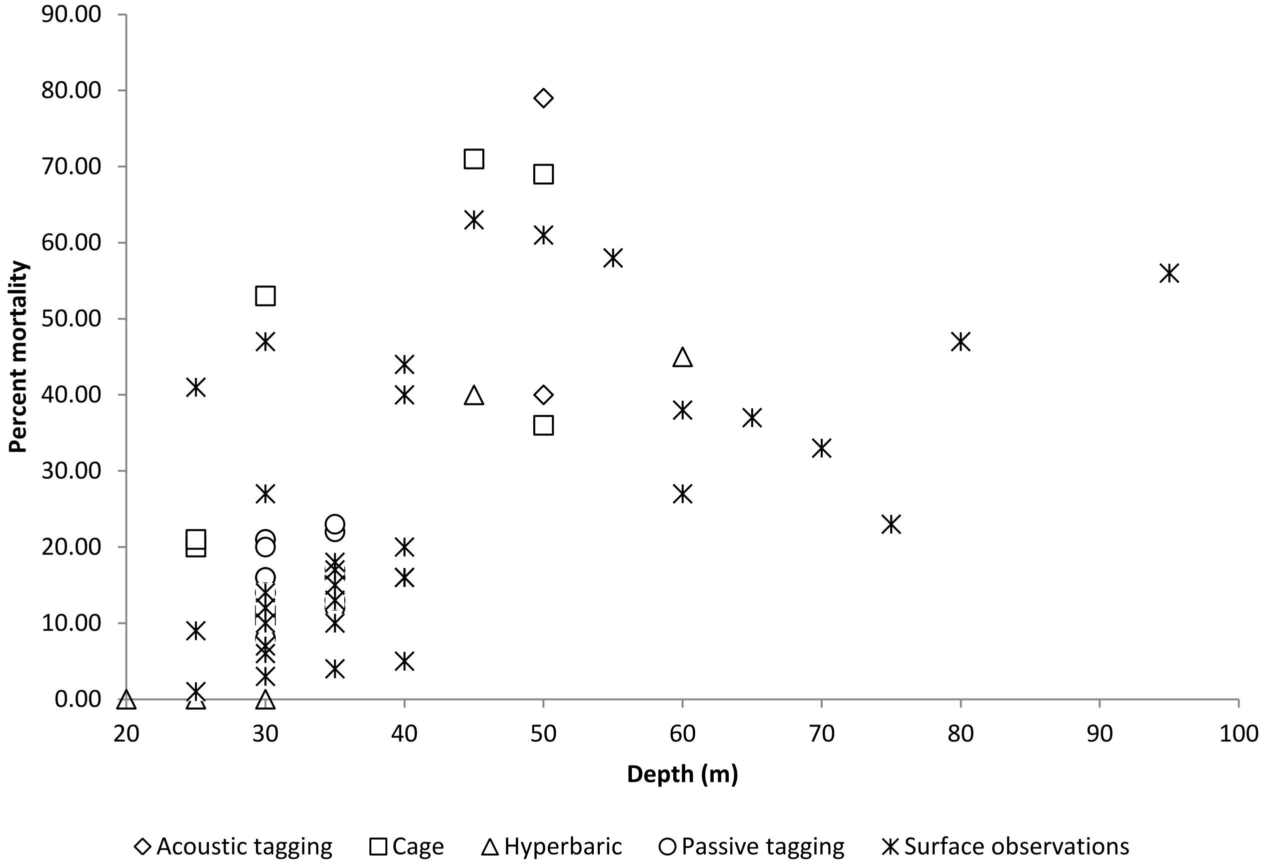



Fig 6.1. Plot of the relationship between study depth and estimated percent release mortality with individual study types identified (acoustic tagging = diamond, cage studies = square, hyperbaric chamber simulation = triangle, passive tag-recapture = circle, and surface observation = asterisk).

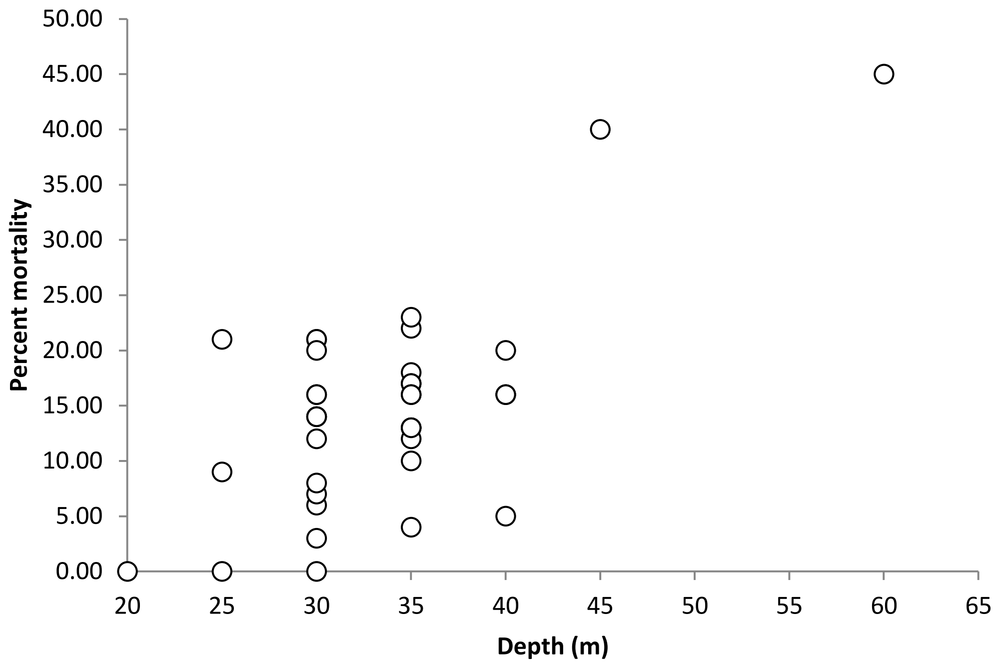



Fig 6.2. Eastern GOM release mortality estimates all methods, all seasons.

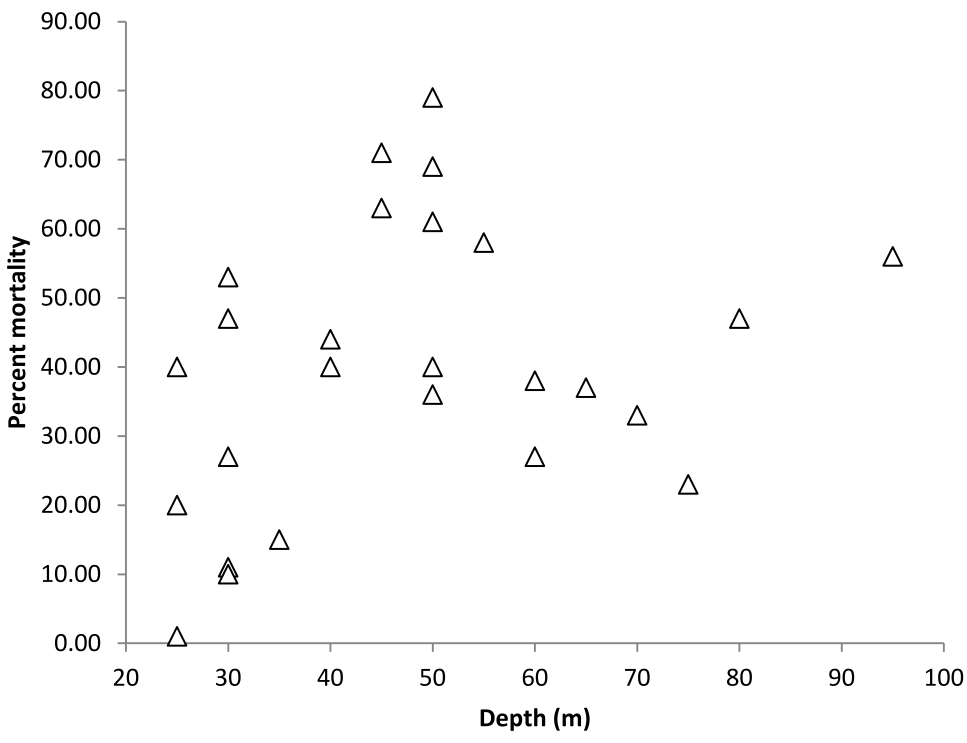



Fig 6.3. Western GOM release mortality estimates all methods, all seasons.

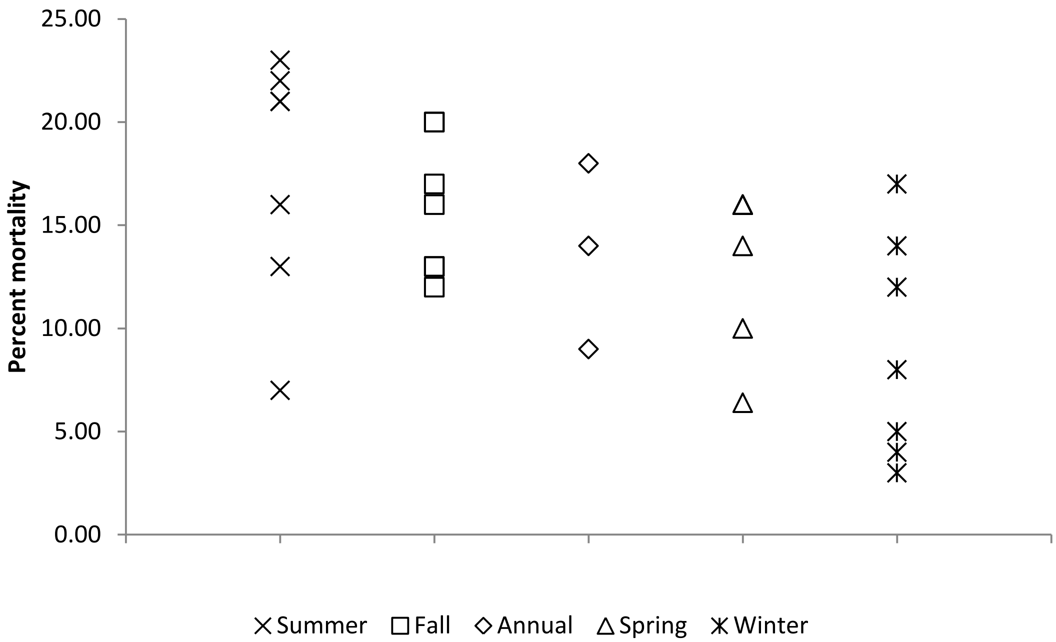



Figure 6.4. Eastern GOM percent release mortality by sampling season.

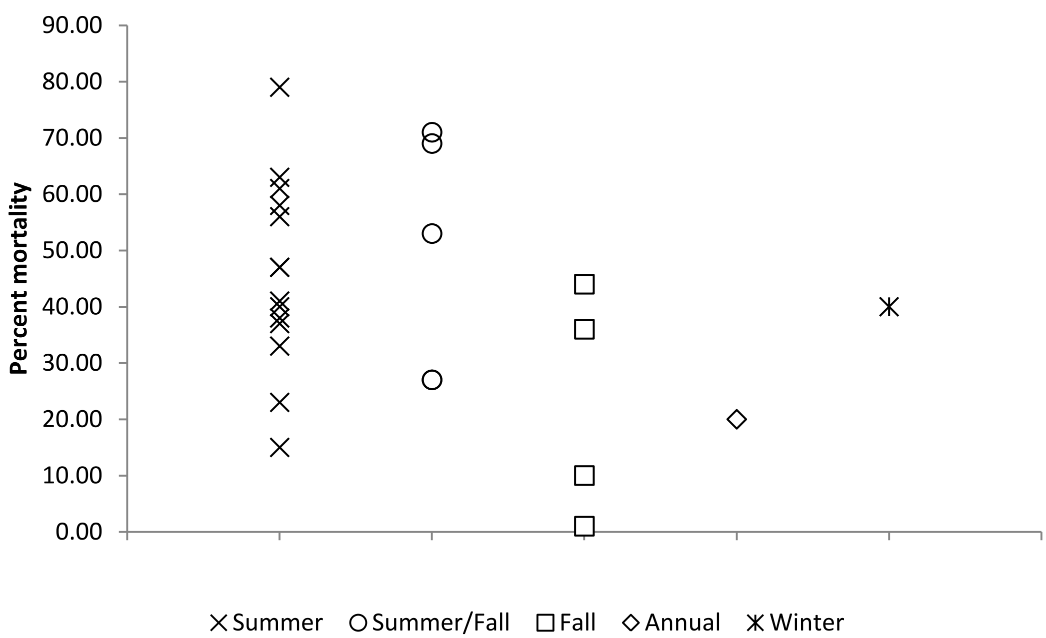



Figure 6.5. Western GOM percent release mortality by sampling season.

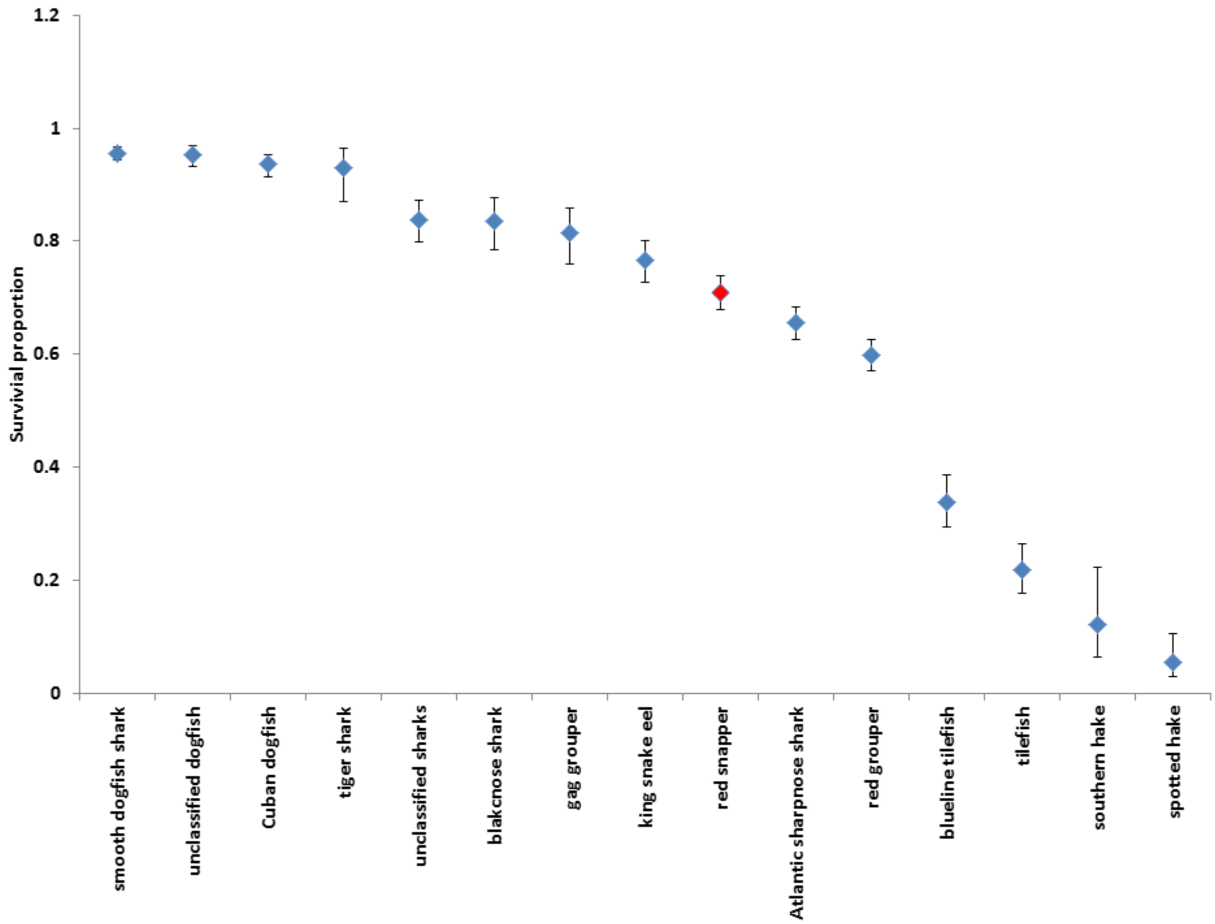



Figure 6.6. Discard mortality of the 15 most frequently observed species or species groups in the Gulf of Mexico commercial longline fishery. Error bars are 95% confidence intervals.

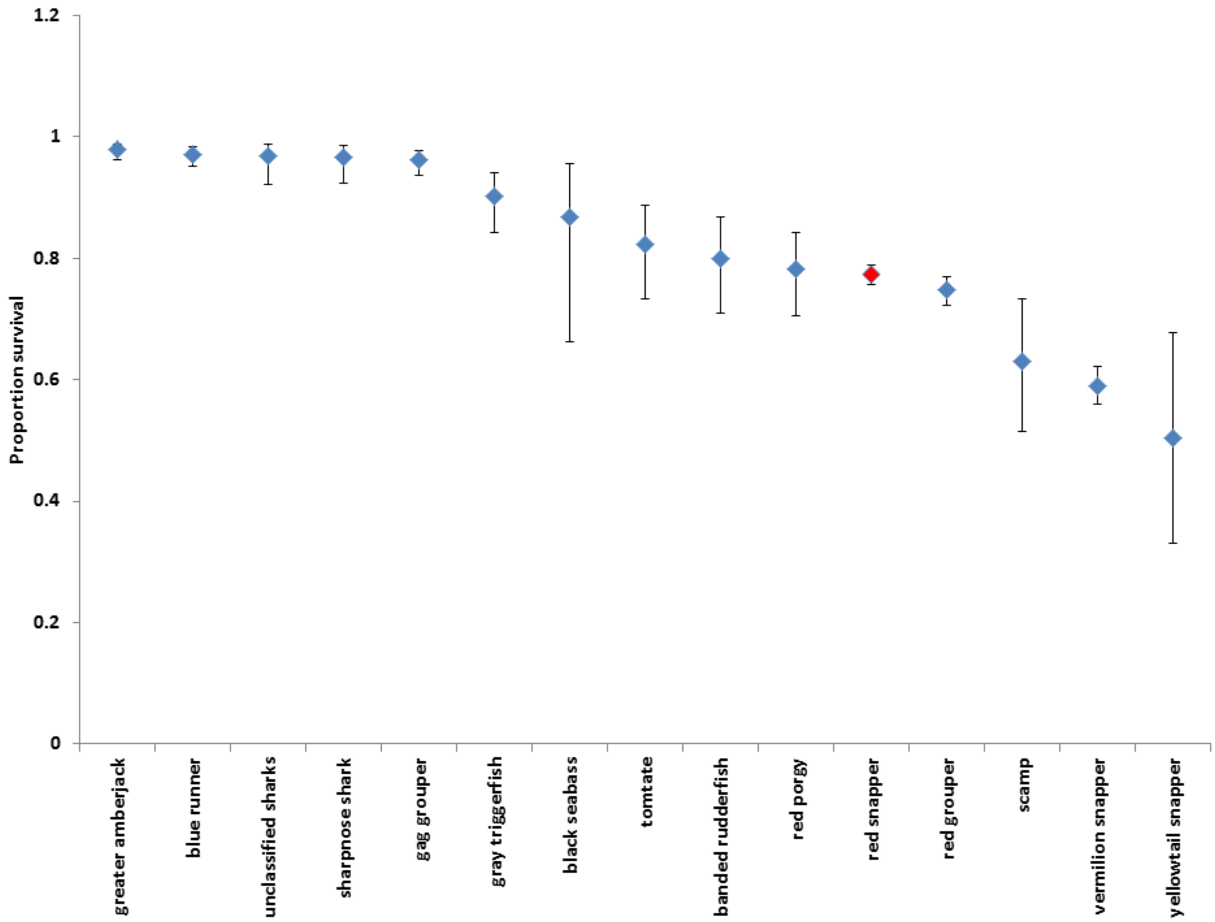



Figure 6.7. Discard mortality of the 15 most frequently observed species or species groups in the Gulf of Mexico commercial vertical line fishery. Error bars are 95% confidence intervals.

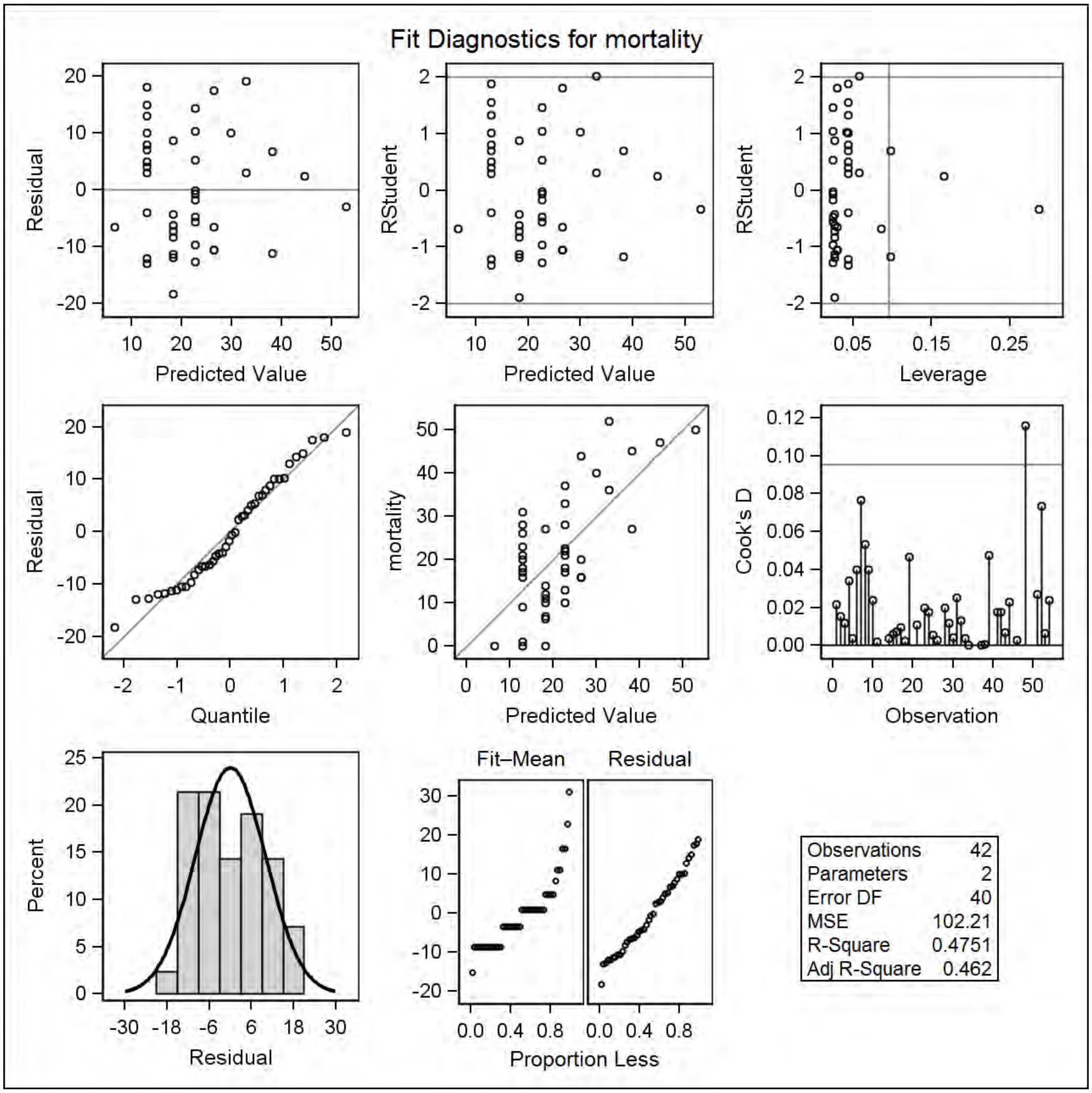



Figure 6.8. Fit diagnostics for the linear regression of log-depth and mortality using after removing studies identified as outliers.

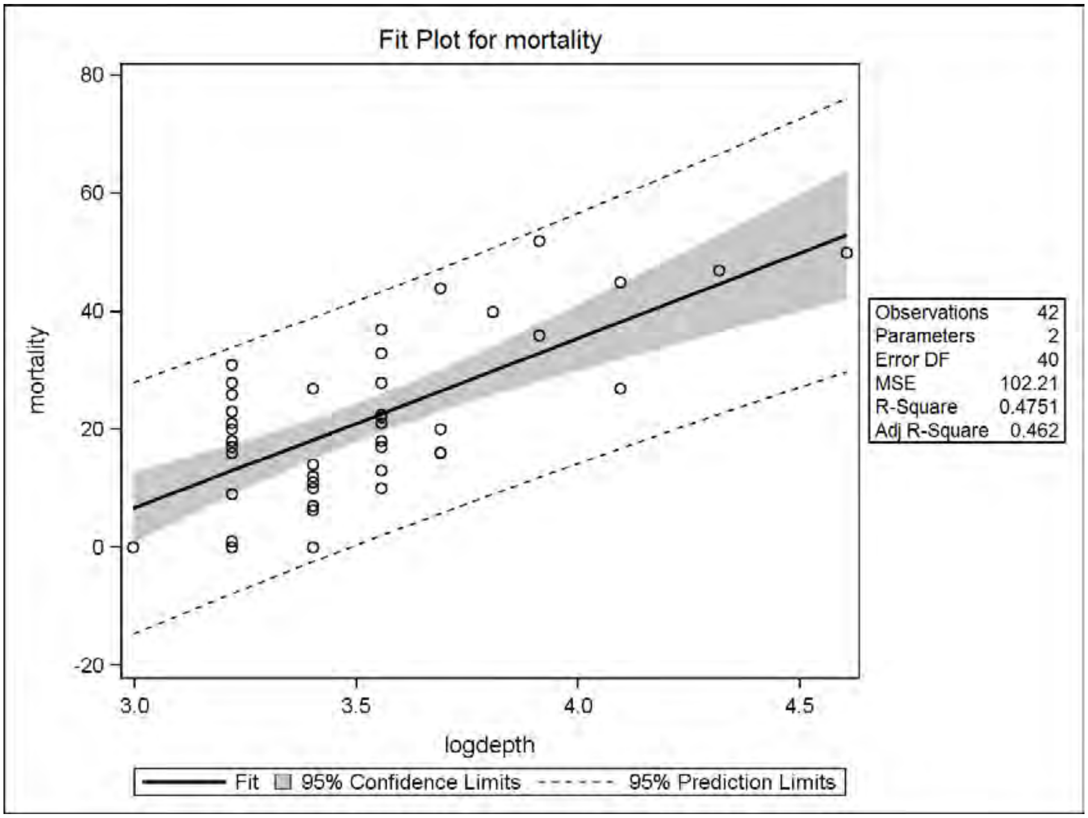



Figure 6.9. Linear regression of log-depth and mortality after removing studies identified as outliers.

# 7 Analytic Approach

## 7.1 Overview

The lead analytical agency for Gulf of Mexico Red Snapper is the Southeast Fishery Science Center in Miami, Florida.

## 7.2 Suggested analytic approach given available data

The assessment models to be used for SEDAR 31- Gulf of Mexico Red Snapper are specified in the Assessment Workshop Terms of Reference. Stock Synthesis and CATCHEM_AD models will be developed.

# 8 Research Recommendations

## 8.1 Life History

1. Review the evidence for density dependence in older ages (e.g. ages 2-3). Incorporate full age model of recruitment to examine density-dependent effect.

2. Site and habitat specific comparisons from more regions of the Gulf are needed for estimation of age-0 and age-1 mortality, accounting for shelf characteristics (e.g., width, slope, depth) in tests of density-dependent variation in M and emigration.

3. Broader understanding of habitat value and areal estimates of habitat (distribution—areas of trawlable vs. untrawlable bottom; more refined maps Gulf-wide etc) are needed to further inform the habitat limitation hypothesis for density dependence.

4. Assess the impact of potential predation/competition for taxa of particular interest (lionfish, marine catfish, sciaenids, and red grouper). As well, investigate alternative population regulatory mechanisms including potential sources of density-independent increases in mortality and distant sources of recruitment (but see stock delineation section).

5. Evaluate the potential for sea-bottom restoration or other means to expand habitat and increase survival for post-settlement red snapper.

6. The LHW recommended that existing otolith archives (e.g., NOAA) be used to further investigate interpretation of increment formation based on section orientation, sample source (location), season and year. This could be conducted as a graduate student project in collaboration with agency personnel.

7. Interested Academic representatives (e.g. Auburn University, University of S. Florida) should be included at Gulf States Marine Fisheries Commission sponsored otolith workshops (e.g., May 2013) to review age determinations and promote standardization.

8. Based upon the results of Szedlmayer and Beyer (2011 SEDAR31-RD20), further investigation of longevity is warranted. More recent catches of older fish should allow a direct comparison to $^{14}C$ coral chronologies established during the nuclear testing period and extend the age that can be directly validated (beyond 38 years in the earlier study by Baker and Wilson 2001).

9. A general recommendation of the LHW is to expand design-based fishery-independent sampling to elucidate regional (i.e., eastern and western GOM) and sub-regional differences in the demographics of red snapper.

10. A further recommendation is to increase random, representative sampling of the catch in order to avoid clustering effects and non-representative sampling which could lead to spurious differences in growth rates. Alternatively, and for localized- or small-scale studies, corrections for length limits and appropriate weighting may need to be utilized to treat data gaps, missing ages and adjust for selectivity (see Chih 2012 SEDAR31-DW18).

11. Future surveys should collect ovarian samples fixed in formalin for histology analysis, spawning marker fraction analysis and age/size at maturity analysis.

12. Additional fecundity collections are necessary from all areas of the Gulf.

13. Additional research is necessary to further clarify regional reproductive and demographic differences.

14. More information is needed to understand movement of young and older adult red snapper across along shore barriers. In particular the LHW recommends a large scale tagging study focused west and east of the Mississippi River.

15. Telemetry versus tagging approaches need to be expanded and evaluated according to shelf characteristics; e.g. cross compared in areas with little natural hard bottom habitat (yet high artificial reefs) versus areas with relatively high areal coverage of hard bottom and with more dispersed artificial reefs.

16. The LHW recommends a workshop or research symposia be convened to synthesize results and assess methodology for estimating red snapper movements and home range.

17. In order to reduce measurement error in the future, the LHW recommends that port agent, observers and field scientists record maximum total length for red snapper.

## 8.2 Commercial Fishery Statistics

**Landings**

1. Revisit how the historical landings were constructed.
2. Explore ways to ensure that IFQ and trip ticket landings match.
3. Apportion landings accordingly in ALS for TX landings with missing gear.

**Discard**

1. Add species to discard logbook form.
2. Provide better instructions on how to complete the discard logbook.
3. Consider and use relevant input from external review of observer program.
4. Social and economic impacts on fisher behavior in terms of fish discards.
5. Better determine available allocation to vessels on a given trip.

**Length/Age**

1. Standardize length and age data formats from various data sources.
2. Build age databases with Trip ID number for FL and FIN data.
3. Evaluate how to handle catch at age of non-representative age samples.

## 8.3 Recreational Fishery Statistics

1) Evaluate the technique used to apply sample weights to landings. Investigate the SEFSC Method by analyzing the order of variables in the hierarchy and the minimum number of fish used. Furthermore, evaluate alternative methods, including a meta-analysis of the existing information from difference sources, areas, states, surveys, etc. that could be performed.

2) Develop methods to identify angler preference and targeted effort. Require a reef fish stamp for anglers targeting reef fish, pelagic stamp for migratory species, and deep-water complex stamp for deep-water species. The program would be similar to the federal duck stamp required of hunters and could help managers identify what anglers were fishing for.

3) Continue and expand fishery dependent at sea observer surveys to collect discard information. This would help to validate self-reported headboat discard rates.

4) Track Texas commercial and recreational discards.

5) Estimate variances associated with the headboat program.

6) Evaluate existing and new methods to estimate historical landings. Hind-casting of red snapper landings is complicated by a lack of reliable historical effort data. To get at estimating historical effort, analysts could track consumables (gas, ice, bait) to develop price indices.

7) Investigate how CPUE changes over time due to technological advances and changes in fishing practices.

## 8.4 Measures of Population Abundance

The following are research recommendations that may improve the utility (precision) of the SEAMAP larval index for red snapper.

1. Expand the use of molecular genetics to identify the smallest and most abundant snapper larvae in SEAMAP samples that cannot be positively identified as red snapper because diagnostic morphological characters are not yet developed.

2. Begin directed sampling for fish eggs on SEAMAP summer trawl and fall plankton surveys using vertical nets hauls. The protocols for fish egg sampling have been established by NMFS/SWFSC scientists and are in use on the west coast. Fish egg collections are easy to make and take little additional sampling time. The eggs in these samples would have to be identified genetically but the protocols for genetic identification of red snapper eggs have been worked out by Frank Hernandez and Keith Bayha at DISL. The results of their MARFIN funded project using CUFES samples from our SEAMAP Fall Plankton surveys are impressive and significant. They produced maps of red snapper egg (i.e. spawning) distribution over the entire Gulfwide survey area. Estimates of egg abundance data coupled with the updated reproduction parameters (spawning frequency and fecundity) generated by NMFS scientists at the Panama City Lab could eventually be used to produce an actual spawning biomass estimate for red snapper.

3. Continue aging red snapper larvae from SEAMAP samples to improve the age-length relationship (key). This should improve the precision of the SEAMAP larval abundance index that is now based on a single age class of larvae across years.

4. Produce a SEAMAP larval index based on the abundance of red snapper larvae captured during SEAMAP summer shrimp/groundfish surveys (past and present). This survey has for a number of years now been expanded to include the entire northern Gulf of Mexico shelf. I don't need to remind you that the data from summer months (i.e. during peak red snapper spawning months) could be a far better indication of spawning production than data from the end of season from which the current SEAMAP larval index is derived.

5. Explore the utility of a larval red snapper index based on a comprehensive modeling approach that includes all SEAMAP stations (regardless of how many times they have been sampled over the time series) and both sampling gears, i.e. neuston and bongo samples. There are other likely explanatory variables (one for sure is salinity) that could ultimately improve the index.

## 8.5 Discard Mortality Rate

Future surveys, at minimum, should be structured around quarterly sampling, collect water temperature profile data, reflect the range of depths associated with the fishery, and strive to calculate season and depth specific estimates. Due to the limited number of experiments evaluating the relationship between thermal stress and release mortality, it is strongly encouraged that investigators measure and report water temperatures and thermocline profiles associated with capture. More studies evaluating the use of bottom release devices are also needed. Future discard observation surveys should collect frequency data regarding specific barotraumas incurred and loss of reflex response, because similar relationships could be developed as better techniques are developed to measure the delayed mortality component. Experiments estimating impairment scaling, and both immediate and delayed mortality, would be particularly useful so that a relationship among components could be developed and historical immediate release mortality estimates could potentially be adjusted.

# Appendix A

**SEDAR 31 Data Workshop- Commercial Selectivity/Catchability/Discard Mortality/IFQ Share Ad-Hoc working group notes**

Commercial fishers from both the eastern and western Gulf of Mexico vertical line and bottom longline fisheries met with NOAA scientists in a working group on Thursday afternoon, August 23, 2012 during the red snapper SEDAR 31 data workshop. Topics discussed included changes in fishing behavior based upon amount of red snapper Individual Fishing Quota (IFQ) shares available to the fisher, red snapper discard mortality in the commercial fishery, and changes in selectivity and catchability in the red snapper fishery over time.

***IFQ Share Bins (pounds of allocation per trip)***

Fishers were asked to define amounts of red snapper IFQ share in pounds available to a vessel per trip that would cause a change in fisher behavior when fishing for red snapper. For example, fishers with a low or moderate amount of allocation may actively avoid areas with known red snapper populations, avoid areas known to have high abundance of red snapper (thereby limiting, but not eliminating, catch of red snapper). Fishers with higher allocation and may target other species and retain some or all red snapper caught, selectively discard some or all red snapper due to price, or actively target red snapper.

The following are fisher suggested categories by fishery and region that may prove meaningful to further examine catch and discard trends:

Bottom longline eastern Gulf of Mexico

1. no allocation (discard all red snapper)
2. 1+ pounds allocation (some red snapper catch retained)

Reasoning: Red snapper have not necessarily been targeted by bottom longline fishers in the east to date, but have been more of a ‘bycatch’ species for those fishers with allocation. Tendencies have been that fish that appeared to be alive were often preferentially released, discards have been less likely to be based on size (catches commonly at or above legal size in the bottom longline fishery), and self-imposed ‘trip’ limits have been based upon amount of available IFQ share.

Bottom longline western Gulf of Mexico

1. no allocation (discard all red snapper)
2. 1+ pounds allocation (some red snapper retained)

Reasoning: In the west, bottom longliners comprised a smaller fleet making fewer trips than in the eastern Gulf of Mexico where groupers have been more frequently landed. Discarding has been more influenced by time of year and specific lengths with smaller fish (13-16 inch total length) kept preferentially due to market value and the possibility of encountering larger red snapper with the fishery restricted to depths 50 fathoms or deeper.

Vertical line eastern Gulf of Mexico

1. no allocation
2. 1-500 pounds allocation
3. 500-1,500 pounds allocation
4. >1,500 pounds allocation

Reasoning: limited by vessel hold space in many vessels (3000 lb); many small vessel lease between 300-500 lb/trip; discard viable fish not based on length, but due to IFQ share limitations; stretching IFQ allocation to last all year; amount of red snapper caught may depend on other fish caught. Additional caveats: increase in vermilion snapper vessels in recent years; turtle closures shifted effort from bottom longline to vertical line.

Vertical line western Gulf of Mexico

1. no allocation
2. 1-500 pounds allocation
3. 500-1,500 pounds allocation
4. >1,500 pounds allocation

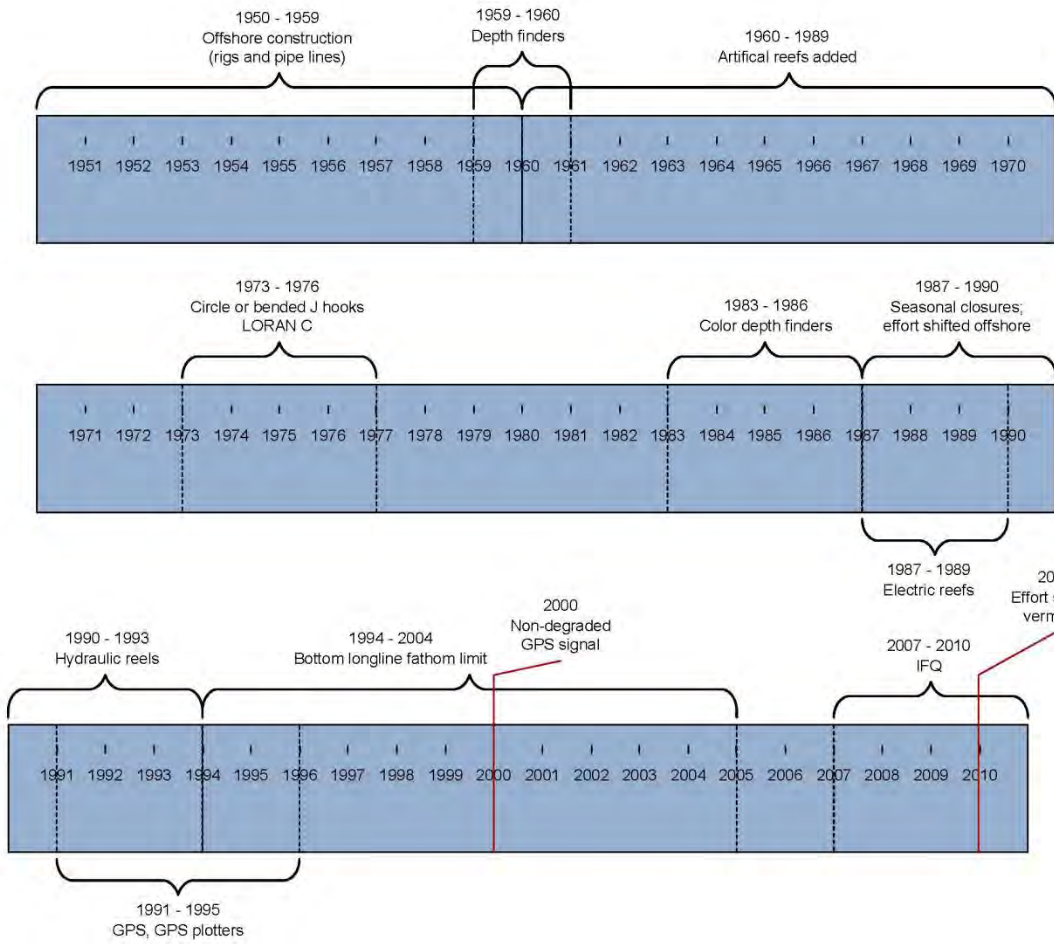
Reasoning: see VL eastern Gulf; additionally, marketability of fish may influence discards (e.g., keep plate size fish)

***Discard Mortality***

Observer reported discard mortality of 20-30% was likely too high according to commercial fishers. Some unknown level of mortality likely resulted from extended handling time of fish onboard the vessels while observers measured both kept fish and the fish to be discarded (i.e., discard mortality of 20-30% was likely an artifact of delay in release).

***Selectivity/Catchability Timeline***

Changes in habitat, technology, regulations, and other factors that resulted in changes in fishing behavior that affected selectivity and/or catchability in the commercial red snapper fishery, as identified by the commercial fishers, are provided in the timeline below. Further explanation of the notations appearing on the timeline is provided in the chronology that follows the timeline.




**1950s-1990s** Offshore oil rig and pipeline construction resulting in additional structure (habitat) in areas exploited by the fishery. Note: approximately 500 structures are in place by 1960, increasing 101 per year on average, to ca. 3800 offshore structures by 1990 and rough stabilization thereafter (Pulsipher et al., 2001).

**1959-60** Depth finders introduced into the fishery (paper machines). Note: Camber (1955) reports earliest fathometers available after 1945-46 and mechanical reels with wire line also available at approximately this time (Siebenaler and Brady 1952).

**1960s – 1980s** Increasing number of artificial reefs constructed in areas exploited by the fishery

**Mid-1970s** Circle hook use began, not mandated, but some fishers made circle hooks by bending J-hooks

**Late 1970s** LORAN C introduced into the fishery. Note: LORAN A available in the early 1960's; however, only one fisher at the data workshop reported using LORAN A and the consensus was that LORAN A was used by few commercial fishers.

**Mid-1980s** Depth finder (color machines) advance = could tell bottom type and could see fish

**Late 1980s** Electric reels introduced into the fishery

**Late 1980s to early 1990s** Seasonal closures began, moved effort offshore (600-800 feet depths)

**1980s - 2006** 20% of fishery was longline reported as vertical line, changed to proper reporting with advent of VMS; where 50%+ of large fish (12 lbs+) were from bottom longline

**1990** Bottom longline move to 50 fathoms in western (west of Cape San Blas) Gulf of Mexico

**Early 1990s** Hydraulic reels introduced into the fishery

**1991-92** GPS introduced into the fishery

**Mid-1990s** GPS plotters, particularly important for bottom longline

**1994-2004** Bottom longline in western GOM fishing within 50 fathom limit in some areas

**1994, 1995** Size limit increase lead to increase in discards and more mortality due to hooking/barotraumas/etc. stress

**2000** Removed GPS “selective availability” allowed for improved accuracy in vessel positioning due to reception of non-degraded GPS signal

**2007** Red snapper fishery became a bycatch/non-targeted fishery due to IFQs; some directed effort in the western GOM

**2007** Vessels moved to new areas to avoid concentrations of red snapper, but at the end of year may target the spots with high concentrations of red snapper to use up all their allocation

**2007** In western GOM – tendency to select for 13-16 inch (TL) fish due to better price, larger fish may be more frequently discarded; this tendency not reported from the eastern GOM where price is not higher for fish of that size

**2010** Effort shift in eastern GOM to vermilion snapper ("beeliners")

***Literature Cited***

Camber, C. I. 1955. A survey of the red snapper fishery of the Gulf of Mexico, with special reference to the Campeche Banks. Florida Board of Conservation Technical Series12. Marine Laboratory St. Petersburg, Florida.

Pulsipher, A.G, O.O. Iledare, D.V. Mesyanzhinov, A. Dupont, and Q. L. Zhu. 2001. Forecasting the number of offshore platforms on the Gulf of Mexico OCS to the year 2023. Prepared by the Center for Energy Studies, Louisiana State University, Baton Rouge, La. OCS Study MMS 2001-013. Gulf of Mexico OCS Region, New Orleans, La. 52 pp.

Siebenaler, J.B., and W. Brady. 1952. A high speed manual commercial fishing reel. Florida Board of Conservation, Marine Laboratory University of Miami Technical Series No. 4, Coral Gables, Florida.

# Appendix B

The following are the Index Report Cards generated by the Indices Working Group. The report cards begin on the following page. Report cards are sorted by index, with the eastern Gulf portion of the index preceding the western Gulf portion, where applicable. The report cards are presented in the following order:

- SEAMAP Groundfish Trawl Survey
- SEAMAP Fall Ichthyoplankton Survey
- NMFS Reef Fish Video Survey
- NMFS Bottom Longline Survey
- Private-for-hire East
- Private-for-hire West
- Headboat East
- Headboat West
- Commercial Vertical Line East
- Commercial Vertical Line West

## DESCRIPTION OF THE DATA SOURCE

### 1. Fishery Independent Indices

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe the survey design (e.g. fixed sampling sites, random stratified sampling), location, seasons/months and years of sampling. | | | | ✓ |
| B. Describe sampling methodology (e.g. gear, vessel, soak time etc.) | | | | ✓ |
| C. Describe any changes in sampling methodology (e.g. gear, vessel, sample design etc.) | | | | ✓ |
| D. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | | | | ✓ |
| E. What species or species assemblages are targeted by this survey (e.g. red snapper, reef fish, pelagic). | | | | ✓ |
| F. Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | | | | ✓ |

### 2. Fishery Dependent Indices

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe the data source and type of fishery (e.g. commercial handline, commercial longline, recreational hook and line etc.). | ✓ | | | |
| B. Describe any changes to reporting requirements, variables reported, etc. | ✓ | | | |
| C. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | ✓ | | | |
| D Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | ✓ | | | |

## METHODS

### 1. Data Reduction and Exclusions

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe any data exclusions (e.g. gears, fishing modes, sampling areas etc.). Report the number of records removed and justify removal. | | | | ✓ |
| B. Describe data reduction techniques (if any) used to address targeting (e.g. Stephens and MacCall, 2004; gear configuration, species assemblage etc). | ✓ | | | |
| C. Discuss procedures used to identify outliers. How many were identified? Were they excluded? | ✓ | | | |

**Working Group Comments:**

SEDAR31-DW20

SEAMAP Groundfish Survey

## 2. Management Regulations (for FD Indices)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide (or cite) history of management regulations (e.g. bag limits, size limits, trip limits, closures etc.). | ✓ | | | |
| B. Describe the effects (if any) of management regulations on CPUE | ✓ | | | |
| C. Discuss methods used (if any) to minimize the effects of management measures on the CPUE series. | ✓ | | | |

## 3. Describe Analysis Dataset (after exclusions and other treatments)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide tables and/or figures of number of observations by factors (including year, area, etc.) and interaction terms. | | ✓ | | |
| B. Include tables and/or figures of number of positive observations by factors and interaction terms. | | ✓ | | |
| C. Include tables and/or figures of the proportion positive observations by factors and interaction terms. | | ✓ | | |
| D. Include tables and/or figures of average (unstandardized) CPUE by factors and interaction terms. | | ✓ | | |
| E. Include annual maps of locations of survey sites (or fishing trips) and associated catch rates ***OR*** supply the raw data needed to construct these maps (Observation, Year, Latitude, Longitude (or statistical grid, area), Catch, Effort). | | | | ✓ |
| F. Describe the effort variable and the units. If more than one effort variable is present in the dataset, justify selection. | | | | ✓ |
| G. What are the units of catch (e.g. numbers or biomass, whole weight, gutted weight, kilograms, pounds). | | | | ✓ |

## 4. Model Standardization

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe model structure (e.g. delta-lognormal) | | | | ✓ |
| B. Describe construction of GLM components (e.g. forward selection from null etc.) | | | | ✓ |
| C. Describe inclusion criteria for factors and interactions terms. | | | | ✓ |
| D. Were YEAR*FACTOR interactions included in the model? If so, how (e.g. fixed effect, random effect)? Were random effects tested for significance using a likelihood ratio test? | | | | ✓ |
| E. Provide a table summarizing the construction of the GLM components. | | | | ✓ |
| F. Summarize model statistics of the mixed model formulation(s) (e.g. log likelihood, AIC, BIC etc.) | | | | ✓ |
| G. Report convergence statistics. | | | | ✓ |

**Working Group Comments:**

3A-D. Available On Demand

4A. Lo et al. method

4G. Available On Demand.

## MODEL DIAGNOSTICS

***Comment: Other model structures are possible and acceptable. Please provide appropriate diagnostics to the CPUE indices working group.***

| | Not Applicable | Absent | Incomplete | Complete | Working Group Comments: |
|---|---|---|---|---|---|
| **1. Binomial Component** | | | | | |
| A. Include plots of the chi-square residuals by factor. | | | | ✓ | |
| B. Include plots of predicted and observed proportion of positive trips by year and factor (e.g. year*area) | | ✓ | | | |
| C. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | | | | ✓ | |
| **2. Lognormal/Gamma Component** | | | | | |
| A. Include histogram of log(CPUE) or a histogram of the residuals of the model on CPUE. Overlay the expected distribution. | | | | ✓ | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | | | | ✓ | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | | | | ✓ | |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | | | | ✓ | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | | | | ✓ | |
| F. Include plots of the residuals by factor | | | | ✓ | |
| **3. Poisson Component** | | | | | |
| A. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | ✓ | | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | ✓ | | | | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | ✓ | | | | |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | ✓ | | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | ✓ | | | | ***The feasibility of this diagnostic is still under review.*** |
| **4. Zero-inflated model** | | | | | |
| A. Include ROC curve to quantify goodness of fit. | ✓ | | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor). | ✓ | | | | |
| C. Include QQ-plot (e.g. Student dev. residuals vs. theoretical quantiles), Overlay expected distribution. | ✓ | | | | |

## MODEL DIAGNOSTICS (CONT.)

| | Not Applicable | Absent | Incomplete | Complete | Working Group Comments: |
|---|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | ✓ | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | ✓ | | | |

## MODEL RESULTS

| | | | | |
|---|---|---|---|---|
| A. Tables of Nominal CPUE, Standardized CPUE, Observations, Positive Observations, Proportion Positive Observations and Coefficients of Variation (CVs). Other statistics may also be appropriate to report | | | | ✓ |
| B. Figure of Nominal and Standardized Indices with measure of variance (i.e. CVs). | | | | ✓ |

## IF MULTIPLE MODEL STRUCTURES WERE CONSIDERED:

(***Note: this is always recommended but required when model diagnostics are poor***.)

| | | | | |
|---|---|---|---|---|
| 1. Plot of resulting indices and estimates of variance | ✓ | | | |
| 2. Table of model statistics (e.g. AIC criteria) | ✓ | | | |

| | *Date Received* | *Workshop Recommendation* | *Revision Deadline* *** | *Author and Rapporteur Signatures* |
|---|---|---|---|---|
| **First Submission** | 09/20/2012 | accept as prepared | N/A | |
| **Revision** | | | | |

*The revision deadline is negotiated by the author, the SEDAR coordinator and the CPUE rapporteur. The author* ***DOES NOT*** *commit to any* ***LEGAL OBLIGATION*** *by agreeing to submit a manuscript before this deadline. The maximum penalty for failure to submit a revised document prior to the submission deadline is rejection of the CPUE series.*

***Justification of Working Group Recommendation***

The SEAMAP Groundfish Survey was recommended for inclusion in the stock assessment model for red snapper. These indices characterized long running, start dates of 1982 and 1972 for the summer and fall respectively, fishery independent surveys. The surveys have undergone some changes in methodology over time, along with an expansion of the area sampled; however, the model was able to account for these differences with the addition of variables. The final interactions of the model recommended for use were the long time series with separate indices for the summer and fall surveys, along with a split into east and west gulf. However, if the combination index with Dauphin Island is accepted, we would recommend using that in place of the eastern gulf indices. The decision to split the indices into summer and fall centered on the age structure of each survey, with the summer representative of age 1 fish and the fall representative of age 0 fish.

For the rest of the indices presented in SEDAR31-DW20, the following is a brief discussion on why the indices were not selected for use based upon discussion at the Data Workshop. Based on the work of the life history group and the decision to split the stock into eastern and western components, no full gulf indices were considered for use. In addition, it was decided that the stock assessment model was more capable of estimating changes in the indices with regard to selectivity; therefore the indices that had incorporated the selectivity factor in calculating catch were not recommended. The age specific indices were initially recommended for use; however, with the inclusion of the early part of the time series (pre-1987), it was no longer possible to separate the catch by age. Given the two options, using the longer time series was more desirable than using the age specific indices, especially since the stock assessment model would be able to utilize the catch structure of the groundfish data.

## DESCRIPTION OF THE DATA SOURCE

### 1. Fishery Independent Indices

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe the survey design (e.g. fixed sampling sites, random stratified sampling), location, seasons/months and years of sampling. | | | | ✓ |
| B. Describe sampling methodology (e.g. gear, vessel, soak time etc.) | | | | ✓ |
| C. Describe any changes in sampling methodology (e.g. gear, vessel, sample design etc.) | | | | ✓ |
| D. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | | | | ✓ |
| E. What species or species assemblages are targeted by this survey (e.g. red snapper, reef fish, pelagic). | | | | ✓ |
| F. Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | | | | ✓ |

### 2. Fishery Dependent Indices

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe the data source and type of fishery (e.g. commercial handline, commercial longline, recreational hook and line etc.). | ✓ | | | |
| B. Describe any changes to reporting requirements, variables reported, etc. | ✓ | | | |
| C. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | ✓ | | | |
| D Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | ✓ | | | |

## METHODS

### 1. Data Reduction and Exclusions

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe any data exclusions (e.g. gears, fishing modes, sampling areas etc.). Report the number of records removed and justify removal. | | | | ✓ |
| B. Describe data reduction techniques (if any) used to address targeting (e.g. Stephens and MacCall, 2004; gear configuration, species assemblage etc). | ✓ | | | |
| C. Discuss procedures used to identify outliers. How many were identified? Were they excluded? | ✓ | | | |

**Working Group Comments:**

SEDAR31-DW27

SEAMAP Fall Plankton Survey

## 2. Management Regulations (for FD Indices)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide (or cite) history of management regulations (e.g. bag limits, size limits, trip limits, closures etc.). | ✓ | | | |
| B. Describe the effects (if any) of management regulations on CPUE | ✓ | | | |
| C. Discuss methods used (if any) to minimize the effects of management measures on the CPUE series. | ✓ | | | |

## 3. Describe Analysis Dataset (after exclusions and other treatments)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide tables and/or figures of number of observations by factors (including year, area, etc.) and interaction terms. | | ✓ | | |
| B. Include tables and/or figures of number of positive observations by factors and interaction terms. | | ✓ | | |
| C. Include tables and/or figures of the proportion positive observations by factors and interaction terms. | | ✓ | | |
| D. Include tables and/or figures of average (unstandardized) CPUE by factors and interaction terms. | | ✓ | | |
| E. Include annual maps of locations of survey sites (or fishing trips) and associated catch rates ***OR*** supply the raw data needed to construct these maps (Observation, Year, Latitude, Longitude (or statistical grid, area), Catch, Effort). | | | | ✓ |
| F. Describe the effort variable and the units. If more than one effort variable is present in the dataset, justify selection. | | | | ✓ |
| G. What are the units of catch (e.g. numbers or biomass, whole weight, gutted weight, kilograms, pounds). | | | | ✓ |

## 4. Model Standardization

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe model structure (e.g. delta-lognormal) | | | | ✓ |
| B. Describe construction of GLM components (e.g. forward selection from null etc.) | | | | ✓ |
| C. Describe inclusion criteria for factors and interactions terms. | | | | ✓ |
| D. Were YEAR*FACTOR interactions included in the model? If so, how (e.g. fixed effect, random effect)? Were random effects tested for significance using a likelihood ratio test? | | | | ✓ |
| E. Provide a table summarizing the construction of the GLM components. | | | | ✓ |
| F. Summarize model statistics of the mixed model formulation(s) (e.g. log likelihood, AIC, BIC etc.) | | | | ✓ |
| G. Report convergence statistics. | | | | ✓ |

**Working Group Comments:**

3A-D. Available On Demand

4A. Lo et al. method

4G. Available On Demand.

## MODEL DIAGNOSTICS

***Comment: Other model structures are possible and acceptable. Please provide appropriate diagnostics to the CPUE indices working group.***

| | Not Applicable | Absent | Incomplete | Complete | Working Group Comments: |
|---|---|---|---|---|---|
| **1. Binomial Component** | | | | | |
| A. Include plots of the chi-square residuals by factor. | | | | ✓ | |
| B. Include plots of predicted and observed proportion of positive trips by year and factor (e.g. year*area) | | ✓ | | | |
| C. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | | | | ✓ | |
| **2. Lognormal/Gamma Component** | | | | | |
| A. Include histogram of log(CPUE) or a histogram of the residuals of the model on CPUE. Overlay the expected distribution. | | | | ✓ | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | | | | ✓ | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | | | | ✓ | |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | | | | ✓ | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | | | | ✓ | |
| F. Include plots of the residuals by factor | | | | ✓ | |
| **3. Poisson Component** | | | | | |
| A. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | ✓ | | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | ✓ | | | | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | ✓ | | | | |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | ✓ | | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | ✓ | | | | ***The feasibility of this diagnostic is still under review.*** |
| **4. Zero-inflated model** | | | | | |
| A. Include ROC curve to quantify goodness of fit. | ✓ | | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor). | ✓ | | | | |
| C. Include QQ-plot (e.g. Student dev. residuals vs. theoretical quantiles), Overlay expected distribution. | ✓ | | | | |

## MODEL DIAGNOSTICS (CONT.)

| | Not Applicable | Absent | Incomplete | Complete | Working Group Comments: |
|---|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | ✓ | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | ✓ | | | |

## MODEL RESULTS

| | | | | |
|---|---|---|---|---|
| A. Tables of Nominal CPUE, Standardized CPUE, Observations, Positive Observations, Proportion Positive Observations and Coefficients of Variation (CVs). Other statistics may also be appropriate to report | | | | ✓ |
| B. Figure of Nominal and Standardized Indices with measure of variance (i.e. CVs). | | | | ✓ |

## IF MULTIPLE MODEL STRUCTURES WERE CONSIDERED:

(***Note: this is always recommended but required when model diagnostics are poor***.)

| | | | | |
|---|---|---|---|---|
| 1. Plot of resulting indices and estimates of variance | ✓ | | | |
| 2. Table of model statistics (e.g. AIC criteria) | ✓ | | | |

| | *Date Received* | *Workshop Recommendation* | *Revision Deadline **** | *Author and Rapporteur Signatures* |
|---|---|---|---|---|
| **First Submission** | 09/20/2012 | accept as prepared | | |
| **Revision** | | | | |

*The revision deadline is negotiated by the author, the SEDAR coordinator and the CPUE rapporteur. The author **DOES NOT** commit to any **LEGAL OBLIGATION** by agreeing to submit a manuscript before this deadline. The maximum penalty for failure to submit a revised document prior to the submission deadline is rejection of the CPUE series.*

***Justification of Working Group Recommendation***

The SEAMAP Fall Plankton Survey was recommended for use in the assessment model. This survey represented a long, fishery independent time series, with no change in methodology. Additionally, it was the only survey that characterizes larval red snapper. The final versions of the abundance indices recommended for use were the age adjusted index for the western GOM that included all larvae between 3.75 and 9.25 mm, and the frequency of occurrence model for the eastern GOM. The frequency of occurrence model was chosen over the delta-lognormal index due to extremely low catches and occurrence of red snapper in the eastern GOM. The group agreed that back-calculating of ages was appropriate, especially since high mortality rates existed in the larval data and by back-calculating it brought the index closer to the number of larvae hatched.

# Evaluation of Abundance Indices of list species: List data set (SEDAR28-DW-08)

**DESCRIPTION OF THE DATA SOURCE**

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| **1. Fishery Independent Indices** | | | | |
| A. Describe the survey design (e.g. fixed sampling sites, random stratified sampling), location, seasons/months and years of sampling. | | | | ✓ |
| B. Describe sampling methodology (e.g. gear, vessel, soak time etc.) | | | | ✓ |
| C. Describe any changes in sampling methodology (e.g. gear, vessel, sample design etc.) | | | | ✓ |
| D. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | | | | ✓ |
| E. What species or species assemblages are targeted by this survey (e.g. red snapper, reef fish, pelagic). | | | | ✓ |
| F. Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | | | | ✓ |
| **2. Fishery Dependent Indices** | | | | |
| A. Describe the data source and type of fishery (e.g. commercial handline, commercial longline, recreational hook and line etc.). | ✓ | | | |
| B. Describe any changes to reporting requirements, variables reported, etc. | ✓ | | | |
| C. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | ✓ | | | |
| D Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | ✓ | | | |

**METHODS**

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| **1. Data Reduction and Exclusions** | | | | |
| A. Describe any data exclusions (e.g. gears, fishing modes, sampling areas etc.). Report the number of records removed and justify removal. | | | | ✓ |
| B. Describe data reduction techniques (if any) used to address targeting (e.g. Stephens and MacCall, 2004; gear configuration, species assemblage etc). | | | | ✓ |
| C. Discuss procedures used to identify outliers. How many were identified? Were they excluded? | | | | ✓ |

**Working Group Comments:**

## Working Group Comments:

2. Management Regulations (for FD Indices)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide (or cite) history of management regulations (e.g. bag limits, size limits, trip limits, closures etc.). | ✓ | | | |
| B. Describe the effects (if any) of management regulations on CPUE | ✓ | | | |
| C. Discuss methods used (if any) to minimize the effects of management measures on the CPUE series. | ✓ | | | |

3. Describe Analysis Dataset (after exclusions and other treatments)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide tables and/or figures of number of observations by factors (including year, area, etc.) and interaction terms. | | | | ✓ |
| B. Include tables and/or figures of number of positive observations by factors and interaction terms. | | | | ✓ |
| C. Include tables and/or figures of the proportion positive observations by factors and interaction terms. | | | | ✓ |
| D. Include tables and/or figures of average (unstandardized) CPUE by factors and interaction terms. | | | | ✓ |
| E. Include annual maps of locations of survey sites (or fishing trips) and associated catch rates ***OR*** supply the raw data needed to construct these maps (Observation, Year, Latitude, Longitude (or statistical grid, area), Catch, Effort). | | | | ✓ |
| F. Describe the effort variable and the units. If more than one effort variable is present in the dataset, justify selection. | | | | ✓ |
| G. What are the units of catch (e.g. numbers or biomass, whole weight, gutted weight, kilograms, pounds). | | | | ✓ |

4. Model Standardization

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe model structure (e.g. delta-lognormal) | | | | ✓ |
| B. Describe construction of GLM components (e.g. forward selection from null etc.) | | | | ✓ |
| C. Describe inclusion criteria for factors and interactions terms. | | | | ✓ |
| D. Were YEAR*FACTOR interactions included in the model? If so, how (e.g. fixed effect, random effect)? Were random effects tested for significance using a likelihood ratio test? | | | | ✓ |
| E. Provide a table summarizing the construction of the GLM components. | | | | ✓ |
| F. Summarize model statistics of the mixed model formulation(s) (e.g. log likelihood, AIC, BIC etc.) | | | | ✓ |
| G. Report convergence statistics. | | | | ✓ |

## MODEL DIAGNOSTICS

***Comment: Other model structures are possible and acceptable. Please provide appropriate diagnostics to the CPUE indices working group.***

### 1. Binomial Component

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Include plots of the chi-square residuals by factor. | | | | ✓ |
| B. Include plots of predicted and observed proportion of positive trips by year and factor (e.g. year*area) | | | | ✓ |
| C. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | | | | ✓ |

### 2. Lognormal/Gamma Component

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Include histogram of log(CPUE) or a histogram of the residuals of the model on CPUE. Overlay the expected distribution. | | | | ✓ |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | | | | ✓ |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | | | | ✓ |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | | | | ✓ |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | | | | ✓ |
| F. Include plots of the residuals by factor | | | | ✓ |

### 3. Poisson Component

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | ✓ | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | ✓ | | | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | ✓ | | | |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | ✓ | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | ✓ | | | |

### 4. Zero-inflated model

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Include ROC curve to quantify goodness of fit. | ✓ | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor). | ✓ | | | |
| C. Include QQ-plot (e.g. Student dev. residuals vs. theoretical quantiles), Overlay expected distribution. | ✓ | | | |

**Working Group Comments:**

***The feasibility of this diagnostic is still under review.***

## MODEL DIAGNOSTICS (CONT.)

| Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|

**Working Group Comments:**

| | | | | |
|---|---|---|---|---|
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | ✓ | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | ✓ | | | |

## MODEL RESULTS

| | | | | |
|---|---|---|---|---|
| A. Tables of Nominal CPUE, Standardized CPUE, Observations, Positive Observations, Proportion Positive Observations and Coefficients of Variation (CVs). Other statistics may also be appropriate to report | | | | ✓ |
| B. Figure of Nominal and Standardized Indices with measure of variance (i.e. CVs). | | | | ✓ |

## IF MULTIPLE MODEL STRUCTURES WERE CONSIDERED:

(***Note: this is always recommended but required when model diagnostics are poor***.)

| | | | | |
|---|---|---|---|---|
| 1. Plot of resulting indices and estimates of variance | ✓ | | | |
| 2. Table of model statistics (e.g. AIC criteria) | ✓ | | | |

| | *Date Received* | *Workshop Recommendation* | *Revision Deadline* *** | *Author and Rapporteur Signatures* |
|---|---|---|---|---|
| **First Submission** | 20 August 2012 | Use as presented | | |
| **Revision** | | | | |

*The revision deadline is negotiated by the author, the SEDAR coordinator and the CPUE rapporteur. The author* ***DOES NOT*** *commit to any* ***LEGAL OBLIGATION*** *by agreeing to submit a manuscript before this deadline. The maximum penalty for failure to submit a revised document prior to the submission deadline is rejection of the CPUE series.*

***Justification of Working Group Recommendation***

Assessment scientists evaluated the abundance indices and coefficient of variation output and advised the working group that the model based runs were most appropriate for use in the assessment models, therefore those runs are presented in this report, however, all of the runs are available in the working document that was provided prior to the workshop (Campbell et al. DW-08).

An ad hoc group evaluating the efficacy of combining a set of less extensive reef fish video surveys (NMFS-PC, DISL, and FWRI) identified an issue associated with estimating length using lasers, versus the stereo video from NMFS-PC data. Laser data appears to potentially be underestimating size. It is unclear at this point if this is a measurement issue associated with parallelism of the laser mounting, or if this is associated with fish behavior relative to the camera gear (e.g. smaller fish swarming closer to the gear). At this point the NMFS-MS lab survey has no comparison data available to reassure the working group that this survey does not suffer from the same issue. The group is therefore recommending that the length composition data that was estimated using lasers is excluded from analysis until it can be determined if length is also underestimated in this survey as well.

## DESCRIPTION OF THE DATA SOURCE

### 1. Fishery Independent Indices

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe the survey design (e.g. fixed sampling sites, random stratified sampling), location, seasons/months and years of sampling. | | | | ✓ |
| B. Describe sampling methodology (e.g. gear, vessel, soak time etc.) | | | | ✓ |
| C. Describe any changes in sampling methodology (e.g. gear, vessel, sample design etc.) | | | | ✓ |
| D. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | | | | ✓ |
| E. What species or species assemblages are targeted by this survey (e.g. red snapper, reef fish, pelagic). | | | | ✓ |
| F. Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | | | | ✓ |

### 2. Fishery Dependent Indices

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe the data source and type of fishery (e.g. commercial handline, commercial longline, recreational hook and line etc.). | ✓ | | | |
| B. Describe any changes to reporting requirements, variables reported, etc. | ✓ | | | |
| C. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | ✓ | | | |
| D Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | ✓ | | | |

## METHODS

### 1. Data Reduction and Exclusions

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe any data exclusions (e.g. gears, fishing modes, sampling areas etc.). Report the number of records removed and justify removal. | | | | ✓ |
| B. Describe data reduction techniques (if any) used to address targeting (e.g. Stephens and MacCall, 2004; gear configuration, species assemblage etc). | ✓ | | | |
| C. Discuss procedures used to identify outliers. How many were identified? Were they excluded? | ✓ | | | |

**Working Group Comments:**

SEDAR31-DW-19

NMFS Bottom Longline Survey

2. Management Regulations (for FD Indices)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide (or cite) history of management regulations (e.g. bag limits, size limits, trip limits, closures etc.). | ✓ | | | |
| B. Describe the effects (if any) of management regulations on CPUE | ✓ | | | |
| C. Discuss methods used (if any) to minimize the effects of management measures on the CPUE series. | ✓ | | | |

3. Describe Analysis Dataset (after exclusions and other treatments)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide tables and/or figures of number of observations by factors (including year, area, etc.) and interaction terms. | | | | ✓ |
| B. Include tables and/or figures of number of positive observations by factors and interaction terms. | | | | ✓ |
| C. Include tables and/or figures of the proportion positive observations by factors and interaction terms. | | | | ✓ |
| D. Include tables and/or figures of average (unstandardized) CPUE by factors and interaction terms. | | | ✓ | |
| E. Include annual maps of locations of survey sites (or fishing trips) and associated catch rates ***OR*** supply the raw data needed to construct these maps (Observation, Year, Latitude, Longitude (or statistical grid, area), Catch, Effort). | | | | ✓ |
| F. Describe the effort variable and the units. If more than one effort variable is present in the dataset, justify selection. | | | | ✓ |
| G. What are the units of catch (e.g. numbers or biomass, whole weight, gutted weight, kilograms, pounds). | | | | ✓ |

4. Model Standardization

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe model structure (e.g. delta-lognormal) | | | | ✓ |
| B. Describe construction of GLM components (e.g. forward selection from null etc.) | | | | ✓ |
| C. Describe inclusion criteria for factors and interactions terms. | | | | ✓ |
| D. Were YEAR*FACTOR interactions included in the model? If so, how (e.g. fixed effect, random effect)? Were random effects tested for significance using a likelihood ratio test? | | | | ✓ |
| E. Provide a table summarizing the construction of the GLM components. | | | | ✓ |
| F. Summarize model statistics of the mixed model formulation(s) (e.g. log likelihood, AIC, BIC etc.) | | | | ✓ |
| G. Report convergence statistics. | | | | ✓ |

**Working Group Comments:**

3A-D. Available On Demand

4A. Lo et al. method

4G. Available On Demand.

**MODEL DIAGNOSTICS**

***Comment: Other model structures are possible and acceptable. Please provide appropriate diagnostics to the CPUE indices working group.***

| | Not Applicable | Absent | Incomplete | Complete | Working Group Comments: |
|---|---|---|---|---|---|
| 1. Binomial Component | | | | | |
| A. Include plots of the chi-square residuals by factor. | | | | ✓ | |
| B. Include plots of predicted and observed proportion of positive trips by year and factor (e.g. year*area) | | ✓ | | | |
| C. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | | | | ✓ | |
| 2. Lognormal/Gamma Component | | | | | |
| A. Include histogram of log(CPUE) or a histogram of the residuals of the model on CPUE. Overlay the expected distribution. | | | | ✓ | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | | | | ✓ | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | | | | ✓ | |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | | | | ✓ | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | | | | ✓ | |
| F. Include plots of the residuals by factor | | | | ✓ | |
| 3. Poisson Component | | | | | |
| A. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | ✓ | | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | ✓ | | | | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | ✓ | | | | |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | ✓ | | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | ✓ | | | | ***The feasibility of this diagnostic is still under review.*** |
| 4. Zero-inflated model | | | | | |
| A. Include ROC curve to quantify goodness of fit. | ✓ | | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor). | ✓ | | | | |
| C. Include QQ-plot (e.g. Student dev. residuals vs. theoretical quantiles), Overlay expected distribution. | ✓ | | | | |

**MODEL DIAGNOSTICS (CONT.)**

| | Not Applicable | Absent | Incomplete | Complete | Working Group Comments: |
|---|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | ✓ | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | ✓ | | | |

## MODEL RESULTS

| | | | | |
|---|---|---|---|---|
| A. Tables of Nominal CPUE, Standardized CPUE, Observations, Positive Observations, Proportion Positive Observations and Coefficients of Variation (CVs). Other statistics may also be appropriate to report | | | | ✓ |
| B. Figure of Nominal and Standardized Indices with measure of variance (i.e. CVs). | | | | ✓ |

## IF MULTIPLE MODEL STRUCTURES WERE CONSIDERED:

(***Note: this is always recommended but required when model diagnostics are poor***.)

| | | | | |
|---|---|---|---|---|
| 1. Plot of resulting indices and estimates of variance | ✓ | | | |
| 2. Table of model statistics (e.g. AIC criteria) | ✓ | | | |

| | *Date Received* | *Workshop Recommendation* | *Revision Deadline* *** | *Author and Rapporteur Signatures* |
|---|---|---|---|---|
| **First Submission** | 09/20/2012 | accept as prepared | N/A | |
| **Revision** | | | | |

*The revision deadline is negotiated by the author, the SEDAR coordinator and the CPUE rapporteur. The author* ***DOES NOT*** *commit to any* ***LEGAL OBLIGATION*** *by agreeing to submit a manuscript before this deadline. The maximum penalty for failure to submit a revised document prior to the submission deadline is rejection of the CPUE series.*

***Justification of Working Group Recommendation***

The index work group recommends that the assessment panel consider the use of indices from both the Eastern GOM and the Western GOM.

# Evaluation of Abundance Indices of Red Snapper for SEDAR 31
# Recreational Private/For Hire East (SEDAR31-DW-33 updated 10/12/2012)
# Data Used in Analysis: MRFSS

**DESCRIPTION OF THE DATA SOURCE**

1. Fishery Independent Indices

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe the survey design (e.g. fixed sampling sites, random stratified sampling), location, seasons/months and years of sampling. | ✓ | | | |
| B. Describe sampling methodology (e.g. gear, vessel, soak time etc.) | ✓ | | | |
| C. Describe any changes in sampling methodology (e.g. gear, vessel, sample design etc.) | ✓ | | | |
| D. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | ✓ | | | |
| E. What species or species assemblages are targeted by this survey (e.g. red snapper, reef fish, pelagic). | ✓ | | | |
| F. Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | ✓ | | | |

2. Fishery Dependent Indices

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe the data source and type of fishery (e.g. commercial handline, commercial longline, recreational hook and line etc.). | | | | ✓ |
| B. Describe any changes to reporting requirements, variables reported, etc. | | | | ✓ |
| C. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | | | | ✓ |
| D Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | | ✓ | | |

**METHODS**

1. Data Reduction and Exclusions

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe any data exclusions (e.g. gears, fishing modes, sampling areas etc.). Report the number of records removed and justify removal. | | | | ✓ |
| B. Describe data reduction techniques (if any) used to address targeting (e.g. Stephens and MacCall, 2004; gear configuration, species assemblage etc). | | | | ✓ |
| C. Discuss procedures used to identify outliers. How many were identified? Were they excluded? | | | | ✓ |

**Working Group Comments:**

see sedar31-dw-10

## Working Group Comments:

covered eastern Gulf of Mexico (Florida, Alabama, and Mississippi)

### 2. Management Regulations (for FD Indices)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide (or cite) history of management regulations (e.g. bag limits, size limits, trip limits, closures etc.). | | | | ✓ |
| B. Describe the effects (if any) of management regulations on CPUE | | | | ✓ |
| C. Discuss methods used (if any) to minimize the effects of management measures on the CPUE series. | | | | ✓ |

### 3. Describe Analysis Dataset (after exclusions and other treatments)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide tables and/or figures of number of observations by factors (including year, area, etc.) and interaction terms. | | | | ✓ |
| B. Include tables and/or figures of number of positive observations by factors and interaction terms. | | | | ✓ |
| C. Include tables and/or figures of the proportion positive observations by factors and interaction terms. | | | | ✓ |
| D. Include tables and/or figures of average (unstandardized) CPUE by factors and interaction terms. | | | | ✓ |
| E. Include annual maps of locations of survey sites (or fishing trips) and associated catch rates ***OR*** supply the raw data needed to construct these maps (Observation, Year, Latitude, Longitude (or statistical grid, area), Catch, Effort). | | ✓ | | |
| F. Describe the effort variable and the units. If more than one effort variable is present in the dataset, justify selection. | | | | ✓ |
| G. What are the units of catch (e.g. numbers or biomass, whole weight, gutted weight, kilograms, pounds). | | | | ✓ |

### 4. Model Standardization

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe model structure (e.g. delta-lognormal) | | | | ✓ |
| B. Describe construction of GLM components (e.g. forward selection from null etc.) | | | | ✓ |
| C. Describe inclusion criteria for factors and interactions terms. | | | | ✓ |
| D. Were YEAR*FACTOR interactions included in the model? If so, how (e.g. fixed effect, random effect)? Were random effects tested for significance using a likelihood ratio test? | ✓ | | | |
| E. Provide a table summarizing the construction of the GLM components. | | | | ✓ |
| F. Summarize model statistics of the mixed model formulation(s) (e.g. log likelihood, AIC, BIC etc.) | | | | ✓ |
| G. Report convergence statistics. | | | | ✓ |

## MODEL DIAGNOSTICS

***Comment: Other model structures are possible and acceptable. Please provide appropriate diagnostics to the CPUE indices working group.***

| | Not Applicable | Absent | Incomplete | Complete | Working Group Comments: |
|---|---|---|---|---|---|
| **1. Binomial Component** | | | | | |
| A. Include plots of the chi-square residuals by factor. | | | | ✓ | |
| B. Include plots of predicted and observed proportion of positive trips by year and factor (e.g. year*area) | | | | ✓ | |
| C. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | | | | ✓ | |
| **2. Lognormal/Gamma Component** | | | | | |
| A. Include histogram of log(CPUE) or a histogram of the residuals of the model on CPUE. Overlay the expected distribution. | | ✓ | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | | | | ✓ | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | | | | ✓ | |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | | ✓ | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | | ✓ | | | |
| F. Include plots of the residuals by factor | | ✓ | | | |
| **3. Poisson Component** | | | | | |
| A. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | ✓ | | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | ✓ | | | | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | ✓ | | | | |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | ✓ | | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | ✓ | | | | ***The feasibility of this diagnostic is still under review.*** |
| **4. Zero-inflated model** | | | | | |
| A. Include ROC curve to quantify goodness of fit. | ✓ | | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor). | ✓ | | | | |
| C. Include QQ-plot (e.g. Student dev. residuals vs. theoretical quantiles), Overlay expected distribution. | ✓ | | | | |

## MODEL DIAGNOSTICS (CONT.)

| | Not Applicable | Absent | Incomplete | Complete | Working Group Comments: |
|---|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | ✓ | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | ✓ | | | |

**MODEL RESULTS**

| | | | | |
|---|---|---|---|---|
| A. Tables of Nominal CPUE, Standardized CPUE, Observations, Positive Observations, Proportion Positive Observations and Coefficients of Variation (CVs). Other statistics may also be appropriate to report | | | | ✓ |
| B. Figure of Nominal and Standardized Indices with measure of variance (i.e. CVs). | | | | ✓ |

**IF MULTIPLE MODEL STRUCTURES WERE CONSIDERED**:

(***Note: this is always recommended but required when model diagnostics are poor***.)

| | | | | | Comments |
|---|---|---|---|---|---|
| 1. Plot of resulting indices and estimates of variance | | | | ✓ | cannot compare using AIC |
| 2. Table of model statistics (e.g. AIC criteria) | | ✓ | | | |

| | *Date Received* | *Workshop Recommendation* | *Revision Deadline **** | *Author and Rapporteur Signatures* |
|---|---|---|---|---|
| **First Submission** | 8/20/2012 | recommend for use | | |
| **Revision** | 10/12/2012 | recommend for use | | |

*The revision deadline is negotiated by the author, the SEDAR coordinator and the CPUE rapporteur. The author* ***DOES NOT*** *commit to any* ***LEGAL OBLIGATION*** *by agreeing to submit a manuscript before this deadline. The maximum penalty for failure to submit a revised document prior to the submission deadline is rejection of the CPUE series.*

***Justification of Working Group Recommendation***

This paper explored two different ways of standardizing CPUE for this component of the red snapper fishery. One was using a Delta lognormal approach, which models the presence or absence of encountering the species on that trip as zero or one using a binomial model, separately from the positive observations of actual CPUE using a lognormal model. The second approach was to also use a Delta model, however a censored lognormal model was used to model the positive observations of CPUE. The reason for using this model was to capture the effect of the bag limit on CPUE, which had become increasingly strict over the time series.

The working group recommended the use of the censored approach to standardizing CPUE and recommended this index be used in the assessment. The group felt that the censored approach was able to account for the bag limit effect which would otherwise give the artificial perception that abundance had decreased over the time series. In addition, the group decided to recommend this index because it covers a long time series.

# Evaluation of Abundance Indices of Red Snapper for SEDAR 31
# Recreational Private/For Hire West (SEDAR31-DW-33 updated 10/12/2012)
# Data Used in Analysis: MRFSS and Texas Parks and Wildlife Survey

**Working Group Comments:** see sedar31-dw-10

**DESCRIPTION OF THE DATA SOURCE**

| Item | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| **1. Fishery Independent Indices** | | | | |
| A. Describe the survey design (e.g. fixed sampling sites, random stratified sampling), location, seasons/months and years of sampling. | ✓ | | | |
| B. Describe sampling methodology (e.g. gear, vessel, soak time etc.) | ✓ | | | |
| C. Describe any changes in sampling methodology (e.g. gear, vessel, sample design etc.) | ✓ | | | |
| D. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | ✓ | | | |
| E. What species or species assemblages are targeted by this survey (e.g. red snapper, reef fish, pelagic). | ✓ | | | |
| F. Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | ✓ | | | |
| **2. Fishery Dependent Indices** | | | | |
| A. Describe the data source and type of fishery (e.g. commercial handline, commercial longline, recreational hook and line etc.). | | | | ✓ |
| B. Describe any changes to reporting requirements, variables reported, etc. | | | | ✓ |
| C. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | | | | ✓ |
| D Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | | ✓ | | |

**METHODS**

| Item | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| **1. Data Reduction and Exclusions** | | | | |
| A. Describe any data exclusions (e.g. gears, fishing modes, sampling areas etc.). Report the number of records removed and justify removal. | | | | ✓ |
| B. Describe data reduction techniques (if any) used to address targeting (e.g. Stephens and MacCall, 2004; gear configuration, species assemblage etc). | | | | ✓ |
| C. Discuss procedures used to identify outliers. How many were identified? Were they excluded? | | | | ✓ |

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| **2. Management Regulations (for FD Indices)** | | | | |
| A. Provide (or cite) history of management regulations (e.g. bag limits, size limits, trip limits, closures etc.). | | | | ✓ |
| B. Describe the effects (if any) of management regulations on CPUE | | | | ✓ |
| C. Discuss methods used (if any) to minimize the effects of management measures on the CPUE series. | | | | ✓ |
| **3. Describe Analysis Dataset (after exclusions and other treatments)** | | | | |
| A. Provide tables and/or figures of number of observations by factors (including year, area, etc.) and interaction terms. | | | | ✓ |
| B. Include tables and/or figures of number of positive observations by factors and interaction terms. | | | | ✓ |
| C. Include tables and/or figures of the proportion positive observations by factors and interaction terms. | | | | ✓ |
| D. Include tables and/or figures of average (unstandardized) CPUE by factors and interaction terms. | | | | ✓ |
| E. Include annual maps of locations of survey sites (or fishing trips) and associated catch rates ***OR*** supply the raw data needed to construct these maps (Observation, Year, Latitude, Longitude (or statistical grid, area), Catch, Effort). | | ✓ | | |
| F. Describe the effort variable and the units. If more than one effort variable is present in the dataset, justify selection. | | | | ✓ |
| G. What are the units of catch (e.g. numbers or biomass, whole weight, gutted weight, kilograms, pounds). | | | | ✓ |
| **4. Model Standardization** | | | | |
| A. Describe model structure (e.g. delta-lognormal) | | | | ✓ |
| B. Describe construction of GLM components (e.g. forward selection from null etc.) | | | | ✓ |
| C. Describe inclusion criteria for factors and interactions terms. | | | | ✓ |
| D. Were YEAR*FACTOR interactions included in the model? If so, how (e.g. fixed effect, random effect)? Were random effects tested for significance using a likelihood ratio test? | ✓ | | | |
| E. Provide a table summarizing the construction of the GLM components. | | | | ✓ |
| F. Summarize model statistics of the mixed model formulation(s) (e.g. log likelihood, AIC, BIC etc.) | | | | ✓ |
| G. Report convergence statistics. | | | | ✓ |

## Working Group Comments:

covered western Gulf of Mexico (Louisiana and Texas)

## MODEL DIAGNOSTICS

***Comment: Other model structures are possible and acceptable. Please provide appropriate diagnostics to the CPUE indices working group.***

| Item | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| **1. Binomial Component** | | | | |
| A. Include plots of the chi-square residuals by factor. | | | | ✓ |
| B. Include plots of predicted and observed proportion of positive trips by year and factor (e.g. year*area) | | | | ✓ |
| C. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | | | | ✓ |
| **2. Lognormal/Gamma Component** | | | | |
| A. Include histogram of log(CPUE) or a histogram of the residuals of the model on CPUE. Overlay the expected distribution. | | ✓ | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | | | | ✓ |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | | | | ✓ |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | | ✓ | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | | ✓ | | |
| F. Include plots of the residuals by factor | | ✓ | | |
| **3. Poisson Component** | | | | |
| A. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | ✓ | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | ✓ | | | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | ✓ | | | |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | ✓ | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | ✓ | | | |
| **4. Zero-inflated model** | | | | |
| A. Include ROC curve to quantify goodness of fit. | ✓ | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor). | ✓ | | | |
| C. Include QQ-plot (e.g. Student dev. residuals vs. theoretical quantiles), Overlay expected distribution. | ✓ | | | |

**Working Group Comments:**

***The feasibility of this diagnostic is still under review.***

## MODEL DIAGNOSTICS (CONT.)

| Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|

**Working Group Comments:**

| | | | | |
|---|---|---|---|---|
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | ✓ | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | ✓ | | | |

## MODEL RESULTS

| | | | | |
|---|---|---|---|---|
| A. Tables of Nominal CPUE, Standardized CPUE, Observations, Positive Observations, Proportion Positive Observations and Coefficients of Variation (CVs). Other statistics may also be appropriate to report | | | | ✓ |
| B. Figure of Nominal and Standardized Indices with measure of variance (i.e. CVs). | | | | ✓ |

## IF MULTIPLE MODEL STRUCTURES WERE CONSIDERED:

(***Note: this is always recommended but required when model diagnostics are poor***.)

| | | | | |
|---|---|---|---|---|
| 1. Plot of resulting indices and estimates of variance | | | | ✓ |
| 2. Table of model statistics (e.g. AIC criteria) | | ✓ | | |

cannot compare using AIC

| | *Date Received* | *Workshop Recommendation* | *Revision Deadline **** | *Author and Rapporteur Signatures* |
|---|---|---|---|---|
| **First Submission** | 8/20/2012 | recommend for use | | |
| **Revision** | 10/12/2012 | recommend for use | | |

*The revision deadline is negotiated by the author, the SEDAR coordinator and the CPUE rapporteur. The author* ***DOES NOT*** *commit to any* ***LEGAL OBLIGATION*** *by agreeing to submit a manuscript before this deadline. The maximum penalty for failure to submit a revised document prior to the submission deadline is rejection of the CPUE series.*

***Justification of Working Group Recommendation***

This paper explored two different ways of standardizing CPUE for this component of the red snapper fishery. One was using a Delta lognormal approach, which models the presence or absence of encountering the species on that trip as zero or one using a binomial model, separately from the positive observations of actual CPUE using a lognormal model. The second approach was to also use a Delta model, however a censored lognormal model was used to model the positive observations of CPUE. The reason for using this model was to capture the effect of the bag limit on CPUE, which had become increasingly strict over the time series.

The working group recommended the use of the censored approach to standardizing CPUE and recommended this index be used in the assessment. The group felt that the censored approach was able to account for the bag limit effect which would otherwise give the artificial perception that abundance had decreased over the time series. In addition, the group decided to recommend this index because it covers a long time series.

# Evaluation of Abundance Indices of Red Snapper for SEDAR 31
# Recreational Headboat East (SEDAR31-DW-33 updated 10/12/2012)
# Data Used in Analysis: NMFS Headboat Survey

**DESCRIPTION OF THE DATA SOURCE**

1. Fishery Independent Indices

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe the survey design (e.g. fixed sampling sites, random stratified sampling), location, seasons/months and years of sampling. | ✓ | | | |
| B. Describe sampling methodology (e.g. gear, vessel, soak time etc.) | ✓ | | | |
| C. Describe any changes in sampling methodology (e.g. gear, vessel, sample design etc.) | ✓ | | | |
| D. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | ✓ | | | |
| E. What species or species assemblages are targeted by this survey (e.g. red snapper, reef fish, pelagic). | ✓ | | | |
| F. Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | ✓ | | | |

2. Fishery Dependent Indices

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe the data source and type of fishery (e.g. commercial handline, commercial longline, recreational hook and line etc.). | | | | ✓ |
| B. Describe any changes to reporting requirements, variables reported, etc. | | | | ✓ |
| C. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | | | | ✓ |
| D Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | | ✓ | | |

**METHODS**

1. Data Reduction and Exclusions

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe any data exclusions (e.g. gears, fishing modes, sampling areas etc.). Report the number of records removed and justify removal. | | | | ✓ |
| B. Describe data reduction techniques (if any) used to address targeting (e.g. Stephens and MacCall, 2004; gear configuration, species assemblage etc). | | | | ✓ |
| C. Discuss procedures used to identify outliers. How many were identified? Were they excluded? | | | | ✓ |

**Working Group Comments:**

see sedar31-dw-10

## 2. Management Regulations (for FD Indices)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide (or cite) history of management regulations (e.g. bag limits, size limits, trip limits, closures etc.). | | | | ✓ |
| B. Describe the effects (if any) of management regulations on CPUE | | | | ✓ |
| C. Discuss methods used (if any) to minimize the effects of management measures on the CPUE series. | | | | ✓ |

## 3. Describe Analysis Dataset (after exclusions and other treatments)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide tables and/or figures of number of observations by factors (including year, area, etc.) and interaction terms. | | | | ✓ |
| B. Include tables and/or figures of number of positive observations by factors and interaction terms. | | | | ✓ |
| C. Include tables and/or figures of the proportion positive observations by factors and interaction terms. | | | | ✓ |
| D. Include tables and/or figures of average (unstandardized) CPUE by factors and interaction terms. | | | | ✓ |
| E. Include annual maps of locations of survey sites (or fishing trips) and associated catch rates ***OR*** supply the raw data needed to construct these maps (Observation, Year, Latitude, Longitude (or statistical grid, area), Catch, Effort). | | ✓ | | |
| F. Describe the effort variable and the units. If more than one effort variable is present in the dataset, justify selection. | | | | ✓ |
| G. What are the units of catch (e.g. numbers or biomass, whole weight, gutted weight, kilograms, pounds). | | | | ✓ |

## 4. Model Standardization

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe model structure (e.g. delta-lognormal) | | | | ✓ |
| B. Describe construction of GLM components (e.g. forward selection from null etc.) | | | | ✓ |
| C. Describe inclusion criteria for factors and interactions terms. | | | | ✓ |
| D. Were YEAR*FACTOR interactions included in the model? If so, how (e.g. fixed effect, random effect)? Were random effects tested for significance using a likelihood ratio test? | ✓ | | | |
| E. Provide a table summarizing the construction of the GLM components. | | | | ✓ |
| F. Summarize model statistics of the mixed model formulation(s) (e.g. log likelihood, AIC, BIC etc.) | | | | ✓ |
| G. Report convergence statistics. | | | | ✓ |

## Working Group Comments:

covered eastern Gulf of Mexico (Florida, Alabama, and Mississippi)

**MODEL DIAGNOSTICS**

***Comment: Other model structures are possible and acceptable. Please provide appropriate diagnostics to the CPUE indices working group.***

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| **1. Binomial Component** | | | | |
| A. Include plots of the chi-square residuals by factor. | | | | ✓ |
| B. Include plots of predicted and observed proportion of positive trips by year and factor (e.g. year*area) | | | | ✓ |
| C. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | | | | ✓ |
| **2. Lognormal/Gamma Component** | | | | |
| A. Include histogram of log(CPUE) or a histogram of the residuals of the model on CPUE. Overlay the expected distribution. | | ✓ | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | | | | ✓ |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | | | | ✓ |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | | ✓ | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | | ✓ | | |
| F. Include plots of the residuals by factor | | ✓ | | |
| **3. Poisson Component** | | | | |
| A. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | ✓ | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | ✓ | | | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | ✓ | | | |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | ✓ | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | ✓ | | | |
| **4. Zero-inflated model** | | | | |
| A. Include ROC curve to quantify goodness of fit. | ✓ | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor). | ✓ | | | |
| C. Include QQ-plot (e.g. Student dev. residuals vs. theoretical quantiles), Overlay expected distribution. | ✓ | | | |

**Working Group Comments:**

***The feasibility of this diagnostic is still under review.***

**MODEL DIAGNOSTICS (CONT.)**

| Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|

**Working Group Comments:**

| | | | | | |
|---|---|---|---|---|---|
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | ✓ | | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | ✓ | | | | |

## MODEL RESULTS

| | | | | | |
|---|---|---|---|---|---|
| A. Tables of Nominal CPUE, Standardized CPUE, Observations, Positive Observations, Proportion Positive Observations and Coefficients of Variation (CVs). Other statistics may also be appropriate to report | | | | ✓ | |
| B. Figure of Nominal and Standardized Indices with measure of variance (i.e. CVs). | | | | ✓ | |

## IF MULTIPLE MODEL STRUCTURES WERE CONSIDERED:

(***Note: this is always recommended but required when model diagnostics are poor***.)

| | | | | | Comments |
|---|---|---|---|---|---|
| 1. Plot of resulting indices and estimates of variance | | | | ✓ | |
| 2. Table of model statistics (e.g. AIC criteria) | | ✓ | | | cannot compare using AIC |

| | *Date Received* | *Workshop Recommendation* | *Revision Deadline **** | *Author and Rapporteur Signatures* |
|---|---|---|---|---|
| **First Submission** | 8/20/2012 | recommend for use | | |
| **Revision** | 10/12/2012 | recommend for use | | |

*The revision deadline is negotiated by the author, the SEDAR coordinator and the CPUE rapporteur. The author* **DOES NOT** *commit to any* **LEGAL OBLIGATION** *by agreeing to submit a manuscript before this deadline. The maximum penalty for failure to submit a revised document prior to the submission deadline is rejection of the CPUE series.*

***Justification of Working Group Recommendation***

This paper explored two different ways of standardizing CPUE for this component of the red snapper fishery. One was using a Delta lognormal approach, which models the presence or absence of encountering the species on that trip as zero or one using a binomial model, separately from the positive observations of actual CPUE using a lognormal model. The second approach was to also use a Delta model, however a censored lognormal model was used to model the positive observations of CPUE. The reason for using this model was to capture the effect of the bag limit on CPUE, which had become increasingly strict over the time series.

The working group recommended the use of the censored approach to standardizing CPUE and recommended this index be used in the assessment. The group felt that the censored approach was able to account for the bag limit effect which would otherwise give the artificial perception that abundance had decreased over the time series. In addition, the group decided to recommend this index because it covers a long time series.

# Evaluation of Abundance Indices of Red Snapper for SEDAR 31
# Recreational Headboat West (SEDAR31-DW-33 updated 10/12/2012)
# Data Used in Analysis: NMFS Headboat Survey

**DESCRIPTION OF THE DATA SOURCE**

**Working Group Comments:** see sedar31-dw-10

1. Fishery Independent Indices

| Item | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe the survey design (e.g. fixed sampling sites, random stratified sampling), location, seasons/months and years of sampling. | ✓ | | | |
| B. Describe sampling methodology (e.g. gear, vessel, soak time etc.) | ✓ | | | |
| C. Describe any changes in sampling methodology (e.g. gear, vessel, sample design etc.) | ✓ | | | |
| D. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | ✓ | | | |
| E. What species or species assemblages are targeted by this survey (e.g. red snapper, reef fish, pelagic). | ✓ | | | |
| F. Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | ✓ | | | |

2. Fishery Dependent Indices

| Item | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe the data source and type of fishery (e.g. commercial handline, commercial longline, recreational hook and line etc.). | | | | ✓ |
| B. Describe any changes to reporting requirements, variables reported, etc. | | | | ✓ |
| C. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | | | | ✓ |
| D Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | | ✓ | | |

**METHODS**

1. Data Reduction and Exclusions

| Item | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe any data exclusions (e.g. gears, fishing modes, sampling areas etc.). Report the number of records removed and justify removal. | | | | ✓ |
| B. Describe data reduction techniques (if any) used to address targeting (e.g. Stephens and MacCall, 2004; gear configuration, species assemblage etc). | | | | ✓ |
| C. Discuss procedures used to identify outliers. How many were identified? Were they excluded? | | | | ✓ |

## 2. Management Regulations (for FD Indices)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide (or cite) history of management regulations (e.g. bag limits, size limits, trip limits, closures etc.). | | | | ✓ |
| B. Describe the effects (if any) of management regulations on CPUE | | | | ✓ |
| C. Discuss methods used (if any) to minimize the effects of management measures on the CPUE series. | | | | ✓ |

## 3. Describe Analysis Dataset (after exclusions and other treatments)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide tables and/or figures of number of observations by factors (including year, area, etc.) and interaction terms. | | | | ✓ |
| B. Include tables and/or figures of number of positive observations by factors and interaction terms. | | | | ✓ |
| C. Include tables and/or figures of the proportion positive observations by factors and interaction terms. | | | | ✓ |
| D. Include tables and/or figures of average (unstandardized) CPUE by factors and interaction terms. | | | | ✓ |
| E. Include annual maps of locations of survey sites (or fishing trips) and associated catch rates ***OR*** supply the raw data needed to construct these maps (Observation, Year, Latitude, Longitude (or statistical grid, area), Catch, Effort). | | ✓ | | |
| F. Describe the effort variable and the units. If more than one effort variable is present in the dataset, justify selection. | | | | ✓ |
| G. What are the units of catch (e.g. numbers or biomass, whole weight, gutted weight, kilograms, pounds). | | | | ✓ |

## 4. Model Standardization

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe model structure (e.g. delta-lognormal) | | | | ✓ |
| B. Describe construction of GLM components (e.g. forward selection from null etc.) | | | | ✓ |
| C. Describe inclusion criteria for factors and interactions terms. | | | | ✓ |
| D. Were YEAR*FACTOR interactions included in the model? If so, how (e.g. fixed effect, random effect)? Were random effects tested for significance using a likelihood ratio test? | ✓ | | | |
| E. Provide a table summarizing the construction of the GLM components. | | | | ✓ |
| F. Summarize model statistics of the mixed model formulation(s) (e.g. log likelihood, AIC, BIC etc.) | | | | ✓ |
| G. Report convergence statistics. | | | | ✓ |

**Working Group Comments:**

covered western Gulf of Mexico (Louisiana and Texas)

## MODEL DIAGNOSTICS

***Comment: Other model structures are possible and acceptable. Please provide appropriate diagnostics to the CPUE indices working group.***

| Item | Not Applicable | Absent | Incomplete | Complete | Working Group Comments: |
|---|---|---|---|---|---|
| **1. Binomial Component** | | | | | |
| A. Include plots of the chi-square residuals by factor. | | | | ✓ | |
| B. Include plots of predicted and observed proportion of positive trips by year and factor (e.g. year*area) | | | | ✓ | |
| C. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | | | | ✓ | |
| **2. Lognormal/Gamma Component** | | | | | |
| A. Include histogram of log(CPUE) or a histogram of the residuals of the model on CPUE. Overlay the expected distribution. | | ✓ | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | | | | ✓ | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | | | | ✓ | |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | | ✓ | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | | ✓ | | | |
| F. Include plots of the residuals by factor | | ✓ | | | |
| **3. Poisson Component** | | | | | |
| A. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | ✓ | | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | ✓ | | | | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | ✓ | | | | |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | ✓ | | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | ✓ | | | | ***The feasibility of this diagnostic is still under review.*** |
| **4. Zero-inflated model** | | | | | |
| A. Include ROC curve to quantify goodness of fit. | ✓ | | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor). | ✓ | | | | |
| C. Include QQ-plot (e.g. Student dev. residuals vs. theoretical quantiles), Overlay expected distribution. | ✓ | | | | |

## MODEL DIAGNOSTICS (CONT.)

| | Not Applicable | Absent | Incomplete | Complete | Working Group Comments: |
|---|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | ✓ | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | ✓ | | | |

**MODEL RESULTS**

| | | | | |
|---|---|---|---|---|
| A. Tables of Nominal CPUE, Standardized CPUE, Observations, Positive Observations, Proportion Positive Observations and Coefficients of Variation (CVs). Other statistics may also be appropriate to report | | | | ✓ |
| B. Figure of Nominal and Standardized Indices with measure of variance (i.e. CVs). | | | | ✓ |

**IF MULTIPLE MODEL STRUCTURES WERE CONSIDERED**:

(***Note: this is always recommended but required when model diagnostics are poor***.)

| | | | | |
|---|---|---|---|---|
| 1. Plot of resulting indices and estimates of variance | | | | ✓ |
| 2. Table of model statistics (e.g. AIC criteria) | | ✓ | | |

cannot compare using AIC

| | *Date Received* | *Workshop Recommendation* | *Revision Deadline **** | *Author and Rapporteur Signatures* |
|---|---|---|---|---|
| **First Submission** | 8/20/2012 | recommend for use | | |
| **Revision** | 10/12/2012 | recommend for use | | |

*The revision deadline is negotiated by the author, the SEDAR coordinator and the CPUE rapporteur. The author* ***DOES NOT*** *commit to any* ***LEGAL OBLIGATION*** *by agreeing to submit a manuscript before this deadline. The maximum penalty for failure to submit a revised document prior to the submission deadline is rejection of the CPUE series.*

***Justification of Working Group Recommendation***

This paper explored two different ways of standardizing CPUE for this component of the red snapper fishery. One was using a Delta lognormal approach, which models the presence or absence of encountering the species on that trip as zero or one using a binomial model, separately from the positive observations of actual CPUE using a lognormal model. The second approach was to also use a Delta model, however a censored lognormal model was used to model the positive observations of CPUE. The reason for using this model was to capture the effect of the bag limit on CPUE, which had become increasingly strict over the time series.

The working group recommended the use of the censored approach to standardizing CPUE and recommended this index be used in the assessment. The group felt that the censored approach was able to account for the bag limit effect which would otherwise give the artificial perception that abundance had decreased over the time series. In addition, the group decided to recommend this index because it covers a long time series.

## DESCRIPTION OF THE DATA SOURCE

### 1. Fishery Independent Indices

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe the survey design (e.g. fixed sampling sites, random stratified sampling), location, seasons/months and years of sampling. | | | | |
| B. Describe sampling methodology (e.g. gear, vessel, soak time etc.) | | | | |
| C. Describe any changes in sampling methodology (e.g. gear, vessel, sample design etc.) | | | | |
| D. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | | | | |
| E. What species or species assemblages are targeted by this survey (e.g. red snapper, reef fish, pelagic). | | | | |
| F. Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | | | | |

### 2. Fishery Dependent Indices

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe the data source and type of fishery (e.g. commercial handline, commercial longline, recreational hook and line etc.). | | | | ✓ |
| B. Describe any changes to reporting requirements, variables reported, etc. | | | | ✓ |
| C. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | | | | ✓ |
| D Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | ✓ | | | ✓ |

## METHODS

### 1. Data Reduction and Exclusions

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe any data exclusions (e.g. gears, fishing modes, sampling areas etc.). Report the number of records removed and justify removal. | | | | ✓ |
| B. Describe data reduction techniques (if any) used to address targeting (e.g. Stephens and MacCall, 2004; gear configuration, species assemblage etc). | | | | ✓ |
| C. Discuss procedures used to identify outliers. How many were identified? Were they excluded? | | | | ✓ |

## Working Group Comments:

see SEDAR7-DW-47 and SEDAR7-AW-9 for details

2D unknown, data are pounds landed no size data reported

## 2. Management Regulations (for FD Indices)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide (or cite) history of management regulations (e.g. bag limits, size limits, trip limits, closures etc.). | | | | ✓ |
| B. Describe the effects (if any) of management regulations on CPUE | | | | ✓ |
| C. Discuss methods used (if any) to minimize the effects of management measures on the CPUE series. | | | | ✓ |

## 3. Describe Analysis Dataset (after exclusions and other treatments)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide tables and/or figures of number of observations by factors (including year, area, etc.) and interaction terms. | | | ✓ | |
| B. Include tables and/or figures of number of positive observations by factors and interaction terms. | | | ✓ | |
| C. Include tables and/or figures of the proportion positive observations by factors and interaction terms. | | | ✓ | |
| D. Include tables and/or figures of average (unstandardized) CPUE by factors and interaction terms. | | | ✓ | |
| E. Include annual maps of locations of survey sites (or fishing trips) and associated catch rates ***OR*** supply the raw data needed to construct these maps (Observation, Year, Latitude, Longitude (or statistical grid, area), Catch, Effort). | | | ✓ | |
| F. Describe the effort variable and the units. If more than one effort variable is present in the dataset, justify selection. | | | | ✓ |
| G. What are the units of catch (e.g. numbers or biomass, whole weight, gutted weight, kilograms, pounds). | | | | ✓ |

## 4. Model Standardization

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe model structure (e.g. delta-lognormal) | | | | ✓ |
| B. Describe construction of GLM components (e.g. forward selection from null etc.) | | | | ✓ |
| C. Describe inclusion criteria for factors and interactions terms. | | | | ✓ |
| D. Were YEAR*FACTOR interactions included in the model? If so, how (e.g. fixed effect, random effect)? Were random effects tested for significance using a likelihood ratio test? | | | | ✓ |
| E. Provide a table summarizing the construction of the GLM components. | | | | ✓ |
| F. Summarize model statistics of the mixed model formulation(s) (e.g. log likelihood, AIC, BIC etc.) | | | ✓ | |
| G. Report convergence statistics. | | | ✓ | |

**Working Group Comments:**

see SEDAR7-DW-47 and SEDAR7-AW-9 for details

4F,G. Available on demand

## MODEL DIAGNOSTICS

***Comment: Other model structures are possible and acceptable. Please provide appropriate diagnostics to the CPUE indices working group.***

| Item | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| **1. Binomial Component** | | | | |
| A. Include plots of the chi-square residuals by factor. | | | | ✓ |
| B. Include plots of predicted and observed proportion of positive trips by year and factor (e.g. year*area) | | | ✓ | |
| C. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | | | ✓ | |
| **2. Lognormal/Gamma Component** | | | | |
| A. Include histogram of log(CPUE) or a histogram of the residuals of the model on CPUE. Overlay the expected distribution. | | | | ✓ |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | | | ✓ | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | | | | ✓ |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | | | ✓ | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | | | ✓ | |
| F. Include plots of the residuals by factor | | | | ✓ |
| **3. Poisson Component** | | | | |
| A. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | | | | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | | | | |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | | | | |
| **4. Zero-inflated model** | | | | |
| A. Include ROC curve to quantify goodness of fit. | | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor). | | | | |
| C. Include QQ-plot (e.g. Student dev. residuals vs. theoretical quantiles), Overlay expected distribution. | | | | |

**Working Group Comments:**

see SEDAR7-DW-47 and SEDAR7-AW-9 for details

1C. Available on demand

2B,D,E. Available on demand

***The feasibility of this diagnostic is still under review.***

## MODEL DIAGNOSTICS (CONT.)

| Not Applicable | Absent | Incomplete | Complete | Working Group Comments: |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | | | | |

## MODEL RESULTS

| | | | | |
|---|---|---|---|---|
| A. Tables of Nominal CPUE, Standardized CPUE, Observations, Positive Observations, Proportion Positive Observations and Coefficients of Variation (CVs). Other statistics may also be appropriate to report | | | | ✓ |
| B. Figure of Nominal and Standardized Indices with measure of variance (i.e. CVs). | | | | ✓ |

## IF MULTIPLE MODEL STRUCTURES WERE CONSIDERED:

(***Note: this is always recommended but required when model diagnostics are poor***.)

| | | | | |
|---|---|---|---|---|
| 1. Plot of resulting indices and estimates of variance | | | | |
| 2. Table of model statistics (e.g. AIC criteria) | | | | |

| | *Date Received* | *Workshop Recommendation* | *Revision Deadline **** | *Author and Rapporteur Signatures* |
|---|---|---|---|---|
| **First Submission** | 9/7/12 | accept as submitted | | |
| **Revision** | | | | |

*The revision deadline is negotiated by the author, the SEDAR coordinator and the CPUE rapporteur. The author **DOES NOT** commit to any **LEGAL OBLIGATION** by agreeing to submit a manuscript before this deadline. The maximum penalty for failure to submit a revised document prior to the submission deadline is rejection of the CPUE series.*

***Justification of Working Group Recommendation***

The index was presented as prepared for the 2009 red snapper update, no additional analyses were completed for this data workshop. The working group recommended that the index be accepted as presented.

**DESCRIPTION OF THE DATA SOURCE**

1. Fishery Independent Indices

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe the survey design (e.g. fixed sampling sites, random stratified sampling), location, seasons/months and years of sampling. | | | | |
| B. Describe sampling methodology (e.g. gear, vessel, soak time etc.) | | | | |
| C. Describe any changes in sampling methodology (e.g. gear, vessel, sample design etc.) | | | | |
| D. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | | | | |
| E. What species or species assemblages are targeted by this survey (e.g. red snapper, reef fish, pelagic). | | | | |
| F. Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | | | | |

2. Fishery Dependent Indices

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe the data source and type of fishery (e.g. commercial handline, commercial longline, recreational hook and line etc.). | | | | ✓ |
| B. Describe any changes to reporting requirements, variables reported, etc. | | | | ✓ |
| C. Describe the variables reported in the data set (e.g. location, time, temperature, catch, effort etc.). | | | | ✓ |
| D Describe the size/age range that the index applies to. Include supporting figures (e.g. size comp) if available. | ✓ | | | ✓ |

**METHODS**

1. Data Reduction and Exclusions

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe any data exclusions (e.g. gears, fishing modes, sampling areas etc.). Report the number of records removed and justify removal. | | | | ✓ |
| B. Describe data reduction techniques (if any) used to address targeting (e.g. Stephens and MacCall, 2004; gear configuration, species assemblage etc). | | | | ✓ |
| C. Discuss procedures used to identify outliers. How many were identified? Were they excluded? | | | | ✓ |

**Working Group Comments:**

see SEDAR7-DW-47 and SEDAR7-AW-9 for details

2D unknown, data are pounds landed no size data reported

## 2. Management Regulations (for FD Indices)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide (or cite) history of management regulations (e.g. bag limits, size limits, trip limits, closures etc.). | | | | ✓ |
| B. Describe the effects (if any) of management regulations on CPUE | | | | ✓ |
| C. Discuss methods used (if any) to minimize the effects of management measures on the CPUE series. | | | | ✓ |

## 3. Describe Analysis Dataset (after exclusions and other treatments)

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Provide tables and/or figures of number of observations by factors (including year, area, etc.) and interaction terms. | | | ✓ | |
| B. Include tables and/or figures of number of positive observations by factors and interaction terms. | | | ✓ | |
| C. Include tables and/or figures of the proportion positive observations by factors and interaction terms. | | | ✓ | |
| D. Include tables and/or figures of average (unstandardized) CPUE by factors and interaction terms. | | | ✓ | |
| E. Include annual maps of locations of survey sites (or fishing trips) and associated catch rates ***OR*** supply the raw data needed to construct these maps (Observation, Year, Latitude, Longitude (or statistical grid, area), Catch, Effort). | | | ✓ | |
| F. Describe the effort variable and the units. If more than one effort variable is present in the dataset, justify selection. | | | | ✓ |
| G. What are the units of catch (e.g. numbers or biomass, whole weight, gutted weight, kilograms, pounds). | | | | ✓ |

## 4. Model Standardization

| | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| A. Describe model structure (e.g. delta-lognormal) | | | | ✓ |
| B. Describe construction of GLM components (e.g. forward selection from null etc.) | | | | ✓ |
| C. Describe inclusion criteria for factors and interactions terms. | | | | ✓ |
| D. Were YEAR*FACTOR interactions included in the model? If so, how (e.g. fixed effect, random effect)? Were random effects tested for significance using a likelihood ratio test? | | | | ✓ |
| E. Provide a table summarizing the construction of the GLM components. | | | | ✓ |
| F. Summarize model statistics of the mixed model formulation(s) (e.g. log likelihood, AIC, BIC etc.) | | | ✓ | |
| G. Report convergence statistics. | | | ✓ | |

**Working Group Comments:**

see SEDAR7-DW-47 and SEDAR7-AW-9 for details

4F,G. Available on demand

## MODEL DIAGNOSTICS

***Comment: Other model structures are possible and acceptable. Please provide appropriate diagnostics to the CPUE indices working group.***

| Item | Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|---|
| **1. Binomial Component** | | | | |
| A. Include plots of the chi-square residuals by factor. | ✓ | | | |
| B. Include plots of predicted and observed proportion of positive trips by year and factor (e.g. year*area) | ✓ | | | |
| C. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | ✓ | | | |
| **2. Lognormal/Gamma Component** | | | | |
| A. Include histogram of log(CPUE) or a histogram of the residuals of the model on CPUE. Overlay the expected distribution. | | | | ✓ |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | | | ✓ | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | | | | ✓ |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | | | ✓ | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | | | ✓ | |
| F. Include plots of the residuals by factor | | | | ✓ |
| **3. Poisson Component** | | | | |
| A. Report overdispersion parameter and other fit statistics (e.g. chi-square / degrees of freedom). | | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor. | | | | |
| C. Include QQ-plot – (e.g. Student deviance residuals vs. theoretical quantiles), Overlay expected distribution. | | | | |
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | | | | |
| **4. Zero-inflated model** | | | | |
| A. Include ROC curve to quantify goodness of fit. | | | | |
| B. Include plots describing error distribution (e.g. Studentized residuals vs. linear predictor). | | | | |
| C. Include QQ-plot (e.g. Student dev. residuals vs. theoretical quantiles), Overlay expected distribution. | | | | |

**Working Group Comments:**

see SEDAR7-DW-47 and SEDAR7-AW-9 for details

1. Index was lognormal on positives only

2B,D,E. Available on demand

***The feasibility of this diagnostic is still under review.***

## MODEL DIAGNOSTICS (CONT.)

| Not Applicable | Absent | Incomplete | Complete |
|---|---|---|---|

**Working Group Comments:**

| | | | | |
|---|---|---|---|---|
| D. Include diagnostic plot for variance function (e.g. square root of std residuals vs. fitted values). Overlay expected distribution. | | | | |
| E. Include diagnostic plot for link function (e.g. linear response variable vs. linear predictor). Overlay expected distribution. | | | | |

## MODEL RESULTS

| | | | | |
|---|---|---|---|---|
| A. Tables of Nominal CPUE, Standardized CPUE, Observations, Positive Observations, Proportion Positive Observations and Coefficients of Variation (CVs). Other statistics may also be appropriate to report | | | | ✓ |
| B. Figure of Nominal and Standardized Indices with measure of variance (i.e. CVs). | | | | ✓ |

## IF MULTIPLE MODEL STRUCTURES WERE CONSIDERED:

(***Note: this is always recommended but required when model diagnostics are poor***.)

| | | | | |
|---|---|---|---|---|
| 1. Plot of resulting indices and estimates of variance | | | | |
| 2. Table of model statistics (e.g. AIC criteria) | | | | |

| | *Date Received* | *Workshop Recommendation* | *Revision Deadline **** | *Author and Rapporteur Signatures* |
|---|---|---|---|---|
| **First Submission** | 9/7/12 | accept as submitted | | |
| **Revision** | | | | |

*The revision deadline is negotiated by the author, the SEDAR coordinator and the CPUE rapporteur. The author* ***DOES NOT*** *commit to any* ***LEGAL OBLIGATION*** *by agreeing to submit a manuscript before this deadline. The maximum penalty for failure to submit a revised document prior to the submission deadline is rejection of the CPUE series.*

***Justification of Working Group Recommendation***

The index was presented as prepared for the 2009 red snapper update, no additional analyses were completed for this data workshop. The working group recommended that the index be accepted as presented.

# SEDAR

Southeast Data, Assessment, and Review

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# SEDAR 31

## Gulf of Mexico Red Snapper

## SECTION III: Assessment Workshop Report

**April 2013**

SEDAR
4055 Faber Place Drive, Suite 201
North Charleston, SC 29405

**Table of Contents**

# 1. Workshop Proceedings

## 1.1 Introduction

### *1.1.1 Workshop Time and Place*

The SEDAR 31 Assessment Workshop for Gulf of Mexico Red Snapper was conducted as a workshop held January 28 through February 1, 2013 at the Courtyard Coconut Grove in Miami, FL. Eight webinars were held after the in-person workshop between February 21st and April 18th, 2013.

### *1.1.2 Terms of Reference*

1. Review and provide justification for any changes in data following the data workshop and any analyses suggested by the data workshop. Summarize data as used in each assessment model.
2. Develop population assessment models that are compatible with available data and document input data, model assumptions and configuration, and equations for each model considered. Consider past modeling approaches (SEDAR 7 (2004), SEDAR 7 Update (2009)).
3. Incorporate known applicable environmental covariates into the selected model, and provide justification for why any of those covariates cannot be included at the time of the assessment.
4. Provide estimates of stock population parameters, if feasible.
    - Include fishing mortality, abundance, biomass, selectivity, stock-recruitment relationship, and other parameters as appropriate given data availability and modeling approaches
    - Include appropriate and representative measures of precision for parameter estimates
5. Characterize uncertainty in the assessment and estimated values.
    - Consider uncertainty in input data, modeling approach, and model configuration
    - Provide appropriate measures of model performance, reliability, and ‘goodness of fit’
    - Provide a continuity model consistent with the prior assessment configuration, if one exists, updated to include the most recent observations. Alternative approaches to a strict continuity run that distinguish between model, population, and input data influences on findings, may be considered
    - Provide measures of uncertainty for estimated parameters
6. Provide yield-per-recruit, spawner-per-recruit, and stock-recruitment evaluations.

7. Provide estimates of stock status for management criteria consistent with applicable FMPs, proposed FMPs and Amendments, other ongoing or proposed management programs, and National Standards for each model run presented for review.
    - Evaluate existing or proposed management criteria as specified in the management summary
    - Recommend proxy values when necessary
8. Provide declarations of stock status relative to management benchmarks, or alternative data poor approaches if necessary.
9. Project future stock conditions (biomass, abundance, and exploitation) and develop rebuilding schedules if warranted; include estimated generation time. Stock projections (in both biomass and number of fish) shall be developed in accordance with the following:

    a) If stock is overfished:

    F=0, FCurrent, FMSY, FOY

    F=FRebuild (max that permits rebuild in allowed time)

    b) If stock is undergoing overfishing:

    F= FCurrent, FMSY, FOY

    c) If stock is neither overfished nor undergoing overfishing:

    F= FCurrent, FMSY, FOY

    d) If data limitations preclude classic projections (i.e. A, B, C above), explore alternate models to provide management advice

10. Provide a probability density function for the base model, or a combination of models that represent alternate states of nature, presented for review.
    - Determine the yield associated with a probability of exceeding OFL at P* values of 30% to 50% in single percentage increments for use with the Tier 1 ABC control rule
    - Provide justification for the weightings used in producing combinations of models
11. Provide recommendations for future research and data collection.
    - Be as specific as practicable in describing sampling design and intensity
    - Emphasize items which will improve future assessment capabilities and reliability
    - Recommend an appropriate interval and type for the next assessment
12. Prepare a spreadsheet containing all model parameter estimates, all relevant population information resulting from model estimates, and projection and simulation exercises. Include all data included in assessment report tables and all data that support assessment workshop figures.
13. Complete the Assessment Workshop Report (Section III: SEDAR Stock Assessment Report).

### *1.1.3 List of Participants*

***Workshop Panel***

| **Appointee** | **Function** | **Affiliation** |
|---|---|---|
| **Analytical Team** | | |
| Brian Linton | Lead Assessment Scientist I | NMFS Miami |
| Steve Saul | Assessment Analyst | NMFS Miami |
| Nancie Cummings | Assessment Analyst | NMFS Miami |
| Jakob Tetzlaff | Assessment Analyst | NMFS Miami |
| **Panelists** | | |
| Luiz Barbieri | Panelist | Gulf SSC |
| Clay Porch | Panelist | NMFS Miami |
| Sean Powers | Panelist | Gulf SSC |
| Joe Powers | Panelist | Gulf SSC |
| Greg Stunz | Panelist | Gulf SSC |
| **Observers** | | |
| Donny Waters | Observer | Fisherman |
| Mike Thierry | Observer | Fisherman |
| ***Staff*** | | |
| Ryan Rindone | SEDAR 31 Coordinator | SEDAR |
| Charlotte Schiaffo | Administrative Support | Gulf Council |
| Carrie Simmons | Fishery Biologist | Gulf Council |
| Steven Atran | Population Dynamics | Gulf Council |
| Jessica Stephen | Fishery Biologist | SERO |
| Shannon Calay | Analytical Support | NMFS Miami |
| John Walter | Analytical Support | NMFS Miami |
| Mandy Karnaukas | Analytical Support | NMFS Miami |

### *1.1.4 List of Assessment Workshop Working Papers*

| | | |
|---|---|---|
| SEDAR31-AW01 | Headboat Discards for Red Snapper in the Gulf of Mexico | Matter and Walter |
| SEDAR31-AW02 | Accounting for changes in fishing mortality when comparing density-dependent to density-independent mortality in Gulf of Mexico red | Vincent |

| | | |
|---|---|---|
| | snapper | |
| SEDAR31-AW03 | Modeling the dependence of batch fecundity and spawning frequency on size and age for use in stock assessments of red snapper in U.S. Gulf of Mexico waters | Porch, Fitzhugh, and Linton |
| SEDAR31-AW04 | The Effect of Hook Type on Red Snapper Catch | Saul, Walter, Shipp, Powers, and Powers |
| SEDAR31-AW05 | Age Composition of Red Snapper Bycatch in the Gulf of Mexico Shrimp Fishery, 1997-2011 | Linton |
| SEDAR31-AW06 | Shrimp trawl index of abundance for Gulf of Mexico red snapper, 1967-1989 | Linton |
| SEDAR31-AW07 | Red Snapper Abundance Indices from Combined Bottom Trawl Surveys in the Eastern Gulf of Mexico | Pollack, Ingram, and Henwood |
| SEDAR31-AW08 | A proposed methodology to incorporate ROV length data into red snapper stock assessments | Walter, DeVries, Drymon, Patterson, Powers, and Williams |
| SEDAR31-AW09 | Reconstructed time series of offshore shrimp trawl effort in the Gulf of Mexico from 1945 to 1972 for use in the SEDAR 31 Gulf of Mexico red snapper assessment | Porch |
| SEDAR31-AW10 | Use of the Connectivity Modeling System to estimate movements of red snapper recruits in the northern Gulf of Mexico | Karnauskas, Walter, and Paris |
| SEDAR31-AW11 | Estimating historical recreational angler effort in the Gulf of Mexico for the private, charter, and headboat fishing modes | Rios |

| | | |
|---|---|---|
| SEDAR31-AW12 | Estimation of hook selectivity on red snapper (*Lutjanus campechanus*) during a fishery independent survey of natural reefs in the Gulf of Mexico | Pollack, Campbell, and Driggers |
| SEDAR31-AW13 | Dauphin Island Sea Lab Bottom Longline Survey incorporation into the NMFS Bottom Longline Survey | Ingram |
| SEDAR31-AW14 | Combined Index for Florida Fish and Wildlife Research Institute and NMFS Panama City Video Surveys | Ingram |
| SEDAR31-AW15 | Age frequency distributions estimated with reweighting methods for red snappers in the Gulf of Mexico from 1991 to 2011 | Chih |
| SEDAR31-AW16 | Changes in lengths-at-age and size selectivity of red snappers in the Gulf of Mexico from 2002 to 2011 | Chih |

### 1.2.1 Panel Recommendations and Comment on Terms of Reference

#### *1.2.1 Term of Reference 1*

*Review and provide justification for any changes in data following the data workshop and any analyses suggested by the data workshop. Summarize data as used in each assessment model.*

The model data inputs are summarized in Section 2. Following the data workshop, there were significant changes in many of the data inputs including: natural mortality, length-length and length-weight conversions, growth, age composition and length composition. In addition, some inputs were developed during the assessment workshop process, including explosive oil rig removal estimates and depth-related release mortality.

#### *1.2.2 Term of Reference 2*

*Develop population assessment models that are compatible with available data and document input data, model assumptions and configuration, and equations for each model considered. Consider past modeling approaches (SEDAR 7 (2004), SEDAR 7 Update (2009)).*

A fully integrated length based statistical-catch-at-age model configured using Stock Synthesis was used for the assessment. The model configuration and data inputs are described in Section 3.1.1. See Section 2 for a complete description of all data inputs.

### *1.2.3 Term of Reference 3*

*Incorporate known applicable environmental covariates into the selected model, and provide justification for why any of those covariates cannot be included at the time of the assessment.*

An index of predicted recruitment was developed using environmental covariates, and presented during the SEDAR 31 assessment webinars. This index was used in a sensitivity analysis to be presented to the RW.

### *1.2.4 Term of Reference 4*

*Provide estimates of stock population parameters*

- *Include fishing mortality, abundance, biomass, selectivity, stock-recruitment relationship, and other parameters as appropriate given data availability and modeling approaches*
- *Include appropriate and representative measures of precision for parameter estimates.*

Estimates of assessment model parameters and their associated standard errors are reported in Section 3.2.2 and Table 3.2.2.2. Estimates of assessment model parameters and standard deviations from the bootstrap analysis are presented in Table 3.2.2.3. Estimates of stock biomass, spawning stock biomass, recruitment, and fishing mortality are presented in Tables 3.2.4.1-3.2.4.6.

### *1.2.5 Term of Reference 5*

*Characterize uncertainty in the assessment and estimated values.*

- *Consider uncertainty in input data, modeling approach, and model configuration*
- *Provide appropriate measures of model performance, reliability, and 'goodness of fit'*
- *Provide a continuity model consistent with the prior assessment configuration, if one exists, updated to include the most recent observations. Alternative approaches to a strict continuity run that distinguish between model, population, and input data influences on findings, may be considered*
- *Provide measures of uncertainty for estimated parameters*

Model performance and reliability are characterized in Section 3.2. Uncertainty in the assessment inputs and estimated values were characterized using sensitivity analyses and a parametric bootstrap approach. Results of the sensitivity analysis are characterized in Section 3.2.7 and Tables X.X.X-X.X.X (to be presented at the Review Workshop and subsequently added to a later draft of this report). Uncertainty in the assessment parameters and estimated values are characterized in Section 3.2 and Table 3.2.2.2.

### *1.2.6 Term of Reference 6*

*Provide yield-per-recruit, spawner-per-recruit, and stock-recruitment evaluations.*

Yield-per-recruit, spawner-per-recruit, and stock-recruitment evaluations are provided in Section 3.2.4.

### *1.2.7 Term of Reference 7*

*Provide estimates of stock status for management criteria consistent with applicable FMPs, proposed FMPs and Amendments, other ongoing or proposed management programs, and National Standards for each model run presented for review.*

- *Evaluate existing or proposed management criteria as specified in the management summary*
- *Recommend proxy values when necessary*

Stock status relative to a management criteria of $F_{SPR26\%}$ are presented in Tables X.X.X (to be presented at the Review Workshop and subsequently added to a later draft of this report).

### *1.2.8 Term of Reference 8*

*Provide declarations of stock status relative to management benchmarks, or alternative data poor approaches if necessary.*

Stock status relative to a management criteria of $F_{SPR26\%}$ are presented in Tables X.X.X (to be presented at the Review Workshop and subsequently added to a later draft of this report).

### *1.2.9 Term of Reference 9*

*Project future stock conditions (biomass, abundance, and exploitation) and develop rebuilding schedules if warranted; include estimated generation time. Stock projections (in both biomass and number of fish) shall be developed in accordance with the following:*

*A) If stock is overfished:*
    $F=0$, $F_{Current}$, $F_{MSY}$, $F_{OY}$
    $F=F_{Rebuild}$ *(max that permits rebuild in allowed time)*
*B) If stock is undergoing overfishing:*
    $F= F_{Current}$, $F_{MSY}$, $F_{OY}$
*C) If stock is neither overfished nor undergoing overfishing:*
    $F= F_{Current}$, $F_{MSY}$, $F_{OY}$
*D) If data limitations preclude classic projections (i.e. A, B, C above), explore alternate models to provide management advice*

Projected stock dynamics, including projected biomass, abundance, exploitation, recruitment and yield will be presented for evaluation at the SEDAR 31 Review Workshop. If warranted, rebuilding schedules including estimated generation time will also be presented at that time.

### *1.2.10 Term of Reference 10*

*Provide a probability density function for the base model, or a combination of models that represent alternate states of nature, presented for review.*

- *Determine the yield associated with a probability of exceeding OFL at P* values of 30% to 50% in single percentage increments for use with the Tier 1 ABC control rule*
- *Provide justification for the weightings used in producing combinations of models*

### *1.2.11 Term of Reference 11*

*Provide recommendations for future research and data collection.*

- *Be as specific as practicable in describing sampling design and intensity*
- *Emphasize items which will improve future assessment capabilities and reliability*
- *Recommend an appropriate interval and type for the next assessment*

Recommendations for future research and data collection were made in the SEDAR 31 Data Workshop report. Additional recommendations are made in Section 3.3.

### *1.2.12 Term of Reference 12*

*Prepare a spreadsheet containing all model parameter estimates, all relevant population information resulting from model estimates, and projection and simulation exercises. Include all data included in assessment report tables and all data that support assessment workshop figures.*

All assessment model inputs are presented in Appendices A-D. All model parameter estimates and their associated standard errors are reported in Table 3.2.2.2.

### *1.2.13 Term of Reference 13*

*Complete the Assessment Workshop Report (Section III: SEDAR Stock Assessment Report).*

# 2 Data Review and Update

## 2.1 Life history

### *2.1.1 Natural Mortality*

There are a number of methods to estimate M as noted by the DW Report. Generally, they fall into two classes: those based on the maximum age and those based on growth relationships. Additionally, there are methods that combine the two.

In the context of Gulf red snapper, the Panel determined age-specific M's for the exploited ages, i.e. ages 2 and greater. This was done in two steps 1) establishing a M value over the lifespan of the fish; and 2) then rescaling the Lorenzen relationship (Table 2 of DW Report) such that the average natural mortality rate on the exploited age classes was equal to the lifespan M.

The Panel agreed that the lifespan M was best based upon observations of maximum age using the Hoenig method. The maximum age was determined by first examining the frequency of very old fish that had been aged by otoliths. The oldest observed age in this data was 57 (1 observation). It was also noted that the oldest age which had been validated by bomb radiocarbon dating was 38 years old (DW Report) The midpoint of the two (48 years old) at which 5 fish had been aged was specified as the maximum age for use in the Hoenig relationship. As noted in the DW Report, there were two versions of the Hoenig relationship, one including just fish and the other including a few other fisheries related taxa. The Panel chose the latter. This was consistent with red snapper in the South Atlantic Council and consistent with the advice of Hoenig offered for the South Atlantic.

The range of lifespan M estimates using these methods for Gulf red snapper were:

| tmax | Hoenig Fish | Hoenig All |
|---|---|---|
| 38 | 0.109266872 | 0.118586858 |
| 48 | 0.086301093 | 0.094276871 |
| 57 | 0.07254982 | 0.07963701 |

As noted the Panel used an M=0.094277 as the central estimate of lifespan M to be distributed across ages.

The Panel reviewed estimates of age-0 and age-1 M from the DW Report, which suggested that M for those ages might be higher than thought at the 2009 update assessment (SEDAR 2009). Therefore, the panel decided to set baseline M for age-0 and age-1 equal to the high M scenario values from the 2009 update assessment (i.e., age-0 M = 2.0 and age-1 M = 1.2). Age-specific M values for age-2 and older were set equal to the Lorenzen M values scaled to the Hoenig M value selected above (Table 2.1.1.1).

The age-specific M values had to be adjusted to account for the manner in which SS treats age (Table 2.1.1.1). Stock Synthesis advances the age of fish on January 1 of each year regardless of when recruitment occurs. Therefore in SS, an age class 0 red snapper, with an assumed birth date of July 1, would only experience a half year of age-0 M before advancing to age class 1. An

SS age class 1 red snapper would experience half a year of age-0 M and half a year of age-1 M, and so forth.

### *2.1.2 Growth*

During the workshop, it was discovered that the growth curve presented in the DW Report was estimated using only age and length data collected from 2009-2011. Therefore, the Panel decided to re-estimate the growth curve using the same methods on data from 2003-2011, where 2003 was the first year in which maximum TL (i.e., the measure of length used in this assessment) was recorded for red snapper.

The new growth parameters are:
Linf (max TL cm) = 85.6374,
K = 0.191852,
t0 = -0.394525.

The growth curve had to be adjusted to account for the manner in which SS treats age. Stock Synthesis advances the age of fish on January 1 of each year regardless of when recruitment occurs, which is assumed to be July 1 for red snapper. Therefore, the growth curve was estimated using the biological age of the fish (i.e., the fractional age based on a July 1 birth date), then the curve was adjusted by adding 0.5 to t0. The adjusted t0 value is 0.10547.

### *2.1.3 Reproduction*

Porch et al. (2013) produced estimates of annual fecundity for use in the assessment. Fecundity for the age-20 plus group was calculated as the weighted average of fecundity for ages 20-39, where the weights are the age-specific Lorenzen M values (Table 2.1.4.1).

### *2.1.4 Conversion Factors*

The FL to maximum TL conversion factor and whole weight to maximum TL conversion factors were also re-estimated. The new conversion factors are:

Whole weight (kg) = 1.673E-05 * Max TL (cm) ^ 2.953,

Max TL (cm) = 1.079*FL (cm).

All other conversion factors are unchanged from the DW Report.

### *2.1.5 Oil and Gas Platform Removal*

An estimate of red snapper mortality due to explosive oil rig removals was generated for use in a sensitivity run. A time series of the number of explosive oil rig removals in the eastern and western Gulf was constructed from data provided by BOEM (Table 2.1.6.1, Figure 2.1.6.1) (Benny Gallaway 2013, Personal Communication). The time series was constrained to explosive removals in depths greater than 10 m to better represent rigs that might be used by red snapper.

This is probably still an overestimate, because it includes deep water rigs that might not be utilized by red snapper. Due to the low number of explosive oil rig removals in the eastern Gulf, the Panel decided to only estimate explosive oil rig removal mortality for the western Gulf.

The 1993-1999 average number of red snapper killed per explosive oil rig removal (i.e., 515 fish per rig) was calculated from Gitschlag et al. (2000). The 1993-1999 average number of red snapper killed per explosive rig removal was multiplied by the 1993-1999 average number of explosive oil rig removals in the western Gulf (i.e., 55.14 explosive removals) to obtain the 1993-1999 average number of red snapper killed by explosive oil rig removals in the western Gulf (i.e., 28,380 fish). The proportion of red snapper killed at age by explosive oil rig removals as estimated by Gitschlag et al. (2000) was assumed to be the 1993-1999 average proportion of fish killed at age by explosive removals (Table 2.1.6.2).

## 2.2 Landings

### *2.2.1 Commercial landings*

Commercial landings are unchanged from the DW Report.

### *2.2.2 Recreational landings*

Recreational landings were split out into charter boat/private boat landings and headboat landings by region (Table 2.2.2.1). The recreational landings were split to allow for the use of both the MRIP (i.e., charter/private) indices of abundance and the headboat indices of abundance in the assessment model, because each index must be assigned to a fleet in the model.

## 2.3 Discards

### *2.3.1 Commercial discards*

In the 2009 update assessment, it was assumed that there were no closed season commercial discards after the implementation of IFQs in 2007 (SEDAR 2009). However, during this assessment process, the assessment panel decided the behavior of fishers with no IFQ allocation was likely to be similar to the behavior of fishers during the closed season prior to IFQs. Therefore, discards were estimated separately for trips with no IFQ allocation and trips with IFQ allocation (Table 2.3.1.1). Discards from trips with IFQ allocation were considered open season discards, while discards from trips with no IFQ allocation were included with the commercial closed season discards from the time period before IFQs.

After the assessment workshop, an issue was discovered with the analysis used to estimate commercial discards during the IFQ period (i.e., 2007-2011). As a result, it was necessary to re-estimate the commercial discards for that time period. The updated commercial discards are those values presented in Table 2.3.1.1.

### *2.3.2 Recreational discards*

Recreational discards remain unchanged from the DW Report.

### *2.3.3 Shrimp bycatch*

The Panel noted that the annual bycatch of red snapper from the shrimp fishery was poorly estimated, having very large variances in all years. Accordingly, the panel decided to use the median of the annual median estimates from the Bayesian shrimp bycatch analysis (Linton 2012) to represent the 1972-2011 median shrimp bycatch. An estimate of the median bycatch in conjunction with a shrimp effort series can be used by the assessment model to estimate annual shrimp bycatch. A similar approach was used in the SEDAR 28 assessments (SEDAR 2013a, 2013b). The median bycatch in the eastern Gulf is 1,118,000 fish, and in the western Gulf is 20,680,000 fish.

## 2.4 Length composition

### *2.4.1 Commercial length composition*

Commercial landings length frequencies were reconstructed after ensuring that all of the lengths had been converted to maximum TL (Figures 2.4.1.1-2.4.1.4).

Commercial discard length frequencies were constructed using commercial observer program data. Feedback from fishers at the DW suggested that discard behavior varied depending upon the amount of IFQ allocation available on a given trip. Separate discard length frequencies were constructed for a series of IFQ allocation bins that were specified based on discussions with fishers (see Appendix of DW Report).

As with the commercial discard estimates, the discard length frequencies for no IFQ allocation trips were assigned to the commercial closed season (Figures 2.4.1.5-2.4.1.6). Combined open season discard length frequencies were obtained from a weighted average of the IFQ allocation bins that included trips with some amount of IFQ allocation. The weights were the number of trips for each IFQ allocation bin from the commercial logbooks (Figures 2.4.1.7-2.4.1.10). There were only 7 discarded red snapper sampled in 2008 and 6 discarded red snapper sampled in 2010 for the long line fishery in the western Gulf of Mexico. The Panel decided to exclude the western long line length compositions for discarded fish from the assessment model, because these data would not provide any information to help with the estimation of selectivity and retention patterns for the fishery during that time period (2007-2011) due to the low sample sizes and sparse temporal coverage.

### *2.4.2 Recreational length composition*

Recreational length frequencies were reconstructed after ensuring that all of the lengths had been converted to maximum TL (Figures 2.4.2.1-2.4.2.4).

Discard length frequencies for the headboat fishery in the eastern Gulf were constructed from headboat observer program data (Figure 2.4.2.5).

### *2.4.3 Shrimp bycatch length composition*

Shrimp bycatch length data were available from the shrimp observer program. These length data were converted to age compositions (see Section 2.5.3).

### *2.4.4 Fishery-independent survey length composition*

Fishery-independent survey length data were available for the SEAMAP reef fish video survey, SEAMAP groundfish surveys, NMFS bottom long line survey, and the combined ROV survey (Walter et al. 2013). These length compositions were all converted over to age compositions (see Section 2.5.4).

The combined ROV survey includes length data from University of West Florida ROV surveys, Dauphin Island Sea Lab ROV surveys, Panama City ROV studies, and Panama City stationary camera surveys. A multinomial regression model was used to predict the probability of a fish being in one of the length bins as a function of the covariates. The covariates used in this analysis were year, season, longitude bin ((-89,-85.3] or (-85.3,-83]), and reef type (natural or artificial). The final model was:

TLcat ~ year + reef type.

Sample sizes for the length comps were calculated as the number of red snapper measured multiplied by the area covered by the ROV surveys. The combined ROV length compositions include lengths of fish observed on artificial reefs.

## 2.5 Age composition

### *2.5.1 Commercial age composition*

It was observed that the length frequency distributions of the red snapper age samples differed from the length frequency distributions of the larger set of red snapper length samples, particularly prior to 2000 (Chih 2013). These differences in length frequency distributions suggest that the age samples were not representative in the earlier years. Therefore, the Panel decided to reweight the age frequency distributions by the length frequency distributions to correct for these differences (Figures 2.5.1.1 -2.5.1.4).

Commercial discard age compositions for both the open and closed seasons were constructed by applying age length keys to the length frequencies from the commercial observer program (Figures 2.5.1.5-2.5.1.9). Separate age length keys for the eastern and western Gulf were used, which included length and age data from commercial fisheries, recreational fisheries, and the NMFS bottom long line survey. There were only 7 discarded red snapper sampled in 2008 and 6 discarded red snapper sampled in 2010 for the long line fishery in the western Gulf of Mexico. Therefore, the Panel decided to exclude the western long line age compositions for discarded fish from the assessment model.

### *2.5.2 Recreational age composition*

It was observed that the length frequency distributions of the red snapper age samples differed from the length frequency distributions of the larger set of red snapper length samples, particularly prior to 2000 (Chih 2013). These differences in length frequency distributions suggest that the age samples were not representative in the earlier years. Therefore, the Panel decided to reweight the age frequency distributions by the length frequency distributions to correct for these differences (Figures 2.5.2.1 -2.5.2.4).

Headboat discard age compositions for the eastern Gulf were constructed by applying age length keys to the length frequencies from the commercial observer program (Figure 2.5.2.5). Separate age length keys for the eastern and western Gulf were used, which included length and age data from commercial fisheries, recreational fisheries, and the NMFS bottom long line survey.

### *2.5.3 Shrimp bycatch age composition*

Linton (2013a) derived age compositions for the shrimp bycatch through visual inspection of modes in length frequencies from the shrimp observer program (Figures 2.5.3.1-2.5.3.2).

### *2.5.4 Fishery-independent survey age composition*

SEAMAP reef fish video survey age compositions were constructed by applying age length keys to length frequencies from the survey (Figure 2.5.4.1-2.5.4.2). Separate age length keys for the eastern and western Gulf were used, which included length and age data from commercial fisheries, recreational fisheries, and the NMFS bottom long line survey.

Age compositions for the SEAMAP groundfish surveys were derived through visual inspection of modes in length frequencies from the surveys (Figures 2.5.4.3-2.5.4.6).

Direct age compositions were used for the NMFS bottom long line survey, which included age data from the 2011 supplemental sampling (Figures 2.5.4.7-2.5.4.8). Direct age compositions were considered to be representative, because the majority of red snapper caught in the survey have their age estimated.

Age compositions for the combined ROV survey were constructed by applying age length keys to length frequencies from the surveys (Figure 2.5.4.9). Separate age length keys for the eastern and western Gulf were used, which included length and age data from commercial fisheries, recreational fisheries, and the NMFS bottom long line survey.

## 2.6 Indices

Linton (2013b) reconstructed a shrimp trawl index of abundance that was originally used in the 1995 Gulf of Mexico red snapper assessment (Goodyear 1995). This index of abundance covers 1967-1989, which is earlier than any of the other indices of abundance in the assessment (Table 2.6.1, Figure 2.6.1). The panel decided to include the shrimp trawl index in a sensitivity run rather than in the base run, because of two issues that were brought up during the 1995 assessment. Testimony by fishers suggested that 1) many of these fish were caught using handlines fished from the shrimp vessels, and 2) many of these fish were landed in Mexico waters of the Gulf.

## 2.7 Discard Mortality

A meta-analysis was used to estimate discard mortality rates for Gulf of Mexico red snapper. Data used in this meta-analysis were compiled from 11 studies that produced 70 distinct estimates (Table 2.7.1). There are multiple estimates from some studies because they produced estimates for multiple fishing depths and/or seasons in which data were collected. Most of the estimates were compiled from refereed publications (Dorf 2003, Patterson et al. 2001, Render and Wilson 1994, Gitschlag and Renaud 1994, Diamond and Campbell 2009, Campbell et al. 2010a), one was calculated from a publication that did not report a rate but did collect appropriate data (Patterson personal communication, *from* et al. 2008), and several were only available from 'gray-literature' documents (Parker 1985, Burns et al. 2004, Diamond et al. 2011, Sauls 2012). This meta-analysis did not weight the various studies based on the peer-reviewed publication status. From each publication we gathered data on percent release mortality (%, converted to a proportion), fishing depth (m), season (winter, spring, summer, fall, annual), sample size (*N*), type of study (surface release with venting, surface release with intermittent venting, cage, passive tagging, acoustic tagging, and hyperbaric chamber), the type of estimate derived (immediate or delayed), hook type used (circle, j, and unknown), and the sector to which the study applied (commercial or recreational). Sample sizes were treated as count data, percent release mortality and fishing depth were continuous variables, and all other data were categorical in nature.

The meta-analytic model used is a special case of a weighted general linear model as detailed in the metafor R package (Viechtbauer 2010). Analysis used effect size (*es*) where *es* is the logit-transformed proportion and calculated as:

$$es = \log * \frac{x_i}{(n_i - x_i)}$$

where $x_i$ is the total number of individuals experiencing mortality, and $n_i$ is the total sample size. The estimate and the corresponding sampling variance are calculated using the escalc function in metfor.

We fit effect size estimates to a mixed-effects model to evaluate the effect of depth, season, estimate type, hook type, and sector (Viechtbauer 2010). Dummy-coded seasonal moderator variables (i.e. 1=group membership, 0=false) included in the model were winter, spring, summer, and fall. Dummy coded estimate type moderator variables included in the model were immediate with 100% venting (immediate-v), immediate with intermittent venting (immediate-iv), and delayed. Dummy coded hook type moderator variables included in the model were circle hooks (circle), and j-hooks (j).

Heterogeneity ($\tau^2$) was estimated using restricted maximum-likelihood (REML) then coefficients for $\mu, \beta_0,\ldots,\beta_{p'}$ were estimated using weighted least squares in which each *es* estimate is weighted by the inverse of its variance. Wald-type tests and confidence intervals were calculated for $\mu, \beta_0,\ldots,\beta_{p'}$ assuming normality. Based on the fitted model we calculated predicted values, and residuals. Cochran's *Q*-test was used to assess the amount of heterogeneity among study estimates (i.e. a null hypothesis of $\tau^2 = 0$). Predicted values and associated upper and lower bounds were then converted back to proportions by taking the inverse of the logit transformed effect size data as:

$$Proportion = \frac{exp^{es}}{(1 + exp^{es})}$$

The final model is reported in Table 2.7.2 and Figure 2.7.1. From the final model, separate discard mortality relationships were developed for each sector (i.e., commercial and recreational). No venting was assumed to occur prior to 2008 (i.e., when venting became mandatory), and venting was assumed to occur from 2008 onward. An average seasonal effect was assumed in the relationships. For the commercial sector, average depths at which discards occurred for each gear (handline or long line), region (eastern or western Gulf), and season (open or closed) were calculated using commercial observer program data. Consistent with how commercial discards have been treated in other parts of the assessment, discards from trips with IFQ allocation were considered open season discards, while discards from trips with no IFQ allocation were considered closed season discards (Table 2.7.3). For the recreational sector, average depths at which discards occurred for each region (eastern or western Gulf) and season (open or closed) were calculated using self-reported data from the iSnapper program (Table 2.7.4). The average depths calculated from the iSnapper data were similar to depths reported by recreational fishers at the Assessment Workshop and Webinars.

## 2.8 Tables

Table 2.1.1.1. Age-specific natural mortality rates for Gulf of Mexico red snapper for input into three possible model scenarios: the base model, a model that assumes low natural mortality, and a model that assumes high natural mortality. M represents natural mortality experienced from July 1-June 30. Adjusted M (adj M) is adjusted to account for SS advancing age on January 1.

| | **Base M** | | | **Low M** | | | **High M** | |
|---|---|---|---|---|---|---|---|---|
| *age* | *M* | *adj M* | *age* | *M* | *adj M* | *age* | *M* | *adj M* |
| 0 | 2.000 | 1.000 | 0 | 1.000 | 0.500 | 0 | 3.400 | 1.700 |
| 1 | 1.200 | 1.600 | 1 | 0.600 | 0.800 | 1 | 2.000 | 2.700 |
| 2 | 0.190 | 0.695 | 2 | 0.190 | 0.395 | 2 | 0.190 | 1.095 |
| 3 | 0.150 | 0.170 | 3 | 0.150 | 0.170 | 3 | 0.150 | 0.170 |
| 4 | 0.129 | 0.140 | 4 | 0.129 | 0.140 | 4 | 0.129 | 0.140 |
| 5 | 0.115 | 0.122 | 5 | 0.115 | 0.122 | 5 | 0.115 | 0.122 |
| 6 | 0.106 | 0.110 | 6 | 0.106 | 0.110 | 6 | 0.106 | 0.110 |
| 7 | 0.099 | 0.103 | 7 | 0.099 | 0.103 | 7 | 0.099 | 0.103 |
| 8 | 0.095 | 0.097 | 8 | 0.095 | 0.097 | 8 | 0.095 | 0.097 |
| 9 | 0.091 | 0.093 | 9 | 0.091 | 0.093 | 9 | 0.091 | 0.093 |
| 10 | 0.088 | 0.090 | 10 | 0.088 | 0.090 | 10 | 0.088 | 0.090 |
| 11 | 0.086 | 0.087 | 11 | 0.086 | 0.087 | 11 | 0.086 | 0.087 |
| 12 | 0.085 | 0.085 | 12 | 0.085 | 0.085 | 12 | 0.085 | 0.085 |
| 13 | 0.083 | 0.084 | 13 | 0.083 | 0.084 | 13 | 0.083 | 0.084 |
| 14 | 0.082 | 0.083 | 14 | 0.082 | 0.083 | 14 | 0.082 | 0.083 |
| 15 | 0.081 | 0.082 | 15 | 0.081 | 0.082 | 15 | 0.081 | 0.082 |
| 16 | 0.081 | 0.081 | 16 | 0.081 | 0.081 | 16 | 0.081 | 0.081 |
| 17 | 0.080 | 0.080 | 17 | 0.080 | 0.080 | 17 | 0.080 | 0.080 |
| 18 | 0.080 | 0.080 | 18 | 0.080 | 0.080 | 18 | 0.080 | 0.080 |
| 19 | 0.079 | 0.079 | 19 | 0.079 | 0.079 | 19 | 0.079 | 0.079 |
| 20 | 0.078 | 0.079 | 20 | 0.078 | 0.079 | 20 | 0.078 | 0.079 |

Table 2.1.4.1. Annual fecundity at age (number of eggs) for Gulf of Mexico red snapper.

| Age | Fecundity |
|---|---|
| 0 | 0 |
| 1 | 0 |
| 2 | 350,000 |
| 3 | 2,620,000 |
| 4 | 9,070,000 |
| 5 | 20,300,000 |
| 6 | 34,710,000 |
| 7 | 49,950,000 |
| 8 | 64,270,000 |
| 9 | 76,760,000 |
| 10 | 87,150,000 |
| 11 | 95,530,000 |
| 12 | 102,150,000 |
| 13 | 107,300,000 |
| 14 | 111,270,000 |
| 15 | 114,300,000 |
| 16 | 116,610,000 |
| 17 | 118,360,000 |
| 18 | 119,680,000 |
| 19 | 120,670,000 |
| 20 | 123,234,591 |

Table 2.1.6.1. Number of explosive oil rig removals in the Gulf of Mexico in depths greater than 10 m.

| Year | West | East |
|---|---|---|
| 1973 | 1 | 0 |
| 1974 | 4 | 0 |
| 1975 | 16 | 0 |
| 1976 | 19 | 0 |
| 1977 | 14 | 1 |
| 1978 | 21 | 0 |
| 1979 | 17 | 2 |
| 1980 | 20 | 2 |
| 1981 | 14 | 1 |
| 1982 | 6 | 0 |
| 1983 | 19 | 0 |
| 1984 | 40 | 0 |
| 1985 | 34 | 1 |
| 1986 | 20 | 0 |
| 1987 | 11 | 0 |
| 1988 | 50 | 4 |
| 1989 | 57 | 1 |
| 1990 | 48 | 5 |
| 1991 | 48 | 3 |
| 1992 | 54 | 0 |
| 1993 | 81 | 7 |
| 1994 | 75 | 1 |
| 1995 | 37 | 4 |
| 1996 | 38 | 1 |
| 1997 | 67 | 2 |
| 1998 | 24 | 0 |
| 1999 | 64 | 8 |
| 2000 | 82 | 5 |
| 2001 | 50 | 6 |
| 2002 | 63 | 1 |
| 2003 | 74 | 2 |
| 2004 | 57 | 11 |
| 2005 | 69 | 6 |
| 2006 | 37 | 16 |
| 2007 | 67 | 9 |
| 2008 | 89 | 9 |
| 2009 | 133 | 14 |
| 2010 | 154 | 8 |
| 2011 | 146 | 12 |

Table 2.1.6.2. Age composition of red snapper killed by explosive oil rig removals in the Gulf of Mexico, 1993-1999 (from Gitschlag et al. 2000).

| Age | Proportion |
|---|---|
| 0 | 0.0010 |
| 1 | 0.1025 |
| 2 | 0.3383 |
| 3 | 0.2980 |
| 4 | 0.0961 |
| 5 | 0.0457 |
| 6 | 0.0287 |
| 7 | 0.0190 |
| 8 | 0.0146 |
| 9 | 0.0110 |
| 10 | 0.0065 |
| 11 | 0.0097 |
| 12 | 0.0013 |
| 13 | 0.0074 |
| 14 | 0.0037 |
| 15 | 0.0006 |
| 16 | 0.0024 |
| 17 | 0.0029 |
| 17+ | 0.0108 |

Table 2.2.2.1. Recreational landings (thousand fish) for Gulf of Mexico red snapper.

| | **Charter/Private** | | **Headboat** | |
|---|---|---|---|---|
| *Year* | *East* | *West* | *East* | *West* |
| 1981 | 800.814 | 1446.453 | 47.780 | 344.252 |
| 1982 | 714.399 | 1070.948 | 153.823 | 388.247 |
| 1983 | 781.401 | 1871.322 | 301.790 | 370.500 |
| 1984 | 145.704 | 649.416 | 40.842 | 373.218 |
| 1985 | 400.133 | 589.589 | 90.234 | 368.605 |
| 1986 | 558.466 | 397.233 | 16.364 | 316.090 |
| 1987 | 538.002 | 164.712 | 9.685 | 319.348 |
| 1988 | 509.493 | 301.681 | 13.832 | 423.024 |
| 1989 | 462.519 | 219.292 | 10.797 | 372.473 |
| 1990 | 305.131 | 128.976 | 15.539 | 187.006 |
| 1991 | 533.087 | 254.500 | 15.580 | 264.686 |
| 1992 | 830.961 | 318.487 | 33.873 | 413.056 |
| 1993 | 1235.076 | 416.012 | 37.275 | 458.772 |
| 1994 | 772.832 | 311.899 | 28.998 | 497.738 |
| 1995 | 617.484 | 386.121 | 23.078 | 354.550 |
| 1996 | 570.569 | 241.885 | 28.388 | 349.266 |
| 1997 | 961.781 | 248.887 | 48.439 | 347.424 |
| 1998 | 754.329 | 180.824 | 76.759 | 244.738 |
| 1999 | 721.883 | 146.019 | 67.432 | 98.699 |
| 2000 | 697.981 | 157.591 | 57.640 | 111.410 |
| 2001 | 833.130 | 107.566 | 51.289 | 116.358 |
| 2002 | 1108.290 | 102.092 | 75.121 | 138.475 |
| 2003 | 967.577 | 112.594 | 71.021 | 157.905 |
| 2004 | 1190.622 | 129.176 | 63.482 | 110.329 |
| 2005 | 724.663 | 166.187 | 46.791 | 99.988 |
| 2006 | 793.646 | 236.218 | 47.882 | 121.177 |
| 2007 | 1064.180 | 206.435 | 63.603 | 110.314 |
| 2008 | 591.638 | 120.753 | 61.986 | 57.569 |
| 2009 | 698.335 | 131.637 | 81.590 | 75.998 |
| 2010 | 327.013 | 36.874 | 35.943 | 51.514 |
| 2011 | 488.919 | 67.480 | 69.187 | 50.656 |

Table 2.3.1.1. Commercial discards (number of fish) for Gulf of Mexico red snapper, 2007-2011.

| | | Hand Line | | Longline | |
|---|---|---|---|---|---|
| IFQ allocation | year | east | west | east | west |
| 0 pounds | 2007 | 204,923 | 50,944 | 20,043 | |
| | 2008 | 208,276 | | 2,675 | |
| | 2009 | 667,840 | | 28,964 | 229 |
| | 2010 | 45,081 | 3,228 | 6,628 | 172 |
| | 2011 | 166,207 | | 4,666 | 1,282 |
| 1+ pounds | 2007 | 676,711 | 332,439 | 17,188 | |
| | 2008 | 166,436 | 557,104 | 2,449 | 491 |
| | 2009 | 1,936,860 | 103,320 | 6,030 | 166 |
| | 2010 | 1,243,613 | 267,798 | 8,337 | 43 |
| | 2011 | 771,486 | 190,414 | 15,046 | 6 |

Table 2.6.1. Shrimp trawl index of abundance for Gulf of Mexico red snapper.

| Year | Catch 1000 lbs | Catch MT | Effort Days | Effort 1000 Days | CPUE Nominal | CPUE Relative |
|---|---|---|---|---|---|---|
| 1967 | 482 | 218 | 83717 | 83.7 | 2.609915 | 1.589464 |
| 1968 | 601 | 273 | 79868 | 79.9 | 3.414939 | 2.079732 |
| 1969 | 457 | 207 | 96845 | 96.8 | 2.140918 | 1.30384 |
| 1970 | 622 | 282 | 89655 | 89.7 | 3.145876 | 1.91587 |
| 1971 | 484 | 220 | 88827 | 88.8 | 2.471543 | 1.505195 |
| 1972 | 632 | 287 | 96688 | 96.7 | 2.963763 | 1.804961 |
| 1973 | 694 | 315 | 84518 | 84.5 | 3.726264 | 2.269332 |
| 1974 | 559 | 254 | 82869 | 82.9 | 3.062275 | 1.864956 |
| 1975 | 320 | 145 | 79737 | 79.7 | 1.821594 | 1.109369 |
| 1976 | 294 | 133 | 86667 | 86.7 | 1.53934 | 0.937474 |
| 1977 | 275 | 125 | 82116 | 82.1 | 1.519745 | 0.92554 |
| 1978 | 174 | 79 | 84793 | 84.8 | 0.933409 | 0.568455 |
| 1979 | 142 | 64 | 88110 | 88.1 | 0.730801 | 0.445065 |
| 1980 | 185 | 84 | 53539 | 53.5 | 1.566211 | 0.953838 |
| 1981 | 211 | 96 | 83058 | 83.1 | 1.152002 | 0.701581 |
| 1982 | 173 | 79 | 84290 | 84.3 | 0.933554 | 0.568544 |
| 1983 | 246 | 111 | 74303 | 74.3 | 1.500335 | 0.913719 |
| 1984 | 144 | 65 | 92253 | 92.3 | 0.709451 | 0.432063 |
| 1985 | 74 | 34 | 89468 | 89.5 | 0.376053 | 0.22902 |
| 1986 | 67 | 30 | 113968 | 114.0 | 0.265016 | 0.161397 |
| 1987 | 51 | 23 | 110780 | 110.8 | 0.210643 | 0.128284 |
| 1988 | 73 | 33 | 106734 | 106.7 | 0.311255 | 0.189557 |
| 1989 | 33 | 15 | 102774 | 102.8 | 0.146002 | 0.088917 |

Table 2.6.2. SEAMAP summer and fall groundfish survey indices of abundance (standardized CPUE and log-scale standard deviations), updated to include Dauphin Island Sea Lab survey data.

| | Summer Survey | | Fall Survey | |
|---|---|---|---|---|
| Year | CPUE | log SD | CPUE | log SD |
| 1972 | | | 3.279 | 0.2279 |
| 1973 | | | 0.5331 | 0.1894 |
| 1974 | | | 0.6179 | 0.2411 |
| 1975 | | | 0.5142 | 0.2322 |
| 1976 | | | 0.6228 | 0.2111 |
| 1977 | | | 0.8583 | 0.2425 |
| 1978 | | | 0.3874 | 0.1904 |
| 1979 | | | 0.3081 | 0.2114 |
| 1980 | | | 0.5748 | 0.1934 |
| 1981 | | | 1.9983 | 0.1961 |
| 1982 | 1.2795 | 0.5567 | 2.2476 | 0.1523 |
| 1983 | 1.0482 | 0.6401 | 0.3182 | 0.2021 |
| 1984 | 0.0534 | 0.8136 | 0.2587 | 0.2851 |
| 1985 | 0.3899 | 0.399 | 0.1183 | 0.3016 |
| 1986 | 0.046 | 0.919 | 0.1097 | 0.579 |
| 1987 | 0.585 | 0.2739 | 0.1852 | 0.4056 |
| 1988 | 0.684 | 0.4683 | 0.2453 | 0.3525 |
| 1989 | 2.4489 | 0.4525 | 3.7635 | 0.2824 |
| 1990 | 1.0921 | 0.2693 | 2.1418 | 0.2538 |
| 1991 | 1.1373 | 0.34 | 2.4028 | 0.2184 |
| 1992 | 3.0769 | 0.4212 | 0.1932 | 0.3493 |
| 1993 | 0.3517 | 0.4772 | 1.3914 | 0.2864 |
| 1994 | 0.9481 | 0.3132 | 0.3439 | 0.2398 |
| 1995 | 0.3593 | 0.506 | 0.7211 | 0.2317 |
| 1996 | 0.5434 | 0.3517 | 0.5548 | 0.2874 |
| 1997 | 0.7403 | 0.3457 | 0.9297 | 0.2988 |
| 1998 | 0.3116 | 0.8449 | 0.2211 | 0.3095 |
| 1999 | 0.1385 | 0.564 | 0.6077 | 0.298 |
| 2000 | 0.6111 | 0.3355 | 1.6791 | 0.2376 |
| 2001 | 0.2328 | 0.5349 | 0.5215 | 0.3769 |
| 2002 | 0.204 | 0.5145 | 0.4148 | 0.2964 |
| 2003 | 0.7617 | 0.4981 | 1.2279 | 0.2177 |
| 2004 | 0.6962 | 0.4502 | 0.3297 | 0.323 |
| 2005 | 1.6259 | 0.4769 | 0.7323 | 0.2597 |
| 2006 | 0.3275 | 0.3703 | 2.8692 | 0.1853 |
| 2007 | 2.9675 | 0.2804 | 1.8366 | 0.2324 |
| 2008 | 3.7999 | 0.2662 | 0.3735 | 0.2942 |
| 2009 | 0.5502 | 0.2608 | 3.0412 | 0.2445 |

| | | | | |
|---|---|---|---|---|
| 2010 | 2.4658 | 0.3644 | 0.3246 | 0.3558 |
| 2011 | 0.5233 | 0.3849 | 0.2019 | 0.4042 |

Table 2.7.1. List of studies conducted in the Gulf of Mexico reporting release mortality estimates sorted by the fishing depth where the study was conducted.

| Depth (m) | % mortality | Season | *N* | Author | Study type | Estimate type |
|---|---|---|---|---|---|---|
| 10 | 28 | Summer | 25 | Dorf (2003) | Surface + intermittant | Immediate |
| 15 | 28 | Summer | 425 | Dorf (2003) | Surface + intermittant | Immediate |
| 20 | 27 | Summer | 825 | Dorf (2003) | Surface + intermittant | Immediate |
| 21 | 0 | n/a | 20 | Burns et al. (2004) | Hyperbaric | Delayed |
| 21 | 20 | Annual | 282 | Render & Wilson (1994) | Cage | Delayed |
| 21 | 9 | Annual | 1064 | Patterson et al. (2001) | Surface + venting | Immediate |
| 22 | 21 | Spring | 14 | Parker (1985) | Cage | Delayed |
| 24 | 1 | Fall | 140 | Gitschlag & Renaud (1994) | Surface + intermittant | Immediate |
| 25 | 41 | Summer | 525 | Dorf (2003) | Surface + intermittant | Immediate |
| 25 | 28 | Summer | 353 | Sauls (2012) | Passive tag | Delayed |
| 25 | 26 | Summer | 353 | Sauls (2012) | Passive tag | Delayed |
| 25 | 23 | Fall | 353 | Sauls (2012) | Passive tag | Delayed |
| 25 | 16 | Fall | 353 | Sauls (2012) | Passive tag | Delayed |
| 25 | 29 | Winter | 353 | Sauls (2012) | Passive tag | Delayed |
| 25 | 25 | Winter | 353 | Sauls (2012) | Passive tag | Delayed |
| 25 | 17 | Spring | 353 | Sauls (2012) | Passive tag | Delayed |
| 25 | 18 | Spring | 353 | Sauls (2012) | Passive tag | Delayed |
| 27 | 14 | Annual | 856 | Patterson et al. (2001) | Surface + venting | Immediate |
| 27 | 0 | n/a | 20 | Burns et al. (2004) | Hyperbaric | Delayed |
| 30 | 11 | Spring | 30 | Parker (1985) | Cage | Delayed |
| 30 | 10 | Fall | 31 | Gitschlag & Renaud (1994) | Surface + intermittant | Immediate |
| 30 | 42 | Summer | 47 | Diamond & Campbell (2009) | Cage | Delayed |
| 30 | 13 | Fall | 30 | Diamond & Campbell (2009) | Cage | Delayed |
| 30 | 47 | Summer | 225 | Dorf (2003) | Surface + intermittant | Immediate |
| 30 | 21 | Fall | 137 | Campbell et al. (2010a) | Surface + venting | Immediate |
| 30 | 23 | Summer | 137 | Campbell et al. (2010a) | Surface + venting | Immediate |
| 30 | 3 | Winter | 138 | Patterson (pers. comm.) | Surface + venting | Immediate |
| 30 | 6 | Spring | 31 | Patterson (pers. comm.) | Surface + venting | Immediate |
| 30 | 7 | Summer | 52 | Patterson (pers. comm.) | Surface + venting | Immediate |
| 30 | 12 | Fall | 221 | Patterson (pers. comm.) | Surface + venting | Immediate |
| 32 | 18 | Annual | 1012 | Patterson et al. (2001) | Surface + venting | Immediate |
| 35 | 15 | Summer | 100 | Dorf (2003) | Surface + intermittant | Immediate |
| 35 | 4 | Winter | 375 | Patterson (pers. comm.) | Surface + venting | Immediate |
| 35 | 10 | Spring | 196 | Patterson (pers. comm.) | Surface + venting | Immediate |
| 35 | 13 | Summer | 264 | Patterson (pers. comm.) | Surface + venting | Immediate |
| 35 | 17 | Fall | 563 | Patterson (pers. comm.) | Surface + venting | Immediate |
| 35 | 37 | Summer | 863 | Sauls (2012) | Passive tag | Delayed |
| 35 | 33 | Summer | 863 | Sauls (2012) | Passive tag | Delayed |
| 35 | 28 | Fall | 863 | Sauls (2012) | Passive tag | Delayed |
| 35 | 22 | Fall | 863 | Sauls (2012) | Passive tag | Delayed |
| 35 | 22 | Winter | 863 | Sauls (2012) | Passive tag | Delayed |
| 35 | 12 | Winter | 863 | Sauls (2012) | Passive tag | Delayed |
| 35 | 23 | Spring | 863 | Sauls (2012) | Passive tag | Delayed |
| 35 | 21 | Spring | 863 | Sauls (2012) | Passive tag | Delayed |

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| | | | | | | |
|---|---|---|---|---|---|---|
| 40 | 44 | Fall | 61 | Gitschlag & Renaud (1994) | Surface + intermittant | Immediate |
| 40 | 40 | Summer | 155 | Dorf (2003) | Surface + intermittant | Immediate |
| 40 | 5 | Winter | 65 | Patterson (pers. comm.) | Surface + venting | Immediate |
| 40 | 16 | Spring | 107 | Patterson (pers. comm.) | Surface + venting | Immediate |
| 40 | 16 | Summer | 44 | Patterson (pers. comm.) | Surface + venting | Immediate |
| 40 | 20 | Fall | 60 | Patterson (pers. comm.) | Surface + venting | Immediate |
| 43 | 40 | n/a | 20 | Burns et al. (2004) | Hyperbaric | Delayed |
| 40 | 42 | Summer | 56 | Diamond & Campbell (2009) | Cage | Delayed |
| 40 | 34 | Fall | 32 | Diamond & Campbell (2009) | Cage | Delayed |
| 45 | 63 | Summer | 280 | Dorf (2003) | Surface + intermittant | Immediate |
| 50 | 36 | Fall | 55 | Gitschlag & Renaud (1994) | Cage | Delayed |
| 50 | 69 | Summer | 24 | Diamond & Campbell (2009) | Cage | Delayed |
| 50 | 44 | Fall | 36 | Diamond & Campbell (2009) | Cage | Delayed |
| 50 | 61 | Summer | 105 | Dorf (2003) | Surface + intermittant | Immediate |
| 50 | 79 | Summer | 24 | Diamond et al. (2011) | Acoustic tag | Delayed |
| 50 | 40 | Winter | 20 | Diamond et al. (2011) | Acoustic tag | Delayed |
| 55 | 58 | Summer | 240 | Dorf (2003) | Surface + intermittant | Immediate |
| 60 | 38 | Summer | 125 | Dorf (2003) | Surface + intermittant | Immediate |
| 60 | 21 | Fall | 282 | Campbell et al. (2010a) | Surface + venting | Immediate |
| 60 | 26 | Summer | 282 | Campbell et al. (2010a) | Surface + venting | Immediate |
| 61 | 45 | n/a | 30 | Burns et al. (2004) | Hyperbaric | Delayed |
| 65 | 37 | Summer | 50 | Dorf (2003) | Surface + intermittant | Immediate |
| 70 | 33 | Summer | 10 | Dorf (2003) | Surface + intermittant | Immediate |
| 75 | 23 | Summer | 75 | Dorf (2003) | Surface + intermittant | Immediate |
| 80 | 47 | Summer | 100 | Dorf (2003) | Surface + intermittant | Immediate |
| 95 | 56 | Summer | 30 | Dorf (2003) | Surface + intermittant | Immediate |

† Patterson personal communication calculated from Addis et al. 2008

ψ Sauls (2012) depths are reflective of the average depth reported in Florida territorial seas, and from federal waters (EEZ).

Table 2.7.2. Coefficients, standard errors, z-scores, and p-values from the final discard mortality model.

| | coef | se | z | pval |
|---|---|---|---|---|
| intrcpt | -1.35226 | 0.200127 | -6.757 | 1.41E-11 |
| Depth | 0.020087 | 0.004118 | 4.877466 | 1.07E-06 |
| comm | 2.19531 | 0.291132 | 7.5406 | 4.68E-14 |
| Vent | -0.86463 | 0.158936 | -5.44012 | 5.32E-08 |
| Winter | -0.89422 | 0.232041 | -3.8537 | 0.000116 |
| Spring | -0.63132 | 0.239966 | -2.63087 | 0.008517 |
| Fall | -0.40114 | 0.17862 | -2.24578 | 0.024718 |
| Mixed | 1.445082 | 0.268201 | 5.388055 | 7.12E-08 |

Table 2.7.3. Average depths and associated discard mortality rates for commercial discards of red snapper in the Gulf of Mexico.

| **Gear** | **Handline** | | | | **Longline** | | | |
|---|---|---|---|---|---|---|---|---|
| **Region** | **East** | | **West** | | **East** | | **West** | |
| **Season** | **Closed** | **Open** | **Closed** | **Open** | **Closed** | **Open** | **Closed** | **Open** |
| Average Depth (m) | 42 | 45 | 84 | 53 | 66 | 62 | 132 | 104 |
| Disc Mort - no venting | 0.74 | 0.75 | 0.87 | 0.78 | 0.82 | 0.81 | 0.95 | 0.91 |
| Disc Mort - venting | 0.55 | 0.56 | 0.74 | 0.60 | 0.66 | 0.64 | 0.88 | 0.81 |

Table 2.7.4. Average depths and associated discard mortality rates for recreational discards of red snapper in the Gulf of Mexico.

| **Gear** | **Recreational** | | | |
|---|---|---|---|---|
| **Region** | **East** | | **West** | |
| **Season** | **Closed** | **Open** | **Closed** | **Open** |
| Average Depth (m) | 33 | 34 | 36 | 35 |
| Disc Mort - no venting | 0.21 | 0.21 | 0.22 | 0.22 |
| Disc Mort - venting | 0.10 | 0.10 | 0.11 | 0.10 |

## 2.9 Figures

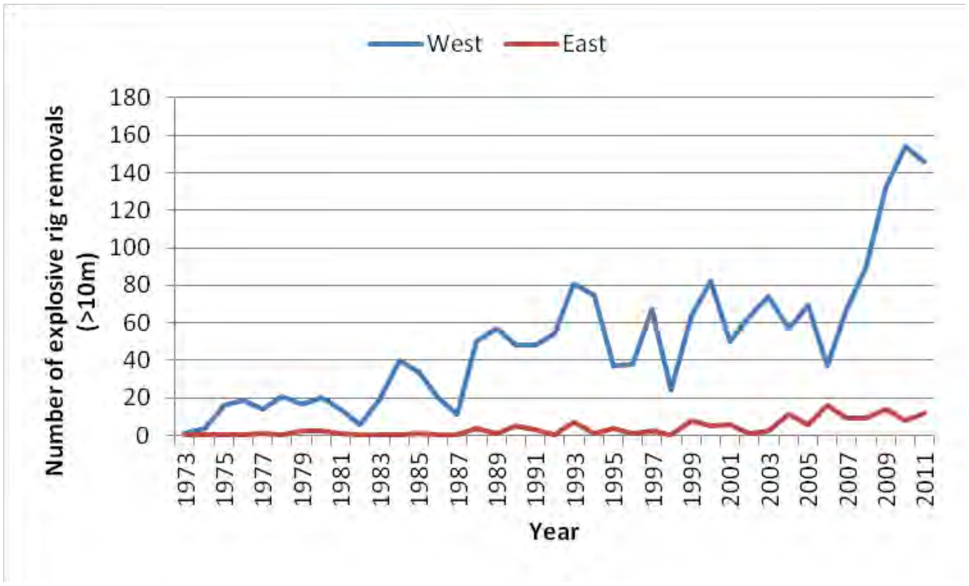


Figure 2.1.6.1. Number of explosive oil rig removals in the Gulf of Mexico in depths greater than 10 m (Benny Gallaway, 2013, Personal Communication).

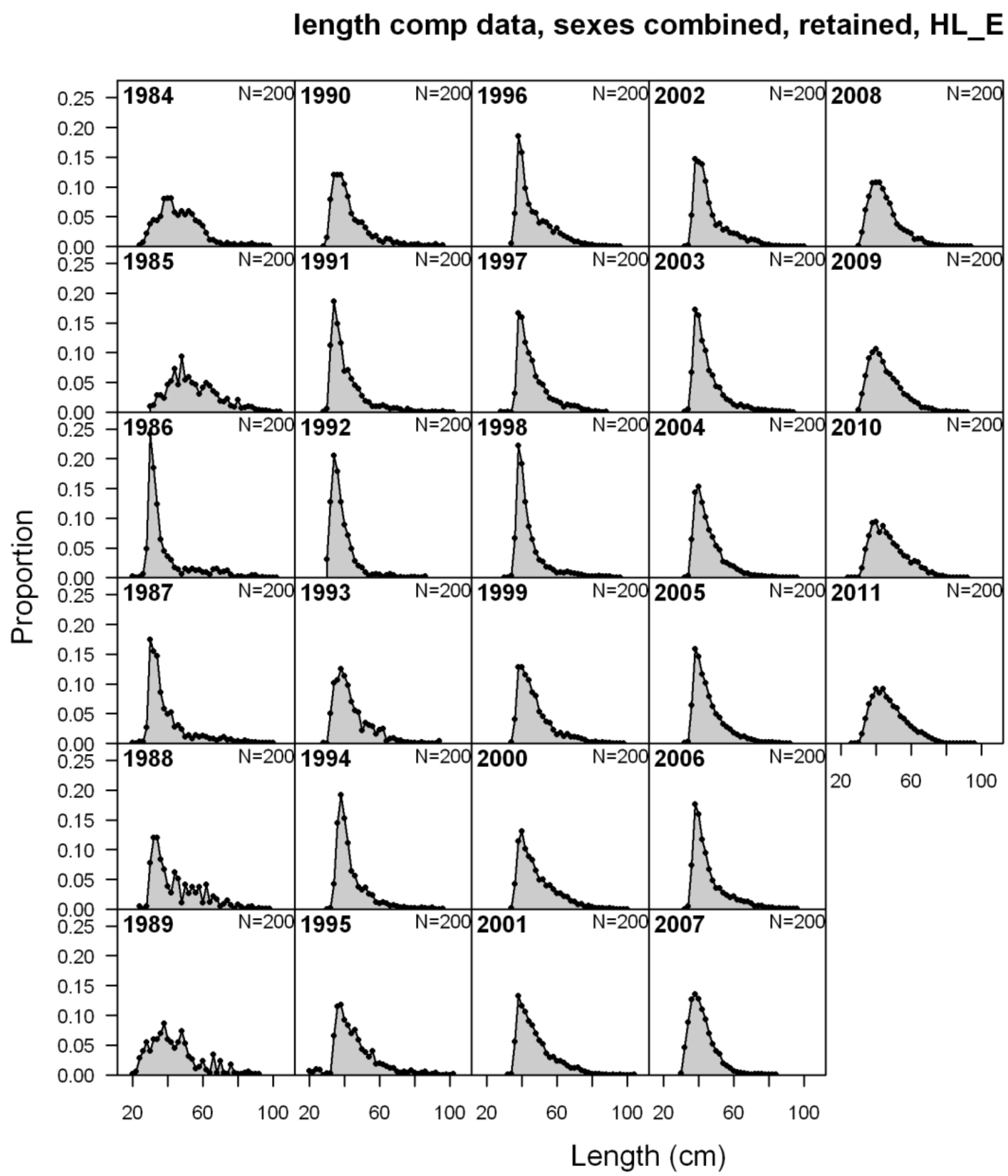


Figure 2.4.1.1. Length compositions of landed red snapper from the commercial handline fishery in the eastern Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

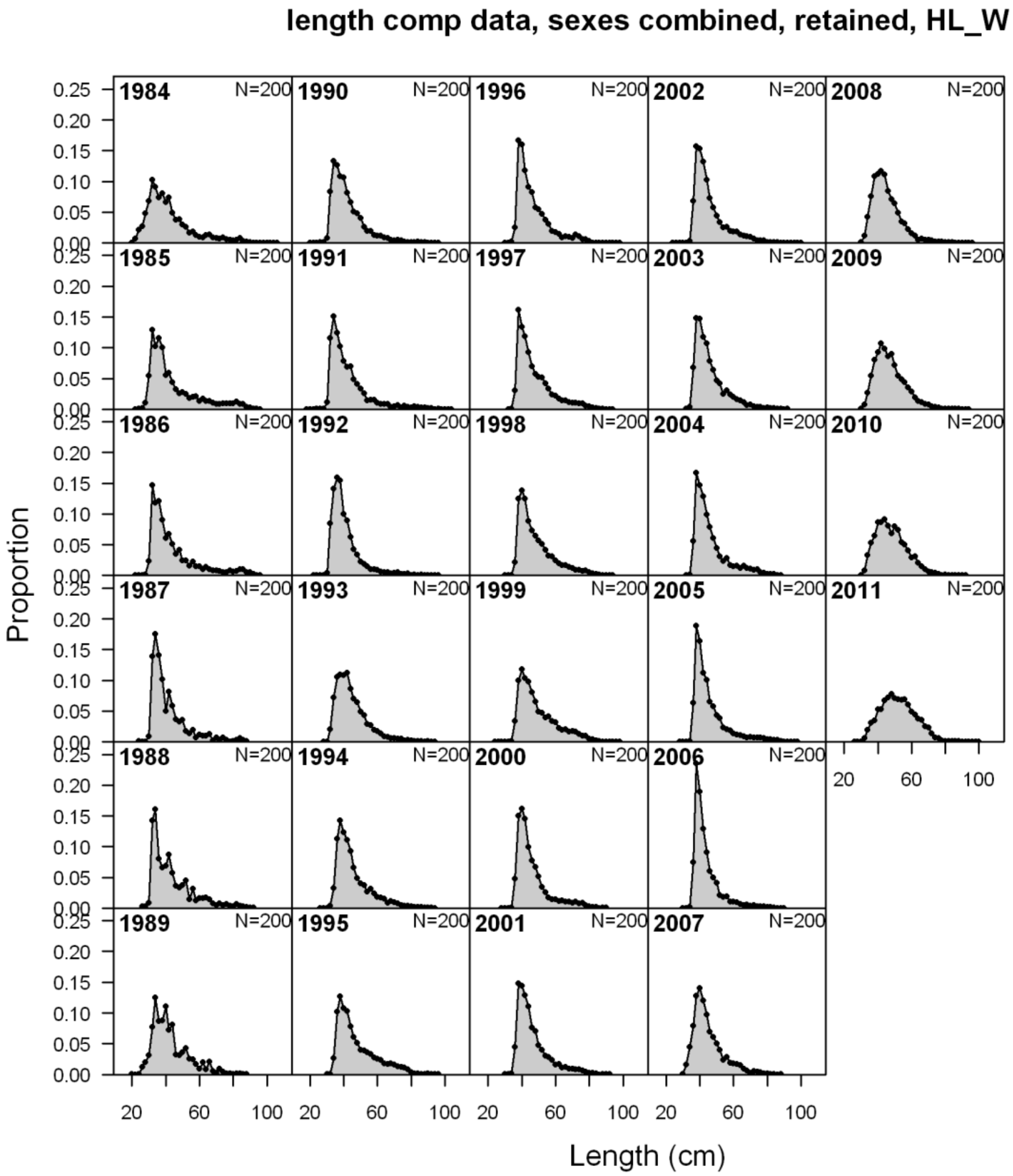


Figure 2.4.1.2. Length compositions of landed red snapper from the commercial handline fishery in the western Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

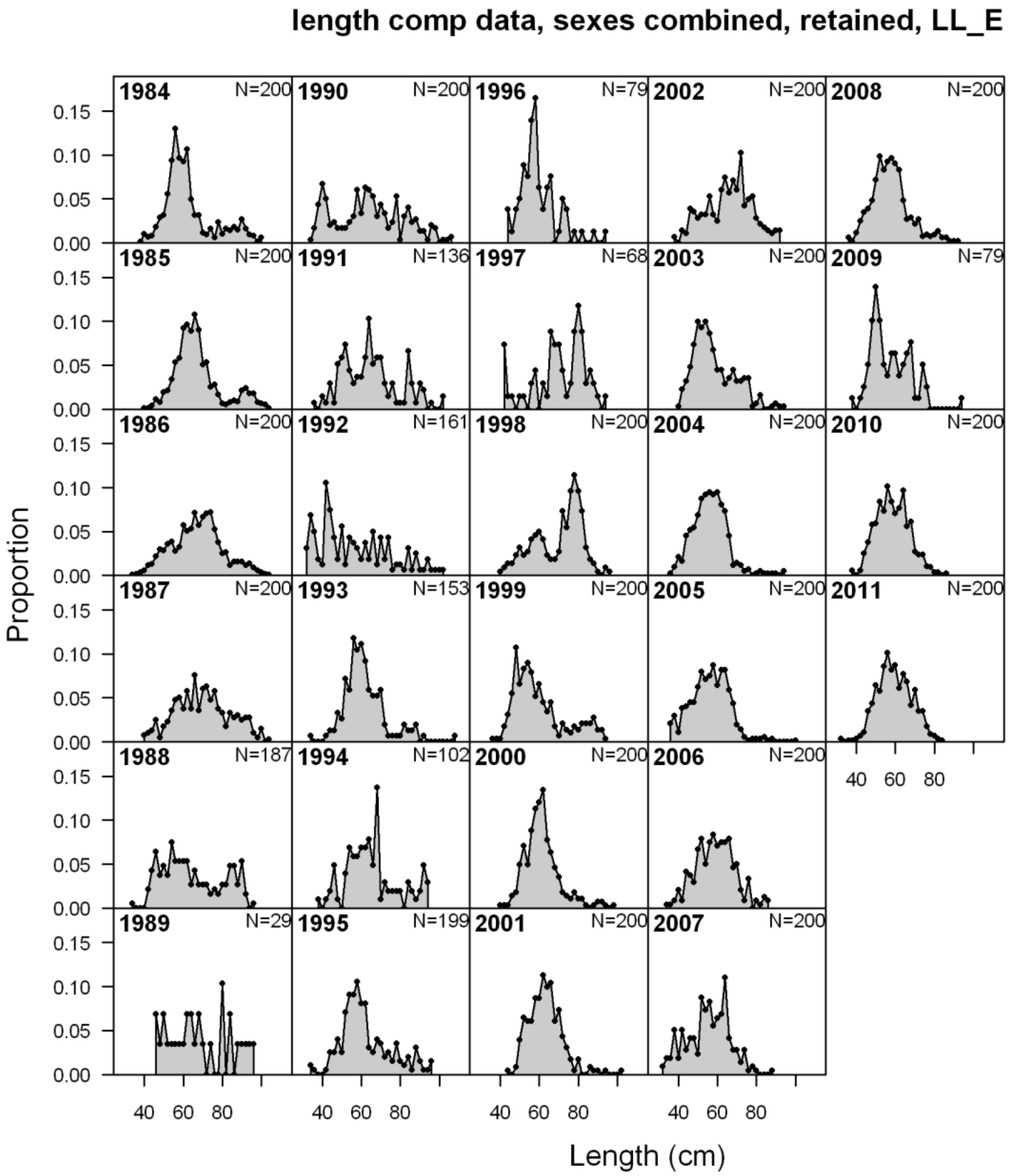


Figure 2.4.1.3. Length compositions of landed red snapper from the commercial long line fishery in the eastern Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

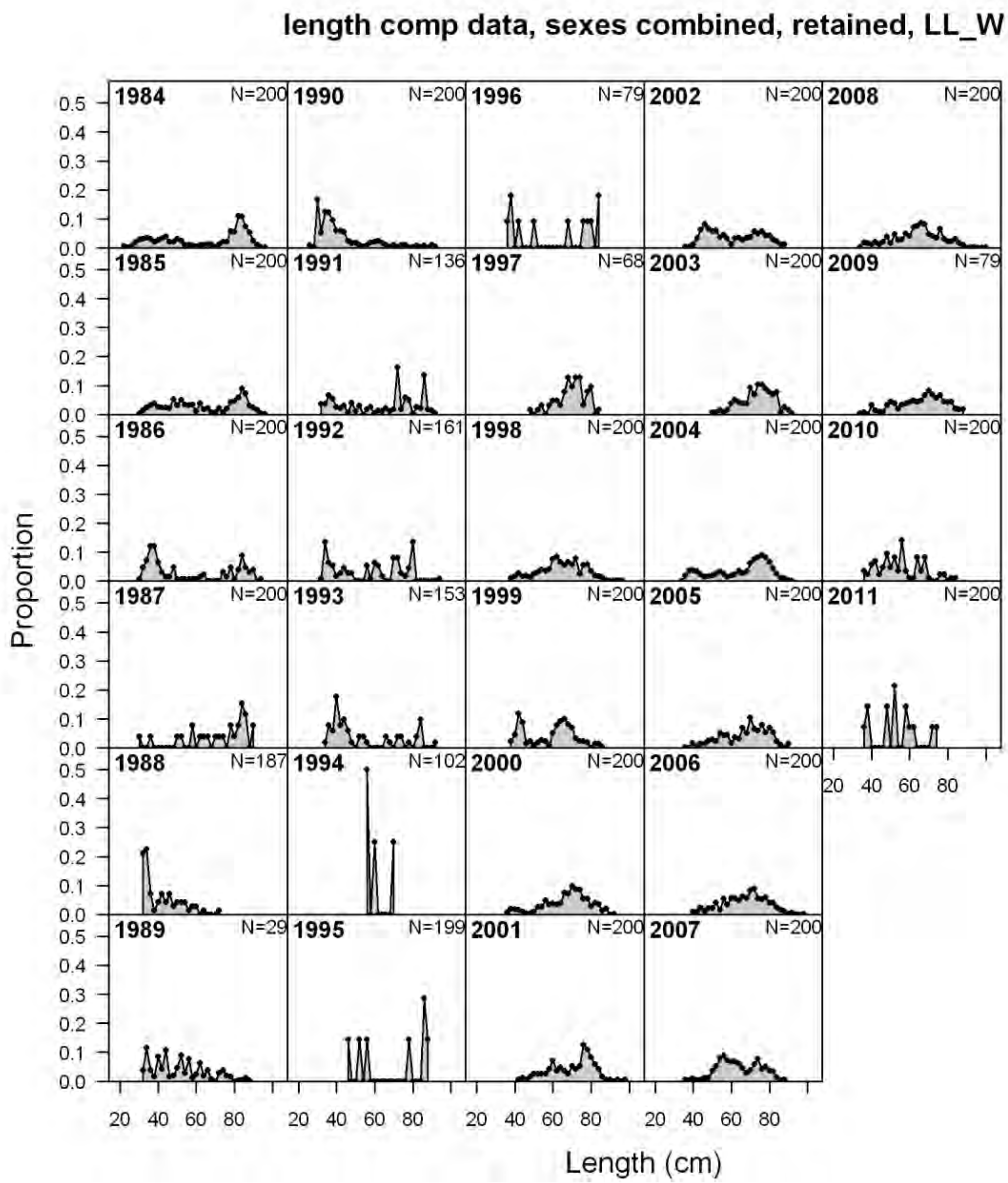


Figure 2.4.1.4. Length compositions of landed red snapper from the commercial long line fishery in the western Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

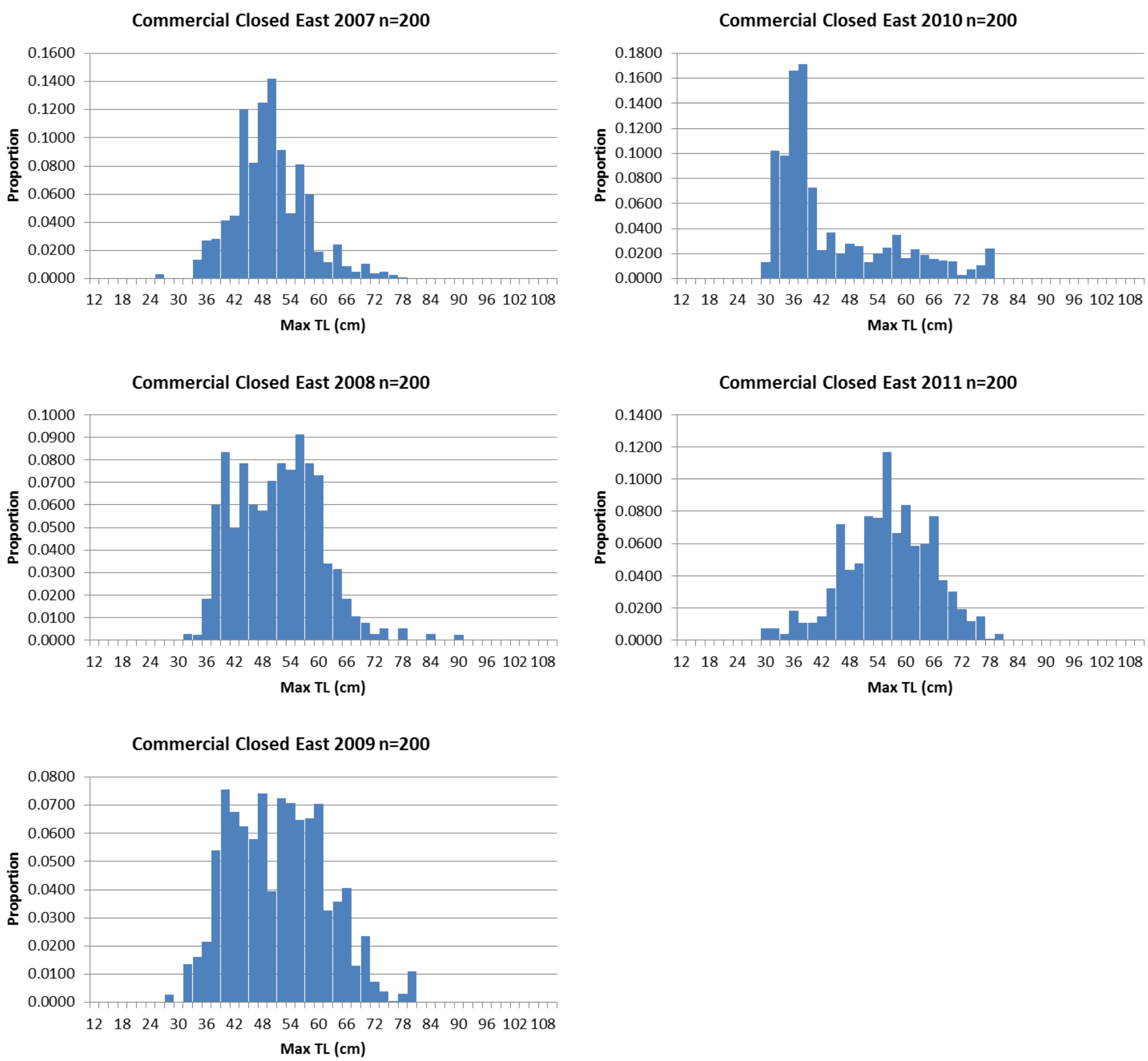


Figure 2.4.1.5. Length compositions of discarded red snapper from the commercial closed season in the eastern Gulf of Mexico. Sample sizes (n) were capped at maximum value of 200 fish.

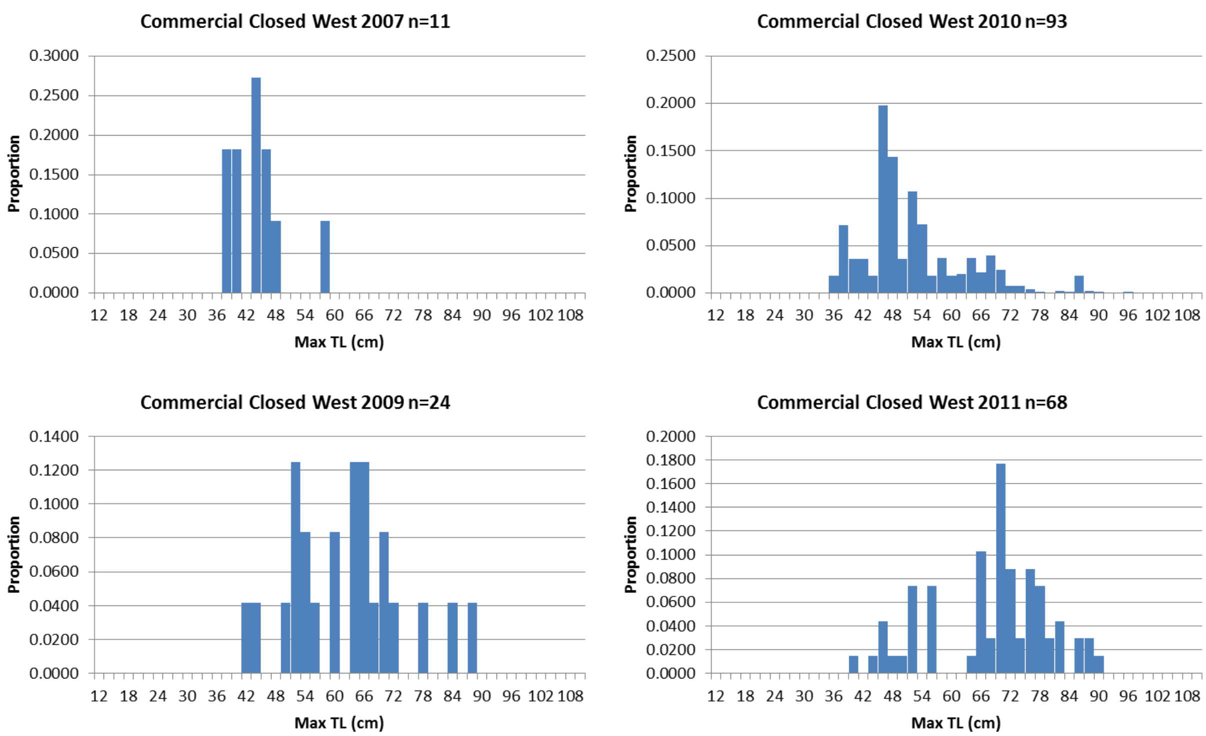


Figure 2.4.1.6. Length compositions of discarded red snapper from the commercial closed season in the western Gulf of Mexico. Sample sizes (n) were capped at maximum value of 200 fish.

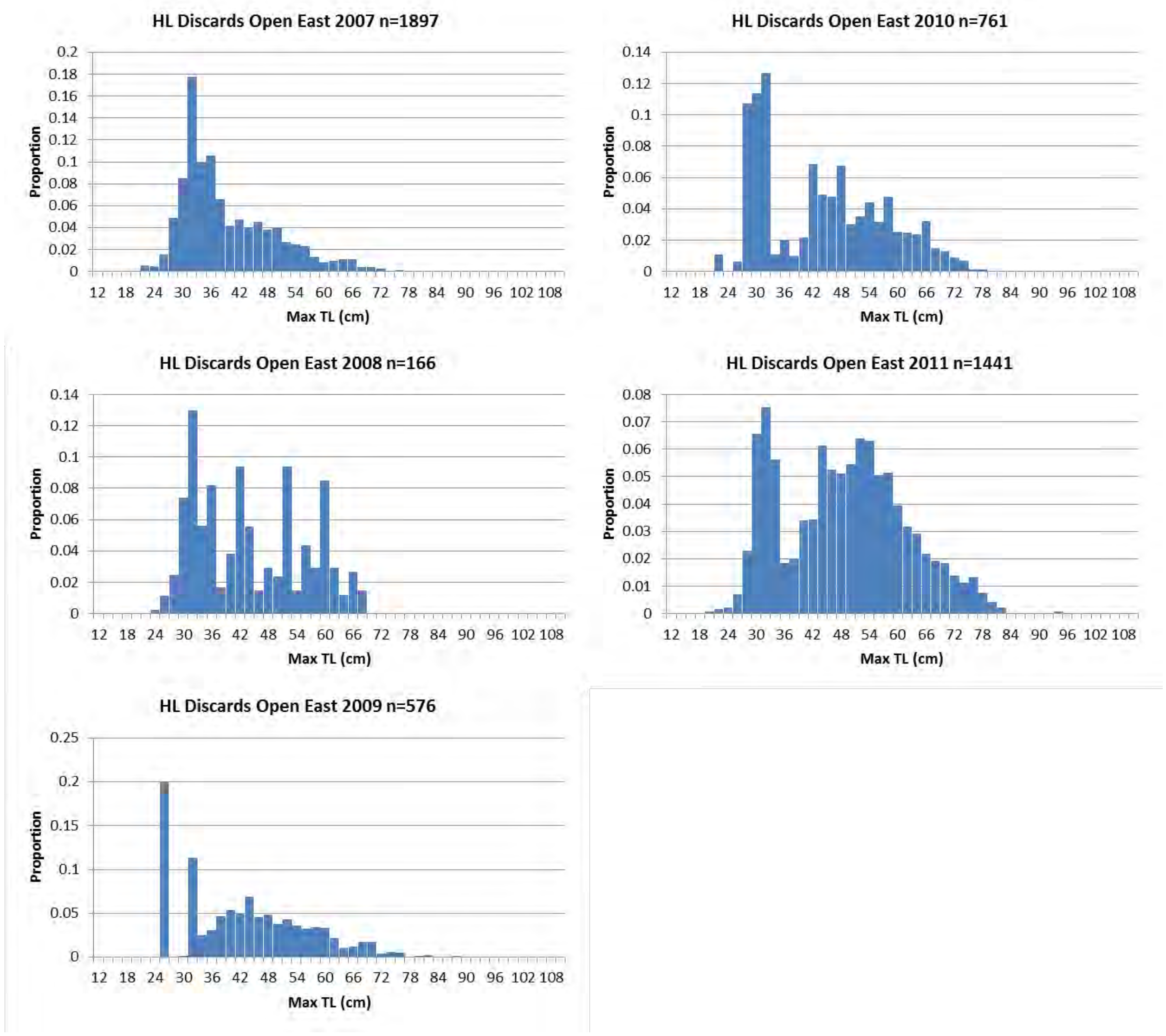


Figure 2.4.1.7. Length compositions of discarded red snapper from the commercial handline fishery in the eastern Gulf of Mexico.

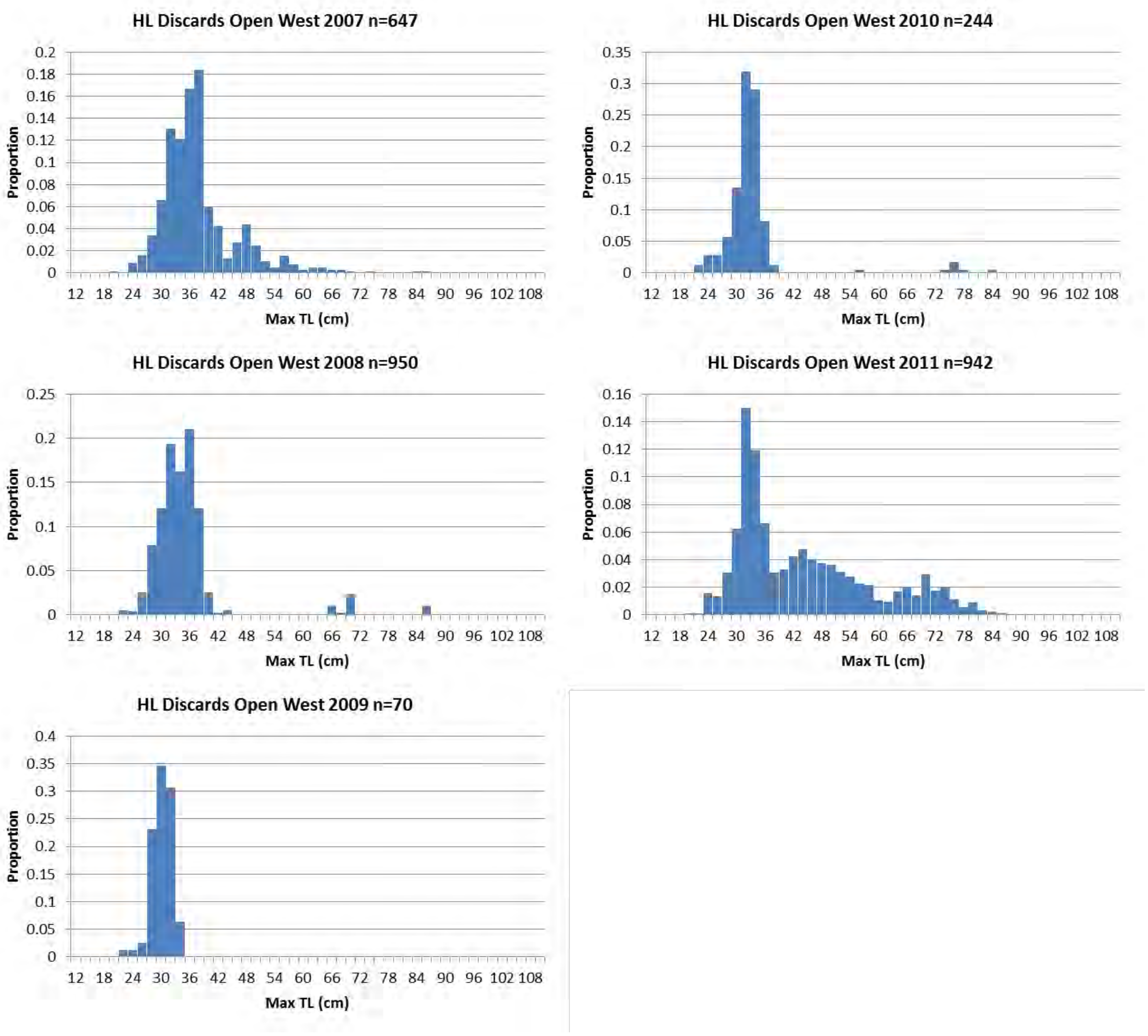


Figure 2.4.1.8. Length compositions of discarded red snapper from the commercial handline fishery in the western Gulf of Mexico.

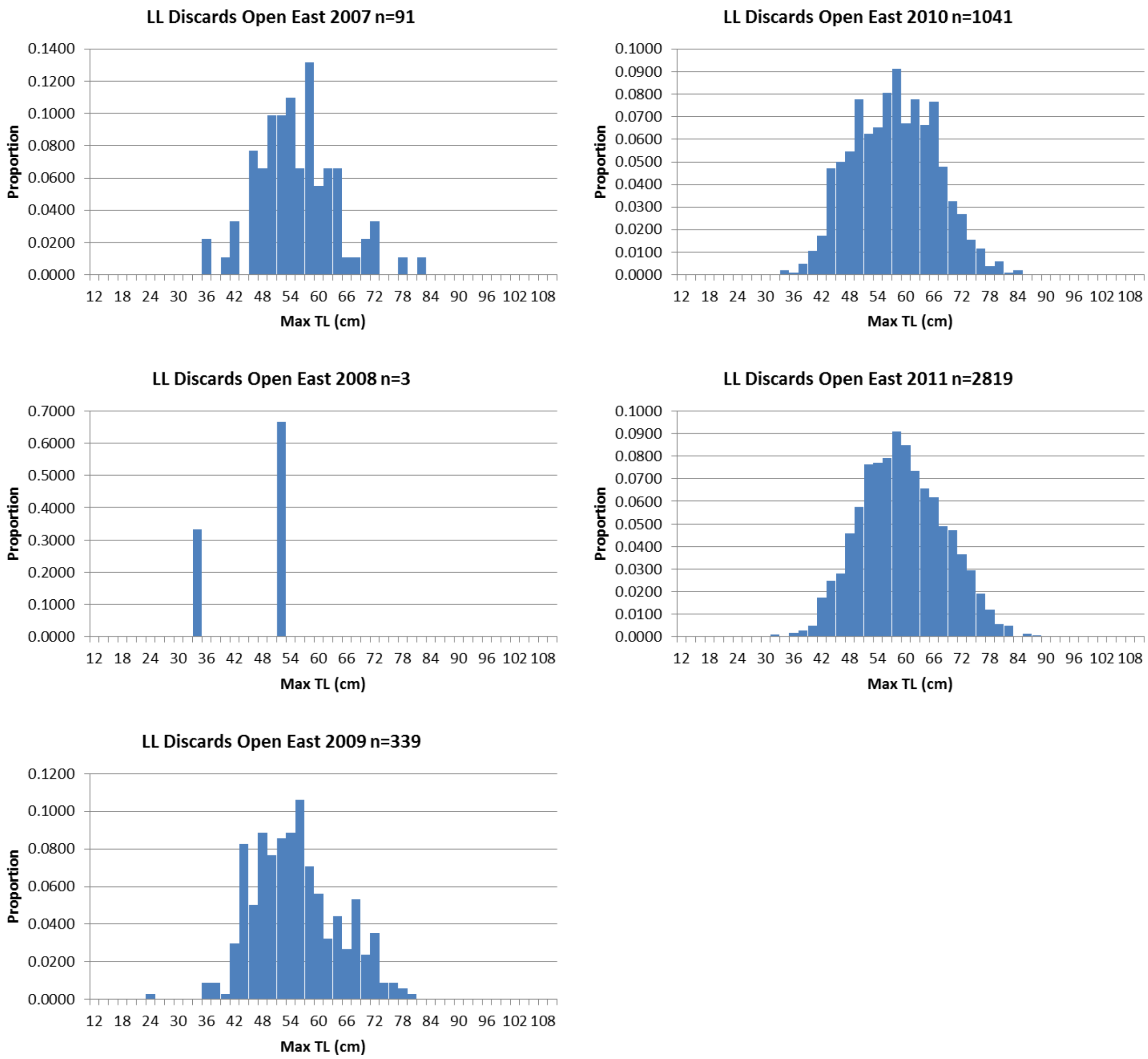


Figure 2.4.1.9. Length compositions of discarded red snapper from the commercial long line fishery in the eastern Gulf of Mexico.

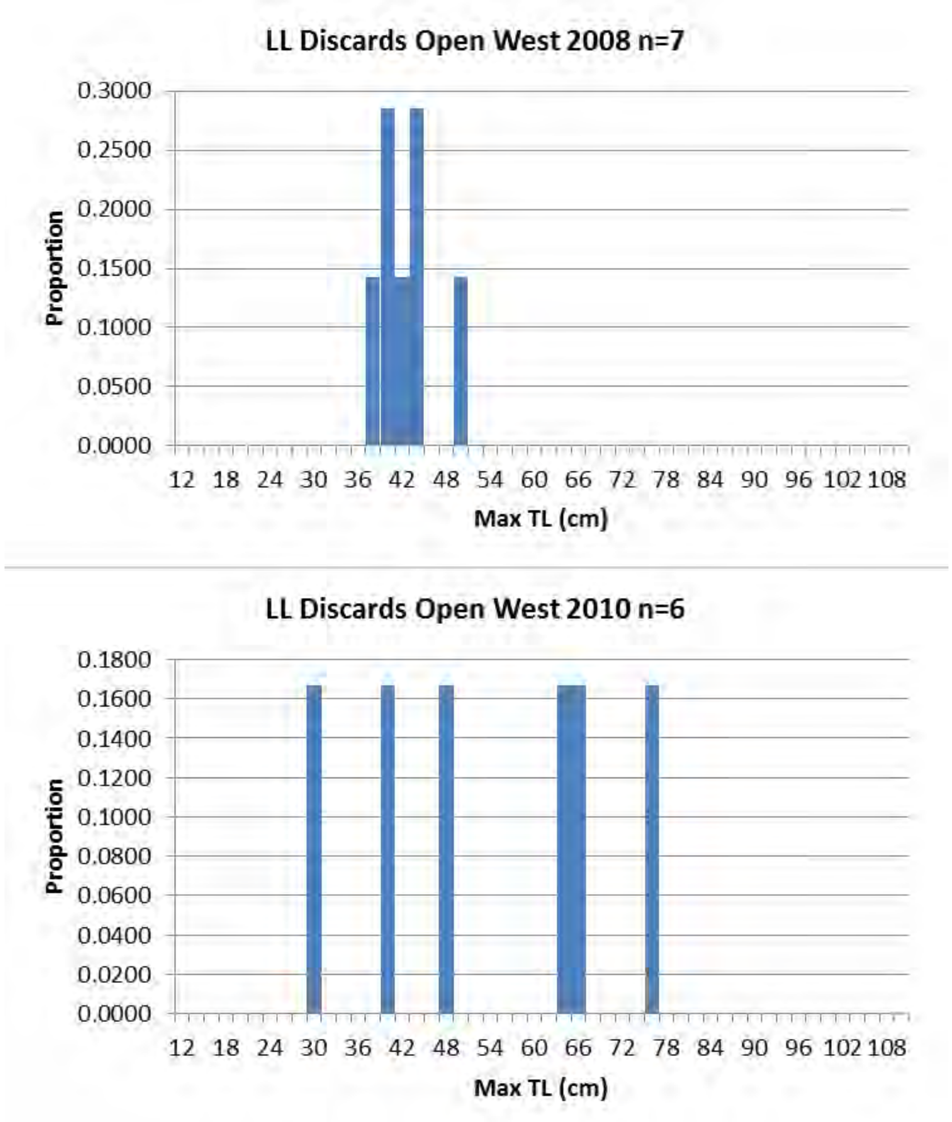


Figure 2.4.1.10. Length compositions of discarded red snapper from the commercial long line fishery in the western Gulf of Mexico.

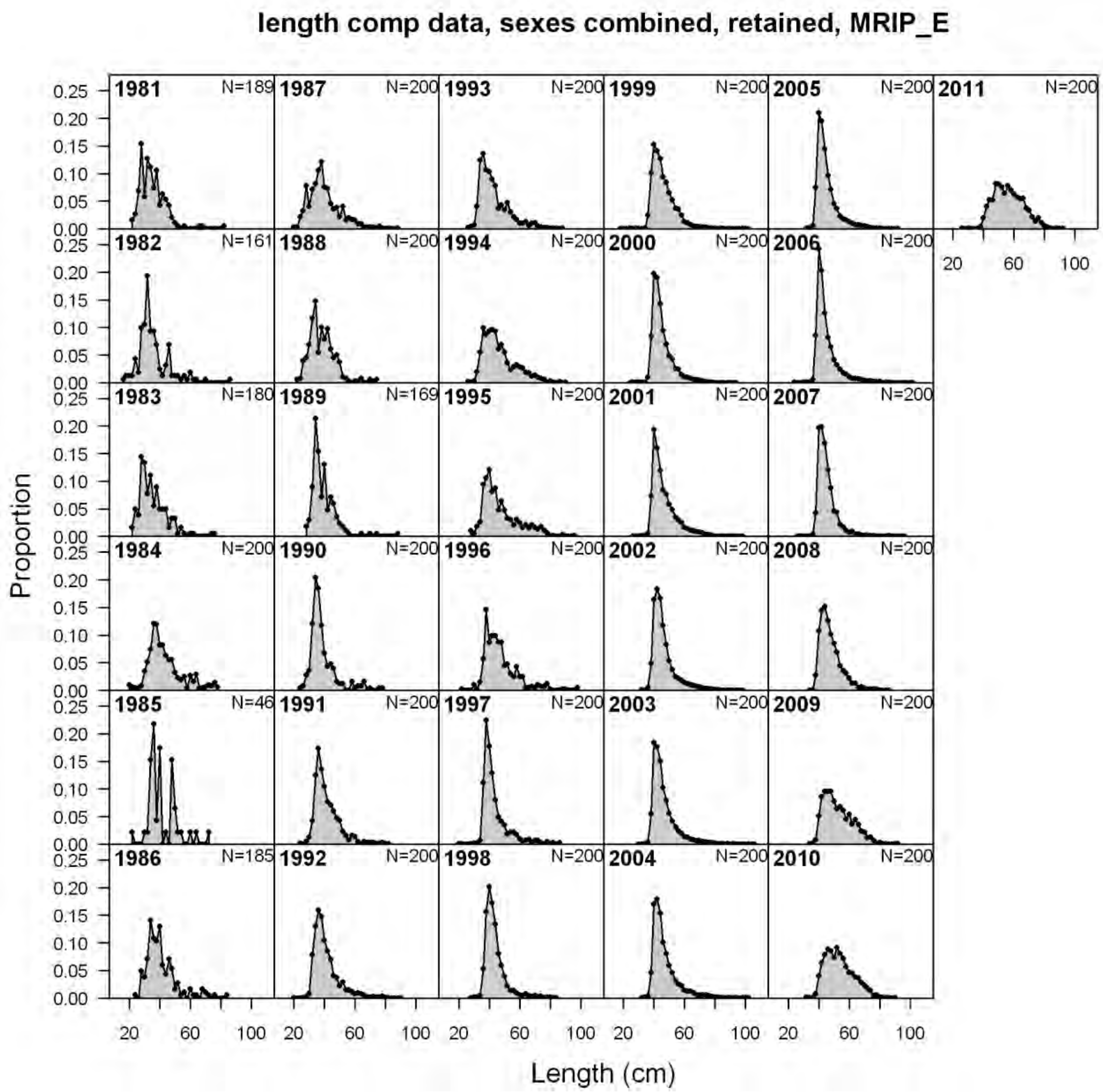


Figure 2.4.2.1. Length compositions of landed red snapper from the recreational charter/private fishery in the eastern Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

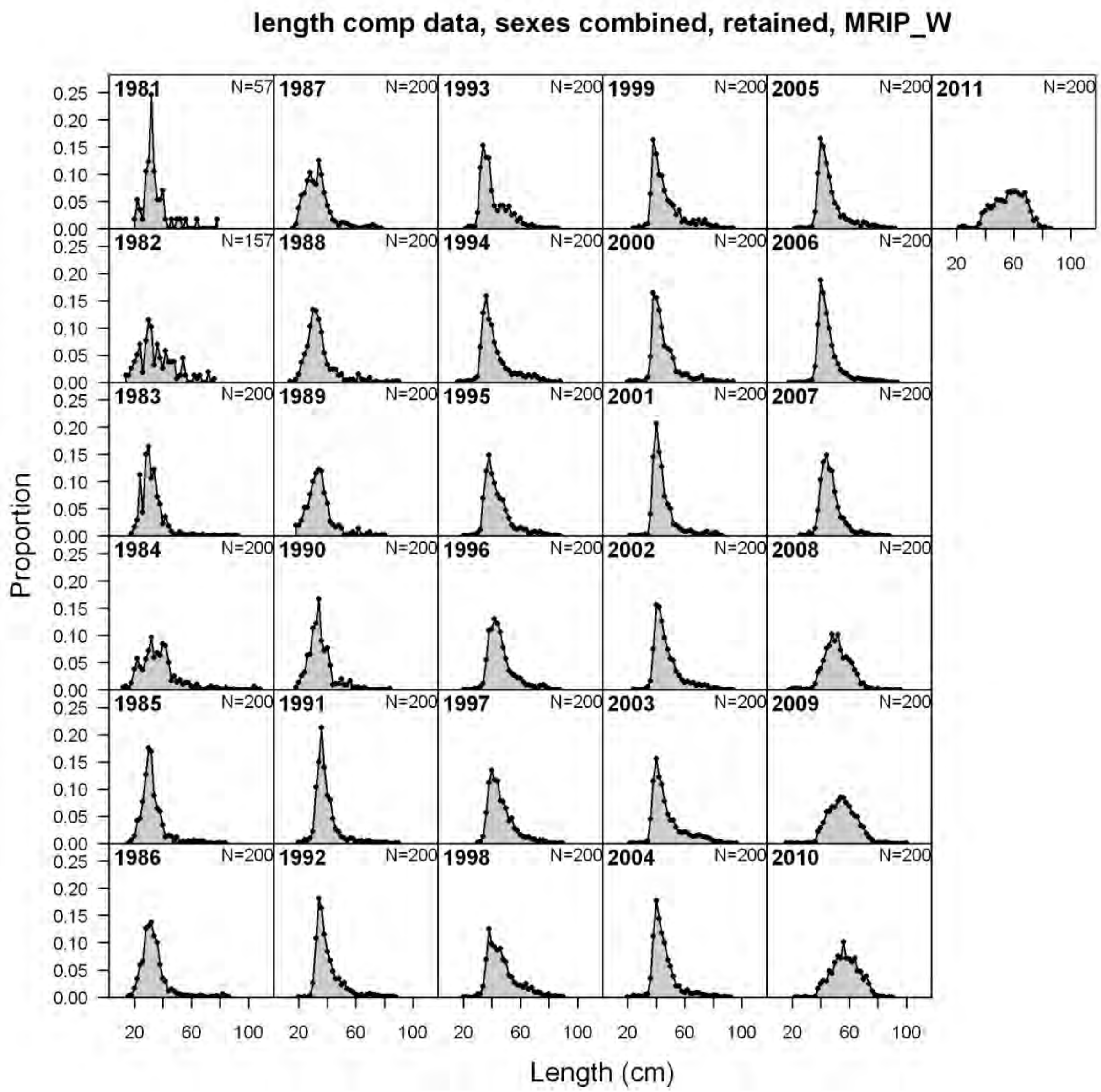


Figure 2.4.2.2. Length compositions of landed red snapper from the recreational charter/private fishery in the western Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

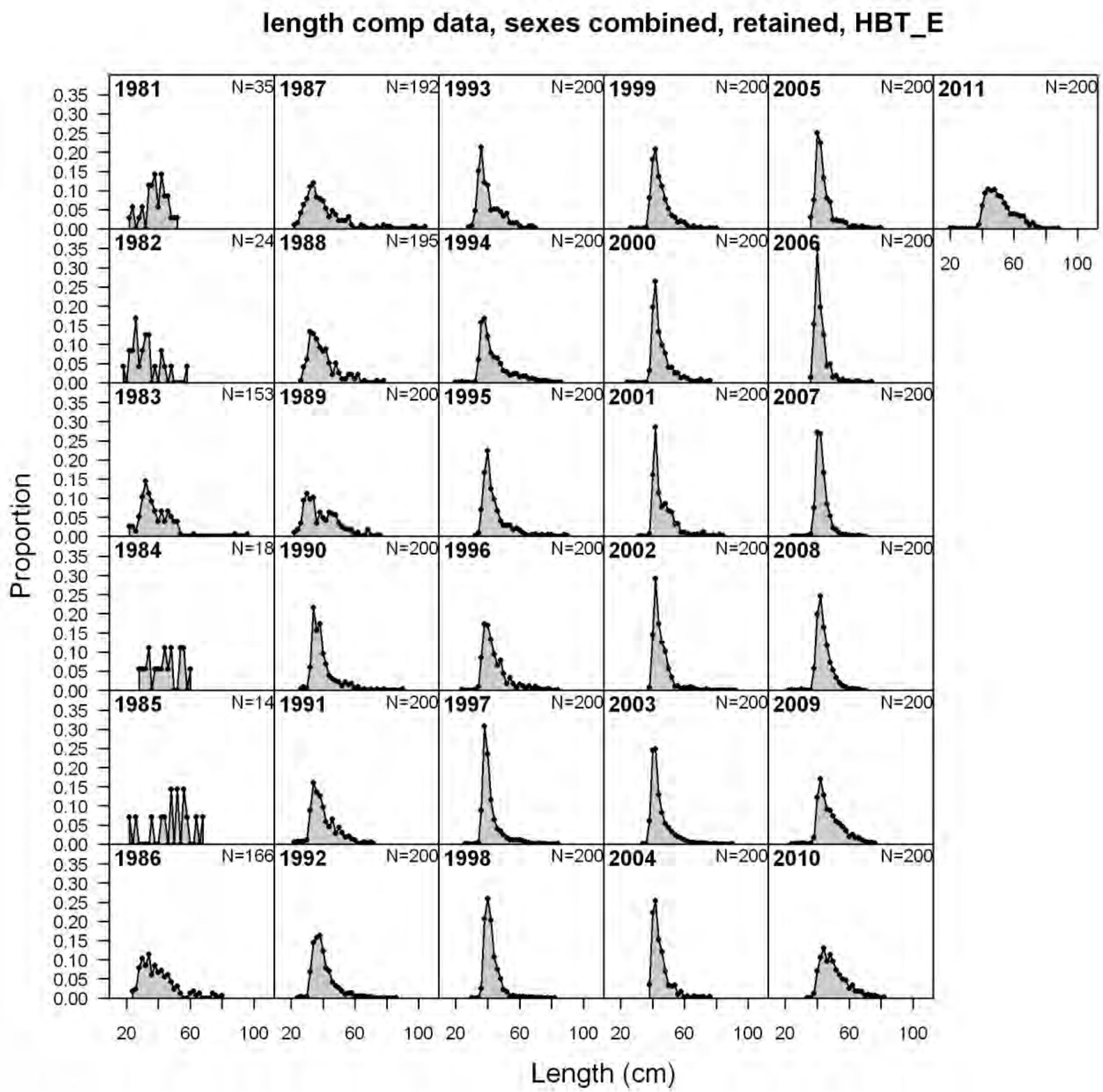


Figure 2.4.2.3. Length compositions of landed red snapper from the recreational headboat fishery in the eastern Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

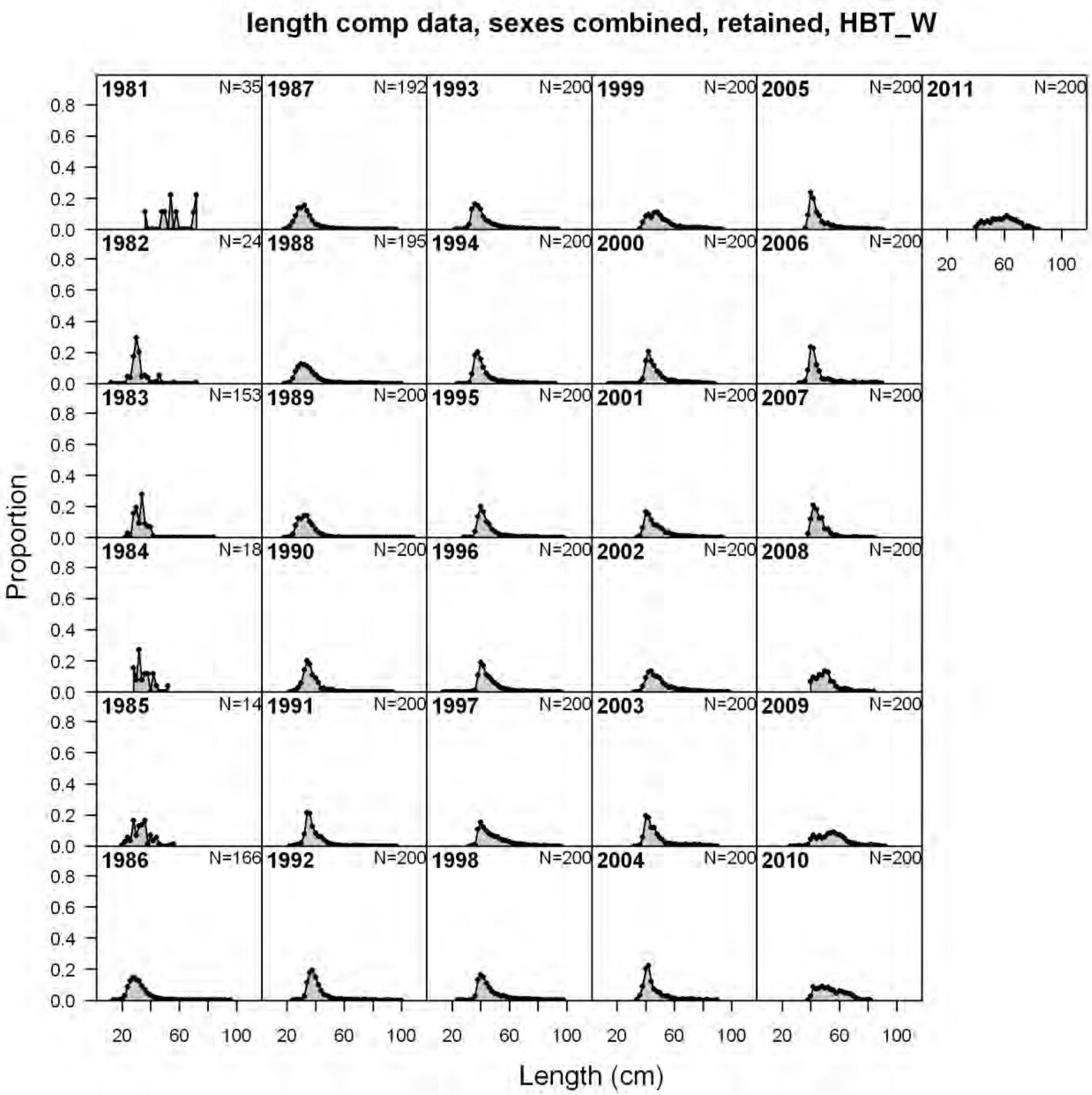


Figure 2.4.2.4. Length compositions of landed red snapper from the recreational headboat fishery in the western Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

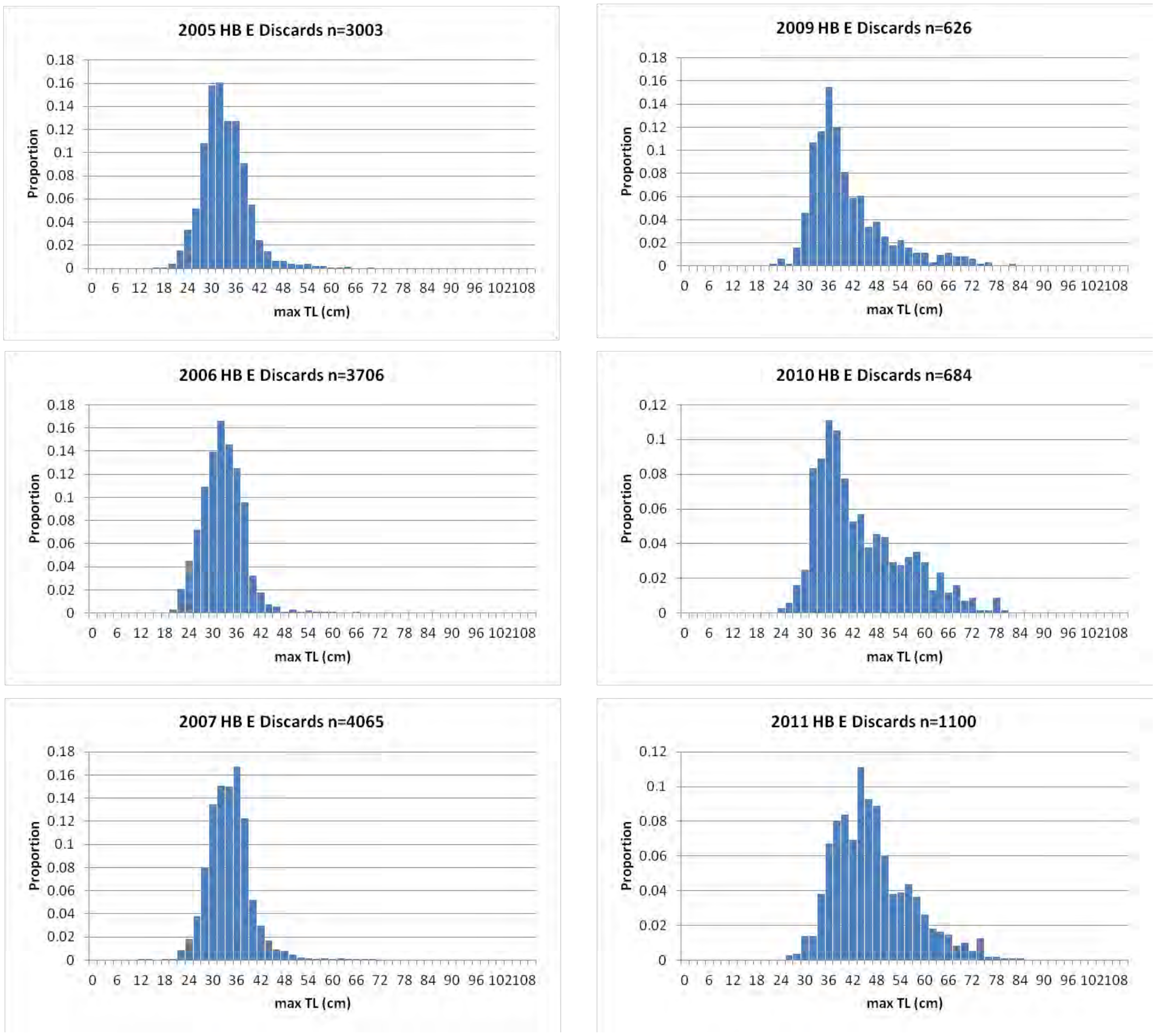


Figure 2.4.2.5. Length compositions of discarded red snapper from the recreational headboat fishery in the eastern Gulf of Mexico.

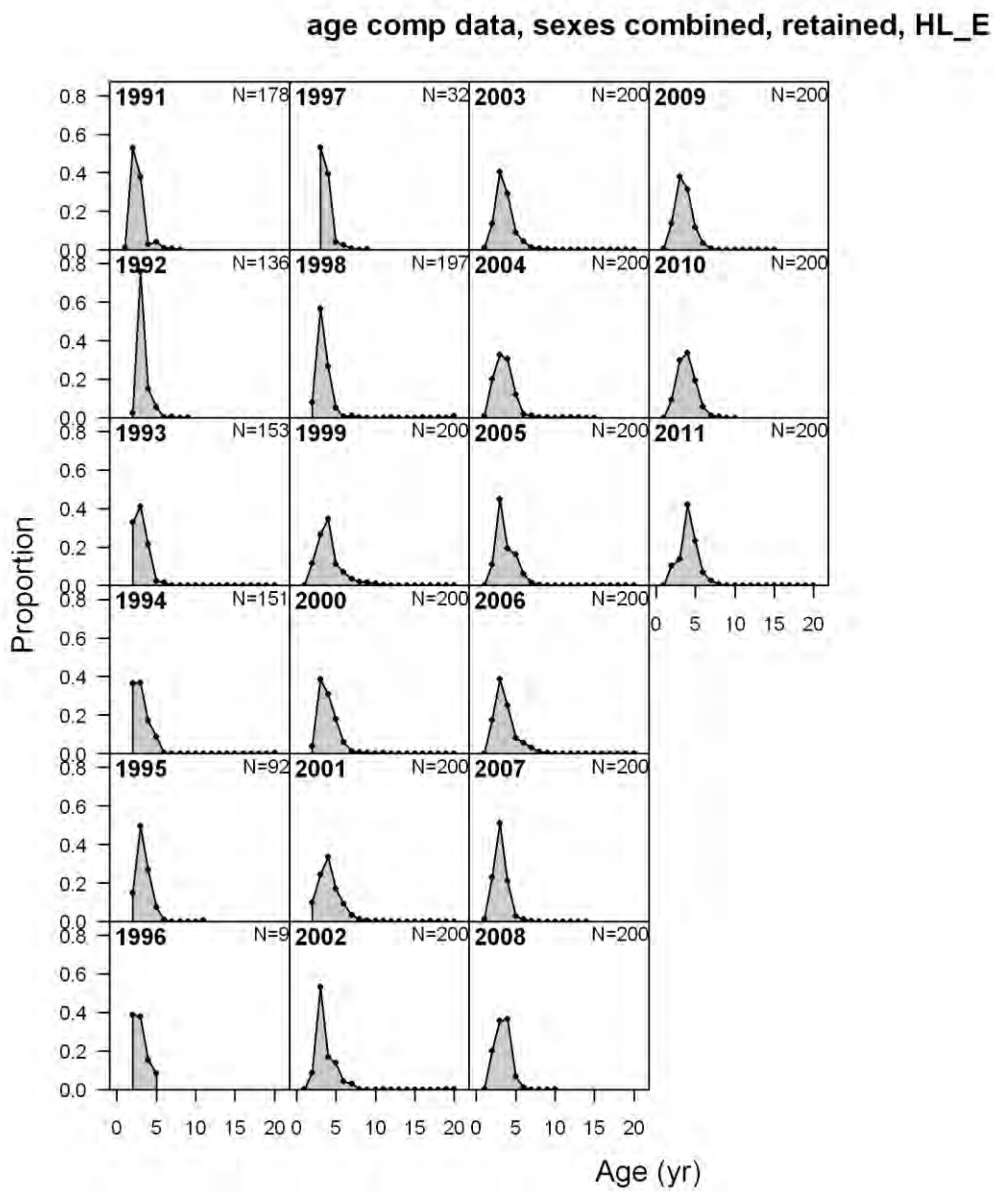


Figure 2.5.1.1. Age compositions of landed red snapper from the commercial handline fishery in the eastern Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

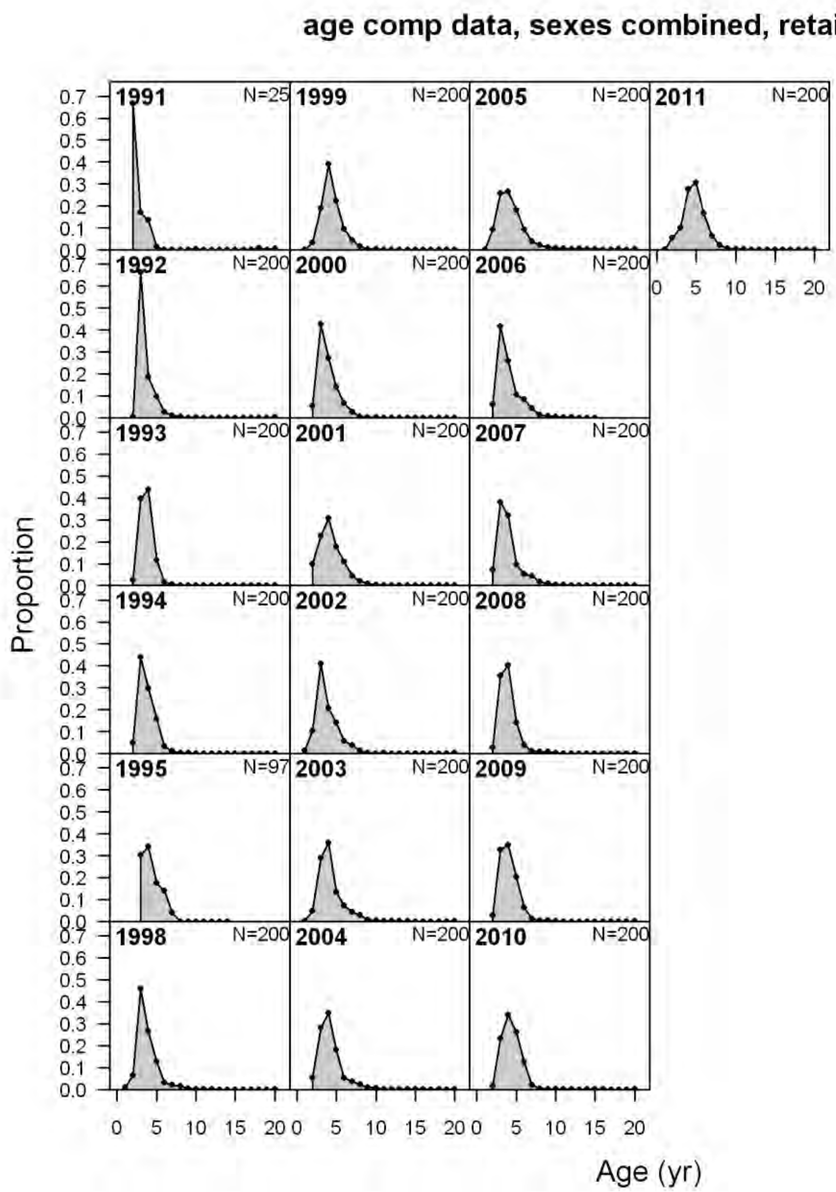


Figure 2.5.1.2. Age compositions of landed red snapper from the commercial handline fishery in the western Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

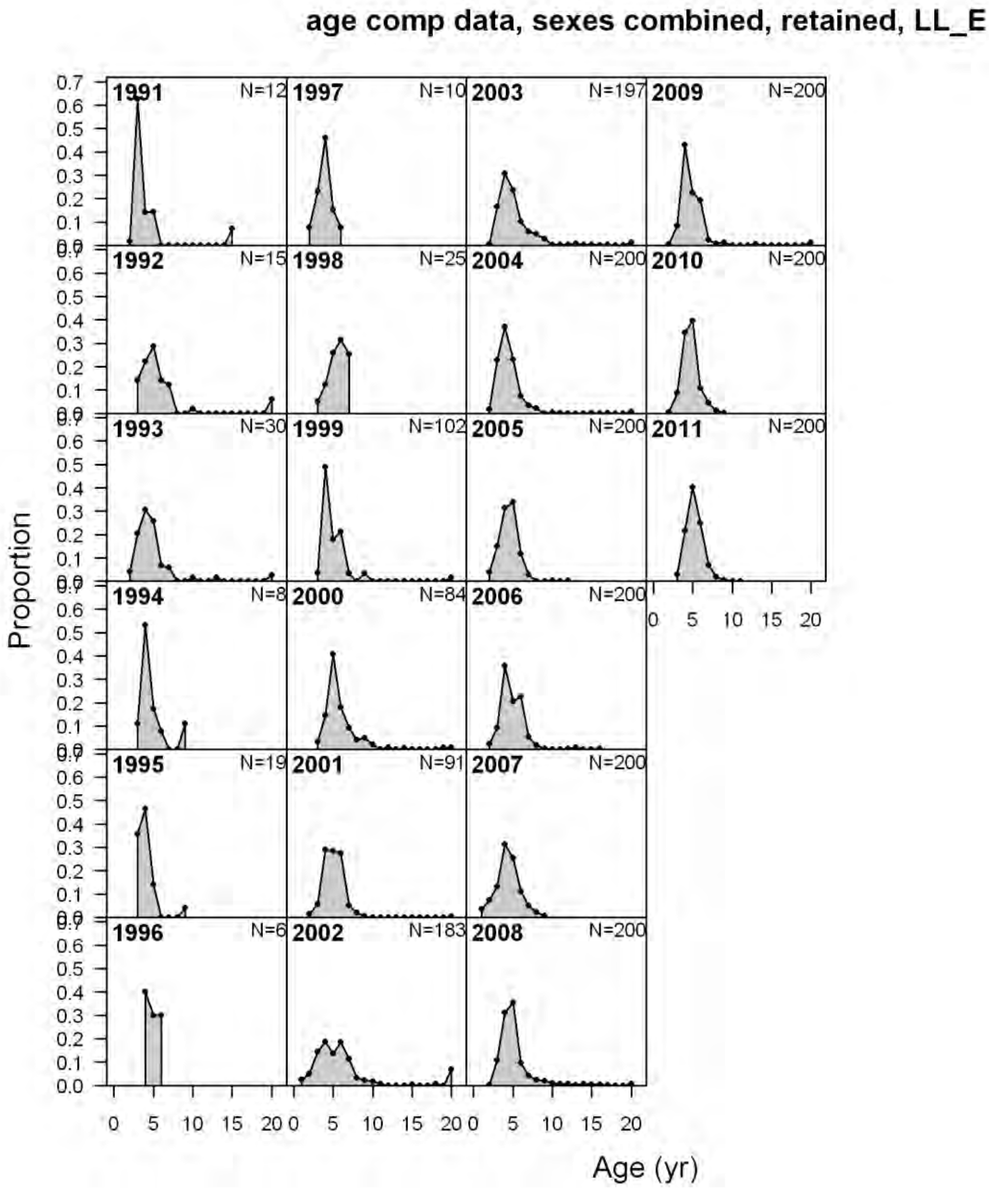


Figure 2.5.1.3. Age compositions of landed red snapper from the commercial long line fishery in the eastern Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

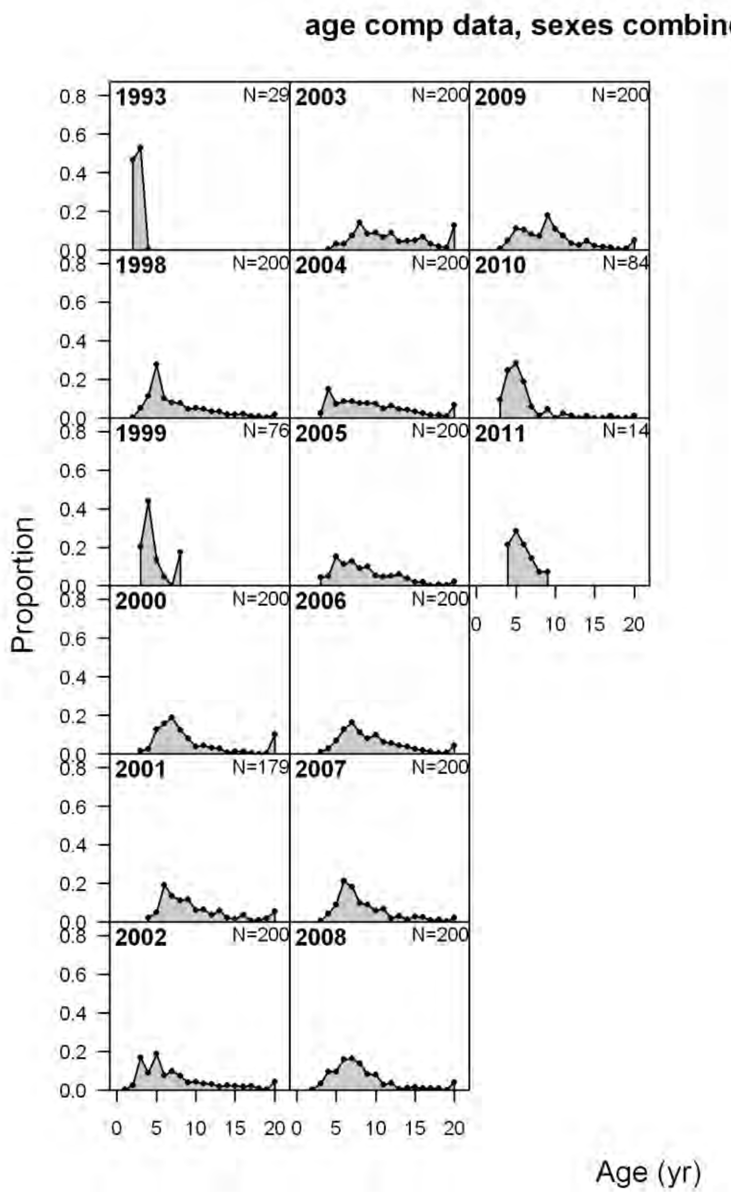


Figure 2.5.1.4. Age compositions of landed red snapper from the commercial long line fishery in the western Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

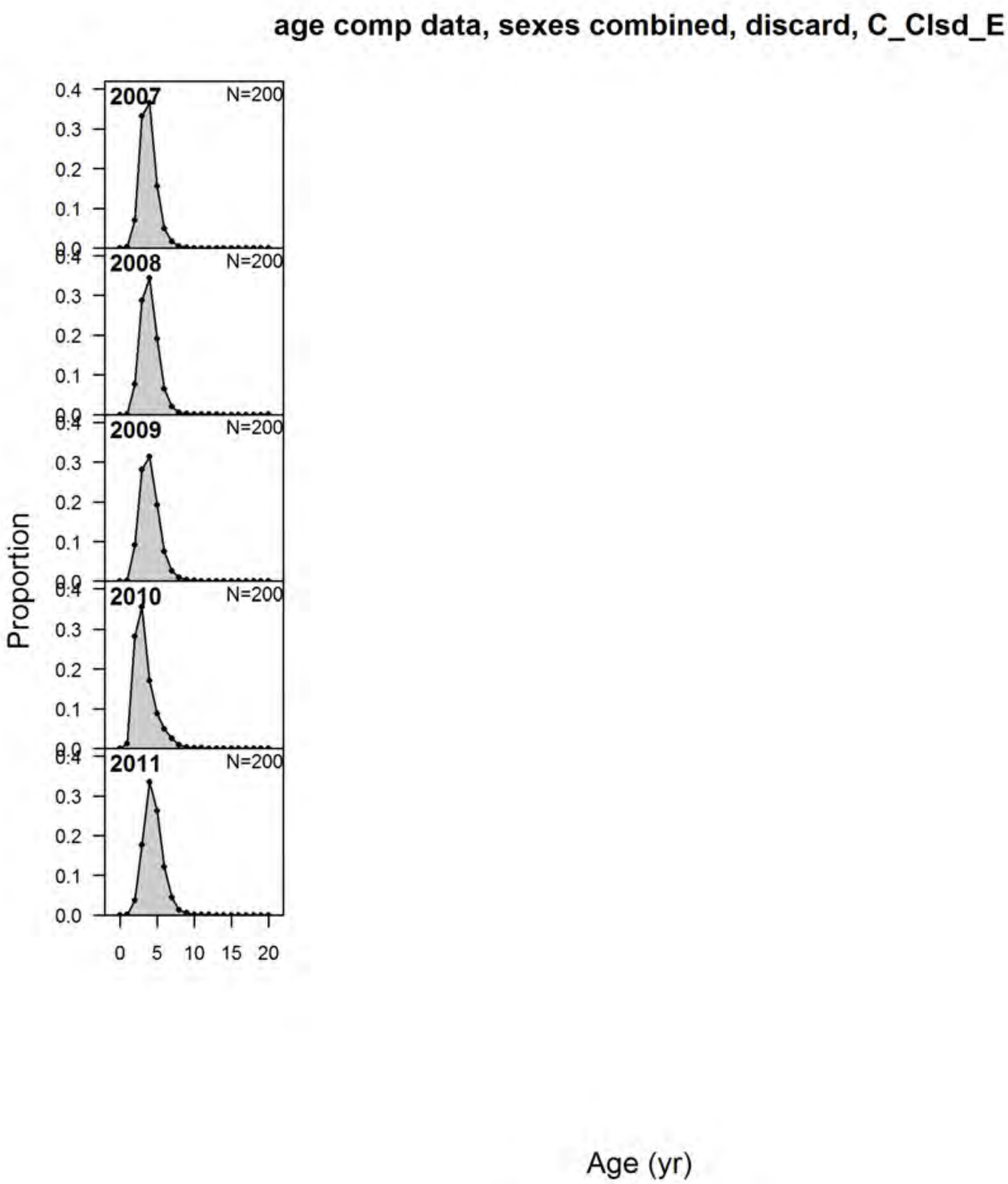


Figure 2.5.1.5. Age compositions of discarded red snapper from the commercial closed season in the eastern Gulf of Mexico. Sample sizes (n) were capped at maximum value of 200 fish.

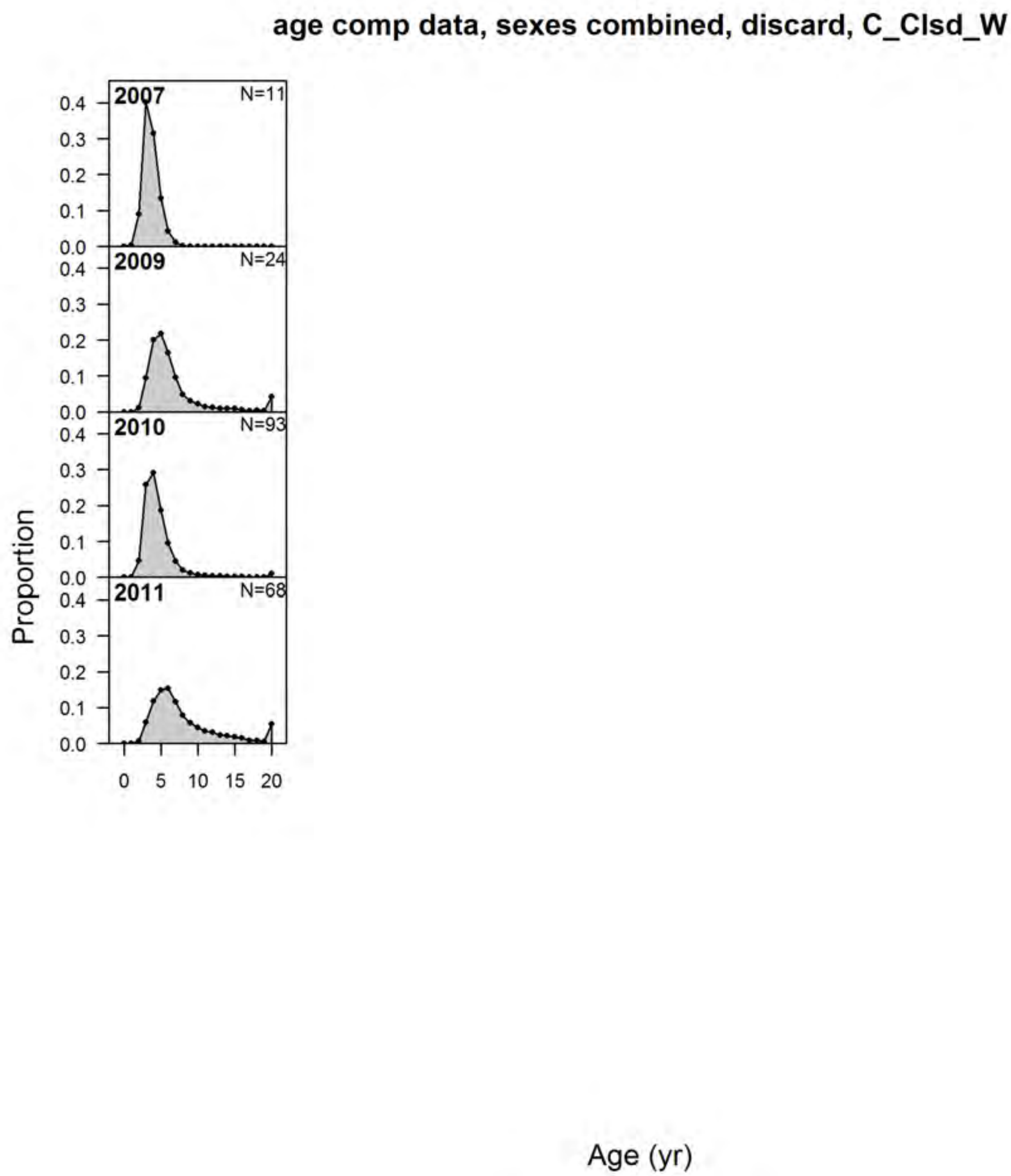


Figure 2.5.1.6. Age compositions of discarded red snapper from the commercial closed season in the western Gulf of Mexico. Sample sizes (n) were capped at maximum value of 200 fish.

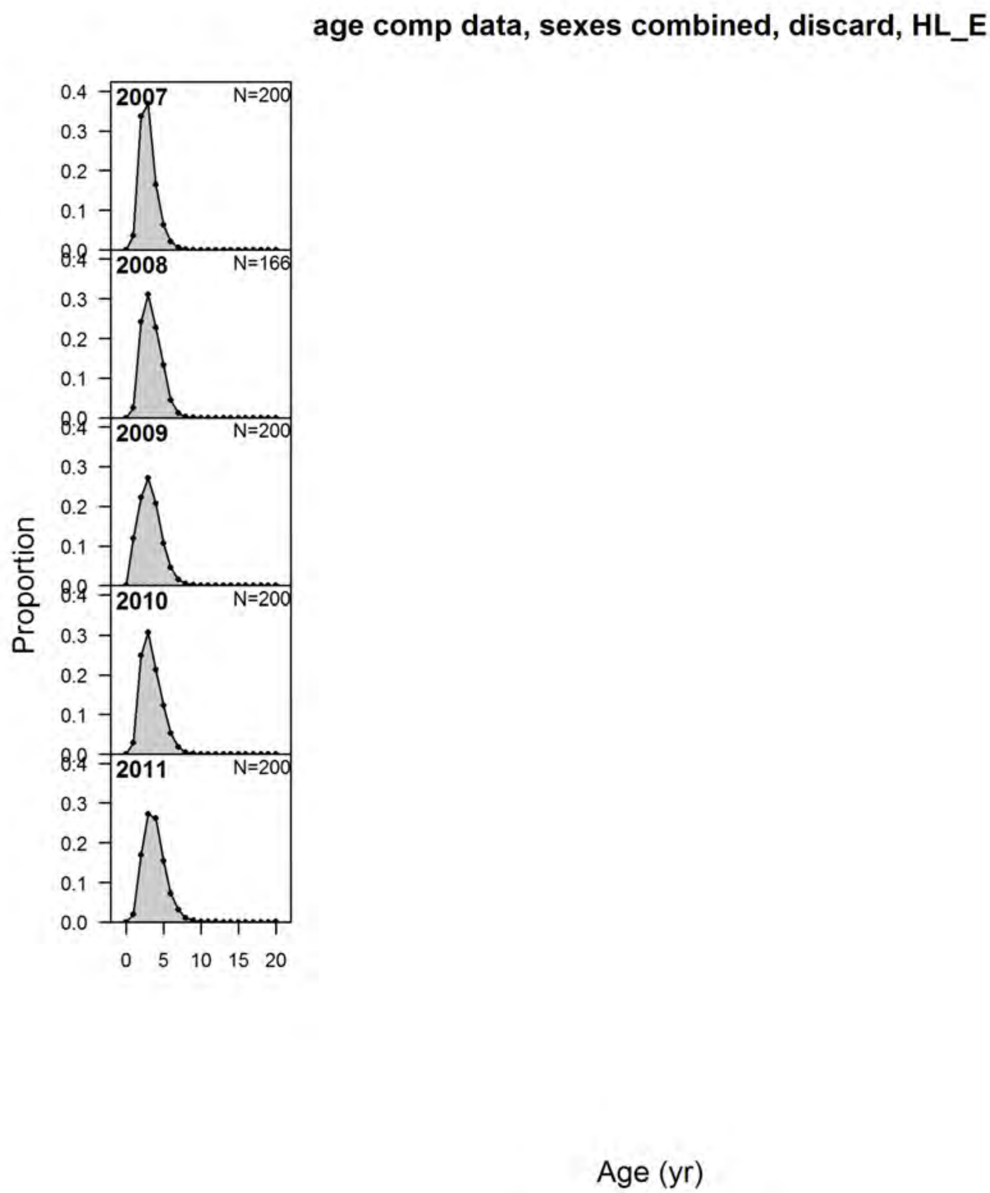


Figure 2.5.1.7. Age compositions of discarded red snapper from the commercial handline fishery in the eastern Gulf of Mexico. Sample sizes (n) were capped at maximum value of 200 fish.

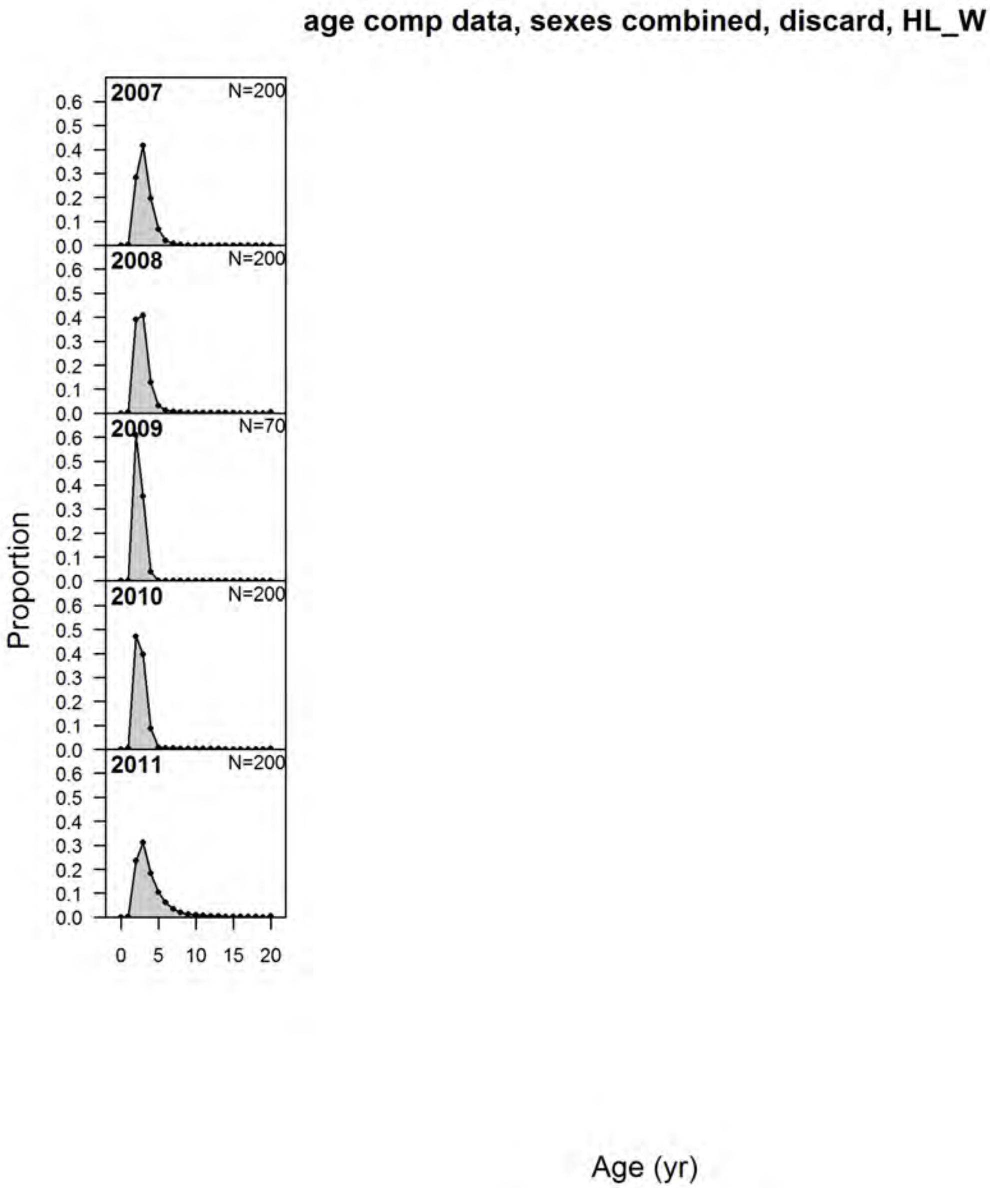


Figure 2.5.1.8. Age compositions of discarded red snapper from the commercial handline fishery in the western Gulf of Mexico. Sample sizes (n) were capped at maximum value of 200 fish.

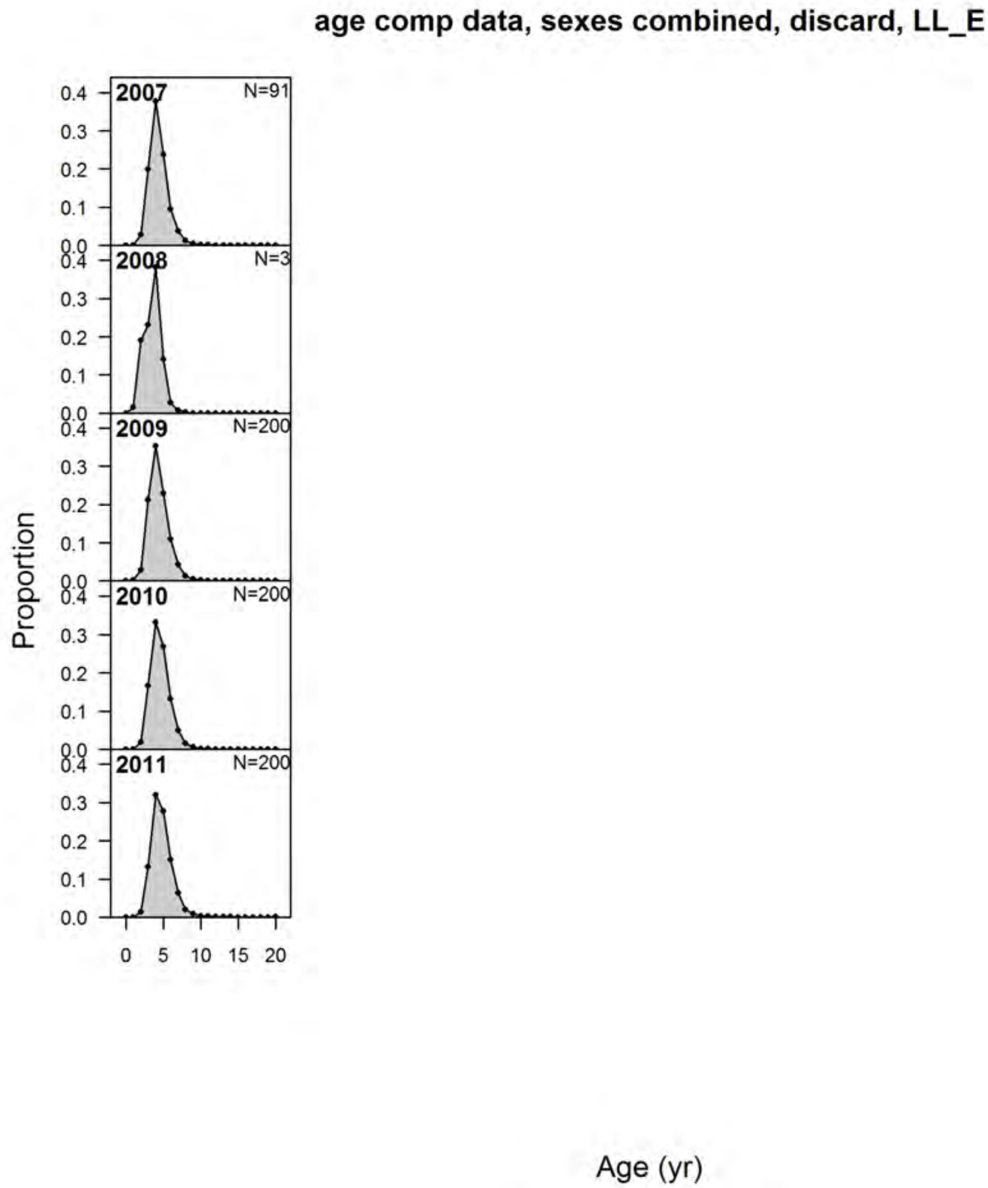


Figure 2.5.1.9. Age compositions of discarded red snapper from the commercial long line fishery in the eastern Gulf of Mexico. Sample sizes (n) were capped at maximum value of 200 fish.

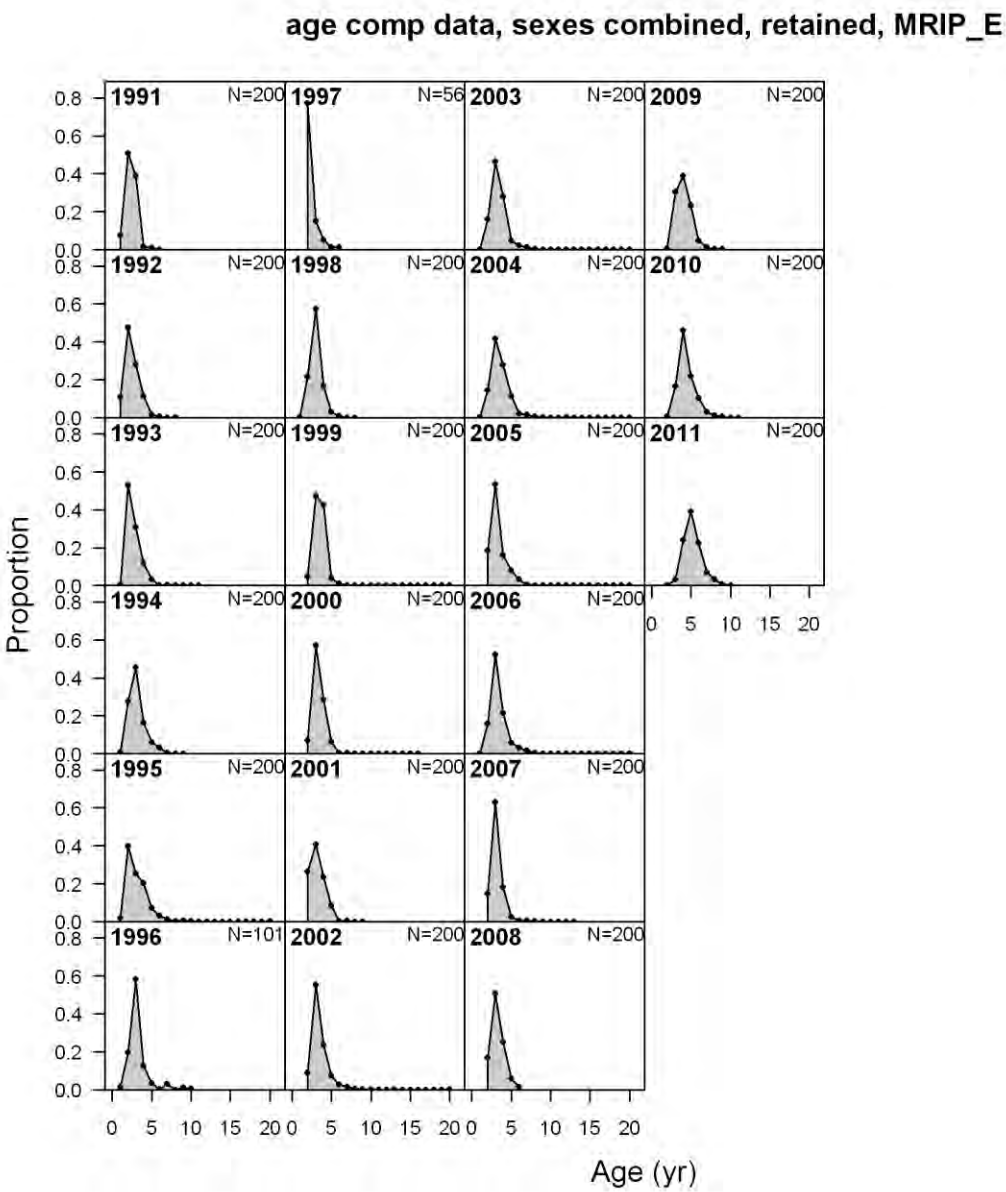


Figure 2.5.2.1. Age compositions of landed red snapper from the recreational charter/private fishery in the eastern Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

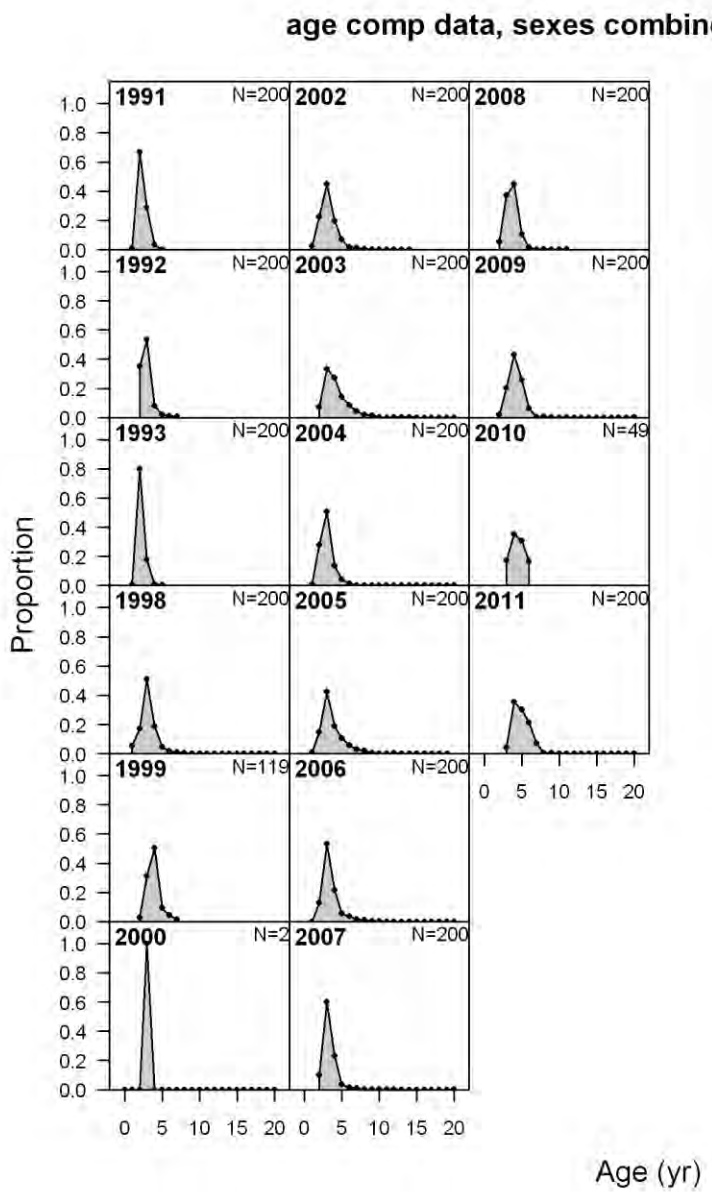


Figure 2.5.2.2. Age compositions of landed red snapper from the recreational charter/private fishery in the western Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

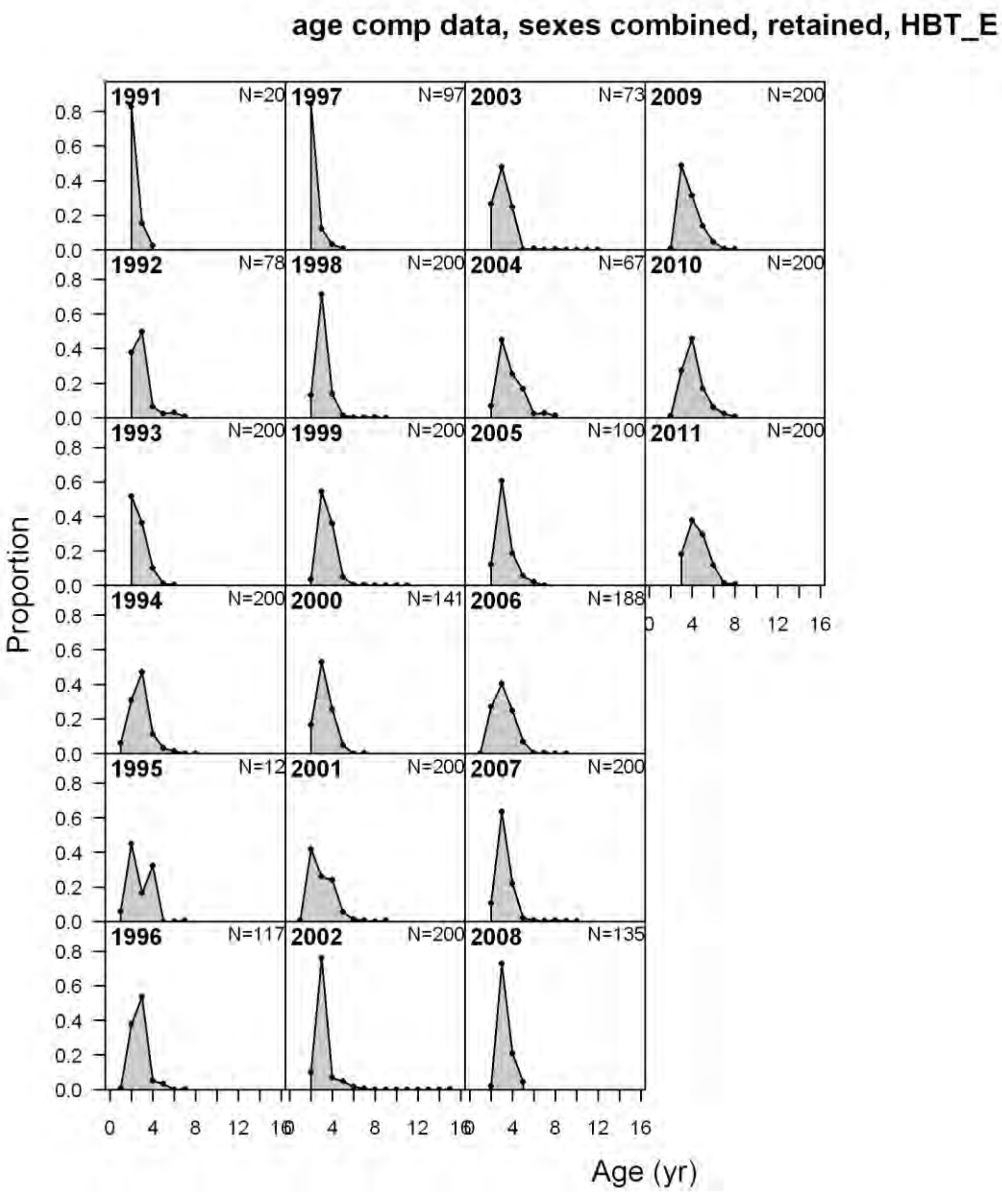


Figure 2.5.2.3. Age compositions of landed red snapper from the recreational headboat fishery in the eastern Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

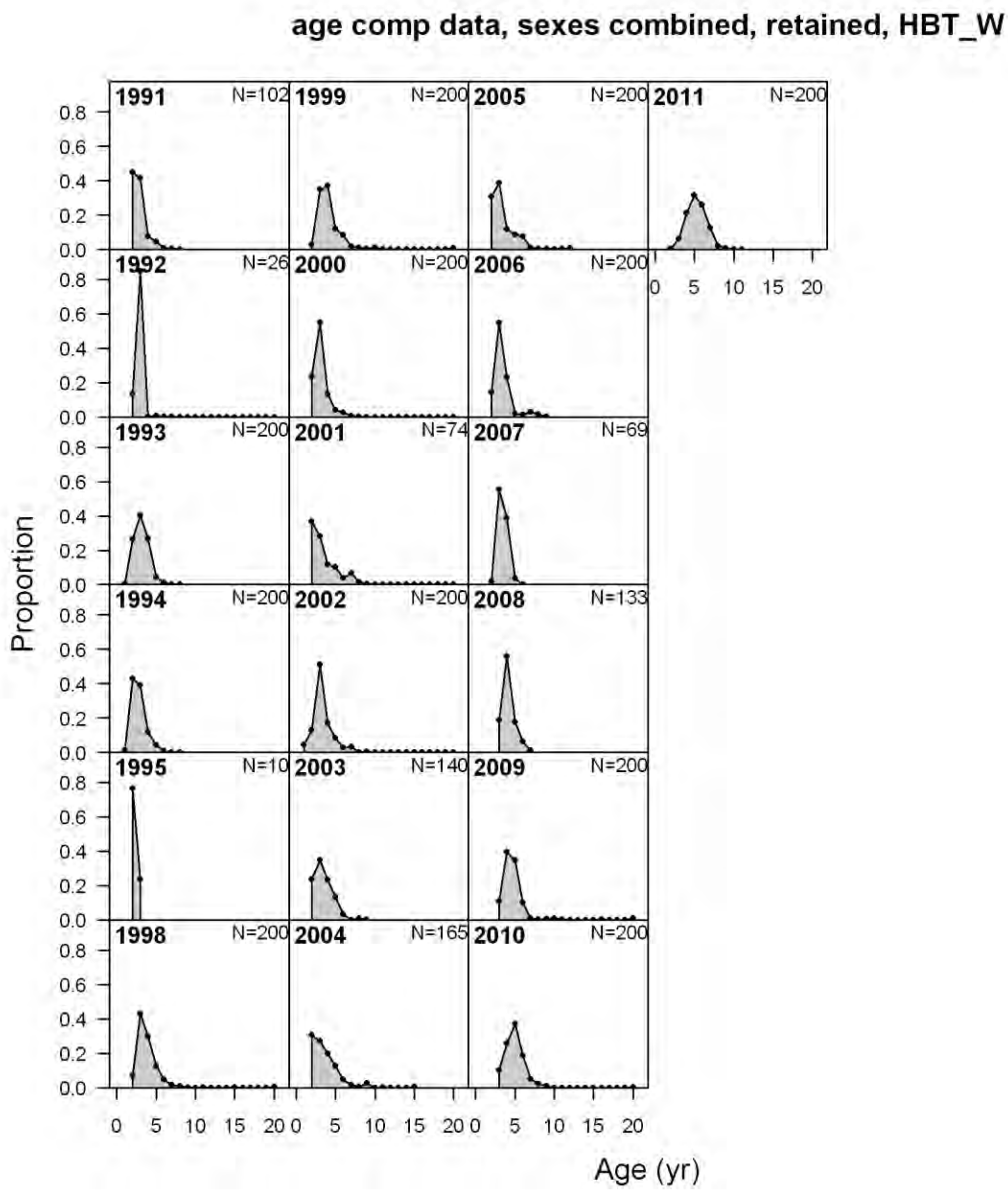


Figure 2.5.2.4. Age compositions of landed red snapper from the recreational headboat fishery in the western Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

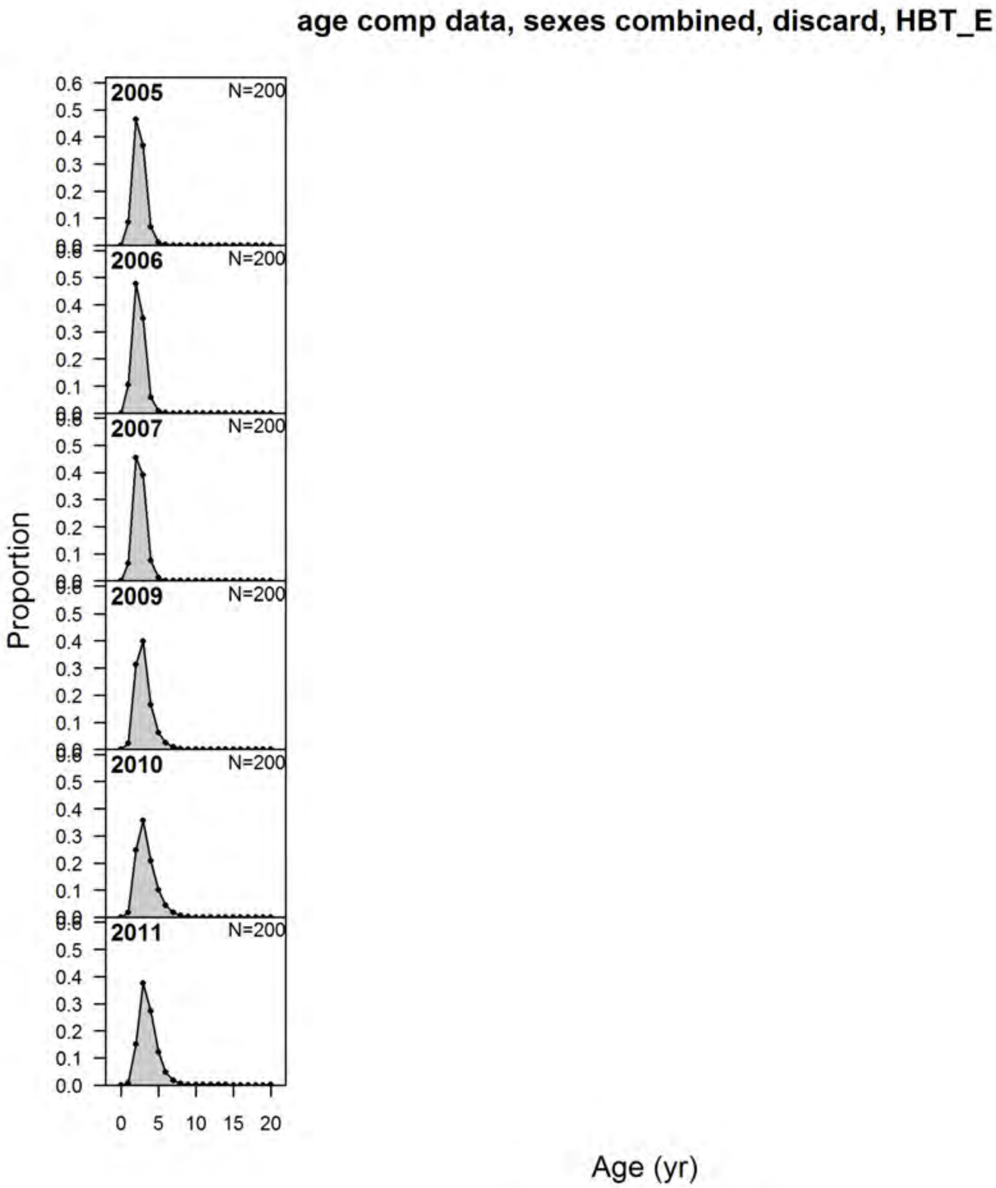


Figure 2.5.2.5. Age compositions of discarded red snapper from the recreational headboat fishery in the eastern Gulf of Mexico.

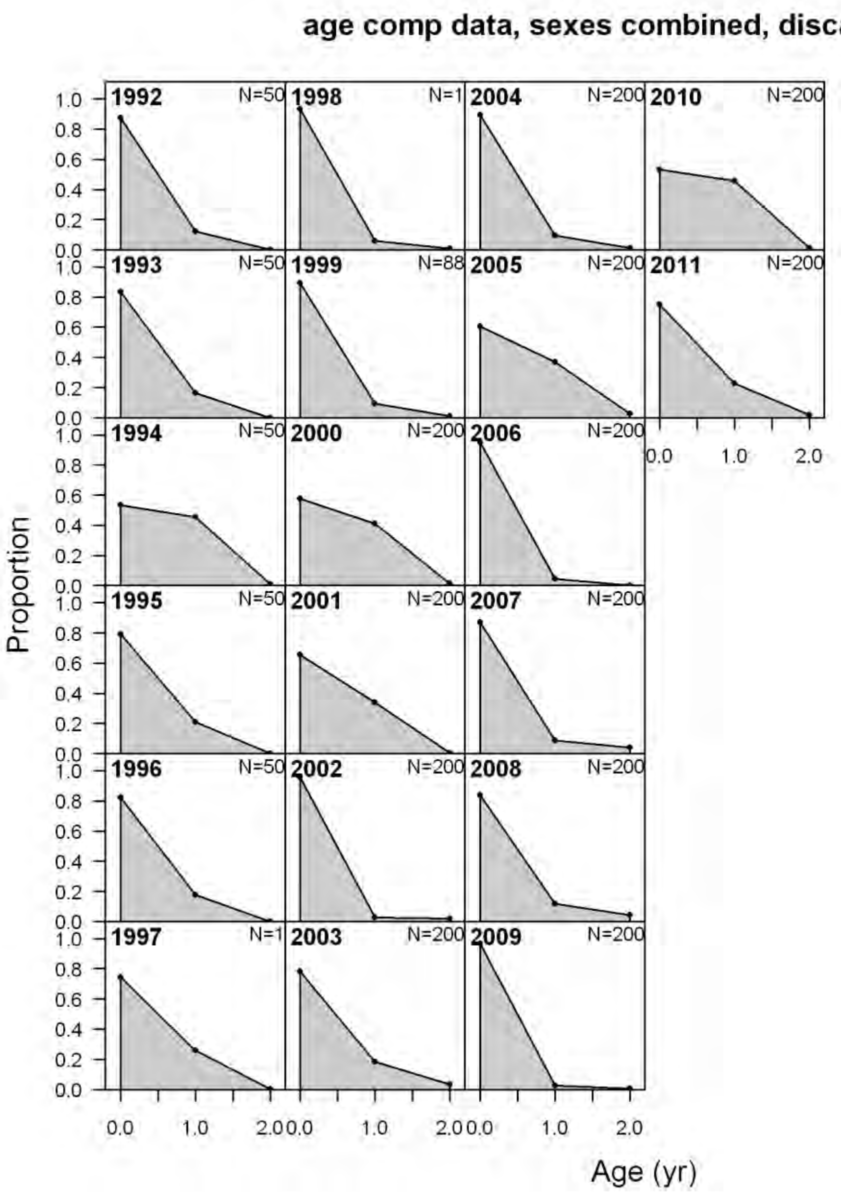


Figure 2.5.3.1. Age compositions of red snapper bycatch from the shrimp fishery in the eastern Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

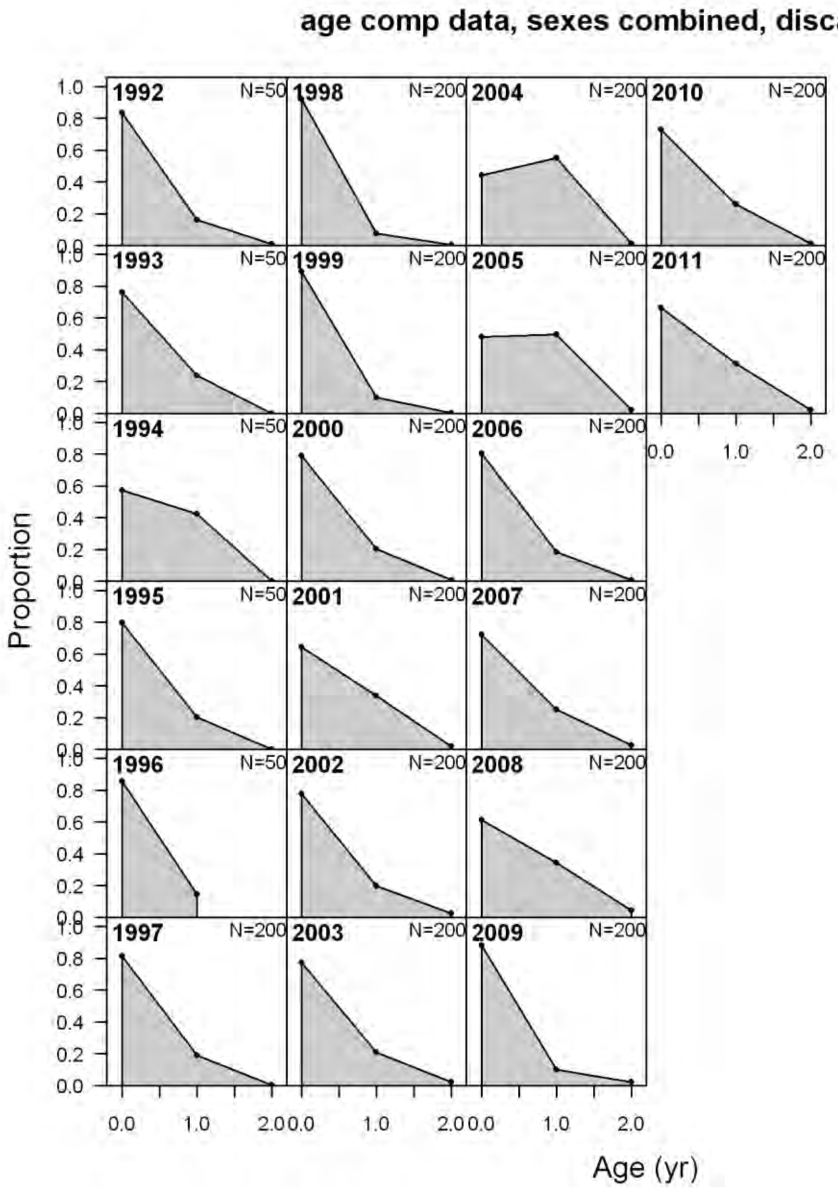


Figure 2.5.3.2. Age compositions of red snapper bycatch from the shrimp fishery in the western Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

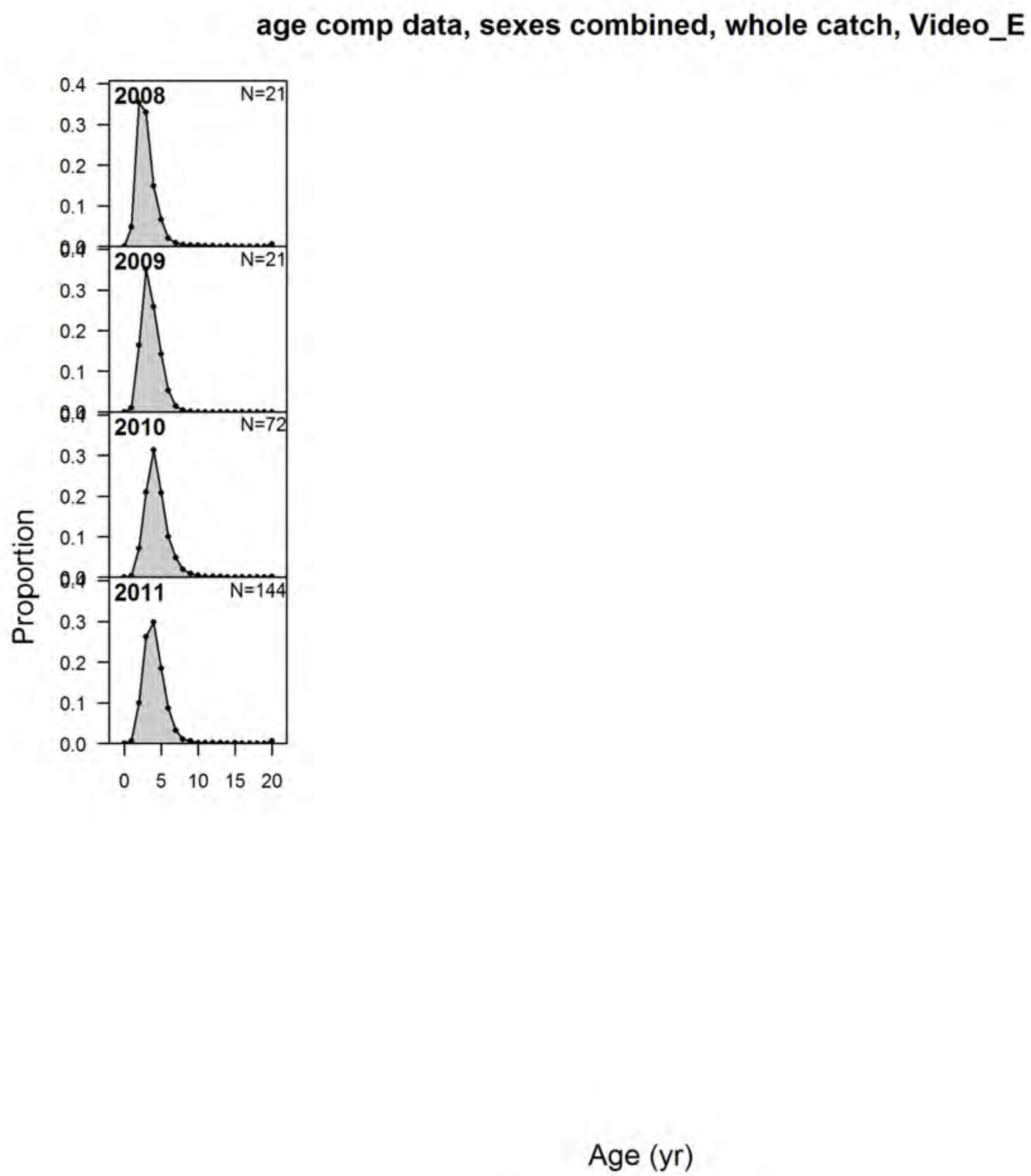


Figure 2.5.4.1. Age compositions of red snapper caught in the SEAMAP reef fish video survey in the eastern Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

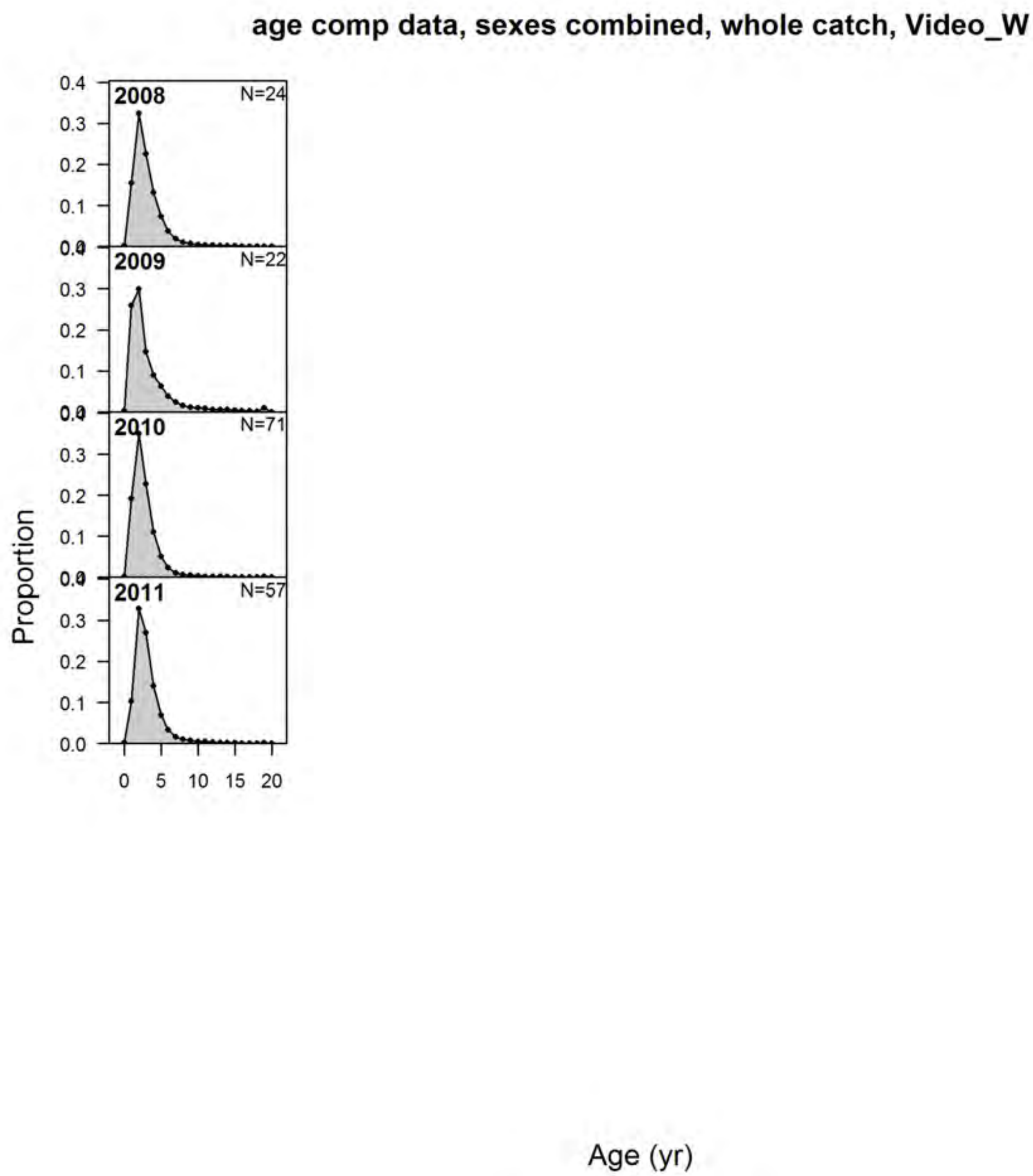


Figure 2.5.4.2. Age compositions of red snapper caught in the SEAMAP reef fish video survey in the eastern Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

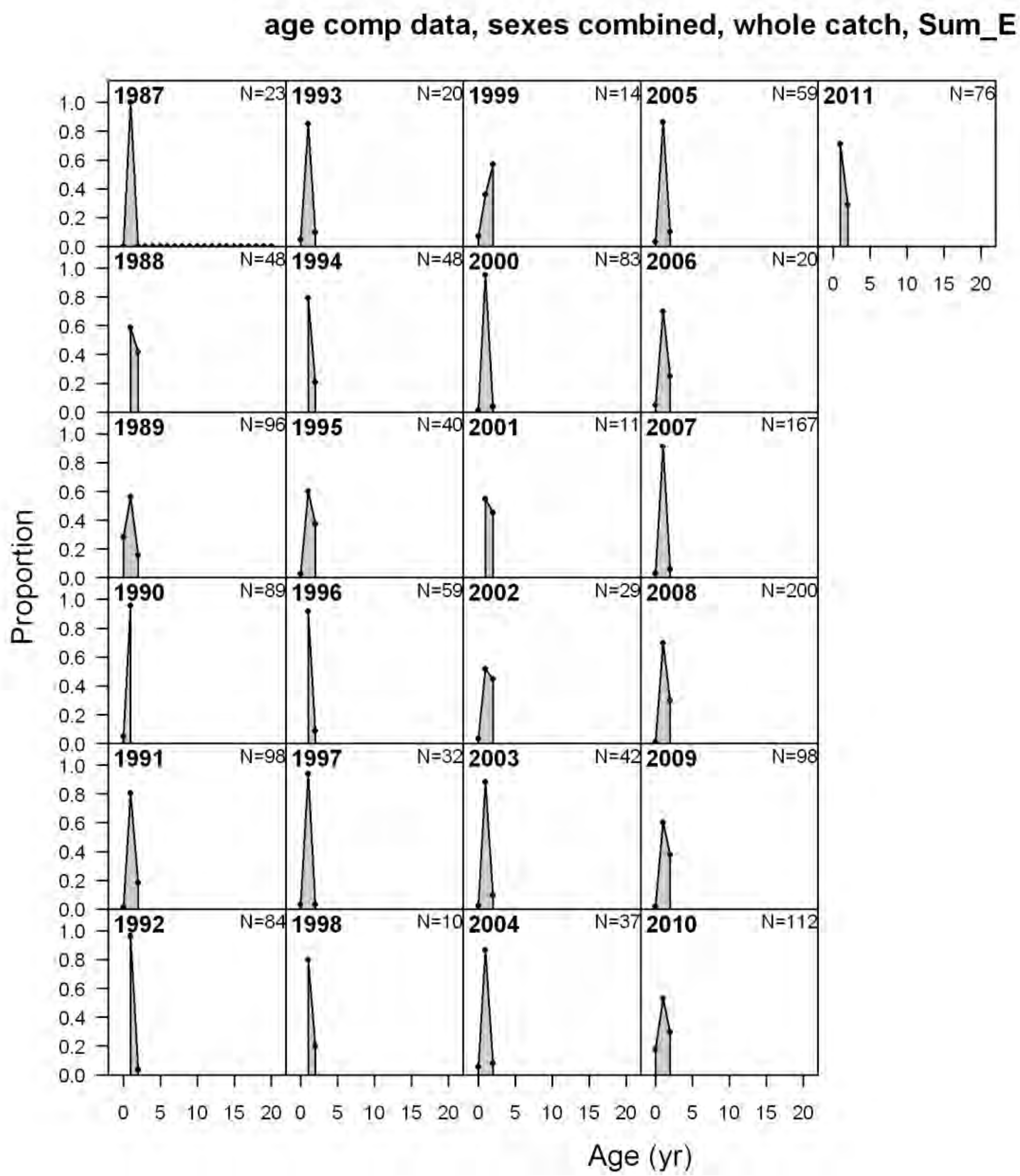


Figure 2.5.4.3. Age compositions of red snapper caught in the SEAMAP summer groundfish survey in the eastern Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

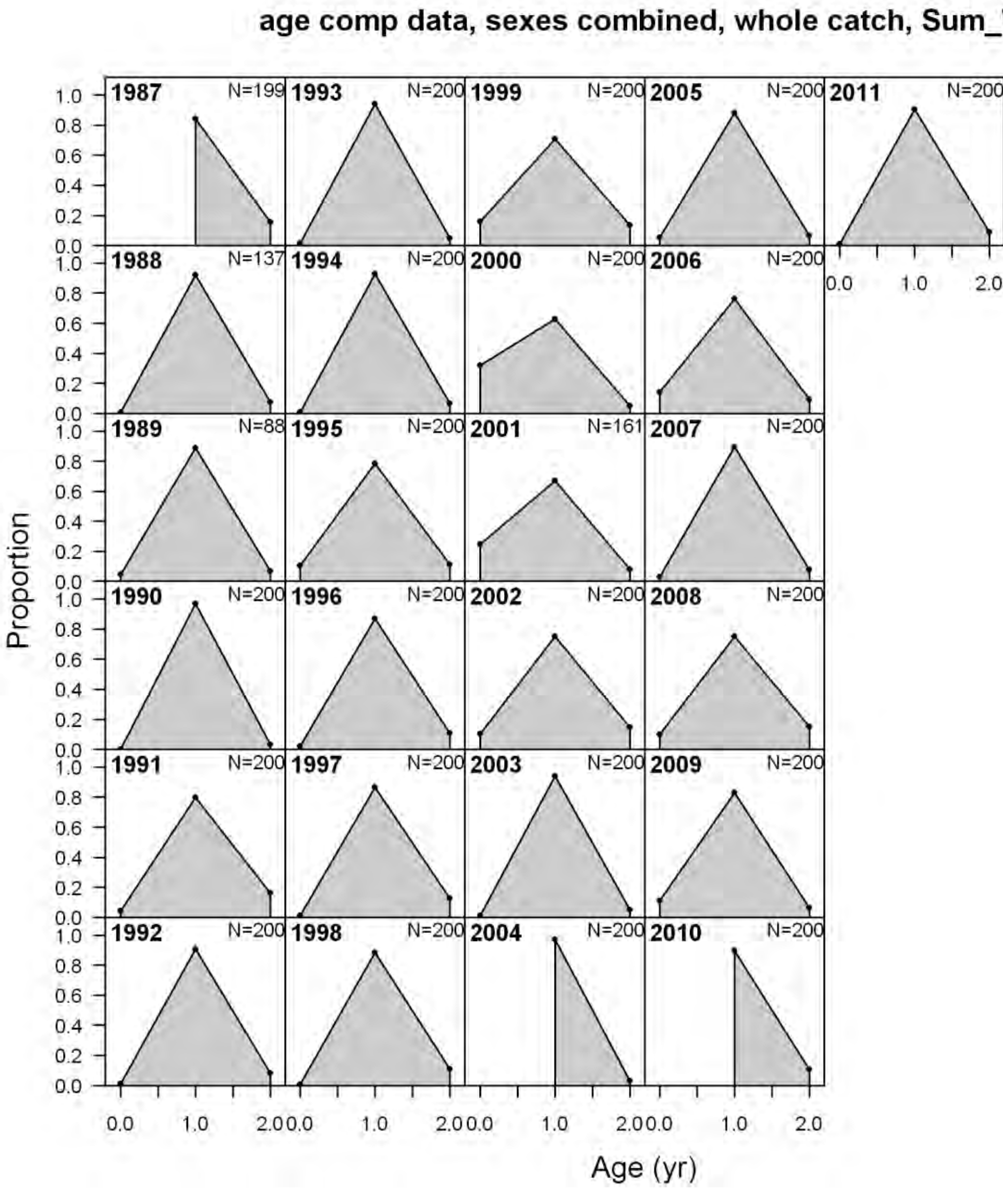


Figure 2.5.4.4. Age compositions of red snapper caught in the SEAMAP summer groundfish survey in the western Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

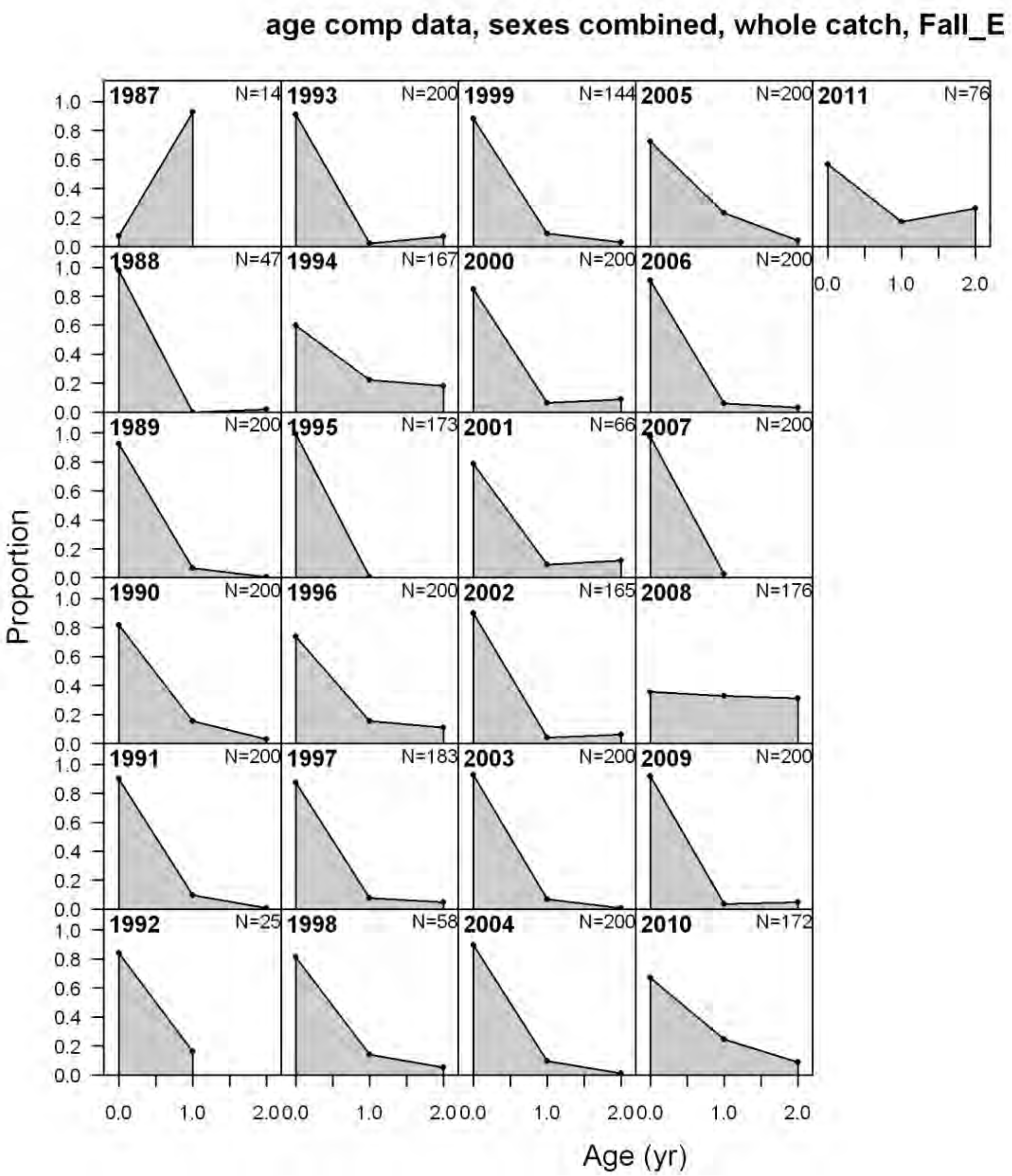


Figure 2.5.4.5. Age compositions of red snapper caught in the SEAMAP fall groundfish survey in the eastern Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

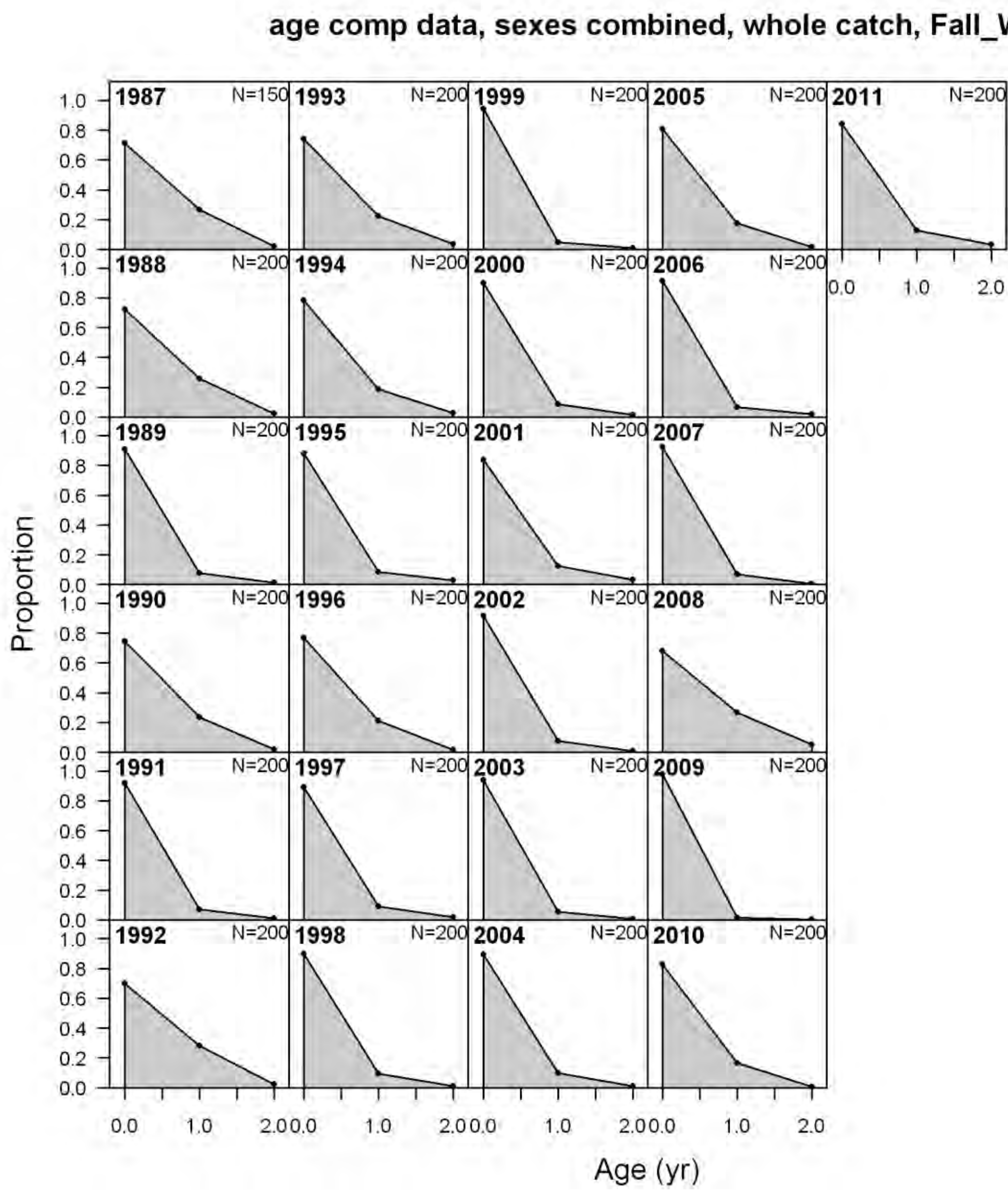


Figure 2.5.4.6. Age compositions of red snapper caught in the SEAMAP fall groundfish survey in the western Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

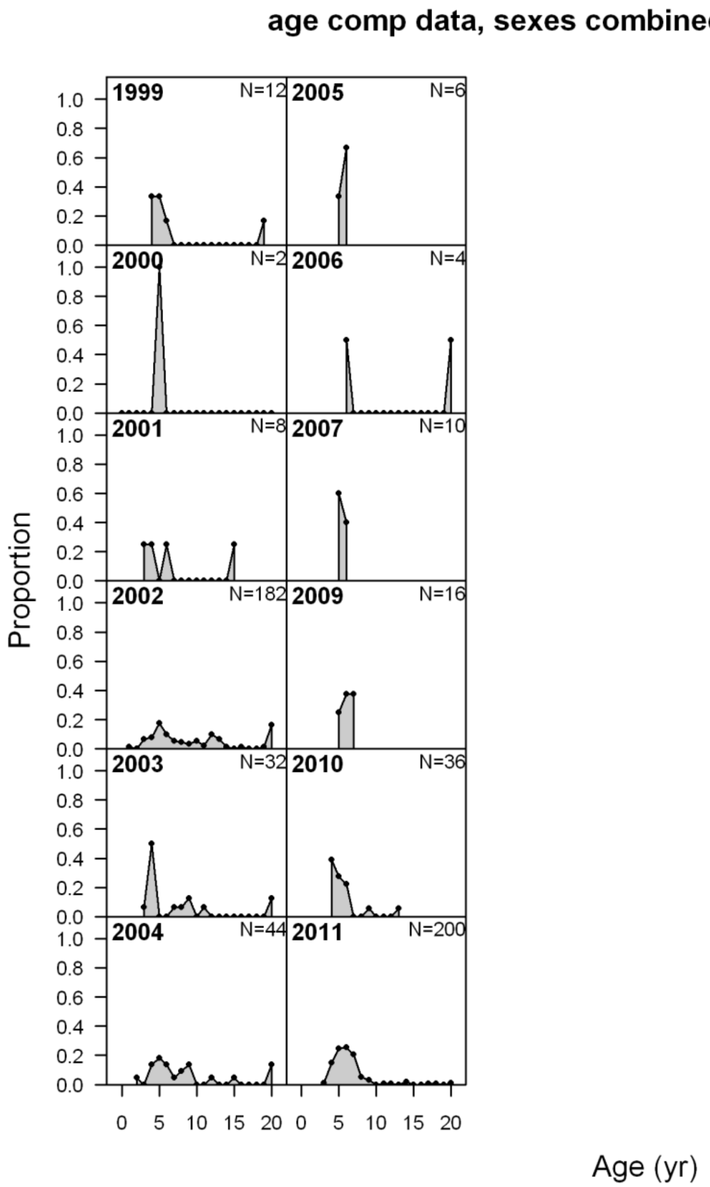


Figure 2.5.4.7. Age compositions of red snapper caught in the NMFS bottom long line survey in the eastern Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

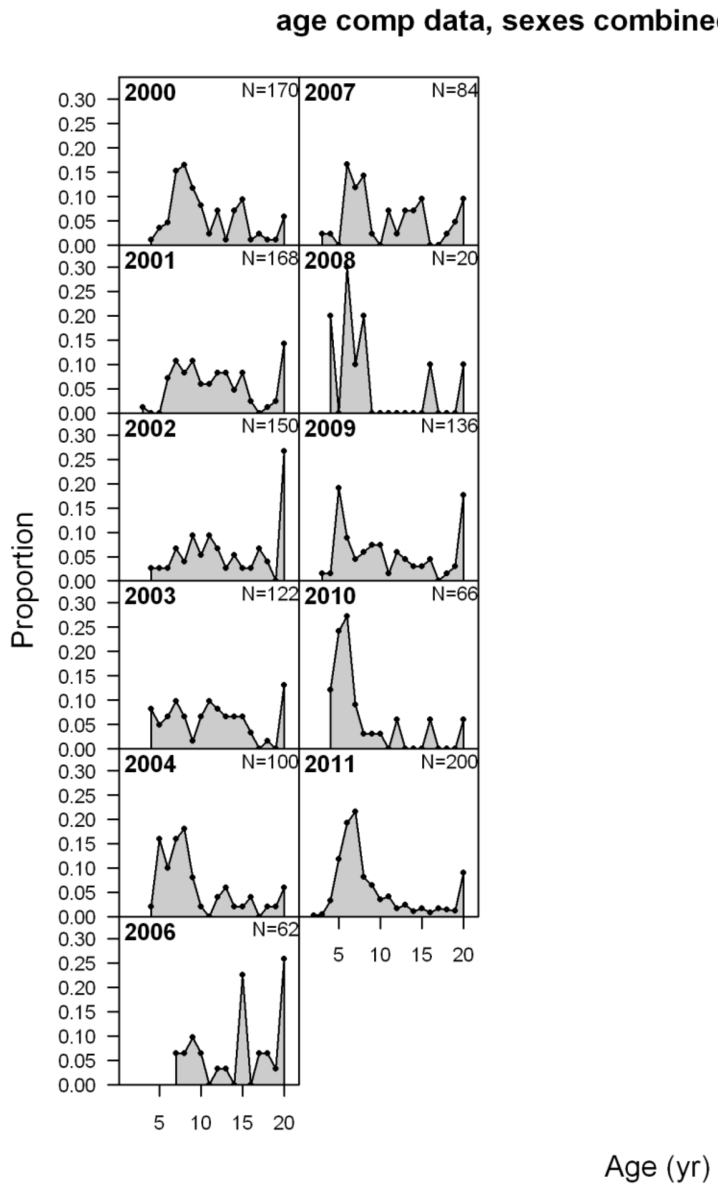


Figure 2.5.4.8. Age compositions of red snapper caught in the NMFS bottom long line survey in the western Gulf of Mexico. Sample sizes (N) were capped at maximum value of 200 fish.

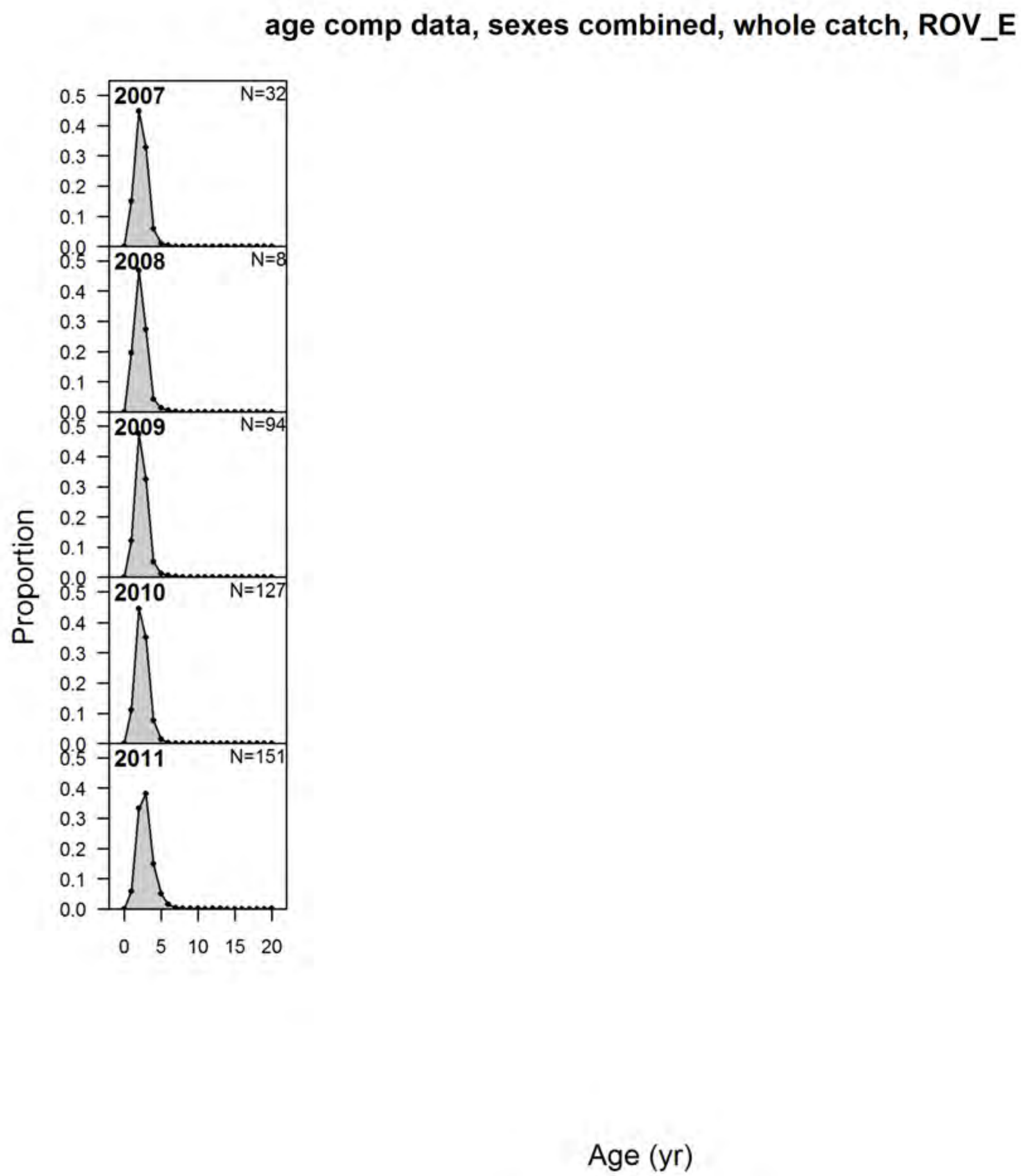


Figure 2.5.4.9. Age compositions of red snapper caught in the combined ROV survey in the eastern Gulf of Mexico.


Figure 2.6.1. Shrimp trawl index of abundance for Gulf of Mexico red snapper.

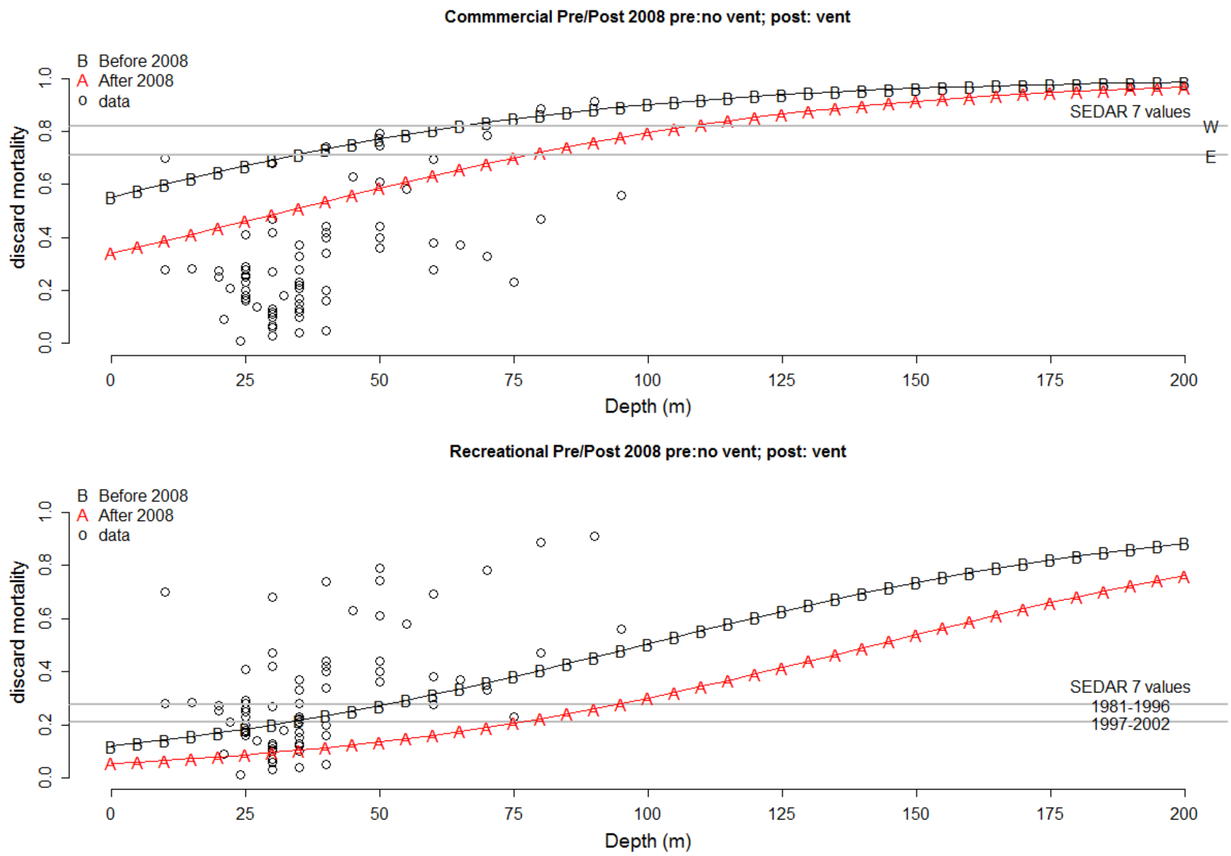


Figure 2.7.1. Discard mortality-depth relationships for commercial (top panel) and recreational (bottom panel) sectors. These relationships assume an average season effect, and that no venting occurred prior to 2008 (B) and venting occurred from 2008 onward (A). The open circles represent estimates of discard mortality from the studies included in the meta-analysis. The reference lines show the discard mortality rates used in the SEDAR 7 Gulf of Mexico red snapper assessment.

## 3.1 Stock Synthesis

### *3.1.1 Overview*

Stock Synthesis (SS) is an integrated statistical catch-at-age model which is widely used for stock assessments in the United States and throughout the world. SS takes relatively unprocessed input data and incorporates many of the important processes (mortality, selectivity, growth, etc.) that operate in conjunction to produce observed catch, size and age composition and CPUE indices. In addition, SS can incorporate time series of environmental data. Because many of these inputs are correlated, the concept behind SS is that they should be modeled together, which helps to ensure that uncertainties in the input data are properly accounted for in the assessment. SS has the ability to incorporate an early, data poor time period for which only catch data are available and a more recent, data-rich time-period for which indices of abundance and length and age-length or age composition observations are available.

The primary assessment model selected for the Gulf of Mexico red snapper stock evaluation assessment was stock Synthesis (Methot 2010) version 3.24j (beta). Stock Synthesis has been widely used and tested for assessment evaluations, particularly in the US west coast NMFS centers (Methot 2010). Descriptions of SS algorithms and options are available in the SS user's manual (Methot 2010) and at the NOAA Fisheries Toolbox website (http://nft.nefsc.noaa.gov/).

The r4ss software (www.cran.r-project.org/web/packages/**r4ss**/index.html) was utilized extensively to develop various graphics for the SS outputs and also was used to summarize various SS output files and to conduct the parametric bootstrap.

The Stock Synthesis parametric bootstrap procedure was the approach used to characterize the uncertainty in final model estimates and projections of future caches for a variety of alternative scenarios recommended by the Assessment Panel (AP). This tool is based on parametric bootstrap analyses used with the integrated fishery stock assessment model, Stock Synthesis (SS, Methot R.D. 2011).

### *3.1.2 Data Sources*

The SS model was fitted to landings, discards, age composition observations, and indices of abundance. Annual landings from the commercial and recreational fishing sector were input into the model, with commercial landings in metric tons and recreational landings in numbers of thousands of fish. Discards from the commercial and recreational fishing fleets were input in as thousands of numbers of fish. Annual estimates of shrimp fishery red snapper bycatch (as dead discards in numbers of thousands of fish) were estimated however there was a large amount of uncertainty in these annual estimates. As a result, the estimated annual median across the entire time series was used in conjunction with an annual time series of shrimp effort to allow the model to estimate shrimp bycatch (see further description in next section below). Standardized indices of relative abundance from both fishery dependent and independent data sources were included in the model. The fishery dependent indices came from the commercial handline fleet, recreational headboat, and recreational private/for hire sectors. Fishery independent indices came from the SEAMAP bottom trawl survey, SEAMAP reef fish video survey, NMFS bottom longline survey, and the SEAMAP plankton survey. Finally, age composition information was available from both fishery dependent and independent sources. Fishery dependent age composition came from the commercial handline and longline fleets, shrimp fishery bycatch, as well as the recreational headboat and charter/for hire fleets. Fishery independent age composition came from the SEAMAP bottom trawl survey, SEAMAP reef fish video survey, NMFS bottom longline survey, and from the combined remotely operated vehicle (ROV) survey. All age composition distributions were from direct aging of fish by measuring otoliths, except observations from the combined ROV survey, the SEAMAP reef fish video survey, the commercial shrimp bycatch, and the SEAMAP bottom trawl. The combined ROV survey and SEAMAP reef fish video survey age observations were converted to age from length distributions using an age-length key. The age length keys that were used to make these conversions were compiled using all the data direct aging data across all years for each area (east and west of the Mississippi River). The shrimp bycatch and SEAMAP groundfish trawl survey age comps were developed through visual inspection of modes in the length comps.

### *3.1.3 Model Configuration and Equations*

The initial set up of the Stock Synthesis model was based off of the configuration of the last stock assessment model for red snapper, CATCHEM, in an effort to replicate model results and alleviate concern about differences in modeling platform affecting the assessment results. Like this base model, CATCHEM was age-structured and modeled red snapper as two separate stocks in the Gulf of Mexico: one stock east and the other stock west of the Mississippi River. The SEDAR 31 DW report provides information on the rationale behind the two-stock hypothesis. As a result, all input data series are split into an east and a west component.

Throughout the stock assessment process, various model configurations were tried with stock synthesis which included incorporating length data, and age-length keys (age conditional on length) into the model, however these length-based models revealed systematic bias in the fits to the age at length data that could not be resolved in the timeframe of the assessment. A similar issue arose in a recent Pacific Hake stock assessment, where a similar decision was made to proceed with an age based model over an age at length based model (Richard Methot 2013, Personal Communication). The base model for this assessment represented red snapper age classes from age zero through age 20, where age 20 is a plus group. An age estimation error matrix, based on reader precision analyses, was available for those fleets and surveys for which we had direct age observations from otoliths. Stock Synthesis has the ability to use this information in the model as a source of error. However, the Panel felt that the available age error matrix did not fully represent the true age estimation error, which likely varies over time and across fleets/surveys. As a result, no aging error was included in the model.

The time series in the model started in 1872, when the stock was assumed to be in a virgin, unfished state. The terminal year of data was 2011. The SEDAR 31 DW provides details and a characterization of the fisheries for red snapper in the Gulf of Mexico since the late 1800s. Recreational fishery removals were available since 1981 and were hindcast from 1950 to 1980 by the SEDAR 31 DW. It was generally thought that recreational removals of red snapper prior to 1955 were not large. Shrimp discards were available since 1972.

Fourteen fishing fleets and fifteen fishery independent surveys were set up in Stock Synthesis to represent the red snapper fishery. The fishing fleets in the model were separated into east and west and included the commercial handline and longline, recreational headboat and private/charter fleets, the shrimp bycatch fleet, a commercial closed season fleet, and a recreational closed season fleet. The commercial and recreational closed season fleets were incorporated to represent fishery discards for those years when strict closed seasons were in place for each sector, in addition to the component of the commercial fishing fleet since 2007 that has had no red snapper IFQ allocation. Age composition data exist for the commercial closed season fishery (see Section 2.5.1) with which to estimate a selectivity pattern. No such age composition data exists for the recreational closed season fishery, therefore the recreational closed season fishery selectivity pattern was set to mirror the selectivity pattern of the private/charter fishery.

The fishery independent surveys that were incorporated were the SEAMAP video survey, SEAMAP larval survey, SEAMAP summer and fall groundfish trawl, NMFS bottom longline, and the combined ROV survey. In addition, the recreational private/charter and headboat indices of abundance were specified in Stock Synthesis as fishery-independent surveys and not linked to their corresponding fishing fleets because the indices were constructed using a censored regression to account for changes in the bag limit over time. The censored regression used data on removals only (landed catch) for the entire time series however this time series included years when there was no bag limit, during which we can assume that any red snapper that were landed were retained because red snapper is a high valued recreational fish. The censored regression algorithm uses this information to fill in the distribution for those catch observations that are censored in the more recent years by the imposition of a strict bag limit. As a result, the final recreational indices really represent total removals (retained + discarded fish). SS assumes that fishery-dependent indices of abundance represent retained catch only, and that indices assigned to fishery-independent surveys represent total removals. Therefore, the recreational indices were specified as fishery-independent surveys, because they indexed total removals, but they were linked to the recreational fleets by mirroring selectivity patterns of those fleets.

A special index that is incorporated into the model is an index of shrimp effort. As mentioned above in section 3.1.2, this information is used by the model in conjunction with the median value from the time series of annual shrimp bycatch estimates to estimate annual levels of shrimp bycatch. While annual estimates of shrimp bycatch do exist, they are highly uncertain, with large coefficients of variation. Therefore, we have much more confidence in the estimate of the overall median level of shrimp bycatch across the time series. In order to inform the model of the trend over time, we use the shrimp effort time series, in which we greater confidence. In the estimation process, a catchability parameter (Q) is used to scale the effort series to the estimate of bycatch. Since the shrimp bycatch was input as the median estimate across the entire time series (i.e., as a super year), the model estimates annual values of shrimp bycatch, and fits the median of those annual estimates to the observed median shrimp bycatch.

The weight-length relationship, the maturity schedule, fecundity estimates, natural mortality vector, and growth were all re-evaluated during the assessment workshop. The resulting estimates of these values and methodologies used can be found in section 2.1 above. All of these values were incorporated into the base model as fixed parameters and these processes were not estimated. In Stock Synthesis, when fish recruit at the real age of 0.0 the body size at length is set equal to the lower edge of the first population bin ($L_{bin}$; fixed at 8-cm maximum total length). Then, individuals grow linearly until they reach a real age equal to the input value of $A_{min}$ (growth age for $L_{min}$) and have a size equal to the $L_{min}$. Then, as fish advance in age, the size at age is then characterized according to a von Bertalanffy growth equation. The value of $A_{min}$ was fixed at 0.75. The $L_{min}$ value was set equal to the length at $A_{min}$ from the growth curve described in Section 2.1.2. $L_{max}$ was specified as equivalent to $L_\infty$.

For all of the fleets and surveys except for the NMFS bottom longline survey, age-specific selectivity parameters were specified for each age using a random walk approach. In the random walk selectivity approach, The age-specific selectivity parameters represent the rate of change from the selectivity value for the previous age. For some of the age classes within a given fleet or survey, selectivity was set equal to selectivity for the previous age by fixing the rate of change equal to zero. For example, the selectivity parameters for ages three and older of the SEAMAP groundfish survey were fixed at zero because no red snapper older than age 2 are caught in the survey. The only fleet that did not use this random walk function was the NMFS bottom longline survey, which was estimated using a two parameter logistic function, because all older ages of red snapper are assumed to be vulnerable to this survey. In some cases, the selectivity for one fleet was set equal to the estimated selectivity for another fleet – this is referred to as mirroring selectivity. In the base model, the selectivity pattern for the NMFS bottom longline survey in the east was mirrored off of that in the west, due to the low sample sizes of age compositions in the east. In addition, as mentioned above, the recreational closed season fisheries assume that fisher selectivity is the same as during the open season for the private/charter fishery, with the difference being that no red snapper are retained during the closed season. Note that for the commercial closed season fisheries, the assumption is that selectivity during the true closed season period (i.e., prior to IFQs in 2007) is the same as selectivity for fishers with no IFQ allocation during the IFQ period. This assumption is necessary because we only have discard age or size data from the observer program for the period when IFQs were also in place. Finally, since the recreational indices were specified as surveys, they mirrored the selectivity patterns of their respective fisheries.

Several time-varying processes were explored for inclusion in the base model in order to account for the way changes to fishing regulations might alter the way people fish. The time varying processes that were explored include a change in selectivity, a change in catchability, and a change in discard mortality rate. The changes in selectivity and catchability were explored to account for the switch to circle hooks in the recreational fishery, and to account for the switch to an IFQ system in the commercial fishery. The change in discard mortality rate was included to account for changes in venting practices, which were shown to have a significant effect on discard mortality rates (see Section 2.7). Various models were constructed early on to test the effect of incorporating these time varying processes on model fit. Akaike's Information Criteria (AIC) was used to determine which time varying process, or combination of processes, provided the best model fit (Table 3.1.3.1). These results support the study that was done prior to the assessment workshop which showed that the change to circle hooks was mainly manifested as a change in selectivity, not catchability (SEDAR 31-AW-4). As a result, the final base model contains time-varying discard mortality and time-varying selectivity.

Retention curves were used to account for discards that resulted from the implementation of minimum size regulations. The retention function was specified as a four parameter logistic function. Generally, these parameters were not estimated in the base model and the logistic function parameters were fixed to represent knife-edged retention at the minimum size limit. Retention functions changed over time as the size limits changed. In for fleets and size limit time periods where discard age composition data were available (i.e., commercial handline east and west and long line east for 2007-2011, and headboat east for 2000-2011), the inflection point and asymptote of the retention functions were estimated. Attempts to estimate the slopes of the retention functions resulted in poor model convergence.

Despite the fact that the red snapper Stock Synthesis model contained two areas (east and west of the Mississippi River), the model only estimates one stock recruitment relationship for the entire Gulf of Mexico. Annually estimated recruits are then allocated to each area using the following equation, where in the red snapper model, there are two parameters, p, one for each area, one which is fixed at zero and the other which is estimated:

$$\text{rate}_i = e^{p_i} \Big/ \sum_{j=1}^{N} e^{p_j}$$

The recruitment distribution parameter was allowed to vary over time according to a white noise model (i.e., annual deviations around the baseline parameter value) from 1972-2011 (i.e., the data rich period of the assessment).

The model tended to estimate values for the steepness parameter near its maximum of 1.0. This was consistent with previous assessments and the panel decided to fix steepness near 0.99. It was noted that fixing the steepness near 1.0 in conjunction with atime-varying recruitment distribution parameter approximates the independent recruitment that is thought to exist between the eastern and western stocks. Estimated recruitments in the early data poor period of the assessment were consistently lower than recruitments from the later data rich period, which might suggest a change in productivity over time. Therefore, the parameter controlling recruitment at virgin levels ($R_0$) was estimated as a time-varying process for two blocks of the time series: one prior to 1984 and another from 1984 to the present. The time-varying component was accomplished by estimating a multiplicative adjustment to the $R_0$ parameter. Incorporating a time-varying $R_0$ allows us to use the more recent estimate of stock productivity in the projections and the calculation of reference points. This apparent change in productivity was acknowledged and accounted for in the SEDAR 7 (2005) and 2009 SEDAR 7 Update Assessment, where a stock-recruitment relationship calculated for the most recent years (i.e., 1984 forward) was used for projections and reference point calculations. The R-sigma parameter, which represents the standard deviation of the log of recruitment, was fixed at 0.3. This parameter has two related roles: it penalizes deviations from the spawner-recruitment curve, and it defines the offset between the arithmetic mean spawner-recruitment curve (as calculated from log(R0) and steepness) and the expected geometric mean (which is the basis from which the deviations are calculated). Due to the inclusion of time-varying R0, setting R-sigma at higher values (e.g., 0.6) led to biologically implausible results, because the model would then be allowed too much flexibility in estimating recruitment.

Stock Synthesis is hard-coded to model recruits as age 0 fish. Annual deviations from the stock-recruit function were estimated in SS as a vector of deviations forced to sum to zero. Stock Synthesis assumes a lognormal error structure for recruitment. Consequently, expected recruitments were bias adjusted. Methot (2010) recommends that the full bias adjustment only be applied to data-rich years in the assessment therefore the estimates are very precise ($\sigma^2$=0). Therefore, no bias adjustment was applied prior to 1985, when only catch data are available. Prior to 1984, recruitment is estimated as a function of spawning stock biomass based on the stock-recruit parameters. This is done so SS will apply the full bias-correction only to those recruitment deviations that have enough data to inform the model about the full range of recruitment variability (Method 2011). Full bias adjustment was used from 1990 to 2010 when age composition data are available. Bias adjustment was phased in from no bias adjustment prior to 1972 to full bias adjustment in 1984 linearly. Bias adjustment was phased out over the last two years (2010-2011), decreasing from full bias adjustment to no bias adjustment, because the age composition data contains little information on younger year classes for those years. The years selected for full bias adjustment were estimated following the methods of Methot and Taylor (2011).

In the base model run, age composition data were weighted by the number of fish observed, with sample sizes capped at 200 fish to prevent the model fitting the age compositions to the exclusion of the indices of abundance. Indices of abundance were weighted by the log-scale standard deviations estimated as part of the index standardization process. Uninformative uniform priors were assigned to all model parameters. The SS input files are presented in Appendices A-D.

### *3.1.4 Parameters Estimated*

Table 3.1.4.1 provides a listing of all parameters estimated and held fixed in Stock Synthesis. Results included are predicted parameter values, standard errors from SS, initial parameter values, minimum and maximum values a parameter could take, and prior densities assigned to parameters.

### *3.1.5 Model Convergence*

The ability of the model to find a global minimum was evaluated using an internal SS parameter "jitter" option which randomly changes the input parameter by a specified value. A jitter value of 10% was input for this assessment and 100 runs were made. SS carries out the jitter exercise by randomly changing the initial starting values of the parameters by 10% thus altering the starting estimates across many runs. The purpose in changing the parameter starting estimates across numerous models is to explore the model's ability to reach a global solution (i.e., minima) from starting at different places along the likelihood space.

### *3.1.6 Uncertainty and Measures of Precision*

Uncertainty in parameter estimates was quantified by computing asymptotic standard errors for each parameter (Table 3.1). Asymptotic standard errors are calculated by inverting the Hessian matrix (i.e., the matrix of second derivatives) after the model fitting process. Asymptotic standard errors provide a minimum estimate of uncertainty in parameter values.

### *3.1.7 Sensitivity Analysis*

### *3.1.8 Benchmark/Reference Point Methods*

### *3.1.9 Projection Methods*

## 3.2 Model Results

### *3.2.1 Measures of overall model fit*

#### *3.2.1.1 Landings*

Stock Synthesis effectively treats the landings data as being known with little error; an input standard error of 0.05 was used for all landings time series. Therefore, the landings are fit nearly precisely for all fleets with directed landings (Figures 3.2.1.1-3.2.1.8).

#### *3.2.1.2 Discards*

The model fits to the discard data varied by fishing fleet. In general, the model fits to the commercial discard data were better than the fits to the recreational discard data. For each of the discard time series a fixed CV of 0.5 was used to characterize uncertainty in the data. This forced the model to fit the landings data more precisely than the discard data when the two sources of information diverged from model expectations.

The model fit the handline fishery discard time series fairly well. In general, the model tended to overestimate discards for the handline fishery in both the eastern and western GOM. Model estimated discards were greater than observed discards each year from 1990-2008 for the eastern GOM but fit the observed increase in discards for 2009-2011 well (Figure 3.2.1.9). The model fit the handline discards in the western GOM well over most of the time series but failed to fit the observed decrease in discards over the most recent years (Figure 3.2.1.10).

The model fit the eastern GOM longline discard time series well from 1990-2006 but overestimated discards for 2008-2011 (Figure 3.2.1.11). The model fit the western GOM longline discard time series well over the entire time period and was able to accurately capture the large observed decrease in discards from 2008-2011 (Figure 3.2.1.12).

The model did not provide an exact fit to the recreational (MRIP) discard data in both the eastern and western GOM for the majority of the time series. This discard data however is highly uncertain and as a result, the model is not constrained to match discards exactly (Figure 3.2.1.13-3.2.1.14). The model was, however able to accurately predict the expected decrease in discards associated with a change in selectivity in 2008 and fit the most recent years well.

Similarly, the model did not provide an exact fit to the recreational headboat discard data in both the eastern and western GOM for the majority of the time series. For the eastern GOM, the most substantial difference between the model estimated headboat discards and the observed data occurred in 2000-2007, which coincided with an increase in the size of retention in the model

(Figure 3.2.1.15). The model adequately fit the observed discards in the most recent years, 2008-2011. The patterns of model fit in the western GOM were similar to the eastern GOM. The model underestimated discards for 1981-1984, and then overestimated discards substantially from 1985-2007 (Figure 3.2.1.16). Similar to the eastern GOM, the model predicted a large decrease in discards for western GOM headboat fleet following a change in selectivity associated with circle hook requirements starting in 2008.

The model fit the commercial closed season discards well in both the eastern and western GOM. Model fits to the observed time series were very precise in most years, especially for the western GOM commercial closed season (Figures 3.2.1.17-3.2.1.18). Since the closed season fleet was configured as a discard only fleet the model did not have to fit to both landings and discard data as was done for the directed fishing fleets. This allowed the model to fit the commercial closed season discards very well. Similarly, the model fit the recreational closed season discards well. Model predicted discards were very similar to observations in almost all years for both the eastern and western GOM (Figure 3.2.1.19-3.2.1.20).

Predicted red snapper bycatch from the shrimp fishery was appropriately scaled and generally followed the patterns of shrimp fishing effort input into the model and model predicted recruitments. The model predicted mean bycatch level was similar to the input estimate used for the super-year approach for the eastern fleet (Figure 3.2.1.21). For the western GOM shrimp fleet, the model predicted a mean bycatch level on the lower bound of the input estimate used for the super-year (Figure 3.2.1.22). The model predicted a generally increasing trend of red snapper bycatch from the shrimp fleet in both the eastern and western GOM through the early 2000's and then a large decline in red snapper bycatch associated with decreasing shrimp fishing effort (Figure 3.2.1.23-3.2.1.24). The model also predicts a large removal of red snapper bycatch in both the eastern and western GOM in 1972. The predicted bycatch in 1972 is the highest predicted level for both fleets over the entire time series. The bycatch in 1972 is associated with a large model predicted recruitment in the same year.

#### *3.2.1.3 Indices*

The model was able to fit the commercial handline indices of abundance well. The model predicted an increasing trend in abundance for the handline fishery in the eastern GOM which fit the observed data well over most of the time period (Figure 3.2.1.25). The model did predict a stronger than observed increase in abundance over the most recent years, however, this index did have high CVs throughout the time series. The root mean squared error (rmse) suggested that the model fit this index better than expected (rmse < observed se) (Table 3.2.1). The model also fit the western handline index of abundance well (Figure 3.2.1.26). The model predicted an increase in abundance from 1990 through the later 1990s followed by a slightly decreasing trend through the early 2000s. The model predicts an increasing trend in abundance over the most recent years and, similar to the eastern handline index, exhibits positive residuals in the most recent years.

The model fit MRIP indices of abundance well. In general, the model was able to track the observed changes in abundance in both the eastern and western GOM over the majority of the time series. Both the eastern and western MRIP abundance indices show a large increase in abundance between 2006 and 2007 (Figure 3.2.1.27-3.2.1.28). The model has some difficulty explaining this large jump in both indices in 2007 with positive residuals for 2004-2006 and negative residuals from 2007-2011for the western MRIP index (Figure 3.2.1.28). The model predicts a strong decrease in the abundance index from 2008-2011 for the eastern GOM MRIP index and a steady trend for the western GOM MRIP index.

The model was able to fit the eastern GOM headboat index well throughout the majority of the time series but had difficulty fitting the western GOM headboat index. The eastern GOM headboat index shows a generally increasing trend in abundance over entire time series. The model predicts an increase in abundance from 1985-2007 followed by a decreasing trend from 2007-2011 (Figure 3.2.1.29). The model was unable to effectively fit the western GOM headboat index which exhibits strong fluctuations in abundance over the time series. The fit to this time series is characterized by consecutive years of negative residuals throughout the mid-1990s, positive residuals from 1999-2007, and negative residuals from 2008-2011 (Figure 3.2.1.30).

The model fit both the eastern and western GOM NMFS bottom longline indices of abundance well. Both the observed and model predicted index show a strong trend of increasing abundance for the NMFS bottom longline survey in the eastern GOM (Figure 3.2.1.31). The model was unable to fit some of the large inter-annual observed changes in the western NMFS bottom longline index, however, the model does fit the overall trend in the data and predicts a strong increase in abundance for this index in the most recent years (Figure 3.2.1.32).

The model fits to the SEAMAP reef fish video survey had a high root mean squared error (Table 3.2.1.1). The model fit the eastern video survey better than the western survey, however, this index had high standard errors the model predicted a declining trend in the most recent years whereas the data displays an increasing trend (Figure 3.2.1.33). The model did not fit the western video survey well as the observed index shows strong inter-annual changes in the abundance index. The model predicted index had large negative residuals in the two most recent years, 2010-2011 (Figure 3.2.1.34).

The model predicted an increasing trend in the abundance of larval red snapper that fit the observed SEAMAP fall plankton surveys well for both the eastern and western GOM. The model fit the eastern plankton index well in most years and predicted a strong increase in the abundance of larval red snapper in the most recent years (Figure 3.2.1.35). The model predicted a smooth increasing trend in larval abundance in the western GOM which was unable to fit some the annual changes in the observed index but captured the general trend in the index well (Figure 31.1.36).

The model did not fit the SEAMAP summer groundfish survey as well for the eastern GOM (Figure 3.2.1.37). The model fit was stronger early in the time series but displayed a pattern of negative residuals from 1987-1992 and positive residuals from 1993-2006. The model predicted a strong decrease in this index from 2005-2011. The model fit to SEAMAP summer groundfish survey for the western GOM was better than the eastern GOM. The model was unable to fit the first observation in the time series but did fit most years in the time series well (Figure 3.2.1.38).

The model fit the SEAMAP fall groundfish survey well for both the eastern and western GOM. The model was unable to fit a number of the high observations in the eastern index but fit the overall pattern well, especially early in the time series (Figure 3.2.1.39). The model was able to fit to the first year of this index (1972) which was substantially higher than the following years. In order to fit this point the model predicts the highest recruitment year in the time series in 1972. The reason the model is able to fit this point is that the only other information in the model in early 1970s are landings and discard data, since the other indices and age composition do not begin until the early 1980's. The model was able to effectively fit the western SEAMAP fall groundfish survey as well. Similar to the eastern index, the model was able to fit the first year of this index (Figure 3.2.1.40).

The model fit the observed fishing effort series for the shrimp fishery in both the eastern and western GOM very closely (Figures 3.2.1.41-3.2.1.42). The model configuration did not require an exact match to the shrimp fishing effort; a CV of 0.10 was used for the index.

#### *3.2.1.4 Age composition*

The model fits to the age composition samples and the associated residual plots are presented in Figures 3.2.1.43 through 3.2.1.92. In general, the base model fit well to the age composition and no systematic biases across time or fleets were seen. The model fit less well to the discard age composition, and also in cases where there were a low number of samples in a given year.

### ***3.2.2 Parameter estimates & associated measures of uncertainty***

Table 3.2.2.2 provides a listing of all parameters that were both fixed and estimated in Stock Synthesis for the base model recommended by the panel for final projections and status determinations. Table 3.2.2.3 includes predicted parameter values and their associated standard errors from SS, initial parameter values, minimum and maximum values a parameter could take, and prior densities assigned to parameters. Parameters designated as fixed were held at their initial values. Asymptotic standard errors are obtained in Stock Synthesis by inverting the Hessian matrix that is the matrix of second derivatives, after the final model fitting process.

Model convergence was examined by the SS jitter option. Summary results are presented in Table 3.2.2.3 and Figures 3.2.2.1a-d for the 100 jitter runs that were run against the SS model configuration for the base model. Of the 100 runs, ninety-eight model runs resulted in likelihood values that fell within two units of the total likelihood of the base model value (6675.24, Figure 3.2.2.1a-d).

Results of the 100 jitter trials predicted very similar levels of a variety of key quantities and stock status metrics (Figure 3.2.2.2- 3.2.2.4).

### ***3.2.3 Fishery Selectivity***

Predicted age-based selectivities for fleets and indices in the terminal year (2011) are illustrated in Figure 3.2.3.1. (fleet-specific) and Figure 3.2.3.2 (survey-specific). In addition, time varying selectivity functions were estimated for the recreational fisheries to allow changes in selectivity to be estimated due to the regulatory mandate requiring the use of circle-hooks (Figures 3.2.3.3 and 3.2.3.4).

Multiple length-based time-varying retention functions (logistic in form) were modeled for the commercial and recreational fisheries to account for the changes in the size of fished retained due to various minimum size limits (Figure 3.2.3.5).

For all of the fleets and most of the surveys, the selectivity functions were estimated using a random-walk and are dome-shaped, except for the NMFS Bottom Longline Survey which was estimated using a logistic function. In the terminal year (2011) red snapper were almost fully selected at:

- age 0 for the eastern and western shrimp discard fleets (Shr_E and Shr_W)
- age 0 for the fall groundfish survey in the east and west (Fall_E, Fall_W)
- age 1 for the summer groundfish survey in the east and west (Sum_E, Sum_W)
- ages 2-5 for the R_Clsd_E, R_Clsd_W, MRIP_E, MRIP_W, and MRIP_Indices_E and W)
- age 3 for the western video survey and ROV_E
- ages 3-4 for the HL_E, HL_W and HB_E fleet and index.
- ages 3-5 for the eastern video survey
- age 4 for the eastern commercial closed season discard fleet (C_Clsd_E)
- ages 4-5 for the HBT_W fleet and index
- ages 4-9 for the western commercial closed season discard fleet (C_Clsd_W)
- age 5 for the LL_E
- ages 6-9 for the LL_W
- ages 6-20+ for the NMFS Bottom Longline Survey in the east and West (BLL_E, BLL_W)

As expected, the longline fisheries and the NMFS Bottom Longline survey landed the oldest fish while the youngest fish were discarded by the shrimp fleet or landed by the recreational private and charterboat (MRIP) fleets in the eastern and western Gulf (Figures 3.2.3.1 and 3.2.3.2).

In general, circle-hooks resulted in a shift in selectivity toward older red snapper, with one exception being the eastern longline fishery (Figure 3.2.3.3a). Also as expected, increases in the minimum size limit resulted in larger red snapper retained by the fisheries, while red snapper below the size limit were generally discarded (Figure 3.2.3.5).

### *3.2.4 Recruitment*

Profiling of the steepness parameter is presented in Figure 3.2.4.1 for the base model configuration. The profile of steepness for base model configuration is noisy for the age composition, the index, and the discard data components as seen in Figure 3.2.4.1 however the overall pattern across all data components suggested a steepness value towards the upper bound of 1. The SEDAR 31 AP Panel recommended fixing the Beverton – Holt steepness parameter at 0.99. Additional discussion of the model parameterization as relates this parameter was given earlier in Section 3.1.3.

Section 3.1.3 described the base model parameterization of the spawner – recruit relationship $R_0$ parameter. SS was able to estimate the $R_0$ (log of virgin recruitment level for the early time period, i.e., block 1 early period 1884-1983 time period, without difficulty for the red snapper base model configuration. SS estimated ln(R0) for the early time period time block (1884-1983) to be 12.0255 (0.0587 = SD) for the base model. As mentioned earlier in section 3.1.3, sigmaR, the standard error of log recruitment was fixed at 0.3. Figure 3.2.4.2 presents the profile for R0 early time period block (1884-1983).

The spawner-recruit relationship as estimated from SS for the base model configuration (assuming steepness = 0.99 and sigmaR = 0.3) is shown in Figure 3.2.4.3. Estimated recruit deviations varied without trend over the time series except during two periods: in the mid 1980's and the recent years, since 2008 (Figure 3.2.4.4). The recent years, since 2008 contain less information from which to estimate the level of recruitment as not all cohorts have fully contributed to the fishery. The very high and aberrant estimated recruitment deviation value for 1972 corresponds to an observed high recruitment index value from the SEAMAP groundfish trawl survey.

Predicted abundance at age is presented in Figure 3.2.4.5 and 3.2.4.6 for the base model configuration for the East and West areas. Predicted age-0 recruits are also presented in Table 3.2.4.1 and Figure 3.2.4.7 and 3.2.4.8 (East, West areas) for the base model configuration. Figure 3.2.4.7 presents SS estimated recruitment by area for the red snapper base model. Annual recruitments since 1990 have been higher than the mean recruitment over prior years. For this reason, the R0 spawner-recruit parameter in the base model was parameterized to be time varying.

Figure 3.2.4.8 presents SS estimated YPR and SPR as estimated for the red snapper base model configuration (with steepness=0.99 and sigmaR=0.3).

### *3.2.5 Stock Biomass*

Predicted total biomass and spawning biomass are presented in Table 3.3.2.4.1 and in Figures 3.2.5.1 and 3.2.5.2 for the base model configuration (steepness =9.99, sigmaR=0.3) Total biomass and spawning biomass show a steady declining trend from the late 1880's through the early 1900s, followed by a flat trend up to the 1940s. Predicted SS total biomass showed strong declines starting in the 1940s and lasting through the late 1970s. Increases in total and spawning stock biomass are predicted by SS beginning in the late 1980s. This trend is also consistent across both areas.

Predicted abundance at age was presented in Figure 3.2.4.5 and 3.2.4.6 for the base model (steepness=0.99, sigmaR=0.3). SS predicted the mean age of Gulf of Mexico red snapper to be ~ 3.5 in the unfished state in 1872. The population mean age showed a steady decline until around 1910, after which it remained stable at around age 2, until the early 1940s, when average age slightly increased, followed by a sharp drop around 1960. Since 1972, average age fluctuated between about 0.5 and 0.9, until 2004, when it started increasing again.

The decline in mean age in the earliest years of the time series corresponds with increasing landings and the development of the commercial handline fishery. The sharp decline in mean age that began in the early 1960s corresponds to the increasing popularity of red snapper by recreational anglers.

### *3.2.6 Fishing Mortality*

Exploitation rate (catch in weight including discards / total biomass) was used as the proxy for annual fishing mortality rate in this assessment. Predicted annual fishing mortality rates are presented in Table 3.2.6.1 and Figure 3.2.6.1 (top panel) for the SS base model configuration (steepness = 0.99 and sigmaR= 0.3). This represents the fishing mortality level on the most vulnerable age class. Predicted annual fishing mortality estimates (all fleets combined, top panel plot) shows flat and low levels of F through the late 1940s. From the early 1950s through the mid-1970s, steady increasing trend in F are predicted. Since the mid-1970s estimated total annual F's have continued to decline.

Table 3.2.6.2 and Figure 3.2.6.1 (bottom panel) present instantaneous fishing mortality by year and fleet. An increasing trend in fishing mortality was observed for the handline fleet in the east beginning in the early 1880s as the fishery developed, which lasted until the early 1900s. Fishing mortality remained variable without trend until the late 1950s, when after which a significant increase in fishing mortality was observed for the handline fleet in both the east and the west. Fishing mortality declined in the early 1970s until the mid-1980s, after which an increase in fishing mortality was observed for the recreational fleet.

### *3.2.7 Evaluation of Uncertainty*

### *3.2.8 Benchmarks/Reference points*

### *3.2.9 Projections*

#### *3.2.9.1 Deterministic*

#### *3.2.9.2 Stochastic*

## 3.3 Discussion and Recommendations

## 3.4 Acknowledgements

## 3.5 References

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## 3.6 Tables

Table 3.1.1.1: AIC table comparing model runs with time varying processes.

| Run | Neg Log Like | N Parm | N Data | AIC | AICc | Delta AICc |
|---|---|---|---|---|---|---|
| Time-varying Discard | 4883.68 | 1026 | 7914 | 11819.36 | 12125.36 | 787.77 |
| Time-varying Discard and Selectivity | 4391.03 | 1100 | 7914 | 10982.06 | 11337.59 | 0.00 |
| Time-varying Discard and Catchability | 4874.84 | 1034 | 7914 | 11817.68 | 12128.83 | 791.24 |
| Time-varying Discard, Selectivity and Catchability | 4383.28 | 1108 | 7914 | 10982.56 | 11343.70 | 6.11 |

Table 3.1.1.2. Listing of parameters from the Stock Synthesis model that used for Gulf of Mexico red snapper. This includes predicted parameter values and their associated standard errors from the base model run, initial parameter values, the upper and lower bounds on that parameter, and any prior densities assigned to parameters. Parameters that are designated as fixed were held at their initial value and not estimated.

| Label | Value/Estimate | Parm_StDev | Init | Min | Max | PR_type | Prior | Pr_SD | Status | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| L_at_Amin_Fem_GP_1 | 9.96 | _ | 9.96 | 7 | 21 | No_prior | | | Fixed | Size at age 0.5 |
| L_at_Amax_Fem_GP_1 | 85.64 | _ | 85.64 | 70 | 100 | No_prior | | | Fixed | von Bertalanffy Linfintiy |
| VonBert_K_Fem_GP_1 | 0.1919 | _ | 0.1919 | 0.05 | 0.8 | No_prior | | | Fixed | von Bertalanffy K |
| CV_young_Fem_GP_1 | 0.1735 | _ | 0.1735 | 0.01 | 0.5 | No_prior | | | Fixed | Young growth CV |
| CV_old_Fem_GP_1 | 0.0715 | _ | 0.0715 | 0.01 | 0.5 | No_prior | | | Fixed | Old growth CV |
| Wtlen_1_Fem | 1.67E-05 | _ | 1.67E-05 | 0 | 1 | No_prior | | | Fixed | Weight length a parameter |
| Wtlen_2_Fem | 2.953 | _ | 2.953 | 0 | 4 | No_prior | | | Fixed | weight length b parameter |
| Mat50%_Fem | 999 | _ | 999 | 50 | 1000 | No_prior | | | Fixed | Maturity inflection point |
| Mat_slope_Fem | 999 | _ | 999 | -1 | 1000 | No_prior | | | Fixed | Maturity slope |
| Eggs_scalar_Fem | 999 | _ | 999 | 0 | 1000 | No_prior | | | Fixed | Fecundity scalar |
| Eggs_exp_wt_Fem | 999 | _ | 999 | 0 | 1000 | No_prior | | | Fixed | Fecundity slope |
| RecrDist_Area_1 | -0.535195 | 0.0541729 | -0.8 | -4 | 4 | No_prior | | | Estimated | Distribution of recruits to east |
| RecrDist_Area_2 | 0 | _ | 0 | -4 | 4 | No_prior | | | Fixed | Distribution of recruits to west |
| CohortGrowDev | 1 | _ | 1 | 0 | 0 | No_prior | | | Fixed | Cohort growth deviation |
| RecrDist_Area_1_DEVadd_1972 | 0.063609 | 0.0551824 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1972 |
| RecrDist_Area_1_DEVadd_1973 | -0.152341 | 0.0545079 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1973 |
| RecrDist_Area_1_DEVadd_1974 | 0.0499031 | 0.0623765 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1974 |
| RecrDist_Area_1_DEVadd_1975 | -0.0325 | 0.0599335 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1975 |
| RecrDist_Area_1_DEVadd_1976 | -0.000729519 | 0.0560378 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1976 |
| RecrDist_Area_1_DEVadd_1977 | 0.0350554 | 0.0575183 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1977 |
| RecrDist_Area_1_DEVadd_1978 | -0.0394221 | 0.0593888 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1978 |
| RecrDist_Area_1_DEVadd_1979 | -0.159613 | 0.0575262 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1979 |
| RecrDist_Area_1_DEVadd_1980 | -0.230331 | 0.0490503 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1980 |
| RecrDist_Area_1_DEVadd_1981 | 0.0302631 | 0.0433775 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1981 |
| RecrDist_Area_1_DEVadd_1982 | 0.0643535 | 0.0390812 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1982 |
| RecrDist_Area_1_DEVadd_1983 | -0.163478 | 0.0478398 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1983 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RecrDist_Area_1_DEVadd_1984 | -0.169218 | 0.0566068 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1984 |
| RecrDist_Area_1_DEVadd_1985 | -0.384553 | 0.0534389 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1985 |
| RecrDist_Area_1_DEVadd_1986 | -0.118263 | 0.0323719 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1986 |
| RecrDist_Area_1_DEVadd_1987 | -0.303697 | 0.0374486 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1987 |
| RecrDist_Area_1_DEVadd_1988 | -0.135244 | 0.025499 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1988 |
| RecrDist_Area_1_DEVadd_1989 | -0.138557 | 0.0211055 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1989 |
| RecrDist_Area_1_DEVadd_1990 | -0.0808705 | 0.0215477 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1990 |
| RecrDist_Area_1_DEVadd_1991 | -0.111192 | 0.021035 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1991 |
| RecrDist_Area_1_DEVadd_1992 | -0.171327 | 0.0230465 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1992 |
| RecrDist_Area_1_DEVadd_1993 | -0.125217 | 0.0220232 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1993 |
| RecrDist_Area_1_DEVadd_1994 | -0.167395 | 0.023204 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1994 |
| RecrDist_Area_1_DEVadd_1995 | 0.019913 | 0.0247432 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1995 |
| RecrDist_Area_1_DEVadd_1996 | 0.0266694 | 0.0226605 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1996 |
| RecrDist_Area_1_DEVadd_1997 | -0.011149 | 0.0217856 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1997 |
| RecrDist_Area_1_DEVadd_1998 | -0.0226383 | 0.0217545 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1998 |
| RecrDist_Area_1_DEVadd_1999 | 0.111583 | 0.0199139 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 1999 |
| RecrDist_Area_1_DEVadd_2000 | 0.0791057 | 0.0216658 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 2000 |
| RecrDist_Area_1_DEVadd_2001 | 0.103155 | 0.0212609 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 2001 |
| RecrDist_Area_1_DEVadd_2002 | 0.135878 | 0.0216979 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 2002 |
| RecrDist_Area_1_DEVadd_2003 | 0.0998837 | 0.019777 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 2003 |
| RecrDist_Area_1_DEVadd_2004 | 0.103242 | 0.0192952 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 2004 |
| RecrDist_Area_1_DEVadd_2005 | 0.116459 | 0.0199011 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 2005 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RecrDist_Area_1_DEVadd_2006 | 0.131224 | 0.0206407 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 2006 |
| RecrDist_Area_1_DEVadd_2007 | 0.123774 | 0.0217456 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 2007 |
| RecrDist_Area_1_DEVadd_2008 | 0.0571669 | 0.0240058 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 2008 |
| RecrDist_Area_1_DEVadd_2009 | -0.101008 | 0.0260944 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 2009 |
| RecrDist_Area_1_DEVadd_2010 | -0.296128 | 0.0342834 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 2010 |
| RecrDist_Area_1_DEVadd_2011 | -0.377282 | 0.0486139 | _ | _ | _ | dev | | | Estimated | Recruitment distribution deviations for east in 2011 |
| SR_LN(R0) | 12.0255 | 0.0587277 | 11.8 | 1 | 20 | No_prior | | | Estimated | Virgin Recruitment |
| SR_BH_steep | 0.99 | _ | 0.99 | 0.2 | 1 | No_prior | | | Fixed | Steepness |
| SR_sigmaR | 0.3 | _ | 0.3 | 0 | 2 | No_prior | | | Fixed | Stock recruitment standard deviation |
| SR_envlink | -0.555309 | 0.0757126 | 0 | -5 | 5 | No_prior | | | Estimated | stock recruitment environmental link |
| SR_R1_offset | 0 | _ | 0 | -5 | 5 | No_prior | | | Fixed | stock recruitment offset |
| SR_autocorr | 0 | _ | 0 | 0 | 0 | No_prior | | | Fixed | stock recruitment autocorrelation |
| Main_RecrDev_1899 | 0.00538531 | 0.299373 | _ | _ | _ | dev | | | Estimated | 1899 recruitment deviation |
| Main_RecrDev_1900 | 0.00486779 | 0.299332 | _ | _ | _ | dev | | | Estimated | 1900 recruitment deviation |
| Main_RecrDev_1901 | 0.00472258 | 0.299326 | _ | _ | _ | dev | | | Estimated | 1901 recruitment deviation |
| Main_RecrDev_1902 | 0.00515615 | 0.299352 | _ | _ | _ | dev | | | Estimated | 1902 recruitment deviation |
| Main_RecrDev_1903 | 0.00579238 | 0.299367 | _ | _ | _ | dev | | | Estimated | 1903 recruitment deviation |
| Main_RecrDev_1904 | 0.00629497 | 0.29935 | _ | _ | _ | dev | | | Estimated | 1904 recruitment deviation |
| Main_RecrDev_1905 | 0.0067649 | 0.299311 | _ | _ | _ | dev | | | Estimated | 1905 recruitment deviation |
| Main_RecrDev_1906 | 0.00721831 | 0.299287 | _ | _ | _ | dev | | | Estimated | 1906 recruitment deviation |
| Main_RecrDev_1907 | 0.00753374 | 0.299261 | _ | _ | _ | dev | | | Estimated | 1907 recruitment deviation |
| Main_RecrDev_1908 | 0.00775592 | 0.29925 | _ | _ | _ | dev | | | Estimated | 1908 recruitment deviation |
| Main_RecrDev_1909 | 0.0078228 | 0.299237 | _ | _ | _ | dev | | | Estimated | 1909 recruitment deviation |
| Main_RecrDev_1910 | 0.0077536 | 0.299203 | _ | _ | _ | dev | | | Estimated | 1910 recruitment deviation |
| Main_RecrDev_1911 | 0.00768661 | 0.299172 | _ | _ | _ | dev | | | Estimated | 1911 recruitment deviation |
| Main_RecrDev_1912 | 0.00746333 | 0.299115 | _ | _ | _ | dev | | | Estimated | 1912 recruitment deviation |
| Main_RecrDev_1913 | 0.00714869 | 0.299041 | _ | _ | _ | dev | | | Estimated | 1913 recruitment deviation |
| Main_RecrDev_1914 | 0.00696715 | 0.29897 | _ | _ | _ | dev | | | Estimated | 1914 recruitment deviation |
| Main_RecrDev_1915 | 0.00683252 | 0.298911 | _ | _ | _ | dev | | | Estimated | 1915 recruitment deviation |
| Main_RecrDev_1916 | 0.00662306 | 0.298852 | _ | _ | _ | dev | | | Estimated | 1916 recruitment deviation |
| Main_RecrDev_1917 | 0.00618352 | 0.29878 | _ | _ | _ | dev | | | Estimated | 1917 recruitment deviation |
| Main_RecrDev_1918 | 0.00544974 | 0.298693 | _ | _ | _ | dev | | | Estimated | 1918 recruitment deviation |
| Main_RecrDev_1919 | 0.00444271 | 0.298577 | _ | _ | _ | dev | | | Estimated | 1919 recruitment deviation |
| Main_RecrDev_1920 | 0.00330824 | 0.298438 | _ | _ | _ | dev | | | Estimated | 1920 recruitment deviation |
| Main_RecrDev_1921 | 0.00173399 | 0.298241 | _ | _ | _ | dev | | | Estimated | 1921 recruitment deviation |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Main_RecrDev_1922 | -0.000207832 | 0.297994 | _ | _ | _ | dev | | | Estimated | 1922 recruitment deviation |
| Main_RecrDev_1923 | -0.00271411 | 0.297676 | _ | _ | _ | dev | | | Estimated | 1923 recruitment deviation |
| Main_RecrDev_1924 | -0.00563368 | 0.29731 | _ | _ | _ | dev | | | Estimated | 1924 recruitment deviation |
| Main_RecrDev_1925 | -0.00851658 | 0.296928 | _ | _ | _ | dev | | | Estimated | 1925 recruitment deviation |
| Main_RecrDev_1926 | -0.0109698 | 0.296578 | _ | _ | _ | dev | | | Estimated | 1926 recruitment deviation |
| Main_RecrDev_1927 | -0.0126475 | 0.296276 | _ | _ | _ | dev | | | Estimated | 1927 recruitment deviation |
| Main_RecrDev_1928 | -0.0143097 | 0.296003 | _ | _ | _ | dev | | | Estimated | 1928 recruitment deviation |
| Main_RecrDev_1929 | -0.0163246 | 0.295707 | _ | _ | _ | dev | | | Estimated | 1929 recruitment deviation |
| Main_RecrDev_1930 | -0.0185345 | 0.295352 | _ | _ | _ | dev | | | Estimated | 1930 recruitment deviation |
| Main_RecrDev_1931 | -0.0204521 | 0.295025 | _ | _ | _ | dev | | | Estimated | 1931 recruitment deviation |
| Main_RecrDev_1932 | -0.0228556 | 0.294666 | _ | _ | _ | dev | | | Estimated | 1932 recruitment deviation |
| Main_RecrDev_1933 | -0.0263461 | 0.294188 | _ | _ | _ | dev | | | Estimated | 1933 recruitment deviation |
| Main_RecrDev_1934 | -0.0305497 | 0.293623 | _ | _ | _ | dev | | | Estimated | 1934 recruitment deviation |
| Main_RecrDev_1935 | -0.0355816 | 0.292984 | _ | _ | _ | dev | | | Estimated | 1935 recruitment deviation |
| Main_RecrDev_1936 | -0.0409583 | 0.292265 | _ | _ | _ | dev | | | Estimated | 1936 recruitment deviation |
| Main_RecrDev_1937 | -0.045249 | 0.291618 | _ | _ | _ | dev | | | Estimated | 1937 recruitment deviation |
| Main_RecrDev_1938 | -0.0488732 | 0.291042 | _ | _ | _ | dev | | | Estimated | 1938 recruitment deviation |
| Main_RecrDev_1939 | -0.0522587 | 0.290461 | _ | _ | _ | dev | | | Estimated | 1939 recruitment deviation |
| Main_RecrDev_1940 | -0.0564333 | 0.289786 | _ | _ | _ | dev | | | Estimated | 1940 recruitment deviation |
| Main_RecrDev_1941 | -0.0620423 | 0.288967 | _ | _ | _ | dev | | | Estimated | 1941 recruitment deviation |
| Main_RecrDev_1942 | -0.0692543 | 0.287996 | _ | _ | _ | dev | | | Estimated | 1942 recruitment deviation |
| Main_RecrDev_1943 | -0.0779058 | 0.28691 | _ | _ | _ | dev | | | Estimated | 1943 recruitment deviation |
| Main_RecrDev_1944 | -0.0866058 | 0.285825 | _ | _ | _ | dev | | | Estimated | 1944 recruitment deviation |
| Main_RecrDev_1945 | -0.094774 | 0.2848 | _ | _ | _ | dev | | | Estimated | 1945 recruitment deviation |
| Main_RecrDev_1946 | -0.10052 | 0.283982 | _ | _ | _ | dev | | | Estimated | 1946 recruitment deviation |
| Main_RecrDev_1947 | -0.102218 | 0.283555 | _ | _ | _ | dev | | | Estimated | 1947 recruitment deviation |
| Main_RecrDev_1948 | -0.104424 | 0.283114 | _ | _ | _ | dev | | | Estimated | 1948 recruitment deviation |
| Main_RecrDev_1949 | -0.115305 | 0.28223 | _ | _ | _ | dev | | | Estimated | 1949 recruitment deviation |
| Main_RecrDev_1950 | -0.126146 | 0.281055 | _ | _ | _ | dev | | | Estimated | 1950 recruitment deviation |
| Main_RecrDev_1951 | -0.138452 | 0.279771 | _ | _ | _ | dev | | | Estimated | 1951 recruitment deviation |
| Main_RecrDev_1952 | -0.148914 | 0.278739 | _ | _ | _ | dev | | | Estimated | 1952 recruitment deviation |
| Main_RecrDev_1953 | -0.160328 | 0.277541 | _ | _ | _ | dev | | | Estimated | 1953 recruitment deviation |
| Main_RecrDev_1954 | -0.165224 | 0.276944 | _ | _ | _ | dev | | | Estimated | 1954 recruitment deviation |
| Main_RecrDev_1955 | -0.173065 | 0.275782 | _ | _ | _ | dev | | | Estimated | 1955 recruitment deviation |
| Main_RecrDev_1956 | -0.171425 | 0.275665 | _ | _ | _ | dev | | | Estimated | 1956 recruitment deviation |
| Main_RecrDev_1957 | -0.167063 | 0.275886 | _ | _ | _ | dev | | | Estimated | 1957 recruitment deviation |
| Main_RecrDev_1958 | -0.154704 | 0.277316 | _ | _ | _ | dev | | | Estimated | 1958 recruitment deviation |
| Main_RecrDev_1959 | -0.152841 | 0.277404 | _ | _ | _ | dev | | | Estimated | 1959 recruitment deviation |
| Main_RecrDev_1960 | -0.152413 | 0.277139 | _ | _ | _ | dev | | | Estimated | 1960 recruitment deviation |
| Main_RecrDev_1961 | -0.158589 | 0.275783 | _ | _ | _ | dev | | | Estimated | 1961 recruitment deviation |
| Main_RecrDev_1962 | -0.156664 | 0.27562 | _ | _ | _ | dev | | | Estimated | 1962 recruitment deviation |
| Main_RecrDev_1963 | -0.147554 | 0.276791 | _ | _ | _ | dev | | | Estimated | 1963 recruitment deviation |
| Main_RecrDev_1964 | -0.137684 | 0.278019 | _ | _ | _ | dev | | | Estimated | 1964 recruitment deviation |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Main_RecrDev_1965 | -0.119258 | 0.280957 | _ | _ | _ | dev | | | Estimated | 1965 recruitment deviation |
| Main_RecrDev_1966 | -0.105426 | 0.283347 | _ | _ | _ | dev | | | Estimated | 1966 recruitment deviation |
| Main_RecrDev_1967 | -0.0899769 | 0.28604 | _ | _ | _ | dev | | | Estimated | 1967 recruitment deviation |
| Main_RecrDev_1968 | -0.0922465 | 0.285512 | _ | _ | _ | dev | | | Estimated | 1968 recruitment deviation |
| Main_RecrDev_1969 | -0.0932068 | 0.284746 | _ | _ | _ | dev | | | Estimated | 1969 recruitment deviation |
| Main_RecrDev_1970 | -0.14608 | 0.275325 | _ | _ | _ | dev | | | Estimated | 1970 recruitment deviation |
| Main_RecrDev_1971 | -0.257548 | 0.265 | _ | _ | _ | dev | | | Estimated | 1971 recruitment deviation |
| Main_RecrDev_1972 | 1.41825 | 0.124442 | _ | _ | _ | dev | | | Estimated | 1972 recruitment deviation |
| Main_RecrDev_1973 | 0.502217 | 0.114524 | _ | _ | _ | dev | | | Estimated | 1973 recruitment deviation |
| Main_RecrDev_1974 | -0.0347604 | 0.137554 | _ | _ | _ | dev | | | Estimated | 1974 recruitment deviation |
| Main_RecrDev_1975 | 0.0667031 | 0.129133 | _ | _ | _ | dev | | | Estimated | 1975 recruitment deviation |
| Main_RecrDev_1976 | 0.142146 | 0.121744 | _ | _ | _ | dev | | | Estimated | 1976 recruitment deviation |
| Main_RecrDev_1977 | 0.215134 | 0.125041 | _ | _ | _ | dev | | | Estimated | 1977 recruitment deviation |
| Main_RecrDev_1978 | -0.200763 | 0.136231 | _ | _ | _ | dev | | | Estimated | 1978 recruitment deviation |
| Main_RecrDev_1979 | 0.0117181 | 0.123198 | _ | _ | _ | dev | | | Estimated | 1979 recruitment deviation |
| Main_RecrDev_1980 | 0.851951 | 0.0966517 | _ | _ | _ | dev | | | Estimated | 1980 recruitment deviation |
| Main_RecrDev_1981 | 0.768071 | 0.0961729 | _ | _ | _ | dev | | | Estimated | 1981 recruitment deviation |
| Main_RecrDev_1982 | 0.66111 | 0.0878723 | _ | _ | _ | dev | | | Estimated | 1982 recruitment deviation |
| Main_RecrDev_1983 | 0.032575 | 0.100091 | _ | _ | _ | dev | | | Estimated | 1983 recruitment deviation |
| Main_RecrDev_1984 | -0.987231 | 0.117604 | _ | _ | _ | dev | | | Estimated | 1984 recruitment deviation |
| Main_RecrDev_1985 | -0.540608 | 0.0889957 | _ | _ | _ | dev | | | Estimated | 1985 recruitment deviation |
| Main_RecrDev_1986 | -0.38159 | 0.0776189 | _ | _ | _ | dev | | | Estimated | 1986 recruitment deviation |
| Main_RecrDev_1987 | -0.764745 | 0.0775934 | _ | _ | _ | dev | | | Estimated | 1987 recruitment deviation |
| Main_RecrDev_1988 | -0.482123 | 0.0677627 | _ | _ | _ | dev | | | Estimated | 1988 recruitment deviation |
| Main_RecrDev_1989 | 0.203194 | 0.0618786 | _ | _ | _ | dev | | | Estimated | 1989 recruitment deviation |
| Main_RecrDev_1990 | -0.0816824 | 0.0631159 | _ | _ | _ | dev | | | Estimated | 1990 recruitment deviation |
| Main_RecrDev_1991 | 0.256905 | 0.0636397 | _ | _ | _ | dev | | | Estimated | 1991 recruitment deviation |
| Main_RecrDev_1992 | 0.0425372 | 0.0645401 | _ | _ | _ | dev | | | Estimated | 1992 recruitment deviation |
| Main_RecrDev_1993 | 0.200806 | 0.0633563 | _ | _ | _ | dev | | | Estimated | 1993 recruitment deviation |
| Main_RecrDev_1994 | 0.0509409 | 0.0637427 | _ | _ | _ | dev | | | Estimated | 1994 recruitment deviation |
| Main_RecrDev_1995 | 0.372901 | 0.0639458 | _ | _ | _ | dev | | | Estimated | 1995 recruitment deviation |
| Main_RecrDev_1996 | -0.0899007 | 0.0627364 | _ | _ | _ | dev | | | Estimated | 1996 recruitment deviation |
| Main_RecrDev_1997 | 0.0257446 | 0.0644737 | _ | _ | _ | dev | | | Estimated | 1997 recruitment deviation |
| Main_RecrDev_1998 | -0.149943 | 0.0642867 | _ | _ | _ | dev | | | Estimated | 1998 recruitment deviation |
| Main_RecrDev_1999 | 0.355205 | 0.0602877 | _ | _ | _ | dev | | | Estimated | 1999 recruitment deviation |
| Main_RecrDev_2000 | 0.275995 | 0.0631225 | _ | _ | _ | dev | | | Estimated | 2000 recruitment deviation |
| Main_RecrDev_2001 | 0.0207561 | 0.0618949 | _ | _ | _ | dev | | | Estimated | 2001 recruitment deviation |
| Main_RecrDev_2002 | 0.292806 | 0.0619723 | _ | _ | _ | dev | | | Estimated | 2002 recruitment deviation |
| Main_RecrDev_2003 | 0.521228 | 0.0597901 | _ | _ | _ | dev | | | Estimated | 2003 recruitment deviation |
| Main_RecrDev_2004 | 0.757285 | 0.0590067 | _ | _ | _ | dev | | | Estimated | 2004 recruitment deviation |
| Main_RecrDev_2005 | 0.602593 | 0.0594974 | _ | _ | _ | dev | | | Estimated | 2005 recruitment deviation |
| Main_RecrDev_2006 | 0.537308 | 0.0602997 | _ | _ | _ | dev | | | Estimated | 2006 recruitment deviation |
| Main_RecrDev_2007 | 0.296674 | 0.061876 | _ | _ | _ | dev | | | Estimated | 2007 recruitment deviation |

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|---|---|---|---|---|---|---|---|---|---|---|
| Main_RecrDev_2008 | -0.256078 | 0.0647969 | _ | _ | _ | dev | | | Estimated | 2008 recruitment deviation |
| Main_RecrDev_2009 | -0.0416416 | 0.0663633 | _ | _ | _ | dev | | | Estimated | 2009 recruitment deviation |
| Main_RecrDev_2010 | -0.549135 | 0.075473 | _ | _ | _ | dev | | | Estimated | 2010 recruitment deviation |
| Main_RecrDev_2011 | -0.56619 | 0.0921481 | _ | _ | _ | dev | | | Estimated | 2011 recruitment deviation |
| InitF_1HL_E | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: handline east |
| InitF_2HL_W | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: handline west |
| InitF_3LL_E | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: longline east |
| InitF_4LL_W | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: longline west |
| InitF_5MRIP_E | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: charter/for hire east |
| InitF_6MRIP_W | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: charter/for hire west |
| InitF_7HBT_E | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: headboat east |
| InitF_8HBT_W | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: headboat west |
| InitF_9C_Clsd_E | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: commercial closed season east |
| InitF_10C_Clsd_W | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: commercial closed season west |
| InitF_11R_Clsd_E | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: recreational closed season east |
| InitF_12R_Clsd_W | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: recreational closed season west |
| InitF_13Shr_E | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: shrimp bycatch east |
| InitF_14Shr_W | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: shrimp bycatch west |
| F_fleet_1_YR_1872_s_1 | 0.0114787 | 0.00129437 | _ | 0 | 8 | F | | | Estimated | F handline east in 1872 |
| F_fleet_1_YR_1873_s_1 | 0.0174635 | 0.00198397 | _ | 0 | 8 | F | | | Estimated | F handline east in 1873 |
| F_fleet_1_YR_1874_s_1 | 0.0269952 | 0.00310519 | _ | 0 | 8 | F | | | Estimated | F handline east in 1874 |
| F_fleet_1_YR_1875_s_1 | 0.0349861 | 0.00410657 | _ | 0 | 8 | F | | | Estimated | F handline east in 1875 |
| F_fleet_1_YR_1876_s_1 | 0.0451479 | 0.00547821 | _ | 0 | 8 | F | | | Estimated | F handline east in 1876 |
| F_fleet_1_YR_1877_s_1 | 0.0422994 | 0.00521647 | _ | 0 | 8 | F | | | Estimated | F handline east in 1877 |
| F_fleet_1_YR_1878_s_1 | 0.0419184 | 0.00517358 | _ | 0 | 8 | F | | | Estimated | F handline east in 1878 |
| F_fleet_1_YR_1879_s_1 | 0.0496452 | 0.00606931 | _ | 0 | 8 | F | | | Estimated | F handline east in 1879 |
| F_fleet_1_YR_1880_s_1 | 0.0660633 | 0.00806053 | _ | 0 | 8 | F | | | Estimated | F handline east in 1880 |
| F_fleet_1_YR_1881_s_1 | 0.0772054 | 0.00938144 | _ | 0 | 8 | F | | | Estimated | F handline east in 1881 |
| F_fleet_1_YR_1882_s_1 | 0.0884525 | 0.0108464 | _ | 0 | 8 | F | | | Estimated | F handline east in 1882 |
| F_fleet_1_YR_1883_s_1 | 0.100514 | 0.0124578 | _ | 0 | 8 | F | | | Estimated | F handline east in 1883 |
| F_fleet_1_YR_1884_s_1 | 0.113523 | 0.0142381 | _ | 0 | 8 | F | | | Estimated | F handline east in 1884 |
| F_fleet_1_YR_1885_s_1 | 0.127564 | 0.0162099 | _ | 0 | 8 | F | | | Estimated | F handline east in 1885 |
| F_fleet_1_YR_1886_s_1 | 0.142861 | 0.0184219 | _ | 0 | 8 | F | | | Estimated | F handline east in 1886 |
| F_fleet_1_YR_1887_s_1 | 0.159404 | 0.0208993 | _ | 0 | 8 | F | | | Estimated | F handline east in 1887 |
| F_fleet_1_YR_1888_s_1 | 0.158653 | 0.0210931 | _ | 0 | 8 | F | | | Estimated | F handline east in 1888 |
| F_fleet_1_YR_1889_s_1 | 0.174731 | 0.0235011 | _ | 0 | 8 | F | | | Estimated | F handline east in 1889 |
| F_fleet_1_YR_1890_s_1 | 0.219891 | 0.0302245 | _ | 0 | 8 | F | | | Estimated | F handline east in 1890 |
| F_fleet_1_YR_1891_s_1 | 0.210448 | 0.02963 | _ | 0 | 8 | F | | | Estimated | F handline east in 1891 |
| F_fleet_1_YR_1892_s_1 | 0.230506 | 0.0331006 | _ | 0 | 8 | F | | | Estimated | F handline east in 1892 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_1_YR_1893_s_1 | 0.248353 | 0.0364537 | _ | 0 | 8 | F | | | Estimated | F handline east in 1893 |
| F_fleet_1_YR_1894_s_1 | 0.266009 | 0.0399919 | _ | 0 | 8 | F | | | Estimated | F handline east in 1894 |
| F_fleet_1_YR_1895_s_1 | 0.271216 | 0.0417157 | _ | 0 | 8 | F | | | Estimated | F handline east in 1895 |
| F_fleet_1_YR_1896_s_1 | 0.285368 | 0.0448213 | _ | 0 | 8 | F | | | Estimated | F handline east in 1896 |
| F_fleet_1_YR_1897_s_1 | 0.294706 | 0.0472583 | _ | 0 | 8 | F | | | Estimated | F handline east in 1897 |
| F_fleet_1_YR_1898_s_1 | 0.344357 | 0.0569444 | _ | 0 | 8 | F | | | Estimated | F handline east in 1898 |
| F_fleet_1_YR_1899_s_1 | 0.412378 | 0.0720378 | _ | 0 | 8 | F | | | Estimated | F handline east in 1899 |
| F_fleet_1_YR_1900_s_1 | 0.502297 | 0.0956164 | _ | 0 | 8 | F | | | Estimated | F handline east in 1900 |
| F_fleet_1_YR_1901_s_1 | 0.606606 | 0.130773 | _ | 0 | 8 | F | | | Estimated | F handline east in 1901 |
| F_fleet_1_YR_1902_s_1 | 0.737294 | 0.187886 | _ | 0 | 8 | F | | | Estimated | F handline east in 1902 |
| F_fleet_1_YR_1903_s_1 | 0.782392 | 0.234121 | _ | 0 | 8 | F | | | Estimated | F handline east in 1903 |
| F_fleet_1_YR_1904_s_1 | 0.818288 | 0.277288 | _ | 0 | 8 | F | | | Estimated | F handline east in 1904 |
| F_fleet_1_YR_1905_s_1 | 0.805452 | 0.299944 | _ | 0 | 8 | F | | | Estimated | F handline east in 1905 |
| F_fleet_1_YR_1906_s_1 | 0.754682 | 0.301993 | _ | 0 | 8 | F | | | Estimated | F handline east in 1906 |
| F_fleet_1_YR_1907_s_1 | 0.670526 | 0.282573 | _ | 0 | 8 | F | | | Estimated | F handline east in 1907 |
| F_fleet_1_YR_1908_s_1 | 0.582779 | 0.253821 | _ | 0 | 8 | F | | | Estimated | F handline east in 1908 |
| F_fleet_1_YR_1909_s_1 | 0.465692 | 0.204154 | _ | 0 | 8 | F | | | Estimated | F handline east in 1909 |
| F_fleet_1_YR_1910_s_1 | 0.349743 | 0.148312 | _ | 0 | 8 | F | | | Estimated | F handline east in 1910 |
| F_fleet_1_YR_1911_s_1 | 0.309539 | 0.123433 | _ | 0 | 8 | F | | | Estimated | F handline east in 1911 |
| F_fleet_1_YR_1912_s_1 | 0.278519 | 0.103713 | _ | 0 | 8 | F | | | Estimated | F handline east in 1912 |
| F_fleet_1_YR_1913_s_1 | 0.255714 | 0.0886287 | _ | 0 | 8 | F | | | Estimated | F handline east in 1913 |
| F_fleet_1_YR_1914_s_1 | 0.239375 | 0.0772267 | _ | 0 | 8 | F | | | Estimated | F handline east in 1914 |
| F_fleet_1_YR_1915_s_1 | 0.227897 | 0.0686712 | _ | 0 | 8 | F | | | Estimated | F handline east in 1915 |
| F_fleet_1_YR_1916_s_1 | 0.219913 | 0.0622929 | _ | 0 | 8 | F | | | Estimated | F handline east in 1916 |
| F_fleet_1_YR_1917_s_1 | 0.207909 | 0.0556937 | _ | 0 | 8 | F | | | Estimated | F handline east in 1917 |
| F_fleet_1_YR_1918_s_1 | 0.203289 | 0.0518065 | _ | 0 | 8 | F | | | Estimated | F handline east in 1918 |
| F_fleet_1_YR_1919_s_1 | 0.218269 | 0.0536761 | _ | 0 | 8 | F | | | Estimated | F handline east in 1919 |
| F_fleet_1_YR_1920_s_1 | 0.237685 | 0.0575704 | _ | 0 | 8 | F | | | Estimated | F handline east in 1920 |
| F_fleet_1_YR_1921_s_1 | 0.262484 | 0.063869 | _ | 0 | 8 | F | | | Estimated | F handline east in 1921 |
| F_fleet_1_YR_1922_s_1 | 0.293805 | 0.0731804 | _ | 0 | 8 | F | | | Estimated | F handline east in 1922 |
| F_fleet_1_YR_1923_s_1 | 0.33259 | 0.0863914 | _ | 0 | 8 | F | | | Estimated | F handline east in 1923 |
| F_fleet_1_YR_1924_s_1 | 0.344219 | 0.0940354 | _ | 0 | 8 | F | | | Estimated | F handline east in 1924 |
| F_fleet_1_YR_1925_s_1 | 0.363096 | 0.104256 | _ | 0 | 8 | F | | | Estimated | F handline east in 1925 |
| F_fleet_1_YR_1926_s_1 | 0.369527 | 0.11129 | _ | 0 | 8 | F | | | Estimated | F handline east in 1926 |
| F_fleet_1_YR_1927_s_1 | 0.423406 | 0.13503 | _ | 0 | 8 | F | | | Estimated | F handline east in 1927 |
| F_fleet_1_YR_1928_s_1 | 0.395299 | 0.133419 | _ | 0 | 8 | F | | | Estimated | F handline east in 1928 |
| F_fleet_1_YR_1929_s_1 | 0.434098 | 0.153961 | _ | 0 | 8 | F | | | Estimated | F handline east in 1929 |
| F_fleet_1_YR_1930_s_1 | 0.260509 | 0.0924453 | _ | 0 | 8 | F | | | Estimated | F handline east in 1930 |
| F_fleet_1_YR_1931_s_1 | 0.240769 | 0.0798029 | _ | 0 | 8 | F | | | Estimated | F handline east in 1931 |
| F_fleet_1_YR_1932_s_1 | 0.238804 | 0.0737865 | _ | 0 | 8 | F | | | Estimated | F handline east in 1932 |
| F_fleet_1_YR_1933_s_1 | 0.201278 | 0.0579396 | _ | 0 | 8 | F | | | Estimated | F handline east in 1933 |
| F_fleet_1_YR_1934_s_1 | 0.168483 | 0.0446431 | _ | 0 | 8 | F | | | Estimated | F handline east in 1934 |
| F_fleet_1_YR_1935_s_1 | 0.196107 | 0.048362 | _ | 0 | 8 | F | | | Estimated | F handline east in 1935 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_1_YR_1936_s_1 | 0.222336 | 0.0528237 | _ | 0 | 8 | F | | | Estimated | F handline east in 1936 |
| F_fleet_1_YR_1937_s_1 | 0.196944 | 0.045672 | _ | 0 | 8 | F | | | Estimated | F handline east in 1937 |
| F_fleet_1_YR_1938_s_1 | 0.258545 | 0.0595532 | _ | 0 | 8 | F | | | Estimated | F handline east in 1938 |
| F_fleet_1_YR_1939_s_1 | 0.321232 | 0.076721 | _ | 0 | 8 | F | | | Estimated | F handline east in 1939 |
| F_fleet_1_YR_1940_s_1 | 0.223999 | 0.0546719 | _ | 0 | 8 | F | | | Estimated | F handline east in 1940 |
| F_fleet_1_YR_1941_s_1 | 0.201009 | 0.0477638 | _ | 0 | 8 | F | | | Estimated | F handline east in 1941 |
| F_fleet_1_YR_1942_s_1 | 0.154082 | 0.0347202 | _ | 0 | 8 | F | | | Estimated | F handline east in 1942 |
| F_fleet_1_YR_1943_s_1 | 0.114342 | 0.0238589 | _ | 0 | 8 | F | | | Estimated | F handline east in 1943 |
| F_fleet_1_YR_1944_s_1 | 0.123363 | 0.0238779 | _ | 0 | 8 | F | | | Estimated | F handline east in 1944 |
| F_fleet_1_YR_1945_s_1 | 0.101987 | 0.0185535 | _ | 0 | 8 | F | | | Estimated | F handline east in 1945 |
| F_fleet_1_YR_1946_s_1 | 0.158756 | 0.0278593 | _ | 0 | 8 | F | | | Estimated | F handline east in 1946 |
| F_fleet_1_YR_1947_s_1 | 0.169035 | 0.0295188 | _ | 0 | 8 | F | | | Estimated | F handline east in 1947 |
| F_fleet_1_YR_1948_s_1 | 0.18619 | 0.0326928 | _ | 0 | 8 | F | | | Estimated | F handline east in 1948 |
| F_fleet_1_YR_1949_s_1 | 0.233777 | 0.0418781 | _ | 0 | 8 | F | | | Estimated | F handline east in 1949 |
| F_fleet_1_YR_1950_s_1 | 0.132521 | 0.0238585 | _ | 0 | 8 | F | | | Estimated | F handline east in 1950 |
| F_fleet_1_YR_1951_s_1 | 0.16171 | 0.0288271 | _ | 0 | 8 | F | | | Estimated | F handline east in 1951 |
| F_fleet_1_YR_1952_s_1 | 0.187667 | 0.0337534 | _ | 0 | 8 | F | | | Estimated | F handline east in 1952 |
| F_fleet_1_YR_1953_s_1 | 0.177647 | 0.03243 | _ | 0 | 8 | F | | | Estimated | F handline east in 1953 |
| F_fleet_1_YR_1954_s_1 | 0.17174 | 0.0316119 | _ | 0 | 8 | F | | | Estimated | F handline east in 1954 |
| F_fleet_1_YR_1955_s_1 | 0.200343 | 0.0373151 | _ | 0 | 8 | F | | | Estimated | F handline east in 1955 |
| F_fleet_1_YR_1956_s_1 | 0.255464 | 0.0491885 | _ | 0 | 8 | F | | | Estimated | F handline east in 1956 |
| F_fleet_1_YR_1957_s_1 | 0.24675 | 0.0495991 | _ | 0 | 8 | F | | | Estimated | F handline east in 1957 |
| F_fleet_1_YR_1958_s_1 | 0.456748 | 0.099912 | _ | 0 | 8 | F | | | Estimated | F handline east in 1958 |
| F_fleet_1_YR_1959_s_1 | 0.497642 | 0.123472 | _ | 0 | 8 | F | | | Estimated | F handline east in 1959 |
| F_fleet_1_YR_1960_s_1 | 0.6739 | 0.192019 | _ | 0 | 8 | F | | | Estimated | F handline east in 1960 |
| F_fleet_1_YR_1961_s_1 | 0.757349 | 0.249192 | _ | 0 | 8 | F | | | Estimated | F handline east in 1961 |
| F_fleet_1_YR_1962_s_1 | 0.949342 | 0.357458 | _ | 0 | 8 | F | | | Estimated | F handline east in 1962 |
| F_fleet_1_YR_1963_s_1 | 0.933337 | 0.390099 | _ | 0 | 8 | F | | | Estimated | F handline east in 1963 |
| F_fleet_1_YR_1964_s_1 | 1.32322 | 0.61077 | _ | 0 | 8 | F | | | Estimated | F handline east in 1964 |
| F_fleet_1_YR_1965_s_1 | 1.72489 | 0.878327 | _ | 0 | 8 | F | | | Estimated | F handline east in 1965 |
| F_fleet_1_YR_1966_s_1 | 1.75071 | 0.922631 | _ | 0 | 8 | F | | | Estimated | F handline east in 1966 |
| F_fleet_1_YR_1967_s_1 | 1.85224 | 0.98499 | _ | 0 | 8 | F | | | Estimated | F handline east in 1967 |
| F_fleet_1_YR_1968_s_1 | 1.80961 | 0.982335 | _ | 0 | 8 | F | | | Estimated | F handline east in 1968 |
| F_fleet_1_YR_1969_s_1 | 1.78311 | 1.00572 | _ | 0 | 8 | F | | | Estimated | F handline east in 1969 |
| F_fleet_1_YR_1970_s_1 | 1.77302 | 1.05356 | _ | 0 | 8 | F | | | Estimated | F handline east in 1970 |
| F_fleet_1_YR_1971_s_1 | 1.8355 | 1.16788 | _ | 0 | 8 | F | | | Estimated | F handline east in 1971 |
| F_fleet_1_YR_1972_s_1 | 2.35858 | 1.67073 | _ | 0 | 8 | F | | | Estimated | F handline east in 1972 |
| F_fleet_1_YR_1973_s_1 | 1.22939 | 0.251201 | _ | 0 | 8 | F | | | Estimated | F handline east in 1973 |
| F_fleet_1_YR_1974_s_1 | 0.974308 | 0.135062 | _ | 0 | 8 | F | | | Estimated | F handline east in 1974 |
| F_fleet_1_YR_1975_s_1 | 0.755495 | 0.140571 | _ | 0 | 8 | F | | | Estimated | F handline east in 1975 |
| F_fleet_1_YR_1976_s_1 | 0.780838 | 0.190321 | _ | 0 | 8 | F | | | Estimated | F handline east in 1976 |
| F_fleet_1_YR_1977_s_1 | 0.623846 | 0.171111 | _ | 0 | 8 | F | | | Estimated | F handline east in 1977 |
| F_fleet_1_YR_1978_s_1 | 0.554114 | 0.131241 | _ | 0 | 8 | F | | | Estimated | F handline east in 1978 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_1_YR_1979_s_1 | 0.544481 | 0.113476 | _ | 0 | 8 | F | | | Estimated | F handline east in 1979 |
| F_fleet_1_YR_1980_s_1 | 0.557261 | 0.115809 | _ | 0 | 8 | F | | | Estimated | F handline east in 1980 |
| F_fleet_1_YR_1981_s_1 | 0.741662 | 0.163735 | _ | 0 | 8 | F | | | Estimated | F handline east in 1981 |
| F_fleet_1_YR_1982_s_1 | 0.776178 | 0.133723 | _ | 0 | 8 | F | | | Estimated | F handline east in 1982 |
| F_fleet_1_YR_1983_s_1 | 0.616606 | 0.078376 | _ | 0 | 8 | F | | | Estimated | F handline east in 1983 |
| F_fleet_1_YR_1984_s_1 | 0.303314 | 0.0341903 | _ | 0 | 8 | F | | | Estimated | F handline east in 1984 |
| F_fleet_1_YR_1985_s_1 | 0.255461 | 0.027229 | _ | 0 | 8 | F | | | Estimated | F handline east in 1985 |
| F_fleet_1_YR_1986_s_1 | 0.13299 | 0.0142981 | _ | 0 | 8 | F | | | Estimated | F handline east in 1986 |
| F_fleet_1_YR_1987_s_1 | 0.153846 | 0.0184729 | _ | 0 | 8 | F | | | Estimated | F handline east in 1987 |
| F_fleet_1_YR_1988_s_1 | 0.228038 | 0.028448 | _ | 0 | 8 | F | | | Estimated | F handline east in 1988 |
| F_fleet_1_YR_1989_s_1 | 0.236679 | 0.028158 | _ | 0 | 8 | F | | | Estimated | F handline east in 1989 |
| F_fleet_1_YR_1990_s_1 | 0.321571 | 0.0369243 | _ | 0 | 8 | F | | | Estimated | F handline east in 1990 |
| F_fleet_1_YR_1991_s_1 | 0.156386 | 0.0177142 | _ | 0 | 8 | F | | | Estimated | F handline east in 1991 |
| F_fleet_1_YR_1992_s_1 | 0.117448 | 0.0126327 | _ | 0 | 8 | F | | | Estimated | F handline east in 1992 |
| F_fleet_1_YR_1993_s_1 | 0.112476 | 0.0116198 | _ | 0 | 8 | F | | | Estimated | F handline east in 1993 |
| F_fleet_1_YR_1994_s_1 | 0.146801 | 0.0159959 | _ | 0 | 8 | F | | | Estimated | F handline east in 1994 |
| F_fleet_1_YR_1995_s_1 | 0.0518602 | 0.00602636 | _ | 0 | 8 | F | | | Estimated | F handline east in 1995 |
| F_fleet_1_YR_1996_s_1 | 0.0605908 | 0.00670932 | _ | 0 | 8 | F | | | Estimated | F handline east in 1996 |
| F_fleet_1_YR_1997_s_1 | 0.0429575 | 0.0047388 | _ | 0 | 8 | F | | | Estimated | F handline east in 1997 |
| F_fleet_1_YR_1998_s_1 | 0.064087 | 0.00840395 | _ | 0 | 8 | F | | | Estimated | F handline east in 1998 |
| F_fleet_1_YR_1999_s_1 | 0.0819901 | 0.00854774 | _ | 0 | 8 | F | | | Estimated | F handline east in 1999 |
| F_fleet_1_YR_2000_s_1 | 0.099849 | 0.00987011 | _ | 0 | 8 | F | | | Estimated | F handline east in 2000 |
| F_fleet_1_YR_2001_s_1 | 0.122295 | 0.0123327 | _ | 0 | 8 | F | | | Estimated | F handline east in 2001 |
| F_fleet_1_YR_2002_s_1 | 0.138629 | 0.0148281 | _ | 0 | 8 | F | | | Estimated | F handline east in 2002 |
| F_fleet_1_YR_2003_s_1 | 0.117086 | 0.0127992 | _ | 0 | 8 | F | | | Estimated | F handline east in 2003 |
| F_fleet_1_YR_2004_s_1 | 0.0987374 | 0.0114294 | _ | 0 | 8 | F | | | Estimated | F handline east in 2004 |
| F_fleet_1_YR_2005_s_1 | 0.0683499 | 0.00822938 | _ | 0 | 8 | F | | | Estimated | F handline east in 2005 |
| F_fleet_1_YR_2006_s_1 | 0.0457023 | 0.00525999 | _ | 0 | 8 | F | | | Estimated | F handline east in 2006 |
| F_fleet_1_YR_2007_s_1 | 0.14277 | 0.0208815 | _ | 0 | 8 | F | | | Estimated | F handline east in 2007 |
| F_fleet_1_YR_2008_s_1 | 0.110995 | 0.0161343 | _ | 0 | 8 | F | | | Estimated | F handline east in 2008 |
| F_fleet_1_YR_2009_s_1 | 0.110627 | 0.0155437 | _ | 0 | 8 | F | | | Estimated | F handline east in 2009 |
| F_fleet_1_YR_2010_s_1 | 0.162985 | 0.0222191 | _ | 0 | 8 | F | | | Estimated | F handline east in 2010 |
| F_fleet_1_YR_2011_s_1 | 0.221012 | 0.0311475 | _ | 0 | 8 | F | | | Estimated | F handline east in 2011 |
| F_fleet_2_YR_1872_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F handline west in 1872 |
| F_fleet_2_YR_1873_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F handline west in 1873 |
| F_fleet_2_YR_1874_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F handline west in 1874 |
| F_fleet_2_YR_1875_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F handline west in 1875 |
| F_fleet_2_YR_1876_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F handline west in 1876 |
| F_fleet_2_YR_1877_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F handline west in 1877 |
| F_fleet_2_YR_1878_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F handline west in 1878 |
| F_fleet_2_YR_1879_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F handline west in 1879 |
| F_fleet_2_YR_1880_s_1 | 0.0277656 | 0.00213199 | _ | 0 | 8 | F | | | Estimated | F handline west in 1880 |
| F_fleet_2_YR_1881_s_1 | 0.0256506 | 0.00198107 | _ | 0 | 8 | F | | | Estimated | F handline west in 1881 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_2_YR_1882_s_1 | 0.0231208 | 0.00179159 | _ | 0 | 8 | F | | | Estimated | F handline west in 1882 |
| F_fleet_2_YR_1883_s_1 | 0.0208149 | 0.00161504 | _ | 0 | 8 | F | | | Estimated | F handline west in 1883 |
| F_fleet_2_YR_1884_s_1 | 0.0183792 | 0.00142581 | _ | 0 | 8 | F | | | Estimated | F handline west in 1884 |
| F_fleet_2_YR_1885_s_1 | 0.0158282 | 0.00122682 | _ | 0 | 8 | F | | | Estimated | F handline west in 1885 |
| F_fleet_2_YR_1886_s_1 | 0.0132695 | 0.0010274 | _ | 0 | 8 | F | | | Estimated | F handline west in 1886 |
| F_fleet_2_YR_1887_s_1 | 0.00674452 | 0.00052112 | _ | 0 | 8 | F | | | Estimated | F handline west in 1887 |
| F_fleet_2_YR_1888_s_1 | 0.00702178 | 0.000541906 | _ | 0 | 8 | F | | | Estimated | F handline west in 1888 |
| F_fleet_2_YR_1889_s_1 | 0.00888041 | 0.000685489 | _ | 0 | 8 | F | | | Estimated | F handline west in 1889 |
| F_fleet_2_YR_1890_s_1 | 0.00800817 | 0.000618488 | _ | 0 | 8 | F | | | Estimated | F handline west in 1890 |
| F_fleet_2_YR_1891_s_1 | 0.00892022 | 0.000689645 | _ | 0 | 8 | F | | | Estimated | F handline west in 1891 |
| F_fleet_2_YR_1892_s_1 | 0.0097342 | 0.000753607 | _ | 0 | 8 | F | | | Estimated | F handline west in 1892 |
| F_fleet_2_YR_1893_s_1 | 0.0103956 | 0.000805957 | _ | 0 | 8 | F | | | Estimated | F handline west in 1893 |
| F_fleet_2_YR_1894_s_1 | 0.010865 | 0.000843545 | _ | 0 | 8 | F | | | Estimated | F handline west in 1894 |
| F_fleet_2_YR_1895_s_1 | 0.0112041 | 0.000871028 | _ | 0 | 8 | F | | | Estimated | F handline west in 1895 |
| F_fleet_2_YR_1896_s_1 | 0.0114766 | 0.000893311 | _ | 0 | 8 | F | | | Estimated | F handline west in 1896 |
| F_fleet_2_YR_1897_s_1 | 0.0114999 | 0.000896093 | _ | 0 | 8 | F | | | Estimated | F handline west in 1897 |
| F_fleet_2_YR_1898_s_1 | 0.0184686 | 0.00144311 | _ | 0 | 8 | F | | | Estimated | F handline west in 1898 |
| F_fleet_2_YR_1899_s_1 | 0.0246958 | 0.00193754 | _ | 0 | 8 | F | | | Estimated | F handline west in 1899 |
| F_fleet_2_YR_1900_s_1 | 0.030737 | 0.00243048 | _ | 0 | 8 | F | | | Estimated | F handline west in 1900 |
| F_fleet_2_YR_1901_s_1 | 0.0356615 | 0.00288362 | _ | 0 | 8 | F | | | Estimated | F handline west in 1901 |
| F_fleet_2_YR_1902_s_1 | 0.0398024 | 0.00376791 | _ | 0 | 8 | F | | | Estimated | F handline west in 1902 |
| F_fleet_2_YR_1903_s_1 | 0.037787 | 0.00444938 | _ | 0 | 8 | F | | | Estimated | F handline west in 1903 |
| F_fleet_2_YR_1904_s_1 | 0.0362463 | 0.0048159 | _ | 0 | 8 | F | | | Estimated | F handline west in 1904 |
| F_fleet_2_YR_1905_s_1 | 0.0337636 | 0.00471165 | _ | 0 | 8 | F | | | Estimated | F handline west in 1905 |
| F_fleet_2_YR_1906_s_1 | 0.031101 | 0.00443081 | _ | 0 | 8 | F | | | Estimated | F handline west in 1906 |
| F_fleet_2_YR_1907_s_1 | 0.0282958 | 0.00404544 | _ | 0 | 8 | F | | | Estimated | F handline west in 1907 |
| F_fleet_2_YR_1908_s_1 | 0.0262062 | 0.00374087 | _ | 0 | 8 | F | | | Estimated | F handline west in 1908 |
| F_fleet_2_YR_1909_s_1 | 0.0224459 | 0.00319404 | _ | 0 | 8 | F | | | Estimated | F handline west in 1909 |
| F_fleet_2_YR_1910_s_1 | 0.018983 | 0.00269091 | _ | 0 | 8 | F | | | Estimated | F handline west in 1910 |
| F_fleet_2_YR_1911_s_1 | 0.0185189 | 0.00261618 | _ | 0 | 8 | F | | | Estimated | F handline west in 1911 |
| F_fleet_2_YR_1912_s_1 | 0.0181166 | 0.00255298 | _ | 0 | 8 | F | | | Estimated | F handline west in 1912 |
| F_fleet_2_YR_1913_s_1 | 0.0177491 | 0.00249682 | _ | 0 | 8 | F | | | Estimated | F handline west in 1913 |
| F_fleet_2_YR_1914_s_1 | 0.0173905 | 0.00244313 | _ | 0 | 8 | F | | | Estimated | F handline west in 1914 |
| F_fleet_2_YR_1915_s_1 | 0.0170425 | 0.00239153 | _ | 0 | 8 | F | | | Estimated | F handline west in 1915 |
| F_fleet_2_YR_1916_s_1 | 0.0166674 | 0.00233635 | _ | 0 | 8 | F | | | Estimated | F handline west in 1916 |
| F_fleet_2_YR_1917_s_1 | 0.0163282 | 0.00228613 | _ | 0 | 8 | F | | | Estimated | F handline west in 1917 |
| F_fleet_2_YR_1918_s_1 | 0.0159887 | 0.00223562 | _ | 0 | 8 | F | | | Estimated | F handline west in 1918 |
| F_fleet_2_YR_1919_s_1 | 0.016408 | 0.00229135 | _ | 0 | 8 | F | | | Estimated | F handline west in 1919 |
| F_fleet_2_YR_1920_s_1 | 0.0168356 | 0.00234866 | _ | 0 | 8 | F | | | Estimated | F handline west in 1920 |
| F_fleet_2_YR_1921_s_1 | 0.0173127 | 0.00241328 | _ | 0 | 8 | F | | | Estimated | F handline west in 1921 |
| F_fleet_2_YR_1922_s_1 | 0.0177576 | 0.00247392 | _ | 0 | 8 | F | | | Estimated | F handline west in 1922 |
| F_fleet_2_YR_1923_s_1 | 0.0182098 | 0.00253595 | _ | 0 | 8 | F | | | Estimated | F handline west in 1923 |
| F_fleet_2_YR_1924_s_1 | 0.0176192 | 0.00245237 | _ | 0 | 8 | F | | | Estimated | F handline west in 1924 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_2_YR_1925_s_1 | 0.0170224 | 0.00236738 | _ | 0 | 8 | F | | | Estimated | F handline west in 1925 |
| F_fleet_2_YR_1926_s_1 | 0.0164115 | 0.00227998 | _ | 0 | 8 | F | | | Estimated | F handline west in 1926 |
| F_fleet_2_YR_1927_s_1 | 0.0206204 | 0.00286435 | _ | 0 | 8 | F | | | Estimated | F handline west in 1927 |
| F_fleet_2_YR_1928_s_1 | 0.0150632 | 0.00209043 | _ | 0 | 8 | F | | | Estimated | F handline west in 1928 |
| F_fleet_2_YR_1929_s_1 | 0.0147272 | 0.00203935 | _ | 0 | 8 | F | | | Estimated | F handline west in 1929 |
| F_fleet_2_YR_1930_s_1 | 0.019585 | 0.00270896 | _ | 0 | 8 | F | | | Estimated | F handline west in 1930 |
| F_fleet_2_YR_1931_s_1 | 0.0121472 | 0.00167627 | _ | 0 | 8 | F | | | Estimated | F handline west in 1931 |
| F_fleet_2_YR_1932_s_1 | 0.0145711 | 0.00200448 | _ | 0 | 8 | F | | | Estimated | F handline west in 1932 |
| F_fleet_2_YR_1933_s_1 | 0.015879 | 0.00217934 | _ | 0 | 8 | F | | | Estimated | F handline west in 1933 |
| F_fleet_2_YR_1934_s_1 | 0.0165256 | 0.00226319 | _ | 0 | 8 | F | | | Estimated | F handline west in 1934 |
| F_fleet_2_YR_1935_s_1 | 0.0241303 | 0.00330273 | _ | 0 | 8 | F | | | Estimated | F handline west in 1935 |
| F_fleet_2_YR_1936_s_1 | 0.0314525 | 0.00431204 | _ | 0 | 8 | F | | | Estimated | F handline west in 1936 |
| F_fleet_2_YR_1937_s_1 | 0.034598 | 0.00475404 | _ | 0 | 8 | F | | | Estimated | F handline west in 1937 |
| F_fleet_2_YR_1938_s_1 | 0.0345938 | 0.00475859 | _ | 0 | 8 | F | | | Estimated | F handline west in 1938 |
| F_fleet_2_YR_1939_s_1 | 0.0318865 | 0.00438162 | _ | 0 | 8 | F | | | Estimated | F handline west in 1939 |
| F_fleet_2_YR_1940_s_1 | 0.030618 | 0.00419476 | _ | 0 | 8 | F | | | Estimated | F handline west in 1940 |
| F_fleet_2_YR_1941_s_1 | 0.027777 | 0.00378794 | _ | 0 | 8 | F | | | Estimated | F handline west in 1941 |
| F_fleet_2_YR_1942_s_1 | 0.0204911 | 0.00277427 | _ | 0 | 8 | F | | | Estimated | F handline west in 1942 |
| F_fleet_2_YR_1943_s_1 | 0.0139123 | 0.00186524 | _ | 0 | 8 | F | | | Estimated | F handline west in 1943 |
| F_fleet_2_YR_1944_s_1 | 0.0104184 | 0.00138176 | _ | 0 | 8 | F | | | Estimated | F handline west in 1944 |
| F_fleet_2_YR_1945_s_1 | 0.00569845 | 0.000747347 | _ | 0 | 8 | F | | | Estimated | F handline west in 1945 |
| F_fleet_2_YR_1946_s_1 | 0.011977 | 0.00155649 | _ | 0 | 8 | F | | | Estimated | F handline west in 1946 |
| F_fleet_2_YR_1947_s_1 | 0.0178264 | 0.00230307 | _ | 0 | 8 | F | | | Estimated | F handline west in 1947 |
| F_fleet_2_YR_1948_s_1 | 0.0224646 | 0.00289103 | _ | 0 | 8 | F | | | Estimated | F handline west in 1948 |
| F_fleet_2_YR_1949_s_1 | 0.0333952 | 0.00429244 | _ | 0 | 8 | F | | | Estimated | F handline west in 1949 |
| F_fleet_2_YR_1950_s_1 | 0.0589705 | 0.0076373 | _ | 0 | 8 | F | | | Estimated | F handline west in 1950 |
| F_fleet_2_YR_1951_s_1 | 0.0634511 | 0.00839102 | _ | 0 | 8 | F | | | Estimated | F handline west in 1951 |
| F_fleet_2_YR_1952_s_1 | 0.0771455 | 0.0105005 | _ | 0 | 8 | F | | | Estimated | F handline west in 1952 |
| F_fleet_2_YR_1953_s_1 | 0.0685003 | 0.00955732 | _ | 0 | 8 | F | | | Estimated | F handline west in 1953 |
| F_fleet_2_YR_1954_s_1 | 0.0734728 | 0.0104326 | _ | 0 | 8 | F | | | Estimated | F handline west in 1954 |
| F_fleet_2_YR_1955_s_1 | 0.0850654 | 0.0122694 | _ | 0 | 8 | F | | | Estimated | F handline west in 1955 |
| F_fleet_2_YR_1956_s_1 | 0.122468 | 0.0180228 | _ | 0 | 8 | F | | | Estimated | F handline west in 1956 |
| F_fleet_2_YR_1957_s_1 | 0.130843 | 0.0196735 | _ | 0 | 8 | F | | | Estimated | F handline west in 1957 |
| F_fleet_2_YR_1958_s_1 | 0.239007 | 0.0372893 | _ | 0 | 8 | F | | | Estimated | F handline west in 1958 |
| F_fleet_2_YR_1959_s_1 | 0.276057 | 0.0453426 | _ | 0 | 8 | F | | | Estimated | F handline west in 1959 |
| F_fleet_2_YR_1960_s_1 | 0.330604 | 0.05725 | _ | 0 | 8 | F | | | Estimated | F handline west in 1960 |
| F_fleet_2_YR_1961_s_1 | 0.45692 | 0.0841574 | _ | 0 | 8 | F | | | Estimated | F handline west in 1961 |
| F_fleet_2_YR_1962_s_1 | 0.525421 | 0.10272 | _ | 0 | 8 | F | | | Estimated | F handline west in 1962 |
| F_fleet_2_YR_1963_s_1 | 0.533469 | 0.10861 | _ | 0 | 8 | F | | | Estimated | F handline west in 1963 |
| F_fleet_2_YR_1964_s_1 | 0.570343 | 0.120127 | _ | 0 | 8 | F | | | Estimated | F handline west in 1964 |
| F_fleet_2_YR_1965_s_1 | 0.626616 | 0.137443 | _ | 0 | 8 | F | | | Estimated | F handline west in 1965 |
| F_fleet_2_YR_1966_s_1 | 0.550065 | 0.124446 | _ | 0 | 8 | F | | | Estimated | F handline west in 1966 |
| F_fleet_2_YR_1967_s_1 | 0.830235 | 0.199001 | _ | 0 | 8 | F | | | Estimated | F handline west in 1967 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_2_YR_1968_s_1 | 1.25173 | 0.33223 | _ | 0 | 8 | F | | | Estimated | F handline west in 1968 |
| F_fleet_2_YR_1969_s_1 | 1.26708 | 0.355374 | _ | 0 | 8 | F | | | Estimated | F handline west in 1969 |
| F_fleet_2_YR_1970_s_1 | 1.7289 | 0.488685 | _ | 0 | 8 | F | | | Estimated | F handline west in 1970 |
| F_fleet_2_YR_1971_s_1 | 2.65197 | 0.698396 | _ | 0 | 8 | F | | | Estimated | F handline west in 1971 |
| F_fleet_2_YR_1972_s_1 | 3.18906 | 0.710637 | _ | 0 | 8 | F | | | Estimated | F handline west in 1972 |
| F_fleet_2_YR_1973_s_1 | 2.39253 | 0.33606 | _ | 0 | 8 | F | | | Estimated | F handline west in 1973 |
| F_fleet_2_YR_1974_s_1 | 1.43991 | 0.193049 | _ | 0 | 8 | F | | | Estimated | F handline west in 1974 |
| F_fleet_2_YR_1975_s_1 | 0.864545 | 0.154802 | _ | 0 | 8 | F | | | Estimated | F handline west in 1975 |
| F_fleet_2_YR_1976_s_1 | 0.697604 | 0.152474 | _ | 0 | 8 | F | | | Estimated | F handline west in 1976 |
| F_fleet_2_YR_1977_s_1 | 0.680315 | 0.164008 | _ | 0 | 8 | F | | | Estimated | F handline west in 1977 |
| F_fleet_2_YR_1978_s_1 | 0.671982 | 0.156976 | _ | 0 | 8 | F | | | Estimated | F handline west in 1978 |
| F_fleet_2_YR_1979_s_1 | 0.628985 | 0.143728 | _ | 0 | 8 | F | | | Estimated | F handline west in 1979 |
| F_fleet_2_YR_1980_s_1 | 0.663025 | 0.151772 | _ | 0 | 8 | F | | | Estimated | F handline west in 1980 |
| F_fleet_2_YR_1981_s_1 | 0.757465 | 0.14184 | _ | 0 | 8 | F | | | Estimated | F handline west in 1981 |
| F_fleet_2_YR_1982_s_1 | 0.65886 | 0.0935945 | _ | 0 | 8 | F | | | Estimated | F handline west in 1982 |
| F_fleet_2_YR_1983_s_1 | 0.45019 | 0.0579132 | _ | 0 | 8 | F | | | Estimated | F handline west in 1983 |
| F_fleet_2_YR_1984_s_1 | 0.27754 | 0.0336805 | _ | 0 | 8 | F | | | Estimated | F handline west in 1984 |
| F_fleet_2_YR_1985_s_1 | 0.170605 | 0.0199582 | _ | 0 | 8 | F | | | Estimated | F handline west in 1985 |
| F_fleet_2_YR_1986_s_1 | 0.185273 | 0.020506 | _ | 0 | 8 | F | | | Estimated | F handline west in 1986 |
| F_fleet_2_YR_1987_s_1 | 0.154877 | 0.0166224 | _ | 0 | 8 | F | | | Estimated | F handline west in 1987 |
| F_fleet_2_YR_1988_s_1 | 0.249924 | 0.0250816 | _ | 0 | 8 | F | | | Estimated | F handline west in 1988 |
| F_fleet_2_YR_1989_s_1 | 0.206826 | 0.0201896 | _ | 0 | 8 | F | | | Estimated | F handline west in 1989 |
| F_fleet_2_YR_1990_s_1 | 0.19354 | 0.0186646 | _ | 0 | 8 | F | | | Estimated | F handline west in 1990 |
| F_fleet_2_YR_1991_s_1 | 0.168489 | 0.0157358 | _ | 0 | 8 | F | | | Estimated | F handline west in 1991 |
| F_fleet_2_YR_1992_s_1 | 0.201558 | 0.0185171 | _ | 0 | 8 | F | | | Estimated | F handline west in 1992 |
| F_fleet_2_YR_1993_s_1 | 0.196828 | 0.0179478 | _ | 0 | 8 | F | | | Estimated | F handline west in 1993 |
| F_fleet_2_YR_1994_s_1 | 0.170613 | 0.0158377 | _ | 0 | 8 | F | | | Estimated | F handline west in 1994 |
| F_fleet_2_YR_1995_s_1 | 0.168264 | 0.0151688 | _ | 0 | 8 | F | | | Estimated | F handline west in 1995 |
| F_fleet_2_YR_1996_s_1 | 0.231625 | 0.0202791 | _ | 0 | 8 | F | | | Estimated | F handline west in 1996 |
| F_fleet_2_YR_1997_s_1 | 0.262128 | 0.0226278 | _ | 0 | 8 | F | | | Estimated | F handline west in 1997 |
| F_fleet_2_YR_1998_s_1 | 0.252636 | 0.02245 | _ | 0 | 8 | F | | | Estimated | F handline west in 1998 |
| F_fleet_2_YR_1999_s_1 | 0.275701 | 0.0250109 | _ | 0 | 8 | F | | | Estimated | F handline west in 1999 |
| F_fleet_2_YR_2000_s_1 | 0.274249 | 0.0249509 | _ | 0 | 8 | F | | | Estimated | F handline west in 2000 |
| F_fleet_2_YR_2001_s_1 | 0.269995 | 0.0242574 | _ | 0 | 8 | F | | | Estimated | F handline west in 2001 |
| F_fleet_2_YR_2002_s_1 | 0.260539 | 0.0235198 | _ | 0 | 8 | F | | | Estimated | F handline west in 2002 |
| F_fleet_2_YR_2003_s_1 | 0.233482 | 0.0214175 | _ | 0 | 8 | F | | | Estimated | F handline west in 2003 |
| F_fleet_2_YR_2004_s_1 | 0.235693 | 0.0217923 | _ | 0 | 8 | F | | | Estimated | F handline west in 2004 |
| F_fleet_2_YR_2005_s_1 | 0.225086 | 0.0215643 | _ | 0 | 8 | F | | | Estimated | F handline west in 2005 |
| F_fleet_2_YR_2006_s_1 | 0.236891 | 0.0232155 | _ | 0 | 8 | F | | | Estimated | F handline west in 2006 |
| F_fleet_2_YR_2007_s_1 | 0.16302 | 0.0187818 | _ | 0 | 8 | F | | | Estimated | F handline west in 2007 |
| F_fleet_2_YR_2008_s_1 | 0.0956395 | 0.0108625 | _ | 0 | 8 | F | | | Estimated | F handline west in 2008 |
| F_fleet_2_YR_2009_s_1 | 0.0746869 | 0.00838343 | _ | 0 | 8 | F | | | Estimated | F handline west in 2009 |
| F_fleet_2_YR_2010_s_1 | 0.0855433 | 0.00958413 | _ | 0 | 8 | F | | | Estimated | F handline west in 2010 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_2_YR_2011_s_1 | 0.0866875 | 0.0099746 | _ | 0 | 8 | F | | | Estimated | F handline west in 2011 |
| F_fleet_3_YR_1872_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1872 |
| F_fleet_3_YR_1873_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1873 |
| F_fleet_3_YR_1874_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1874 |
| F_fleet_3_YR_1875_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1875 |
| F_fleet_3_YR_1876_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1876 |
| F_fleet_3_YR_1877_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1877 |
| F_fleet_3_YR_1878_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1878 |
| F_fleet_3_YR_1879_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1879 |
| F_fleet_3_YR_1880_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1880 |
| F_fleet_3_YR_1881_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1881 |
| F_fleet_3_YR_1882_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1882 |
| F_fleet_3_YR_1883_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1883 |
| F_fleet_3_YR_1884_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1884 |
| F_fleet_3_YR_1885_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1885 |
| F_fleet_3_YR_1886_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1886 |
| F_fleet_3_YR_1887_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1887 |
| F_fleet_3_YR_1888_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1888 |
| F_fleet_3_YR_1889_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1889 |
| F_fleet_3_YR_1890_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1890 |
| F_fleet_3_YR_1891_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1891 |
| F_fleet_3_YR_1892_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1892 |
| F_fleet_3_YR_1893_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1893 |
| F_fleet_3_YR_1894_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1894 |
| F_fleet_3_YR_1895_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1895 |
| F_fleet_3_YR_1896_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1896 |
| F_fleet_3_YR_1897_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1897 |
| F_fleet_3_YR_1898_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1898 |
| F_fleet_3_YR_1899_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1899 |
| F_fleet_3_YR_1900_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1900 |
| F_fleet_3_YR_1901_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1901 |
| F_fleet_3_YR_1902_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1902 |
| F_fleet_3_YR_1903_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1903 |
| F_fleet_3_YR_1904_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1904 |
| F_fleet_3_YR_1905_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1905 |
| F_fleet_3_YR_1906_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1906 |
| F_fleet_3_YR_1907_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1907 |
| F_fleet_3_YR_1908_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1908 |
| F_fleet_3_YR_1909_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1909 |
| F_fleet_3_YR_1910_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1910 |
| F_fleet_3_YR_1911_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1911 |
| F_fleet_3_YR_1912_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1912 |
| F_fleet_3_YR_1913_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1913 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_3_YR_1914_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1914 |
| F_fleet_3_YR_1915_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1915 |
| F_fleet_3_YR_1916_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1916 |
| F_fleet_3_YR_1917_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1917 |
| F_fleet_3_YR_1918_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1918 |
| F_fleet_3_YR_1919_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1919 |
| F_fleet_3_YR_1920_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1920 |
| F_fleet_3_YR_1921_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1921 |
| F_fleet_3_YR_1922_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1922 |
| F_fleet_3_YR_1923_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1923 |
| F_fleet_3_YR_1924_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1924 |
| F_fleet_3_YR_1925_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1925 |
| F_fleet_3_YR_1926_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1926 |
| F_fleet_3_YR_1927_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1927 |
| F_fleet_3_YR_1928_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1928 |
| F_fleet_3_YR_1929_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1929 |
| F_fleet_3_YR_1930_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1930 |
| F_fleet_3_YR_1931_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1931 |
| F_fleet_3_YR_1932_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1932 |
| F_fleet_3_YR_1933_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1933 |
| F_fleet_3_YR_1934_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1934 |
| F_fleet_3_YR_1935_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1935 |
| F_fleet_3_YR_1936_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1936 |
| F_fleet_3_YR_1937_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1937 |
| F_fleet_3_YR_1938_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1938 |
| F_fleet_3_YR_1939_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1939 |
| F_fleet_3_YR_1940_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1940 |
| F_fleet_3_YR_1941_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1941 |
| F_fleet_3_YR_1942_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1942 |
| F_fleet_3_YR_1943_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1943 |
| F_fleet_3_YR_1944_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1944 |
| F_fleet_3_YR_1945_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1945 |
| F_fleet_3_YR_1946_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1946 |
| F_fleet_3_YR_1947_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1947 |
| F_fleet_3_YR_1948_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1948 |
| F_fleet_3_YR_1949_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1949 |
| F_fleet_3_YR_1950_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1950 |
| F_fleet_3_YR_1951_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1951 |
| F_fleet_3_YR_1952_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1952 |
| F_fleet_3_YR_1953_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1953 |
| F_fleet_3_YR_1954_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1954 |
| F_fleet_3_YR_1955_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1955 |
| F_fleet_3_YR_1956_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1956 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_3_YR_1957_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1957 |
| F_fleet_3_YR_1958_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1958 |
| F_fleet_3_YR_1959_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1959 |
| F_fleet_3_YR_1960_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1960 |
| F_fleet_3_YR_1961_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1961 |
| F_fleet_3_YR_1962_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1962 |
| F_fleet_3_YR_1963_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1963 |
| F_fleet_3_YR_1964_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1964 |
| F_fleet_3_YR_1965_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1965 |
| F_fleet_3_YR_1966_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1966 |
| F_fleet_3_YR_1967_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1967 |
| F_fleet_3_YR_1968_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1968 |
| F_fleet_3_YR_1969_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1969 |
| F_fleet_3_YR_1970_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1970 |
| F_fleet_3_YR_1971_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1971 |
| F_fleet_3_YR_1972_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1972 |
| F_fleet_3_YR_1973_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1973 |
| F_fleet_3_YR_1974_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1974 |
| F_fleet_3_YR_1975_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1975 |
| F_fleet_3_YR_1976_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1976 |
| F_fleet_3_YR_1977_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1977 |
| F_fleet_3_YR_1978_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1978 |
| F_fleet_3_YR_1979_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline east in 1979 |
| F_fleet_3_YR_1980_s_1 | 0.0508978 | 0.015171 | _ | 0 | 8 | F | | | Estimated | F longline east in 1980 |
| F_fleet_3_YR_1981_s_1 | 0.104414 | 0.031433 | _ | 0 | 8 | F | | | Estimated | F longline east in 1981 |
| F_fleet_3_YR_1982_s_1 | 0.1515 | 0.0438291 | _ | 0 | 8 | F | | | Estimated | F longline east in 1982 |
| F_fleet_3_YR_1983_s_1 | 0.318548 | 0.0794025 | _ | 0 | 8 | F | | | Estimated | F longline east in 1983 |
| F_fleet_3_YR_1984_s_1 | 0.22169 | 0.0461569 | _ | 0 | 8 | F | | | Estimated | F longline east in 1984 |
| F_fleet_3_YR_1985_s_1 | 0.0417023 | 0.00788331 | _ | 0 | 8 | F | | | Estimated | F longline east in 1985 |
| F_fleet_3_YR_1986_s_1 | 0.0174119 | 0.00304588 | _ | 0 | 8 | F | | | Estimated | F longline east in 1986 |
| F_fleet_3_YR_1987_s_1 | 0.0124625 | 0.00203277 | _ | 0 | 8 | F | | | Estimated | F longline east in 1987 |
| F_fleet_3_YR_1988_s_1 | 0.0186859 | 0.00312141 | _ | 0 | 8 | F | | | Estimated | F longline east in 1988 |
| F_fleet_3_YR_1989_s_1 | 0.0291834 | 0.00528373 | _ | 0 | 8 | F | | | Estimated | F longline east in 1989 |
| F_fleet_3_YR_1990_s_1 | 0.0385485 | 0.00725404 | _ | 0 | 8 | F | | | Estimated | F longline east in 1990 |
| F_fleet_3_YR_1991_s_1 | 0.0121287 | 0.00225366 | _ | 0 | 8 | F | | | Estimated | F longline east in 1991 |
| F_fleet_3_YR_1992_s_1 | 0.00310417 | 0.000543799 | _ | 0 | 8 | F | | | Estimated | F longline east in 1992 |
| F_fleet_3_YR_1993_s_1 | 0.00719077 | 0.00127615 | _ | 0 | 8 | F | | | Estimated | F longline east in 1993 |
| F_fleet_3_YR_1994_s_1 | 0.00352189 | 0.000633803 | _ | 0 | 8 | F | | | Estimated | F longline east in 1994 |
| F_fleet_3_YR_1995_s_1 | 0.00356196 | 0.000652762 | _ | 0 | 8 | F | | | Estimated | F longline east in 1995 |
| F_fleet_3_YR_1996_s_1 | 0.00297036 | 0.000539781 | _ | 0 | 8 | F | | | Estimated | F longline east in 1996 |
| F_fleet_3_YR_1997_s_1 | 0.00163769 | 0.000292609 | _ | 0 | 8 | F | | | Estimated | F longline east in 1997 |
| F_fleet_3_YR_1998_s_1 | 0.00161254 | 0.000292825 | _ | 0 | 8 | F | | | Estimated | F longline east in 1998 |
| F_fleet_3_YR_1999_s_1 | 0.00155027 | 0.000270546 | _ | 0 | 8 | F | | | Estimated | F longline east in 1999 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_3_YR_2000_s_1 | 0.00184458 | 0.000332911 | _ | 0 | 8 | F | | | Estimated | F longline east in 2000 |
| F_fleet_3_YR_2001_s_1 | 0.00202945 | 0.000364596 | _ | 0 | 8 | F | | | Estimated | F longline east in 2001 |
| F_fleet_3_YR_2002_s_1 | 0.00365554 | 0.000686842 | _ | 0 | 8 | F | | | Estimated | F longline east in 2002 |
| F_fleet_3_YR_2003_s_1 | 0.00259 | 0.000507794 | _ | 0 | 8 | F | | | Estimated | F longline east in 2003 |
| F_fleet_3_YR_2004_s_1 | 0.00304494 | 0.000615001 | _ | 0 | 8 | F | | | Estimated | F longline east in 2004 |
| F_fleet_3_YR_2005_s_1 | 0.00268753 | 0.00053249 | _ | 0 | 8 | F | | | Estimated | F longline east in 2005 |
| F_fleet_3_YR_2006_s_1 | 0.00154704 | 0.000293659 | _ | 0 | 8 | F | | | Estimated | F longline east in 2006 |
| F_fleet_3_YR_2007_s_1 | 0.00303143 | 0.000572394 | _ | 0 | 8 | F | | | Estimated | F longline east in 2007 |
| F_fleet_3_YR_2008_s_1 | 0.00475468 | 0.000891801 | _ | 0 | 8 | F | | | Estimated | F longline east in 2008 |
| F_fleet_3_YR_2009_s_1 | 0.00164308 | 0.000299715 | _ | 0 | 8 | F | | | Estimated | F longline east in 2009 |
| F_fleet_3_YR_2010_s_1 | 0.00729742 | 0.00129836 | _ | 0 | 8 | F | | | Estimated | F longline east in 2010 |
| F_fleet_3_YR_2011_s_1 | 0.00798124 | 0.00139376 | _ | 0 | 8 | F | | | Estimated | F longline east in 2011 |
| F_fleet_4_YR_1872_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1872 |
| F_fleet_4_YR_1873_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1873 |
| F_fleet_4_YR_1874_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1874 |
| F_fleet_4_YR_1875_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1875 |
| F_fleet_4_YR_1876_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1876 |
| F_fleet_4_YR_1877_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1877 |
| F_fleet_4_YR_1878_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1878 |
| F_fleet_4_YR_1879_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1879 |
| F_fleet_4_YR_1880_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1880 |
| F_fleet_4_YR_1881_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1881 |
| F_fleet_4_YR_1882_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1882 |
| F_fleet_4_YR_1883_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1883 |
| F_fleet_4_YR_1884_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1884 |
| F_fleet_4_YR_1885_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1885 |
| F_fleet_4_YR_1886_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1886 |
| F_fleet_4_YR_1887_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1887 |
| F_fleet_4_YR_1888_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1888 |
| F_fleet_4_YR_1889_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1889 |
| F_fleet_4_YR_1890_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1890 |
| F_fleet_4_YR_1891_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1891 |
| F_fleet_4_YR_1892_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1892 |
| F_fleet_4_YR_1893_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1893 |
| F_fleet_4_YR_1894_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1894 |
| F_fleet_4_YR_1895_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1895 |
| F_fleet_4_YR_1896_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1896 |
| F_fleet_4_YR_1897_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1897 |
| F_fleet_4_YR_1898_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1898 |
| F_fleet_4_YR_1899_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1899 |
| F_fleet_4_YR_1900_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1900 |
| F_fleet_4_YR_1901_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1901 |
| F_fleet_4_YR_1902_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1902 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_4_YR_1903_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1903 |
| F_fleet_4_YR_1904_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1904 |
| F_fleet_4_YR_1905_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1905 |
| F_fleet_4_YR_1906_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1906 |
| F_fleet_4_YR_1907_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1907 |
| F_fleet_4_YR_1908_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1908 |
| F_fleet_4_YR_1909_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1909 |
| F_fleet_4_YR_1910_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1910 |
| F_fleet_4_YR_1911_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1911 |
| F_fleet_4_YR_1912_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1912 |
| F_fleet_4_YR_1913_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1913 |
| F_fleet_4_YR_1914_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1914 |
| F_fleet_4_YR_1915_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1915 |
| F_fleet_4_YR_1916_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1916 |
| F_fleet_4_YR_1917_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1917 |
| F_fleet_4_YR_1918_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1918 |
| F_fleet_4_YR_1919_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1919 |
| F_fleet_4_YR_1920_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1920 |
| F_fleet_4_YR_1921_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1921 |
| F_fleet_4_YR_1922_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1922 |
| F_fleet_4_YR_1923_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1923 |
| F_fleet_4_YR_1924_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1924 |
| F_fleet_4_YR_1925_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1925 |
| F_fleet_4_YR_1926_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1926 |
| F_fleet_4_YR_1927_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1927 |
| F_fleet_4_YR_1928_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1928 |
| F_fleet_4_YR_1929_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1929 |
| F_fleet_4_YR_1930_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1930 |
| F_fleet_4_YR_1931_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1931 |
| F_fleet_4_YR_1932_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1932 |
| F_fleet_4_YR_1933_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1933 |
| F_fleet_4_YR_1934_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1934 |
| F_fleet_4_YR_1935_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1935 |
| F_fleet_4_YR_1936_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1936 |
| F_fleet_4_YR_1937_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1937 |
| F_fleet_4_YR_1938_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1938 |
| F_fleet_4_YR_1939_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1939 |
| F_fleet_4_YR_1940_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1940 |
| F_fleet_4_YR_1941_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1941 |
| F_fleet_4_YR_1942_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1942 |
| F_fleet_4_YR_1943_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1943 |
| F_fleet_4_YR_1944_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1944 |
| F_fleet_4_YR_1945_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1945 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_4_YR_1946_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1946 |
| F_fleet_4_YR_1947_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1947 |
| F_fleet_4_YR_1948_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1948 |
| F_fleet_4_YR_1949_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1949 |
| F_fleet_4_YR_1950_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1950 |
| F_fleet_4_YR_1951_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1951 |
| F_fleet_4_YR_1952_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1952 |
| F_fleet_4_YR_1953_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1953 |
| F_fleet_4_YR_1954_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1954 |
| F_fleet_4_YR_1955_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1955 |
| F_fleet_4_YR_1956_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1956 |
| F_fleet_4_YR_1957_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1957 |
| F_fleet_4_YR_1958_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1958 |
| F_fleet_4_YR_1959_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1959 |
| F_fleet_4_YR_1960_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1960 |
| F_fleet_4_YR_1961_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1961 |
| F_fleet_4_YR_1962_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1962 |
| F_fleet_4_YR_1963_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1963 |
| F_fleet_4_YR_1964_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1964 |
| F_fleet_4_YR_1965_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1965 |
| F_fleet_4_YR_1966_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1966 |
| F_fleet_4_YR_1967_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1967 |
| F_fleet_4_YR_1968_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1968 |
| F_fleet_4_YR_1969_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1969 |
| F_fleet_4_YR_1970_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1970 |
| F_fleet_4_YR_1971_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1971 |
| F_fleet_4_YR_1972_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1972 |
| F_fleet_4_YR_1973_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1973 |
| F_fleet_4_YR_1974_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1974 |
| F_fleet_4_YR_1975_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1975 |
| F_fleet_4_YR_1976_s_1 | 4.54E-05 | 7.20E-06 | _ | 0 | 8 | F | | | Estimated | F longline west in 1976 |
| F_fleet_4_YR_1977_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1977 |
| F_fleet_4_YR_1978_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1978 |
| F_fleet_4_YR_1979_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F longline west in 1979 |
| F_fleet_4_YR_1980_s_1 | 0.0024624 | 0.000405758 | _ | 0 | 8 | F | | | Estimated | F longline west in 1980 |
| F_fleet_4_YR_1981_s_1 | 0.00294133 | 0.000488332 | _ | 0 | 8 | F | | | Estimated | F longline west in 1981 |
| F_fleet_4_YR_1982_s_1 | 0.00452048 | 0.000746611 | _ | 0 | 8 | F | | | Estimated | F longline west in 1982 |
| F_fleet_4_YR_1983_s_1 | 0.00642296 | 0.00104403 | _ | 0 | 8 | F | | | Estimated | F longline west in 1983 |
| F_fleet_4_YR_1984_s_1 | 0.0496958 | 0.00793644 | _ | 0 | 8 | F | | | Estimated | F longline west in 1984 |
| F_fleet_4_YR_1985_s_1 | 0.0371921 | 0.00579545 | _ | 0 | 8 | F | | | Estimated | F longline west in 1985 |
| F_fleet_4_YR_1986_s_1 | 0.0479337 | 0.00738246 | _ | 0 | 8 | F | | | Estimated | F longline west in 1986 |
| F_fleet_4_YR_1987_s_1 | 0.0388281 | 0.00593954 | _ | 0 | 8 | F | | | Estimated | F longline west in 1987 |
| F_fleet_4_YR_1988_s_1 | 0.0328819 | 0.00485877 | _ | 0 | 8 | F | | | Estimated | F longline west in 1988 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_4_YR_1989_s_1 | 0.0221813 | 0.00332107 | _ | 0 | 8 | F | | | Estimated | F longline west in 1989 |
| F_fleet_4_YR_1990_s_1 | 0.00566744 | 0.000842639 | _ | 0 | 8 | F | | | Estimated | F longline west in 1990 |
| F_fleet_4_YR_1991_s_1 | 0.00337904 | 0.000502112 | _ | 0 | 8 | F | | | Estimated | F longline west in 1991 |
| F_fleet_4_YR_1992_s_1 | 0.000871822 | 0.000130465 | _ | 0 | 8 | F | | | Estimated | F longline west in 1992 |
| F_fleet_4_YR_1993_s_1 | 0.000835581 | 0.000123334 | _ | 0 | 8 | F | | | Estimated | F longline west in 1993 |
| F_fleet_4_YR_1994_s_1 | 0.000596953 | 8.81E-05 | _ | 0 | 8 | F | | | Estimated | F longline west in 1994 |
| F_fleet_4_YR_1995_s_1 | 0.000614621 | 9.07E-05 | _ | 0 | 8 | F | | | Estimated | F longline west in 1995 |
| F_fleet_4_YR_1996_s_1 | 0.000862221 | 0.000126463 | _ | 0 | 8 | F | | | Estimated | F longline west in 1996 |
| F_fleet_4_YR_1997_s_1 | 0.000913673 | 0.000131708 | _ | 0 | 8 | F | | | Estimated | F longline west in 1997 |
| F_fleet_4_YR_1998_s_1 | 0.000759199 | 0.000111856 | _ | 0 | 8 | F | | | Estimated | F longline west in 1998 |
| F_fleet_4_YR_1999_s_1 | 0.00243545 | 0.000357385 | _ | 0 | 8 | F | | | Estimated | F longline west in 1999 |
| F_fleet_4_YR_2000_s_1 | 0.00471425 | 0.000699808 | _ | 0 | 8 | F | | | Estimated | F longline west in 2000 |
| F_fleet_4_YR_2001_s_1 | 0.0031566 | 0.000470635 | _ | 0 | 8 | F | | | Estimated | F longline west in 2001 |
| F_fleet_4_YR_2002_s_1 | 0.00368577 | 0.000555172 | _ | 0 | 8 | F | | | Estimated | F longline west in 2002 |
| F_fleet_4_YR_2003_s_1 | 0.00432635 | 0.000652811 | _ | 0 | 8 | F | | | Estimated | F longline west in 2003 |
| F_fleet_4_YR_2004_s_1 | 0.0112941 | 0.00172742 | _ | 0 | 8 | F | | | Estimated | F longline west in 2004 |
| F_fleet_4_YR_2005_s_1 | 0.00691277 | 0.00105918 | _ | 0 | 8 | F | | | Estimated | F longline west in 2005 |
| F_fleet_4_YR_2006_s_1 | 0.00620248 | 0.000953899 | _ | 0 | 8 | F | | | Estimated | F longline west in 2006 |
| F_fleet_4_YR_2007_s_1 | 0.00589221 | 0.000875847 | _ | 0 | 8 | F | | | Estimated | F longline west in 2007 |
| F_fleet_4_YR_2008_s_1 | 0.0016336 | 0.000238918 | _ | 0 | 8 | F | | | Estimated | F longline west in 2008 |
| F_fleet_4_YR_2009_s_1 | 0.00131988 | 0.000189343 | _ | 0 | 8 | F | | | Estimated | F longline west in 2009 |
| F_fleet_4_YR_2010_s_1 | 0.000801915 | 0.00011231 | _ | 0 | 8 | F | | | Estimated | F longline west in 2010 |
| F_fleet_4_YR_2011_s_1 | 0.000324955 | 4.39E-05 | _ | 0 | 8 | F | | | Estimated | F longline west in 2011 |
| F_fleet_5_YR_1872_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1872 |
| F_fleet_5_YR_1873_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1873 |
| F_fleet_5_YR_1874_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1874 |
| F_fleet_5_YR_1875_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1875 |
| F_fleet_5_YR_1876_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1876 |
| F_fleet_5_YR_1877_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1877 |
| F_fleet_5_YR_1878_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1878 |
| F_fleet_5_YR_1879_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1879 |
| F_fleet_5_YR_1880_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1880 |
| F_fleet_5_YR_1881_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1881 |
| F_fleet_5_YR_1882_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1882 |
| F_fleet_5_YR_1883_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1883 |
| F_fleet_5_YR_1884_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1884 |
| F_fleet_5_YR_1885_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1885 |
| F_fleet_5_YR_1886_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1886 |
| F_fleet_5_YR_1887_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1887 |
| F_fleet_5_YR_1888_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1888 |
| F_fleet_5_YR_1889_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1889 |
| F_fleet_5_YR_1890_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1890 |
| F_fleet_5_YR_1891_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1891 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_5_YR_1892_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1892 |
| F_fleet_5_YR_1893_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1893 |
| F_fleet_5_YR_1894_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1894 |
| F_fleet_5_YR_1895_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1895 |
| F_fleet_5_YR_1896_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1896 |
| F_fleet_5_YR_1897_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1897 |
| F_fleet_5_YR_1898_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1898 |
| F_fleet_5_YR_1899_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1899 |
| F_fleet_5_YR_1900_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1900 |
| F_fleet_5_YR_1901_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1901 |
| F_fleet_5_YR_1902_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1902 |
| F_fleet_5_YR_1903_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1903 |
| F_fleet_5_YR_1904_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1904 |
| F_fleet_5_YR_1905_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1905 |
| F_fleet_5_YR_1906_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1906 |
| F_fleet_5_YR_1907_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1907 |
| F_fleet_5_YR_1908_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1908 |
| F_fleet_5_YR_1909_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1909 |
| F_fleet_5_YR_1910_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1910 |
| F_fleet_5_YR_1911_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1911 |
| F_fleet_5_YR_1912_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1912 |
| F_fleet_5_YR_1913_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1913 |
| F_fleet_5_YR_1914_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1914 |
| F_fleet_5_YR_1915_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1915 |
| F_fleet_5_YR_1916_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1916 |
| F_fleet_5_YR_1917_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1917 |
| F_fleet_5_YR_1918_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1918 |
| F_fleet_5_YR_1919_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1919 |
| F_fleet_5_YR_1920_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1920 |
| F_fleet_5_YR_1921_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1921 |
| F_fleet_5_YR_1922_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1922 |
| F_fleet_5_YR_1923_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1923 |
| F_fleet_5_YR_1924_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1924 |
| F_fleet_5_YR_1925_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1925 |
| F_fleet_5_YR_1926_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1926 |
| F_fleet_5_YR_1927_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1927 |
| F_fleet_5_YR_1928_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1928 |
| F_fleet_5_YR_1929_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1929 |
| F_fleet_5_YR_1930_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1930 |
| F_fleet_5_YR_1931_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1931 |
| F_fleet_5_YR_1932_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1932 |
| F_fleet_5_YR_1933_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1933 |
| F_fleet_5_YR_1934_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1934 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_5_YR_1935_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1935 |
| F_fleet_5_YR_1936_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1936 |
| F_fleet_5_YR_1937_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1937 |
| F_fleet_5_YR_1938_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1938 |
| F_fleet_5_YR_1939_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1939 |
| F_fleet_5_YR_1940_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1940 |
| F_fleet_5_YR_1941_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1941 |
| F_fleet_5_YR_1942_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1942 |
| F_fleet_5_YR_1943_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1943 |
| F_fleet_5_YR_1944_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1944 |
| F_fleet_5_YR_1945_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1945 |
| F_fleet_5_YR_1946_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1946 |
| F_fleet_5_YR_1947_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1947 |
| F_fleet_5_YR_1948_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1948 |
| F_fleet_5_YR_1949_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire east in 1949 |
| F_fleet_5_YR_1950_s_1 | 0.0335851 | 0.00546476 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1950 |
| F_fleet_5_YR_1951_s_1 | 0.0394718 | 0.00647901 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1951 |
| F_fleet_5_YR_1952_s_1 | 0.0460942 | 0.00763254 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1952 |
| F_fleet_5_YR_1953_s_1 | 0.052847 | 0.00882666 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1953 |
| F_fleet_5_YR_1954_s_1 | 0.0594917 | 0.0100062 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1954 |
| F_fleet_5_YR_1955_s_1 | 0.0665866 | 0.011329 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1955 |
| F_fleet_5_YR_1956_s_1 | 0.0749395 | 0.0129901 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1956 |
| F_fleet_5_YR_1957_s_1 | 0.0832651 | 0.0147126 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1957 |
| F_fleet_5_YR_1958_s_1 | 0.0946364 | 0.0174383 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1958 |
| F_fleet_5_YR_1959_s_1 | 0.107127 | 0.0208382 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1959 |
| F_fleet_5_YR_1960_s_1 | 0.121113 | 0.0250319 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1960 |
| F_fleet_5_YR_1961_s_1 | 0.129635 | 0.0284507 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1961 |
| F_fleet_5_YR_1962_s_1 | 0.138719 | 0.0325155 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1962 |
| F_fleet_5_YR_1963_s_1 | 0.144758 | 0.0355528 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1963 |
| F_fleet_5_YR_1964_s_1 | 0.155269 | 0.041557 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1964 |
| F_fleet_5_YR_1965_s_1 | 0.17248 | 0.0515419 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1965 |
| F_fleet_5_YR_1966_s_1 | 0.183878 | 0.0577075 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1966 |
| F_fleet_5_YR_1967_s_1 | 0.189719 | 0.0610804 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1967 |
| F_fleet_5_YR_1968_s_1 | 0.192246 | 0.0627079 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1968 |
| F_fleet_5_YR_1969_s_1 | 0.196057 | 0.0646889 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1969 |
| F_fleet_5_YR_1970_s_1 | 0.200637 | 0.0669217 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1970 |
| F_fleet_5_YR_1971_s_1 | 0.221691 | 0.0753763 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1971 |
| F_fleet_5_YR_1972_s_1 | 0.274183 | 0.102426 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1972 |
| F_fleet_5_YR_1973_s_1 | 0.0573758 | 0.00854754 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1973 |
| F_fleet_5_YR_1974_s_1 | 0.0781345 | 0.010617 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1974 |
| F_fleet_5_YR_1975_s_1 | 0.126774 | 0.0162025 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1975 |
| F_fleet_5_YR_1976_s_1 | 0.16304 | 0.0217859 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1976 |
| F_fleet_5_YR_1977_s_1 | 0.165407 | 0.021187 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1977 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_5_YR_1978_s_1 | 0.145926 | 0.0179852 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1978 |
| F_fleet_5_YR_1979_s_1 | 0.183719 | 0.0222872 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1979 |
| F_fleet_5_YR_1980_s_1 | 0.248413 | 0.0309755 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1980 |
| F_fleet_5_YR_1981_s_1 | 0.226634 | 0.027868 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1981 |
| F_fleet_5_YR_1982_s_1 | 0.11497 | 0.0122532 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1982 |
| F_fleet_5_YR_1983_s_1 | 0.0980392 | 0.00778668 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1983 |
| F_fleet_5_YR_1984_s_1 | 0.0268399 | 0.00210061 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1984 |
| F_fleet_5_YR_1985_s_1 | 0.194383 | 0.017279 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1985 |
| F_fleet_5_YR_1986_s_1 | 0.444851 | 0.0411567 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1986 |
| F_fleet_5_YR_1987_s_1 | 0.725759 | 0.0729926 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1987 |
| F_fleet_5_YR_1988_s_1 | 0.669824 | 0.0516731 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1988 |
| F_fleet_5_YR_1989_s_1 | 0.79512 | 0.067299 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1989 |
| F_fleet_5_YR_1990_s_1 | 0.479247 | 0.0371501 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1990 |
| F_fleet_5_YR_1991_s_1 | 0.456515 | 0.0351795 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1991 |
| F_fleet_5_YR_1992_s_1 | 0.595093 | 0.0464344 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1992 |
| F_fleet_5_YR_1993_s_1 | 0.845605 | 0.0595451 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1993 |
| F_fleet_5_YR_1994_s_1 | 0.791073 | 0.0640697 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1994 |
| F_fleet_5_YR_1995_s_1 | 0.854833 | 0.0785625 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1995 |
| F_fleet_5_YR_1996_s_1 | 0.655335 | 0.0566646 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1996 |
| F_fleet_5_YR_1997_s_1 | 0.880369 | 0.0780044 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1997 |
| F_fleet_5_YR_1998_s_1 | 0.497002 | 0.0610798 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1998 |
| F_fleet_5_YR_1999_s_1 | 0.512846 | 0.0437904 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 1999 |
| F_fleet_5_YR_2000_s_1 | 0.692686 | 0.052018 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 2000 |
| F_fleet_5_YR_2001_s_1 | 0.85893 | 0.0620217 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 2001 |
| F_fleet_5_YR_2002_s_1 | 0.831676 | 0.0617956 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 2002 |
| F_fleet_5_YR_2003_s_1 | 0.632481 | 0.0500343 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 2003 |
| F_fleet_5_YR_2004_s_1 | 0.752929 | 0.0620374 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 2004 |
| F_fleet_5_YR_2005_s_1 | 0.381468 | 0.0351181 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 2005 |
| F_fleet_5_YR_2006_s_1 | 0.290751 | 0.0266605 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 2006 |
| F_fleet_5_YR_2007_s_1 | 0.290694 | 0.0267767 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 2007 |
| F_fleet_5_YR_2008_s_1 | 0.0948315 | 0.00950512 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 2008 |
| F_fleet_5_YR_2009_s_1 | 0.0980695 | 0.00966331 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 2009 |
| F_fleet_5_YR_2010_s_1 | 0.0457753 | 0.00463931 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 2010 |
| F_fleet_5_YR_2011_s_1 | 0.0818074 | 0.00902366 | _ | 0 | 8 | F | | | Estimated | F charter/for hire east in 2011 |
| F_fleet_6_YR_1872_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1872 |
| F_fleet_6_YR_1873_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1873 |
| F_fleet_6_YR_1874_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1874 |
| F_fleet_6_YR_1875_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1875 |
| F_fleet_6_YR_1876_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1876 |
| F_fleet_6_YR_1877_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1877 |
| F_fleet_6_YR_1878_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1878 |
| F_fleet_6_YR_1879_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1879 |
| F_fleet_6_YR_1880_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1880 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_6_YR_1881_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1881 |
| F_fleet_6_YR_1882_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1882 |
| F_fleet_6_YR_1883_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1883 |
| F_fleet_6_YR_1884_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1884 |
| F_fleet_6_YR_1885_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1885 |
| F_fleet_6_YR_1886_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1886 |
| F_fleet_6_YR_1887_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1887 |
| F_fleet_6_YR_1888_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1888 |
| F_fleet_6_YR_1889_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1889 |
| F_fleet_6_YR_1890_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1890 |
| F_fleet_6_YR_1891_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1891 |
| F_fleet_6_YR_1892_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1892 |
| F_fleet_6_YR_1893_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1893 |
| F_fleet_6_YR_1894_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1894 |
| F_fleet_6_YR_1895_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1895 |
| F_fleet_6_YR_1896_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1896 |
| F_fleet_6_YR_1897_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1897 |
| F_fleet_6_YR_1898_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1898 |
| F_fleet_6_YR_1899_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1899 |
| F_fleet_6_YR_1900_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1900 |
| F_fleet_6_YR_1901_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1901 |
| F_fleet_6_YR_1902_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1902 |
| F_fleet_6_YR_1903_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1903 |
| F_fleet_6_YR_1904_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1904 |
| F_fleet_6_YR_1905_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1905 |
| F_fleet_6_YR_1906_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1906 |
| F_fleet_6_YR_1907_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1907 |
| F_fleet_6_YR_1908_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1908 |
| F_fleet_6_YR_1909_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1909 |
| F_fleet_6_YR_1910_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1910 |
| F_fleet_6_YR_1911_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1911 |
| F_fleet_6_YR_1912_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1912 |
| F_fleet_6_YR_1913_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1913 |
| F_fleet_6_YR_1914_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1914 |
| F_fleet_6_YR_1915_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1915 |
| F_fleet_6_YR_1916_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1916 |
| F_fleet_6_YR_1917_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1917 |
| F_fleet_6_YR_1918_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1918 |
| F_fleet_6_YR_1919_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1919 |
| F_fleet_6_YR_1920_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1920 |
| F_fleet_6_YR_1921_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1921 |
| F_fleet_6_YR_1922_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1922 |
| F_fleet_6_YR_1923_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1923 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_6_YR_1924_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1924 |
| F_fleet_6_YR_1925_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1925 |
| F_fleet_6_YR_1926_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1926 |
| F_fleet_6_YR_1927_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1927 |
| F_fleet_6_YR_1928_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1928 |
| F_fleet_6_YR_1929_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1929 |
| F_fleet_6_YR_1930_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1930 |
| F_fleet_6_YR_1931_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1931 |
| F_fleet_6_YR_1932_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1932 |
| F_fleet_6_YR_1933_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1933 |
| F_fleet_6_YR_1934_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1934 |
| F_fleet_6_YR_1935_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1935 |
| F_fleet_6_YR_1936_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1936 |
| F_fleet_6_YR_1937_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1937 |
| F_fleet_6_YR_1938_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1938 |
| F_fleet_6_YR_1939_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1939 |
| F_fleet_6_YR_1940_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1940 |
| F_fleet_6_YR_1941_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1941 |
| F_fleet_6_YR_1942_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1942 |
| F_fleet_6_YR_1943_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1943 |
| F_fleet_6_YR_1944_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1944 |
| F_fleet_6_YR_1945_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1945 |
| F_fleet_6_YR_1946_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1946 |
| F_fleet_6_YR_1947_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1947 |
| F_fleet_6_YR_1948_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1948 |
| F_fleet_6_YR_1949_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F charter/for hire west in 1949 |
| F_fleet_6_YR_1950_s_1 | 0.0295649 | 0.00499378 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1950 |
| F_fleet_6_YR_1951_s_1 | 0.0370505 | 0.00638219 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1951 |
| F_fleet_6_YR_1952_s_1 | 0.0445661 | 0.007761 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1952 |
| F_fleet_6_YR_1953_s_1 | 0.0522267 | 0.00914696 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1953 |
| F_fleet_6_YR_1954_s_1 | 0.0599273 | 0.0105341 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1954 |
| F_fleet_6_YR_1955_s_1 | 0.0683431 | 0.0120591 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1955 |
| F_fleet_6_YR_1956_s_1 | 0.0767715 | 0.013639 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1956 |
| F_fleet_6_YR_1957_s_1 | 0.085825 | 0.0153564 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1957 |
| F_fleet_6_YR_1958_s_1 | 0.0973132 | 0.0176452 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1958 |
| F_fleet_6_YR_1959_s_1 | 0.112276 | 0.0207707 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1959 |
| F_fleet_6_YR_1960_s_1 | 0.127526 | 0.0241419 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1960 |
| F_fleet_6_YR_1961_s_1 | 0.136878 | 0.0265747 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1961 |
| F_fleet_6_YR_1962_s_1 | 0.142113 | 0.0280904 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1962 |
| F_fleet_6_YR_1963_s_1 | 0.14517 | 0.0289047 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1963 |
| F_fleet_6_YR_1964_s_1 | 0.150372 | 0.030203 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1964 |
| F_fleet_6_YR_1965_s_1 | 0.154027 | 0.0314196 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1965 |
| F_fleet_6_YR_1966_s_1 | 0.160248 | 0.0331741 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1966 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_6_YR_1967_s_1 | 0.172194 | 0.0369395 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1967 |
| F_fleet_6_YR_1968_s_1 | 0.197903 | 0.0452917 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1968 |
| F_fleet_6_YR_1969_s_1 | 0.214434 | 0.0511102 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1969 |
| F_fleet_6_YR_1970_s_1 | 0.246048 | 0.0610748 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1970 |
| F_fleet_6_YR_1971_s_1 | 0.319383 | 0.0813205 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1971 |
| F_fleet_6_YR_1972_s_1 | 0.433134 | 0.110077 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1972 |
| F_fleet_6_YR_1973_s_1 | 0.123491 | 0.0148023 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1973 |
| F_fleet_6_YR_1974_s_1 | 0.12852 | 0.0137513 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1974 |
| F_fleet_6_YR_1975_s_1 | 0.217301 | 0.0259847 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1975 |
| F_fleet_6_YR_1976_s_1 | 0.257955 | 0.0318715 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1976 |
| F_fleet_6_YR_1977_s_1 | 0.252629 | 0.0306741 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1977 |
| F_fleet_6_YR_1978_s_1 | 0.23973 | 0.0284453 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1978 |
| F_fleet_6_YR_1979_s_1 | 0.281449 | 0.0362043 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1979 |
| F_fleet_6_YR_1980_s_1 | 0.259839 | 0.031754 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1980 |
| F_fleet_6_YR_1981_s_1 | 0.131499 | 0.0124288 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1981 |
| F_fleet_6_YR_1982_s_1 | 0.0915752 | 0.00797784 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1982 |
| F_fleet_6_YR_1983_s_1 | 0.1872 | 0.0153618 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1983 |
| F_fleet_6_YR_1984_s_1 | 0.079763 | 0.00639019 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1984 |
| F_fleet_6_YR_1985_s_1 | 0.248235 | 0.0226367 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1985 |
| F_fleet_6_YR_1986_s_1 | 0.217127 | 0.0205992 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1986 |
| F_fleet_6_YR_1987_s_1 | 0.0826427 | 0.00678928 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1987 |
| F_fleet_6_YR_1988_s_1 | 0.144972 | 0.0116781 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1988 |
| F_fleet_6_YR_1989_s_1 | 0.119691 | 0.00977169 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1989 |
| F_fleet_6_YR_1990_s_1 | 0.067672 | 0.00527118 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1990 |
| F_fleet_6_YR_1991_s_1 | 0.0830201 | 0.00603006 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1991 |
| F_fleet_6_YR_1992_s_1 | 0.0973485 | 0.00750786 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1992 |
| F_fleet_6_YR_1993_s_1 | 0.119029 | 0.00892943 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1993 |
| F_fleet_6_YR_1994_s_1 | 0.113836 | 0.00901409 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1994 |
| F_fleet_6_YR_1995_s_1 | 0.181311 | 0.0146582 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1995 |
| F_fleet_6_YR_1996_s_1 | 0.108757 | 0.00887391 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1996 |
| F_fleet_6_YR_1997_s_1 | 0.114875 | 0.00927521 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1997 |
| F_fleet_6_YR_1998_s_1 | 0.0882485 | 0.00738383 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1998 |
| F_fleet_6_YR_1999_s_1 | 0.0862684 | 0.00716909 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 1999 |
| F_fleet_6_YR_2000_s_1 | 0.128757 | 0.0111851 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 2000 |
| F_fleet_6_YR_2001_s_1 | 0.092322 | 0.00796667 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 2001 |
| F_fleet_6_YR_2002_s_1 | 0.0799328 | 0.00695672 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 2002 |
| F_fleet_6_YR_2003_s_1 | 0.0887962 | 0.00785745 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 2003 |
| F_fleet_6_YR_2004_s_1 | 0.112142 | 0.00996473 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 2004 |
| F_fleet_6_YR_2005_s_1 | 0.133899 | 0.0118865 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 2005 |
| F_fleet_6_YR_2006_s_1 | 0.143798 | 0.0129505 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 2006 |
| F_fleet_6_YR_2007_s_1 | 0.0938335 | 0.00867556 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 2007 |
| F_fleet_6_YR_2008_s_1 | 0.0215786 | 0.00217482 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 2008 |
| F_fleet_6_YR_2009_s_1 | 0.0197456 | 0.00193249 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 2009 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_6_YR_2010_s_1 | 0.00517159 | 0.000494867 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 2010 |
| F_fleet_6_YR_2011_s_1 | 0.0103427 | 0.00100539 | _ | 0 | 8 | F | | | Estimated | F charter/for hire west in 2011 |
| F_fleet_7_YR_1872_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1872 |
| F_fleet_7_YR_1873_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1873 |
| F_fleet_7_YR_1874_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1874 |
| F_fleet_7_YR_1875_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1875 |
| F_fleet_7_YR_1876_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1876 |
| F_fleet_7_YR_1877_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1877 |
| F_fleet_7_YR_1878_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1878 |
| F_fleet_7_YR_1879_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1879 |
| F_fleet_7_YR_1880_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1880 |
| F_fleet_7_YR_1881_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1881 |
| F_fleet_7_YR_1882_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1882 |
| F_fleet_7_YR_1883_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1883 |
| F_fleet_7_YR_1884_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1884 |
| F_fleet_7_YR_1885_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1885 |
| F_fleet_7_YR_1886_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1886 |
| F_fleet_7_YR_1887_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1887 |
| F_fleet_7_YR_1888_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1888 |
| F_fleet_7_YR_1889_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1889 |
| F_fleet_7_YR_1890_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1890 |
| F_fleet_7_YR_1891_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1891 |
| F_fleet_7_YR_1892_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1892 |
| F_fleet_7_YR_1893_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1893 |
| F_fleet_7_YR_1894_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1894 |
| F_fleet_7_YR_1895_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1895 |
| F_fleet_7_YR_1896_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1896 |
| F_fleet_7_YR_1897_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1897 |
| F_fleet_7_YR_1898_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1898 |
| F_fleet_7_YR_1899_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1899 |
| F_fleet_7_YR_1900_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1900 |
| F_fleet_7_YR_1901_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1901 |
| F_fleet_7_YR_1902_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1902 |
| F_fleet_7_YR_1903_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1903 |
| F_fleet_7_YR_1904_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1904 |
| F_fleet_7_YR_1905_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1905 |
| F_fleet_7_YR_1906_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1906 |
| F_fleet_7_YR_1907_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1907 |
| F_fleet_7_YR_1908_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1908 |
| F_fleet_7_YR_1909_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1909 |
| F_fleet_7_YR_1910_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1910 |
| F_fleet_7_YR_1911_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1911 |
| F_fleet_7_YR_1912_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1912 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_7_YR_1913_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1913 |
| F_fleet_7_YR_1914_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1914 |
| F_fleet_7_YR_1915_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1915 |
| F_fleet_7_YR_1916_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1916 |
| F_fleet_7_YR_1917_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1917 |
| F_fleet_7_YR_1918_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1918 |
| F_fleet_7_YR_1919_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1919 |
| F_fleet_7_YR_1920_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1920 |
| F_fleet_7_YR_1921_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1921 |
| F_fleet_7_YR_1922_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1922 |
| F_fleet_7_YR_1923_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1923 |
| F_fleet_7_YR_1924_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1924 |
| F_fleet_7_YR_1925_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1925 |
| F_fleet_7_YR_1926_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1926 |
| F_fleet_7_YR_1927_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1927 |
| F_fleet_7_YR_1928_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1928 |
| F_fleet_7_YR_1929_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1929 |
| F_fleet_7_YR_1930_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1930 |
| F_fleet_7_YR_1931_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1931 |
| F_fleet_7_YR_1932_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1932 |
| F_fleet_7_YR_1933_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1933 |
| F_fleet_7_YR_1934_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1934 |
| F_fleet_7_YR_1935_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1935 |
| F_fleet_7_YR_1936_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1936 |
| F_fleet_7_YR_1937_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1937 |
| F_fleet_7_YR_1938_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1938 |
| F_fleet_7_YR_1939_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1939 |
| F_fleet_7_YR_1940_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1940 |
| F_fleet_7_YR_1941_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1941 |
| F_fleet_7_YR_1942_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1942 |
| F_fleet_7_YR_1943_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1943 |
| F_fleet_7_YR_1944_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1944 |
| F_fleet_7_YR_1945_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1945 |
| F_fleet_7_YR_1946_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1946 |
| F_fleet_7_YR_1947_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1947 |
| F_fleet_7_YR_1948_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1948 |
| F_fleet_7_YR_1949_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat east in 1949 |
| F_fleet_7_YR_1950_s_1 | 0.0409913 | 0.00651125 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1950 |
| F_fleet_7_YR_1951_s_1 | 0.0419787 | 0.00675413 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1951 |
| F_fleet_7_YR_1952_s_1 | 0.043528 | 0.0070916 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1952 |
| F_fleet_7_YR_1953_s_1 | 0.044925 | 0.00738976 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1953 |
| F_fleet_7_YR_1954_s_1 | 0.0459401 | 0.00761511 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1954 |
| F_fleet_7_YR_1955_s_1 | 0.0471224 | 0.00791146 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1955 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_7_YR_1956_s_1 | 0.0490927 | 0.00841609 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1956 |
| F_fleet_7_YR_1957_s_1 | 0.0508407 | 0.00890177 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1957 |
| F_fleet_7_YR_1958_s_1 | 0.0543866 | 0.00997575 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1958 |
| F_fleet_7_YR_1959_s_1 | 0.0585106 | 0.0114029 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1959 |
| F_fleet_7_YR_1960_s_1 | 0.0630274 | 0.0131811 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1960 |
| F_fleet_7_YR_1961_s_1 | 0.0675675 | 0.0151982 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1961 |
| F_fleet_7_YR_1962_s_1 | 0.0723983 | 0.0176204 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1962 |
| F_fleet_7_YR_1963_s_1 | 0.0754769 | 0.0194516 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1963 |
| F_fleet_7_YR_1964_s_1 | 0.080867 | 0.0228756 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1964 |
| F_fleet_7_YR_1965_s_1 | 0.0903284 | 0.0286279 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1965 |
| F_fleet_7_YR_1966_s_1 | 0.0952058 | 0.0316202 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1966 |
| F_fleet_7_YR_1967_s_1 | 0.0964181 | 0.0327402 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1967 |
| F_fleet_7_YR_1968_s_1 | 0.0956493 | 0.0328728 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1968 |
| F_fleet_7_YR_1969_s_1 | 0.0953273 | 0.0332211 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1969 |
| F_fleet_7_YR_1970_s_1 | 0.0953255 | 0.0337249 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1970 |
| F_fleet_7_YR_1971_s_1 | 0.0999482 | 0.036291 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1971 |
| F_fleet_7_YR_1972_s_1 | 0.117902 | 0.0471779 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1972 |
| F_fleet_7_YR_1973_s_1 | 0.0240787 | 0.00369067 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1973 |
| F_fleet_7_YR_1974_s_1 | 0.0310411 | 0.00437439 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1974 |
| F_fleet_7_YR_1975_s_1 | 0.0395621 | 0.00560112 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1975 |
| F_fleet_7_YR_1976_s_1 | 0.054426 | 0.00768063 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1976 |
| F_fleet_7_YR_1977_s_1 | 0.0556448 | 0.00747211 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1977 |
| F_fleet_7_YR_1978_s_1 | 0.0485806 | 0.00614606 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1978 |
| F_fleet_7_YR_1979_s_1 | 0.0576398 | 0.00723178 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1979 |
| F_fleet_7_YR_1980_s_1 | 0.0725892 | 0.00959285 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1980 |
| F_fleet_7_YR_1981_s_1 | 0.0200269 | 0.0025938 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1981 |
| F_fleet_7_YR_1982_s_1 | 0.0387198 | 0.00454951 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1982 |
| F_fleet_7_YR_1983_s_1 | 0.0606689 | 0.00574036 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1983 |
| F_fleet_7_YR_1984_s_1 | 0.0100888 | 0.000885152 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1984 |
| F_fleet_7_YR_1985_s_1 | 0.0451599 | 0.00417213 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1985 |
| F_fleet_7_YR_1986_s_1 | 0.0139888 | 0.00136442 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1986 |
| F_fleet_7_YR_1987_s_1 | 0.0153213 | 0.00166963 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1987 |
| F_fleet_7_YR_1988_s_1 | 0.0242964 | 0.0022511 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1988 |
| F_fleet_7_YR_1989_s_1 | 0.0202467 | 0.00194158 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1989 |
| F_fleet_7_YR_1990_s_1 | 0.0315214 | 0.00293081 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1990 |
| F_fleet_7_YR_1991_s_1 | 0.0171155 | 0.00156443 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1991 |
| F_fleet_7_YR_1992_s_1 | 0.0265491 | 0.00231319 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1992 |
| F_fleet_7_YR_1993_s_1 | 0.0288732 | 0.00243847 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1993 |
| F_fleet_7_YR_1994_s_1 | 0.030259 | 0.00267669 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1994 |
| F_fleet_7_YR_1995_s_1 | 0.0327924 | 0.0031914 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1995 |
| F_fleet_7_YR_1996_s_1 | 0.0319203 | 0.00283512 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1996 |
| F_fleet_7_YR_1997_s_1 | 0.0507503 | 0.00484154 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1997 |
| F_fleet_7_YR_1998_s_1 | 0.050868 | 0.00619032 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1998 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_7_YR_1999_s_1 | 0.0483521 | 0.0041621 | _ | 0 | 8 | F | | | Estimated | F headboat east in 1999 |
| F_fleet_7_YR_2000_s_1 | 0.124801 | 0.0133379 | _ | 0 | 8 | F | | | Estimated | F headboat east in 2000 |
| F_fleet_7_YR_2001_s_1 | 0.109327 | 0.0119729 | _ | 0 | 8 | F | | | Estimated | F headboat east in 2001 |
| F_fleet_7_YR_2002_s_1 | 0.113879 | 0.0125727 | _ | 0 | 8 | F | | | Estimated | F headboat east in 2002 |
| F_fleet_7_YR_2003_s_1 | 0.10273 | 0.0117128 | _ | 0 | 8 | F | | | Estimated | F headboat east in 2003 |
| F_fleet_7_YR_2004_s_1 | 0.0907433 | 0.0109159 | _ | 0 | 8 | F | | | Estimated | F headboat east in 2004 |
| F_fleet_7_YR_2005_s_1 | 0.0502327 | 0.00622033 | _ | 0 | 8 | F | | | Estimated | F headboat east in 2005 |
| F_fleet_7_YR_2006_s_1 | 0.0369498 | 0.00451899 | _ | 0 | 8 | F | | | Estimated | F headboat east in 2006 |
| F_fleet_7_YR_2007_s_1 | 0.0384028 | 0.00469605 | _ | 0 | 8 | F | | | Estimated | F headboat east in 2007 |
| F_fleet_7_YR_2008_s_1 | 0.031042 | 0.00388511 | _ | 0 | 8 | F | | | Estimated | F headboat east in 2008 |
| F_fleet_7_YR_2009_s_1 | 0.03786 | 0.00467894 | _ | 0 | 8 | F | | | Estimated | F headboat east in 2009 |
| F_fleet_7_YR_2010_s_1 | 0.0177863 | 0.00222003 | _ | 0 | 8 | F | | | Estimated | F headboat east in 2010 |
| F_fleet_7_YR_2011_s_1 | 0.0463987 | 0.00608171 | _ | 0 | 8 | F | | | Estimated | F headboat east in 2011 |
| F_fleet_8_YR_1872_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1872 |
| F_fleet_8_YR_1873_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1873 |
| F_fleet_8_YR_1874_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1874 |
| F_fleet_8_YR_1875_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1875 |
| F_fleet_8_YR_1876_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1876 |
| F_fleet_8_YR_1877_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1877 |
| F_fleet_8_YR_1878_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1878 |
| F_fleet_8_YR_1879_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1879 |
| F_fleet_8_YR_1880_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1880 |
| F_fleet_8_YR_1881_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1881 |
| F_fleet_8_YR_1882_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1882 |
| F_fleet_8_YR_1883_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1883 |
| F_fleet_8_YR_1884_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1884 |
| F_fleet_8_YR_1885_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1885 |
| F_fleet_8_YR_1886_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1886 |
| F_fleet_8_YR_1887_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1887 |
| F_fleet_8_YR_1888_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1888 |
| F_fleet_8_YR_1889_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1889 |
| F_fleet_8_YR_1890_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1890 |
| F_fleet_8_YR_1891_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1891 |
| F_fleet_8_YR_1892_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1892 |
| F_fleet_8_YR_1893_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1893 |
| F_fleet_8_YR_1894_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1894 |
| F_fleet_8_YR_1895_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1895 |
| F_fleet_8_YR_1896_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1896 |
| F_fleet_8_YR_1897_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1897 |
| F_fleet_8_YR_1898_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1898 |
| F_fleet_8_YR_1899_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1899 |
| F_fleet_8_YR_1900_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1900 |
| F_fleet_8_YR_1901_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1901 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_8_YR_1902_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1902 |
| F_fleet_8_YR_1903_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1903 |
| F_fleet_8_YR_1904_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1904 |
| F_fleet_8_YR_1905_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1905 |
| F_fleet_8_YR_1906_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1906 |
| F_fleet_8_YR_1907_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1907 |
| F_fleet_8_YR_1908_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1908 |
| F_fleet_8_YR_1909_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1909 |
| F_fleet_8_YR_1910_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1910 |
| F_fleet_8_YR_1911_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1911 |
| F_fleet_8_YR_1912_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1912 |
| F_fleet_8_YR_1913_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1913 |
| F_fleet_8_YR_1914_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1914 |
| F_fleet_8_YR_1915_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1915 |
| F_fleet_8_YR_1916_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1916 |
| F_fleet_8_YR_1917_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1917 |
| F_fleet_8_YR_1918_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1918 |
| F_fleet_8_YR_1919_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1919 |
| F_fleet_8_YR_1920_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1920 |
| F_fleet_8_YR_1921_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1921 |
| F_fleet_8_YR_1922_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1922 |
| F_fleet_8_YR_1923_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1923 |
| F_fleet_8_YR_1924_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1924 |
| F_fleet_8_YR_1925_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1925 |
| F_fleet_8_YR_1926_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1926 |
| F_fleet_8_YR_1927_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1927 |
| F_fleet_8_YR_1928_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1928 |
| F_fleet_8_YR_1929_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1929 |
| F_fleet_8_YR_1930_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1930 |
| F_fleet_8_YR_1931_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1931 |
| F_fleet_8_YR_1932_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1932 |
| F_fleet_8_YR_1933_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1933 |
| F_fleet_8_YR_1934_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1934 |
| F_fleet_8_YR_1935_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1935 |
| F_fleet_8_YR_1936_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1936 |
| F_fleet_8_YR_1937_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1937 |
| F_fleet_8_YR_1938_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1938 |
| F_fleet_8_YR_1939_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1939 |
| F_fleet_8_YR_1940_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1940 |
| F_fleet_8_YR_1941_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1941 |
| F_fleet_8_YR_1942_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1942 |
| F_fleet_8_YR_1943_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1943 |
| F_fleet_8_YR_1944_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1944 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_8_YR_1945_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1945 |
| F_fleet_8_YR_1946_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1946 |
| F_fleet_8_YR_1947_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1947 |
| F_fleet_8_YR_1948_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1948 |
| F_fleet_8_YR_1949_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F headboat west in 1949 |
| F_fleet_8_YR_1950_s_1 | 0.0496336 | 0.00806101 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1950 |
| F_fleet_8_YR_1951_s_1 | 0.0526874 | 0.00874511 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1951 |
| F_fleet_8_YR_1952_s_1 | 0.0550608 | 0.0092584 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1952 |
| F_fleet_8_YR_1953_s_1 | 0.0570248 | 0.00965775 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1953 |
| F_fleet_8_YR_1954_s_1 | 0.0585938 | 0.0099692 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1954 |
| F_fleet_8_YR_1955_s_1 | 0.0604882 | 0.0103379 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1955 |
| F_fleet_8_YR_1956_s_1 | 0.0621277 | 0.0107009 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1956 |
| F_fleet_8_YR_1957_s_1 | 0.0640212 | 0.011117 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1957 |
| F_fleet_8_YR_1958_s_1 | 0.0673427 | 0.0118704 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1958 |
| F_fleet_8_YR_1959_s_1 | 0.0725226 | 0.0130667 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1959 |
| F_fleet_8_YR_1960_s_1 | 0.0773074 | 0.0142798 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1960 |
| F_fleet_8_YR_1961_s_1 | 0.0818344 | 0.0155487 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1961 |
| F_fleet_8_YR_1962_s_1 | 0.0838629 | 0.0162744 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1962 |
| F_fleet_8_YR_1963_s_1 | 0.0844033 | 0.016535 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1963 |
| F_fleet_8_YR_1964_s_1 | 0.0859299 | 0.0170017 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1964 |
| F_fleet_8_YR_1965_s_1 | 0.0865831 | 0.0174148 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1965 |
| F_fleet_8_YR_1966_s_1 | 0.0864866 | 0.0176604 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1966 |
| F_fleet_8_YR_1967_s_1 | 0.0894115 | 0.0189582 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1967 |
| F_fleet_8_YR_1968_s_1 | 0.0993363 | 0.0225732 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1968 |
| F_fleet_8_YR_1969_s_1 | 0.104223 | 0.0247303 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1969 |
| F_fleet_8_YR_1970_s_1 | 0.115741 | 0.0286596 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1970 |
| F_fleet_8_YR_1971_s_1 | 0.136923 | 0.0347937 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1971 |
| F_fleet_8_YR_1972_s_1 | 0.170517 | 0.0432022 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1972 |
| F_fleet_8_YR_1973_s_1 | 0.0450764 | 0.00539271 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1973 |
| F_fleet_8_YR_1974_s_1 | 0.0433873 | 0.00463246 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1974 |
| F_fleet_8_YR_1975_s_1 | 0.0665059 | 0.00793793 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1975 |
| F_fleet_8_YR_1976_s_1 | 0.0794512 | 0.00974266 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1976 |
| F_fleet_8_YR_1977_s_1 | 0.0796869 | 0.00959539 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1977 |
| F_fleet_8_YR_1978_s_1 | 0.0765453 | 0.00899844 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1978 |
| F_fleet_8_YR_1979_s_1 | 0.090433 | 0.0114949 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1979 |
| F_fleet_8_YR_1980_s_1 | 0.0846563 | 0.0102296 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1980 |
| F_fleet_8_YR_1981_s_1 | 0.0324899 | 0.00303303 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1981 |
| F_fleet_8_YR_1982_s_1 | 0.0340965 | 0.00294431 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1982 |
| F_fleet_8_YR_1983_s_1 | 0.0377426 | 0.0030661 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1983 |
| F_fleet_8_YR_1984_s_1 | 0.0450259 | 0.00355274 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1984 |
| F_fleet_8_YR_1985_s_1 | 0.135872 | 0.0125006 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1985 |
| F_fleet_8_YR_1986_s_1 | 0.152769 | 0.014666 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1986 |
| F_fleet_8_YR_1987_s_1 | 0.145369 | 0.0120159 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1987 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_8_YR_1988_s_1 | 0.178479 | 0.0146351 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1988 |
| F_fleet_8_YR_1989_s_1 | 0.175876 | 0.0145881 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1989 |
| F_fleet_8_YR_1990_s_1 | 0.0856063 | 0.00682078 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1990 |
| F_fleet_8_YR_1991_s_1 | 0.0781278 | 0.00577578 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1991 |
| F_fleet_8_YR_1992_s_1 | 0.109954 | 0.00857925 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1992 |
| F_fleet_8_YR_1993_s_1 | 0.115967 | 0.00873353 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1993 |
| F_fleet_8_YR_1994_s_1 | 0.152942 | 0.0122312 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1994 |
| F_fleet_8_YR_1995_s_1 | 0.135949 | 0.0113421 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1995 |
| F_fleet_8_YR_1996_s_1 | 0.12823 | 0.0106625 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1996 |
| F_fleet_8_YR_1997_s_1 | 0.130939 | 0.0107545 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1997 |
| F_fleet_8_YR_1998_s_1 | 0.0962169 | 0.00815349 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1998 |
| F_fleet_8_YR_1999_s_1 | 0.0461919 | 0.00390437 | _ | 0 | 8 | F | | | Estimated | F headboat west in 1999 |
| F_fleet_8_YR_2000_s_1 | 0.0715032 | 0.00630034 | _ | 0 | 8 | F | | | Estimated | F headboat west in 2000 |
| F_fleet_8_YR_2001_s_1 | 0.0791278 | 0.00694735 | _ | 0 | 8 | F | | | Estimated | F headboat west in 2001 |
| F_fleet_8_YR_2002_s_1 | 0.0861818 | 0.00762029 | _ | 0 | 8 | F | | | Estimated | F headboat west in 2002 |
| F_fleet_8_YR_2003_s_1 | 0.0967965 | 0.00868523 | _ | 0 | 8 | F | | | Estimated | F headboat west in 2003 |
| F_fleet_8_YR_2004_s_1 | 0.0738177 | 0.00665272 | _ | 0 | 8 | F | | | Estimated | F headboat west in 2004 |
| F_fleet_8_YR_2005_s_1 | 0.0632664 | 0.00570275 | _ | 0 | 8 | F | | | Estimated | F headboat west in 2005 |
| F_fleet_8_YR_2006_s_1 | 0.0591471 | 0.00542891 | _ | 0 | 8 | F | | | Estimated | F headboat west in 2006 |
| F_fleet_8_YR_2007_s_1 | 0.0402914 | 0.00379066 | _ | 0 | 8 | F | | | Estimated | F headboat west in 2007 |
| F_fleet_8_YR_2008_s_1 | 0.0113184 | 0.00132058 | _ | 0 | 8 | F | | | Estimated | F headboat west in 2008 |
| F_fleet_8_YR_2009_s_1 | 0.0117782 | 0.00127041 | _ | 0 | 8 | F | | | Estimated | F headboat west in 2009 |
| F_fleet_8_YR_2010_s_1 | 0.00714551 | 0.000738564 | _ | 0 | 8 | F | | | Estimated | F headboat west in 2010 |
| F_fleet_8_YR_2011_s_1 | 0.00715393 | 0.000714625 | _ | 0 | 8 | F | | | Estimated | F headboat west in 2011 |
| F_fleet_9_YR_1872_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1872 |
| F_fleet_9_YR_1873_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1873 |
| F_fleet_9_YR_1874_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1874 |
| F_fleet_9_YR_1875_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1875 |
| F_fleet_9_YR_1876_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1876 |
| F_fleet_9_YR_1877_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1877 |
| F_fleet_9_YR_1878_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1878 |
| F_fleet_9_YR_1879_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1879 |
| F_fleet_9_YR_1880_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1880 |
| F_fleet_9_YR_1881_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1881 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_9_YR_1882_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1882 |
| F_fleet_9_YR_1883_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1883 |
| F_fleet_9_YR_1884_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1884 |
| F_fleet_9_YR_1885_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1885 |
| F_fleet_9_YR_1886_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1886 |
| F_fleet_9_YR_1887_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1887 |
| F_fleet_9_YR_1888_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1888 |
| F_fleet_9_YR_1889_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1889 |
| F_fleet_9_YR_1890_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1890 |
| F_fleet_9_YR_1891_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1891 |
| F_fleet_9_YR_1892_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1892 |
| F_fleet_9_YR_1893_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1893 |
| F_fleet_9_YR_1894_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1894 |
| F_fleet_9_YR_1895_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1895 |
| F_fleet_9_YR_1896_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1896 |
| F_fleet_9_YR_1897_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1897 |
| F_fleet_9_YR_1898_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1898 |
| F_fleet_9_YR_1899_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1899 |
| F_fleet_9_YR_1900_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1900 |
| F_fleet_9_YR_1901_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1901 |
| F_fleet_9_YR_1902_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1902 |
| F_fleet_9_YR_1903_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1903 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_9_YR_1904_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1904 |
| F_fleet_9_YR_1905_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1905 |
| F_fleet_9_YR_1906_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1906 |
| F_fleet_9_YR_1907_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1907 |
| F_fleet_9_YR_1908_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1908 |
| F_fleet_9_YR_1909_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1909 |
| F_fleet_9_YR_1910_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1910 |
| F_fleet_9_YR_1911_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1911 |
| F_fleet_9_YR_1912_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1912 |
| F_fleet_9_YR_1913_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1913 |
| F_fleet_9_YR_1914_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1914 |
| F_fleet_9_YR_1915_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1915 |
| F_fleet_9_YR_1916_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1916 |
| F_fleet_9_YR_1917_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1917 |
| F_fleet_9_YR_1918_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1918 |
| F_fleet_9_YR_1919_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1919 |
| F_fleet_9_YR_1920_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1920 |
| F_fleet_9_YR_1921_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1921 |
| F_fleet_9_YR_1922_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1922 |
| F_fleet_9_YR_1923_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1923 |
| F_fleet_9_YR_1924_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1924 |
| F_fleet_9_YR_1925_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1925 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_9_YR_1926_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1926 |
| F_fleet_9_YR_1927_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1927 |
| F_fleet_9_YR_1928_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1928 |
| F_fleet_9_YR_1929_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1929 |
| F_fleet_9_YR_1930_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1930 |
| F_fleet_9_YR_1931_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1931 |
| F_fleet_9_YR_1932_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1932 |
| F_fleet_9_YR_1933_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1933 |
| F_fleet_9_YR_1934_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1934 |
| F_fleet_9_YR_1935_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1935 |
| F_fleet_9_YR_1936_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1936 |
| F_fleet_9_YR_1937_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1937 |
| F_fleet_9_YR_1938_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1938 |
| F_fleet_9_YR_1939_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1939 |
| F_fleet_9_YR_1940_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1940 |
| F_fleet_9_YR_1941_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1941 |
| F_fleet_9_YR_1942_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1942 |
| F_fleet_9_YR_1943_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1943 |
| F_fleet_9_YR_1944_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1944 |
| F_fleet_9_YR_1945_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1945 |
| F_fleet_9_YR_1946_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1946 |
| F_fleet_9_YR_1947_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1947 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_9_YR_1948_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1948 |
| F_fleet_9_YR_1949_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1949 |
| F_fleet_9_YR_1950_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1950 |
| F_fleet_9_YR_1951_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1951 |
| F_fleet_9_YR_1952_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1952 |
| F_fleet_9_YR_1953_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1953 |
| F_fleet_9_YR_1954_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1954 |
| F_fleet_9_YR_1955_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1955 |
| F_fleet_9_YR_1956_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1956 |
| F_fleet_9_YR_1957_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1957 |
| F_fleet_9_YR_1958_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1958 |
| F_fleet_9_YR_1959_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1959 |
| F_fleet_9_YR_1960_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1960 |
| F_fleet_9_YR_1961_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1961 |
| F_fleet_9_YR_1962_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1962 |
| F_fleet_9_YR_1963_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1963 |
| F_fleet_9_YR_1964_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1964 |
| F_fleet_9_YR_1965_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1965 |
| F_fleet_9_YR_1966_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1966 |
| F_fleet_9_YR_1967_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1967 |
| F_fleet_9_YR_1968_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1968 |
| F_fleet_9_YR_1969_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1969 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_9_YR_1970_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1970 |
| F_fleet_9_YR_1971_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1971 |
| F_fleet_9_YR_1972_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1972 |
| F_fleet_9_YR_1973_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1973 |
| F_fleet_9_YR_1974_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1974 |
| F_fleet_9_YR_1975_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1975 |
| F_fleet_9_YR_1976_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1976 |
| F_fleet_9_YR_1977_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1977 |
| F_fleet_9_YR_1978_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1978 |
| F_fleet_9_YR_1979_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1979 |
| F_fleet_9_YR_1980_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1980 |
| F_fleet_9_YR_1981_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1981 |
| F_fleet_9_YR_1982_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1982 |
| F_fleet_9_YR_1983_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1983 |
| F_fleet_9_YR_1984_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1984 |
| F_fleet_9_YR_1985_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1985 |
| F_fleet_9_YR_1986_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1986 |
| F_fleet_9_YR_1987_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1987 |
| F_fleet_9_YR_1988_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1988 |
| F_fleet_9_YR_1989_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1989 |
| F_fleet_9_YR_1990_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season east in 1990 |
| F_fleet_9_YR_1991_s_1 | 0.0607242 | 0.0306321 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 1991 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_9_YR_1992_s_1 | 0.224643 | 0.129559 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 1992 |
| F_fleet_9_YR_1993_s_1 | 0.213114 | 0.142614 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 1993 |
| F_fleet_9_YR_1994_s_1 | 0.207542 | 0.102482 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 1994 |
| F_fleet_9_YR_1995_s_1 | 0.167754 | 0.0911398 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 1995 |
| F_fleet_9_YR_1996_s_1 | 0.25239 | 0.144721 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 1996 |
| F_fleet_9_YR_1997_s_1 | 0.132943 | 0.0650681 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 1997 |
| F_fleet_9_YR_1998_s_1 | 0.0895101 | 0.0373141 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 1998 |
| F_fleet_9_YR_1999_s_1 | 0.460397 | 0.283012 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 1999 |
| F_fleet_9_YR_2000_s_1 | 0.0830179 | 0.0473893 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 2000 |
| F_fleet_9_YR_2001_s_1 | 0.0756199 | 0.0414702 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 2001 |
| F_fleet_9_YR_2002_s_1 | 0.0326116 | 0.0161846 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 2002 |
| F_fleet_9_YR_2003_s_1 | 0.081324 | 0.039802 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 2003 |
| F_fleet_9_YR_2004_s_1 | 0.0287766 | 0.0133259 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 2004 |
| F_fleet_9_YR_2005_s_1 | 0.0193537 | 0.00962896 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 2005 |
| F_fleet_9_YR_2006_s_1 | 0.0127799 | 0.00672379 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 2006 |
| F_fleet_9_YR_2007_s_1 | 0.0262227 | 0.0138526 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 2007 |
| F_fleet_9_YR_2008_s_1 | 0.0256563 | 0.0139802 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 2008 |
| F_fleet_9_YR_2009_s_1 | 0.0555329 | 0.0246365 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 2009 |
| F_fleet_9_YR_2010_s_1 | 0.00594167 | 0.00293629 | _ | 0 | 8 | F | | | Estimated | F commercial closed season east in 2010 |
| F_fleet_9_YR_2011_s_1 | 0.0228247 | 0.010988 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 2011 |
| F_fleet_10_YR_1872_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1872 |
| F_fleet_10_YR_1873_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1873 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_10_YR_1874_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1874 |
| F_fleet_10_YR_1875_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1875 |
| F_fleet_10_YR_1876_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1876 |
| F_fleet_10_YR_1877_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1877 |
| F_fleet_10_YR_1878_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1878 |
| F_fleet_10_YR_1879_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1879 |
| F_fleet_10_YR_1880_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1880 |
| F_fleet_10_YR_1881_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1881 |
| F_fleet_10_YR_1882_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1882 |
| F_fleet_10_YR_1883_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1883 |
| F_fleet_10_YR_1884_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1884 |
| F_fleet_10_YR_1885_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1885 |
| F_fleet_10_YR_1886_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1886 |
| F_fleet_10_YR_1887_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1887 |
| F_fleet_10_YR_1888_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1888 |
| F_fleet_10_YR_1889_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1889 |
| F_fleet_10_YR_1890_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1890 |
| F_fleet_10_YR_1891_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1891 |
| F_fleet_10_YR_1892_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1892 |
| F_fleet_10_YR_1893_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1893 |
| F_fleet_10_YR_1894_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1894 |
| F_fleet_10_YR_1895_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1895 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_10_YR_1896_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1896 |
| F_fleet_10_YR_1897_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1897 |
| F_fleet_10_YR_1898_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1898 |
| F_fleet_10_YR_1899_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1899 |
| F_fleet_10_YR_1900_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1900 |
| F_fleet_10_YR_1901_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1901 |
| F_fleet_10_YR_1902_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1902 |
| F_fleet_10_YR_1903_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1903 |
| F_fleet_10_YR_1904_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1904 |
| F_fleet_10_YR_1905_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1905 |
| F_fleet_10_YR_1906_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1906 |
| F_fleet_10_YR_1907_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1907 |
| F_fleet_10_YR_1908_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1908 |
| F_fleet_10_YR_1909_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1909 |
| F_fleet_10_YR_1910_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1910 |
| F_fleet_10_YR_1911_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1911 |
| F_fleet_10_YR_1912_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1912 |
| F_fleet_10_YR_1913_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1913 |
| F_fleet_10_YR_1914_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1914 |
| F_fleet_10_YR_1915_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1915 |
| F_fleet_10_YR_1916_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1916 |
| F_fleet_10_YR_1917_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1917 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_10_YR_1918_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1918 |
| F_fleet_10_YR_1919_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1919 |
| F_fleet_10_YR_1920_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1920 |
| F_fleet_10_YR_1921_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1921 |
| F_fleet_10_YR_1922_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1922 |
| F_fleet_10_YR_1923_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1923 |
| F_fleet_10_YR_1924_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1924 |
| F_fleet_10_YR_1925_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1925 |
| F_fleet_10_YR_1926_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1926 |
| F_fleet_10_YR_1927_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1927 |
| F_fleet_10_YR_1928_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1928 |
| F_fleet_10_YR_1929_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1929 |
| F_fleet_10_YR_1930_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1930 |
| F_fleet_10_YR_1931_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1931 |
| F_fleet_10_YR_1932_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1932 |
| F_fleet_10_YR_1933_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1933 |
| F_fleet_10_YR_1934_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1934 |
| F_fleet_10_YR_1935_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1935 |
| F_fleet_10_YR_1936_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1936 |
| F_fleet_10_YR_1937_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1937 |
| F_fleet_10_YR_1938_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1938 |
| F_fleet_10_YR_1939_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1939 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_10_YR_1940_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1940 |
| F_fleet_10_YR_1941_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1941 |
| F_fleet_10_YR_1942_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1942 |
| F_fleet_10_YR_1943_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1943 |
| F_fleet_10_YR_1944_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1944 |
| F_fleet_10_YR_1945_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1945 |
| F_fleet_10_YR_1946_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1946 |
| F_fleet_10_YR_1947_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1947 |
| F_fleet_10_YR_1948_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1948 |
| F_fleet_10_YR_1949_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1949 |
| F_fleet_10_YR_1950_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1950 |
| F_fleet_10_YR_1951_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1951 |
| F_fleet_10_YR_1952_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1952 |
| F_fleet_10_YR_1953_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1953 |
| F_fleet_10_YR_1954_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1954 |
| F_fleet_10_YR_1955_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1955 |
| F_fleet_10_YR_1956_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1956 |
| F_fleet_10_YR_1957_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1957 |
| F_fleet_10_YR_1958_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1958 |
| F_fleet_10_YR_1959_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1959 |
| F_fleet_10_YR_1960_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1960 |
| F_fleet_10_YR_1961_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1961 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_10_YR_1962_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1962 |
| F_fleet_10_YR_1963_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1963 |
| F_fleet_10_YR_1964_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1964 |
| F_fleet_10_YR_1965_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1965 |
| F_fleet_10_YR_1966_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1966 |
| F_fleet_10_YR_1967_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1967 |
| F_fleet_10_YR_1968_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1968 |
| F_fleet_10_YR_1969_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1969 |
| F_fleet_10_YR_1970_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1970 |
| F_fleet_10_YR_1971_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1971 |
| F_fleet_10_YR_1972_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1972 |
| F_fleet_10_YR_1973_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1973 |
| F_fleet_10_YR_1974_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1974 |
| F_fleet_10_YR_1975_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1975 |
| F_fleet_10_YR_1976_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1976 |
| F_fleet_10_YR_1977_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1977 |
| F_fleet_10_YR_1978_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1978 |
| F_fleet_10_YR_1979_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1979 |
| F_fleet_10_YR_1980_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1980 |
| F_fleet_10_YR_1981_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1981 |
| F_fleet_10_YR_1982_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1982 |
| F_fleet_10_YR_1983_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1983 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_10_YR_1984_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1984 |
| F_fleet_10_YR_1985_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1985 |
| F_fleet_10_YR_1986_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1986 |
| F_fleet_10_YR_1987_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1987 |
| F_fleet_10_YR_1988_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1988 |
| F_fleet_10_YR_1989_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1989 |
| F_fleet_10_YR_1990_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 1990 |
| F_fleet_10_YR_1991_s_1 | 0.0184555 | 0.0126238 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 1991 |
| F_fleet_10_YR_1992_s_1 | 0.0278383 | 0.0191143 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 1992 |
| F_fleet_10_YR_1993_s_1 | 0.0125299 | 0.00852902 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 1993 |
| F_fleet_10_YR_1994_s_1 | 0.00762057 | 0.00500744 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 1994 |
| F_fleet_10_YR_1995_s_1 | 0.00701696 | 0.00463129 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 1995 |
| F_fleet_10_YR_1996_s_1 | 0.00745539 | 0.00488509 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 1996 |
| F_fleet_10_YR_1997_s_1 | 0.0108958 | 0.0069635 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 1997 |
| F_fleet_10_YR_1998_s_1 | 0.012191 | 0.00867026 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 1998 |
| F_fleet_10_YR_1999_s_1 | 0.00970693 | 0.00648419 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 1999 |
| F_fleet_10_YR_2000_s_1 | 0.0118631 | 0.00778083 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 2000 |
| F_fleet_10_YR_2001_s_1 | 0.00957567 | 0.00619984 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 2001 |
| F_fleet_10_YR_2002_s_1 | 0.0211646 | 0.0135838 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 2002 |
| F_fleet_10_YR_2003_s_1 | 0.00585278 | 0.00382239 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 2003 |
| F_fleet_10_YR_2004_s_1 | 0.00551622 | 0.00362741 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 2004 |
| F_fleet_10_YR_2005_s_1 | 0.0038969 | 0.00252769 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 2005 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_10_YR_2006_s_1 | 0.00213703 | 0.00141606 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 2006 |
| F_fleet_10_YR_2007_s_1 | 0.00573385 | 0.00379642 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 2007 |
| F_fleet_10_YR_2008_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F commercial closed season west in 2008 |
| F_fleet_10_YR_2009_s_1 | 2.06E-05 | 1.36E-05 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 2009 |
| F_fleet_10_YR_2010_s_1 | 0.000286255 | 0.000189585 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 2010 |
| F_fleet_10_YR_2011_s_1 | 0.000105252 | 6.94E-05 | _ | 0 | 8 | F | | | Estimated | F commercial closed season west in 2011 |
| F_fleet_11_YR_1872_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1872 |
| F_fleet_11_YR_1873_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1873 |
| F_fleet_11_YR_1874_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1874 |
| F_fleet_11_YR_1875_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1875 |
| F_fleet_11_YR_1876_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1876 |
| F_fleet_11_YR_1877_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1877 |
| F_fleet_11_YR_1878_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1878 |
| F_fleet_11_YR_1879_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1879 |
| F_fleet_11_YR_1880_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1880 |
| F_fleet_11_YR_1881_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1881 |
| F_fleet_11_YR_1882_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1882 |
| F_fleet_11_YR_1883_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1883 |
| F_fleet_11_YR_1884_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1884 |
| F_fleet_11_YR_1885_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1885 |
| F_fleet_11_YR_1886_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1886 |
| F_fleet_11_YR_1887_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1887 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_11_YR_1888_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1888 |
| F_fleet_11_YR_1889_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1889 |
| F_fleet_11_YR_1890_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1890 |
| F_fleet_11_YR_1891_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1891 |
| F_fleet_11_YR_1892_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1892 |
| F_fleet_11_YR_1893_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1893 |
| F_fleet_11_YR_1894_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1894 |
| F_fleet_11_YR_1895_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1895 |
| F_fleet_11_YR_1896_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1896 |
| F_fleet_11_YR_1897_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1897 |
| F_fleet_11_YR_1898_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1898 |
| F_fleet_11_YR_1899_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1899 |
| F_fleet_11_YR_1900_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1900 |
| F_fleet_11_YR_1901_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1901 |
| F_fleet_11_YR_1902_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1902 |
| F_fleet_11_YR_1903_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1903 |
| F_fleet_11_YR_1904_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1904 |
| F_fleet_11_YR_1905_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1905 |
| F_fleet_11_YR_1906_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1906 |
| F_fleet_11_YR_1907_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1907 |
| F_fleet_11_YR_1908_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1908 |
| F_fleet_11_YR_1909_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1909 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_11_YR_1910_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1910 |
| F_fleet_11_YR_1911_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1911 |
| F_fleet_11_YR_1912_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1912 |
| F_fleet_11_YR_1913_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1913 |
| F_fleet_11_YR_1914_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1914 |
| F_fleet_11_YR_1915_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1915 |
| F_fleet_11_YR_1916_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1916 |
| F_fleet_11_YR_1917_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1917 |
| F_fleet_11_YR_1918_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1918 |
| F_fleet_11_YR_1919_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1919 |
| F_fleet_11_YR_1920_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1920 |
| F_fleet_11_YR_1921_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1921 |
| F_fleet_11_YR_1922_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1922 |
| F_fleet_11_YR_1923_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1923 |
| F_fleet_11_YR_1924_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1924 |
| F_fleet_11_YR_1925_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1925 |
| F_fleet_11_YR_1926_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1926 |
| F_fleet_11_YR_1927_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1927 |
| F_fleet_11_YR_1928_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1928 |
| F_fleet_11_YR_1929_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1929 |
| F_fleet_11_YR_1930_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1930 |
| F_fleet_11_YR_1931_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1931 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_11_YR_1932_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1932 |
| F_fleet_11_YR_1933_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1933 |
| F_fleet_11_YR_1934_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1934 |
| F_fleet_11_YR_1935_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1935 |
| F_fleet_11_YR_1936_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1936 |
| F_fleet_11_YR_1937_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1937 |
| F_fleet_11_YR_1938_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1938 |
| F_fleet_11_YR_1939_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1939 |
| F_fleet_11_YR_1940_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1940 |
| F_fleet_11_YR_1941_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1941 |
| F_fleet_11_YR_1942_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1942 |
| F_fleet_11_YR_1943_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1943 |
| F_fleet_11_YR_1944_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1944 |
| F_fleet_11_YR_1945_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1945 |
| F_fleet_11_YR_1946_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1946 |
| F_fleet_11_YR_1947_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1947 |
| F_fleet_11_YR_1948_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1948 |
| F_fleet_11_YR_1949_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1949 |
| F_fleet_11_YR_1950_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1950 |
| F_fleet_11_YR_1951_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1951 |
| F_fleet_11_YR_1952_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1952 |
| F_fleet_11_YR_1953_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1953 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_11_YR_1954_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1954 |
| F_fleet_11_YR_1955_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1955 |
| F_fleet_11_YR_1956_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1956 |
| F_fleet_11_YR_1957_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1957 |
| F_fleet_11_YR_1958_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1958 |
| F_fleet_11_YR_1959_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1959 |
| F_fleet_11_YR_1960_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1960 |
| F_fleet_11_YR_1961_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1961 |
| F_fleet_11_YR_1962_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1962 |
| F_fleet_11_YR_1963_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1963 |
| F_fleet_11_YR_1964_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1964 |
| F_fleet_11_YR_1965_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1965 |
| F_fleet_11_YR_1966_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1966 |
| F_fleet_11_YR_1967_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1967 |
| F_fleet_11_YR_1968_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1968 |
| F_fleet_11_YR_1969_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1969 |
| F_fleet_11_YR_1970_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1970 |
| F_fleet_11_YR_1971_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1971 |
| F_fleet_11_YR_1972_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1972 |
| F_fleet_11_YR_1973_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1973 |
| F_fleet_11_YR_1974_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1974 |
| F_fleet_11_YR_1975_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1975 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_11_YR_1976_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1976 |
| F_fleet_11_YR_1977_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1977 |
| F_fleet_11_YR_1978_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1978 |
| F_fleet_11_YR_1979_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1979 |
| F_fleet_11_YR_1980_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1980 |
| F_fleet_11_YR_1981_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1981 |
| F_fleet_11_YR_1982_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1982 |
| F_fleet_11_YR_1983_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1983 |
| F_fleet_11_YR_1984_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1984 |
| F_fleet_11_YR_1985_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1985 |
| F_fleet_11_YR_1986_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1986 |
| F_fleet_11_YR_1987_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1987 |
| F_fleet_11_YR_1988_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1988 |
| F_fleet_11_YR_1989_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1989 |
| F_fleet_11_YR_1990_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1990 |
| F_fleet_11_YR_1991_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1991 |
| F_fleet_11_YR_1992_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1992 |
| F_fleet_11_YR_1993_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1993 |
| F_fleet_11_YR_1994_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1994 |
| F_fleet_11_YR_1995_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1995 |
| F_fleet_11_YR_1996_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season east in 1996 |
| F_fleet_11_YR_1997_s_1 | 0.0118386 | 0.00593693 | _ | 0 | 8 | F | | | Estimated | F recreational closed season east in 1997 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_11_YR_1998_s_1 | 0.0215035 | 0.010822 | _ | 0 | 8 | F | | | Estimated | F recreational closed season east in 1998 |
| F_fleet_11_YR_1999_s_1 | 0.0286167 | 0.014397 | _ | 0 | 8 | F | | | Estimated | F recreational closed season east in 1999 |
| F_fleet_11_YR_2000_s_1 | 0.0478899 | 0.0238077 | _ | 0 | 8 | F | | | Estimated | F recreational closed season east in 2000 |
| F_fleet_11_YR_2001_s_1 | 0.0727143 | 0.0355795 | _ | 0 | 8 | F | | | Estimated | F recreational closed season east in 2001 |
| F_fleet_11_YR_2002_s_1 | 0.0650237 | 0.0299075 | _ | 0 | 8 | F | | | Estimated | F recreational closed season east in 2002 |
| F_fleet_11_YR_2003_s_1 | 0.0389422 | 0.0180082 | _ | 0 | 8 | F | | | Estimated | F recreational closed season east in 2003 |
| F_fleet_11_YR_2004_s_1 | 0.024864 | 0.012057 | _ | 0 | 8 | F | | | Estimated | F recreational closed season east in 2004 |
| F_fleet_11_YR_2005_s_1 | 0.0279337 | 0.0137886 | _ | 0 | 8 | F | | | Estimated | F recreational closed season east in 2005 |
| F_fleet_11_YR_2006_s_1 | 0.0228108 | 0.0109746 | _ | 0 | 8 | F | | | Estimated | F recreational closed season east in 2006 |
| F_fleet_11_YR_2007_s_1 | 0.019297 | 0.0089894 | _ | 0 | 8 | F | | | Estimated | F recreational closed season east in 2007 |
| F_fleet_11_YR_2008_s_1 | 0.0409505 | 0.019693 | _ | 0 | 8 | F | | | Estimated | F recreational closed season east in 2008 |
| F_fleet_11_YR_2009_s_1 | 0.0414767 | 0.0194658 | _ | 0 | 8 | F | | | Estimated | F recreational closed season east in 2009 |
| F_fleet_11_YR_2010_s_1 | 0.0534085 | 0.0247073 | _ | 0 | 8 | F | | | Estimated | F recreational closed season east in 2010 |
| F_fleet_11_YR_2011_s_1 | 0.0958887 | 0.0462341 | _ | 0 | 8 | F | | | Estimated | F recreational closed season east in 2011 |
| F_fleet_12_YR_1872_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1872 |
| F_fleet_12_YR_1873_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1873 |
| F_fleet_12_YR_1874_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1874 |
| F_fleet_12_YR_1875_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1875 |
| F_fleet_12_YR_1876_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1876 |
| F_fleet_12_YR_1877_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1877 |
| F_fleet_12_YR_1878_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1878 |
| F_fleet_12_YR_1879_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1879 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_12_YR_1880_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1880 |
| F_fleet_12_YR_1881_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1881 |
| F_fleet_12_YR_1882_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1882 |
| F_fleet_12_YR_1883_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1883 |
| F_fleet_12_YR_1884_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1884 |
| F_fleet_12_YR_1885_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1885 |
| F_fleet_12_YR_1886_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1886 |
| F_fleet_12_YR_1887_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1887 |
| F_fleet_12_YR_1888_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1888 |
| F_fleet_12_YR_1889_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1889 |
| F_fleet_12_YR_1890_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1890 |
| F_fleet_12_YR_1891_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1891 |
| F_fleet_12_YR_1892_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1892 |
| F_fleet_12_YR_1893_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1893 |
| F_fleet_12_YR_1894_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1894 |
| F_fleet_12_YR_1895_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1895 |
| F_fleet_12_YR_1896_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1896 |
| F_fleet_12_YR_1897_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1897 |
| F_fleet_12_YR_1898_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1898 |
| F_fleet_12_YR_1899_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1899 |
| F_fleet_12_YR_1900_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1900 |
| F_fleet_12_YR_1901_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1901 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_12_YR_1902_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1902 |
| F_fleet_12_YR_1903_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1903 |
| F_fleet_12_YR_1904_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1904 |
| F_fleet_12_YR_1905_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1905 |
| F_fleet_12_YR_1906_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1906 |
| F_fleet_12_YR_1907_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1907 |
| F_fleet_12_YR_1908_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1908 |
| F_fleet_12_YR_1909_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1909 |
| F_fleet_12_YR_1910_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1910 |
| F_fleet_12_YR_1911_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1911 |
| F_fleet_12_YR_1912_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1912 |
| F_fleet_12_YR_1913_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1913 |
| F_fleet_12_YR_1914_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1914 |
| F_fleet_12_YR_1915_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1915 |
| F_fleet_12_YR_1916_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1916 |
| F_fleet_12_YR_1917_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1917 |
| F_fleet_12_YR_1918_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1918 |
| F_fleet_12_YR_1919_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1919 |
| F_fleet_12_YR_1920_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1920 |
| F_fleet_12_YR_1921_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1921 |
| F_fleet_12_YR_1922_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1922 |
| F_fleet_12_YR_1923_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1923 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_12_YR_1924_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1924 |
| F_fleet_12_YR_1925_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1925 |
| F_fleet_12_YR_1926_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1926 |
| F_fleet_12_YR_1927_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1927 |
| F_fleet_12_YR_1928_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1928 |
| F_fleet_12_YR_1929_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1929 |
| F_fleet_12_YR_1930_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1930 |
| F_fleet_12_YR_1931_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1931 |
| F_fleet_12_YR_1932_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1932 |
| F_fleet_12_YR_1933_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1933 |
| F_fleet_12_YR_1934_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1934 |
| F_fleet_12_YR_1935_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1935 |
| F_fleet_12_YR_1936_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1936 |
| F_fleet_12_YR_1937_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1937 |
| F_fleet_12_YR_1938_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1938 |
| F_fleet_12_YR_1939_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1939 |
| F_fleet_12_YR_1940_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1940 |
| F_fleet_12_YR_1941_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1941 |
| F_fleet_12_YR_1942_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1942 |
| F_fleet_12_YR_1943_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1943 |
| F_fleet_12_YR_1944_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1944 |
| F_fleet_12_YR_1945_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1945 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_12_YR_1946_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1946 |
| F_fleet_12_YR_1947_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1947 |
| F_fleet_12_YR_1948_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1948 |
| F_fleet_12_YR_1949_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1949 |
| F_fleet_12_YR_1950_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1950 |
| F_fleet_12_YR_1951_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1951 |
| F_fleet_12_YR_1952_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1952 |
| F_fleet_12_YR_1953_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1953 |
| F_fleet_12_YR_1954_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1954 |
| F_fleet_12_YR_1955_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1955 |
| F_fleet_12_YR_1956_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1956 |
| F_fleet_12_YR_1957_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1957 |
| F_fleet_12_YR_1958_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1958 |
| F_fleet_12_YR_1959_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1959 |
| F_fleet_12_YR_1960_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1960 |
| F_fleet_12_YR_1961_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1961 |
| F_fleet_12_YR_1962_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1962 |
| F_fleet_12_YR_1963_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1963 |
| F_fleet_12_YR_1964_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1964 |
| F_fleet_12_YR_1965_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1965 |
| F_fleet_12_YR_1966_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1966 |
| F_fleet_12_YR_1967_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1967 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_12_YR_1968_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1968 |
| F_fleet_12_YR_1969_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1969 |
| F_fleet_12_YR_1970_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1970 |
| F_fleet_12_YR_1971_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1971 |
| F_fleet_12_YR_1972_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1972 |
| F_fleet_12_YR_1973_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1973 |
| F_fleet_12_YR_1974_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1974 |
| F_fleet_12_YR_1975_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1975 |
| F_fleet_12_YR_1976_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1976 |
| F_fleet_12_YR_1977_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1977 |
| F_fleet_12_YR_1978_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1978 |
| F_fleet_12_YR_1979_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1979 |
| F_fleet_12_YR_1980_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1980 |
| F_fleet_12_YR_1981_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1981 |
| F_fleet_12_YR_1982_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1982 |
| F_fleet_12_YR_1983_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1983 |
| F_fleet_12_YR_1984_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1984 |
| F_fleet_12_YR_1985_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1985 |
| F_fleet_12_YR_1986_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1986 |
| F_fleet_12_YR_1987_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1987 |
| F_fleet_12_YR_1988_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1988 |
| F_fleet_12_YR_1989_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1989 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_12_YR_1990_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1990 |
| F_fleet_12_YR_1991_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1991 |
| F_fleet_12_YR_1992_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1992 |
| F_fleet_12_YR_1993_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1993 |
| F_fleet_12_YR_1994_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1994 |
| F_fleet_12_YR_1995_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1995 |
| F_fleet_12_YR_1996_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F recreational closed season west in 1996 |
| F_fleet_12_YR_1997_s_1 | 0.000389863 | 0.000195591 | _ | 0 | 8 | F | | | Estimated | F recreational closed season west in 1997 |
| F_fleet_12_YR_1998_s_1 | 0.00118893 | 0.000597032 | _ | 0 | 8 | F | | | Estimated | F recreational closed season west in 1998 |
| F_fleet_12_YR_1999_s_1 | 0.00316435 | 0.00158642 | _ | 0 | 8 | F | | | Estimated | F recreational closed season west in 1999 |
| F_fleet_12_YR_2000_s_1 | 0.0077284 | 0.00385458 | _ | 0 | 8 | F | | | Estimated | F recreational closed season west in 2000 |
| F_fleet_12_YR_2001_s_1 | 0.00326796 | 0.00163806 | _ | 0 | 8 | F | | | Estimated | F recreational closed season west in 2001 |
| F_fleet_12_YR_2002_s_1 | 0.0036202 | 0.00182596 | _ | 0 | 8 | F | | | Estimated | F recreational closed season west in 2002 |
| F_fleet_12_YR_2003_s_1 | 0.00856113 | 0.00433566 | _ | 0 | 8 | F | | | Estimated | F recreational closed season west in 2003 |
| F_fleet_12_YR_2004_s_1 | 0.00977434 | 0.00497036 | _ | 0 | 8 | F | | | Estimated | F recreational closed season west in 2004 |
| F_fleet_12_YR_2005_s_1 | 0.00827604 | 0.00420481 | _ | 0 | 8 | F | | | Estimated | F recreational closed season west in 2005 |
| F_fleet_12_YR_2006_s_1 | 0.00605634 | 0.00301001 | _ | 0 | 8 | F | | | Estimated | F recreational closed season west in 2006 |
| F_fleet_12_YR_2007_s_1 | 0.00557238 | 0.00273489 | _ | 0 | 8 | F | | | Estimated | F recreational closed season west in 2007 |
| F_fleet_12_YR_2008_s_1 | 0.00921406 | 0.00473676 | _ | 0 | 8 | F | | | Estimated | F recreational closed season west in 2008 |
| F_fleet_12_YR_2009_s_1 | 0.00897238 | 0.00452384 | _ | 0 | 8 | F | | | Estimated | F recreational closed season west in 2009 |
| F_fleet_12_YR_2010_s_1 | 0.00138887 | 0.000725147 | _ | 0 | 8 | F | | | Estimated | F recreational closed season west in 2010 |
| F_fleet_12_YR_2011_s_1 | 0.00991861 | 0.00510062 | _ | 0 | 8 | F | | | Estimated | F recreational closed season west in 2011 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_13_YR_1872_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1872 |
| F_fleet_13_YR_1873_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1873 |
| F_fleet_13_YR_1874_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1874 |
| F_fleet_13_YR_1875_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1875 |
| F_fleet_13_YR_1876_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1876 |
| F_fleet_13_YR_1877_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1877 |
| F_fleet_13_YR_1878_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1878 |
| F_fleet_13_YR_1879_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1879 |
| F_fleet_13_YR_1880_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1880 |
| F_fleet_13_YR_1881_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1881 |
| F_fleet_13_YR_1882_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1882 |
| F_fleet_13_YR_1883_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1883 |
| F_fleet_13_YR_1884_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1884 |
| F_fleet_13_YR_1885_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1885 |
| F_fleet_13_YR_1886_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1886 |
| F_fleet_13_YR_1887_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1887 |
| F_fleet_13_YR_1888_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1888 |
| F_fleet_13_YR_1889_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1889 |
| F_fleet_13_YR_1890_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1890 |
| F_fleet_13_YR_1891_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1891 |
| F_fleet_13_YR_1892_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1892 |
| F_fleet_13_YR_1893_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1893 |
| F_fleet_13_YR_1894_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1894 |
| F_fleet_13_YR_1895_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1895 |
| F_fleet_13_YR_1896_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1896 |
| F_fleet_13_YR_1897_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1897 |
| F_fleet_13_YR_1898_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1898 |
| F_fleet_13_YR_1899_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1899 |
| F_fleet_13_YR_1900_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1900 |
| F_fleet_13_YR_1901_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1901 |
| F_fleet_13_YR_1902_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1902 |
| F_fleet_13_YR_1903_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1903 |
| F_fleet_13_YR_1904_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1904 |
| F_fleet_13_YR_1905_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1905 |
| F_fleet_13_YR_1906_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1906 |
| F_fleet_13_YR_1907_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1907 |
| F_fleet_13_YR_1908_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1908 |
| F_fleet_13_YR_1909_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1909 |
| F_fleet_13_YR_1910_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1910 |
| F_fleet_13_YR_1911_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1911 |
| F_fleet_13_YR_1912_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1912 |
| F_fleet_13_YR_1913_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1913 |
| F_fleet_13_YR_1914_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1914 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_13_YR_1915_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1915 |
| F_fleet_13_YR_1916_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1916 |
| F_fleet_13_YR_1917_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1917 |
| F_fleet_13_YR_1918_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1918 |
| F_fleet_13_YR_1919_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1919 |
| F_fleet_13_YR_1920_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1920 |
| F_fleet_13_YR_1921_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1921 |
| F_fleet_13_YR_1922_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1922 |
| F_fleet_13_YR_1923_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1923 |
| F_fleet_13_YR_1924_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1924 |
| F_fleet_13_YR_1925_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1925 |
| F_fleet_13_YR_1926_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1926 |
| F_fleet_13_YR_1927_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1927 |
| F_fleet_13_YR_1928_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1928 |
| F_fleet_13_YR_1929_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1929 |
| F_fleet_13_YR_1930_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1930 |
| F_fleet_13_YR_1931_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1931 |
| F_fleet_13_YR_1932_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1932 |
| F_fleet_13_YR_1933_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1933 |
| F_fleet_13_YR_1934_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1934 |
| F_fleet_13_YR_1935_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1935 |
| F_fleet_13_YR_1936_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1936 |
| F_fleet_13_YR_1937_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1937 |
| F_fleet_13_YR_1938_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1938 |
| F_fleet_13_YR_1939_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1939 |
| F_fleet_13_YR_1940_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1940 |
| F_fleet_13_YR_1941_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1941 |
| F_fleet_13_YR_1942_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1942 |
| F_fleet_13_YR_1943_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1943 |
| F_fleet_13_YR_1944_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1944 |
| F_fleet_13_YR_1945_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1945 |
| F_fleet_13_YR_1946_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1946 |
| F_fleet_13_YR_1947_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1947 |
| F_fleet_13_YR_1948_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1948 |
| F_fleet_13_YR_1949_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch east in 1949 |
| F_fleet_13_YR_1950_s_1 | 0.00585261 | 0.00096626 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1950 |
| F_fleet_13_YR_1951_s_1 | 0.0100827 | 0.00166443 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1951 |
| F_fleet_13_YR_1952_s_1 | 0.0119138 | 0.00196663 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1952 |
| F_fleet_13_YR_1953_s_1 | 0.0131593 | 0.00217217 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1953 |
| F_fleet_13_YR_1954_s_1 | 0.0168716 | 0.00278479 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1954 |
| F_fleet_13_YR_1955_s_1 | 0.0199269 | 0.00328899 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1955 |
| F_fleet_13_YR_1956_s_1 | 0.0252378 | 0.00416535 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1956 |
| F_fleet_13_YR_1957_s_1 | 0.0276338 | 0.00456073 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1957 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_13_YR_1958_s_1 | 0.0292328 | 0.0048246 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1958 |
| F_fleet_13_YR_1959_s_1 | 0.0317237 | 0.00523564 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1959 |
| F_fleet_13_YR_1960_s_1 | 0.0311387 | 0.00513919 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1960 |
| F_fleet_13_YR_1961_s_1 | 0.022591 | 0.00372884 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1961 |
| F_fleet_13_YR_1962_s_1 | 0.0215648 | 0.00355951 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1962 |
| F_fleet_13_YR_1963_s_1 | 0.0241982 | 0.0039941 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1963 |
| F_fleet_13_YR_1964_s_1 | 0.0287282 | 0.00474157 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1964 |
| F_fleet_13_YR_1965_s_1 | 0.0311602 | 0.00514274 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1965 |
| F_fleet_13_YR_1966_s_1 | 0.0291862 | 0.00481689 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1966 |
| F_fleet_13_YR_1967_s_1 | 0.0277004 | 0.00457162 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1967 |
| F_fleet_13_YR_1968_s_1 | 0.03263 | 0.00538472 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1968 |
| F_fleet_13_YR_1969_s_1 | 0.0318249 | 0.0052518 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1969 |
| F_fleet_13_YR_1970_s_1 | 0.0313601 | 0.00517507 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1970 |
| F_fleet_13_YR_1971_s_1 | 0.0270212 | 0.00445945 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1971 |
| F_fleet_13_YR_1972_s_1 | 0.0291721 | 0.00443101 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1972 |
| F_fleet_13_YR_1973_s_1 | 0.0321615 | 0.00525882 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1973 |
| F_fleet_13_YR_1974_s_1 | 0.0310831 | 0.00508307 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1974 |
| F_fleet_13_YR_1975_s_1 | 0.0310105 | 0.00507751 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1975 |
| F_fleet_13_YR_1976_s_1 | 0.0287563 | 0.00470387 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1976 |
| F_fleet_13_YR_1977_s_1 | 0.0340817 | 0.00555505 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1977 |
| F_fleet_13_YR_1978_s_1 | 0.0263515 | 0.00432882 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1978 |
| F_fleet_13_YR_1979_s_1 | 0.0271361 | 0.00446173 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1979 |
| F_fleet_13_YR_1980_s_1 | 0.0166061 | 0.00272742 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1980 |
| F_fleet_13_YR_1981_s_1 | 0.0260874 | 0.00423894 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1981 |
| F_fleet_13_YR_1982_s_1 | 0.026067 | 0.00424572 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1982 |
| F_fleet_13_YR_1983_s_1 | 0.0284807 | 0.00468238 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1983 |
| F_fleet_13_YR_1984_s_1 | 0.0335004 | 0.00552672 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1984 |
| F_fleet_13_YR_1985_s_1 | 0.0323871 | 0.00535328 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1985 |
| F_fleet_13_YR_1986_s_1 | 0.0334069 | 0.00547674 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1986 |
| F_fleet_13_YR_1987_s_1 | 0.0271225 | 0.00447582 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1987 |
| F_fleet_13_YR_1988_s_1 | 0.0255454 | 0.00420224 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1988 |
| F_fleet_13_YR_1989_s_1 | 0.0312837 | 0.00514642 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1989 |
| F_fleet_13_YR_1990_s_1 | 0.0272098 | 0.00446657 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1990 |
| F_fleet_13_YR_1991_s_1 | 0.0280744 | 0.00460203 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1991 |
| F_fleet_13_YR_1992_s_1 | 0.0338982 | 0.00555229 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1992 |
| F_fleet_13_YR_1993_s_1 | 0.028023 | 0.00458871 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1993 |
| F_fleet_13_YR_1994_s_1 | 0.0285486 | 0.00463611 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1994 |
| F_fleet_13_YR_1995_s_1 | 0.0340053 | 0.00546528 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1995 |
| F_fleet_13_YR_1996_s_1 | 0.0383327 | 0.00619087 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1996 |
| F_fleet_13_YR_1997_s_1 | 0.0408137 | 0.00662477 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1997 |
| F_fleet_13_YR_1998_s_1 | 0.0509582 | 0.00823103 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1998 |
| F_fleet_13_YR_1999_s_1 | 0.0312608 | 0.0049972 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 1999 |
| F_fleet_13_YR_2000_s_1 | 0.0267213 | 0.00428625 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 2000 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_13_YR_2001_s_1 | 0.0300706 | 0.0048376 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 2001 |
| F_fleet_13_YR_2002_s_1 | 0.0361128 | 0.00577375 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 2002 |
| F_fleet_13_YR_2003_s_1 | 0.0299893 | 0.00478715 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 2003 |
| F_fleet_13_YR_2004_s_1 | 0.0297763 | 0.00471703 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 2004 |
| F_fleet_13_YR_2005_s_1 | 0.0247297 | 0.00392135 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 2005 |
| F_fleet_13_YR_2006_s_1 | 0.0163912 | 0.00266664 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 2006 |
| F_fleet_13_YR_2007_s_1 | 0.0123053 | 0.00201615 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 2007 |
| F_fleet_13_YR_2008_s_1 | 0.00799546 | 0.00131364 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 2008 |
| F_fleet_13_YR_2009_s_1 | 0.0124558 | 0.00206099 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 2009 |
| F_fleet_13_YR_2010_s_1 | 0.00775735 | 0.00128155 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 2010 |
| F_fleet_13_YR_2011_s_1 | 0.00964833 | 0.00159266 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch east in 2011 |
| F_fleet_14_YR_1872_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1872 |
| F_fleet_14_YR_1873_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1873 |
| F_fleet_14_YR_1874_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1874 |
| F_fleet_14_YR_1875_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1875 |
| F_fleet_14_YR_1876_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1876 |
| F_fleet_14_YR_1877_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1877 |
| F_fleet_14_YR_1878_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1878 |
| F_fleet_14_YR_1879_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1879 |
| F_fleet_14_YR_1880_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1880 |
| F_fleet_14_YR_1881_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1881 |
| F_fleet_14_YR_1882_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1882 |
| F_fleet_14_YR_1883_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1883 |
| F_fleet_14_YR_1884_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1884 |
| F_fleet_14_YR_1885_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1885 |
| F_fleet_14_YR_1886_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1886 |
| F_fleet_14_YR_1887_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1887 |
| F_fleet_14_YR_1888_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1888 |
| F_fleet_14_YR_1889_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1889 |
| F_fleet_14_YR_1890_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1890 |
| F_fleet_14_YR_1891_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1891 |
| F_fleet_14_YR_1892_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1892 |
| F_fleet_14_YR_1893_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1893 |
| F_fleet_14_YR_1894_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1894 |
| F_fleet_14_YR_1895_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1895 |
| F_fleet_14_YR_1896_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1896 |
| F_fleet_14_YR_1897_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1897 |
| F_fleet_14_YR_1898_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1898 |
| F_fleet_14_YR_1899_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1899 |
| F_fleet_14_YR_1900_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1900 |
| F_fleet_14_YR_1901_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1901 |
| F_fleet_14_YR_1902_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1902 |
| F_fleet_14_YR_1903_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1903 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_14_YR_1904_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1904 |
| F_fleet_14_YR_1905_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1905 |
| F_fleet_14_YR_1906_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1906 |
| F_fleet_14_YR_1907_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1907 |
| F_fleet_14_YR_1908_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1908 |
| F_fleet_14_YR_1909_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1909 |
| F_fleet_14_YR_1910_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1910 |
| F_fleet_14_YR_1911_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1911 |
| F_fleet_14_YR_1912_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1912 |
| F_fleet_14_YR_1913_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1913 |
| F_fleet_14_YR_1914_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1914 |
| F_fleet_14_YR_1915_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1915 |
| F_fleet_14_YR_1916_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1916 |
| F_fleet_14_YR_1917_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1917 |
| F_fleet_14_YR_1918_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1918 |
| F_fleet_14_YR_1919_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1919 |
| F_fleet_14_YR_1920_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1920 |
| F_fleet_14_YR_1921_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1921 |
| F_fleet_14_YR_1922_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1922 |
| F_fleet_14_YR_1923_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1923 |
| F_fleet_14_YR_1924_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1924 |
| F_fleet_14_YR_1925_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1925 |
| F_fleet_14_YR_1926_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1926 |
| F_fleet_14_YR_1927_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1927 |
| F_fleet_14_YR_1928_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1928 |
| F_fleet_14_YR_1929_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1929 |
| F_fleet_14_YR_1930_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1930 |
| F_fleet_14_YR_1931_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1931 |
| F_fleet_14_YR_1932_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1932 |
| F_fleet_14_YR_1933_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1933 |
| F_fleet_14_YR_1934_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1934 |
| F_fleet_14_YR_1935_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1935 |
| F_fleet_14_YR_1936_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1936 |
| F_fleet_14_YR_1937_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1937 |
| F_fleet_14_YR_1938_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1938 |
| F_fleet_14_YR_1939_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1939 |
| F_fleet_14_YR_1940_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1940 |
| F_fleet_14_YR_1941_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1941 |
| F_fleet_14_YR_1942_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1942 |
| F_fleet_14_YR_1943_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1943 |
| F_fleet_14_YR_1944_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1944 |
| F_fleet_14_YR_1945_s_1 | 0 | _ | _ | _ | _ | F | | | Fixed | F shrimp bycatch west in 1945 |
| F_fleet_14_YR_1946_s_1 | 0.00219895 | 0.00033466 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1946 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_14_YR_1947_s_1 | 0.0112264 | 0.0017083 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1947 |
| F_fleet_14_YR_1948_s_1 | 0.0295238 | 0.00449444 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1948 |
| F_fleet_14_YR_1949_s_1 | 0.0477381 | 0.00727108 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1949 |
| F_fleet_14_YR_1950_s_1 | 0.0576826 | 0.00878868 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1950 |
| F_fleet_14_YR_1951_s_1 | 0.0606681 | 0.00924516 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1951 |
| F_fleet_14_YR_1952_s_1 | 0.0716459 | 0.0109223 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1952 |
| F_fleet_14_YR_1953_s_1 | 0.0698687 | 0.0106515 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1953 |
| F_fleet_14_YR_1954_s_1 | 0.0922549 | 0.0140737 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1954 |
| F_fleet_14_YR_1955_s_1 | 0.0760844 | 0.0116014 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1955 |
| F_fleet_14_YR_1956_s_1 | 0.0993525 | 0.0151583 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1956 |
| F_fleet_14_YR_1957_s_1 | 0.124668 | 0.019031 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1957 |
| F_fleet_14_YR_1958_s_1 | 0.192688 | 0.0294525 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1958 |
| F_fleet_14_YR_1959_s_1 | 0.20595 | 0.0314832 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1959 |
| F_fleet_14_YR_1960_s_1 | 0.210865 | 0.0322347 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1960 |
| F_fleet_14_YR_1961_s_1 | 0.168061 | 0.0256705 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1961 |
| F_fleet_14_YR_1962_s_1 | 0.16343 | 0.024959 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1962 |
| F_fleet_14_YR_1963_s_1 | 0.189673 | 0.028976 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1963 |
| F_fleet_14_YR_1964_s_1 | 0.17289 | 0.0263982 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1964 |
| F_fleet_14_YR_1965_s_1 | 0.19821 | 0.0302677 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1965 |
| F_fleet_14_YR_1966_s_1 | 0.207736 | 0.031719 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1966 |
| F_fleet_14_YR_1967_s_1 | 0.261749 | 0.039984 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1967 |
| F_fleet_14_YR_1968_s_1 | 0.227134 | 0.0346826 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1968 |
| F_fleet_14_YR_1969_s_1 | 0.304066 | 0.0464773 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1969 |
| F_fleet_14_YR_1970_s_1 | 0.275134 | 0.0420967 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1970 |
| F_fleet_14_YR_1971_s_1 | 0.289027 | 0.0443627 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1971 |
| F_fleet_14_YR_1972_s_1 | 0.334512 | 0.0486792 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1972 |
| F_fleet_14_YR_1973_s_1 | 0.253652 | 0.0384071 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1973 |
| F_fleet_14_YR_1974_s_1 | 0.250261 | 0.0383377 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1974 |
| F_fleet_14_YR_1975_s_1 | 0.235893 | 0.0359944 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1975 |
| F_fleet_14_YR_1976_s_1 | 0.27575 | 0.0420975 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1976 |
| F_fleet_14_YR_1977_s_1 | 0.235972 | 0.0360742 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1977 |
| F_fleet_14_YR_1978_s_1 | 0.275894 | 0.0421916 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1978 |
| F_fleet_14_YR_1979_s_1 | 0.286852 | 0.043568 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1979 |
| F_fleet_14_YR_1980_s_1 | 0.175422 | 0.0266709 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1980 |
| F_fleet_14_YR_1981_s_1 | 0.268353 | 0.0403851 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1981 |
| F_fleet_14_YR_1982_s_1 | 0.276155 | 0.0417997 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1982 |
| F_fleet_14_YR_1983_s_1 | 0.216069 | 0.0323351 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1983 |
| F_fleet_14_YR_1984_s_1 | 0.280146 | 0.0424542 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1984 |
| F_fleet_14_YR_1985_s_1 | 0.258428 | 0.0375839 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1985 |
| F_fleet_14_YR_1986_s_1 | 0.352013 | 0.0504212 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1986 |
| F_fleet_14_YR_1987_s_1 | 0.32811 | 0.044648 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1987 |
| F_fleet_14_YR_1988_s_1 | 0.313088 | 0.0422966 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1988 |
| F_fleet_14_YR_1989_s_1 | 0.292771 | 0.0399597 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1989 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F_fleet_14_YR_1990_s_1 | 0.308627 | 0.0445782 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1990 |
| F_fleet_14_YR_1991_s_1 | 0.35932 | 0.0495529 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1991 |
| F_fleet_14_YR_1992_s_1 | 0.311286 | 0.0397454 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1992 |
| F_fleet_14_YR_1993_s_1 | 0.308667 | 0.0393875 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1993 |
| F_fleet_14_YR_1994_s_1 | 0.297243 | 0.0418857 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1994 |
| F_fleet_14_YR_1995_s_1 | 0.29651 | 0.0455252 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1995 |
| F_fleet_14_YR_1996_s_1 | 0.299027 | 0.0451677 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1996 |
| F_fleet_14_YR_1997_s_1 | 0.399789 | 0.0621568 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1997 |
| F_fleet_14_YR_1998_s_1 | 0.362208 | 0.0573582 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1998 |
| F_fleet_14_YR_1999_s_1 | 0.35982 | 0.0586187 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 1999 |
| F_fleet_14_YR_2000_s_1 | 0.418011 | 0.0698564 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 2000 |
| F_fleet_14_YR_2001_s_1 | 0.381916 | 0.058099 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 2001 |
| F_fleet_14_YR_2002_s_1 | 0.427742 | 0.0621231 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 2002 |
| F_fleet_14_YR_2003_s_1 | 0.308466 | 0.0429413 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 2003 |
| F_fleet_14_YR_2004_s_1 | 0.254003 | 0.0334712 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 2004 |
| F_fleet_14_YR_2005_s_1 | 0.198331 | 0.0276646 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 2005 |
| F_fleet_14_YR_2006_s_1 | 0.171226 | 0.0263119 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 2006 |
| F_fleet_14_YR_2007_s_1 | 0.134545 | 0.0204505 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 2007 |
| F_fleet_14_YR_2008_s_1 | 0.0930089 | 0.0138772 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 2008 |
| F_fleet_14_YR_2009_s_1 | 0.123136 | 0.0196628 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 2009 |
| F_fleet_14_YR_2010_s_1 | 0.113542 | 0.0174499 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 2010 |
| F_fleet_14_YR_2011_s_1 | 0.135763 | 0.020448 | _ | 0 | 8 | F | | | Estimated | F shrimp bycatch west in 2011 |
| LnQ_base_13_Shr_E | 3.63462 | 0.107832 | 1 | -10 | 20 | No_prior | | | Estimated | catchability coefficient for the shrimp effort index in east |
| LnQ_base_14_Shr_W | 1.49402 | 0.0866804 | 1 | -10 | 20 | No_prior | | | Estimated | catchability coefficient for the shrimp effort index in west |
| Retain_1P_1_HL_E | 15.24 | _ | 15.24 | 10 | 100 | No_prior | | | Fixed | retention function inflection point: handline east |
| Retain_1P_2_HL_E | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | retention function slope: handline east |
| Retain_1P_3_HL_E | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | retention function asymptote: handline east |
| Retain_1P_4_HL_E | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | retention function gender param: handline east |
| DiscMort_1P_1_HL_E | -5 | _ | -5 | -10 | 10 | No_prior | | | Fixed | discard mortality function inflection point: handline east |
| DiscMort_1P_2_HL_E | 1 | _ | 1 | -1 | 2 | No_prior | | | Fixed | discard mortality function slope: handline east |
| DiscMort_1P_3_HL_E | 0.75 | _ | 0.75 | -1 | 2 | No_prior | | | Fixed | discard mortality function asymptote: handline east |
| DiscMort_1P_4_HL_E | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | discard mortality function gender param: handline east |
| Retain_2P_1_HL_W | 15.24 | _ | 15.24 | 10 | 100 | No_prior | | | Fixed | retention function inflection point: handline west |

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|---|---|---|---|---|---|---|---|---|---|---|
| Retain_2P_2_HL_W | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | retention function slope: handline west |
| Retain_2P_3_HL_W | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | retention function asymptote: handline west |
| Retain_2P_4_HL_W | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | retention function gender param: handline west |
| DiscMort_2P_1_HL_W | -5 | _ | -5 | -10 | 10 | No_prior | | | Fixed | discard mortality function inflection point: handline west |
| DiscMort_2P_2_HL_W | 1 | _ | 1 | -1 | 2 | No_prior | | | Fixed | discard mortality function slope: handline west |
| DiscMort_2P_3_HL_W | 0.78 | _ | 0.78 | -1 | 2 | No_prior | | | Fixed | discard mortality function asymptote: handline west |
| DiscMort_2P_4_HL_W | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | discard mortality function gender param: handline west |
| Retain_3P_1_LL_E | 15.24 | _ | 15.24 | 10 | 100 | No_prior | | | Fixed | retention function inflection point: longline east |
| Retain_3P_2_LL_E | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | retention function slope: longline east |
| Retain_3P_3_LL_E | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | retention function asymptote: longline east |
| Retain_3P_4_LL_E | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | retention function gender param: longline east |
| DiscMort_3P_1_LL_E | -5 | _ | -5 | -10 | 10 | No_prior | | | Fixed | discard mortality function inflection point: longline east |
| DiscMort_3P_2_LL_E | 1 | _ | 1 | -1 | 2 | No_prior | | | Fixed | discard mortality function slope: longline east |
| DiscMort_3P_3_LL_E | 0.81 | _ | 0.81 | -1 | 2 | No_prior | | | Fixed | discard mortality function asymptote: longline east |
| DiscMort_3P_4_LL_E | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | discard mortality function gender param: longline east |
| Retain_4P_1_LL_W | 15.24 | _ | 15.24 | 10 | 100 | No_prior | | | Fixed | retention function inflection point: longline west |
| Retain_4P_2_LL_W | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | retention function slope: longline west |
| Retain_4P_3_LL_W | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | retention function asymptote: longline west |
| Retain_4P_4_LL_W | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | retention function gender param: longline west |
| DiscMort_4P_1_LL_W | -5 | _ | -5 | -10 | 10 | No_prior | | | Fixed | discard mortality function inflection point: longline west |
| DiscMort_4P_2_LL_W | 1 | _ | 1 | -1 | 2 | No_prior | | | Fixed | discard mortality function slope: longline west |
| DiscMort_4P_3_LL_W | 0.91 | _ | 0.91 | -1 | 2 | No_prior | | | Fixed | discard mortality function asymptote: longline west |

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|---|---|---|---|---|---|---|---|---|---|---|
| DiscMort_4P_4_LL_W | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | discard mortality function gender param: longline west |
| Retain_5P_1_MRIP_E | 15.24 | _ | 15.24 | 10 | 100 | No_prior | | | Fixed | retention function inflection point: charter/for hire east |
| Retain_5P_2_MRIP_E | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | retention function slope: charter/for hire east |
| Retain_5P_3_MRIP_E | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | retention function asymptote: charter/for hire east |
| Retain_5P_4_MRIP_E | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | retention function gender param: charter/for hire east |
| DiscMort_5P_1_MRIP_E | -5 | _ | -5 | -10 | 10 | No_prior | | | Fixed | discard mortality function inflection point: charter/for hire east |
| DiscMort_5P_2_MRIP_E | 1 | _ | 1 | -1 | 2 | No_prior | | | Fixed | discard mortality function slope: charter/for hire east |
| DiscMort_5P_3_MRIP_E | 0.21 | _ | 0.21 | -1 | 2 | No_prior | | | Fixed | discard mortality function asymptote: charter/for hire east |
| DiscMort_5P_4_MRIP_E | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | discard mortality function gender param: charter/for hire east |
| Retain_6P_1_MRIP_W | 15.24 | _ | 15.24 | 10 | 100 | No_prior | | | Fixed | retention function inflection point: charter/for hire west |
| Retain_6P_2_MRIP_W | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | retention function slope: charter/for hire west |
| Retain_6P_3_MRIP_W | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | retention function asymptote: charter/for hire west |
| Retain_6P_4_MRIP_W | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | retention function gender param: charter/for hire west |
| DiscMort_6P_1_MRIP_W | -5 | _ | -5 | -10 | 10 | No_prior | | | Fixed | discard mortality function inflection point: charter/for hire west |
| DiscMort_6P_2_MRIP_W | 1 | _ | 1 | -1 | 2 | No_prior | | | Fixed | discard mortality function slope: charter/for hire west |
| DiscMort_6P_3_MRIP_W | 0.22 | _ | 0.22 | -1 | 2 | No_prior | | | Fixed | discard mortality function asymptote: charter/for hire west |
| DiscMort_6P_4_MRIP_W | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | discard mortality function gender param: charter/for hire west |
| Retain_7P_1_HBT_E | 15.24 | _ | 15.24 | 10 | 100 | No_prior | | | Fixed | retention function inflection point: headboat east |
| Retain_7P_2_HBT_E | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | retention function slope: headboat east |

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|---|---|---|---|---|---|---|---|---|---|---|
| Retain_7P_3_HBT_E | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | retention function asymptote: headboat east |
| Retain_7P_4_HBT_E | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | retention function gender param: headboat east |
| DiscMort_7P_1_HBT_E | -5 | _ | -5 | -10 | 10 | No_prior | | | Fixed | discard mortality function inflection point: headboat east |
| DiscMort_7P_2_HBT_E | 1 | _ | 1 | -1 | 2 | No_prior | | | Fixed | discard mortality function slope: headboat east |
| DiscMort_7P_3_HBT_E | 0.21 | _ | 0.21 | -1 | 2 | No_prior | | | Fixed | discard mortality function asymptote: headboat east |
| DiscMort_7P_4_HBT_E | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | discard mortality function gender param: headboat east |
| Retain_8P_1_HBT_W | 15.24 | _ | 15.24 | 10 | 100 | No_prior | | | Fixed | retention function inflection point: headboat west |
| Retain_8P_2_HBT_W | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | retention function slope: headboat west |
| Retain_8P_3_HBT_W | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | retention function asymptote: headboat west |
| Retain_8P_4_HBT_W | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | retention function gender param: headboat west |
| DiscMort_8P_1_HBT_W | -5 | _ | -5 | -10 | 10 | No_prior | | | Fixed | discard mortality function inflection point: headboat west |
| DiscMort_8P_2_HBT_W | 1 | _ | 1 | -1 | 2 | No_prior | | | Fixed | discard mortality function slope: headboat west |
| DiscMort_8P_3_HBT_W | 0.22 | _ | 0.22 | -1 | 2 | No_prior | | | Fixed | discard mortality function asymptote: headboat west |
| DiscMort_8P_4_HBT_W | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | discard mortality function gender param: headboat west |
| Retain_9P_1_C_Clsd_E | 10 | _ | 10 | 10 | 100 | No_prior | | | Fixed | retention function inflection point: commercial closed season east |
| Retain_9P_2_C_Clsd_E | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | retention function slope: commercial closed season east |
| Retain_9P_3_C_Clsd_E | 0 | _ | 0 | 0 | 1 | No_prior | | | Fixed | retention function asymptote: commercial closed season east |
| Retain_9P_4_C_Clsd_E | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | retention function gender param: commercial closed season east |
| DiscMort_9P_1_C_Clsd_E | -5 | _ | -5 | -10 | 10 | No_prior | | | Fixed | discard mortality function inflection point: commercial closed season east |
| DiscMort_9P_2_C_Clsd_E | 1 | _ | 1 | -1 | 2 | No_prior | | | Fixed | discard mortality function slope: commercial closed season east |

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|---|---|---|---|---|---|---|---|---|---|---|
| DiscMort_9P_3_C_Clsd_E | 0.74 | _ | 0.74 | -1 | 2 | No_prior | | | Fixed | discard mortality function asymptote: commercial closed season east |
| DiscMort_9P_4_C_Clsd_E | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | discard mortality function gender param: commercial closed season east |
| Retain_10P_1_C_Clsd_W | 10 | _ | 10 | 10 | 100 | No_prior | | | Fixed | retention function inflection point: commercial closed season west |
| Retain_10P_2_C_Clsd_W | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | retention function slope: commercial closed season west |
| Retain_10P_3_C_Clsd_W | 0 | _ | 0 | 0 | 1 | No_prior | | | Fixed | retention function asymptote: commercial closed season west |
| Retain_10P_4_C_Clsd_W | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | retention function gender param: commercial closed season west |
| DiscMort_10P_1_C_Clsd_W | -5 | _ | -5 | -10 | 10 | No_prior | | | Fixed | discard mortality function inflection point: commercial closed season west |
| DiscMort_10P_2_C_Clsd_W | 1 | _ | 1 | -1 | 2 | No_prior | | | Fixed | discard mortality function slope: commercial closed season west |
| DiscMort_10P_3_C_Clsd_W | 0.87 | _ | 0.87 | -1 | 2 | No_prior | | | Fixed | discard mortality function asymptote: commercial closed season west |
| DiscMort_10P_4_C_Clsd_W | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | discard mortality function gender param: commercial closed season west |
| Retain_11P_1_R_Clsd_E | 10 | _ | 10 | 10 | 100 | No_prior | | | Fixed | retention function inflection point: recreational closed season east |
| Retain_11P_2_R_Clsd_E | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | retention function slope: recreational closed season east |
| Retain_11P_3_R_Clsd_E | 0 | _ | 0 | 0 | 1 | No_prior | | | Fixed | retention function asymptote: recreational closed season east |
| Retain_11P_4_R_Clsd_E | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | retention function gender param: recreational closed season east |
| DiscMort_11P_1_R_Clsd_E | -5 | _ | -5 | -10 | 10 | No_prior | | | Fixed | discard mortality function inflection point: recreational closed season east |
| DiscMort_11P_2_R_Clsd_E | 1 | _ | 1 | -1 | 2 | No_prior | | | Fixed | discard mortality function slope: recreational closed season east |
| DiscMort_11P_3_R_Clsd_E | 0.21 | _ | 0.21 | -1 | 2 | No_prior | | | Fixed | discard mortality function asymptote: recreational closed |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | season east |
| DiscMort_11P_4_R_Clsd_E | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | discard mortality function gender param: recreational closed season east |
| Retain_12P_1_R_Clsd_W | 10 | _ | 10 | 10 | 100 | No_prior | | | Fixed | retention function inflection point: recreational closed season west |
| Retain_12P_2_R_Clsd_W | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | retention function slope: recreational closed season west |
| Retain_12P_3_R_Clsd_W | 0 | _ | 0 | 0 | 1 | No_prior | | | Fixed | retention function asymptote: recreational closed season west |
| Retain_12P_4_R_Clsd_W | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | retention function gender param: recreational closed season west |
| DiscMort_12P_1_R_Clsd_W | -5 | _ | -5 | -10 | 10 | No_prior | | | Fixed | discard mortality function inflection point: recreational closed season west |
| DiscMort_12P_2_R_Clsd_W | 1 | _ | 1 | -1 | 2 | No_prior | | | Fixed | discard mortality function slope: recreational closed season west |
| DiscMort_12P_3_R_Clsd_W | 0.22 | _ | 0.22 | -1 | 2 | No_prior | | | Fixed | discard mortality function asymptote: recreational closed season west |
| DiscMort_12P_4_R_Clsd_W | 0 | _ | 0 | -1 | 2 | No_prior | | | Fixed | discard mortality function gender param: recreational closed season west |
| AgeSel_1P_1_HL_E | -1000 | _ | -1000 | -1 | 1 | No_prior | | | Fixed | Age 0 selectivity parameter: handline east |
| AgeSel_1P_2_HL_E | -0.00315602 | 22.3571 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 1 selectivity parameter: handline east |
| AgeSel_1P_3_HL_E | 1 | 1.99E-05 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 2 selectivity parameter: handline east |
| AgeSel_1P_4_HL_E | 0.543361 | 0.0613635 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 3 selectivity parameter: handline east |
| AgeSel_1P_5_HL_E | 0.0960119 | 0.0592435 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 4 selectivity parameter: handline east |
| AgeSel_1P_6_HL_E | -0.0871693 | 0.0879676 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 5 selectivity parameter: handline east |
| AgeSel_1P_7_HL_E | -0.350256 | 0.127831 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 6 selectivity parameter: handline east |
| AgeSel_1P_8_HL_E | -0.300772 | 0.188091 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 7 selectivity parameter: handline east |
| AgeSel_1P_9_HL_E | -0.823869 | 0.314101 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 8 selectivity parameter: handline east |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_1P_10_HL_E | -0.530573 | 0.341458 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 9 selectivity parameter: handline east |
| AgeSel_1P_11_HL_E | -0.999236 | 0.0529937 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 10 selectivity parameter: handline east |
| AgeSel_1P_12_HL_E | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 11 selectivity parameter: handline east |
| AgeSel_1P_13_HL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 12 selectivity parameter: handline east |
| AgeSel_1P_14_HL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 13 selectivity parameter: handline east |
| AgeSel_1P_15_HL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 14 selectivity parameter: handline east |
| AgeSel_1P_16_HL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 15 selectivity parameter: handline east |
| AgeSel_1P_17_HL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 16 selectivity parameter: handline east |
| AgeSel_1P_18_HL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 17 selectivity parameter: handline east |
| AgeSel_1P_19_HL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 18 selectivity parameter: handline east |
| AgeSel_1P_20_HL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 19 selectivity parameter: handline east |
| AgeSel_1P_21_HL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 20 selectivity parameter: handline east |
| AgeSel_2P_1_HL_W | -1000 | _ | -1000 | -1 | 1 | No_prior | | | Fixed | Age 0 selectivity parameter: handline west |
| AgeSel_2P_2_HL_W | -0.00315602 | 22.3571 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 1 selectivity parameter: handline west |
| AgeSel_2P_3_HL_W | 1 | 5.59E-05 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 2 selectivity parameter: handline west |
| AgeSel_2P_4_HL_W | 0.999936 | 0.00528502 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 3 selectivity parameter: handline west |
| AgeSel_2P_5_HL_W | 0.0446502 | 0.0504074 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 4 selectivity parameter: handline west |
| AgeSel_2P_6_HL_W | -0.352663 | 0.0654265 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 5 selectivity parameter: handline west |
| AgeSel_2P_7_HL_W | -0.534541 | 0.0949369 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 6 selectivity parameter: handline west |
| AgeSel_2P_8_HL_W | -0.489301 | 0.139028 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 7 selectivity parameter: handline west |
| AgeSel_2P_9_HL_W | -0.807097 | 0.173301 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 8 selectivity parameter: handline west |
| AgeSel_2P_10_HL_W | -0.999931 | 0.00462777 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 9 selectivity parameter: handline west |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_2P_11_HL_W | -0.999975 | 0.00305152 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 10 selectivity parameter: handline west |
| AgeSel_2P_12_HL_W | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 11 selectivity parameter: handline west |
| AgeSel_2P_13_HL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 12 selectivity parameter: handline west |
| AgeSel_2P_14_HL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 13 selectivity parameter: handline west |
| AgeSel_2P_15_HL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 14 selectivity parameter: handline west |
| AgeSel_2P_16_HL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 15 selectivity parameter: handline west |
| AgeSel_2P_17_HL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 16 selectivity parameter: handline west |
| AgeSel_2P_18_HL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 17 selectivity parameter: handline west |
| AgeSel_2P_19_HL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 18 selectivity parameter: handline west |
| AgeSel_2P_20_HL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 19 selectivity parameter: handline west |
| AgeSel_2P_21_HL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 20 selectivity parameter: handline west |
| AgeSel_3P_1_LL_E | -1000 | _ | -1000 | -1 | 1 | No_prior | | | Fixed | Age 0 selectivity parameter: longline east |
| AgeSel_3P_2_LL_E | -0.00315602 | 22.3571 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 1 selectivity parameter: longline east |
| AgeSel_3P_3_LL_E | 0.113351 | 0.17104 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 2 selectivity parameter: longline east |
| AgeSel_3P_4_LL_E | 0.999912 | 0.00593842 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 3 selectivity parameter: longline east |
| AgeSel_3P_5_LL_E | 1 | 6.90E-05 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 4 selectivity parameter: longline east |
| AgeSel_3P_6_LL_E | 0.665686 | 0.089297 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 5 selectivity parameter: longline east |
| AgeSel_3P_7_LL_E | 0.122202 | 0.0986968 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 6 selectivity parameter: longline east |
| AgeSel_3P_8_LL_E | -0.524416 | 0.135892 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 7 selectivity parameter: longline east |
| AgeSel_3P_9_LL_E | -0.632861 | 0.216846 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 8 selectivity parameter: longline east |
| AgeSel_3P_10_LL_E | -0.234189 | 0.290326 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 9 selectivity parameter: longline east |
| AgeSel_3P_11_LL_E | -0.846953 | 0.272084 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 10 selectivity parameter: longline east |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_3P_12_LL_E | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 11 selectivity parameter: longline east |
| AgeSel_3P_13_LL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 12 selectivity parameter: longline east |
| AgeSel_3P_14_LL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 13 selectivity parameter: longline east |
| AgeSel_3P_15_LL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 14 selectivity parameter: longline east |
| AgeSel_3P_16_LL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 15 selectivity parameter: longline east |
| AgeSel_3P_17_LL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 16 selectivity parameter: longline east |
| AgeSel_3P_18_LL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 17 selectivity parameter: longline east |
| AgeSel_3P_19_LL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 18 selectivity parameter: longline east |
| AgeSel_3P_20_LL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 19 selectivity parameter: longline east |
| AgeSel_3P_21_LL_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 20 selectivity parameter: longline east |
| AgeSel_4P_1_LL_W | -1000 | _ | -1000 | -1 | 1 | No_prior | | | Fixed | Age 0 selectivity parameter: longline west |
| AgeSel_4P_2_LL_W | -0.00315602 | 22.3571 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 1 selectivity parameter: longline west |
| AgeSel_4P_3_LL_W | 0.99987 | 0.00731612 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 2 selectivity parameter: longline west |
| AgeSel_4P_4_LL_W | 0.674579 | 0.166743 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 3 selectivity parameter: longline west |
| AgeSel_4P_5_LL_W | 0.532203 | 0.137479 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 4 selectivity parameter: longline west |
| AgeSel_4P_6_LL_W | 0.780619 | 0.115079 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 5 selectivity parameter: longline west |
| AgeSel_4P_7_LL_W | 0.130948 | 0.104984 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 6 selectivity parameter: longline west |
| AgeSel_4P_8_LL_W | 0.242926 | 0.106378 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 7 selectivity parameter: longline west |
| AgeSel_4P_9_LL_W | 0.108017 | 0.106576 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 8 selectivity parameter: longline west |
| AgeSel_4P_10_LL_W | -0.296366 | 0.118945 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 9 selectivity parameter: longline west |
| AgeSel_4P_11_LL_W | -0.276121 | 0.103016 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 10 selectivity parameter: longline west |
| AgeSel_4P_12_LL_W | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 11 selectivity parameter: longline west |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_4P_13_LL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 12 selectivity parameter: longline west |
| AgeSel_4P_14_LL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 13 selectivity parameter: longline west |
| AgeSel_4P_15_LL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 14 selectivity parameter: longline west |
| AgeSel_4P_16_LL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 15 selectivity parameter: longline west |
| AgeSel_4P_17_LL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 16 selectivity parameter: longline west |
| AgeSel_4P_18_LL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 17 selectivity parameter: longline west |
| AgeSel_4P_19_LL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 18 selectivity parameter: longline west |
| AgeSel_4P_20_LL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 19 selectivity parameter: longline west |
| AgeSel_4P_21_LL_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 20 selectivity parameter: longline west |
| AgeSel_5P_1_MRIP_E | -1000 | _ | -1000 | -1 | 1 | No_prior | | | Fixed | Age 0 selectivity parameter: charter/for hire east |
| AgeSel_5P_2_MRIP_E | -0.00315602 | 22.3571 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 1 selectivity parameter: charter/for hire east |
| AgeSel_5P_3_MRIP_E | 1 | 1.54E-06 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 2 selectivity parameter: charter/for hire east |
| AgeSel_5P_4_MRIP_E | -0.12259 | 0.0474221 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 3 selectivity parameter: charter/for hire east |
| AgeSel_5P_5_MRIP_E | -0.352851 | 0.0550106 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 4 selectivity parameter: charter/for hire east |
| AgeSel_5P_6_MRIP_E | -0.566584 | 0.100657 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 5 selectivity parameter: charter/for hire east |
| AgeSel_5P_7_MRIP_E | -0.549516 | 0.166571 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 6 selectivity parameter: charter/for hire east |
| AgeSel_5P_8_MRIP_E | -0.566939 | 0.219007 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 7 selectivity parameter: charter/for hire east |
| AgeSel_5P_9_MRIP_E | -0.999906 | 0.00608141 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 8 selectivity parameter: charter/for hire east |
| AgeSel_5P_10_MRIP_E | -0.999932 | 0.00541889 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 9 selectivity parameter: charter/for hire east |
| AgeSel_5P_11_MRIP_E | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 10 selectivity parameter: charter/for hire east |
| AgeSel_5P_12_MRIP_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 11 selectivity parameter: charter/for hire east |
| AgeSel_5P_13_MRIP_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 12 selectivity parameter: charter/for hire east |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_5P_14_MRIP_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 13 selectivity parameter: charter/for hire east |
| AgeSel_5P_15_MRIP_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 14 selectivity parameter: charter/for hire east |
| AgeSel_5P_16_MRIP_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 15 selectivity parameter: charter/for hire east |
| AgeSel_5P_17_MRIP_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 16 selectivity parameter: charter/for hire east |
| AgeSel_5P_18_MRIP_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 17 selectivity parameter: charter/for hire east |
| AgeSel_5P_19_MRIP_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 18 selectivity parameter: charter/for hire east |
| AgeSel_5P_20_MRIP_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 19 selectivity parameter: charter/for hire east |
| AgeSel_5P_21_MRIP_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 20 selectivity parameter: charter/for hire east |
| AgeSel_6P_1_MRIP_W | -1000 | _ | -1000 | -1 | 1 | No_prior | | | Fixed | Age 0 selectivity parameter: charter/for hire west |
| AgeSel_6P_2_MRIP_W | -0.00315602 | 22.3571 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 1 selectivity parameter: charter/for hire west |
| AgeSel_6P_3_MRIP_W | 1 | 1.70E-05 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 2 selectivity parameter: charter/for hire west |
| AgeSel_6P_4_MRIP_W | -0.411827 | 0.060717 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 3 selectivity parameter: charter/for hire west |
| AgeSel_6P_5_MRIP_W | -0.755365 | 0.0650165 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 4 selectivity parameter: charter/for hire west |
| AgeSel_6P_6_MRIP_W | -0.75844 | 0.108715 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 5 selectivity parameter: charter/for hire west |
| AgeSel_6P_7_MRIP_W | -0.419745 | 0.164081 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 6 selectivity parameter: charter/for hire west |
| AgeSel_6P_8_MRIP_W | -0.593414 | 0.19157 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 7 selectivity parameter: charter/for hire west |
| AgeSel_6P_9_MRIP_W | -0.999471 | 0.0207485 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 8 selectivity parameter: charter/for hire west |
| AgeSel_6P_10_MRIP_W | -0.999965 | 0.00449514 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 9 selectivity parameter: charter/for hire west |
| AgeSel_6P_11_MRIP_W | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 10 selectivity parameter: charter/for hire west |
| AgeSel_6P_12_MRIP_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 11 selectivity parameter: charter/for hire west |
| AgeSel_6P_13_MRIP_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 12 selectivity parameter: charter/for hire west |
| AgeSel_6P_14_MRIP_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 13 selectivity parameter: charter/for hire west |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_6P_15_MRIP_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 14 selectivity parameter: charter/for hire west |
| AgeSel_6P_16_MRIP_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 15 selectivity parameter: charter/for hire west |
| AgeSel_6P_17_MRIP_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 16 selectivity parameter: charter/for hire west |
| AgeSel_6P_18_MRIP_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 17 selectivity parameter: charter/for hire west |
| AgeSel_6P_19_MRIP_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 18 selectivity parameter: charter/for hire west |
| AgeSel_6P_20_MRIP_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 19 selectivity parameter: charter/for hire west |
| AgeSel_6P_21_MRIP_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 20 selectivity parameter: charter/for hire west |
| AgeSel_7P_1_HBT_E | -1000 | _ | -1000 | -1 | 1 | No_prior | | | Fixed | Age 0 selectivity parameter: headboat east |
| AgeSel_7P_2_HBT_E | -0.00315602 | 22.3571 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 1 selectivity parameter: headboat east |
| AgeSel_7P_3_HBT_E | 1 | 1.19E-06 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 2 selectivity parameter: headboat east |
| AgeSel_7P_4_HBT_E | 0.465736 | 0.0560667 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 3 selectivity parameter: headboat east |
| AgeSel_7P_5_HBT_E | -0.46735 | 0.0630827 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 4 selectivity parameter: headboat east |
| AgeSel_7P_6_HBT_E | -0.776352 | 0.12185 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 5 selectivity parameter: headboat east |
| AgeSel_7P_7_HBT_E | -0.813035 | 0.23978 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 6 selectivity parameter: headboat east |
| AgeSel_7P_8_HBT_E | -0.5539 | 0.340327 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 7 selectivity parameter: headboat east |
| AgeSel_7P_9_HBT_E | -0.998202 | 0.0595537 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 8 selectivity parameter: headboat east |
| AgeSel_7P_10_HBT_E | -0.99961 | 0.0154368 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 9 selectivity parameter: headboat east |
| AgeSel_7P_11_HBT_E | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 10 selectivity parameter: headboat east |
| AgeSel_7P_12_HBT_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 11 selectivity parameter: headboat east |
| AgeSel_7P_13_HBT_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 12 selectivity parameter: headboat east |
| AgeSel_7P_14_HBT_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 13 selectivity parameter: headboat east |
| AgeSel_7P_15_HBT_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 14 selectivity parameter: headboat east |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_7P_16_HBT_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 15 selectivity parameter: headboat east |
| AgeSel_7P_17_HBT_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 16 selectivity parameter: headboat east |
| AgeSel_7P_18_HBT_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 17 selectivity parameter: headboat east |
| AgeSel_7P_19_HBT_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 18 selectivity parameter: headboat east |
| AgeSel_7P_20_HBT_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 19 selectivity parameter: headboat east |
| AgeSel_7P_21_HBT_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 20 selectivity parameter: headboat east |
| AgeSel_8P_1_HBT_W | -1000 | _ | -1000 | -1 | 1 | No_prior | | | Fixed | Age 0 selectivity parameter: headboat west |
| AgeSel_8P_2_HBT_W | -0.00315602 | 22.3571 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 1 selectivity parameter: headboat west |
| AgeSel_8P_3_HBT_W | 1 | 7.62E-06 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 2 selectivity parameter: headboat west |
| AgeSel_8P_4_HBT_W | -0.217663 | 0.062671 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 3 selectivity parameter: headboat west |
| AgeSel_8P_5_HBT_W | -0.630776 | 0.0607678 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 4 selectivity parameter: headboat west |
| AgeSel_8P_6_HBT_W | -0.694752 | 0.093233 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 5 selectivity parameter: headboat west |
| AgeSel_8P_7_HBT_W | -0.475739 | 0.140687 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 6 selectivity parameter: headboat west |
| AgeSel_8P_8_HBT_W | -0.698763 | 0.173562 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 7 selectivity parameter: headboat west |
| AgeSel_8P_9_HBT_W | -0.99931 | 0.0242857 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 8 selectivity parameter: headboat west |
| AgeSel_8P_10_HBT_W | -0.999878 | 0.00691998 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 9 selectivity parameter: headboat west |
| AgeSel_8P_11_HBT_W | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 10 selectivity parameter: headboat west |
| AgeSel_8P_12_HBT_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 11 selectivity parameter: headboat west |
| AgeSel_8P_13_HBT_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 12 selectivity parameter: headboat west |
| AgeSel_8P_14_HBT_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 13 selectivity parameter: headboat west |
| AgeSel_8P_15_HBT_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 14 selectivity parameter: headboat west |
| AgeSel_8P_16_HBT_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 15 selectivity parameter: headboat west |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_8P_17_HBT_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 16 selectivity parameter: headboat west |
| AgeSel_8P_18_HBT_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 17 selectivity parameter: headboat west |
| AgeSel_8P_19_HBT_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 18 selectivity parameter: headboat west |
| AgeSel_8P_20_HBT_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 19 selectivity parameter: headboat west |
| AgeSel_8P_21_HBT_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 20 selectivity parameter: headboat west |
| AgeSel_9P_1_C_Clsd_E | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 0 selectivity parameter: commercial closed season east |
| AgeSel_9P_2_C_Clsd_E | 0.999974 | 0.00410778 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 1 selectivity parameter: commercial closed season east |
| AgeSel_9P_3_C_Clsd_E | 1 | 6.91E-06 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 2 selectivity parameter: commercial closed season east |
| AgeSel_9P_4_C_Clsd_E | 1 | 6.92E-06 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 3 selectivity parameter: commercial closed season east |
| AgeSel_9P_5_C_Clsd_E | 0.765071 | 0.0885048 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 4 selectivity parameter: commercial closed season east |
| AgeSel_9P_6_C_Clsd_E | -0.215691 | 0.103738 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 5 selectivity parameter: commercial closed season east |
| AgeSel_9P_7_C_Clsd_E | -0.441015 | 0.147885 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 6 selectivity parameter: commercial closed season east |
| AgeSel_9P_8_C_Clsd_E | -0.634294 | 0.229995 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 7 selectivity parameter: commercial closed season east |
| AgeSel_9P_9_C_Clsd_E | -0.600937 | 0.397522 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 8 selectivity parameter: commercial closed season east |
| AgeSel_9P_10_C_Clsd_E | -0.474065 | 0.635758 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 9 selectivity parameter: commercial closed season east |
| AgeSel_9P_11_C_Clsd_E | -0.70737 | 0.70644 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 10 selectivity parameter: commercial closed season east |
| AgeSel_9P_12_C_Clsd_E | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 11 selectivity parameter: commercial closed season east |
| AgeSel_9P_13_C_Clsd_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 12 selectivity parameter: commercial closed season east |
| AgeSel_9P_14_C_Clsd_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 13 selectivity parameter: commercial closed season east |
| AgeSel_9P_15_C_Clsd_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 14 selectivity parameter: commercial closed season east |
| AgeSel_9P_16_C_Clsd_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 15 selectivity parameter: commercial closed season east |
| AgeSel_9P_17_C_Clsd_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 16 selectivity parameter: commercial closed season east |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_9P_18_C_Clsd_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 17 selectivity parameter: commercial closed season east |
| AgeSel_9P_19_C_Clsd_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 18 selectivity parameter: commercial closed season east |
| AgeSel_9P_20_C_Clsd_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 19 selectivity parameter: commercial closed season east |
| AgeSel_9P_21_C_Clsd_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 20 selectivity parameter: commercial closed season east |
| AgeSel_10P_1_C_Clsd_W | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 0 selectivity parameter: commercial closed season west |
| AgeSel_10P_2_C_Clsd_W | 0.998667 | 0.0453961 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 1 selectivity parameter: commercial closed season west |
| AgeSel_10P_3_C_Clsd_W | 1 | 0.000358127 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 2 selectivity parameter: commercial closed season west |
| AgeSel_10P_4_C_Clsd_W | 1 | 6.89E-05 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 3 selectivity parameter: commercial closed season west |
| AgeSel_10P_5_C_Clsd_W | 0.984707 | 0.201008 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 4 selectivity parameter: commercial closed season west |
| AgeSel_10P_6_C_Clsd_W | -0.0228919 | 0.226387 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 5 selectivity parameter: commercial closed season west |
| AgeSel_10P_7_C_Clsd_W | -0.111809 | 0.268572 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 6 selectivity parameter: commercial closed season west |
| AgeSel_10P_8_C_Clsd_W | -0.0180057 | 0.334885 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 7 selectivity parameter: commercial closed season west |
| AgeSel_10P_9_C_Clsd_W | 0.108348 | 0.434606 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 8 selectivity parameter: commercial closed season west |
| AgeSel_10P_10_C_Clsd_W | 0.161171 | 0.546352 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 9 selectivity parameter: commercial closed season west |
| AgeSel_10P_11_C_Clsd_W | -0.673356 | 0.46831 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 10 selectivity parameter: commercial closed season west |
| AgeSel_10P_12_C_Clsd_W | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 11 selectivity parameter: commercial closed season west |
| AgeSel_10P_13_C_Clsd_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 12 selectivity parameter: commercial closed season west |
| AgeSel_10P_14_C_Clsd_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 13 selectivity parameter: commercial closed season west |
| AgeSel_10P_15_C_Clsd_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 14 selectivity parameter: commercial closed season west |
| AgeSel_10P_16_C_Clsd_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 15 selectivity parameter: commercial closed season west |
| AgeSel_10P_17_C_Clsd_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 16 selectivity parameter: commercial closed season west |
| AgeSel_10P_18_C_Clsd_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 17 selectivity parameter: commercial closed season west |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_10P_19_C_Clsd_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 18 selectivity parameter: commercial closed season west |
| AgeSel_10P_20_C_Clsd_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 19 selectivity parameter: commercial closed season west |
| AgeSel_10P_21_C_Clsd_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 20 selectivity parameter: commercial closed season west |
| AgeSel_13P_1_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 0 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_2_Shr_E | -3.32043 | 0.0500899 | -0.1 | -20 | 20 | No_prior | | | Estimated | Age 1 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_3_Shr_E | -1.29713 | 0.15144 | -0.1 | -20 | 20 | No_prior | | | Estimated | Age 2 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_4_Shr_E | -15.1764 | 292.117 | -20 | -30 | 0 | No_prior | | | Estimated | Age 3 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_5_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 4 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_6_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 5 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_7_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 6 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_8_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 7 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_9_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 8 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_10_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 9 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_11_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 10 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_12_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 11 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_13_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 12 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_14_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 13 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_15_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 14 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_16_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 15 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_17_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 16 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_18_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 17 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_19_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 18 selectivity parameter: shrimp bycatch east |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_13P_20_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 19 selectivity parameter: shrimp bycatch east |
| AgeSel_13P_21_Shr_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 20 selectivity parameter: shrimp bycatch east |
| AgeSel_14P_1_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 0 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_2_Shr_W | -2.72043 | 0.043767 | -0.1 | -20 | 20 | No_prior | | | Estimated | Age 1 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_3_Shr_W | -1.53246 | 0.14477 | -0.1 | -20 | 20 | No_prior | | | Estimated | Age 2 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_4_Shr_W | -14.8535 | 335.577 | -20 | -30 | 0 | No_prior | | | Estimated | Age 3 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_5_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 4 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_6_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 5 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_7_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 6 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_8_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 7 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_9_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 8 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_10_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 9 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_11_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 10 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_12_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 11 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_13_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 12 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_14_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 13 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_15_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 14 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_16_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 15 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_17_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 16 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_18_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 17 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_19_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 18 selectivity parameter: shrimp bycatch west |
| AgeSel_14P_20_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 19 selectivity parameter: shrimp bycatch west |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_14P_21_Shr_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 20 selectivity parameter: shrimp bycatch west |
| AgeSel_15P_1_Video_E | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 0 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_2_Video_E | 0.999651 | 0.0142041 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 1 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_3_Video_E | 1 | 2.56E-05 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 2 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_4_Video_E | 1 | 0.000327731 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 3 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_5_Video_E | 0.232265 | 0.158787 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 4 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_6_Video_E | -0.284238 | 0.191135 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 5 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_7_Video_E | -0.462274 | 0.264594 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 6 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_8_Video_E | -0.602096 | 0.405285 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 7 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_9_Video_E | -0.544028 | 0.668815 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 8 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_10_Video_E | -0.0733812 | 0.721838 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 9 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_11_Video_E | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 10 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_12_Video_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 11 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_13_Video_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 12 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_14_Video_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 13 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_15_Video_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 14 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_16_Video_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 15 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_17_Video_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 16 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_18_Video_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 17 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_19_Video_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 18 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_20_Video_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 19 selectivity parameter: SEAMAP video survey east |
| AgeSel_15P_21_Video_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 20 selectivity parameter: SEAMAP video survey east |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_16P_1_Video_W | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 0 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_2_Video_W | 0.99989 | 0.00664747 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 1 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_3_Video_W | 1 | 3.95E-05 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 2 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_4_Video_W | 0.544662 | 0.191888 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 3 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_5_Video_W | -0.525528 | 0.269726 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 4 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_6_Video_W | -0.413745 | 0.376563 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 5 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_7_Video_W | -0.36468 | 0.532217 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 6 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_8_Video_W | -0.251229 | 0.747811 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 7 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_9_Video_W | 0.145093 | 0.974873 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 8 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_10_Video_W | -0.784928 | 0.877729 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 9 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_11_Video_W | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 10 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_12_Video_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 11 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_13_Video_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 12 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_14_Video_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 13 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_15_Video_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 14 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_16_Video_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 15 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_17_Video_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 16 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_18_Video_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 17 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_19_Video_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 18 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_20_Video_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 19 selectivity parameter: SEAMAP video survey west |
| AgeSel_16P_21_Video_W | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 20 selectivity parameter: SEAMAP video survey west |
| AgeSel_19P_1_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 0 selectivity parameter: SEAMAP summer groundfish |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | east |
| AgeSel_19P_2_Sum_E | 1.21886 | 0.125492 | -0.1 | -20 | 20 | No_prior | | | Estimated | Age 1 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_3_Sum_E | -0.210476 | 0.0667305 | -0.1 | -20 | 20 | No_prior | | | Estimated | Age 2 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_4_Sum_E | -15.8568 | 193.703 | -10 | -30 | 0 | No_prior | | | Estimated | Age 3 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_5_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 4 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_6_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 5 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_7_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 6 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_8_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 7 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_9_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 8 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_10_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 9 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_11_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 10 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_12_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 11 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_13_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 12 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_14_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 13 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_15_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 14 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_16_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 15 selectivity parameter: SEAMAP summer groundfish east |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_19P_17_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 16 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_18_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 17 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_19_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 18 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_20_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 19 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_19P_21_Sum_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 20 selectivity parameter: SEAMAP summer groundfish east |
| AgeSel_20P_1_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 0 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_2_Sum_W | 1.12303 | 0.0632146 | -0.1 | -20 | 20 | No_prior | | | Estimated | Age 1 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_3_Sum_W | -1.02379 | 0.0509979 | -0.1 | -20 | 20 | No_prior | | | Estimated | Age 2 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_4_Sum_W | -15.8496 | 243.575 | -10 | -30 | 0 | No_prior | | | Estimated | Age 3 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_5_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 4 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_6_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 5 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_7_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 6 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_8_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 7 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_9_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 8 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_10_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 9 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_11_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 10 selectivity parameter: SEAMAP summer groundfish |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | west |
| AgeSel_20P_12_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 11 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_13_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 12 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_14_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 13 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_15_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 14 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_16_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 15 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_17_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 16 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_18_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 17 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_19_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 18 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_20_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 19 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_20P_21_Sum_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 20 selectivity parameter: SEAMAP summer groundfish west |
| AgeSel_21P_1_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 0 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_2_Fall_E | -3.75685 | 0.052464 | -0.1 | -20 | 20 | No_prior | | | Estimated | Age 1 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_3_Fall_E | 0.661347 | 0.0812963 | -0.1 | -20 | 20 | No_prior | | | Estimated | Age 2 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_4_Fall_E | -15.7481 | 225.928 | -20 | -30 | 0 | No_prior | | | Estimated | Age 3 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_5_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 4 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_6_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 5 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_7_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 6 selectivity parameter: SEAMAP fall groundfish east |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_21P_8_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 7 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_9_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 8 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_10_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 9 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_11_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 10 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_12_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 11 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_13_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 12 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_14_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 13 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_15_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 14 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_16_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 15 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_17_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 16 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_18_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 17 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_19_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 18 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_20_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 19 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_21P_21_Fall_E | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 20 selectivity parameter: SEAMAP fall groundfish east |
| AgeSel_22P_1_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 0 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_2_Fall_W | -3.40802 | 0.043909 | -0.1 | -20 | 20 | No_prior | | | Estimated | Age 1 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_3_Fall_W | -0.763396 | 0.11052 | -0.1 | -20 | 20 | No_prior | | | Estimated | Age 2 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_4_Fall_W | -15.1075 | 305.244 | -20 | -30 | 0 | No_prior | | | Estimated | Age 3 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_5_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 4 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_6_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 5 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_7_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 6 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_8_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 7 selectivity parameter: SEAMAP fall groundfish west |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_22P_9_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 8 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_10_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 9 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_11_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 10 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_12_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 11 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_13_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 12 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_14_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 13 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_15_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 14 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_16_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 15 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_17_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 16 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_18_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 17 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_19_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 18 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_20_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 19 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_22P_21_Fall_W | 0 | _ | 0 | -20 | 20 | No_prior | | | Fixed | Age 20 selectivity parameter: SEAMAP fall groundfish west |
| AgeSel_23P_1_BLL_W | 4.7426 | 0.10078 | 12 | 4 | 18 | No_prior | | | Estimated | logistic selectivity age at inflection parameter: NMFS bottom longline west |
| AgeSel_23P_2_BLL_W | 1.42954 | 0.07793 | 2 | -1 | 5 | No_prior | | | Estimated | logistic selectivity width at 95% selection parameter: NMFS bottom longline west |
| AgeSel_25P_1_ROV_E | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 0 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_2_ROV_E | 0.999817 | 0.00895002 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 1 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_3_ROV_E | 1 | 1.08E-05 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 2 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_4_ROV_E | 0.277566 | 0.10631 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 3 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_5_ROV_E | -0.999999 | 0.000772903 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 4 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_6_ROV_E | -0.999847 | 0.00797623 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 5 selectivity parameter: Dauphin Is. Lab ROV east |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_25P_7_ROV_E | -0.997666 | 0.0758403 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 6 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_8_ROV_E | -0.937658 | 0.866658 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 7 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_9_ROV_E | -0.379881 | 1.70844 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 8 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_10_ROV_E | 0.430091 | 1.71018 | 0.1 | -1 | 1 | No_prior | | | Estimated | Age 9 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_11_ROV_E | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Age 10 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_12_ROV_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 11 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_13_ROV_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 12 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_14_ROV_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 13 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_15_ROV_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 14 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_16_ROV_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 15 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_17_ROV_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 16 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_18_ROV_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 17 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_19_ROV_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 18 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_20_ROV_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 19 selectivity parameter: Dauphin Is. Lab ROV east |
| AgeSel_25P_21_ROV_E | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Age 20 selectivity parameter: Dauphin Is. Lab ROV east |
| Retain_1P_1_HL_E_BLK1repl_1985 | 33.02 | _ | 33.02 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: handline east, 1985 |
| Retain_1P_1_HL_E_BLK1repl_1994 | 35.56 | _ | 35.56 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: handline east, 1994 |
| Retain_1P_1_HL_E_BLK1repl_1995 | 38.1 | _ | 38.1 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: handline east, 1995 |
| Retain_1P_1_HL_E_BLK1repl_2007 | 27.8804 | 0.766722 | 33.02 | 10 | 100 | No_prior | | | Estimated | Time varying retention function inflection point: handline east, 2007 |
| Retain_1P_2_HL_E_BLK1repl_1985 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: handline east, 1985 |

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|---|---|---|---|---|---|---|---|---|---|---|
| Retain_1P_2_HL_E_BLK1repl_1994 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: handline east, 1994 |
| Retain_1P_2_HL_E_BLK1repl_1995 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: handline east, 1995 |
| Retain_1P_2_HL_E_BLK1repl_2007 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: handline east, 2007 |
| Retain_1P_3_HL_E_BLK1repl_1985 | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | Time varying retention function asymptote: handline east, 1985 |
| Retain_1P_3_HL_E_BLK1repl_1994 | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | Time varying retention function asymptote: handline east, 1994 |
| Retain_1P_3_HL_E_BLK1repl_1995 | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | Time varying retention function asymptote: handline east, 1995 |
| Retain_1P_3_HL_E_BLK1repl_2007 | 0.277538 | 0.0255538 | 0.5 | 0 | 1 | No_prior | | | Estimated | Time varying retention function asymptote: handline east, 2007 |
| DiscMort_1P_3_HL_E_BLK4repl_2008 | 0.56 | _ | 0.56 | -1 | 2 | No_prior | | | Fixed | Time varying discard mortality function asymptote: handline east, 2008 |
| Retain_2P_1_HL_W_BLK1repl_1985 | 33.02 | _ | 33.02 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: handline west, 1985 |
| Retain_2P_1_HL_W_BLK1repl_1994 | 35.56 | _ | 35.56 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: handline west, 1994 |
| Retain_2P_1_HL_W_BLK1repl_1995 | 38.1 | _ | 38.1 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: handline west, 1995 |
| Retain_2P_1_HL_W_BLK1repl_2007 | 39.2785 | 0.463259 | 33.02 | 10 | 100 | No_prior | | | Estimated | Time varying retention function inflection point: handline west, 2007 |
| Retain_2P_2_HL_W_BLK1repl_1985 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: handline west, 1985 |
| Retain_2P_2_HL_W_BLK1repl_1994 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: handline west, 1994 |
| Retain_2P_2_HL_W_BLK1repl_1995 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: handline west, 1995 |
| Retain_2P_2_HL_W_BLK1repl_2007 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: handline west, 2007 |
| Retain_2P_3_HL_W_BLK1repl_1985 | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | Time varying retention function asymptote: handline west, 1985 |
| Retain_2P_3_HL_W_BLK1repl_1994 | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | Time varying retention function asymptote: handline west, 1994 |
| Retain_2P_3_HL_W_BLK1repl_1995 | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | Time varying retention function asymptote: handline west, |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 1995 |
| Retain_2P_3_HL_W_BLK1repl_2007 | 0.594586 | 0.0353754 | 0.5 | 0 | 1 | No_prior | | | Estimated | Time varying retention function asymptote: handline west, 2007 |
| DiscMort_2P_3_HL_W_BLK4repl_2008 | 0.6 | _ | 0.6 | -1 | 2 | No_prior | | | Fixed | Time varying discard mortality function asymptote: handline west, 2008 |
| Retain_3P_1_LL_E_BLK1repl_1985 | 33.02 | _ | 33.02 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: longline east, 1985 |
| Retain_3P_1_LL_E_BLK1repl_1994 | 35.56 | _ | 35.56 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: longline east, 1994 |
| Retain_3P_1_LL_E_BLK1repl_1995 | 38.1 | _ | 38.1 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: longline east, 1995 |
| Retain_3P_1_LL_E_BLK1repl_2007 | 26.4941 | 1.40801 | 33.02 | 10 | 100 | No_prior | | | Estimated | Time varying retention function inflection point: longline east, 2007 |
| Retain_3P_2_LL_E_BLK1repl_1985 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: longline east, 1985 |
| Retain_3P_2_LL_E_BLK1repl_1994 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: longline east, 1994 |
| Retain_3P_2_LL_E_BLK1repl_1995 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: longline east, 1995 |
| Retain_3P_2_LL_E_BLK1repl_2007 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: longline east, 2007 |
| Retain_3P_3_LL_E_BLK1repl_1985 | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | Time varying retention function asymptote: longline east, 1985 |
| Retain_3P_3_LL_E_BLK1repl_1994 | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | Time varying retention function asymptote: longline east, 1994 |
| Retain_3P_3_LL_E_BLK1repl_1995 | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | Time varying retention function asymptote: longline east, 1995 |
| Retain_3P_3_LL_E_BLK1repl_2007 | 0.317704 | 0.0381553 | 0.5 | 0 | 1 | No_prior | | | Estimated | Time varying retention function asymptote: longline east, 2007 |
| DiscMort_3P_3_LL_E_BLK4repl_2008 | 0.64 | _ | 0.64 | -1 | 2 | No_prior | | | Fixed | Time varying discard mortality function asymptote: longline east, 2008 |
| Retain_4P_1_LL_W_BLK1repl_1985 | 33.02 | _ | 33.02 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: longline west, 1985 |
| Retain_4P_1_LL_W_BLK1repl_1994 | 35.56 | _ | 35.56 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: longline west, 1994 |

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|---|---|---|---|---|---|---|---|---|---|---|
| Retain_4P_1_LL_W_BLK1repl_1995 | 38.1 | _ | 38.1 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: longline west, 1995 |
| Retain_4P_1_LL_W_BLK1repl_2007 | 33.02 | _ | 33.02 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: longline west, 2007 |
| Retain_4P_2_LL_W_BLK1repl_1985 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: longline west, 1985 |
| Retain_4P_2_LL_W_BLK1repl_1994 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: longline west, 1994 |
| Retain_4P_2_LL_W_BLK1repl_1995 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: longline west, 1995 |
| Retain_4P_2_LL_W_BLK1repl_2007 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: longline west, 2007 |
| Retain_4P_3_LL_W_BLK1repl_1985 | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | Time varying retention function asymptote: longline west, 1985 |
| Retain_4P_3_LL_W_BLK1repl_1994 | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | Time varying retention function asymptote: longline west, 1994 |
| Retain_4P_3_LL_W_BLK1repl_1995 | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | Time varying retention function asymptote: longline west, 1995 |
| Retain_4P_3_LL_W_BLK1repl_2007 | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | Time varying retention function asymptote: longline west, 2007 |
| DiscMort_4P_3_LL_W_BLK4repl_2008 | 0.81 | _ | 0.81 | -1 | 2 | No_prior | | | Fixed | Time varying discard mortality function asymptote: longline west, 2008 |
| Retain_5P_1_MRIP_E_BLK2repl_1985 | 33.02 | _ | 33.02 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: charter/for hire east , 1985 |
| Retain_5P_1_MRIP_E_BLK2repl_1994 | 35.56 | _ | 35.56 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: charter/for hire east , 1994 |
| Retain_5P_1_MRIP_E_BLK2repl_1995 | 38.1 | _ | 38.1 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: charter/for hire east , 1995 |
| Retain_5P_1_MRIP_E_BLK2repl_2000 | 40.64 | _ | 40.64 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: charter/for hire east , 2000 |
| Retain_5P_2_MRIP_E_BLK2repl_1985 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: charter/for hire east , 1985 |
| Retain_5P_2_MRIP_E_BLK2repl_1994 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: charter/for hire east , 1994 |
| Retain_5P_2_MRIP_E_BLK2repl_1995 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: charter/for hire east , |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 1995 |
| Retain_5P_2_MRIP_E_BLK2repl_2000 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: charter/for hire east , 2000 |
| DiscMort_5P_3_MRIP_E_BLK4repl_2008 | 0.1 | _ | 0.1 | -1 | 2 | No_prior | | | Fixed | Time varying discard mortality function asymptote: charter/for hire east , 2008 |
| Retain_6P_1_MRIP_W_BLK2repl_1985 | 33.02 | _ | 33.02 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: charter/for hire west, 1985 |
| Retain_6P_1_MRIP_W_BLK2repl_1994 | 35.56 | _ | 35.56 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: charter/for hire west, 1994 |
| Retain_6P_1_MRIP_W_BLK2repl_1995 | 38.1 | _ | 38.1 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: charter/for hire west, 1995 |
| Retain_6P_1_MRIP_W_BLK2repl_2000 | 40.64 | _ | 40.64 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: charter/for hire west, 2000 |
| Retain_6P_2_MRIP_W_BLK2repl_1985 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: charter/for hire west, 1985 |
| Retain_6P_2_MRIP_W_BLK2repl_1994 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: charter/for hire west, 1994 |
| Retain_6P_2_MRIP_W_BLK2repl_1995 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: charter/for hire west, 1995 |
| Retain_6P_2_MRIP_W_BLK2repl_2000 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: charter/for hire west, 2000 |
| DiscMort_6P_3_MRIP_W_BLK4repl_2008 | 0.1 | _ | 0.1 | -1 | 2 | No_prior | | | Fixed | Time varying discard mortality function asymptote: charter/for hire west, 2008 |
| Retain_7P_1_HBT_E_BLK2repl_1985 | 33.02 | _ | 33.02 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: headboat east, 1985 |
| Retain_7P_1_HBT_E_BLK2repl_1994 | 35.56 | _ | 35.56 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: headboat east, 1994 |
| Retain_7P_1_HBT_E_BLK2repl_1995 | 38.1 | _ | 38.1 | 10 | 100 | No_prior | | | Fixed | Time varying retention function inflection point: headboat east, 1995 |
| Retain_7P_1_HBT_E_BLK2repl_2000 | 36.6387 | 0.310588 | 40.64 | 10 | 100 | No_prior | | | Estimated | Time varying retention function inflection point: headboat east, |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 2000 |
| Retain_7P_2_HBT_E_BLK2repl_1985 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: headboat east, 1985 |
| Retain_7P_2_HBT_E_BLK2repl_1994 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: headboat east, 1994 |
| Retain_7P_2_HBT_E_BLK2repl_1995 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: headboat east, 1995 |
| Retain_7P_2_HBT_E_BLK2repl_2000 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying retention function slope: headboat east, 2000 |
| Retain_7P_3_HBT_E_BLK2repl_1985 | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | Time varying retention function asymptote: headboat east, 1985 |
| Retain_7P_3_HBT_E_BLK2repl_1994 | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | Time varying retention function asymptote: headboat east, 1994 |
| Retain_7P_3_HBT_E_BLK2repl_1995 | 1 | _ | 1 | 0 | 1 | No_prior | | | Fixed | Time varying retention function asymptote: headboat east, 1995 |
| Retain_7P_3_HBT_E_BLK2repl_2000 | 0.316327 | 0.0252556 | 0.5 | 0 | 1 | No_prior | | | Estimated | Time varying retention function asymptote: headboat east, 2000 |
| DiscMort_7P_3_HBT_E_BLK4repl_2008 | 0.1 | _ | 0.1 | -1 | 2 | No_prior | | | Fixed | Time varying discard mortality function asymptote: headboat east, 2008 |
| Retain_8P_1_HBT_W_BLK2repl_1985 | 33.02 | _ | 33.02 | 10 | 100 | No_prior | | | Fixed | Time varying discard mortality function asymptote: headboat west, 1985 |
| Retain_8P_1_HBT_W_BLK2repl_1994 | 35.56 | _ | 35.56 | 10 | 100 | No_prior | | | Fixed | Time varying discard mortality function asymptote: headboat west, 1994 |
| Retain_8P_1_HBT_W_BLK2repl_1995 | 38.1 | _ | 38.1 | 10 | 100 | No_prior | | | Fixed | Time varying discard mortality function asymptote: headboat west, 1995 |
| Retain_8P_1_HBT_W_BLK2repl_2000 | 40.64 | _ | 40.64 | 10 | 100 | No_prior | | | Fixed | Time varying discard mortality function asymptote: headboat west, 2000 |
| Retain_8P_2_HBT_W_BLK2repl_1985 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying discard mortality function asymptote: headboat west, 1985 |
| Retain_8P_2_HBT_W_BLK2repl_1994 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying discard mortality function asymptote: headboat west, 1994 |

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|---|---|---|---|---|---|---|---|---|---|---|
| Retain_8P_2_HBT_W_BLK2repl_1995 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying discard mortality function asymptote: headboat west, 1995 |
| Retain_8P_2_HBT_W_BLK2repl_2000 | 1 | _ | 1 | -1 | 20 | No_prior | | | Fixed | Time varying discard mortality function asymptote: headboat west, 2000 |
| DiscMort_8P_3_HBT_W_BLK4repl_2008 | 0.1 | _ | 0.1 | -1 | 2 | No_prior | | | Fixed | Time varying discard mortality function asymptote: headboat west, 1985 |
| DiscMort_9P_3_C_Clsd_E_BLK4repl_2008 | 0.55 | _ | 0.55 | -1 | 2 | No_prior | | | Fixed | Time varying discard mortality function asymptote: headboat west, 1994 |
| DiscMort_10P_3_C_Clsd_W_BLK4repl_2008 | 0.74 | _ | 0.74 | -1 | 2 | No_prior | | | Fixed | Time varying discard mortality function asymptote: headboat west, 1995 |
| DiscMort_11P_3_R_Clsd_E_BLK4repl_2008 | 0.1 | _ | 0.1 | -1 | 2 | No_prior | | | Fixed | Time varying discard mortality function asymptote: headboat west, 2000 |
| DiscMort_12P_3_R_Clsd_W_BLK4repl_2008 | 0.11 | _ | 0.11 | -1 | 2 | No_prior | | | Fixed | Time varying discard mortality function asymptote: headboat west, 2008 |
| AgeSel_1P_1_HL_E_BLK3repl_2007 | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Time varying Age 0 selectivity parameter: handline east, 2007 |
| AgeSel_1P_2_HL_E_BLK3repl_2007 | 0.999979 | 0.00383427 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 1 selectivity parameter: handline east, 2007 |
| AgeSel_1P_3_HL_E_BLK3repl_2007 | 1 | 4.04E-06 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 2 selectivity parameter: handline east, 2007 |
| AgeSel_1P_4_HL_E_BLK3repl_2007 | 1 | 4.09E-05 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 3 selectivity parameter: handline east, 2007 |
| AgeSel_1P_5_HL_E_BLK3repl_2007 | 0.156668 | 0.0633105 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 4 selectivity parameter: handline east, 2007 |
| AgeSel_1P_6_HL_E_BLK3repl_2007 | -0.420032 | 0.0852048 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 5 selectivity parameter: handline east, 2007 |
| AgeSel_1P_7_HL_E_BLK3repl_2007 | -0.625819 | 0.132234 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 6 selectivity parameter: handline east, 2007 |
| AgeSel_1P_8_HL_E_BLK3repl_2007 | -0.729241 | 0.227761 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 7 selectivity parameter: handline east, 2007 |
| AgeSel_1P_9_HL_E_BLK3repl_2007 | -0.663183 | 0.408309 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 8 selectivity parameter: handline east, 2007 |
| AgeSel_1P_10_HL_E_BLK3repl_2007 | -0.567341 | 0.705453 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 9 selectivity parameter: handline east, 2007 |
| AgeSel_1P_11_HL_E_BLK3repl_2007 | -0.720619 | 0.821327 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 10 selectivity parameter: handline east, 2007 |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_1P_12_HL_E_BLK3repl_2007 | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Time varying Age 11 selectivity parameter: handline east, 2007 |
| AgeSel_1P_13_HL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 12 selectivity parameter: handline east, 2007 |
| AgeSel_1P_14_HL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 13 selectivity parameter: handline east, 2007 |
| AgeSel_1P_15_HL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 14 selectivity parameter: handline east, 2007 |
| AgeSel_1P_16_HL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 15 selectivity parameter: handline east, 2007 |
| AgeSel_1P_17_HL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 16 selectivity parameter: handline east, 2007 |
| AgeSel_1P_18_HL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 17 selectivity parameter: handline east, 2007 |
| AgeSel_1P_19_HL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 18 selectivity parameter: handline east, 2007 |
| AgeSel_1P_20_HL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 19 selectivity parameter: handline east, 2007 |
| AgeSel_1P_21_HL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 20 selectivity parameter: handline east, 2007 |
| AgeSel_2P_1_HL_W_BLK3repl_2007 | -1000 | _ | -1000 | -1 | 1 | No_prior | | | Fixed | Time varying Age 0 selectivity parameter: handline west, 2007 |
| AgeSel_2P_2_HL_W_BLK3repl_2007 | -0.00315602 | 22.357 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 1 selectivity parameter: handline west, 2007 |
| AgeSel_2P_3_HL_W_BLK3repl_2007 | 1 | 4.77E-07 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 2 selectivity parameter: handline west, 2007 |
| AgeSel_2P_4_HL_W_BLK3repl_2007 | 1 | 1.94E-05 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 3 selectivity parameter: handline west, 2007 |
| AgeSel_2P_5_HL_W_BLK3repl_2007 | 0.0689474 | 0.0690583 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 4 selectivity parameter: handline west, 2007 |
| AgeSel_2P_6_HL_W_BLK3repl_2007 | -0.264559 | 0.0822335 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 5 selectivity parameter: handline west, 2007 |
| AgeSel_2P_7_HL_W_BLK3repl_2007 | -0.434903 | 0.117601 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 6 selectivity parameter: handline west, 2007 |
| AgeSel_2P_8_HL_W_BLK3repl_2007 | -0.604183 | 0.184729 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 7 selectivity parameter: handline west, 2007 |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_2P_9_HL_W_BLK3repl_2007 | -0.441117 | 0.289125 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 8 selectivity parameter: handline west, 2007 |
| AgeSel_2P_10_HL_W_BLK3repl_2007 | -0.377785 | 0.306118 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 9 selectivity parameter: handline west, 2007 |
| AgeSel_2P_11_HL_W_BLK3repl_2007 | -0.999373 | 0.0231095 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 10 selectivity parameter: handline west, 2007 |
| AgeSel_2P_12_HL_W_BLK3repl_2007 | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Time varying Age 11 selectivity parameter: handline west, 2007 |
| AgeSel_2P_13_HL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 12 selectivity parameter: handline west, 2007 |
| AgeSel_2P_14_HL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 13 selectivity parameter: handline west, 2007 |
| AgeSel_2P_15_HL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 14 selectivity parameter: handline west, 2007 |
| AgeSel_2P_16_HL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 15 selectivity parameter: handline west, 2007 |
| AgeSel_2P_17_HL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 16 selectivity parameter: handline west, 2007 |
| AgeSel_2P_18_HL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 17 selectivity parameter: handline west, 2007 |
| AgeSel_2P_19_HL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 18 selectivity parameter: handline west, 2007 |
| AgeSel_2P_20_HL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 19 selectivity parameter: handline west, 2007 |
| AgeSel_2P_21_HL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 20 selectivity parameter: handline west, 2007 |
| AgeSel_3P_1_LL_E_BLK3repl_2007 | -1000 | _ | -1000 | -1 | 1 | No_prior | | | Fixed | Time varying Age 0 selectivity parameter: longline east, 2007 |
| AgeSel_3P_2_LL_E_BLK3repl_2007 | -0.00315602 | 22.3571 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 1 selectivity parameter: longline east, 2007 |
| AgeSel_3P_3_LL_E_BLK3repl_2007 | 1 | 4.07E-05 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 2 selectivity parameter: longline east, 2007 |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_3P_4_LL_E_BLK3repl_2007 | 1 | 2.68E-05 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 3 selectivity parameter: longline east, 2007 |
| AgeSel_3P_5_LL_E_BLK3repl_2007 | 1 | 2.85E-05 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 4 selectivity parameter: longline east, 2007 |
| AgeSel_3P_6_LL_E_BLK3repl_2007 | 0.501019 | 0.0710243 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 5 selectivity parameter: longline east, 2007 |
| AgeSel_3P_7_LL_E_BLK3repl_2007 | -0.290645 | 0.0841517 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 6 selectivity parameter: longline east, 2007 |
| AgeSel_3P_8_LL_E_BLK3repl_2007 | -0.675975 | 0.131705 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 7 selectivity parameter: longline east, 2007 |
| AgeSel_3P_9_LL_E_BLK3repl_2007 | -0.548965 | 0.221202 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 8 selectivity parameter: longline east, 2007 |
| AgeSel_3P_10_LL_E_BLK3repl_2007 | -0.096344 | 0.32154 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 9 selectivity parameter: longline east, 2007 |
| AgeSel_3P_11_LL_E_BLK3repl_2007 | -0.745326 | 0.357234 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 10 selectivity parameter: longline east, 2007 |
| AgeSel_3P_12_LL_E_BLK3repl_2007 | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Time varying Age 11 selectivity parameter: longline east, 2007 |
| AgeSel_3P_13_LL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 12 selectivity parameter: longline east, 2007 |
| AgeSel_3P_14_LL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 13 selectivity parameter: longline east, 2007 |
| AgeSel_3P_15_LL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 14 selectivity parameter: longline east, 2007 |
| AgeSel_3P_16_LL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 15 selectivity parameter: longline east, 2007 |
| AgeSel_3P_17_LL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 16 selectivity parameter: longline east, 2007 |
| AgeSel_3P_18_LL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 17 selectivity parameter: longline east, 2007 |
| AgeSel_3P_19_LL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 18 selectivity parameter: longline east, 2007 |
| AgeSel_3P_20_LL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 19 selectivity parameter: longline east, 2007 |
| AgeSel_3P_21_LL_E_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 20 selectivity parameter: longline east, 2007 |
| AgeSel_4P_1_LL_W_BLK3repl_2007 | -1000 | _ | -1000 | -1 | 1 | No_prior | | | Fixed | Time varying Age 0 selectivity parameter: longline west, 2007 |
| AgeSel_4P_2_LL_W_BLK3repl_2007 | -0.00315602 | 22.3571 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 1 selectivity parameter: longline west, 2007 |
| AgeSel_4P_3_LL_W_BLK3repl_2007 | 0.999915 | 0.00588877 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 2 selectivity parameter: longline west, 2007 |
| AgeSel_4P_4_LL_W_BLK3repl_2007 | 1 | 0.00019307 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 3 selectivity parameter: longline west, 2007 |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_4P_5_LL_W_BLK3repl_2007 | 1 | 1.93E-05 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 4 selectivity parameter: longline west, 2007 |
| AgeSel_4P_6_LL_W_BLK3repl_2007 | 0.999987 | 0.00354538 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 5 selectivity parameter: longline west, 2007 |
| AgeSel_4P_7_LL_W_BLK3repl_2007 | 0.96793 | 0.124922 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 6 selectivity parameter: longline west, 2007 |
| AgeSel_4P_8_LL_W_BLK3repl_2007 | 0.196422 | 0.142601 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 7 selectivity parameter: longline west, 2007 |
| AgeSel_4P_9_LL_W_BLK3repl_2007 | -0.147972 | 0.16531 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 8 selectivity parameter: longline west, 2007 |
| AgeSel_4P_10_LL_W_BLK3repl_2007 | 0.212977 | 0.145487 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 9 selectivity parameter: longline west, 2007 |
| AgeSel_4P_11_LL_W_BLK3repl_2007 | -0.999993 | 0.00246258 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 10 selectivity parameter: longline west, 2007 |
| AgeSel_4P_12_LL_W_BLK3repl_2007 | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Time varying Age 11 selectivity parameter: longline west, 2007 |
| AgeSel_4P_13_LL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 12 selectivity parameter: longline west, 2007 |
| AgeSel_4P_14_LL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 13 selectivity parameter: longline west, 2007 |
| AgeSel_4P_15_LL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 14 selectivity parameter: longline west, 2007 |
| AgeSel_4P_16_LL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 15 selectivity parameter: longline west, 2007 |
| AgeSel_4P_17_LL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 16 selectivity parameter: longline west, 2007 |
| AgeSel_4P_18_LL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 17 selectivity parameter: longline west, 2007 |
| AgeSel_4P_19_LL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 18 selectivity parameter: longline west, 2007 |
| AgeSel_4P_20_LL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 19 selectivity parameter: longline west, 2007 |
| AgeSel_4P_21_LL_W_BLK3repl_2007 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 20 selectivity parameter: longline west, 2007 |
| AgeSel_5P_1_MRIP_E_BLK4repl_2008 | -1000 | _ | -1000 | -1 | 1 | No_prior | | | Fixed | Time varying Age 0 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_2_MRIP_E_BLK4repl_2008 | 0.408318 | 18.631 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 1 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_3_MRIP_E_BLK4repl_2008 | 0.401941 | 0.31385 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 2 selectivity parameter: charter/for hire east, 2008 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_5P_4_MRIP_E_BLK4repl_2008 | -4.69E-13 | 0.000435314 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 3 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_5_MRIP_E_BLK4repl_2008 | -0.022883 | 0.0948744 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 4 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_6_MRIP_E_BLK4repl_2008 | -0.119657 | 0.102467 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 5 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_7_MRIP_E_BLK4repl_2008 | -0.443503 | 0.140156 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 6 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_8_MRIP_E_BLK4repl_2008 | -0.763206 | 0.238298 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 7 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_9_MRIP_E_BLK4repl_2008 | -0.598562 | 0.347996 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 8 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_10_MRIP_E_BLK4repl_2008 | -0.999613 | 0.015556 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 9 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_11_MRIP_E_BLK4repl_2008 | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Time varying Age 10 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_12_MRIP_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 11 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_13_MRIP_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 12 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_14_MRIP_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 13 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_15_MRIP_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 14 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_16_MRIP_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 15 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_17_MRIP_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 16 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_18_MRIP_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 17 selectivity parameter: charter/for hire east, 2008 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_5P_19_MRIP_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 18 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_20_MRIP_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 19 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_5P_21_MRIP_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 20 selectivity parameter: charter/for hire east, 2008 |
| AgeSel_6P_1_MRIP_W_BLK4repl_2008 | -1000 | _ | -1000 | -1 | 1 | No_prior | | | Fixed | Time varying Age 0 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_2_MRIP_W_BLK4repl_2008 | -0.00315602 | 22.3571 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 1 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_3_MRIP_W_BLK4repl_2008 | 0.615989 | 0.580131 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 2 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_4_MRIP_W_BLK4repl_2008 | -0.0624098 | 0.281443 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 3 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_5_MRIP_W_BLK4repl_2008 | 0.21252 | 0.109978 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 4 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_6_MRIP_W_BLK4repl_2008 | -0.220925 | 0.107065 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 5 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_7_MRIP_W_BLK4repl_2008 | -0.417124 | 0.137295 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 6 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_8_MRIP_W_BLK4repl_2008 | -0.999909 | 0.00608277 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 7 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_9_MRIP_W_BLK4repl_2008 | -0.999892 | 0.00653832 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 8 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_10_MRIP_W_BLK4repl_2008 | -0.999874 | 0.00712828 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 9 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_11_MRIP_W_BLK4repl_2008 | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Time varying Age 10 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_12_MRIP_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 11 selectivity parameter: charter/for hire west, 2008 |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_6P_13_MRIP_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 12 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_14_MRIP_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 13 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_15_MRIP_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 14 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_16_MRIP_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 15 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_17_MRIP_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 16 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_18_MRIP_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 17 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_19_MRIP_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 18 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_20_MRIP_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 19 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_6P_21_MRIP_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 20 selectivity parameter: charter/for hire west, 2008 |
| AgeSel_7P_1_HBT_E_BLK4repl_2008 | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Time varying Age 0 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_2_HBT_E_BLK4repl_2008 | 0.999755 | 0.0108895 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 1 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_3_HBT_E_BLK4repl_2008 | 1 | 1.20E-05 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 2 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_4_HBT_E_BLK4repl_2008 | 1 | 1.63E-05 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 3 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_5_HBT_E_BLK4repl_2008 | -0.18891 | 0.0727238 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 4 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_6_HBT_E_BLK4repl_2008 | -0.477564 | 0.0950758 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 5 selectivity parameter: headboat east, 2008 |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_7P_7_HBT_E_BLK4repl_2008 | -0.630987 | 0.147084 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 6 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_8_HBT_E_BLK4repl_2008 | -0.966899 | 0.28993 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 7 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_9_HBT_E_BLK4repl_2008 | -0.803597 | 0.441417 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 8 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_10_HBT_E_BLK4repl_2008 | -0.999054 | 0.0304323 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 9 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_11_HBT_E_BLK4repl_2008 | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Time varying Age 10 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_12_HBT_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 11 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_13_HBT_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 12 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_14_HBT_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 13 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_15_HBT_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 14 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_16_HBT_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 15 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_17_HBT_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 16 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_18_HBT_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 17 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_19_HBT_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 18 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_20_HBT_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 19 selectivity parameter: headboat east, 2008 |
| AgeSel_7P_21_HBT_E_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 20 selectivity parameter: headboat east, 2008 |
| AgeSel_8P_1_HBT_W_BLK4repl_2008 | -1000 | _ | -1000 | -1 | 1 | No_prior | | | Fixed | Time varying Age 0 selectivity parameter: headboat west, |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 2008 |
| AgeSel_8P_2_HBT_W_BLK4repl_2008 | -0.00315602 | 22.3571 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 1 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_3_HBT_W_BLK4repl_2008 | 0.237589 | 0.500786 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 2 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_4_HBT_W_BLK4repl_2008 | 0.999675 | 0.0134232 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 3 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_5_HBT_W_BLK4repl_2008 | 0.750121 | 0.129898 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 4 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_6_HBT_W_BLK4repl_2008 | 0.0920628 | 0.0928338 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 5 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_7_HBT_W_BLK4repl_2008 | -0.236185 | 0.115426 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 6 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_8_HBT_W_BLK4repl_2008 | -0.805234 | 0.163359 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 7 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_9_HBT_W_BLK4repl_2008 | -0.999915 | 0.00586376 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 8 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_10_HBT_W_BLK4repl_2008 | -0.99997 | 0.00408006 | 0.1 | -1 | 1 | No_prior | | | Estimated | Time varying Age 9 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_11_HBT_W_BLK4repl_2008 | 0 | _ | 0 | -1 | 1 | No_prior | | | Fixed | Time varying Age 10 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_12_HBT_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 11 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_13_HBT_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 12 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_14_HBT_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 13 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_15_HBT_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 14 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_16_HBT_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 15 selectivity parameter: headboat west, 2008 |

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|---|---|---|---|---|---|---|---|---|---|---|
| AgeSel_8P_17_HBT_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 16 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_18_HBT_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 17 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_19_HBT_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 18 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_20_HBT_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 19 selectivity parameter: headboat west, 2008 |
| AgeSel_8P_21_HBT_W_BLK4repl_2008 | -999 | _ | -999 | -1 | 1 | No_prior | | | Fixed | Time varying Age 20 selectivity parameter: headboat west, 2008 |

Table 3.2.1.1. Input standard errors and model estimated root mean squared error for each index of abundance.

| Fishery/Survey | N | mean_input_SE | r.m.s.e. |
|---|---|---|---|
| HL_E | 17 | 0.616 | 0.396 |
| HL_W | 17 | 0.173 | 0.276 |
| MRIP_Index_E | 31 | 0.331 | 0.541 |
| MRIP_Index_W | 31 | 0.300 | 0.409 |
| HBT_Index_E | 26 | 0.692 | 0.495 |
| HBT_Index_W | 26 | 0.259 | 0.448 |
| BLL_W | 14 | 0.393 | 0.807 |
| BLL_E | 14 | 0.637 | 0.513 |
| Video_E | 14 | 0.981 | 1.225 |
| Video_W | 15 | 0.251 | 0.502 |
| Larv_E | 16 | 0.776 | 0.571 |
| Larv_W | 21 | 0.447 | 0.571 |
| Sum_E | 30 | 0.456 | 1.144 |
| Sum_W | 30 | 0.208 | 0.517 |
| Fall_E | 40 | 0.272 | 0.773 |
| Fall_W | 40 | 0.157 | 0.471 |
| Shr_E | 62 | 0.125 | 0.005 |
| Shr_W | 66 | 0.125 | 0.079 |

Table 3.2.2.2. Summary of jitter results for Gulf of Mexico red snapper for: Total Likelihood, Total Biomass Unfished, SSB_SPRTtgt, SSB_MSY, SSB-2011, SPR_MSY, F_current, SSB/SSB_SPRTtgt, F_SPRTgt, F_MSy, SSB/SSB_MSY and Fcurrent/F_MSY. F_SPRTtgt = F26%SPR. Fcurrent is from the SS jitter analysis for the base model configuration (steepness fixed at 0.99). Fcurrent = geometric mean of F in 2009 through 2011.

| Run_ID | Likelihood | Total Biomsas Unfished | SSB_SPRTtgt | SSB_MSY | SSB_2011 | SPR_MSY | F_CURRENT | SSB / SSB_SPRTtgt | F_SPRTtgt | F_MSY | Fcurrent / F_SPRTtgt | SSB / SSB_MSY | Fcurrent / F_Msy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6675 | 334474 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 2 | 6675 | 334547 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.22 | 0.19 |
| 3 | 6675 | 337350 | 1.26E+12 | 9.01E+11 | 1.11E+12 | 0.19 | 0.25 | 0.88 | 0.89 | 1.29 | 0.28 | 1.23 | 0.19 |
| 4 | 6675 | 337407 | 1.26E+12 | 9.01E+11 | 1.11E+12 | 0.19 | 0.25 | 0.88 | 0.89 | 1.29 | 0.28 | 1.23 | 0.19 |
| 5 | 6675 | 334473 | 1.25E+12 | 8.91E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 6 | 6675 | 334504 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 7 | 6675 | 334459 | 1.25E+12 | 8.91E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 8 | 6675 | 337342 | 1.26E+12 | 9.01E+11 | 1.11E+12 | 0.19 | 0.25 | 0.88 | 0.89 | 1.29 | 0.28 | 1.23 | 0.19 |
| 9 | 6675 | 334739 | 1.25E+12 | 8.92E+11 | 1.09E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.27 | 0.28 | 1.22 | 0.19 |
| 10 | 6675 | 334439 | 1.25E+12 | 8.91E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 11 | 6675 | 334537 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.22 | 0.19 |
| 12 | 6675 | 334503 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 13 | 6675 | 334503 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 14 | 6675 | 334386 | 1.24E+12 | 8.91E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 15 | 6675 | 334509 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.19 |
| 16 | 6675 | 334502 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 17 | 6675 | 334502 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 18 | 6675 | 332890 | 1.24E+12 | 8.89E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.29 | 1.21 | 0.20 |
| 19 | 6675 | 334696 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 20 | 6675 | 334511 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 21 | 6675 | 334500 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 22 | 6675 | 334501 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | 6675 | 334514 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.19 |
| 24 | 6675 | 334502 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 25 | 6675 | 337652 | 1.26E+12 | 9.02E+11 | 1.11E+12 | 0.19 | 0.25 | 0.89 | 0.89 | 1.29 | 0.28 | 1.23 | 0.19 |
| 26 | 6675 | 334503 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 27 | 6675 | 334435 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 28 | 6675 | 337421 | 1.26E+12 | 9.01E+11 | 1.11E+12 | 0.19 | 0.25 | 0.88 | 0.89 | 1.29 | 0.28 | 1.23 | 0.19 |
| 29 | 6675 | 336875 | 1.25E+12 | 8.99E+11 | 1.11E+12 | 0.19 | 0.25 | 0.88 | 0.88 | 1.28 | 0.28 | 1.23 | 0.19 |
| 30 | 6675 | 334503 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 31 | 6675 | 332947 | 1.24E+12 | 8.94E+11 | 1.05E+12 | 0.19 | 0.25 | 0.85 | 0.87 | 1.25 | 0.29 | 1.17 | 0.20 |
| 32 | 6675 | 334885 | 1.25E+12 | 8.92E+11 | 1.09E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.27 | 0.28 | 1.22 | 0.19 |
| 33 | 6675 | 334488 | 1.25E+12 | 8.94E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.19 |
| 34 | 6675 | 334519 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.19 |
| 35 | 6675 | 334607 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.19 |
| 36 | 6675 | 334503 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 37 | 6675 | 334503 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 38 | 6675 | 336862 | 1.25E+12 | 8.99E+11 | 1.10E+12 | 0.19 | 0.25 | 0.88 | 0.88 | 1.28 | 0.28 | 1.23 | 0.19 |
| 39 | 6675 | 334647 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.27 | 0.28 | 1.22 | 0.19 |
| 40 | 6675 | 334585 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.22 | 0.19 |
| 41 | 6675 | 334503 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 42 | 6675 | 334502 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.19 |
| 43 | 6675 | 334515 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.19 |
| 44 | 6675 | 334515 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.19 |
| 45 | 6675 | 334504 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 46 | 6675 | 334526 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.19 |
| 47 | 6675 | 334503 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 48 | 6675 | 333725 | 1.24E+12 | 8.90E+11 | 1.07E+12 | 0.19 | 0.25 | 0.86 | 0.87 | 1.26 | 0.29 | 1.20 | 0.20 |
| 49 | 6675 | 337470 | 1.26E+12 | 9.01E+11 | 1.11E+12 | 0.19 | 0.25 | 0.88 | 0.89 | 1.29 | 0.28 | 1.23 | 0.19 |
| 50 | 6675 | 334500 | 1.25E+12 | 8.91E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 51 | 6675 | 334508 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.19 |
| 52 | 6675 | 336805 | 1.25E+12 | 8.98E+11 | 1.11E+12 | 0.19 | 0.25 | 0.88 | 0.88 | 1.28 | 0.28 | 1.23 | 0.19 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 53 | 6675 | 334495 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 54 | 6675 | 334503 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 55 | 6675 | 334502 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 56 | 6675 | 337009 | 1.25E+12 | 9.00E+11 | 1.11E+12 | 0.19 | 0.25 | 0.88 | 0.88 | 1.28 | 0.28 | 1.23 | 0.19 |
| 57 | 6675 | 334617 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.22 | 0.19 |
| 58 | 6675 | 334572 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.22 | 0.19 |
| 59 | 6675 | 336935 | 1.25E+12 | 8.99E+11 | 1.11E+12 | 0.19 | 0.25 | 0.88 | 0.88 | 1.28 | 0.28 | 1.23 | 0.19 |
| 60 | 6675 | 334550 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 61 | 6675 | 334271 | 1.24E+12 | 8.90E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 62 | 6675 | 334272 | 1.24E+12 | 8.91E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.27 | 0.28 | 1.21 | 0.20 |
| 63 | 6675 | 333633 | 1.24E+12 | 8.90E+11 | 1.07E+12 | 0.19 | 0.25 | 0.86 | 0.87 | 1.26 | 0.29 | 1.20 | 0.20 |
| 64 | 6675 | 334548 | 1.25E+12 | 8.91E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.22 | 0.19 |
| 65 | 6675 | 336895 | 1.25E+12 | 8.99E+11 | 1.11E+12 | 0.19 | 0.25 | 0.88 | 0.88 | 1.28 | 0.28 | 1.23 | 0.19 |
| 66 | 6675 | 334502 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 67 | 6675 | 334503 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 68 | 6675 | 334610 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.22 | 0.19 |
| 69 | 6675 | 334472 | 1.25E+12 | 8.91E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 70 | 6675 | 334431 | 1.24E+12 | 8.91E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 71 | 6675 | 334449 | 1.25E+12 | 8.91E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 72 | 6675 | 334144 | 1.24E+12 | 8.91E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 73 | 6675 | 337379 | 1.26E+12 | 9.01E+11 | 1.11E+12 | 0.19 | 0.25 | 0.88 | 0.89 | 1.29 | 0.28 | 1.23 | 0.19 |
| 74 | 6675 | 334580 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.22 | 0.19 |
| 75 | 6675 | 334502 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 76 | 6675 | 334471 | 1.25E+12 | 8.91E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 77 | 6676 | 334500 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 78 | 6676 | 334503 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 79 | 6676 | 334517 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.19 |
| 80 | 6676 | 335146 | 1.25E+12 | 9.17E+11 | 9.96E+11 | 0.19 | 0.27 | 0.80 | 0.89 | 1.26 | 0.30 | 1.09 | 0.21 |
| 81 | 6676 | 334501 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 82 | 6676 | 334596 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.22 | 0.19 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 83 | 6676 | 334544 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.19 |
| 84 | 6676 | 336920 | 1.25E+12 | 8.99E+11 | 1.11E+12 | 0.19 | 0.25 | 0.88 | 0.88 | 1.28 | 0.28 | 1.23 | 0.19 |
| 85 | 6676 | 334886 | 1.25E+12 | 8.91E+11 | 1.09E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.27 | 0.28 | 1.22 | 0.19 |
| 86 | 6676 | 337092 | 1.25E+12 | 9.00E+11 | 1.10E+12 | 0.19 | 0.25 | 0.88 | 0.88 | 1.28 | 0.28 | 1.23 | 0.19 |
| 87 | 6676 | 334632 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 88 | 6676 | 334503 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 89 | 6676 | 337365 | 1.26E+12 | 9.01E+11 | 1.11E+12 | 0.19 | 0.25 | 0.88 | 0.89 | 1.29 | 0.28 | 1.23 | 0.19 |
| 90 | 6676 | 334512 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.19 |
| 91 | 6676 | 334491 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 92 | 6676 | 334513 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.19 |
| 93 | 6676 | 335011 | 1.25E+12 | 8.92E+11 | 1.09E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.27 | 0.28 | 1.22 | 0.19 |
| 94 | 6676 | 334503 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 95 | 6676 | 334442 | 1.25E+12 | 8.91E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 96 | 6676 | 334576 | 1.25E+12 | 8.96E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.29 | 1.20 | 0.20 |
| 97 | 6676 | 334508 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 98 | 6677 | 334502 | 1.25E+12 | 8.92E+11 | 1.08E+12 | 0.19 | 0.25 | 0.87 | 0.87 | 1.26 | 0.28 | 1.21 | 0.20 |
| 99 | 6680 | 333096 | 1.24E+12 | 8.90E+11 | 1.06E+12 | 0.19 | 0.25 | 0.86 | 0.87 | 1.26 | 0.29 | 1.19 | 0.20 |
| 100 | 6693 | 337330 | 1.26E+12 | 9.01E+11 | 1.11E+12 | 0.19 | 0.25 | 0.88 | 0.89 | 1.29 | 0.28 | 1.23 | 0.19 |

Table 3.2.4.1. Predicted total biomass (whole weight metric tons), spawning biomass (whole weight metric tons), age-0 recruits (thousand fish), and fishing mortality for Gulf of Mexico red snapper from the Stock Synthesis base model.

| Region | | | | | | | East and West Combined | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| East | | | | West | | | | | | |
| Year | Total Biomass | Spawning Biomass | Recruits | Total Biomass | Spawning Biomass | Recruits | Total Biomass | Spawning Biomass | Recruits | Instantaneous Fishing Mortality |
| 1872 | 123216 | 1.78E+12 | 35,425 | 210426 | 3.04E+12 | 60498 | 333642 | 4.82E+12 | 95924 | 0.00 |
| 1873 | 122582 | 1.78E+12 | 35,425 | 209772 | 3.04E+12 | 60498 | 332354 | 4.82E+12 | 95924 | 0.00 |
| 1874 | 121645 | 1.77E+12 | 35,425 | 208865 | 3.04E+12 | 60498 | 330510 | 4.81E+12 | 95923 | 0.00 |
| 1875 | 120307 | 1.76E+12 | 35,425 | 207661 | 3.04E+12 | 60498 | 327968 | 4.80E+12 | 95923 | 0.00 |
| 1876 | 118409 | 1.74E+12 | 35,425 | 205783 | 3.02E+12 | 60497 | 324192 | 4.77E+12 | 95922 | 0.01 |
| 1877 | 115995 | 1.71E+12 | 35,424 | 203286 | 3.00E+12 | 60496 | 319281 | 4.71E+12 | 95920 | 0.00 |
| 1878 | 113384 | 1.68E+12 | 35,423 | 200277 | 2.96E+12 | 60495 | 313661 | 4.64E+12 | 95918 | 0.00 |
| 1879 | 110616 | 1.64E+12 | 35,422 | 196877 | 2.91E+12 | 60493 | 307493 | 4.55E+12 | 95915 | 0.01 |
| 1880 | 107652 | 1.59E+12 | 35,421 | 193210 | 2.86E+12 | 60491 | 300862 | 4.45E+12 | 95912 | 0.01 |
| 1881 | 104432 | 1.54E+12 | 35,419 | 188950 | 2.79E+12 | 60489 | 293382 | 4.33E+12 | 95908 | 0.01 |
| 1882 | 101070 | 1.49E+12 | 35,418 | 184603 | 2.72E+12 | 60486 | 285673 | 4.21E+12 | 95903 | 0.01 |
| 1883 | 97608 | 1.43E+12 | 35,416 | 180264 | 2.65E+12 | 60483 | 277872 | 4.09E+12 | 95899 | 0.01 |
| 1884 | 94075 | 1.38E+12 | 35,414 | 176001 | 2.59E+12 | 60479 | 270076 | 3.96E+12 | 95893 | 0.02 |
| 1885 | 90498 | 1.32E+12 | 35,412 | 171875 | 2.52E+12 | 60476 | 262373 | 3.84E+12 | 95888 | 0.02 |
| 1886 | 86896 | 1.27E+12 | 35,410 | 167932 | 2.46E+12 | 60473 | 254828 | 3.72E+12 | 95883 | 0.02 |
| 1887 | 83281 | 1.21E+12 | 35,408 | 164203 | 2.40E+12 | 60469 | 247484 | 3.61E+12 | 95877 | 0.02 |
| 1888 | 79665 | 1.16E+12 | 35,406 | 160766 | 2.34E+12 | 60465 | 240431 | 3.50E+12 | 95871 | 0.02 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 1889 | 76230 | 1.11E+12 | 35,404 | 157542 | 2.29E+12 | 60462 | 233772 | 3.40E+12 | 95865 | 0.02 | |
| 1890 | 72830 | 1.05E+12 | 35,401 | 154502 | 2.25E+12 | 60458 | 227332 | 3.30E+12 | 95859 | 0.03 | |
| 1891 | 69229 | 1.00E+12 | 35,399 | 151677 | 2.20E+12 | 60454 | 220906 | 3.20E+12 | 95853 | 0.02 | |
| 1892 | 65892 | 9.50E+11 | 35,397 | 148999 | 2.16E+12 | 60450 | 214891 | 3.11E+12 | 95847 | 0.03 | |
| 1893 | 62613 | 9.01E+11 | 35,395 | 146522 | 2.13E+12 | 60446 | 209135 | 3.03E+12 | 95841 | 0.03 | |
| 1894 | 59416 | 8.53E+11 | 35,392 | 144227 | 2.09E+12 | 60443 | 203643 | 2.95E+12 | 95835 | 0.03 | |
| 1895 | 56306 | 8.06E+11 | 35,390 | 142100 | 2.06E+12 | 60439 | 198406 | 2.87E+12 | 95829 | 0.03 | |
| 1896 | 53372 | 7.62E+11 | 35,388 | 140129 | 2.03E+12 | 60435 | 193501 | 2.79E+12 | 95823 | 0.03 | |
| 1897 | 50552 | 7.20E+11 | 35,386 | 138301 | 2.00E+12 | 60431 | 188853 | 2.72E+12 | 95816 | 0.03 | |
| 1898 | 47873 | 6.79E+11 | 35,383 | 136610 | 1.98E+12 | 60427 | 184483 | 2.66E+12 | 95810 | 0.04 | |
| 1899 | 45099 | 6.38E+11 | 35,572 | 134949 | 1.95E+12 | 60749 | 180048 | 2.59E+12 | 96321 | 0.05 | |
| 1900 | 42168 | 5.96E+11 | 35,551 | 133302 | 1.93E+12 | 60714 | 175470 | 2.53E+12 | 96265 | 0.06 | |
| 1901 | 39055 | 5.51E+11 | 35,543 | 131656 | 1.91E+12 | 60700 | 170711 | 2.46E+12 | 96243 | 0.07 | |
| 1902 | 35821 | 5.04E+11 | 35,556 | 130015 | 1.88E+12 | 60721 | 165836 | 2.39E+12 | 96277 | 0.07 | |
| 1903 | 32509 | 4.57E+11 | 35,575 | 128385 | 1.86E+12 | 60754 | 160894 | 2.31E+12 | 96329 | 0.07 | |
| 1904 | 29496 | 4.12E+11 | 35,590 | 126847 | 1.83E+12 | 60779 | 156343 | 2.25E+12 | 96369 | 0.08 | |
| 1905 | 26765 | 3.71E+11 | 35,603 | 125400 | 1.81E+12 | 60802 | 152165 | 2.18E+12 | 96406 | 0.07 | |
| 1906 | 24378 | 3.35E+11 | 35,616 | 124064 | 1.79E+12 | 60825 | 148442 | 2.13E+12 | 96441 | 0.07 | |
| 1907 | 22348 | 3.03E+11 | 35,625 | 122847 | 1.77E+12 | 60839 | 145195 | 2.08E+12 | 96464 | 0.06 | |
| 1908 | 20683 | 2.77E+11 | 35,630 | 121756 | 1.76E+12 | 60848 | 142439 | 2.03E+12 | 96478 | 0.06 | |
| 1909 | 19344 | 2.55E+11 | 35,630 | 120782 | 1.74E+12 | 60848 | 140126 | 1.99E+12 | 96478 | 0.05 | |
| 1910 | 18387 | 2.38E+11 | 35,626 | 119948 | 1.73E+12 | 60841 | 138335 | 1.96E+12 | 96467 | 0.04 | |
| 1911 | 17828 | 2.26E+11 | 35,622 | 119251 | 1.72E+12 | 60834 | 137079 | 1.94E+12 | 96456 | 0.04 | |

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|---|---|---|---|---|---|---|---|---|---|---|
| 1912 | 17467 | 2.18E+11 | 35,613 | 118647 | 1.71E+12 | 60819 | 136114 | 1.93E+12 | 96432 | 0.04 |
| 1913 | 17281 | 2.14E+11 | 35,601 | 118125 | 1.70E+12 | 60798 | 135406 | 1.91E+12 | 96399 | 0.04 |
| 1914 | 17247 | 2.12E+11 | 35,594 | 117676 | 1.69E+12 | 60786 | 134923 | 1.90E+12 | 96380 | 0.03 |
| 1915 | 17342 | 2.13E+11 | 35,589 | 117289 | 1.69E+12 | 60778 | 134631 | 1.90E+12 | 96366 | 0.03 |
| 1916 | 17544 | 2.16E+11 | 35,581 | 116959 | 1.68E+12 | 60765 | 134503 | 1.90E+12 | 96346 | 0.03 |
| 1917 | 17833 | 2.20E+11 | 35,565 | 116677 | 1.68E+12 | 60738 | 134510 | 1.90E+12 | 96303 | 0.03 |
| 1918 | 18223 | 2.26E+11 | 35,540 | 116437 | 1.67E+12 | 60694 | 134660 | 1.90E+12 | 96233 | 0.03 |
| 1919 | 18666 | 2.33E+11 | 35,504 | 116235 | 1.67E+12 | 60633 | 134901 | 1.91E+12 | 96137 | 0.03 |
| 1920 | 19041 | 2.40E+11 | 35,464 | 116054 | 1.67E+12 | 60565 | 135095 | 1.91E+12 | 96029 | 0.04 |
| 1921 | 19310 | 2.45E+11 | 35,408 | 115888 | 1.67E+12 | 60470 | 135198 | 1.91E+12 | 95878 | 0.04 |
| 1922 | 19439 | 2.49E+11 | 35,340 | 115729 | 1.67E+12 | 60353 | 135168 | 1.91E+12 | 95693 | 0.04 |
| 1923 | 19400 | 2.50E+11 | 35,251 | 115573 | 1.66E+12 | 60202 | 134973 | 1.91E+12 | 95453 | 0.05 |
| 1924 | 19172 | 2.48E+11 | 35,148 | 115416 | 1.66E+12 | 60026 | 134588 | 1.91E+12 | 95174 | 0.05 |
| 1925 | 18904 | 2.45E+11 | 35,047 | 115268 | 1.66E+12 | 59852 | 134172 | 1.90E+12 | 94899 | 0.05 |
| 1926 | 18567 | 2.41E+11 | 34,961 | 115128 | 1.66E+12 | 59705 | 133695 | 1.90E+12 | 94665 | 0.05 |
| 1927 | 18219 | 2.36E+11 | 34,901 | 114997 | 1.66E+12 | 59604 | 133216 | 1.89E+12 | 94505 | 0.05 |
| 1928 | 17670 | 2.29E+11 | 34,843 | 114806 | 1.65E+12 | 59504 | 132476 | 1.88E+12 | 94347 | 0.05 |
| 1929 | 17257 | 2.22E+11 | 34,772 | 114681 | 1.65E+12 | 59383 | 131938 | 1.87E+12 | 94155 | 0.05 |
| 1930 | 16720 | 2.14E+11 | 34,695 | 114561 | 1.65E+12 | 59251 | 131281 | 1.86E+12 | 93946 | 0.03 |
| 1931 | 16840 | 2.13E+11 | 34,628 | 114375 | 1.65E+12 | 59137 | 131215 | 1.86E+12 | 93765 | 0.03 |
| 1932 | 17056 | 2.14E+11 | 34,545 | 114282 | 1.65E+12 | 58995 | 131338 | 1.86E+12 | 93540 | 0.03 |
| 1933 | 17286 | 2.16E+11 | 34,424 | 114159 | 1.64E+12 | 58789 | 131445 | 1.86E+12 | 93214 | 0.03 |
| 1934 | 17696 | 2.21E+11 | 34,280 | 114016 | 1.64E+12 | 58543 | 131712 | 1.86E+12 | 92823 | 0.03 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1935 | 18291 | 2.28E+11 | 34,109 | 113856 | 1.64E+12 | 58250 | 132147 | 1.87E+12 | 92359 | 0.03 |
| 1936 | 18749 | 2.35E+11 | 33,926 | 113581 | 1.64E+12 | 57938 | 132330 | 1.87E+12 | 91864 | 0.04 |
| 1937 | 19054 | 2.41E+11 | 33,781 | 113180 | 1.63E+12 | 57690 | 132234 | 1.87E+12 | 91471 | 0.03 |
| 1938 | 19493 | 2.49E+11 | 33,659 | 112700 | 1.63E+12 | 57482 | 132193 | 1.87E+12 | 91140 | 0.04 |
| 1939 | 19583 | 2.52E+11 | 33,545 | 112182 | 1.62E+12 | 57287 | 131765 | 1.87E+12 | 90831 | 0.05 |
| 1940 | 19339 | 2.51E+11 | 33,404 | 111670 | 1.61E+12 | 57047 | 131009 | 1.86E+12 | 90451 | 0.04 |
| 1941 | 19584 | 2.55E+11 | 33,217 | 111156 | 1.60E+12 | 56728 | 130740 | 1.86E+12 | 89945 | 0.03 |
| 1942 | 19942 | 2.59E+11 | 32,978 | 110668 | 1.60E+12 | 56320 | 130610 | 1.85E+12 | 89298 | 0.03 |
| 1943 | 20542 | 2.67E+11 | 32,694 | 110271 | 1.59E+12 | 55835 | 130813 | 1.86E+12 | 88529 | 0.02 |
| 1944 | 21378 | 2.78E+11 | 32,411 | 109972 | 1.58E+12 | 55352 | 131350 | 1.86E+12 | 87763 | 0.02 |
| 1945 | 22177 | 2.89E+11 | 32,148 | 109739 | 1.58E+12 | 54902 | 131916 | 1.87E+12 | 87050 | 0.02 |
| 1946 | 23113 | 3.02E+11 | 31,965 | 109590 | 1.58E+12 | 54589 | 132703 | 1.88E+12 | 86554 | 0.03 |
| 1947 | 23661 | 3.12E+11 | 31,911 | 109379 | 1.58E+12 | 54497 | 133040 | 1.89E+12 | 86408 | 0.04 |
| 1948 | 24099 | 3.21E+11 | 31,841 | 109080 | 1.57E+12 | 54377 | 133179 | 1.89E+12 | 86218 | 0.06 |
| 1949 | 24384 | 3.27E+11 | 31,497 | 108676 | 1.57E+12 | 53789 | 133060 | 1.89E+12 | 85286 | 0.09 |
| 1950 | 24340 | 3.28E+11 | 31,157 | 108072 | 1.56E+12 | 53209 | 132412 | 1.89E+12 | 84365 | 0.12 |
| 1951 | 24606 | 3.33E+11 | 30,775 | 106572 | 1.55E+12 | 52557 | 131178 | 1.88E+12 | 83332 | 0.14 |
| 1952 | 24634 | 3.35E+11 | 30,453 | 104785 | 1.52E+12 | 52008 | 129419 | 1.86E+12 | 82461 | 0.16 |
| 1953 | 24444 | 3.34E+11 | 30,106 | 102642 | 1.50E+12 | 51415 | 127086 | 1.83E+12 | 81521 | 0.16 |
| 1954 | 24242 | 3.32E+11 | 29,957 | 100406 | 1.47E+12 | 51160 | 124648 | 1.80E+12 | 81117 | 0.19 |
| 1955 | 24014 | 3.29E+11 | 29,720 | 97975 | 1.43E+12 | 50756 | 121989 | 1.76E+12 | 80476 | 0.19 |
| 1956 | 23605 | 3.24E+11 | 29,766 | 95351 | 1.39E+12 | 50834 | 118956 | 1.72E+12 | 80600 | 0.24 |
| 1957 | 22915 | 3.15E+11 | 29,892 | 92351 | 1.35E+12 | 51050 | 115266 | 1.66E+12 | 80942 | 0.28 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1958 | 22254 | 3.05E+11 | 30,260 | 89222 | 1.30E+12 | 51677 | 111476 | 1.61E+12 | 81937 | 0.42 |
| 1959 | 20840 | 2.87E+11 | 30,310 | 85314 | 1.25E+12 | 51762 | 106154 | 1.53E+12 | 82072 | 0.47 |
| 1960 | 19445 | 2.68E+11 | 30,315 | 81204 | 1.19E+12 | 51772 | 100649 | 1.45E+12 | 82087 | 0.54 |
| 1961 | 17783 | 2.44E+11 | 30,120 | 76897 | 1.12E+12 | 51438 | 94679 | 1.37E+12 | 81557 | 0.52 |
| 1962 | 16209 | 2.22E+11 | 30,167 | 72257 | 1.05E+12 | 51518 | 88466 | 1.28E+12 | 81684 | 0.58 |
| 1963 | 14575 | 1.98E+11 | 30,430 | 67672 | 9.86E+11 | 51967 | 82247 | 1.18E+12 | 82397 | 0.66 |
| 1964 | 13214 | 1.77E+11 | 30,717 | 63333 | 9.19E+11 | 52458 | 76547 | 1.10E+12 | 83175 | 0.72 |
| 1965 | 11636 | 1.54E+11 | 31,271 | 59158 | 8.55E+11 | 53404 | 70794 | 1.01E+12 | 84675 | 0.87 |
| 1966 | 10056 | 1.32E+11 | 31,687 | 55087 | 7.92E+11 | 54114 | 65142 | 9.24E+11 | 85800 | 0.94 |
| 1967 | 8796 | 1.13E+11 | 32,158 | 51437 | 7.35E+11 | 54919 | 60233 | 8.48E+11 | 87077 | 1.18 |
| 1968 | 7691 | 9.58E+10 | 32,059 | 47374 | 6.76E+11 | 54750 | 55065 | 7.72E+11 | 86810 | 1.25 |
| 1969 | 6775 | 8.18E+10 | 31,997 | 43024 | 6.14E+11 | 54644 | 49799 | 6.95E+11 | 86641 | 1.57 |
| 1970 | 5973 | 6.98E+10 | 30,316 | 39159 | 5.57E+11 | 51773 | 45132 | 6.27E+11 | 82089 | 1.59 |
| 1971 | 5239 | 5.97E+10 | 27,083 | 35195 | 5.01E+11 | 46252 | 40434 | 5.61E+11 | 73335 | 1.79 |
| 1972 | 6214 | 5.07E+10 | 168,048 | 33143 | 4.43E+11 | 223131 | 39357 | 4.94E+11 | 391179 | 6.81 |
| 1973 | 5979 | 4.17E+10 | 38,503 | 29975 | 3.89E+11 | 117686 | 35954 | 4.30E+11 | 156189 | 5.71 |
| 1974 | 6164 | 4.00E+10 | 37,941 | 27360 | 3.49E+11 | 53199 | 33524 | 3.89E+11 | 91140 | 0.96 |
| 1975 | 5616 | 3.99E+10 | 34,271 | 25165 | 3.20E+11 | 66458 | 30781 | 3.60E+11 | 100729 | 1.17 |
| 1976 | 5215 | 3.97E+10 | 39,985 | 23113 | 2.95E+11 | 68482 | 28328 | 3.35E+11 | 108467 | 1.67 |
| 1977 | 4755 | 3.63E+10 | 46,830 | 21407 | 2.72E+11 | 69646 | 26162 | 3.09E+11 | 116476 | 1.65 |
| 1978 | 4474 | 3.43E+10 | 25,637 | 19772 | 2.51E+11 | 51070 | 24246 | 2.86E+11 | 76707 | 1.43 |
| 1979 | 4305 | 3.39E+10 | 22,878 | 18583 | 2.33E+11 | 71826 | 22888 | 2.66E+11 | 94705 | 1.62 |
| 1980 | 4234 | 3.33E+10 | 43,389 | 18642 | 2.16E+11 | 175637 | 22875 | 2.49E+11 | 219026 | 2.81 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 1981 | 4558 | 3.14E+10 | 79,892 | 18390 | 2.00E+11 | 121091 | 22947 | 2.31E+11 | 200983 | 3.32 |
| 1982 | 4925 | 2.81E+10 | 77,554 | 18227 | 1.88E+11 | 102670 | 23152 | 2.16E+11 | 180223 | 1.68 |
| 1983 | 4846 | 2.67E+10 | 22,946 | 17725 | 1.82E+11 | 73066 | 22571 | 2.08E+11 | 96012 | 1.10 |
| 1984 | 4516 | 2.75E+10 | 13,852 | 16951 | 1.79E+11 | 45043 | 21467 | 2.07E+11 | 58895 | 0.70 |
| 1985 | 4785 | 3.43E+10 | 11,829 | 17127 | 1.81E+11 | 79738 | 21912 | 2.15E+11 | 91567 | 1.10 |
| 1986 | 4955 | 4.13E+10 | 28,937 | 17259 | 1.86E+11 | 77913 | 22215 | 2.27E+11 | 106850 | 1.73 |
| 1987 | 4806 | 4.63E+10 | 11,681 | 17129 | 1.90E+11 | 60758 | 21936 | 2.37E+11 | 72439 | 1.24 |
| 1988 | 4564 | 4.66E+10 | 24,697 | 17685 | 1.99E+11 | 70854 | 22248 | 2.46E+11 | 95551 | 1.31 |
| 1989 | 4633 | 4.56E+10 | 48,229 | 18497 | 2.03E+11 | 140082 | 23130 | 2.49E+11 | 188311 | 2.62 |
| 1990 | 4777 | 4.42E+10 | 42,173 | 19174 | 2.11E+11 | 98553 | 23951 | 2.55E+11 | 140726 | 1.89 |
| 1991 | 5324 | 4.45E+10 | 54,641 | 21168 | 2.24E+11 | 143256 | 26492 | 2.69E+11 | 197897 | 1.91 |
| 1992 | 5852 | 4.75E+10 | 37,447 | 22792 | 2.39E+11 | 122713 | 28643 | 2.87E+11 | 160160 | 1.59 |
| 1993 | 6193 | 4.97E+10 | 49,974 | 24477 | 2.55E+11 | 138107 | 30670 | 3.05E+11 | 188081 | 1.52 |
| 1994 | 5932 | 4.93E+10 | 38,360 | 25964 | 2.75E+11 | 123912 | 31896 | 3.24E+11 | 162272 | 1.41 |
| 1995 | 6424 | 4.90E+10 | 87,033 | 27932 | 2.99E+11 | 137423 | 34356 | 3.48E+11 | 224456 | 1.43 |
| 1996 | 6856 | 5.02E+10 | 55,821 | 29238 | 3.24E+11 | 85819 | 36094 | 3.74E+11 | 141640 | 1.05 |
| 1997 | 7486 | 5.33E+10 | 57,232 | 30536 | 3.47E+11 | 102109 | 38022 | 4.01E+11 | 159341 | 1.20 |
| 1998 | 7667 | 5.67E+10 | 46,712 | 30998 | 3.67E+11 | 87169 | 38665 | 4.24E+11 | 133881 | 1.11 |
| 1999 | 9030 | 6.52E+10 | 106,016 | 32043 | 3.86E+11 | 116241 | 41074 | 4.52E+11 | 222257 | 1.44 |
| 2000 | 9392 | 6.64E+10 | 91,418 | 32880 | 4.03E+11 | 114116 | 42271 | 4.69E+11 | 205533 | 1.70 |
| 2001 | 10186 | 7.20E+10 | 74,682 | 33125 | 4.14E+11 | 84690 | 43312 | 4.86E+11 | 159372 | 1.06 |
| 2002 | 10924 | 7.65E+10 | 104,945 | 33834 | 4.25E+11 | 104413 | 44758 | 5.01E+11 | 209358 | 1.33 |
| 2003 | 11848 | 8.24E+10 | 122,499 | 34664 | 4.32E+11 | 140743 | 46512 | 5.14E+11 | 263241 | 1.45 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 2004 | 13610 | 9.13E+10 | 156,356 | 36281 | 4.42E+11 | 177248 | 49891 | 5.33E+11 | 333605 | 1.43 |
| 2005 | 15202 | 1.01E+11 | 137,812 | 37576 | 4.50E+11 | 148186 | 52778 | 5.51E+11 | 285997 | 0.86 |
| 2006 | 18267 | 1.26E+11 | 134,235 | 39265 | 4.61E+11 | 136063 | 57531 | 5.87E+11 | 270298 | 0.56 |
| 2007 | 21796 | 1.64E+11 | 104,905 | 40748 | 4.77E+11 | 109550 | 62544 | 6.41E+11 | 214455 | 0.40 |
| 2008 | 24125 | 2.06E+11 | 52,725 | 42782 | 5.05E+11 | 71825 | 66907 | 7.11E+11 | 124550 | 0.18 |
| 2009 | 27588 | 2.66E+11 | 44,239 | 46751 | 5.54E+11 | 111609 | 74340 | 8.20E+11 | 155848 | 0.28 |
| 2010 | 30168 | 3.29E+11 | 15,598 | 50686 | 6.15E+11 | 79113 | 80854 | 9.44E+11 | 94711 | 0.22 |
| 2011 | 32817 | 3.98E+11 | 12,379 | 54845 | 6.85E+11 | 81585 | 87661 | 1.08E+12 | 93964 | 0.25 |

Table 3.6.1 Continuous fishing mortality rate in terms of exploitable biomass for Gulf of Mexico red snapper base model configuration from SS (steepness =0.99, sigmaR=0.3).

| Year | Annual Exploitation Rate | Standard Deviation |
|---|---|---|
| 1872 | 0.0017 | 0.0002 |
| 1873 | 0.0024 | 0.0002 |
| 1874 | 0.0037 | 0.0004 |
| 1875 | 0.0045 | 0.0005 |
| 1876 | 0.0054 | 0.0006 |
| 1877 | 0.0048 | 0.0005 |
| 1878 | 0.0046 | 0.0005 |
| 1879 | 0.0054 | 0.0006 |
| 1880 | 0.0113 | 0.0009 |
| 1881 | 0.0123 | 0.0010 |
| 1882 | 0.0133 | 0.0011 |
| 1883 | 0.0144 | 0.0012 |
| 1884 | 0.0156 | 0.0014 |
| 1885 | 0.0168 | 0.0015 |
| 1886 | 0.0182 | 0.0017 |
| 1887 | 0.0189 | 0.0019 |

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|---|---|---|
| 1888 | 0.0189 | 0.0019 |
| 1889 | 0.0211 | 0.0021 |
| 1890 | 0.0258 | 0.0026 |
| 1891 | 0.0248 | 0.0025 |
| 1892 | 0.0272 | 0.0028 |
| 1893 | 0.0292 | 0.0031 |
| 1894 | 0.0311 | 0.0033 |
| 1895 | 0.0316 | 0.0034 |
| 1896 | 0.0332 | 0.0037 |
| 1897 | 0.0342 | 0.0038 |
| 1898 | 0.0407 | 0.0045 |
| 1899 | 0.0482 | 0.0055 |
| 1900 | 0.0569 | 0.0080 |
| 1901 | 0.0653 | 0.0100 |
| 1902 | 0.0745 | 0.0125 |
| 1903 | 0.0749 | 0.0143 |
| 1904 | 0.0758 | 0.0163 |
| 1905 | 0.0739 | 0.0174 |
| 1906 | 0.0701 | 0.0177 |
| 1907 | 0.0645 | 0.0172 |

| | | |
|---|---|---|
| 1908 | 0.0590 | 0.0164 |
| 1909 | 0.0503 | 0.0143 |
| 1910 | 0.0410 | 0.0115 |
| 1911 | 0.0390 | 0.0105 |
| 1912 | 0.0372 | 0.0096 |
| 1913 | 0.0357 | 0.0088 |
| 1914 | 0.0345 | 0.0081 |
| 1915 | 0.0336 | 0.0076 |
| 1916 | 0.0329 | 0.0072 |
| 1917 | 0.0316 | 0.0066 |
| 1918 | 0.0311 | 0.0064 |
| 1919 | 0.0333 | 0.0067 |
| 1920 | 0.0357 | 0.0071 |
| 1921 | 0.0386 | 0.0077 |
| 1922 | 0.0419 | 0.0085 |
| 1923 | 0.0457 | 0.0096 |
| 1924 | 0.0459 | 0.0100 |
| 1925 | 0.0471 | 0.0106 |
| 1926 | 0.0470 | 0.0110 |
| 1927 | 0.0532 | 0.0128 |

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|---|---|---|
| 1928 | 0.0481 | 0.0122 |
| 1929 | 0.0517 | 0.0137 |
| 1930 | 0.0347 | 0.0089 |
| 1931 | 0.0320 | 0.0081 |
| 1932 | 0.0334 | 0.0080 |
| 1933 | 0.0299 | 0.0067 |
| 1934 | 0.0265 | 0.0056 |
| 1935 | 0.0324 | 0.0064 |
| 1936 | 0.0375 | 0.0071 |
| 1937 | 0.0348 | 0.0063 |
| 1938 | 0.0425 | 0.0079 |
| 1939 | 0.0487 | 0.0093 |
| 1940 | 0.0358 | 0.0069 |
| 1941 | 0.0326 | 0.0062 |
| 1942 | 0.0254 | 0.0047 |
| 1943 | 0.0191 | 0.0034 |
| 1944 | 0.0200 | 0.0034 |
| 1945 | 0.0160 | 0.0027 |
| 1946 | 0.0279 | 0.0043 |
| 1947 | 0.0397 | 0.0063 |

| | | |
|---|---|---|
| 1948 | 0.0617 | 0.0119 |
| 1949 | 0.0883 | 0.0182 |
| 1950 | 0.1237 | 0.0227 |
| 1951 | 0.1378 | 0.0251 |
| 1952 | 0.1605 | 0.0298 |
| 1953 | 0.1613 | 0.0299 |
| 1954 | 0.1937 | 0.0389 |
| 1955 | 0.1897 | 0.0350 |
| 1956 | 0.2413 | 0.0463 |
| 1957 | 0.2832 | 0.0583 |
| 1958 | 0.4215 | 0.0899 |
| 1959 | 0.4746 | 0.1037 |
| 1960 | 0.5365 | 0.1166 |
| 1961 | 0.5249 | 0.1082 |
| 1962 | 0.5785 | 0.1213 |
| 1963 | 0.6624 | 0.1494 |
| 1964 | 0.7187 | 0.1637 |
| 1965 | 0.8707 | 0.2111 |
| 1966 | 0.9427 | 0.2414 |
| 1967 | 1.1768 | 0.3111 |

| | | |
|---|---|---|
| 1968 | 1.2468 | 0.3319 |
| 1969 | 1.5657 | 0.4527 |
| 1970 | 1.5891 | 0.4641 |
| 1971 | 1.7883 | 0.5325 |
| 1972 | 6.8061 | 1.8763 |
| 1973 | 5.7069 | 1.5836 |
| 1974 | 0.9589 | 0.1279 |
| 1975 | 1.1721 | 0.1714 |
| 1976 | 1.6651 | 0.2738 |
| 1977 | 1.6484 | 0.2795 |
| 1978 | 1.4317 | 0.2465 |
| 1979 | 1.6154 | 0.2782 |
| 1980 | 2.8082 | 0.5103 |
| 1981 | 3.3153 | 0.5821 |
| 1982 | 1.6847 | 0.2546 |
| 1983 | 1.0993 | 0.1365 |
| 1984 | 0.6996 | 0.0989 |
| 1985 | 1.1021 | 0.1625 |
| 1986 | 1.7257 | 0.2709 |
| 1987 | 1.2393 | 0.1792 |

| | | |
|---|---|---|
| 1988 | 1.3097 | 0.1779 |
| 1989 | 2.6237 | 0.3898 |
| 1990 | 1.8886 | 0.2868 |
| 1991 | 1.9123 | 0.2914 |
| 1992 | 1.5880 | 0.2045 |
| 1993 | 1.5245 | 0.1950 |
| 1994 | 1.4110 | 0.1960 |
| 1995 | 1.4291 | 0.2121 |
| 1996 | 1.0458 | 0.1380 |
| 1997 | 1.1971 | 0.1815 |
| 1998 | 1.1110 | 0.1688 |
| 1999 | 1.4401 | 0.2272 |
| 2000 | 1.6952 | 0.2901 |
| 2001 | 1.0573 | 0.1461 |
| 2002 | 1.3347 | 0.1893 |
| 2003 | 1.4506 | 0.1935 |
| 2004 | 1.4253 | 0.1733 |
| 2005 | 0.8588 | 0.1023 |
| 2006 | 0.5620 | 0.0694 |
| 2007 | 0.4045 | 0.0440 |

| | | |
|---|---|---|
| 2008 | 0.1802 | 0.0197 |
| 2009 | 0.2781 | 0.0381 |
| 2010 | 0.2154 | 0.0283 |
| 2011 | 0.2495 | 0.0341 |

Table 3.2.6.2. Fleet-specific estimates of instantaneous fishing mortality rate in terms of exploitable biomass for Gulf of Mexico red snapper base model.

| | Fleet | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | **HL-E** | **HL-W** | **LL-E** | **LL-W** | **MRIP_E** | **MRIP_W** | **HBT_E** | **HBT_W** | **C_Clsc_E** | **C_Clsd_W** | **R_Clsd_E** | **R_Clsd_W** | **SHR_E** | SHR_W |
| 1872 | 0.01 | | | | | | | | | | | | | |
| 1873 | 0.02 | | | | | | | | | | | | | |
| 1874 | 0.03 | | | | | | | | | | | | | |
| 1875 | 0.03 | | | | | | | | | | | | | |
| 1876 | 0.05 | | | | | | | | | | | | | |
| 1877 | 0.04 | | | | | | | | | | | | | |
| 1878 | 0.04 | | | | | | | | | | | | | |
| 1879 | 0.05 | | | | | | | | | | | | | |
| 1880 | 0.07 | 0.03 | | | | | | | | | | | | |
| 1881 | 0.08 | 0.03 | | | | | | | | | | | | |
| 1882 | 0.09 | 0.02 | | | | | | | | | | | | |
| 1883 | 0.10 | 0.02 | | | | | | | | | | | | |
| 1884 | 0.11 | 0.02 | | | | | | | | | | | | |
| 1885 | 0.13 | 0.02 | | | | | | | | | | | | |
| 1886 | 0.14 | 0.01 | | | | | | | | | | | | |
| 1887 | 0.16 | 0.01 | | | | | | | | | | | | |
| 1888 | 0.16 | 0.01 | | | | | | | | | | | | |
| 1889 | 0.17 | 0.01 | | | | | | | | | | | | |
| 1890 | 0.22 | 0.01 | | | | | | | | | | | | |
| 1891 | 0.21 | 0.01 | | | | | | | | | | | | |
| 1892 | 0.23 | 0.01 | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1893 | 0.25 | 0.01 | | | | | | | | | | | | |
| 1894 | 0.27 | 0.01 | | | | | | | | | | | | |
| 1895 | 0.27 | 0.01 | | | | | | | | | | | | |
| 1896 | 0.29 | 0.01 | | | | | | | | | | | | |
| 1897 | 0.29 | 0.01 | | | | | | | | | | | | |
| 1898 | 0.34 | 0.02 | | | | | | | | | | | | |
| 1899 | 0.41 | 0.02 | | | | | | | | | | | | |
| 1900 | 0.50 | 0.03 | | | | | | | | | | | | |
| 1901 | 0.61 | 0.04 | | | | | | | | | | | | |
| 1902 | 0.74 | 0.04 | | | | | | | | | | | | |
| 1903 | 0.78 | 0.04 | | | | | | | | | | | | |
| 1904 | 0.82 | 0.04 | | | | | | | | | | | | |
| 1905 | 0.81 | 0.03 | | | | | | | | | | | | |
| 1906 | 0.75 | 0.03 | | | | | | | | | | | | |
| 1907 | 0.67 | 0.03 | | | | | | | | | | | | |
| 1908 | 0.58 | 0.03 | | | | | | | | | | | | |
| 1909 | 0.47 | 0.02 | | | | | | | | | | | | |
| 1910 | 0.35 | 0.02 | | | | | | | | | | | | |
| 1911 | 0.31 | 0.02 | | | | | | | | | | | | |
| 1912 | 0.28 | 0.02 | | | | | | | | | | | | |
| 1913 | 0.26 | 0.02 | | | | | | | | | | | | |
| 1914 | 0.24 | 0.02 | | | | | | | | | | | | |
| 1915 | 0.23 | 0.02 | | | | | | | | | | | | |
| 1916 | 0.22 | 0.02 | | | | | | | | | | | | |
| 1917 | 0.21 | 0.02 | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1918 | 0.20 | 0.02 | | | | | | | | | | | | |
| 1919 | 0.22 | 0.02 | | | | | | | | | | | | |
| 1920 | 0.24 | 0.02 | | | | | | | | | | | | |
| 1921 | 0.26 | 0.02 | | | | | | | | | | | | |
| 1922 | 0.29 | 0.02 | | | | | | | | | | | | |
| 1923 | 0.33 | 0.02 | | | | | | | | | | | | |
| 1924 | 0.34 | 0.02 | | | | | | | | | | | | |
| 1925 | 0.36 | 0.02 | | | | | | | | | | | | |
| 1926 | 0.37 | 0.02 | | | | | | | | | | | | |
| 1927 | 0.42 | 0.02 | | | | | | | | | | | | |
| 1928 | 0.40 | 0.02 | | | | | | | | | | | | |
| 1929 | 0.43 | 0.01 | | | | | | | | | | | | |
| 1930 | 0.26 | 0.02 | | | | | | | | | | | | |
| 1931 | 0.24 | 0.01 | | | | | | | | | | | | |
| 1932 | 0.24 | 0.01 | | | | | | | | | | | | |
| 1933 | 0.20 | 0.02 | | | | | | | | | | | | |
| 1934 | 0.17 | 0.02 | | | | | | | | | | | | |
| 1935 | 0.20 | 0.02 | | | | | | | | | | | | |
| 1936 | 0.22 | 0.03 | | | | | | | | | | | | |
| 1937 | 0.20 | 0.03 | | | | | | | | | | | | |
| 1938 | 0.26 | 0.03 | | | | | | | | | | | | |
| 1939 | 0.32 | 0.03 | | | | | | | | | | | | |
| 1940 | 0.22 | 0.03 | | | | | | | | | | | | |
| 1941 | 0.20 | 0.03 | | | | | | | | | | | | |
| 1942 | 0.15 | 0.02 | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1943 | 0.11 | 0.01 | | | | | | | | | | | | |
| 1944 | 0.12 | 0.01 | | | | | | | | | | | | |
| 1945 | 0.10 | 0.01 | | | | | | | | | | | | |
| 1946 | 0.16 | 0.01 | | | | | | | | | | | | |
| 1947 | 0.17 | 0.02 | | | | | | | | | | | | |
| 1948 | 0.19 | 0.02 | | | | | | | | | | | | |
| 1949 | 0.23 | 0.03 | | | | | | | | | | | | |
| 1950 | 0.13 | 0.06 | | | 0.03 | 0.03 | 0.04 | 0.05 | | | | | 0.01 | 0.00 |
| 1951 | 0.16 | 0.06 | | | 0.04 | 0.04 | 0.04 | 0.05 | | | | | 0.01 | 0.01 |
| 1952 | 0.19 | 0.08 | | | 0.05 | 0.04 | 0.04 | 0.06 | | | | | 0.01 | 0.03 |
| 1953 | 0.18 | 0.07 | | | 0.05 | 0.05 | 0.04 | 0.06 | | | | | 0.01 | 0.05 |
| 1954 | 0.17 | 0.07 | | | 0.06 | 0.06 | 0.05 | 0.06 | | | | | 0.02 | 0.06 |
| 1955 | 0.20 | 0.09 | | | 0.07 | 0.07 | 0.05 | 0.06 | | | | | 0.02 | 0.06 |
| 1956 | 0.26 | 0.12 | | | 0.07 | 0.08 | 0.05 | 0.06 | | | | | 0.03 | 0.07 |
| 1957 | 0.25 | 0.13 | | | 0.08 | 0.09 | 0.05 | 0.06 | | | | | 0.03 | 0.07 |
| 1958 | 0.46 | 0.24 | | | 0.09 | 0.10 | 0.05 | 0.07 | | | | | 0.03 | 0.09 |
| 1959 | 0.50 | 0.28 | | | 0.11 | 0.11 | 0.06 | 0.07 | | | | | 0.03 | 0.08 |
| 1960 | 0.67 | 0.33 | | | 0.12 | 0.13 | 0.06 | 0.08 | | | | | 0.03 | 0.10 |
| 1961 | 0.76 | 0.46 | | | 0.13 | 0.14 | 0.07 | 0.08 | | | | | 0.02 | 0.12 |
| 1962 | 0.95 | 0.53 | | | 0.14 | 0.14 | 0.07 | 0.08 | | | | | 0.02 | 0.19 |
| 1963 | 0.93 | 0.53 | | | 0.14 | 0.15 | 0.08 | 0.08 | | | | | 0.02 | 0.21 |
| 1964 | 1.32 | 0.57 | | | 0.16 | 0.15 | 0.08 | 0.09 | | | | | 0.03 | 0.21 |
| 1965 | 1.72 | 0.63 | | | 0.17 | 0.15 | 0.09 | 0.09 | | | | | 0.03 | 0.17 |
| 1966 | 1.75 | 0.55 | | | 0.18 | 0.16 | 0.10 | 0.09 | | | | | 0.03 | 0.16 |
| 1967 | 1.85 | 0.83 | | | 0.19 | 0.17 | 0.10 | 0.09 | | | | | 0.03 | 0.19 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1968 | 1.81 | 1.25 | | | 0.19 | 0.20 | 0.10 | 0.10 | | | | | 0.03 | 0.17 |
| 1969 | 1.78 | 1.27 | | | 0.20 | 0.21 | 0.10 | 0.10 | | | | | 0.03 | 0.20 |
| 1970 | 1.77 | 1.73 | | | 0.20 | 0.25 | 0.10 | 0.12 | | | | | 0.03 | 0.21 |
| 1971 | 1.84 | 2.65 | | | 0.22 | 0.32 | 0.10 | 0.14 | | | | | 0.03 | 0.26 |
| 1972 | 2.36 | 3.19 | | | 0.27 | 0.43 | 0.12 | 0.17 | | | | | 0.03 | 0.23 |
| 1973 | 1.23 | 2.39 | | | 0.06 | 0.12 | 0.02 | 0.05 | | | | | 0.03 | 0.30 |
| 1974 | 0.97 | 1.44 | | | 0.08 | 0.13 | 0.03 | 0.04 | | | | | 0.03 | 0.28 |
| 1975 | 0.76 | 0.86 | | | 0.13 | 0.22 | 0.04 | 0.07 | | | | | 0.03 | 0.29 |
| 1976 | 0.78 | 0.70 | | 0.00 | 0.16 | 0.26 | 0.05 | 0.08 | | | | | 0.03 | 0.33 |
| 1977 | 0.62 | 0.68 | | 0.00 | 0.17 | 0.25 | 0.06 | 0.08 | | | | | 0.03 | 0.25 |
| 1978 | 0.55 | 0.67 | | 0.00 | 0.15 | 0.24 | 0.05 | 0.08 | | | | | 0.03 | 0.25 |
| 1979 | 0.54 | 0.63 | | 0.00 | 0.18 | 0.28 | 0.06 | 0.09 | | | | | 0.03 | 0.24 |
| 1980 | 0.56 | 0.66 | 0.05 | 0.00 | 0.25 | 0.26 | 0.07 | 0.08 | | | | | 0.02 | 0.28 |
| 1981 | 0.74 | 0.76 | 0.10 | 0.00 | 0.23 | 0.13 | 0.02 | 0.03 | | | | | 0.03 | 0.24 |
| 1982 | 0.78 | 0.66 | 0.15 | 0.00 | 0.11 | 0.09 | 0.04 | 0.03 | | | | | 0.03 | 0.28 |
| 1983 | 0.62 | 0.45 | 0.32 | 0.01 | 0.10 | 0.19 | 0.06 | 0.04 | | | | | 0.03 | 0.29 |
| 1984 | 0.30 | 0.28 | 0.22 | 0.05 | 0.03 | 0.08 | 0.01 | 0.05 | | | | | 0.03 | 0.18 |
| 1985 | 0.26 | 0.17 | 0.04 | 0.04 | 0.19 | 0.25 | 0.05 | 0.14 | | | | | 0.03 | 0.27 |
| 1986 | 0.13 | 0.19 | 0.02 | 0.05 | 0.44 | 0.22 | 0.01 | 0.15 | | | | | 0.03 | 0.28 |
| 1987 | 0.15 | 0.15 | 0.01 | 0.04 | 0.73 | 0.08 | 0.02 | 0.15 | | | | | 0.03 | 0.22 |
| 1988 | 0.23 | 0.25 | 0.02 | 0.03 | 0.67 | 0.14 | 0.02 | 0.18 | | | | | 0.03 | 0.28 |
| 1989 | 0.24 | 0.21 | 0.03 | 0.02 | 0.80 | 0.12 | 0.02 | 0.18 | | | | | 0.03 | 0.26 |
| 1990 | 0.32 | 0.19 | 0.04 | 0.01 | 0.48 | 0.07 | 0.03 | 0.09 | | | | | 0.03 | 0.35 |
| 1991 | 0.16 | 0.17 | 0.01 | 0.00 | 0.46 | 0.08 | 0.02 | 0.08 | 0.06 | 0.02 | | | 0.03 | 0.33 |
| 1992 | 0.12 | 0.20 | 0.00 | 0.00 | 0.60 | 0.10 | 0.03 | 0.11 | 0.22 | 0.03 | | | 0.03 | 0.31 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1993 | 0.11 | 0.20 | 0.01 | 0.00 | 0.85 | 0.12 | 0.03 | 0.12 | 0.21 | 0.01 | | | 0.03 | 0.29 |
| 1994 | 0.15 | 0.17 | 0.00 | 0.00 | 0.79 | 0.11 | 0.03 | 0.15 | 0.21 | 0.01 | | | 0.03 | 0.31 |
| 1995 | 0.05 | 0.17 | 0.00 | 0.00 | 0.85 | 0.18 | 0.03 | 0.14 | 0.17 | 0.01 | | | 0.03 | 0.36 |
| 1996 | 0.06 | 0.23 | 0.00 | 0.00 | 0.66 | 0.11 | 0.03 | 0.13 | 0.25 | 0.01 | | | 0.04 | 0.31 |
| 1997 | 0.04 | 0.26 | 0.00 | 0.00 | 0.88 | 0.11 | 0.05 | 0.13 | 0.13 | 0.01 | 0.01 | 0.00 | 0.04 | 0.31 |
| 1998 | 0.06 | 0.25 | 0.00 | 0.00 | 0.50 | 0.09 | 0.05 | 0.10 | 0.09 | 0.01 | 0.02 | 0.00 | 0.05 | 0.30 |
| 1999 | 0.08 | 0.28 | 0.00 | 0.00 | 0.51 | 0.09 | 0.05 | 0.05 | 0.46 | 0.01 | 0.03 | 0.00 | 0.03 | 0.30 |
| 2000 | 0.10 | 0.27 | 0.00 | 0.00 | 0.69 | 0.13 | 0.12 | 0.07 | 0.08 | 0.01 | 0.05 | 0.01 | 0.03 | 0.30 |
| 2001 | 0.12 | 0.27 | 0.00 | 0.00 | 0.86 | 0.09 | 0.11 | 0.08 | 0.08 | 0.01 | 0.07 | 0.00 | 0.03 | 0.40 |
| 2002 | 0.14 | 0.26 | 0.00 | 0.00 | 0.83 | 0.08 | 0.11 | 0.09 | 0.03 | 0.02 | 0.07 | 0.00 | 0.04 | 0.36 |
| 2003 | 0.12 | 0.23 | 0.00 | 0.00 | 0.63 | 0.09 | 0.10 | 0.10 | 0.08 | 0.01 | 0.04 | 0.01 | 0.03 | 0.36 |
| 2004 | 0.10 | 0.24 | 0.00 | 0.01 | 0.75 | 0.11 | 0.09 | 0.07 | 0.03 | 0.01 | 0.02 | 0.01 | 0.03 | 0.42 |
| 2005 | 0.07 | 0.23 | 0.00 | 0.01 | 0.38 | 0.13 | 0.05 | 0.06 | 0.02 | 0.00 | 0.03 | 0.01 | 0.02 | 0.38 |
| 2006 | 0.05 | 0.24 | 0.00 | 0.01 | 0.29 | 0.14 | 0.04 | 0.06 | 0.01 | 0.00 | 0.02 | 0.01 | 0.02 | 0.43 |
| 2007 | 0.14 | 0.16 | 0.00 | 0.01 | 0.29 | 0.09 | 0.04 | 0.04 | 0.03 | 0.01 | 0.02 | 0.01 | 0.01 | 0.31 |
| 2008 | 0.11 | 0.10 | 0.00 | 0.00 | 0.09 | 0.02 | 0.03 | 0.01 | 0.03 | 0.00 | 0.04 | 0.01 | 0.01 | 0.25 |
| 2009 | 0.11 | 0.07 | 0.00 | 0.00 | 0.10 | 0.02 | 0.04 | 0.01 | 0.06 | 0.00 | 0.04 | 0.01 | 0.01 | 0.20 |
| 2010 | 0.16 | 0.09 | 0.01 | 0.00 | 0.05 | 0.01 | 0.02 | 0.01 | 0.01 | 0.00 | 0.05 | 0.00 | 0.01 | 0.17 |
| 2011 | 0.22 | 0.09 | 0.01 | 0.00 | 0.08 | 0.01 | 0.05 | 0.01 | 0.02 | 0.00 | 0.10 | 0.01 | 0.01 | 0.13 |

## 3.7 Figures

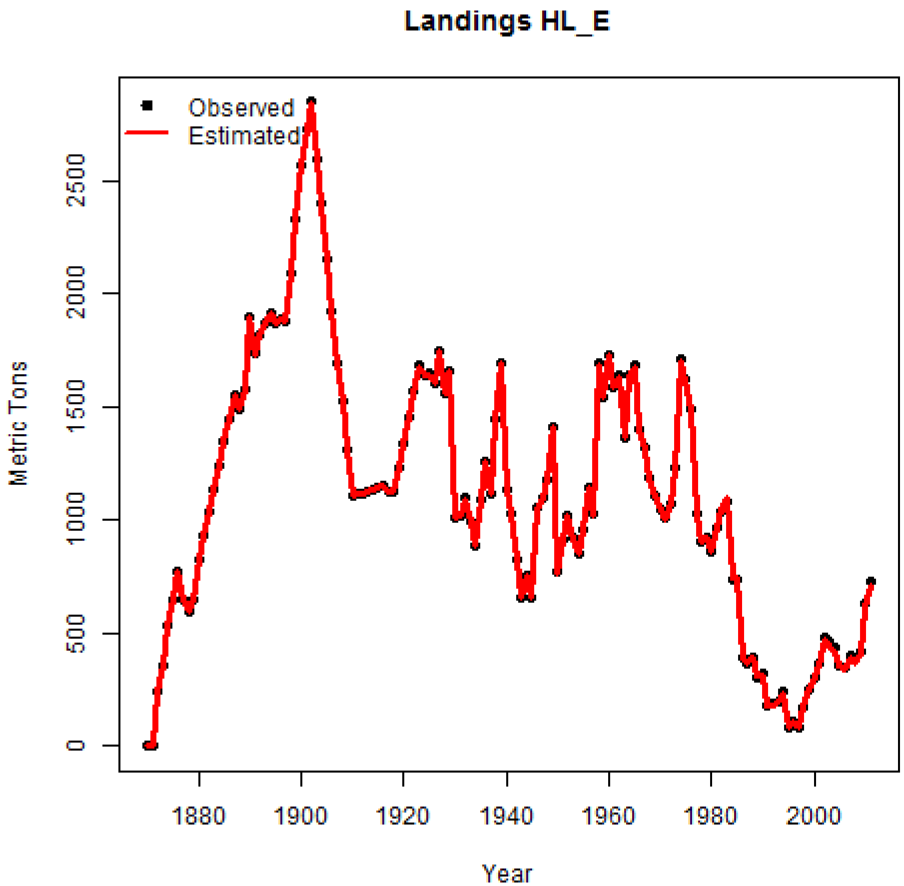



Figure 3.2.1.1. Observed (black dots) and estimated landings (red line) of red snapper for the commercial handline fishery in the eastern Gulf of Mexico, 1872-2011.

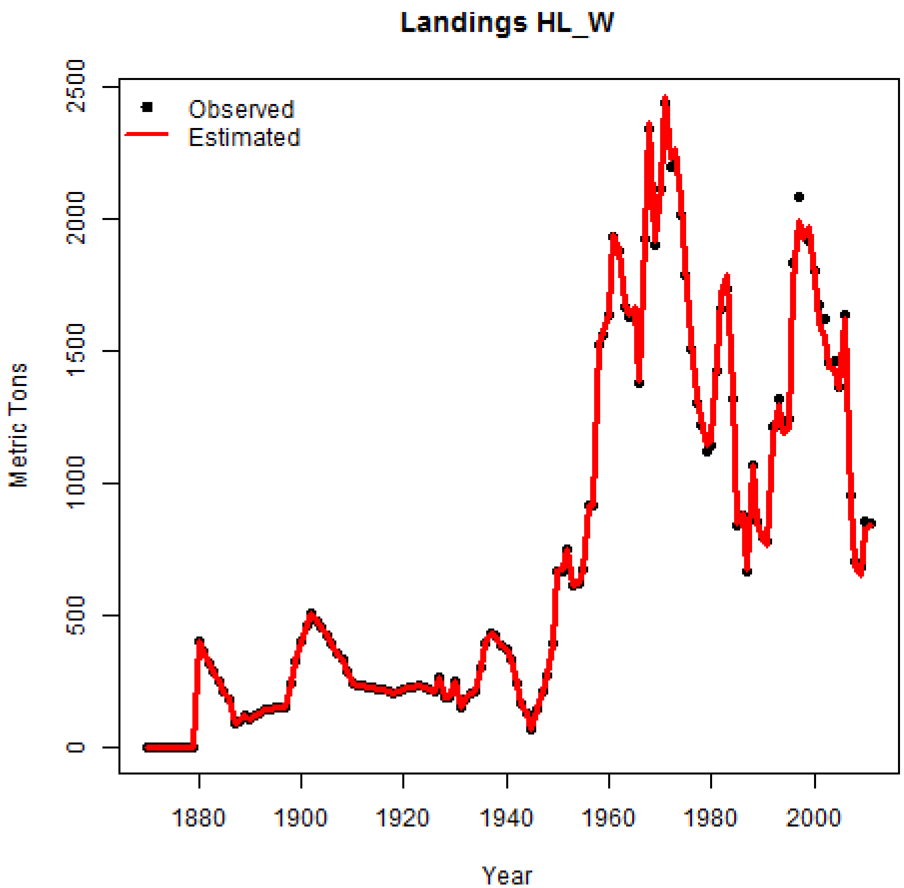



Figure 3.2.1.2. Observed (black dots) and estimated landings (red line) of red snapper for the commercial handline fishery in the western Gulf of Mexico, 1872-2011.

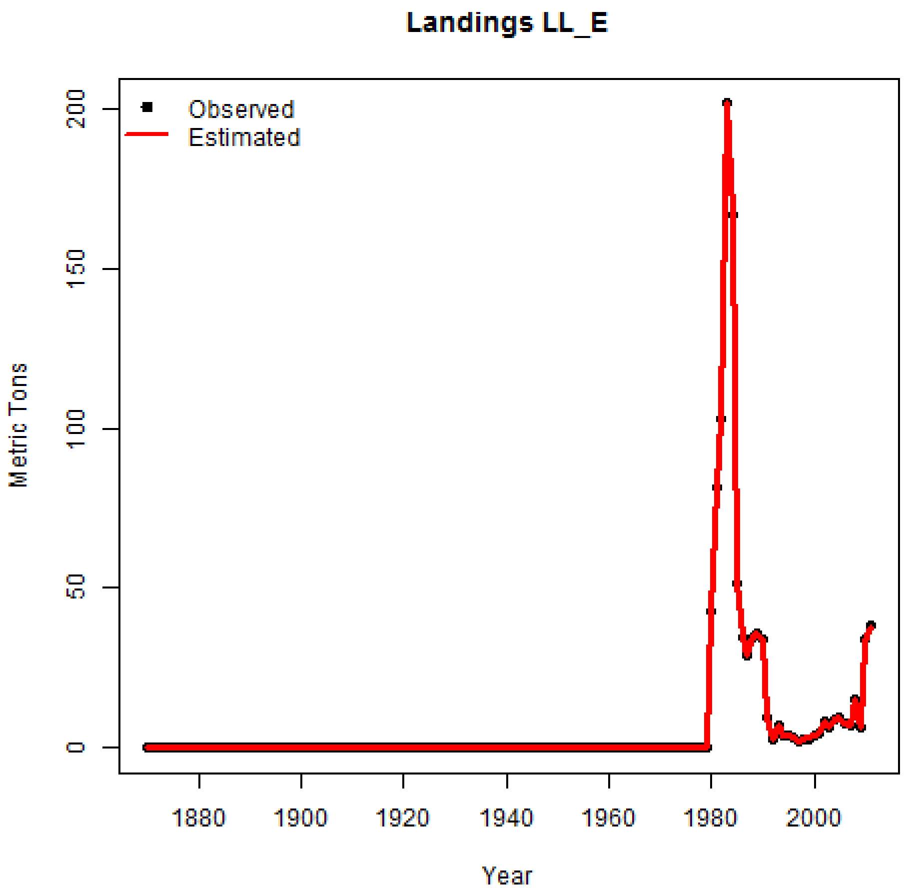



Figure 3.2.1.3. Observed (black dots) and estimated landings (red line) of red snapper for the commercial longline fishery in the eastern Gulf of Mexico, 1872-2011.

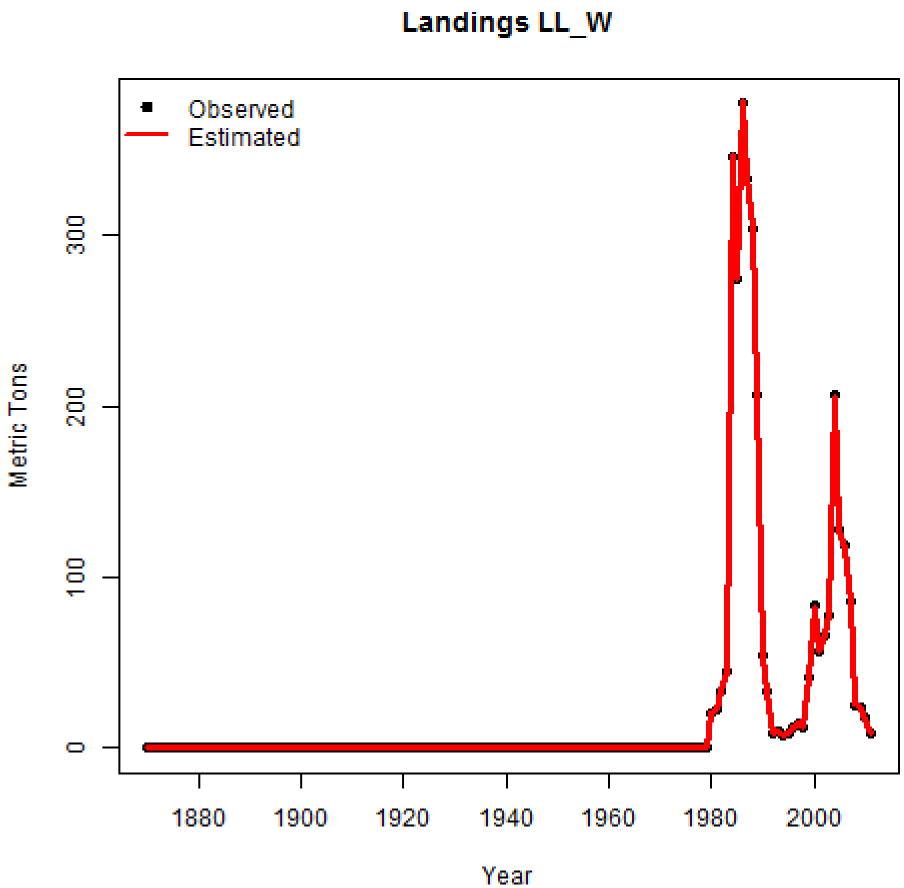



Figure 3.2.1.4. Observed (black dots) and estimated landings (red line) of red snapper for the commercial longline fishery in the western Gulf of Mexico, 1872-2011.

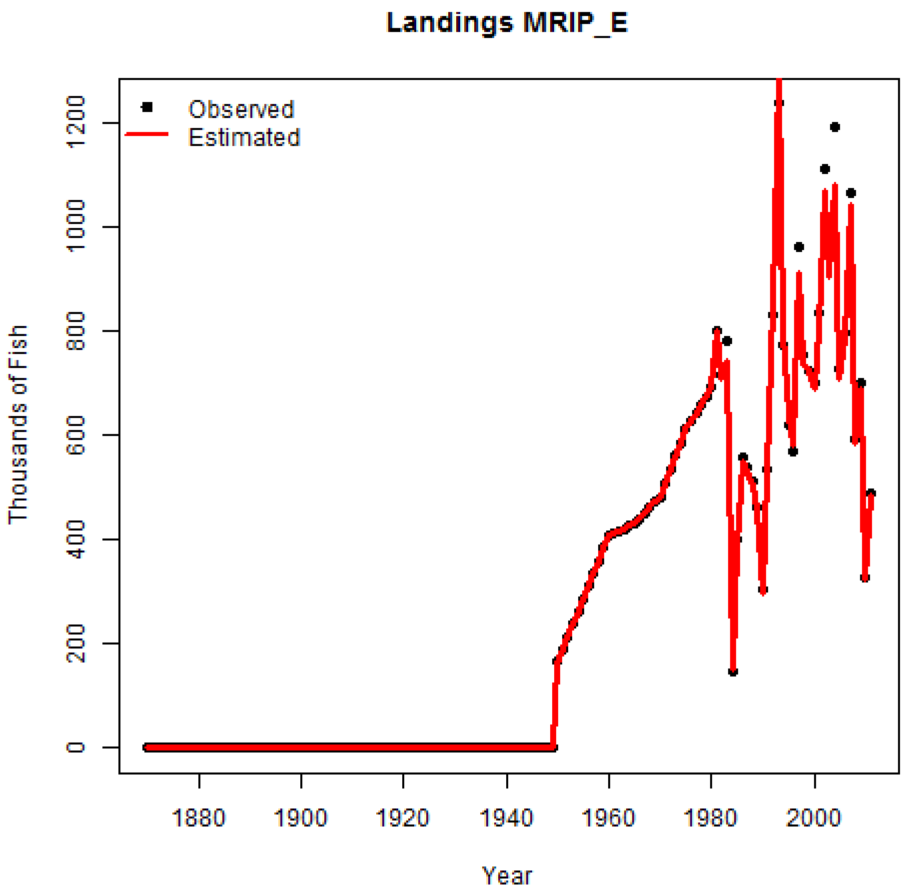



Figure 3.2.1.5. Observed (black dots) and estimated landings (red line) of red snapper for the private recreational fishery in the eastern Gulf of Mexico, 1872-2011.

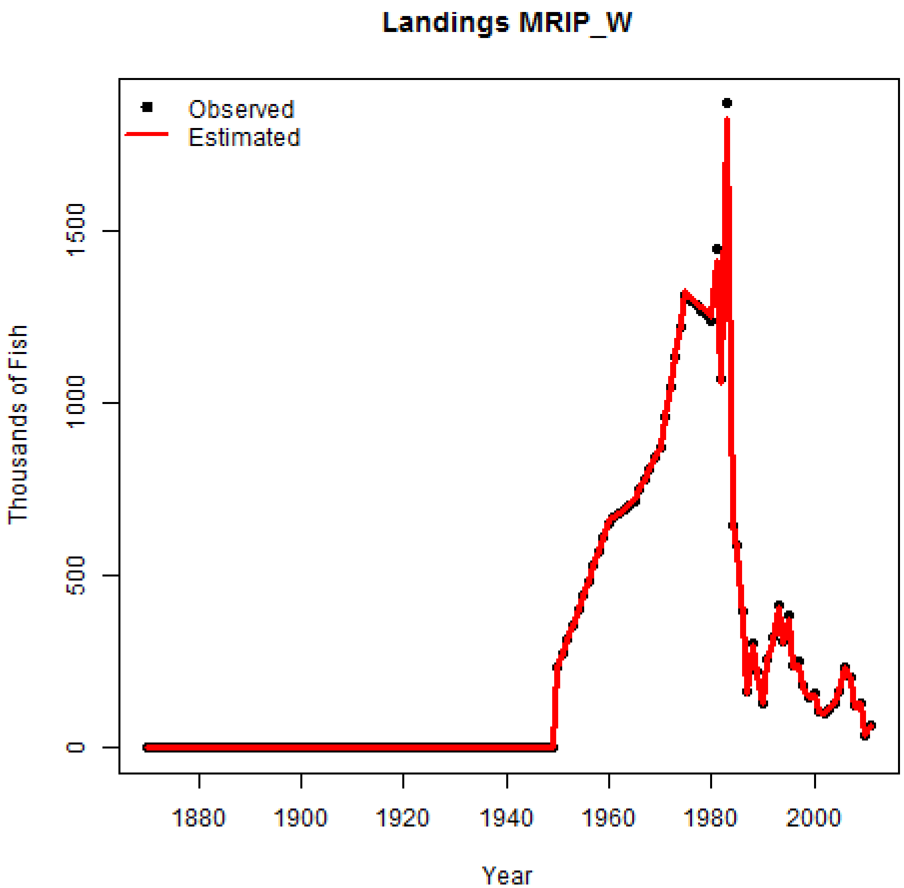



Figure 3.2.1.6. Observed (black dots) and estimated landings (red line) of red snapper for the private recreational fishery in the western Gulf of Mexico, 1872-2011.

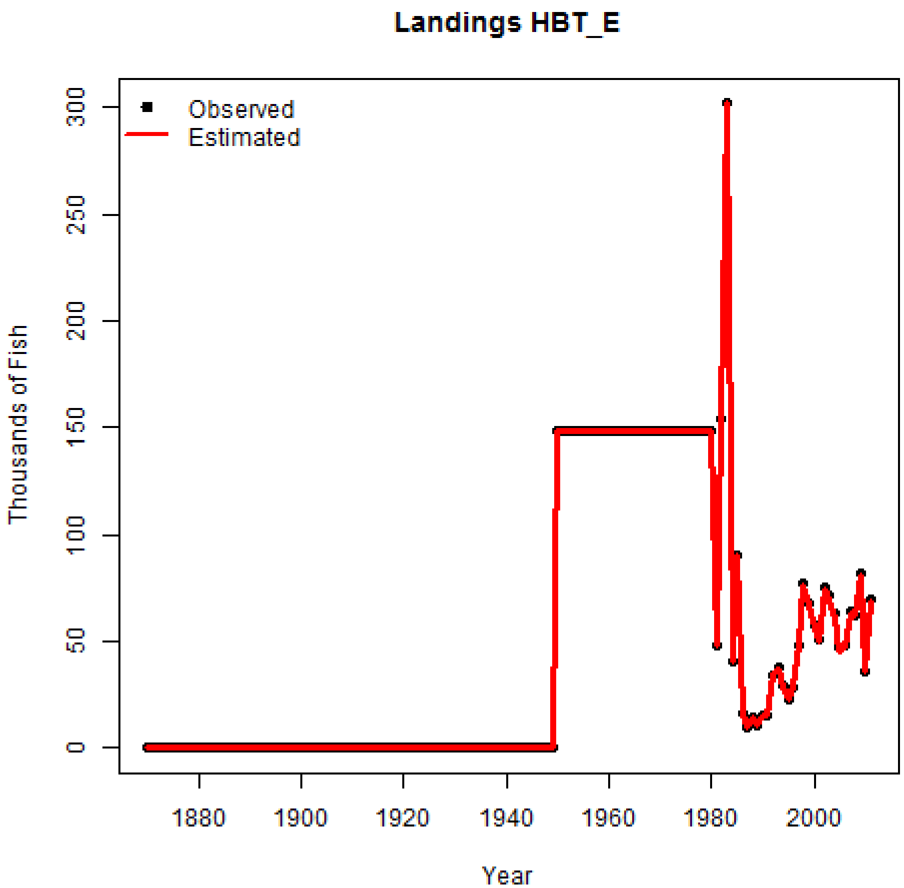



Figure 3.2.1.7. Observed (black dots) and estimated landings (red line) of red snapper for the recreational headboat fishery in the eastern Gulf of Mexico, 1872-2011.

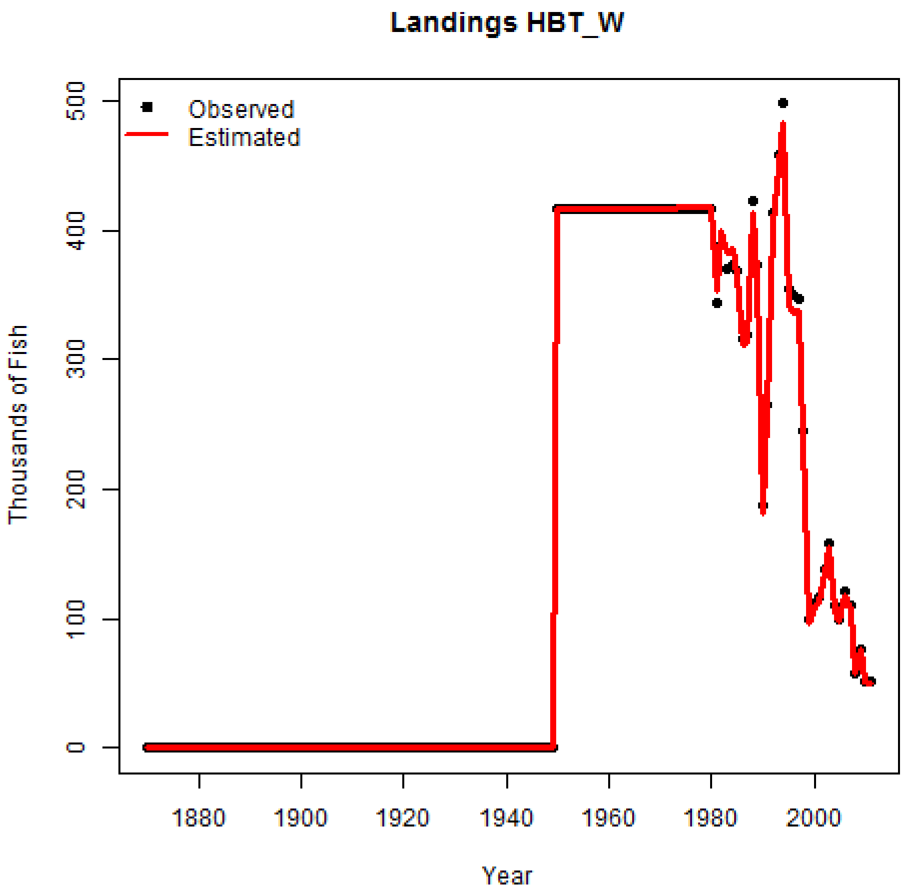



Figure 3.2.1.8. Observed (black dots) and estimated landings (red line) of red snapper for the recreational headboat fishery in the western Gulf of Mexico, 1872-2011.

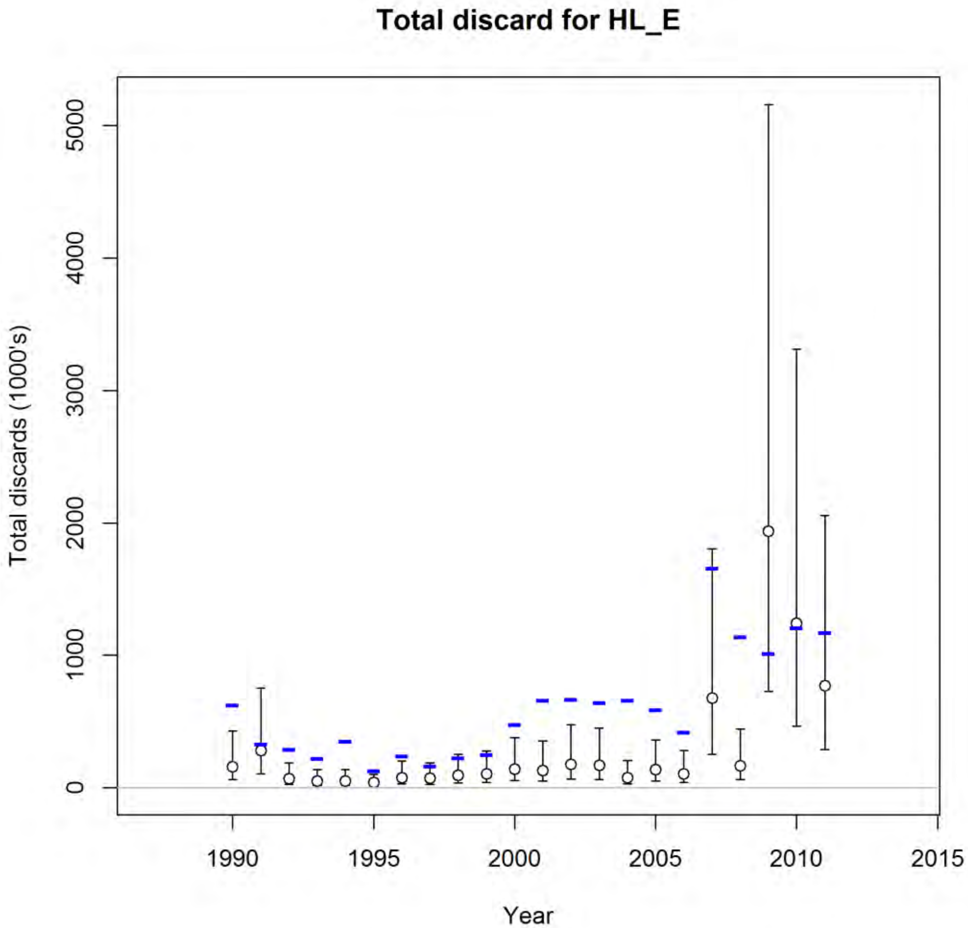



Figure 3.2.1.9. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the commercial handline fishery in the eastern Gulf of Mexico, 1990-2011.

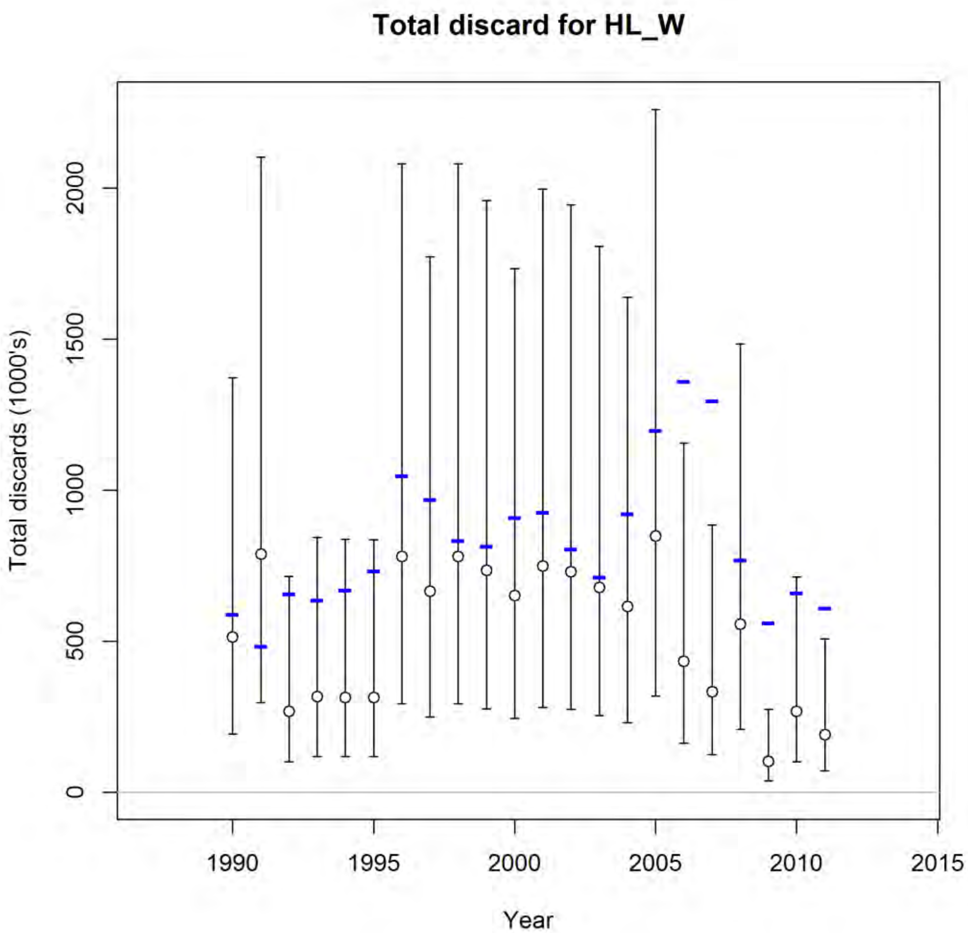



Figure 3.2.1.10. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the commercial handline fishery in the western Gulf of Mexico, 1990-2011.

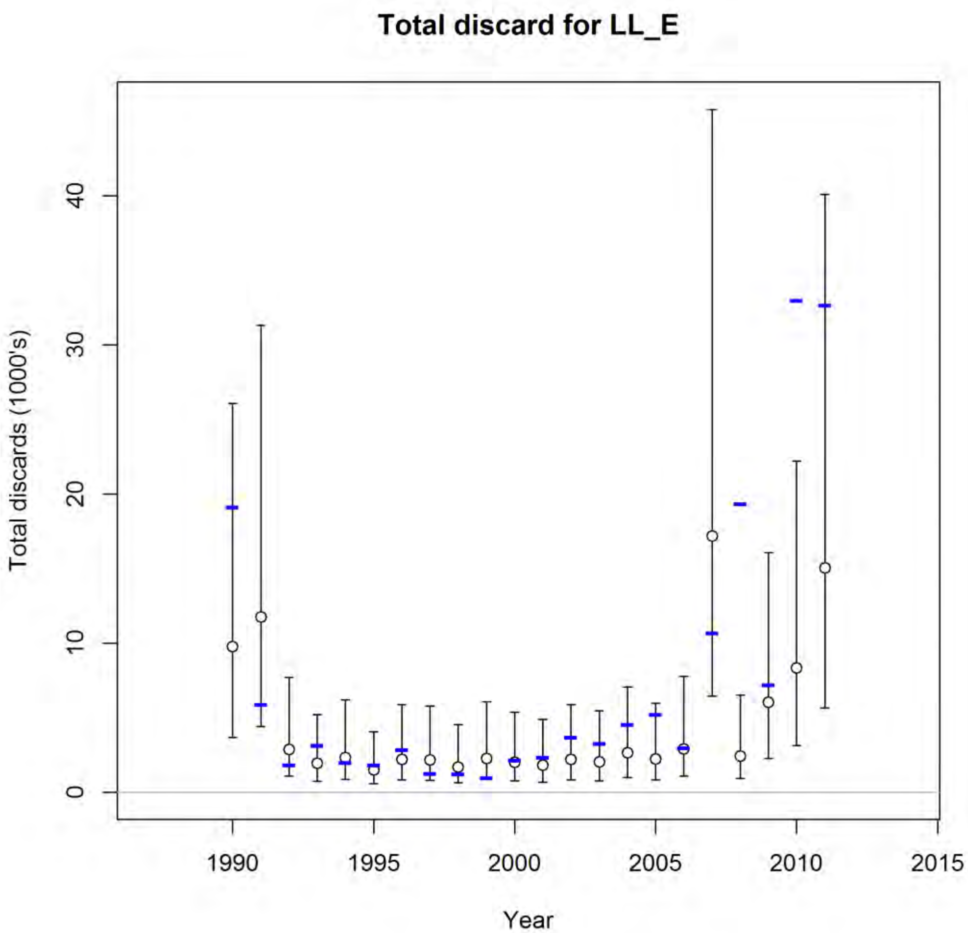



Figure 3.2.1.11. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the commercial longline fishery in the eastern Gulf of Mexico, 1990-2011.

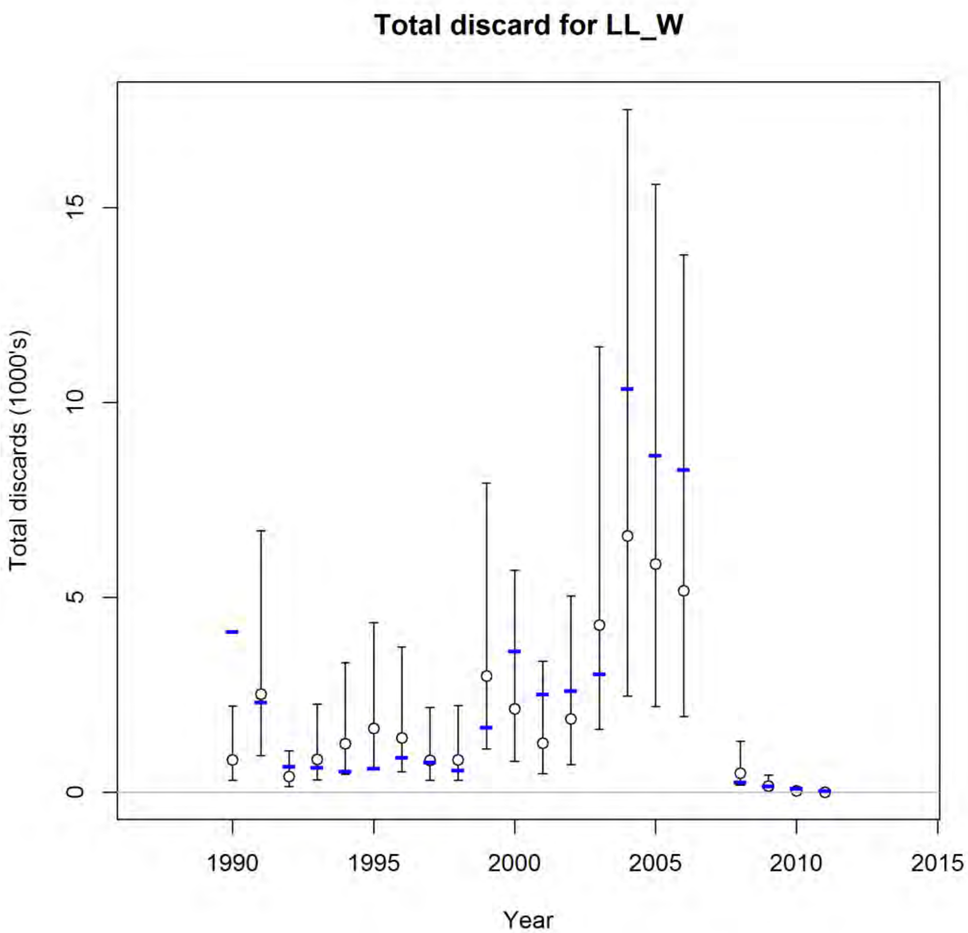



Figure 3.2.1.12. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the commercial longline fishery in the western Gulf of Mexico, 1990-2011.

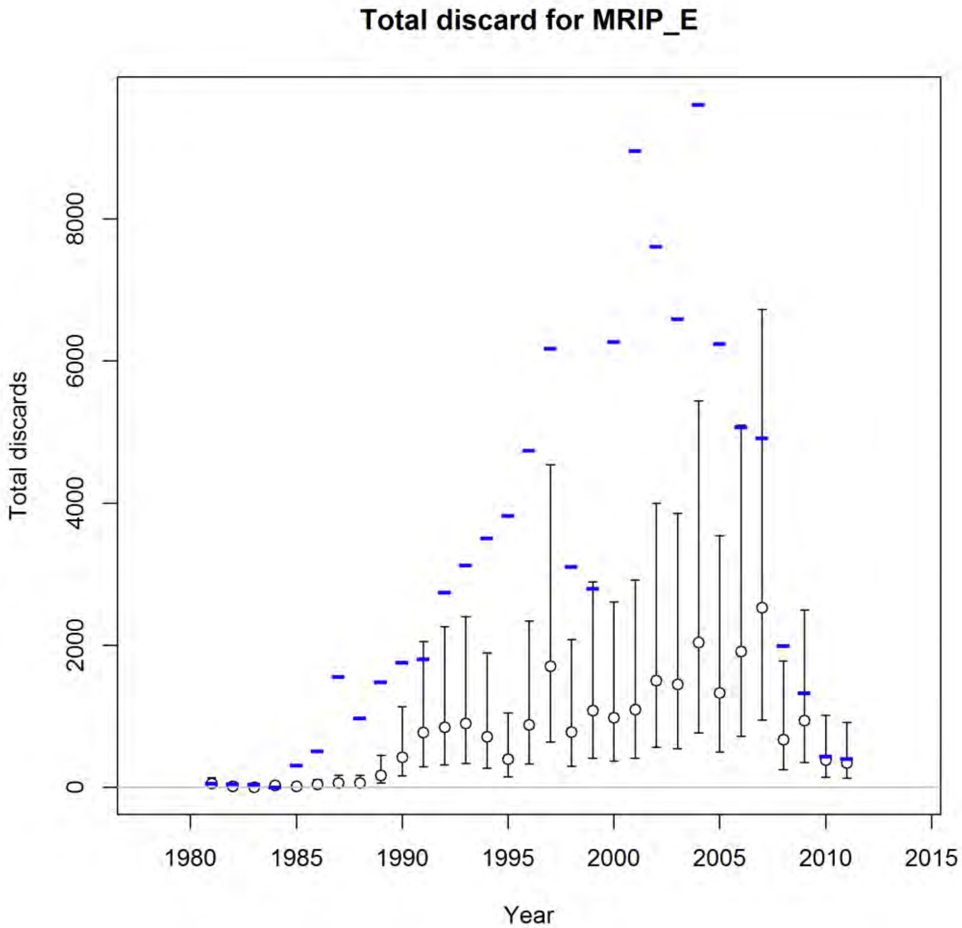



Figure 3.2.1.13. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the private recreational fishery in the eastern Gulf of Mexico, 1981-2011.

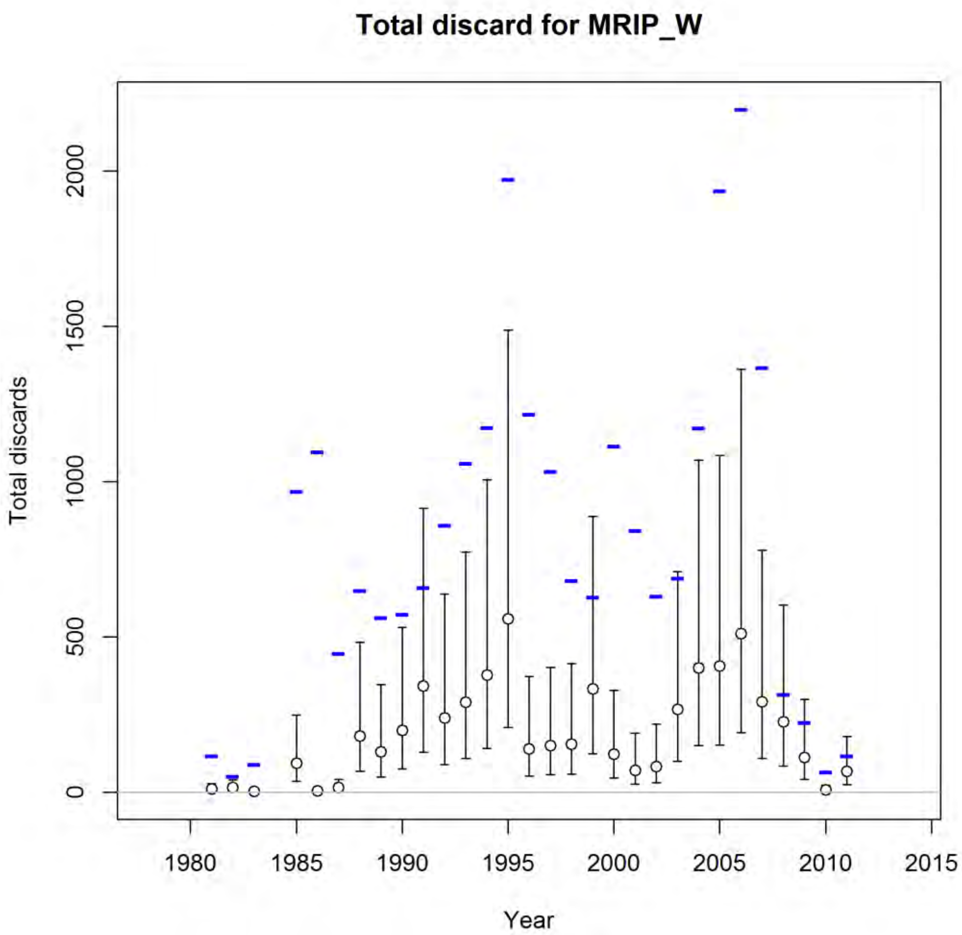



Figure 3.2.1.14. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the private recreational fishery in the western Gulf of Mexico, 1981-2011.

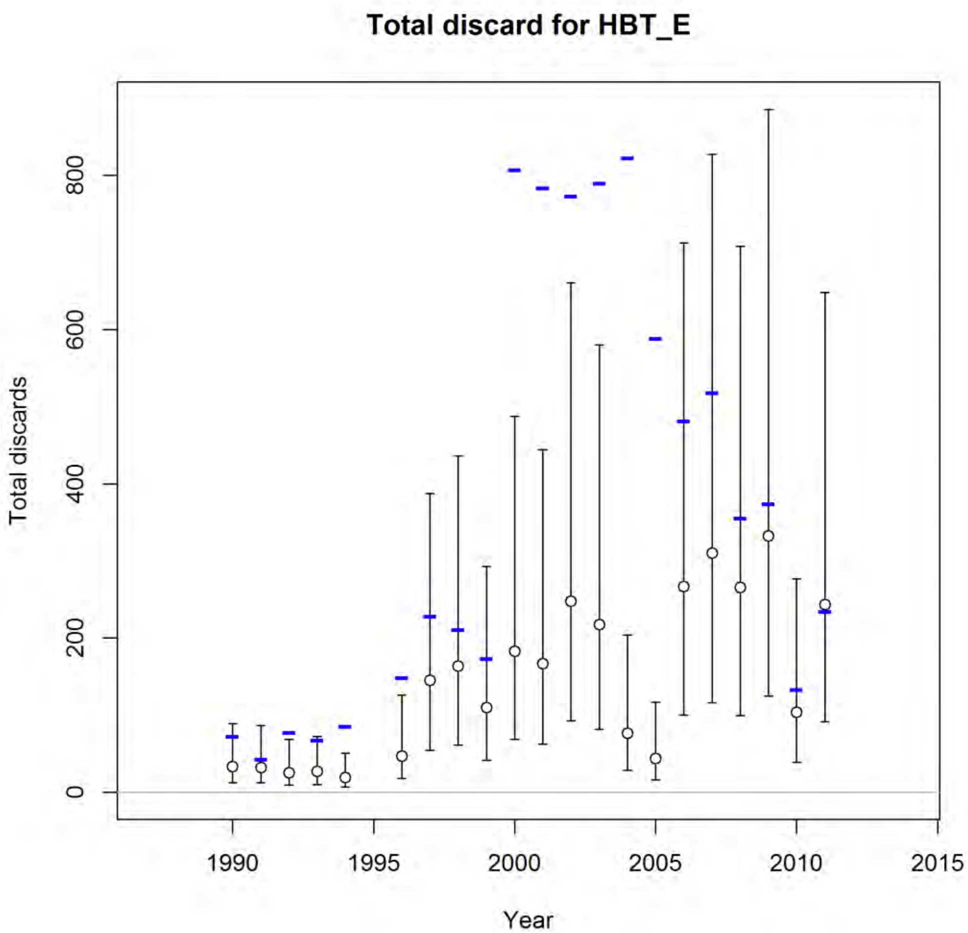



Figure 3.2.1.15. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the recreational headboat fishery in the eastern Gulf of Mexico, 1990-2011.

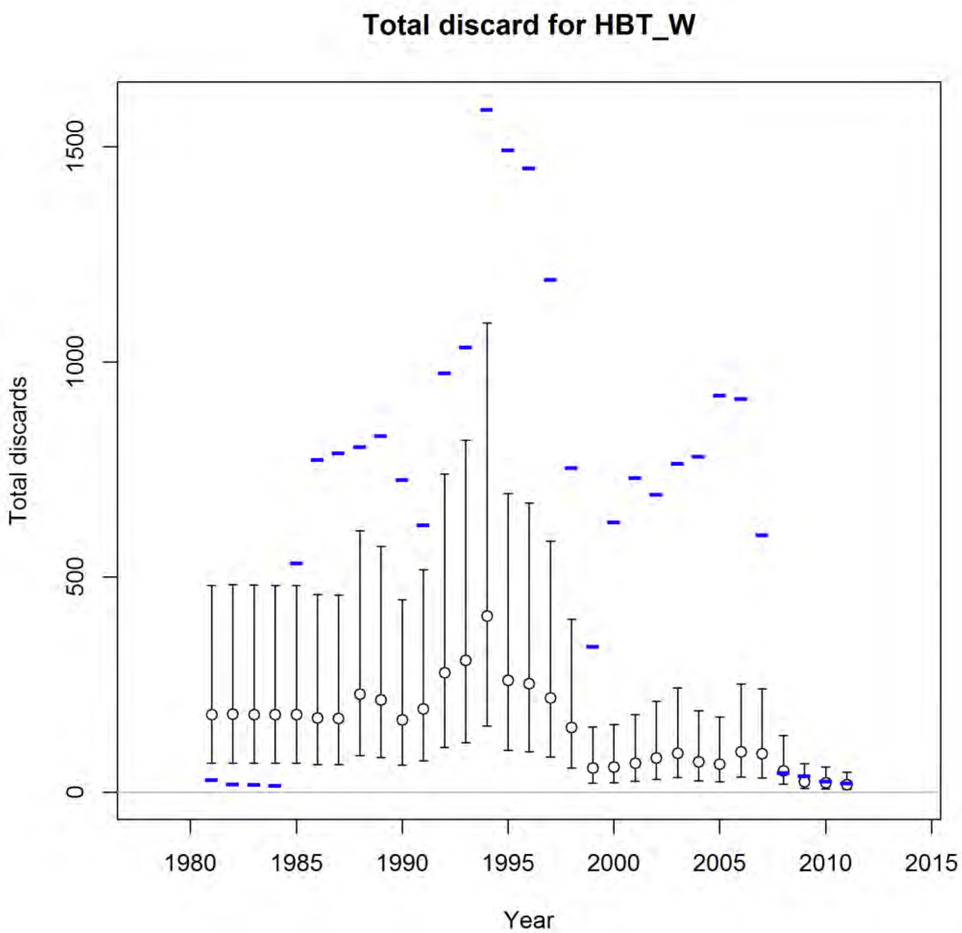



Figure 3.2.1.16. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the recreational headboat fishery in the western Gulf of Mexico, 1981-2011.

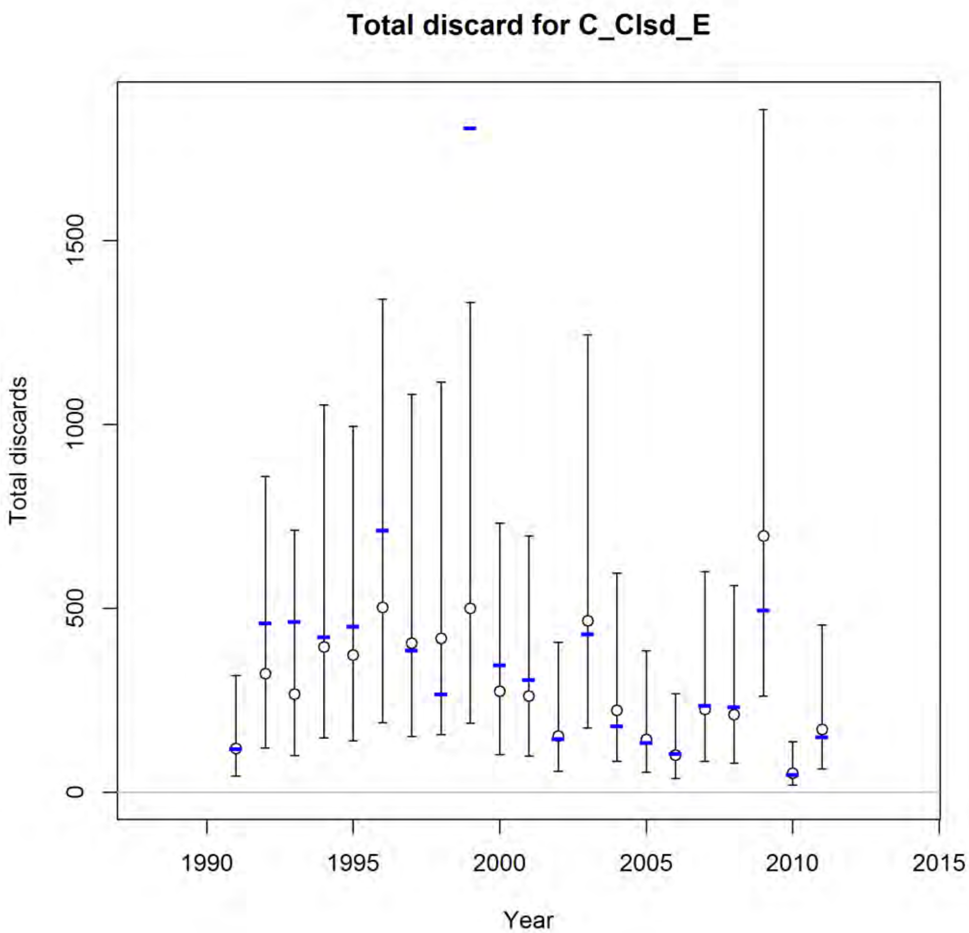



Figure 3.2.1.17. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the commercial closed season fishery in the eastern Gulf of Mexico, 1991-2011.

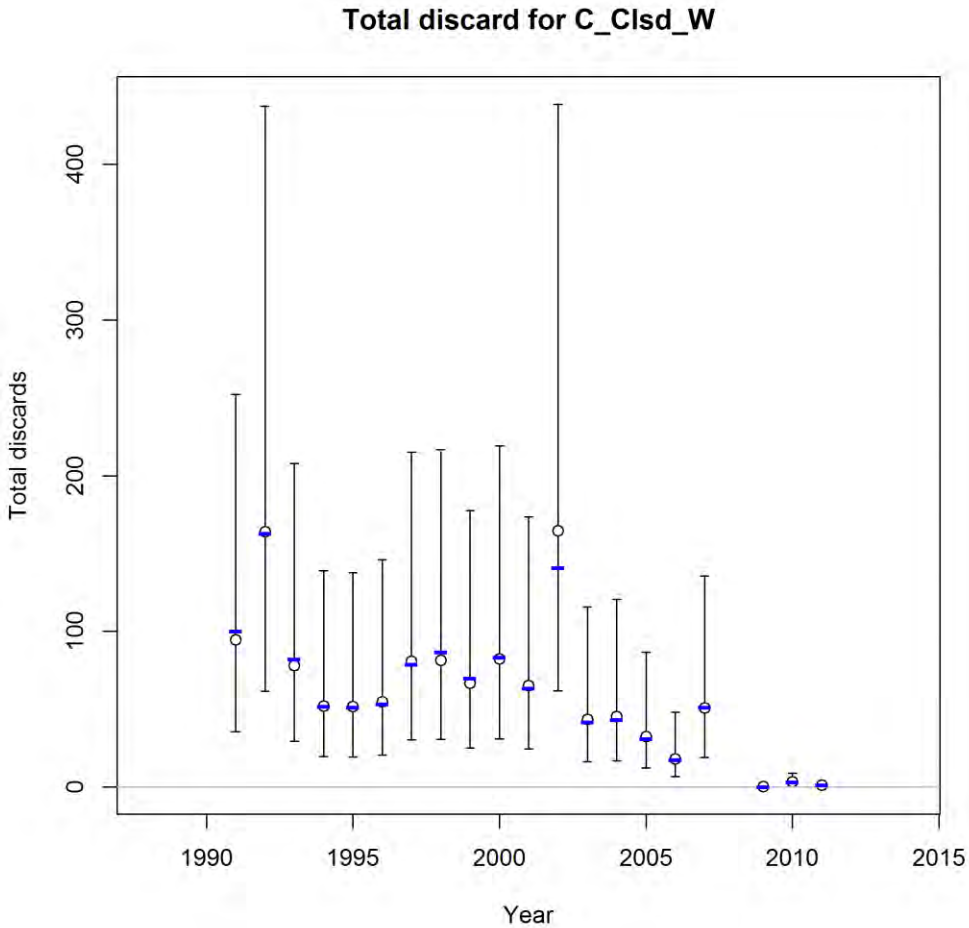



Figure 3.2.1.18. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the commercial closed season fishery in the western Gulf of Mexico, 1991-2011.

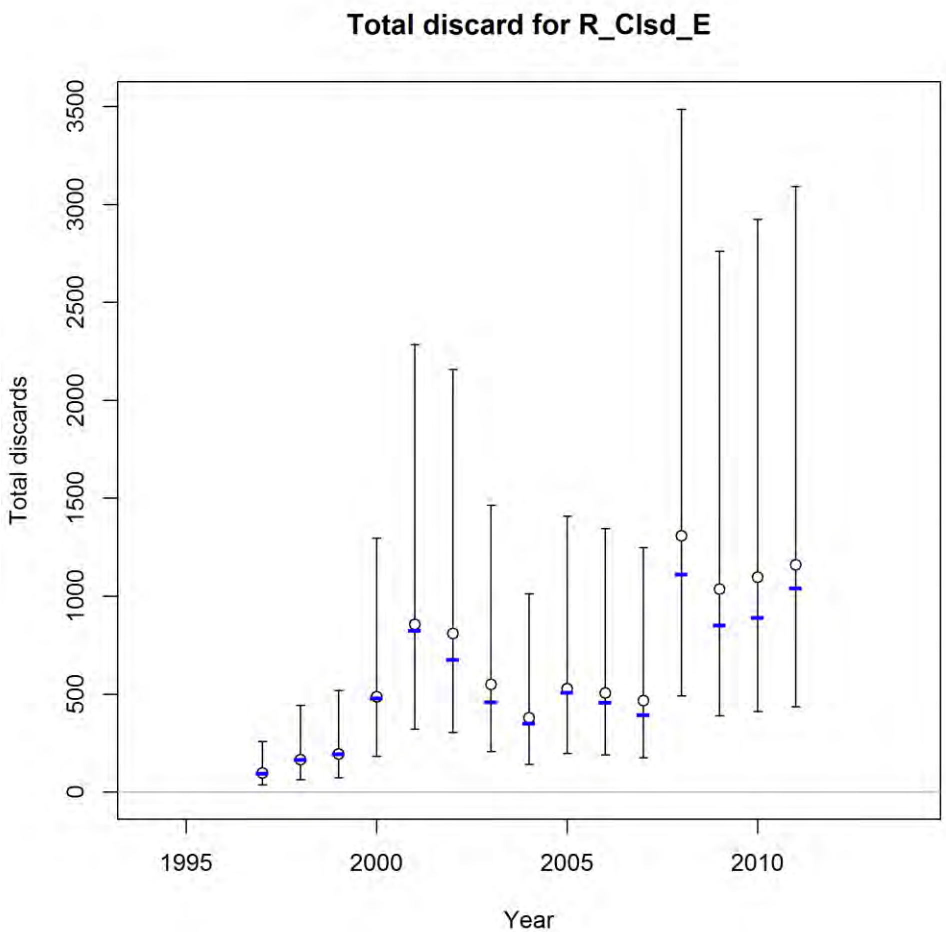



Figure 3.2.1.19. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the recreational closed season fishery in the eastern Gulf of Mexico, 1997-2011.

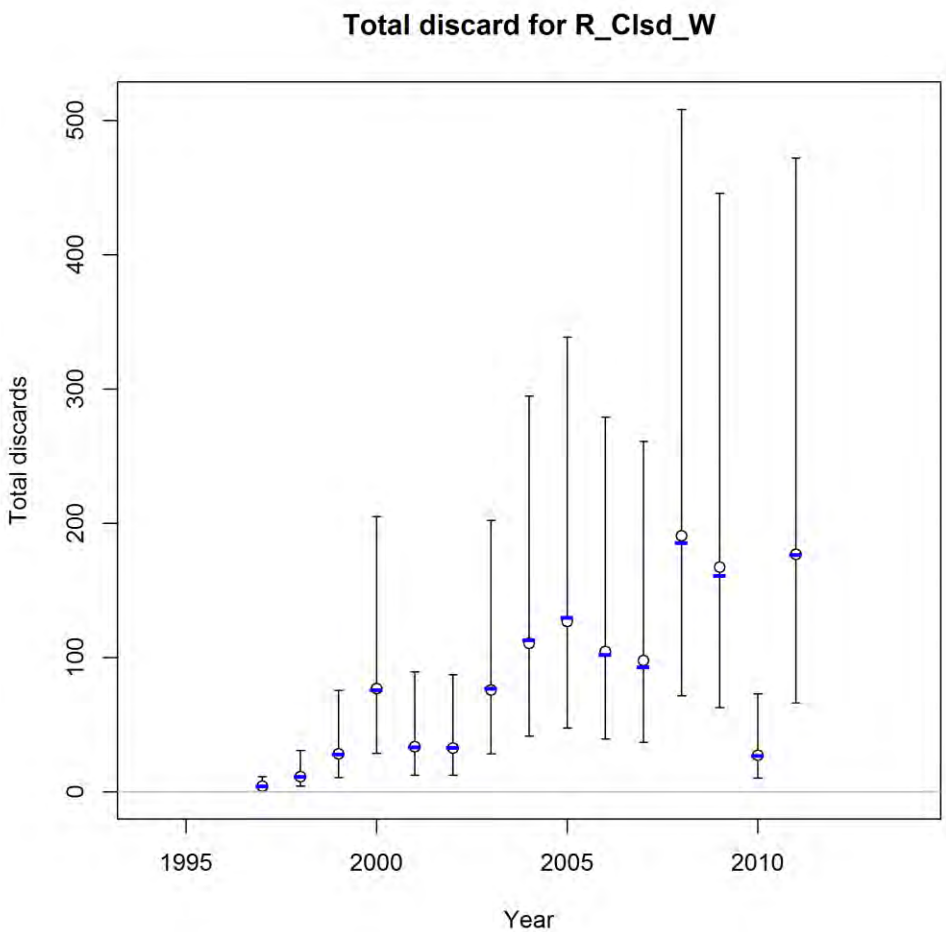



Figure 3.2.1.20. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the recreational closed season fishery in the western Gulf of Mexico, 1997-2011.

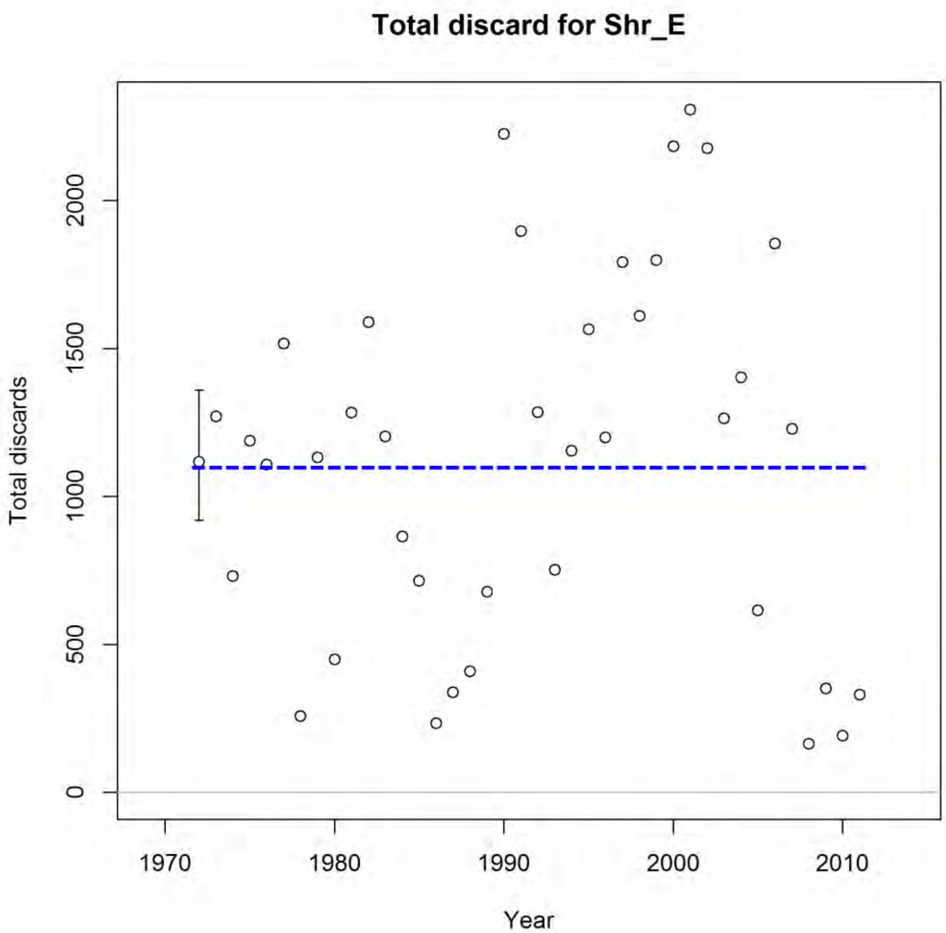



Figure 3.2.1.21. Model predicted mean bycatch (blue dashed line) of red snapper from the shrimp fishery in the eastern Gulf of Mexico, 1972-2011.

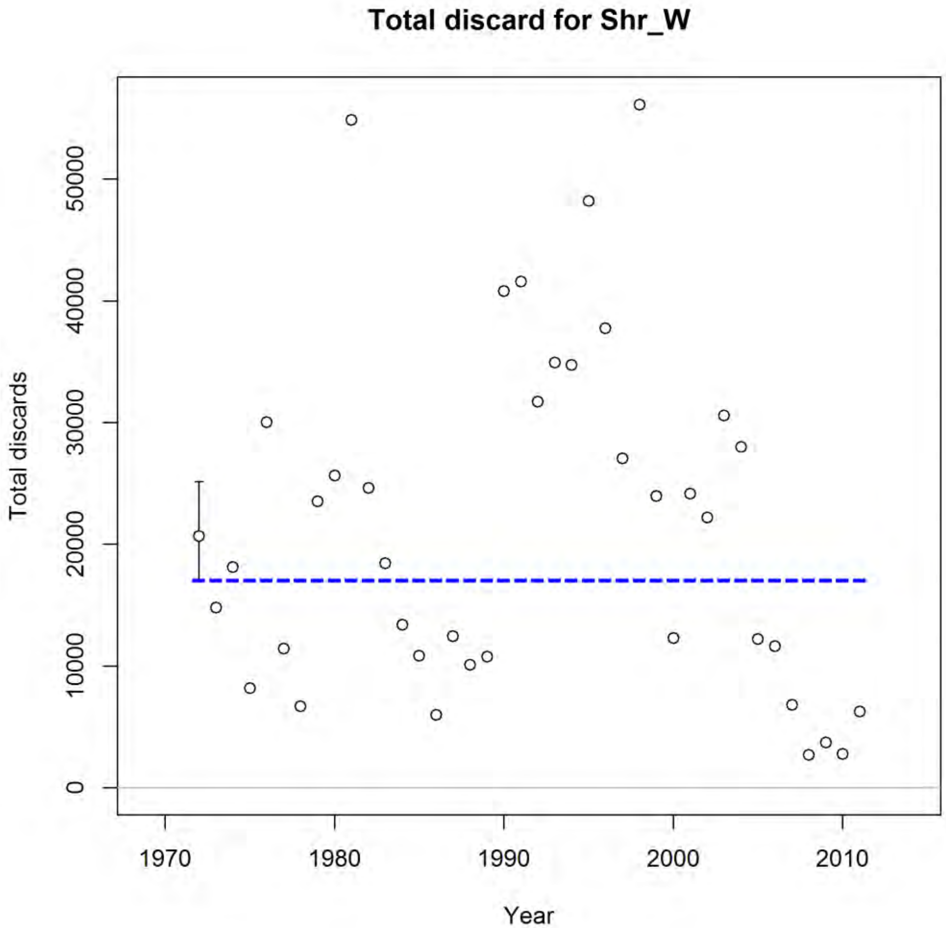



Figure 3.2.1.22. Model predicted mean bycatch (blue dashed line) of red snapper from the shrimp fishery in the western Gulf of Mexico, 1972-2011.

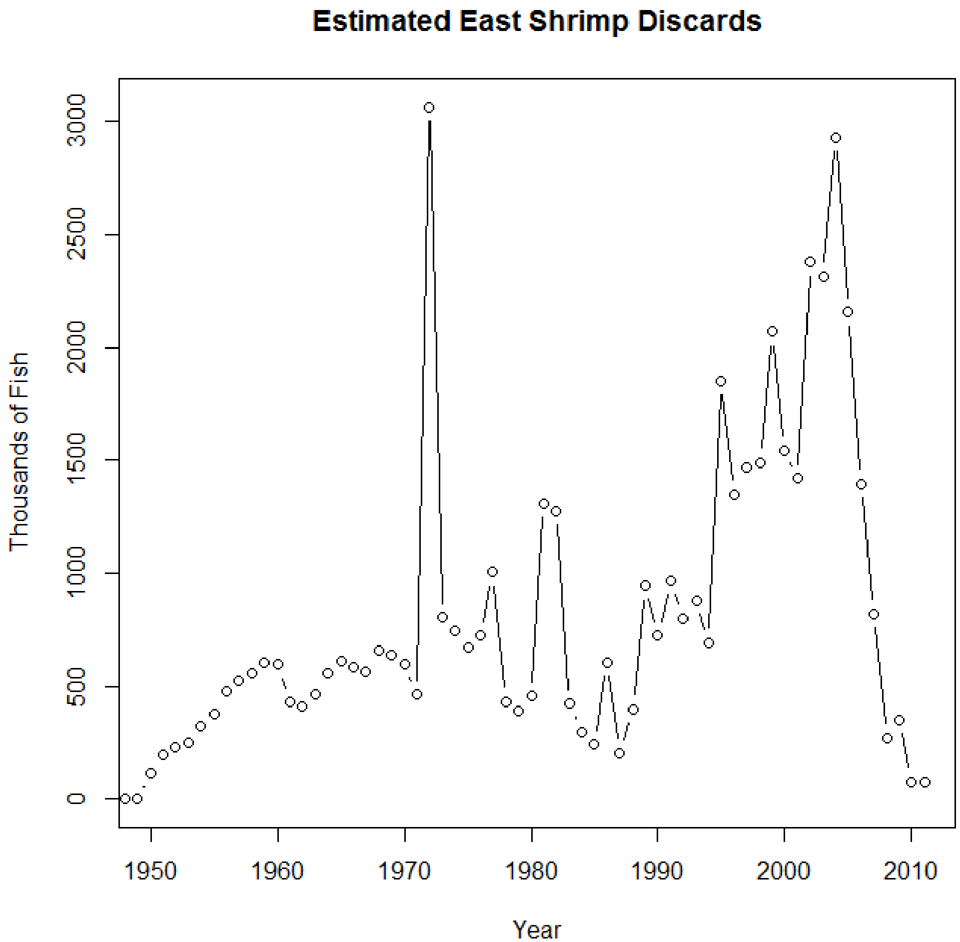



Figure 3.2.1.23. Model predicted total discards of red snapper from the shrimp fishery in the eastern Gulf of Mexico, 1946-2011.

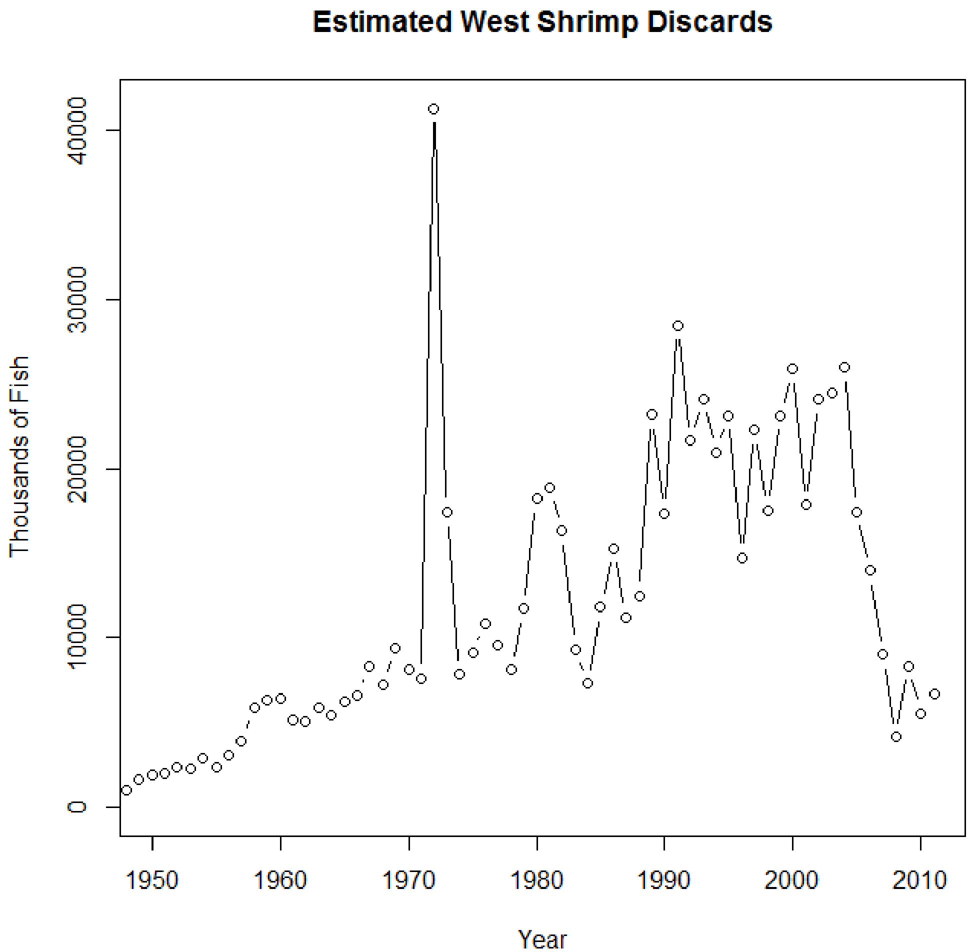



Figure 3.2.1.24. Model predicted total discards of red snapper from the shrimp fishery in the western Gulf of Mexico, 1946-2011.

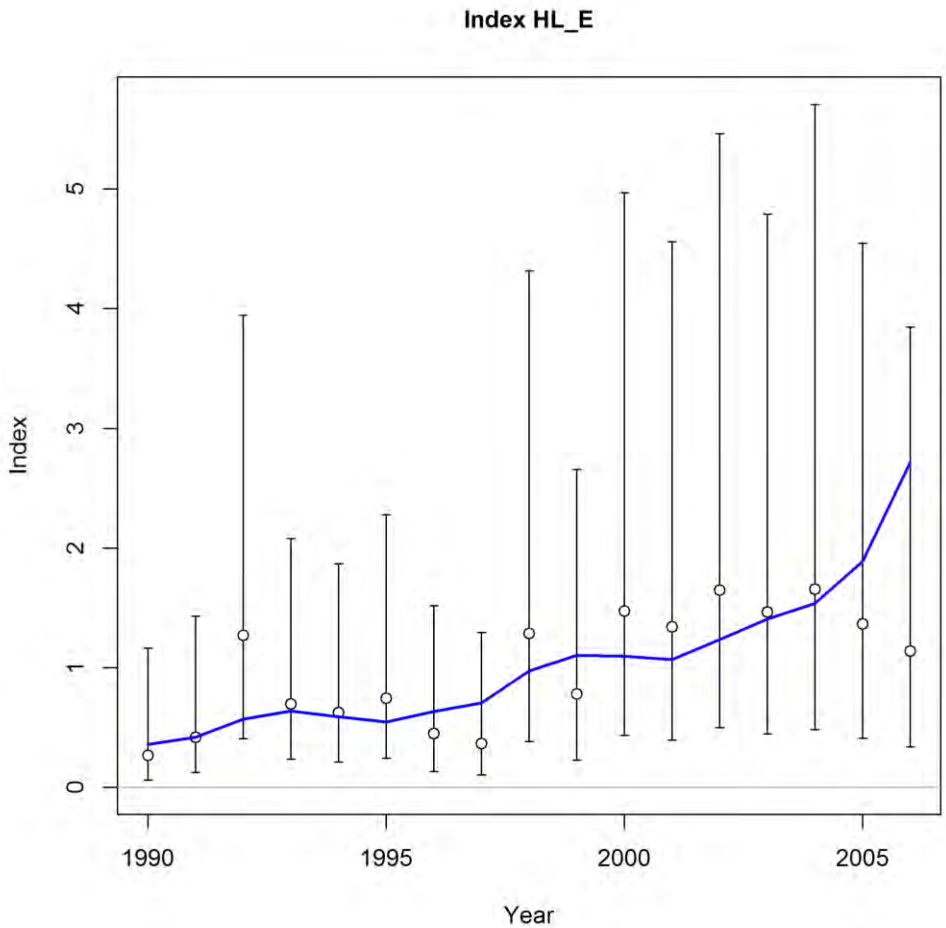



Figure 3.2.1.25. Observed and predicted vertical line standardized index of abundance for red snapper in the eastern Gulf of Mexico, 1990-2011.

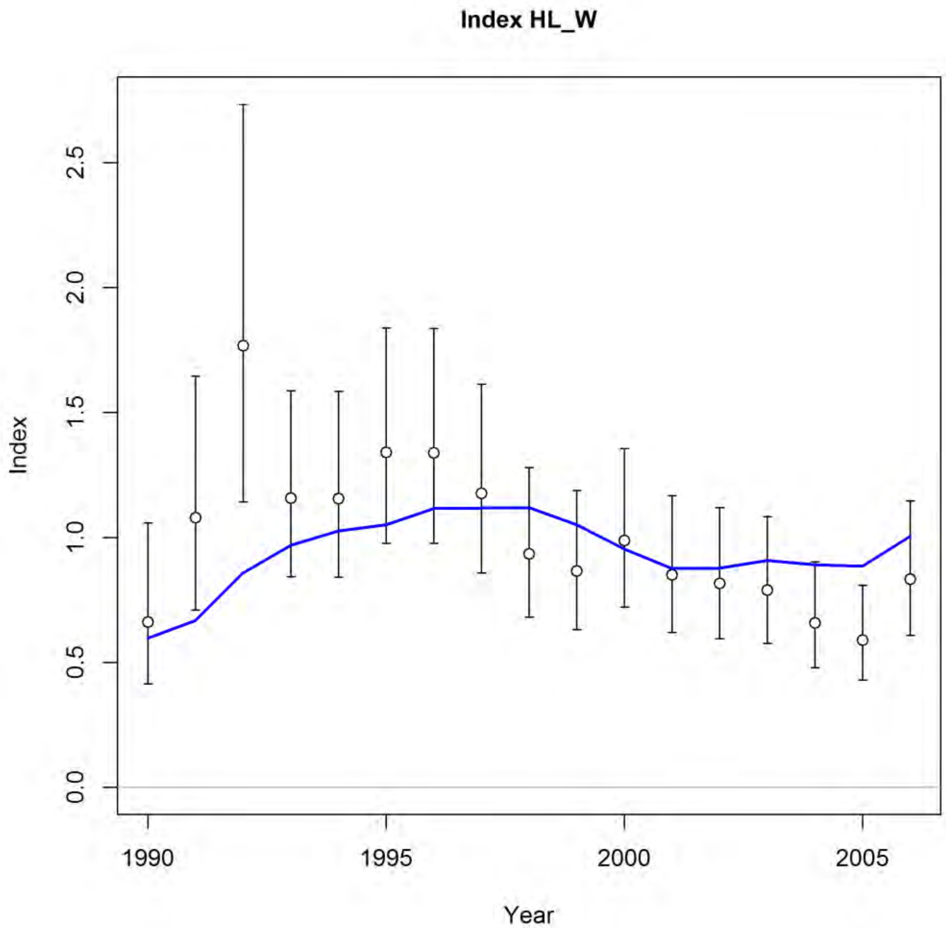



Figure 3.2.1.26. Observed and predicted vertical line standardized index of abundance for red snapper in the western Gulf of Mexico, 1990-2011.

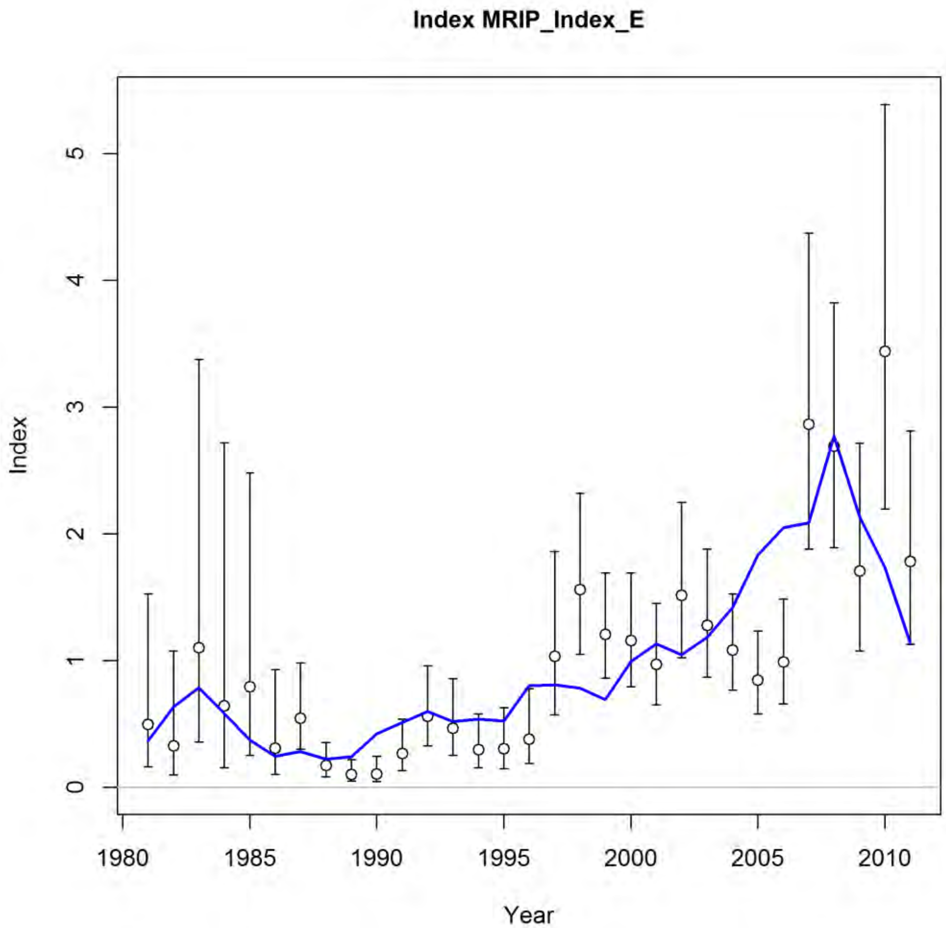



Figure 3.2.1.27. Observed and predicted private recreational fishery (MRIP) standardized index of abundance for red snapper in the eastern Gulf of Mexico, 1981-2011.

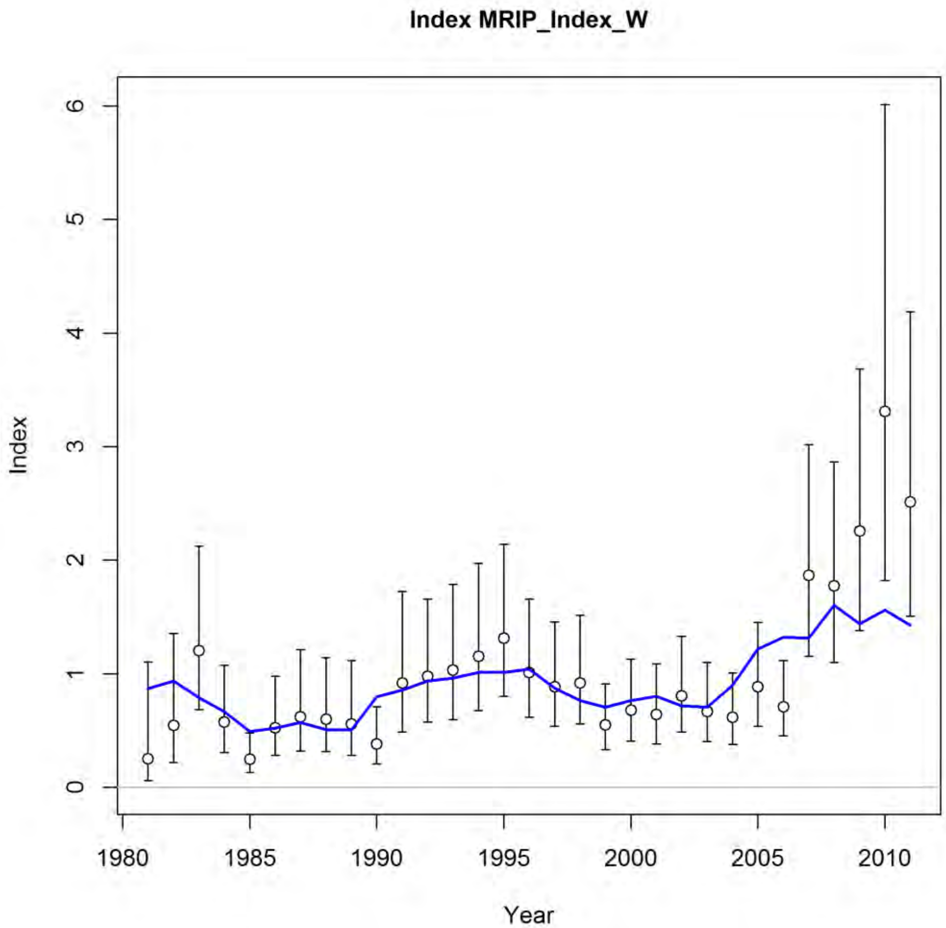



Figure 3.2.1.28. Observed and predicted private recreational fishery (MRIP) standardized index of abundance for red snapper in the western Gulf of Mexico, 1981-2011.

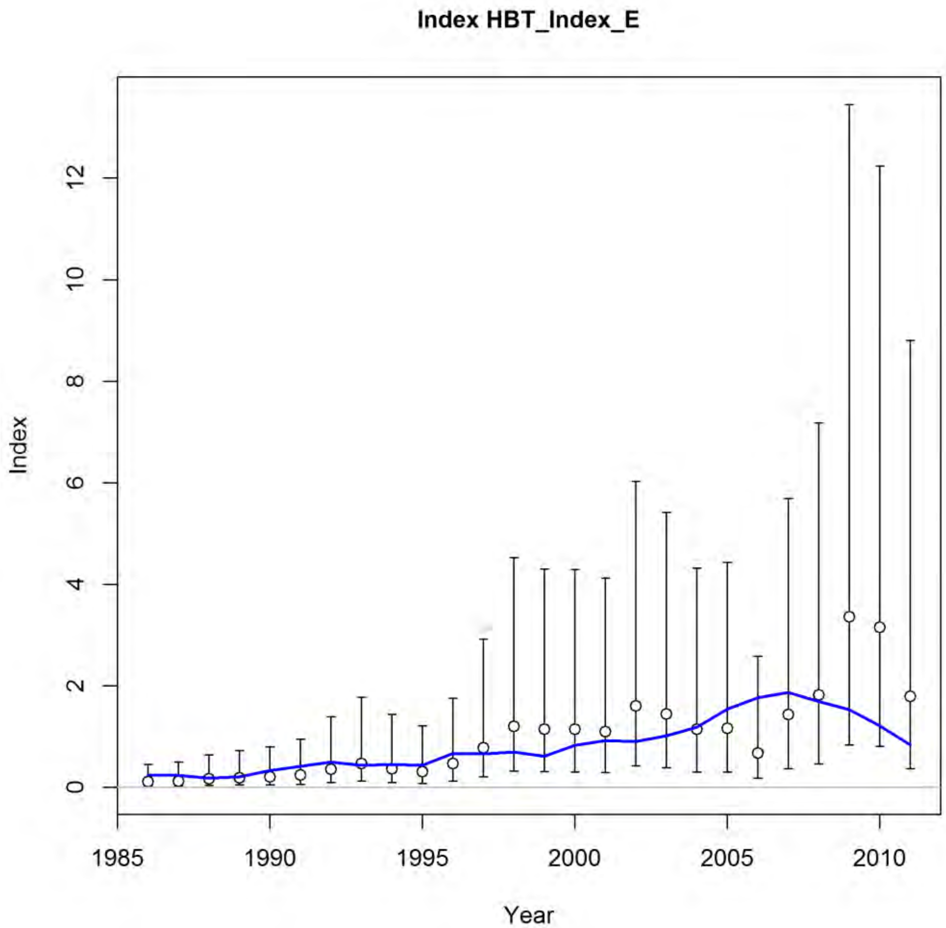



Figure 3.2.1.29. Observed and predicted recreational headboat fishery standardized index of abundance for red snapper in the eastern Gulf of Mexico, 1986-2011.

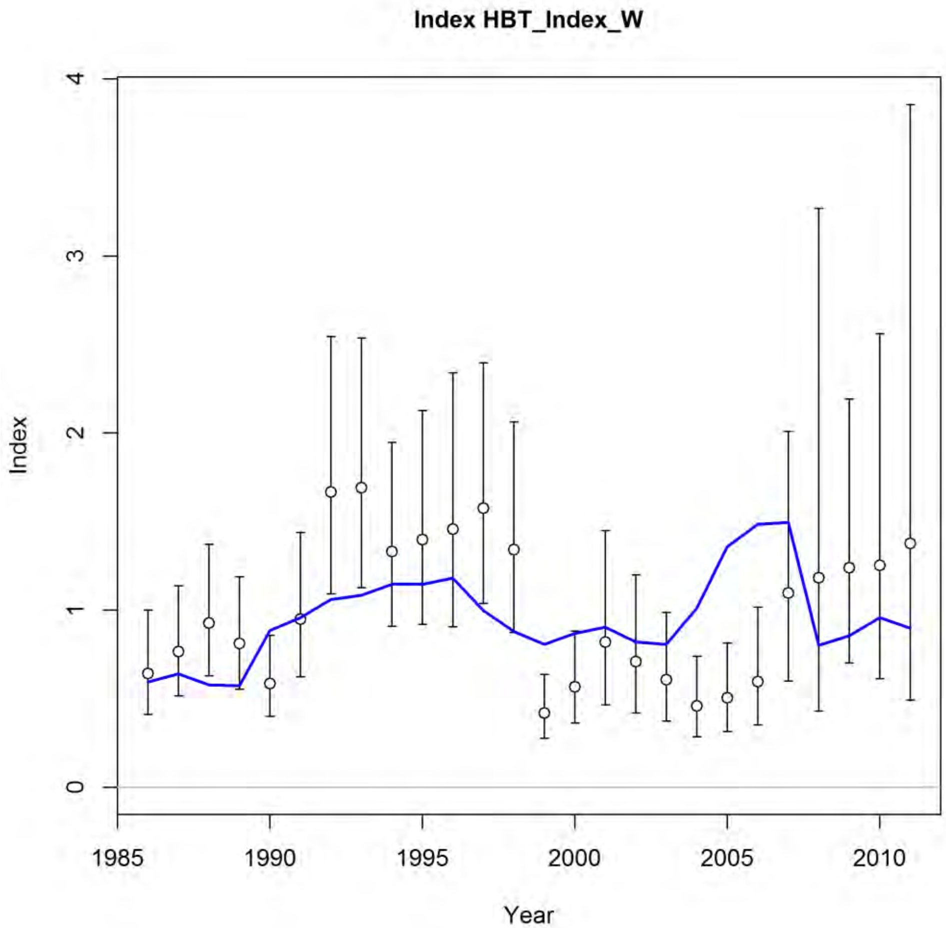



Figure 3.2.1.30. Observed and predicted recreational headboat fishery standardized index of abundance for red snapper fishery in the western Gulf of Mexico, 1986-2011.

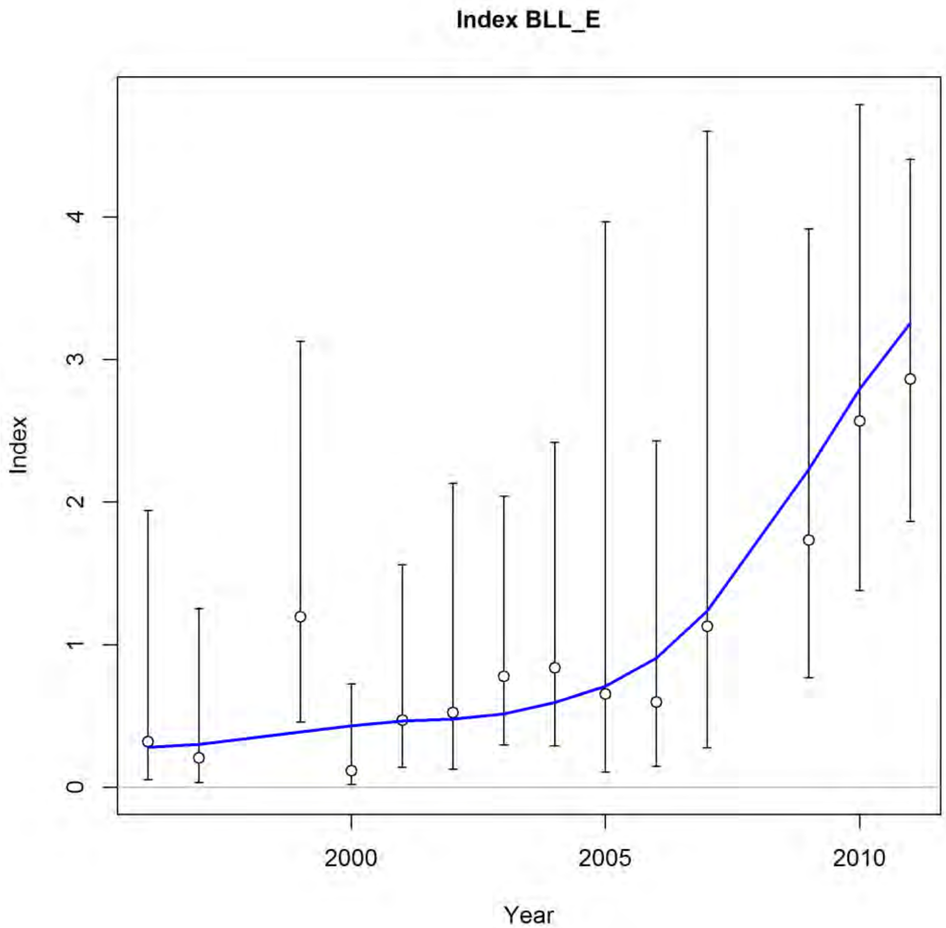



Figure 3.2.1.31. Observed and predicted index of abundance for red snapper in the eastern Gulf of Mexico from the NMFS bottom longline survey, 1996-2011.

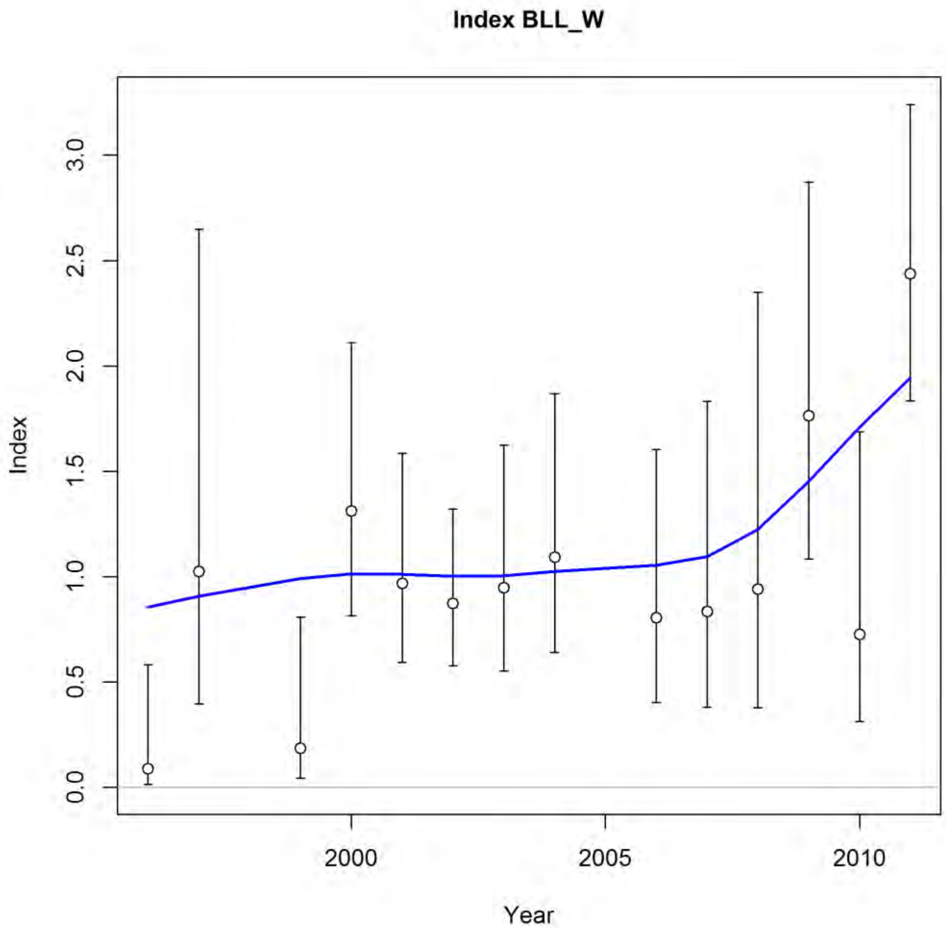



Figure 3.2.1.32. Observed and predicted index of abundance for red snapper in the western Gulf of Mexico from the NMFS bottom longline survey, 1996-2011.

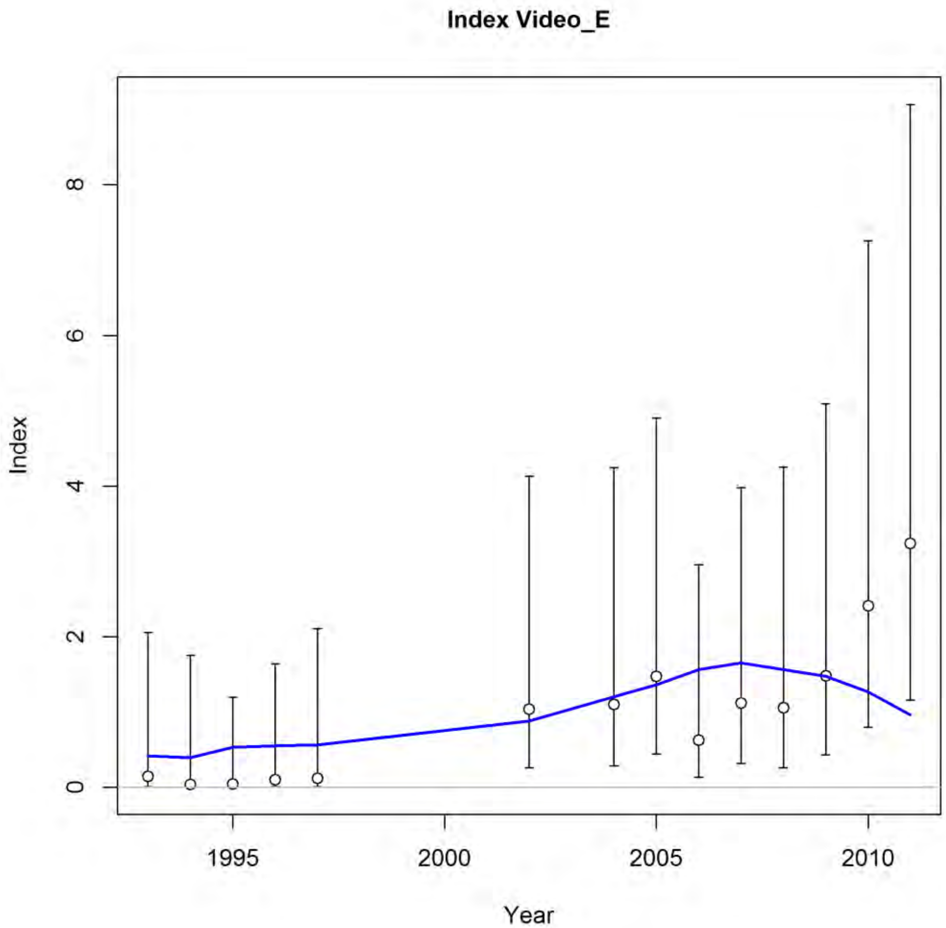



Figure 3.2.1.33. Observed and predicted index of abundance for red snapper in the eastern Gulf of Mexico from the SEAMAP reef fish video survey, 1993-2011.

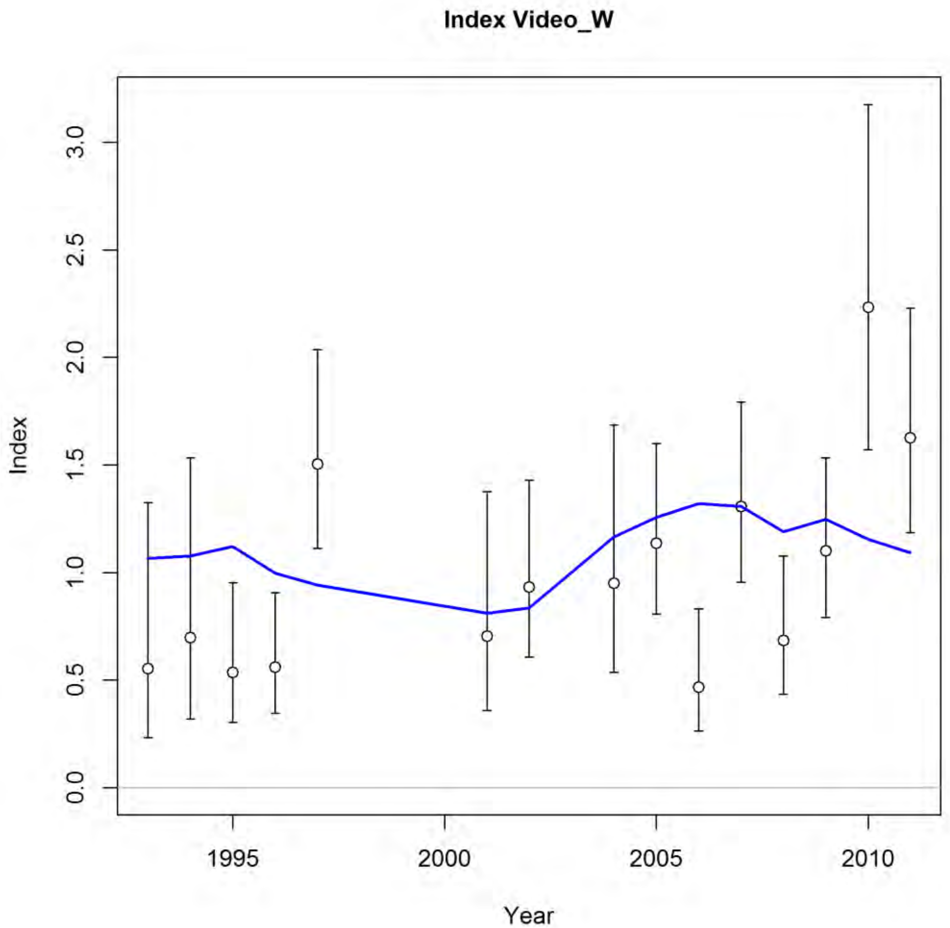



Figure 3.2.1.34. Observed and predicted index of abundance for red snapper in the western Gulf of Mexico from the SEAMAP reef fish video survey, 1993-2011.

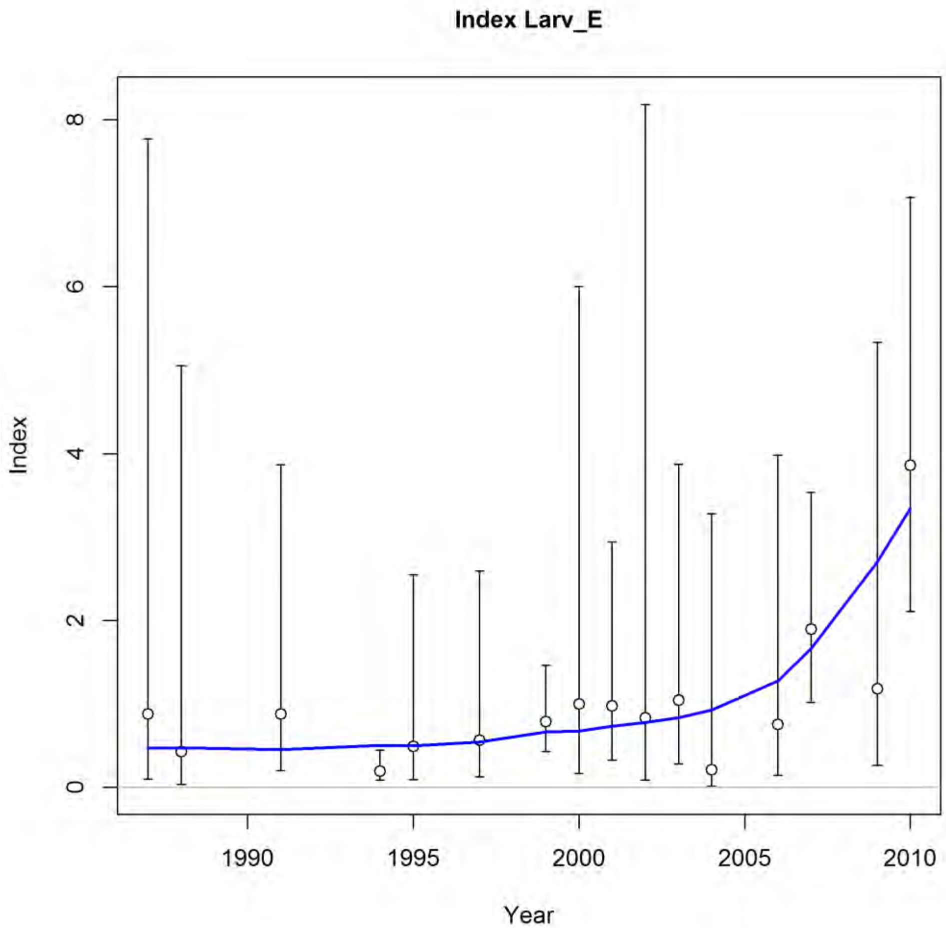



Figure 3.2.1.35. Observed and predicted index of abundance for larval red snapper in the eastern Gulf of Mexico from the SEAMAP Fall Plankton Survey, 1986-2011.

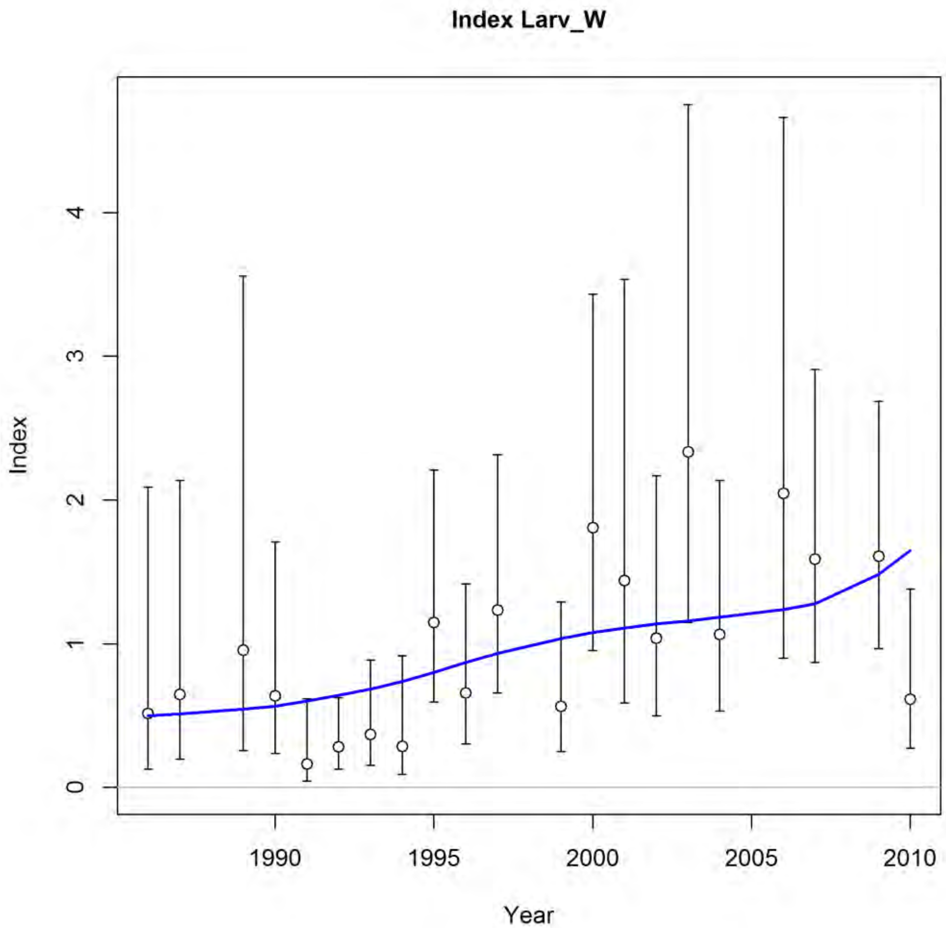



Figure 3.2.1.36. Observed and predicted index of abundance for larval red snapper in the western Gulf of Mexico from the SEAMAP Fall Plankton Survey, 1986-2011.

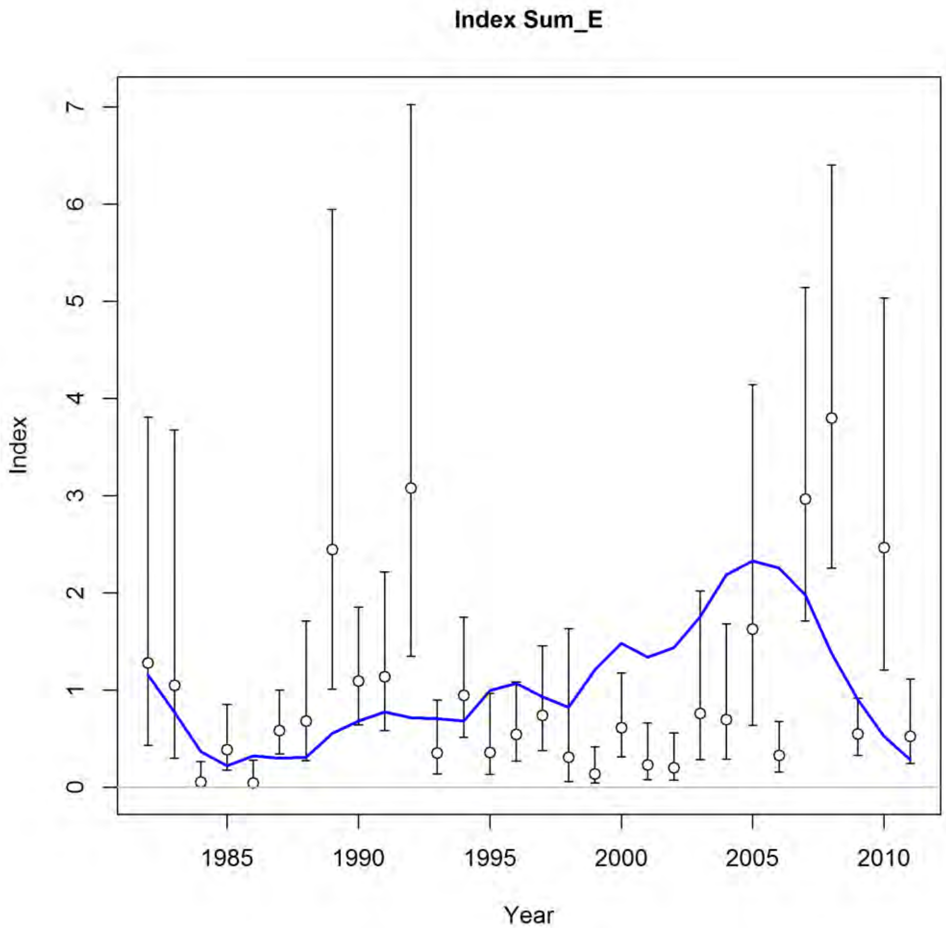



Figure 3.2.1.37. Observed and predicted index of abundance for red snapper in the eastern Gulf of Mexico from the SEAMAP groundfish summer survey, 1982-2011.

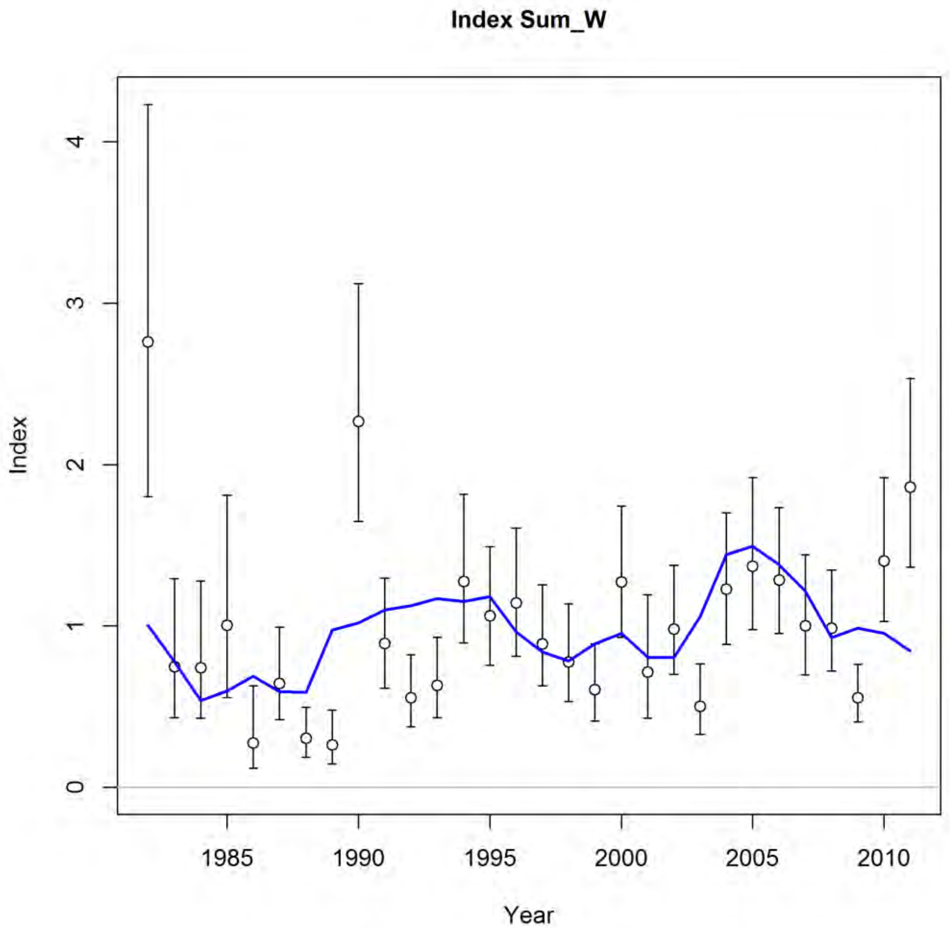



Figure 3.2.1.38. Observed and predicted index of abundance for red snapper in the western Gulf of Mexico from the SEAMAP groundfish summer survey, 1982-2011.

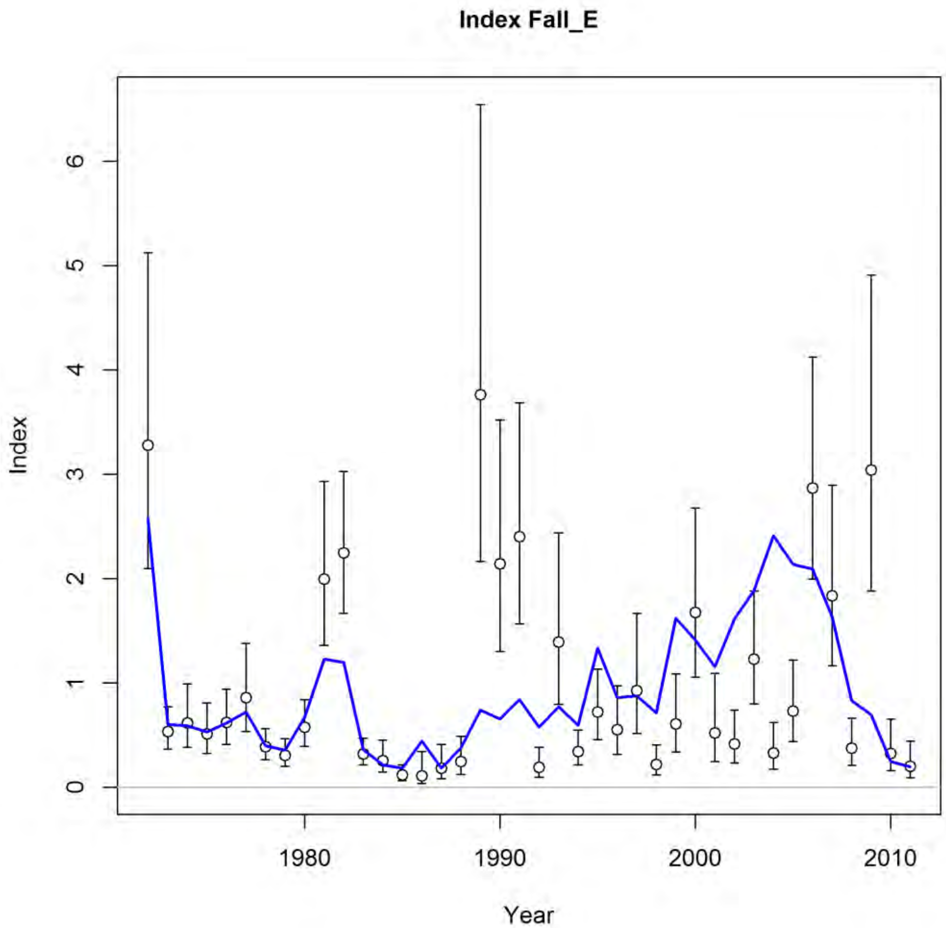



Figure 3.2.1.39. Observed and predicted index of abundance for red snapper in the eastern Gulf of Mexico from the SEAMAP groundfish fall survey, 1972-2011.

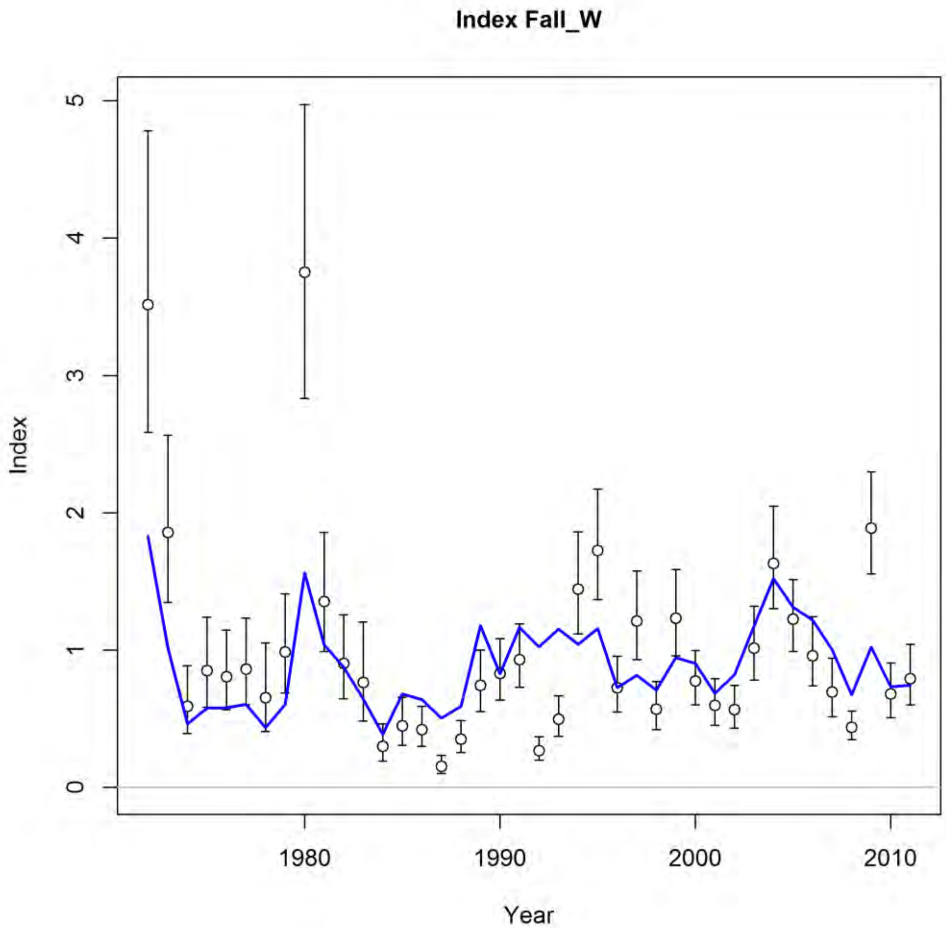



Figure 3.2.1.40. Observed and predicted index of abundance for red snapper in the western Gulf of Mexico from the SEAMAP groundfish fall survey, 1972-2011.

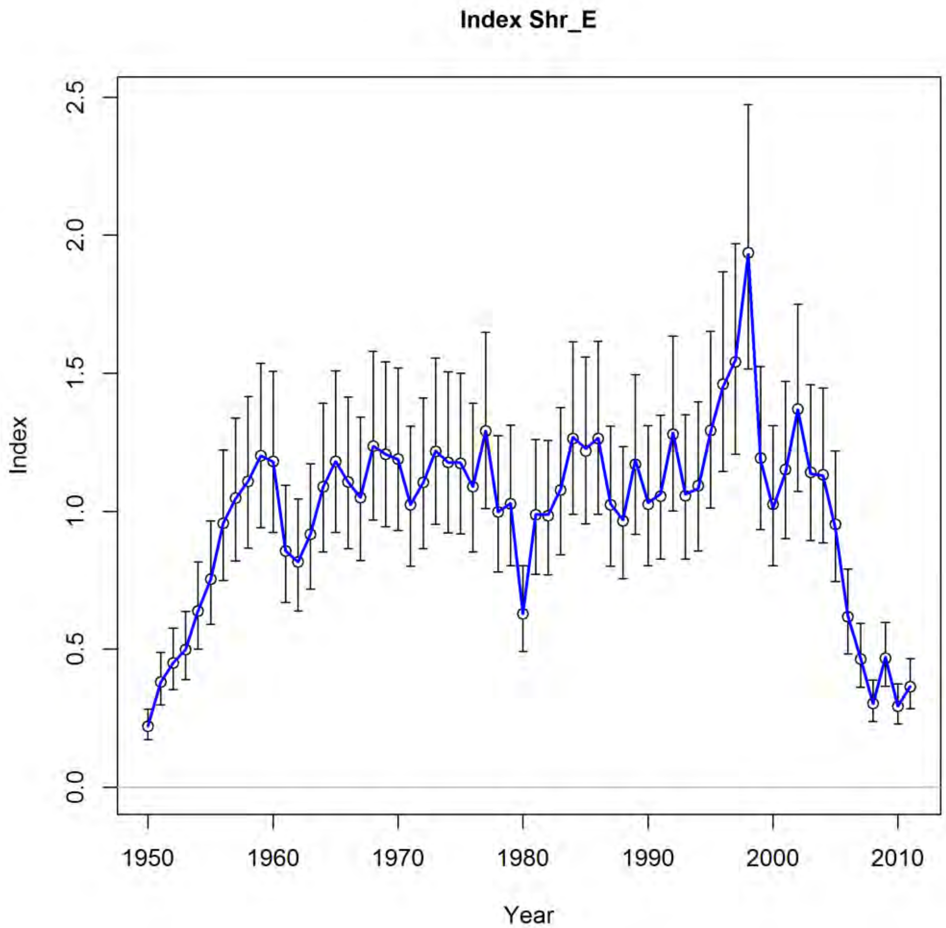



Figure 3.2.1.41. Observed and predicted index of fishing effort for the shrimp fishery in the eastern Gulf of Mexico, 1950-2011.

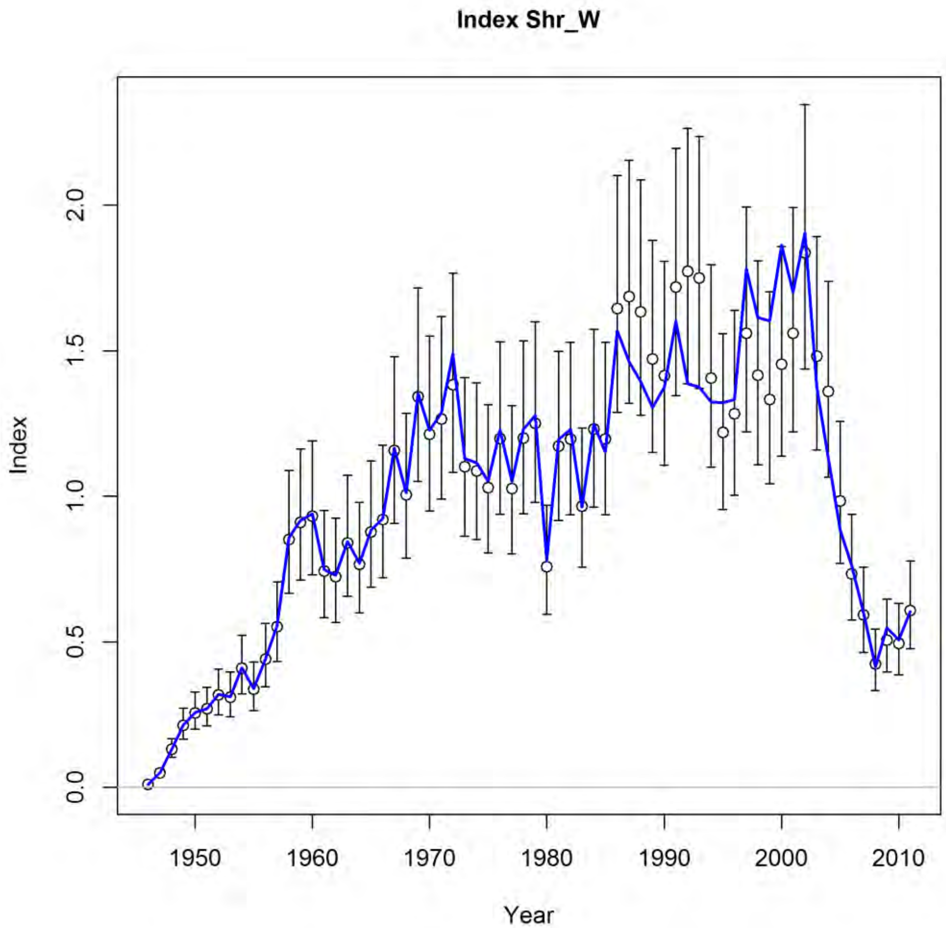



Figure 3.2.1.42. Observed and predicted index of fishing effort for the shrimp fishery in the western Gulf of Mexico, 1946-2011.

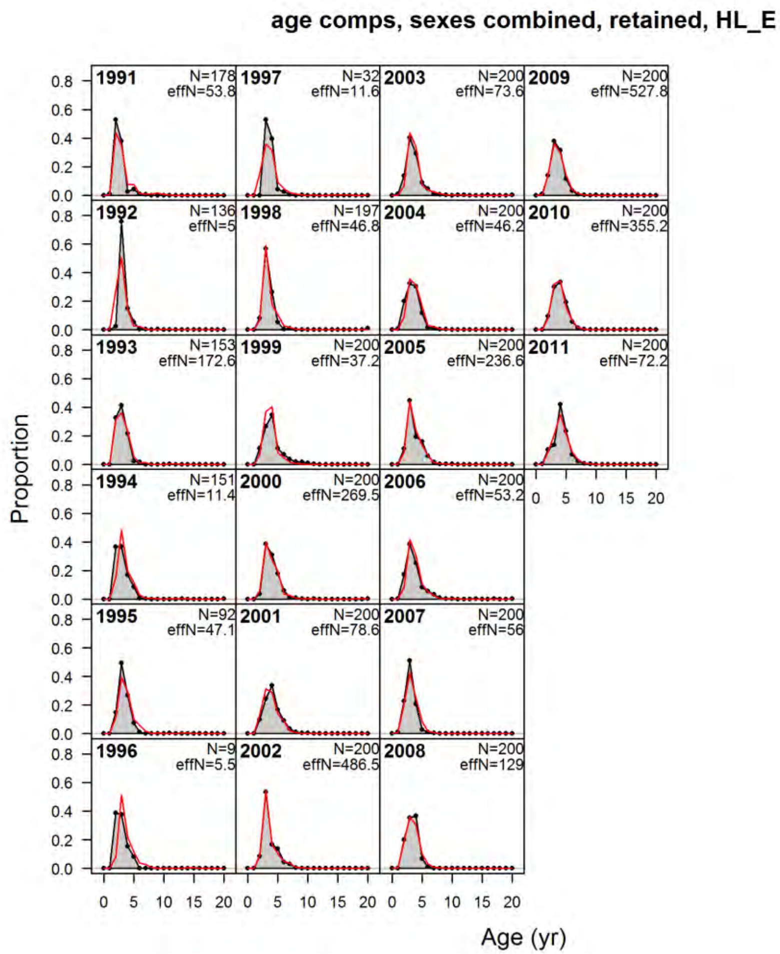



Figure 3.2.1.43. Observed and predicted age composition of red snapper landed from the commercial handline fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

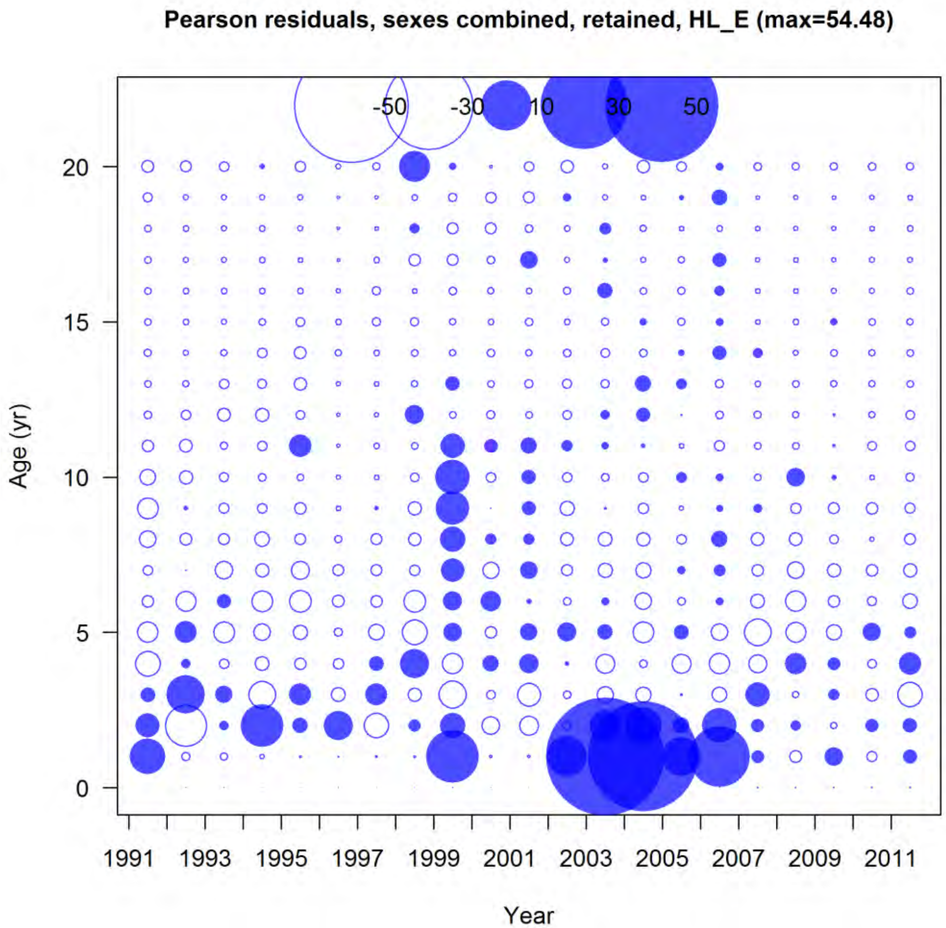



Figure 3.2.1.44. Pearson residuals of age composition fits for landed snapper from the commercial handline fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

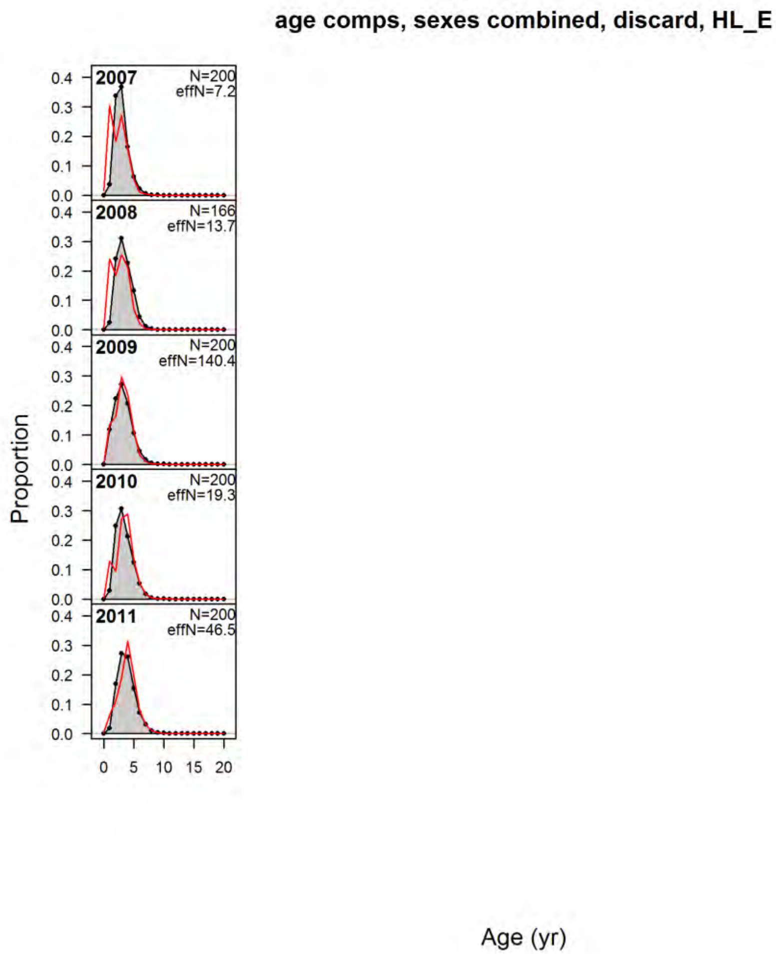



Figure 3.2.1.45. Observed and predicted age composition of red snapper discarded from the commercial handline fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

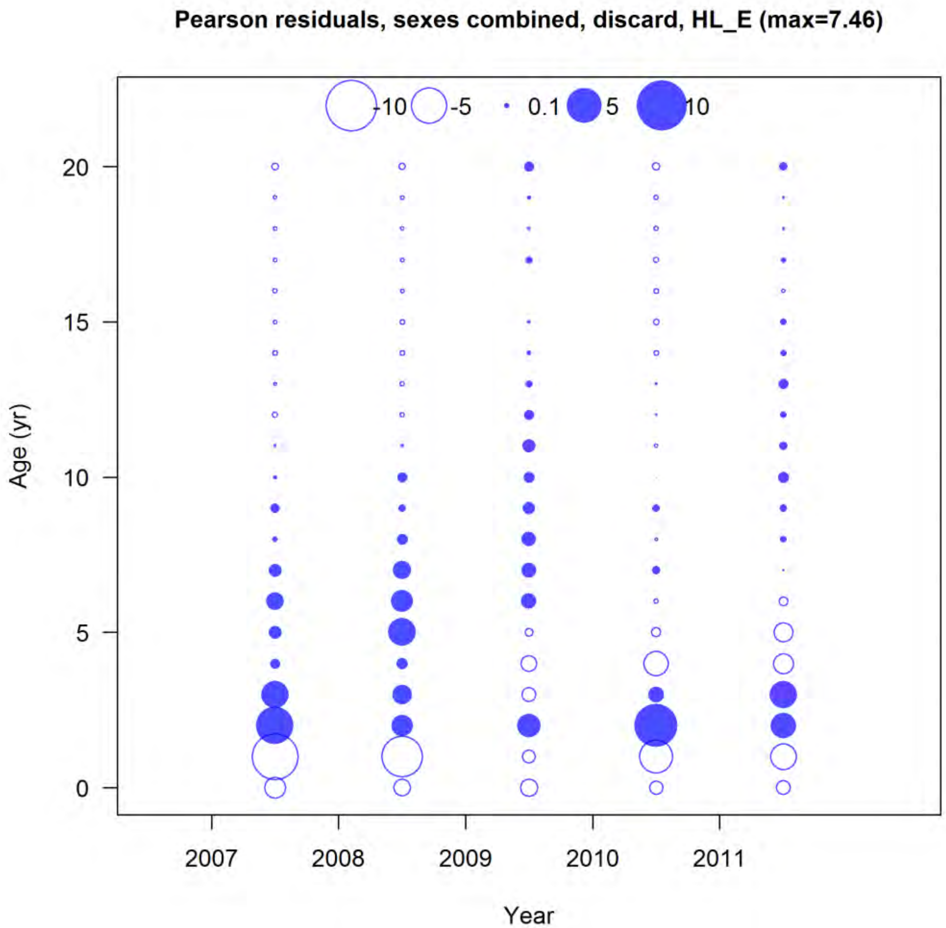



Figure 3.2.1.46. Pearson residuals of age composition fits for discarded red snapper from the commercial handline fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

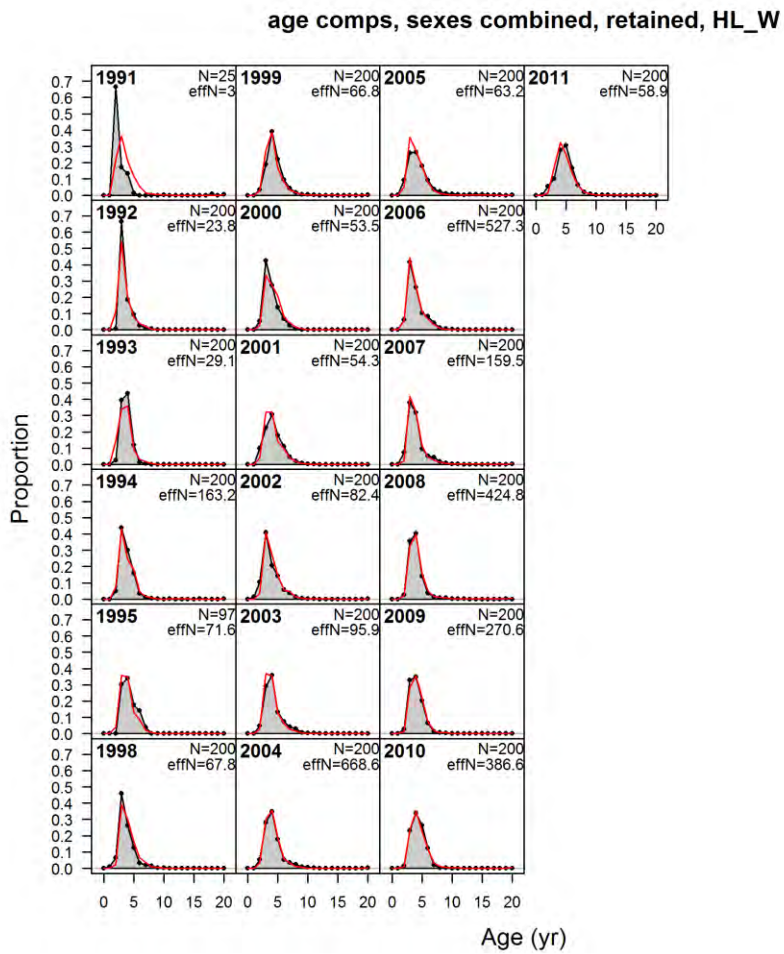



Figure 3.2.1.47. Observed and predicted age composition of red snapper landed from the commercial handline fishery in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

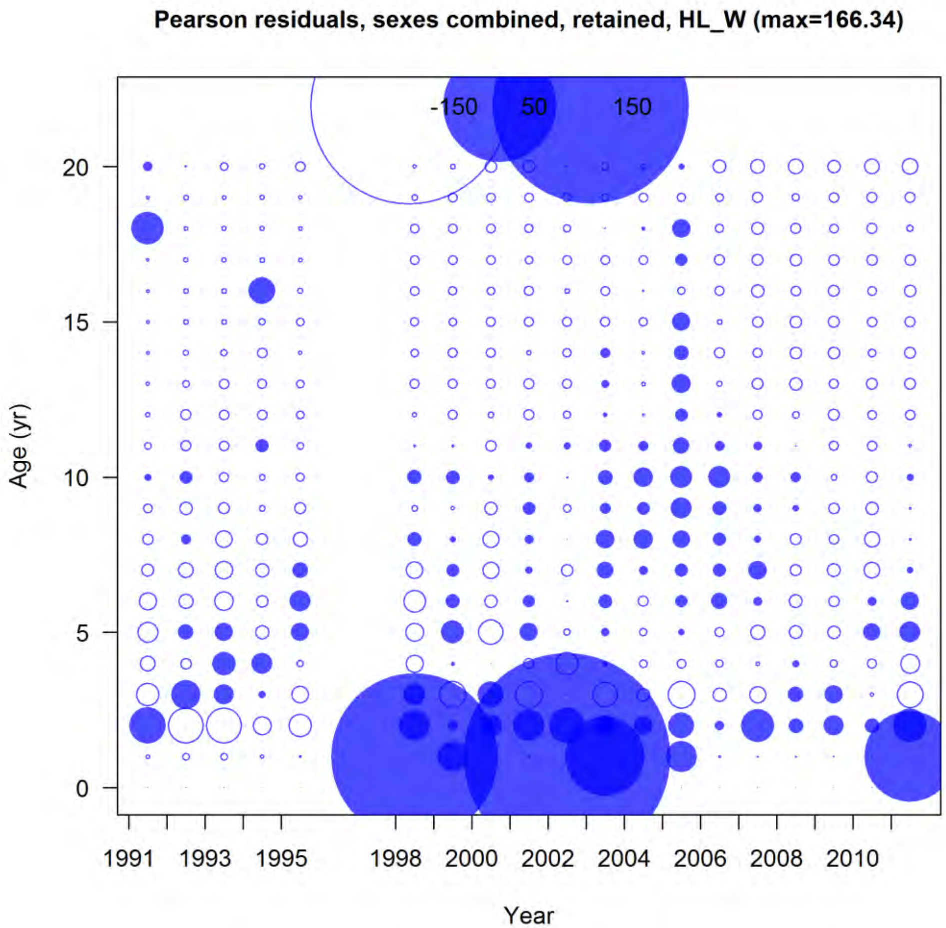



Figure 3.2.1.48. Pearson residuals of age composition fits for landed snapper from the commercial handline fishery in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

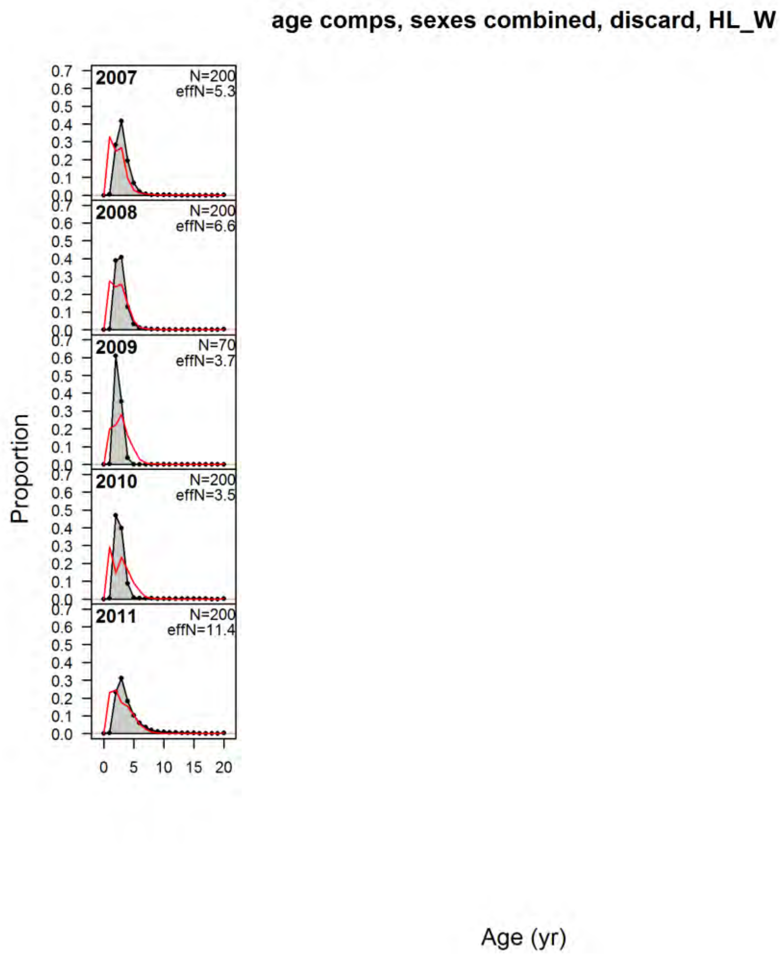



Figure 3.2.1.49. Observed and predicted age composition of red snapper discarded from the commercial handline fishery in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

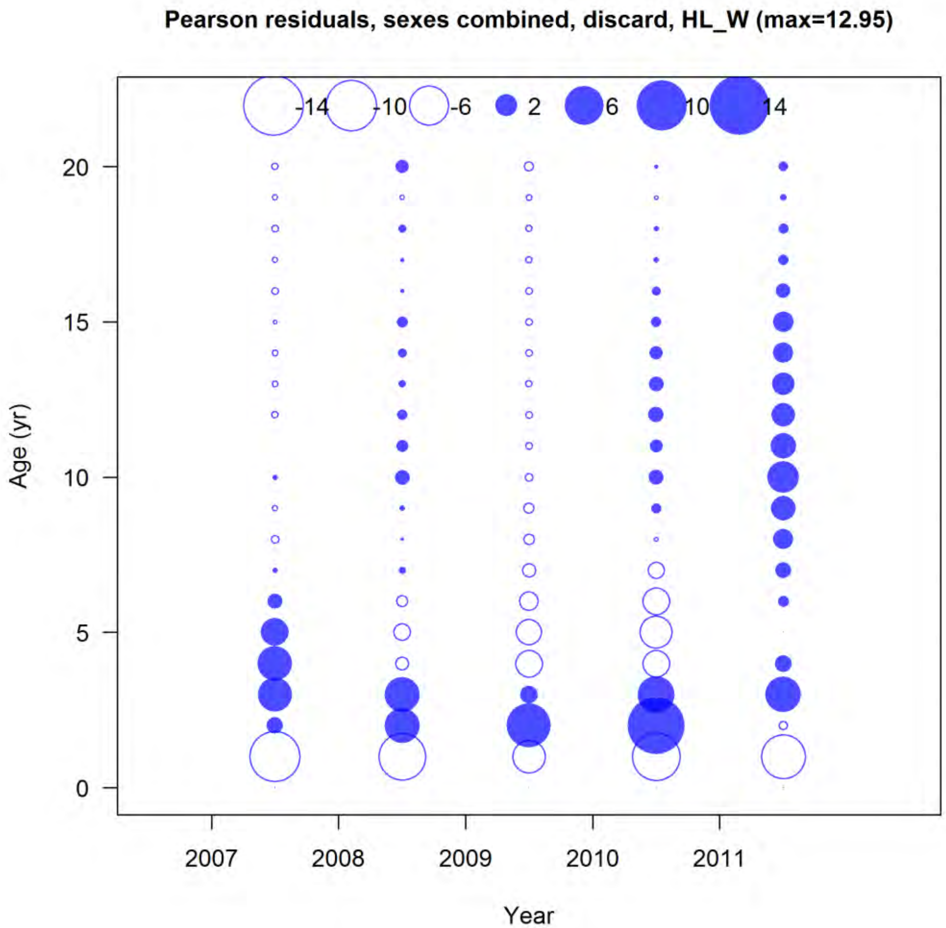



Figure 3.2.1.50. Pearson residuals of age composition fits for discarded red snapper from the commercial handline fishery in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

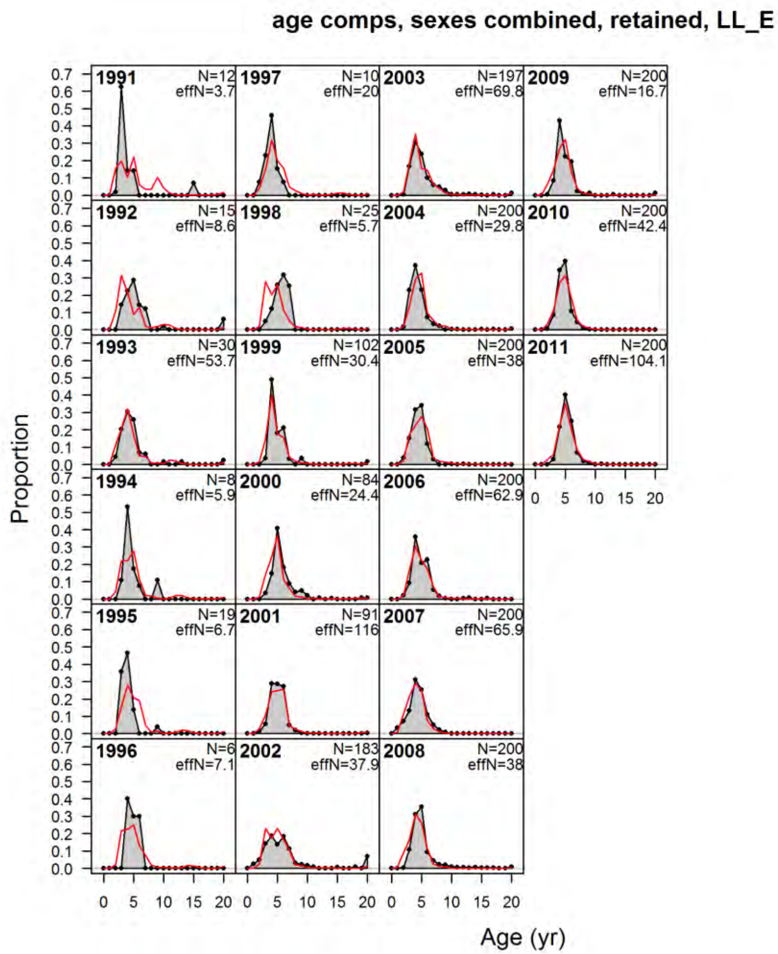



Figure 3.2.1.51. Observed and predicted age composition of red snapper landed from the commercial longline fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

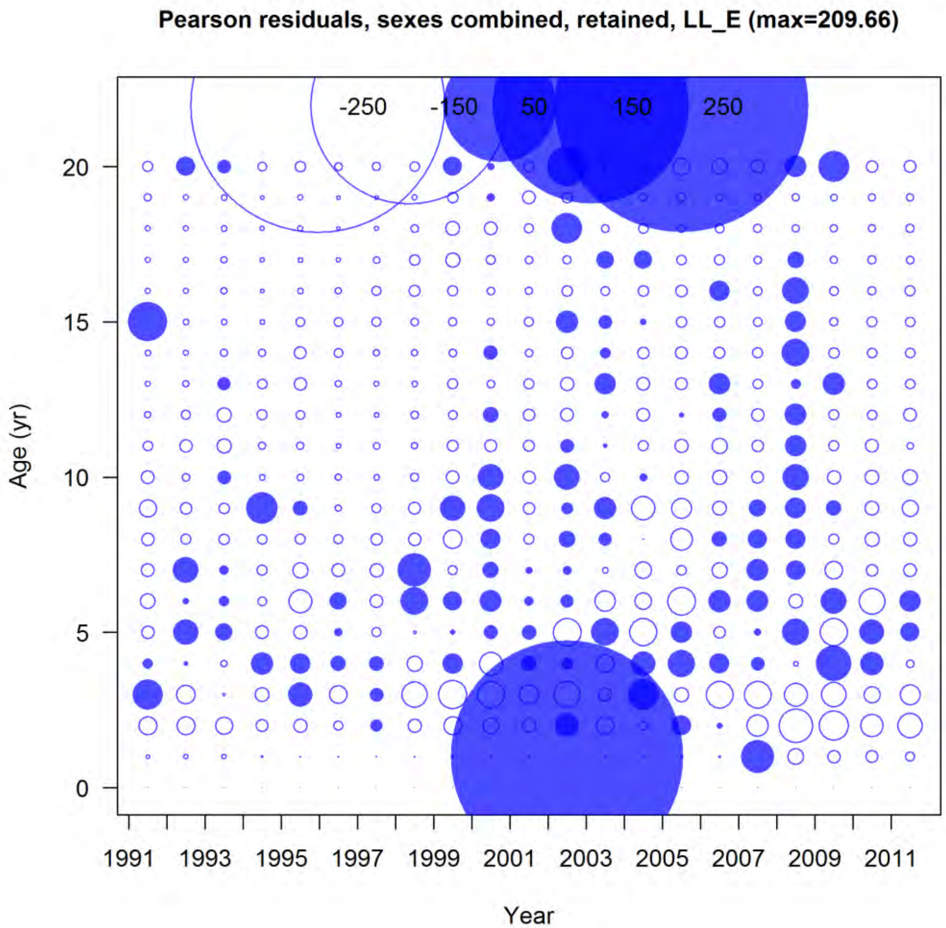



Figure 3.2.1.52. Pearson residuals of age composition fits for landed snapper from the commercial longline fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

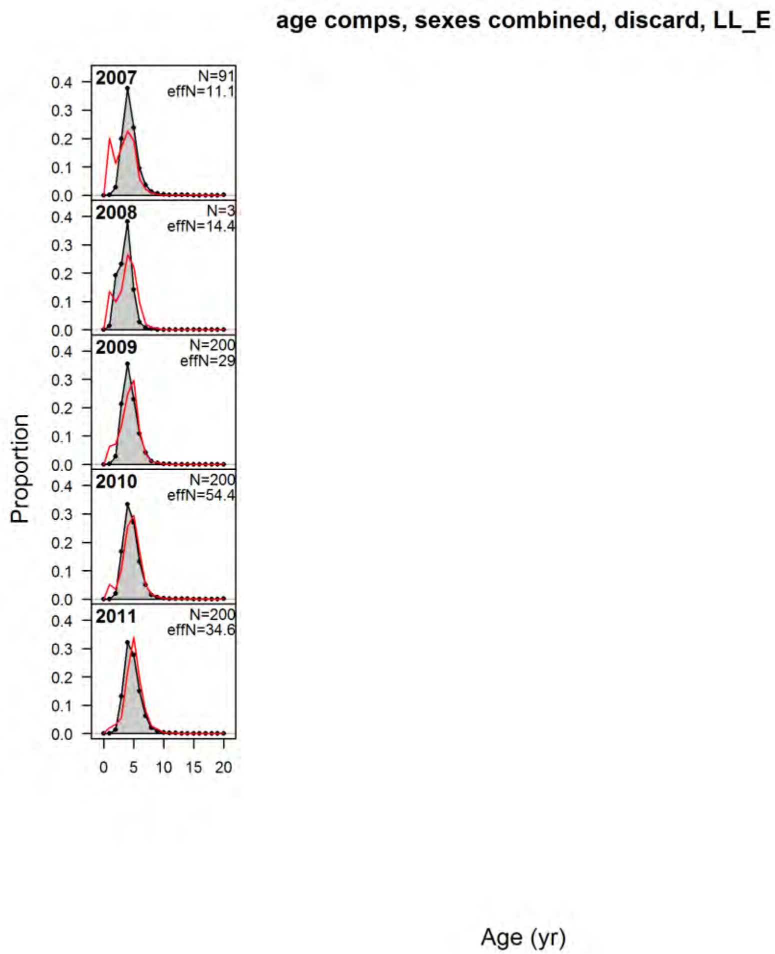



Figure 3.2.1.53. Observed and predicted age composition of red snapper discarded from the commercial longline fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

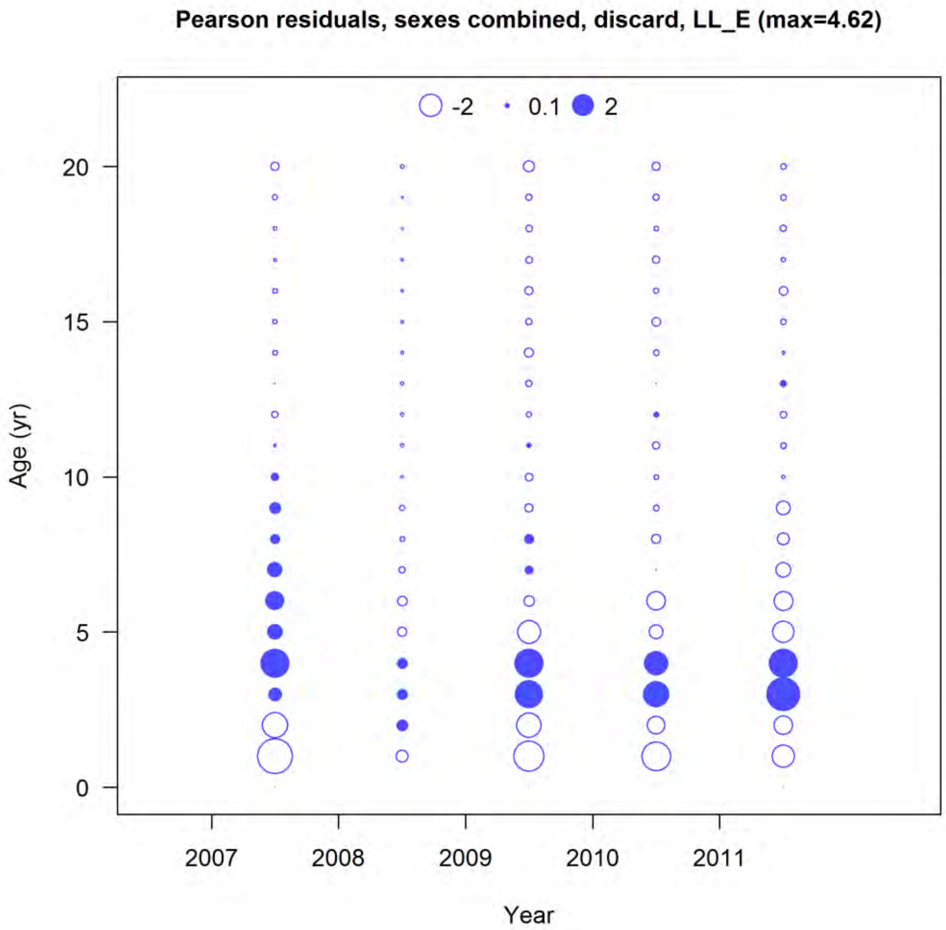



Figure 3.2.1.54. Pearson residuals of age composition fits for discarded red snapper from the commercial longline fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

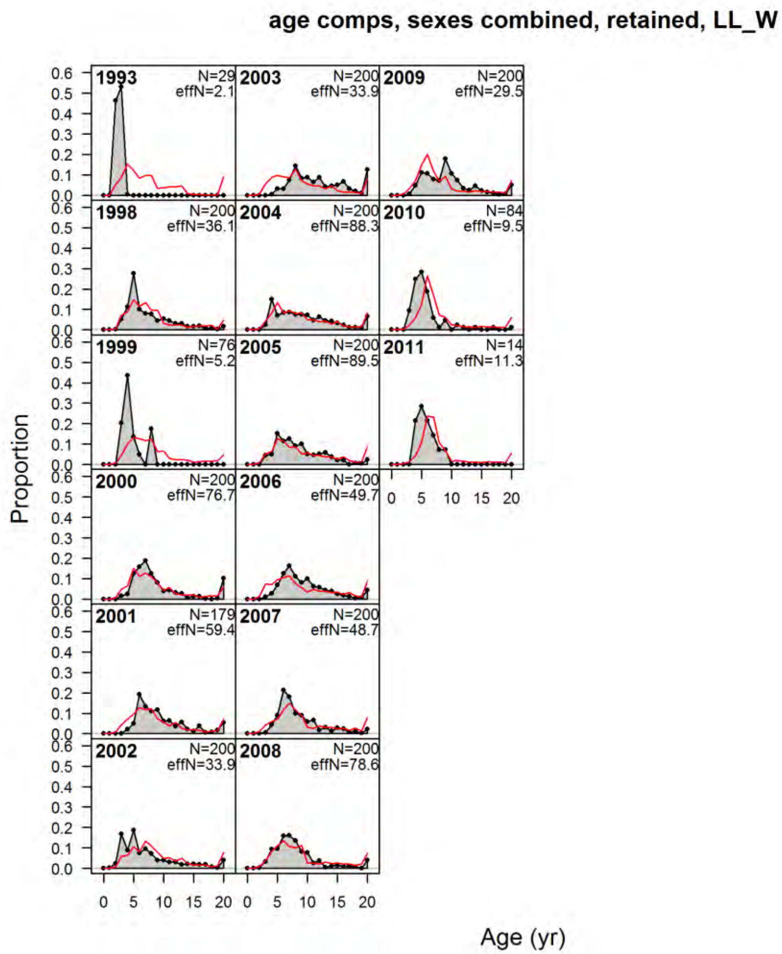



Figure 3.2.1.55. Observed and predicted age composition of red snapper landed from the commercial longline fishery in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

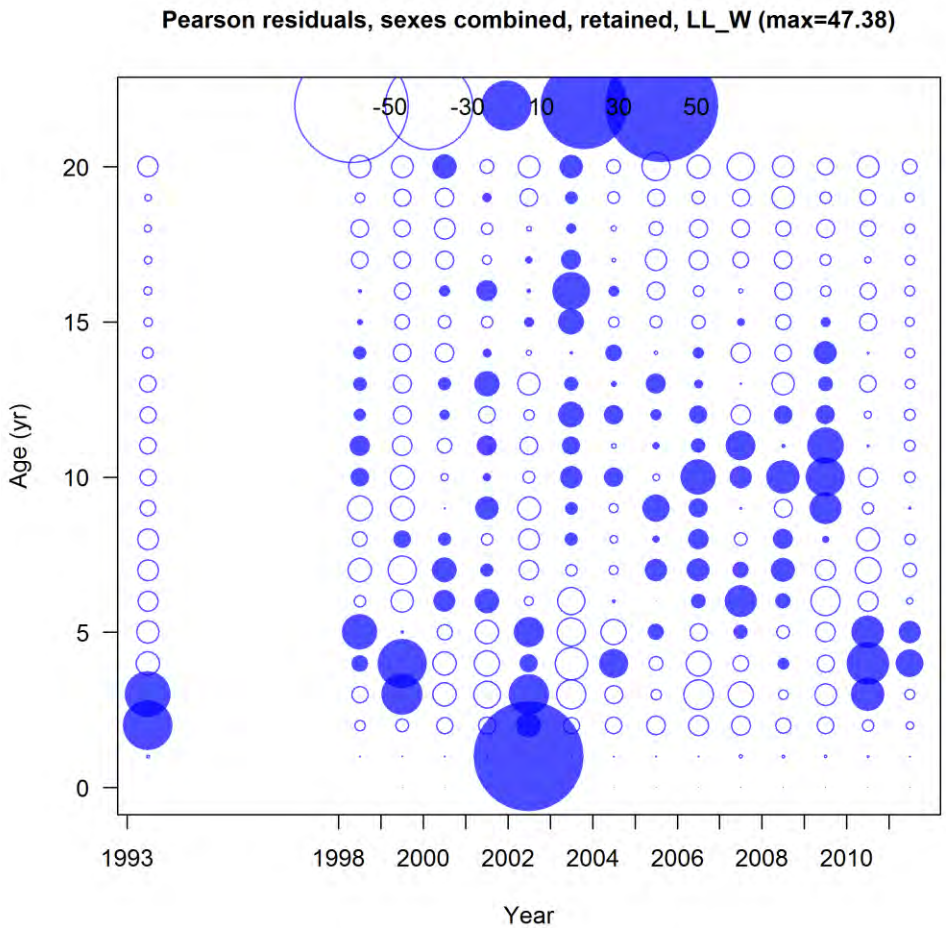



Figure 3.2.1.56. Pearson residuals of age composition fits for landed snapper from the commercial longline fishery in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

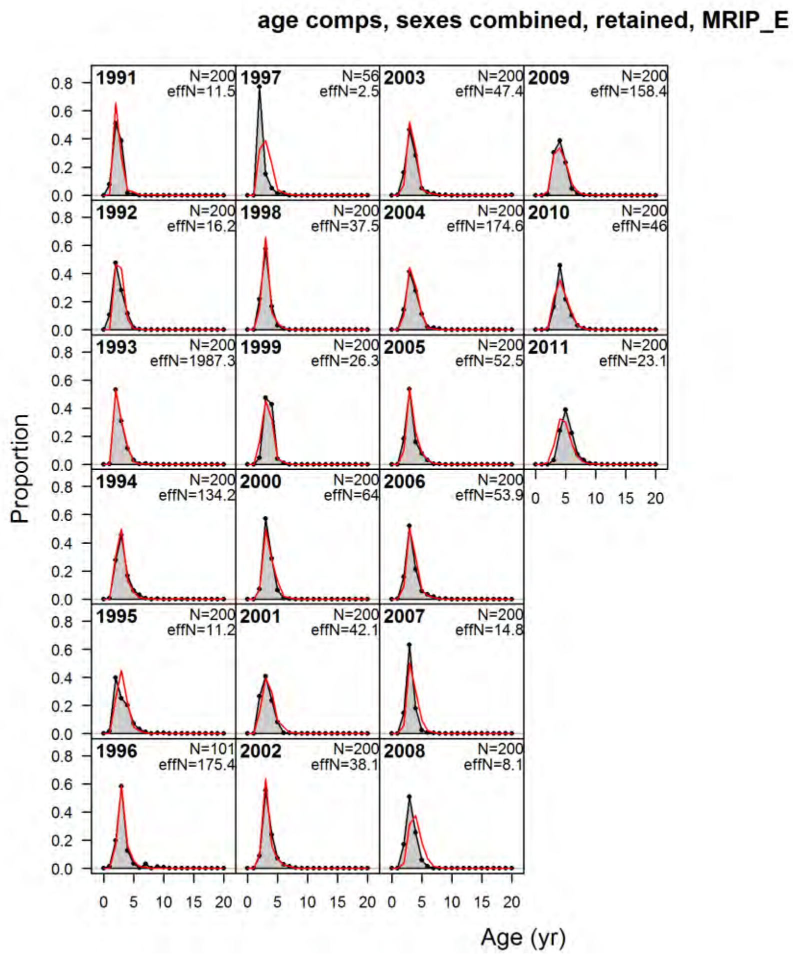



Figure 3.2.1.57. Observed and predicted age composition of red snapper landed from the private recreational fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

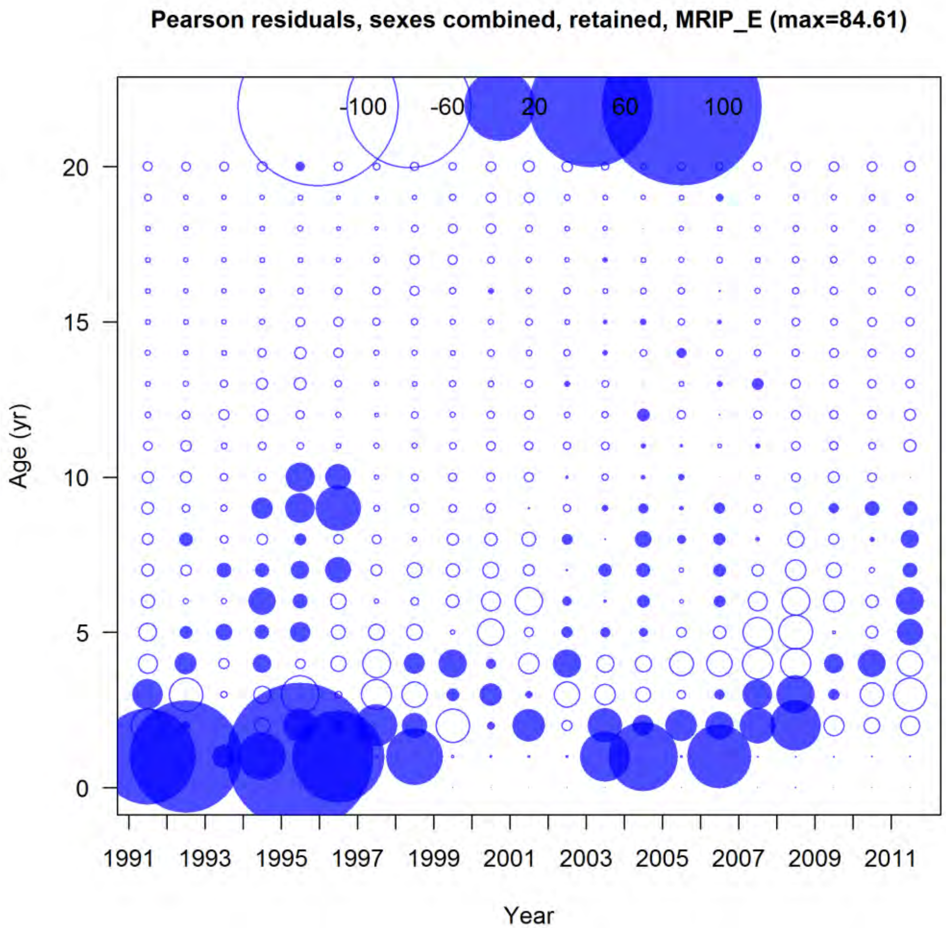



Figure 3.2.1.58. Pearson residuals of age composition fits for landed snapper from the private recreational fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

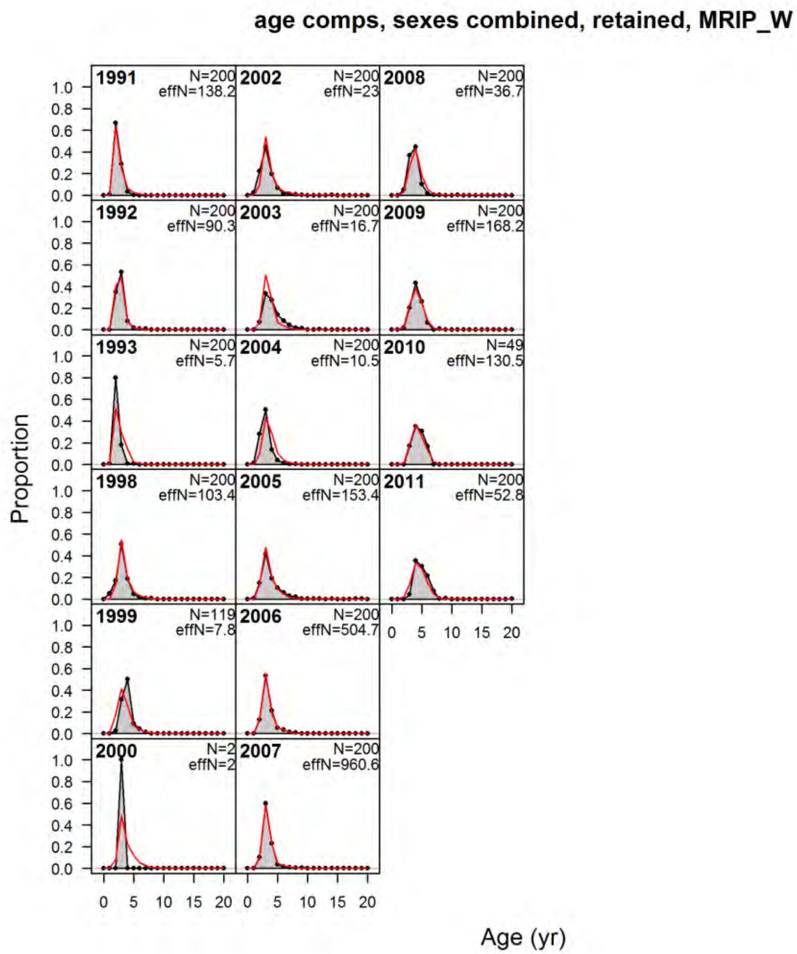



Figure 3.2.1.59. Observed and predicted age composition of red snapper landed from the private recreational fishery in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

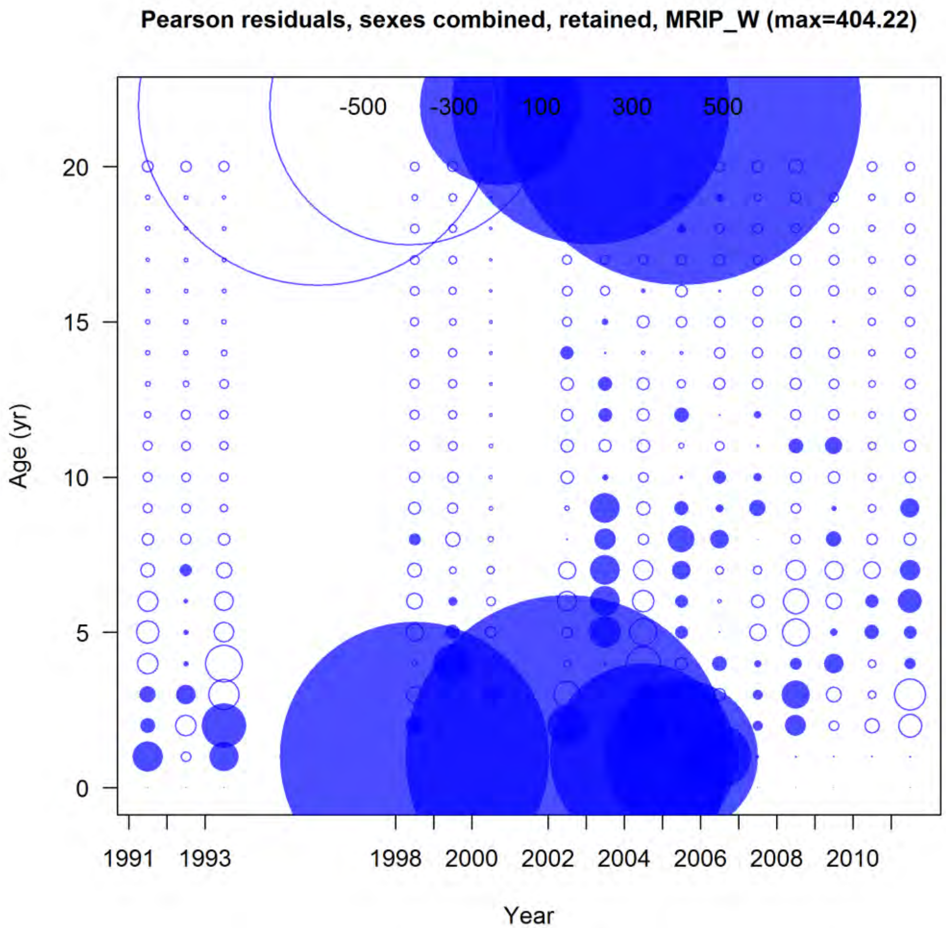



Figure 3.2.1.60. Pearson residuals of age composition fits for landed snapper from the private recreational fishery in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

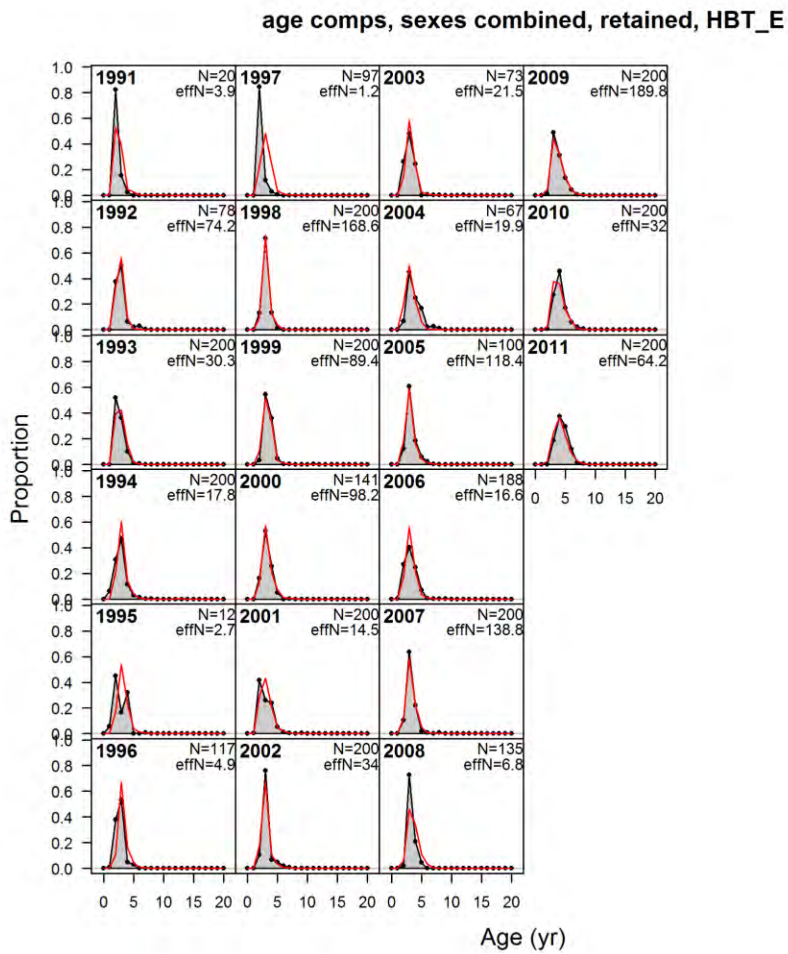



Figure 3.2.1.61. Observed and predicted age composition of red snapper landed from the recreational headboat fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

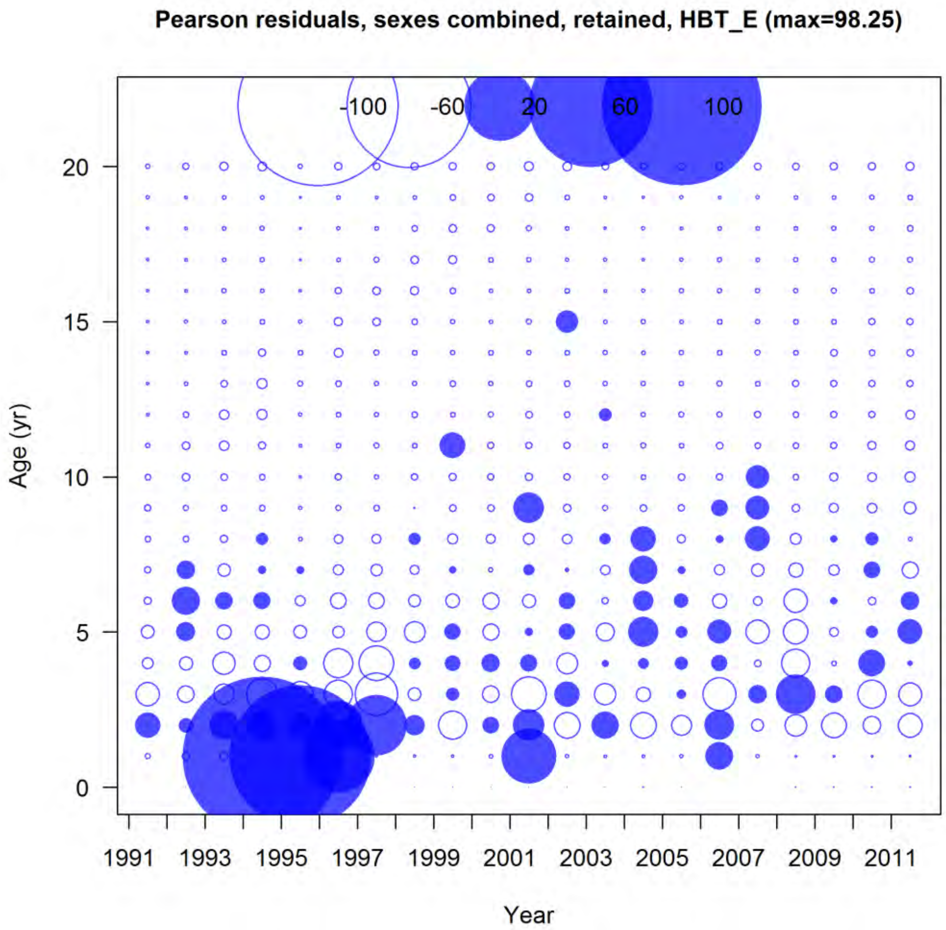



Figure 3.2.1.62. Pearson residuals of age composition fits for landed snapper from the recreational headboat fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

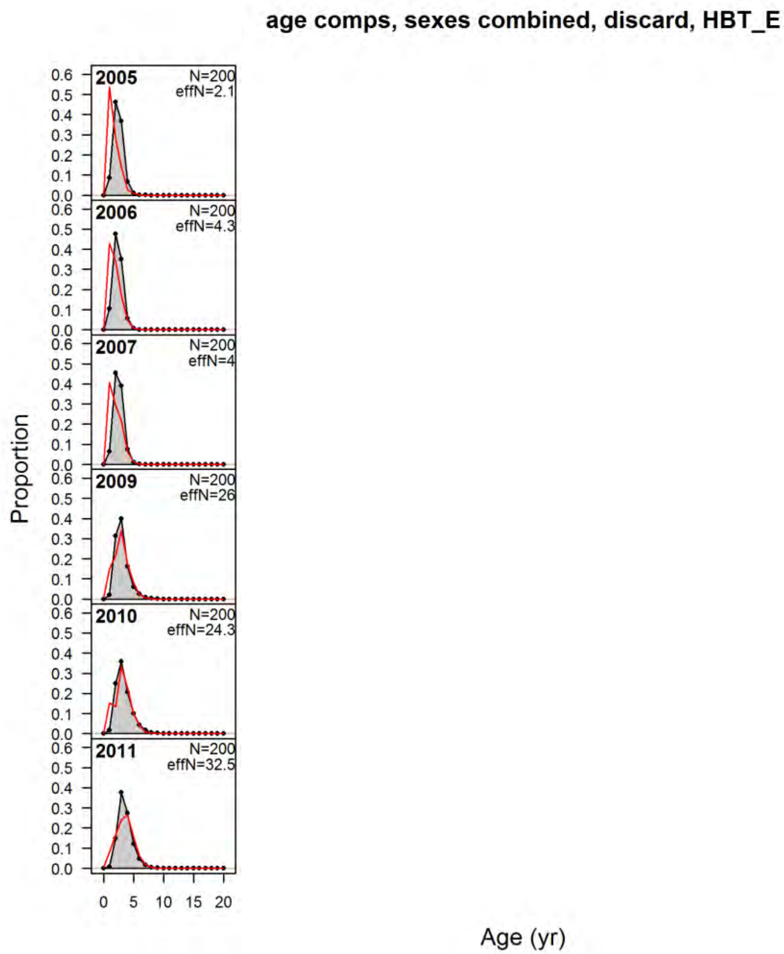



Figure 3.2.1.63. Observed and predicted age composition of discarded red snapper from the recreational headboat fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

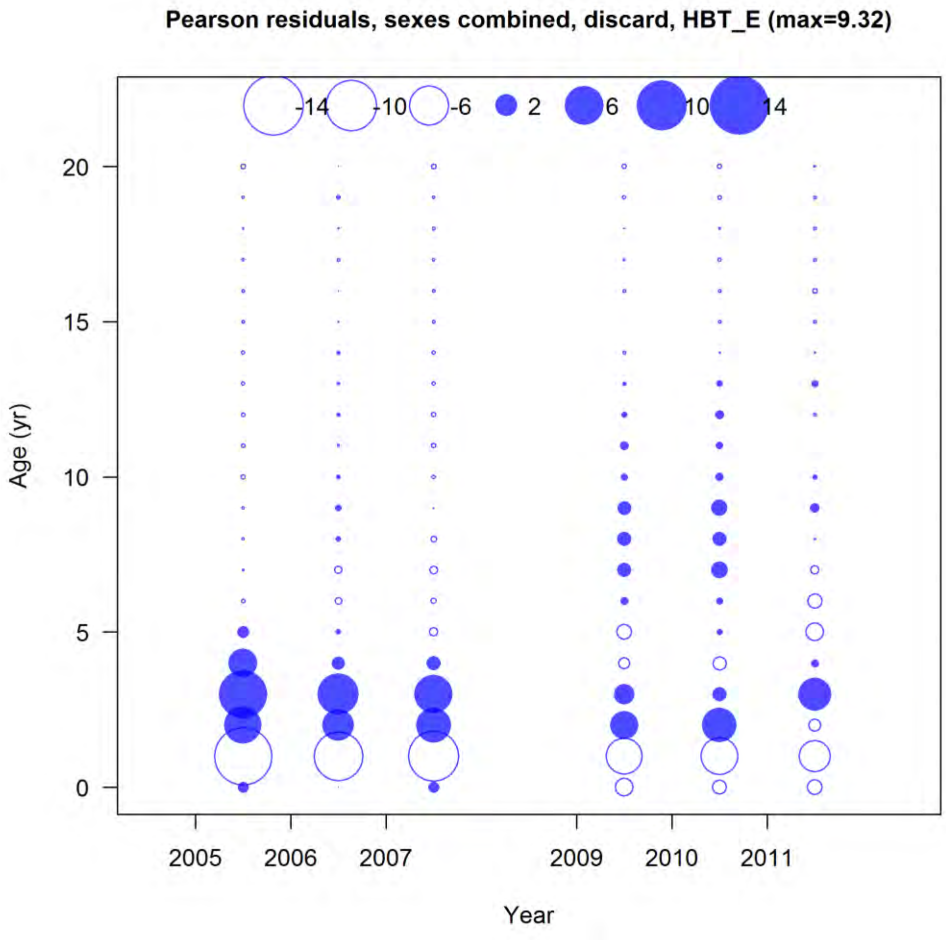



Figure 3.2.1.64. Pearson residuals of age composition fits for discarded snapper from the recreational headboat fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

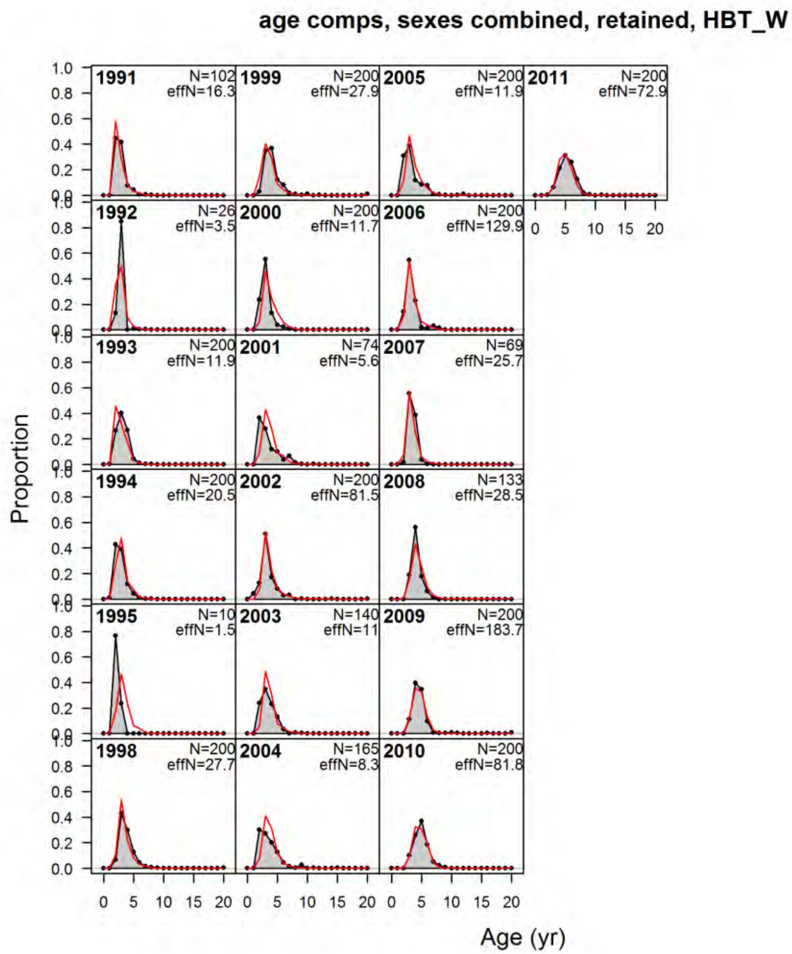



Figure 3.2.1.65. Observed and predicted age composition of red snapper landed from the recreational headboat fishery in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

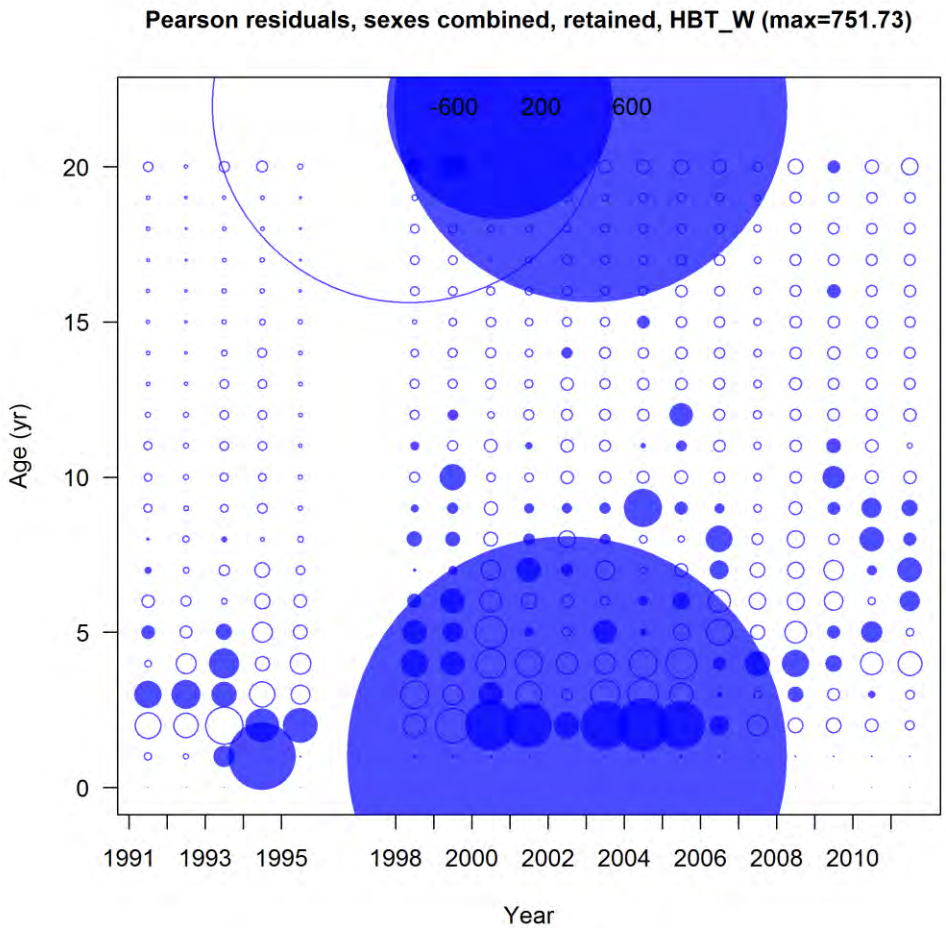



Figure 3.2.1.66. Pearson residuals of age composition fits for landed snapper from the recreational headboat fishery in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

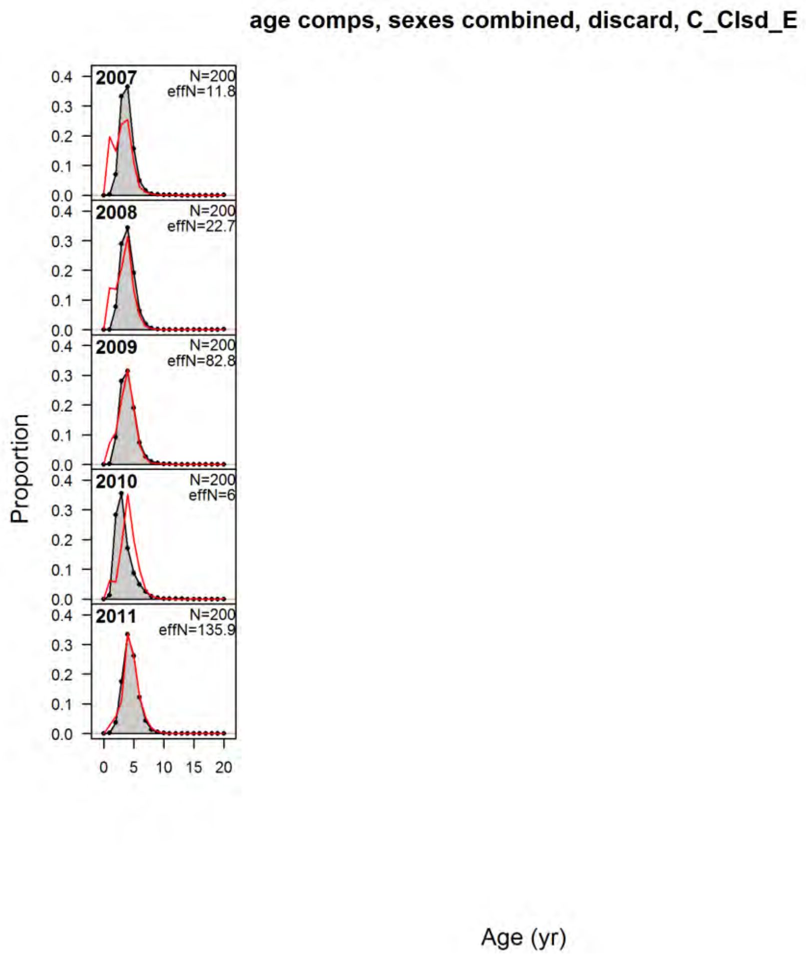



Figure 3.2.1.67. Observed and predicted age composition of red snapper discarded from the commercial closed season fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

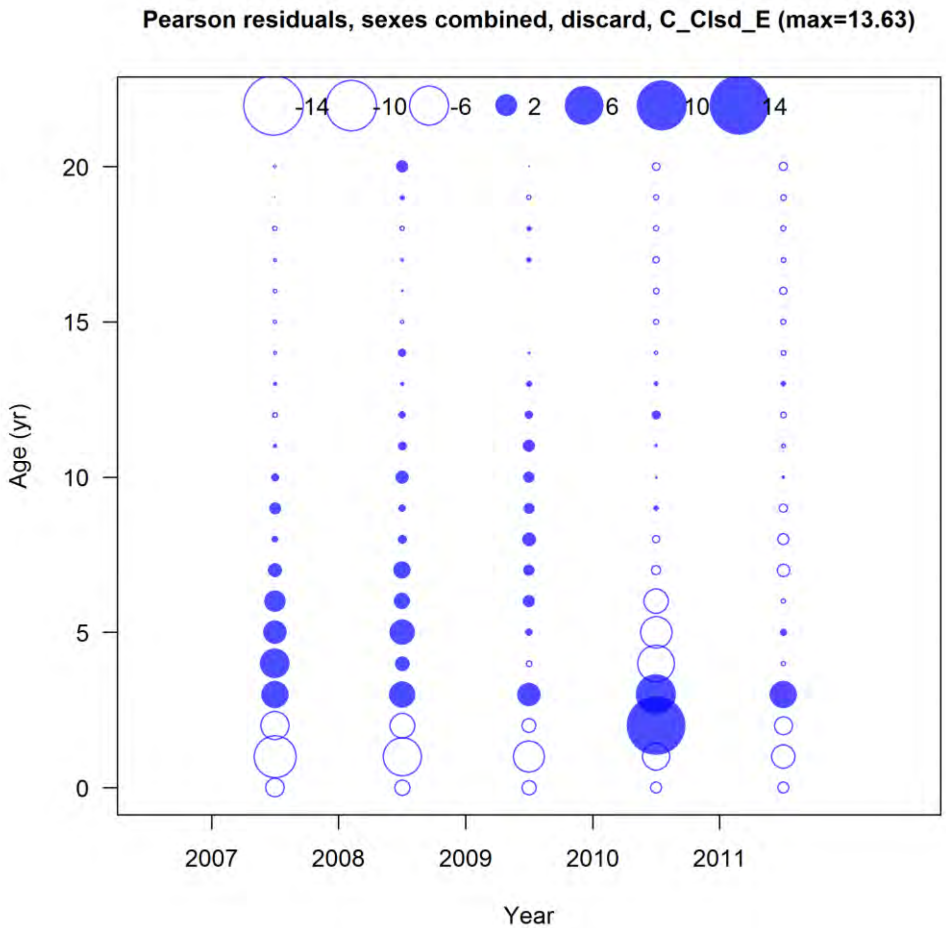



Figure 3.2.1.68. Pearson residuals of age composition fits for of red snapper discarded from the commercial closed season fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

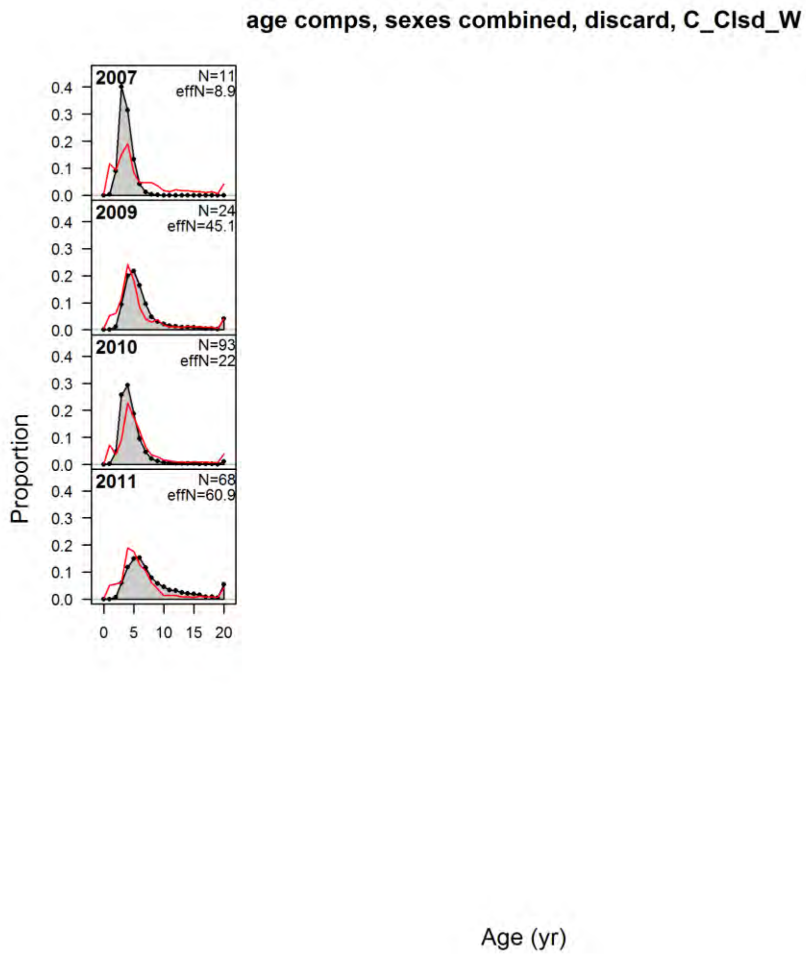



Figure 3.2.1.69. Observed and predicted age composition of red snapper discarded from the commercial closed season fishery in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

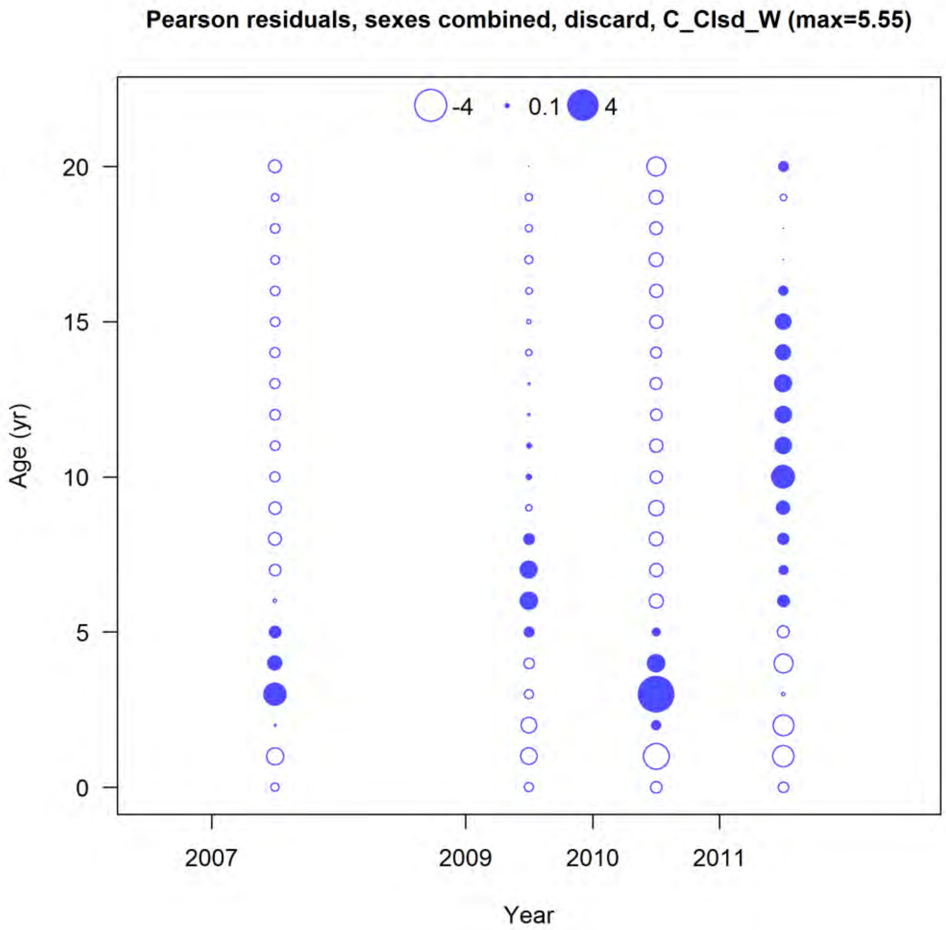



Figure 3.2.1.70. Pearson residuals of age composition fits for of red snapper discarded from the commercial closed season fishery in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

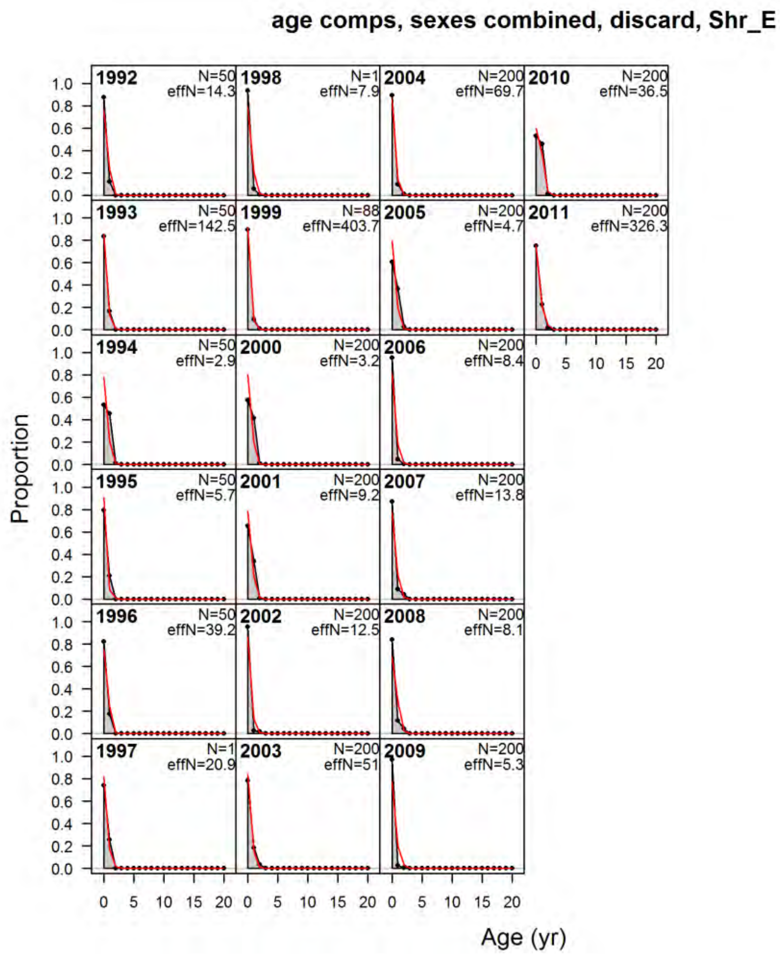



Figure 3.2.1.71. Observed and predicted age composition of red snapper discarded from the shrimp fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

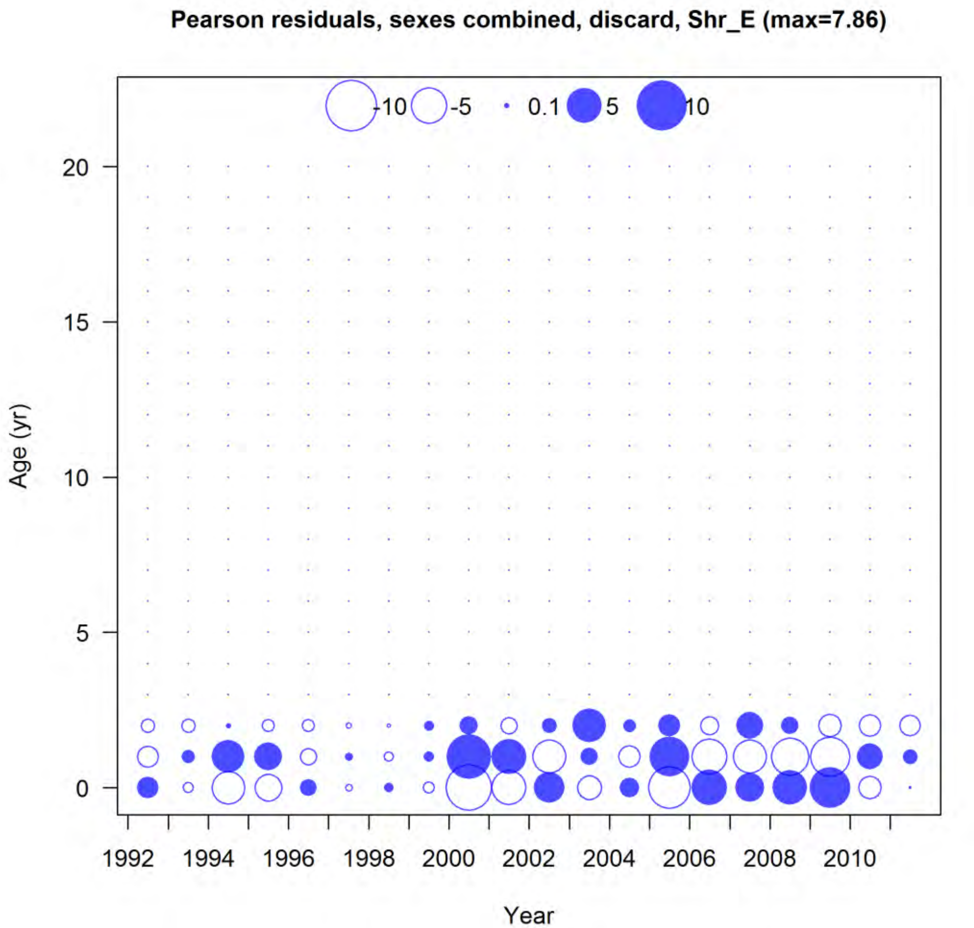



Figure 3.2.1.72. Pearson residuals of age composition fits for of red snapper discarded from the shrimp fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

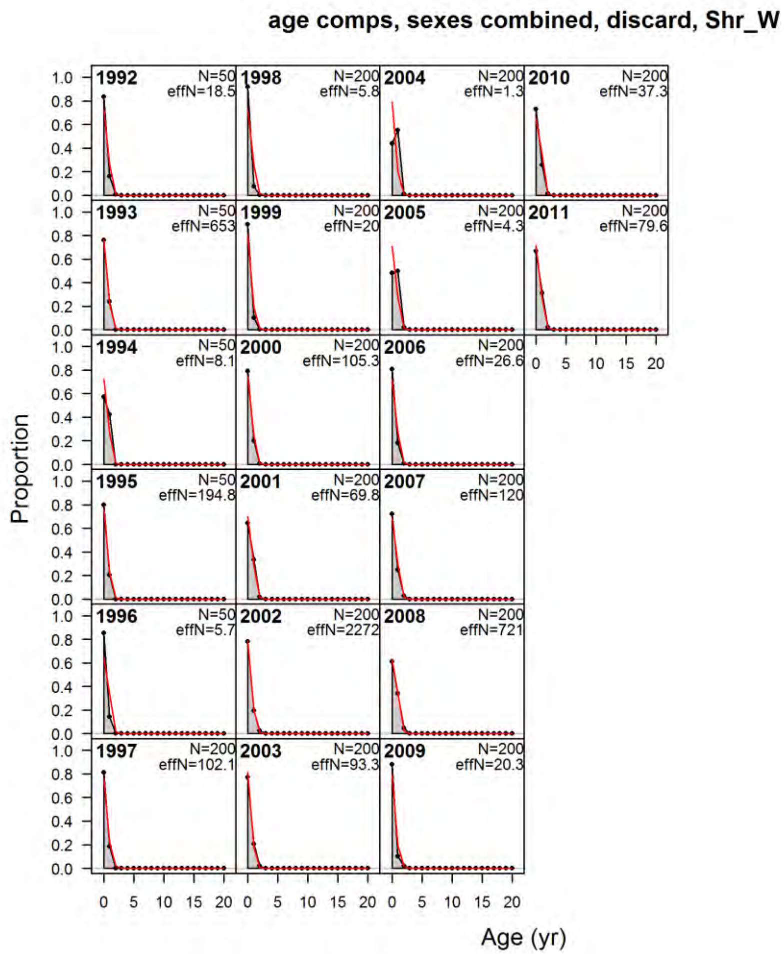



Figure 3.2.1.73. Observed and predicted age composition of red snapper discarded from the shrimp fishery in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

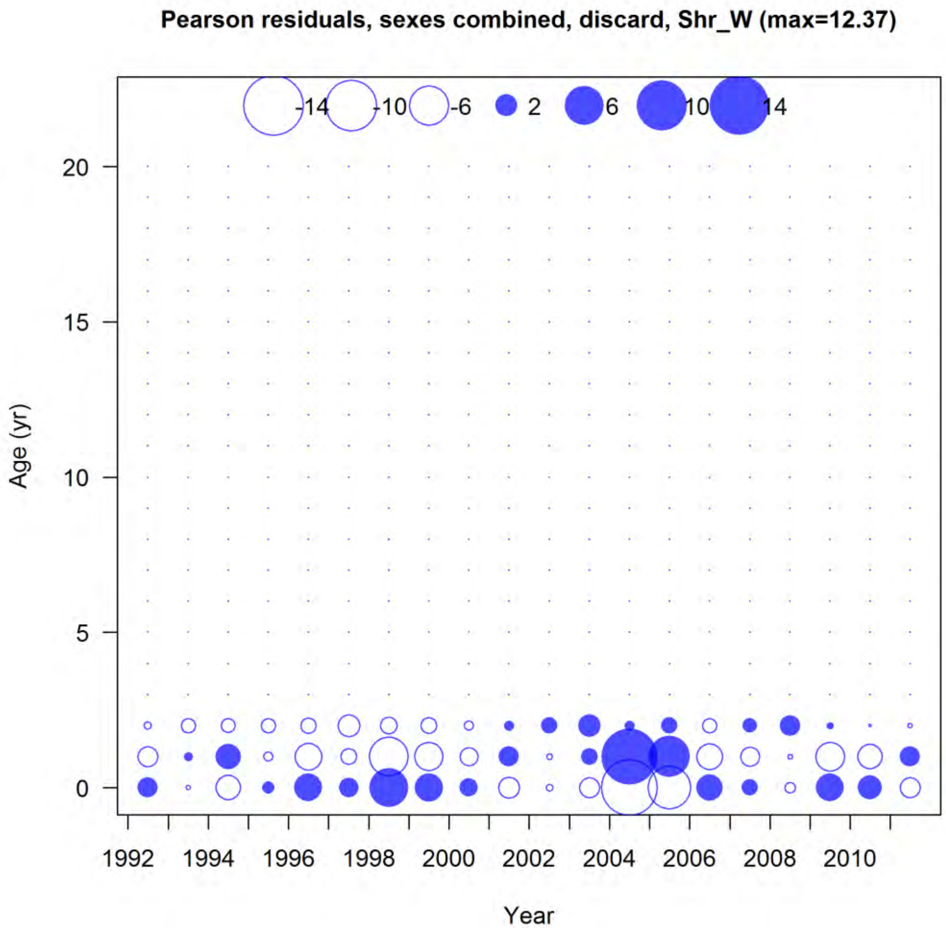



Figure 3.2.1.74. Pearson residuals of age composition fits for of red snapper discarded from the shrimp fishery in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

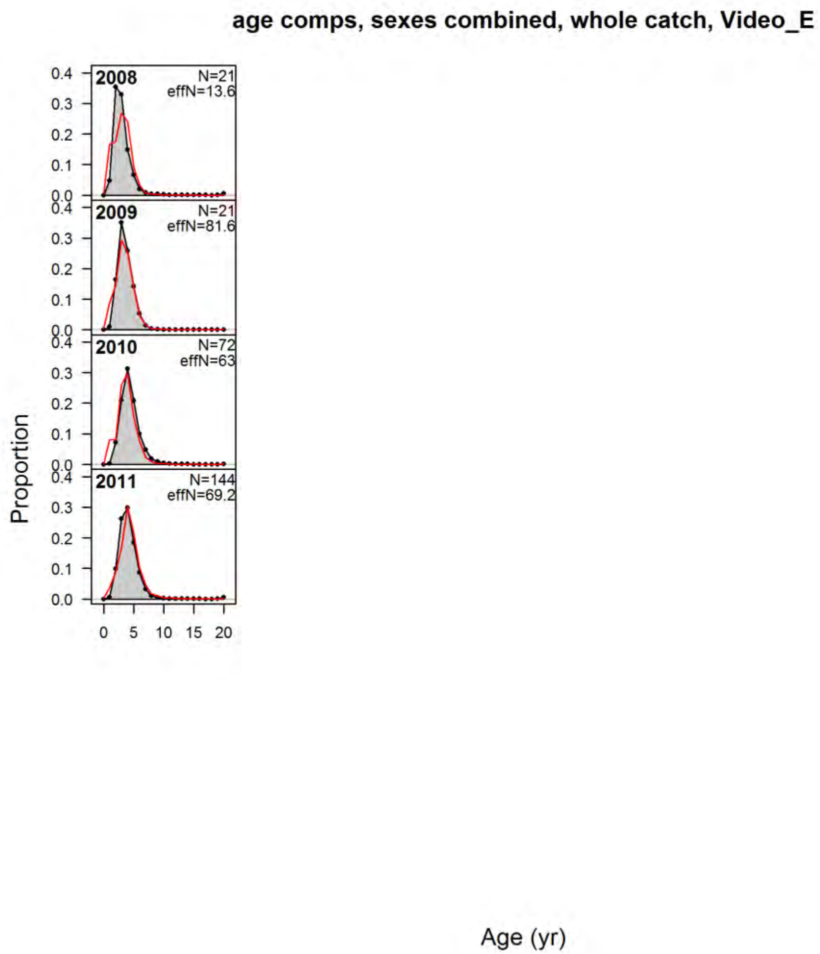



Figure 3.2.1.75. Observed and predicted age composition of red snapper from the SEAMAP reef fish video survey in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

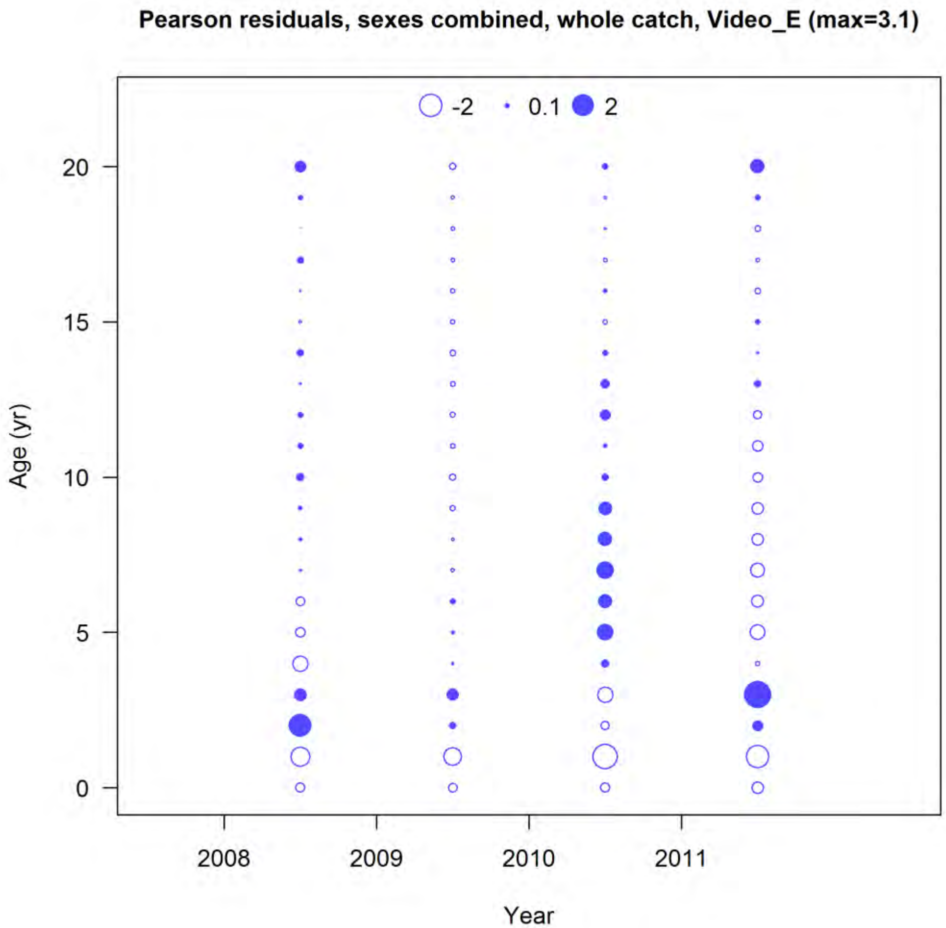



Figure 3.2.1.76. Pearson residuals of age composition fits from the SEAMAP reef fish video survey in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

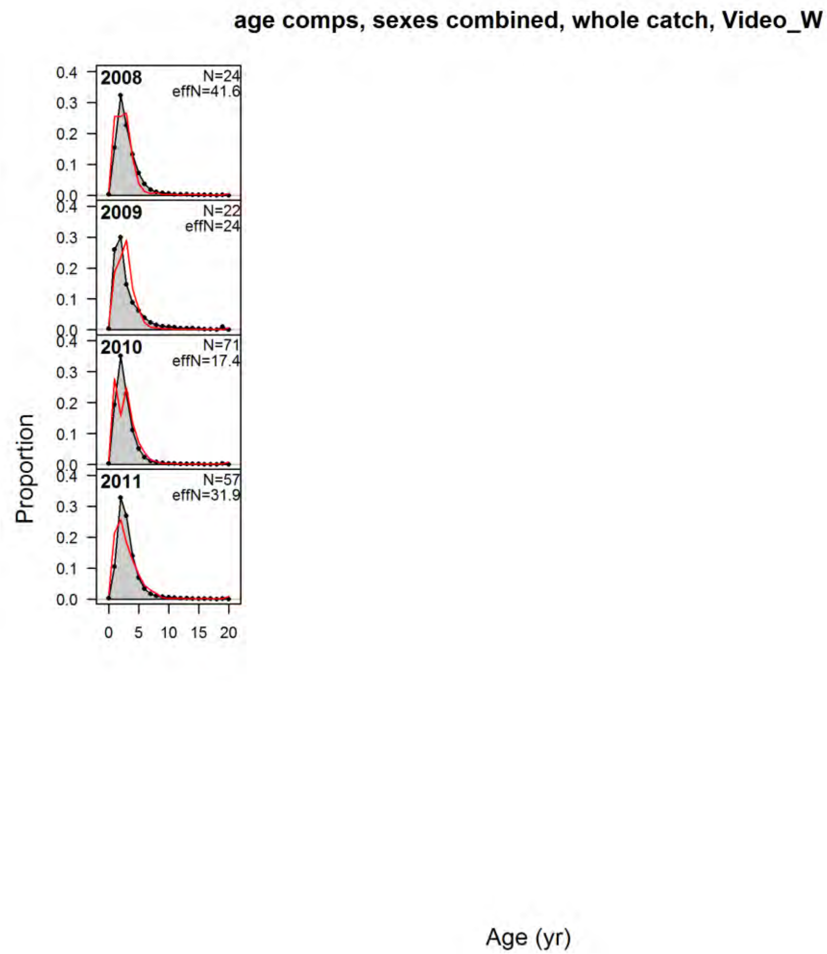



Figure 3.2.1.77. Observed and predicted age composition of red snapper from the SEAMAP reef fish video survey in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

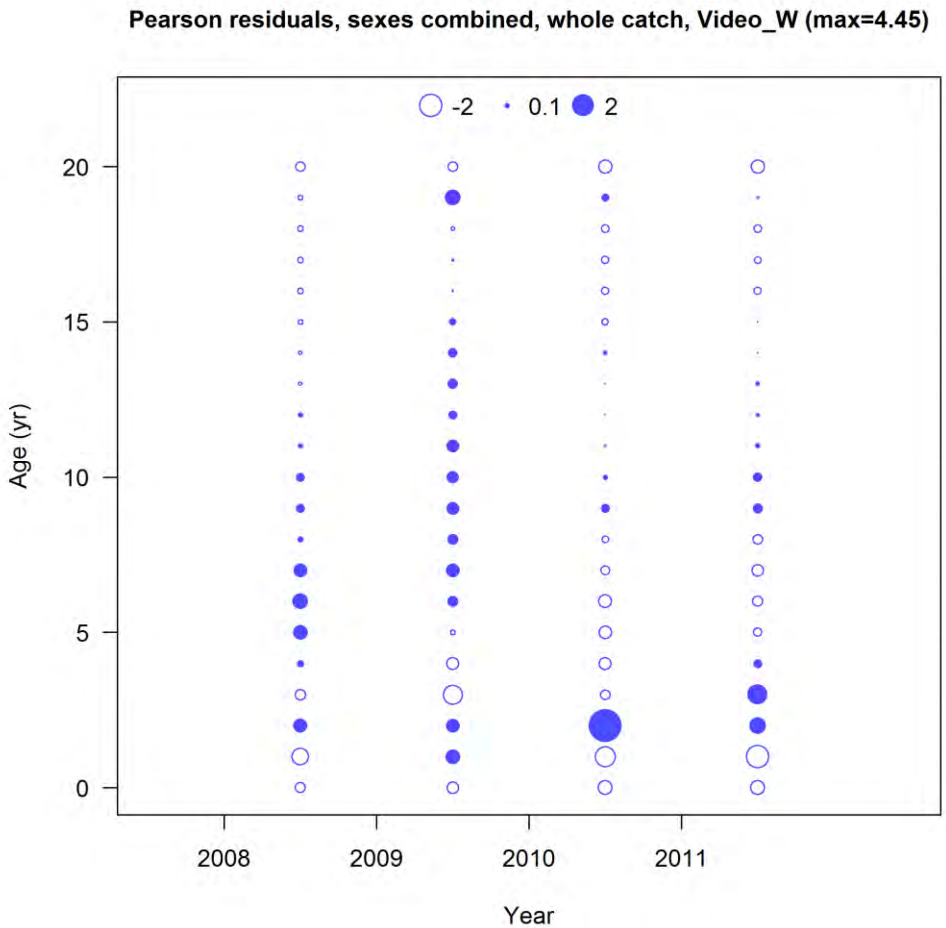



Figure 3.2.1.78. Pearson residuals of age composition fits from the SEAMAP reef fish video survey in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

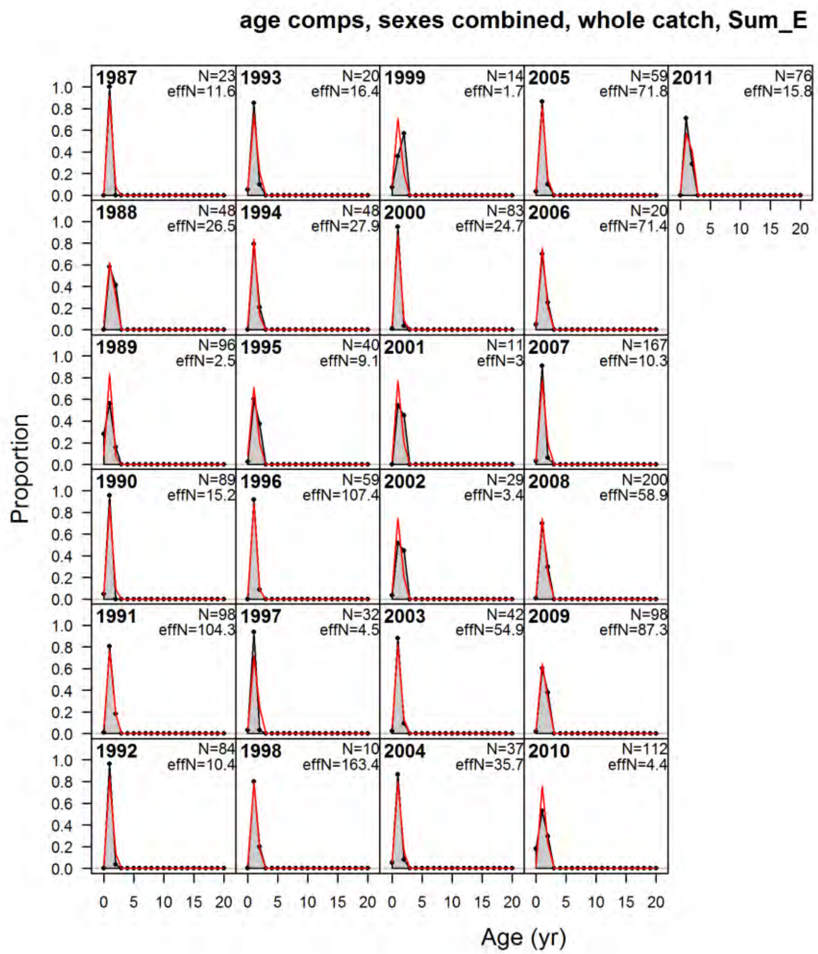



Figure 3.2.1.79. Observed and predicted age composition of red snapper from the SEAMAP groundfish summer survey in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

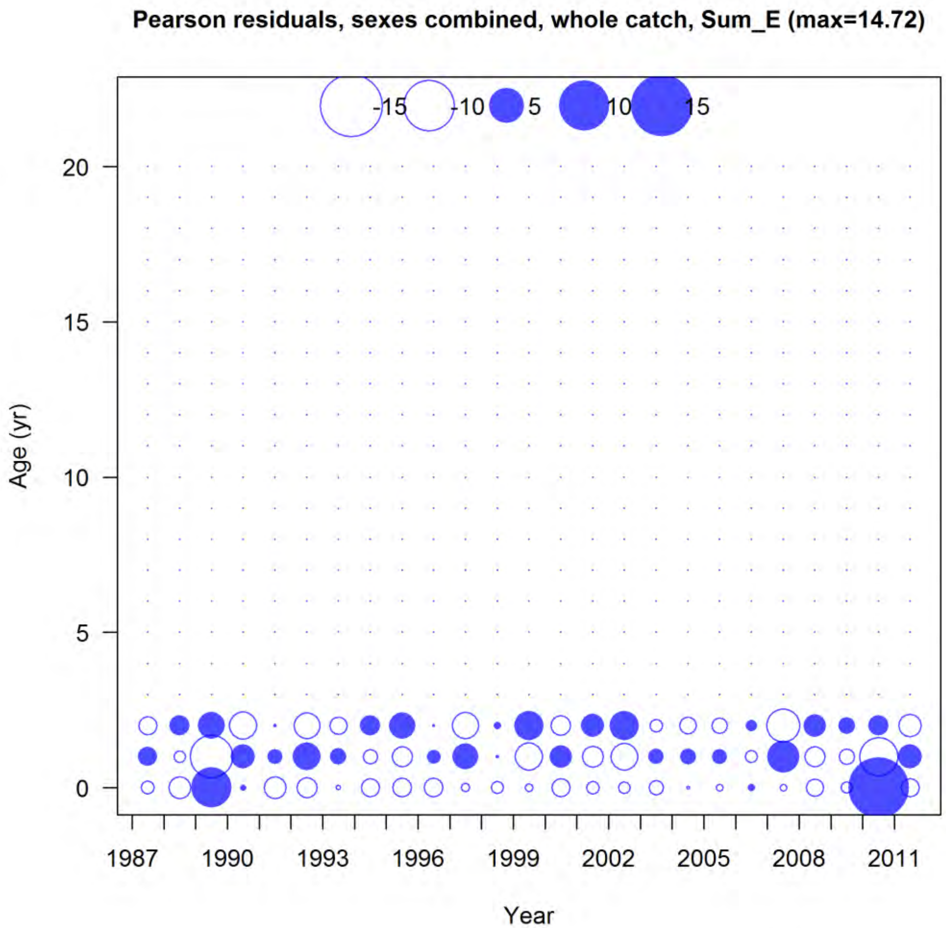



Figure 3.2.1.80. Pearson residuals of age composition fits from the SEAMAP groundfish summer survey in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

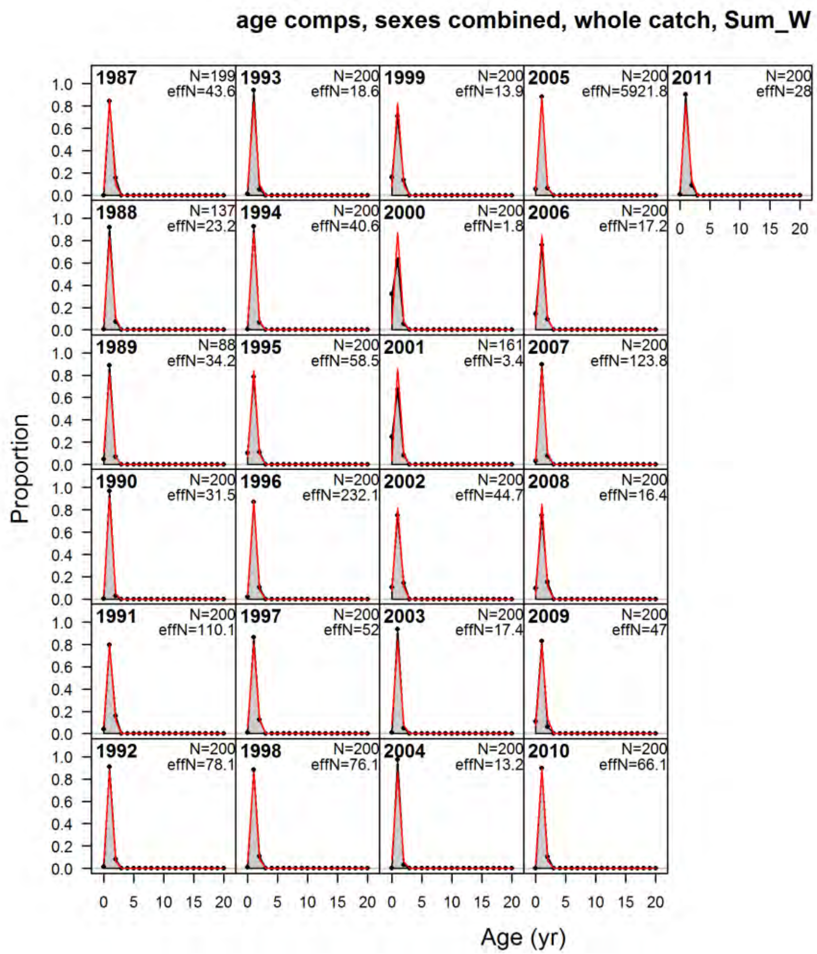



Figure 3.2.1.81. Observed and predicted age composition of red snapper from the SEAMAP groundfish summer survey in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

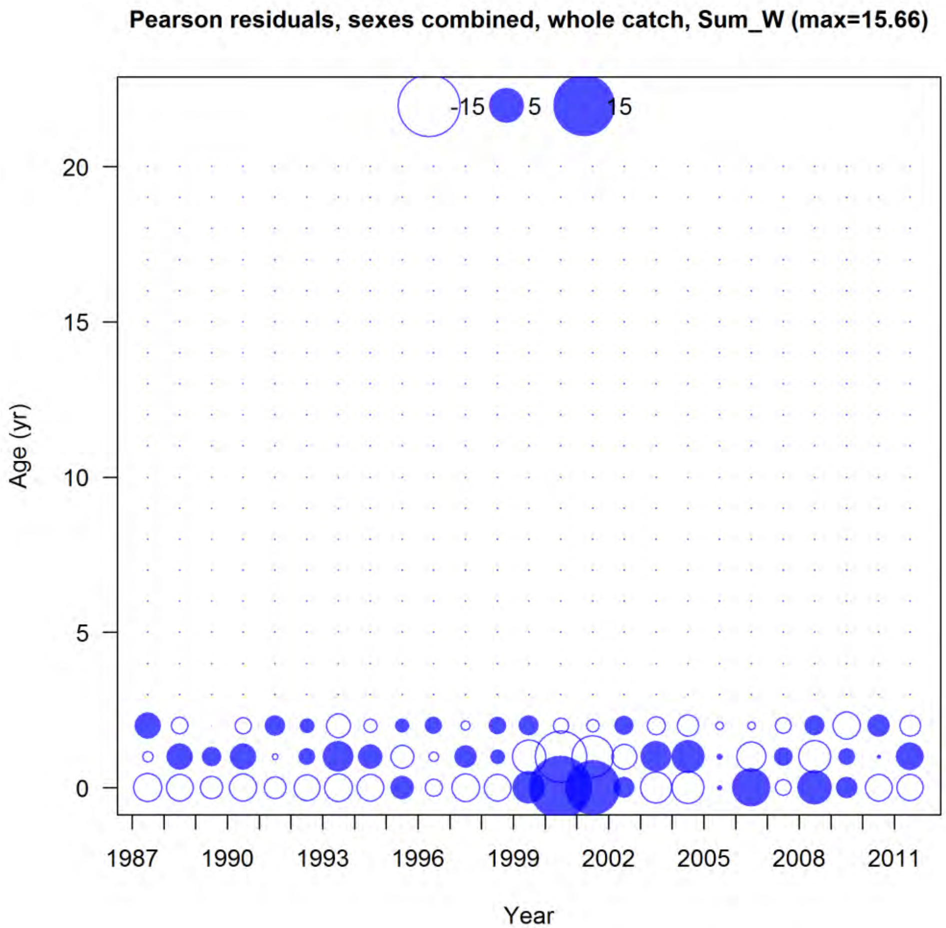



Figure 3.2.1.82. Pearson residuals of age composition fits from the SEAMAP groundfish summer survey in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

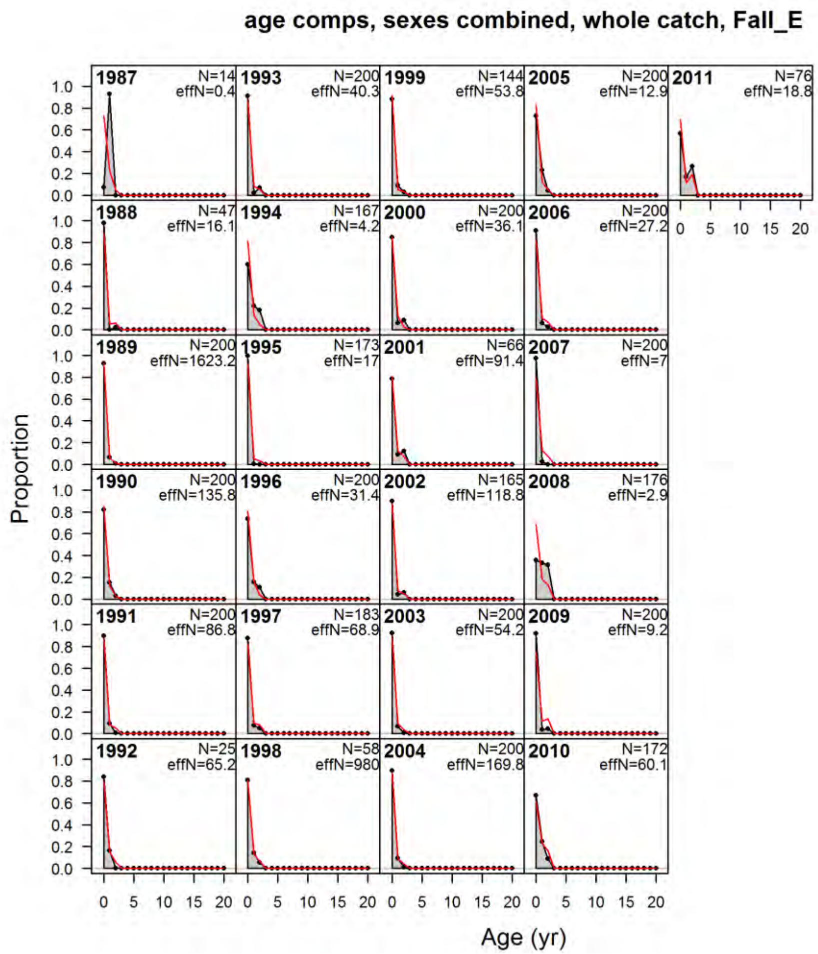



Figure 3.2.1.83. Observed and predicted age composition of red snapper from the SEAMAP groundfish fall survey in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

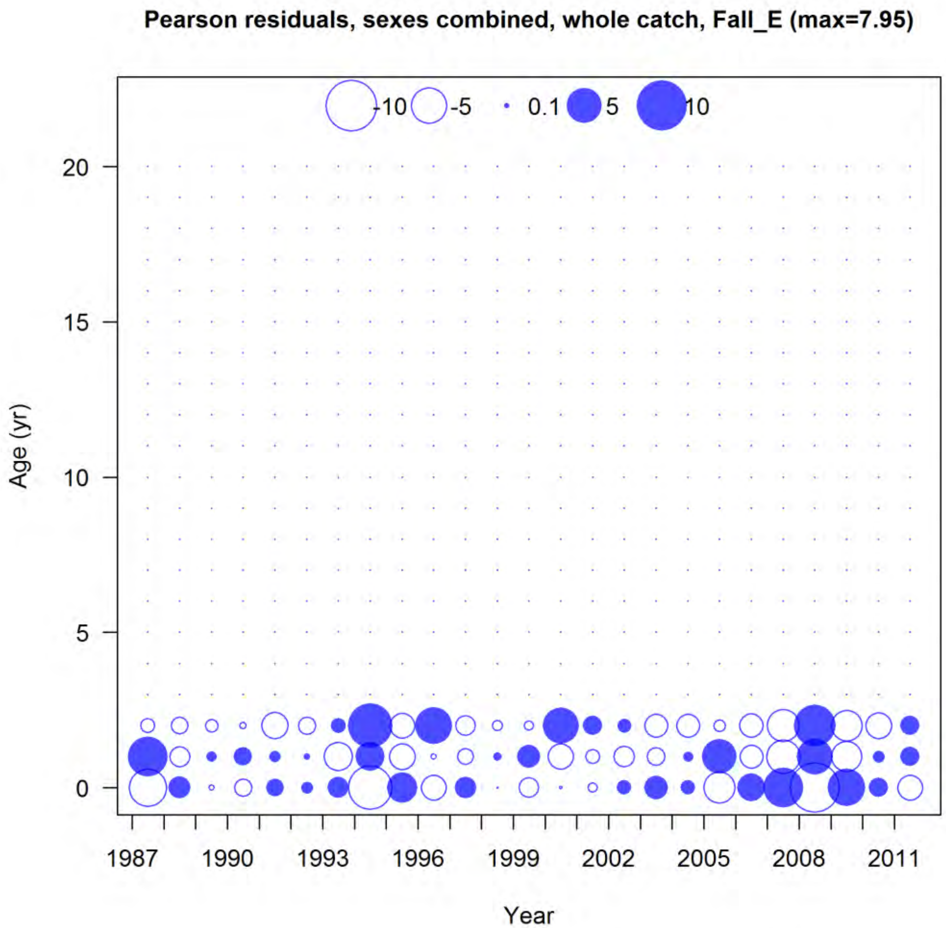



Figure 3.2.1.84. Pearson residuals of age composition fits from the SEAMAP groundfish fall survey in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

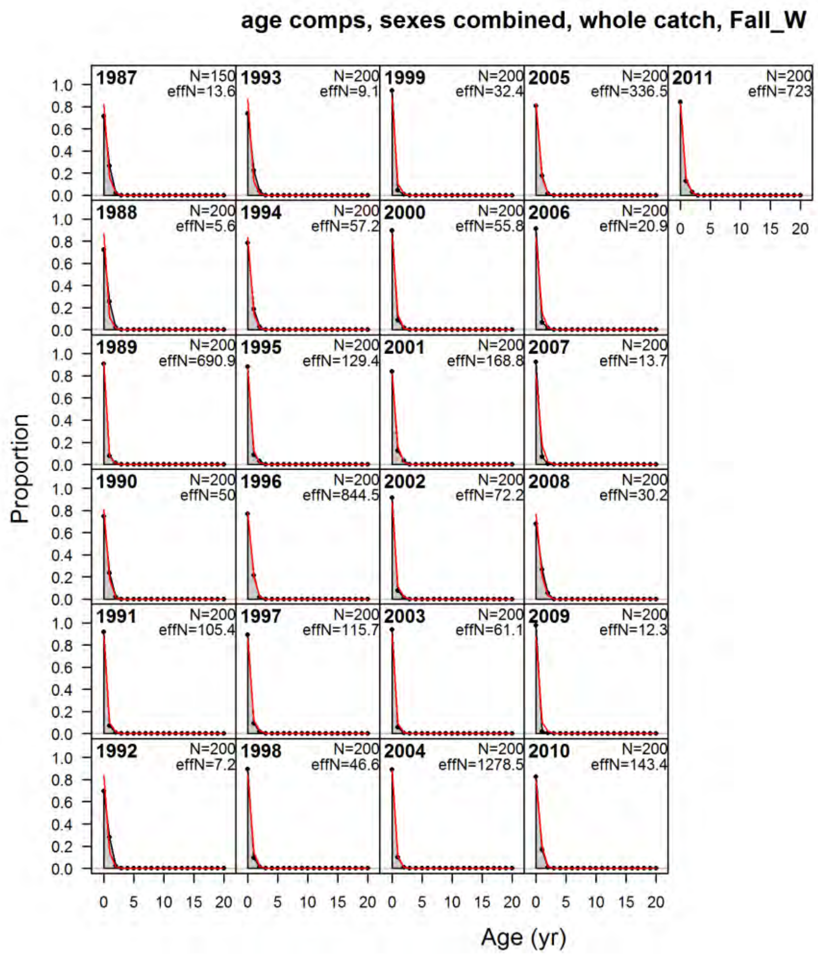



Figure 3.2.1.85. Observed and predicted age composition of red snapper from the SEAMAP groundfish fall survey in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

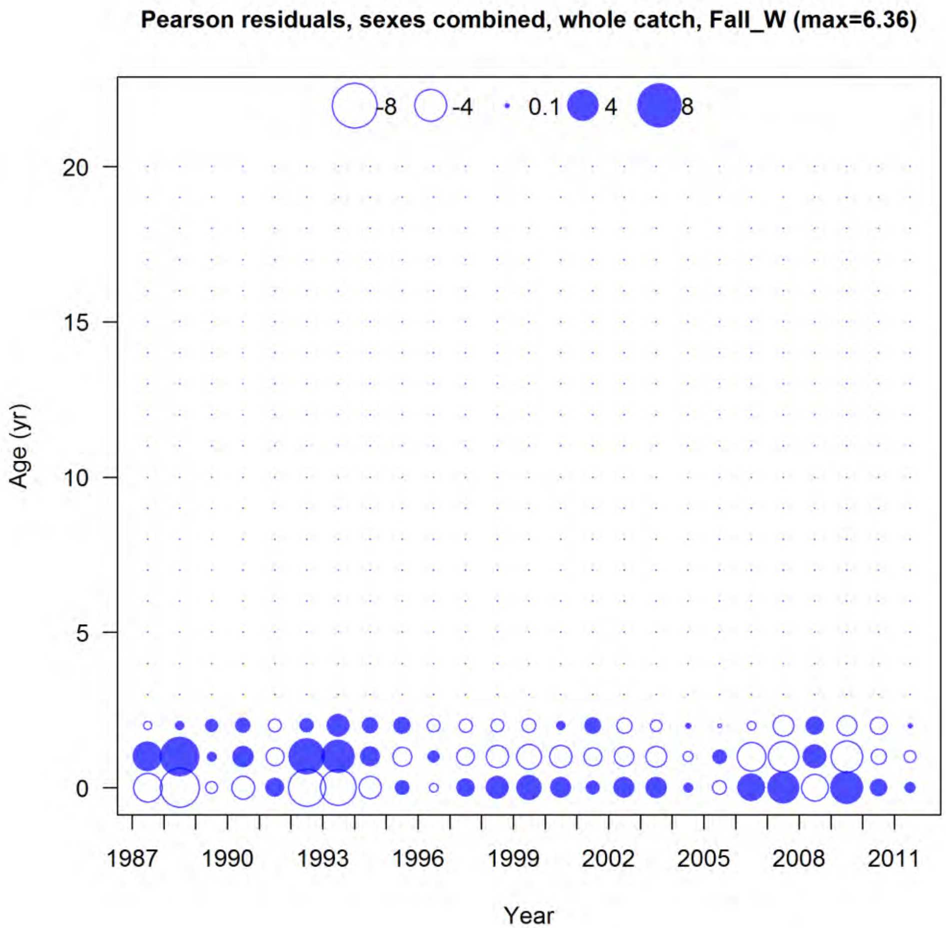



Figure 3.2.1.86. Pearson residuals of age composition fits from the SEAMAP groundfish fall survey in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

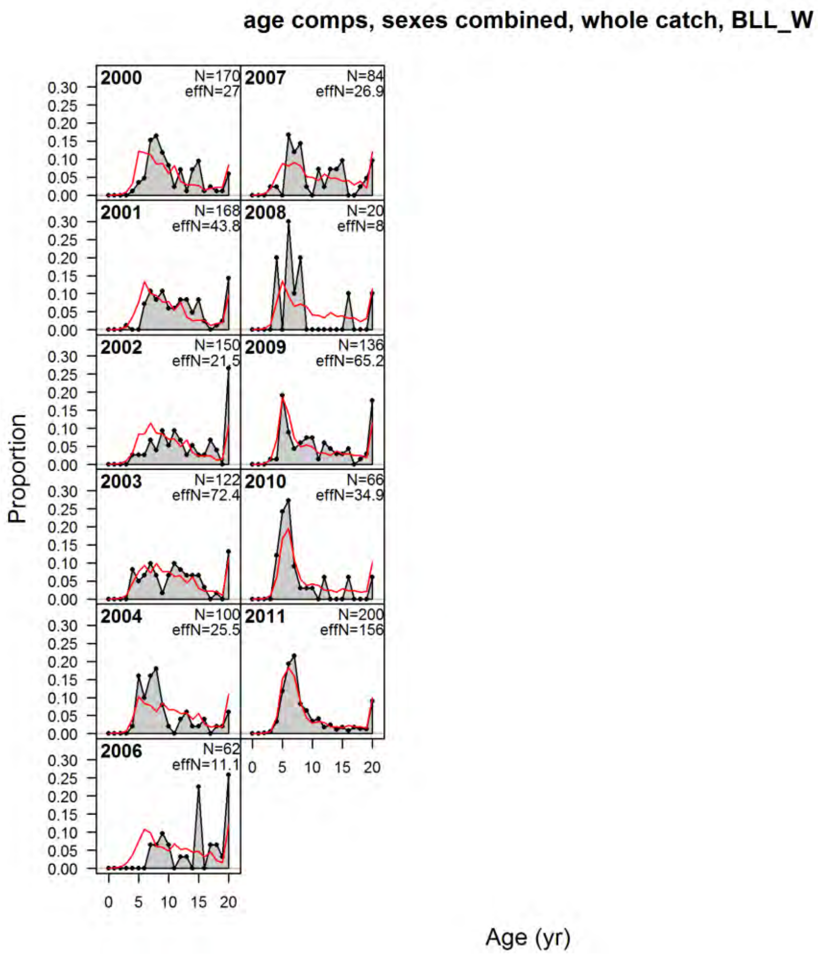



Figure 3.2.1.87. Observed and predicted age composition of red snapper from the NMFS bottom longline survey in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

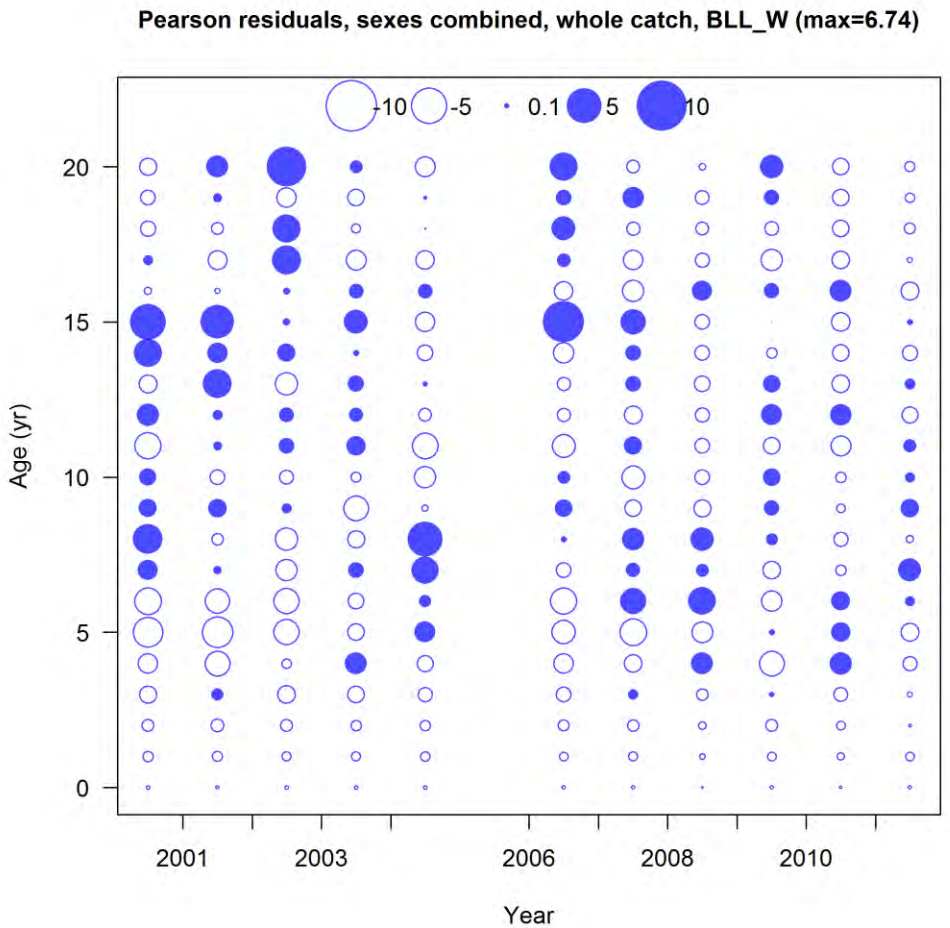



Figure 3.2.1.88. Pearson residuals of age composition fits from the NMFS bottom longline survey in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

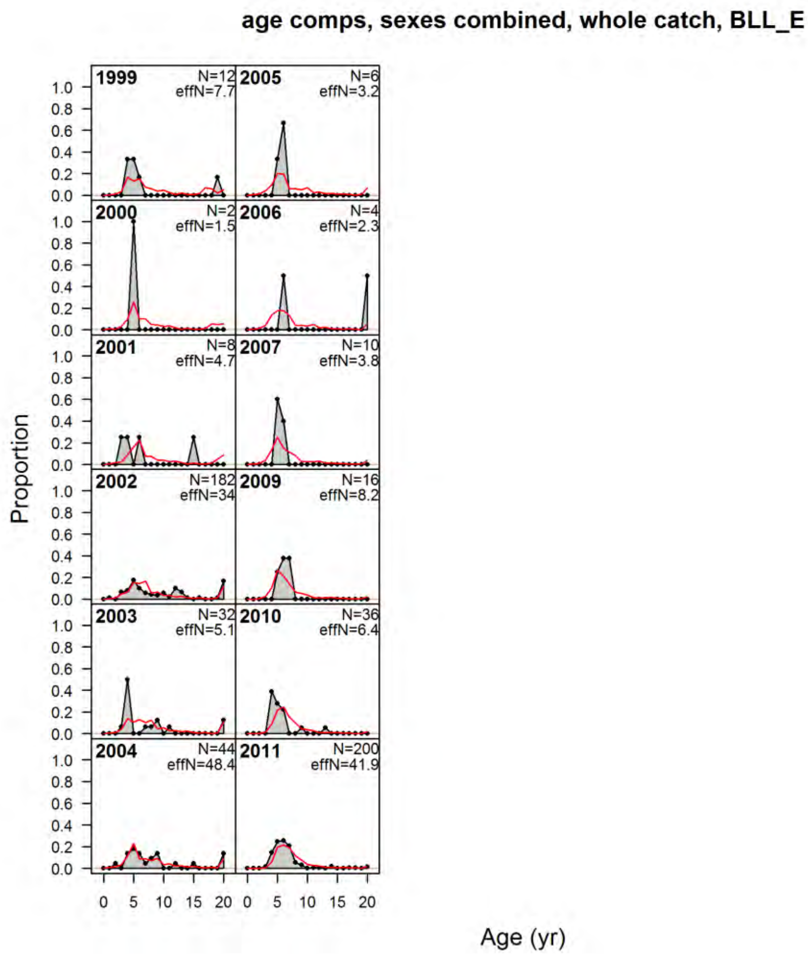



Figure 3.2.1.89. Observed and predicted age composition of red snapper from the NMFS bottom longline survey in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

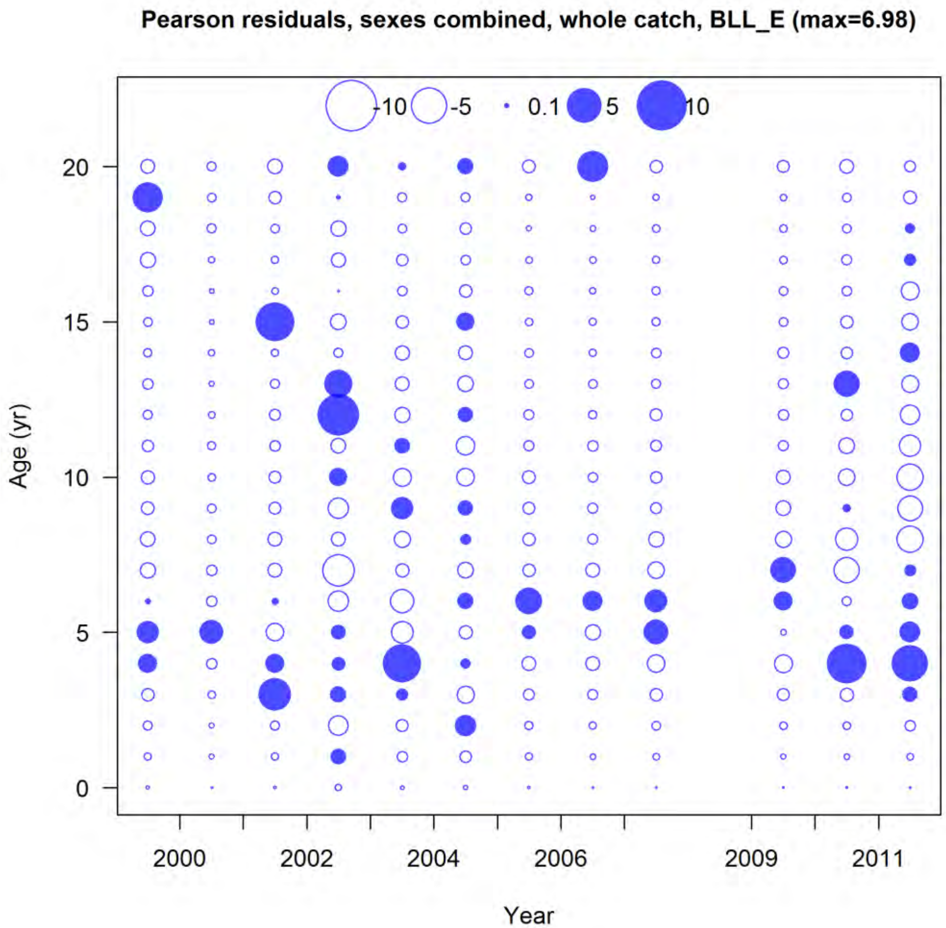



Figure 3.2.1.90. Pearson residuals of age composition fits from the NMFS bottom longline fall survey in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

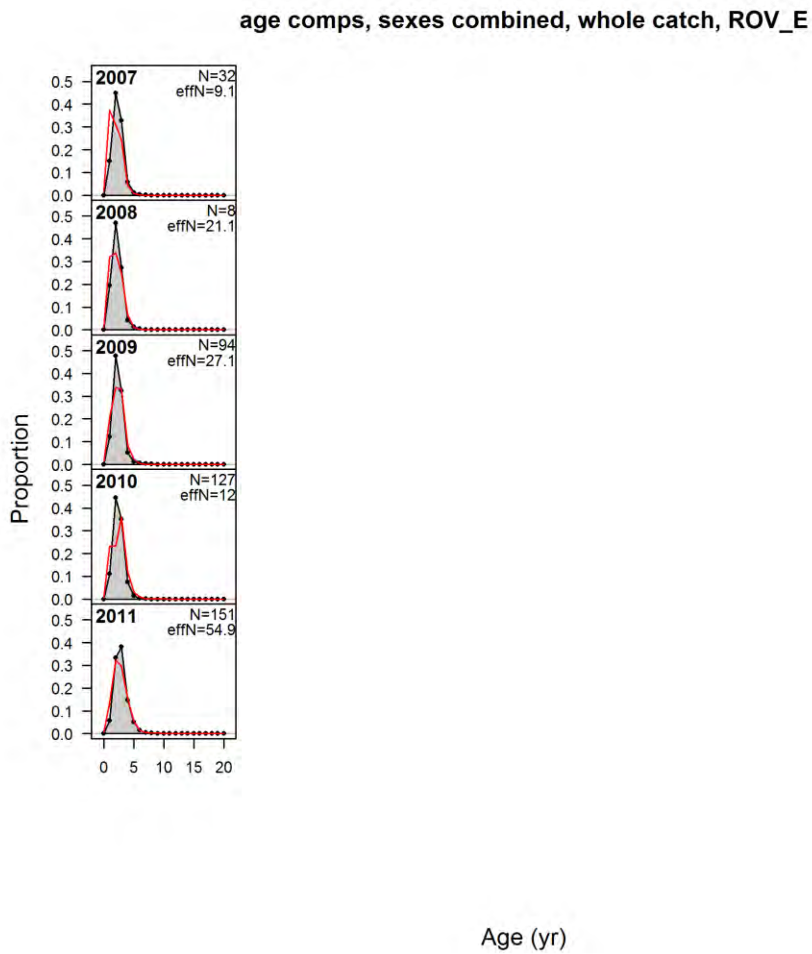



Figure 3.2.1.91. Observed and predicted age composition of red snapper from ROV survey in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

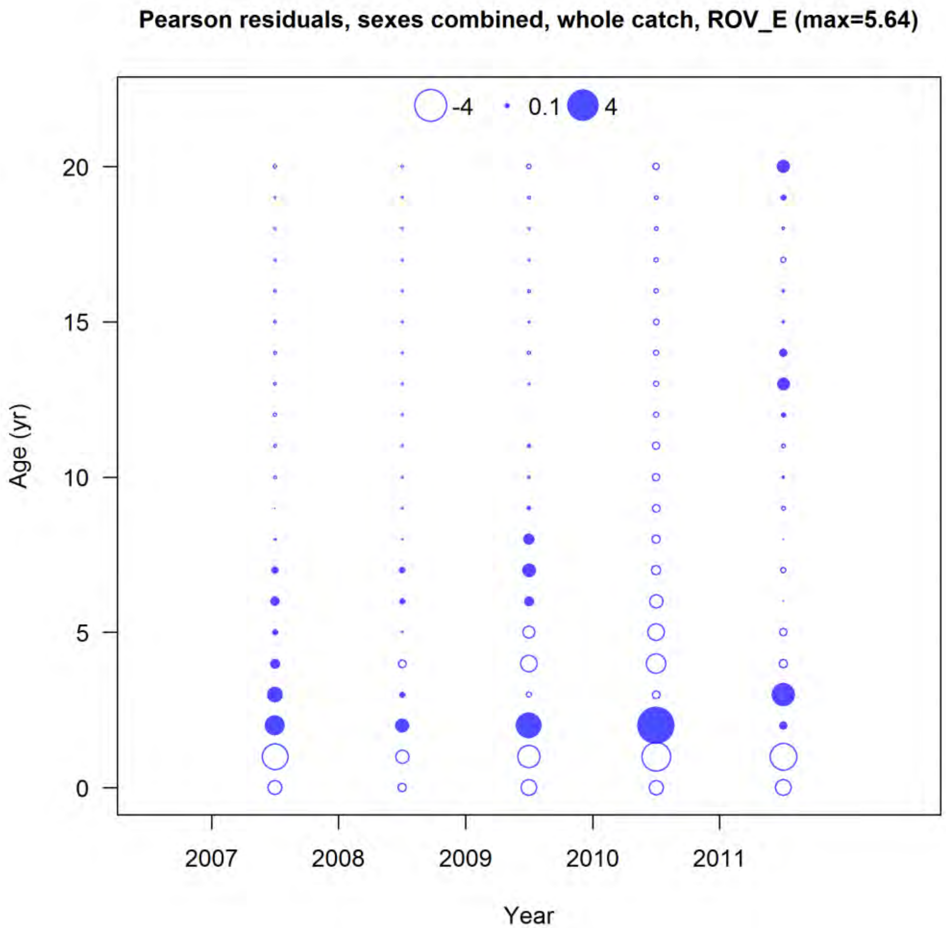
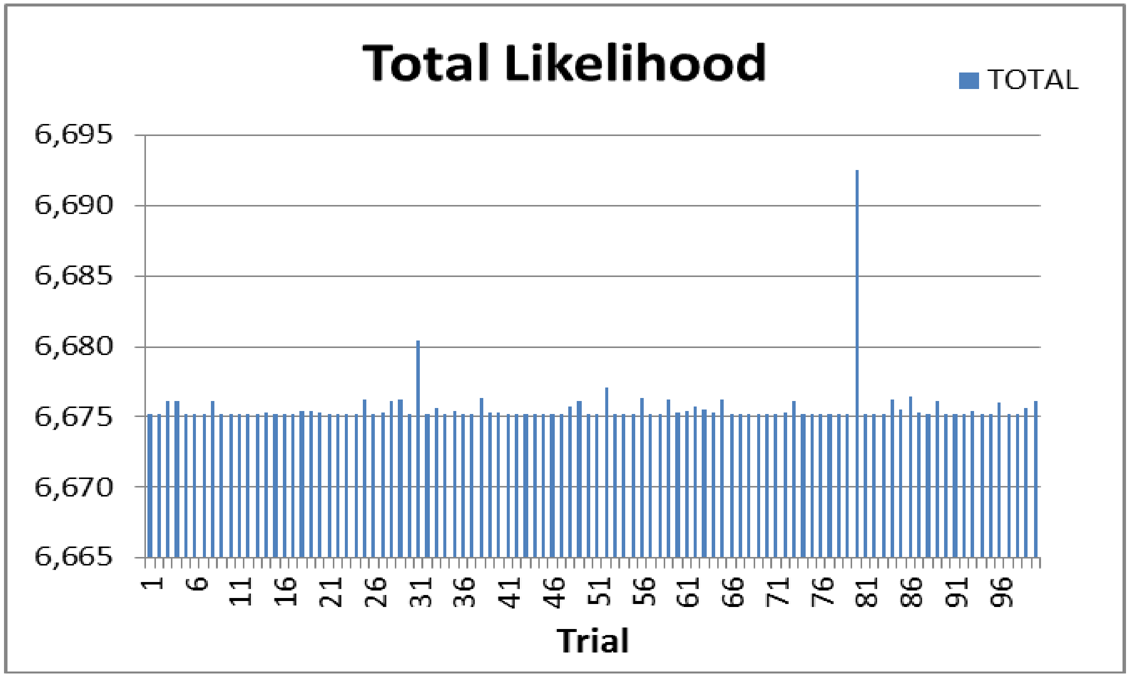



Figure 3.2.1.92. Pearson residuals of age composition fits from the ROV survey in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

a.


Total Likelihood
TOTAL
6,695
6,690
6,685
6,680
6,675
6,670
6,665
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
76
81
86
91
96
Trial

b.

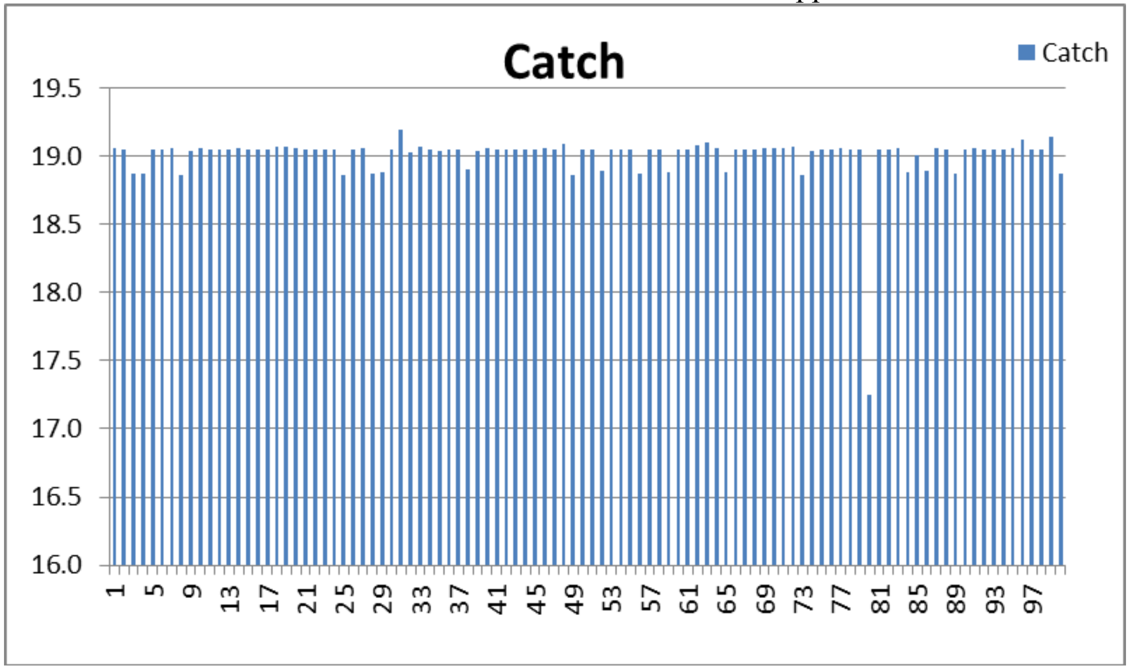
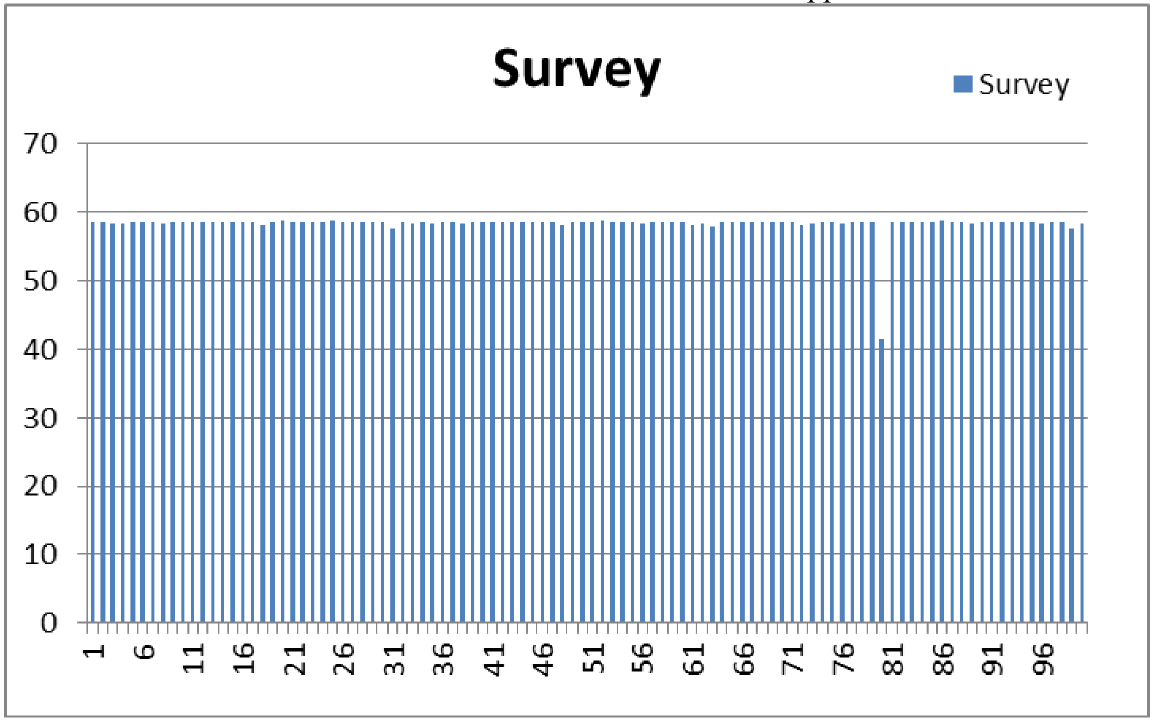



Figure 3.2.2.1 (a and b). Summary results of model likelihood estimates for 100 jittered runs of the SS red snapper stock assessment base model. The top panel (a) is the total model likelihood, while the bottom panel (b) is the catch likelihood.

c.


Survey
Survey
70
60
50
40
30
20
10
0
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
76
81
86
91
96

d.

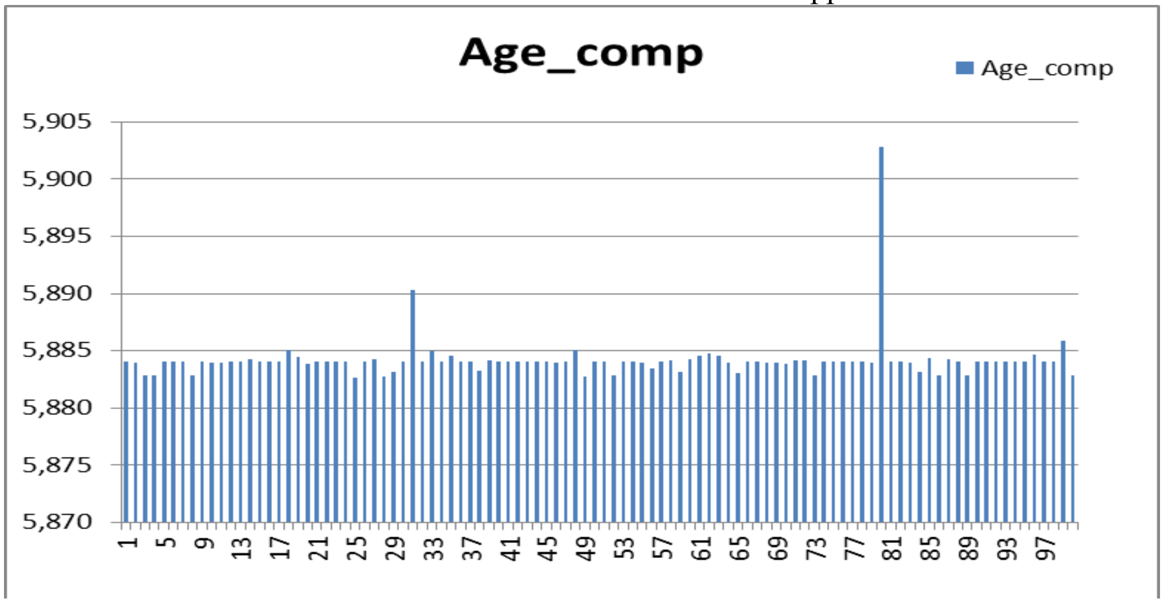
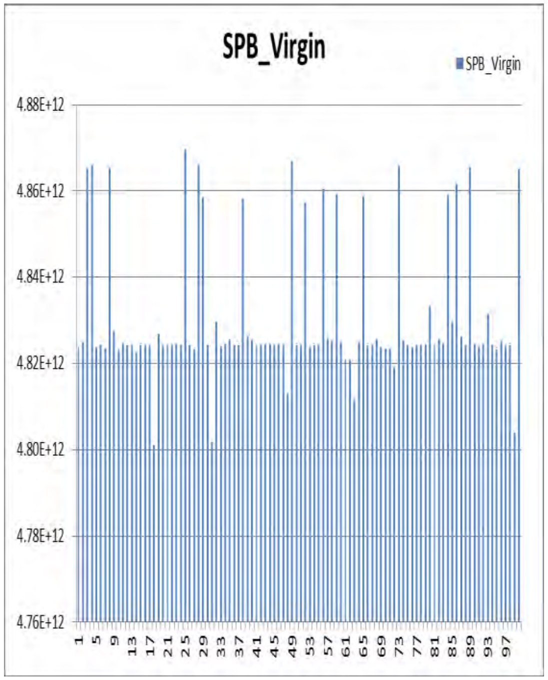
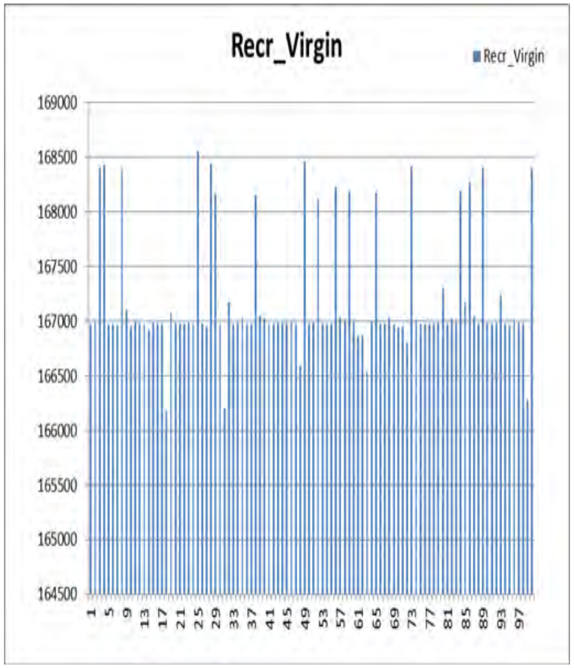



Figure 3.2.2.1 (c and d). Summary results of model likelihood estimates for 100 jittered runs of the SS red snapper stock assessment base model. The top panel (c) is the survey Likelihood, while the bottom panel (d) is the age composition likelihood.

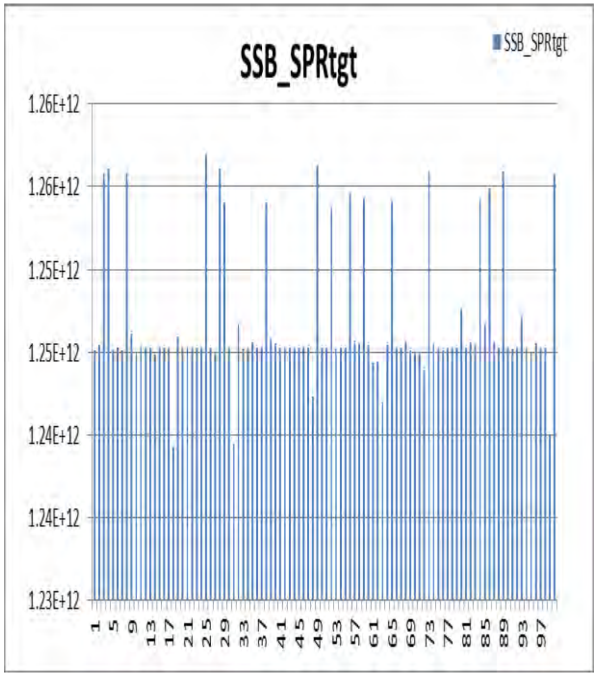
a. b.


SPB_Virgin
SPB_Virgin
4.88E+12
4.86E+12
4.84E+12
4.82E+12
4.80E+12
4.78E+12
4.76E+12
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93 97

c.


Recr_Virgin
Recr_Virgin
169000
168500
168000
167500
167000
166500
166000
165500
165000
164500
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93 97

d.



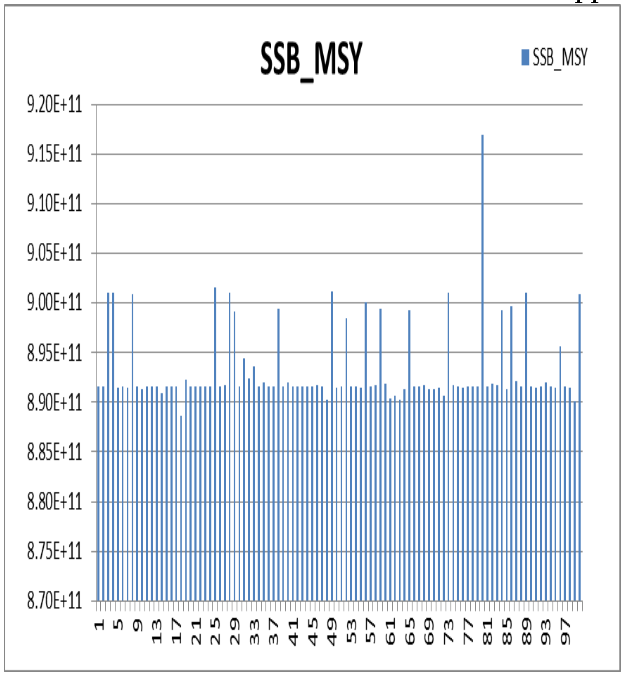
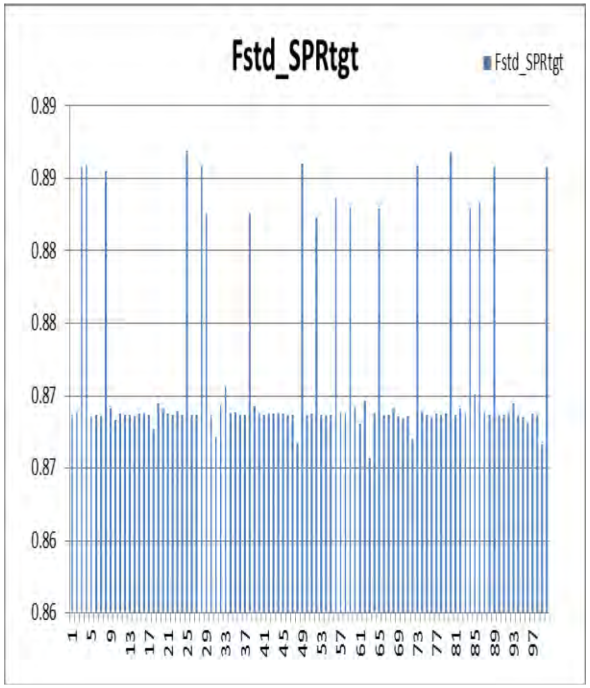
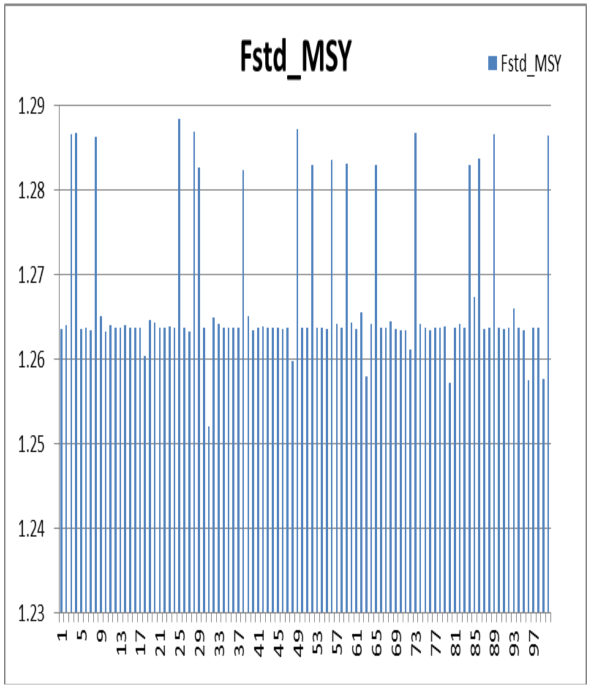




Figure 3.2.2.2. Summary results for key SS model parameters for 100 jitter runs from the SS stock assessment base model for Gulf of Mexico red snapper.

a. b.


Fstd_SPRtgt
Fstd_SPRtgt
0.89
0.89
0.88
0.88
0.87
0.87
0.86
0.86

c.


Fstd_MSY
Fstd_MSY
1.29
1.28
1.27
1.26
1.25
1.24
1.23

d.

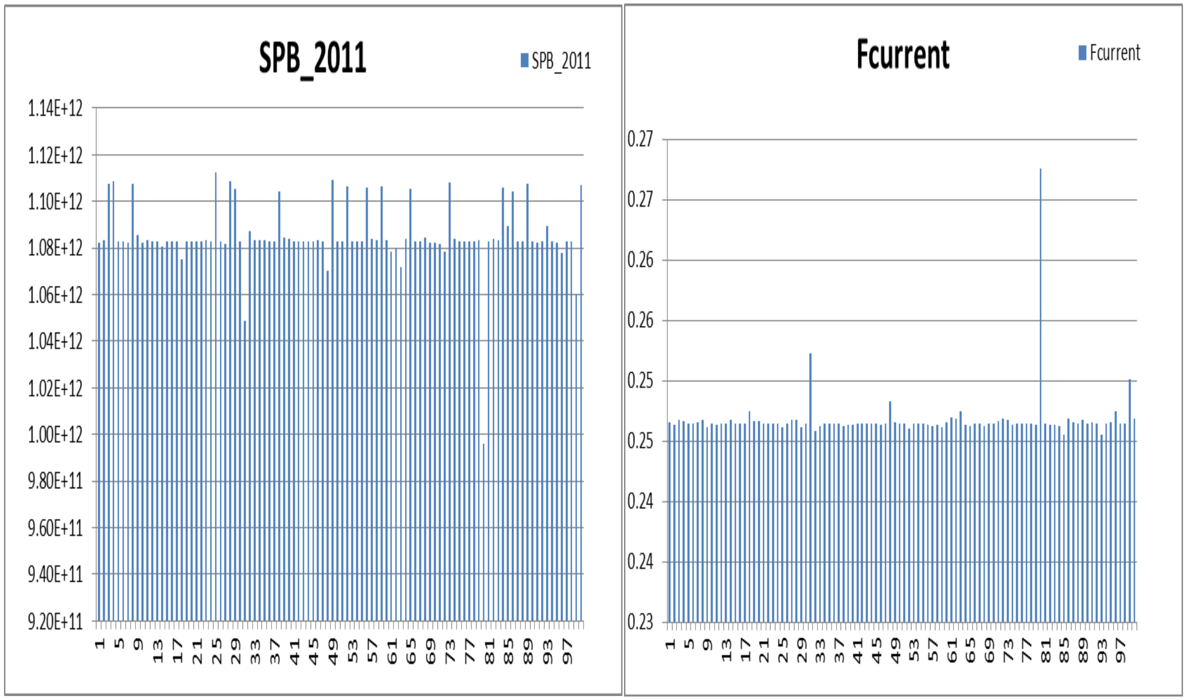
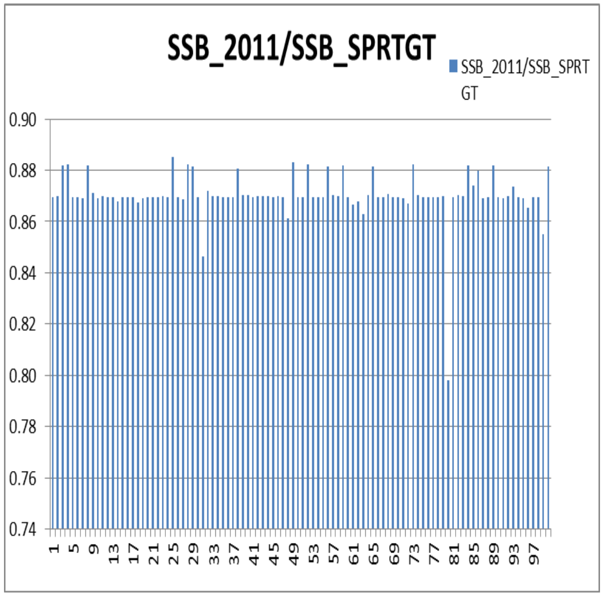
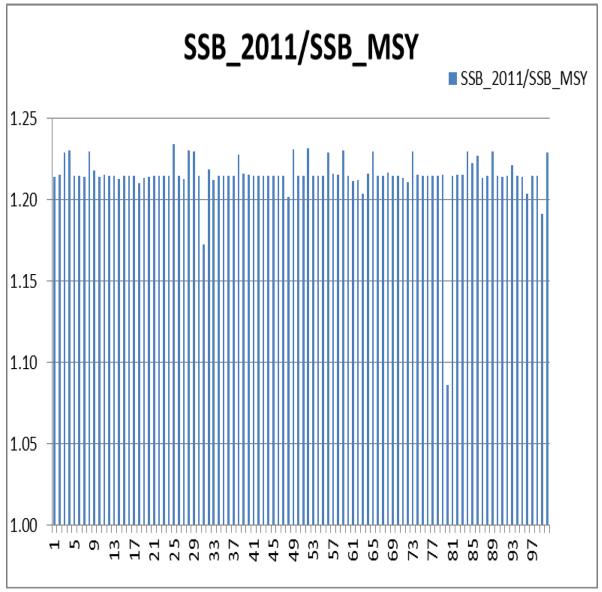



Figure 3.2.2.3. Summary results for key SS model parameters for 100 jitter runs from the SS stock assessment base model for Gulf of Mexico red snapper.

a. b.


SSB_2011/SSB_SPRTGT
SSB_2011/SSB_SPRT GT
0.90
0.88
0.86
0.84
0.82
0.80
0.78
0.76
0.74
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93 97


SSB_2011/SSB_MSY
SSB_2011/SSB_MSY
1.25
1.20
1.15
1.10
1.05
1.00
1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93 97

c. d.

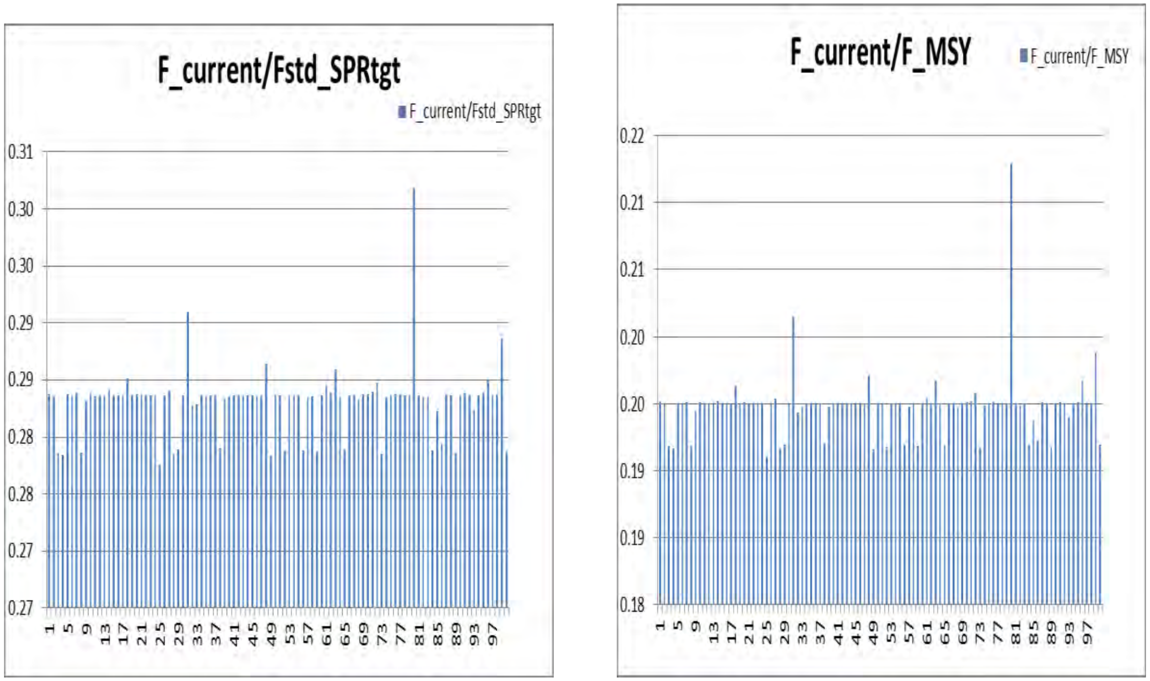



Figure 3.2.2.4. Summary results for key SS model parameters for 100 jitter runs from the SS stock assessment base model for Gulf of Mexico red snapper.

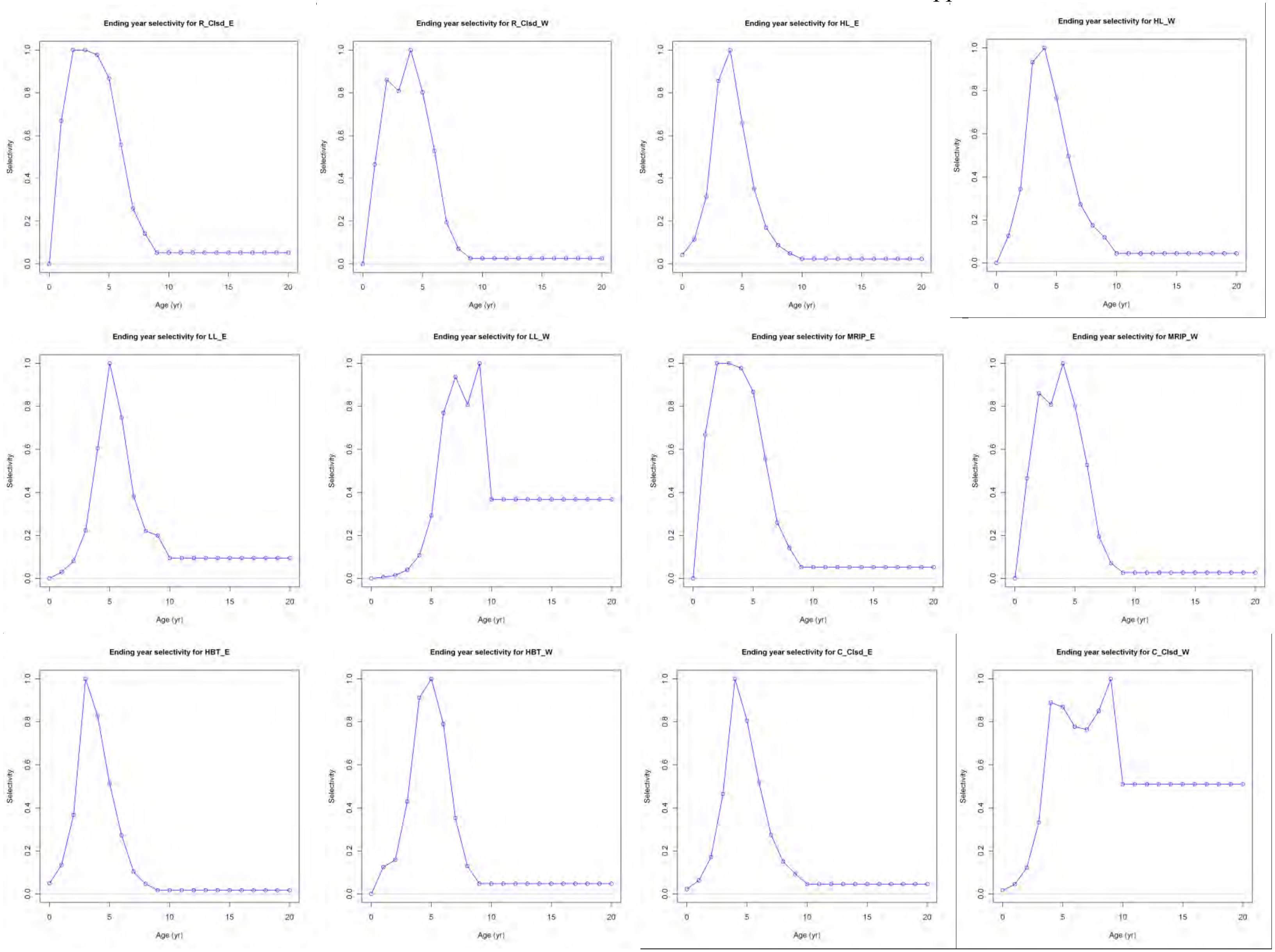



Figure 3.2.3.1a. Ending year (2011) age-based selectivity by fleet for the red snapper SS base model (continued on next page).

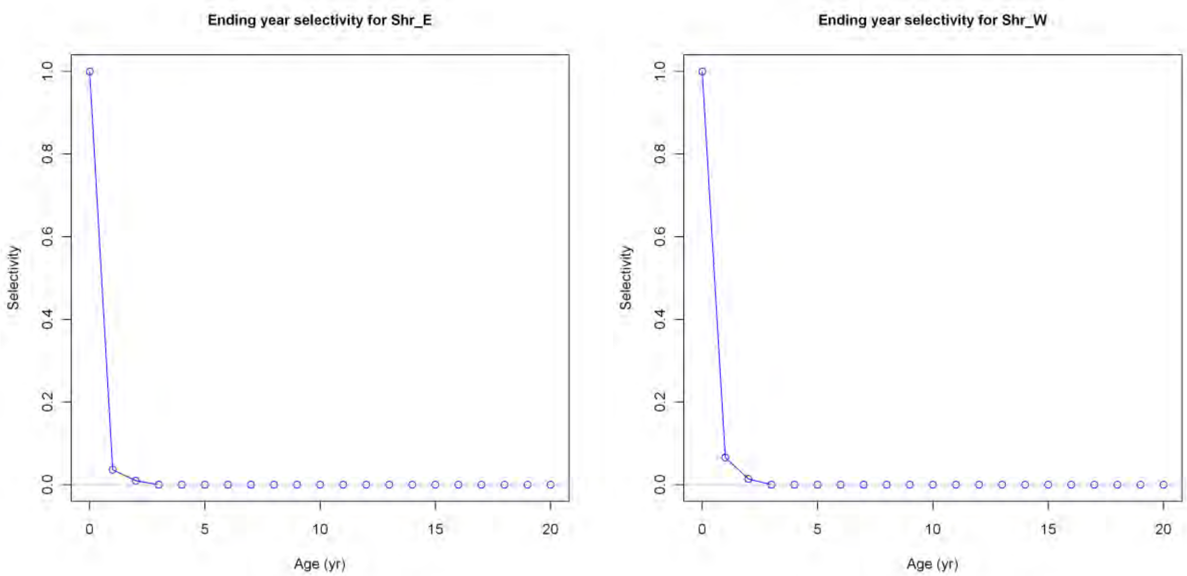



Figure 3.2.3.1b. Ending year (2011) age-based selectivity by fleet for the red snapper SS base model (continued from previous page).

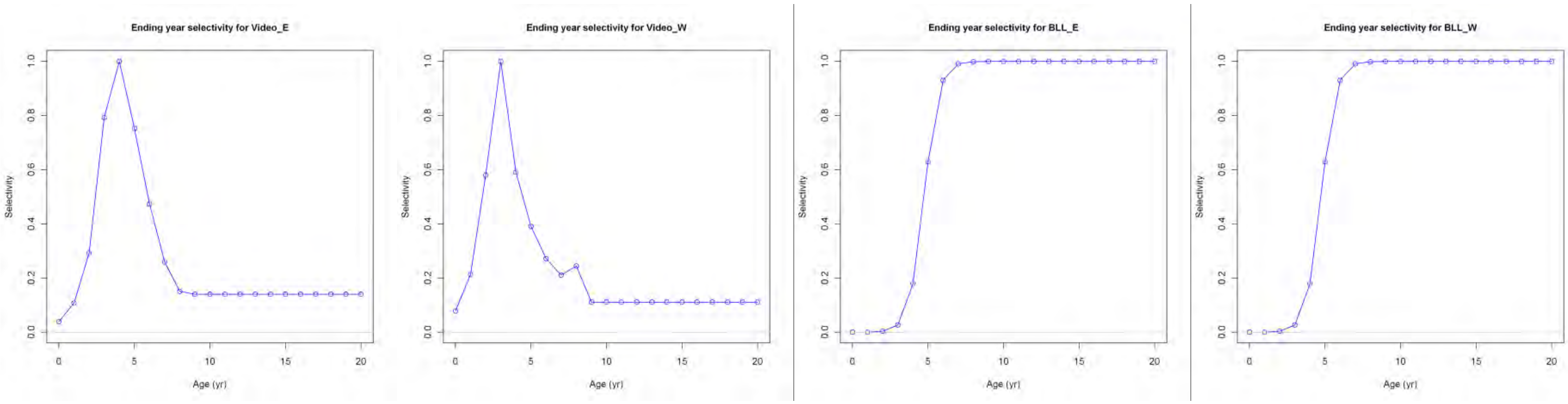



Figure 3.2.3.2a. Ending year (2011) age-based selectivity by survey for the red snapper SS base model (continued on next page).

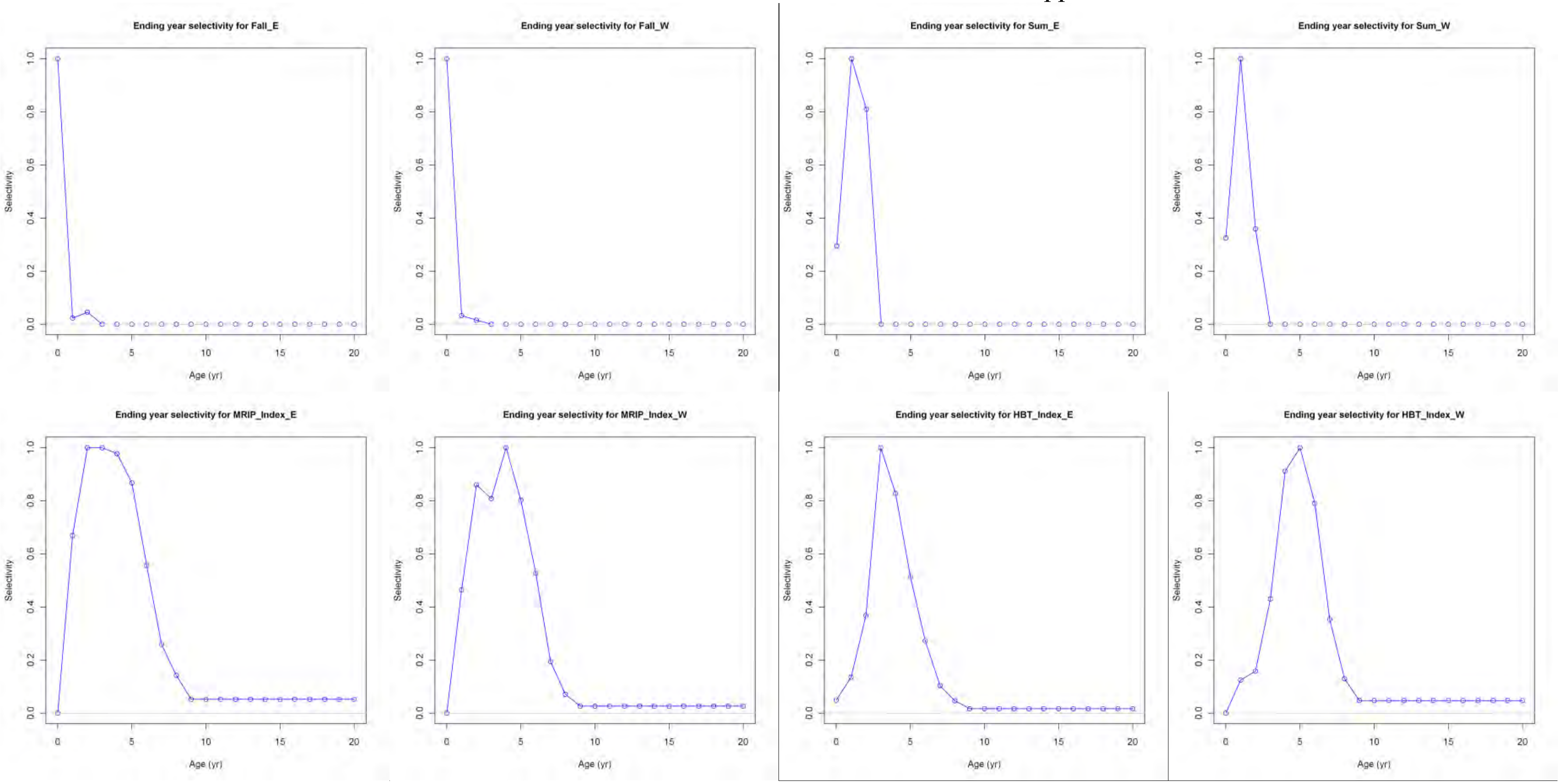



Figure 3.2.3.2b. Ending year (2011) age-based selectivity by survey for the red snapper SS base model (continued from previous page).

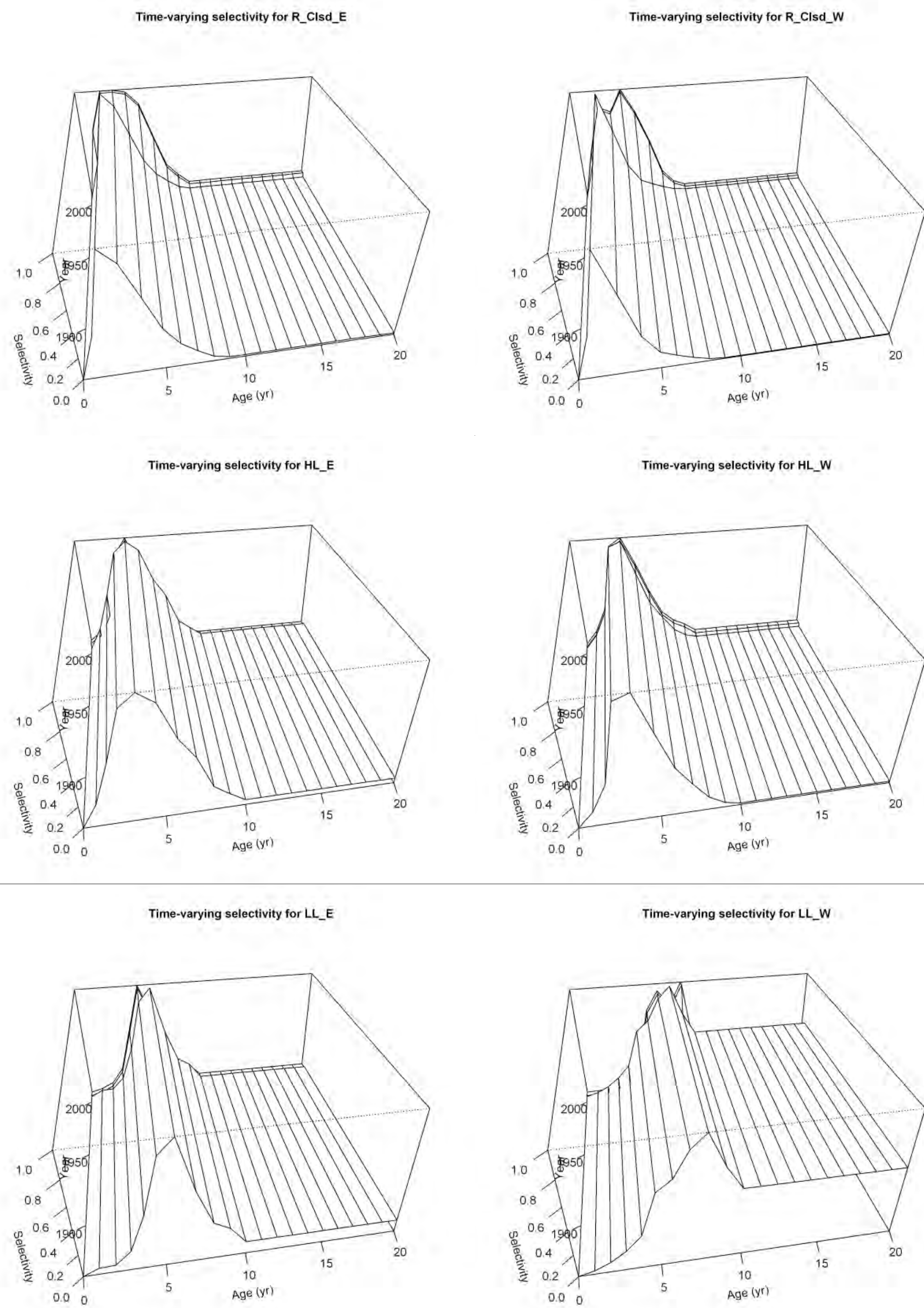



Figure 3.2.3.3a. Time-varying age-based selectivity by fleet (continued on next page).

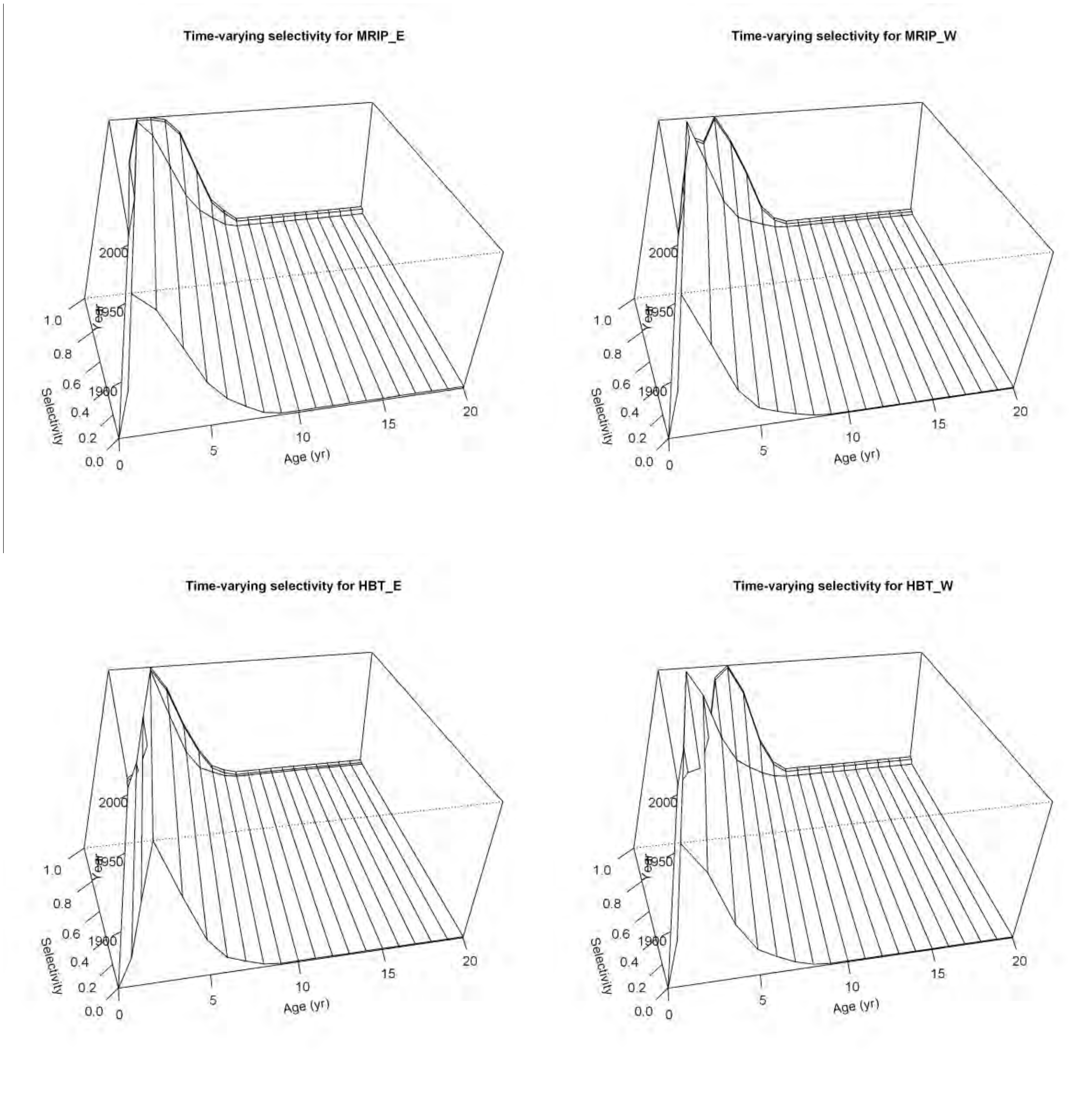



Figure 3.2.3.3b. Time-varying age-based selectivity by fleet (continued from previous page).

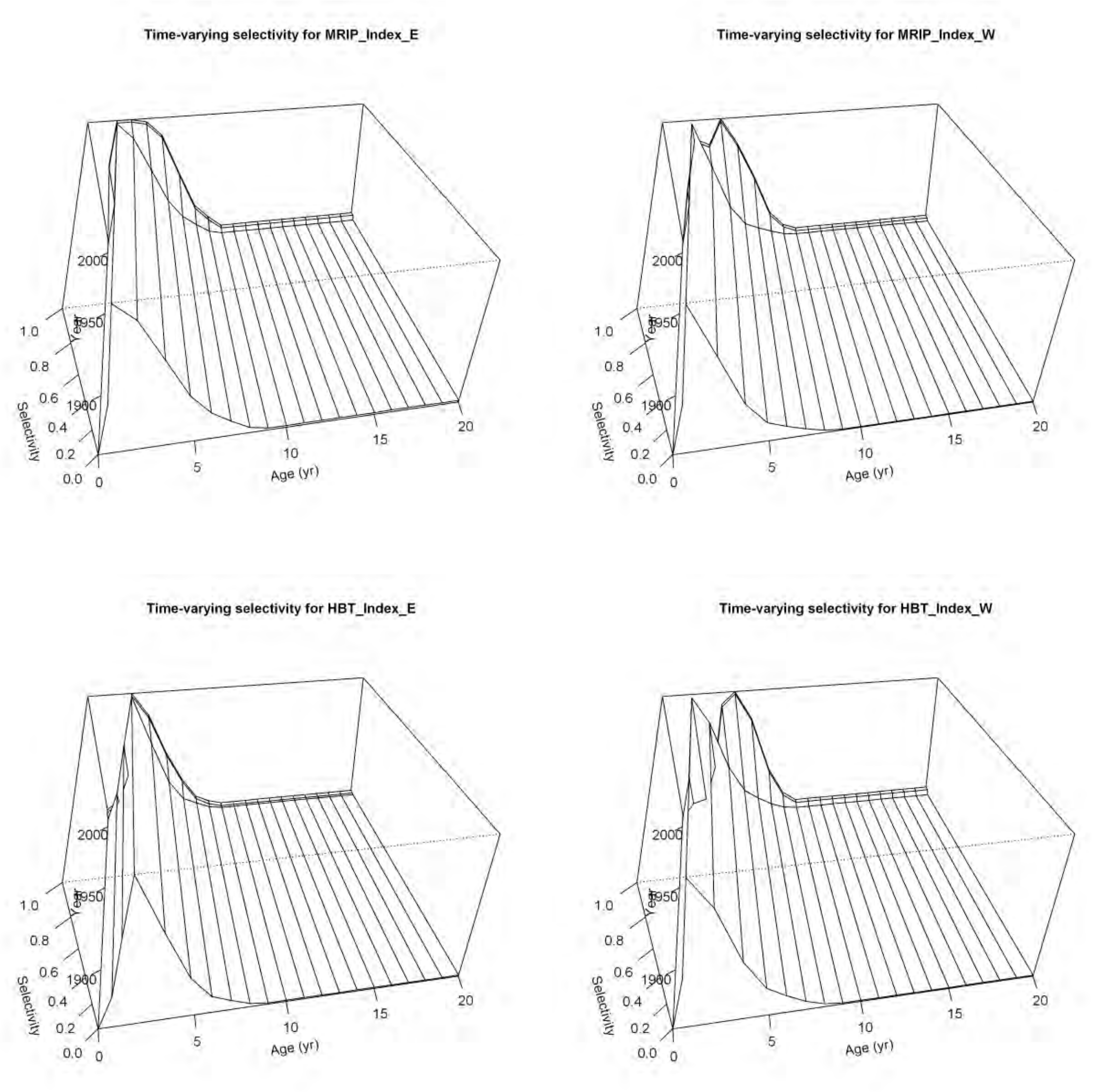



Figure 3.2.3.4. Time-varying age-based selectivity by survey.

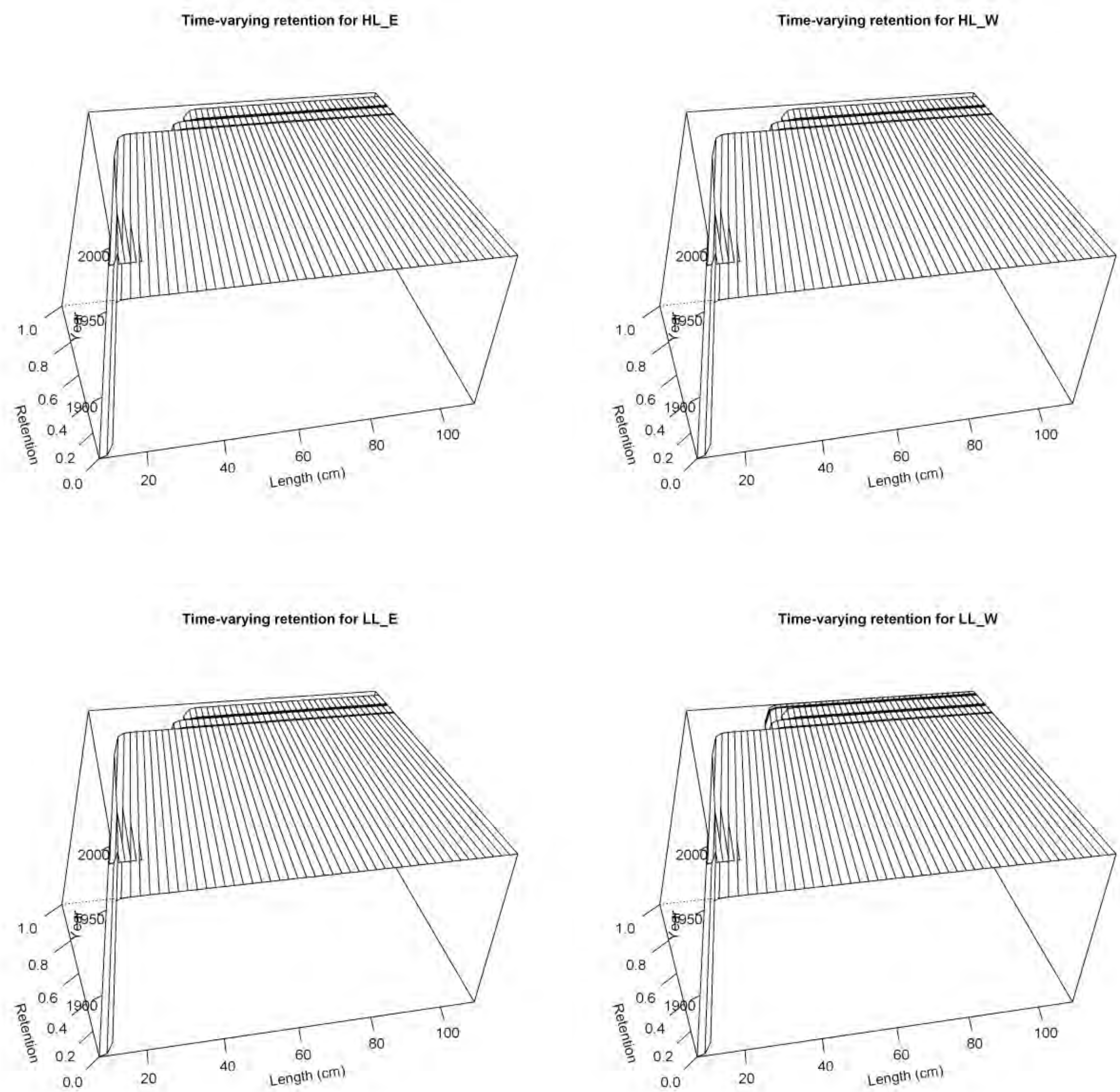



Figure 3.2.3.5a. Time-varying retention by fleet (continued on next page).

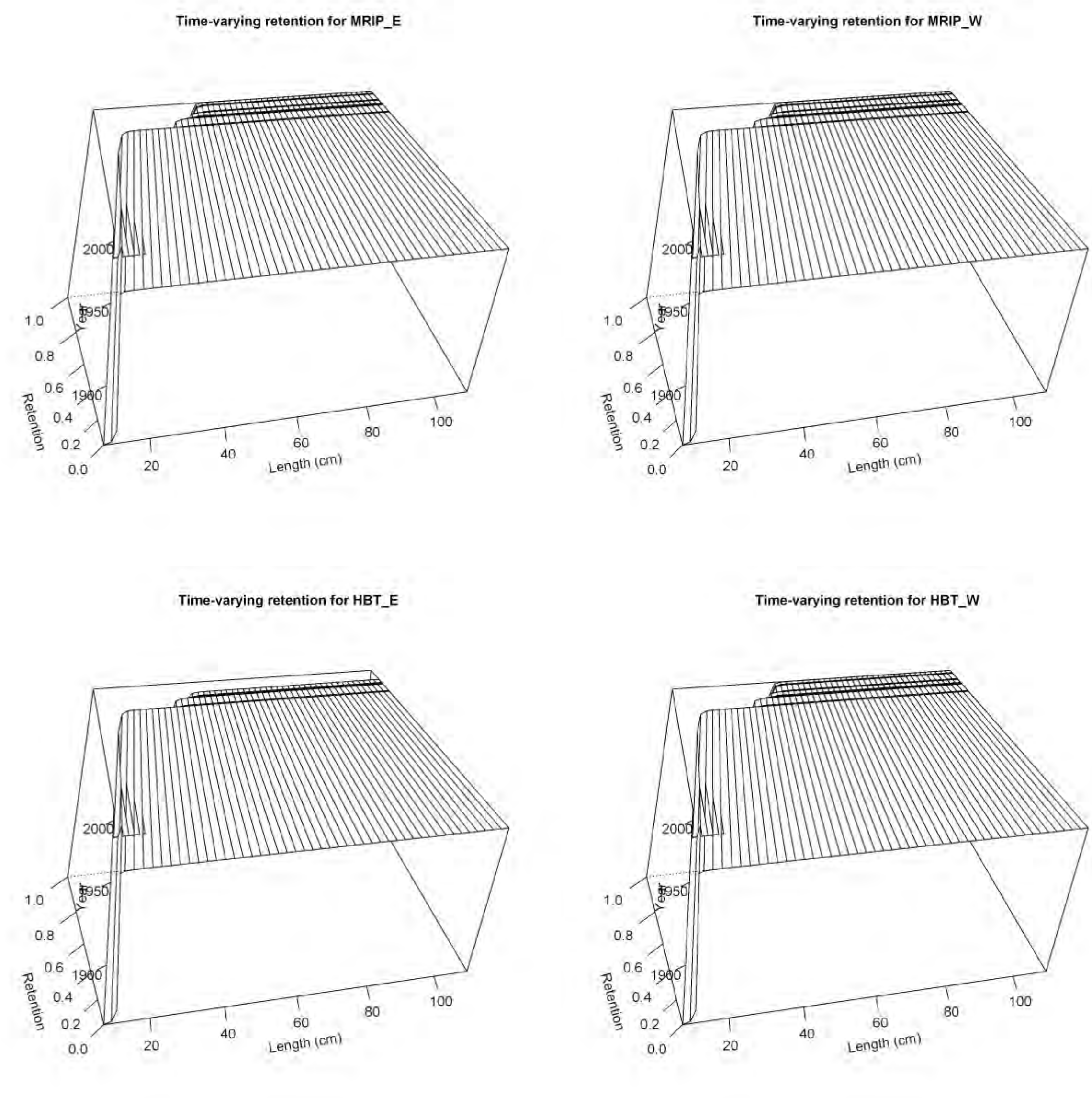



Figure 3.2.3.5b. Time-varying retention by fleet (continued from previous page).

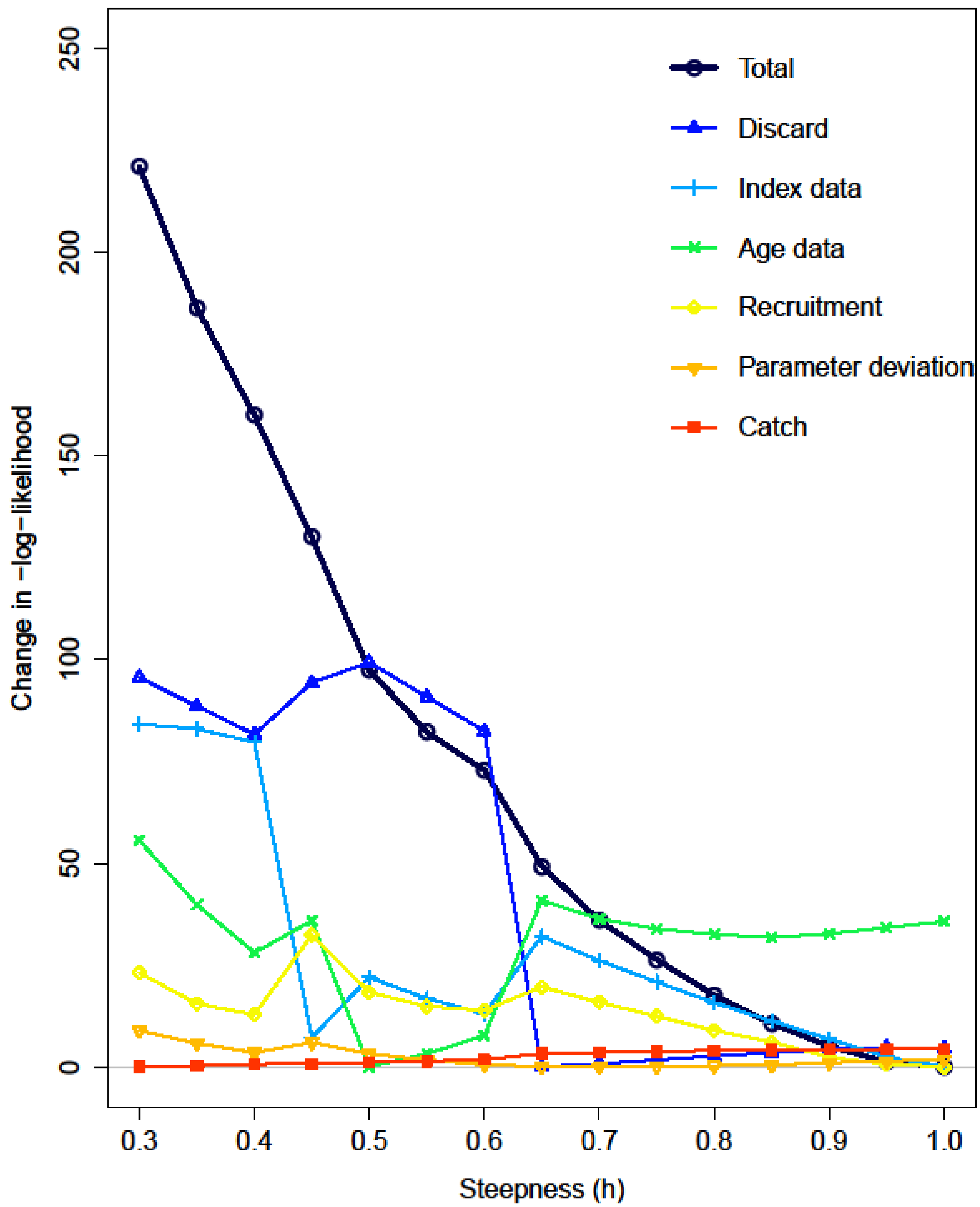



Figure 3.2.4.1. SS profile of Beverton – Holt steepness parameter for Gulf of Mexico red snapper for the base model configuration. The black line represents the change in total model data likelihood, the blue line is the change in discard data likelihood, the green line is the change in age likelihood, the aqua colored line is the change in index data likelihood, the red line is the change in catch data likelihood, and the yellow line is the change in recruitment data likelihood.

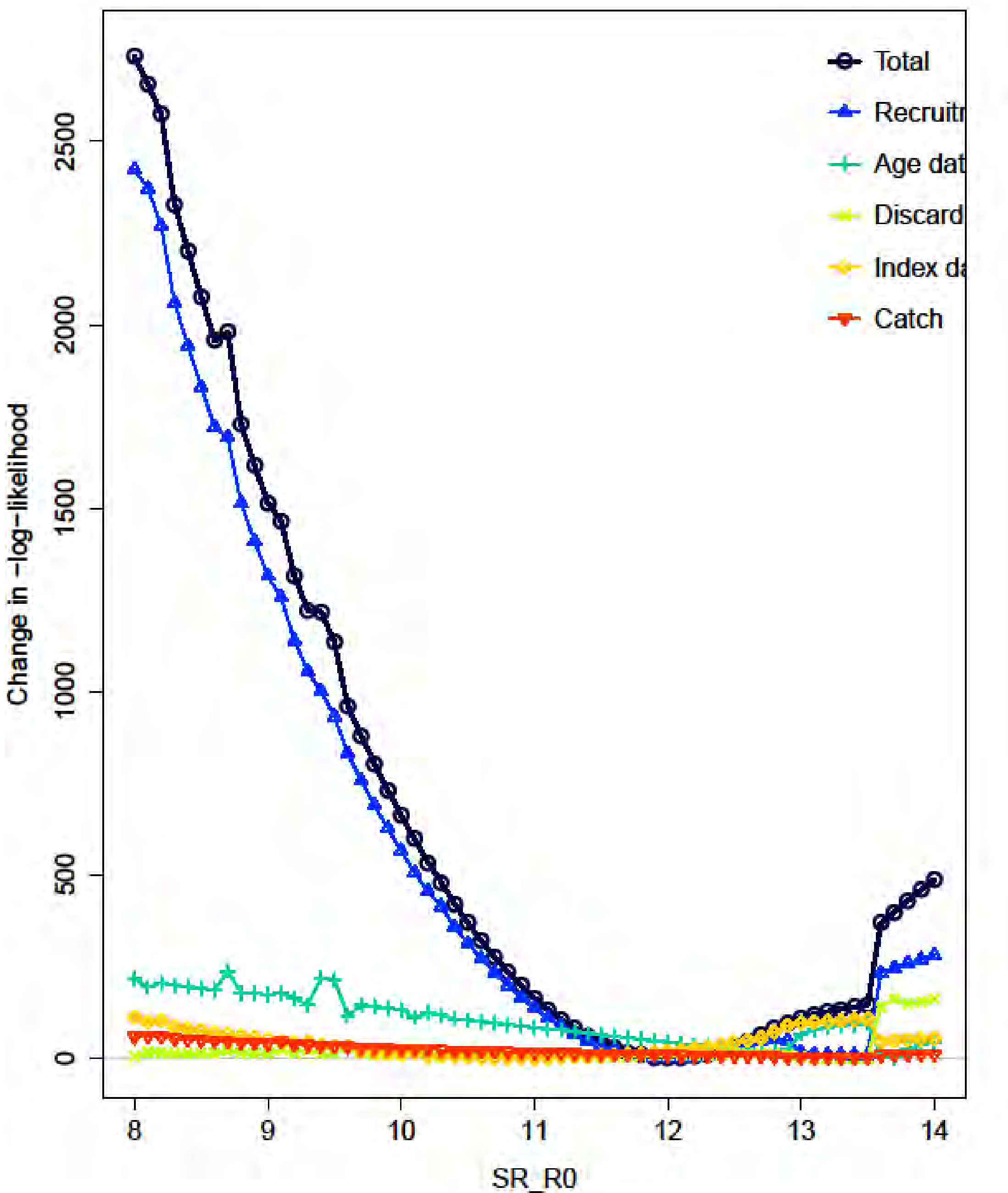



Figure 3.2.4.2. SS profile of virgin biomass ($R_0$) for the Gulf of Mexico red snapper base model configuration. The black line represents the change in total model data likelihood, the blue line is the change in recruitment data likelihood, the green line is the change in age likelihood, the mustard colored line is the change in index data likelihood, and the yellow line is the change in recruitment data likelihood. The SS base model estimated $R_0$ for the early period as 12.0255 (SD= 0.0587).

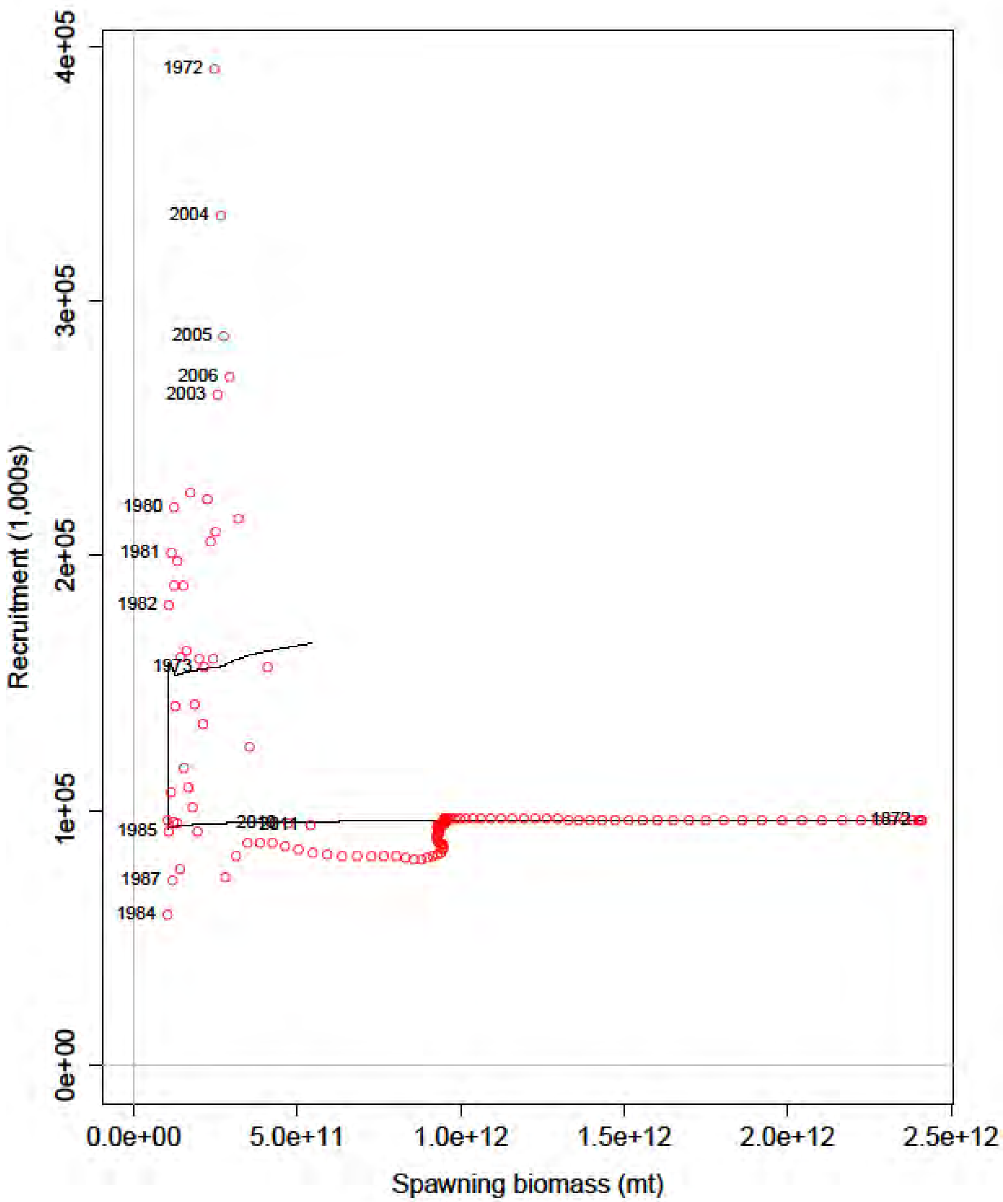



Figure 3.2.4.3. Predicted stock-recruitment relationship for Gulf of Mexico red snapper from SS base model configuration (steepness = 0.99, sigmaR=0.3). Plotted are predicted annual recruitments from SS (circles) and expected recruitment from the stock recruit relationship (black line). Labels are included on the first year, last year, and years with natural log deviations > 0.5.

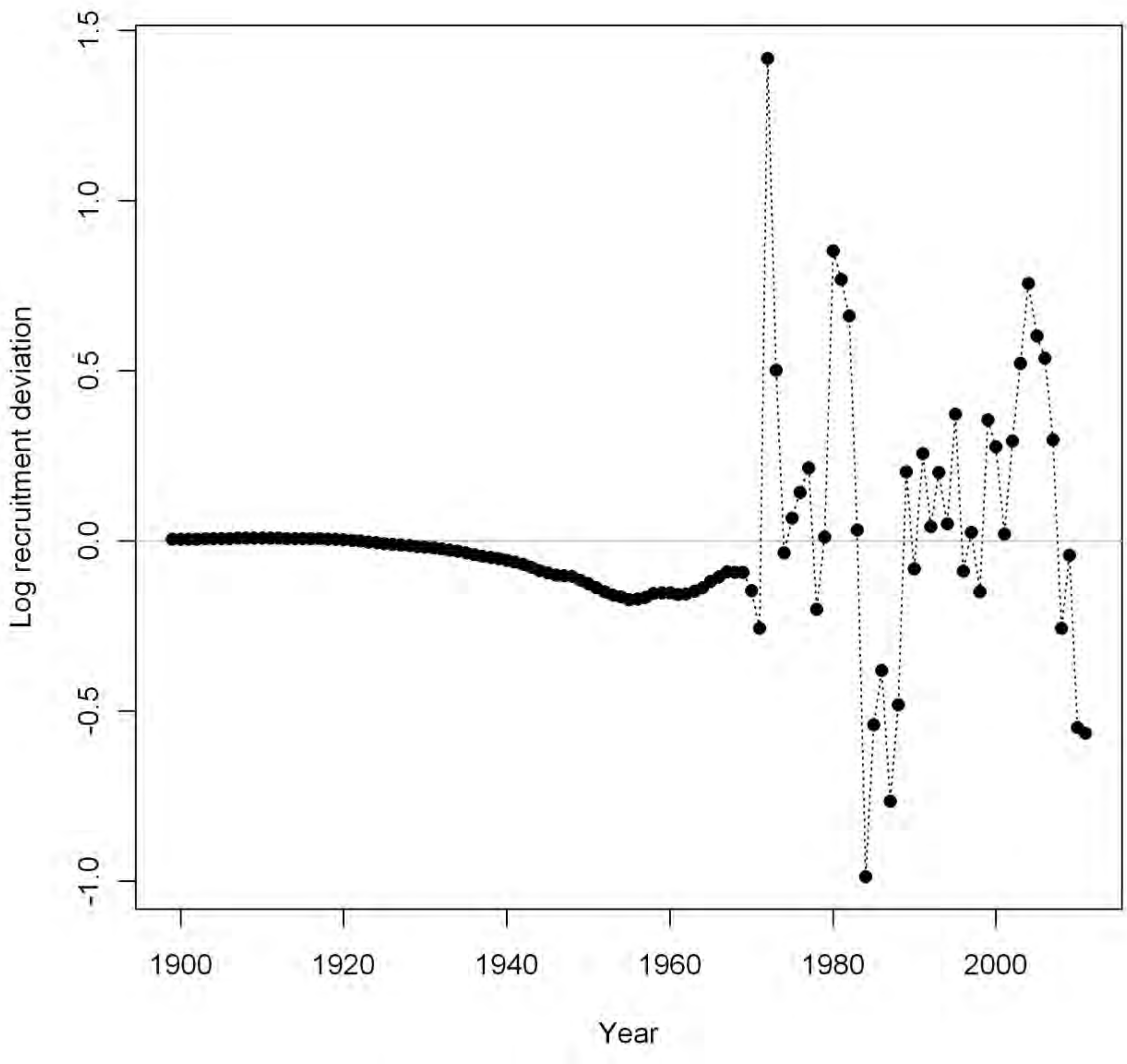



Figure 3.2.4.4. Asymptotic standard errors for recruitment deviations (1985-2010) for Gulf of Mexico red snapper from the SS base model configuration (steepness = 0.99, sigmaR=0.3).

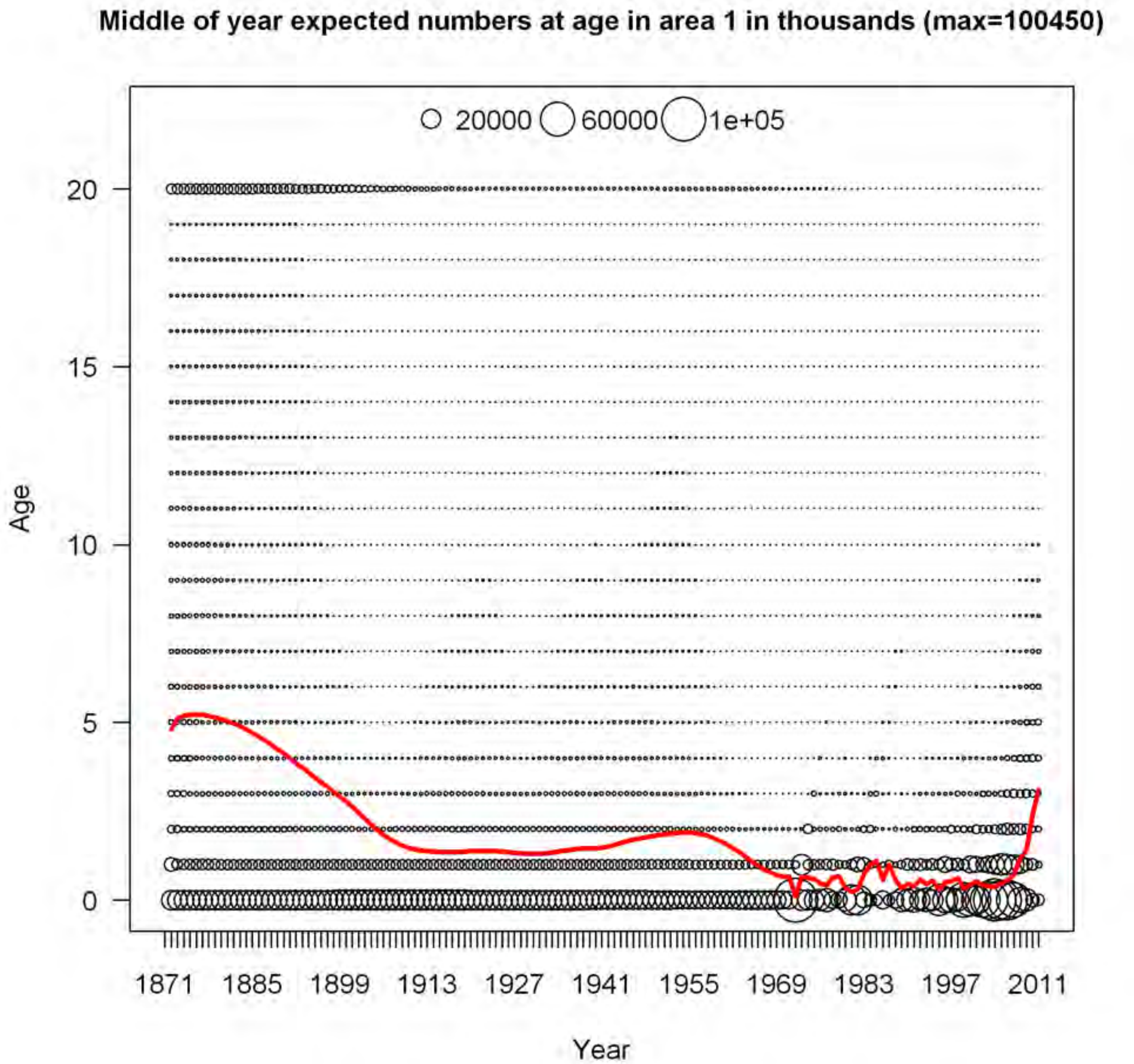



Figure 3.2.4.5. Predicted abundance at age (circles) and mean age (line) for Gulf of Mexico red snapper for the East area, from the SS base model configuration (steepness = 0.99, sigmaR=0.3). Units are abundance in thousands of fish.

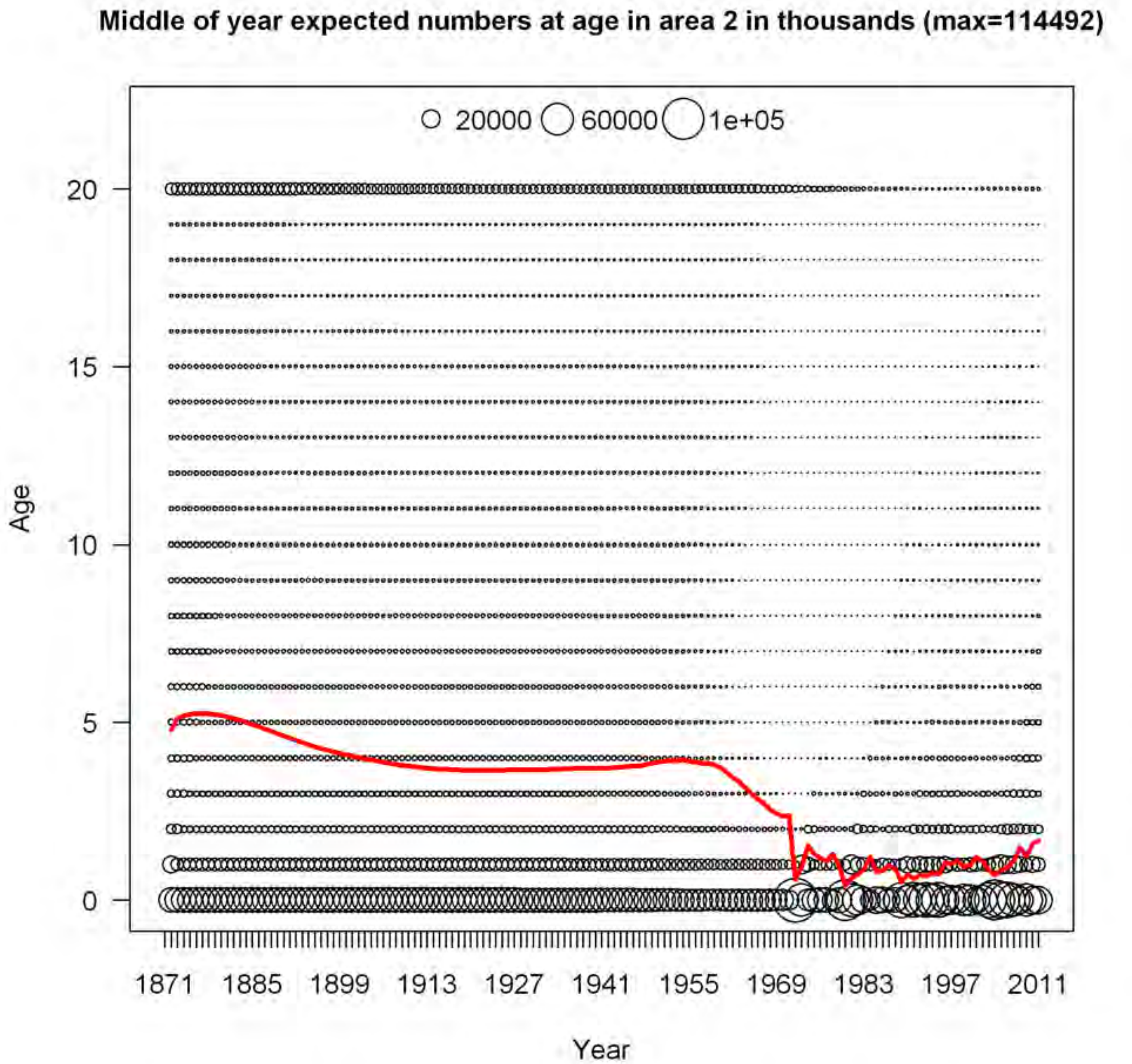
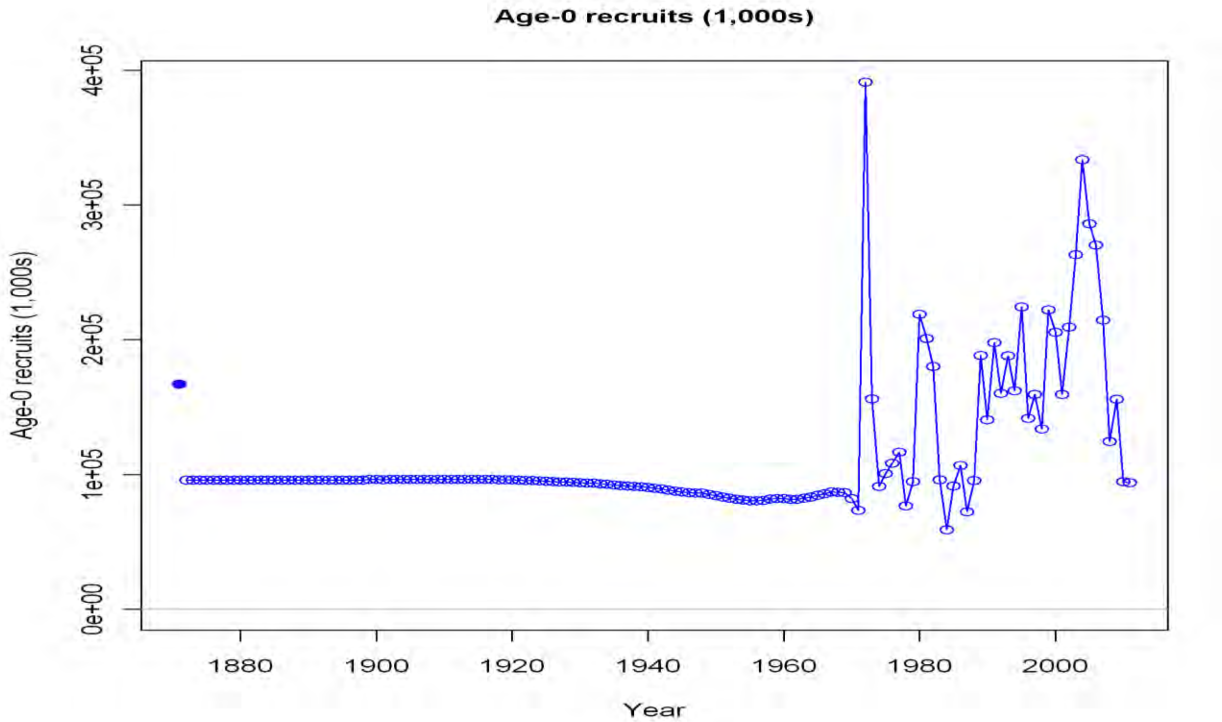



Figure 3.2.4.6. Predicted abundance at age (circles) and mean age (line) for Gulf of Mexico Red snapper for the West area, for the SS base model configuration (steepness = 0.99, sigmaR=0.3). Units are abundance in thousands of fish.

a. Age 0 recruits, all areas combined.




b. Age 0 Recruits by area (area 1 represents the eastern Gulf of Mexico and area 2 represents the western Gulf of Mexico).

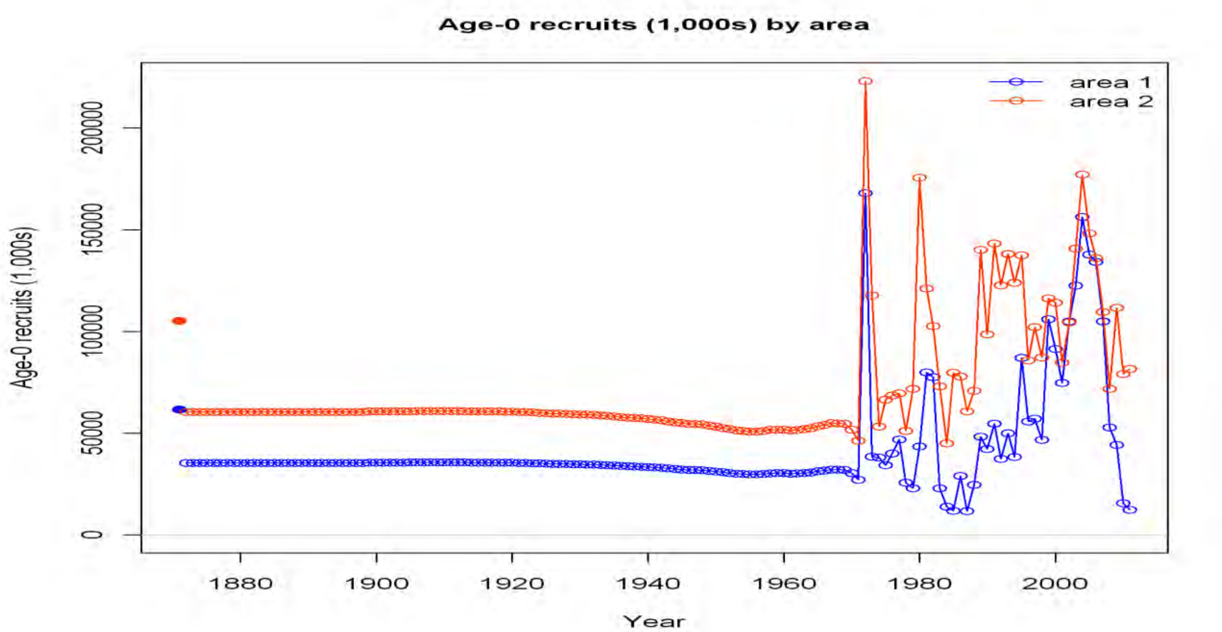



Figure 3.2.4.7. Predicted age-0 recruits in thousands of fish for the Gulf of Mexico red snapper SS base model configuration (steepness = 0.99, sigmaR=0.3).

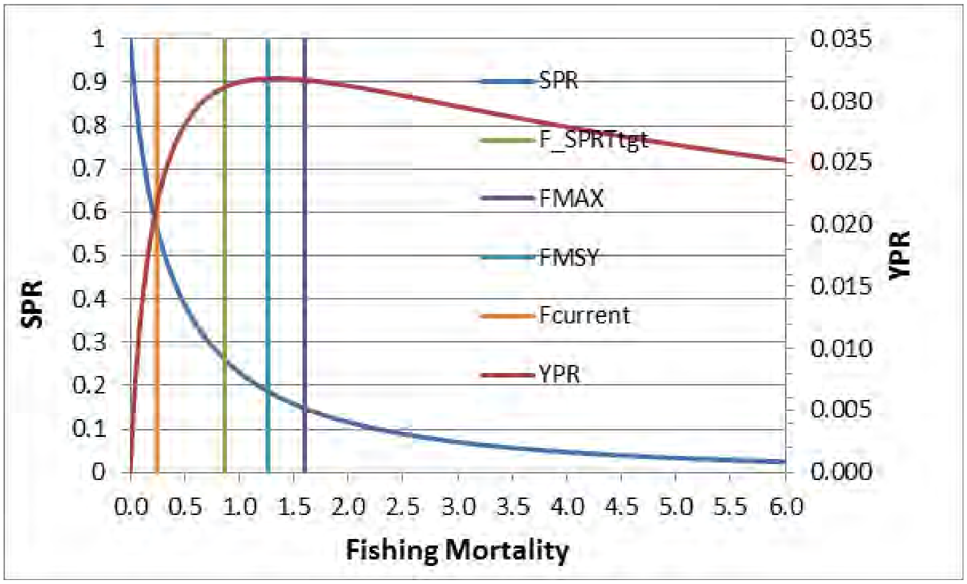



Figure 3.2.4.8. SS estimated yield per recruit and spawner per recruit for Gulf of Mexico red snapper from the SS base model configuration (steepness = 0.99, sigmaR=0.3).

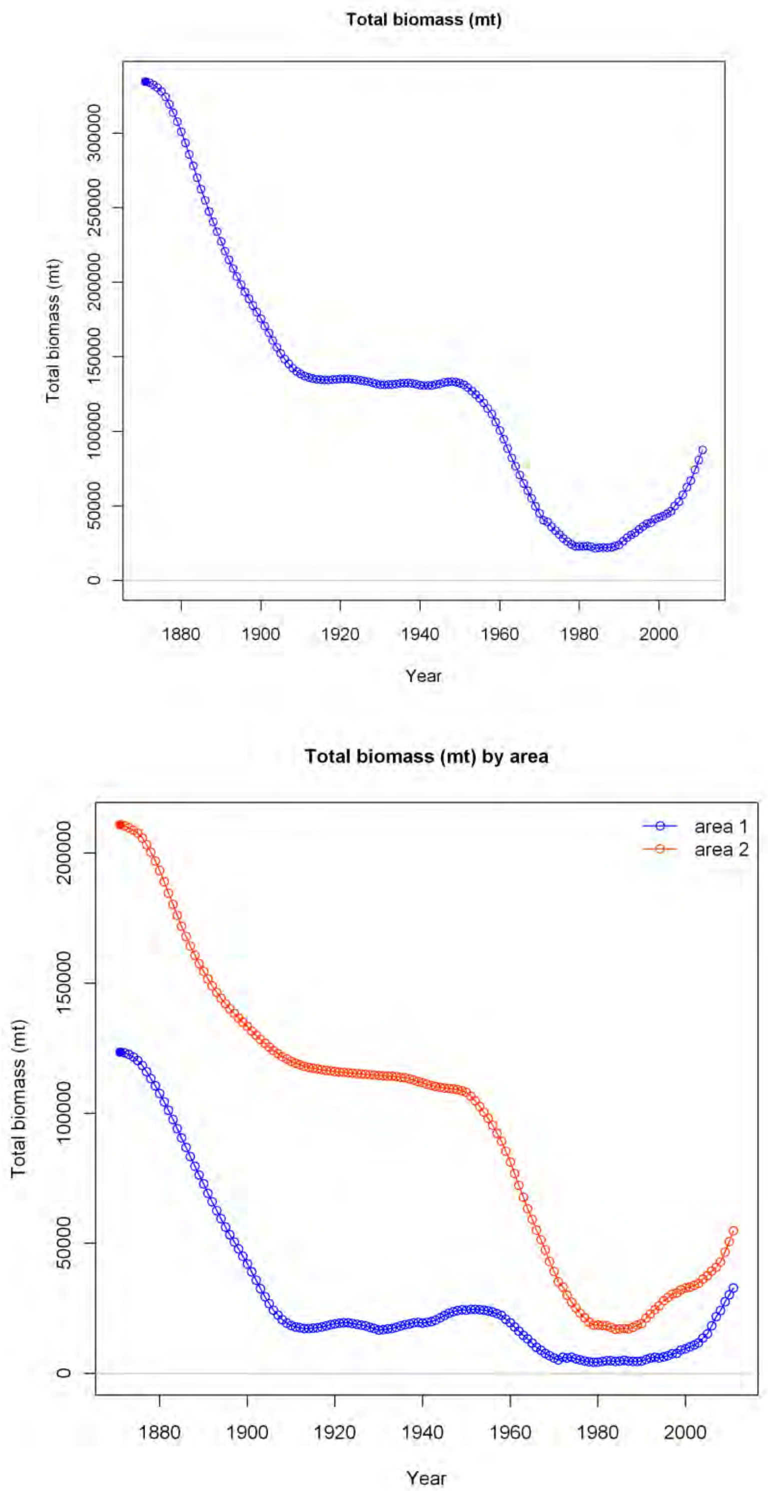



Figure 3.2.5.1. SS predicted total biomass for Gulf of Mexico red snapper from the base model run. The top panel represents east and west combined and bottom panel represents east and west separate.

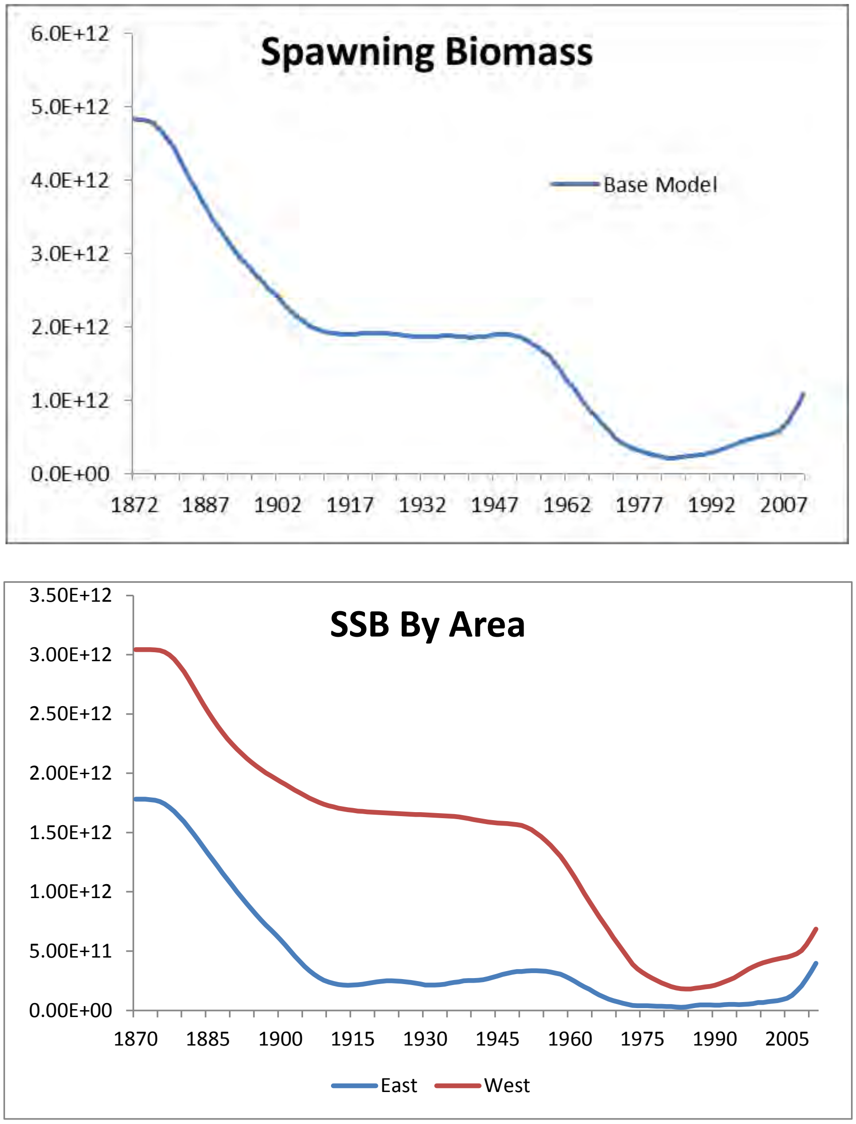



Figure 3.2.5.2. Spawning biomass for Gulf of Mexico red snapper from the base model run. The top panel represents east and west combined and bottom panel represents east and west separate.

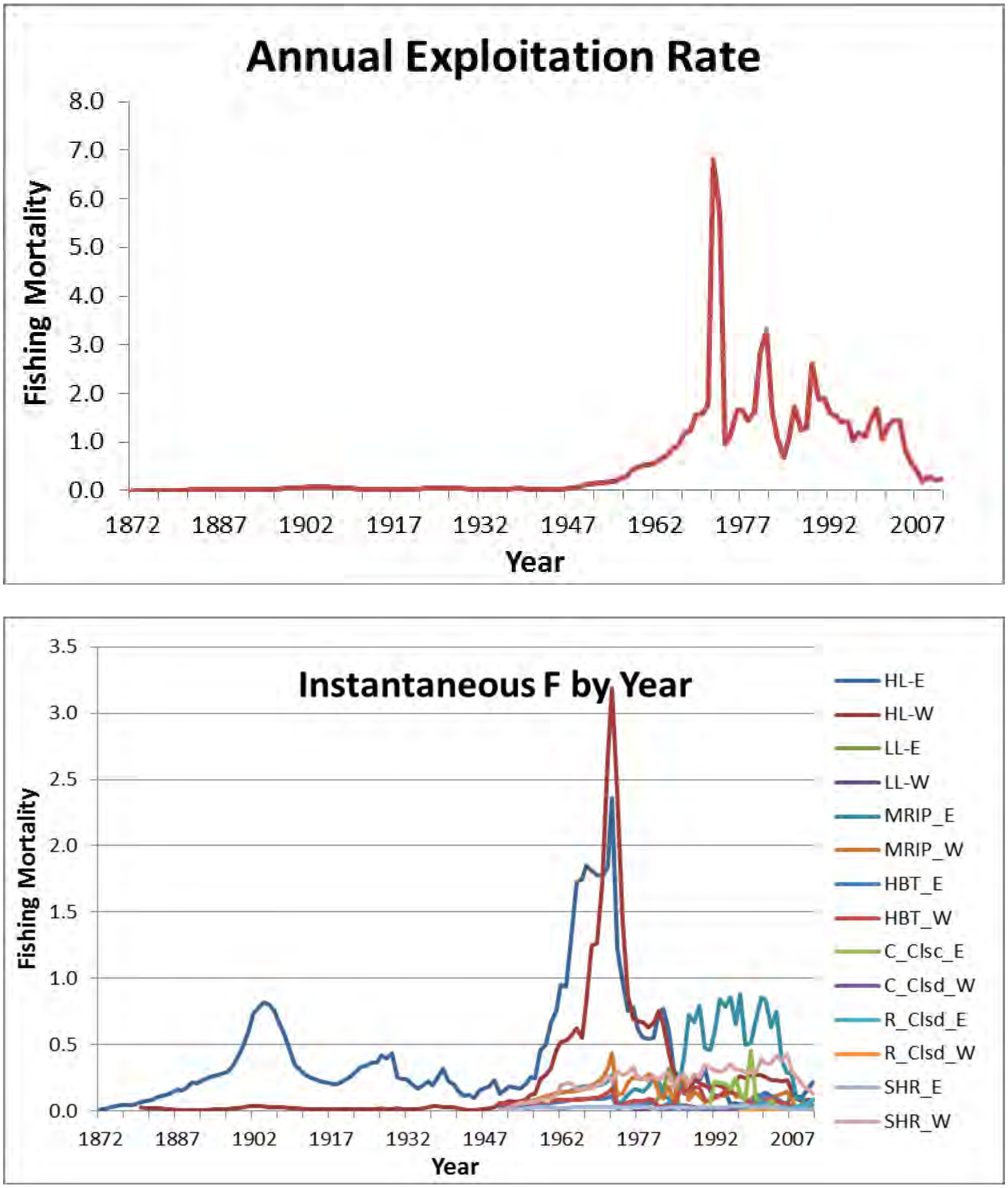



Figure 3.2.6.1. Predicted fishing mortality for Gulf of Mexico red snapper from SS for the base model configuration (Steepness = 0.99, sigmaR=0. This represents the fishing mortality level on the most vulnerable age class for each fleet. The top panel is annual exploitation rate and the bottom panel is fleet specific continuous fishing mortality.

## 3.8 Appendix A: Stock Synthesis Data Input File

```
#V3.224j                                                                                         .

#C Run1, age data only, single season

1872      #_styr

2011      #_endyr

1         #_nseas

12        #_months/season

1         #_spawn_seas

14        #_Nfleet

15        #_Nsurveys

2         #_N_areas

# below are the fishery and survey names, separated by a % delimiter; later the data from first survey will have index number 2
and survey 2 will have index number 3

HL_E%HL_W%LL_E%LL_W%MRIP_E%MRIP_W%HBT_E%HBT_W%C_Clsd_E%C_Clsd_W%R_Clsd_E%R_Clsd_W%Shr_E%Shr_W%Video_E%Video_W%Larv_E%Larv_W%Sum_E
%Sum_W%Fall_E%Fall_W%BLL_W%BLL_E%ROV_E%MRIP_Index_E%MRIP_Index_W%HBT_Index_E%HBT_Index_W
-1        -1        -1        -1        -1        -1        -1        -1        -1        -1        -1        -1        -1
          -1        0.5       0.5       0.5       0.5       0.5       0.5       0.5       0.5       0.5       0.5       0.5   0.5
0.5   0.5   0.5 #_surveytiming_in_season;  but use -1 for a fishery so that the expected value will be same as the whole season
catch-at-age, rather than a midseason sample

1         2         1         2         1         2         1         2         1         2         1         2         1
          2         1         2         1         2         1         2       1       2     2       1         1     1     2     1
2    #_area_assignments_for_each_fishery_and_survey; so in a multi-area setup, each fleet and survey only occurs in one area

1         1         1         1         2         2         2         2         2         2         2         2         2
          2         #_units_of_Catch_for_each_Fleet:_1=biomass;_2=numbers; It is OK to have some fleets with catch in biomass and
some in numbers

0.05      0.05      0.05      0.05      0.05      0.05      0.05      0.05      -1        -1        -1        -1        -1
          -1        #_se_of_log(catch) for each fleet.  This is used for
init_eq_catch_and_for_Fmethod_2_and_3;_do_not_make_this_overly_small.  Year specific values can be input in the control file if
needed.

1         #_Ngenders:  if 2 genders are used, females will be gender=1 and their data will be entered first
```

20 #_Nages: this accumulator age should be large enough so that little growth occurs after reaching this age

0 0 0 0 0 0 0 0 0 0 0 0 0
0 #_init_equil_catch_for_each_fishery

140 #_N_lines_of_catch_to_read

| #_HL_E | HL_W | LL_E | LL_W | MRIP_E | MRIP_W | HBT_E | HBT_W | C_Clsd_E | C_Clsd_W | R_Clsd_E | R_Clsd_W | Shr_E | Shr_W | Year | Season |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 236.469 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1872 | 1 |
| 354.704 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1873 | 1 |
| 532.057 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1874 | 1 |
| 650.291 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1875 | 1 |
| 768.526 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1876 | 1 |
| 650.291 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1877 | 1 |
| 591.174 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1878 | 1 |
| 650.291 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1879 | 1 |
| 827.643 | 404.166 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1880 | 1 |
| 930.944 | 363.755 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1881 | 1 |
| 1035.147 | 322.894 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1882 | 1 |
| 1138.454 | 287.72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1883 | 1 |
| 1241.764 | 252.544 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1884 | 1 |
| 1345.078 | 216.919 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1885 | 1 |
| 1449.293 | 181.742 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1886 | 1 |
| 1552.613 | 92.519 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1887 | 1 |
| 1486.615 | 96.563 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1888 | 1 |
| 1580.058 | 122.165 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1889 | 1 |
| 1901.608 | 110.01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1890 | 1 |
| 1733.754 | 122.262 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1891 | 1 |
| 1819.08 | 132.982 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1892 | 1 |
| 1874.349 | 141.507 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1893 | 1 |
| 1917.621 | 147.355 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1894 | 1 |
| 1871.201 | 151.426 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1895 | 1 |
| 1890.397 | 154.624 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1896 | 1 |
| 1877.08 | 154.513 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1897 | 1 |
| 2092.14 | 247.059 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1898 | 1 |
| 2334.448 | 327.777 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1899 | 1 |
| 2573.747 | 403.686 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1900 | 1 |
| 2733.814 | 462.833 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1901 | 1 |
| 2850.182 | 510.76 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1902 | 1 |
| 2595.511 | 480.718 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1903 | 1 |
| 2398.021 | 458.911 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1904 | 1 |
| 2157.303 | 426.798 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1905 | 1 |
| 1923.66 | 393.57 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1906 | 1 |
| 1697.843 | 359.066 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1907 | 1 |
| 1525.545 | 333.741 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1908 | 1 |
| 1311.271 | 287.097 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1909 | 1 |
| 1105.269 | 244.082 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1910 | 1 |

```
1113.783  239.279  0     0     0    0    0    0    0    0    0    0    0
          0        1911  1
1121.933  234.904  0     0     0    0    0    0    0    0    0    0    0
          0        1912  1
1129.934  230.64   0     0     0    0    0    0    0    0    0    0    0
          0        1913  1
1137.315  226.265  0     0     0    0    0    0    0    0    0    0    0
          0        1914  1
1144.311  221.89   0     0     0    0    0    0    0    0    0    0    0
          0        1915  1
1150.897  217.087  0     0     0    0    0    0    0    0    0    0    0
          0        1916  1
1124.573  212.712  0     0     0    0    0    0    0    0    0    0    0
          0        1917  1
1130.603  208.337  0     0     0    0    0    0    0    0    0    0    0
          0        1918  1
1233.286  213.815  0     0     0    0    0    0    0    0    0    0    0
          0        1919  1
1340.104  219.293  0     0     0    0    0    0    0    0    0    0    0
          0        1920  1
1451.011  225.31   0     0     0    0    0    0    0    0    0    0    0
          0        1921  1
1565.878  230.788  0     0     0    0    0    0    0    0    0    0    0
          0        1922  1
1681.61   236.265  0     0     0    0    0    0    0    0    0    0    0
          0        1923  1
1642.634  228.237  0     0     0    0    0    0    0    0    0    0    0
          0        1924  1
1645.323  220.207  0     0     0    0    0    0    0    0    0    0    0
          0        1925  1
1602.24   212.066  0     0     0    0    0    0    0    0    0    0    0
          0        1926  1
1749.768  265.763  0     0     0    0    0    0    0    0    0    0    0
          0        1927  1
1562.257  193.625  0     0     0    0    0    0    0    0    0    0    0
          0        1928  1
1659.604  189.19   0     0     0    0    0    0    0    0    0    0    0
          0        1929  1
1013.096  251.09   0     0     0    0    0    0    0    0    0    0    0
          0        1930  1
1020.483  155.489  0     0     0    0    0    0    0    0    0    0    0
          0        1931  1
1095.896  186.565  0     0     0    0    0    0    0    0    0    0    0
          0        1932  1
990.809   203.038  0     0     0    0    0    0    0    0    0    0    0
          0        1933  1
891.247   210.803  0     0     0    0    0    0    0    0    0    0    0
          0        1934  1
1093.623  306.234  0     0     0    0    0    0    0    0    0    0    0
          0        1935  1
1258.258  395.255  0     0     0    0    0    0    0    0    0    0    0
          0        1936  1
1115.129  429.359  0     0     0    0    0    0    0    0    0    0    0
          0        1937  1
1442.592  424.259  0     0     0    0    0    0    0    0    0    0    0
          0        1938  1
1693.125  387.581  0     0     0    0    0    0    0    0    0    0    0
          0        1939  1
1132.599  370.073  0     0     0    0    0    0    0    0    0    0    0
          0        1940  1
1030.467  334.702  0     0     0    0    0    0    0    0    0    0    0
          0        1941  1
824.791   247.044  0     0     0    0    0    0    0    0    0    0    0
          0        1942  1
656.019   168.459  0     0     0    0    0    0    0    0    0    0    0
          0        1943  1
757.513   126.865  0     0     0    0    0    0    0    0    0    0    0
          0        1944  1
660.07    69.736   0     0     0    0    0    0    0    0    0    0    0
          0        1945  1
1052.244  146.692  0     0     0    0    0    0    0    0    0    0    0
          0.001    1946  1
1103.225  216.899  0     0     0    0    0    0    0    0    0    0    0
          0.001    1947  1
1178.742  270.078  0     0     0    0    0    0    0    0    0    0    0
          0.001    1948  1
1409.947  394.532  0     0     0    0    0    0    0    0    0    0    0
          0.001    1949  1
767.985   669.524  0     0     163.8740931     230.836805      148.1652877     416.2298968     0
          0        0     0     0.001    0.001  1950    1
914.858   670.201  0     0     188.2718121     273.2406133     148.1652877     416.2298968     0
          0        0     0     0.001    0.001  1951    1
1018.333  750.322  0     0     212.6695311     315.6444217     148.1652877     416.2298968     0
          0        0     0     0.001    0.001  1952    1
919.191   616.247  0     0     237.0672502     358.04823 148.1652877     416.2298968     0     0
          0        0     0.001 0.001    1953   1
854.201   619.599  0     0     261.4649692     400.4520383     148.1652877     416.2298968     0
          0        0     0     0.001    0.001  1954    1
955.561   676.778  0     0     285.8626882     442.8558467     148.1652877     416.2298968     0
          0        0     0     0.001    0.001  1955    1
1143.445  915.086  0     0     310.2604073     485.259655      148.1652877     416.2298968     0
          0        0     0     0.001    0.001  1956    1
1025.976  913.316  0     0     334.6581263     527.6634633     148.1652877     416.2298968     0
          0        0     0     0.001    0.001  1957    1
```

```
1689.444  1522.886  0         0         359.0558454         570.0672717         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1958      1
1545.775  1556.548  0         0         383.4535644         612.47108 148.1652877         416.2298968         0         0
          0         0         0.001     0.001     1959      1
1731.283  1633.469  0         0         407.8512834         654.8748883         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1960      1
1589.504  1927.299  0         0         412.1997075         667.6926936         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1961      1
1638.699  1874.063  0         0         416.5481315         680.5104988         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1962      1
1365.294  1667.933  0         0         420.8965555         693.328304          148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1963      1
1635.958  1628.533  0         0         425.2449796         706.1461093         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1964      1
1683.991  1653.835  0         0         429.5934036         718.9639145         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1965      1
1405.576  1379.478  0         0         440.121674          749.6151118         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1966      1
1318.568  1919.127  0         0         450.6499443         780.266309          148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1967      1
1187.299  2340.939  0         0         461.1782147         810.9175063         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1968      1
1107.646  1899.4    0         0         471.7064851         841.5687035         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1969      1
1047.551  2110.442  0         0         482.2347554         872.2199008         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1970      1
1008.594  2433.99   0         0         507.907431          960.2911658         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1971      1
1076.974  2196.193  0         0         533.5801066         1048.362431         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1972      1
1230.611  2207.723  0         0         559.2527822         1136.433696         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1973      1
1708.939  2011.138  0         0         584.9254578         1224.504961         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1974      1
1622.329  1783.962  0         0         610.5981334         1312.576226         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1975      1
1491.469  1508.466  0         0.487     626.5253762         1298.242222         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1976      1
1026.819  1303.215  0         0         642.4526191         1283.908218         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1977      1
905.53    1221.978  0         0         658.3798619         1269.574214         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1978      1
924.374   1121.499  0         0         674.3071048         1255.24021          148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1979      1
859.897   1141.469  42.64     19.983    690.2343476         1240.906206         148.1652877         416.2298968         0
          0         0         0         0.001     0.001     1980      1
965.088   1425.778  81.582    22.344    800.8137606         1446.453354         47.78031999         344.2520058         0
          0         0         0         0.001     0.001     1981      1
1039.592  1660.844  102.772   32.485    714.3988929         1070.947571         153.8230256         388.2474776         0
          0         0         0         0.001     0.001     1982      1
1082.97   1732.789  201.859   44.786    781.4011802         1871.322401         301.7901615         370.50009 0         0
          0         0         0.001     0.001     1983      1
740.225   1318.327  167.126   345.942   145.70364 649.4160468         40.84213878         373.2178774         0         0
          0         0         0.001     0.001     1984      1
736.531   837.351   51.863    274.373   400.1327095         589.5885057         90.2343129          368.6049395         0
          0         0         0         0.001     0.001     1985      1
390.013   876.968   34.426    377.106   558.4660968         397.2324893         16.364    316.09    0         0         0
          0         0.001     0.001     1986      1
361.431   668.724   28.791    332.954   538.0023492         164.7116171         9.685     319.348   0         0         0
          0         0.001     0.001     1987      1
389.164   1068.26   34.775    303.966   509.4928464         301.6810221         13.832    423.024   0         0         0
          0         0.001     0.001     1988      1
305.307   858.179   35.64     206.268   462.5192986         219.2916611         10.797    372.473   0         0         0
          0         0.001     0.001     1989      1
316.432   797.32    33.923    54.622    305.1307864         128.9756973         15.539    187.006   0         0         0
          0         0.001     0.001     1990      1
179.249   782.317   9.391     32.927    533.0869612         254.5001924         15.58     264.686   0.001     0.001     0
          0         0.001     0.001     1991      1
184.382   1213.132  2.58      8.99      830.9607683         318.4869281         33.873    413.056   0.001     0.001     0
          0         0.001     0.001     1992      1
198.211   1316.047  6.91      9.204     1235.076419         416.0116675         37.275    458.772   0.001     0.001     0
          0         0.001     0.001     1993      1
239.1     1211.754  3.61      7.171     772.8320665         311.8985931         28.998    497.738   0.001     0.001     0
          0         0.001     0.001     1994      1
78.354    1240.758  3.837     7.94      617.4837293         386.1209981         23.078    354.55    0.001     0.001     0
          0         0.001     0.001     1995      1
106.132   1834.388  3.442     12.411    570.5690071         241.8846121         28.388    349.266   0.001     0.001     0
          0         0.001     0.001     1996      1
83.647    2081.763  2.099     14.251    961.7805461         248.8867682         48.439    347.424   0.001     0.001     0.001
          0.001     0.001     0.001     1997      1
172.093   1935.716  2.501     12.349    754.3286879         180.8237779         76.759    244.738   0.001     0.001     0.001
          0.001     0.001     0.001     1998      1
248.76    1918.9    2.936     41.083    721.8827369         146.0185585         67.432    98.699    0.001     0.001     0.001
          0.001     0.001     0.001     1999      1
301.768   1805.154  3.91      83.251    697.9807083         157.5912334         57.64     111.41    0.001     0.001     0.001
          0.001     0.001     0.001     2000      1
361.933   1675.012  4.595     56.451    833.1294816         107.5658317         51.289    116.358   0.001     0.001     0.001
          0.001     0.001     0.001     2001      1
475.685   1617.493  8.221     66.313    1108.290488         102.0921118         75.121    138.475   0.001     0.001     0.001
          0.001     0.001     0.001     2002      1
462.327   1453.422  6.284     77.687    967.57738 112.5934756         71.021    157.905   0.001     0.001     0.001     0.001
          0.001     0.001     2003      1
431.337   1462.943  8.778     206.761   1190.621924         129.1754529         63.482    110.329   0.001     0.001     0.001
          0.001     0.001     0.001     2004      1
```

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 359.25 | 1360.924 | 9.58 | 128.271 | 724.6629138 | 166.187208 | 46.791 | 99.988 | 0.001 | 0.001 | 0.001 |
| | 0.001 | 0.001 | 0.001 | 2005 | 1 | | | | | |
| 344.879 | 1638.234 | 7.409 | 118.23 | 793.645715 | 236.2178074 | 47.882 | 121.177 | 0.001 | 0.001 | 0.001 |
| | 0.001 | 0.001 | 0.001 | 2006 | 1 | | | | | |
| 397.002 | 954.023 | 7.134 | 85.504 | 1064.179522 | 206.4353258 | 63.603 | 110.314 | 0.001 | 0.001 | 0.001 |
| | 0.001 | 0.001 | 0.001 | 2007 | 1 | | | | | |
| 378.522 | 707.21 | 15.479 | 25.332 | 591.6374724 | 120.7530441 | 61.986 | 57.569 | 0.001 | 0 | 0.001 |
| | 0.001 | 0.001 | 0.001 | 2008 | 1 | | | | | |
| 416.794 | 679.616 | 6.635 | 23.481 | 698.3349386 | 131.636978 | 81.59 | 75.998 | 0.001 | 0.001 | 0.001 |
| | 0.001 | 0.001 | 0.001 | 2009 | 1 | | | | | |
| 633.962 | 853.143 | 34.251 | 17.324 | 327.0127363 | 36.87349948 | 35.943 | 51.514 | 0.001 | 0.001 | 0.001 |
| | 0.001 | 0.001 | 0.001 | 2010 | 1 | | | | | |
| 731.693 | 851.987 | 38.231 | 8.55 | 488.9193338 | 67.480174 69.187 | 50.656 | 0.001 | 0.001 | 0.001 | 0.001 |
| | 0.001 | 0.001 | 2011 | 1 | | | | | | |

580 #_N_cpue_and_surveyabundance_observations

#_Units: 0=numbers; 1=biomass; 2=F

#_Errtype: -1=normal; 0=lognormal; >0=T

| #_Fleet/ | Survey | Units | Errtype |
|---|---|---|---|
| 1 | 1 | 0 | |
| 2 | 1 | 0 | |
| 3 | 1 | 0 | |
| 4 | 1 | 0 | |
| 5 | 0 | 0 | |
| 6 | 0 | 0 | |
| 7 | 0 | 0 | |
| 8 | 0 | 0 | |
| 9 | 0 | 0 | |
| 10 | 0 | 0 | |
| 11 | 0 | 0 | |
| 12 | 0 | 0 | |
| 13 | 2 | 0 | |
| 14 | 2 | 0 | |
| 15 | 0 | 0 | |
| 16 | 0 | 0 | |
| 17 | 0 | 0 | |
| 18 | 0 | 0 | |
| 19 | 0 | 0 | |
| 20 | 0 | 0 | |
| 21 | 0 | 0 | |
| 22 | 0 | 0 | |
| 23 | 0 | 0 | |
| 24 | 0 | 0 | |
| 25 | 0 | 0 | |
| 26 | 0 | 0 | |
| 27 | 0 | 0 | |
| 28 | 0 | 0 | |
| 29 | 0 | 0 | |

| #_year | seas | Fleet/ Survey | obs | err | # comment |
|---|---|---|---|---|---|
| 1990 | 1 | 1 | 0.2659 | 0.7527 | #_HL_E_index |
| 1991 | 1 | 1 | 0.4204 | 0.624 | #_HL_E_index |
| 1992 | 1 | 1 | 1.2686 | 0.5789 | #_HL_E_index |
| 1993 | 1 | 1 | 0.6989 | 0.5566 | #_HL_E_index |
| 1994 | 1 | 1 | 0.6265 | 0.5571 | #_HL_E_index |
| 1995 | 1 | 1 | 0.7456 | 0.57 | #_HL_E_index |
| 1996 | 1 | 1 | 0.4489 | 0.621 | #_HL_E_index |
| 1997 | 1 | 1 | 0.3675 | 0.6419 | #_HL_E_index |
| 1998 | 1 | 1 | 1.2883 | 0.6167 | #_HL_E_index |
| 1999 | 1 | 1 | 0.7796 | 0.6255 | #_HL_E_index |
| 2000 | 1 | 1 | 1.4717 | 0.6209 | #_HL_E_index |
| 2001 | 1 | 1 | 1.3417 | 0.6239 | #_HL_E_index |
| 2002 | 1 | 1 | 1.6504 | 0.6105 | #_HL_E_index |
| 2003 | 1 | 1 | 1.4638 | 0.6048 | #_HL_E_index |
| 2004 | 1 | 1 | 1.6566 | 0.631 | #_HL_E_index |
| 2005 | 1 | 1 | 1.3668 | 0.6133 | #_HL_E_index |
| 2006 | 1 | 1 | 1.1386 | 0.6209 | #_HL_E_index |
| 1990 | 1 | 2 | 0.6614 | 0.2394 | #_HL_W_index |
| 1991 | 1 | 2 | 1.0801 | 0.2146 | #_HL_W_index |
| 1992 | 1 | 2 | 1.767 | 0.2224 | #_HL_W_index |
| 1993 | 1 | 2 | 1.1568 | 0.1612 | #_HL_W_index |
| 1994 | 1 | 2 | 1.155 | 0.1614 | #_HL_W_index |
| 1995 | 1 | 2 | 1.3402 | 0.1613 | #_HL_W_index |
| 1996 | 1 | 2 | 1.3387 | 0.1611 | #_HL_W_index |

| | | | | | |
|---|---|---|---|---|---|
| 1997 | 1 | 2 | 1.1762 | 0.1611 | #_HL_W_index |
| 1998 | 1 | 2 | 0.9335 | 0.1611 | #_HL_W_index |
| 1999 | 1 | 2 | 0.8658 | 0.1612 | #_HL_W_index |
| 2000 | 1 | 2 | 0.9879 | 0.1613 | #_HL_W_index |
| 2001 | 1 | 2 | 0.8514 | 0.1612 | #_HL_W_index |
| 2002 | 1 | 2 | 0.8156 | 0.1613 | #_HL_W_index |
| 2003 | 1 | 2 | 0.7899 | 0.1613 | #_HL_W_index |
| 2004 | 1 | 2 | 0.6571 | 0.1613 | #_HL_W_index |
| 2005 | 1 | 2 | 0.5891 | 0.1614 | #_HL_W_index |
| 2006 | 1 | 2 | 0.8341 | 0.1617 | #_HL_W_index |
| 1950 | 1 | 13 | 0.2218 | 0.125 | #_Shr_E_effort |
| 1951 | 1 | 13 | 0.3821 | 0.125 | #_Shr_E_effort |
| 1952 | 1 | 13 | 0.4515 | 0.125 | #_Shr_E_effort |
| 1953 | 1 | 13 | 0.4987 | 0.125 | #_Shr_E_effort |
| 1954 | 1 | 13 | 0.6394 | 0.125 | #_Shr_E_effort |
| 1955 | 1 | 13 | 0.7552 | 0.125 | #_Shr_E_effort |
| 1956 | 1 | 13 | 0.9565 | 0.125 | #_Shr_E_effort |
| 1957 | 1 | 13 | 1.0473 | 0.125 | #_Shr_E_effort |
| 1958 | 1 | 13 | 1.1079 | 0.125 | #_Shr_E_effort |
| 1959 | 1 | 13 | 1.2023 | 0.125 | #_Shr_E_effort |
| 1960 | 1 | 13 | 1.1801 | 0.125 | #_Shr_E_effort |
| 1961 | 1 | 13 | 0.8561 | 0.125 | #_Shr_E_effort |
| 1962 | 1 | 13 | 0.8172 | 0.125 | #_Shr_E_effort |
| 1963 | 1 | 13 | 0.917 | 0.125 | #_Shr_E_effort |
| 1964 | 1 | 13 | 1.0887 | 0.125 | #_Shr_E_effort |
| 1965 | 1 | 13 | 1.1809 | 0.125 | #_Shr_E_effort |
| 1966 | 1 | 13 | 1.1061 | 0.125 | #_Shr_E_effort |
| 1967 | 1 | 13 | 1.0498 | 0.125 | #_Shr_E_effort |
| 1968 | 1 | 13 | 1.2367 | 0.125 | #_Shr_E_effort |
| 1969 | 1 | 13 | 1.2062 | 0.125 | #_Shr_E_effort |
| 1970 | 1 | 13 | 1.1886 | 0.125 | #_Shr_E_effort |
| 1971 | 1 | 13 | 1.0241 | 0.125 | #_Shr_E_effort |
| 1972 | 1 | 13 | 1.1044 | 0.125 | #_Shr_E_effort |
| 1973 | 1 | 13 | 1.2174 | 0.125 | #_Shr_E_effort |
| 1974 | 1 | 13 | 1.1776 | 0.125 | #_Shr_E_effort |
| 1975 | 1 | 13 | 1.1743 | 0.125 | #_Shr_E_effort |
| 1976 | 1 | 13 | 1.0893 | 0.125 | #_Shr_E_effort |
| 1977 | 1 | 13 | 1.2908 | 0.125 | #_Shr_E_effort |
| 1978 | 1 | 13 | 0.9976 | 0.125 | #_Shr_E_effort |
| 1979 | 1 | 13 | 1.0267 | 0.125 | #_Shr_E_effort |
| 1980 | 1 | 13 | 0.6286 | 0.125 | #_Shr_E_effort |
| 1981 | 1 | 13 | 0.9868 | 0.125 | #_Shr_E_effort |
| 1982 | 1 | 13 | 0.9833 | 0.125 | #_Shr_E_effort |
| 1983 | 1 | 13 | 1.0771 | 0.125 | #_Shr_E_effort |
| 1984 | 1 | 13 | 1.2637 | 0.125 | #_Shr_E_effort |
| 1985 | 1 | 13 | 1.2196 | 0.125 | #_Shr_E_effort |
| 1986 | 1 | 13 | 1.2642 | 0.125 | #_Shr_E_effort |
| 1987 | 1 | 13 | 1.0244 | 0.125 | #_Shr_E_effort |
| 1988 | 1 | 13 | 0.9658 | 0.125 | #_Shr_E_effort |
| 1989 | 1 | 13 | 1.1707 | 0.125 | #_Shr_E_effort |
| 1990 | 1 | 13 | 1.0255 | 0.125 | #_Shr_E_effort |
| 1991 | 1 | 13 | 1.0555 | 0.125 | #_Shr_E_effort |
| 1992 | 1 | 13 | 1.2798 | 0.125 | #_Shr_E_effort |
| 1993 | 1 | 13 | 1.057 | 0.125 | #_Shr_E_effort |
| 1994 | 1 | 13 | 1.0933 | 0.125 | #_Shr_E_effort |
| 1995 | 1 | 13 | 1.2933 | 0.125 | #_Shr_E_effort |
| 1996 | 1 | 13 | 1.4612 | 0.125 | #_Shr_E_effort |
| 1997 | 1 | 13 | 1.541 | 0.125 | #_Shr_E_effort |
| 1998 | 1 | 13 | 1.9362 | 0.125 | #_Shr_E_effort |
| 1999 | 1 | 13 | 1.1931 | 0.125 | #_Shr_E_effort |
| 2000 | 1 | 13 | 1.0252 | 0.125 | #_Shr_E_effort |
| 2001 | 1 | 13 | 1.1516 | 0.125 | #_Shr_E_effort |
| 2002 | 1 | 13 | 1.37 | 0.125 | #_Shr_E_effort |
| 2003 | 1 | 13 | 1.1419 | 0.125 | #_Shr_E_effort |
| 2004 | 1 | 13 | 1.1325 | 0.125 | #_Shr_E_effort |
| 2005 | 1 | 13 | 0.9538 | 0.125 | #_Shr_E_effort |
| 2006 | 1 | 13 | 0.6183 | 0.125 | #_Shr_E_effort |
| 2007 | 1 | 13 | 0.4644 | 0.125 | #_Shr_E_effort |
| 2008 | 1 | 13 | 0.3036 | 0.125 | #_Shr_E_effort |
| 2009 | 1 | 13 | 0.4676 | 0.125 | #_Shr_E_effort |
| 2010 | 1 | 13 | 0.2933 | 0.125 | #_Shr_E_effort |
| 2011 | 1 | 13 | 0.3652 | 0.125 | #_Shr_E_effort |
| 1946 | 1 | 14 | 0.0098 | 0.125 | #_Shr_W_effort |
| 1947 | 1 | 14 | 0.05 | 0.125 | #_Shr_W_effort |
| 1948 | 1 | 14 | 0.1314 | 0.125 | #_Shr_W_effort |
| 1949 | 1 | 14 | 0.2123 | 0.125 | #_Shr_W_effort |
| 1950 | 1 | 14 | 0.2564 | 0.125 | #_Shr_W_effort |
| 1951 | 1 | 14 | 0.2696 | 0.125 | #_Shr_W_effort |
| 1952 | 1 | 14 | 0.3182 | 0.125 | #_Shr_W_effort |
| 1953 | 1 | 14 | 0.3103 | 0.125 | #_Shr_W_effort |
| 1954 | 1 | 14 | 0.4093 | 0.125 | #_Shr_W_effort |
| 1955 | 1 | 14 | 0.3378 | 0.125 | #_Shr_W_effort |
| 1956 | 1 | 14 | 0.4407 | 0.125 | #_Shr_W_effort |
| 1957 | 1 | 14 | 0.5525 | 0.125 | #_Shr_W_effort |
| 1958 | 1 | 14 | 0.852 | 0.125 | #_Shr_W_effort |
| 1959 | 1 | 14 | 0.9104 | 0.125 | #_Shr_W_effort |
| 1960 | 1 | 14 | 0.9321 | 0.125 | #_Shr_W_effort |
| 1961 | 1 | 14 | 0.744 | 0.125 | #_Shr_W_effort |
| 1962 | 1 | 14 | 0.7237 | 0.125 | #_Shr_W_effort |
| 1963 | 1 | 14 | 0.8394 | 0.125 | #_Shr_W_effort |
| 1964 | 1 | 14 | 0.7658 | 0.125 | #_Shr_W_effort |
| 1965 | 1 | 14 | 0.8777 | 0.125 | #_Shr_W_effort |
| 1966 | 1 | 14 | 0.92 | 0.125 | #_Shr_W_effort |
| 1967 | 1 | 14 | 1.158 | 0.125 | #_Shr_W_effort |
| 1968 | 1 | 14 | 1.0056 | 0.125 | #_Shr_W_effort |

| | | | | | |
|---|---|---|---|---|---|
| 1969 | 1 | 14 | 1.343 | 0.125 | #_Shr_W_effort |
| 1970 | 1 | 14 | 1.213 | 0.125 | #_Shr_W_effort |
| 1971 | 1 | 14 | 1.2664 | 0.125 | #_Shr_W_effort |
| 1972 | 1 | 14 | 1.3829 | 0.125 | #_Shr_W_effort |
| 1973 | 1 | 14 | 1.1026 | 0.125 | #_Shr_W_effort |
| 1974 | 1 | 14 | 1.0879 | 0.125 | #_Shr_W_effort |
| 1975 | 1 | 14 | 1.0294 | 0.125 | #_Shr_W_effort |
| 1976 | 1 | 14 | 1.1977 | 0.125 | #_Shr_W_effort |
| 1977 | 1 | 14 | 1.0259 | 0.125 | #_Shr_W_effort |
| 1978 | 1 | 14 | 1.2005 | 0.125 | #_Shr_W_effort |
| 1979 | 1 | 14 | 1.2516 | 0.125 | #_Shr_W_effort |
| 1980 | 1 | 14 | 0.7586 | 0.125 | #_Shr_W_effort |
| 1981 | 1 | 14 | 1.1719 | 0.125 | #_Shr_W_effort |
| 1982 | 1 | 14 | 1.1969 | 0.125 | #_Shr_W_effort |
| 1983 | 1 | 14 | 0.9665 | 0.125 | #_Shr_W_effort |
| 1984 | 1 | 14 | 1.231 | 0.125 | #_Shr_W_effort |
| 1985 | 1 | 14 | 1.1964 | 0.125 | #_Shr_W_effort |
| 1986 | 1 | 14 | 1.6459 | 0.125 | #_Shr_W_effort |
| 1987 | 1 | 14 | 1.6859 | 0.125 | #_Shr_W_effort |
| 1988 | 1 | 14 | 1.6333 | 0.125 | #_Shr_W_effort |
| 1989 | 1 | 14 | 1.4713 | 0.125 | #_Shr_W_effort |
| 1990 | 1 | 14 | 1.4144 | 0.125 | #_Shr_W_effort |
| 1991 | 1 | 14 | 1.7185 | 0.125 | #_Shr_W_effort |
| 1992 | 1 | 14 | 1.7724 | 0.125 | #_Shr_W_effort |
| 1993 | 1 | 14 | 1.7508 | 0.125 | #_Shr_W_effort |
| 1994 | 1 | 14 | 1.4062 | 0.125 | #_Shr_W_effort |
| 1995 | 1 | 14 | 1.2205 | 0.125 | #_Shr_W_effort |
| 1996 | 1 | 14 | 1.2832 | 0.125 | #_Shr_W_effort |
| 1997 | 1 | 14 | 1.5609 | 0.125 | #_Shr_W_effort |
| 1998 | 1 | 14 | 1.4164 | 0.125 | #_Shr_W_effort |
| 1999 | 1 | 14 | 1.3332 | 0.125 | #_Shr_W_effort |
| 2000 | 1 | 14 | 1.4545 | 0.125 | #_Shr_W_effort |
| 2001 | 1 | 14 | 1.5595 | 0.125 | #_Shr_W_effort |
| 2002 | 1 | 14 | 1.8364 | 0.125 | #_Shr_W_effort |
| 2003 | 1 | 14 | 1.4817 | 0.125 | #_Shr_W_effort |
| 2004 | 1 | 14 | 1.361 | 0.125 | #_Shr_W_effort |
| 2005 | 1 | 14 | 0.9839 | 0.125 | #_Shr_W_effort |
| 2006 | 1 | 14 | 0.7344 | 0.125 | #_Shr_W_effort |
| 2007 | 1 | 14 | 0.5925 | 0.125 | #_Shr_W_effort |
| 2008 | 1 | 14 | 0.425 | 0.125 | #_Shr_W_effort |
| 2009 | 1 | 14 | 0.5059 | 0.125 | #_Shr_W_effort |
| 2010 | 1 | 14 | 0.4949 | 0.125 | #_Shr_W_effort |
| 2011 | 1 | 14 | 0.6082 | 0.125 | #_Shr_W_effort |
| 1993 | 1 | 15 | 0.1451 | 1.3527 | #_Video_E_index |
| 1994 | 1 | 15 | 0.0405 | 1.9222 | #_Video_E_index |
| 1995 | 1 | 15 | 0.0424 | 1.7055 | #_Video_E_index |
| 1996 | 1 | 15 | 0.1011 | 1.4224 | #_Video_E_index |
| 1997 | 1 | 15 | 0.121 | 1.4579 | #_Video_E_index |
| 2002 | 1 | 15 | 1.0414 | 0.7035 | #_Video_E_index |
| 2004 | 1 | 15 | 1.0998 | 0.6893 | #_Video_E_index |
| 2005 | 1 | 15 | 1.4742 | 0.6135 | #_Video_E_index |
| 2006 | 1 | 15 | 0.6298 | 0.7885 | #_Video_E_index |
| 2007 | 1 | 15 | 1.1209 | 0.6463 | #_Video_E_index |
| 2008 | 1 | 15 | 1.0571 | 0.7098 | #_Video_E_index |
| 2009 | 1 | 15 | 1.4792 | 0.6308 | #_Video_E_index |
| 2010 | 1 | 15 | 2.4086 | 0.5628 | #_Video_E_index |
| 2011 | 1 | 15 | 3.2389 | 0.5252 | #_Video_E_index |
| 1993 | 1 | 16 | 0.5543 | 0.4443 | #_Video_W_index |
| 1994 | 1 | 16 | 0.699 | 0.4005 | #_Video_W_index |
| 1995 | 1 | 16 | 0.5374 | 0.2926 | #_Video_W_index |
| 1996 | 1 | 16 | 0.56 | 0.2454 | #_Video_W_index |
| 1997 | 1 | 16 | 1.5053 | 0.1543 | #_Video_W_index |
| 2001 | 1 | 16 | 0.7038 | 0.3424 | #_Video_W_index |
| 2002 | 1 | 16 | 0.9325 | 0.2179 | #_Video_W_index |
| 2004 | 1 | 16 | 0.9505 | 0.2927 | #_Video_W_index |
| 2005 | 1 | 16 | 1.136 | 0.1744 | #_Video_W_index |
| 2006 | 1 | 16 | 0.4674 | 0.2935 | #_Video_W_index |
| 2007 | 1 | 16 | 1.3083 | 0.1608 | #_Video_W_index |
| 2008 | 1 | 16 | 0.6849 | 0.231 | #_Video_W_index |
| 2009 | 1 | 16 | 1.1012 | 0.169 | #_Video_W_index |
| 2010 | 1 | 16 | 2.2338 | 0.1794 | #_Video_W_index |
| 2011 | 1 | 16 | 1.6255 | 0.1613 | #_Video_W_index |
| 1987 | 1 | 17 | 0.881 | 1.111 | #_Larv_E_index |
| 1988 | 1 | 17 | 0.4313 | 1.256 | #_Larv_E_index |
| 1991 | 1 | 17 | 0.8782 | 0.7566 | #_Larv_E_index |
| 1994 | 1 | 17 | 0.1971 | 0.4177 | #_Larv_E_index |
| 1995 | 1 | 17 | 0.4904 | 0.8411 | #_Larv_E_index |
| 1997 | 1 | 17 | 0.568 | 0.7747 | #_Larv_E_index |
| 1999 | 1 | 17 | 0.7901 | 0.3144 | #_Larv_E_index |
| 2000 | 1 | 17 | 1.0029 | 0.9128 | #_Larv_E_index |
| 2001 | 1 | 17 | 0.9772 | 0.5626 | #_Larv_E_index |
| 2002 | 1 | 17 | 0.8339 | 1.1653 | #_Larv_E_index |
| 2003 | 1 | 17 | 1.0435 | 0.6694 | #_Larv_E_index |
| 2004 | 1 | 17 | 0.2115 | 1.3981 | #_Larv_E_index |
| 2006 | 1 | 17 | 0.7547 | 0.8488 | #_Larv_E_index |
| 2007 | 1 | 17 | 1.8977 | 0.3174 | #_Larv_E_index |
| 2009 | 1 | 17 | 1.1842 | 0.7678 | #_Larv_E_index |
| 2010 | 1 | 17 | 3.8585 | 0.309 | #_Larv_E_index |
| 1986 | 1 | 18 | 0.5131 | 0.7164 | #_Larv_W_index |
| 1987 | 1 | 18 | 0.6456 | 0.6103 | #_Larv_W_index |
| 1989 | 1 | 18 | 0.9543 | 0.6716 | #_Larv_W_index |
| 1990 | 1 | 18 | 0.6357 | 0.5045 | #_Larv_W_index |
| 1991 | 1 | 18 | 0.1633 | 0.6797 | #_Larv_W_index |
| 1992 | 1 | 18 | 0.2809 | 0.4066 | #_Larv_W_index |
| 1993 | 1 | 18 | 0.3673 | 0.4485 | #_Larv_W_index |

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1994	1	18	0.2854	0.5957	#_Larv_W_index
1995	1	18	1.1469	0.3342	#_Larv_W_index
1996	1	18	0.6556	0.3931	#_Larv_W_index
1997	1	18	1.2344	0.321	#_Larv_W_index
1999	1	18	0.5658	0.4201	#_Larv_W_index
2000	1	18	1.8084	0.3271	#_Larv_W_index
2001	1	18	1.4411	0.4581	#_Larv_W_index
2002	1	18	1.04	0.3753	#_Larv_W_index
2003	1	18	2.3357	0.3625	#_Larv_W_index
2004	1	18	1.066	0.3548	#_Larv_W_index
2006	1	18	2.0481	0.4196	#_Larv_W_index
2007	1	18	1.5888	0.3083	#_Larv_W_index
2009	1	18	1.6099	0.2614	#_Larv_W_index
2010	1	18	0.6138	0.4128	#_Larv_W_index
-1982	1	19	1.0925	0.5059	#_Summer_E_index
-1983	1	19	0.8106	0.5388	#_Summer_E_index
-1984	1	19	0.0821	0.9255	#_Summer_E_index
-1985	1	19	0.566	0.4395	#_Summer_E_index
-1986	1	19	0.0665	0.9476	#_Summer_E_index
-1987	1	19	0.7576	0.3087	#_Summer_E_index
-1988	1	19	0.5971	0.4212	#_Summer_E_index
-1989	1	19	1.5778	0.3659	#_Summer_E_index
-1990	1	19	1.2186	0.2686	#_Summer_E_index
-1991	1	19	1.2724	0.3374	#_Summer_E_index
-1992	1	19	2.6585	0.3734	#_Summer_E_index
-1993	1	19	0.4352	0.4623	#_Summer_E_index
-1994	1	19	1.0018	0.3079	#_Summer_E_index
-1995	1	19	0.3872	0.4892	#_Summer_E_index
-1996	1	19	0.7369	0.3956	#_Summer_E_index
-1997	1	19	0.7938	0.3501	#_Summer_E_index
-1998	1	19	0.2617	0.7374	#_Summer_E_index
-1999	1	19	0.1891	0.62	#_Summer_E_index
-2000	1	19	0.7721	0.3634	#_Summer_E_index
-2001	1	19	0.3235	0.6009	#_Summer_E_index
-2002	1	19	0.3075	0.6039	#_Summer_E_index
-2003	1	19	0.6891	0.4549	#_Summer_E_index
-2004	1	19	0.7284	0.4504	#_Summer_E_index
-2005	1	19	1.7139	0.417	#_Summer_E_index
-2006	1	19	0.4742	0.4376	#_Summer_E_index
-2007	1	19	2.8421	0.2634	#_Summer_E_index
-2008	1	19	4.4579	0.2784	#_Summer_E_index
-2009	1	19	0.7116	0.284	#_Summer_E_index
-2010	1	19	1.764	0.3557	#_Summer_E_index
-2011	1	19	0.7105	0.4958	#_Summer_E_index
1982	1	20	2.7604	0.218	#_Summer_W_index
1983	1	20	0.7463	0.2811	#_Summer_W_index
1984	1	20	0.7414	0.2787	#_Summer_W_index
1985	1	20	1.0036	0.3014	#_Summer_W_index
1986	1	20	0.275	0.4231	#_Summer_W_index
1987	1	20	0.6449	0.2202	#_Summer_W_index
1988	1	20	0.3054	0.2491	#_Summer_W_index
1989	1	20	0.264	0.3032	#_Summer_W_index
1990	1	20	2.2675	0.163	#_Summer_W_index
1991	1	20	0.8919	0.1906	#_Summer_W_index
1992	1	20	0.5548	0.2001	#_Summer_W_index
1993	1	20	0.6329	0.1959	#_Summer_W_index
1994	1	20	1.275	0.1807	#_Summer_W_index
1995	1	20	1.0623	0.1733	#_Summer_W_index
1996	1	20	1.1433	0.174	#_Summer_W_index
1997	1	20	0.8891	0.176	#_Summer_W_index
1998	1	20	0.7765	0.1944	#_Summer_W_index
1999	1	20	0.6045	0.1965	#_Summer_W_index
2000	1	20	1.2735	0.1597	#_Summer_W_index
2001	1	20	0.715	0.2618	#_Summer_W_index
2002	1	20	0.9813	0.1731	#_Summer_W_index
2003	1	20	0.5011	0.2156	#_Summer_W_index
2004	1	20	1.2281	0.1663	#_Summer_W_index
2005	1	20	1.3698	0.1721	#_Summer_W_index
2006	1	20	1.2859	0.152	#_Summer_W_index
2007	1	20	1.0014	0.1856	#_Summer_W_index
2008	1	20	0.9855	0.1594	#_Summer_W_index
2009	1	20	0.5551	0.1615	#_Summer_W_index
2010	1	20	1.4043	0.1593	#_Summer_W_index
2011	1	20	1.8601	0.1579	#_Summer_W_index
-1972	1	21	3.2744	0.2263	#_Fall_E_index
-1973	1	21	0.5383	0.1862	#_Fall_E_index
-1974	1	21	0.6326	0.2413	#_Fall_E_index
-1975	1	21	0.5233	0.2196	#_Fall_E_index
-1976	1	21	0.6325	0.2043	#_Fall_E_index
-1977	1	21	0.8727	0.2405	#_Fall_E_index
-1978	1	21	0.3951	0.1843	#_Fall_E_index
-1979	1	21	0.3126	0.2131	#_Fall_E_index
-1980	1	21	0.5844	0.1974	#_Fall_E_index
-1981	1	21	2.0198	0.1905	#_Fall_E_index
-1982	1	21	2.2453	0.1505	#_Fall_E_index
-1983	1	21	0.323	0.1951	#_Fall_E_index
-1984	1	21	0.265	0.2934	#_Fall_E_index
-1985	1	21	0.1218	0.2987	#_Fall_E_index
-1986	1	21	0.1147	0.6042	#_Fall_E_index
-1987	1	21	0.1913	0.4125	#_Fall_E_index
-1988	1	21	0.2506	0.3648	#_Fall_E_index
-1989	1	21	3.7366	0.2776	#_Fall_E_index
-1990	1	21	2.0826	0.258	#_Fall_E_index
-1991	1	21	2.384	0.2255	#_Fall_E_index
-1992	1	21	0.1947	0.3295	#_Fall_E_index
```

| | | | | | |
|---|---|---|---|---|---|
| -1993 | 1 | 21 | 1.4128 | 0.2926 | #_Fall_E_index |
| -1994 | 1 | 21 | 0.3466 | 0.2421 | #_Fall_E_index |
| -1995 | 1 | 21 | 0.7218 | 0.2399 | #_Fall_E_index |
| -1996 | 1 | 21 | 0.5483 | 0.2783 | #_Fall_E_index |
| -1997 | 1 | 21 | 0.9211 | 0.2987 | #_Fall_E_index |
| -1998 | 1 | 21 | 0.2249 | 0.2984 | #_Fall_E_index |
| -1999 | 1 | 21 | 0.5978 | 0.2834 | #_Fall_E_index |
| -2000 | 1 | 21 | 1.6395 | 0.2292 | #_Fall_E_index |
| -2001 | 1 | 21 | 0.5169 | 0.3698 | #_Fall_E_index |
| -2002 | 1 | 21 | 0.4204 | 0.2956 | #_Fall_E_index |
| -2003 | 1 | 21 | 1.2318 | 0.22 | #_Fall_E_index |
| -2004 | 1 | 21 | 0.3355 | 0.3122 | #_Fall_E_index |
| -2005 | 1 | 21 | 0.7299 | 0.2441 | #_Fall_E_index |
| -2006 | 1 | 21 | 2.8423 | 0.1829 | #_Fall_E_index |
| -2007 | 1 | 21 | 1.8403 | 0.2456 | #_Fall_E_index |
| -2008 | 1 | 21 | 0.3737 | 0.2692 | #_Fall_E_index |
| -2009 | 1 | 21 | 3.0438 | 0.2322 | #_Fall_E_index |
| -2010 | 1 | 21 | 0.3534 | 0.354 | #_Fall_E_index |
| -2011 | 1 | 21 | 0.2038 | 0.427 | #_Fall_E_index |
| 1972 | 1 | 22 | 3.5159 | 0.1569 | #_Fall_W_index |
| 1973 | 1 | 22 | 1.8579 | 0.1642 | #_Fall_W_index |
| 1974 | 1 | 22 | 0.5893 | 0.2069 | #_Fall_W_index |
| 1975 | 1 | 22 | 0.8492 | 0.193 | #_Fall_W_index |
| 1976 | 1 | 22 | 0.8068 | 0.1792 | #_Fall_W_index |
| 1977 | 1 | 22 | 0.8605 | 0.1827 | #_Fall_W_index |
| 1978 | 1 | 22 | 0.6528 | 0.2437 | #_Fall_W_index |
| 1979 | 1 | 22 | 0.9858 | 0.1826 | #_Fall_W_index |
| 1980 | 1 | 22 | 3.7524 | 0.1437 | #_Fall_W_index |
| 1981 | 1 | 22 | 1.3545 | 0.1607 | #_Fall_W_index |
| 1982 | 1 | 22 | 0.9019 | 0.1692 | #_Fall_W_index |
| 1983 | 1 | 22 | 0.7632 | 0.2335 | #_Fall_W_index |
| 1984 | 1 | 22 | 0.2977 | 0.2224 | #_Fall_W_index |
| 1985 | 1 | 22 | 0.4488 | 0.1949 | #_Fall_W_index |
| 1986 | 1 | 22 | 0.4198 | 0.1742 | #_Fall_W_index |
| 1987 | 1 | 22 | 0.1542 | 0.209 | #_Fall_W_index |
| 1988 | 1 | 22 | 0.3524 | 0.1643 | #_Fall_W_index |
| 1989 | 1 | 22 | 0.7427 | 0.1521 | #_Fall_W_index |
| 1990 | 1 | 22 | 0.8295 | 0.1365 | #_Fall_W_index |
| 1991 | 1 | 22 | 0.9302 | 0.1253 | #_Fall_W_index |
| 1992 | 1 | 22 | 0.2689 | 0.1597 | #_Fall_W_index |
| 1993 | 1 | 22 | 0.4971 | 0.1486 | #_Fall_W_index |
| 1994 | 1 | 22 | 1.4425 | 0.1302 | #_Fall_W_index |
| 1995 | 1 | 22 | 1.7244 | 0.1177 | #_Fall_W_index |
| 1996 | 1 | 22 | 0.7252 | 0.1407 | #_Fall_W_index |
| 1997 | 1 | 22 | 1.2111 | 0.1338 | #_Fall_W_index |
| 1998 | 1 | 22 | 0.5698 | 0.1538 | #_Fall_W_index |
| 1999 | 1 | 22 | 1.2337 | 0.1282 | #_Fall_W_index |
| 2000 | 1 | 22 | 0.7732 | 0.1287 | #_Fall_W_index |
| 2001 | 1 | 22 | 0.5977 | 0.1441 | #_Fall_W_index |
| 2002 | 1 | 22 | 0.5656 | 0.1393 | #_Fall_W_index |
| 2003 | 1 | 22 | 1.0151 | 0.1341 | #_Fall_W_index |
| 2004 | 1 | 22 | 1.6319 | 0.1159 | #_Fall_W_index |
| 2005 | 1 | 22 | 1.2243 | 0.1083 | #_Fall_W_index |
| 2006 | 1 | 22 | 0.9597 | 0.1322 | #_Fall_W_index |
| 2007 | 1 | 22 | 0.6961 | 0.1542 | #_Fall_W_index |
| 2008 | 1 | 22 | 0.4379 | 0.1201 | #_Fall_W_index |
| 2009 | 1 | 22 | 1.8892 | 0.0999 | #_Fall_W_index |
| 2010 | 1 | 22 | 0.6795 | 0.1478 | #_Fall_W_index |
| 2011 | 1 | 22 | 0.7917 | 0.1401 | #_Fall_W_index |
| 1996 | 1 | 24 | 0.3197 | 0.9198 | #_NMFS_BLL_E_index |
| 1997 | 1 | 24 | 0.2061 | 0.9211 | #_NMFS_BLL_E_index |
| 1999 | 1 | 24 | 1.1974 | 0.4896 | #_NMFS_BLL_E_index |
| 2000 | 1 | 24 | 0.1187 | 0.9225 | #_NMFS_BLL_E_index |
| 2001 | 1 | 24 | 0.4705 | 0.6116 | #_NMFS_BLL_E_index |
| 2002 | 1 | 24 | 0.5237 | 0.7163 | #_NMFS_BLL_E_index |
| 2003 | 1 | 24 | 0.7802 | 0.4908 | #_NMFS_BLL_E_index |
| 2004 | 1 | 24 | 0.8383 | 0.5409 | #_NMFS_BLL_E_index |
| 2005 | 1 | 24 | 0.6538 | 0.9196 | #_NMFS_BLL_E_index |
| 2006 | 1 | 24 | 0.5971 | 0.7157 | #_NMFS_BLL_E_index |
| 2007 | 1 | 24 | 1.1281 | 0.7172 | #_NMFS_BLL_E_index |
| 2009 | 1 | 24 | 1.7333 | 0.4156 | #_NMFS_BLL_E_index |
| 2010 | 1 | 24 | 2.5694 | 0.3175 | #_NMFS_BLL_E_index |
| 2011 | 1 | 24 | 2.8638 | 0.2194 | #_NMFS_BLL_E_index |
| 1996 | 1 | 23 | 0.0878 | 0.9637 | #_NMFS_BLL_W_index |
| 1997 | 1 | 23 | 1.0248 | 0.4844 | #_NMFS_BLL_W_index |
| 1999 | 1 | 23 | 0.1861 | 0.7486 | #_NMFS_BLL_W_index |
| 2000 | 1 | 23 | 1.3118 | 0.2427 | #_NMFS_BLL_W_index |
| 2001 | 1 | 23 | 0.9689 | 0.2515 | #_NMFS_BLL_W_index |
| 2002 | 1 | 23 | 0.8728 | 0.2112 | #_NMFS_BLL_W_index |
| 2003 | 1 | 23 | 0.9471 | 0.2748 | #_NMFS_BLL_W_index |
| 2004 | 1 | 23 | 1.0931 | 0.2732 | #_NMFS_BLL_W_index |
| 2006 | 1 | 23 | 0.8043 | 0.3523 | #_NMFS_BLL_W_index |
| 2007 | 1 | 23 | 0.8349 | 0.401 | #_NMFS_BLL_W_index |
| 2008 | 1 | 23 | 0.9418 | 0.4665 | #_NMFS_BLL_W_index |
| 2009 | 1 | 23 | 1.7631 | 0.2489 | #_NMFS_BLL_W_index |
| 2010 | 1 | 23 | 0.7251 | 0.4311 | #_NMFS_BLL_W_index |
| 2011 | 1 | 23 | 2.4383 | 0.1452 | #_NMFS_BLL_W_index |
| 1981 | 1 | 26 | 0.498 | 0.5711 | #_MRIP_E_index |
| 1982 | 1 | 26 | 0.328 | 0.6051 | #_MRIP_E_index |
| 1983 | 1 | 26 | 1.101 | 0.5719 | #_MRIP_E_index |
| 1984 | 1 | 26 | 0.645 | 0.7341 | #_MRIP_E_index |
| 1985 | 1 | 26 | 0.793 | 0.582 | #_MRIP_E_index |
| 1986 | 1 | 26 | 0.308 | 0.5632 | #_MRIP_E_index |
| 1987 | 1 | 26 | 0.545 | 0.301 | #_MRIP_E_index |
| 1988 | 1 | 26 | 0.172 | 0.3682 | #_MRIP_E_index |

| | | | | | |
|---|---|---|---|---|---|
| 1989 | 1 | 26 | 0.103 | 0.3879 | #_MRIP_E_index |
| 1990 | 1 | 26 | 0.106 | 0.4251 | #_MRIP_E_index |
| 1991 | 1 | 26 | 0.267 | 0.3564 | #_MRIP_E_index |
| 1992 | 1 | 26 | 0.56 | 0.2747 | #_MRIP_E_index |
| 1993 | 1 | 26 | 0.465 | 0.3113 | #_MRIP_E_index |
| 1994 | 1 | 26 | 0.299 | 0.339 | #_MRIP_E_index |
| 1995 | 1 | 26 | 0.305 | 0.3682 | #_MRIP_E_index |
| 1996 | 1 | 26 | 0.381 | 0.3636 | #_MRIP_E_index |
| 1997 | 1 | 26 | 1.033 | 0.3001 | #_MRIP_E_index |
| 1998 | 1 | 26 | 1.559 | 0.2029 | #_MRIP_E_index |
| 1999 | 1 | 26 | 1.207 | 0.1727 | #_MRIP_E_index |
| 2000 | 1 | 26 | 1.158 | 0.1932 | #_MRIP_E_index |
| 2001 | 1 | 26 | 0.972 | 0.2048 | #_MRIP_E_index |
| 2002 | 1 | 26 | 1.517 | 0.201 | #_MRIP_E_index |
| 2003 | 1 | 26 | 1.277 | 0.1971 | #_MRIP_E_index |
| 2004 | 1 | 26 | 1.083 | 0.1756 | #_MRIP_E_index |
| 2005 | 1 | 26 | 0.845 | 0.1922 | #_MRIP_E_index |
| 2006 | 1 | 26 | 0.988 | 0.2077 | #_MRIP_E_index |
| 2007 | 1 | 26 | 2.866 | 0.2155 | #_MRIP_E_index |
| 2008 | 1 | 26 | 2.69 | 0.1795 | #_MRIP_E_index |
| 2009 | 1 | 26 | 1.708 | 0.2366 | #_MRIP_E_index |
| 2010 | 1 | 26 | 3.439 | 0.229 | #_MRIP_E_index |
| 2011 | 1 | 26 | 1.781 | 0.2328 | #_MRIP_E_index |
| 1981 | 1 | 27 | 0.253 | 0.7507 | #_MRIP_W_index |
| 1982 | 1 | 27 | 0.546 | 0.4647 | #_MRIP_W_index |
| 1983 | 1 | 27 | 1.206 | 0.2889 | #_MRIP_W_index |
| 1984 | 1 | 27 | 0.574 | 0.3206 | #_MRIP_W_index |
| 1985 | 1 | 27 | 0.25 | 0.3307 | #_MRIP_W_index |
| 1986 | 1 | 27 | 0.526 | 0.3169 | #_MRIP_W_index |
| 1987 | 1 | 27 | 0.621 | 0.3409 | #_MRIP_W_index |
| 1988 | 1 | 27 | 0.599 | 0.3289 | #_MRIP_W_index |
| 1989 | 1 | 27 | 0.56 | 0.3518 | #_MRIP_W_index |
| 1990 | 1 | 27 | 0.381 | 0.3178 | #_MRIP_W_index |
| 1991 | 1 | 27 | 0.918 | 0.3215 | #_MRIP_W_index |
| 1992 | 1 | 27 | 0.977 | 0.27 | #_MRIP_W_index |
| 1993 | 1 | 27 | 1.032 | 0.2804 | #_MRIP_W_index |
| 1994 | 1 | 27 | 1.155 | 0.2728 | #_MRIP_W_index |
| 1995 | 1 | 27 | 1.312 | 0.25 | #_MRIP_W_index |
| 1996 | 1 | 27 | 1.01 | 0.2529 | #_MRIP_W_index |
| 1997 | 1 | 27 | 0.886 | 0.2539 | #_MRIP_W_index |
| 1998 | 1 | 27 | 0.921 | 0.2539 | #_MRIP_W_index |
| 1999 | 1 | 27 | 0.552 | 0.2567 | #_MRIP_W_index |
| 2000 | 1 | 27 | 0.68 | 0.2586 | #_MRIP_W_index |
| 2001 | 1 | 27 | 0.643 | 0.2672 | #_MRIP_W_index |
| 2002 | 1 | 27 | 0.804 | 0.2567 | #_MRIP_W_index |
| 2003 | 1 | 27 | 0.667 | 0.2548 | #_MRIP_W_index |
| 2004 | 1 | 27 | 0.616 | 0.251 | #_MRIP_W_index |
| 2005 | 1 | 27 | 0.884 | 0.2529 | #_MRIP_W_index |
| 2006 | 1 | 27 | 0.711 | 0.2299 | #_MRIP_W_index |
| 2007 | 1 | 27 | 1.866 | 0.2453 | #_MRIP_W_index |
| 2008 | 1 | 27 | 1.775 | 0.2443 | #_MRIP_W_index |
| 2009 | 1 | 27 | 2.256 | 0.25 | #_MRIP_W_index |
| 2010 | 1 | 27 | 3.308 | 0.3048 | #_MRIP_W_index |
| 2011 | 1 | 27 | 2.512 | 0.2605 | #_MRIP_W_index |
| 1986 | 1 | 28 | 0.114 | 0.704732569 | #_HBT_E_index |
| 1987 | 1 | 28 | 0.125 | 0.705424885 | #_HBT_E_index |
| 1988 | 1 | 28 | 0.166 | 0.689376455 | #_HBT_E_index |
| 1989 | 1 | 28 | 0.188 | 0.690782393 | #_HBT_E_index |
| 1990 | 1 | 28 | 0.204 | 0.694288533 | #_HBT_E_index |
| 1991 | 1 | 28 | 0.243 | 0.697084503 | #_HBT_E_index |
| 1992 | 1 | 28 | 0.359 | 0.690079673 | #_HBT_E_index |
| 1993 | 1 | 28 | 0.468 | 0.679478977 | #_HBT_E_index |
| 1994 | 1 | 28 | 0.372 | 0.689376455 | #_HBT_E_index |
| 1995 | 1 | 28 | 0.313 | 0.690782393 | #_HBT_E_index |
| 1996 | 1 | 28 | 0.468 | 0.675920382 | #_HBT_E_index |
| 1997 | 1 | 28 | 0.783 | 0.672349228 | #_HBT_E_index |
| 1998 | 1 | 28 | 1.2 | 0.677345326 | #_HBT_E_index |
| 1999 | 1 | 28 | 1.149 | 0.673064465 | #_HBT_E_index |
| 2000 | 1 | 28 | 1.145 | 0.673779199 | #_HBT_E_index |
| 2001 | 1 | 28 | 1.1 | 0.674493429 | #_HBT_E_index |
| 2002 | 1 | 28 | 1.602 | 0.675920382 | #_HBT_E_index |
| 2003 | 1 | 28 | 1.443 | 0.675207157 | #_HBT_E_index |
| 2004 | 1 | 28 | 1.147 | 0.675920382 | #_HBT_E_index |
| 2005 | 1 | 28 | 1.165 | 0.681608117 | #_HBT_E_index |
| 2006 | 1 | 28 | 0.68 | 0.680189191 | #_HBT_E_index |
| 2007 | 1 | 28 | 1.44 | 0.701263592 | #_HBT_E_index |
| 2008 | 1 | 28 | 1.819 | 0.700568314 | #_HBT_E_index |
| 2009 | 1 | 28 | 3.357 | 0.70818922 | #_HBT_E_index |
| 2010 | 1 | 28 | 3.152 | 0.692186341 | #_HBT_E_index |
| 2011 | 1 | 28 | 1.798 | 0.810651078 | #_HBT_E_index |
| 1986 | 1 | 29 | 0.642 | 0.227042423 | #_HBT_W_index |
| 1987 | 1 | 29 | 0.768 | 0.200954069 | #_HBT_W_index |
| 1988 | 1 | 29 | 0.929 | 0.199013104 | #_HBT_W_index |
| 1989 | 1 | 29 | 0.812 | 0.194155801 | #_HBT_W_index |
| 1990 | 1 | 29 | 0.587 | 0.193183512 | #_HBT_W_index |
| 1991 | 1 | 29 | 0.949 | 0.212575746 | #_HBT_W_index |
| 1992 | 1 | 29 | 1.667 | 0.215474556 | #_HBT_W_index |
| 1993 | 1 | 29 | 1.691 | 0.206770131 | #_HBT_W_index |
| 1994 | 1 | 29 | 1.331 | 0.194155801 | #_HBT_W_index |
| 1995 | 1 | 29 | 1.4 | 0.213542315 | #_HBT_W_index |
| 1996 | 1 | 29 | 1.457 | 0.241438383 | #_HBT_W_index |
| 1997 | 1 | 29 | 1.577 | 0.213542315 | #_HBT_W_index |
| 1998 | 1 | 29 | 1.343 | 0.219335421 | #_HBT_W_index |
| 1999 | 1 | 29 | 0.421 | 0.21160888 | #_HBT_W_index |
| 2000 | 1 | 29 | 0.567 | 0.226080136 | #_HBT_W_index |

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2001	1	29	0.821	0.289807082		#_HBT_W_index
2002	1	29	0.711	0.267161184		#_HBT_W_index
2003	1	29	0.609	0.247176132		#_HBT_W_index
2004	1	29	0.459	0.24430876		#_HBT_W_index
2005	1	29	0.507	0.242395508		#_HBT_W_index
2006	1	29	0.598	0.270950212		#_HBT_W_index
2007	1	29	1.098	0.308511365		#_HBT_W_index
2008	1	29	1.185	0.517368499		#_HBT_W_index
2009	1	29	1.24	0.290745981		#_HBT_W_index
2010	1	29	1.253	0.364546382		#_HBT_W_index
2011	1	29	1.376	0.525536175		#_HBT_W_index
#_SEAMAP groundfish index with DISL data
1982	1	19	1.2795	0.5567	#_DISL_Sum_E_index
1983	1	19	1.0482	0.6401	#_DISL_Sum_E_index
1984	1	19	0.0534	0.8136	#_DISL_Sum_E_index
1985	1	19	0.3899	0.399	#_DISL_Sum_E_index
1986	1	19	0.046	0.919	#_DISL_Sum_E_index
1987	1	19	0.585	0.2739	#_DISL_Sum_E_index
1988	1	19	0.684	0.4683	#_DISL_Sum_E_index
1989	1	19	2.4489	0.4525	#_DISL_Sum_E_index
1990	1	19	1.0921	0.2693	#_DISL_Sum_E_index
1991	1	19	1.1373	0.34	#_DISL_Sum_E_index
1992	1	19	3.0769	0.4212	#_DISL_Sum_E_index
1993	1	19	0.3517	0.4772	#_DISL_Sum_E_index
1994	1	19	0.9481	0.3132	#_DISL_Sum_E_index
1995	1	19	0.3593	0.506	#_DISL_Sum_E_index
1996	1	19	0.5434	0.3517	#_DISL_Sum_E_index
1997	1	19	0.7403	0.3457	#_DISL_Sum_E_index
1998	1	19	0.3116	0.8449	#_DISL_Sum_E_index
1999	1	19	0.1385	0.564	#_DISL_Sum_E_index
2000	1	19	0.6111	0.3355	#_DISL_Sum_E_index
2001	1	19	0.2328	0.5349	#_DISL_Sum_E_index
2002	1	19	0.204	0.5145	#_DISL_Sum_E_index
2003	1	19	0.7617	0.4981	#_DISL_Sum_E_index
2004	1	19	0.6962	0.4502	#_DISL_Sum_E_index
2005	1	19	1.6259	0.4769	#_DISL_Sum_E_index
2006	1	19	0.3275	0.3703	#_DISL_Sum_E_index
2007	1	19	2.9675	0.2804	#_DISL_Sum_E_index
2008	1	19	3.7999	0.2662	#_DISL_Sum_E_index
2009	1	19	0.5502	0.2608	#_DISL_Sum_E_index
2010	1	19	2.4658	0.3644	#_DISL_Sum_E_index
2011	1	19	0.5233	0.3849	#_DISL_Sum_E_index
1972	1	21	3.279	0.2279	#_DISL_Fall_E_index
1973	1	21	0.5331	0.1894	#_DISL_Fall_E_index
1974	1	21	0.6179	0.2411	#_DISL_Fall_E_index
1975	1	21	0.5142	0.2322	#_DISL_Fall_E_index
1976	1	21	0.6228	0.2111	#_DISL_Fall_E_index
1977	1	21	0.8583	0.2425	#_DISL_Fall_E_index
1978	1	21	0.3874	0.1904	#_DISL_Fall_E_index
1979	1	21	0.3081	0.2114	#_DISL_Fall_E_index
1980	1	21	0.5748	0.1934	#_DISL_Fall_E_index
1981	1	21	1.9983	0.1961	#_DISL_Fall_E_index
1982	1	21	2.2476	0.1523	#_DISL_Fall_E_index
1983	1	21	0.3182	0.2021	#_DISL_Fall_E_index
1984	1	21	0.2587	0.2851	#_DISL_Fall_E_index
1985	1	21	0.1183	0.3016	#_DISL_Fall_E_index
1986	1	21	0.1097	0.579	#_DISL_Fall_E_index
1987	1	21	0.1852	0.4056	#_DISL_Fall_E_index
1988	1	21	0.2453	0.3525	#_DISL_Fall_E_index
1989	1	21	3.7635	0.2824	#_DISL_Fall_E_index
1990	1	21	2.1418	0.2538	#_DISL_Fall_E_index
1991	1	21	2.4028	0.2184	#_DISL_Fall_E_index
1992	1	21	0.1932	0.3493	#_DISL_Fall_E_index
1993	1	21	1.3914	0.2864	#_DISL_Fall_E_index
1994	1	21	0.3439	0.2398	#_DISL_Fall_E_index
1995	1	21	0.7211	0.2317	#_DISL_Fall_E_index
1996	1	21	0.5548	0.2874	#_DISL_Fall_E_index
1997	1	21	0.9297	0.2988	#_DISL_Fall_E_index
1998	1	21	0.2211	0.3095	#_DISL_Fall_E_index
1999	1	21	0.6077	0.298	#_DISL_Fall_E_index
2000	1	21	1.6791	0.2376	#_DISL_Fall_E_index
2001	1	21	0.5215	0.3769	#_DISL_Fall_E_index
2002	1	21	0.4148	0.2964	#_DISL_Fall_E_index
2003	1	21	1.2279	0.2177	#_DISL_Fall_E_index
2004	1	21	0.3297	0.323	#_DISL_Fall_E_index
2005	1	21	0.7323	0.2597	#_DISL_Fall_E_index
2006	1	21	2.8692	0.1853	#_DISL_Fall_E_index
2007	1	21	1.8366	0.2324	#_DISL_Fall_E_index
2008	1	21	0.3735	0.2942	#_DISL_Fall_E_index
2009	1	21	3.0412	0.2445	#_DISL_Fall_E_index
2010	1	21	0.3246	0.3558	#_DISL_Fall_E_index
2011	1	21	0.2019	0.4042	#_DISL_Fall_E_index
#


14	#_N_fleets_with_discard


#_discard_units (1=same_as_catchunits(bio/num); 2=fraction; 3=numbers)
```

#_discard_errtype: >0 for DF of T-dist(read CV below); 0 for normal with CV; -1 for normal with se; -2 for lognormal

| #Fleet | Disc_units | err_type |
|---|---|---|
| 1 | 3 | -2 |
| 2 | 3 | -2 |
| 3 | 3 | -2 |
| 4 | 3 | -2 |
| 5 | 1 | -2 |
| 6 | 1 | -2 |
| 7 | 1 | -2 |
| 8 | 1 | -2 |
| 9 | 1 | -2 |
| 10 | 1 | -2 |
| 11 | 1 | -2 |
| 12 | 1 | -2 |
| 13 | 1 | -2 |
| 14 | 1 | -2 |

355 #N_discard_observations

| #_year | seas | index | obs | err |
|---|---|---|---|---|
| 1990 | 1 | 1 | 160.529 | 0.5 |
| 1991 | 1 | 1 | 283.019 | 0.5 |
| 1992 | 1 | 1 | 70.130 | 0.5 |
| 1993 | 1 | 1 | 51.412 | 0.5 |
| 1994 | 1 | 1 | 51.153 | 0.5 |
| 1995 | 1 | 1 | 38.470 | 0.5 |
| 1996 | 1 | 1 | 75.826 | 0.5 |
| 1997 | 1 | 1 | 70.864 | 0.5 |
| 1998 | 1 | 1 | 95.073 | 0.5 |
| 1999 | 1 | 1 | 104.236 | 0.5 |
| 2000 | 1 | 1 | 142.410 | 0.5 |
| 2001 | 1 | 1 | 131.998 | 0.5 |
| 2002 | 1 | 1 | 178.383 | 0.5 |
| 2003 | 1 | 1 | 168.982 | 0.5 |
| 2004 | 1 | 1 | 77.097 | 0.5 |
| 2005 | 1 | 1 | 135.848 | 0.5 |
| 2006 | 1 | 1 | 106.061 | 0.5 |
| 2007 | 1 | 1 | 676.711 | 0.5 |
| 2008 | 1 | 1 | 166.436 | 0.5 |
| 2009 | 1 | 1 | 1936.860 | 0.5 |
| 2010 | 1 | 1 | 1243.613 | 0.5 |
| 2011 | 1 | 1 | 771.486 | 0.5 |
| 1990 | 1 | 2 | 514.832 | 0.5 |
| 1991 | 1 | 2 | 789.015 | 0.5 |
| 1992 | 1 | 2 | 268.014 | 0.5 |
| 1993 | 1 | 2 | 316.531 | 0.5 |
| 1994 | 1 | 2 | 314.558 | 0.5 |
| 1995 | 1 | 2 | 313.774 | 0.5 |
| 1996 | 1 | 2 | 780.752 | 0.5 |
| 1997 | 1 | 2 | 665.234 | 0.5 |
| 1998 | 1 | 2 | 780.944 | 0.5 |
| 1999 | 1 | 2 | 735.395 | 0.5 |
| 2000 | 1 | 2 | 650.846 | 0.5 |
| 2001 | 1 | 2 | 749.238 | 0.5 |
| 2002 | 1 | 2 | 729.981 | 0.5 |
| 2003 | 1 | 2 | 678.232 | 0.5 |
| 2004 | 1 | 2 | 615.041 | 0.5 |
| 2005 | 1 | 2 | 848.414 | 0.5 |
| 2006 | 1 | 2 | 434.172 | 0.5 |
| 2007 | 1 | 2 | 332.439 | 0.5 |
| 2008 | 1 | 2 | 557.104 | 0.5 |
| 2009 | 1 | 2 | 103.320 | 0.5 |
| 2010 | 1 | 2 | 267.798 | 0.5 |
| 2011 | 1 | 2 | 190.414 | 0.5 |
| 1990 | 1 | 3 | 9.785 | 0.5 |
| 1991 | 1 | 3 | 11.759 | 0.5 |
| 1992 | 1 | 3 | 2.891 | 0.5 |
| 1993 | 1 | 3 | 1.955 | 0.5 |
| 1994 | 1 | 3 | 2.330 | 0.5 |
| 1995 | 1 | 3 | 1.522 | 0.5 |
| 1996 | 1 | 3 | 2.206 | 0.5 |
| 1997 | 1 | 3 | 2.177 | 0.5 |
| 1998 | 1 | 3 | 1.701 | 0.5 |
| 1999 | 1 | 3 | 2.283 | 0.5 |
| 2000 | 1 | 3 | 2.019 | 0.5 |
| 2001 | 1 | 3 | 1.833 | 0.5 |
| 2002 | 1 | 3 | 2.214 | 0.5 |
| 2003 | 1 | 3 | 2.054 | 0.5 |

| | | | | |
|---|---|---|---|---|
| 2004 | 1 | 3 | 2.658 | 0.5 |
| 2005 | 1 | 3 | 2.239 | 0.5 |
| 2006 | 1 | 3 | 2.911 | 0.5 |
| 2007 | 1 | 3 | 17.188 | 0.5 |
| 2008 | 1 | 3 | 2.449 | 0.5 |
| 2009 | 1 | 3 | 6.030 | 0.5 |
| 2010 | 1 | 3 | 8.337 | 0.5 |
| 2011 | 1 | 3 | 15.046 | 0.5 |
| 1990 | 1 | 4 | 0.830 | 0.5 |
| 1991 | 1 | 4 | 2.521 | 0.5 |
| 1992 | 1 | 4 | 0.400 | 0.5 |
| 1993 | 1 | 4 | 0.851 | 0.5 |
| 1994 | 1 | 4 | 1.248 | 0.5 |
| 1995 | 1 | 4 | 1.635 | 0.5 |
| 1996 | 1 | 4 | 1.398 | 0.5 |
| 1997 | 1 | 4 | 0.818 | 0.5 |
| 1998 | 1 | 4 | 0.834 | 0.5 |
| 1999 | 1 | 4 | 2.979 | 0.5 |
| 2000 | 1 | 4 | 2.137 | 0.5 |
| 2001 | 1 | 4 | 1.261 | 0.5 |
| 2002 | 1 | 4 | 1.889 | 0.5 |
| 2003 | 1 | 4 | 4.289 | 0.5 |
| 2004 | 1 | 4 | 6.574 | 0.5 |
| 2005 | 1 | 4 | 5.853 | 0.5 |
| 2006 | 1 | 4 | 5.174 | 0.5 |
| -2007 | 1 | 4 | 0.000 | 0.5 |
| 2008 | 1 | 4 | 0.491 | 0.5 |
| 2009 | 1 | 4 | 0.166 | 0.5 |
| 2010 | 1 | 4 | 0.043 | 0.5 |
| 2011 | 1 | 4 | 0.006 | 0.5 |
| 1981 | 1 | 5 | 51.548 | 0.5 |
| 1982 | 1 | 5 | 16.659 | 0.5 |
| 1983 | 1 | 5 | 0.479 | 0.5 |
| 1984 | 1 | 5 | 25.159 | 0.5 |
| 1985 | 1 | 5 | 15.349 | 0.5 |
| 1986 | 1 | 5 | 39.599 | 0.5 |
| 1987 | 1 | 5 | 62.666 | 0.5 |
| 1988 | 1 | 5 | 64.040 | 0.5 |
| 1989 | 1 | 5 | 168.435 | 0.5 |
| 1990 | 1 | 5 | 424.721 | 0.5 |
| 1991 | 1 | 5 | 769.651 | 0.5 |
| 1992 | 1 | 5 | 847.379 | 0.5 |
| 1993 | 1 | 5 | 900.495 | 0.5 |
| 1994 | 1 | 5 | 709.312 | 0.5 |
| 1995 | 1 | 5 | 393.610 | 0.5 |
| 1996 | 1 | 5 | 878.667 | 0.5 |
| 1997 | 1 | 5 | 1703.537 | 0.5 |
| 1998 | 1 | 5 | 781.128 | 0.5 |
| 1999 | 1 | 5 | 1083.969 | 0.5 |
| 2000 | 1 | 5 | 978.455 | 0.5 |
| 2001 | 1 | 5 | 1095.368 | 0.5 |
| 2002 | 1 | 5 | 1501.272 | 0.5 |
| 2003 | 1 | 5 | 1447.141 | 0.5 |
| 2004 | 1 | 5 | 2042.088 | 0.5 |
| 2005 | 1 | 5 | 1330.296 | 0.5 |
| 2006 | 1 | 5 | 1913.881 | 0.5 |
| 2007 | 1 | 5 | 2525.639 | 0.5 |
| 2008 | 1 | 5 | 668.307 | 0.5 |
| 2009 | 1 | 5 | 937.089 | 0.5 |
| 2010 | 1 | 5 | 381.545 | 0.5 |
| 2011 | 1 | 5 | 343.198 | 0.5 |
| 1981 | 1 | 6 | 10.551 | 0.5 |
| 1982 | 1 | 6 | 14.963 | 0.5 |
| 1983 | 1 | 6 | 3.671 | 0.5 |
| -1984 | 1 | 6 | 0.000 | 0.5 |
| 1985 | 1 | 6 | 93.093 | 0.5 |
| 1986 | 1 | 6 | 5.272 | 0.5 |
| 1987 | 1 | 6 | 15.463 | 0.5 |
| 1988 | 1 | 6 | 181.540 | 0.5 |
| 1989 | 1 | 6 | 130.008 | 0.5 |
| 1990 | 1 | 6 | 199.581 | 0.5 |
| 1991 | 1 | 6 | 343.038 | 0.5 |
| 1992 | 1 | 6 | 239.695 | 0.5 |
| 1993 | 1 | 6 | 290.434 | 0.5 |
| 1994 | 1 | 6 | 377.895 | 0.5 |
| 1995 | 1 | 6 | 558.554 | 0.5 |
| 1996 | 1 | 6 | 139.802 | 0.5 |
| 1997 | 1 | 6 | 151.141 | 0.5 |
| 1998 | 1 | 6 | 155.640 | 0.5 |
| 1999 | 1 | 6 | 333.250 | 0.5 |
| 2000 | 1 | 6 | 123.306 | 0.5 |
| 2001 | 1 | 6 | 71.470 | 0.5 |
| 2002 | 1 | 6 | 82.585 | 0.5 |
| 2003 | 1 | 6 | 266.414 | 0.5 |
| 2004 | 1 | 6 | 401.279 | 0.5 |
| 2005 | 1 | 6 | 407.268 | 0.5 |
| 2006 | 1 | 6 | 511.576 | 0.5 |
| 2007 | 1 | 6 | 292.363 | 0.5 |
| 2008 | 1 | 6 | 226.577 | 0.5 |
| 2009 | 1 | 6 | 112.597 | 0.5 |
| 2010 | 1 | 6 | 8.681 | 0.5 |
| 2011 | 1 | 6 | 67.660 | 0.5 |
| 1990 | 1 | 7 | 33.485 | 0.5 |
| 1991 | 1 | 7 | 32.514 | 0.5 |
| 1992 | 1 | 7 | 25.686 | 0.5 |

| | | | | |
|---|---|---|---|---|
| 1993 | 1 | 7 | 27.191 | 0.5 |
| 1994 | 1 | 7 | 19.137 | 0.5 |
| -1995 | 1 | 7 | 0.000 | 0.5 |
| 1996 | 1 | 7 | 47.357 | 0.5 |
| 1997 | 1 | 7 | 145.427 | 0.5 |
| 1998 | 1 | 7 | 163.609 | 0.5 |
| 1999 | 1 | 7 | 109.930 | 0.5 |
| 2000 | 1 | 7 | 182.937 | 0.5 |
| 2001 | 1 | 7 | 166.822 | 0.5 |
| 2002 | 1 | 7 | 247.894 | 0.5 |
| 2003 | 1 | 7 | 217.624 | 0.5 |
| 2004 | 1 | 7 | 76.453 | 0.5 |
| 2005 | 1 | 7 | 43.765 | 0.5 |
| 2006 | 1 | 7 | 267.267 | 0.5 |
| 2007 | 1 | 7 | 310.466 | 0.5 |
| 2008 | 1 | 7 | 265.668 | 0.5 |
| 2009 | 1 | 7 | 332.307 | 0.5 |
| 2010 | 1 | 7 | 103.884 | 0.5 |
| 2011 | 1 | 7 | 243.191 | 0.5 |
| 1981 | 1 | 8 | 180.326 | 0.5 |
| 1982 | 1 | 8 | 181.278 | 0.5 |
| 1983 | 1 | 8 | 180.780 | 0.5 |
| 1984 | 1 | 8 | 180.326 | 0.5 |
| 1985 | 1 | 8 | 180.326 | 0.5 |
| 1986 | 1 | 8 | 172.405 | 0.5 |
| 1987 | 1 | 8 | 172.164 | 0.5 |
| 1988 | 1 | 8 | 228.068 | 0.5 |
| 1989 | 1 | 8 | 214.371 | 0.5 |
| 1990 | 1 | 8 | 167.931 | 0.5 |
| 1991 | 1 | 8 | 194.253 | 0.5 |
| 1992 | 1 | 8 | 277.476 | 0.5 |
| 1993 | 1 | 8 | 307.239 | 0.5 |
| 1994 | 1 | 8 | 409.424 | 0.5 |
| 1995 | 1 | 8 | 260.663 | 0.5 |
| 1996 | 1 | 8 | 252.035 | 0.5 |
| 1997 | 1 | 8 | 218.917 | 0.5 |
| 1998 | 1 | 8 | 150.965 | 0.5 |
| 1999 | 1 | 8 | 56.959 | 0.5 |
| 2000 | 1 | 8 | 59.240 | 0.5 |
| 2001 | 1 | 8 | 67.759 | 0.5 |
| 2002 | 1 | 8 | 79.538 | 0.5 |
| 2003 | 1 | 8 | 90.954 | 0.5 |
| 2004 | 1 | 8 | 71.153 | 0.5 |
| 2005 | 1 | 8 | 65.633 | 0.5 |
| 2006 | 1 | 8 | 94.376 | 0.5 |
| 2007 | 1 | 8 | 90.361 | 0.5 |
| 2008 | 1 | 8 | 49.594 | 0.5 |
| 2009 | 1 | 8 | 24.940 | 0.5 |
| 2010 | 1 | 8 | 21.956 | 0.5 |
| 2011 | 1 | 8 | 17.364 | 0.5 |
| 1991 | 1 | 9 | 119.128 | 0.5 |
| 1992 | 1 | 9 | 322.519 | 0.5 |
| 1993 | 1 | 9 | 267.299 | 0.5 |
| 1994 | 1 | 9 | 395.348 | 0.5 |
| 1995 | 1 | 9 | 373.652 | 0.5 |
| 1996 | 1 | 9 | 503.041 | 0.5 |
| 1997 | 1 | 9 | 405.851 | 0.5 |
| 1998 | 1 | 9 | 418.597 | 0.5 |
| 1999 | 1 | 9 | 499.850 | 0.5 |
| 2000 | 1 | 9 | 274.811 | 0.5 |
| 2001 | 1 | 9 | 261.631 | 0.5 |
| 2002 | 1 | 9 | 153.115 | 0.5 |
| 2003 | 1 | 9 | 466.757 | 0.5 |
| 2004 | 1 | 9 | 223.617 | 0.5 |
| 2005 | 1 | 9 | 144.575 | 0.5 |
| 2006 | 1 | 9 | 100.835 | 0.5 |
| 2007 | 1 | 9 | 224.966 | 0.5 |
| 2008 | 1 | 9 | 210.951 | 0.5 |
| 2009 | 1 | 9 | 696.804 | 0.5 |
| 2010 | 1 | 9 | 51.708 | 0.5 |
| 2011 | 1 | 9 | 170.873 | 0.5 |
| 1991 | 1 | 10 | 94.685 | 0.5 |
| 1992 | 1 | 10 | 164.140 | 0.5 |
| 1993 | 1 | 10 | 78.035 | 0.5 |
| 1994 | 1 | 10 | 52.136 | 0.5 |
| 1995 | 1 | 10 | 51.757 | 0.5 |
| 1996 | 1 | 10 | 54.827 | 0.5 |
| 1997 | 1 | 10 | 80.809 | 0.5 |
| 1998 | 1 | 10 | 81.316 | 0.5 |
| 1999 | 1 | 10 | 66.659 | 0.5 |
| 2000 | 1 | 10 | 82.290 | 0.5 |
| 2001 | 1 | 10 | 65.146 | 0.5 |
| 2002 | 1 | 10 | 164.643 | 0.5 |
| 2003 | 1 | 10 | 43.403 | 0.5 |
| 2004 | 1 | 10 | 45.313 | 0.5 |
| 2005 | 1 | 10 | 32.566 | 0.5 |
| 2006 | 1 | 10 | 17.996 | 0.5 |
| 2007 | 1 | 10 | 50.944 | 0.5 |
| -2008 | 1 | 10 | 0.000 | 0.5 |
| 2009 | 1 | 10 | 0.229 | 0.5 |
| 2010 | 1 | 10 | 3.401 | 0.5 |
| 2011 | 1 | 10 | 1.282 | 0.5 |
| 1997 | 1 | 11 | 96.636 | 0.5 |
| 1998 | 1 | 11 | 166.715 | 0.5 |
| 1999 | 1 | 11 | 194.850 | 0.5 |

| | | | | |
|---|---|---|---|---|
| 2000 | 1 | 11 | 486.259 | 0.5 |
| 2001 | 1 | 11 | 857.661 | 0.5 |
| 2002 | 1 | 11 | 810.308 | 0.5 |
| 2003 | 1 | 11 | 549.490 | 0.5 |
| 2004 | 1 | 11 | 379.867 | 0.5 |
| 2005 | 1 | 11 | 528.889 | 0.5 |
| 2006 | 1 | 11 | 505.109 | 0.5 |
| 2007 | 1 | 11 | 468.469 | 0.5 |
| 2008 | 1 | 11 | 1308.445 | 0.5 |
| 2009 | 1 | 11 | 1036.408 | 0.5 |
| 2010 | 1 | 11 | 1097.405 | 0.5 |
| 2011 | 1 | 11 | 1160.255 | 0.5 |
| 1997 | 1 | 12 | 4.330 | 0.5 |
| 1998 | 1 | 12 | 11.571 | 0.5 |
| 1999 | 1 | 12 | 28.425 | 0.5 |
| 2000 | 1 | 12 | 76.976 | 0.5 |
| 2001 | 1 | 12 | 33.609 | 0.5 |
| 2002 | 1 | 12 | 32.776 | 0.5 |
| 2003 | 1 | 12 | 75.882 | 0.5 |
| 2004 | 1 | 12 | 110.642 | 0.5 |
| 2005 | 1 | 12 | 127.018 | 0.5 |
| 2006 | 1 | 12 | 104.763 | 0.5 |
| 2007 | 1 | 12 | 97.917 | 0.5 |
| 2008 | 1 | 12 | 190.687 | 0.5 |
| 2009 | 1 | 12 | 167.291 | 0.5 |
| 2010 | 1 | 12 | 27.372 | 0.5 |
| 2011 | 1 | 12 | 177.106 | 0.5 |
| 1972 | -1 | 13 | 1118.000 | 0.1 |
| 1973 | 1 | -13 | 1270.000 | 0.5 |
| 1974 | 1 | -13 | 731.100 | 0.5 |
| 1975 | 1 | -13 | 1188.000 | 0.5 |
| 1976 | 1 | -13 | 1108.000 | 0.5 |
| 1977 | 1 | -13 | 1517.000 | 0.5 |
| 1978 | 1 | -13 | 257.400 | 0.5 |
| 1979 | 1 | -13 | 1133.000 | 0.5 |
| 1980 | 1 | -13 | 450.000 | 0.5 |
| 1981 | 1 | -13 | 1283.000 | 0.5 |
| 1982 | 1 | -13 | 1590.000 | 0.5 |
| 1983 | 1 | -13 | 1203.000 | 0.5 |
| 1984 | 1 | -13 | 864.800 | 0.5 |
| 1985 | 1 | -13 | 715.300 | 0.5 |
| 1986 | 1 | -13 | 234.500 | 0.5 |
| 1987 | 1 | -13 | 338.800 | 0.5 |
| 1988 | 1 | -13 | 409.200 | 0.5 |
| 1989 | 1 | -13 | 678.500 | 0.5 |
| 1990 | 1 | -13 | 2225.000 | 0.5 |
| 1991 | 1 | -13 | 1897.000 | 0.5 |
| 1992 | 1 | -13 | 1286.000 | 0.5 |
| 1993 | 1 | -13 | 752.900 | 0.5 |
| 1994 | 1 | -13 | 1155.000 | 0.5 |
| 1995 | 1 | -13 | 1566.000 | 0.5 |
| 1996 | 1 | -13 | 1200.000 | 0.5 |
| 1997 | 1 | -13 | 1793.000 | 0.5 |
| 1998 | 1 | -13 | 1611.000 | 0.5 |
| 1999 | 1 | -13 | 1799.000 | 0.5 |
| 2000 | 1 | -13 | 2183.000 | 0.5 |
| 2001 | 1 | -13 | 2308.000 | 0.5 |
| 2002 | 1 | -13 | 2178.000 | 0.5 |
| 2003 | 1 | -13 | 1265.000 | 0.5 |
| 2004 | 1 | -13 | 1402.000 | 0.5 |
| 2005 | 1 | -13 | 615.200 | 0.5 |
| 2006 | 1 | -13 | 1855.000 | 0.5 |
| 2007 | 1 | -13 | 1229.000 | 0.5 |
| 2008 | 1 | -13 | 165.300 | 0.5 |
| 2009 | 1 | -13 | 351.400 | 0.5 |
| 2010 | 1 | -13 | 191.700 | 0.5 |
| 2011 | -1 | -13 | 329.900 | 0.5 |
| 1972 | -1 | 14 | 20680.000 | 0.1 |
| 1973 | 1 | -14 | 14820.000 | 0.5 |
| 1974 | 1 | -14 | 18120.000 | 0.5 |
| 1975 | 1 | -14 | 8205.000 | 0.5 |
| 1976 | 1 | -14 | 30050.000 | 0.5 |
| 1977 | 1 | -14 | 11440.000 | 0.5 |
| 1978 | 1 | -14 | 6706.000 | 0.5 |
| 1979 | 1 | -14 | 23550.000 | 0.5 |
| 1980 | 1 | -14 | 25660.000 | 0.5 |
| 1981 | 1 | -14 | 54870.000 | 0.5 |
| 1982 | 1 | -14 | 24640.000 | 0.5 |
| 1983 | 1 | -14 | 18460.000 | 0.5 |
| 1984 | 1 | -14 | 13400.000 | 0.5 |
| 1985 | 1 | -14 | 10860.000 | 0.5 |
| 1986 | 1 | -14 | 5984.000 | 0.5 |
| 1987 | 1 | -14 | 12440.000 | 0.5 |
| 1988 | 1 | -14 | 10110.000 | 0.5 |
| 1989 | 1 | -14 | 10790.000 | 0.5 |
| 1990 | 1 | -14 | 40820.000 | 0.5 |
| 1991 | 1 | -14 | 41610.000 | 0.5 |
| 1992 | 1 | -14 | 31720.000 | 0.5 |
| 1993 | 1 | -14 | 34920.000 | 0.5 |
| 1994 | 1 | -14 | 34750.000 | 0.5 |
| 1995 | 1 | -14 | 48220.000 | 0.5 |
| 1996 | 1 | -14 | 37760.000 | 0.5 |
| 1997 | 1 | -14 | 27080.000 | 0.5 |
| 1998 | 1 | -14 | 56130.000 | 0.5 |
| 1999 | 1 | -14 | 23980.000 | 0.5 |

```
2000	1	-14	12320.000 0.5
2001	1	-14	24160.000 0.5
2002	1	-14	22210.000 0.5
2003	1	-14	30610.000 0.5
2004	1	-14	27990.000 0.5
2005	1	-14	12220.000 0.5
2006	1	-14	11630.000 0.5
2007	1	-14	6837.000  0.5
2008	1	-14	2714.000  0.5
2009	1	-14	3736.000  0.5
2010	1	-14	2785.000  0.5
2011	-1	-14	6273.000  0.5

#

0	#_N_meanbodywt_obs

30	#_DF_for_meanbodywt_T-distribution_like

#

#Population length bins are needed even if there are no size data

#  These define the resolution at which the mean weight-at-length, maturity-at-length and size-selectivity are based.
Calculations use the mid-length of the population bins.

2	# length bin method: 1=use databins(read below); 2=generate from binwidth,min,max below; 3=read vector

2	# binwidth for population size comp

8	# minimum size in the population (lower edge of first bin and size at age 0.00)

110	# maximum size in the population (lower edge of last bin)

#

-0.001	#_comp_tail_compression

1.00E-07	#_add_to_comp

0	#_combine males into females at or below this bin number

50	#_Nbins for length composition data

#lower edge of each length data bin (in cm)
```

```
12        14        16        18        20        22        24        26        28        30        32        34        36
          38        40        42        44        46        48        50        52        54        56        58        60
          62        64        66        68        70        72        74        76        78        80        82        84
          86        88        90        92        94        96        98        100       102       104       106       108
          110

0         #_N_Length_obs;  this can be 0 if there are no length data
#year     Seas      Flt_Svy   Gender    Part      Nsamp     N.12      N.14      N.16      N.18      N.20      N.22      N.24
          N.26      N.28      N.30      N.32      N.34      N.36      N.38      N.40      N.42      N.44      N.46      N.48
          N.50      N.52      N.54      N.56      N.58      N.60      N.62      N.64      N.66      N.68      N.70      N.72
          N.74      N.76      N.78      N.80      N.82      N.84      N.86      N.88      N.90      N.92      N.94      N.96
          N.98      N.100     N.102     N.104     N.106     N.108     N.110
#

21        #_N_age'_bins;  these are in terms of age', not true age.  Age' is estimated age taking into account any ageing bias
and imprecision

# following vector is the lower edge of the integer age' for each age' bin; by starting at age' = 1, any zero-year-old fish that
are in the expected values will be accumulated up into the age 1 bin.

0         1         2         3         4         5         6         7         8         9         10        11        12
          13        14        15        16    17    18    19    20

2         #_N_ageerror_definitions;  these define how SS will convert true age into a distribution of expected ages to represent
the effect of ageing bias and imprecision

#true_age=0         1         2         etc.,
-1        -1        -1        -1        -1        -1        -1        -1        -1        -1        -1        -1        -1
          -1        -1        -1        -1        -1        -1        -1        -1
0.001     0.845     0.552     0.517     0.661     0.860     0.800     1.035     1.008     1.141     1.579     2.019     2.019
          2.019     2.019     2.019     2.310     2.310     2.310     2.310     4.489

-1        -1        -1        -1        -1        -1        -1        -1        -1        -1        -1        -1        -1
          -1        -1        -1        -1        -1        -1        -1        -1
0.001     0.001     0.001     0.001     0.001     0.001     0.001     0.001     0.001     0.001     0.001     0.001     0.001
          0.001     0.001     0.001     0.001     0.001     0.001     0.001     0.001
#

419       #_N_Agecomp_obs

2         #_Lbin_method:      1=poplenbins;       2=datalenbins;      3=lengths This is needed because agecomp data can be
entered for a subset of the entire length range

0         #_combine males into females at or below this bin number

# the age composition data vectors below are by age' bins, not by true age

#Yr       Seas      Flt/Svy   Gender    Part      Ageerr    Lbin_lo   Lbin_hi   Nsamp     datavector(female, then male)

1991      1         1         0         2         2         -1        -1        178       0.00000   0.00970   0.52720   0.37950
          0.02670   0.04150   0.00840   0.00670   0.00030   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
          0.00000   0.00000   0.00000   0.00000   0.00000
```

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1992 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 136 | 0.00000 | 0.00000 | 0.02330 | 0.75810 |
| | 0.15170 | 0.05560 | 0.00310 | 0.00500 | 0.00000 | 0.00320 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1993 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 153 | 0.00000 | 0.00000 | 0.32770 | 0.41270 |
| | 0.21590 | 0.02330 | 0.01700 | 0.00080 | 0.00000 | 0.00000 | 0.00000 | 0.00230 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00040 | | | | | | | |
| 1994 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 151 | 0.00000 | 0.00000 | 0.36540 | 0.36690 |
| | 0.17050 | 0.08660 | 0.00490 | 0.00170 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00170 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00240 | | | | | | | |
| 1995 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 92 | 0.00000 | 0.00000 | 0.14860 | 0.49560 |
| | 0.26640 | 0.07400 | 0.00980 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00540 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1996 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 9 | 0.00000 | 0.00000 | 0.38720 | 0.37770 |
| | 0.15340 | 0.08170 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1997 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 32 | 0.00000 | 0.00000 | 0.00000 | 0.52970 |
| | 0.39530 | 0.04080 | 0.02530 | 0.00560 | 0.00000 | 0.00330 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1998 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 197 | 0.00000 | 0.00000 | 0.07990 | 0.56630 |
| | 0.26570 | 0.05290 | 0.00580 | 0.01250 | 0.00130 | 0.00000 | 0.00000 | 0.00000 | 0.00270 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00130 | 0.00000 | 0.00110 | 0.00000 | 0.01020 | | | | | | | |
| 1999 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00130 | 0.11470 | 0.26600 |
| | 0.34600 | 0.11270 | 0.06880 | 0.03510 | 0.02000 | 0.01700 | 0.01100 | 0.00430 | 0.00000 | 0.00160 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00150 | | | | | | | |
| 2000 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.03650 | 0.38550 |
| | 0.31000 | 0.17940 | 0.06040 | 0.01360 | 0.00810 | 0.00310 | 0.00000 | 0.00240 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00120 | | | | | | | |
| 2001 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.09700 | 0.24360 |
| | 0.33730 | 0.16900 | 0.09180 | 0.03400 | 0.01280 | 0.00600 | 0.00310 | 0.00280 | 0.00040 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00130 | 0.00000 | 0.00000 | 0.00100 | | | | | | | |
| 2002 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00090 | 0.08420 | 0.53370 |
| | 0.16690 | 0.13720 | 0.04260 | 0.03010 | 0.00210 | 0.00000 | 0.00000 | 0.00170 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00050 | 0.00020 | | | | | | | |
| 2003 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00840 | 0.13700 | 0.40310 |
| | 0.29090 | 0.08890 | 0.04420 | 0.01320 | 0.00550 | 0.00270 | 0.00050 | 0.00100 | 0.00120 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00080 | 0.00030 | 0.00040 | 0.00000 | 0.00180 | | | | | | | |
| 2004 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00770 | 0.20100 | 0.32570 |
| | 0.30590 | 0.11890 | 0.01710 | 0.01150 | 0.00300 | 0.00320 | 0.00000 | 0.00110 | 0.00180 | 0.00230 | 0.00000 | 0.00070 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2005 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00100 | 0.11100 | 0.44730 |
| | 0.19240 | 0.16090 | 0.05890 | 0.01590 | 0.00390 | 0.00270 | 0.00270 | 0.00040 | 0.00070 | 0.00100 | 0.00060 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00020 | 0.00040 | | | | | | | |
| 2006 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00190 | 0.17390 | 0.38710 |
| | 0.25080 | 0.08160 | 0.05490 | 0.03250 | 0.00830 | 0.00280 | 0.00120 | 0.00000 | 0.00000 | 0.00000 | 0.00110 | 0.00050 |
| | 0.00050 | 0.00090 | 0.00000 | 0.00050 | 0.00160 | | | | | | | |
| 2007 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.01040 | 0.22720 | 0.51130 |
| | 0.20790 | 0.02820 | 0.01050 | 0.00330 | 0.00000 | 0.00090 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00040 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2008 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00180 | 0.19930 | 0.35480 |
| | 0.36540 | 0.06670 | 0.01050 | 0.00000 | 0.00000 | 0.00000 | 0.00150 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2009 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00730 | 0.13910 | 0.37950 |
| | 0.31500 | 0.11670 | 0.03300 | 0.00640 | 0.00160 | 0.00000 | 0.00060 | 0.00020 | 0.00020 | 0.00000 | 0.00000 | 0.00020 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2010 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00070 | 0.09290 | 0.29950 |
| | 0.33510 | 0.19380 | 0.05920 | 0.01290 | 0.00550 | 0.00000 | 0.00040 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2011 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00270 | 0.10450 | 0.13640 |
| | 0.42020 | 0.23280 | 0.06910 | 0.02490 | 0.00690 | 0.00210 | 0.00030 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00010 | | | | | | | |
| 2007 | 1 | 1 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.03583 | 0.33730 | 0.36779 |
| | 0.16476 | 0.06317 | 0.02151 | 0.00671 | 0.00185 | 0.00066 | 0.00020 | 0.00011 | 0.00005 | 0.00004 | 0.00001 | 0.00001 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2008 | 1 | 1 | 0 | 1 | 2 | -1 | -1 | 166 | 0.00001 | 0.02470 | 0.24167 | 0.31125 |
| | 0.22743 | 0.13313 | 0.04448 | 0.01204 | 0.00331 | 0.00125 | 0.00045 | 0.00018 | 0.00004 | 0.00006 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2009 | 1 | 1 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.11872 | 0.22248 | 0.27216 |
| | 0.20656 | 0.10737 | 0.04509 | 0.01645 | 0.00524 | 0.00236 | 0.00101 | 0.00064 | 0.00042 | 0.00026 | 0.00023 | 0.00009 |
| | 0.00007 | 0.00012 | 0.00006 | 0.00005 | 0.00062 | | | | | | | |
| 2010 | 1 | 1 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.02848 | 0.24901 | 0.30729 |
| | 0.21311 | 0.12369 | 0.05293 | 0.01764 | 0.00479 | 0.00190 | 0.00051 | 0.00030 | 0.00015 | 0.00012 | 0.00003 | 0.00003 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00001 | | | | | | | |
| 2011 | 1 | 1 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.01875 | 0.16916 | 0.27195 |
| | 0.26102 | 0.15424 | 0.07213 | 0.03147 | 0.01077 | 0.00453 | 0.00177 | 0.00117 | 0.00075 | 0.00049 | 0.00031 | 0.00030 |
| | 0.00014 | 0.00014 | 0.00012 | 0.00004 | 0.00075 | | | | | | | |
| 1991 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 25 | 0.00000 | 0.00000 | 0.66550 | 0.17010 |
| | 0.13460 | 0.01340 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00270 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00750 | 0.00000 | 0.00620 | | | | | | | |
| 1992 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00610 | 0.66360 |
| | 0.18570 | 0.09580 | 0.02710 | 0.01160 | 0.00600 | 0.00000 | 0.00220 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00190 | | | | | | | |
| 1993 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.02560 | 0.39620 |
| | 0.43710 | 0.11860 | 0.01450 | 0.00640 | 0.00060 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00090 | | | | | | | |
| 1994 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.04850 | 0.43810 |
| | 0.29910 | 0.15920 | 0.03400 | 0.01000 | 0.00420 | 0.00190 | 0.00020 | 0.00180 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00160 | 0.00000 | 0.00000 | 0.00000 | 0.00120 | | | | | | | |
| 1995 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 97 | 0.00000 | 0.00000 | 0.00000 | 0.30300 |
| | 0.34050 | 0.17570 | 0.14110 | 0.03910 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00050 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1996 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -1997 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1998 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00870 | 0.06440 | 0.45920 |
| | 0.26410 | 0.12650 | 0.03100 | 0.02090 | 0.01610 | 0.00440 | 0.00280 | 0.00060 | 0.00050 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00110 | | | | | | | |
| 1999 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00030 | 0.03290 | 0.19000 |
| | 0.39020 | 0.22140 | 0.09490 | 0.04420 | 0.01650 | 0.00350 | 0.00420 | 0.00100 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00110 | | | | | | | |
| 2000 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.05380 | 0.42610 |
| | 0.27360 | 0.13950 | 0.06800 | 0.02780 | 0.00600 | 0.00210 | 0.00180 | 0.00050 | 0.00060 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00030 | | | | | | | |
| 2001 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.09850 | 0.22620 |
| | 0.30610 | 0.17710 | 0.11060 | 0.04580 | 0.02080 | 0.00850 | 0.00320 | 0.00180 | 0.00060 | 0.00000 | 0.00050 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00040 | | | | | | | |
| 2002 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.01390 | 0.10310 | 0.41000 |
| | 0.20720 | 0.14230 | 0.05870 | 0.03730 | 0.01520 | 0.00420 | 0.00170 | 0.00230 | 0.00060 | 0.00060 | 0.00020 | 0.00000 |
| | 0.00040 | 0.00000 | 0.00000 | 0.00000 | 0.00250 | | | | | | | |
| 2003 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00220 | 0.04910 | 0.28930 |
| | 0.35850 | 0.13370 | 0.07380 | 0.04160 | 0.02970 | 0.00690 | 0.00420 | 0.00300 | 0.00170 | 0.00160 | 0.00240 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00050 | 0.00000 | 0.00180 | | | | | | | |
| 2004 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.05270 | 0.28130 |
| | 0.34910 | 0.17990 | 0.05240 | 0.03610 | 0.02300 | 0.00900 | 0.00620 | 0.00280 | 0.00130 | 0.00120 | 0.00090 | 0.00060 |
| | 0.00070 | 0.00000 | 0.00060 | 0.00000 | 0.00230 | | | | | | | |
| 2005 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00050 | 0.09370 | 0.25880 |
| | 0.26470 | 0.18100 | 0.09340 | 0.03730 | 0.02240 | 0.01140 | 0.00800 | 0.00450 | 0.00320 | 0.00510 | 0.00370 | 0.00390 |
| | 0.00070 | 0.00160 | 0.00260 | 0.00000 | 0.00340 | | | | | | | |
| 2006 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.06130 | 0.41690 |
| | 0.26050 | 0.10430 | 0.08360 | 0.04230 | 0.01380 | 0.00650 | 0.00540 | 0.00240 | 0.00140 | 0.00080 | 0.00000 | 0.00070 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2007 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.07190 | 0.38010 |
| | 0.31970 | 0.09580 | 0.05190 | 0.04340 | 0.01720 | 0.00820 | 0.00380 | 0.00290 | 0.00150 | 0.00050 | 0.00110 | 0.00050 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00160 | | | | | | | |
| 2008 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.02690 | 0.35550 |
| | 0.40330 | 0.14050 | 0.03780 | 0.01250 | 0.00810 | 0.00840 | 0.00300 | 0.00170 | 0.00090 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00030 | 0.00000 | 0.00000 | 0.00080 | 0.00030 | | | | | | | |
| 2009 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.02790 | 0.32850 |
| | 0.34780 | 0.20350 | 0.06510 | 0.01290 | 0.00600 | 0.00370 | 0.00160 | 0.00040 | 0.00000 | 0.00030 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00040 | 0.00000 | 0.00180 | | | | | | | |
| 2010 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.01490 | 0.23120 |
| | 0.33950 | 0.26240 | 0.12310 | 0.02040 | 0.00360 | 0.00170 | 0.00040 | 0.00070 | 0.00040 | 0.00000 | 0.00040 | 0.00040 |
| | 0.00040 | 0.00000 | 0.00000 | 0.00000 | 0.00060 | | | | | | | |
| 2011 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00130 | 0.05370 | 0.10040 |
| | 0.27590 | 0.30690 | 0.16560 | 0.06230 | 0.02090 | 0.00690 | 0.00240 | 0.00190 | 0.00070 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00070 | 0.00000 | 0.00040 | | | | | | | |
| 2007 | 1 | 2 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.00349 | 0.28274 | 0.41549 |
| | 0.19545 | 0.06777 | 0.01924 | 0.00741 | 0.00280 | 0.00132 | 0.00079 | 0.00051 | 0.00038 | 0.00033 | 0.00030 | 0.00037 |
| | 0.00017 | 0.00017 | 0.00018 | 0.00010 | 0.00098 | | | | | | | |
| 2008 | 1 | 2 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.00356 | 0.38950 | 0.40843 |
| | 0.12872 | 0.03268 | 0.01074 | 0.00644 | 0.00400 | 0.00278 | 0.00195 | 0.00143 | 0.00106 | 0.00105 | 0.00101 | 0.00127 |
| | 0.00054 | 0.00056 | 0.00062 | 0.00030 | 0.00337 | | | | | | | |
| 2009 | 1 | 2 | 0 | 1 | 2 | -1 | -1 | 70 | 0.00000 | 0.00229 | 0.60849 | 0.35197 |
| | 0.03724 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2010 | 1 | 2 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.00423 | 0.47110 | 0.39726 |
| | 0.08777 | 0.00817 | 0.00424 | 0.00446 | 0.00389 | 0.00316 | 0.00268 | 0.00200 | 0.00206 | 0.00179 | 0.00133 | 0.00127 |
| | 0.00094 | 0.00065 | 0.00052 | 0.00028 | 0.00221 | | | | | | | |
| 2011 | 1 | 2 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.00267 | 0.23462 | 0.31133 |
| | 0.18306 | 0.10292 | 0.06086 | 0.03538 | 0.01904 | 0.01225 | 0.00846 | 0.00620 | 0.00516 | 0.00373 | 0.00306 | 0.00283 |
| | 0.00208 | 0.00110 | 0.00102 | 0.00062 | 0.00358 | | | | | | | |
| 1991 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 12 | 0.00000 | 0.00000 | 0.01790 | 0.62500 |
| | 0.14290 | 0.14290 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.07140 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1992 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 15 | 0.00000 | 0.00000 | 0.00000 | 0.14290 |
| | 0.22450 | 0.28570 | 0.14290 | 0.12240 | 0.00000 | 0.00000 | 0.02040 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.06120 | | | | | | | |
| 1993 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 30 | 0.00000 | 0.00000 | 0.04270 | 0.20430 |
| | 0.30600 | 0.25900 | 0.06840 | 0.05980 | 0.00000 | 0.00000 | 0.01710 | 0.00000 | 0.00000 | 0.01710 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.02560 | | | | | | | |
| 1994 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 8 | 0.00000 | 0.00000 | 0.00000 | 0.10870 |
| | 0.53260 | 0.17390 | 0.07610 | 0.00000 | 0.00000 | 0.10870 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1995 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 19 | 0.00000 | 0.00000 | 0.00000 | 0.35780 |
| | 0.46470 | 0.13820 | 0.00000 | 0.00000 | 0.00000 | 0.03920 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1996 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 6 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.40000 | 0.30000 | 0.30000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1997 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 10 | 0.00000 | 0.00000 | 0.07690 | 0.23080 |
| | 0.46150 | 0.15380 | 0.07690 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1998 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 25 | 0.00000 | 0.00000 | 0.00000 | 0.04920 |
| | 0.12300 | 0.25820 | 0.31560 | 0.25410 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1999 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 102 | 0.00000 | 0.00000 | 0.00000 | 0.03560 |
| | 0.48900 | 0.18010 | 0.21120 | 0.03360 | 0.00000 | 0.03460 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.01580 | | | | | | | |
| 2000 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 84 | 0.00000 | 0.00000 | 0.00000 | 0.03380 |
| | 0.14650 | 0.40840 | 0.18200 | 0.09100 | 0.03990 | 0.04920 | 0.02080 | 0.00000 | 0.00750 | 0.00000 | 0.00560 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00750 | 0.00760 | | | | | | | |
| 2001 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 91 | 0.00000 | 0.00000 | 0.01550 | 0.05600 |
| | 0.28900 | 0.28530 | 0.27400 | 0.05170 | 0.01900 | 0.00480 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00480 | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 183 | 0.00000 | 0.02460 | 0.05090 | 0.14330 |
| | 0.18740 | 0.13700 | 0.18530 | 0.11330 | 0.03160 | 0.02250 | 0.01690 | 0.00730 | 0.00000 | 0.00000 | 0.00000 | 0.00460 |
| | 0.00000 | 0.00000 | 0.00730 | 0.00000 | 0.06780 | | | | | | | |
| 2003 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 197 | 0.00000 | 0.00000 | 0.00560 | 0.16630 |
| | 0.30890 | 0.23670 | 0.10090 | 0.05980 | 0.04960 | 0.02800 | 0.00400 | 0.00360 | 0.00400 | 0.00840 | 0.00400 | 0.00320 |
| | 0.00000 | 0.00400 | 0.00000 | 0.00000 | 0.01280 | | | | | | | |
| 2004 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.01840 | 0.22930 |
| | 0.37130 | 0.23030 | 0.07290 | 0.03500 | 0.02320 | 0.00000 | 0.00490 | 0.00240 | 0.00000 | 0.00000 | 0.00000 | 0.00240 |
| | 0.00000 | 0.00240 | 0.00000 | 0.00000 | 0.00720 | | | | | | | |
| 2005 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.03880 | 0.15070 |
| | 0.31480 | 0.34060 | 0.11800 | 0.03050 | 0.00000 | 0.00000 | 0.00280 | 0.00000 | 0.00370 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2006 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.02210 | 0.09200 |
| | 0.35760 | 0.20730 | 0.22780 | 0.05290 | 0.01940 | 0.00420 | 0.00000 | 0.00000 | 0.00420 | 0.00840 | 0.00000 | 0.00000 |
| | 0.00420 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2007 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.03520 | 0.07260 | 0.13190 |
| | 0.31220 | 0.25460 | 0.11140 | 0.05070 | 0.02300 | 0.00840 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2008 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00190 | 0.10730 |
| | 0.31060 | 0.35390 | 0.09480 | 0.04330 | 0.02350 | 0.01880 | 0.00800 | 0.00600 | 0.00580 | 0.00240 | 0.00580 | 0.00390 |
| | 0.00430 | 0.00190 | 0.00000 | 0.00000 | 0.00770 | | | | | | | |
| 2009 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00470 | 0.08430 |
| | 0.43000 | 0.22390 | 0.19470 | 0.02330 | 0.00770 | 0.01360 | 0.00000 | 0.00000 | 0.00000 | 0.00510 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.01270 | | | | | | | |
| 2010 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00560 | 0.08610 |
| | 0.34440 | 0.39610 | 0.10900 | 0.04430 | 0.01150 | 0.00310 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2011 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.03020 |
| | 0.21830 | 0.40220 | 0.25090 | 0.06920 | 0.01980 | 0.00710 | 0.00000 | 0.00220 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2007 | 1 | 3 | 0 | 1 | 2 | -1 | -1 | 91 | 0.00000 | 0.00041 | 0.02863 | 0.19848 |
| | 0.37748 | 0.23854 | 0.09511 | 0.03678 | 0.01264 | 0.00539 | 0.00236 | 0.00133 | 0.00078 | 0.00058 | 0.00037 | 0.00020 |
| | 0.00017 | 0.00017 | 0.00017 | 0.00000 | 0.00042 | | | | | | | |
| 2008 | 1 | 3 | 0 | 1 | 2 | -1 | -1 | 3 | 0.00000 | 0.01456 | 0.19118 | 0.23192 |
| | 0.38203 | 0.14117 | 0.02788 | 0.00700 | 0.00343 | 0.00041 | 0.00041 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2009 | 1 | 3 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.00201 | 0.02830 | 0.21270 |
| | 0.35425 | 0.22927 | 0.10946 | 0.04197 | 0.01260 | 0.00516 | 0.00159 | 0.00107 | 0.00060 | 0.00042 | 0.00019 | 0.00014 |
| | 0.00004 | 0.00004 | 0.00004 | 0.00000 | 0.00014 | | | | | | | |
| 2010 | 1 | 3 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.00032 | 0.01938 | 0.16668 |
| | 0.33295 | 0.26909 | 0.13251 | 0.04961 | 0.01520 | 0.00683 | 0.00245 | 0.00150 | 0.00098 | 0.00079 | 0.00041 | 0.00024 |
| | 0.00017 | 0.00010 | 0.00012 | 0.00003 | 0.00064 | | | | | | | |
| 2011 | 1 | 3 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.00025 | 0.01447 | 0.13140 |
| | 0.32072 | 0.27750 | 0.15065 | 0.06346 | 0.02072 | 0.00934 | 0.00346 | 0.00230 | 0.00154 | 0.00114 | 0.00069 | 0.00039 |
| | 0.00025 | 0.00023 | 0.00018 | 0.00008 | 0.00123 | | | | | | | |
| -1991 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1992 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1993 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 29 | 0.00000 | 0.00000 | 0.46410 | 0.53090 |
| | 0.00500 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1994 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1995 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1996 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1997 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1998 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00340 | 0.05140 |
| | 0.11340 | 0.27570 | 0.10160 | 0.08020 | 0.07750 | 0.04510 | 0.05330 | 0.04430 | 0.03180 | 0.03190 | 0.01700 | 0.01820 |
| | 0.01980 | 0.00770 | 0.00780 | 0.00250 | 0.01730 | | | | | | | |
| 1999 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 76 | 0.00000 | 0.00000 | 0.00000 | 0.20360 |
| | 0.43730 | 0.13540 | 0.04890 | 0.00000 | 0.17480 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2000 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.01450 |
| | 0.02610 | 0.12640 | 0.15730 | 0.18780 | 0.12440 | 0.08170 | 0.03900 | 0.04370 | 0.03260 | 0.02720 | 0.00630 | 0.01300 |
| | 0.01310 | 0.00260 | 0.00000 | 0.00290 | 0.10140 | | | | | | | |
| 2001 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 179 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.02080 | 0.04890 | 0.19110 | 0.13380 | 0.10980 | 0.11710 | 0.06170 | 0.06330 | 0.03530 | 0.05770 | 0.02200 | 0.01350 |
| | 0.03710 | 0.00660 | 0.00840 | 0.01790 | 0.05490 | | | | | | | |
| 2002 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00200 | 0.02280 | 0.16860 |
| | 0.08780 | 0.18690 | 0.07500 | 0.09630 | 0.07180 | 0.03960 | 0.04050 | 0.03140 | 0.02940 | 0.01790 | 0.02220 | 0.02070 |
| | 0.01820 | 0.01890 | 0.00760 | 0.00190 | 0.04030 | | | | | | | |
| 2003 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00390 | 0.03090 | 0.03090 | 0.07340 | 0.14290 | 0.08400 | 0.08840 | 0.06550 | 0.08840 | 0.04230 | 0.04600 | 0.04950 |
| | 0.06670 | 0.03090 | 0.01910 | 0.01140 | 0.12600 | | | | | | | |
| 2004 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.02310 |
| | 0.14930 | 0.07180 | 0.08420 | 0.08610 | 0.07510 | 0.07560 | 0.07390 | 0.04780 | 0.06400 | 0.04460 | 0.04380 | 0.03430 |
| | 0.02390 | 0.01360 | 0.01350 | 0.00910 | 0.06610 | | | | | | | |
| 2005 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.04340 |
| | 0.04990 | 0.15220 | 0.11380 | 0.12660 | 0.09210 | 0.09930 | 0.05250 | 0.04760 | 0.05180 | 0.05930 | 0.03750 | 0.01990 |
| | 0.02040 | 0.00000 | 0.00650 | 0.00370 | 0.02350 | | | | | | | |
| 2006 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.01000 |
| | 0.02790 | 0.06970 | 0.12580 | 0.16230 | 0.11050 | 0.08070 | 0.09960 | 0.06260 | 0.05750 | 0.04300 | 0.03870 | 0.02420 |
| | 0.01850 | 0.01420 | 0.00400 | 0.00610 | 0.04480 | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2007 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.00550 |
| | 0.04220 | 0.08850 | 0.21320 | 0.17980 | 0.09900 | 0.08900 | 0.05930 | 0.06730 | 0.01670 | 0.03050 | 0.01160 | 0.02800 |
| | 0.02520 | 0.00850 | 0.01100 | 0.00280 | 0.02220 | | | | | | | |
| 2008 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00310 | 0.03200 |
| | 0.09270 | 0.09520 | 0.15950 | 0.16070 | 0.13640 | 0.08250 | 0.07820 | 0.02690 | 0.03670 | 0.00560 | 0.01210 | 0.01450 |
| | 0.00870 | 0.00870 | 0.00660 | 0.00000 | 0.03970 | | | | | | | |
| 2009 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.00700 |
| | 0.04900 | 0.11080 | 0.10560 | 0.07930 | 0.07220 | 0.17830 | 0.10730 | 0.07340 | 0.03480 | 0.02510 | 0.04700 | 0.02230 |
| | 0.01450 | 0.01130 | 0.00420 | 0.00720 | 0.05090 | | | | | | | |
| 2010 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 84 | 0.00000 | 0.00000 | 0.00000 | 0.09410 |
| | 0.24710 | 0.28240 | 0.18820 | 0.05880 | 0.01180 | 0.04710 | 0.00000 | 0.02350 | 0.01180 | 0.00000 | 0.01180 | 0.00000 |
| | 0.00000 | 0.01180 | 0.00000 | 0.00000 | 0.01180 | | | | | | | |
| 2011 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 14 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.21430 | 0.28570 | 0.21430 | 0.14290 | 0.07140 | 0.07140 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -2008 | 1 | 4 | 0 | 1 | 2 | -1 | -1 | 7 | 0.00000 | 0.00335 | 0.10426 | 0.44043 |
| | 0.30561 | 0.10879 | 0.02976 | 0.00663 | 0.00104 | 0.00012 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -2010 | 1 | 4 | 0 | 1 | 2 | -1 | -1 | 6 | 0.00000 | 0.00090 | 0.14171 | 0.18468 |
| | 0.15822 | 0.14357 | 0.12084 | 0.08101 | 0.04443 | 0.02937 | 0.02220 | 0.01600 | 0.01406 | 0.01138 | 0.00746 | 0.00635 |
| | 0.00586 | 0.00307 | 0.00194 | 0.00097 | 0.00598 | | | | | | | |
| 1991 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.07580 | 0.50960 | 0.38810 |
| | 0.01700 | 0.00930 | 0.00020 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1992 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.10540 | 0.47530 | 0.28210 |
| | 0.11590 | 0.01370 | 0.00610 | 0.00000 | 0.00150 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1993 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00440 | 0.53000 | 0.30890 |
| | 0.11600 | 0.03150 | 0.00250 | 0.00590 | 0.00000 | 0.00000 | 0.00000 | 0.00070 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1994 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00700 | 0.27540 | 0.45550 |
| | 0.16410 | 0.06120 | 0.03090 | 0.00410 | 0.00000 | 0.00180 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1995 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.01900 | 0.39860 | 0.25270 |
| | 0.20220 | 0.07150 | 0.03120 | 0.01220 | 0.00170 | 0.00600 | 0.00330 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00170 | | | | | | | |
| 1996 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 101 | 0.00000 | 0.01460 | 0.19650 | 0.58110 |
| | 0.12380 | 0.03360 | 0.00280 | 0.03080 | 0.00000 | 0.01120 | 0.00560 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1997 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 56 | 0.00000 | 0.00000 | 0.77030 | 0.15140 |
| | 0.05060 | 0.01340 | 0.01430 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1998 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00250 | 0.21660 | 0.57370 |
| | 0.16560 | 0.03180 | 0.00860 | 0.00030 | 0.00080 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1999 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.04760 | 0.47450 |
| | 0.42570 | 0.03920 | 0.01180 | 0.00110 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00010 | | | | | | | |
| 2000 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.06990 | 0.57200 |
| | 0.28710 | 0.06240 | 0.00520 | 0.00310 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00020 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2001 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.26380 | 0.40660 |
| | 0.23560 | 0.08400 | 0.00400 | 0.00530 | 0.00000 | 0.00070 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2002 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.08840 | 0.55460 |
| | 0.23780 | 0.07240 | 0.02730 | 0.01460 | 0.00330 | 0.00030 | 0.00050 | 0.00010 | 0.00010 | 0.00050 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00020 | | | | | | | |
| 2003 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00080 | 0.16170 | 0.46500 |
| | 0.28290 | 0.04880 | 0.02120 | 0.01300 | 0.00380 | 0.00080 | 0.00030 | 0.00000 | 0.00010 | 0.00000 | 0.00040 | 0.00020 |
| | 0.00000 | 0.00020 | 0.00000 | 0.00000 | 0.00070 | | | | | | | |
| 2004 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00160 | 0.14340 | 0.41500 |
| | 0.27710 | 0.11400 | 0.02210 | 0.01380 | 0.00680 | 0.00220 | 0.00060 | 0.00070 | 0.00110 | 0.00030 | 0.00000 | 0.00040 |
| | 0.00000 | 0.00000 | 0.00010 | 0.00000 | 0.00080 | | | | | | | |
| 2005 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.18350 | 0.53400 |
| | 0.16070 | 0.07840 | 0.03180 | 0.00500 | 0.00300 | 0.00080 | 0.00120 | 0.00040 | 0.00000 | 0.00010 | 0.00060 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00030 | | | | | | | |
| 2006 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00110 | 0.15710 | 0.52100 |
| | 0.21220 | 0.05560 | 0.03230 | 0.01510 | 0.00260 | 0.00120 | 0.00040 | 0.00040 | 0.00020 | 0.00040 | 0.00000 | 0.00020 |
| | 0.00010 | 0.00000 | 0.00000 | 0.00010 | 0.00020 | | | | | | | |
| 2007 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.14750 | 0.63020 |
| | 0.18170 | 0.02390 | 0.00710 | 0.00570 | 0.00280 | 0.00000 | 0.00020 | 0.00040 | 0.00000 | 0.00060 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2008 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.16870 | 0.50690 |
| | 0.25260 | 0.05830 | 0.01350 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2009 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00660 | 0.30460 |
| | 0.38780 | 0.23280 | 0.04770 | 0.01420 | 0.00360 | 0.00290 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2010 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00430 | 0.16460 |
| | 0.45940 | 0.21930 | 0.10420 | 0.03030 | 0.01210 | 0.00460 | 0.00060 | 0.00070 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2011 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00100 | 0.03160 |
| | 0.24120 | 0.39050 | 0.22320 | 0.07070 | 0.03150 | 0.00830 | 0.00210 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1991 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00690 | 0.66640 | 0.28940 |
| | 0.03500 | 0.00230 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1992 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.34710 | 0.53110 |
| | 0.08010 | 0.02130 | 0.01200 | 0.00840 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1993 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00690 | 0.79800 | 0.17890 |
| | 0.00900 | 0.00720 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |

```
-1994   1       6       0       2       2       -1      -1      0       0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
-1995   1       6       0       2       2       -1      -1      0       0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
-1996   1       6       0       2       2       -1      -1      0       0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
-1997   1       6       0       2       2       -1      -1      0       0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
1998    1       6       0       2       2       -1      -1      200     0.00000 0.05270 0.17160 0.50890
        0.18740 0.04620 0.01810 0.00860 0.00600 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00040
1999    1       6       0       2       2       -1      -1      119     0.00000 0.00000 0.02680 0.31430
        0.50420 0.09500 0.04560 0.01400 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
2000    1       6       0       2       2       -1      -1      2       0.00000 0.00000 0.00000 1.00000
        0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
-2001   1       6       0       2       2       -1      -1      0       0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
2002    1       6       0       2       2       -1      -1      200     0.00000 0.02640 0.22440 0.44680
        0.19710 0.06810 0.01490 0.01120 0.00660 0.00210 0.00000 0.00000 0.00000 0.00000 0.00240 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
2003    1       6       0       2       2       -1      -1      200     0.00000 0.00000 0.07270 0.33400
        0.27380 0.14160 0.08560 0.04600 0.01920 0.01390 0.00260 0.00000 0.00400 0.00320 0.00180 0.00120
        0.00000 0.00000 0.00000 0.00000 0.00040
2004    1       6       0       2       2       -1      -1      200     0.00000 0.01200 0.27970 0.50480
        0.13780 0.04150 0.01270 0.00380 0.00280 0.00000 0.00080 0.00000 0.00000 0.00000 0.00110 0.00000
        0.00100 0.00000 0.00000 0.00000 0.00220
2005    1       6       0       2       2       -1      -1      200     0.00000 0.00900 0.14900 0.42200
        0.18990 0.10570 0.05880 0.02880 0.02050 0.00380 0.00240 0.00140 0.00430 0.00070 0.00140 0.00000
        0.00000 0.00000 0.00100 0.00130 0.00000
2006    1       6       0       2       2       -1      -1      200     0.00000 0.00130 0.12910 0.53160
        0.21430 0.05520 0.03480 0.01440 0.01030 0.00200 0.00270 0.00070 0.00120 0.00000 0.00000 0.00000
        0.00070 0.00000 0.00000 0.00070 0.00100
2007    1       6       0       2       2       -1      -1      200     0.00000 0.00000 0.09970 0.59900
        0.23080 0.03410 0.01480 0.01000 0.00400 0.00340 0.00150 0.00070 0.00160 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00040
2008    1       6       0       2       2       -1      -1      200     0.00000 0.00000 0.05170 0.36880
        0.44840 0.10610 0.01650 0.00120 0.00360 0.00060 0.00000 0.00320 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
2009    1       6       0       2       2       -1      -1      200     0.00000 0.00000 0.01760 0.20300
        0.43200 0.26080 0.06540 0.00360 0.00830 0.00180 0.00000 0.00360 0.00000 0.00000 0.00000 0.00080
        0.00000 0.00000 0.00000 0.00000 0.00320
2010    1       6       0       2       2       -1      -1      49      0.00000 0.00000 0.00000 0.17200
        0.35100 0.30880 0.16820 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
2011    1       6       0       2       2       -1      -1      200     0.00000 0.00000 0.00000 0.04300
        0.35620 0.30200 0.21330 0.07180 0.00510 0.00620 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00240
1991    1       7       0       2       2       -1      -1      20      0.00000 0.00000 0.82340 0.15360
        0.02300 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
1992    1       7       0       2       2       -1      -1      78      0.00000 0.00000 0.37660 0.49720
        0.06540 0.02460 0.03070 0.00550 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
1993    1       7       0       2       2       -1      -1      200     0.00000 0.00000 0.51830 0.36360
        0.10050 0.01080 0.00680 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
1994    1       7       0       2       2       -1      -1      200     0.00000 0.06050 0.30830 0.47060
        0.11330 0.02990 0.01370 0.00190 0.00190 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
1995    1       7       0       2       2       -1      -1      12      0.00000 0.05870 0.44890 0.16290
        0.32200 0.00000 0.00000 0.00760 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
1996    1       7       0       2       2       -1      -1      117     0.00000 0.00680 0.37740 0.53350
        0.04860 0.03170 0.00000 0.00200 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
1997    1       7       0       2       2       -1      -1      97      0.00000 0.00000 0.84440 0.11930
        0.03010 0.00630 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
1998    1       7       0       2       2       -1      -1      200     0.00000 0.00000 0.12990 0.71360
        0.13550 0.01420 0.00310 0.00160 0.00170 0.00030 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
1999    1       7       0       2       2       -1      -1      200     0.00000 0.00000 0.03450 0.54510
        0.36030 0.04820 0.00560 0.00380 0.00000 0.00000 0.00000 0.00240 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
2000    1       7       0       2       2       -1      -1      141     0.00000 0.00000 0.16400 0.52860
        0.25430 0.04910 0.00000 0.00410 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
2001    1       7       0       2       2       -1      -1      200     0.00000 0.00480 0.41820 0.26140
        0.24000 0.05280 0.01240 0.00570 0.00000 0.00470 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
2002    1       7       0       2       2       -1      -1      200     0.00000 0.00000 0.10260 0.75910
        0.06730 0.04670 0.01730 0.00620 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00080
        0.00000 0.00000 0.00000 0.00000 0.00000
2003    1       7       0       2       2       -1      -1      73      0.00000 0.00000 0.26380 0.47950
        0.24410 0.00000 0.00680 0.00100 0.00390 0.00000 0.00000 0.00000 0.00100 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
```

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 67 | 0.00000 | 0.00000 | 0.06900 | 0.44880 |
| | 0.25050 | 0.16700 | 0.02480 | 0.02790 | 0.01190 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2005 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 100 | 0.00000 | 0.00000 | 0.12140 | 0.60790 |
| | 0.18570 | 0.05810 | 0.02360 | 0.00340 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2006 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 188 | 0.00000 | 0.00100 | 0.27130 | 0.40320 |
| | 0.24650 | 0.06870 | 0.00460 | 0.00240 | 0.00090 | 0.00140 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2007 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.10620 | 0.63450 |
| | 0.22010 | 0.01920 | 0.00760 | 0.00130 | 0.00710 | 0.00200 | 0.00200 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2008 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 135 | 0.00000 | 0.00000 | 0.01920 | 0.72750 |
| | 0.20960 | 0.04370 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2009 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00850 | 0.48900 |
| | 0.31180 | 0.13680 | 0.04470 | 0.00660 | 0.00270 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2010 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00980 | 0.27030 |
| | 0.45610 | 0.17250 | 0.06030 | 0.02390 | 0.00710 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2011 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.18440 |
| | 0.37660 | 0.29780 | 0.11900 | 0.01520 | 0.00700 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2005 | 1 | 7 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.08562 | 0.46375 | 0.36916 |
| | 0.06762 | 0.01126 | 0.00199 | 0.00043 | 0.00011 | 0.00003 | 0.00001 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2006 | 1 | 7 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.10412 | 0.47613 | 0.35058 |
| | 0.05775 | 0.00868 | 0.00162 | 0.00048 | 0.00020 | 0.00012 | 0.00007 | 0.00004 | 0.00004 | 0.00004 | 0.00003 | 0.00001 |
| | 0.00001 | 0.00000 | 0.00001 | 0.00001 | 0.00006 | | | | | | | |
| 2007 | 1 | 7 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.06505 | 0.45446 | 0.38980 |
| | 0.07557 | 0.01232 | 0.00216 | 0.00047 | 0.00011 | 0.00003 | 0.00001 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2009 | 1 | 7 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.02170 | 0.31418 | 0.39974 |
| | 0.16356 | 0.06108 | 0.02506 | 0.00935 | 0.00288 | 0.00120 | 0.00044 | 0.00027 | 0.00017 | 0.00011 | 0.00006 | 0.00004 |
| | 0.00002 | 0.00002 | 0.00002 | 0.00000 | 0.00006 | | | | | | | |
| 2010 | 1 | 7 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.01767 | 0.24806 | 0.35730 |
| | 0.20705 | 0.10092 | 0.04286 | 0.01676 | 0.00524 | 0.00212 | 0.00071 | 0.00050 | 0.00029 | 0.00020 | 0.00009 | 0.00007 |
| | 0.00002 | 0.00002 | 0.00002 | 0.00000 | 0.00008 | | | | | | | |
| 2011 | 1 | 7 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.00673 | 0.14961 | 0.37620 |
| | 0.27334 | 0.12158 | 0.04647 | 0.01652 | 0.00504 | 0.00210 | 0.00077 | 0.00046 | 0.00030 | 0.00027 | 0.00014 | 0.00008 |
| | 0.00006 | 0.00003 | 0.00004 | 0.00002 | 0.00025 | | | | | | | |
| 1991 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 102 | 0.00000 | 0.00000 | 0.44730 | 0.41600 |
| | 0.07670 | 0.04520 | 0.00800 | 0.00480 | 0.00200 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1992 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 26 | 0.00000 | 0.00000 | 0.13350 | 0.84770 |
| | 0.00260 | 0.00790 | 0.00370 | 0.00380 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00080 | | | | | | | |
| 1993 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00380 | 0.26410 | 0.40400 |
| | 0.26800 | 0.04470 | 0.01040 | 0.00290 | 0.00220 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1994 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.01130 | 0.42840 | 0.38880 |
| | 0.11700 | 0.04310 | 0.00870 | 0.00090 | 0.00180 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1995 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 10 | 0.00000 | 0.00000 | 0.76400 | 0.23600 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1996 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1997 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1998 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.06620 | 0.42950 |
| | 0.29940 | 0.12750 | 0.04530 | 0.01590 | 0.00800 | 0.00260 | 0.00000 | 0.00120 | 0.00000 | 0.00000 | 0.00000 | 0.00030 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00440 | | | | | | | |
| 1999 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.02680 | 0.34720 |
| | 0.36880 | 0.12180 | 0.08180 | 0.01910 | 0.01070 | 0.00280 | 0.01070 | 0.00000 | 0.00150 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00890 | | | | | | | |
| 2000 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.23680 | 0.55170 |
| | 0.13230 | 0.04040 | 0.02550 | 0.00780 | 0.00240 | 0.00000 | 0.00080 | 0.00000 | 0.00070 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00050 | 0.00030 | 0.00000 | 0.00070 | | | | | | | |
| 2001 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 74 | 0.00000 | 0.00000 | 0.36670 | 0.28100 |
| | 0.11920 | 0.10240 | 0.03900 | 0.06870 | 0.01400 | 0.00450 | 0.00060 | 0.00280 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00100 | | | | | | | |
| 2002 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.04450 | 0.12660 | 0.51080 |
| | 0.16910 | 0.08210 | 0.02960 | 0.03070 | 0.00000 | 0.00380 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00200 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00090 | | | | | | | |
| 2003 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 140 | 0.00000 | 0.00000 | 0.23860 | 0.34650 |
| | 0.23270 | 0.13260 | 0.03490 | 0.00000 | 0.01070 | 0.00410 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2004 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 165 | 0.00000 | 0.00000 | 0.30360 | 0.27210 |
| | 0.20010 | 0.12540 | 0.04670 | 0.01600 | 0.00370 | 0.02610 | 0.00000 | 0.00250 | 0.00000 | 0.00000 | 0.00000 | 0.00370 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2005 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.30610 | 0.38560 |
| | 0.11820 | 0.08550 | 0.07530 | 0.00980 | 0.00450 | 0.00350 | 0.00000 | 0.00310 | 0.00850 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2006 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.14420 | 0.54680 |
| | 0.22880 | 0.01890 | 0.01180 | 0.03060 | 0.01660 | 0.00230 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2007 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 69 | 0.00000 | 0.00000 | 0.01990 | 0.55470 |
| | 0.38670 | 0.03590 | 0.00270 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 133 | 0.00000 | 0.00000 | 0.00000 | 0.18830 |
| | 0.55950 | 0.17750 | 0.06230 | 0.01230 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2009 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.11150 |
| | 0.39490 | 0.34770 | 0.09860 | 0.01000 | 0.00440 | 0.00520 | 0.01010 | 0.00450 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00360 | 0.00000 | 0.00000 | 0.00000 | 0.00950 | | | | | | | |
| 2010 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.10080 |
| | 0.25760 | 0.36960 | 0.18740 | 0.05110 | 0.02400 | 0.00750 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00190 | | | | | | | |
| 2011 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00230 | 0.06140 |
| | 0.21000 | 0.31330 | 0.25920 | 0.12420 | 0.02090 | 0.00700 | 0.00000 | 0.00170 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2007 | 1 | 9 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.00329 | 0.06930 | 0.33213 |
| | 0.36446 | 0.15571 | 0.04931 | 0.01613 | 0.00492 | 0.00191 | 0.00080 | 0.00047 | 0.00032 | 0.00027 | 0.00018 | 0.00008 |
| | 0.00007 | 0.00005 | 0.00003 | 0.00005 | 0.00052 | | | | | | | |
| 2008 | 1 | 9 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.00117 | 0.07696 | 0.28802 |
| | 0.34322 | 0.19126 | 0.06465 | 0.02018 | 0.00612 | 0.00281 | 0.00123 | 0.00077 | 0.00060 | 0.00053 | 0.00041 | 0.00014 |
| | 0.00013 | 0.00014 | 0.00002 | 0.00015 | 0.00149 | | | | | | | |
| 2009 | 1 | 9 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.00241 | 0.09181 | 0.28107 |
| | 0.31363 | 0.19134 | 0.07447 | 0.02624 | 0.00902 | 0.00415 | 0.00205 | 0.00106 | 0.00067 | 0.00047 | 0.00035 | 0.00015 |
| | 0.00018 | 0.00018 | 0.00017 | 0.00001 | 0.00054 | | | | | | | |
| 2010 | 1 | 9 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.01267 | 0.28254 | 0.35550 |
| | 0.17050 | 0.08834 | 0.04861 | 0.02565 | 0.00884 | 0.00357 | 0.00113 | 0.00101 | 0.00067 | 0.00041 | 0.00020 | 0.00018 |
| | 0.00002 | 0.00001 | 0.00001 | 0.00000 | 0.00014 | | | | | | | |
| 2011 | 1 | 9 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.00147 | 0.03684 | 0.17567 |
| | 0.33449 | 0.26217 | 0.12167 | 0.04411 | 0.01311 | 0.00557 | 0.00184 | 0.00114 | 0.00065 | 0.00049 | 0.00022 | 0.00015 |
| | 0.00007 | 0.00006 | 0.00006 | 0.00000 | 0.00021 | | | | | | | |
| 2007 | 1 | 10 | 0 | 1 | 2 | -1 | -1 | 11 | 0.00000 | 0.00277 | 0.09002 | 0.40073 |
| | 0.31407 | 0.13385 | 0.04253 | 0.01236 | 0.00258 | 0.00061 | 0.00028 | 0.00019 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2009 | 1 | 10 | 0 | 1 | 2 | -1 | -1 | 24 | 0.00000 | 0.00039 | 0.01077 | 0.09367 |
| | 0.19996 | 0.21738 | 0.16450 | 0.09582 | 0.04889 | 0.03134 | 0.02246 | 0.01467 | 0.01254 | 0.01016 | 0.00938 | 0.00883 |
| | 0.00676 | 0.00369 | 0.00474 | 0.00269 | 0.04136 | | | | | | | |
| 2010 | 1 | 10 | 0 | 1 | 2 | -1 | -1 | 93 | 0.00000 | 0.00142 | 0.04620 | 0.25766 |
| | 0.29161 | 0.18718 | 0.09589 | 0.04552 | 0.02051 | 0.01206 | 0.00767 | 0.00515 | 0.00390 | 0.00327 | 0.00304 | 0.00318 |
| | 0.00181 | 0.00131 | 0.00151 | 0.00079 | 0.01031 | | | | | | | |
| 2011 | 1 | 10 | 0 | 1 | 2 | -1 | -1 | 68 | 0.00000 | 0.00027 | 0.00706 | 0.05896 |
| | 0.11818 | 0.14884 | 0.15293 | 0.11654 | 0.07832 | 0.05673 | 0.04483 | 0.03374 | 0.03083 | 0.02362 | 0.02077 | 0.01891 |
| | 0.01510 | 0.00804 | 0.00812 | 0.00471 | 0.05350 | | | | | | | |
| -1991 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.64706 | 0.30588 |
| | 0.03529 | 0.01176 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1992 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.04847 | 0.33345 | 0.33348 |
| | 0.23238 | 0.02727 | 0.02157 | 0.00054 | 0.00285 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1993 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00251 | 0.44399 | 0.34077 |
| | 0.14426 | 0.04812 | 0.00526 | 0.01509 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1994 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00916 | 0.26416 | 0.41488 |
| | 0.18394 | 0.08105 | 0.03925 | 0.00499 | 0.00013 | 0.00243 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1995 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.02431 | 0.27263 | 0.22170 |
| | 0.26799 | 0.11184 | 0.05326 | 0.02431 | 0.00266 | 0.01065 | 0.00533 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00533 | | | | | | | |
| -1996 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.01927 | 0.25483 | 0.53159 |
| | 0.10699 | 0.02089 | 0.00943 | 0.02870 | 0.00000 | 0.00943 | 0.01886 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1997 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.73213 | 0.11041 |
| | 0.08846 | 0.01799 | 0.05100 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1998 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00081 | 0.00244 | 0.23878 | 0.61671 |
| | 0.12015 | 0.01503 | 0.00407 | 0.00100 | 0.00100 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1999 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.03069 | 0.47396 |
| | 0.44627 | 0.03588 | 0.01100 | 0.00147 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00073 | | | | | | | |
| -2000 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.08136 | 0.59251 |
| | 0.26080 | 0.05628 | 0.00362 | 0.00181 | 0.00000 | 0.00000 | 0.00181 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00181 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -2001 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00053 | 0.32186 | 0.42377 |
| | 0.19356 | 0.05186 | 0.00271 | 0.00298 | 0.00000 | 0.00271 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -2002 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00321 | 0.08391 | 0.52179 |
| | 0.23009 | 0.08951 | 0.03960 | 0.02282 | 0.00518 | 0.00043 | 0.00086 | 0.00043 | 0.00043 | 0.00130 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00043 | | | | | | | |
| -2003 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00072 | 0.16528 | 0.45808 |
| | 0.28289 | 0.04678 | 0.02348 | 0.01367 | 0.00545 | 0.00086 | 0.00029 | 0.00000 | 0.00108 | 0.00000 | 0.00029 | 0.00014 |
| | 0.00000 | 0.00014 | 0.00000 | 0.00000 | 0.00086 | | | | | | | |
| -2004 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00165 | 0.13197 | 0.40516 |
| | 0.27735 | 0.12191 | 0.02636 | 0.01833 | 0.00855 | 0.00283 | 0.00094 | 0.00118 | 0.00142 | 0.00047 | 0.00000 | 0.00047 |
| | 0.00000 | 0.00000 | 0.00024 | 0.00000 | 0.00118 | | | | | | | |
| -2005 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.18279 | 0.53235 |
| | 0.16080 | 0.07804 | 0.03224 | 0.00577 | 0.00356 | 0.00125 | 0.00125 | 0.00053 | 0.00000 | 0.00018 | 0.00089 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00036 | | | | | | | |
| -2006 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00283 | 0.14940 | 0.50540 |
| | 0.22122 | 0.05870 | 0.03527 | 0.01900 | 0.00308 | 0.00157 | 0.00051 | 0.00051 | 0.00051 | 0.00051 | 0.00025 | 0.00025 |
| | 0.00025 | 0.00000 | 0.00000 | 0.00051 | 0.00025 | | | | | | | |
| -2007 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.09648 | 0.60144 |
| | 0.23053 | 0.03684 | 0.01130 | 0.01130 | 0.00685 | 0.00027 | 0.00185 | 0.00158 | 0.00000 | 0.00158 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -2008 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.16204 | 0.52824 |
| | 0.24616 | 0.05266 | 0.01090 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -2009 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00158 | 0.00547 | 0.30249 |
| | 0.39557 | 0.21723 | 0.05402 | 0.01541 | 0.00504 | 0.00317 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -2010 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.00441 | 0.16408 |
| | 0.47254 | 0.21643 | 0.09783 | 0.02875 | 0.01092 | 0.00378 | 0.00063 | 0.00063 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -2011 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.00097 | 0.06375 |
| | 0.24498 | 0.38012 | 0.21835 | 0.06187 | 0.02221 | 0.00581 | 0.00097 | 0.00097 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1991 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1992 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.25341 | 0.56087 |
| | 0.05122 | 0.05506 | 0.02887 | 0.02887 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.02172 | | | | | | | |
| -1993 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00672 | 0.51788 | 0.27461 |
| | 0.15779 | 0.03266 | 0.00574 | 0.00230 | 0.00230 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1994 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00515 | 0.27062 | 0.32732 |
| | 0.25773 | 0.10825 | 0.02577 | 0.00258 | 0.00258 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1995 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.60000 | 0.40000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1996 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1997 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -1998 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00491 | 0.08162 | 0.41201 |
| | 0.29265 | 0.12521 | 0.04797 | 0.02176 | 0.00866 | 0.00199 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00322 | | | | | | | |
| -1999 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.01504 | 0.31458 |
| | 0.46654 | 0.12514 | 0.06279 | 0.00501 | 0.00545 | 0.00545 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -2000 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.05409 | 0.75150 |
| | 0.06593 | 0.04733 | 0.04902 | 0.01690 | 0.00507 | 0.00000 | 0.00338 | 0.00000 | 0.00169 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00169 | 0.00169 | 0.00000 | 0.00169 | | | | | | | |
| -2001 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.13699 | 0.20548 |
| | 0.20548 | 0.10959 | 0.09589 | 0.15068 | 0.01370 | 0.01370 | 0.01370 | 0.02740 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.02740 | | | | | | | |
| -2002 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.03978 | 0.18243 | 0.44155 |
| | 0.17292 | 0.07882 | 0.03027 | 0.03583 | 0.00225 | 0.00706 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00631 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00278 | | | | | | | |
| -2003 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.18692 | 0.31491 |
| | 0.24057 | 0.13200 | 0.06178 | 0.01916 | 0.02652 | 0.01090 | 0.00104 | 0.00000 | 0.00207 | 0.00155 | 0.00104 | 0.00104 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00052 | | | | | | | |
| -2004 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00686 | 0.26955 | 0.38157 |
| | 0.17144 | 0.09875 | 0.03146 | 0.01328 | 0.00996 | 0.00838 | 0.00053 | 0.00279 | 0.00000 | 0.00000 | 0.00053 | 0.00279 |
| | 0.00053 | 0.00000 | 0.00000 | 0.00000 | 0.00158 | | | | | | | |
| -2005 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00357 | 0.16333 | 0.42610 |
| | 0.17039 | 0.10807 | 0.07129 | 0.02428 | 0.01506 | 0.00384 | 0.00204 | 0.00283 | 0.00616 | 0.00051 | 0.00102 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00051 | 0.00102 | 0.00000 | | | | | | | |
| -2006 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00105 | 0.12048 | 0.54283 |
| | 0.22824 | 0.04507 | 0.02873 | 0.01335 | 0.01073 | 0.00323 | 0.00262 | 0.00052 | 0.00052 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00052 | 0.00000 | 0.00000 | 0.00105 | 0.00105 | | | | | | | |
| -2007 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.07437 | 0.55370 |
| | 0.28839 | 0.04610 | 0.01736 | 0.00972 | 0.00324 | 0.00324 | 0.00130 | 0.00065 | 0.00130 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00065 | | | | | | | |
| -2008 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.01326 | 0.29586 |
| | 0.53322 | 0.12856 | 0.02072 | 0.00396 | 0.00110 | 0.00110 | 0.00000 | 0.00221 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| -2009 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.00742 | 0.13294 |
| | 0.40825 | 0.33212 | 0.08717 | 0.00724 | 0.00765 | 0.00468 | 0.00256 | 0.00382 | 0.00000 | 0.00000 | 0.00000 | 0.00148 |
| | 0.00085 | 0.00000 | 0.00000 | 0.00000 | 0.00382 | | | | | | | |
| -2010 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.00000 | 0.08175 |
| | 0.30265 | 0.36626 | 0.19608 | 0.03106 | 0.01627 | 0.00444 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00148 | | | | | | | |
| -2011 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.00130 | 0.03529 |
| | 0.17873 | 0.33789 | 0.30960 | 0.11464 | 0.01255 | 0.00665 | 0.00000 | 0.00065 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00270 | | | | | | | |
| 1992 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 50 | 0.87620 | 0.12380 | 0.00010 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1993 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 50 | 0.83370 | 0.16590 | 0.00040 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1994 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 50 | 0.53270 | 0.45570 | 0.01160 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1995 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 50 | 0.79220 | 0.20770 | 0.00010 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1996 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 50 | 0.82170 | 0.17810 | 0.00020 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1997 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 1 | 0.74104 | 0.25702 | 0.00195 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1998 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 1 | 0.93543 | 0.05793 | 0.00663 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1999 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 88 | 0.89501 | 0.09449 | 0.01050 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2000 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.57539 | 0.41119 | 0.01338 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2001 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.65289 | 0.34095 | 0.00617 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2002 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.95645 | 0.02634 | 0.01721 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2003 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.78377 | 0.18146 | 0.03477 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2004 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.89318 | 0.09473 | 0.01210 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2005 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.60592 | 0.36878 | 0.02530 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2006 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.95100 | 0.04533 | 0.00359 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2007 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.87154 | 0.08646 | 0.04193 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2008 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.84018 | 0.11695 | 0.04287 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2009 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.96814 | 0.02643 | 0.00552 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2010 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.53115 | 0.45819 | 0.01056 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2011 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.75106 | 0.22872 | 0.02022 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1992 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 50 | 0.83290 | 0.15950 | 0.00760 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1993 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 50 | 0.76100 | 0.23890 | 0.00010 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1994 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 50 | 0.57360 | 0.42600 | 0.00040 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1995 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 50 | 0.79690 | 0.20290 | 0.00020 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1996 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 50 | 0.85530 | 0.14470 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1997 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.81204 | 0.18742 | 0.00054 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1998 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.91873 | 0.07693 | 0.00425 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1999 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.89357 | 0.10208 | 0.00429 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2000 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.78995 | 0.20209 | 0.00798 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2001 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.64356 | 0.33567 | 0.02083 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2002 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.77877 | 0.19625 | 0.02498 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2003 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.77165 | 0.20639 | 0.02195 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2004 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.43975 | 0.55015 | 0.01010 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2005 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.48291 | 0.49598 | 0.02111 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2006 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.80686 | 0.18362 | 0.00953 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2007 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.72176 | 0.25095 | 0.02729 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2008 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.61280 | 0.34238 | 0.04490 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2009 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.87985 | 0.10080 | 0.01934 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2010 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.72841 | 0.25796 | 0.01359 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2011 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.66636 | 0.31182 | 0.02175 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2008 | 1 | 15 | 0 | 0 | 2 | -1 | -1 | 21 | 0.00000 | 0.04752 | 0.35414 | 0.33010 |
| | 0.14922 | 0.06647 | 0.02024 | 0.00872 | 0.00447 | 0.00343 | 0.00260 | 0.00177 | 0.00156 | 0.00086 | 0.00136 | 0.00030 |
| | 0.00036 | 0.00088 | 0.00019 | 0.00052 | 0.00529 | | | | | | | |
| 2009 | 1 | 15 | 0 | 0 | 2 | -1 | -1 | 21 | 0.00001 | 0.01046 | 0.16332 | 0.35078 |
| | 0.25883 | 0.14291 | 0.05358 | 0.01446 | 0.00358 | 0.00139 | 0.00042 | 0.00012 | 0.00006 | 0.00009 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2010 | 1 | 15 | 0 | 0 | 2 | -1 | -1 | 72 | 0.00000 | 0.00373 | 0.07195 | 0.21032 |
| | 0.31283 | 0.20824 | 0.09955 | 0.04829 | 0.01888 | 0.00928 | 0.00448 | 0.00283 | 0.00227 | 0.00190 | 0.00118 | 0.00062 |
| | 0.00056 | 0.00024 | 0.00032 | 0.00016 | 0.00234 | | | | | | | |
| 2011 | 1 | 15 | 0 | 0 | 2 | -1 | -1 | 144 | 0.00001 | 0.00558 | 0.09909 | 0.26204 |
| | 0.29818 | 0.18416 | 0.08708 | 0.03220 | 0.01034 | 0.00541 | 0.00235 | 0.00131 | 0.00145 | 0.00145 | 0.00092 | 0.00116 |
| | 0.00070 | 0.00031 | 0.00025 | 0.00051 | 0.00551 | | | | | | | |
| 2008 | 1 | 16 | 0 | 0 | 2 | -1 | -1 | 24 | 0.00227 | 0.15418 | 0.32341 | 0.22592 |
| | 0.13209 | 0.07239 | 0.03710 | 0.01803 | 0.01084 | 0.00708 | 0.00506 | 0.00305 | 0.00259 | 0.00181 | 0.00140 | 0.00102 |
| | 0.00044 | 0.00040 | 0.00012 | 0.00080 | 0.00000 | | | | | | | |
| 2009 | 1 | 16 | 0 | 0 | 2 | -1 | -1 | 22 | 0.00293 | 0.25894 | 0.29875 | 0.14674 |
| | 0.08898 | 0.06186 | 0.03894 | 0.02335 | 0.01551 | 0.01164 | 0.01002 | 0.00800 | 0.00498 | 0.00528 | 0.00587 | 0.00388 |
| | 0.00220 | 0.00196 | 0.00108 | 0.00909 | 0.00000 | | | | | | | |
| 2010 | 1 | 16 | 0 | 0 | 2 | -1 | -1 | 71 | 0.00278 | 0.19218 | 0.35062 | 0.22809 |
| | 0.11101 | 0.05128 | 0.02315 | 0.01140 | 0.00699 | 0.00476 | 0.00387 | 0.00273 | 0.00183 | 0.00184 | 0.00192 | 0.00122 |
| | 0.00067 | 0.00064 | 0.00032 | 0.00271 | 0.00000 | | | | | | | |
| 2011 | 1 | 16 | 0 | 0 | 2 | -1 | -1 | 57 | 0.00234 | 0.10354 | 0.32772 | 0.26941 |
| | 0.13947 | 0.06893 | 0.03316 | 0.01654 | 0.01057 | 0.00723 | 0.00521 | 0.00398 | 0.00330 | 0.00234 | 0.00182 | 0.00150 |
| | 0.00072 | 0.00059 | 0.00029 | 0.00133 | 0.00000 | | | | | | | |
| 1987 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 23 | 0.00000 | 1.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1988 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 48 | 0.00000 | 0.58333 | 0.41667 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1989 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 96 | 0.28125 | 0.56250 | 0.15625 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1990 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 89 | 0.04494 | 0.95506 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1991 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 98 | 0.01020 | 0.80612 | 0.18367 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1992 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 84 | 0.00000 | 0.96429 | 0.03571 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1993 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 20 | 0.05000 | 0.85000 | 0.10000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1994 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 48 | 0.00000 | 0.79167 | 0.20833 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1995 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 40 | 0.02500 | 0.60000 | 0.37500 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1996 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 59 | 0.00000 | 0.91525 | 0.08475 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1997 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 32 | 0.03125 | 0.93750 | 0.03125 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1998 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 10 | 0.00000 | 0.80000 | 0.20000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1999 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 14 | 0.07143 | 0.35714 | 0.57143 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2000 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 83 | 0.01205 | 0.95181 | 0.03614 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2001 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 11 | 0.00000 | 0.54545 | 0.45455 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2002 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 29 | 0.03448 | 0.51724 | 0.44828 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2003 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 42 | 0.02381 | 0.88095 | 0.09524 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2004 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 37 | 0.05405 | 0.86486 | 0.08108 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2005 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 59 | 0.03390 | 0.86441 | 0.10169 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2006 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 20 | 0.05000 | 0.70000 | 0.25000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2007 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 167 | 0.02994 | 0.91018 | 0.05988 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 200 | 0.00802 | 0.69519 | 0.29679 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2009 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 98 | 0.02041 | 0.60204 | 0.37755 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2010 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 112 | 0.17857 | 0.52679 | 0.29464 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2011 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 76 | 0.00000 | 0.71053 | 0.28947 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1987 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 199 | 0.00000 | 0.84422 | 0.15578 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1988 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 137 | 0.00730 | 0.91971 | 0.07299 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1989 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 88 | 0.04545 | 0.88636 | 0.06818 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1990 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.00146 | 0.96793 | 0.03061 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1991 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.04110 | 0.79726 | 0.16164 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1992 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.01200 | 0.90800 | 0.08000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1993 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.01136 | 0.94034 | 0.04830 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1994 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.00789 | 0.92702 | 0.06509 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1995 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.10280 | 0.78505 | 0.11215 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1996 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.02170 | 0.87145 | 0.10684 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1997 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.01064 | 0.86383 | 0.12553 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1998 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.00798 | 0.88298 | 0.10904 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1999 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.15976 | 0.70710 | 0.13314 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2000 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.32021 | 0.62842 | 0.05137 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2001 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 161 | 0.24845 | 0.67081 | 0.08075 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2002 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.10470 | 0.75000 | 0.14530 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2003 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.01230 | 0.93852 | 0.04918 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2004 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.00000 | 0.97175 | 0.02825 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2005 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.05206 | 0.88330 | 0.06463 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2006 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.14209 | 0.76259 | 0.09532 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2007 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.02951 | 0.89508 | 0.07541 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2008 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.09862 | 0.75087 | 0.15052 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2009 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.10969 | 0.82908 | 0.06122 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2010 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.00000 | 0.89560 | 0.10440 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2011 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.00745 | 0.90559 | 0.08696 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1987 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 14 | 0.07143 | 0.92857 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1988 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 47 | 0.97872 | 0.00000 | 0.02128 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1989 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.92549 | 0.06667 | 0.00784 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1990 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.81882 | 0.15331 | 0.02787 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1991 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.89806 | 0.09466 | 0.00728 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1992 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 25 | 0.84000 | 0.16000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1993 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.91051 | 0.01946 | 0.07004 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1994 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 167 | 0.59880 | 0.22156 | 0.17964 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1995 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 173 | 0.99422 | 0.00578 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1996 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.73500 | 0.15500 | 0.11000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1997 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 183 | 0.87432 | 0.07650 | 0.04918 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1998 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 58 | 0.81034 | 0.13793 | 0.05172 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1999 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 144 | 0.88194 | 0.09028 | 0.02778 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2000 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.84868 | 0.06250 | 0.08882 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2001 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 66 | 0.78788 | 0.09091 | 0.12121 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2002 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 165 | 0.89697 | 0.04242 | 0.06061 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2003 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.92506 | 0.06718 | 0.00775 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2004 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.89604 | 0.09406 | 0.00990 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2005 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.72642 | 0.23113 | 0.04245 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2006 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.90855 | 0.06163 | 0.02982 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2007 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.97436 | 0.02564 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2008 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 176 | 0.35795 | 0.32955 | 0.31250 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2009 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.91789 | 0.03519 | 0.04692 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2010 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 172 | 0.66860 | 0.24419 | 0.08721 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2011 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 76 | 0.56579 | 0.17105 | 0.26316 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1987 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 150 | 0.71333 | 0.26667 | 0.02000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1988 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.72174 | 0.25652 | 0.02174 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1989 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.90865 | 0.07917 | 0.01218 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1990 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.74521 | 0.23467 | 0.02011 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1991 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.91746 | 0.07012 | 0.01242 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1992 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.69852 | 0.28007 | 0.02142 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1993 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.73905 | 0.22298 | 0.03797 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1994 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.78377 | 0.18829 | 0.02794 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1995 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.88325 | 0.08698 | 0.02977 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1996 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.77026 | 0.21322 | 0.01652 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1997 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.89253 | 0.09002 | 0.01745 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1998 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.89577 | 0.09288 | 0.01135 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1999 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.94367 | 0.04762 | 0.00871 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2000 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.89746 | 0.08585 | 0.01669 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2001 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.83887 | 0.12532 | 0.03581 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2002 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.91552 | 0.07438 | 0.01010 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2003 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.93784 | 0.05541 | 0.00676 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2004 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.89183 | 0.09756 | 0.01060 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2005 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.80809 | 0.17662 | 0.01529 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2006 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.91409 | 0.06631 | 0.01959 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2007 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.92457 | 0.07037 | 0.00505 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2008 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.67985 | 0.26712 | 0.05304 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2009 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.97829 | 0.01676 | 0.00494 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2010 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.82593 | 0.16702 | 0.00705 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2011 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.84113 | 0.12825 | 0.03062 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 1999 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 12 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.33333 | 0.33333 | 0.16667 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.16667 | 0.00000 | | | | | | | |
| 2000 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 2 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 1.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2001 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 8 | 0.00000 | 0.00000 | 0.00000 | 0.25000 |
| | 0.25000 | 0.00000 | 0.25000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.25000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2002 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 182 | 0.00000 | 0.01099 | 0.00000 | 0.06593 |
| | 0.07692 | 0.17582 | 0.09890 | 0.05495 | 0.04396 | 0.03297 | 0.05495 | 0.02198 | 0.09890 | 0.06593 | 0.01099 | 0.00000 |
| | 0.01099 | 0.00000 | 0.00000 | 0.01099 | 0.16484 | | | | | | | |
| 2003 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 32 | 0.00000 | 0.00000 | 0.00000 | 0.06250 |
| | 0.50000 | 0.00000 | 0.00000 | 0.06250 | 0.06250 | 0.12500 | 0.00000 | 0.06250 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.12500 | | | | | | | |
| 2004 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 44 | 0.00000 | 0.00000 | 0.04545 | 0.00000 |
| | 0.13636 | 0.18182 | 0.13636 | 0.04545 | 0.09091 | 0.13636 | 0.00000 | 0.00000 | 0.04545 | 0.00000 | 0.00000 | 0.04545 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.13636 | | | | | | | |
| 2005 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 6 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.33333 | 0.66667 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2006 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 4 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.50000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.50000 | | | | | | | |
| 2007 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 10 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.60000 | 0.40000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2009 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 16 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.25000 | 0.37500 | 0.37500 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2010 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 36 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.38889 | 0.27778 | 0.22222 | 0.00000 | 0.00000 | 0.05556 | 0.00000 | 0.00000 | 0.00000 | 0.05556 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | | |
| 2011 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.01176 |
| | 0.14706 | 0.24706 | 0.25294 | 0.20588 | 0.05294 | 0.02941 | 0.00000 | 0.00588 | 0.00588 | 0.00000 | 0.01765 | 0.00000 |
| | 0.00000 | 0.00588 | 0.00588 | 0.00000 | 0.01176 | | | | | | | |
| 2000 | 1 | 23 | 0 | 0 | 2 | -1 | -1 | 170 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.01176 | 0.03529 | 0.04706 | 0.15294 | 0.16471 | 0.11765 | 0.08235 | 0.02353 | 0.07059 | 0.01176 | 0.07059 | 0.09412 |
| | 0.01176 | 0.02353 | 0.01176 | 0.01176 | 0.05882 | | | | | | | |
| 2001 | 1 | 23 | 0 | 0 | 2 | -1 | -1 | 168 | 0.00000 | 0.00000 | 0.00000 | 0.01190 |
| | 0.00000 | 0.00000 | 0.07143 | 0.10714 | 0.08333 | 0.10714 | 0.05952 | 0.05952 | 0.08333 | 0.08333 | 0.04762 | 0.08333 |
| | 0.02381 | 0.00000 | 0.01190 | 0.02381 | 0.14286 | | | | | | | |

```
2002    1       23      0       0       2       -1      -1      150     0.00000 0.00000 0.00000 0.00000
        0.02667 0.02667 0.02667 0.06667 0.04000 0.09333 0.05333 0.09333 0.06667 0.02667 0.05333 0.02667
        0.02667 0.06667 0.04000 0.00000 0.26667
2003    1       23      0       0       2       -1      -1      122     0.00000 0.00000 0.00000 0.00000
        0.08197 0.04918 0.06557 0.09836 0.06557 0.01639 0.06557 0.09836 0.08197 0.06557 0.06557 0.06557
        0.03279 0.00000 0.01639 0.00000 0.13115
2004    1       23      0       0       2       -1      -1      100     0.00000 0.00000 0.00000 0.00000
        0.02000 0.16000 0.10000 0.16000 0.18000 0.08000 0.02000 0.00000 0.04000 0.06000 0.02000 0.02000
        0.04000 0.00000 0.02000 0.02000 0.06000
2006    1       23      0       0       2       -1      -1      62      0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.06452 0.06452 0.09677 0.06452 0.00000 0.03226 0.03226 0.00000 0.22581
        0.00000 0.06452 0.06452 0.03226 0.25806
2007    1       23      0       0       2       -1      -1      84      0.00000 0.00000 0.00000 0.02381
        0.02381 0.00000 0.16667 0.11905 0.14286 0.02381 0.00000 0.07143 0.02381 0.07143 0.07143 0.09524
        0.00000 0.00000 0.02381 0.04762 0.09524
2008    1       23      0       0       2       -1      -1      20      0.00000 0.00000 0.00000 0.00000
        0.20000 0.00000 0.30000 0.10000 0.20000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
        0.10000 0.00000 0.00000 0.00000 0.10000
2009    1       23      0       0       2       -1      -1      136     0.00000 0.00000 0.00000 0.01471
        0.01471 0.19118 0.08824 0.04412 0.05882 0.07353 0.07353 0.01471 0.05882 0.04412 0.02941 0.02941
        0.04412 0.00000 0.01471 0.02941 0.17647
2010    1       23      0       0       2       -1      -1      66      0.00000 0.00000 0.00000 0.00000
        0.12121 0.24242 0.27273 0.09091 0.03030 0.03030 0.03030 0.00000 0.06061 0.00000 0.00000 0.00000
        0.06061 0.00000 0.00000 0.00000 0.06061
2011    1       23      0       0       2       -1      -1      200     0.00000 0.00000 0.00174 0.00521
        0.03299 0.11806 0.19271 0.21528 0.08160 0.06424 0.03472 0.04167 0.01736 0.02431 0.01042 0.01736
        0.00868 0.01736 0.01389 0.01215 0.09028
2007    1       25      0       0       2       -1      -1      32      0.00000 0.15023 0.44842 0.32701
        0.05856 0.01087 0.00339 0.00108 0.00027 0.00011 0.00002 0.00002 0.00001 0.00001 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
2008    1       25      0       0       2       -1      -1      8       0.00000 0.19501 0.46845 0.27231
        0.04283 0.01358 0.00546 0.00168 0.00042 0.00017 0.00004 0.00002 0.00001 0.00001 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
2009    1       25      0       0       2       -1      -1      94      0.00000 0.12132 0.47615 0.32482
        0.05150 0.01292 0.00709 0.00357 0.00129 0.00058 0.00024 0.00017 0.00011 0.00007 0.00005 0.00003
        0.00002 0.00002 0.00002 0.00000 0.00005
2010    1       25      0       0       2       -1      -1      127     0.00000 0.11109 0.44544 0.35061
        0.07525 0.01398 0.00285 0.00059 0.00013 0.00003 0.00002 0.00001 0.00000 0.00000 0.00000 0.00000
        0.00000 0.00000 0.00000 0.00000 0.00000
2011    1       25      0       0       2       -1      -1      151     0.00001 0.05783 0.33367 0.38069
        0.14824 0.05029 0.01518 0.00417 0.00198 0.00173 0.00110 0.00058 0.00077 0.00091 0.00053 0.00023
        0.00030 0.00000 0.00008 0.00015 0.00158
2012    1       25      0       0       2       -1      -1      44      0.00001 0.07947 0.33316 0.34555
        0.14563 0.05639 0.02114 0.00857 0.00317 0.00165 0.00095 0.00061 0.00050 0.00026 0.00035 0.00025
        0.00016 0.00025 0.00010 0.00015 0.00169
#


0       #_N_MeanSize-at-Age_obs


#


1       #_N_environ_variables


140     #_N_environ_obs
#_year  variable  value
1872    1       1
1873    1       1
1874    1       1
1875    1       1
1876    1       1
1877    1       1
1878    1       1
1879    1       1
1880    1       1
1881    1       1
1882    1       1
1883    1       1
1884    1       1
1885    1       1
1886    1       1
1887    1       1
1888    1       1
1889    1       1
1890    1       1
1891    1       1
1892    1       1
1893    1       1
1894    1       1
1895    1       1
1896    1       1
1897    1       1
1898    1       1
1899    1       1
```

| | | |
|---|---|---|
| 1900 | 1 | 1 |
| 1901 | 1 | 1 |
| 1902 | 1 | 1 |
| 1903 | 1 | 1 |
| 1904 | 1 | 1 |
| 1905 | 1 | 1 |
| 1906 | 1 | 1 |
| 1907 | 1 | 1 |
| 1908 | 1 | 1 |
| 1909 | 1 | 1 |
| 1910 | 1 | 1 |
| 1911 | 1 | 1 |
| 1912 | 1 | 1 |
| 1913 | 1 | 1 |
| 1914 | 1 | 1 |
| 1915 | 1 | 1 |
| 1916 | 1 | 1 |
| 1917 | 1 | 1 |
| 1918 | 1 | 1 |
| 1919 | 1 | 1 |
| 1920 | 1 | 1 |
| 1921 | 1 | 1 |
| 1922 | 1 | 1 |
| 1923 | 1 | 1 |
| 1924 | 1 | 1 |
| 1925 | 1 | 1 |
| 1926 | 1 | 1 |
| 1927 | 1 | 1 |
| 1928 | 1 | 1 |
| 1929 | 1 | 1 |
| 1930 | 1 | 1 |
| 1931 | 1 | 1 |
| 1932 | 1 | 1 |
| 1933 | 1 | 1 |
| 1934 | 1 | 1 |
| 1935 | 1 | 1 |
| 1936 | 1 | 1 |
| 1937 | 1 | 1 |
| 1938 | 1 | 1 |
| 1939 | 1 | 1 |
| 1940 | 1 | 1 |
| 1941 | 1 | 1 |
| 1942 | 1 | 1 |
| 1943 | 1 | 1 |
| 1944 | 1 | 1 |
| 1945 | 1 | 1 |
| 1946 | 1 | 1 |
| 1947 | 1 | 1 |
| 1948 | 1 | 1 |
| 1949 | 1 | 1 |
| 1950 | 1 | 1 |
| 1951 | 1 | 1 |
| 1952 | 1 | 1 |
| 1953 | 1 | 1 |
| 1954 | 1 | 1 |
| 1955 | 1 | 1 |
| 1956 | 1 | 1 |
| 1957 | 1 | 1 |
| 1958 | 1 | 1 |
| 1959 | 1 | 1 |
| 1960 | 1 | 1 |
| 1961 | 1 | 1 |
| 1962 | 1 | 1 |
| 1963 | 1 | 1 |
| 1964 | 1 | 1 |
| 1965 | 1 | 1 |
| 1966 | 1 | 1 |
| 1967 | 1 | 1 |
| 1968 | 1 | 1 |
| 1969 | 1 | 1 |
| 1970 | 1 | 1 |
| 1971 | 1 | 1 |
| 1972 | 1 | 1 |
| 1973 | 1 | 1 |
| 1974 | 1 | 1 |
| 1975 | 1 | 1 |
| 1976 | 1 | 1 |
| 1977 | 1 | 1 |
| 1978 | 1 | 1 |
| 1979 | 1 | 1 |
| 1980 | 1 | 1 |
| 1981 | 1 | 1 |
| 1982 | 1 | 1 |
| 1983 | 1 | 1 |
| 1984 | 1 | 0 |
| 1985 | 1 | 0 |
| 1986 | 1 | 0 |
| 1987 | 1 | 0 |
| 1988 | 1 | 0 |
| 1989 | 1 | 0 |
| 1990 | 1 | 0 |
| 1991 | 1 | 0 |
| 1992 | 1 | 0 |
| 1993 | 1 | 0 |
| 1994 | 1 | 0 |

```
1995	1	0
1996	1	0
1997	1	0
1998	1	0
1999	1	0
2000	1	0
2001	1	0
2002	1	0
2003	1	0
2004	1	0
2005	1	0
2006	1	0
2007	1	0
2008	1	0
2009	1	0
2010	1	0
2011	1	0
#
0	# N sizefreq methods to read
#
0	# no tag data
#
0	# no morph composition data
#
999	# end of file marker
```

## 3.9 Appendix B: Stock Synthesis Control File

```
#V3.24f
#_data_and_control_files: data.ss // control.ss
#_SS-V3.24f-safe;_08/03/2012;_Stock_Synthesis_by_Richard_Methot_(NOAA)_using_ADMB_10.1
1  #_N_Growth_Patterns
1 #_N_Morphs_Within_GrowthPattern
#_Cond 1 #_Morph_between/within_stdev_ratio (no read if N_morphs=1)
#_Cond  1 #vector_Morphdist_(-1_in_first_val_gives_normal_approx)
#
2  #  N recruitment designs goes here if N_GP*nseas*area>1
0  #  placeholder for recruitment interaction request
1 1 1  #_recruitment design element for GP=1, seas=1, area=1
1 1 2  #_recruitment design element for GP=1, seas=1, area=2
#
0 # N_movement_definitions goes here if N_areas > 1
#_Cond 1.0 # first age that moves (real age at begin of season, not integer) also cond on do_migration>0
#_Cond 1 1 1 2 4 10 # example move definition for seas=1, morph=1, source=1 dest=2, age1=4, age2=10
#
4 #_Nblock_Patterns
4 4 1 1 #_blocks_per_pattern
# begin and end years of blocks
1985 1993 1994 1994 1995 2006 2007 2011
1985 1993 1994 1994 1995 1999 2000 2011
2007 2011
2008 2011
#
0.5 #_fracfemale
3 #_natM_type:_0=1Parm; 1=N_breakpoints;_2=Lorenzen;_3=agespecific;_4=agespec_withseasinterpolate
#3 #_reference age for Lorenzen function
#_Age_natmort_by gender x growthpattern
1.000    1.600    0.695    0.170    0.140    0.122    0.110    0.103    0.097    0.093    0.090    0.087    0.085
         0.084    0.083    0.082    0.081    0.080    0.080    0.079    0.079
#0.725 0.522773 0.431125 0.38 0.348236 0.327179 0.312616 0.30225 0.294718 0.289164 0.285023 0.278818
#0.341 0.506661 0.425543 0.38 0.351759 0.333168 0.320444 0.311505 0.305108 0.300469 0.297074 0.292321
#0.495 0.62 0.43 0.37 0.35 0.34 0.33 0.325 0.321 0.32 0.32 0.32
1 # GrowthModel: 1=vonBert with L1&L2; 2=Richards with L1&L2; 3=age_speciific_K; 4=not implemented
0.75 #_Growth_Age_for_L1
999 #_Growth_Age_for_L2 (999 to use as Linf)
0 #_SD_add_to_LAA (set to 0.1 for SS2 V1.x compatibility)
0 #_CV_Growth_Pattern:  0 CV=f(LAA); 1 CV=F(A); 2 SD=F(LAA); 3 SD=F(A); 4 logSD=F(A)
4 #_maturity_option:  1=length logistic; 2=age logistic; 3=read age-maturity matrix by growth_pattern; 4=read
age-fecundity; 5=read fec and wt from wtatage.ss
0        0        350000   2620000  9070000  20300000 34710000 49950000 64270000 76760000 87150000 95530000
         102150000         107300000         111270000         114300000         116610000         118360000
         119680000         120670000         123234591
2 #_First_Mature_Age
3 #_fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b; (4)eggs=a+b*L; (5)eggs=a+b*W
0 #_hermaphroditism option:  0=none; 1=age-specific fxn
1 #_parameter_offset_approach (1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)
2 #_env/block/dev_adjust_method (1=standard; 2=logistic transform keeps in base parm bounds; 3=standard w/ no
bound check)
#
# Prior types (-1 = none, 0=normal, 1=symmetric beta, 2=full beta, 3=lognormal)
#_growth_parms
#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
# 0.2 0.5 0.38 0.4 0 1 -3 0 0 0 0 0 0 0 # NatM_p_1_Fem_GP_1
7        21       9.96     9.96     -1       1        -3       0        0        0        0        0        0
         0        # L_at_Amin_Fem_GP_1
70       100      85.64    85.64    -1       1        -3       0        0        0        0        0        0
         0        # L_at_Amax_Fem_GP_1
0.05     0.8      0.1919   0.1919   -1       1        -3       0        0        0        0        0        0
         0        # VonBert_K_Fem_GP_1
0.01     0.5      0.1735   0.1735   -1       1        -5       0        0        0        0        0        0
         0        # CV_young_Fem_GP_1
0.01     0.5      0.0715   0.0715   -1       1        -5       0        0        0        0        0        0
         0        # CV_old_Fem_GP_1
0        1        0.00001673        0.00001673       -1       1        -3       0        0        0        0
         0        0        0        # Wtlen_1_Fem
0        4        2.953    2.953    -1       1        -3       0        0        0        0        0        0
         0        # Wtlen_2_Fem
50       1000     999      999      -1       1        -3       0        0        0        0        0        0
         0        # Mat50%_Fem
-1       1000     999      999      -1       1        -3       0        0        0        0        0        0
         0        # Mat_slope_Fem
0        1000     999      999      -1       1        -3       0        0        0        0        0        0
         0        # Eggs/kg_inter_Fem
0        1000     999      999      -1       1        -3       0        0        0        0        0        0
         0        # Eggs/kg_slope_wt_Fem
```

```
0       0       0       0       -1      0       -4      0       0       0       0       0       0
        0       # RecrDist_GP_1
-4      4       -0.8    -0.8    -1      1       4       0       2       1972    2011    0.1     0
        0       # RecrDist_Area1
-4      4       0       0       -1      1       -4      0       0       0       0       0       0
        0       # RecrDist_Area2
0       0       0       0       -1      0       -4      0       0       0       0       0       0
        0       # RecrDist_Seas_1
0       0       1       1       -1      0       -4      0       0       0       0       0       0
        0       # CohortGrowDev
#
#_Cond 0  #custom_MG-env_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no MG-environ parameters
#
#_Cond 0  #custom_MG-block_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no MG-block parameters
#_Cond No MG parm trends
#
#_seasonal_effects_on_biology_parms
 0 0 0 0 0 0 0 0 0 0 #_femwtlen1,femwtlen2,mat1,mat2,fec1,fec2,Malewtlen1,malewtlen2,L1,K
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no seasonal MG parameters
#
5 #_MGparm_Dev_Phase
#
#_Spawner-Recruitment
3 #_SR_function: 2=Ricker; 3=std_B-H; 4=SCAA; 5=Hockey; 6=B-H_flattop; 7=survival_3Parm
#_LO HI INIT PRIOR PR_type SD PHASE
 1      20      11.8    11.8    -1      1       1       # SR_LN(R0)
 0.2    1       0.99    0.99    -1      1       -4      # SR_BH_steep
 0      2       0.3     0.3     -1      1       -4      # SR_sigmaR
 -5     5       0       0       -1      1       3       # SR_envlink
 -5     5       0       0       -1      1       -4      # SR_R1_offset
 0      0       0       0       -1      0       -99     # SR_autocorr
1 #_SR_env_link
2 #_SR_env_target_0=none;1=devs;_2=R0;_3=steepness
1 #do_recdev:  0=none; 1=devvector; 2=simple deviations
1899 # first year of main recr_devs; early devs can preceed this era
2011 # last year of main recr_devs; forecast devs start in following year
4 #_recdev phase
1 # (0/1) to read 13 advanced options
0 #_recdev_early_start (0=none; neg value makes relative to recdev_start)
-5 #_recdev_early_phase
-5 #_forecast_recruitment phase (incl. late recr) (0 value resets to maxphase+1)
1 #_lambda for Fcast_recr_like occurring before endyr+1
1984 #_last_early_yr_nobias_adj_in_MPD
1990 #_first_yr_fullbias_adj_in_MPD
2005 #_last_yr_fullbias_adj_in_MPD
2011 #_first_recent_yr_nobias_adj_in_MPD
1 #_max_bias_adj_in_MPD (-1 to override ramp and set biasadj=1.0 for all estimated recdevs)
0 #_period of cycles in recruitment (N parms read below)
-5 #min rec_dev
5 #max rec_dev
0 #_read_recdevs
#_end of advanced SR options
#
#Fishing Mortality info
0.3 # F ballpark for tuning early phases
-2001 # F ballpark year (neg value to disable)
2 # F_Method:  1=Pope; 2=instan. F; 3=hybrid (hybrid is recommended)
2.9 # max F or harvest rate, depends on F_Method
# no additional F input needed for Fmethod 1
# if Fmethod=2; read overall start F value; overall phase; N detailed inputs to read
# 5 # if Fmethod=3; read N iterations for tuning for Fmethod 3
0.05 1 14 # overall start F value; overall phase; N detailed inputs to read
#Fleet Year Seas F_value se phase (for detailed setup of F_Method=2)
1       1872    1       0.05    0.05    1
2       1880    1       0.05    0.05    1
3       1980    1       0.05    0.05    1
4       1976    1       0.05    0.05    1
5       1950    1       0.05    0.05    1
6       1950    1       0.05    0.05    1
7       1950    1       0.05    0.05    1
8       1950    1       0.05    0.05    1
9       1991    1       0.05    0.05    1
10      1991    1       0.05    0.05    1
11      1997    1       0.05    0.05    1
12      1997    1       0.05    0.05    1
13      1950    1       0.05    0.05    1
14      1946    1       0.05    0.05    1
#
#_initial_F_parms
```

```
#_LO HI INIT PRIOR PR_type SD PHASE
0	1	0	0.01	0	99	-1	#_HLE
0	1	0	0.01	0	99	-1	#_HL_W
0	1	0	0.01	0	99	-1	#_LL_E
0	1	0	0.01	0	99	-1	#_LL_W
0	1	0	0.01	0	99	-1	#_MRIP_E
0	1	0	0.01	0	99	-1	#_MRIP_W
0	1	0	0.01	0	99	-1	#_HBT_E
0	1	0	0.01	0	99	-1	#_HBT_W
0	1	0	0.01	0	99	-1	#_C_Clsd_E
0	1	0	0.01	0	99	-1	#_C_Clsd_W
0	1	0	0.01	0	99	-1	#_R_Clsd_E
0	1	0	0.01	0	99	-1	#_R_Clsd_W
0	1	0	0.01	0	99	-1	#_Shr_E
0	1	0	0.01	0	99	-1	#_Shr_W
#
#_Q_setup
# Q_type options:  <0=mirror, 0=float_nobiasadj, 1=float_biasadj, 2=parm_nobiasadj, 3=parm_w_random_dev,
4=parm_w_randwalk, 5=mean_unbiased_float_assign_to_parm
#_for_env-var:_enter_index_of_the_env-var_to_be_linked
#_Den-dep  env-var  extra_se  Q_type
0	0	0	0	#_HLE
0	0	0	0	#_HL_W
0	0	0	0	#_LL_E
0	0	0	0	#_LL_W
0	0	0	0	#_MRIP_E
0	0	0	0	#_MRIP_W
0	0	0	0	#_HBT_E
0	0	0	0	#_HBT_W
0	0	0	0	#_C_Clsd_E
0	0	0	0	#_C_Clsd_W
0	0	0	0	#_R_Clsd_E
0	0	0	0	#_R_Clsd_W
0	0	0	2	#_Shr_E
0	0	0	2	#_Shr_W
0	0	0	0	#_Video_E
0	0	0	0	#_Video_W
0	0	0	0	#_Larv_E
0	0	0	0	#_Larv_W
0	0	0	0	#_Sum_E
0	0	0	0	#_Sum_W
0	0	0	0	#_Fall_E
0	0	0	0	#_Fall_W
0	0	0	0	#_BLL_W
0	0	0	0	#_BLL_E
0	0	0	0	#_ROV_E
0	0	0	0	#_MRIP_Index_E
0	0	0	0	#_MRIP_Index_W
0	0	0	0	#_HBT_Index_E
0	0	0	0	#_HBT_Index_W
#
#_Cond 0 #_If q has random component, then 0=read one parm for each fleet with random q; 1=read a parm for each
year of index
#_Q_parms(if_any)
# LO HI INIT PRIOR PR_type SD PHASE
 -10	20	1	1	-1	1	1	#_Shr_E
 -10	20	1	1	-1	1	1	#_Shr_W
#
#_size_selex_types
#discard_options:_0=none;_1=define_retention;_2=retention&mortality;_3=all_discarded_dead
#_Pattern Discard Male Special
0	2	0	0	#_HLE
0	2	0	0	#_HL_W
0	2	0	0	#_LL_E
0	2	0	0	#_LL_W
0	2	0	0	#_MRIP_E
0	2	0	0	#_MRIP_W
0	2	0	0	#_HBT_E
0	2	0	0	#_HBT_W
0	2	0	0	#_C_Clsd_E
0	2	0	0	#_C_Clsd_W
0	2	0	0	#_R_Clsd_E
0	2	0	0	#_R_Clsd_W
0	3	0	0	#_Shr_E
0	3	0	0	#_Shr_W
0	0	0	0	#_Video_E
0	0	0	0	#_Video_W
30	0	0	0	#_Larv_E
30	0	0	0	#_Larv_W
0	0	0	0	#_Sum_E
0	0	0	0	#_Sum_W
```

```
0       0       0       0       #_Fall_E
0       0       0       0       #_Fall_W
0       0       0       0       #_BLL_W
0       0       0       0       #_BLL_E
0       0       0       0       #_ROV_E
0       0       0       0       #_MRIP_Index_E
0       0       0       0       #_MRIP_Index_W
0       0       0       0       #_HBT_Index_E
0       0       0       0       #_HBT_Index_W
#
#_age_selex_types
#_Pattern ___ Male Special
17      0       0       0       #_HLE
17      0       0       0       #_HL_W
17      0       0       0       #_LL_E
17      0       0       0       #_LL_W
17      0       0       0       #_MRIP_E
17      0       0       0       #_MRIP_W
17      0       0       0       #_HBT_E
17      0       0       0       #_HBT_W
17      0       0       0       #_C_Clsd_E
17      0       0       0       #_C_Clsd_W
15      0       0       5       #_R_Clsd_E
15      0       0       6       #_R_Clsd_W
17      0       0       0       #_Shr_E
17      0       0       0       #_Shr_W
17      0       0       0       #_Video_E
17      0       0       0       #_Video_W
10      0       0       0       #_Larv_E
10      0       0       0       #_Larv_W
17      0       0       0       #_Sum_E
17      0       0       0       #_Sum_W
17      0       0       0       #_Fall_E
17      0       0       0       #_Fall_W
12      0       0       0       #_BLL_W
15      0       0       23      #_BLL_E
17      0       0       0       #_ROV_E
15      0       0       5       #_MRIP_Index_E
15      0       0       6       #_MRIP_Index_W
15      0       0       7       #_HBT_Index_E
15      0       0       8       #_HBT_Index_W
#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
10      100     15.24   15.24   -1      1       -3      0       0       0       0       0       1
        2       #_Retain_1P_HL_E
-1      20      1       1       -1      1       -3      0       0       0       0       0       1
        2       #_Retain_2P_HL_E
0       1       1       1       -1      1       -2      0       0       0       0       0       1
        2       #_Retain_3P_HL_E
-1      2       0       0       -1      1       -4      0       0       0       0       0       0
        0       #_Retain_4P_HL_E
-10     10      -5      -5      -1      1       -2      0       0       0       0       0       0
        0       #_DiscMort_1P_HL_E
-1      2       1       1       -1      1       -4      0       0       0       0       0       0
        0       #_DiscMort_2P_HL_E
-1      2       0.75    0.75    -1      1       -2      0       0       0       0       0       4
        2       #_DiscMort_3P_HL_E
-1      2       0       0       -1      1       -4      0       0       0       0       0       0
        0       #_DiscMort_4P_HL_E
10      100     15.24   15.24   -1      1       -3      0       0       0       0       0       1
        2       #_Retain_1P_HL_W
-1      20      1       1       -1      1       -3      0       0       0       0       0       1
        2       #_Retain_2P_HL_W
0       1       1       1       -1      1       -2      0       0       0       0       0       1
        2       #_Retain_3P_HL_W
-1      2       0       0       -1      1       -4      0       0       0       0       0       0
        0       #_Retain_4P_HL_W
-10     10      -5      -5      -1      1       -2      0       0       0       0       0       0
        0       #_DiscMort_1P_HL_W
-1      2       1       1       -1      1       -4      0       0       0       0       0       0
        0       #_DiscMort_2P_HL_W
-1      2       0.78    0.78    -1      1       -2      0       0       0       0       0       4
        2       #_DiscMort_3P_HL_W
-1      2       0       0       -1      1       -4      0       0       0       0       0       0
        0       #_DiscMort_4P_HL_W
10      100     15.24   15.24   -1      1       -3      0       0       0       0       0       1
        2       #_Retain_1P_LL_E
-1      20      1       1       -1      1       -3      0       0       0       0       0       1
        2       #_Retain_2P_LL_E
0       1       1       1       -1      1       -2      0       0       0       0       0       1
        2       #_Retain_3P_LL_E
```

```
-1	2	0	0	-1	1	-4	0	0	0	0	0	0
	0	#_Retain_4P_LL_E
-10	10	-5	-5	-1	1	-2	0	0	0	0	0	0
	0	#_DiscMort_1P_LL_E
-1	2	1	1	-1	1	-4	0	0	0	0	0	0
	0	#_DiscMort_2P_LL_E
-1	2	0.81	0.81	-1	1	-2	0	0	0	0	0	4
	2	#_DiscMort_3P_LL_E
-1	2	0	0	-1	1	-4	0	0	0	0	0	0
	0	#_DiscMort_4P_LL_E
10	100	15.24	15.24	-1	1	-3	0	0	0	0	0	1
	2	#_Retain_1P_LL_W
-1	20	1	1	-1	1	-3	0	0	0	0	0	1
	2	#_Retain_2P_LL_W
0	1	1	1	-1	1	-2	0	0	0	0	0	1
	2	#_Retain_3P_LL_W
-1	2	0	0	-1	1	-4	0	0	0	0	0	0
	0	#_Retain_4P_LL_W
-10	10	-5	-5	-1	1	-2	0	0	0	0	0	0
	0	#_DiscMort_1P_LL_W
-1	2	1	1	-1	1	-4	0	0	0	0	0	0
	0	#_DiscMort_2P_LL_W
-1	2	0.91	0.91	-1	1	-2	0	0	0	0	0	4
	2	#_DiscMort_3P_LL_W
-1	2	0	0	-1	1	-4	0	0	0	0	0	0
	0	#_DiscMort_4P_LL_W
10	100	15.24	15.24	-1	1	-3	0	0	0	0	0	2
	2	#_Retain_1P_MRIP_E
-1	20	1	1	-1	1	-3	0	0	0	0	0	2
	2	#_Retain_2P_MRIP_E
0	1	1	1	-1	1	-2	0	0	0	0	0	0
	0	#_Retain_3P_MRIP_E
-1	2	0	0	-1	1	-4	0	0	0	0	0	0
	0	#_Retain_4P_MRIP_E
-10	10	-5	-5	-1	1	-2	0	0	0	0	0	0
	0	#_DiscMort_1P_MRIP_E
-1	2	1	1	-1	1	-4	0	0	0	0	0	0
	0	#_DiscMort_2P_MRIP_E
-1	2	0.21	0.21	-1	1	-2	0	0	0	0	0	4
	2	#_DiscMort_3P_MRIP_E
-1	2	0	0	-1	1	-4	0	0	0	0	0	0
	0	#_DiscMort_4P_MRIP_E
10	100	15.24	15.24	-1	1	-3	0	0	0	0	0	2
	2	#_Retain_1P_MRIP_W
-1	20	1	1	-1	1	-3	0	0	0	0	0	2
	2	#_Retain_2P_MRIP_W
0	1	1	1	-1	1	-2	0	0	0	0	0	0
	0	#_Retain_3P_MRIP_W
-1	2	0	0	-1	1	-4	0	0	0	0	0	0
	0	#_Retain_4P_MRIP_W
-10	10	-5	-5	-1	1	-2	0	0	0	0	0	0
	0	#_DiscMort_1P_MRIP_W
-1	2	1	1	-1	1	-4	0	0	0	0	0	0
	0	#_DiscMort_2P_MRIP_W
-1	2	0.22	0.22	-1	1	-2	0	0	0	0	0	4
	2	#_DiscMort_3P_MRIP_W
-1	2	0	0	-1	1	-4	0	0	0	0	0	0
	0	#_DiscMort_4P_MRIP_W
10	100	15.24	15.24	-1	1	-3	0	0	0	0	0	2
	2	#_Retain_1P_HBT_E
-1	20	1	1	-1	1	-3	0	0	0	0	0	2
	2	#_Retain_2P_HBT_E
0	1	1	1	-1	1	-2	0	0	0	0	0	2
	2	#_Retain_3P_HBT_E
-1	2	0	0	-1	1	-4	0	0	0	0	0	0
	0	#_Retain_4P_HBT_E
-10	10	-5	-5	-1	1	-2	0	0	0	0	0	0
	0	#_DiscMort_1P_HBT_E
-1	2	1	1	-1	1	-4	0	0	0	0	0	0
	0	#_DiscMort_2P_HBT_E
-1	2	0.21	0.21	-1	1	-2	0	0	0	0	0	4
	2	#_DiscMort_3P_HBT_E
-1	2	0	0	-1	1	-4	0	0	0	0	0	0
	0	#_DiscMort_4P_HBT_E
10	100	15.24	15.24	-1	1	-3	0	0	0	0	0	2
	2	#_Retain_1P_HBT_W
-1	20	1	1	-1	1	-3	0	0	0	0	0	2
	2	#_Retain_2P_HBT_W
0	1	1	1	-1	1	-2	0	0	0	0	0	0
	0	#_Retain_3P_HBT_W
```

```
-1      2       0       0       -1      1       -4      0       0       0       0       0       0
        0       #_Retain_4P_HBT_W
-10     10      -5      -5      -1      1       -2      0       0       0       0       0       0
        0       #_DiscMort_1P_HBT_W
-1      2       1       1       -1      1       -4      0       0       0       0       0       0
        0       #_DiscMort_2P_HBT_W
-1      2       0.22    0.22    -1      1       -2      0       0       0       0       0       4
        2       #_DiscMort_3P_HBT_W
-1      2       0       0       -1      1       -4      0       0       0       0       0       0
        0       #_DiscMort_4P_HBT_W
10      100     10      10      -1      1       -3      0       0       0       0       0       0
        0       #_Retain_1P_C_Clsd_E
-1      20      1       1       -1      1       -3      0       0       0       0       0       0
        0       #_Retain_2P_C_Clsd_E
0       1       0       0       -1      1       -2      0       0       0       0       0       0
        0       #_Retain_3P_C_Clsd_E
-1      2       0       0       -1      1       -4      0       0       0       0       0       0
        0       #_Retain_4P_C_Clsd_E
-10     10      -5      -5      -1      1       -2      0       0       0       0       0       0
        0       #_DiscMort_1P_C_Clsd_E
-1      2       1       1       -1      1       -4      0       0       0       0       0       0
        0       #_DiscMort_2P_C_Clsd_E
-1      2       0.74    0.74    -1      1       -2      0       0       0       0       0       4
        2       #_DiscMort_3P_C_Clsd_E
-1      2       0       0       -1      1       -4      0       0       0       0       0       0
        0       #_DiscMort_4P_C_Clsd_E
10      100     10      10      -1      1       -3      0       0       0       0       0       0
        0       #_Retain_1P_C_Clsd_W
-1      20      1       1       -1      1       -3      0       0       0       0       0       0
        0       #_Retain_2P_C_Clsd_W
0       1       0       0       -1      1       -2      0       0       0       0       0       0
        0       #_Retain_3P_C_Clsd_W
-1      2       0       0       -1      1       -4      0       0       0       0       0       0
        0       #_Retain_4P_C_Clsd_W
-10     10      -5      -5      -1      1       -2      0       0       0       0       0       0
        0       #_DiscMort_1P_C_Clsd_W
-1      2       1       1       -1      1       -4      0       0       0       0       0       0
        0       #_DiscMort_2P_C_Clsd_W
-1      2       0.87    0.87    -1      1       -2      0       0       0       0       0       4
        2       #_DiscMort_3P_C_Clsd_W
-1      2       0       0       -1      1       -4      0       0       0       0       0       0
        0       #_DiscMort_4P_C_Clsd_W
10      100     10      10      -1      1       -3      0       0       0       0       0       0
        0       #_Retain_1P_R_Clsd_E
-1      20      1       1       -1      1       -3      0       0       0       0       0       0
        0       #_Retain_2P_R_Clsd_E
0       1       0       0       -1      1       -2      0       0       0       0       0       0
        0       #_Retain_3P_R_Clsd_E
-1      2       0       0       -1      1       -4      0       0       0       0       0       0
        0       #_Retain_4P_R_Clsd_E
-10     10      -5      -5      -1      1       -2      0       0       0       0       0       0
        0       #_DiscMort_1P_R_Clsd_E
-1      2       1       1       -1      1       -4      0       0       0       0       0       0
        0       #_DiscMort_2P_R_Clsd_E
-1      2       0.21    0.21    -1      1       -2      0       0       0       0       0       4
        2       #_DiscMort_3P_R_Clsd_E
-1      2       0       0       -1      1       -4      0       0       0       0       0       0
        0       #_DiscMort_4P_R_Clsd_E
10      100     10      10      -1      1       -3      0       0       0       0       0       0
        0       #_Retain_1P_R_Clsd_W
-1      20      1       1       -1      1       -3      0       0       0       0       0       0
        0       #_Retain_2P_R_Clsd_W
0       1       0       0       -1      1       -2      0       0       0       0       0       0
        0       #_Retain_3P_R_Clsd_W
-1      2       0       0       -1      1       -4      0       0       0       0       0       0
        0       #_Retain_4P_R_Clsd_W
-10     10      -5      -5      -1      1       -2      0       0       0       0       0       0
        0       #_DiscMort_1P_R_Clsd_W
-1      2       1       1       -1      1       -4      0       0       0       0       0       0
        0       #_DiscMort_2P_R_Clsd_W
-1      2       0.22    0.22    -1      1       -2      0       0       0       0       0       4
        2       #_DiscMort_3P_R_Clsd_W
-1      2       0       0       -1      1       -4      0       0       0       0       0       0
        0       #_DiscMort_4P_R_Clsd_W
-1      1       -1000   -1000   -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_E_P0
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_E_P1
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_E_P2
```

```
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_E_P3
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_E_P4
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_E_P5
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_E_P6
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_E_P7
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_E_P8
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_E_P9
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_E_P10
-1      1       0       0       -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_E_P11
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_E_P12
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_E_P13
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_E_P14
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_E_P15
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_E_P16
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_E_P17
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_E_P18
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_E_P19
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_E_P20
-1      1       -1000   -1000   -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_W_P0
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_W_P1
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_W_P2
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_W_P3
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_W_P4
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_W_P5
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_W_P6
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_W_P7
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_W_P8
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_W_P9
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       3
        2       #_AgeSel_HL_W_P10
-1      1       0       0       -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_W_P11
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_W_P12
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_W_P13
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_W_P14
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_W_P15
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_W_P16
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_W_P17
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_W_P18
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_W_P19
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_HL_W_P20
-1      1       -1000   -1000   -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_LL_E_P0
```

```
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P1
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P2
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P3
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P4
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P5
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P6
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P7
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P8
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P9
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P10
-1	1	0	0	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P11
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P12
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P13
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P14
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P15
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P16
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P17
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P18
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P19
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_E_P20
-1	1	-1000	-1000	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P0
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P1
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P2
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P3
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P4
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P5
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P6
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P7
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P8
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P9
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P10
-1	1	0	0	-1	1	-2	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P11
-1	1	-999	-999	-1	1	-2	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P12
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P13
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P14
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P15
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P16
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P17
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P18
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	3
	2	#_AgeSel_LL_W_P19
```

```
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       3
        2       #_AgeSel_LL_W_P20
-1      1       -1000   -1000   -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P0
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P1
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P2
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P3
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P4
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P5
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P6
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P7
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P8
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P9
-1      1       0       0       -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P10
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P11
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P12
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P13
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P14
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P15
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P16
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P17
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P18
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P19
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_E_P20
-1      1       -1000   -1000   -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P0
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P1
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P2
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P3
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P4
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P5
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P6
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P7
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P8
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P9
-1      1       0       0       -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P10
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P11
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P12
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P13
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P14
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P15
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P16
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_MRIP_W_P17
```

```
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_MRIP_W_P18
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_MRIP_W_P19
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_MRIP_W_P20
-1   1   -1000   -1000   -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P0
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P1
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P2
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P3
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P4
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P5
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P6
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P7
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P8
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P9
-1   1   0       0       -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P10
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P11
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P12
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P13
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P14
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P15
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P16
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P17
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P18
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P19
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_E_P20
-1   1   -1000   -1000   -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_W_P0
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_W_P1
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_W_P2
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_W_P3
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_W_P4
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_W_P5
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_W_P6
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_W_P7
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_W_P8
-1   1   0.1     0.1     -1   1   2    0   0   0   0   0   4
     2   #_AgeSel_HBT_W_P9
-1   1   0       0       -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_W_P10
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_W_P11
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_W_P12
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_W_P13
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_W_P14
-1   1   -999    -999    -1   1   -1   0   0   0   0   0   4
     2   #_AgeSel_HBT_W_P15
```

```
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_HBT_W_P16
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_HBT_W_P17
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_HBT_W_P18
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_HBT_W_P19
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       4
        2       #_AgeSel_HBT_W_P20
-1      1       0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P0
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P1
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P2
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P3
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P4
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P5
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P6
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P7
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P8
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P9
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P10
-1      1       0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P11
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P12
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P13
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P14
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P15
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P16
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P17
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P18
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P19
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_E_P20
-1      1       0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P0
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P1
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P2
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P3
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P4
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P5
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P6
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P7
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P8
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P9
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P10
-1      1       0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P11
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P12
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P13
```

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-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P14
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P15
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P16
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P17
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P18
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P19
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_C_Clsd_W_P20
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P0
-20     20      -0.1    -0.1    -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P1
-20     20      -0.1    -0.1    -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P2
-30     0       -20     -20     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P3
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P4
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P5
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P6
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P7
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P8
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P9
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P10
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P11
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P12
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P13
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P14
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P15
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P16
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P17
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P18
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P19
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_E_P20
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_W_P0
-20     20      -0.1    -0.1    -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_Shr_W_P1
-20     20      -0.1    -0.1    -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_Shr_W_P2
-30     0       -20     -20     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_Shr_W_P3
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_W_P4
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_W_P5
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_W_P6
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_W_P7
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_W_P8
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_W_P9
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_W_P10
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Shr_W_P11
```

```
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Shr_W_P12
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Shr_W_P13
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Shr_W_P14
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Shr_W_P15
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Shr_W_P16
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Shr_W_P17
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Shr_W_P18
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Shr_W_P19
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Shr_W_P20
-1	1	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P0
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P1
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P2
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P3
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P4
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P5
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P6
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P7
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P8
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P9
-1	1	0	0	-1	1	-2	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P10
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P11
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P12
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P13
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P14
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P15
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P16
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P17
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P18
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P19
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_E_P20
-1	1	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P0
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P1
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P2
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P3
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P4
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P5
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P6
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P7
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P8
-1	1	0.1	0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P9
```

```
-1	1	0	0	-1	1	-2	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P10
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P11
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P12
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P13
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P14
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P15
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P16
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P17
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P18
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P19
-1	1	-999	-999	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Video_W_P20
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P0
-20	20	-0.1	-0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P1
-20	20	-0.1	-0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P2
-30	0	-10	-10	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P3
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P4
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P5
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P6
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P7
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P8
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P9
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P10
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P11
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P12
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P13
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P14
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P15
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P16
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P17
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P18
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P19
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_E_P20
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P0
-20	20	-0.1	-0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P1
-20	20	-0.1	-0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P2
-30	0	-10	-10	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P3
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P4
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P5
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P6
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P7
```

```
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P8
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P9
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P10
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P11
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P12
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P13
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P14
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P15
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P16
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P17
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P18
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P19
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Sum_W_P20
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P0
-20	20	-0.1	-0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P1
-20	20	-0.1	-0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P2
-30	0	-20	-20	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P3
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P4
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P5
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P6
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P7
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P8
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P9
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P10
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P11
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P12
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P13
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P14
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P15
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P16
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P17
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P18
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P19
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_E_P20
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_W_P0
-20	20	-0.1	-0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Fall_W_P1
-20	20	-0.1	-0.1	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Fall_W_P2
-30	0	-20	-20	-1	1	2	0	0	0	0	0	0
	0	#_AgeSel_Fall_W_P3
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_W_P4
-20	20	0	0	-1	1	-1	0	0	0	0	0	0
	0	#_AgeSel_Fall_W_P5
```

```
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Fall_W_P6
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Fall_W_P7
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Fall_W_P8
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Fall_W_P9
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Fall_W_P10
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Fall_W_P11
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Fall_W_P12
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Fall_W_P13
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Fall_W_P14
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Fall_W_P15
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Fall_W_P16
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Fall_W_P17
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Fall_W_P18
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Fall_W_P19
-20     20      0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_Fall_W_P20
4       18      12      12      -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_BLL_W_P1
-1      5       2       2       -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_BLL_W_P2
-1      1       0       0       -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P0
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P1
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P2
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P3
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P4
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P5
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P6
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P7
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P8
-1      1       0.1     0.1     -1      1       2       0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P9
-1      1       0       0       -1      1       -2      0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P10
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P11
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P12
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P13
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P14
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P15
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P16
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P17
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P18
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P19
-1      1       -999    -999    -1      1       -1      0       0       0       0       0       0
        0       #_AgeSel_ROV_E_P20
#_Cond  0       #_custom_sel-env_setup  (0/1)

#_Cond  -2      2       0       0       -1      99      -2      #_placeholder   when    no      enviro
        fxns
```

```
1       #_custom_sel-blk_setup   (0/1)
10      100     33.02   33.02   -1      1       -4      #_Retain_1P_HL_E_1985
10      100     35.56   35.56   -1      1       -4      #_Retain_1P_HL_E_1994
10      100     38.1    38.1    -1      1       -4      #_Retain_1P_HL_E_1995
10      100     33.02   33.02   -1      1       6       #_Retain_1P_HL_E_2007
-1      20      1       1       -1      1       -4      #_Retain_2P_HL_E_1985
-1      20      1       1       -1      1       -4      #_Retain_2P_HL_E_1994
-1      20      1       1       -1      1       -4      #_Retain_2P_HL_E_1995
-1      20      1       1       -1      1       -4      #_Retain_2P_HL_E_2007
0       1       1       1       -1      1       -4      #_Retain_3P_HL_E_1985
0       1       1       1       -1      1       -4      #_Retain_3P_HL_E_1994
0       1       1       1       -1      1       -4      #_Retain_3P_HL_E_1995
0       1       0.5     0.5     -1      1       6       #_Retain_3P_HL_E_2007
-1      2       0.56    0.56    -1      1       -4      #_DiscMort_3P_HL_E_2008
10      100     33.02   33.02   -1      1       -4      #_Retain_1P_HL_W_1985
10      100     35.56   35.56   -1      1       -4      #_Retain_1P_HL_W_1994
10      100     38.1    38.1    -1      1       -4      #_Retain_1P_HL_W_1995
10      100     33.02   33.02   -1      1       6       #_Retain_1P_HL_W_2007
-1      20      1       1       -1      1       -4      #_Retain_2P_HL_W_1985
-1      20      1       1       -1      1       -4      #_Retain_2P_HL_W_1994
-1      20      1       1       -1      1       -4      #_Retain_2P_HL_W_1995
-1      20      1       1       -1      1       -4      #_Retain_2P_HL_W_2007
0       1       1       1       -1      1       -4      #_Retain_3P_HL_W_1985
0       1       1       1       -1      1       -4      #_Retain_3P_HL_W_1994
0       1       1       1       -1      1       -4      #_Retain_3P_HL_W_1995
0       1       0.5     0.5     -1      1       6       #_Retain_3P_HL_W_2007
-1      2       0.6     0.6     -1      1       -4      #_DiscMort_3P_HL_W_2008
10      100     33.02   33.02   -1      1       -4      #_Retain_1P_LL_E_1985
10      100     35.56   35.56   -1      1       -4      #_Retain_1P_LL_E_1994
10      100     38.1    38.1    -1      1       -4      #_Retain_1P_LL_E_1995
10      100     33.02   33.02   -1      1       6       #_Retain_1P_LL_E_2007
-1      20      1       1       -1      1       -4      #_Retain_2P_LL_E_1985
-1      20      1       1       -1      1       -4      #_Retain_2P_LL_E_1994
-1      20      1       1       -1      1       -4      #_Retain_2P_LL_E_1995
-1      20      1       1       -1      1       -4      #_Retain_2P_LL_E_2007
0       1       1       1       -1      1       -4      #_Retain_3P_LL_E_1985
0       1       1       1       -1      1       -4      #_Retain_3P_LL_E_1994
0       1       1       1       -1      1       -4      #_Retain_3P_LL_E_1995
0       1       0.5     0.5     -1      1       6       #_Retain_3P_LL_E_2007
-1      2       0.64    0.64    -1      1       -4      #_DiscMort_3P_LL_E_2008
```

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10 | 100 | 33.02 | 33.02 | -1 | 1 | -4 | #_Retain_1P_LL_W_1985 |
| 10 | 100 | 35.56 | 35.56 | -1 | 1 | -4 | #_Retain_1P_LL_W_1994 |
| 10 | 100 | 38.1 | 38.1 | -1 | 1 | -4 | #_Retain_1P_LL_W_1995 |
| 10 | 100 | 33.02 | 33.02 | -1 | 1 | -6 | #_Retain_1P_LL_W_2007 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_LL_W_1985 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_LL_W_1994 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_LL_W_1995 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_LL_W_2007 |
| 0 | 1 | 1 | 1 | -1 | 1 | -4 | #_Retain_3P_LL_W_1985 |
| 0 | 1 | 1 | 1 | -1 | 1 | -4 | #_Retain_3P_LL_W_1994 |
| 0 | 1 | 1 | 1 | -1 | 1 | -4 | #_Retain_3P_LL_W_1995 |
| 0 | 1 | 1 | 1 | -1 | 1 | -6 | #_Retain_3P_LL_W_2007 |
| -1 | 2 | 0.81 | 0.81 | -1 | 1 | -4 | #_DiscMort_3P_LL_W_2008 |
| 10 | 100 | 33.02 | 33.02 | -1 | 1 | -4 | #_Retain_1P_MRIP_E_1985 |
| 10 | 100 | 35.56 | 35.56 | -1 | 1 | -4 | #_Retain_1P_MRIP_E_1994 |
| 10 | 100 | 38.1 | 38.1 | -1 | 1 | -4 | #_Retain_1P_MRIP_E_1995 |
| 10 | 100 | 40.64 | 40.64 | -1 | 1 | -4 | #_Retain_1P_MRIP_E_2000 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_MRIP_E_1985 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_MRIP_E_1994 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_MRIP_E_1995 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_MRIP_E_2000 |
| -1 | 2 | 0.1 | 0.1 | -1 | 1 | -4 | #_DiscMort_3P_MRIP_E_2008 |
| 10 | 100 | 33.02 | 33.02 | -1 | 1 | -4 | #_Retain_1P_MRIP_W_1985 |
| 10 | 100 | 35.56 | 35.56 | -1 | 1 | -4 | #_Retain_1P_MRIP_W_1994 |
| 10 | 100 | 38.1 | 38.1 | -1 | 1 | -4 | #_Retain_1P_MRIP_W_1995 |
| 10 | 100 | 40.64 | 40.64 | -1 | 1 | -4 | #_Retain_1P_MRIP_W_2000 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_MRIP_W_1985 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_MRIP_W_1994 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_MRIP_W_1995 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_MRIP_W_2000 |
| -1 | 2 | 0.1 | 0.1 | -1 | 1 | -4 | #_DiscMort_3P_MRIP_W_2008 |
| 10 | 100 | 33.02 | 33.02 | -1 | 1 | -4 | #_Retain_1P_HBT_E_1985 |
| 10 | 100 | 35.56 | 35.56 | -1 | 1 | -4 | #_Retain_1P_HBT_E_1994 |
| 10 | 100 | 38.1 | 38.1 | -1 | 1 | -4 | #_Retain_1P_HBT_E_1995 |
| 10 | 100 | 40.64 | 40.64 | -1 | 1 | 6 | #_Retain_1P_HBT_E_2000 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_HBT_E_1985 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_HBT_E_1994 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_HBT_E_1995 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_HBT_E_2000 |
| 0 | 1 | 1 | 1 | -1 | 1 | -4 | #_Retain_3P_HBT_E_1985 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 1 | 1 | -1 | 1 | -4 | #_Retain_3P_HBT_E_1994 |
| 0 | 1 | 1 | 1 | -1 | 1 | -4 | #_Retain_3P_HBT_E_1995 |
| 0 | 1 | 0.5 | 0.5 | -1 | 1 | 6 | #_Retain_3P_HBT_E_2000 |
| -1 | 2 | 0.1 | 0.1 | -1 | 1 | -4 | #_DiscMort_3P_HBT_E_2008 |
| 10 | 100 | 33.02 | 33.02 | -1 | 1 | -4 | #_Retain_1P_HBT_W_1985 |
| 10 | 100 | 35.56 | 35.56 | -1 | 1 | -4 | #_Retain_1P_HBT_W_1994 |
| 10 | 100 | 38.1 | 38.1 | -1 | 1 | -4 | #_Retain_1P_HBT_W_1995 |
| 10 | 100 | 40.64 | 40.64 | -1 | 1 | -4 | #_Retain_1P_HBT_W_2000 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_HBT_W_1985 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_HBT_W_1994 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_HBT_W_1995 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_HBT_W_2000 |
| -1 | 2 | 0.1 | 0.1 | -1 | 1 | -4 | #_DiscMort_3P_HBT_W_2008 |
| -1 | 2 | 0.55 | 0.55 | -1 | 1 | -4 | #_DiscMort_3P_C_Clsd_E_2008 |
| -1 | 2 | 0.74 | 0.74 | -1 | 1 | -4 | #_DiscMort_3P_C_Clsd_W_2008 |
| -1 | 2 | 0.1 | 0.1 | -1 | 1 | -4 | #_DiscMort_3P_R_Clsd_E_2008 |
| -1 | 2 | 0.11 | 0.11 | -1 | 1 | -4 | #_DiscMort_3P_R_Clsd_W_2008 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | #_AgeSel_HL_E_P0_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P1_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P2_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P3_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P4_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P5_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P6_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P7_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P8_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P9_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P10_2008 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | #_AgeSel_HL_E_P11_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P12_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P13_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P14_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P15_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P16_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P17_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P18_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P19_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P20_2008 |
| -1 | 1 | -1000 | -1000 | -1 | 1 | -1 | #_AgeSel_HL_W_P0_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P1_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P2_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P3_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P4_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P5_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P6_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P7_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P8_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P9_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P10_2008 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | #_AgeSel_HL_W_P11_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P12_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P13_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P14_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P15_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P16_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P17_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P18_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P19_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P20_2008 |
| -1 | 1 | -1000 | -1000 | -1 | 1 | -1 | #_AgeSel_LL_E_P0_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P1_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P2_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P3_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P4_2008 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P5_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P6_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P7_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P8_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P9_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P10_2008 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | #_AgeSel_LL_E_P11_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P12_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P13_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P14_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P15_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P16_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P17_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P18_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P19_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P20_2008 |
| -1 | 1 | -1000 | -1000 | -1 | 1 | -1 | #_AgeSel_LL_W_P0_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P1_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P2_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P3_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P4_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P5_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P6_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P7_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P8_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P9_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P10_2008 |
| -1 | 1 | 0 | 0 | -1 | 1 | -2 | #_AgeSel_LL_W_P11_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -2 | #_AgeSel_LL_W_P12_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_W_P13_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_W_P14_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_W_P15_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_W_P16_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_W_P17_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_W_P18_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_W_P19_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_W_P20_2008 |
| -1 | 1 | -1000 | -1000 | -1 | 1 | -1 | #_AgeSel_MRIP_E_P0_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_E_P1_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_E_P2_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_E_P3_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_E_P4_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_E_P5_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_E_P6_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_E_P7_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_E_P8_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_E_P9_2007 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | #_AgeSel_MRIP_E_P10_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_E_P11_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_E_P12_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_E_P13_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_E_P14_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_E_P15_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_E_P16_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_E_P17_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_E_P18_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_E_P19_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_E_P20_2007 |
| -1 | 1 | -1000 | -1000 | -1 | 1 | -1 | #_AgeSel_MRIP_W_P0_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_W_P1_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_W_P2_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_W_P3_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_W_P4_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_W_P5_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_W_P6_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_W_P7_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_W_P8_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_MRIP_W_P9_2007 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | #_AgeSel_MRIP_W_P10_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_W_P11_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_W_P12_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_W_P13_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_W_P14_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_W_P15_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_W_P16_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_W_P17_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_W_P18_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_W_P19_2007 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_MRIP_W_P20_2007 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | #_AgeSel_HBT_E_P0_2007 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HBT_E_P1_2007 |

```
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_E_P2_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_E_P3_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_E_P4_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_E_P5_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_E_P6_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_E_P7_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_E_P8_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_E_P9_2007
-1      1       0       0       -1      1       -1      #_AgeSel_HBT_E_P10_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_E_P11_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_E_P12_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_E_P13_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_E_P14_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_E_P15_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_E_P16_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_E_P17_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_E_P18_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_E_P19_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_E_P20_2007
-1      1       -1000   -1000   -1      1       -1      #_AgeSel_HBT_W_P0_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P1_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P2_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P3_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P4_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P5_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P6_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P7_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P8_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P9_2007
-1      1       0       0       -1      1       -1      #_AgeSel_HBT_W_P10_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P11_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P12_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P13_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P14_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P15_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P16_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P17_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P18_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P19_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P20_2007

#_Cond No selex parm trends
#_Cond -4 # placeholder for selparm_Dev_Phase
3 #_env/block/dev_adjust_method (1=standard; 2=logistic trans to keep in base parm bounds; 3=standard w/ no
bound check)
#
# Tag loss and Tag reporting parameters go next
0  # TG_custom:  0=no read; 1=read if tags exist
#_Cond -6 6 1 1 2 0.01 -4 0 0 0 0 0 0 0  #_placeholder if no parameters
#
1 #_Variance_adjustments_to_input_values
#_fleet: 1 2 3 4 5 6 7 8 9 10 11 12 13 14  survey: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0 0 0 0
0  #_add_to_survey_CV
0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0 0 0 0
0  #_add_to_discard_stddev
0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0 0 0 0
0  #_add_to_bodywt_CV
1       1       1       1       1       1       1       1       1       1       1       1       1
        1       1       1       1       1       1       1       1       1       1       1       1 1 1 1
1  #_mult_by_lencomp_N
1       1       1       1       1       1       1       1       1       1       1       1       1
        1       1       1       1       1       1       1       1       1       1       1       1 1 1 1
1  #_mult_by_agecomp_N
1       1       1       1       1       1       1       1       1       1       1       1       1
        1       1       1       1       1       1       1       1       1       1       1       1 1 1 1
1  #_mult_by_size-at-age_N
#
7 #_maxlambdaphase
1 #_sd_offset
#
0 # number of changes to make to default Lambdas (default value is 1.0)
# Like_comp codes:  1=surv; 2=disc; 3=mnwt; 4=length; 5=age; 6=SizeFreq; 7=sizeage; 8=catch;
# 9=init_equ_catch; 10=recrdev; 11=parm_prior; 12=parm_dev; 13=CrashPen; 14=Morphcomp; 15=Tag-comp; 16=Tag-
negbin
#like_comp fleet/survey  phase  value  sizefreq_method
# 2 7 1 0.6 1
# 2 8 1 0.6 1
```

```
#
# lambdas (for info only; columns are phases)
#  0 #_CPUE/survey:_1
#  1 #_CPUE/survey:_2
#  1 #_CPUE/survey:_3
#  1 #_CPUE/survey:_4
#  1 #_discard:_1
#  1 #_discard:_2
#  1 #_discard:_3
#  0 #_discard:_4
#  1 #_lencomp:_1
#  1 #_lencomp:_2
#  1 #_lencomp:_3
#  0 #_lencomp:_4
#  0 #_agecomp:_1
#  1 #_agecomp:_2
#  0 #_agecomp:_3
#  0 #_agecomp:_4
#  1 #_init_equ_catch
#  1 #_recruitments
#  1 #_parameter-priors
#  1 #_parameter-dev-vectors
#  1 #_crashPenLambda
0 # (0/1) read specs for more stddev reporting
 # 0 1 -1 5 1 5 1 -1 5 # placeholder for selex type, len/age, year, N selex bins, Growth pattern, N growth
ages, NatAge_area(-1 for all), NatAge_yr, N Natages
 # placeholder for vector of selex bins to be reported
 # placeholder for vector of growth ages to be reported
 # placeholder for vector of NatAges ages to be reported
999
```

## 3.10 Appendix C: Stock Synthesis Starter File

```
#Control file for red snapper
#Stock Synthesis Version 3.24j
rsnapper.dat
rsnapper.ctl
0 # 0=use init values in control file; 1=use ss3.par
1 # run display detail (0,1,2)
1 # detailed age-structured reports in REPORT.SSO (0,1)
0 # write detailed checkup.sso file (0,1)
0 # write parm values to ParmTrace.sso
0 # report level in CUMREPORT.SSO (0,1,2)
1 # Include prior_like for non-estimated parameters (0,1)
1 # Use Soft Boundaries to aid convergence
1 # Number of bootstrap datafiles to produce
10 # Turn off estimation for parameters entering after this phase
1000 # MCMC burn interval
100  # MCMC thin interval
0  # jitter initial parm value by this fraction
-1 # min yr for sdreport outputs (-1 for styr)
-2 # max yr for sdreport outputs (-1 for endyr; -2 for endyr+Nforecastyrs
0 # N individual STD years
0.0001 # final convergence criteria
0 # retrospective year relative to end year
2 # min age for calc of summary biomass
1 # Depletion basis:  denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
1 # Fraction (X) for Depletion denominator
4 # (1-SPR)_reporting:  0=skip; 1=rel(1-SPR); 2=rel(1-SPR_MSY); 3=rel(1-SPR_Btarget); 4=notrel
2 # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num); 3=sum(frates)
0 # F_report_basis: 0=raw; 1=rel Fspr; 2=rel Fmsy ; 3=rel Fbtgt
999
```

## 3.11 Appendix D: Stock Synthesis Forecast File

```
#C generic forecast file
#V3.20b
# for all year entries except rebuilder; enter either: actual year, -999 for styr, 0 for endyr, neg number for
rel.endyr
1 # Benchmarks: 0=skip; 1=calc F_spr,F_btgt,F_msy
#it calculates targets at MSY, SPR, and biomass targets all independently during model run
2 # MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to F(endyr)
0.26 # SPR target (e.g. 0.40)
0.3 # Biomass target (e.g. 0.40)
2008 2011 2008 2011 2008 2011 #_Bmark_years: beg_bio, end_bio, beg_selex, end_selex, beg_relF, end_relF (enter
actual year, or values of 0 or -integer to be rel. endyr) - use range of year where there was not change in any
time varying processies, i.e. time varying change in selectivity, chagne in R0, etc.
1 #Bmark_relF_Basis: 1 = use year range; 2 = set relF same as forecast below
0 # Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=Ave F (uses first-last relF yrs); 5=input annual F scalar
21 # N forecast years
0.2 # F scalar (only used for Do_Forecast==5)
2009 2011 2009 2011 #_Fcast_years: beg_selex, end_selex, beg_relF, end_relF (enter actual year, or values of 0
or -integer to be rel.endyr) # the last years to use F - typically use the last three years!
2 # Control rule method (1=catch=f(SSB) west coast; 2=F=f(SSB) )   # leave alone
0.01 # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40) - leave this alone, this is west
coast thing
0.001 # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)   - leave this alone, this is west
coast thing
1.0 # Control rule target as fraction of Flimit (e.g. 0.75)   # this is to do the F at OY - i.e. the 75 percent
of Fmsy
3 #_N forecast loops (1-3) (fixed at 3 for now)   # leave alone
3 #_First forecast loop with stochastic recruitment        # leave alone
0 #_Forecast loop control #3 (reserved for future bells&whistles)     # leave alone
0 #_Forecast loop control #4 (reserved for future bells&whistles)     # leave alone
0 #_Forecast loop control #5 (reserved for future bells&whistles)    # leave alone
#get final 2012 landings info from data:  commecial get from IFQ page, recreation may not be final and may have
to do some hole filling - get with Vivian on this.
2013 #FirstYear for caps and allocations (should be after years with fixed inputs)  # thsi is the year when to
start the projections - remember triggefish, when we added the landings from the last year sicne they wanted
manamagement advice from current year
0 # stddev of log(realized catch/target catch) in forecast (set value>0.0 to cause active impl_error)
0 # Do West Coast gfish rebuilder output (0/1)
2013 # Rebuilder: first year catch could have been set to zero (Ydecl)(-1 to set to 1999)
2012 # Rebuilder: year for current age structure (Yinit) (-1 to set to endyear+1)
#this is how we allocate fishing effort and mortality with the fleets - i.e  we want a fixed effort for the
shrimp fleets and constant level of closed season discards in the projections going forward - talk with Jake
about how to do this
1 # fleet relative F: 1=use first-last alloc year; 2=read seas(row) x fleet(col) below
# Note that fleet allocation is used directly as average F if Do_Forecast=4
# this will just give you retained biomass and won't have to back out the discards
3 # basis for fcast catch tuning and for fcast catch caps and allocation (2=deadbio; 3=retainbio;
5=deadnum;6=retainnum)
# Conditional input if relative F choice = 2
# Fleet relative F: rows are seasons, columns are fleets
#_Fleet: FISHERY1
# 1
# max totalcatch by fleet (-1 to have no max)
-1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1
# max totalcatch by area (-1 to have no max)
-1 -1
# fleet assignment to allocation group (enter group ID# for each fleet, 0 for not included in an alloc group)
0 0 0 0 0 0 0 0 0 0 0 0 0 0
#_Conditional on >1 allocation group
# allocation fraction for each of: 0 allocation groups
# no allocation groups
0 # Number of forecast catch levels to input (else calc catch from forecast F)
3 # basis for input Fcast catch: 2=dead catch; 3=retained catch; 99=input Hrate(F) (units are from fleetunits;
note new codes in SSV3.20)
# Input fixed catch values
#Year Seas Fleet Catch(or_F)
#2012   1       1       112.565
#2012   1       2       68.27
#2012   1       3       48.6321
999 # verify end of input
```

# SEDAR

## Southeast Data, Assessment, and Review

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# SEDAR 31
## Gulf of Mexico Red Snapper

## SECTION IV: Research Recommendations
## May 2013

SEDAR
4055 Faber Place Drive, Suite 201
North Charleston, SC 29405

# Section IV: Research Recommendations

## Contents

## Data Workshop Research Recommendations:
Gulf of Mexico Red Snapper

### Life History

- Review the evidence for density dependence in older ages (e.g. ages 2-3). Incorporate full age model of recruitment to examine density-dependent effect.
- Site and habitat specific comparisons from more regions of the Gulf are needed for estimation of age-0 and age-1 mortality, accounting for shelf characteristics (e.g., width, slope, depth) in tests of density-dependent variation in M and emigration.
- Broader understanding of habitat value and areal estimates of habitat (distribution—areas of trawlable vs. untrawlable bottom; more refined maps Gulf-wide etc) are needed to further inform the habitat limitation hypothesis for density dependence.
- Assess the impact of potential predation/competition for taxa of particular interest (lionfish, marine catfish, sciaenids, and red grouper). As well, investigate alternative population regulatory mechanisms including potential sources of density-independent increases in mortality and distant sources of recruitment (but see stock delineation section).
- Evaluate the potential for sea-bottom restoration or other means to expand habitat and increase survival for post-settlement red snapper.
- The LHW recommended that existing otolith archives (e.g., NOAA) be used to further investigate interpretation of increment formation based on section orientation, sample source (location), season and year. This could be conducted as a graduate student project in collaboration with agency personnel.
- Interested Academic representatives (e.g. Auburn University, University of S. Florida) should be included at Gulf States Marine Fisheries Commission sponsored otolith workshops (e.g., May 2013) to review age determinations and promote standardization.
- Based upon the results of Szedlmayer and Beyer (2011 SEDAR31-RD20), further investigation of longevity is warranted. More recent catches of older fish should allow a direct comparison to 14C coral chronologies established during the nuclear testing period and extend the age that can be directly validated (beyond 38 years in the earlier study by Baker and Wilson 2001).
- A general recommendation of the LHW is to expand design-based fishery-independent sampling to elucidate regional (i.e., eastern and western GOM) and sub-regional differences in the demographics of red snapper.
- A further recommendation is to increase random, representative sampling of the catch in order to avoid clustering effects and non-representative sampling which could lead to spurious differences in growth rates. Alternatively, and for localized- or small-scale

studies, corrections for length limits and appropriate weighting may need to be utilized to treat data gaps, missing ages and adjust for selectivity (see Chih 2012 SEDAR31-DW18).

- Future surveys should collect ovarian samples fixed in formalin for histology analysis, spawning marker fraction analysis and age/size at maturity analysis.
- Additional fecundity collections are necessary from all areas of the Gulf.
- Additional research is necessary to further clarify regional reproductive and demographic differences.
- More information is needed to understand movement of young and older adult red snapper across along shore barriers. In particular the LHW recommends a large scale tagging study focused west and east of the Mississippi River.
- Telemetry versus tagging approaches need to be expanded and evaluated according to shelf characteristics; e.g. cross compared in areas with little natural hard bottom habitat (yet high artificial reefs) versus areas with relatively high areal coverage of hard bottom and with more dispersed artificial reefs.
- The LHW recommends a workshop or research symposia be convened to synthesize results and assess methodology for estimating red snapper movements and home range.
- In order to reduce measurement error in the future, the LHW recommends that port agents, observers and field scientists record maximum total length for red snapper.

**Commercial Fishery Statistics**

<u>Landings</u>

- Revisit how the historical landings were constructed.
- Explore ways to ensure that IFQ and trip ticket landings match.
- Apportion landings accordingly in ALS for TX landings with missing gear.

<u>Discards</u>

- Add species to discard logbook form.
- Provide better instructions on how to complete the discard logbook.
- Consider and use relevant input from external review of observer program.
- Social and economic impacts on fisher behavior in terms of fish discards.
- Better determine available allocation to vessels on a given trip.

<u>Length/Age</u>

- Standardize length and age data formats from various data sources.
- Build age databases with Trip ID number for FL and FIN data.
- Evaluate how to handle catch at age of non-representative age samples.

**Recreational Fishery Statistics**

- Evaluate the technique used to apply sample weights to landings. Investigate the SEFSC
- Method by analyzing the order of variables in the hierarchy and the minimum number of fish used. Furthermore, evaluate alternative methods, including a meta-analysis of the existing information from difference sources, areas, states, surveys, etc. that could be performed.
- Develop methods to identify angler preference and targeted effort. Require a reef fish stamp for anglers targeting reef fish, pelagic stamp for migratory species, and deep-water complex stamp for deep-water species. The program would be similar to the federal duck stamp required of hunters and could help managers identify what anglers were fishing for.
- Continue and expand fishery dependent at sea observer surveys to collect discard information. This would help to validate self-reported headboat discard rates.
- Track Texas commercial and recreational discards.
- Estimate variances associated with the headboat program.
- Evaluate existing and new methods to estimate historical landings. Hind-casting of red snapper landings is complicated by a lack of reliable historical effort data. To get at estimating historical effort, analysts could track consumables (gas, ice, bait) to develop price indices.
- Investigate how CPUE changes over time due to technological advances and changes in fishing practices.

**Measures of Population Abundance**

The following are research recommendations that may improve the utility (precision) of the SEAMAP larval index for red snapper.

- Expand the use of molecular genetics to identify the smallest and most abundant snapper larvae in SEAMAP samples that cannot be positively identified as red snapper because diagnostic morphological characters are not yet developed.
- Begin directed sampling for fish eggs on SEAMAP summer trawl and fall plankton surveys using vertical nets hauls. The protocols for fish egg sampling have been established by NMFS/SWFSC scientists and are in use on the west coast. Fish egg collections are easy to make and take little additional sampling time. The eggs in these samples would have to be identified genetically but the protocols for genetic identification of red snapper eggs have been worked out by Frank Hernandez and Keith Bayha at DISL. The results of their MARFIN funded project using CUFES samples from our SEAMAP Fall Plankton surveys are impressive and significant. They produced maps of red snapper egg (i.e. spawning) distribution over the entire Gulfwide survey area.

- Estimates of egg abundance data coupled with the updated reproduction parameters spawning frequency and fecundity) generated by NMFS scientists at the Panama City Lab could eventually be used to produce an actual spawning biomass estimate for red snapper.
- Continue aging red snapper larvae from SEAMAP samples to improve the age-length relationship (key). This should improve the precision of the SEAMAP larval abundance index that is now based on a single age class of larvae across years.
- Produce a SEAMAP larval index based on the abundance of red snapper larvae captured during SEAMAP summer shrimp/groundfish surveys (past and present). This survey has for a number of years now been expanded to include the entire northern Gulf of Mexico shelf. The data from summer months (i.e. during peak red snapper spawning months) could be a far better indication of spawning production than data from the end of season from which the current SEAMAP larval index is derived.
- Explore the utility of a larval red snapper index based on a comprehensive modeling approach that includes all SEAMAP stations (regardless of how many times they have been sampled over the time series) and both sampling gears, i.e. neuston and bongo samples. There are other likely explanatory variables (e.g., salinity) that could ultimately improve the index.

**Discard Mortality Rate**

Future surveys, at minimum, should be structured around quarterly sampling, collect water temperature profile data, reflect the range of depths associated with the fishery, and strive to calculate season and depth specific estimates. Due to the limited number of experiments evaluating the relationship between thermal stress and release mortality, it is strongly encouraged that investigators measure and report water temperatures and thermocline profiles associated with capture. More studies evaluating the use of bottom release devices are also needed. Future discard observation surveys should collect frequency data regarding specific barotraumas incurred and loss of reflex response, because similar relationships could be developed as better techniques are developed to measure the delayed mortality component. Experiments estimating impairment scaling, and both immediate and delayed mortality, would be particularly useful so that a relationship among components could be developed and historical immediate release mortality estimates could potentially be adjusted.

## Assessment Workshop Research Recommendations:
Gulf of Mexico Red Snapper

None provided.

## **Review Workshop Research Recommendations:**
Gulf of Mexico Red Snapper

Below, the RW Panel highlights research recommendations they feel should be emphasized, and provides new recommendations partly based on assessment methodology and results.

***Age and Mortality***

The RW Panel recommends that research effort be focused on the issue of ageing error, both within and among ageing facilities. A more comprehensive analysis of ageing error should permit its inclusion in the SS3 model.

There appeared to be some confusion in the DW report as to the purpose of and resultant data from bomb radiocarbon analysis of otoliths. This method is a means to evaluate the estimated birthdate of a fish relative to the $\Delta^{14}C$ preserved in other aragonitic structures, such as corals. Radioactive $^{14}C$ was enriched in oceanic waters in the late 1950s and early 1960s following above ground nuclear weapons testing. Coral skeletons, for example, reflect this enrichment by having peak $\Delta^{14}C$ values in skeletons formed during the early to mid 1960s and then declines thereafter. If opaque zones in otoliths are formed annually, then fish estimated to have birthdates in the early 1960s should have similar high $\Delta^{14}C$ values at the core of their otoliths. Other radio chemistry validation techniques, such as $^{210}Pb/^{226}Ra$ dating, provide estimates of absolute fish age; bomb radiocarbon analysis only provides a relative age estimate but can be used to validate opaque zone formation. Both of these age validation techniques have been applied to red snapper, along with other validation and verification techniques. In fact, no other marine fish has been the subject of as many different age validation/verification studies as red snapper. Results of these studies are overwhelming: opaque zones in red snapper otoliths are formed annually.

***Growth***

The RW Panel recommends further analysis on the growth function fit to size at age data from 2003-11. The fitted model included in the assessment tends to overestimate size at age for fish <5 yr, overestimate size at age for fish 5-10 yr, and underestimate size at age for fish >20 yr. Part of this results from the manner in which the model accounts for variable size limits through time. However, the RW Panel expressed concern whether some of the observed variability in size at age in the data resulted from ageing error between laboratories. In the future, modeling growth with a random effects approach may be more appropriate.

***Population Structure***

The RW Panel reiterates various research recommendations focused on the population structure of Gulf red snapper. Hydrographic models should continue to be employed to estimate potential larval dispersal within the US Gulf, between the eastern and western Gulf, and on smaller spatial scales. A large-scale conventional tagging study might be useful to examine post-settlement mixing both between the eastern and western Gulf and within these areas. Lastly, advances in restriction-site-associated-DNA (RAD) sequencing mean that much more powerful genetic population structure analysis is now possible relative to historical mitochondrial DNA or microsatellite DNA approaches previously applied to Gulf red snapper.

***Discard Mortality***

Estimation of dead discards is a product of the number of discards and the discard mortality rate, both of which are highly uncertain for red snapper. Observer data in the shrimp trawl and directed commercial fisheries enable estimates of the magnitude of discards. There are much more limited data available in the recreational fishery to estimate the magnitude of discards. There are some observer-based estimates available for the headboat and charter boat sectors, but efforts to collect those data should be expanded. Reliance on self-reported discards in the MRIP to estimate discards in the private recreational sector is problematic with no clear solution. Electronic reporting through smart-phone applications does provide for instantaneous reporting of discards, but the process involved remains reliant on self-reporting which has been shown to be biased in other sectors where both self-reporting and observer-based estimates of discards are available.

Further research appears warranted with respect to estimating the magnitude of discards among fishery sectors, as well as providing more robust estimates of post-release mortality. Few of the existing discard mortality studies address the issue of depredation on released fish and that should be a focus moving forward. Several existing lines of research indicate chronic effects of barotrauma which may lead to mortality are pervasive in released red snapper, and that studies which simply examine surface condition or submergence of released fish may grossly underestimate release mortality. Therefore, a focus moving forward should be on conducting studies that examine both depredation on released fish and chronic versus acute mortality caused by catch and release.

***Episodic Mortality Events***

Episodic events have the potential to impact red snapper population ecology in the northern Gulf of Mexico. Among recent and ongoing events that have this potential are hypoxia associated with plumes of the Mississippi and other northern Gulf rivers, harmful algal blooms, particularly along the west Florida shelf, and the Deepwater Horizon Oil Spill (DHOS). Potential impacts of the DHOS were discussed during the RW but little work had been done attempting to examine potential impacts in either the DW or AW. In fact the words “Deepwater Horizon” appear only once in the DW Report and never in the AW Report. Part of this issue may stem from the fact that if potential impacts were restricted to recruitment effects then an assessment model would not capture that signal until affected cohorts moved into the fishery. Future assessments of Gulf red snapper should be conducted with the explicit goal of attempting to model any enduring DHOS effects.

*Recommendation for Research on Improvement of the SS Model*

The RW Panel recommends changing the model’s code to enable separate sets of SR parameters to be estimated for the different population subunits.

*Recommendations for Improvement of the SEDAR Process*

The third charge included in RW TOR number 6 is to provide recommendations on possible ways to improve the SEDAR process. Improvements should include:

- The most critical need is for timeliness in completion of tasks and reports. The SEDAR process is complex and demanding, involving scientists with diverse areas of specialization and including a large array of issues and concerns. Completion of work requirements on schedule is challenging and demanding, but the more closely that deadlines are met, the more efficient and productive the process can be.

- More standardization of report format would be helpful. Sections of reports are written by different individuals and groups, all of which have their own writing styles and preferences, but content of reports would be improved if each workgroup provided summaries of their results and conclusions, enumerated or in paragraph form. In addition, a more uniform identification of procedural and research issues, presented at the end of each workgroup section would be informative. Proposals and rationale for further study have potential for moving forward directly on problems that are recognized as especially important.

- Given that the AW analyzes the extant databases for the species under consideration, the group would be well placed to be critically aware of additional data needs. Recommendations for future research could profitably be a standard part of their SEDAR report.

*Guidance on key improvements in data and modeling approaches which should be considered when scheduling the next assessment:*

The RW Panel expressed serious concerns regarding the amount of time allotted for review of this assessment. As noted above, the AW Report was provided to the RW Panel on Friday, April 26$^{th}$ for a RW beginning on Monday, April 29$^{th}$. Furthermore, the AW Report had not been reviewed by the AW Panel. The AW Report was incomplete, contained errors, and the documentation of the model inadequate for a thorough review.

The RW Panel recommends that given the data and model complexities inherently associated with stock assessment of Gulf red snapper, more realistic timelines be considered for the next assessment.

# Addendum to the Gulf of Mexico Red Snapper Assessment

## SEDAR 31

**NOAA Southeast Fisheries Science Center**

**5/18/2013**
**Updated: 5/23/2013**

## Contents

# 1 Stock Synthesis

## *1.1 Overview*

The primary assessment model selected for the Gulf of Mexico red snapper stock evaluation assessment was Stock Synthesis (Methot 2010) version 3.24p (beta). Stock Synthesis (SS) is an integrated statistical catch-at-age model which is widely used for stock assessments in the United States and throughout the world. SS takes relatively unprocessed input data and incorporates many of the important processes (mortality, selectivity, growth, etc.) that operate in conjunction to produce observed catch, size and age composition and CPUE indices. In addition, SS can incorporate time series of environmental data. Because many of these inputs are correlated, the concept behind SS is that they should be modeled together, which helps to ensure that uncertainties in the input data are properly accounted for in the assessment. SS has the ability to incorporate an early, data poor time period for which only catch data are available and a more recent, data-rich time period for which indices of abundance and length and age-length or age composition observations are available. Descriptions of SS algorithms and options are available in the SS user's manual (Methot 2010) and at the NOAA Fisheries Toolbox website (http://nft.nefsc.noaa.gov/).

The SS parametric bootstrap procedure (Methot R.D. 2011) was used to characterize the uncertainty in final model estimates and projections of future caches for a variety of alternative scenarios recommended by the Assessment (AW) and Review Workshop (RW) Panels.

The r4ss software (www.cran.r-project.org/web/packages/**r4ss**/index.html) was utilized extensively to develop various graphics for the SS outputs and also was used to summarize various SS output files and to conduct the parametric bootstrap analyses.

## *1.2 Data Sources*

The SS model was fitted to landings, discards, age composition observations, and indices of abundance. Annual landings from the commercial and recreational fishing sector were input into the model, with commercial landings in metric tons and recreational landings in numbers (thousands of fish). Discards from the commercial and recreational fishing fleets were also input in numbers (thousands of fish). Annual estimates of red snapper bycatch from the shrimp fishery (expressed as dead discards in thousands of fish) were estimated; however, there was a large amount of uncertainty in these annual estimates. As a result, the estimated annual median across the entire time series was used in conjunction with an annual time series of shrimp effort to allow the model to estimate shrimp bycatch (see further description in next section below).

Standardized indices of relative abundance from both fishery dependent and independent data sources were included in the model. The fishery dependent indices came from the commercial handline fleet, recreational headboat, and recreational private/for hire sectors. Fishery independent indices came from the SEAMAP bottom trawl survey, SEAMAP reef fish video survey, NMFS bottom longline survey, and the SEAMAP plankton survey.

Finally, age composition information was available from both fishery dependent and independent sources. Fishery dependent age composition came from the commercial handline and longline fleets, shrimp fishery bycatch, and the recreational headboat and charter/for hire fleets. Fishery independent age composition came from the SEAMAP bottom trawl survey, SEAMAP reef fish video survey, NMFS bottom longline survey, and from the combined remotely operated vehicle (ROV) survey. All age composition distributions were from direct aging of fish by measuring otoliths, except observations from the combined ROV survey, the SEAMAP reef fish video survey, the commercial shrimp bycatch, and the SEAMAP bottom trawl survey. The combined ROV survey and SEAMAP reef fish video survey age observations were converted to age from length distributions using an age-length key. The age-length keys that were used to make these conversions were compiled using all direct aging data across all years for each area (east and west of the Mississippi River). The shrimp bycatch and SEAMAP groundfish trawl survey age composition data were developed through visual inspection of modes in the length composition data.

### *1.3 Model Configuration and Equations*

The initial set up of the SS model was based off of the configuration of the last stock assessment model for red snapper, CATCHEM, in an effort to replicate model results and alleviate concern about differences in modeling platform affecting the assessment results. Like this base model, CATCHEM was age-structured and modeled red snapper as two separate stocks in the Gulf of Mexico: one stock east and the other stock west of the Mississippi River. The SEDAR 31 Data Workshop (DW) report provides information on the rationale behind the two-stock hypothesis. As a result, all input data series are split into east and west components.

Throughout the stock assessment process, various model configurations were tried with SS which included incorporating length data and age-length keys (age conditional on length) into the model; however, these length-based models revealed systematic bias in the fits to the age at length data that could not be resolved in the time frame of the assessment. A similar issue arose in a recent Pacific Hake stock assessment, where a similar decision was made to proceed with an age-based model over an age at length-based model (Richard Methot 2013, Personal Communication). The base model for this assessment represented red snapper age classes from age zero through age 20, where age 20 is a plus group. An age estimation error matrix, based on reader precision analyses, was available for those fleets and surveys for which we had direct age observations from otoliths. Stock Synthesis has the ability to use this information in the model as a source of error. The RW Panel considered model runs that incorporated aging error, but ultimately decided that the available age error matrix did not fully represent the true age estimation error, which likely varies over time and across fleets/surveys. Although no aging error was included in the base model, a sensitivity run was made with the aging error.

The time series in the model started in 1872, when the stock was assumed to be in a virgin, unfished state. The terminal year of data was 2011. The SEDAR 31 DW provides details and a characterization of the fisheries for red snapper in the Gulf of Mexico since the late 1800s. Recreational fishery removals were available since 1981 and were hindcast from 1950 to 1980 by the SEDAR 31 DW. It was generally thought that recreational removals of red snapper prior to 1955 were not large. Shrimp discards were available since 1972.

Fourteen fishing fleets and fifteen fishery independent surveys were set up in SS to represent the red snapper fishery. The fishing fleets in the model were separated into east and west and included the commercial handline and longline, recreational headboat and private/charter fleets, the shrimp bycatch fleet, a commercial closed season fleet, and a recreational closed season fleet. The commercial and recreational closed season fleets were incorporated to represent fishery discards for those years when strict closed seasons were in place for each sector, in addition to the component of the commercial fishing fleet since 2007 that has had no red snapper IFQ allocation. Age composition data exist for the commercial closed season fishery (SEDAR 2013; Section 2.5.1) with which to estimate a selectivity pattern. No such age composition data exists for the recreational closed season fishery, therefore the recreational closed season fishery selectivity pattern was set to mirror the selectivity pattern of the private/charter fishery.

The fishery independent surveys that were incorporated were the SEAMAP video survey, SEAMAP larval survey, SEAMAP summer and fall groundfish trawl, NMFS bottom longline, and the combined ROV survey. In addition, the recreational private/charter and headboat indices of abundance were specified in SS as though they were fishery-independent surveys and not assigned directly to their corresponding fishing fleets because the indices were constructed using a censored regression to account for changes in the bag limit over time. The censored regression approach used data on landed catch for the entire time series; however, this time series included years when there were bag limits. The censored regression algorithm infers the distribution of catch per unit effort (CPUE) from the censored distributions of landings per unit effort for years when the bag limits were in effect, essentially assuming that any legal-sized red snapper would have been retained if the bag limit had not been in effect (because red snapper are highly-valued recreational fish). As a result, the final recreational indices actually represent total catch (retained + discarded fish). The SS program is configured such that fishery-dependent indices of abundance are assumed to represent retained catch only and fishery-independent surveys are assumed to represent total catch. Therefore, the recreational indices were specified as fishery-independent surveys, because they indexed total catch (removals and discards), but they were linked to the recreational fleets by mirroring the selectivity patterns of those fleets.

A special index that is incorporated into the model is an index of shrimp effort. As mentioned above in Section 1.1.2, this information is used by the model in conjunction with the median value from the time series (1972-2011) of annual shrimp bycatch estimates to estimate annual levels of shrimp bycatch. While annual estimates of shrimp bycatch do exist, they are highly uncertain, with large coefficients of variation. Therefore, we have more confidence in the estimate of the overall median level of shrimp bycatch across the time series than we do in the annual bycatch estimates. In order to inform the model of the trend over time, we use the shrimp effort time series (1946-2011), in which we have greater confidence than the annual bycatch estimates. In the estimation process, a catchability parameter (Q) is used to scale the effort series to the estimate of bycatch. Since shrimp bycatch was input as the median estimate across 1972-2011 (i.e., as a super year), the model estimates annual values of shrimp bycatch for 1946-2011, and fits the median of the 1972-2011 annual estimates to the observed 1972-2011 median shrimp bycatch.

The weight-length relationship, the maturity schedule, fecundity estimates, natural mortality vector, and growth were all reevaluated during the assessment workshop, and are described in the assessment report (SEDAR 2013). All of these values were incorporated into the base model as fixed parameters and these processes were not estimated. In SS, when fish recruit at the real age of 0.0, the body size at length is set equal to the lower edge of the first population bin ($L_{bin}$;

fixed at 8-cm maximum total length). Then, individuals grow linearly until they reach a real age equal to the input value of $A_{min}$ (growth age for $L_{min}$) and have a size equal to the $L_{min}$. Then, as fish advance in age, the size at age is then characterized according to a von Bertalanffy growth equation. The value of $A_{min}$ was fixed at 0.75. The $L_{min}$ value was set equal to the length at $A_{min}$ from the growth curve described in the assessment report (SEDAR 2013; Section 2.1.2). $L_{max}$ was specified as equivalent to $L_{\infty}$.

For all fleets and surveys except the NMFS bottom longline survey, age-specific selectivity parameters were specified for each age using a random walk approach. In this approach, the age-specific selectivity parameters represent the rate of change from the selectivity value for the previous age. For some of the age classes within a given fleet or survey, selectivity was set equal to selectivity for the previous age by fixing the rate of change equal to zero. For example, the selectivity parameters for ages three and older of the SEAMAP groundfish surveys were fixed at zero because no red snapper older than age 2 are caught in the surveys. The only fleet that did not use this random walk function was the NMFS bottom longline survey, which was estimated using a two parameter logistic function, because all older ages of red snapper are assumed to be vulnerable to this survey. In some cases, the selectivity for one fleet was set equal to the estimated selectivity for another fleet – this is referred to as mirroring selectivity. In the base model, the selectivity pattern for the NMFS bottom longline survey in the east was mirrored off of that in the west, due to the low sample sizes of age compositions in the east. In addition, as mentioned above, the recreational closed season fisheries assume that fisher selectivity is the same as during the open season for the private/charter fishery, the difference being that no red snapper are retained during the closed season. Note that for the commercial closed season fisheries, the assumption is that selectivity during the true closed season period (i.e., prior to IFQs in 2007) is the same as selectivity for fishers with no IFQ allocation during the IFQ period. This assumption is necessary because we only have discard age or size data from the observer program for the period when IFQs were also in place. Finally, since the recreational indices were specified as surveys, they mirrored the selectivity patterns of their respective fisheries.

Several time-varying processes were included in the base model in order to account for the way changes to fishing regulations might alter fishing behavior. The time varying processes that were explored include changes in selectivity, catchability, discard mortality rates, retention, distribution of recruits between areas, and productivity. In order to account for these changes, four patterns of time blocks were established. The first pattern allowed the retention rate parameters for the commercial fleets to vary among five time blocks to accommodate changes in commercial fishing size limit regulations: 1872 to 1984, 1985 to 1993, 1994, 1995 to 2006, and 2007 to 2011. The second pattern similarly allowed the retention rate parameters for the recreational fleets to vary among five time blocks to accommodate changes in recreational fishing size limit regulations: 1872 to 1984, 1985 to 1993, 1994, 1995 to 1999, and 2000 to 2011. The third pattern allowed the selection and catchability parameters for each of the commercial fleets to vary among two time blocks to represent the implementation of the commercial IFQ program: 1872 to 2006 and 2007 to 2011. Finally, the fourth pattern allowed the selection and catchability parameters for each of the recreational fleets to vary among two time blocks to represent the implementation of the circle hook requirement for the recreational fishery: 1872 to 2007 and 2008 to 2011.

Changes in selectivity and catchability were explored to account for the switch to circle hooks in the recreational fishery, and to account for the switch to an IFQ system in the commercial fishery. A change in discard mortality rates was included to account for changes in venting practices, which were shown to have a significant effect on discard mortality rates (SEDAR 2013; Section 2.7). Various models were constructed early on to test the effect of incorporating these time varying processes on model fit. Akaike's Information Criteria corrected for small sample sizes (AICc) was used to determine which time varying process, or combination of processes, provided the best model fit (**Table 1.1.3.1**). These results support the study that was done prior to the AW which showed that the change to circle hooks was mainly manifested as a change in selectivity, not catchability (SEDAR 31-AW-4). As a result, the final base model contains time-varying discard mortality and time-varying selectivity.

Retention curves were used to account for discards that resulted from the implementation of minimum size regulations. The retention function was specified as a four parameter logistic function. For the early years of the time series, where discard age composition data were not available, these parameters were not estimated in the base model and the logistic function parameters were fixed to represent knife-edged retention at the minimum size limit. Retention function parameters varied over time as the size limits changed. For fleets and size limit time periods where discard age composition data were available (i.e., commercial handline east and west and long line east for 2007-2011, and headboat east for 2000-2011), the inflection point and asymptote of the retention functions were estimated. Attempts to estimate the slopes of the retention functions resulted in poor model convergence.

Although the red snapper SS model contained two areas (east and west of the Mississippi River), the model only estimates one stock recruitment relationship for the entire Gulf of Mexico. Annually estimated recruits are then allocated to each area using an annually-varying rate coefficient according to the following equation, where in the red snapper model, there are two parameters, p, one for each area, one which is fixed at zero and the other which is estimated:

$$\text{rate}_i = e^{p_i} \Big/ \sum_{j=1}^{N} e^{p_j}$$

The recruitment distribution parameter was allowed to vary over time according to a white noise model (i.e., annual deviations around the baseline parameter value) from 1972-2011 (i.e., the data rich period of the assessment).

The model tended to estimate values for the steepness parameter near its maximum of 1.0. This was consistent with previous assessments, leading the AW Panel to recommend fixing steepness at 0.99. It was noted that fixing the steepness near 1.0 in conjunction with a time-varying recruitment distribution parameter approximates the independent recruitment that is thought to exist between the eastern and western stocks. Estimated recruitments in the early data poor period of the assessment were consistently lower than recruitments from the later data rich period, which might suggest a change in productivity over time. Therefore, the parameter controlling recruitment at virgin levels ($R_0$) was estimated as a time-varying process for two blocks of the time series: one prior to 1984 and another from 1984 to the present. The time-varying component was accomplished by estimating a multiplicative adjustment to the $R_0$

parameter. Incorporating a time-varying $R_0$ allows us to use the more recent estimate of stock productivity in the projections and the calculation of reference points. This apparent change in productivity was acknowledged and accounted for in the SEDAR 7 (2005) and 2009 SEDAR 7 Update Assessment, where a stock-recruitment relationship calculated for the most recent years (i.e., 1984 forward) was used for projections and reference point calculations. The $\sigma_R$ parameter, which represents the standard deviation of the log of recruitment, was fixed at 0.3. This parameter has two related roles: it penalizes deviations from the spawner-recruitment curve, and it defines the offset between the arithmetic mean spawner-recruitment curve (as calculated from log (R0) and steepness) and the expected geometric mean (which is the basis from which the deviations are calculated). Due to the inclusion of time-varying R0, setting $\sigma_R$ at higher values (e.g., 0.6) led to biologically implausible results, likely because the model was then allowed too much flexibility in estimating recruitment deviations.

SS is hard-coded to model recruits as age 0 fish. Annual deviations from the stock-recruit function were estimated in SS as a vector of deviations forced to sum to zero. SS assumes a lognormal error structure for recruitment. Consequently, expected recruitments were bias adjusted. Methot (2010) recommends that the full bias adjustment only be applied to data-rich years in the assessment; therefore, no bias adjustment was applied prior to 1985, when only catch data are available. This is done so SS will apply the full bias-correction only to those recruitment deviations that have enough data to inform the model about the full range of recruitment variability (Methot 2011). Full bias adjustment was used from 1990 to 2005 when age composition data are available. Bias adjustment was phased in linearly from no bias adjustment prior to 1985 to full bias adjustment in 1990. Bias adjustment was phased out over the last six years (2006-2011), linearly decreasing from full bias adjustment in 2005 to no bias adjustment in 2011, because the age composition data contained little information on younger year classes for those years. The years selected for full bias adjustment were estimated following the methods of Methot and Taylor (2011).

In the base model run, age composition data were weighted by the number of fish observed, with sample sizes capped at 200 fish to prevent the model fitting the age compositions to the exclusion of the indices of abundance. Indices of abundance were weighted by the log-scale standard deviations estimated as part of the index standardization process. Uninformative uniform priors were assigned to all model parameters, except for the random walk selectivity parameters which were assigned normal priors to smooth selectivity between ages. The SS input files are presented in Appendices A-D.

### *1.4 Parameters Estimated*

Table 1.1.4.1 provides a listing of the parameters of primary importance estimated and held fixed in SS. Results include predicted parameter values, standard errors from SS, initial parameter values, minimum and maximum values a parameter could take, and prior densities assigned to parameters.

### *1.5 Model Convergence*

The ability of the model to find a global minimum was evaluated using an internal SS parameter "jitter" option which randomly changes the input parameter by a specified value. A jitter value of 10% was input for this assessment and 100 runs were made. The purpose in changing the parameter starting values across numerous model runs is to explore the model's ability to reach a global solution (i.e., minima) when starting at different places along the likelihood space.

### *1.6 Uncertainty and Measures of Precision*

Uncertainty in parameter estimates was quantified by computing asymptotic standard errors for each parameter (Table 1.4.1). Asymptotic standard errors are calculated by inverting the Hessian matrix (i.e., the matrix of second derivatives) after the model fitting process. Asymptotic standard errors provide a minimum estimate of uncertainty in parameter values.

Uncertainty in parameter estimates was further investigated using a parametric bootstrap approach. Bootstrapping is a standard technique used to estimate confidence intervals for model parameters or other quantities of interest. In SS, there is a built-in option to create bootstrapped data-sets. This feature performs a parametric bootstrap using the error assumptions and sample sizes from the input data to generate new observations about the fitted model expectations. The model was refit to 1000 bootstrapped data-sets and the distribution of the parameter estimates was used to represent the uncertainty in the parameters and derived quantities of interest.

### *1.7 Sensitivity Analysis*

Uncertainty in data inputs and model configuration assumptions was examined through various sensitivity analyses. In all, results of 15 separate SS3 sensitivity model runs and 4 retrospective model runs are included in this report describing the initial SS model configuration, sensitivity analyses, data exclusions, and reweighting runs conducted to evaluate a) sensitivity to parameter inputs (steepness), b) sensitivity to data inputs (M level, discard mortality, age error, data inclusions), and c) model component weighting. Over the course of the stock assessment, many additional sensitivity analyses were explored. Those runs that best explored the sensitivity of key model parameters and/or demonstrated discord (or agreement) in model estimates between runs are presented here. Table 1.7.1 describes the SS Base Model run and all the alternative sensitivity analyses made for the stock assessment.

Sensitivity runs to parameter inputs included varying steepness and estimating time-varying steepness. Sensitivity runs evaluating data inputs included high and low natural mortality, high and low discard mortality, incorporating aging error (i.e. reader precision), index exclusion, and the start year of the model. Finally, sensitivity runs were also made that considered different model component weightings.

A complete characterization of all the sensitivity and alternative models explored for the stock assessment are listed below and further detailed in Table 1.7.1:

Run 1: Base Model – Model configured as described in Section 1.3.

Run 2: M High – Set age zero M equal to 3.5 and age one M equal to 2.0. All other model inputs were configured as in the Base Model.

Run 3: M Low – Set age zero M equal to 1.0 and age one M equal to 0.6. All other model inputs were configured as in the Base Model.

Run 4: Density Dependent M – Set shrimp selectivity for age 0 equal to 1.0 (i.e. fully selected) and 0.0 for all other ages. All other model inputs were configured as in the Base Model.

Run 5: Steepness fixed at 0.8. All other model inputs were configured as in the Base Model.

Run 6: Set the Beverton-Holt spawner recruit equation $\sigma_R$ parameter equal to 0.6. All other model inputs were configured as in the Base Model.

Run 7: Time Varying Steepness – Steepness estimated for two time blocks, 1872 through 1983, and 1984 through 2011. All other model inputs were configured as in the Base Model.

Run 8: High discard mortality – Added 20% of base model discard mortality to the base model discard mortality rates. All other model inputs were configured as in the Base Model.

Run 9: Low discard mortality – Subtracted 20% of base model discard mortality from the base model discard mortality rates. All other model inputs were configured as in the Base Model.

Run 10: Incorporate Age Reader Error – incorporate vector of reader precision estimates at age. All other model inputs were configured as in the Base Model.

Run 11: Set start year of model equal to 1964. All other model inputs were configured as in the Base Model.

Run 12: Removed the 1972 SEAMAP Fall Groundfish Survey index data values. All other model inputs were configured as in the Base Model.

Run 13: Removed all fishery dependent indices from the model. All other model inputs were configured as in the Base Model.

Run 14: Incorporated estimates of deaths due to explosive oil rig removals into the model. All other model inputs were configured as in the Base Model.

Run 15: Increased weighting of the age composition data by increasing the maximum effective sample size to 1,000. All other model inputs were configured as in the Base Model.

Run 16: Increased weighting of the indices by rescaling the log-scale standard errors for each index to a mean of 0.1. All other model inputs were configured as in the Base Model.

### *1.8 Retrospective Analysis*

A retrospective analysis was conducted to look for systematic bias in estimates of key model output quantities over time. For this analysis, the base model was refit while sequentially dropping the last four years of data from the assessment (i.e., 2011, 2010-2011, 2009-2011, and 2008-2011). The retrospective analysis could only be extended back to 2007, because closed season age composition data were not available prior to 2007.

### 1.9 Benchmark/Reference Point Methods

Various stock status benchmarks and reference points are calculated in SS. The user can select reference points based on maximum sustainable yield (MSY), spawning potential ratio (SPR), and spawning stock biomass (SSB). Stock Synthesis calculates SPR as the equilibrium spawning biomass per recruit that would result from a given selectivity pattern and fishing intensity. For SPR-based reference points, SS searches for an F that will produce the specified level of spawning biomass per recruit relative to the un-fished value. For spawning biomass-based reference points, SS searches for an F that produces the specified level of spawning biomass relative to the un-fished value. Both MSY and spawning biomass-based reference points are dependent on the stock-recruit relationship. In the present case, the steepness was estimated to be near the maximum of 1.0, which implies there is little relationship between the number of eggs produced by the adult stock and the subsequent recruitment of young fish to the population. In that case, the MSY reference points computed by the SS model are equivalent to those that maximize the yield per recruit (hereafter referred to with the subscripts MAX).

The previous Gulf of Mexico red snapper benchmark assessment (SEDAR 7) and subsequent updates defined the MSY proxy as the level that would produce an SPR of 26%, where the maximum fishing mortality threshold (MFMT) = $F_{26\%SPR}$ and the minimum stock size threshold (MSST) was defined as the equilibrium SSB at $F_{26\%SPR}$ multiplied by 1-M (where in the present case M equals 0.086).

The AW and RW Panels also discussed the alternative proxy for MSY based on the level of fishing that maximizes the yield per recruit ($F_{MAX}$). An important nuance, however, is that closed season discards and shrimp bycatch are not likely to change in the same way as directed landings. Following the logic used after SEDAR 7, the $F_{MAX}$ benchmark used here is the level of fishing by the directed fleets, given 2011 rates of shrimp bycatch and closed season discarding, that would produce the SPR associated with $F_{MAX}$ when all sources of fishing mortality may be changed in the same proportions (including shrimp bycatch and closed season discards). In the present case, the level of SPR corresponding to $F_{MAX}$ in the base model is 20%; however, this value varies across the alternative model runs. For this reason, the appellation $F_{MAX}$ is used to represent the alternative proxy for MSY discussed above, with the understanding that it is computed based on achieving the equivalent SPR with 2011 mortality rates due to shrimp bycatch and closed season discarding.

The biomass status indicator is defined as $SSB_{Current}$ / MSST, and the fishing mortality status indicator is defined as $F_{Current}$ / MFMT. $F_{current}$ is defined as the 2009-2011 geometric mean F. $SSB_{Current}$ is defined as the 2011 SSB.

### 1.10 Projection Methods

Projections were run to evaluate stock status and associated yields for a range of fishing mortality rate scenarios. Projections were run from 2013 to 2032 for four model configurations:

1. Base (Run 1)
2. High M (Run 2)

3. Low M (Run 3)
4. Upweighted Indices Scenario (Run 16).

Projections were run assuming that selectivity, discarding rates, and retention were the same as the three most recent years (2009-2011). For the deterministic projections, annual recruitment deviations were not estimated for the forecast years. Forecast recruitments are derived from the model estimated Beverton-Holt stock-recruitment relationship, based on the recent time period (i.e., 1984-2011). Recruitment allocation between the two stocks for the forecast years was set equal to the average recruitment allocation of the recent stock-recruitment period (1984-2011) (65% West, 35% East). The catch allocation used for the projections reflects the average distribution of fishing intensity among fleets during 2009-2011. The terminal year of data for the stock assessment was 2011; therefore, in order to initialize the projection at 2013, 2012 landings data for the eight directed fleets were input into the model. For the six bycatch and discard fleets, removals for 2012 were assumed to be equal to removals in 2011. For each of the fishing mortality rate scenarios, exploitation rates for the bycatch and closed season discard fleets for the projection period (2013-2032) were set equal to exploitation rates in 2011.

Deterministic projections were run for eight fishing mortality rate scenarios for each of the four model configurations:

- $F_0$: fishing mortality rates for the eight directed fleets were held at 0 while fishing mortality for bycatch and discard fleets were held at 2011 values
- $F_{Current}$: fishing mortality rates for all fleets were set to the geometric mean of the past three years (2009-2011)
- $F_{REBUILD(MAX)}$: fishing mortality rates for the bycatch and discard fleets were set to 2011 levels, fishing mortality rates for the eight directed fleets were set to achieve $SSB_{MAX}$ in 2032
- $F_{MAX}$: fishing mortality rates for the bycatch and discard fleets were set to 2011 levels, fishing mortality rates for the eight directed fleets were set to achieve an equilibrium SSB equal to $SSB_{MAX}$
- $FOY_{MAX}$: fishing mortality rates for the bycatch and discard fleets were set to 2011 levels, fishing mortality rates for the eight directed fleets were set to 75% of $F_{MAX}$
- $F_{REBUILD(SPR26\%)}$: fishing mortality rates for the bycatch and discard fleets were set to 2011 levels, fishing mortality rates for the eight directed fleets were set to achieve the SSB associated with an SPR of 26% by 2032
- $F_{SPR26\%}$: fishing mortality rates for the bycatch and discard fleets were set to 2011 levels, fishing mortality rates for the eight directed fleets were set to achieve an equilibrium SSB associated with an SPR of 26%
- $FOY_{SPR26\%}$: fishing mortality rates for the bycatch and discard fleets were set to 2011 levels, fishing mortality rates for the eight directed fleets were set to 75% of $F_{SPR26\%}$

Uncertainty in stock status and forecasted yields for the projection years was investigated using the bootstrap approach discussed in Section 1.6. Bootstrap datasets were created for the same four model configurations used for deterministic projections. For each model configuration, the model was refit to 300 bootstrap datasets and then projected forward at two fishing mortality rate scenarios: $F_{MAX}$ and $F_{SPR26\%}$. The projections followed the same methods and assumptions described above for the deterministic projections; however, the bootstrap projections included annual recruitment deviations for the forecasted period. Random log-scale recruitment deviations for the projection period were created from a normal distribution with mean of 0 and standard deviation equal to the model estimated standard deviation in recruitment from the recent time period (1984-2011). The projections from the bootstrap runs were used to create probability distribution functions for the development of management advice, including the overfishing limit (OFL) and acceptable biological catch (ABC).

# 2 Model Results

## *2.1 Fits to Landings*

A log-scale standard error of 0.05 was assigned to all landings time series. As such, the landings are fit nearly precisely for all directed fleets (Figures 2.2.1 to 2.2.8).

## *2.2 Fits to Discards*

The model fits to the discard data varied by fishing fleet. In general, the model fits to the commercial discard data were better than the fits to the recreational discard data. For each of the discard time series, a fixed CV of 0.5 was used to characterize uncertainty in the data. This forced the model to fit the landings data more precisely than the discard data when the two sources of information diverged from model expectations.

In general, the model tended to estimate discards levels that were higher than the input values for the handline fishery in both the eastern and western GOM. Model estimated discards were greater than input discards each year from 1990-2008 for the eastern GOM but captured the observed increase in discards for 2009-2011 (Figure 2.3.1). The model generally fit the handline discards in the western GOM over most of the time (Figure 2.3.2).

The model generally fit the eastern GOM longline discard time series from 1990-2006 but some lack of fit to the discards is noted for 2008-2011 (Figure 2.3.3). The model generally fit the western GOM longline discard time series over the entire time period and captured the observed decrease in discards from 2008-2011 (Figure 2.3.4).

The model generally did not fit the recreational (MRIP) discard data in both the eastern and western GOM for the majority of the time series, which is not unexpected given the level of uncertainty assigned to the discard observations (Figures 2.3.5 and 2.3.6). The model did capture the observed decrease in discards associated with the regulated change from J-hooks to circle-hooks in 2008, and the resulting change in selectivity.

The model generally did not fit the recreational headboat discard data in both the eastern and western GOM for the majority of the time series. For the eastern GOM, the most substantial difference between the model estimated headboat discards and the observed data occurred in

2000-2007, which coincided with an increase in the size of retention in the model (Figure 2.3.7). The model provided a closer fit to the observed discards in the most recent years, 2008-2011, relative to the early years. The patterns of model fit in the western GOM were similar to the eastern GOM. The model underestimated discards for 1981-1984, and then overestimated discards substantially from 1985-2007 (Figure 2.3.8). Similar to the eastern GOM, the model predicted a large decrease in discards for western GOM headboat fleet following a change in selectivity associated with circle hook requirements starting in 2008.

The model generally fit the commercial closed season discards in both the eastern and western GOM. Model fits to the observed time series were relatively precise in most years, especially for the western GOM commercial closed season (Figures 2.3.9 and 2.3.10). Since the closed season fleet was configured as a discard only fleet, the model did not have to fit to both landings and discard data as was done for the directed fishing fleets. This allowed the model to fit the commercial closed season discards more closely. Similarly, the model generally fit the recreational closed season discards. Model predicted discards were very similar to observations in almost all years for both the eastern and western GOM (Figures 2.3.11 and 2.3.12).

Predicted red snapper bycatch from the shrimp fishery was appropriately scaled and generally followed the patterns of shrimp fishing effort input into the model and model predicted recruitments. The model predicted mean bycatch level was similar to the input estimate used for the super-year approach for the eastern fleet (Figure 2.3.13). For the western GOM shrimp fleet, the model predicted a mean bycatch level on the lower end of what would be expected, given the specified uncertainty (Figure 2.3.14). The model predicted a generally increasing trend of red snapper bycatch from the shrimp fleet in both the eastern and western GOM through the early 2000s and then a large decline in red snapper bycatch associated with decreasing shrimp fishing effort (2.3.15 and 2.3.16). The model also predicts a large removal of red snapper bycatch in both the eastern and western GOM in 1972. The predicted bycatch in 1972 is the highest predicted level for both fleets over the entire time series. The bycatch in 1972 is associated with large model predicted recruitment in the same year.

### *2.3 Fits to Indices*

The model generally was able to fit the commercial handline indices of abundance. The model predicted an increasing trend in abundance for the handline fishery in the eastern GOM which fit the observed data over most of the time period (Figure 2.4.1). The model did predict a stronger than observed increase in abundance over the most recent years; however, this index did have relatively high CVs throughout the time series. The root mean squared error (rmse) suggested that the model fit this index better than expected (rmse < observed se) (Table 2.4.1). The model generally fit the western handline index of abundance (Figure 2.4.2). The model predicted an increase in abundance from 1990 through the later 1990s followed by a slightly decreasing trend through the early 2000s. The model predicts an increasing trend in abundance over the most recent years and, similar to the eastern handline index, exhibits positive residuals in the most recent years.

In general, the model was able to track the observed changes in abundance in both the eastern and western GOM over the majority of the time series. Both the eastern and western MRIP abundance indices show a large increase in abundance between 2006 and 2007 (Figures 2.4.3

and 2.4.4). The model was not able to fit this large jump in both indices in 2007 with positive residuals for 2004 - 2006 and negative residuals from 2007 - 2011for the western MRIP index (Figure 2.4.4). The model predicts abundance to be relatively constant from 2008-2011 for the eastern GOM MRIP index and an increasing trend in abundance for the western GOM MRIP index.

The model was able to fit the eastern GOM headboat index well throughout the majority of the time series. The eastern GOM headboat index shows a generally increasing trend in abundance over entire time series. The model predicts an increase in abundance from 1985-2007 followed by a decreasing trend from 2007-2011 (Figure 2.4.5). The observed western GOM headboat index exhibits strong fluctuations in abundance over the time series. The fit to this time series is characterized by consecutive years of negative residuals throughout the mid-1990s, positive residuals from 1999-2007, and negative residuals from 2008-2011 (Figure 2.4.6).

The model generally fit both the eastern and western GOM NMFS bottom longline indices of abundance. Both the observed and model predicted index show a strong trend of increasing abundance for the NMFS bottom longline survey in the eastern GOM (Figure 2.4.7). The model was unable to fit some of the large inter-annual observed changes in the western NMFS bottom longline index; however, the model does fit the overall trend in the data and predicts a strong increase in abundance for this index in the most recent years (Figure 2.4.8).

The model fits to the SEAMAP reef fish video survey had a high root mean squared error (Table 2.4.1). The model fit the eastern video survey better than the western survey; however, this index had high standard errors with the model predicting a declining trend in the most recent years whereas the data displays an increasing trend (Figure 2.4.9). The model generally did not fit the western video survey, with the observed index showing strong inter-annual changes in the abundance index. The model predicted index had negative residuals in the two most recent years (2010-2011) (Figure 2.4.10).

The model predicted an increasing trend in the abundance of larval red snapper that generally fit the observed SEAMAP fall plankton surveys for both the eastern and western GOM. The model generally fit the eastern plankton index in most years and predicted a strong increase in the abundance of larval red snapper in the most recent years (Figure 2.4.11). The model captured the general trend in the western GOM index, though if did not capture all of the interannual variation (Figure 2.4.12).

The model generally did not fit the SEAMAP summer groundfish survey for the eastern GOM (Figure 2.4.13). The model fit was stronger early in the time series but displayed a pattern of negative residuals from 1987-1992 and positive residuals from 1993-2006. The model predicted a strong decrease in this index from 2005-2011. The model generally fit the SEAMAP summer groundfish survey for the western GOM, with the exception of the first year (Figure 2.4.14).

The model generally fit the SEAMAP fall groundfish survey for both the eastern and western GOM. The model captured the overall pattern in the eastern index, especially early in the time series, while it failed to capture all of the interannual variation (Figure 2.4.15). The model was able to fit to the first year of this index (1972) which was higher than the following years. In order to fit this point the model predicts the highest recruitment year in the time series in 1972. The reason the model is able to fit this point is that the only other information in the model in early 1970s are landings and discard data, since the other indices and age composition do not begin until the early 1980's. The model generally was able to fit the western SEAMAP fall groundfish survey. Similar to the eastern index, the model was able to fit the relatively high value for the first year of this index (Figure 2.4.16).

The model generally fit the observed fishing effort series for the shrimp fishery in both the eastern and western GOM (Figures 2.4.17 and 2.4.18). The model configuration did not require an exact match to the shrimp fishing effort; a CV of 0.10 was used for the index.

### *2.4 Fits to Age composition*

The model fits to the age composition samples and the associated residual plots are presented in Figures 2.5.1 through 2.5.50. In general, the base model fit the age composition data, and no systematic biases across time or fleets were seen. The model had more difficulty fitting the discard age composition data, and also cases where there were a low number of samples in a given year.

### *2.5 Parameter estimates & associated measures of uncertainty*

Table 1.4.1 lists many important parameters, both fixed and estimated, in SS for the base model recommended by the RW Panel for final projections and status determinations. It also includes predicted parameter values and their associated standard errors from SS, initial parameter values, minimum and maximum values a parameter could take, and prior densities assigned to parameters. Parameters designated as fixed were held at their initial values. Asymptotic standard errors are obtained in SS by inverting the Hessian matrix that is the matrix of second derivatives, after the final model fitting process.

In general, estimates of uncertainty from the bootstrap procedure were very similar to estimates of asymptotic standard errors calculated by inverting the Hessian matrix. A list of the mean, median and standard deviation from the distribution of parameter estimates for the 300 bootstrap samples from the base model is presented in Table 2.6.1.

Model convergence was examined by the SS jitter option. Summary results are presented in Table 2.6.2 and Figures 2.6.1a-d for the 100 jitter runs that were run against the SS model configuration for the base model. Of the 100 runs, 98 model runs resulted in likelihood values that fell within two units of the total likelihood of the base model value (6675.24, Figures 2.6.11a-d).

Results of the 100 jitter trials predicted very similar levels of a variety of key quantities and stock status metrics (Figures 2.6.2 to 2.6.4).

### *2.6 Fishery Selectivity*

Predicted age-based selectivities for fleets and indices in the terminal year (2011) are illustrated in Figure 2.7.1. (fleet-specific) and in Figure 2.7.2 (survey-specific). In addition, time varying selectivity functions were estimated for the recreational fisheries to allow changes in selectivity to be estimated due to the regulatory mandate requiring the use of circle-hooks (Figures 2.7.3 and 2.7.4).

Multiple length-based time-varying retention functions (logistic in form) were modeled for the commercial and recreational fisheries to account for the changes in the size of fished retained due to various minimum size limits (Figure 2.7.5).

For all of the fleets and most surveys, selectivity functions were estimated using a random-walk and are dome-shaped, except for the NMFS Bottom Longline Survey which was estimated using a logistic function. In the terminal year (2011) red snapper were fully selected at:

- age 0 for the eastern and western shrimp discard fleets (Shr_E and Shr_W)
- age 0 for the fall groundfish survey in the east and west (Fall_E, Fall_W)
- age 1 for the summer groundfish survey in the east and west (Sum_E, Sum_W)
- ages 2-5 for the R_Clsd_E, R_Clsd_W, MRIP_E, MRIP_W, and MRIP_Indices_E and W)
- age 3 for the western video survey and ROV_E
- ages 3-4 for the HL_E, HL_W and HB_E fleet and index.
- ages 3-5 for the eastern video survey
- age 4 for the eastern commercial closed season discard fleet (C_Clsd_E)
- ages 4-5 for the HBT_W fleet and index
- ages 4-9 for the western commercial closed season discard fleet (C_Clsd_W)
- age 5 for the LL_E
- ages 6-9 for the LL_W
- ages 6-20+ for the NMFS Bottom Longline Survey in the east and West (BLL_E, BLL_W)

As expected, the longline fisheries and the NMFS Bottom Longline survey landed the oldest fish while the youngest fish were discarded by the shrimp fleet or landed by the recreational private and charterboat (MRIP) fleets in the eastern and western Gulf (Figures 2.7.1 and 2.7.2).

In general, a shift in selectivity toward older red snapper was estimated for the time block 2007-2011, with one exception being the eastern longline fishery (Figure 2.7.3a). Also as expected, increases in the minimum size limit resulted in larger red snapper retained by the fisheries, while red snapper below the size limit were generally discarded (Figure 2.7.5).

### *2.7 Recruitment*

Profiling of the steepness parameter is presented in Figure 2.8.1 for the base model configuration. The profile of steepness for base model configuration is noisy for the age composition, the index, and the discard data components as seen in Figure 2.8.1; however, the overall pattern across all data components suggested a steepness value towards the upper bound of 1. The SEDAR 31 AW Panel recommended fixing the Beverton – Holt steepness parameter at 0.99. Additional discussion of the model parameterization as relates this parameter was given earlier in Section 1.3.

Section 3.1.3 also described the base model parameterization of the spawner – recruit relationship $R_0$ parameter. SS was able to estimate the $R_0$ (log of virgin recruitment level for the early time period, i.e., block 1 early period 1872-1983 time period, without difficulty for the red snapper base model configuration. SS estimated ln($R_0$) for the recent time period (1984-2011) to be 12.0255 (0.0587 = SD) for the base model. As mentioned earlier in section 1.3, $\sigma_R$, the standard error of log recruitment was fixed at 0.3. Figure 2.8.2 presents the profile for $R_0$ in the recent time period (1984-2011).

The spawner-recruit relationship as estimated from SS for the base model configuration (assuming steepness = 0.99 and $\sigma_R$ = 0.3) is shown in Figure 2.8.3. Estimated recruitment deviations varied without trend over the time series except during two periods: in the mid 1980's and the recent years, since 2008 (Figure 2.8.4). The recent years (since 2008) contain less information from which to estimate the level of recruitment, since not all cohorts have fully contributed to the fishery. The high estimated recruitment deviation value for 1972 corresponds to observed high recruitment index values from the Fall SEAMAP groundfish trawl survey indices.

Predicted abundance at age is presented in Figures 2.8.5 and 2.8.6 for the base model configuration for the east and west areas. Predicted age-0 recruits are also presented in Table 2.9.1 and Figure 2.8.7 for the base model configuration.

Figure 2.8.8 presents SS estimates of YPR and SPR from the red snapper base model configuration (steepness = 0.99, $\sigma_R$ = 0.3).

### *2.8 Stock Biomass*

Predicted total biomass and spawning biomass are presented in Table 2.9.1 and in Figures 2.9.1 and 2.9.2 for the base model configuration (steepness = 0.99, $\sigma_R$ = 0.3) Total biomass and spawning biomass show a steady declining trend from the late 1880's through the early 1900s, followed by a flat trend up to the 1940s. Predicted SS total biomass showed strong declines starting in the 1940s and lasting through the late 1970s. Increases in total and spawning stock biomass are predicted by SS beginning in the late 1980s. This trend is also consistent across both areas.

Predicted abundance at age was presented previously (Figures 2.8.5 and 2.8.6 for the base model (steepness = 0.99, $\sigma_R$ = 0.3)). SS predicted the mean age of Gulf of Mexico red snapper to be approximately 3.5 in the unfished state in 1872. The population mean age showed a steady decline until around 1910, after which it remained stable at around age 2, until the early 1940s, when average age slightly increased, followed by a sharp drop around 1960. Since 1972, average age fluctuated between about 0.5 and 0.9, until 2004 when it started increasing again.

The decline in mean age in the earliest years of the time series corresponds with increasing landings and the development of the commercial handline fishery. The sharp decline in mean age that began in the early 1960s corresponds to the increasing popularity of red snapper by recreational anglers.

### *2.9 Fishing Mortality*

Exploitation rate (catch in numbers including discards / total numbers) was used as the proxy for annual fishing mortality rate in this assessment. Predicted annual fishing mortality rates are presented in Table 2.10.1 and Figure 2.10.1 (top panel) for the SS base model configuration (steepness = 0.99 and $\sigma_R$ = 0.3). This represents the fishing mortality level on the most vulnerable age class (the most vulnerable age class varies with changes in the relative effort and selectivity patterns of the various fisheries). Predicted annual fishing mortality estimates (all fleets combined, top panel plot) shows flat and low levels of F through the late 1940s. From the early 1950s through the mid-1970s, steady increasing trend in F are predicted. Since the mid-1970s estimated total annual F's have continued to decline.

Table 2.10.2 and Figure 2.10.1 (bottom panel) present instantaneous fishing mortality by year and fleet. An increasing trend in fishing mortality was observed for the handline fleet in the east beginning in the early 1880s as the fishery developed, which lasted until the early 1900s. Fishing mortality remained variable without trend until the late 1950s, when after which a significant increase in fishing mortality was observed for the handline fleet in both the east and the west. Fishing mortality declined in the early 1970s until the mid-1980s, after which an increase in fishing mortality was observed for the recreational fleet.

### *2.10 Sensitivity Analyses*

Table 1.4.1 presented estimates of asymptotic standard errors for all SS estimated parameters for the Gulf of Mexico red snapper stock assessment for the base model configuration. Table 2.6.1 provides a complete listing of the mean, median, and standard deviation of estimated parameters. Table 1.7.1 provides a listing of all the sensitivity runs carried out for the stock assessment. Figures 2.12.1 to 2.12.12 present key metrics from the SS model for all the sensitivity analyses considered for the stock assessment. For each type of sensitivity (natural mortality, steepness assumption, data inputs, model component weighting) plots of total biomass, spawning biomass, recruits, and fishing mortality are presented. Detailed results are summarized in the following sections for the various sensitivity and retrospective and alternative run configurations that were conducted to further examine impacts on model results from varying assumptions on steepness, natural mortality, data exclusion, data weighting and discard release mortality.

Figures 2.12.1 - 2.12.4 present SS model results from varying input levels of natural mortality, varying assumptions on the Beverton and Holt steepness parameter (fixed = base, time varying), and also on varying assumptions on the Beverton and Holt and the $R_0$ parameter. As expected the red snapper model was sensitive to the assumed input level of M (Figures 2.12.1 and 2.12.2). Alternative model configurations were also made exploring assumptions about steepness (Base model = 0.99, steepness = 0.8, and time-varying steepness). Results (Figures 2.12.3 - 2.12.4) indicate that input assumptions about steepness and $R_0$ did affect model results, particularly the model estimates of total biomass and spawning biomass for the western Gulf.

Figures 2.12.5 - 2.12.6 present SS model results from alternative assumptions about discard mortality (Base model run discard level + 20%, Base model run - 20%). Results indicate that changing the discard mortality level plus or minus 20% from the Base model configuration did not have any visible impact on model estimates of total biomass, spawning biomass, recruitment or fishing mortality.

*Figures 2.12.7 and 2.12.8 present results from alternative assumptions about age reader error, beginning year of model = 1964, and assuming an additional source of mortality from explosive oil rig removals. These results indicate the model results are sensitive to assumptions about age error. Early examinations by the assessment team incorporating the empirical estimates of ager error introduced atypical behavior with some parameters thus the AW Panel recommended excluding age error from the final base model.

Figures 2.12.9 and 2.12.10 illustrate results from alternative runs that explored removal of indices and/or specific years of an index (i.e., 1972 Fall SEAMAP groundfish survey data point). Exclusion of the fishery dependent indices of abundance (HL_E, HL_W, LL_E, LL-W, BLL_W, BLL_E, MRIP_Index_E, MRIP_Index_W, HBT_Index_E, HBT_Index_W) from the base model had some impact on model results, though the perception of the current stock status from the base model relative to SPR26% was not altered.

Figure 2.12.11 and 2.12.12 present results from evaluating the impact of alternative weighting schemes for different data components (i.e., indices of abundance and age composition data) in the model. In general, the estimated trends in fishing mortality rate, recruitment and biomass were similar across weighting schemes. Estimates of spawning biomass in recent years were somewhat higher than the base model with increased weight on the indices of abundance and somewhat lower than the base with increased weight on the age composition data.

### *2.11 Retrospective Analyses*

Results of the retrospective analysis are presented in Figures 2.13.1 - 2.13.2. Key model output quantities shown in the plots are: total biomass, spawning biomass, recruitment, and fishing mortality rate. There was some variability in model estimates of these key quantities as the most recent years of data were dropped from the assessment, but no systematic bias was discernible. Sequentially eliminating the last four years of data did not alter the perception of current stock status compared to the base model.

### *2.12 Benchmarks/Reference points*

Benchmarks for the SPR26% and for maximum YPR reference points are presented in Tables 2.14.1 and 2.14.2, and Figures 2.14.1 and 2.14.2 for the base run. The MFMT was the fishing mortality rate that produced SPR26% or maximum YPR. The MSST was calculated as (1-*M*) * SSB_FSPR26% or SSB_$F_{MAX}$. Figures 2.14.3 and 2.14.4 present phase plots of the SPR26% and maximum YPR reference points for the base model and each sensitivity model presented in Sections 1.7 and 2.12. Figures 2.14.1 and 2.14.2 present estimates of reference points for status determinations from the base model run. These results suggest that the Gulf of Mexico red snapper stock remains overfished according to the base model and all of the sensitivity models examined, except the M High sensitivity model. The results suggest that overfishing is not occurring according to the base model and all of the sensitivity models examined.

## 3 Projections

Benchmarks for the MAX and SPR26% reference points and projections are presented in Table 3.1.1 and Table 3.1.2, respectively. Only a subset of the available sensitivity runs were selected for use in projections. The RW Panel felt this subset represented possible alternative states of nature. The RW Panel recommended using three values of natural mortality rate (Runs 1-3) and the model configuration that upweighted the indices (Run 16) for projections. Stock status and SPR for each combination of model configuration and fishing mortality rate scenario are presented in Tables 3.1.3 and 3.1.4.

The projected fishing mortality rate from the base model is summarized in Figures 3.1.1 and 3.2.1. In general, all fishing mortality rates explored resulted in nearly constant fishing mortality during the projection interval, with none resulting in overfishing. The projected SPR for the base model is illustrated in Figures 3.1.3. and 3.1.4. As expected, eliminating directed fishing (F = 0) resulted in the most significant recovery in SPR (SPR > 0.6) while fishing at $F_{MAX}$ resulted in a slower increase in SPR.

The projected spawning stock biomass from the base model is shown in Figures 3.1.5 and 3.1.6. Similar to the projected SPR, eliminating directed fishing (F = 0) resulted in the most significant recovery in spawning biomass while fishing at $F_{MAX}$ resulted in a slower increase in spawning stock biomass.

Regional (East, West GOM) trends in spawning biomass from the base model are illustrated in Figures 3.1.7 and 3.1.8. In the eastern Gulf of Mexico, maintaining current levels of fishing allows the spawning stock to increase while the other F scenarios result in a generally constant spawning biomass. All F scenarios result in increasing spawning biomass in the western Gulf of Mexico.

The projected yield from the base model is summarized in Figures 3.1.9 and 3.1.10. A peak in yield is noted during 2013. This peak is a transient feature caused by a few strong year classes passing through the fishery. The model predicts below average recruitment in the two most recent years (2010-2011); therefore, the yield declines in 2014 then stabilizes at levels supported by near constant recruitment during the projection interval.

## 4 Acknowledgements

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## 6. Tables

Table 1.3.1. AIC table comparing model runs with time varying processes.

| Run | Neg Log Like | N Parm | N Data | AIC | AICc | Delta AICc |
|---|---|---|---|---|---|---|
| Time-varying Discard | 4883.68 | 1026 | 7914 | 11819.36 | 12125.36 | 787.77 |
| Time-varying Discard and Selectivity | 4391.03 | 1100 | 7914 | 10982.06 | 11337.59 | 0.00 |
| Time-varying Discard and Catchability | 4874.84 | 1034 | 7914 | 11817.68 | 12128.83 | 791.24 |
| Time-varying Discard, Selectivity and Catchability | 4383.28 | 1108 | 7914 | 10982.56 | 11343.70 | 6.11 |

Table 1.4.1. Listing of predicted parameter values and associated standard errors from the base model run (with initial parameter values, the upper and lower bounds on that parameter, and any prior densities assigned to parameters). Parameters that are designated as fixed were held at their initial value and not estimated.

| Label | Value/Estimate | Parm_StDev | Init | Min | Max | PR_type | Prior | Pr_SD | Status | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| L_at_Amin_Fem_GP_1 | 9.96 | _ | 9.96 | 7 | 21 | No_prior | | | Fixed | Size at age 0.5 |
| L_at_Amax_Fem_GP_1 | 85.64 | _ | 85.64 | 70 | 100 | No_prior | | | Fixed | von Bertalanffy Linfintiy |
| VonBert_K_Fem_GP_1 | 0.1919 | _ | 0.1919 | 0.05 | 0.8 | No_prior | | | Fixed | von Bertalanffy K |
| CV_young_Fem_GP_1 | 0.1735 | _ | 0.1735 | 0.01 | 0.5 | No_prior | | | Fixed | Young growth CV |
| CV_old_Fem_GP_1 | 0.0715 | _ | 0.0715 | 0.01 | 0.5 | No_prior | | | Fixed | Old growth CV |
| Wtlen_1_Fem | 1.67E-05 | _ | 1.67E-05 | 0 | 1 | No_prior | | | Fixed | Weight length a parameter |
| Wtlen_2_Fem | 2.953 | _ | 2.953 | 0 | 4 | No_prior | | | Fixed | weight length b parameter |
| Mat50%_Fem | 999 | _ | 999 | 50 | 1000 | No_prior | | | Fixed | Maturity inflection point |
| Mat_slope_Fem | 999 | _ | 999 | -1 | 1000 | No_prior | | | Fixed | Maturity slope |
| Eggs_scalar_Fem | 999 | _ | 999 | 0 | 1000 | No_prior | | | Fixed | Fecundity scalar |
| Eggs_exp_wt_Fem | 999 | _ | 999 | 0 | 1000 | No_prior | | | Fixed | Fecundity slope |
| RecrDist_Area_1 | -0.665361 | 0.0462155 | -0.8 | -4 | 4 | No_prior | | | Estimated | Distribution of recruits to east |
| RecrDist_Area_2 | 0 | _ | 0 | -4 | 4 | No_prior | | | Fixed | Distribution of recruits to west |
| CohortGrowDev | 1 | _ | 1 | 0 | 0 | No_prior | | | Fixed | Cohort growth deviation |
| SR_LN(R0) | 12.0011 | 0.0593635 | 11.8 | 1 | 20 | No_prior | | | Estimated | Virgin Recruitment |
| SR_BH_steep | 0.99 | _ | 0.99 | 0.2 | 1 | No_prior | | | Fixed | Steepness |
| SR_sigmaR | 0.3 | _ | 0.3 | 0 | 2 | No_prior | | | Fixed | Stock recruitment standard deviation |
| SR_envlink | -0.509195 | 0.0768754 | 0 | -5 | 5 | No_prior | | | Estimated | stock recruitment environmental link |
| SR_R1_offset | 0 | _ | 0 | -5 | 5 | No_prior | | | Fixed | stock recruitment offset |
| SR_autocorr | 0 | _ | 0 | 0 | 0 | No_prior | | | Fixed | stock recruitment autocorrelation |
| InitF_1HL_E | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: handline east |
| InitF_2HL_W | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: handline west |
| InitF_3LL_E | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: longline east |
| InitF_4LL_W | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: longline west |
| InitF_5MRIP_E | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: charter/for hire east |
| InitF_6MRIP_W | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: charter/for hire west |
| InitF_7HBT_E | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: headboat east |
| InitF_8HBT_W | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: headboat west |
| InitF_9C_Clsd_E | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: commercial closed season east |
| InitF_10C_Clsd_W | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: commercial closed season west |
| InitF_11R_Clsd_E | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: recreational closed season east |
| InitF_12R_Clsd_W | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: recreational closed season west |
| InitF_13Shr_E | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: shrimp bycatch east |
| InitF_14Shr_W | 0 | _ | 0 | 0 | 1 | Normal | 0.01 | 99 | Fixed | initial F: shrimp bycatch west |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LnQ_base_13_Shr_E | 3.48E+00 | 0.104906 | 1 | -10 | 20 | No_prior | | | Estimated | catchability coefficient for the shrimp effort index in east |
| LnQ_base_14_Shr_W | 1.25E+00 | 0.0833721 | 1 | -10 | 20 | No_prior | | | Estimated | catchability coefficient for the shrimp effort index in west |

Table 1.7.1 Description of base model run and alternative sensitivity runs for the Gulf of Mexico red snapper SS evaluation. Sensitivity runs evaluated SS model results to changing input assumptions on model parameters, data inputs, index indices, and model component weightings.

| **Run** | **Name** | **Sensitivity Type** | **Description** |
|---|---|---|---|
| 1 | Base Model | Base Model | Fixed von Bertalanffy growth, fixed M for ages zero and one, and Lorenzen at age natural mortality for ages two and older, scaled to age three, age specific fecundity, steepness was fixed at 0.99, time varying virgin stock parameter ($R_0$) was estimated for two different time blocks (recent, 1984-2011 and historical, 1872-1983), model was spatially structured into two areas (east and west), one stock recruitment relationship was estimated and the distribution of recruitment between areas was estimated assuming the historical period as described in section 3.1.3, recruitment deviations were estimated from 1899 to the present, discards were input as discards (thousands of fish for all fleets, one super period for shrimp bycatch fishery and annual for the other fisheries), time varying selectivity, retention, and discard blocks as described in section 3.1.3. |
| 2 | M High | Natural Mortality Sensitivity | Set age zero M to 3.5 and age one M to 2.0, all other model inputs configured as Base Model |
| 3 | M Low | Natural Mortality Sensitivity | Set age zero M to 1.0 and age one M to 0.6, all other model inputs configured as Base Model |
| 4 | Density Dependent M | Natural Mortality Sensitivity | Set shrimp selectivity for age zero = 1.0 (i.e. fully selected) and selectivity = 0.0 for all other ages, all other model inputs configured as Base Model |
| 5 | Steepness = 0.8 | Steepness | Steepness = 0.8, all other model inputs configured as Base Model. |
| 6 | σR = 0.6. | Steepness | Assumed the Beverton-Holt spawner recruit equation sigma R parameter equals 0.6, all other model inputs configured as Base Model |
| 7 | Time Varying Steepness | Steepness | Two time blocks assumed for steepness parameter, 1872 through 1983, and 1984 through 2011 |

| | | | |
|---|---|---|---|
| 8 | Plus 20% discard mortality | Data Inputs | Base model discard mortality modified by adding 20% to base model run level all other model inputs configured as Base Model |
| 9 | Minus 20% discard mortality | Data Inputs | Incorporate vector of reader precision at age, all other model inputs configured as Base Model |
| 10 | Incorporate Age Reader Error | Data Inputs | Removal of 1972 SEAMAP Fall Groundfish Survey index data values, all other model inputs configured as Base Model |
| 11 | Start Year 1964 | Data Inputs | Assume start year of model equal to 1964 all other model inputs configured as Base Model |
| 12 | Exclude 1972 SEAMAP index | Index Exclusion | Removal of 1972 SEAMAP Fall Groundfish Survey index data values, all other model inputs configured as Base Model |
| 13 | Exclude Fishery Dependent Indices | Data Inputs | Remove fishery dependent indices, all other model inputs configured as Base Model |
| 14 | Incorporate Oil Rig Mortality | Data Inputs | Incorporate oil rig removal mortality all other model inputs configured as Base Model |
| 15 | Age composition Weighting | Model Weighting | Increase weighting of age composition by capping the sample sizes at 1000, all other model inputs configured as Base Model |
| 16 | Index CV 0.1 | Model Weighting | Increase weight of indices by assuming indices error is 0.1, all other model inputs configured as Base Model |

Table 2.4.1. Input standard errors and model estimated root mean squared error for each index of abundance.
Definition of fisheries/surveys: HL_E = handline east, HL_W = handline west, Shr_E= shrimp effort index, Shr_W=shrimp effort index west, Video_E = NMFS, Pascagoula Lab video survey East, Video_E= NMFS, Pascagoula Lab video survey west, Larv_E=SEAMAP ichthyoplankton survey east, Larv_W= SEAMAP ichthyoplankton survey west, Sum_E = summer SEAMAP trawl survey east, SumW=summer SEAMAP trawl survey west, Fall_E= fall SEAMAP trawl survey east, Fall_W =fall SEAMAP trawl survey west, BLL_W = SEFSC, bottom longline survey west, BLL_E= SEFSC bottom longline survey east, ROV_E=Dauphin Island Sea Lab Remote Operated Vehicle juvenile survey east, MRIP_Index_E= MRIP survey east. MRIP_Index_W = MRIP survey west, HBT_Index_E= SEFSC, headboat survey east, HBT_Index_W=SEFSC, headboat survey west.

| **Fishery/Survey** | **N** | **mean_input_SE** | **r.m.s.e.** |
|---|---|---|---|
| HL_E | 17 | 0.62 | 0.37 |
| HL_W | 17 | 0.17 | 0.21 |
| Shr_E | 62 | 0.13 | 0.00 |
| Shr_W | 66 | 0.13 | 0.10 |
| Video_E | 14 | 0.98 | 1.10 |
| Video_W | 15 | 0.25 | 0.44 |
| Larv_E | 16 | 0.78 | 0.53 |
| Larv_W | 21 | 0.45 | 0.62 |
| Sum_E | 30 | 0.46 | 1.05 |
| Sum_W | 30 | 0.21 | 0.49 |
| Fall_E | 40 | 0.27 | 0.73 |
| Fall_W | 40 | 0.16 | 0.44 |
| BLL_W | 14 | 0.39 | 0.84 |
| BLL_E | 14 | 0.64 | 0.55 |
| ROV_E | 0 | 0.00 | 0.00 |
| MRIP_Index_E | 31 | 0.33 | 0.50 |
| MRIP_Index_W | 31 | 0.30 | 0.30 |
| HBT_Index_E | 26 | 0.69 | 0.45 |
| HBT_Index_W | 26 | 0.26 | 0.38 |

Table 2.6.1 Mean, median, and standard deviation of estimated parameter from 300 bootstrap samples for Gulf of Mexico red snapper from the Base Model Run.

| Label | Mean | Median | SD |
|---|---|---|---|
| RecrDist_Area_1 | -0.711 | -0.710 | 0.038 |
| RecrDist_Area_1_DEVadd_1972 | 0.032 | 0.030 | 0.041 |
| RecrDist_Area_1_DEVadd_1973 | -0.093 | -0.092 | 0.042 |
| RecrDist_Area_1_DEVadd_1974 | 0.038 | 0.039 | 0.048 |
| RecrDist_Area_1_DEVadd_1975 | -0.019 | -0.016 | 0.049 |
| RecrDist_Area_1_DEVadd_1976 | 0.006 | 0.007 | 0.048 |
| RecrDist_Area_1_DEVadd_1977 | 0.023 | 0.025 | 0.046 |
| RecrDist_Area_1_DEVadd_1978 | -0.040 | -0.038 | 0.048 |
| RecrDist_Area_1_DEVadd_1979 | -0.104 | -0.103 | 0.046 |
| RecrDist_Area_1_DEVadd_1980 | -0.146 | -0.145 | 0.039 |
| RecrDist_Area_1_DEVadd_1981 | -0.001 | 0.003 | 0.036 |
| RecrDist_Area_1_DEVadd_1982 | 0.024 | 0.024 | 0.034 |
| RecrDist_Area_1_DEVadd_1983 | -0.124 | -0.124 | 0.041 |
| RecrDist_Area_1_DEVadd_1984 | -0.127 | -0.126 | 0.046 |
| RecrDist_Area_1_DEVadd_1985 | -0.274 | -0.274 | 0.039 |
| RecrDist_Area_1_DEVadd_1986 | -0.106 | -0.107 | 0.031 |
| RecrDist_Area_1_DEVadd_1987 | -0.229 | -0.230 | 0.034 |
| RecrDist_Area_1_DEVadd_1988 | -0.072 | -0.072 | 0.025 |
| RecrDist_Area_1_DEVadd_1989 | -0.092 | -0.091 | 0.019 |
| RecrDist_Area_1_DEVadd_1990 | -0.019 | -0.018 | 0.021 |
| RecrDist_Area_1_DEVadd_1991 | -0.049 | -0.048 | 0.021 |
| RecrDist_Area_1_DEVadd_1992 | -0.114 | -0.114 | 0.022 |
| RecrDist_Area_1_DEVadd_1993 | -0.067 | -0.067 | 0.021 |
| RecrDist_Area_1_DEVadd_1994 | -0.121 | -0.121 | 0.020 |
| RecrDist_Area_1_DEVadd_1995 | 0.073 | 0.073 | 0.018 |
| RecrDist_Area_1_DEVadd_1996 | 0.091 | 0.092 | 0.021 |

| | | | |
|---|---|---|---|
| RecrDist_Area_1_DEVadd_1997 | 0.054 | 0.054 | 0.022 |
| RecrDist_Area_1_DEVadd_1998 | 0.014 | 0.014 | 0.020 |
| RecrDist_Area_1_DEVadd_1999 | 0.138 | 0.139 | 0.020 |
| RecrDist_Area_1_DEVadd_2000 | 0.093 | 0.093 | 0.021 |
| RecrDist_Area_1_DEVadd_2001 | 0.102 | 0.102 | 0.022 |
| RecrDist_Area_1_DEVadd_2002 | 0.119 | 0.118 | 0.022 |
| RecrDist_Area_1_DEVadd_2003 | 0.078 | 0.078 | 0.017 |
| RecrDist_Area_1_DEVadd_2004 | 0.110 | 0.110 | 0.017 |
| RecrDist_Area_1_DEVadd_2005 | 0.127 | 0.127 | 0.018 |
| RecrDist_Area_1_DEVadd_2006 | 0.150 | 0.150 | 0.019 |
| RecrDist_Area_1_DEVadd_2007 | 0.163 | 0.162 | 0.020 |
| RecrDist_Area_1_DEVadd_2008 | 0.170 | 0.171 | 0.022 |
| RecrDist_Area_1_DEVadd_2009 | 0.057 | 0.055 | 0.024 |
| RecrDist_Area_1_DEVadd_2010 | -0.083 | -0.083 | 0.030 |
| RecrDist_Area_1_DEVadd_2011 | -0.140 | -0.140 | 0.040 |
| SR_LN(R0) | 12.010 | 12.010 | 0.026 |
| SR_envlink | -0.481 | -0.482 | 0.023 |
| Main_RecrDev_1899 | -0.003 | -0.003 | 0.001 |
| Main_RecrDev_1900 | -0.004 | -0.003 | 0.001 |
| Main_RecrDev_1901 | -0.004 | -0.004 | 0.001 |
| Main_RecrDev_1902 | -0.004 | -0.004 | 0.001 |
| Main_RecrDev_1903 | -0.004 | -0.004 | 0.001 |
| Main_RecrDev_1904 | -0.004 | -0.004 | 0.001 |
| Main_RecrDev_1905 | -0.005 | -0.005 | 0.001 |
| Main_RecrDev_1906 | -0.005 | -0.005 | 0.001 |
| Main_RecrDev_1907 | -0.005 | -0.005 | 0.002 |
| Main_RecrDev_1908 | -0.006 | -0.006 | 0.002 |
| Main_RecrDev_1909 | -0.006 | -0.006 | 0.002 |
| Main_RecrDev_1910 | -0.007 | -0.006 | 0.002 |
| Main_RecrDev_1911 | -0.007 | -0.007 | 0.002 |

| | | | |
|---|---|---|---|
| Main_RecrDev_1912 | -0.008 | -0.007 | 0.002 |
| Main_RecrDev_1913 | -0.008 | -0.008 | 0.002 |
| Main_RecrDev_1914 | -0.009 | -0.008 | 0.002 |
| Main_RecrDev_1915 | -0.009 | -0.009 | 0.002 |
| Main_RecrDev_1916 | -0.010 | -0.010 | 0.002 |
| Main_RecrDev_1917 | -0.010 | -0.010 | 0.002 |
| Main_RecrDev_1918 | -0.011 | -0.011 | 0.002 |
| Main_RecrDev_1919 | -0.012 | -0.012 | 0.002 |
| Main_RecrDev_1920 | -0.013 | -0.012 | 0.002 |
| Main_RecrDev_1921 | -0.014 | -0.013 | 0.002 |
| Main_RecrDev_1922 | -0.015 | -0.014 | 0.003 |
| Main_RecrDev_1923 | -0.016 | -0.015 | 0.003 |
| Main_RecrDev_1924 | -0.017 | -0.016 | 0.003 |
| Main_RecrDev_1925 | -0.018 | -0.018 | 0.003 |
| Main_RecrDev_1926 | -0.019 | -0.019 | 0.003 |
| Main_RecrDev_1927 | -0.021 | -0.021 | 0.003 |
| Main_RecrDev_1928 | -0.022 | -0.022 | 0.003 |
| Main_RecrDev_1929 | -0.024 | -0.024 | 0.004 |
| Main_RecrDev_1930 | -0.026 | -0.026 | 0.004 |
| Main_RecrDev_1931 | -0.028 | -0.028 | 0.004 |
| Main_RecrDev_1932 | -0.030 | -0.030 | 0.004 |
| Main_RecrDev_1933 | -0.032 | -0.032 | 0.004 |
| Main_RecrDev_1934 | -0.034 | -0.034 | 0.005 |
| Main_RecrDev_1935 | -0.036 | -0.036 | 0.005 |
| Main_RecrDev_1936 | -0.039 | -0.039 | 0.005 |
| Main_RecrDev_1937 | -0.042 | -0.042 | 0.005 |
| Main_RecrDev_1938 | -0.045 | -0.045 | 0.006 |
| Main_RecrDev_1939 | -0.049 | -0.049 | 0.006 |
| Main_RecrDev_1940 | -0.053 | -0.053 | 0.007 |
| Main_RecrDev_1941 | -0.057 | -0.057 | 0.007 |

| | | | |
|---|---|---|---|
| Main_RecrDev_1942 | -0.061 | -0.061 | 0.008 |
| Main_RecrDev_1943 | -0.065 | -0.065 | 0.008 |
| Main_RecrDev_1944 | -0.069 | -0.069 | 0.009 |
| Main_RecrDev_1945 | -0.073 | -0.073 | 0.009 |
| Main_RecrDev_1946 | -0.077 | -0.077 | 0.010 |
| Main_RecrDev_1947 | -0.079 | -0.079 | 0.010 |
| Main_RecrDev_1948 | -0.084 | -0.084 | 0.010 |
| Main_RecrDev_1949 | -0.089 | -0.089 | 0.011 |
| Main_RecrDev_1950 | -0.094 | -0.094 | 0.012 |
| Main_RecrDev_1951 | -0.100 | -0.100 | 0.012 |
| Main_RecrDev_1952 | -0.104 | -0.103 | 0.013 |
| Main_RecrDev_1953 | -0.108 | -0.108 | 0.013 |
| Main_RecrDev_1954 | -0.108 | -0.108 | 0.013 |
| Main_RecrDev_1955 | -0.111 | -0.110 | 0.013 |
| Main_RecrDev_1956 | -0.109 | -0.109 | 0.012 |
| Main_RecrDev_1957 | -0.106 | -0.106 | 0.011 |
| Main_RecrDev_1958 | -0.099 | -0.098 | 0.010 |
| Main_RecrDev_1959 | -0.097 | -0.097 | 0.010 |
| Main_RecrDev_1960 | -0.098 | -0.098 | 0.009 |
| Main_RecrDev_1961 | -0.102 | -0.101 | 0.009 |
| Main_RecrDev_1962 | -0.100 | -0.100 | 0.008 |
| Main_RecrDev_1963 | -0.094 | -0.094 | 0.007 |
| Main_RecrDev_1964 | -0.089 | -0.089 | 0.008 |
| Main_RecrDev_1965 | -0.081 | -0.081 | 0.008 |
| Main_RecrDev_1966 | -0.075 | -0.075 | 0.010 |
| Main_RecrDev_1967 | -0.067 | -0.068 | 0.014 |
| Main_RecrDev_1968 | -0.065 | -0.065 | 0.018 |
| Main_RecrDev_1969 | -0.058 | -0.059 | 0.022 |
| Main_RecrDev_1970 | -0.060 | -0.061 | 0.027 |
| Main_RecrDev_1971 | -0.057 | -0.058 | 0.032 |

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|---|---|---|---|
| Main_RecrDev_1972 | 1.106 | 1.102 | 0.110 |
| Main_RecrDev_1973 | 0.376 | 0.373 | 0.112 |
| Main_RecrDev_1974 | -0.075 | -0.077 | 0.123 |
| Main_RecrDev_1975 | 0.024 | 0.039 | 0.123 |
| Main_RecrDev_1976 | 0.087 | 0.080 | 0.118 |
| Main_RecrDev_1977 | 0.155 | 0.155 | 0.102 |
| Main_RecrDev_1978 | -0.158 | -0.149 | 0.129 |
| Main_RecrDev_1979 | -0.018 | -0.018 | 0.116 |
| Main_RecrDev_1980 | 0.706 | 0.709 | 0.086 |
| Main_RecrDev_1981 | 0.767 | 0.769 | 0.083 |
| Main_RecrDev_1982 | 0.490 | 0.489 | 0.078 |
| Main_RecrDev_1983 | -0.050 | -0.049 | 0.092 |
| Main_RecrDev_1984 | -0.881 | -0.880 | 0.096 |
| Main_RecrDev_1985 | -0.523 | -0.520 | 0.069 |
| Main_RecrDev_1986 | -0.413 | -0.419 | 0.062 |
| Main_RecrDev_1987 | -0.782 | -0.777 | 0.060 |
| Main_RecrDev_1988 | -0.465 | -0.467 | 0.050 |
| Main_RecrDev_1989 | 0.254 | 0.253 | 0.038 |
| Main_RecrDev_1990 | -0.061 | -0.065 | 0.043 |
| Main_RecrDev_1991 | 0.240 | 0.240 | 0.045 |
| Main_RecrDev_1992 | -0.006 | -0.006 | 0.042 |
| Main_RecrDev_1993 | 0.177 | 0.178 | 0.046 |
| Main_RecrDev_1994 | 0.047 | 0.046 | 0.042 |
| Main_RecrDev_1995 | 0.394 | 0.394 | 0.036 |
| Main_RecrDev_1996 | -0.061 | -0.062 | 0.038 |
| Main_RecrDev_1997 | 0.073 | 0.073 | 0.047 |
| Main_RecrDev_1998 | -0.133 | -0.136 | 0.044 |
| Main_RecrDev_1999 | 0.340 | 0.338 | 0.038 |
| Main_RecrDev_2000 | 0.251 | 0.248 | 0.044 |
| Main_RecrDev_2001 | -0.068 | -0.068 | 0.043 |

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|---|---|---|---|
| Main_RecrDev_2002 | 0.136 | 0.135 | 0.045 |
| Main_RecrDev_2003 | 0.253 | 0.250 | 0.035 |
| Main_RecrDev_2004 | 0.453 | 0.452 | 0.033 |
| Main_RecrDev_2005 | 0.292 | 0.293 | 0.035 |
| Main_RecrDev_2006 | 0.386 | 0.385 | 0.037 |
| Main_RecrDev_2007 | 0.277 | 0.278 | 0.038 |
| Main_RecrDev_2008 | -0.121 | -0.122 | 0.044 |
| Main_RecrDev_2009 | 0.294 | 0.292 | 0.044 |
| Main_RecrDev_2010 | -0.115 | -0.116 | 0.058 |
| Main_RecrDev_2011 | -0.290 | -0.285 | 0.064 |
| Main_RecrDev_2012 | 0.005 | 0.005 | 0.004 |
| LnQ_base_13_Shr_E | 3.441 | 3.435 | 0.107 |
| LnQ_base_14_Shr_W | 1.261 | 1.261 | 0.078 |
| AgeSel_1P_3_HL_E | 2.967 | 2.913 | 0.478 |
| AgeSel_1P_4_HL_E | 0.435 | 0.435 | 0.063 |
| AgeSel_1P_5_HL_E | 0.209 | 0.215 | 0.056 |
| AgeSel_1P_6_HL_E | 0.152 | 0.158 | 0.078 |
| AgeSel_1P_7_HL_E | 0.013 | 0.027 | 0.127 |
| AgeSel_1P_8_HL_E | -0.023 | -0.028 | 0.186 |
| AgeSel_1P_9_HL_E | -0.677 | -0.671 | 0.323 |
| AgeSel_1P_10_HL_E | -0.452 | -0.422 | 0.471 |
| AgeSel_1P_11_HL_E | -1.137 | -1.157 | 0.448 |
| AgeSel_2P_3_HL_W | 1.599 | 1.563 | 0.306 |
| AgeSel_2P_4_HL_W | 0.932 | 0.928 | 0.087 |
| AgeSel_2P_5_HL_W | 0.116 | 0.118 | 0.050 |
| AgeSel_2P_6_HL_W | -0.249 | -0.250 | 0.068 |
| AgeSel_2P_7_HL_W | -0.397 | -0.394 | 0.100 |
| AgeSel_2P_8_HL_W | -0.390 | -0.391 | 0.141 |
| AgeSel_2P_9_HL_W | -0.524 | -0.513 | 0.205 |
| AgeSel_2P_10_HL_W | -0.876 | -0.882 | 0.314 |

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|---|---|---|---|
| AgeSel_2P_11_HL_W | -1.381 | -1.399 | 0.339 |
| AgeSel_3P_3_LL_E | -0.180 | -0.181 | 0.271 |
| AgeSel_3P_4_LL_E | 1.010 | 1.007 | 0.204 |
| AgeSel_3P_5_LL_E | 1.496 | 1.492 | 0.088 |
| AgeSel_3P_6_LL_E | 0.803 | 0.806 | 0.075 |
| AgeSel_3P_7_LL_E | 0.478 | 0.478 | 0.106 |
| AgeSel_3P_8_LL_E | -0.140 | -0.125 | 0.134 |
| AgeSel_3P_9_LL_E | -0.346 | -0.353 | 0.212 |
| AgeSel_3P_10_LL_E | -0.153 | -0.139 | 0.279 |
| AgeSel_3P_11_LL_E | -0.916 | -0.915 | 0.275 |
| AgeSel_4P_3_LL_W | 1.824 | 1.833 | 0.521 |
| AgeSel_4P_4_LL_W | 0.383 | 0.360 | 0.245 |
| AgeSel_4P_5_LL_W | 0.643 | 0.644 | 0.130 |
| AgeSel_4P_6_LL_W | 0.924 | 0.922 | 0.119 |
| AgeSel_4P_7_LL_W | 0.245 | 0.242 | 0.105 |
| AgeSel_4P_8_LL_W | 0.356 | 0.361 | 0.099 |
| AgeSel_4P_9_LL_W | 0.190 | 0.191 | 0.107 |
| AgeSel_4P_10_LL_W | -0.170 | -0.176 | 0.125 |
| AgeSel_4P_11_LL_W | -0.212 | -0.223 | 0.107 |
| AgeSel_5P_3_MRIP_E | 2.373 | 2.365 | 0.186 |
| AgeSel_5P_4_MRIP_E | -0.209 | -0.212 | 0.048 |
| AgeSel_5P_5_MRIP_E | -0.245 | -0.243 | 0.048 |
| AgeSel_5P_6_MRIP_E | -0.285 | -0.290 | 0.086 |
| AgeSel_5P_7_MRIP_E | -0.266 | -0.268 | 0.157 |
| AgeSel_5P_8_MRIP_E | -0.217 | -0.209 | 0.247 |
| AgeSel_5P_9_MRIP_E | -1.063 | -0.975 | 0.565 |
| AgeSel_5P_10_MRIP_E | -0.500 | -0.491 | 0.779 |
| AgeSel_5P_11_MRIP_E | -1.543 | -1.577 | 0.736 |
| AgeSel_6P_3_MRIP_W | 3.933 | 3.950 | 0.312 |
| AgeSel_6P_4_MRIP_W | -0.548 | -0.557 | 0.057 |

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|---|---|---|---|
| AgeSel_6P_5_MRIP_W | -0.651 | -0.651 | 0.059 |
| AgeSel_6P_6_MRIP_W | -0.614 | -0.614 | 0.102 |
| AgeSel_6P_7_MRIP_W | -0.342 | -0.342 | 0.162 |
| AgeSel_6P_8_MRIP_W | -0.450 | -0.455 | 0.233 |
| AgeSel_6P_9_MRIP_W | -0.472 | -0.479 | 0.336 |
| AgeSel_6P_10_MRIP_W | -0.899 | -0.862 | 0.491 |
| AgeSel_6P_11_MRIP_W | -0.908 | -0.959 | 0.549 |
| AgeSel_7P_3_HBT_E | 3.285 | 3.270 | 0.130 |
| AgeSel_7P_4_HBT_E | 0.212 | 0.215 | 0.055 |
| AgeSel_7P_5_HBT_E | -0.361 | -0.362 | 0.061 |
| AgeSel_7P_6_HBT_E | -0.536 | -0.532 | 0.118 |
| AgeSel_7P_7_HBT_E | -0.465 | -0.462 | 0.224 |
| AgeSel_7P_8_HBT_E | -0.215 | -0.173 | 0.385 |
| AgeSel_7P_9_HBT_E | -0.441 | -0.400 | 0.714 |
| AgeSel_7P_10_HBT_E | -0.764 | -0.829 | 0.870 |
| AgeSel_7P_11_HBT_E | -1.423 | -1.432 | 0.886 |
| AgeSel_8P_3_HBT_W | 2.367 | 2.380 | 0.226 |
| AgeSel_8P_4_HBT_W | -0.325 | -0.329 | 0.061 |
| AgeSel_8P_5_HBT_W | -0.524 | -0.523 | 0.058 |
| AgeSel_8P_6_HBT_W | -0.583 | -0.578 | 0.090 |
| AgeSel_8P_7_HBT_W | -0.346 | -0.357 | 0.142 |
| AgeSel_8P_8_HBT_W | -0.559 | -0.542 | 0.219 |
| AgeSel_8P_9_HBT_W | -0.656 | -0.657 | 0.325 |
| AgeSel_8P_10_HBT_W | -0.388 | -0.373 | 0.432 |
| AgeSel_8P_11_HBT_W | -1.303 | -1.316 | 0.436 |
| AgeSel_9P_2_C_Clsd_E | 1.353 | 1.558 | 0.602 |
| AgeSel_9P_3_C_Clsd_E | 4.268 | 4.241 | 0.384 |
| AgeSel_9P_4_C_Clsd_E | 1.611 | 1.601 | 0.108 |
| AgeSel_9P_5_C_Clsd_E | 0.597 | 0.596 | 0.083 |
| AgeSel_9P_6_C_Clsd_E | 0.385 | 0.388 | 0.083 |

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|---|---|---|---|
| AgeSel_9P_7_C_Clsd_E | -0.284 | -0.285 | 0.139 |
| AgeSel_9P_8_C_Clsd_E | -0.006 | 0.020 | 0.210 |
| AgeSel_9P_9_C_Clsd_E | -0.867 | -0.811 | 0.492 |
| AgeSel_9P_10_C_Clsd_E | -0.408 | -0.355 | 0.766 |
| AgeSel_9P_11_C_Clsd_E | -1.528 | -1.552 | 0.800 |
| AgeSel_10P_2_C_Clsd_W | 1.165 | 1.179 | 0.344 |
| AgeSel_10P_3_C_Clsd_W | 3.003 | 3.054 | 0.637 |
| AgeSel_10P_4_C_Clsd_W | 2.343 | 2.319 | 0.469 |
| AgeSel_10P_5_C_Clsd_W | 0.437 | 0.433 | 0.248 |
| AgeSel_10P_6_C_Clsd_W | 0.176 | 0.202 | 0.240 |
| AgeSel_10P_7_C_Clsd_W | 0.181 | 0.198 | 0.271 |
| AgeSel_10P_8_C_Clsd_W | 0.261 | 0.242 | 0.299 |
| AgeSel_10P_9_C_Clsd_W | 1.190 | 1.195 | 0.263 |
| AgeSel_10P_10_C_Clsd_W | -1.508 | -1.476 | 0.431 |
| AgeSel_10P_11_C_Clsd_W | -0.048 | -0.062 | 0.429 |
| AgeSel_13P_2_Shr_E | -3.249 | -3.249 | 0.044 |
| AgeSel_13P_3_Shr_E | -1.126 | -1.113 | 0.139 |
| AgeSel_13P_4_Shr_E | -20.000 | -20.000 | 0.000 |
| AgeSel_14P_2_Shr_W | -2.642 | -2.641 | 0.046 |
| AgeSel_14P_3_Shr_W | -1.438 | -1.425 | 0.137 |
| AgeSel_14P_4_Shr_W | -20.000 | -20.000 | 0.000 |
| AgeSel_15P_2_Video_E | 1.210 | 1.344 | 0.598 |
| AgeSel_15P_3_Video_E | 3.195 | 3.159 | 0.533 |
| AgeSel_15P_4_Video_E | 1.401 | 1.393 | 0.232 |
| AgeSel_15P_5_Video_E | 0.351 | 0.342 | 0.180 |
| AgeSel_15P_6_Video_E | 0.098 | 0.101 | 0.194 |
| AgeSel_15P_7_Video_E | 0.039 | 0.063 | 0.261 |
| AgeSel_15P_8_Video_E | -0.077 | -0.050 | 0.391 |
| AgeSel_15P_9_Video_E | -0.176 | -0.159 | 0.639 |
| AgeSel_15P_10_Video_E | 0.029 | -0.047 | 0.813 |

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|---|---|---|---|
| AgeSel_15P_11_Video_E | 0.116 | 0.102 | 0.832 |
| AgeSel_16P_2_Video_W | 1.865 | 1.857 | 0.718 |
| AgeSel_16P_3_Video_W | 1.934 | 1.938 | 0.237 |
| AgeSel_16P_4_Video_W | 0.227 | 0.217 | 0.207 |
| AgeSel_16P_5_Video_W | -0.490 | -0.481 | 0.272 |
| AgeSel_16P_6_Video_W | -0.236 | -0.229 | 0.364 |
| AgeSel_16P_7_Video_W | -0.260 | -0.248 | 0.518 |
| AgeSel_16P_8_Video_W | -0.135 | -0.175 | 0.637 |
| AgeSel_16P_9_Video_W | 0.157 | 0.131 | 0.737 |
| AgeSel_16P_10_Video_W | -0.099 | -0.188 | 0.878 |
| AgeSel_16P_11_Video_W | -0.362 | -0.342 | 0.787 |
| AgeSel_19P_2_Sum_E | 1.175 | 1.172 | 0.119 |
| AgeSel_19P_3_Sum_E | -0.092 | -0.094 | 0.065 |
| AgeSel_19P_4_Sum_E | -9.994 | -10.011 | 0.124 |
| AgeSel_20P_2_Sum_W | 1.166 | 1.165 | 0.067 |
| AgeSel_20P_3_Sum_W | -0.990 | -0.986 | 0.051 |
| AgeSel_20P_4_Sum_W | -9.983 | -10.023 | 0.201 |
| AgeSel_21P_2_Fall_E | -3.698 | -3.697 | 0.050 |
| AgeSel_21P_3_Fall_E | 0.750 | 0.756 | 0.079 |
| AgeSel_21P_4_Fall_E | -20.000 | -20.000 | 0.000 |
| AgeSel_22P_2_Fall_W | -3.354 | -3.349 | 0.045 |
| AgeSel_22P_3_Fall_W | -0.727 | -0.722 | 0.109 |
| AgeSel_22P_4_Fall_W | -20.000 | -20.000 | 0.000 |
| AgeSel_23P_1_BLL_W | 5.663 | 5.660 | 0.091 |
| AgeSel_23P_2_BLL_W | 1.689 | 1.688 | 0.055 |
| AgeSel_25P_2_ROV_E | 2.208 | 2.528 | 0.557 |
| AgeSel_25P_3_ROV_E | 2.379 | 2.374 | 0.184 |
| AgeSel_25P_4_ROV_E | 0.348 | 0.350 | 0.118 |
| AgeSel_25P_5_ROV_E | -0.979 | -0.969 | 0.175 |
| AgeSel_25P_6_ROV_E | -0.669 | -0.663 | 0.356 |

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| AgeSel_25P_7_ROV_E | -0.409 | -0.384 | 0.584 |
| AgeSel_25P_8_ROV_E | -0.338 | -0.345 | 0.769 |
| AgeSel_25P_9_ROV_E | -0.036 | -0.077 | 0.811 |
| AgeSel_25P_10_ROV_E | 0.094 | 0.087 | 0.799 |
| AgeSel_25P_11_ROV_E | 0.105 | 0.105 | 0.854 |
| Retain_1P_1_HL_E_BLK1repl_2007 | 27.809 | 27.842 | 0.879 |
| Retain_1P_3_HL_E_BLK1repl_2007 | 0.432 | 0.429 | 0.049 |
| Retain_2P_1_HL_W_BLK1repl_2007 | 37.186 | 37.182 | 0.699 |
| Retain_2P_3_HL_W_BLK1repl_2007 | 0.872 | 0.873 | 0.025 |
| Retain_3P_1_LL_E_BLK1repl_2007 | 13.509 | 13.809 | 5.199 |
| Retain_3P_3_LL_E_BLK1repl_2007 | 0.472 | 0.473 | 0.054 |
| Retain_7P_1_HBT_E_BLK2repl_2000 | 37.724 | 37.734 | 0.285 |
| Retain_7P_3_HBT_E_BLK2repl_2000 | 0.395 | 0.396 | 0.035 |
| AgeSel_1P_3_HL_E_BLK3repl_2007 | 3.056 | 3.063 | 0.174 |
| AgeSel_1P_4_HL_E_BLK3repl_2007 | 1.091 | 1.093 | 0.070 |
| AgeSel_1P_5_HL_E_BLK3repl_2007 | 0.381 | 0.385 | 0.059 |
| AgeSel_1P_6_HL_E_BLK3repl_2007 | -0.032 | -0.030 | 0.088 |
| AgeSel_1P_7_HL_E_BLK3repl_2007 | -0.154 | -0.145 | 0.117 |
| AgeSel_1P_8_HL_E_BLK3repl_2007 | -0.285 | -0.269 | 0.232 |
| AgeSel_1P_9_HL_E_BLK3repl_2007 | -0.341 | -0.319 | 0.378 |
| AgeSel_1P_10_HL_E_BLK3repl_2007 | -0.502 | -0.454 | 0.624 |
| AgeSel_1P_11_HL_E_BLK3repl_2007 | -0.839 | -0.870 | 0.753 |
| AgeSel_2P_3_HL_W_BLK3repl_2007 | 4.861 | 4.966 | 0.176 |
| AgeSel_2P_4_HL_W_BLK3repl_2007 | 1.467 | 1.479 | 0.131 |
| AgeSel_2P_5_HL_W_BLK3repl_2007 | 0.279 | 0.286 | 0.076 |
| AgeSel_2P_6_HL_W_BLK3repl_2007 | -0.049 | -0.044 | 0.079 |
| AgeSel_2P_7_HL_W_BLK3repl_2007 | -0.282 | -0.287 | 0.118 |
| AgeSel_2P_8_HL_W_BLK3repl_2007 | -0.511 | -0.511 | 0.185 |
| AgeSel_2P_9_HL_W_BLK3repl_2007 | -0.405 | -0.382 | 0.312 |
| AgeSel_2P_10_HL_W_BLK3repl_2007 | -0.358 | -0.316 | 0.477 |

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| AgeSel_2P_11_HL_W_BLK3repl_2007 | -0.955 | -1.015 | 0.465 |
| AgeSel_3P_3_LL_E_BLK3repl_2007 | 2.537 | 2.504 | 0.410 |
| AgeSel_3P_4_LL_E_BLK3repl_2007 | 2.502 | 2.490 | 0.201 |
| AgeSel_3P_5_LL_E_BLK3repl_2007 | 1.579 | 1.578 | 0.082 |
| AgeSel_3P_6_LL_E_BLK3repl_2007 | 0.659 | 0.660 | 0.067 |
| AgeSel_3P_7_LL_E_BLK3repl_2007 | 0.194 | 0.200 | 0.088 |
| AgeSel_3P_8_LL_E_BLK3repl_2007 | -0.224 | -0.231 | 0.144 |
| AgeSel_3P_9_LL_E_BLK3repl_2007 | -0.250 | -0.238 | 0.207 |
| AgeSel_3P_10_LL_E_BLK3repl_2007 | 0.081 | 0.098 | 0.303 |
| AgeSel_3P_11_LL_E_BLK3repl_2007 | -0.962 | -0.957 | 0.330 |
| AgeSel_4P_3_LL_W_BLK3repl_2007 | 0.385 | 0.338 | 0.708 |
| AgeSel_4P_4_LL_W_BLK3repl_2007 | 2.090 | 2.057 | 0.519 |
| AgeSel_4P_5_LL_W_BLK3repl_2007 | 1.723 | 1.708 | 0.280 |
| AgeSel_4P_6_LL_W_BLK3repl_2007 | 1.043 | 1.033 | 0.177 |
| AgeSel_4P_7_LL_W_BLK3repl_2007 | 1.014 | 1.019 | 0.146 |
| AgeSel_4P_8_LL_W_BLK3repl_2007 | 0.292 | 0.295 | 0.142 |
| AgeSel_4P_9_LL_W_BLK3repl_2007 | -0.086 | -0.101 | 0.158 |
| AgeSel_4P_10_LL_W_BLK3repl_2007 | 0.385 | 0.384 | 0.173 |
| AgeSel_4P_11_LL_W_BLK3repl_2007 | -1.052 | -1.050 | 0.153 |
| AgeSel_5P_3_MRIP_E_BLK4repl_2008 | 1.410 | 1.386 | 0.505 |
| AgeSel_5P_4_MRIP_E_BLK4repl_2008 | -0.398 | -0.408 | 0.161 |
| AgeSel_5P_5_MRIP_E_BLK4repl_2008 | 0.257 | 0.250 | 0.090 |
| AgeSel_5P_6_MRIP_E_BLK4repl_2008 | 0.219 | 0.223 | 0.099 |
| AgeSel_5P_7_MRIP_E_BLK4repl_2008 | -0.008 | 0.000 | 0.137 |
| AgeSel_5P_8_MRIP_E_BLK4repl_2008 | -0.180 | -0.167 | 0.210 |
| AgeSel_5P_9_MRIP_E_BLK4repl_2008 | -0.047 | -0.034 | 0.342 |
| AgeSel_5P_10_MRIP_E_BLK4repl_2008 | -0.601 | -0.510 | 0.673 |
| AgeSel_5P_11_MRIP_E_BLK4repl_2008 | -1.705 | -1.738 | 0.731 |
| AgeSel_6P_3_MRIP_W_BLK4repl_2008 | 1.634 | 1.637 | 0.696 |
| AgeSel_6P_4_MRIP_W_BLK4repl_2008 | 0.188 | 0.192 | 0.263 |

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| AgeSel_6P_5_MRIP_W_BLK4repl_2008 | 0.393 | 0.401 | 0.111 |
| AgeSel_6P_6_MRIP_W_BLK4repl_2008 | -0.093 | -0.091 | 0.105 |
| AgeSel_6P_7_MRIP_W_BLK4repl_2008 | -0.145 | -0.151 | 0.155 |
| AgeSel_6P_8_MRIP_W_BLK4repl_2008 | -0.976 | -0.979 | 0.282 |
| AgeSel_6P_9_MRIP_W_BLK4repl_2008 | -1.077 | -1.011 | 0.573 |
| AgeSel_6P_10_MRIP_W_BLK4repl_2008 | -0.697 | -0.671 | 0.736 |
| AgeSel_6P_11_MRIP_W_BLK4repl_2008 | -0.965 | -1.011 | 0.767 |
| AgeSel_7P_2_HBT_E_BLK4repl_2008 | 1.379 | 1.736 | 0.726 |
| AgeSel_7P_3_HBT_E_BLK4repl_2008 | 3.601 | 3.590 | 0.325 |
| AgeSel_7P_4_HBT_E_BLK4repl_2008 | 1.337 | 1.336 | 0.105 |
| AgeSel_7P_5_HBT_E_BLK4repl_2008 | -0.003 | 0.000 | 0.075 |
| AgeSel_7P_6_HBT_E_BLK4repl_2008 | -0.058 | -0.058 | 0.090 |
| AgeSel_7P_7_HBT_E_BLK4repl_2008 | -0.129 | -0.121 | 0.141 |
| AgeSel_7P_8_HBT_E_BLK4repl_2008 | -0.471 | -0.466 | 0.259 |
| AgeSel_7P_9_HBT_E_BLK4repl_2008 | -0.316 | -0.290 | 0.503 |
| AgeSel_7P_10_HBT_E_BLK4repl_2008 | -1.278 | -1.259 | 0.685 |
| AgeSel_8P_3_HBT_W_BLK4repl_2008 | -0.199 | -0.189 | 0.587 |
| AgeSel_8P_4_HBT_W_BLK4repl_2008 | 1.749 | 1.723 | 0.460 |
| AgeSel_8P_5_HBT_W_BLK4repl_2008 | 0.850 | 0.850 | 0.126 |
| AgeSel_8P_6_HBT_W_BLK4repl_2008 | 0.284 | 0.292 | 0.098 |
| AgeSel_8P_7_HBT_W_BLK4repl_2008 | -0.047 | -0.048 | 0.119 |
| AgeSel_8P_8_HBT_W_BLK4repl_2008 | -0.523 | -0.517 | 0.189 |
| AgeSel_8P_9_HBT_W_BLK4repl_2008 | -0.849 | -0.836 | 0.369 |
| AgeSel_8P_10_HBT_W_BLK4repl_2008 | -1.559 | -1.579 | 0.433 |

Table 2.6.2. Summary of jitter results for Gulf of Mexico red snapper for: Total Likelihood, Total Biomass Unfished, SSB_SPRTtgt, SSB_MAX, SSB-2011, SPR_MAX, F_current, SSB/SSB_SPRTtgt, F_SPRTgt, F_MAX, SSB/SSB_MAX and Fcurrent/F_MAX. F_SPRTtgt = F26%SPR. $F_{Current}$ is from the SS jitter analysis for the base model configuration (steepness = 0.99). $F_{Current}$ = geometric mean of F in 2009 through 2011.

| Run_ID | Likelihood | Total Biomass Unfished | SSB_SPRTtgt | SSB_MAX | SSB_2011 | SPR_MAX | F_CURRENT | SSB / SSB_SPRTtgt | F_SPRTtgt | F_MAX | Fcurrent / F_SPRTtgt | SSB / SSB_MAX | Fcurrent / F_MAX |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5,227 | 326,442 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 2 | 5,227 | 326,445 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 3 | 5,220 | 325,676 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 4 | 5,220 | 325,660 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 5 | 5,220 | 325,705 | 1.21E+12 | 9.51E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 6 | 5,220 | 325,656 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 7 | 5,227 | 326,447 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 8 | 5,227 | 326,451 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 9 | 5,227 | 326,412 | 1.22E+12 | 9.50E+11 | 4.45E+11 | 0.204 | 0.054 | 0.366 | 0.078 | 0.094 | 0.695 | 0.469 | 0.577 |
| 10 | 5,221 | 325,708 | 1.21E+12 | 9.51E+11 | 4.47E+11 | 0.204 | 0.054 | 0.369 | 0.078 | 0.093 | 0.693 | 0.471 | 0.575 |
| 11 | 5,220 | 325,659 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 12 | 5,227 | 326,438 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 13 | 5,220 | 325,666 | 1.21E+12 | 9.50E+11 | 4.50E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.573 |
| 14 | 5,227 | 326,455 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 15 | 5,227 | 326,444 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 16 | 5,227 | 326,449 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.470 | 0.576 |
| 17 | 5,227 | 326,443 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 18 | 5,227 | 326,429 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 19 | 5,220 | 325,652 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 20 | 5,227 | 326,503 | 1.22E+12 | 9.49E+11 | 4.47E+11 | 0.204 | 0.054 | 0.368 | 0.078 | 0.094 | 0.694 | 0.471 | 0.575 |
| 21 | 5,227 | 326,474 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 22 | 5,227 | 326,454 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | 7,185 | 349,222 | 1.30E+12 | 1.04E+12 | 2.66E+11 | 0.209 | 0.051 | 0.205 | 0.043 | 0.052 | 1.172 | 0.256 | 0.980 |
| 24 | 6,487 | 617,548 | 2.30E+12 | 2.10E+12 | 2.26E+11 | 0.238 | 0.234 | 0.098 | 0.151 | 0.161 | 1.557 | 0.107 | 1.458 |
| 25 | 5,220 | 325,662 | 1.21E+12 | 9.49E+11 | 4.50E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.690 | 0.474 | 0.573 |
| 26 | 7,164 | 416,741 | 1.55E+12 | 1.21E+12 | 2.96E+11 | 0.203 | 0.044 | 0.191 | 0.047 | 0.058 | 0.929 | 0.245 | 0.757 |
| 27 | 5,220 | 325,618 | 1.21E+12 | 9.51E+11 | 4.49E+11 | 0.204 | 0.054 | 0.370 | 0.078 | 0.094 | 0.691 | 0.472 | 0.574 |
| 28 | 5,227 | 326,463 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 29 | 5,220 | 325,659 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 30 | 5,220 | 325,659 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 31 | 5,220 | 325,658 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 32 | 5,227 | 326,441 | 1.22E+12 | 9.49E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 33 | 5,227 | 326,445 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 34 | 5,220 | 325,659 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 35 | 5,227 | 326,439 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 36 | 5,227 | 326,450 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 37 | 5,220 | 325,659 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 38 | 8,138 | 313,490 | 1.17E+12 | 9.63E+11 | 3.21E+11 | 0.215 | 0.036 | 0.275 | 0.040 | 0.048 | 0.898 | 0.333 | 0.757 |
| 39 | 5,220 | 325,655 | 1.21E+12 | 9.50E+11 | 4.50E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 40 | 5,234 | 324,840 | 1.21E+12 | 9.29E+11 | 4.12E+11 | 0.200 | 0.053 | 0.341 | 0.074 | 0.090 | 0.717 | 0.444 | 0.588 |
| 41 | 5,220 | 325,576 | 1.21E+12 | 9.51E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 42 | 5,227 | 326,526 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.694 | 0.470 | 0.576 |
| 43 | 5,221 | 325,700 | 1.21E+12 | 9.50E+11 | 4.53E+11 | 0.204 | 0.054 | 0.373 | 0.078 | 0.094 | 0.688 | 0.477 | 0.571 |
| 44 | 5,227 | 326,481 | 1.22E+12 | 9.49E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.694 | 0.470 | 0.575 |
| 45 | 5,227 | 326,508 | 1.22E+12 | 9.49E+11 | 4.47E+11 | 0.204 | 0.054 | 0.368 | 0.078 | 0.094 | 0.694 | 0.471 | 0.575 |
| 46 | 5,220 | 325,762 | 1.21E+12 | 9.51E+11 | 4.50E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 47 | 5,220 | 325,693 | 1.21E+12 | 9.51E+11 | 4.51E+11 | 0.204 | 0.054 | 0.372 | 0.078 | 0.094 | 0.689 | 0.475 | 0.572 |
| 48 | 5,227 | 326,433 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 49 | 5,227 | 326,443 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 50 | 5,220 | 325,661 | 1.21E+12 | 9.50E+11 | 4.50E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 51 | 5,227 | 326,447 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 52 | 5,222 | 325,760 | 1.21E+12 | 9.50E+11 | 4.47E+11 | 0.204 | 0.054 | 0.369 | 0.078 | 0.094 | 0.692 | 0.470 | 0.575 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 53 | 5,227 | 326,438 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 54 | 5,227 | 326,444 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 55 | 5,220 | 325,662 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 56 | 5,220 | 325,658 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 57 | 5,227 | 326,444 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 58 | 5,220 | 325,679 | 1.21E+12 | 9.50E+11 | 4.50E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.690 | 0.474 | 0.573 |
| 59 | 5,227 | 326,431 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 60 | 5,220 | 325,648 | 1.21E+12 | 9.50E+11 | 4.50E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 61 | 5,220 | 325,658 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 62 | 5,227 | 326,487 | 1.22E+12 | 9.63E+11 | 4.45E+11 | 0.207 | 0.054 | 0.366 | 0.077 | 0.093 | 0.697 | 0.462 | 0.583 |
| 63 | 5,227 | 326,446 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 64 | 5,220 | 325,690 | 1.21E+12 | 9.48E+11 | 4.48E+11 | 0.204 | 0.054 | 0.369 | 0.078 | 0.094 | 0.692 | 0.472 | 0.574 |
| 65 | 5,234 | 324,840 | 1.21E+12 | 9.29E+11 | 4.12E+11 | 0.200 | 0.053 | 0.341 | 0.074 | 0.090 | 0.717 | 0.444 | 0.588 |
| 66 | 5,227 | 326,425 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 67 | 5,220 | 325,703 | 1.21E+12 | 9.50E+11 | 4.52E+11 | 0.204 | 0.054 | 0.373 | 0.078 | 0.094 | 0.688 | 0.475 | 0.572 |
| 68 | 5,220 | 325,659 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 69 | 5,220 | 325,635 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 70 | 5,220 | 325,656 | 1.21E+12 | 9.50E+11 | 4.50E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.690 | 0.473 | 0.573 |
| 71 | 5,220 | 325,659 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 72 | 5,227 | 326,454 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 73 | 5,227 | 326,478 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 74 | 5,227 | 326,445 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 75 | 5,220 | 325,655 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 76 | 5,220 | 325,656 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 77 | 5,227 | 326,442 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 78 | 5,227 | 326,417 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 79 | 5,227 | 326,436 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 80 | 5,220 | 325,658 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 81 | 5,220 | 325,579 | 1.21E+12 | 9.51E+11 | 4.49E+11 | 0.204 | 0.054 | 0.370 | 0.078 | 0.093 | 0.692 | 0.472 | 0.575 |
| 82 | 5,227 | 326,494 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.694 | 0.469 | 0.576 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 83 | 5,227 | 326,399 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 84 | 5,227 | 326,440 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 85 | 5,220 | 325,659 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 86 | 5,220 | 325,648 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 87 | 5,227 | 326,452 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 88 | 5,227 | 326,446 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 89 | 5,227 | 326,359 | 1.21E+12 | 9.51E+11 | 4.45E+11 | 0.204 | 0.054 | 0.366 | 0.077 | 0.093 | 0.696 | 0.468 | 0.577 |
| 90 | 5,220 | 325,659 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 91 | 5,220 | 325,659 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 92 | 5,929 | 359,353 | 1.34E+12 | 1.08E+12 | 2.58E+11 | 0.211 | 0.073 | 0.193 | 0.064 | 0.076 | 1.138 | 0.238 | 0.963 |
| 93 | 5,220 | 325,658 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 94 | 5,220 | 325,659 | 1.21E+12 | 9.50E+11 | 4.49E+11 | 0.204 | 0.054 | 0.371 | 0.078 | 0.094 | 0.691 | 0.473 | 0.574 |
| 95 | 5,227 | 326,235 | 1.21E+12 | 9.48E+11 | 4.46E+11 | 0.204 | 0.054 | 0.368 | 0.078 | 0.094 | 0.694 | 0.471 | 0.575 |
| 96 | 5,227 | 326,452 | 1.22E+12 | 9.51E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 97 | 5,227 | 326,471 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 98 | 5,227 | 326,431 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 99 | 5,227 | 326,445 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |
| 100 | 5,227 | 326,445 | 1.22E+12 | 9.50E+11 | 4.46E+11 | 0.204 | 0.054 | 0.367 | 0.078 | 0.094 | 0.695 | 0.469 | 0.576 |

Table 2.9.1. Predicted total biomass (whole weight metric tons), spawning biomass (eggs), age-0 recruits (thousand fish), and fishing mortality for Gulf of Mexico red snapper from the SS base model.

| Region | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | East | | | West | | | East and West Combined | | | |
| | Total Biomass | Spawning Biomass | Recruits | Total Biomass | Spawning Biomass | Recruits | Total Biomass | Spawning Biomass | Recruits | Instantaneous Fishing Mortality |
| 1872 | 66,600 | 9.61E+11 | 33,249 | 129,560 | 1.87E+12 | 64,675 | 196,160 | 2.83E+12 | 97,923 | 0.00 |
| 1873 | 66,400 | 9.57E+11 | 33,248 | 129,560 | 1.87E+12 | 64,675 | 195,960 | 2.83E+12 | 97,923 | 0.00 |
| 1874 | 66,000 | 9.52E+11 | 33,248 | 129,560 | 1.87E+12 | 64,674 | 195,560 | 2.82E+12 | 97,923 | 0.00 |
| 1875 | 65,400 | 9.43E+11 | 33,248 | 129,560 | 1.87E+12 | 64,674 | 194,960 | 2.81E+12 | 97,922 | 0.00 |
| 1876 | 64,700 | 9.32E+11 | 33,248 | 129,560 | 1.87E+12 | 64,673 | 194,260 | 2.80E+12 | 97,921 | 0.00 |
| 1877 | 63,800 | 9.19E+11 | 33,247 | 129,560 | 1.87E+12 | 64,672 | 193,360 | 2.79E+12 | 97,920 | 0.00 |
| 1878 | 63,000 | 9.07E+11 | 33,247 | 129,560 | 1.87E+12 | 64,672 | 192,560 | 2.78E+12 | 97,919 | 0.00 |
| 1879 | 62,300 | 8.96E+11 | 33,247 | 129,559 | 1.87E+12 | 64,671 | 191,859 | 2.77E+12 | 97,918 | 0.00 |
| 1880 | 61,600 | 8.85E+11 | 33,246 | 129,559 | 1.87E+12 | 64,670 | 191,159 | 2.76E+12 | 97,917 | 0.00 |
| 1881 | 60,700 | 8.71E+11 | 33,246 | 129,125 | 1.86E+12 | 64,669 | 189,825 | 2.73E+12 | 97,915 | 0.00 |
| 1882 | 59,700 | 8.56E+11 | 33,245 | 128,674 | 1.86E+12 | 64,668 | 188,374 | 2.72E+12 | 97,913 | 0.00 |
| 1883 | 58,600 | 8.40E+11 | 33,244 | 128,227 | 1.85E+12 | 64,666 | 186,827 | 2.69E+12 | 97,911 | 0.00 |
| 1884 | 57,400 | 8.22E+11 | 33,243 | 127,799 | 1.84E+12 | 64,665 | 185,199 | 2.66E+12 | 97,908 | 0.00 |
| 1885 | 56,200 | 8.03E+11 | 33,243 | 127,403 | 1.84E+12 | 64,663 | 183,603 | 2.64E+12 | 97,906 | 0.00 |
| 1886 | 54,800 | 7.82E+11 | 33,242 | 127,055 | 1.83E+12 | 64,661 | 181,855 | 2.61E+12 | 97,903 | 0.00 |
| 1887 | 53,400 | 7.61E+11 | 33,241 | 126,763 | 1.83E+12 | 64,660 | 180,163 | 2.59E+12 | 97,900 | 0.00 |
| 1888 | 51,800 | 7.38E+11 | 33,240 | 126,593 | 1.82E+12 | 64,658 | 178,393 | 2.56E+12 | 97,897 | 0.00 |
| 1889 | 50,400 | 7.16E+11 | 33,239 | 126,456 | 1.82E+12 | 64,656 | 176,856 | 2.54E+12 | 97,895 | 0.00 |
| 1890 | 48,900 | 6.93E+11 | 33,238 | 126,324 | 1.82E+12 | 64,654 | 175,224 | 2.51E+12 | 97,892 | 0.00 |
| 1891 | 47,200 | 6.67E+11 | 33,237 | 126,229 | 1.82E+12 | 64,652 | 173,429 | 2.49E+12 | 97,889 | 0.00 |
| 1892 | 45,600 | 6.43E+11 | 33,236 | 126,141 | 1.82E+12 | 64,650 | 171,741 | 2.46E+12 | 97,886 | 0.00 |
| 1893 | 44,000 | 6.18E+11 | 33,235 | 126,057 | 1.81E+12 | 64,648 | 170,057 | 2.43E+12 | 97,883 | 0.00 |
| 1894 | 42,300 | 5.94E+11 | 33,234 | 125,974 | 1.81E+12 | 64,646 | 168,274 | 2.40E+12 | 97,880 | 0.00 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1895 | 40,700 | 5.69E+11 | 33,233 | 125,892 | 1.81E+12 | 64,644 | 166,592 | 2.38E+12 | 97,877 | 0.00 |
| 1896 | 39,200 | 5.46E+11 | 33,232 | 125,812 | 1.81E+12 | 64,642 | 165,012 | 2.36E+12 | 97,874 | 0.00 |
| 1897 | 37,700 | 5.23E+11 | 33,231 | 125,732 | 1.81E+12 | 64,640 | 163,432 | 2.33E+12 | 97,871 | 0.00 |
| 1898 | 36,300 | 5.02E+11 | 33,230 | 125,658 | 1.81E+12 | 64,638 | 161,958 | 2.31E+12 | 97,868 | 0.01 |
| 1899 | 34,700 | 4.79E+11 | 33,154 | 125,487 | 1.81E+12 | 64,491 | 160,187 | 2.29E+12 | 97,645 | 0.01 |
| 1900 | 32,900 | 4.52E+11 | 33,143 | 125,220 | 1.80E+12 | 64,470 | 158,120 | 2.25E+12 | 97,613 | 0.01 |
| 1901 | 30,900 | 4.23E+11 | 33,132 | 124,850 | 1.80E+12 | 64,447 | 155,750 | 2.22E+12 | 97,579 | 0.01 |
| 1902 | 28,700 | 3.91E+11 | 33,121 | 124,392 | 1.79E+12 | 64,426 | 153,092 | 2.18E+12 | 97,546 | 0.01 |
| 1903 | 26,500 | 3.58E+11 | 33,109 | 123,854 | 1.78E+12 | 64,403 | 150,354 | 2.14E+12 | 97,512 | 0.01 |
| 1904 | 24,400 | 3.28E+11 | 33,098 | 123,324 | 1.78E+12 | 64,382 | 147,724 | 2.11E+12 | 97,480 | 0.01 |
| 1905 | 22,600 | 3.01E+11 | 33,087 | 122,808 | 1.77E+12 | 64,361 | 145,408 | 2.07E+12 | 97,448 | 0.01 |
| 1906 | 21,200 | 2.78E+11 | 33,077 | 122,329 | 1.76E+12 | 64,342 | 143,529 | 2.04E+12 | 97,419 | 0.01 |
| 1907 | 20,000 | 2.59E+11 | 33,067 | 121,900 | 1.75E+12 | 64,321 | 141,900 | 2.01E+12 | 97,388 | 0.01 |
| 1908 | 19,200 | 2.46E+11 | 33,055 | 121,530 | 1.75E+12 | 64,299 | 140,730 | 2.00E+12 | 97,354 | 0.01 |
| 1909 | 18,700 | 2.36E+11 | 33,044 | 121,217 | 1.74E+12 | 64,277 | 139,917 | 1.98E+12 | 97,321 | 0.01 |
| 1910 | 18,500 | 2.32E+11 | 33,029 | 120,985 | 1.74E+12 | 64,248 | 139,485 | 1.97E+12 | 97,276 | 0.00 |
| 1911 | 18,700 | 2.33E+11 | 33,011 | 120,834 | 1.74E+12 | 64,213 | 139,534 | 1.97E+12 | 97,224 | 0.00 |
| 1912 | 19,000 | 2.36E+11 | 32,994 | 120,725 | 1.73E+12 | 64,179 | 139,725 | 1.97E+12 | 97,173 | 0.00 |
| 1913 | 19,400 | 2.42E+11 | 32,974 | 120,652 | 1.73E+12 | 64,140 | 140,052 | 1.97E+12 | 97,113 | 0.00 |
| 1914 | 19,800 | 2.49E+11 | 32,951 | 120,609 | 1.73E+12 | 64,096 | 140,409 | 1.98E+12 | 97,048 | 0.00 |
| 1915 | 20,400 | 2.58E+11 | 32,932 | 120,591 | 1.73E+12 | 64,058 | 140,991 | 1.99E+12 | 96,990 | 0.00 |
| 1916 | 21,000 | 2.67E+11 | 32,909 | 120,592 | 1.73E+12 | 64,014 | 141,592 | 2.00E+12 | 96,922 | 0.00 |
| 1917 | 21,500 | 2.76E+11 | 32,880 | 120,611 | 1.73E+12 | 63,957 | 142,111 | 2.01E+12 | 96,837 | 0.00 |
| 1918 | 22,200 | 2.86E+11 | 32,846 | 120,642 | 1.73E+12 | 63,892 | 142,842 | 2.02E+12 | 96,739 | 0.00 |
| 1919 | 22,800 | 2.97E+11 | 32,810 | 120,684 | 1.74E+12 | 63,821 | 143,484 | 2.04E+12 | 96,631 | 0.00 |
| 1920 | 23,300 | 3.05E+11 | 32,773 | 120,723 | 1.74E+12 | 63,750 | 144,023 | 2.05E+12 | 96,523 | 0.00 |
| 1921 | 23,700 | 3.12E+11 | 32,731 | 120,755 | 1.74E+12 | 63,668 | 144,455 | 2.05E+12 | 96,399 | 0.00 |
| 1922 | 23,900 | 3.16E+11 | 32,681 | 120,775 | 1.74E+12 | 63,572 | 144,675 | 2.06E+12 | 96,253 | 0.00 |
| 1923 | 24,000 | 3.18E+11 | 32,626 | 120,782 | 1.74E+12 | 63,464 | 144,782 | 2.06E+12 | 96,090 | 0.01 |
| 1924 | 23,900 | 3.17E+11 | 32,572 | 120,774 | 1.74E+12 | 63,358 | 144,674 | 2.06E+12 | 95,929 | 0.01 |
| 1925 | 23,700 | 3.15E+11 | 32,519 | 120,763 | 1.74E+12 | 63,255 | 144,463 | 2.06E+12 | 95,774 | 0.01 |
| 1926 | 23,600 | 3.12E+11 | 32,466 | 120,751 | 1.74E+12 | 63,153 | 144,351 | 2.05E+12 | 95,619 | 0.01 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1927 | 23,400 | 3.09E+11 | 32,408 | 120,738 | 1.74E+12 | 63,039 | 144,138 | 2.05E+12 | 95,447 | 0.01 |
| 1928 | 23,000 | 3.04E+11 | 32,345 | 120,659 | 1.74E+12 | 62,917 | 143,659 | 2.04E+12 | 95,261 | 0.01 |
| 1929 | 22,800 | 3.00E+11 | 32,272 | 120,640 | 1.74E+12 | 62,775 | 143,440 | 2.04E+12 | 95,046 | 0.01 |
| 1930 | 22,500 | 2.96E+11 | 32,197 | 120,620 | 1.74E+12 | 62,629 | 143,120 | 2.04E+12 | 94,825 | 0.00 |
| 1931 | 22,900 | 2.99E+11 | 32,117 | 120,528 | 1.73E+12 | 62,474 | 143,428 | 2.03E+12 | 94,591 | 0.00 |
| 1932 | 23,300 | 3.04E+11 | 32,029 | 120,522 | 1.73E+12 | 62,303 | 143,822 | 2.03E+12 | 94,332 | 0.00 |
| 1933 | 23,700 | 3.10E+11 | 31,931 | 120,481 | 1.73E+12 | 62,112 | 144,181 | 2.04E+12 | 94,044 | 0.00 |
| 1934 | 24,200 | 3.18E+11 | 31,800 | 120,413 | 1.73E+12 | 61,907 | 144,613 | 2.05E+12 | 93,707 | 0.00 |
| 1935 | 24,900 | 3.27E+11 | 31,700 | 120,322 | 1.73E+12 | 61,691 | 145,222 | 2.06E+12 | 93,391 | 0.00 |
| 1936 | 25,300 | 3.35E+11 | 31,600 | 120,114 | 1.73E+12 | 61,467 | 145,414 | 2.07E+12 | 93,067 | 0.00 |
| 1937 | 25,600 | 3.41E+11 | 31,500 | 119,778 | 1.73E+12 | 61,240 | 145,378 | 2.07E+12 | 92,740 | 0.00 |
| 1938 | 26,100 | 3.48E+11 | 31,400 | 119,365 | 1.72E+12 | 60,999 | 145,465 | 2.07E+12 | 92,399 | 0.01 |
| 1939 | 26,100 | 3.50E+11 | 31,200 | 118,918 | 1.71E+12 | 60,721 | 145,018 | 2.06E+12 | 91,921 | 0.01 |
| 1940 | 25,800 | 3.48E+11 | 31,100 | 118,478 | 1.71E+12 | 60,416 | 144,278 | 2.06E+12 | 91,516 | 0.00 |
| 1941 | 26,100 | 3.51E+11 | 30,881 | 118,036 | 1.70E+12 | 60,070 | 144,136 | 2.05E+12 | 90,951 | 0.00 |
| 1942 | 26,400 | 3.56E+11 | 30,687 | 117,618 | 1.69E+12 | 59,691 | 144,018 | 2.05E+12 | 90,378 | 0.00 |
| 1943 | 27,000 | 3.64E+11 | 30,484 | 117,287 | 1.69E+12 | 59,297 | 144,287 | 2.05E+12 | 89,781 | 0.00 |
| 1944 | 27,800 | 3.74E+11 | 30,287 | 117,047 | 1.69E+12 | 58,913 | 144,847 | 2.06E+12 | 89,200 | 0.00 |
| 1945 | 28,500 | 3.85E+11 | 30,111 | 116,865 | 1.68E+12 | 58,571 | 145,365 | 2.07E+12 | 88,682 | 0.00 |
| 1946 | 29,300 | 3.97E+11 | 29,973 | 116,758 | 1.68E+12 | 58,303 | 146,058 | 2.08E+12 | 88,275 | 0.00 |
| 1947 | 29,600 | 4.04E+11 | 29,889 | 116,579 | 1.68E+12 | 58,140 | 146,179 | 2.08E+12 | 88,029 | 0.01 |
| 1948 | 29,900 | 4.09E+11 | 29,729 | 116,305 | 1.68E+12 | 57,829 | 146,205 | 2.09E+12 | 87,559 | 0.01 |
| 1949 | 30,000 | 4.12E+11 | 29,527 | 115,921 | 1.67E+12 | 57,435 | 145,921 | 2.08E+12 | 86,962 | 0.02 |
| 1950 | 29,900 | 4.11E+11 | 29,314 | 115,333 | 1.67E+12 | 57,022 | 145,233 | 2.08E+12 | 86,336 | 0.03 |
| 1951 | 29,900 | 4.12E+11 | 29,082 | 113,602 | 1.65E+12 | 56,570 | 143,502 | 2.06E+12 | 85,652 | 0.03 |
| 1952 | 29,600 | 4.10E+11 | 28,930 | 111,521 | 1.62E+12 | 56,275 | 141,121 | 2.03E+12 | 85,205 | 0.04 |
| 1953 | 29,100 | 4.03E+11 | 28,770 | 109,034 | 1.59E+12 | 55,962 | 138,134 | 1.99E+12 | 84,732 | 0.04 |
| 1954 | 28,600 | 3.96E+11 | 28,790 | 106,423 | 1.55E+12 | 56,003 | 135,023 | 1.95E+12 | 84,793 | 0.04 |
| 1955 | 28,000 | 3.89E+11 | 28,700 | 103,585 | 1.51E+12 | 55,827 | 131,585 | 1.90E+12 | 84,528 | 0.04 |
| 1956 | 27,300 | 3.78E+11 | 28,846 | 100,543 | 1.47E+12 | 56,111 | 127,843 | 1.85E+12 | 84,956 | 0.05 |
| 1957 | 26,300 | 3.64E+11 | 29,037 | 97,104 | 1.42E+12 | 56,482 | 123,404 | 1.78E+12 | 85,519 | 0.06 |
| 1958 | 25,300 | 3.50E+11 | 29,423 | 93,532 | 1.36E+12 | 57,234 | 118,832 | 1.71E+12 | 86,657 | 0.08 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1959 | 23,600 | 3.26E+11 | 29,541 | 89,164 | 1.30E+12 | 57,462 | 112,764 | 1.63E+12 | 87,003 | 0.09 |
| 1960 | 22,000 | 3.02E+11 | 29,587 | 84,596 | 1.23E+12 | 57,552 | 106,596 | 1.53E+12 | 87,138 | 0.09 |
| 1961 | 20,200 | 2.75E+11 | 29,461 | 79,817 | 1.16E+12 | 57,308 | 100,017 | 1.44E+12 | 86,770 | 0.08 |
| 1962 | 18,500 | 2.50E+11 | 29,543 | 74,730 | 1.09E+12 | 57,466 | 93,230 | 1.34E+12 | 87,009 | 0.08 |
| 1963 | 16,800 | 2.24E+11 | 29,784 | 69,727 | 1.01E+12 | 57,936 | 86,527 | 1.23E+12 | 87,721 | 0.09 |
| 1964 | 15,400 | 2.02E+11 | 29,932 | 65,015 | 9.40E+11 | 58,223 | 80,415 | 1.14E+12 | 88,154 | 0.09 |
| 1965 | 13,800 | 1.78E+11 | 30,251 | 60,505 | 8.70E+11 | 58,844 | 74,305 | 1.05E+12 | 89,095 | 0.10 |
| 1966 | 12,100 | 1.55E+11 | 30,421 | 56,107 | 8.03E+11 | 59,174 | 68,207 | 9.58E+11 | 89,595 | 0.10 |
| 1967 | 10,800 | 1.35E+11 | 30,616 | 52,139 | 7.42E+11 | 59,554 | 62,939 | 8.77E+11 | 90,170 | 0.12 |
| 1968 | 9,660 | 1.17E+11 | 30,436 | 47,740 | 6.78E+11 | 59,204 | 57,400 | 7.95E+11 | 89,639 | 0.12 |
| 1969 | 8,680 | 1.02E+11 | 30,368 | 43,062 | 6.11E+11 | 59,071 | 51,742 | 7.13E+11 | 89,439 | 0.14 |
| 1970 | 7,820 | 8.97E+10 | 29,400 | 38,868 | 5.50E+11 | 57,189 | 46,688 | 6.40E+11 | 86,589 | 0.13 |
| 1971 | 7,050 | 7.86E+10 | 27,994 | 34,640 | 4.90E+11 | 54,454 | 41,690 | 5.69E+11 | 82,449 | 0.14 |
| 1972 | 7,660 | 6.86E+10 | 141,205 | 32,444 | 4.26E+11 | 243,390 | 40,104 | 4.95E+11 | 384,595 | 0.15 |
| 1973 | 7,240 | 5.84E+10 | 35,351 | 28,923 | 3.68E+11 | 128,639 | 36,163 | 4.26E+11 | 163,990 | 0.12 |
| 1974 | 7,170 | 5.12E+10 | 34,338 | 26,030 | 3.23E+11 | 57,697 | 33,200 | 3.74E+11 | 92,035 | 0.13 |
| 1975 | 6,600 | 4.94E+10 | 31,508 | 23,829 | 2.94E+11 | 72,725 | 30,429 | 3.43E+11 | 104,233 | 0.13 |
| 1976 | 6,190 | 4.92E+10 | 36,965 | 21,799 | 2.71E+11 | 74,361 | 27,989 | 3.20E+11 | 111,326 | 0.13 |
| 1977 | 5,620 | 4.57E+10 | 43,326 | 19,825 | 2.47E+11 | 76,143 | 25,445 | 2.93E+11 | 119,469 | 0.12 |
| 1978 | 5,180 | 4.27E+10 | 23,647 | 17,925 | 2.24E+11 | 57,064 | 23,105 | 2.67E+11 | 80,711 | 0.13 |
| 1979 | 4,837 | 4.04E+10 | 20,866 | 16,425 | 2.02E+11 | 76,311 | 21,262 | 2.42E+11 | 97,178 | 0.16 |
| 1980 | 4,632 | 3.79E+10 | 41,209 | 16,124 | 1.82E+11 | 173,007 | 20,756 | 2.20E+11 | 214,216 | 0.11 |
| 1981 | 4,743 | 3.38E+10 | 76,171 | 15,660 | 1.62E+11 | 145,027 | 20,404 | 1.96E+11 | 221,198 | 0.12 |
| 1982 | 4,657 | 2.69E+10 | 59,050 | 14,890 | 1.45E+11 | 103,457 | 19,547 | 1.72E+11 | 162,507 | 0.12 |
| 1983 | 4,323 | 2.20E+10 | 21,129 | 13,947 | 1.35E+11 | 72,327 | 18,270 | 1.57E+11 | 93,456 | 0.13 |
| 1984 | 3,683 | 1.97E+10 | 12,273 | 12,415 | 1.27E+11 | 43,930 | 16,098 | 1.47E+11 | 56,203 | 0.14 |
| 1985 | 3,779 | 2.41E+10 | 10,974 | 11,896 | 1.19E+11 | 77,461 | 15,675 | 1.43E+11 | 88,435 | 0.15 |
| 1986 | 3,710 | 2.79E+10 | 24,813 | 11,495 | 1.14E+11 | 74,166 | 15,205 | 1.42E+11 | 98,978 | 0.16 |
| 1987 | 3,365 | 2.91E+10 | 11,075 | 10,842 | 1.09E+11 | 55,597 | 14,207 | 1.38E+11 | 66,672 | 0.15 |
| 1988 | 2,960 | 2.53E+10 | 24,588 | 10,921 | 1.08E+11 | 65,910 | 13,881 | 1.33E+11 | 90,499 | 0.15 |
| 1989 | 2,888 | 2.08E+10 | 47,205 | 11,337 | 1.04E+11 | 139,542 | 14,225 | 1.25E+11 | 186,747 | 0.14 |
| 1990 | 2,956 | 1.69E+10 | 41,570 | 11,513 | 1.04E+11 | 92,841 | 14,470 | 1.21E+11 | 134,412 | 0.12 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 1991 | 3,501 | 1.62E+10 | 52,393 | 12,978 | 1.11E+11 | 131,347 | 16,479 | 1.27E+11 | 183,740 | 0.15 |
| 1992 | 3,985 | 1.87E+10 | 34,135 | 13,848 | 1.17E+11 | 109,896 | 17,833 | 1.36E+11 | 144,031 | 0.13 |
| 1993 | 4,311 | 2.10E+10 | 47,051 | 14,890 | 1.25E+11 | 127,608 | 19,201 | 1.46E+11 | 174,659 | 0.14 |
| 1994 | 3,961 | 2.02E+10 | 35,961 | 15,808 | 1.37E+11 | 118,046 | 19,769 | 1.57E+11 | 154,007 | 0.13 |
| 1995 | 4,400 | 1.92E+10 | 86,381 | 17,121 | 1.52E+11 | 131,715 | 21,522 | 1.71E+11 | 218,096 | 0.12 |
| 1996 | 4,814 | 1.98E+10 | 57,730 | 17,713 | 1.67E+11 | 80,789 | 22,527 | 1.87E+11 | 138,519 | 0.11 |
| 1997 | 5,415 | 2.14E+10 | 60,208 | 18,365 | 1.79E+11 | 97,872 | 23,780 | 2.00E+11 | 158,079 | 0.16 |
| 1998 | 5,636 | 2.48E+10 | 43,895 | 15,973 | 1.57E+11 | 84,090 | 21,610 | 1.82E+11 | 127,984 | 0.15 |
| 1999 | 6,884 | 3.30E+10 | 95,156 | 16,243 | 1.63E+11 | 112,067 | 23,127 | 1.96E+11 | 207,223 | 0.14 |
| 2000 | 7,746 | 4.02E+10 | 79,054 | 16,340 | 1.67E+11 | 111,318 | 24,086 | 2.07E+11 | 190,372 | 0.15 |
| 2001 | 6,635 | 2.88E+10 | 58,722 | 15,899 | 1.68E+11 | 77,692 | 22,533 | 1.97E+11 | 136,413 | 0.13 |
| 2002 | 6,709 | 2.87E+10 | 74,849 | 15,950 | 1.69E+11 | 93,172 | 22,659 | 1.98E+11 | 168,020 | 0.15 |
| 2003 | 6,632 | 2.90E+10 | 76,582 | 15,944 | 1.67E+11 | 113,747 | 22,576 | 1.96E+11 | 190,329 | 0.12 |
| 2004 | 7,125 | 3.00E+10 | 102,013 | 16,546 | 1.69E+11 | 131,607 | 23,670 | 1.99E+11 | 233,620 | 0.10 |
| 2005 | 7,214 | 2.83E+10 | 90,919 | 16,889 | 1.69E+11 | 107,950 | 24,102 | 1.97E+11 | 198,869 | 0.08 |
| 2006 | 8,492 | 3.42E+10 | 106,584 | 17,619 | 1.72E+11 | 114,033 | 26,111 | 2.06E+11 | 220,617 | 0.07 |
| 2007 | 9,964 | 4.46E+10 | 99,625 | 17,967 | 1.74E+11 | 100,616 | 27,931 | 2.19E+11 | 200,241 | 0.05 |
| 2008 | 10,555 | 5.31E+10 | 68,778 | 19,270 | 1.87E+11 | 67,132 | 29,824 | 2.40E+11 | 135,910 | 0.03 |
| 2009 | 12,517 | 7.24E+10 | 80,892 | 22,592 | 2.17E+11 | 127,205 | 35,110 | 2.89E+11 | 208,097 | 0.05 |
| 2010 | 13,573 | 9.28E+10 | 36,335 | 26,167 | 2.60E+11 | 103,576 | 39,740 | 3.53E+11 | 139,911 | 0.05 |
| 2011 | 15,634 | 1.30E+11 | 24,635 | 30,281 | 3.16E+11 | 92,795 | 45,916 | 4.46E+11 | 117,430 | 0.06 |

Table 2.10.1 Annual fishing mortality rate in terms of exploitable biomass for Gulf of Mexico red snapper base model configuration from SS (steepness = 0.99, $\sigma_R = 0.3$).

| Year | Annual Exploitation Rate | Standard Deviation |
|---|---|---|
| 1872 | 0.0005 | 0.0000 |
| 1873 | 0.0007 | 0.0001 |
| 1874 | 0.0010 | 0.0001 |
| 1875 | 0.0013 | 0.0001 |
| 1876 | 0.0015 | 0.0001 |
| 1877 | 0.0013 | 0.0001 |
| 1878 | 0.0012 | 0.0001 |
| 1879 | 0.0013 | 0.0001 |
| 1880 | 0.0029 | 0.0002 |
| 1881 | 0.0030 | 0.0002 |
| 1882 | 0.0031 | 0.0002 |
| 1883 | 0.0032 | 0.0002 |
| 1884 | 0.0033 | 0.0002 |
| 1885 | 0.0035 | 0.0002 |
| 1886 | 0.0036 | 0.0002 |
| 1887 | 0.0036 | 0.0003 |
| 1888 | 0.0035 | 0.0003 |
| 1889 | 0.0038 | 0.0003 |
| 1890 | 0.0045 | 0.0003 |
| 1891 | 0.0042 | 0.0003 |
| 1892 | 0.0045 | 0.0003 |
| 1893 | 0.0047 | 0.0004 |
| 1894 | 0.0049 | 0.0004 |
| 1895 | 0.0048 | 0.0004 |
| 1896 | 0.0050 | 0.0004 |

| | | |
|---|---|---|
| 1897 | 0.0050 | 0.0004 |
| 1898 | 0.0059 | 0.0004 |
| 1899 | 0.0068 | 0.0005 |
| 1900 | 0.0078 | 0.0007 |
| 1901 | 0.0085 | 0.0008 |
| 1902 | 0.0092 | 0.0010 |
| 1903 | 0.0088 | 0.0009 |
| 1904 | 0.0084 | 0.0009 |
| 1905 | 0.0079 | 0.0009 |
| 1906 | 0.0072 | 0.0009 |
| 1907 | 0.0065 | 0.0008 |
| 1908 | 0.0059 | 0.0008 |
| 1909 | 0.0050 | 0.0007 |
| 1910 | 0.0042 | 0.0005 |
| 1911 | 0.0041 | 0.0005 |
| 1912 | 0.0041 | 0.0005 |
| 1913 | 0.0040 | 0.0005 |
| 1914 | 0.0039 | 0.0005 |
| 1915 | 0.0039 | 0.0004 |
| 1916 | 0.0039 | 0.0004 |
| 1917 | 0.0038 | 0.0004 |
| 1918 | 0.0037 | 0.0004 |
| 1919 | 0.0040 | 0.0004 |
| 1920 | 0.0043 | 0.0005 |
| 1921 | 0.0046 | 0.0005 |
| 1922 | 0.0049 | 0.0006 |
| 1923 | 0.0053 | 0.0006 |
| 1924 | 0.0052 | 0.0006 |
| 1925 | 0.0052 | 0.0006 |
| 1926 | 0.0051 | 0.0006 |
| 1927 | 0.0057 | 0.0007 |
| 1928 | 0.0050 | 0.0006 |

| | | |
|---|---|---|
| 1929 | 0.0053 | 0.0007 |
| 1930 | 0.0037 | 0.0004 |
| 1931 | 0.0034 | 0.0004 |
| 1932 | 0.0037 | 0.0004 |
| 1933 | 0.0034 | 0.0004 |
| 1934 | 0.0031 | 0.0003 |
| 1935 | 0.0040 | 0.0004 |
| 1936 | 0.0047 | 0.0005 |
| 1937 | 0.0044 | 0.0004 |
| 1938 | 0.0053 | 0.0005 |
| 1939 | 0.0059 | 0.0006 |
| 1940 | 0.0043 | 0.0004 |
| 1941 | 0.0040 | 0.0004 |
| 1942 | 0.0031 | 0.0003 |
| 1943 | 0.0024 | 0.0002 |
| 1944 | 0.0025 | 0.0002 |
| 1945 | 0.0020 | 0.0002 |
| 1946 | 0.0040 | 0.0004 |
| 1947 | 0.0071 | 0.0012 |
| 1948 | 0.0130 | 0.0029 |
| 1949 | 0.0195 | 0.0047 |
| 1950 | 0.0289 | 0.0059 |
| 1951 | 0.0315 | 0.0064 |
| 1952 | 0.0363 | 0.0075 |
| 1953 | 0.0360 | 0.0074 |
| 1954 | 0.0438 | 0.0097 |
| 1955 | 0.0409 | 0.0084 |
| 1956 | 0.0509 | 0.0109 |
| 1957 | 0.0594 | 0.0135 |
| 1958 | 0.0846 | 0.0200 |
| 1959 | 0.0906 | 0.0217 |
| 1960 | 0.0948 | 0.0224 |

| | | |
|---|---|---|
| 1961 | 0.0837 | 0.0184 |
| 1962 | 0.0834 | 0.0181 |
| 1963 | 0.0912 | 0.0209 |
| 1964 | 0.0896 | 0.0199 |
| 1965 | 0.0993 | 0.0227 |
| 1966 | 0.1011 | 0.0239 |
| 1967 | 0.1209 | 0.0291 |
| 1968 | 0.1165 | 0.0265 |
| 1969 | 0.1374 | 0.0336 |
| 1970 | 0.1339 | 0.0309 |
| 1971 | 0.1428 | 0.0310 |
| 1972 | 0.1463 | 0.0234 |
| 1973 | 0.1193 | 0.0174 |
| 1974 | 0.1267 | 0.0156 |
| 1975 | 0.1317 | 0.0186 |
| 1976 | 0.1338 | 0.0205 |
| 1977 | 0.1156 | 0.0176 |
| 1978 | 0.1295 | 0.0211 |
| 1979 | 0.1554 | 0.0245 |
| 1980 | 0.1114 | 0.0169 |
| 1981 | 0.1213 | 0.0179 |
| 1982 | 0.1192 | 0.0167 |
| 1983 | 0.1261 | 0.0151 |
| 1984 | 0.1351 | 0.0197 |
| 1985 | 0.1528 | 0.0223 |
| 1986 | 0.1596 | 0.0246 |
| 1987 | 0.1472 | 0.0208 |
| 1988 | 0.1477 | 0.0197 |
| 1989 | 0.1409 | 0.0202 |
| 1990 | 0.1188 | 0.0181 |
| 1991 | 0.1519 | 0.0232 |
| 1992 | 0.1343 | 0.0171 |

| | | |
|---|---|---|
| 1993 | 0.1385 | 0.0175 |
| 1994 | 0.1334 | 0.0187 |
| 1995 | 0.1231 | 0.0190 |
| 1996 | 0.1074 | 0.0151 |
| 1997 | 0.1577 | 0.0246 |
| 1998 | 0.1451 | 0.0229 |
| 1999 | 0.1352 | 0.0233 |
| 2000 | 0.1526 | 0.0282 |
| 2001 | 0.1334 | 0.0198 |
| 2002 | 0.1540 | 0.0230 |
| 2003 | 0.1241 | 0.0170 |
| 2004 | 0.1047 | 0.0128 |
| 2005 | 0.0793 | 0.0095 |
| 2006 | 0.0707 | 0.0088 |
| 2007 | 0.0540 | 0.0062 |
| 2008 | 0.0339 | 0.0037 |
| 2009 | 0.0540 | 0.0074 |
| 2010 | 0.0469 | 0.0066 |
| 2011 | 0.0619 | 0.0089 |

Table 2.10.2. Fleet-specific estimates of instantaneous fishing mortality rate in terms of exploitable biomass for Gulf of Mexico red snapper estimated by SS for the Base model.

| | Fleet | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | HL-E | HL-W | LL-E | LL-W | MRIP_E | MRIP_W | HBT_E | HBT_W | C_Clsc_E | C_Clsd_W | R_Clsd_E | R_Clsd_W | SHR_E | SHR_W |
| 1872 | 0.01 | | | | | | | | | | | | | |
| 1873 | 0.02 | | | | | | | | | | | | | |
| 1874 | 0.03 | | | | | | | | | | | | | |
| 1875 | 0.04 | | | | | | | | | | | | | |
| 1876 | 0.05 | | | | | | | | | | | | | |
| 1877 | 0.04 | | | | | | | | | | | | | |
| 1878 | 0.04 | | | | | | | | | | | | | |
| 1879 | 0.04 | | | | | | | | | | | | | |
| 1880 | 0.06 | 0.02 | | | | | | | | | | | | |
| 1881 | 0.06 | 0.02 | | | | | | | | | | | | |
| 1882 | 0.07 | 0.02 | | | | | | | | | | | | |
| 1883 | 0.08 | 0.02 | | | | | | | | | | | | |
| 1884 | 0.09 | 0.02 | | | | | | | | | | | | |
| 1885 | 0.10 | 0.01 | | | | | | | | | | | | |
| 1886 | 0.11 | 0.01 | | | | | | | | | | | | |
| 1887 | 0.12 | 0.01 | | | | | | | | | | | | |
| 1888 | 0.12 | 0.01 | | | | | | | | | | | | |
| 1889 | 0.13 | 0.01 | | | | | | | | | | | | |
| 1890 | 0.17 | 0.01 | | | | | | | | | | | | |
| 1891 | 0.16 | 0.01 | | | | | | | | | | | | |
| 1892 | 0.17 | 0.01 | | | | | | | | | | | | |
| 1893 | 0.18 | 0.01 | | | | | | | | | | | | |
| 1894 | 0.19 | 0.01 | | | | | | | | | | | | |
| 1895 | 0.19 | 0.01 | | | | | | | | | | | | |
| 1896 | 0.20 | 0.01 | | | | | | | | | | | | |
| 1897 | 0.20 | 0.01 | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1898 | 0.24 | 0.01 | | | | | | | | | | | | |
| 1899 | 0.28 | 0.02 | | | | | | | | | | | | |
| 1900 | 0.33 | 0.02 | | | | | | | | | | | | |
| 1901 | 0.38 | 0.03 | | | | | | | | | | | | |
| 1902 | 0.44 | 0.03 | | | | | | | | | | | | |
| 1903 | 0.44 | 0.03 | | | | | | | | | | | | |
| 1904 | 0.44 | 0.03 | | | | | | | | | | | | |
| 1905 | 0.42 | 0.03 | | | | | | | | | | | | |
| 1906 | 0.38 | 0.02 | | | | | | | | | | | | |
| 1907 | 0.33 | 0.02 | | | | | | | | | | | | |
| 1908 | 0.29 | 0.02 | | | | | | | | | | | | |
| 1909 | 0.23 | 0.02 | | | | | | | | | | | | |
| 1910 | 0.18 | 0.02 | | | | | | | | | | | | |
| 1911 | 0.17 | 0.01 | | | | | | | | | | | | |
| 1912 | 0.16 | 0.01 | | | | | | | | | | | | |
| 1913 | 0.15 | 0.01 | | | | | | | | | | | | |
| 1914 | 0.14 | 0.01 | | | | | | | | | | | | |
| 1915 | 0.14 | 0.01 | | | | | | | | | | | | |
| 1916 | 0.14 | 0.01 | | | | | | | | | | | | |
| 1917 | 0.13 | 0.01 | | | | | | | | | | | | |
| 1918 | 0.13 | 0.01 | | | | | | | | | | | | |
| 1919 | 0.14 | 0.01 | | | | | | | | | | | | |
| 1920 | 0.15 | 0.01 | | | | | | | | | | | | |
| 1921 | 0.17 | 0.01 | | | | | | | | | | | | |
| 1922 | 0.18 | 0.01 | | | | | | | | | | | | |
| 1923 | 0.20 | 0.01 | | | | | | | | | | | | |
| 1924 | 0.20 | 0.01 | | | | | | | | | | | | |
| 1925 | 0.21 | 0.01 | | | | | | | | | | | | |
| 1926 | 0.21 | 0.01 | | | | | | | | | | | | |
| 1927 | 0.23 | 0.02 | | | | | | | | | | | | |
| 1928 | 0.21 | 0.01 | | | | | | | | | | | | |
| 1929 | 0.23 | 0.01 | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1930 | 0.14 | 0.02 | | | | | | | | | | | | |
| 1931 | 0.13 | 0.01 | | | | | | | | | | | | |
| 1932 | 0.13 | 0.01 | | | | | | | | | | | | |
| 1933 | 0.12 | 0.01 | | | | | | | | | | | | |
| 1934 | 0.10 | 0.01 | | | | | | | | | | | | |
| 1935 | 0.12 | 0.02 | | | | | | | | | | | | |
| 1936 | 0.14 | 0.02 | | | | | | | | | | | | |
| 1937 | 0.12 | 0.03 | | | | | | | | | | | | |
| 1938 | 0.16 | 0.03 | | | | | | | | | | | | |
| 1939 | 0.19 | 0.03 | | | | | | | | | | | | |
| 1940 | 0.13 | 0.02 | | | | | | | | | | | | |
| 1941 | 0.12 | 0.02 | | | | | | | | | | | | |
| 1942 | 0.09 | 0.02 | | | | | | | | | | | | |
| 1943 | 0.07 | 0.01 | | | | | | | | | | | | |
| 1944 | 0.08 | 0.01 | | | | | | | | | | | | |
| 1945 | 0.07 | 0.00 | | | | | | | | | | | | |
| 1946 | 0.10 | 0.01 | | | | | | | | | | | | 0.00 |
| 1947 | 0.11 | 0.01 | | | | | | | | | | | | 0.01 |
| 1948 | 0.12 | 0.02 | | | | | | | | | | | | 0.04 |
| 1949 | 0.15 | 0.03 | | | | | | | | | | | | 0.06 |
| 1950 | 0.08 | 0.05 | | | 0.04 | 0.05 | 0.04 | 0.06 | | | | | 0.01 | 0.07 |
| 1951 | 0.10 | 0.05 | | | 0.05 | 0.06 | 0.05 | 0.07 | | | | | 0.01 | 0.08 |
| 1952 | 0.12 | 0.06 | | | 0.06 | 0.07 | 0.05 | 0.07 | | | | | 0.01 | 0.09 |
| 1953 | 0.11 | 0.05 | | | 0.07 | 0.08 | 0.05 | 0.08 | | | | | 0.02 | 0.09 |
| 1954 | 0.11 | 0.06 | | | 0.08 | 0.10 | 0.05 | 0.08 | | | | | 0.02 | 0.12 |
| 1955 | 0.13 | 0.07 | | | 0.09 | 0.11 | 0.05 | 0.08 | | | | | 0.02 | 0.10 |
| 1956 | 0.17 | 0.10 | | | 0.10 | 0.13 | 0.06 | 0.08 | | | | | 0.03 | 0.13 |
| 1957 | 0.16 | 0.11 | | | 0.11 | 0.14 | 0.06 | 0.09 | | | | | 0.03 | 0.16 |
| 1958 | 0.29 | 0.19 | | | 0.12 | 0.16 | 0.06 | 0.09 | | | | | 0.03 | 0.25 |
| 1959 | 0.30 | 0.22 | | | 0.14 | 0.19 | 0.06 | 0.10 | | | | | 0.04 | 0.26 |
| 1960 | 0.38 | 0.26 | | | 0.15 | 0.22 | 0.07 | 0.11 | | | | | 0.04 | 0.27 |
| 1961 | 0.40 | 0.37 | | | 0.16 | 0.25 | 0.07 | 0.12 | | | | | 0.03 | 0.22 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1962 | 0.48 | 0.42 | | | 0.17 | 0.27 | 0.08 | 0.12 | | | | | 0.03 | 0.21 |
| 1963 | 0.44 | 0.43 | | | 0.17 | 0.27 | 0.08 | 0.12 | | | | | 0.03 | 0.24 |
| 1964 | 0.59 | 0.47 | | | 0.18 | 0.28 | 0.08 | 0.13 | | | | | 0.03 | 0.22 |
| 1965 | 0.71 | 0.52 | | | 0.19 | 0.30 | 0.09 | 0.13 | | | | | 0.04 | 0.25 |
| 1966 | 0.68 | 0.46 | | | 0.20 | 0.31 | 0.09 | 0.13 | | | | | 0.03 | 0.27 |
| 1967 | 0.72 | 0.71 | | | 0.21 | 0.34 | 0.09 | 0.14 | | | | | 0.03 | 0.33 |
| 1968 | 0.71 | 1.07 | | | 0.22 | 0.41 | 0.09 | 0.16 | | | | | 0.04 | 0.29 |
| 1969 | 0.71 | 1.10 | | | 0.22 | 0.49 | 0.09 | 0.18 | | | | | 0.04 | 0.39 |
| 1970 | 0.71 | 1.53 | | | 0.23 | 0.57 | 0.09 | 0.20 | | | | | 0.04 | 0.35 |
| 1971 | 0.73 | 2.34 | | | 0.25 | 0.86 | 0.09 | 0.25 | | | | | 0.03 | 0.37 |
| 1972 | 0.87 | 2.76 | | | 0.28 | 1.19 | 0.10 | 0.31 | | | | | 0.03 | 0.40 |
| 1973 | 1.11 | 2.51 | | | 0.15 | 0.89 | 0.08 | 0.13 | | | | | 0.04 | 0.32 |
| 1974 | 0.88 | 1.37 | | | 0.09 | 0.23 | 0.03 | 0.06 | | | | | 0.04 | 0.32 |
| 1975 | 0.72 | 0.81 | | | 0.16 | 0.31 | 0.04 | 0.08 | | | | | 0.04 | 0.30 |
| 1976 | 0.67 | 0.69 | | 0.00 | 0.22 | 0.59 | 0.06 | 0.13 | | | | | 0.03 | 0.35 |
| 1977 | 0.49 | 0.75 | | 0.00 | 0.25 | 0.58 | 0.07 | 0.14 | | | | | 0.04 | 0.30 |
| 1978 | 0.46 | 0.85 | | 0.00 | 0.23 | 0.60 | 0.07 | 0.14 | | | | | 0.03 | 0.35 |
| 1979 | 0.46 | 0.90 | | 0.00 | 0.24 | 0.59 | 0.06 | 0.15 | | | | | 0.03 | 0.36 |
| 1980 | 0.50 | 1.12 | 0.04 | 0.00 | 0.35 | 0.84 | 0.09 | 0.19 | | | | | 0.02 | 0.22 |
| 1981 | 0.74 | 1.54 | 0.10 | 0.00 | 0.44 | 0.72 | 0.04 | 0.09 | | | | | 0.03 | 0.33 |
| 1982 | 1.03 | 1.18 | 0.17 | 0.01 | 0.24 | 0.21 | 0.08 | 0.06 | | | | | 0.03 | 0.35 |
| 1983 | 0.92 | 0.80 | 0.49 | 0.01 | 0.18 | 0.40 | 0.10 | 0.07 | | | | | 0.03 | 0.28 |
| 1984 | 0.46 | 0.50 | 0.42 | 0.07 | 0.04 | 0.16 | 0.01 | 0.08 | | | | | 0.04 | 0.36 |
| 1985 | 0.39 | 0.30 | 0.08 | 0.06 | 0.24 | 0.34 | 0.05 | 0.19 | | | | | 0.04 | 0.33 |
| 1986 | 0.19 | 0.31 | 0.03 | 0.08 | 0.54 | 0.30 | 0.02 | 0.21 | | | | | 0.04 | 0.44 |
| 1987 | 0.21 | 0.24 | 0.02 | 0.07 | 0.84 | 0.11 | 0.02 | 0.19 | | | | | 0.03 | 0.41 |
| 1988 | 0.30 | 0.36 | 0.03 | 0.07 | 0.77 | 0.19 | 0.02 | 0.23 | | | | | 0.03 | 0.39 |
| 1989 | 0.34 | 0.29 | 0.05 | 0.04 | 0.96 | 0.16 | 0.02 | 0.24 | | | | | 0.04 | 0.36 |
| 1990 | 0.47 | 0.27 | 0.07 | 0.01 | 0.50 | 0.09 | 0.03 | 0.11 | | | | | 0.03 | 0.39 |
| 1991 | 0.22 | 0.22 | 0.03 | 0.01 | 0.46 | 0.10 | 0.01 | 0.09 | 0.21 | 0.21 | | | 0.03 | 0.46 |
| 1992 | 0.16 | 0.26 | 0.01 | 0.00 | 0.61 | 0.12 | 0.02 | 0.14 | 0.46 | 0.22 | | | 0.04 | 0.38 |
| 1993 | 0.15 | 0.25 | 0.01 | 0.00 | 0.88 | 0.15 | 0.03 | 0.15 | 0.51 | 0.08 | | | 0.03 | 0.38 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1994 | 0.21 | 0.22 | 0.01 | 0.00 | 0.86 | 0.15 | 0.03 | 0.20 | 0.49 | 0.05 | | | 0.03 | 0.37 |
| 1995 | 0.08 | 0.22 | 0.01 | 0.00 | 0.96 | 0.25 | 0.03 | 0.18 | 0.37 | 0.05 | | | 0.04 | 0.39 |
| 1996 | 0.09 | 0.30 | 0.01 | 0.00 | 0.76 | 0.15 | 0.03 | 0.17 | 0.59 | 0.04 | | | 0.04 | 0.39 |
| 1997 | 0.06 | 0.36 | 0.00 | 0.00 | 0.97 | 0.16 | 0.05 | 0.18 | 0.22 | 0.78 | 0.02 | 0.00 | 0.05 | 0.53 |
| 1998 | 0.09 | 0.37 | 0.00 | 0.00 | 0.52 | 0.13 | 0.05 | 0.14 | 0.19 | 0.09 | 0.03 | 0.00 | 0.06 | 0.48 |
| 1999 | 0.09 | 0.41 | 0.00 | 0.01 | 0.46 | 0.12 | 0.04 | 0.07 | 0.27 | 0.06 | 0.04 | 0.01 | 0.04 | 0.49 |
| 2000 | 0.13 | 0.40 | 0.00 | 0.01 | 0.71 | 0.19 | 0.10 | 0.10 | 1.32 | 0.07 | 0.09 | 0.02 | 0.03 | 0.60 |
| 2001 | 0.20 | 0.39 | 0.01 | 0.01 | 1.08 | 0.14 | 0.11 | 0.12 | 0.22 | 0.09 | 0.14 | 0.01 | 0.04 | 0.51 |
| 2002 | 0.25 | 0.39 | 0.01 | 0.01 | 1.11 | 0.12 | 0.12 | 0.13 | 0.14 | 0.17 | 0.11 | 0.01 | 0.04 | 0.57 |
| 2003 | 0.23 | 0.36 | 0.01 | 0.01 | 0.92 | 0.14 | 0.12 | 0.15 | 0.23 | 0.06 | 0.08 | 0.02 | 0.04 | 0.40 |
| 2004 | 0.22 | 0.37 | 0.01 | 0.03 | 1.26 | 0.18 | 0.12 | 0.12 | 0.13 | 0.04 | 0.06 | 0.03 | 0.03 | 0.33 |
| 2005 | 0.18 | 0.37 | 0.01 | 0.02 | 0.76 | 0.23 | 0.08 | 0.10 | 0.10 | 0.04 | 0.08 | 0.03 | 0.03 | 0.26 |
| 2006 | 0.13 | 0.43 | 0.01 | 0.02 | 0.63 | 0.26 | 0.06 | 0.10 | 0.07 | 0.02 | 0.06 | 0.02 | 0.02 | 0.23 |
| 2007 | 0.23 | 0.21 | 0.01 | 0.02 | 0.63 | 0.18 | 0.07 | 0.07 | 0.15 | 0.05 | 0.04 | 0.02 | 0.01 | 0.17 |
| 2008 | 0.17 | 0.11 | 0.01 | 0.01 | 0.26 | 0.04 | 0.05 | 0.02 | 0.07 | 0.00 | 0.12 | 0.02 | 0.01 | 0.12 |
| 2009 | 0.14 | 0.08 | 0.00 | 0.00 | 0.23 | 0.03 | 0.05 | 0.02 | 0.22 | 0.00 | 0.10 | 0.02 | 0.01 | 0.16 |
| 2010 | 0.16 | 0.08 | 0.01 | 0.00 | 0.08 | 0.01 | 0.02 | 0.01 | 0.01 | 0.00 | 0.09 | 0.00 | 0.01 | 0.14 |
| 2011 | 0.15 | 0.07 | 0.01 | 0.00 | 0.10 | 0.01 | 0.03 | 0.01 | 0.03 | 0.00 | 0.11 | 0.02 | 0.01 | 0.17 |

Table 2.14.1. Summary of benchmarks and reference points for Gulf of Mexico red snapper from the SS base model run and the alternative sensitivity runs examined for the SPR26% status definition.

| | | | B0 | | Bcurrent | | SSB0 | | current | | | | SPR26% | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Run Number | Run | R0 | B0_east | B0_west | Bcurrent_east | Bcurrent_west | SSB0_east | SSB0_west | SSBcurrent_east | SSBcurrent_west | Fcurr | SSBcurr | Fref_spr | SSBref_spr | Fratio_spr | SSBratio_spr |
| 1 | Base Model Run Configuration | 162,940 | 110,828 | 215,581 | 15,634 | 30,281 | 1.60E+12 | 3.11E+12 | 1.30E+11 | 3.16E+11 | 0.05391844 | 4.45E+11 | 0.08 | 1.22E+12 | 0.70 | 0.37 |
| 2 | M High | 1,087,770 | 102,442 | 157,989 | 19,438 | 39,896 | 1.37E+12 | 2.12E+12 | 1.29E+11 | 3.21E+11 | 0.00952747 | 4.51E+11 | 0.02 | 9.01E+11 | 0.63 | 0.50 |
| 3 | M Low | 51,292 | 142,772 | 360,706 | 15,884 | 32,157 | 2.08E+12 | 5.27E+12 | 1.39E+11 | 3.56E+11 | 0.11235873 | 4.95E+11 | 0.14 | 1.90E+12 | 0.82 | 0.26 |
| 4 | Density Dependent M | 159,399 | 109,298 | 210,018 | 15,635 | 32,427 | 1.58E+12 | 3.03E+12 | 1.33E+11 | 3.46E+11 | 0.05270051 | 4.80E+11 | 0.08 | 1.19E+12 | 0.66 | 0.40 |
| 5 | Steepness = 0.8 | 2,357,920 | 1,537,610 | 3,185,900 | 17,180 | 43,907 | 2.22E+13 | 4.59E+13 | 1.49E+11 | 5.07E+11 | 0.04815849 | 6.56E+11 | 0.10 | 1.44E+13 | 0.50 | 0.05 |
| 6 | SigmaR = 0.6 | 11,565,500 | 7,758,930 | 15,409,600 | 16,550 | 37,077 | 1.12E+14 | 2.22E+14 | 1.41E+11 | 4.10E+11 | 0.0492311 | 5.51E+11 | 0.09 | 7.04E+13 | 0.55 | 0.01 |
| 7 | Time Vary Steepness | 112,850 | 76,267 | 149,800 | 14,891 | 29,285 | 1.10E+12 | 2.16E+12 | 1.24E+11 | 3.06E+11 | 0.05204949 | 4.29E+11 | 0.08 | 8.48E+11 | 0.64 | 0.51 |
| 8 | Plus 20% discard mortality | 169,305 | 115,845 | 223,316 | 16,418 | 31,070 | 1.67E+12 | 3.22E+12 | 1.37E+11 | 3.23E+11 | 0.05244998 | 4.60E+11 | 0.08 | 1.26E+12 | 0.69 | 0.36 |
| 9 | Minus 20% discard mortality | 156,163 | 105,574 | 207,261 | 14,879 | 29,518 | 1.52E+12 | 2.99E+12 | 1.23E+11 | 3.09E+11 | 0.05529037 | 4.32E+11 | 0.08 | 1.16E+12 | 0.69 | 0.37 |
| 10 | Incorporate Age Reader Error | 148,712 | 96,484 | 201,423 | 13,904 | 30,308 | 1.39E+12 | 2.90E+12 | 1.12E+11 | 3.22E+11 | 0.0582621 | 4.35E+11 | 0.09 | 1.11E+12 | 0.62 | 0.39 |
| 11 | Start Year 1964 | 168,492 | 119,346 | 218,185 | 15,820 | 27,551 | 1.72E+12 | 3.15E+12 | 1.32E+11 | 2.77E+11 | 0.05059884 | 4.09E+11 | 0.08 | 1.26E+12 | 0.65 | 0.33 |
| 12 | Exclude 1972 SEAMAP index | 168,571 | 114,396 | 223,294 | 16,011 | 31,127 | 1.65E+12 | 3.22E+12 | 1.33E+11 | 3.24E+11 | 0.05756373 | 4.57E+11 | 0.09 | 1.26E+12 | 0.63 | 0.36 |
| 13 | Exclude Fishery Dependent Indices | 160,951 | 109,225 | 213,200 | 14,859 | 34,542 | 1.58E+12 | 3.07E+12 | 1.23E+11 | 3.80E+11 | 0.05296234 | 5.03E+11 | 0.09 | 1.20E+12 | 0.58 | 0.42 |
| 14 | Incorporate Oil Rig Mortality | 163,190 | 110,900 | 216,010 | 15,663 | 30,192 | 1.60E+12 | 3.12E+12 | 1.30E+11 | 3.14E+11 | 0.05399721 | 4.44E+11 | 0.06 | 1.22E+12 | 0.83 | 0.37 |
| 15 | Age composition Weighting | 214,448 | 135,832 | 293,761 | 18,158 | 26,198 | 1.96E+12 | 4.24E+12 | 1.38E+11 | 2.47E+11 | 0.08478682 | 3.85E+11 | 0.11 | 1.60E+12 | 0.81 | 0.24 |
| 16 | Index CV 0.1 Weighting | 172,978 | 121,484 | 225,034 | 19,266 | 32,541 | 1.75E+12 | 3.25E+12 | 1.62E+11 | 3.43E+11 | 0.05554654 | 5.05E+11 | 0.08 | 1.29E+12 | 0.66 | 0.39 |

Table 2.14.2. Summary of benchmarks and reference points for Gulf of Mexico red snapper from the SS base model run and the alternative sensitivity runs examined for the SPR_MAX status definition.

| | | | B0 | | Bcurrent | | SSB0 | | current | | | | SPR_MAX | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Run Number | Run | R0 | B0_east | B0_west | Bcurrent_east | Bcurrent_west | SSB0_east | SSB0_west | SSBcurrent_east | SSBcurrent_west | Fcurr | SSBcurr | Fref_MAX | SSBref_MAX | Fratio_MAX | SSBratio_MAX |
| 1 | Base Model Run Configuration | 162,940 | 110,828 | 215,581 | 15,634 | 30,281 | 1.60E+12 | 3.11E+12 | 1.30E+11 | 3.16E+11 | 0.053918 | 4.45E+11 | 0.09 | 9.50E+11 | 0.58 | 0.47 |
| 2 | M High | 1,087,770 | 102,442 | 157,989 | 19,438 | 39,896 | 1.37E+12 | 2.12E+12 | 1.29E+11 | 3.21E+11 | 0.009527 | 4.51E+11 | 0.03 | 3.86E+11 | 0.35 | 1.17 |
| 3 | M Low | 51,292 | 142,772 | 360,706 | 15,884 | 32,157 | 2.08E+12 | 5.27E+12 | 1.39E+11 | 3.56E+11 | 0.112359 | 4.95E+11 | 0.14 | 1.89E+12 | 0.82 | 0.26 |
| 4 | Density Dependent M | 159,399 | 109,298 | 210,018 | 15,635 | 32,427 | 1.58E+12 | 3.03E+12 | 1.33E+11 | 3.46E+11 | 0.052701 | 4.80E+11 | 0.10 | 9.41E+11 | 0.55 | 0.51 |
| 5 | Steepness = 0.8 | 2,357,920 | 1,537,610 | 3,185,900 | 17,180 | 43,907 | 2.22E+13 | 4.59E+13 | 1.49E+11 | 5.07E+11 | 0.048158 | 6.56E+11 | 0.08 | 1.97E+13 | 0.63 | 0.03 |
| 6 | SigmaR = 0.6 | 11,565,500 | 7,758,930 | 15,409,600 | 16,550 | 37,077 | 1.12E+14 | 2.22E+14 | 1.41E+11 | 4.10E+11 | 0.049231 | 5.51E+11 | 0.07 | 9.60E+13 | 0.68 | 0.01 |
| 7 | Time Vary Steepness | 112,850 | 76,267 | 149,800 | 14,891 | 29,285 | 1.10E+12 | 2.16E+12 | 1.24E+11 | 3.06E+11 | 0.052049 | 4.29E+11 | 0.10 | 6.26E+11 | 0.51 | 0.69 |
| 8 | Plus 20% discard mortality | 169,305 | 115,845 | 223,316 | 16,418 | 31,070 | 1.67E+12 | 3.22E+12 | 1.37E+11 | 3.23E+11 | 0.05245 | 4.60E+11 | 0.09 | 9.83E+11 | 0.57 | 0.47 |
| 9 | Minus 20% discard mortality | 156,163 | 105,574 | 207,261 | 14,879 | 29,518 | 1.52E+12 | 2.99E+12 | 1.23E+11 | 3.09E+11 | 0.05529 | 4.32E+11 | 0.10 | 9.09E+11 | 0.57 | 0.47 |
| 10 | Incorporate Age Reader Error | 148,712 | 96,484 | 201,423 | 13,904 | 30,308 | 1.39E+12 | 2.90E+12 | 1.12E+11 | 3.22E+11 | 0.058262 | 4.35E+11 | 0.12 | 8.30E+11 | 0.50 | 0.52 |
| 11 | Start Year 1964 | 168,492 | 119,346 | 218,185 | 15,820 | 27,551 | 1.72E+12 | 3.15E+12 | 1.32E+11 | 2.77E+11 | 0.050599 | 4.09E+11 | 0.09 | 9.58E+11 | 0.53 | 0.43 |
| 12 | Exclude 1972 SEAMAP index | 168,571 | 114,396 | 223,294 | 16,011 | 31,127 | 1.65E+12 | 3.22E+12 | 1.33E+11 | 3.24E+11 | 0.057564 | 4.57E+11 | 0.11 | 9.97E+11 | 0.53 | 0.46 |
| 13 | Exclude Fishery Dependent Indices | 160,951 | 109,225 | 213,200 | 14,859 | 34,542 | 1.58E+12 | 3.07E+12 | 1.23E+11 | 3.80E+11 | 0.052962 | 5.03E+11 | 0.11 | 9.53E+11 | 0.49 | 0.53 |
| 14 | Incorporate Oil Rig Mortality | 163,190 | 110,900 | 216,010 | 15,663 | 30,192 | 1.60E+12 | 3.12E+12 | 1.30E+11 | 3.14E+11 | 0.053997 | 4.44E+11 | 0.08 | 9.10E+11 | 0.67 | 0.49 |
| 15 | Age composition Weighting | 214,448 | 135,832 | 293,761 | 18,158 | 26,198 | 1.96E+12 | 4.24E+12 | 1.38E+11 | 2.47E+11 | 0.084787 | 3.85E+11 | 0.12 | 1.29E+12 | 0.69 | 0.30 |
| 16 | Index CV 0.1 Weighting | 172,978 | 121,484 | 225,034 | 19,266 | 32,541 | 1.75E+12 | 3.25E+12 | 1.62E+11 | 3.43E+11 | 0.055547 | 5.05E+11 | 0.10 | 1.03E+12 | 0.55 | 0.49 |

Table 3.1.1. Required MSRA evaluations using MAX reference points for Gulf of Mexico red snapper. Yield (retained) is in lbs whole weight. Run 1 = Base Model, Run 2 = M High, Run 3 = M Low, Run 16 = Index CV =0.1.

| Criteria | Definition | Run 1 | Run 2 | Run 3 | Run 16 |
|---|---|---|---|---|---|
| **Base M** | | 0.09 | 0.09 | 0.09 | 0.09 |
| **Steepness** | | 0.99 | 0.99 | 0.99 | 0.99 |
| **Virgin Recruitment** | | 1.63E+05 | 1.09E+06 | 5.15E+04 | 1.74E+05 |
| **SSB unfished (eggs)** | | 4.72E+12 | 3.49E+12 | 7.38E+12 | 5.02E+12 |
| **SPR** | | 0.20 | 0.11 | 0.26 | 0.21 |
| | **Mortality Rate Criteria** | | | | |
| **$F_{MSY\ or\ proxy}$** | $F_{MAX}$ | 0.094 | 0.028 | 0.138 | 0.102 |
| **MFMT** | $F_{MAX}$ | 0.094 | 0.028 | 0.138 | 0.102 |
| **$F_{CURRENT}$** | $F_{2009\text{-}F2011}$ | 0.054 | 0.010 | 0.113 | 0.057 |
| **$F_{CURRENT}$**/MFMT | $F_{2009\text{-}F2011}$ | 0.577 | 0.347 | 0.819 | 0.557 |
| | **Biomass Criteria** | | | | |
| **$SSB_{MSY\ or\ proxy}$** | Equilibrium SSB @ MAX | 9.54E+11 | 3.85E+11 | 1.90E+12 | 1.03E+12 |
| **MSST** | (1-M)*$SSB_{MAX}$ | 8.72E+11 | 3.52E+11 | 1.74E+12 | 9.38E+11 |
| **$SSB_{CURRENT}$** | $SSB_{2011}$ | 4.46E+11 | 4.51E+11 | 4.95E+11 | 5.03E+11 |
| **$SS_{CURRENT}$**/MSST | $SSB_{2011}$ | 0.511 | 1.279 | 0.285 | 0.536 |
| **OFL** | Annual Yield (lbs) @ MFMT | | | | |
| | OFL 2013 | 19,219,196 | 25,979,447 | 16,078,412 | 22,821,137 |
| | OFL 2014 | 15,338,416 | 16,949,714 | 14,320,067 | 18,306,337 |
| | OFL 2015 | 12,901,253 | 12,883,837 | 13,037,277 | 15,088,812 |
| | OFL 2016 | 11,753,737 | 11,394,497 | 12,431,761 | 12,835,909 |
| | OFL 2017 | 11,519,564 | 10,976,593 | 12,516,374 | 12,149,683 |
| | OFL 2018 | 11,625,164 | 10,904,635 | 12,831,015 | 12,194,833 |
| | OFL 2019 | 11,668,727 | 10,812,968 | 13,005,332 | 12,140,556 |
| | OFL 2020 | 11,791,259 | 10,782,125 | 13,288,667 | 12,354,160 |
| | OFL 2021 | 11,881,912 | 10,754,722 | 13,495,260 | 12,512,119 |
| | OFL 2022 | 11,911,233 | 10,710,035 | 13,580,667 | 12,555,572 |
| | OFL 2023 | 11,937,380 | 10,668,787 | 13,667,815 | 12,589,280 |
| | OFL 2024 | 11,961,366 | 10,630,846 | 13,747,996 | 12,620,365 |
| | OFL 2025 | 11,982,817 | 10,595,396 | 13,821,211 | 12,648,319 |
| | OFL 2026 | 12,002,019 | 10,562,503 | 13,887,988 | 12,673,209 |
| | OFL 2027 | 12,018,663 | 10,531,705 | 13,948,240 | 12,694,836 |
| | OFL 2028 | 12,033,214 | 10,503,332 | 14,002,561 | 12,713,642 |
| | OFL 2029 | 12,047,125 | 10,478,221 | 14,052,760 | 12,731,278 |
| | OFL 2030 | 12,059,603 | 10,455,580 | 14,098,152 | 12,746,799 |
| | OFL 2031 | 12,071,177 | 10,435,408 | 14,139,665 | 12,760,886 |
| | OFL 2032 | 12,082,178 | 10,417,595 | 14,178,003 | 12,773,871 |
| **Annual OY (ACT)** | Annual Yield @ $F_{OY}$ | | | | |
| | OY 2013 | 15,025,473 | 20,760,079 | 12,425,015 | 17,919,915 |
| | OY 2014 | 12,935,138 | 15,128,494 | 11,692,537 | 15,673,648 |
| | OY 2015 | 11,366,719 | 12,052,570 | 11,021,170 | 13,690,853 |

| | | | | | |
|---|---|---|---|---|---|
| | OY 2016 | 10,500,245 | 10,726,724 | 10,656,618 | 11,840,466 |
| | OY 2017 | 10,344,005 | 10,366,228 | 10,803,620 | 11,228,866 |
| | OY 2018 | 10,484,063 | 10,355,822 | 11,130,144 | 11,337,420 |
| | OY 2019 | 10,565,105 | 10,317,043 | 11,326,000 | 11,284,466 |
| | OY 2020 | 10,750,093 | 10,348,106 | 11,654,662 | 11,632,528 |
| | OY 2021 | 10,887,682 | 10,368,631 | 11,894,941 | 11,906,141 |
| | OY 2022 | 10,939,578 | 10,355,337 | 11,991,635 | 11,982,574 |
| | OY 2023 | 10,986,382 | 10,342,727 | 12,089,806 | 12,036,918 |
| | OY 2024 | 11,029,239 | 10,330,866 | 12,180,106 | 12,087,359 |
| | OY 2025 | 11,068,018 | 10,319,203 | 12,262,735 | 12,133,589 |
| | OY 2026 | 11,103,115 | 10,308,004 | 12,338,286 | 12,175,719 |
| | OY 2027 | 11,134,310 | 10,296,893 | 12,406,805 | 12,213,528 |
| | OY 2028 | 11,162,066 | 10,286,267 | 12,468,777 | 12,247,281 |
| | OY 2029 | 11,187,882 | 10,277,184 | 12,525,920 | 12,278,718 |
| | OY 2030 | 11,211,030 | 10,268,917 | 12,577,618 | 12,306,871 |
| | OY 2031 | 11,232,194 | 10,261,685 | 12,624,840 | 12,332,554 |
| | OY 2032 | 11,251,904 | 10,255,579 | 12,668,447 | 12,356,210 |
| **Annual Yield** | Annual Yield @ $F_{REBUILD}$ | | | | |
| | OY 2013 | 18,062,310 | 26,485,623 | 13,460,472 | 21,738,326 |
| | OY 2014 | 14,722,804 | 17,091,823 | 12,472,260 | 17,761,845 |
| | OY 2015 | 12,528,587 | 12,939,966 | 11,638,436 | 14,812,156 |
| | OY 2016 | 11,451,751 | 11,440,882 | 11,205,409 | 12,626,626 |
| | OY 2017 | 11,236,890 | 11,018,040 | 11,335,502 | 11,937,093 |
| | OY 2018 | 11,353,051 | 10,939,666 | 11,660,923 | 11,980,678 |
| | OY 2019 | 11,407,857 | 10,842,928 | 11,852,459 | 11,918,112 |
| | OY 2020 | 11,547,783 | 10,806,641 | 12,170,406 | 12,151,799 |
| | OY 2021 | 11,651,333 | 10,774,894 | 12,402,418 | 12,327,594 |
| | OY 2022 | 11,687,180 | 10,727,099 | 12,496,599 | 12,375,302 |
| | OY 2023 | 11,719,301 | 10,683,029 | 12,592,300 | 12,412,603 |
| | OY 2024 | 11,748,710 | 10,642,508 | 12,680,308 | 12,447,017 |
| | OY 2025 | 11,775,143 | 10,604,721 | 12,760,776 | 12,478,058 |
| | OY 2026 | 11,798,887 | 10,569,668 | 12,834,299 | 12,505,858 |
| | OY 2027 | 11,819,698 | 10,536,930 | 12,900,856 | 12,530,175 |
| | OY 2028 | 11,837,997 | 10,506,793 | 12,960,998 | 12,551,471 |
| | OY 2029 | 11,855,303 | 10,480,095 | 13,016,465 | 12,571,379 |
| | OY 2030 | 11,870,801 | 10,456,021 | 13,066,642 | 12,588,971 |
| | OY 2031 | 11,885,109 | 10,434,570 | 13,112,476 | 12,604,933 |
| | OY 2032 | 11,898,579 | 10,415,589 | 13,154,804 | 12,619,637 |
| **Annual Yield** | Annual Yield @ $F_{CURRENT}$ | | | | |
| | Y 2013 | 8,712,954 | 7,993,108 | 9,362,892 | 10,317,704 |
| | Y 2014 | 8,354,795 | 7,487,108 | 9,198,517 | 10,159,723 |
| | Y 2015 | 7,892,953 | 6,936,267 | 8,935,861 | 9,712,916 |
| | Y 2016 | 7,538,277 | 6,519,597 | 8,779,665 | 8,718,840 |
| | Y 2017 | 7,545,729 | 6,443,671 | 8,985,751 | 8,285,019 |
| | Y 2018 | 7,724,918 | 6,540,806 | 9,319,395 | 8,343,221 |

| | | | | |
|---|---|---|---|---|
| Y 2019 | 7,846,701 | 6,602,667 | 9,532,580 | 8,149,282 |
| Y 2020 | 8,096,834 | 6,785,097 | 9,877,556 | 8,546,330 |
| Y 2021 | 8,287,753 | 6,924,208 | 10,132,143 | 8,908,215 |
| Y 2022 | 8,364,715 | 6,973,304 | 10,236,377 | 8,987,647 |
| Y 2023 | 8,433,278 | 7,018,388 | 10,338,935 | 9,049,155 |
| Y 2024 | 8,496,418 | 7,059,724 | 10,433,512 | 9,105,836 |
| Y 2025 | 8,554,289 | 7,097,379 | 10,520,439 | 9,157,952 |
| Y 2026 | 8,607,310 | 7,131,727 | 10,600,290 | 9,205,814 |
| Y 2027 | 8,655,436 | 7,162,657 | 10,673,108 | 9,249,267 |
| Y 2028 | 8,698,911 | 7,190,413 | 10,739,290 | 9,288,487 |
| Y 2029 | 8,739,056 | 7,216,053 | 10,800,379 | 9,324,951 |
| Y 2030 | 8,775,256 | 7,239,047 | 10,855,759 | 9,357,733 |
| Y 2031 | 8,808,347 | 7,260,034 | 10,906,465 | 9,387,694 |
| Y 2032 | 8,838,947 | 7,279,545 | 10,953,313 | 9,415,406 |

Table 3.1.2. Required MSRA evaluations using SPR 26% reference points for Gulf of Mexico red snapper. Yield (retained) is in lbs whole weight. Run 1 = Base Model, Run 2 = M High, Run 3 = M Low, Run 16 = Index CV =0.1.

| Criteria | Definition | Run 1 | Run 2 | Run 3 | Run 16 |
|---|---|---|---|---|---|
| **Base M** | | 0.09 | 0.09 | 0.09 | 0.09 |
| **Steepness** | | 0.99 | 0.99 | 0.99 | 0.99 |
| **Virgin Recruitment** | | 1.63E+05 | 1.09E+06 | 5.15E+04 | 1.74E+05 |
| **SSB unfished (eggs)** | | 4.72E+12 | 3.49E+12 | 7.38E+12 | 5.02E+12 |
| **SPR** | | 0.26 | 0.26 | 0.26 | 0.26 |
| | **Mortality Rate Criteria** | | | | |
| **$F_{MSY\ or\ proxy}$** | $F_{SPR26\%}$ | 0.078 | 0.015 | 0.138 | 0.085 |
| **MFMT** | $F_{SPR26\%}$ | 0.078 | 0.015 | 0.138 | 0.085 |
| **$F_{CURRENT}$** | $F_{2009-F2011}$ | 0.054 | 0.010 | 0.113 | 0.057 |
| **$F_{CURRENT}$**/MFMT | $F_{2009-F2011}$ | 0.695 | 0.630 | 0.821 | 0.664 |
| | **Biomass Criteria** | | | | |
| **$SSB_{MSY\ or\ proxy}$** | Equilibrium SSB @ $F_{SPR26\%}$ | 1.22E+12 | 9.01E+11 | 1.91E+12 | 1.30E+12 |
| **MSST** | (1-M)*$SSB_{SPR26\%}$ | 1.11E+12 | 8.24E+11 | 1.74E+12 | 1.18E+12 |
| **$SSB_{CURRENT}$** | $SSB_{2011}$ | 4.46E+11 | 4.51E+11 | 4.95E+11 | 5.03E+11 |
| **$SS_{CURRENT}$/MSST** | $SSB_{2011}$ | 0.400 | 0.547 | 0.284 | 0.425 |
| **OFL** | Annual Yield (lbs)@ MFMT | | | | |
| | OFL 2013 | 15,901,868 | 14,921,460 | 16,058,836 | 18,972,236 |
| | OFL 2014 | 13,477,095 | 12,238,198 | 14,306,884 | 16,236,416 |
| | OFL 2015 | 11,731,095 | 10,388,097 | 13,027,643 | 13,964,774 |
| | OFL 2016 | 10,800,578 | 9,400,877 | 12,423,384 | 11,990,202 |
| | OFL 2017 | 10,626,238 | 9,137,824 | 12,508,349 | 11,308,562 |
| | OFL 2018 | 10,759,991 | 9,183,790 | 12,823,100 | 11,347,473 |
| | OFL 2019 | 10,834,044 | 9,199,311 | 12,997,572 | 11,255,938 |
| | OFL 2020 | 11,006,289 | 9,309,607 | 13,281,194 | 11,540,398 |
| | OFL 2021 | 11,134,156 | 9,390,075 | 13,487,985 | 11,764,385 |
| | OFL 2022 | 11,181,621 | 9,409,630 | 13,573,458 | 11,821,969 |
| | OFL 2023 | 11,224,368 | 9,427,333 | 13,660,694 | 11,867,516 |
| | OFL 2024 | 11,263,478 | 9,443,118 | 13,740,941 | 11,909,514 |
| | OFL 2025 | 11,298,818 | 9,456,852 | 13,814,222 | 11,947,675 |
| | OFL 2026 | 11,330,762 | 9,468,867 | 13,881,043 | 11,982,155 |
| | OFL 2027 | 11,359,047 | 9,478,942 | 13,941,361 | 12,012,711 |
| | OFL 2028 | 11,384,158 | 9,487,430 | 13,995,727 | 12,039,762 |
| | OFL 2029 | 11,407,570 | 9,495,565 | 14,045,970 | 12,064,938 |
| | OFL 2030 | 11,428,580 | 9,502,686 | 14,091,406 | 12,087,337 |
| | OFL 2031 | 11,447,804 | 9,509,300 | 14,132,941 | 12,107,685 |
| | OFL 2032 | 11,465,750 | 9,515,671 | 14,171,323 | 12,126,402 |
| **Annual OY (ACT)** | Annual Yield @ $F_{OY}$ | | | | |
| | OY 2013 | 12,338,595 | 11,592,206 | 12,409,407 | 14,781,446 |
| | OY 2014 | 11,137,154 | 10,153,175 | 11,680,566 | 13,603,396 |
| | OY 2015 | 10,086,001 | 8,978,498 | 11,011,580 | 12,334,142 |

| | | | | | |
|---|---|---|---|---|---|
| | OY 2016 | 9,428,016 | 8,251,465 | 10,648,042 | 10,804,480 |
| | OY 2017 | 9,332,447 | 8,070,666 | 10,795,309 | 10,240,389 |
| | OY 2018 | 9,488,025 | 8,145,446 | 11,121,810 | 10,337,590 |
| | OY 2019 | 9,586,571 | 8,188,149 | 11,317,733 | 10,229,917 |
| | OY 2020 | 9,807,031 | 8,343,573 | 11,646,549 | 10,625,092 |
| | OY 2021 | 9,972,442 | 8,459,028 | 11,886,917 | 10,954,922 |
| | OY 2022 | 10,036,331 | 8,495,492 | 11,983,654 | 11,038,873 |
| | OY 2023 | 10,094,312 | 8,528,826 | 12,081,869 | 11,099,632 |
| | OY 2024 | 10,147,443 | 8,559,073 | 12,172,192 | 11,155,893 |
| | OY 2025 | 10,195,746 | 8,586,189 | 12,254,842 | 11,207,591 |
| | OY 2026 | 10,239,662 | 8,610,594 | 12,330,438 | 11,254,968 |
| | OY 2027 | 10,279,080 | 8,632,133 | 12,398,979 | 11,297,715 |
| | OY 2028 | 10,314,353 | 8,651,093 | 12,460,972 | 11,336,119 |
| | OY 2029 | 10,346,959 | 8,668,686 | 12,518,138 | 11,371,856 |
| | OY 2030 | 10,376,236 | 8,684,338 | 12,569,858 | 11,403,933 |
| | OY 2031 | 10,402,978 | 8,698,624 | 12,617,102 | 11,433,210 |
| | OY 2032 | 10,427,736 | 8,711,984 | 12,660,731 | 11,460,216 |
| **Annual Yield** | Annual Yield @ $F_{REBUILD}$ | | | | |
| | OY 2013 | 13,699,428 | 14,277,100 | 13,217,305 | 16,476,387 |
| | OY 2014 | 12,073,823 | 11,865,620 | 12,291,681 | 14,688,941 |
| | OY 2015 | 10,766,737 | 10,151,963 | 11,496,901 | 13,005,156 |
| | OY 2016 | 10,001,278 | 9,212,847 | 11,079,989 | 11,265,749 |
| | OY 2017 | 9,874,139 | 8,965,667 | 11,214,139 | 10,614,929 |
| | OY 2018 | 10,022,619 | 9,019,041 | 11,540,001 | 10,650,533 |
| | OY 2019 | 10,113,117 | 9,041,439 | 11,732,705 | 10,524,760 |
| | OY 2020 | 10,316,514 | 9,161,899 | 12,053,342 | 10,851,548 |
| | OY 2021 | 10,468,367 | 9,249,995 | 12,287,426 | 11,120,421 |
| | OY 2022 | 10,526,524 | 9,273,319 | 12,382,246 | 11,185,479 |
| | OY 2023 | 10,579,148 | 9,294,373 | 12,478,587 | 11,237,133 |
| | OY 2024 | 10,627,318 | 9,313,267 | 12,567,168 | 11,284,708 |
| | OY 2025 | 10,671,014 | 9,329,867 | 12,648,187 | 11,328,139 |
| | OY 2026 | 10,710,674 | 9,344,528 | 12,722,240 | 11,367,579 |
| | OY 2027 | 10,746,080 | 9,357,006 | 12,789,303 | 11,402,853 |
| | OY 2028 | 10,777,694 | 9,367,720 | 12,849,886 | 11,434,246 |
| | OY 2029 | 10,806,971 | 9,377,839 | 12,905,795 | 11,463,435 |
| | OY 2030 | 10,833,250 | 9,386,746 | 12,956,324 | 11,489,471 |
| | OY 2031 | 10,857,258 | 9,394,969 | 13,002,510 | 11,513,193 |
| | OY 2032 | 10,879,525 | 9,402,795 | 13,045,169 | 11,535,018 |
| **Annual Yield** | Annual Yield @ $F_{CURRENT}$ | | | | |
| | Y 2013 | 8,712,954 | 7,993,108 | 9,362,892 | 10,317,704 |
| | Y 2014 | 8,354,795 | 7,487,108 | 9,198,517 | 10,159,723 |
| | Y 2015 | 7,892,953 | 6,936,267 | 8,935,861 | 9,712,916 |
| | Y 2016 | 7,538,277 | 6,519,597 | 8,779,665 | 8,718,840 |
| | Y 2017 | 7,545,729 | 6,443,671 | 8,985,751 | 8,285,019 |
| | Y 2018 | 7,724,918 | 6,540,806 | 9,319,395 | 8,343,221 |

| | | | | |
|---|---|---|---|---|
| Y 2019 | 7,846,701 | 6,602,667 | 9,532,580 | 8,149,282 |
| Y 2020 | 8,096,834 | 6,785,097 | 9,877,556 | 8,546,330 |
| Y 2021 | 8,287,753 | 6,924,208 | 10,132,143 | 8,908,215 |
| Y 2022 | 8,364,715 | 6,973,304 | 10,236,377 | 8,987,647 |
| Y 2023 | 8,433,278 | 7,018,388 | 10,338,935 | 9,049,155 |
| Y 2024 | 8,496,418 | 7,059,724 | 10,433,512 | 9,105,836 |
| Y 2025 | 8,554,289 | 7,097,379 | 10,520,439 | 9,157,952 |
| Y 2026 | 8,607,310 | 7,131,727 | 10,600,290 | 9,205,814 |
| Y 2027 | 8,655,436 | 7,162,657 | 10,673,108 | 9,249,267 |
| Y 2028 | 8,698,911 | 7,190,413 | 10,739,290 | 9,288,487 |
| Y 2029 | 8,739,056 | 7,216,053 | 10,800,379 | 9,324,951 |
| Y 2030 | 8,775,256 | 7,239,047 | 10,855,759 | 9,357,733 |
| Y 2031 | 8,808,347 | 7,260,034 | 10,906,465 | 9,387,694 |
| Y 2032 | 8,838,947 | 7,279,545 | 10,953,313 | 9,415,406 |

Table 3.1.3. Stock status, in terms of exploitation rate (F/MFMT) and biomass (SSB/MSST), and SPR for the four model configurations and four fishing mortality scenarios related to MAX benchmarks ($F_{CURRENT}$, $F_{REBUILD}$, $F_{MAX}$, $F_{OY}$). Run 1 = Base Model, Run 2 = M High, Run 3 = M Low, Run 16 = Index CV =0.1.

| | | Run 1 | | | Run 2 | | | Run 3 | | | Run 16 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Fscenario | F/MFMT | SSB/MSST | SPR | F/MFMT | SSB/MSST | SPR | F/MFMT | SSB/MSST | SPR | F/MFMT | SSB/MSST | SPR |
| 2013 | Fcurrent | 0.56 | 0.73 | 0.13 | 0.33 | 1.74 | 0.18 | 0.79 | 0.42 | 0.10 | 0.55 | 0.77 | 0.14 |
| 2014 | Fcurrent | 0.54 | 0.82 | 0.15 | 0.32 | 1.94 | 0.20 | 0.77 | 0.48 | 0.11 | 0.53 | 0.86 | 0.16 |
| 2015 | Fcurrent | 0.54 | 0.91 | 0.17 | 0.32 | 2.12 | 0.21 | 0.75 | 0.54 | 0.13 | 0.52 | 0.94 | 0.18 |
| 2016 | Fcurrent | 0.53 | 1.00 | 0.18 | 0.31 | 2.28 | 0.23 | 0.74 | 0.61 | 0.14 | 0.52 | 1.02 | 0.19 |
| 2017 | Fcurrent | 0.53 | 1.08 | 0.20 | 0.31 | 2.45 | 0.25 | 0.73 | 0.67 | 0.16 | 0.51 | 1.10 | 0.21 |
| 2018 | Fcurrent | 0.53 | 1.17 | 0.22 | 0.32 | 2.61 | 0.26 | 0.73 | 0.74 | 0.17 | 0.51 | 1.19 | 0.22 |
| 2019 | Fcurrent | 0.53 | 1.26 | 0.23 | 0.32 | 2.76 | 0.28 | 0.72 | 0.80 | 0.19 | 0.51 | 1.27 | 0.24 |
| 2020 | Fcurrent | 0.53 | 1.34 | 0.25 | 0.32 | 2.90 | 0.29 | 0.72 | 0.86 | 0.20 | 0.51 | 1.35 | 0.25 |
| 2021 | Fcurrent | 0.53 | 1.41 | 0.26 | 0.32 | 3.03 | 0.31 | 0.72 | 0.92 | 0.22 | 0.51 | 1.43 | 0.27 |
| 2022 | Fcurrent | 0.53 | 1.48 | 0.27 | 0.32 | 3.14 | 0.32 | 0.71 | 0.97 | 0.23 | 0.51 | 1.49 | 0.28 |
| 2023 | Fcurrent | 0.53 | 1.54 | 0.28 | 0.32 | 3.25 | 0.33 | 0.71 | 1.03 | 0.24 | 0.51 | 1.56 | 0.29 |
| 2024 | Fcurrent | 0.53 | 1.60 | 0.30 | 0.32 | 3.35 | 0.34 | 0.70 | 1.07 | 0.25 | 0.51 | 1.61 | 0.30 |
| 2025 | Fcurrent | 0.53 | 1.65 | 0.31 | 0.32 | 3.44 | 0.35 | 0.70 | 1.12 | 0.26 | 0.51 | 1.67 | 0.31 |
| 2026 | Fcurrent | 0.53 | 1.71 | 0.31 | 0.32 | 3.53 | 0.36 | 0.70 | 1.16 | 0.27 | 0.51 | 1.72 | 0.32 |
| 2027 | Fcurrent | 0.53 | 1.75 | 0.32 | 0.32 | 3.60 | 0.36 | 0.69 | 1.20 | 0.28 | 0.51 | 1.76 | 0.33 |
| 2028 | Fcurrent | 0.53 | 1.79 | 0.33 | 0.32 | 3.67 | 0.37 | 0.69 | 1.23 | 0.29 | 0.51 | 1.80 | 0.34 |
| 2029 | Fcurrent | 0.53 | 1.83 | 0.34 | 0.32 | 3.74 | 0.38 | 0.69 | 1.27 | 0.30 | 0.51 | 1.84 | 0.34 |
| 2030 | Fcurrent | 0.53 | 1.87 | 0.35 | 0.32 | 3.80 | 0.38 | 0.69 | 1.30 | 0.31 | 0.51 | 1.88 | 0.35 |
| 2031 | Fcurrent | 0.53 | 1.90 | 0.35 | 0.32 | 3.85 | 0.39 | 0.69 | 1.33 | 0.31 | 0.51 | 1.91 | 0.36 |
| 2032 | Fcurrent | 0.53 | 1.93 | 0.36 | 0.32 | 3.90 | 0.39 | 0.68 | 1.35 | 0.32 | 0.51 | 1.94 | 0.36 |
| 2013 | Frebuild | 0.70 | 0.73 | 0.13 | 0.48 | 1.74 | 0.18 | 0.88 | 0.42 | 0.10 | 0.69 | 0.77 | 0.14 |
| 2014 | Frebuild | 0.66 | 0.75 | 0.14 | 0.42 | 1.57 | 0.16 | 0.85 | 0.47 | 0.11 | 0.65 | 0.77 | 0.14 |
| 2015 | Frebuild | 0.64 | 0.77 | 0.14 | 0.41 | 1.48 | 0.15 | 0.83 | 0.51 | 0.12 | 0.63 | 0.78 | 0.15 |
| 2016 | Frebuild | 0.64 | 0.80 | 0.15 | 0.40 | 1.44 | 0.15 | 0.82 | 0.56 | 0.13 | 0.63 | 0.80 | 0.15 |
| 2017 | Frebuild | 0.64 | 0.83 | 0.15 | 0.40 | 1.42 | 0.14 | 0.82 | 0.61 | 0.14 | 0.62 | 0.83 | 0.15 |
| 2018 | Frebuild | 0.64 | 0.86 | 0.16 | 0.40 | 1.40 | 0.14 | 0.82 | 0.66 | 0.15 | 0.62 | 0.86 | 0.16 |
| 2019 | Frebuild | 0.64 | 0.89 | 0.16 | 0.40 | 1.38 | 0.14 | 0.81 | 0.70 | 0.17 | 0.62 | 0.89 | 0.17 |
| 2020 | Frebuild | 0.64 | 0.92 | 0.17 | 0.40 | 1.35 | 0.14 | 0.81 | 0.75 | 0.18 | 0.62 | 0.92 | 0.17 |
| 2021 | Frebuild | 0.64 | 0.94 | 0.17 | 0.40 | 1.33 | 0.13 | 0.81 | 0.79 | 0.19 | 0.62 | 0.94 | 0.18 |
| 2022 | Frebuild | 0.64 | 0.96 | 0.18 | 0.40 | 1.30 | 0.13 | 0.80 | 0.83 | 0.19 | 0.62 | 0.96 | 0.18 |
| 2023 | Frebuild | 0.64 | 0.98 | 0.18 | 0.40 | 1.28 | 0.13 | 0.80 | 0.86 | 0.20 | 0.62 | 0.98 | 0.18 |
| 2024 | Frebuild | 0.64 | 1.00 | 0.18 | 0.40 | 1.26 | 0.13 | 0.80 | 0.90 | 0.21 | 0.62 | 1.00 | 0.19 |
| 2025 | Frebuild | 0.64 | 1.02 | 0.19 | 0.40 | 1.24 | 0.12 | 0.79 | 0.93 | 0.22 | 0.62 | 1.02 | 0.19 |
| 2026 | Frebuild | 0.64 | 1.03 | 0.19 | 0.40 | 1.22 | 0.12 | 0.79 | 0.96 | 0.23 | 0.62 | 1.03 | 0.19 |
| 2027 | Frebuild | 0.64 | 1.04 | 0.19 | 0.40 | 1.20 | 0.12 | 0.79 | 0.98 | 0.23 | 0.62 | 1.04 | 0.20 |
| 2028 | Frebuild | 0.64 | 1.06 | 0.19 | 0.40 | 1.18 | 0.12 | 0.79 | 1.01 | 0.24 | 0.62 | 1.06 | 0.20 |
| 2029 | Frebuild | 0.64 | 1.07 | 0.20 | 0.40 | 1.17 | 0.12 | 0.78 | 1.03 | 0.24 | 0.62 | 1.07 | 0.20 |
| 2030 | Frebuild | 0.64 | 1.08 | 0.20 | 0.40 | 1.16 | 0.12 | 0.78 | 1.05 | 0.25 | 0.62 | 1.08 | 0.20 |
| 2031 | Frebuild | 0.64 | 1.09 | 0.20 | 0.40 | 1.14 | 0.12 | 0.78 | 1.07 | 0.25 | 0.62 | 1.09 | 0.20 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2032 | Frebuild | 0.64 | 1.09 | 0.20 | 0.40 | 1.13 | 0.11 | 0.78 | 1.09 | 0.26 | 0.62 | 1.09 | 0.20 |
| 2013 | FMAX | 0.71 | 0.73 | 0.13 | 0.48 | 1.74 | 0.18 | 0.93 | 0.42 | 0.10 | 0.70 | 0.77 | 0.14 |
| 2014 | FMAX | 0.67 | 0.74 | 0.14 | 0.42 | 1.58 | 0.16 | 0.88 | 0.45 | 0.11 | 0.66 | 0.76 | 0.14 |
| 2015 | FMAX | 0.65 | 0.75 | 0.14 | 0.41 | 1.50 | 0.15 | 0.86 | 0.49 | 0.12 | 0.64 | 0.77 | 0.14 |
| 2016 | FMAX | 0.65 | 0.77 | 0.14 | 0.40 | 1.46 | 0.15 | 0.86 | 0.53 | 0.12 | 0.63 | 0.78 | 0.15 |
| 2017 | FMAX | 0.65 | 0.80 | 0.15 | 0.40 | 1.44 | 0.15 | 0.85 | 0.57 | 0.13 | 0.63 | 0.80 | 0.15 |
| 2018 | FMAX | 0.65 | 0.83 | 0.15 | 0.40 | 1.43 | 0.14 | 0.85 | 0.61 | 0.14 | 0.63 | 0.83 | 0.16 |
| 2019 | FMAX | 0.65 | 0.86 | 0.16 | 0.40 | 1.40 | 0.14 | 0.85 | 0.65 | 0.15 | 0.63 | 0.86 | 0.16 |
| 2020 | FMAX | 0.65 | 0.88 | 0.16 | 0.40 | 1.38 | 0.14 | 0.84 | 0.68 | 0.16 | 0.63 | 0.89 | 0.17 |
| 2021 | FMAX | 0.65 | 0.90 | 0.17 | 0.40 | 1.36 | 0.14 | 0.84 | 0.72 | 0.17 | 0.63 | 0.91 | 0.17 |
| 2022 | FMAX | 0.65 | 0.92 | 0.17 | 0.40 | 1.33 | 0.13 | 0.84 | 0.75 | 0.18 | 0.63 | 0.93 | 0.17 |
| 2023 | FMAX | 0.65 | 0.93 | 0.17 | 0.40 | 1.31 | 0.13 | 0.84 | 0.78 | 0.18 | 0.63 | 0.94 | 0.18 |
| 2024 | FMAX | 0.65 | 0.95 | 0.17 | 0.40 | 1.29 | 0.13 | 0.83 | 0.80 | 0.19 | 0.63 | 0.96 | 0.18 |
| 2025 | FMAX | 0.65 | 0.96 | 0.18 | 0.40 | 1.27 | 0.13 | 0.83 | 0.83 | 0.20 | 0.63 | 0.97 | 0.18 |
| 2026 | FMAX | 0.65 | 0.97 | 0.18 | 0.40 | 1.25 | 0.13 | 0.83 | 0.85 | 0.20 | 0.63 | 0.98 | 0.18 |
| 2027 | FMAX | 0.65 | 0.98 | 0.18 | 0.40 | 1.24 | 0.12 | 0.83 | 0.87 | 0.21 | 0.63 | 1.00 | 0.19 |
| 2028 | FMAX | 0.65 | 0.99 | 0.18 | 0.40 | 1.22 | 0.12 | 0.83 | 0.89 | 0.21 | 0.63 | 1.01 | 0.19 |
| 2029 | FMAX | 0.65 | 1.00 | 0.18 | 0.40 | 1.21 | 0.12 | 0.82 | 0.91 | 0.21 | 0.63 | 1.01 | 0.19 |
| 2030 | FMAX | 0.65 | 1.01 | 0.19 | 0.40 | 1.19 | 0.12 | 0.82 | 0.93 | 0.22 | 0.63 | 1.02 | 0.19 |
| 2031 | FMAX | 0.65 | 1.01 | 0.19 | 0.40 | 1.18 | 0.12 | 0.82 | 0.94 | 0.22 | 0.63 | 1.03 | 0.19 |
| 2032 | FMAX | 0.65 | 1.02 | 0.19 | 0.40 | 1.17 | 0.12 | 0.82 | 0.95 | 0.22 | 0.63 | 1.04 | 0.19 |
| 2013 | FOY | 0.67 | 0.73 | 0.13 | 0.44 | 1.74 | 0.18 | 0.87 | 0.42 | 0.10 | 0.54 | 0.77 | 0.14 |
| 2014 | FOY | 0.64 | 0.77 | 0.14 | 0.41 | 1.68 | 0.17 | 0.84 | 0.47 | 0.11 | 0.51 | 0.80 | 0.15 |
| 2015 | FOY | 0.63 | 0.81 | 0.15 | 0.39 | 1.66 | 0.17 | 0.82 | 0.52 | 0.12 | 0.49 | 0.83 | 0.16 |
| 2016 | FOY | 0.62 | 0.86 | 0.16 | 0.39 | 1.66 | 0.17 | 0.81 | 0.57 | 0.13 | 0.49 | 0.87 | 0.16 |
| 2017 | FOY | 0.62 | 0.90 | 0.17 | 0.39 | 1.67 | 0.17 | 0.80 | 0.62 | 0.15 | 0.49 | 0.91 | 0.17 |
| 2018 | FOY | 0.62 | 0.95 | 0.18 | 0.39 | 1.69 | 0.17 | 0.80 | 0.67 | 0.16 | 0.49 | 0.96 | 0.18 |
| 2019 | FOY | 0.62 | 1.00 | 0.18 | 0.39 | 1.69 | 0.17 | 0.80 | 0.73 | 0.17 | 0.49 | 1.01 | 0.19 |
| 2020 | FOY | 0.62 | 1.04 | 0.19 | 0.39 | 1.70 | 0.17 | 0.79 | 0.77 | 0.18 | 0.49 | 1.06 | 0.20 |
| 2021 | FOY | 0.62 | 1.07 | 0.20 | 0.39 | 1.70 | 0.17 | 0.79 | 0.82 | 0.19 | 0.49 | 1.10 | 0.21 |
| 2022 | FOY | 0.62 | 1.10 | 0.20 | 0.39 | 1.70 | 0.17 | 0.79 | 0.86 | 0.20 | 0.49 | 1.13 | 0.21 |
| 2023 | FOY | 0.62 | 1.13 | 0.21 | 0.39 | 1.69 | 0.17 | 0.78 | 0.90 | 0.21 | 0.49 | 1.17 | 0.22 |
| 2024 | FOY | 0.62 | 1.16 | 0.21 | 0.39 | 1.69 | 0.17 | 0.78 | 0.94 | 0.22 | 0.49 | 1.20 | 0.22 |
| 2025 | FOY | 0.62 | 1.19 | 0.22 | 0.39 | 1.69 | 0.17 | 0.78 | 0.97 | 0.23 | 0.49 | 1.23 | 0.23 |
| 2026 | FOY | 0.62 | 1.21 | 0.22 | 0.39 | 1.68 | 0.17 | 0.77 | 1.00 | 0.24 | 0.49 | 1.25 | 0.23 |
| 2027 | FOY | 0.62 | 1.23 | 0.23 | 0.39 | 1.68 | 0.17 | 0.77 | 1.03 | 0.24 | 0.49 | 1.28 | 0.24 |
| 2028 | FOY | 0.62 | 1.25 | 0.23 | 0.39 | 1.68 | 0.17 | 0.77 | 1.06 | 0.25 | 0.49 | 1.30 | 0.24 |
| 2029 | FOY | 0.62 | 1.27 | 0.23 | 0.39 | 1.67 | 0.17 | 0.77 | 1.09 | 0.26 | 0.48 | 1.32 | 0.25 |
| 2030 | FOY | 0.62 | 1.28 | 0.24 | 0.39 | 1.67 | 0.17 | 0.76 | 1.11 | 0.26 | 0.48 | 1.34 | 0.25 |
| 2031 | FOY | 0.62 | 1.30 | 0.24 | 0.39 | 1.67 | 0.17 | 0.76 | 1.13 | 0.27 | 0.48 | 1.36 | 0.25 |
| 2032 | FOY | 0.62 | 1.31 | 0.24 | 0.39 | 1.67 | 0.17 | 0.76 | 1.15 | 0.27 | 0.48 | 1.37 | 0.26 |

Table 3.1.4. Stock status, in terms of exploitation rate (F/MFMT) and biomass (SSB/MSST), and SPR for the four model configurations and four fishing mortality scenarios related to SPR26% benchmarks ($F_{CURRENT}$, $F_{REBUILD}$, $F_{SPR26\%}$, $F_{OY}$). Run 1 = Base Model, Run 2 = M High, Run 3 = M Low, Run 16 = Index CV =0.1.

| | | Run 1 | | | Run 2 | | | Run 3 | | | Run 16 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Fscenario | F/MFMT | SSB/MSST | SPR | F/MFMT | SSB/MSST | SPR | F/MFMT | SSB/MSST | SPR | F/MFMT | SSB/MSST | SPR |
| 2013 | Fcurrent | 0.67 | 0.57 | 0.13 | 0.59 | 0.74 | 0.18 | 0.80 | 0.42 | 0.10 | 0.65 | 0.61 | 0.14 |
| 2014 | Fcurrent | 0.65 | 0.64 | 0.15 | 0.58 | 0.83 | 0.20 | 0.77 | 0.48 | 0.11 | 0.63 | 0.68 | 0.16 |
| 2015 | Fcurrent | 0.65 | 0.71 | 0.17 | 0.57 | 0.90 | 0.21 | 0.75 | 0.54 | 0.13 | 0.62 | 0.75 | 0.18 |
| 2016 | Fcurrent | 0.64 | 0.78 | 0.18 | 0.57 | 0.98 | 0.23 | 0.74 | 0.60 | 0.14 | 0.62 | 0.81 | 0.19 |
| 2017 | Fcurrent | 0.64 | 0.85 | 0.20 | 0.57 | 1.05 | 0.25 | 0.74 | 0.67 | 0.16 | 0.61 | 0.88 | 0.21 |
| 2018 | Fcurrent | 0.64 | 0.92 | 0.22 | 0.57 | 1.12 | 0.26 | 0.73 | 0.73 | 0.17 | 0.61 | 0.94 | 0.22 |
| 2019 | Fcurrent | 0.64 | 0.98 | 0.23 | 0.57 | 1.18 | 0.28 | 0.73 | 0.80 | 0.19 | 0.61 | 1.01 | 0.24 |
| 2020 | Fcurrent | 0.64 | 1.05 | 0.25 | 0.57 | 1.24 | 0.29 | 0.72 | 0.86 | 0.20 | 0.61 | 1.07 | 0.25 |
| 2021 | Fcurrent | 0.64 | 1.10 | 0.26 | 0.57 | 1.30 | 0.31 | 0.72 | 0.92 | 0.22 | 0.61 | 1.13 | 0.27 |
| 2022 | Fcurrent | 0.64 | 1.16 | 0.27 | 0.57 | 1.34 | 0.32 | 0.71 | 0.97 | 0.23 | 0.61 | 1.18 | 0.28 |
| 2023 | Fcurrent | 0.64 | 1.21 | 0.28 | 0.57 | 1.39 | 0.33 | 0.71 | 1.02 | 0.24 | 0.61 | 1.23 | 0.29 |
| 2024 | Fcurrent | 0.64 | 1.25 | 0.30 | 0.57 | 1.43 | 0.34 | 0.71 | 1.07 | 0.25 | 0.61 | 1.28 | 0.30 |
| 2025 | Fcurrent | 0.64 | 1.29 | 0.31 | 0.57 | 1.47 | 0.35 | 0.70 | 1.12 | 0.26 | 0.61 | 1.32 | 0.31 |
| 2026 | Fcurrent | 0.64 | 1.33 | 0.31 | 0.57 | 1.51 | 0.36 | 0.70 | 1.16 | 0.27 | 0.61 | 1.36 | 0.32 |
| 2027 | Fcurrent | 0.64 | 1.37 | 0.32 | 0.57 | 1.54 | 0.36 | 0.70 | 1.20 | 0.28 | 0.61 | 1.40 | 0.33 |
| 2028 | Fcurrent | 0.64 | 1.41 | 0.33 | 0.57 | 1.57 | 0.37 | 0.69 | 1.23 | 0.29 | 0.61 | 1.43 | 0.34 |
| 2029 | Fcurrent | 0.63 | 1.44 | 0.34 | 0.57 | 1.60 | 0.38 | 0.69 | 1.27 | 0.30 | 0.60 | 1.46 | 0.34 |
| 2030 | Fcurrent | 0.63 | 1.46 | 0.35 | 0.57 | 1.62 | 0.38 | 0.69 | 1.30 | 0.31 | 0.60 | 1.49 | 0.35 |
| 2031 | Fcurrent | 0.63 | 1.49 | 0.35 | 0.57 | 1.65 | 0.39 | 0.69 | 1.32 | 0.31 | 0.60 | 1.52 | 0.36 |
| 2032 | Fcurrent | 0.63 | 1.51 | 0.36 | 0.57 | 1.67 | 0.39 | 0.68 | 1.35 | 0.32 | 0.60 | 1.54 | 0.36 |
| 2013 | Frebuild | 0.79 | 0.57 | 0.13 | 0.73 | 0.74 | 0.18 | 0.88 | 0.42 | 0.10 | 0.77 | 0.61 | 0.14 |
| 2014 | Frebuild | 0.76 | 0.61 | 0.14 | 0.69 | 0.78 | 0.18 | 0.85 | 0.47 | 0.11 | 0.74 | 0.64 | 0.15 |
| 2015 | Frebuild | 0.74 | 0.65 | 0.15 | 0.68 | 0.80 | 0.19 | 0.83 | 0.51 | 0.12 | 0.73 | 0.67 | 0.16 |
| 2016 | Frebuild | 0.74 | 0.69 | 0.16 | 0.67 | 0.83 | 0.20 | 0.82 | 0.56 | 0.13 | 0.72 | 0.71 | 0.17 |
| 2017 | Frebuild | 0.74 | 0.74 | 0.17 | 0.68 | 0.86 | 0.20 | 0.82 | 0.61 | 0.14 | 0.71 | 0.74 | 0.18 |
| 2018 | Frebuild | 0.74 | 0.78 | 0.18 | 0.68 | 0.90 | 0.21 | 0.81 | 0.66 | 0.16 | 0.71 | 0.79 | 0.19 |
| 2019 | Frebuild | 0.74 | 0.82 | 0.19 | 0.68 | 0.92 | 0.22 | 0.81 | 0.71 | 0.17 | 0.71 | 0.83 | 0.19 |
| 2020 | Frebuild | 0.74 | 0.85 | 0.20 | 0.68 | 0.95 | 0.22 | 0.81 | 0.75 | 0.18 | 0.71 | 0.87 | 0.20 |
| 2021 | Frebuild | 0.74 | 0.89 | 0.21 | 0.68 | 0.97 | 0.23 | 0.80 | 0.80 | 0.19 | 0.71 | 0.90 | 0.21 |
| 2022 | Frebuild | 0.74 | 0.92 | 0.22 | 0.68 | 0.99 | 0.23 | 0.80 | 0.83 | 0.20 | 0.71 | 0.93 | 0.22 |
| 2023 | Frebuild | 0.74 | 0.94 | 0.22 | 0.68 | 1.00 | 0.24 | 0.80 | 0.87 | 0.21 | 0.71 | 0.96 | 0.23 |
| 2024 | Frebuild | 0.74 | 0.97 | 0.23 | 0.68 | 1.02 | 0.24 | 0.79 | 0.91 | 0.21 | 0.71 | 0.98 | 0.23 |
| 2025 | Frebuild | 0.74 | 0.99 | 0.23 | 0.68 | 1.03 | 0.24 | 0.79 | 0.94 | 0.22 | 0.71 | 1.00 | 0.24 |
| 2026 | Frebuild | 0.74 | 1.02 | 0.24 | 0.68 | 1.04 | 0.25 | 0.79 | 0.97 | 0.23 | 0.71 | 1.03 | 0.24 |
| 2027 | Frebuild | 0.74 | 1.04 | 0.24 | 0.68 | 1.05 | 0.25 | 0.78 | 0.99 | 0.23 | 0.71 | 1.05 | 0.25 |
| 2028 | Frebuild | 0.74 | 1.05 | 0.25 | 0.68 | 1.06 | 0.25 | 0.78 | 1.02 | 0.24 | 0.71 | 1.06 | 0.25 |
| 2029 | Frebuild | 0.74 | 1.07 | 0.25 | 0.68 | 1.07 | 0.25 | 0.78 | 1.04 | 0.25 | 0.71 | 1.08 | 0.25 |
| 2030 | Frebuild | 0.74 | 1.08 | 0.26 | 0.68 | 1.08 | 0.25 | 0.78 | 1.06 | 0.25 | 0.71 | 1.09 | 0.26 |
| 2031 | Frebuild | 0.74 | 1.10 | 0.26 | 0.68 | 1.09 | 0.26 | 0.78 | 1.08 | 0.26 | 0.71 | 1.11 | 0.26 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2032 | Frebuild | 0.74 | 1.11 | 0.26 | 0.68 | 1.09 | 0.26 | 0.78 | 1.10 | 0.26 | 0.71 | 1.12 | 0.26 |
| 2013 | FSPR26 | 0.81 | 0.57 | 0.13 | 0.75 | 0.74 | 0.18 | 0.93 | 0.42 | 0.10 | 0.80 | 0.61 | 0.14 |
| 2014 | FSPR26 | 0.78 | 0.60 | 0.14 | 0.72 | 0.77 | 0.18 | 0.88 | 0.45 | 0.11 | 0.76 | 0.63 | 0.15 |
| 2015 | FSPR26 | 0.76 | 0.63 | 0.15 | 0.70 | 0.79 | 0.19 | 0.86 | 0.49 | 0.12 | 0.74 | 0.65 | 0.15 |
| 2016 | FSPR26 | 0.76 | 0.66 | 0.15 | 0.70 | 0.82 | 0.19 | 0.86 | 0.53 | 0.12 | 0.73 | 0.67 | 0.16 |
| 2017 | FSPR26 | 0.76 | 0.69 | 0.16 | 0.70 | 0.85 | 0.20 | 0.85 | 0.57 | 0.13 | 0.73 | 0.70 | 0.17 |
| 2018 | FSPR26 | 0.76 | 0.72 | 0.17 | 0.70 | 0.88 | 0.21 | 0.85 | 0.61 | 0.14 | 0.73 | 0.73 | 0.17 |
| 2019 | FSPR26 | 0.76 | 0.76 | 0.18 | 0.70 | 0.90 | 0.21 | 0.85 | 0.65 | 0.15 | 0.73 | 0.77 | 0.18 |
| 2020 | FSPR26 | 0.76 | 0.78 | 0.18 | 0.70 | 0.92 | 0.22 | 0.85 | 0.68 | 0.16 | 0.73 | 0.80 | 0.19 |
| 2021 | FSPR26 | 0.76 | 0.81 | 0.19 | 0.70 | 0.94 | 0.22 | 0.84 | 0.72 | 0.17 | 0.73 | 0.82 | 0.19 |
| 2022 | FSPR26 | 0.76 | 0.83 | 0.20 | 0.70 | 0.95 | 0.23 | 0.84 | 0.75 | 0.18 | 0.73 | 0.85 | 0.20 |
| 2023 | FSPR26 | 0.76 | 0.85 | 0.20 | 0.70 | 0.97 | 0.23 | 0.84 | 0.78 | 0.18 | 0.73 | 0.87 | 0.20 |
| 2024 | FSPR26 | 0.76 | 0.87 | 0.21 | 0.70 | 0.98 | 0.23 | 0.83 | 0.80 | 0.19 | 0.73 | 0.89 | 0.21 |
| 2025 | FSPR26 | 0.76 | 0.89 | 0.21 | 0.70 | 0.99 | 0.23 | 0.83 | 0.83 | 0.20 | 0.73 | 0.90 | 0.21 |
| 2026 | FSPR26 | 0.76 | 0.90 | 0.21 | 0.70 | 1.00 | 0.24 | 0.83 | 0.85 | 0.20 | 0.73 | 0.92 | 0.22 |
| 2027 | FSPR26 | 0.76 | 0.92 | 0.22 | 0.70 | 1.01 | 0.24 | 0.83 | 0.87 | 0.21 | 0.73 | 0.94 | 0.22 |
| 2028 | FSPR26 | 0.76 | 0.93 | 0.22 | 0.70 | 1.02 | 0.24 | 0.83 | 0.89 | 0.21 | 0.73 | 0.95 | 0.22 |
| 2029 | FSPR26 | 0.76 | 0.94 | 0.22 | 0.70 | 1.03 | 0.24 | 0.82 | 0.91 | 0.21 | 0.73 | 0.96 | 0.23 |
| 2030 | FSPR26 | 0.75 | 0.95 | 0.23 | 0.70 | 1.03 | 0.24 | 0.82 | 0.93 | 0.22 | 0.73 | 0.97 | 0.23 |
| 2031 | FSPR26 | 0.75 | 0.96 | 0.23 | 0.70 | 1.04 | 0.25 | 0.82 | 0.94 | 0.22 | 0.73 | 0.98 | 0.23 |
| 2032 | FSPR26 | 0.75 | 0.97 | 0.23 | 0.70 | 1.05 | 0.25 | 0.82 | 0.95 | 0.23 | 0.73 | 0.99 | 0.23 |
| 2013 | FOY | 0.77 | 0.57 | 0.13 | 0.69 | 0.74 | 0.18 | 0.87 | 0.42 | 0.10 | 0.61 | 0.61 | 0.14 |
| 2014 | FOY | 0.75 | 0.62 | 0.15 | 0.67 | 0.80 | 0.19 | 0.84 | 0.47 | 0.11 | 0.58 | 0.66 | 0.15 |
| 2015 | FOY | 0.73 | 0.67 | 0.16 | 0.66 | 0.85 | 0.20 | 0.82 | 0.52 | 0.12 | 0.57 | 0.70 | 0.16 |
| 2016 | FOY | 0.73 | 0.72 | 0.17 | 0.66 | 0.89 | 0.21 | 0.81 | 0.57 | 0.13 | 0.56 | 0.74 | 0.17 |
| 2017 | FOY | 0.73 | 0.76 | 0.18 | 0.66 | 0.94 | 0.22 | 0.81 | 0.62 | 0.15 | 0.56 | 0.78 | 0.18 |
| 2018 | FOY | 0.73 | 0.81 | 0.19 | 0.66 | 0.98 | 0.23 | 0.80 | 0.67 | 0.16 | 0.56 | 0.83 | 0.20 |
| 2019 | FOY | 0.73 | 0.86 | 0.20 | 0.66 | 1.02 | 0.24 | 0.80 | 0.73 | 0.17 | 0.56 | 0.88 | 0.21 |
| 2020 | FOY | 0.73 | 0.90 | 0.21 | 0.66 | 1.06 | 0.25 | 0.79 | 0.77 | 0.18 | 0.56 | 0.93 | 0.22 |
| 2021 | FOY | 0.73 | 0.94 | 0.22 | 0.66 | 1.10 | 0.26 | 0.79 | 0.82 | 0.19 | 0.56 | 0.97 | 0.23 |
| 2022 | FOY | 0.73 | 0.98 | 0.23 | 0.66 | 1.12 | 0.27 | 0.79 | 0.86 | 0.20 | 0.56 | 1.01 | 0.24 |
| 2023 | FOY | 0.73 | 1.01 | 0.24 | 0.66 | 1.15 | 0.27 | 0.78 | 0.90 | 0.21 | 0.56 | 1.05 | 0.25 |
| 2024 | FOY | 0.73 | 1.04 | 0.24 | 0.66 | 1.18 | 0.28 | 0.78 | 0.94 | 0.22 | 0.56 | 1.08 | 0.26 |
| 2025 | FOY | 0.73 | 1.07 | 0.25 | 0.66 | 1.20 | 0.28 | 0.78 | 0.97 | 0.23 | 0.56 | 1.11 | 0.26 |
| 2026 | FOY | 0.73 | 1.09 | 0.26 | 0.66 | 1.22 | 0.29 | 0.77 | 1.00 | 0.24 | 0.56 | 1.14 | 0.27 |
| 2027 | FOY | 0.73 | 1.12 | 0.26 | 0.66 | 1.24 | 0.29 | 0.77 | 1.03 | 0.24 | 0.56 | 1.17 | 0.28 |
| 2028 | FOY | 0.73 | 1.14 | 0.27 | 0.66 | 1.25 | 0.30 | 0.77 | 1.06 | 0.25 | 0.56 | 1.19 | 0.28 |
| 2029 | FOY | 0.72 | 1.16 | 0.27 | 0.66 | 1.27 | 0.30 | 0.77 | 1.08 | 0.26 | 0.56 | 1.21 | 0.29 |
| 2030 | FOY | 0.72 | 1.17 | 0.28 | 0.66 | 1.28 | 0.30 | 0.77 | 1.11 | 0.26 | 0.56 | 1.23 | 0.29 |
| 2031 | FOY | 0.72 | 1.19 | 0.28 | 0.66 | 1.30 | 0.31 | 0.76 | 1.13 | 0.27 | 0.56 | 1.25 | 0.30 |
| 2032 | FOY | 0.72 | 1.21 | 0.28 | 0.66 | 1.31 | 0.31 | 0.76 | 1.15 | 0.27 | 0.56 | 1.27 | 0.30 |

**7. Figures**

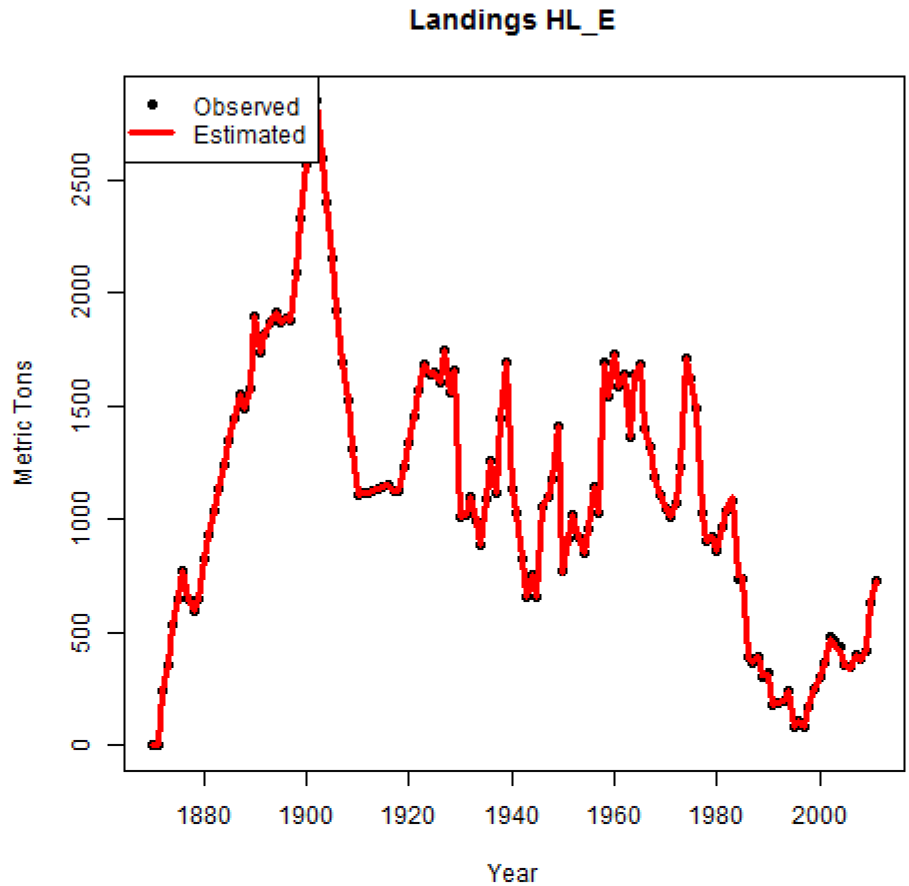



Figure 2.2.1. Observed (black dots) and estimated landings (red line) of red snapper for the commercial handline fishery in the eastern Gulf of Mexico, 1872-2011.

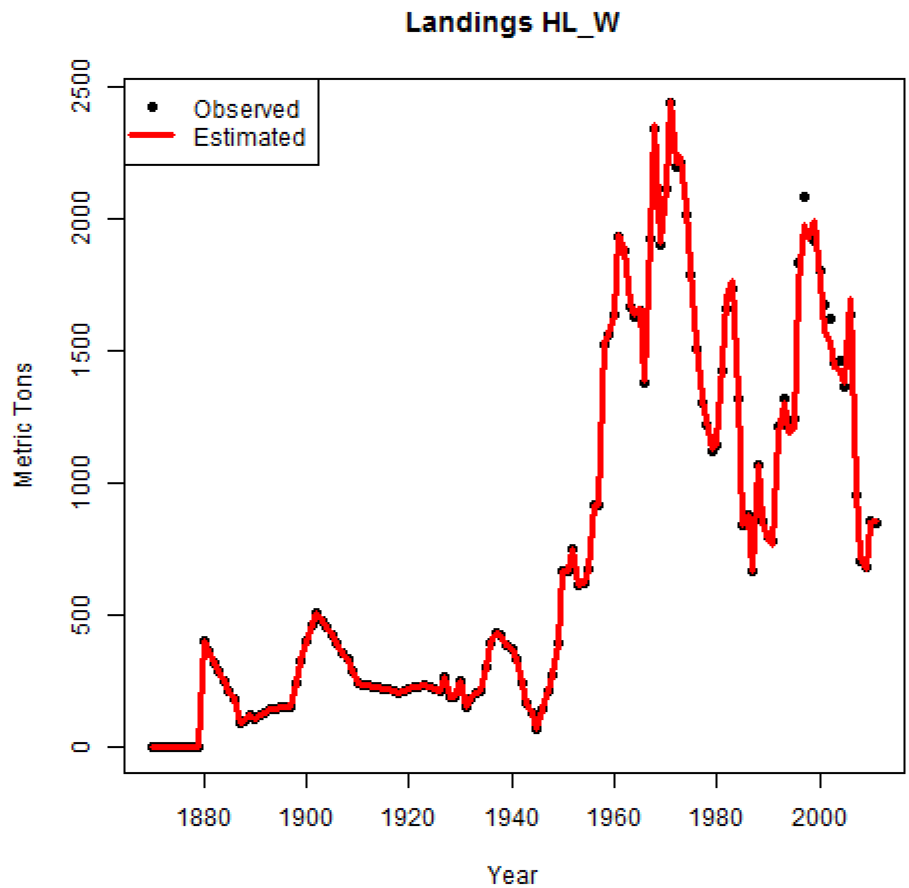



Figure 2.2.2. Observed (black dots) and estimated landings (red line) of red snapper for the commercial handline fishery in the western Gulf of Mexico, 1872-2011.

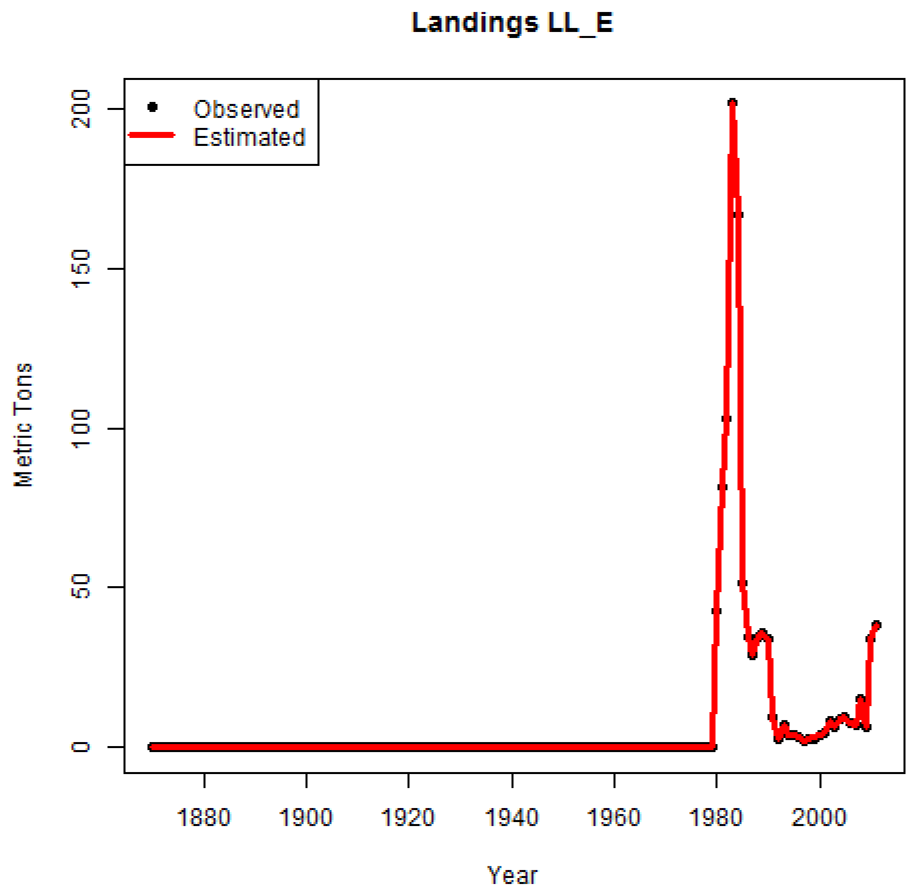



Figure 2.2.3. Observed (black dots) and estimated landings (red line) of red snapper for the commercial longline fishery in the eastern Gulf of Mexico, 1872-2011.

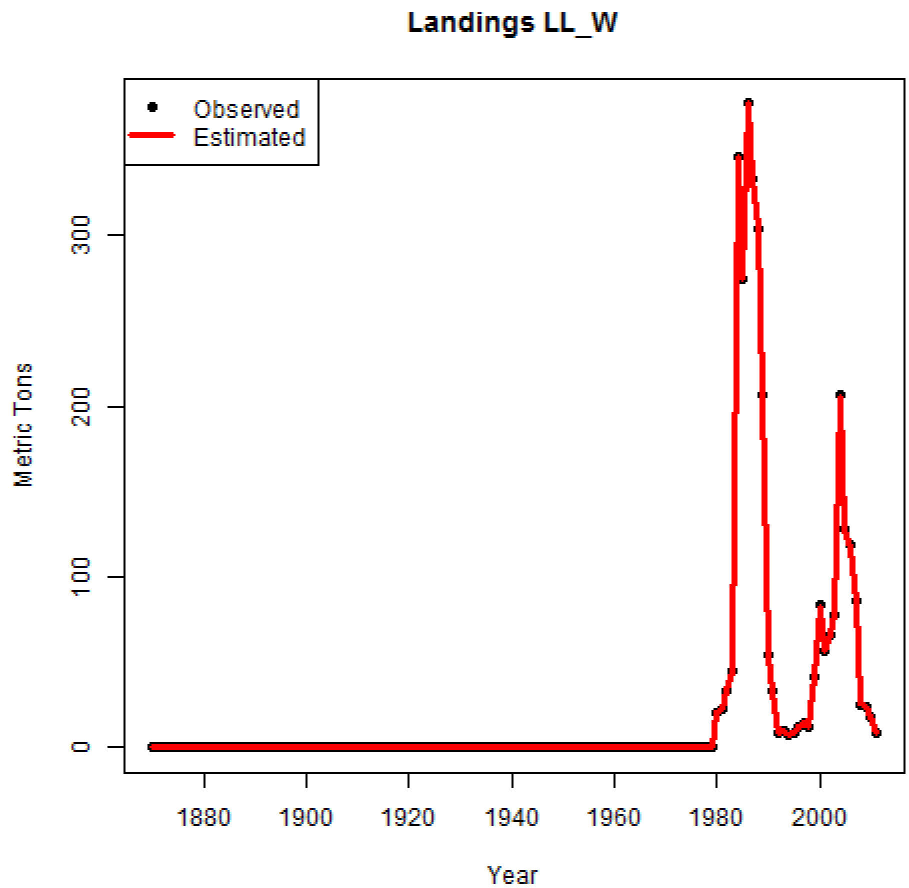



Figure 2.2.4. Observed (black dots) and estimated landings (red line) of red snapper for the commercial longline fishery in the western Gulf of Mexico, 1872-2011.

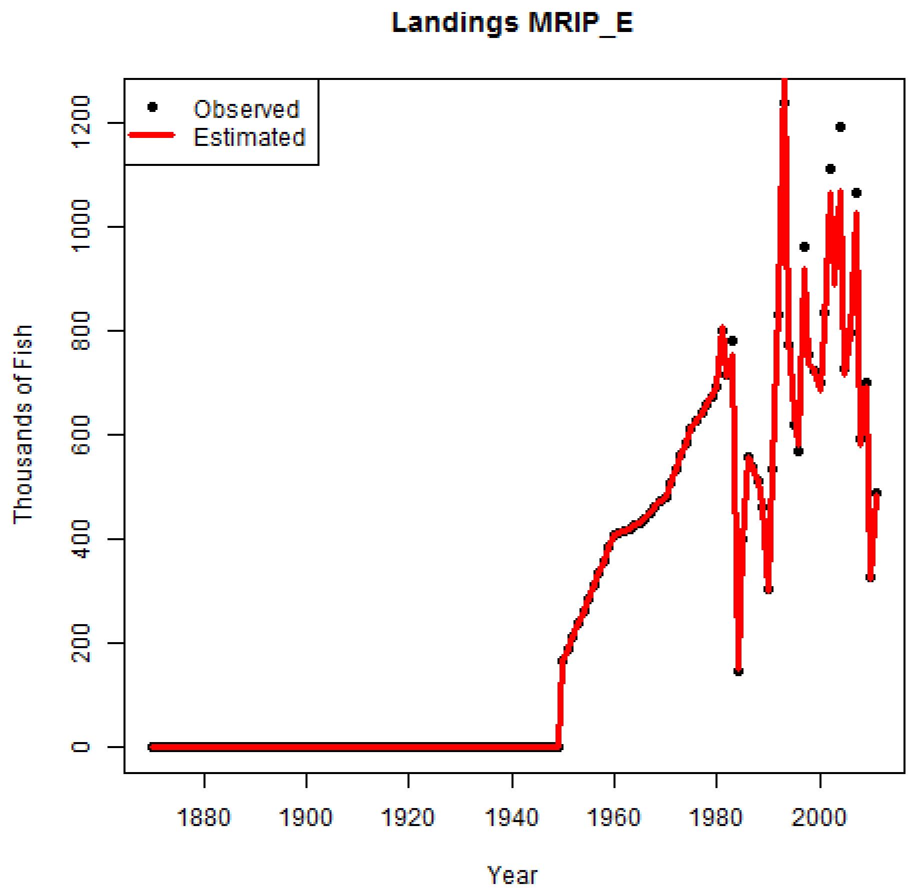



Figure 2.2.5. Observed (black dots) and estimated landings (red line) of red snapper for the private recreational fishery in the eastern Gulf of Mexico, 1872-2011.

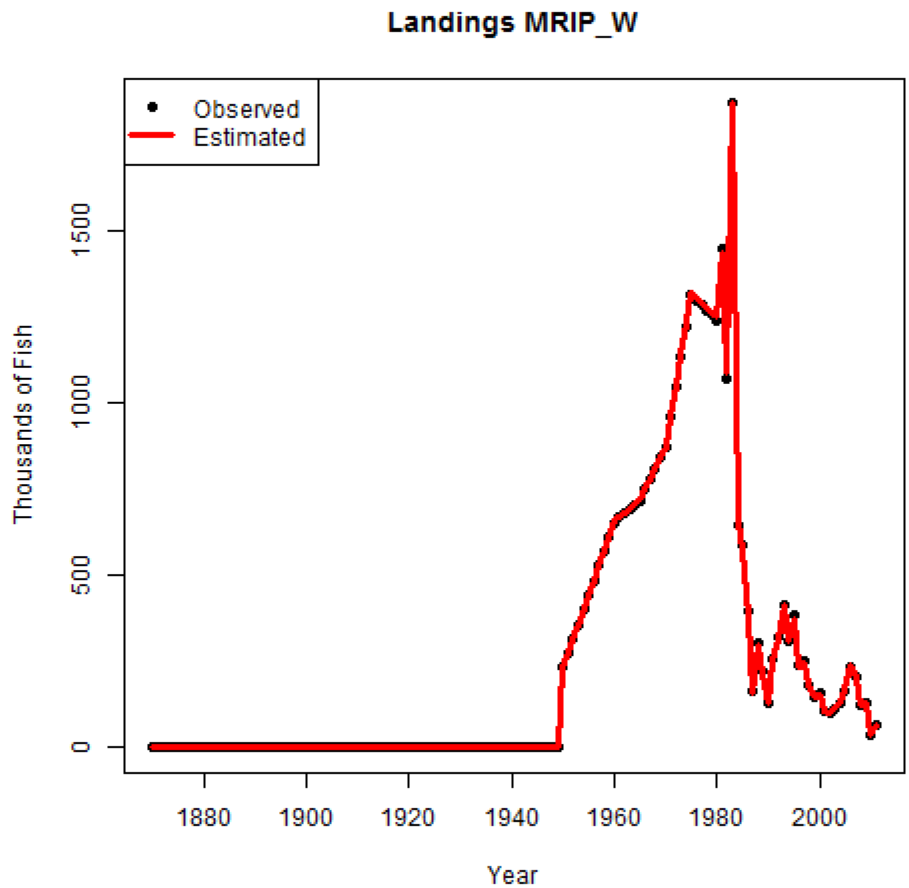



Figure 2.2.6. Observed (black dots) and estimated landings (red line) of red snapper for the private recreational fishery in the western Gulf of Mexico, 1872-2011.

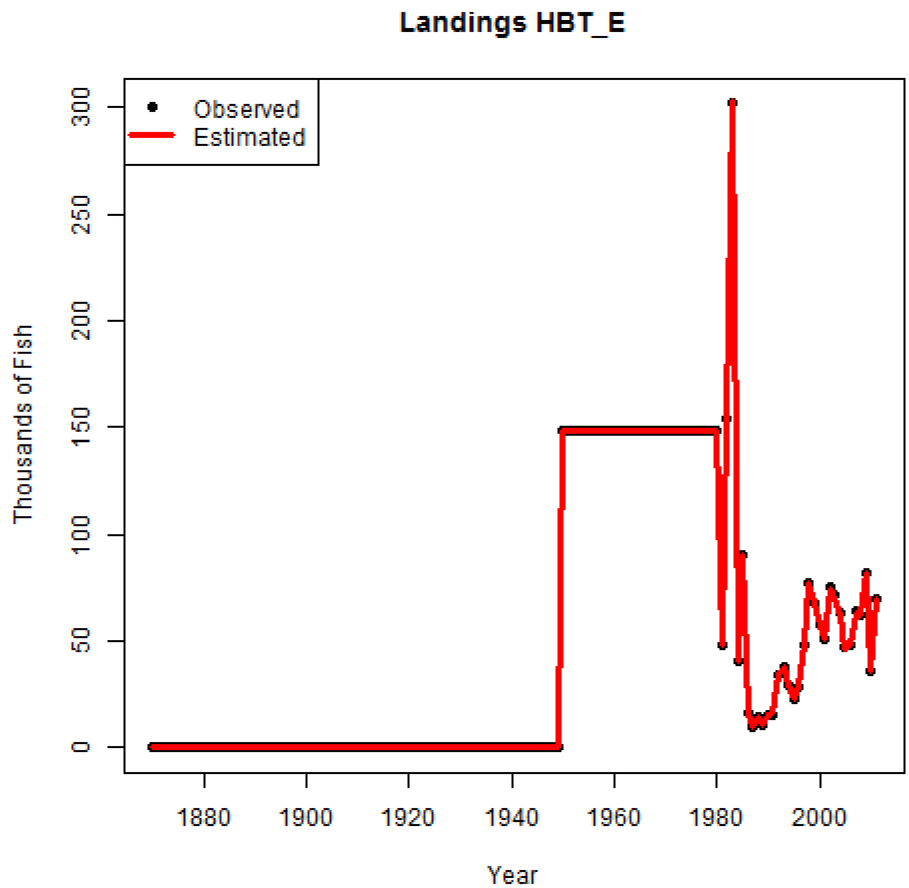



Figure 2.2.7. Observed (black dots) and estimated landings (red line) of red snapper for the recreational headboat fishery in the eastern Gulf of Mexico, 1872-2011.

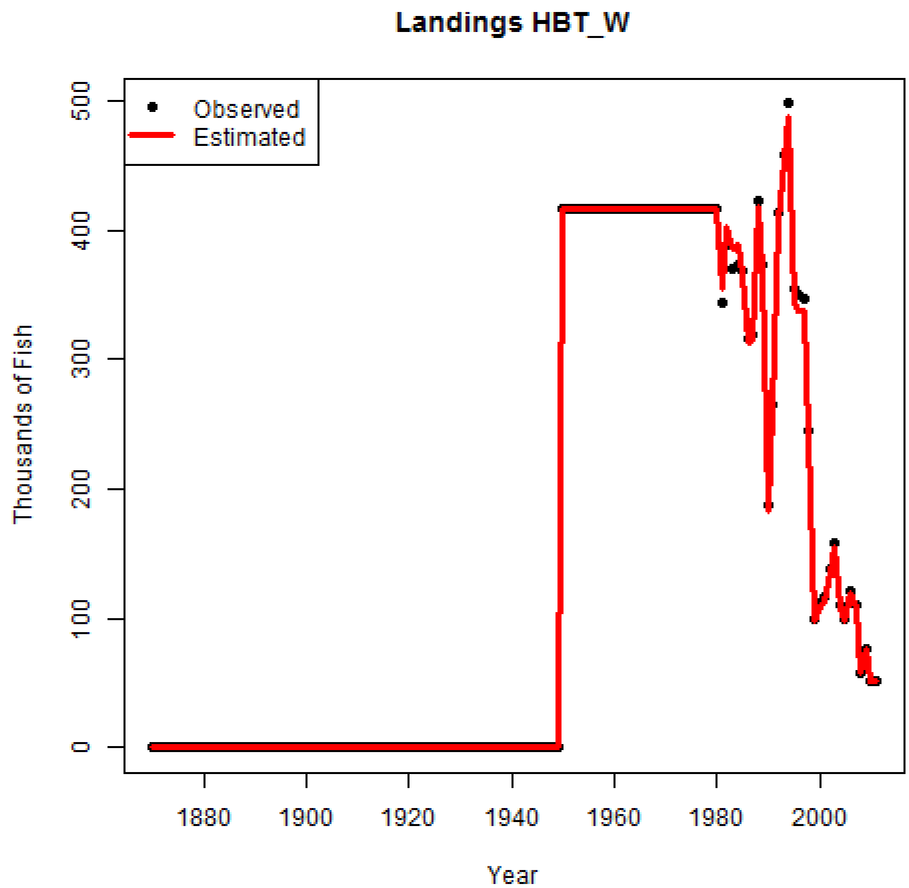



Figure 2.2.8. Observed (black dots) and estimated landings (red line) of red snapper for the recreational headboat fishery in the western Gulf of Mexico, 1872-2011.

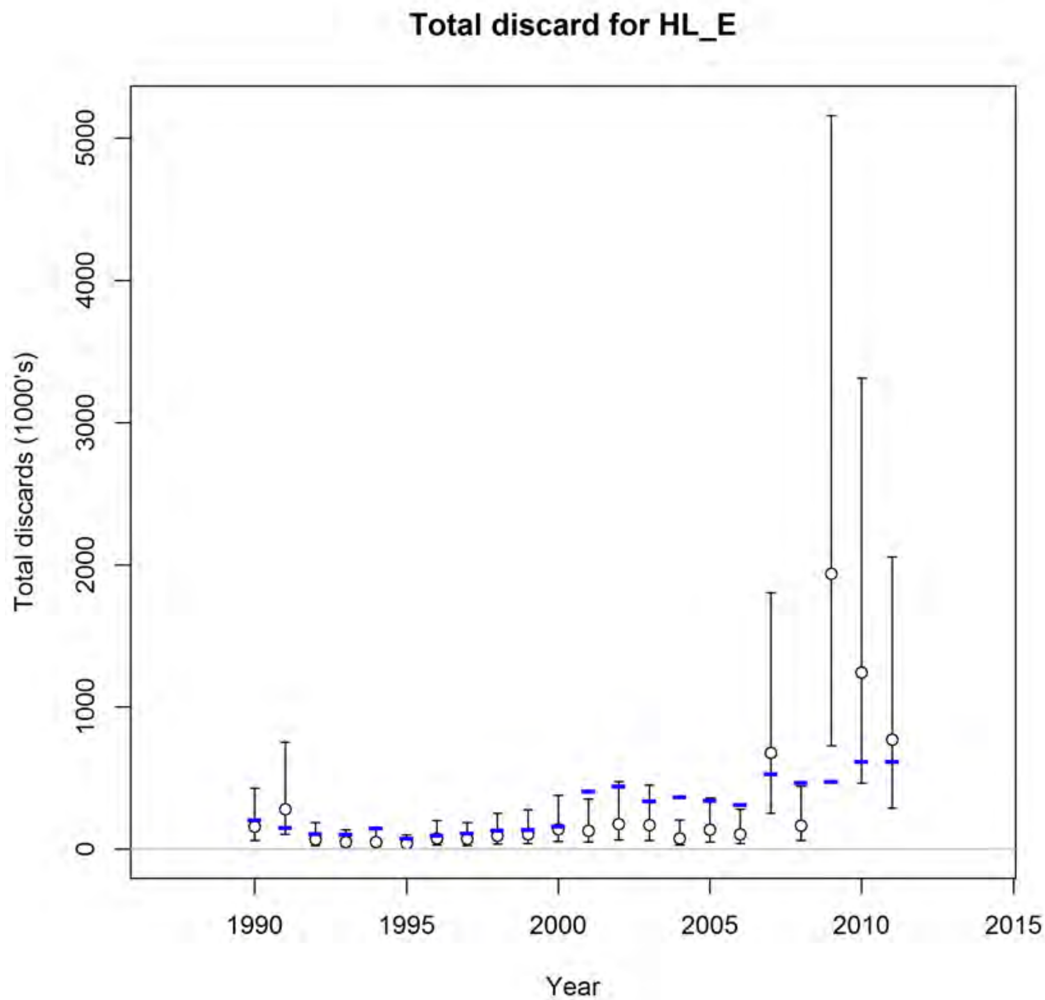



Figure 2.3.1. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the commercial handline fishery in the eastern Gulf of Mexico, 1990-2011.

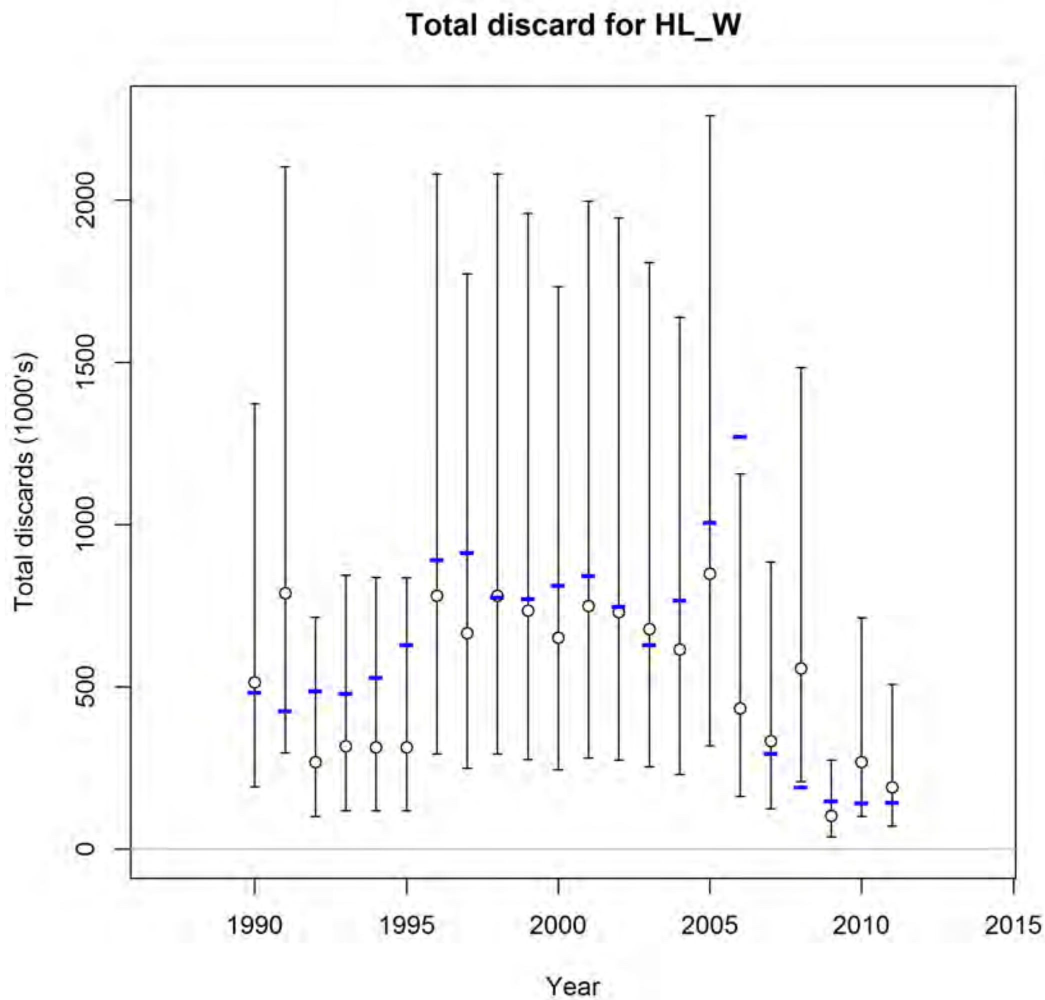



Figure 2.3.2. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the commercial handline fishery in the western Gulf of Mexico, 1990-2011.

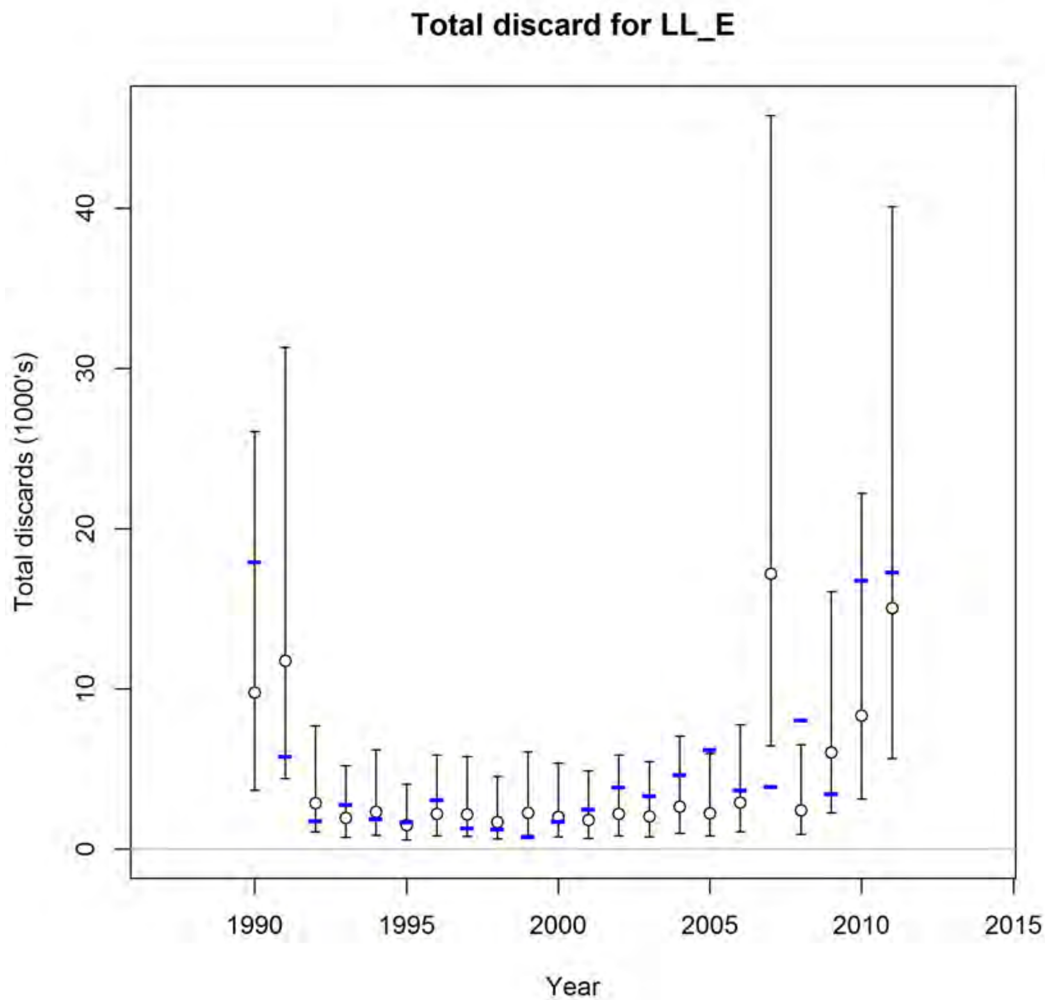



Figure 2.3.3. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the commercial longline fishery in the eastern Gulf of Mexico, 1990-2011.

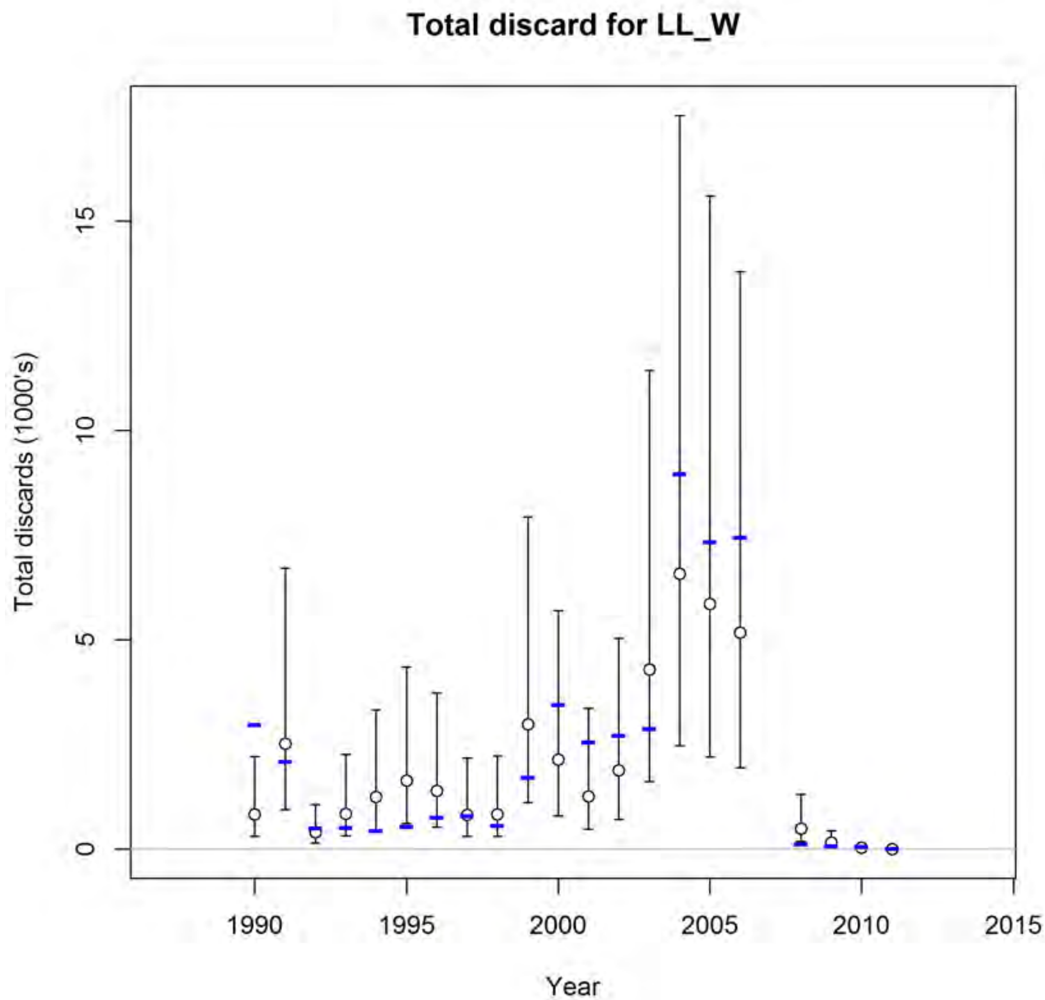



Figure 2.3.4. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the commercial longline fishery in the western Gulf of Mexico, 1990-2011.

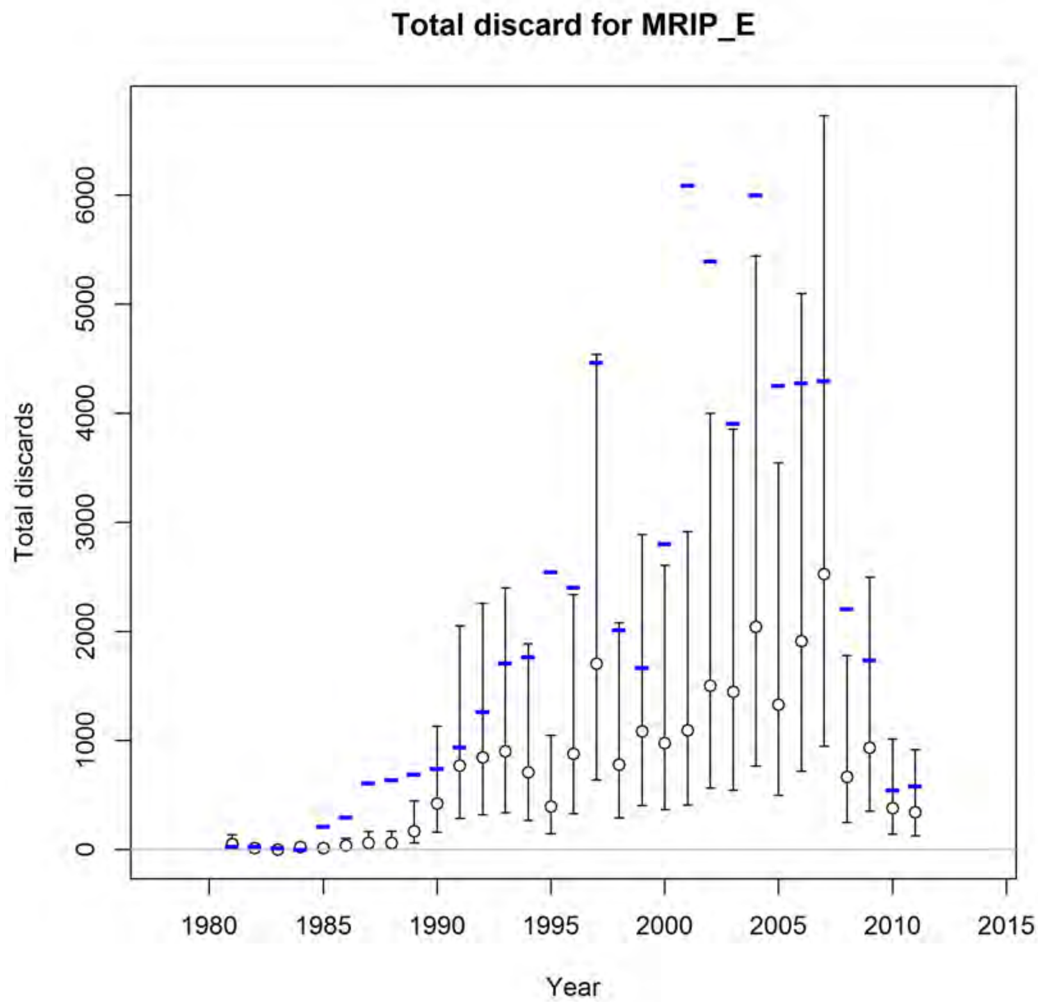



Figure 2.3.5. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the private recreational fishery in the eastern Gulf of Mexico, 1981-2011.

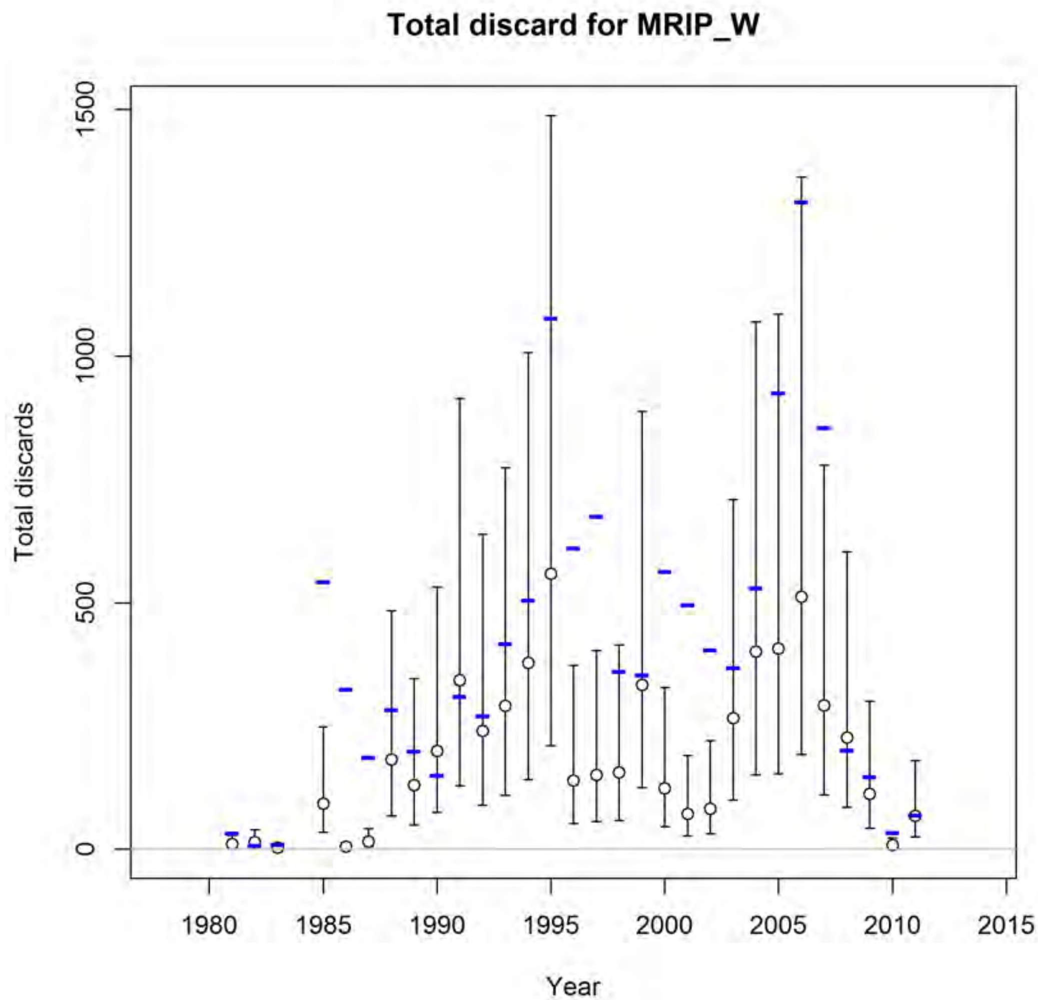



Figure 2.3.6. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the private recreational fishery in the western Gulf of Mexico, 1981-2011.

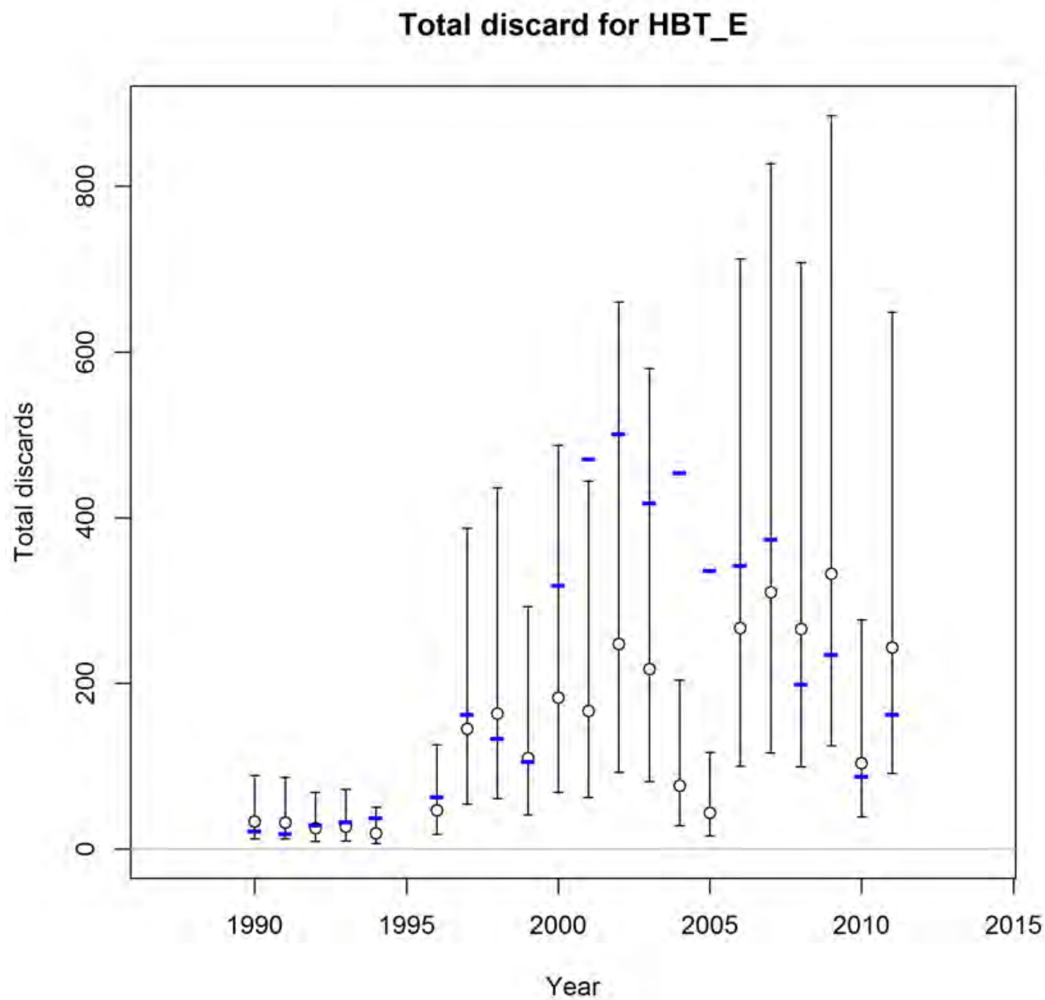



Figure 2.3.7. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the recreational headboat fishery in the eastern Gulf of Mexico, 1990-2011.

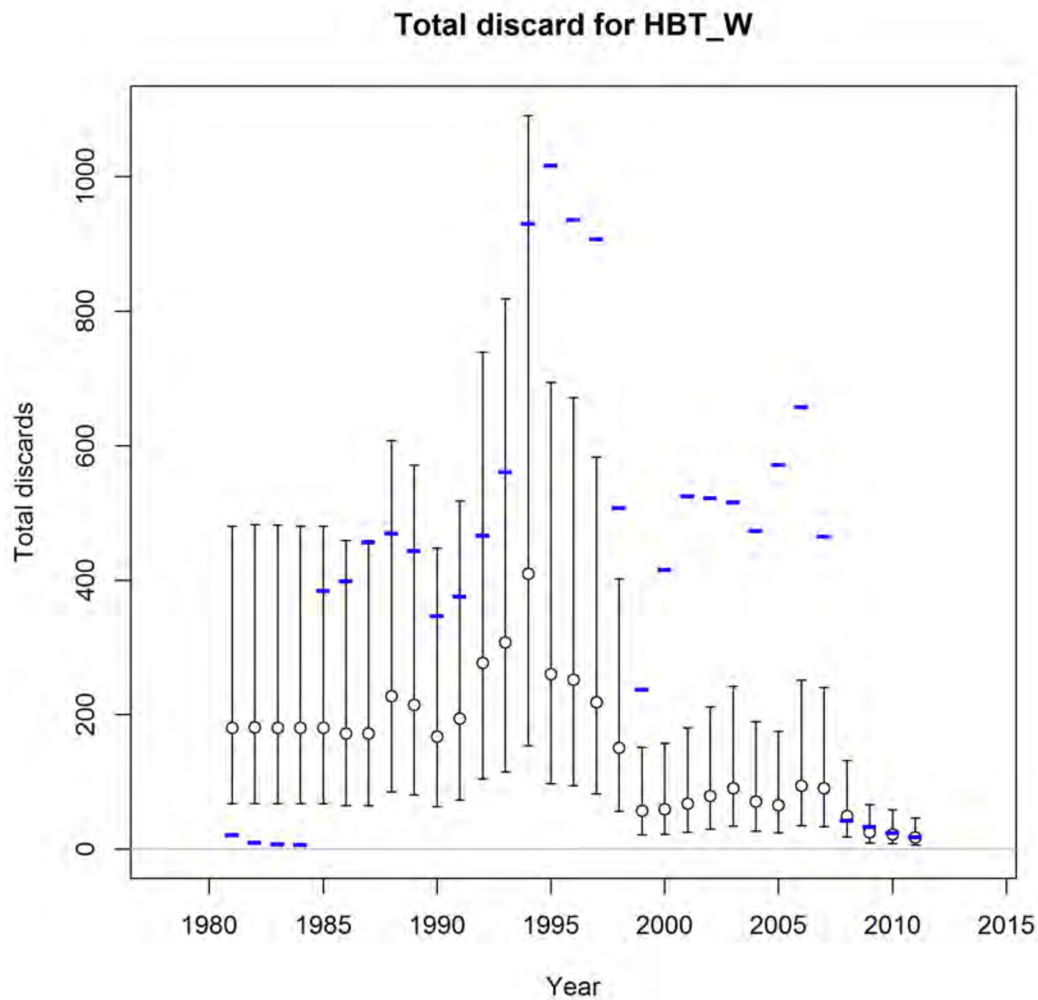



Figure 2.3.8. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the recreational headboat fishery in the western Gulf of Mexico, 1981-2011.

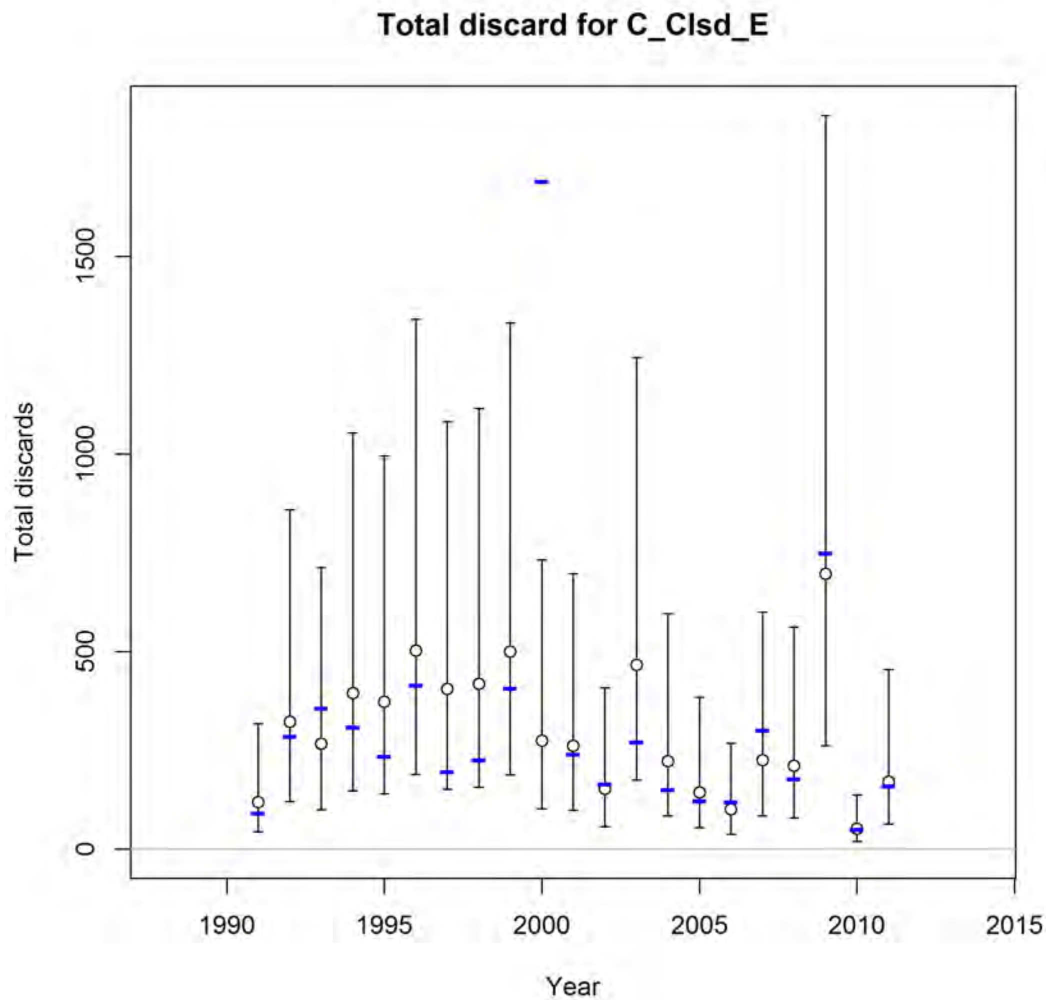



Figure 2.3.9. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the commercial closed season fishery in the eastern Gulf of Mexico, 1991-2011.

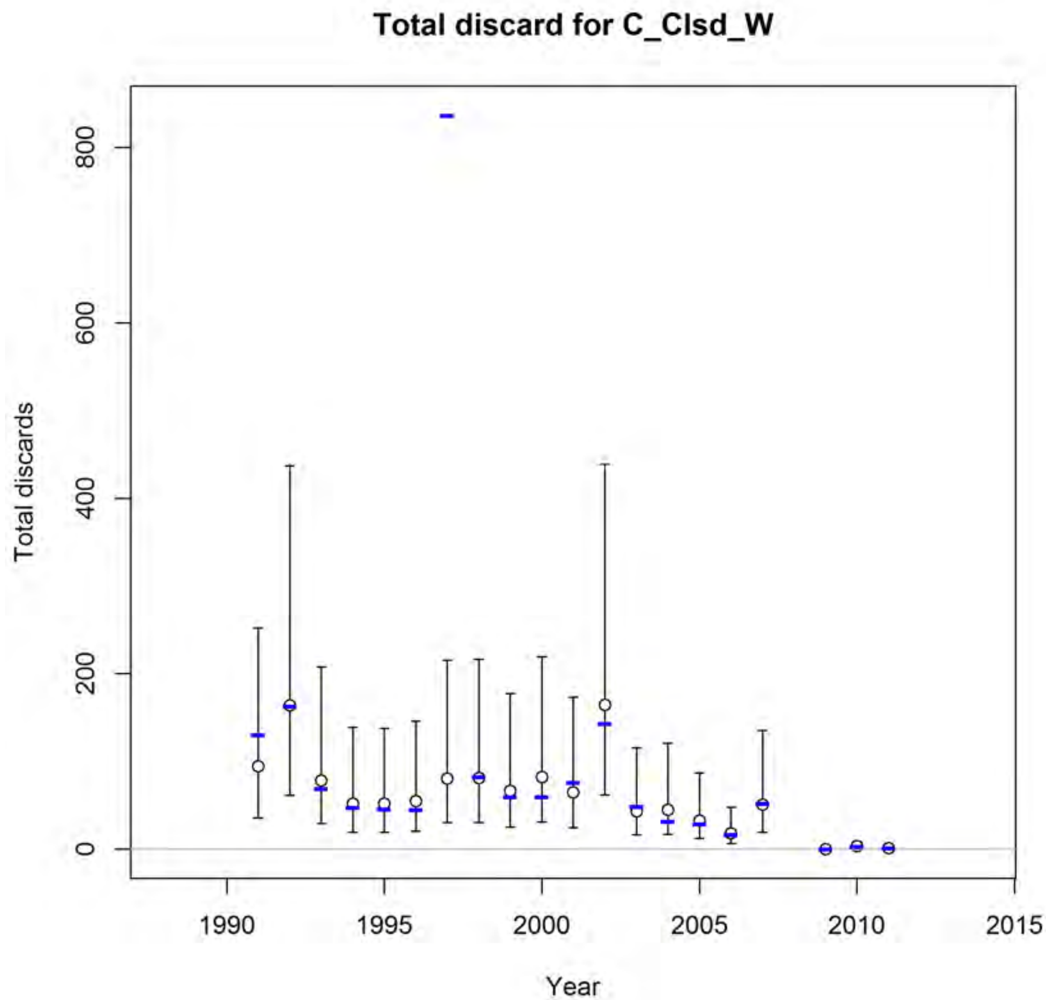



Figure 2.3.10. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the commercial closed season fishery in the western Gulf of Mexico, 1991-2011.

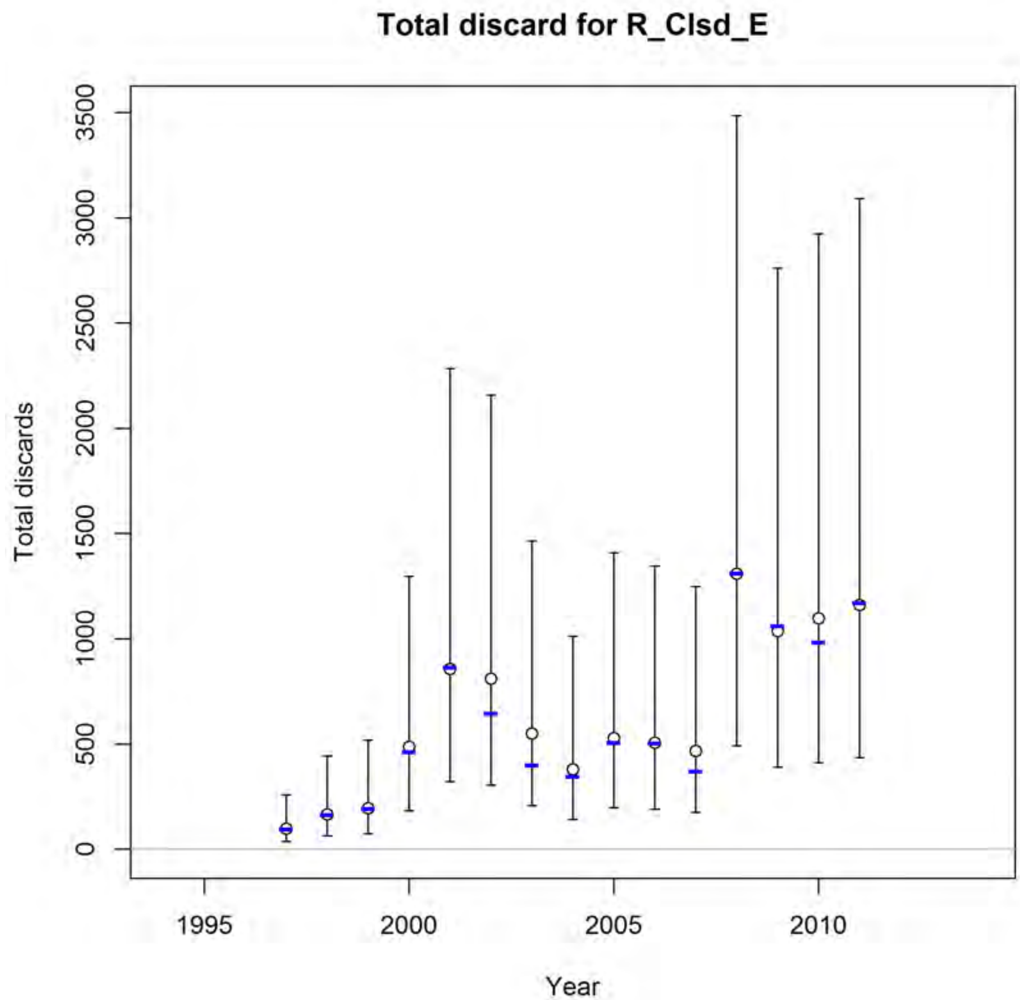



Figure 2.3.11. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the recreational closed season fishery in the eastern Gulf of Mexico, 1997-2011.

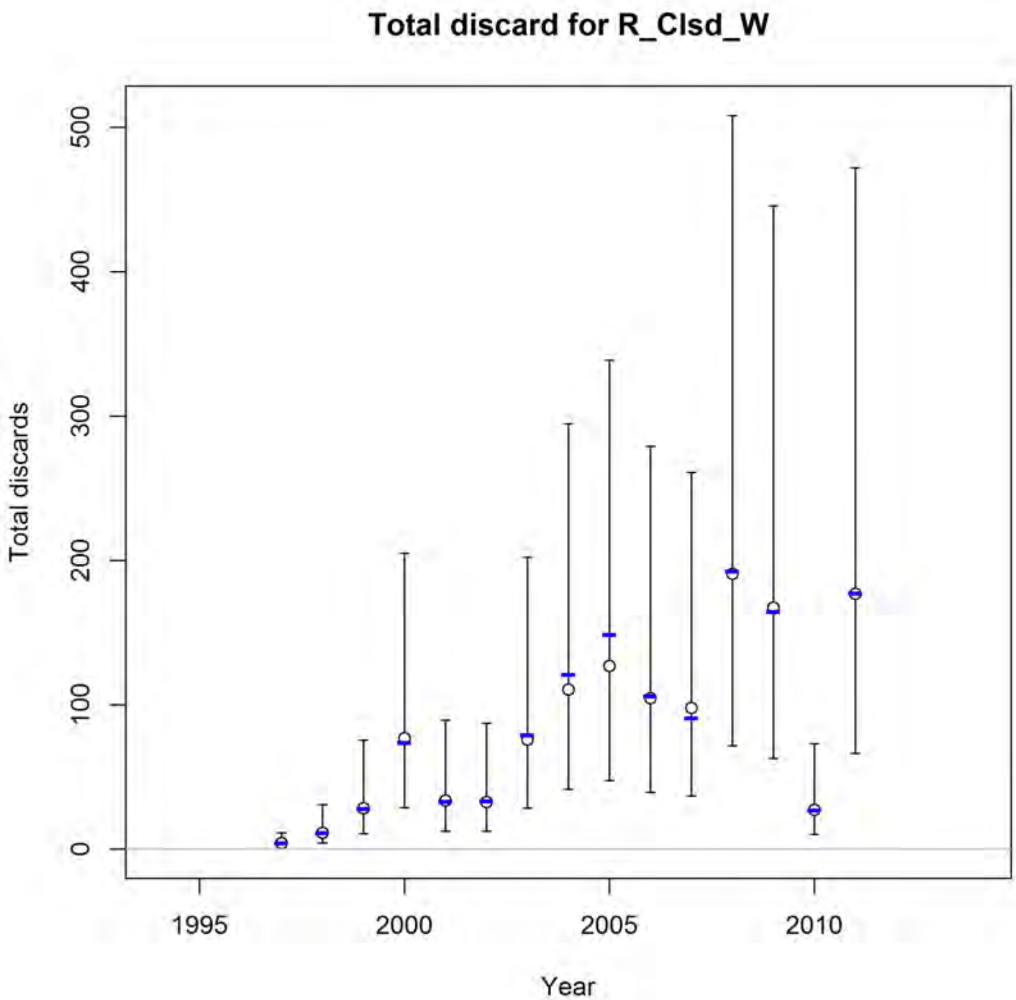



Figure 2.3.12. Observed (open circles) and predicted total discards (blue dashes) of red snapper from the recreational closed season fishery in the western Gulf of Mexico, 1997-2011.

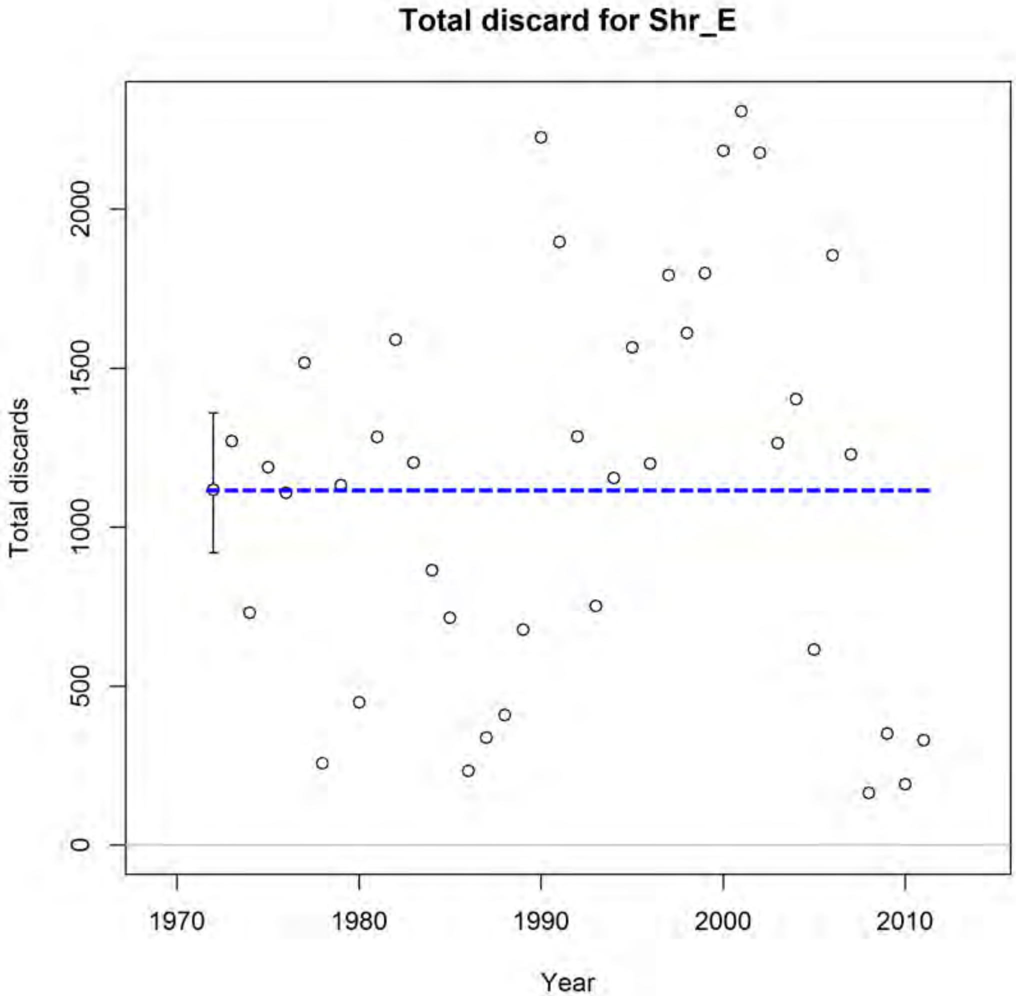



Figure 2.3.13. Model predicted mean bycatch (blue dashed line) of red snapper from the shrimp fishery in the eastern Gulf of Mexico, 1972-2011.

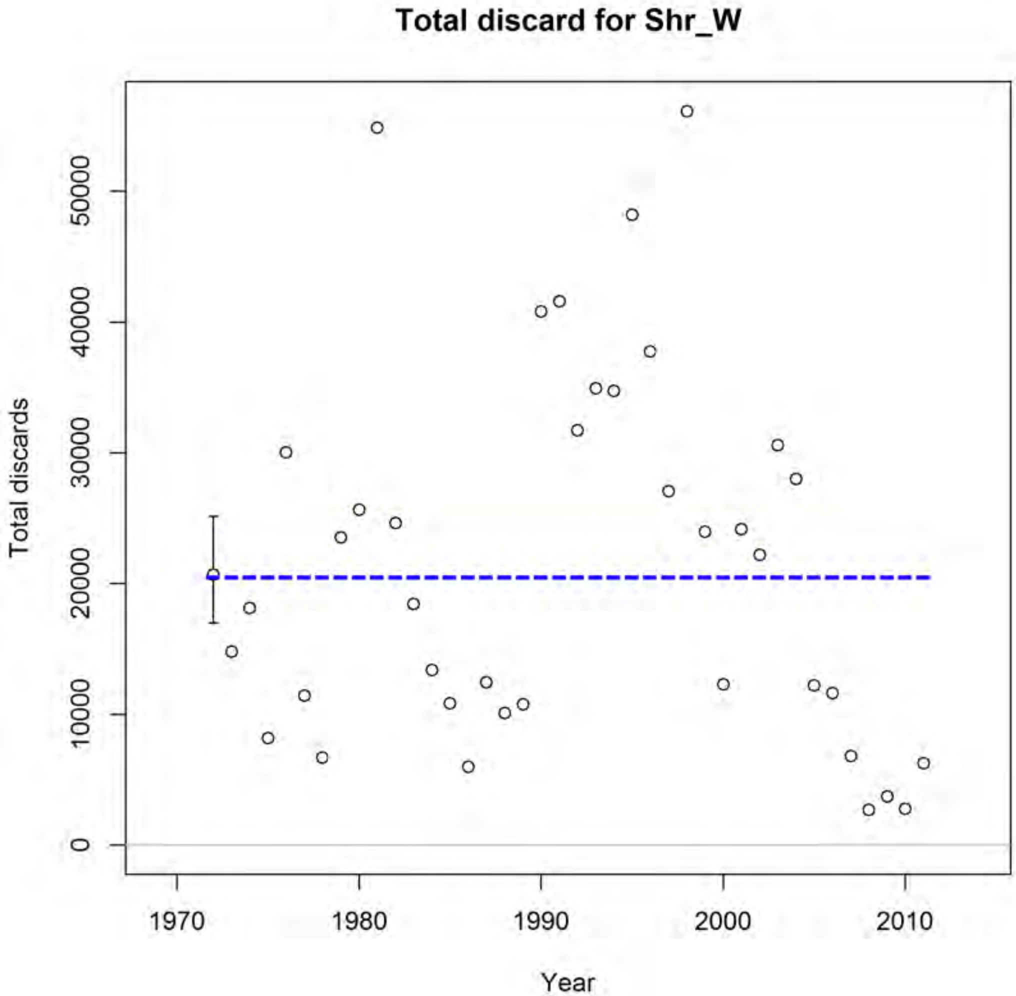



Figure 2.3.14. Model predicted mean bycatch (blue dashed line) of red snapper from the shrimp fishery in the western Gulf of Mexico, 1972-2011.

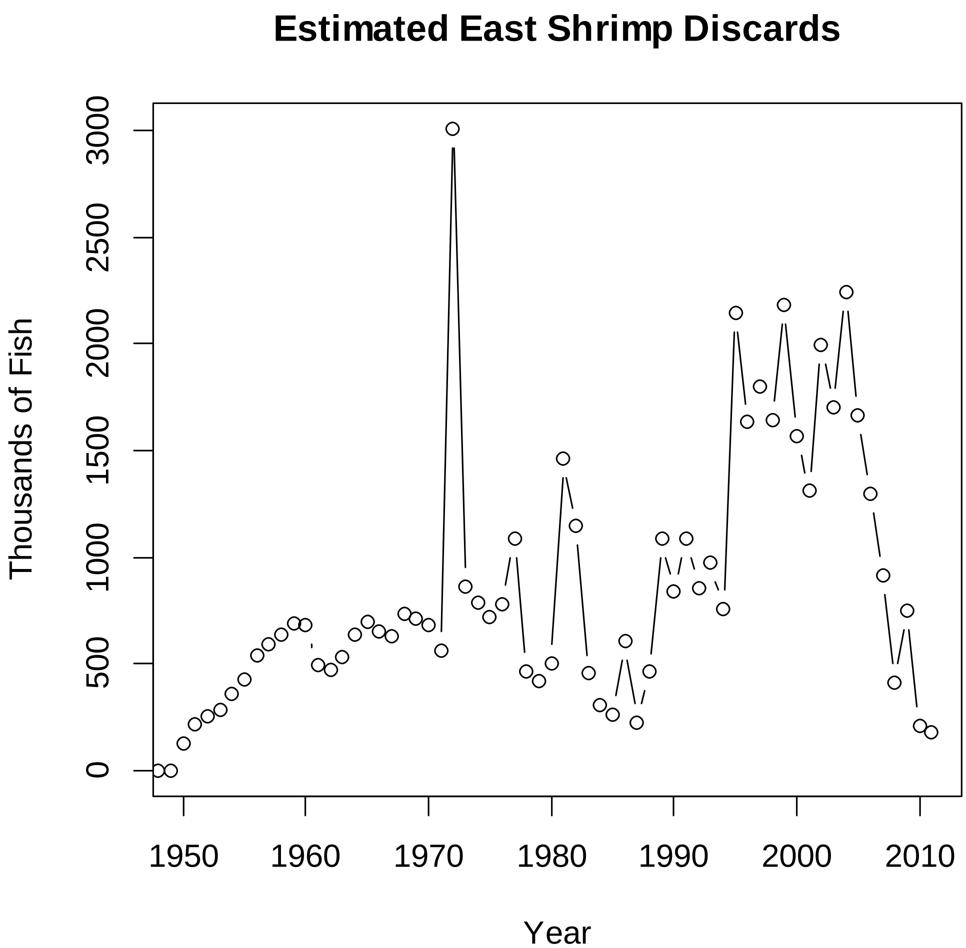



Figure 2.3.15. Model predicted total discards of red snapper from the shrimp fishery in the eastern Gulf of Mexico, 1946-2011.

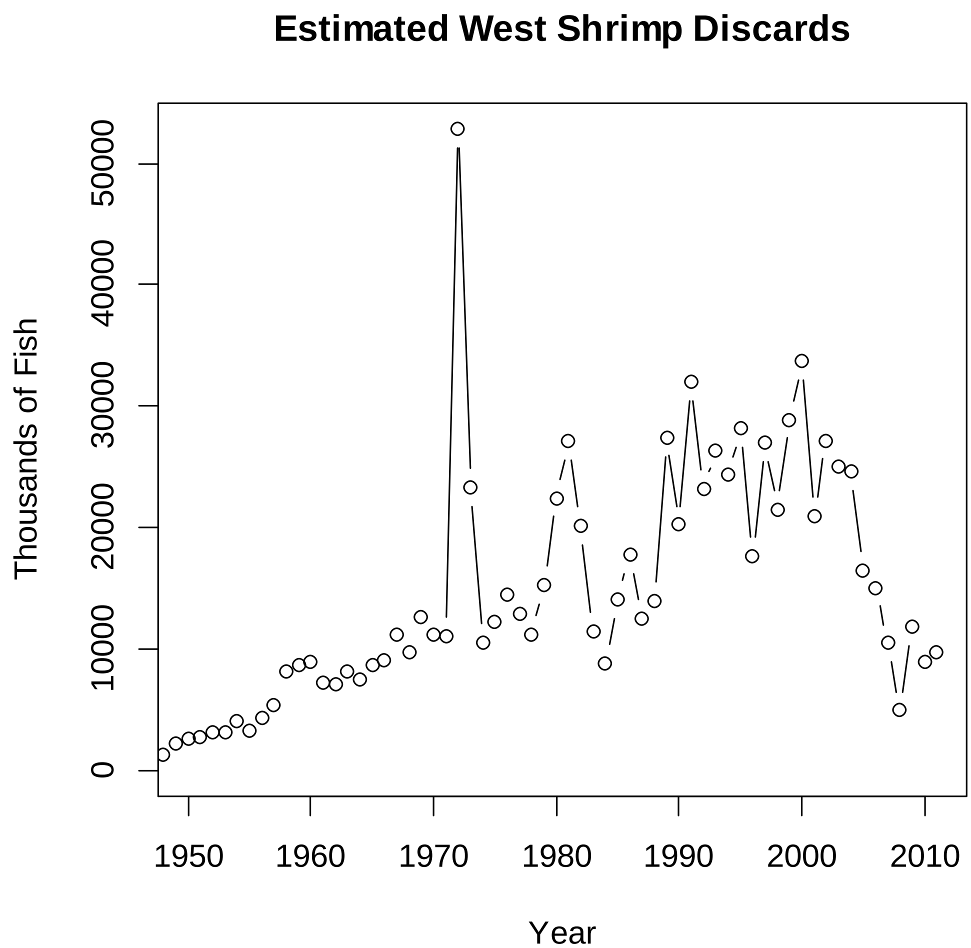



Figure 2.3.16. Model predicted total discards of red snapper from the shrimp fishery in the western Gulf of Mexico, 1946-2011.

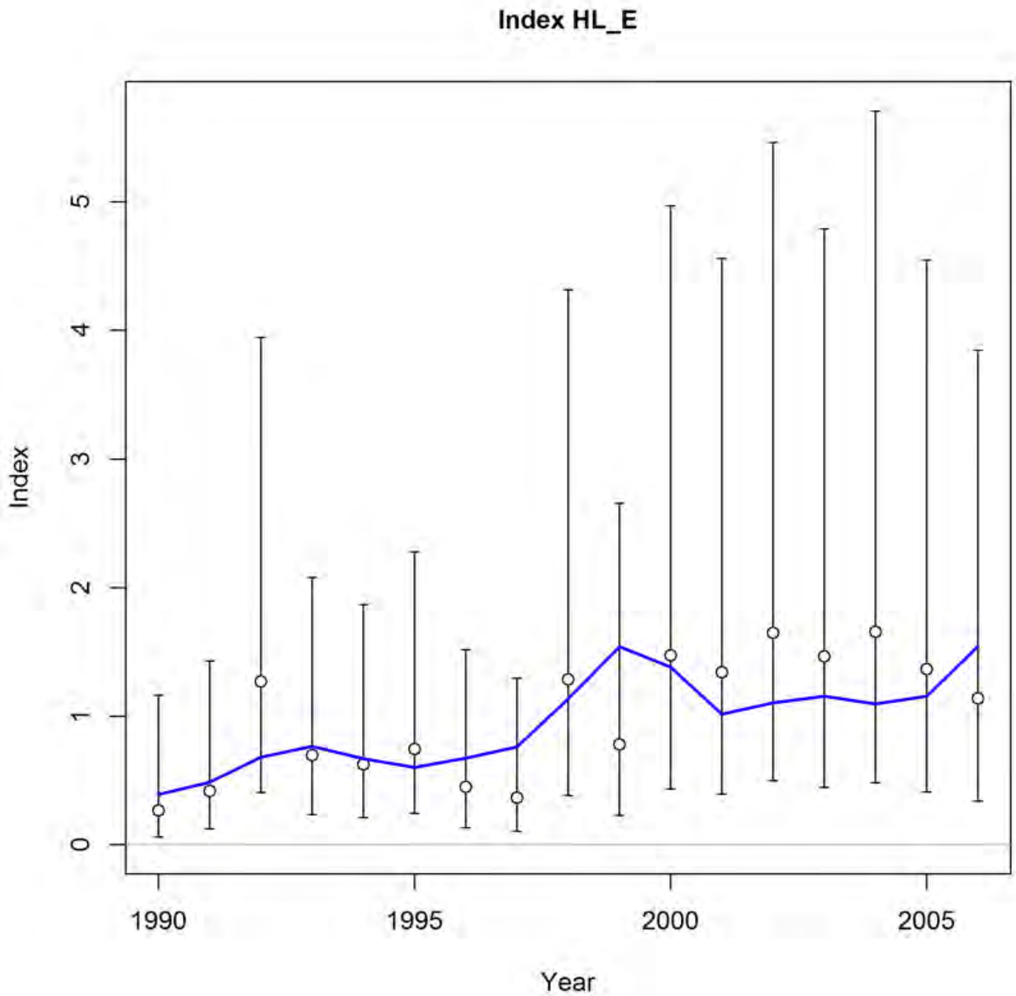



Figure 2.4.1. Observed and predicted vertical line standardized index of abundance for red snapper in the eastern Gulf of Mexico, 1990-2006.

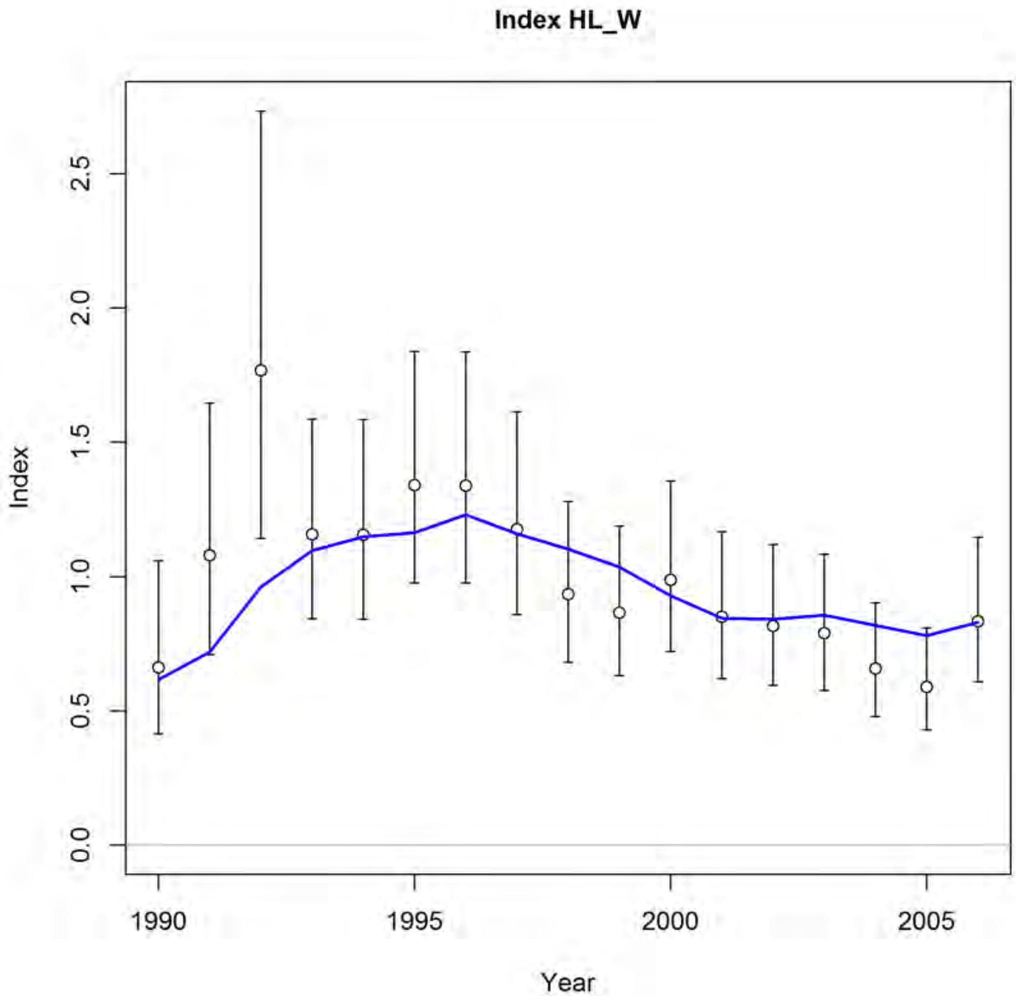



Figure 2.4.2. Observed and predicted vertical line standardized index of abundance for red snapper in the western Gulf of Mexico, 1990-2006.

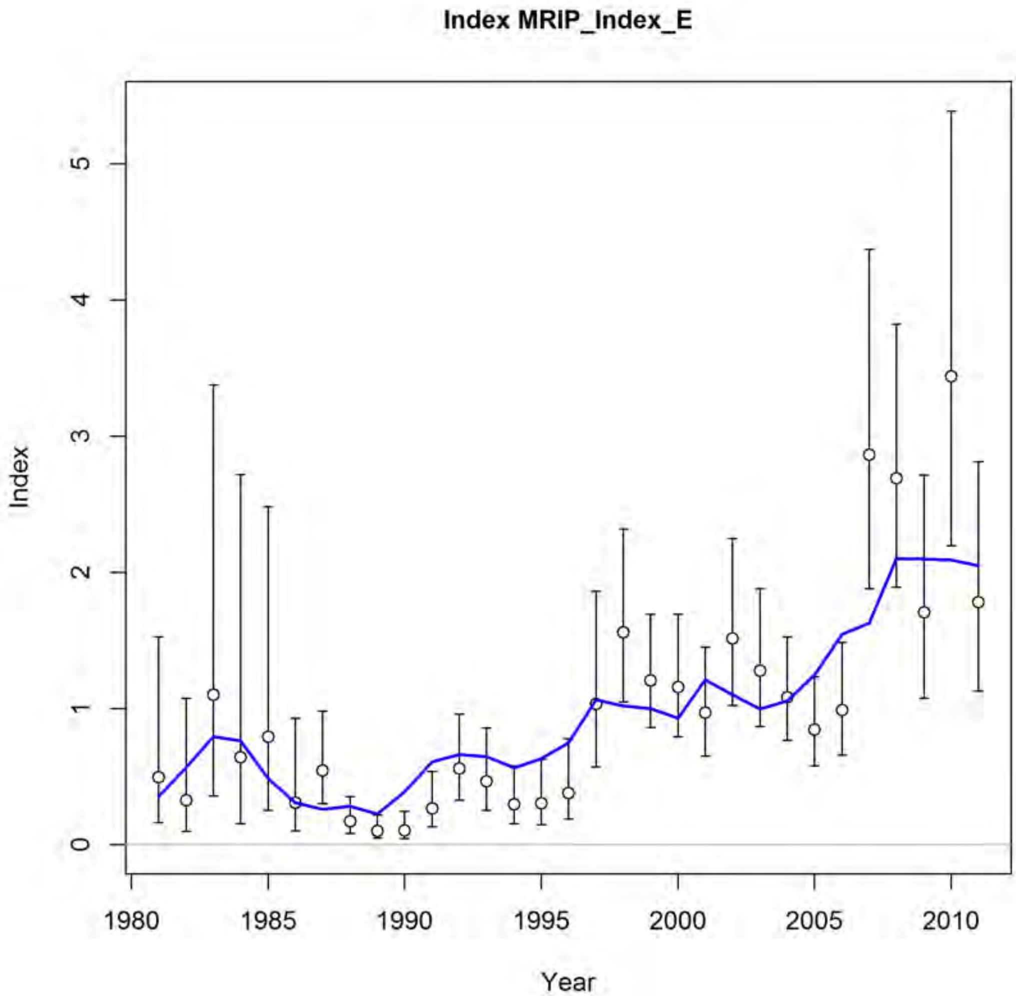



Figure 2.4.3. Observed and predicted private recreational fishery (MRIP) standardized index of abundance for red snapper in the eastern Gulf of Mexico, 1981-2011.

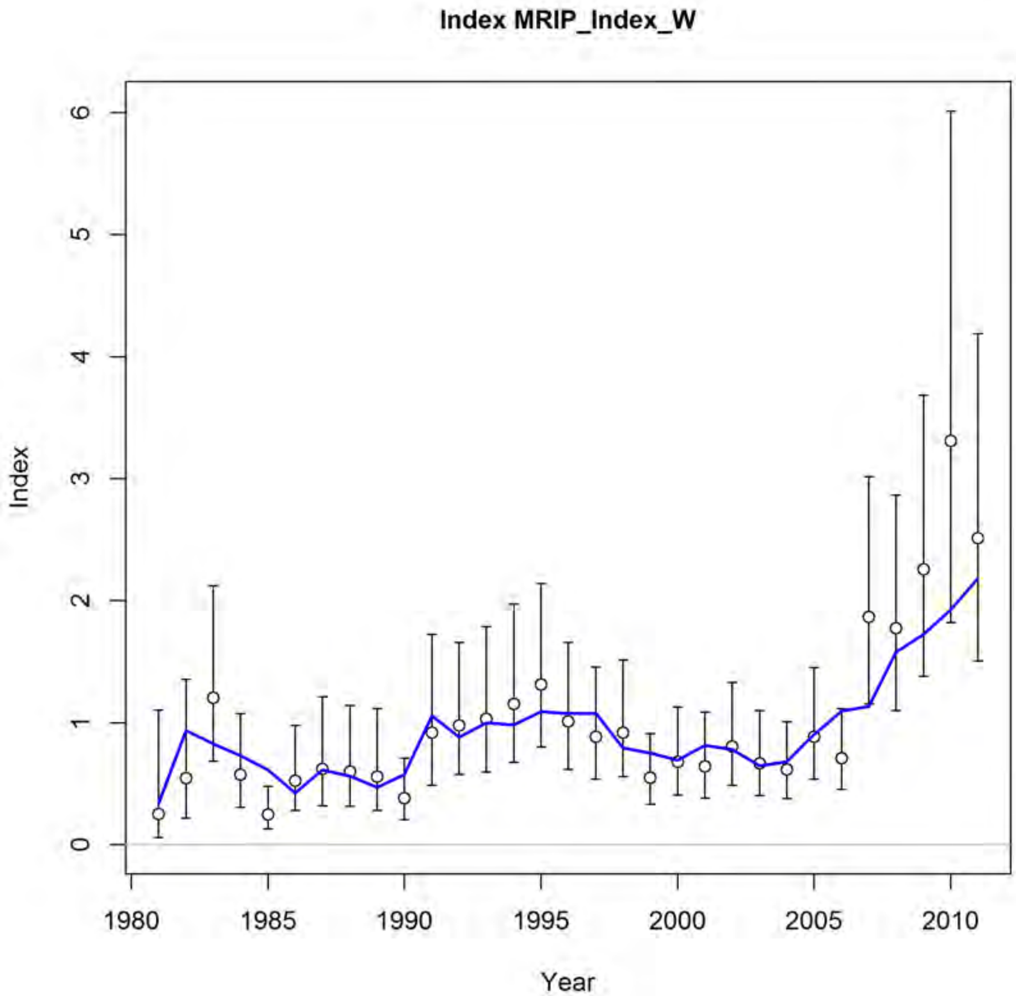



Figure 2.4.4. Observed and predicted private recreational fishery (MRIP) standardized index of abundance for red snapper in the western Gulf of Mexico, 1981-2011.

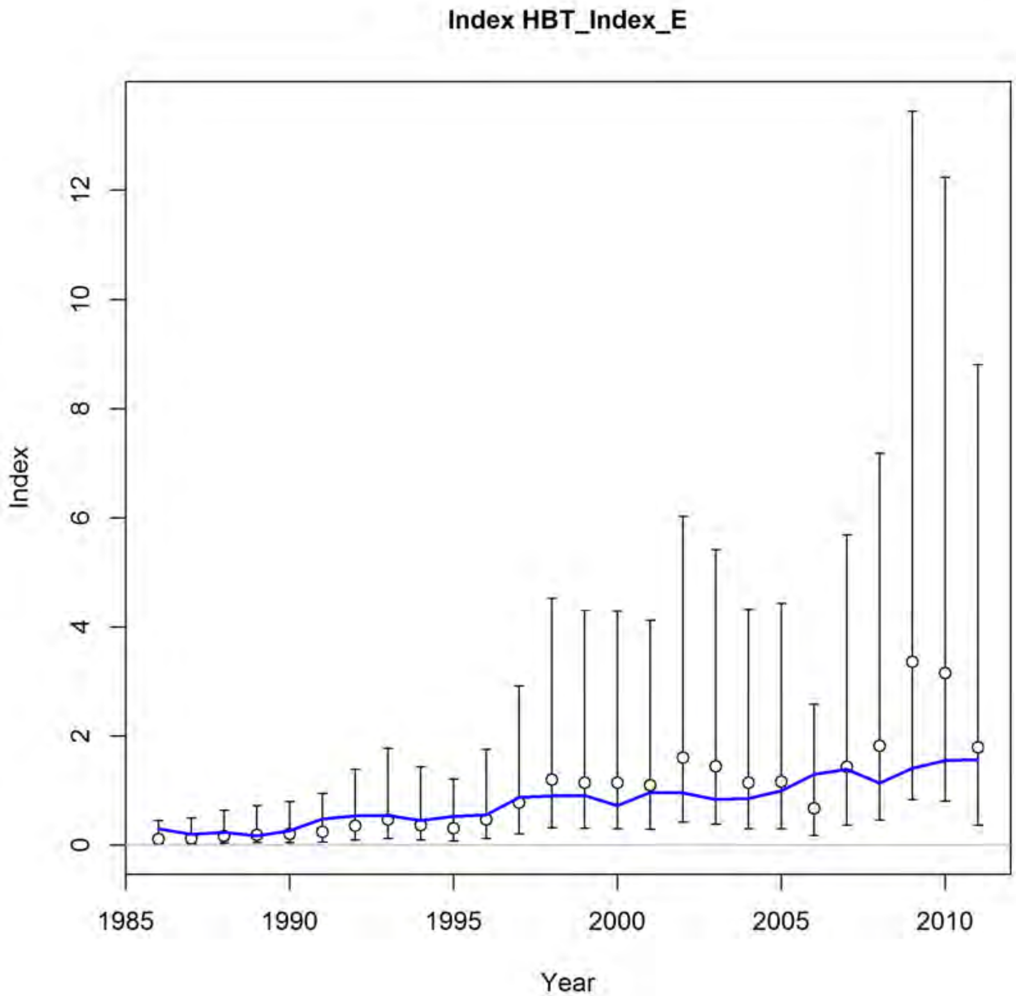



Figure 2.4.5. Observed and predicted recreational headboat fishery standardized index of abundance for red snapper in the eastern Gulf of Mexico, 1986-2011.

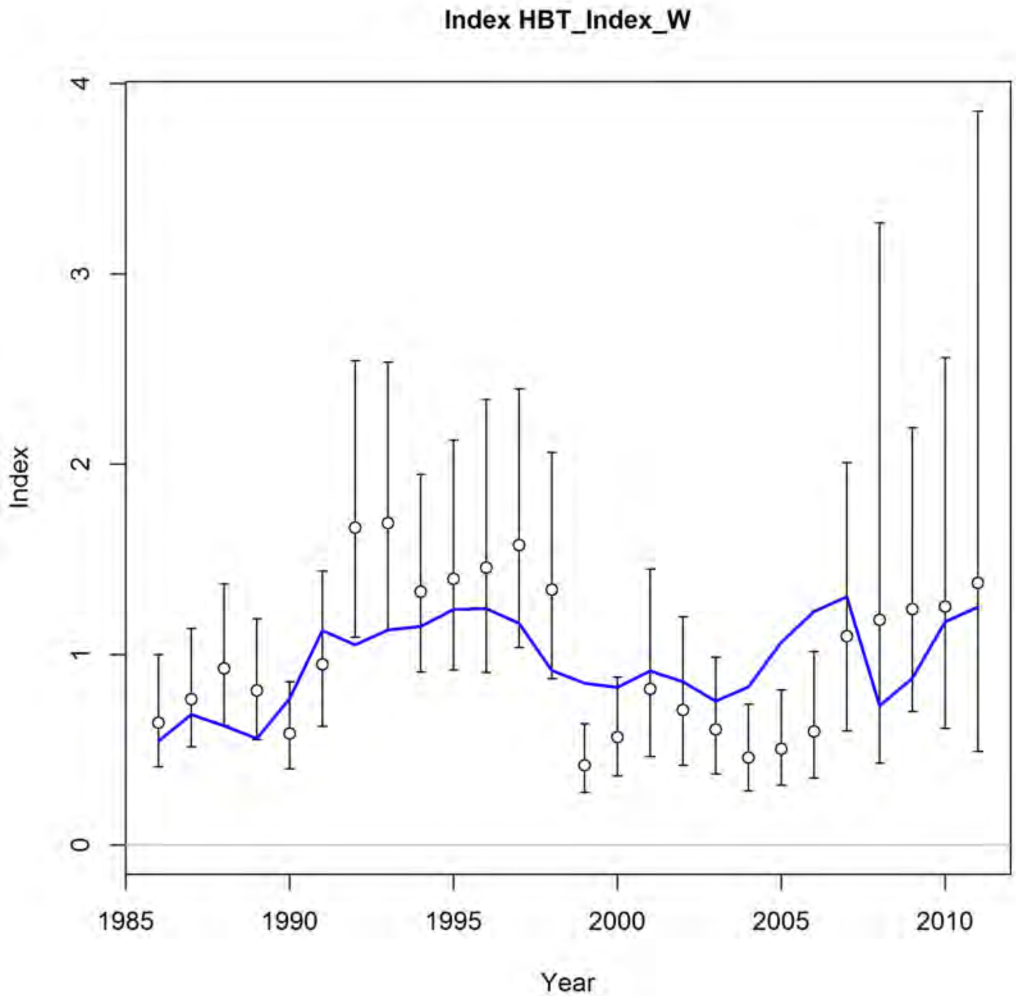



Figure 2.4.6. Observed and predicted recreational headboat fishery standardized index of abundance for red snapper fishery in the western Gulf of Mexico, 1986-2011.

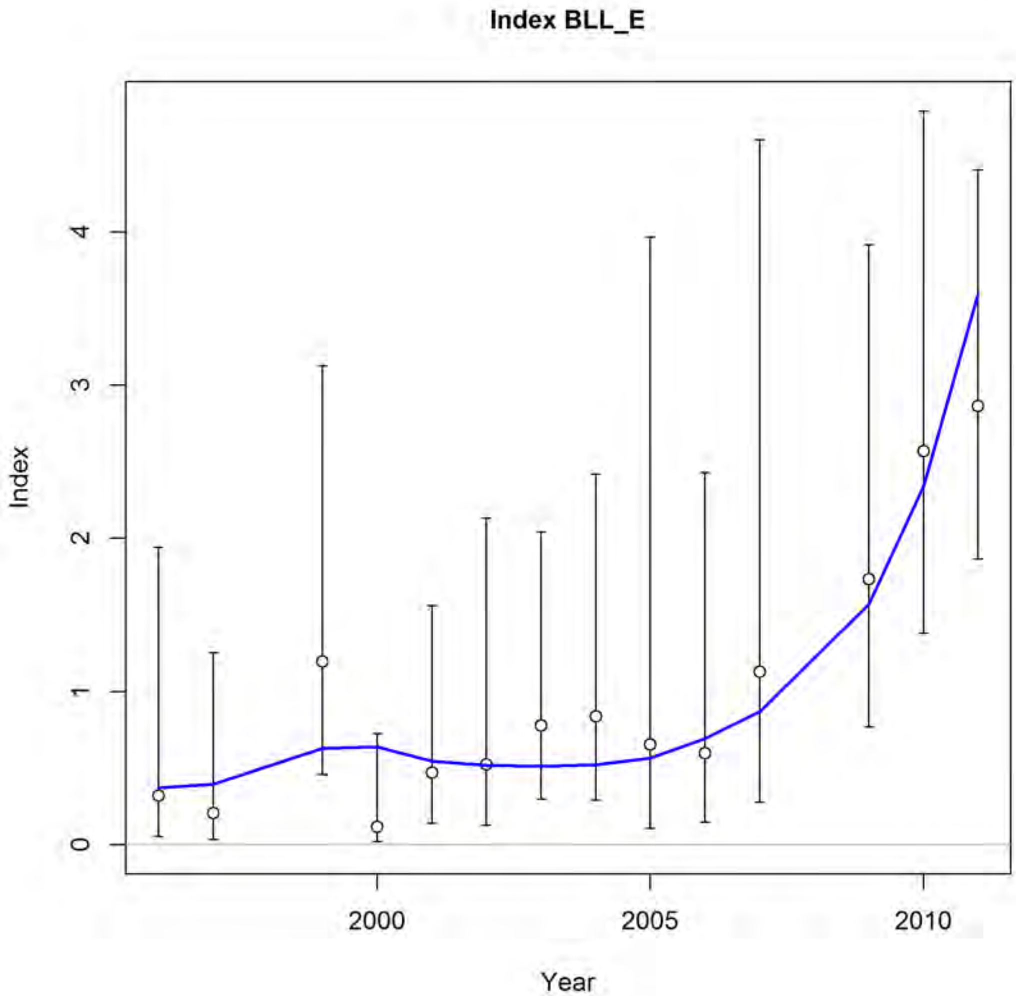



Figure 2.4.7. Observed and predicted index of abundance for red snapper in the eastern Gulf of Mexico from the NMFS bottom longline survey, 1996-2011.

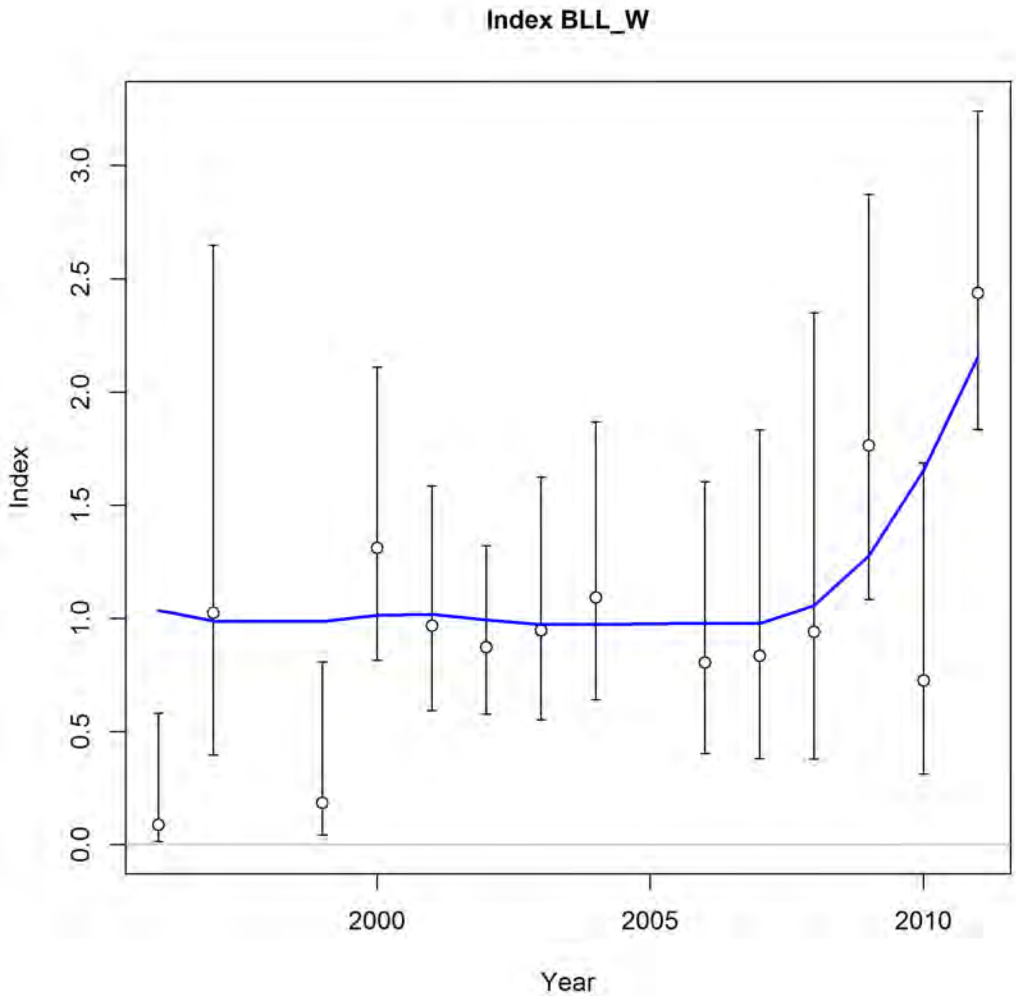



Figure 2.4.8. Observed and predicted index of abundance for red snapper in the western Gulf of Mexico from the NMFS bottom longline survey, 1996-2011.

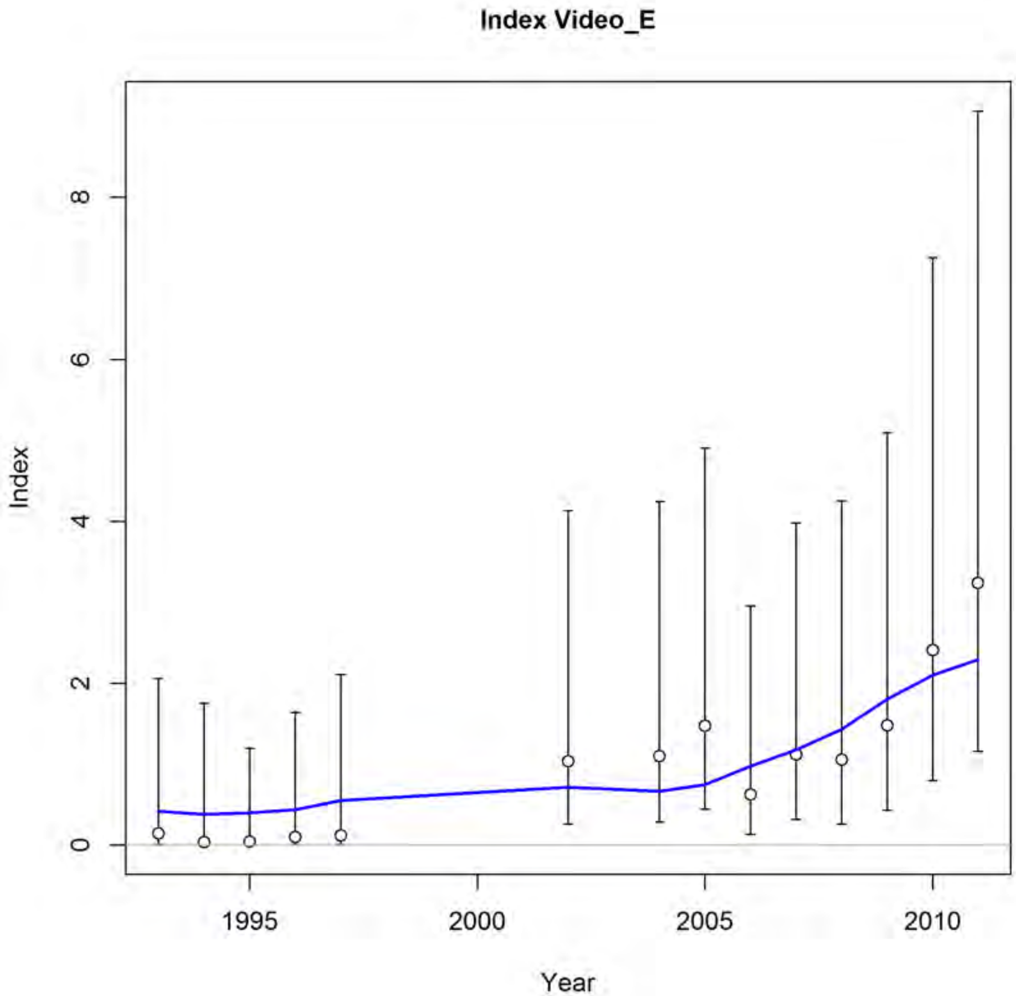



Figure 2.4.9. Observed and predicted index of abundance for red snapper in the eastern Gulf of Mexico from the SEAMAP reef fish video survey, 1993-2011.

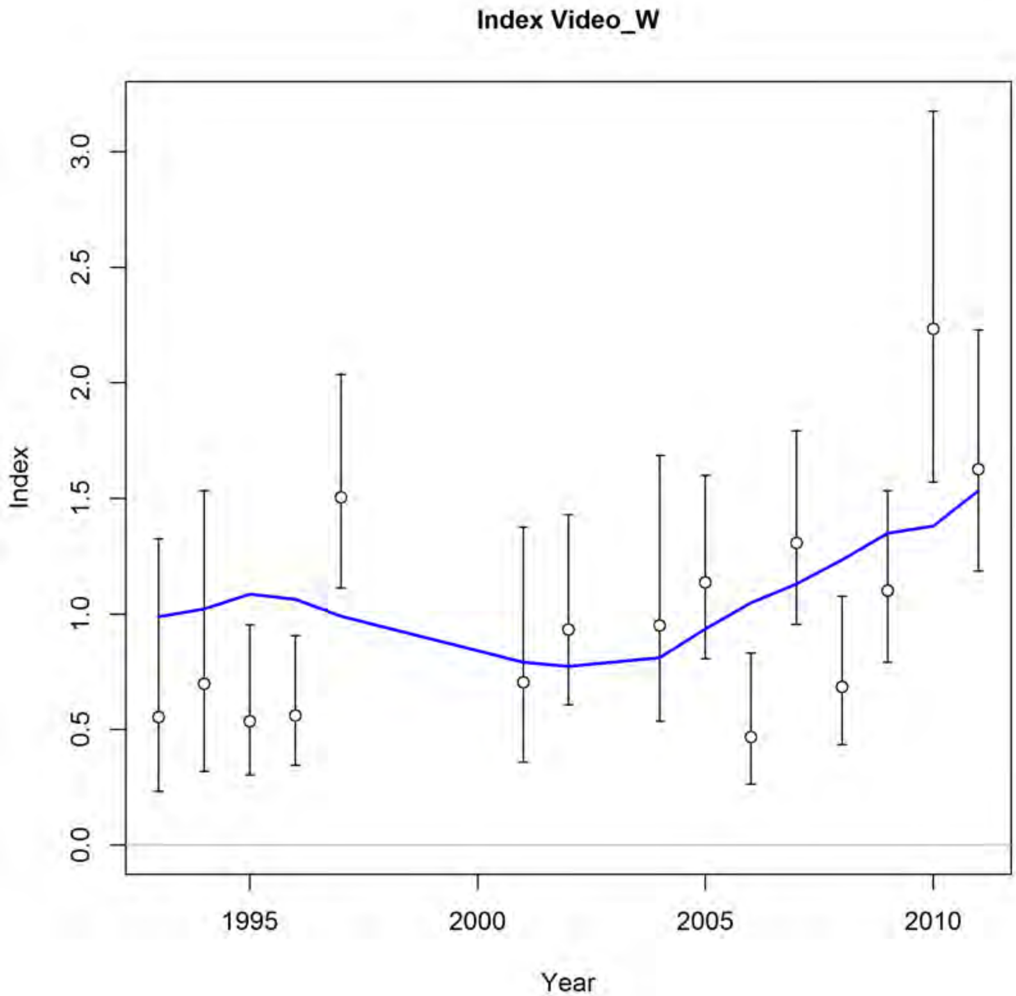



Figure 2.4.10. Observed and predicted index of abundance for red snapper in the western Gulf of Mexico from the SEAMAP reef fish video survey, 1993-2011.

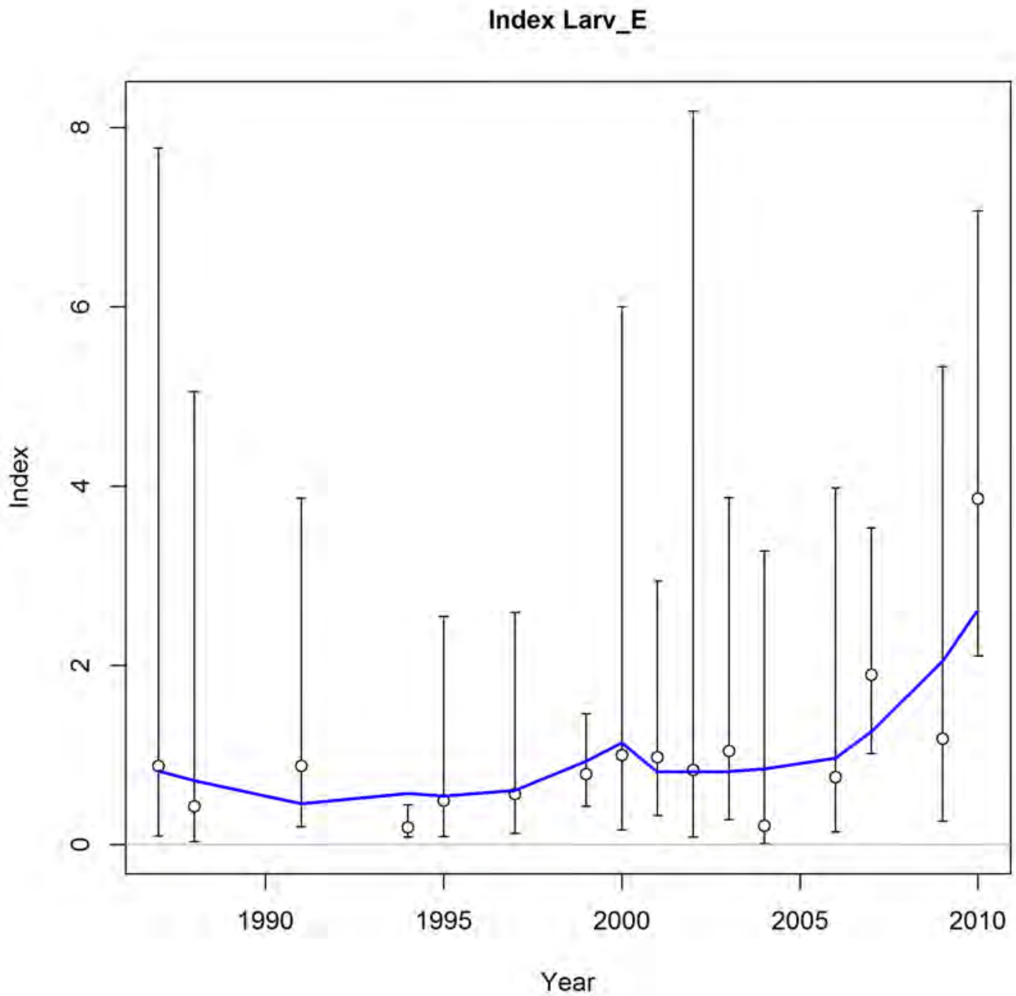



Figure 2.4.11. Observed and predicted index of abundance for larval red snapper in the eastern Gulf of Mexico from the SEAMAP Fall Plankton Survey, 1986-2010.

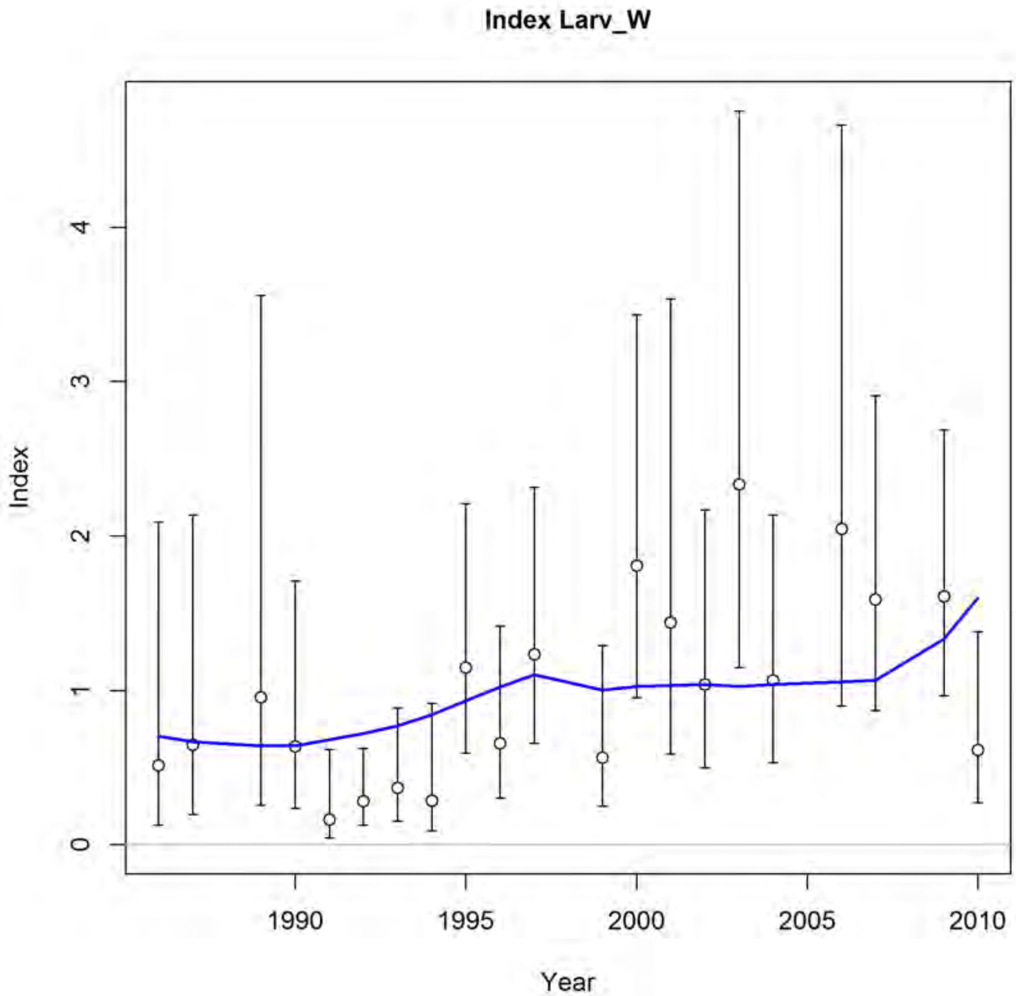



Figure 2.4.12. Observed and predicted index of abundance for larval red snapper in the western Gulf of Mexico from the SEAMAP Fall Plankton Survey, 1986-2010.

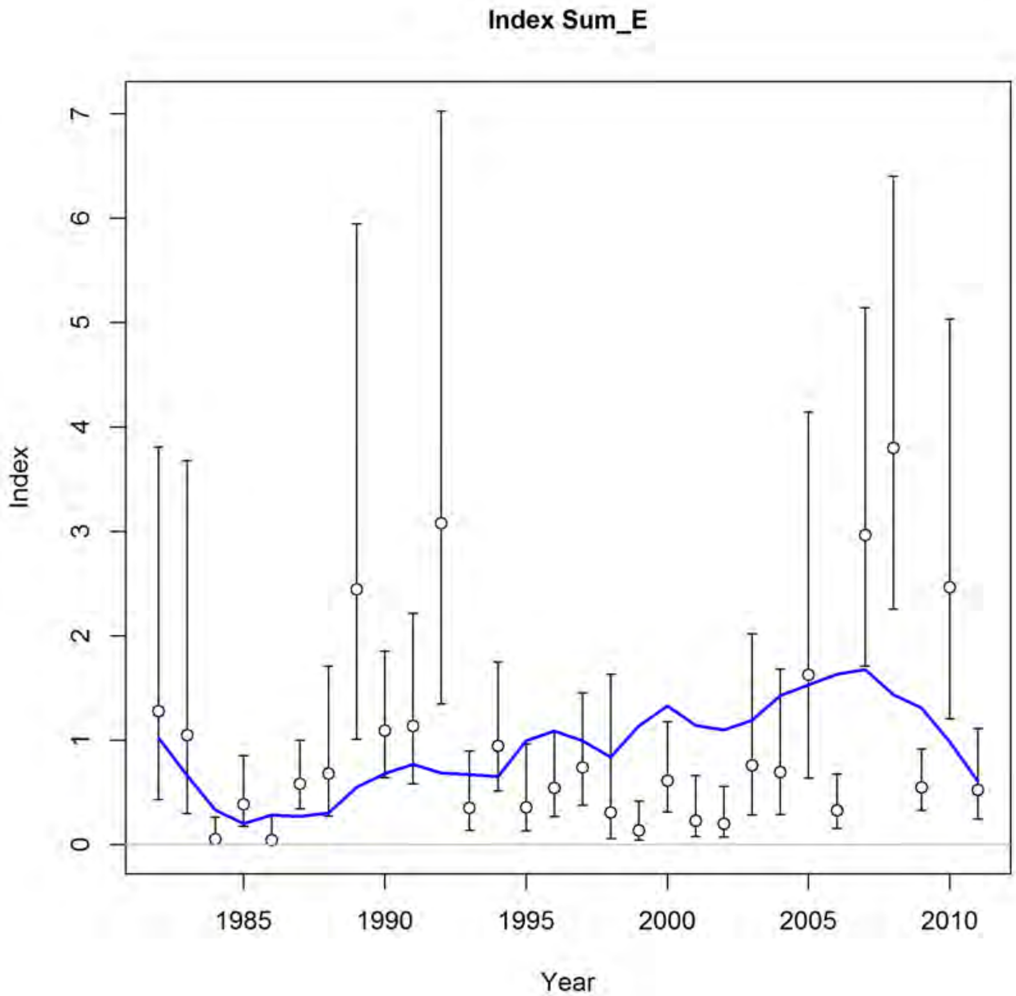



Figure 2.4.13. Observed and predicted index of abundance for red snapper in the eastern Gulf of Mexico from the SEAMAP groundfish summer survey, 1982-2011.

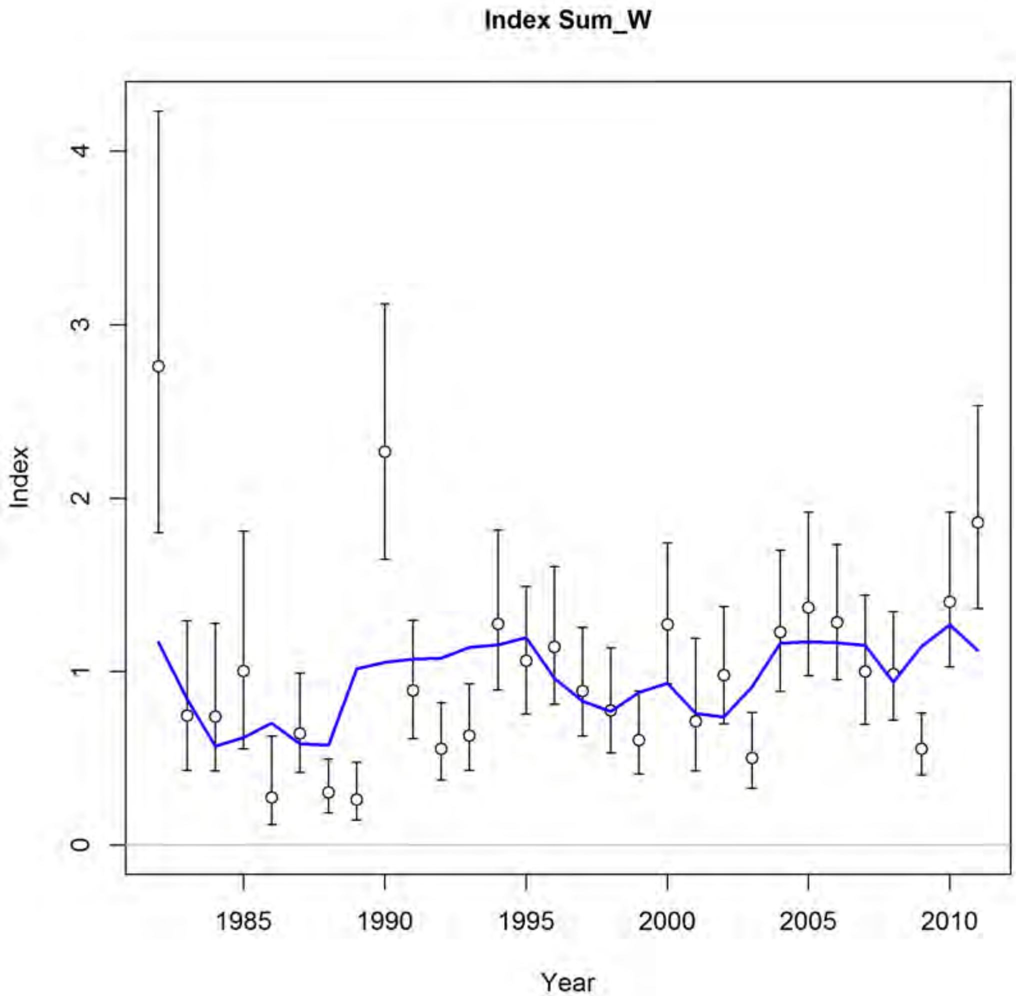



Figure 2.4.14. Observed and predicted index of abundance for red snapper in the western Gulf of Mexico from the SEAMAP groundfish summer survey, 1982-2011.

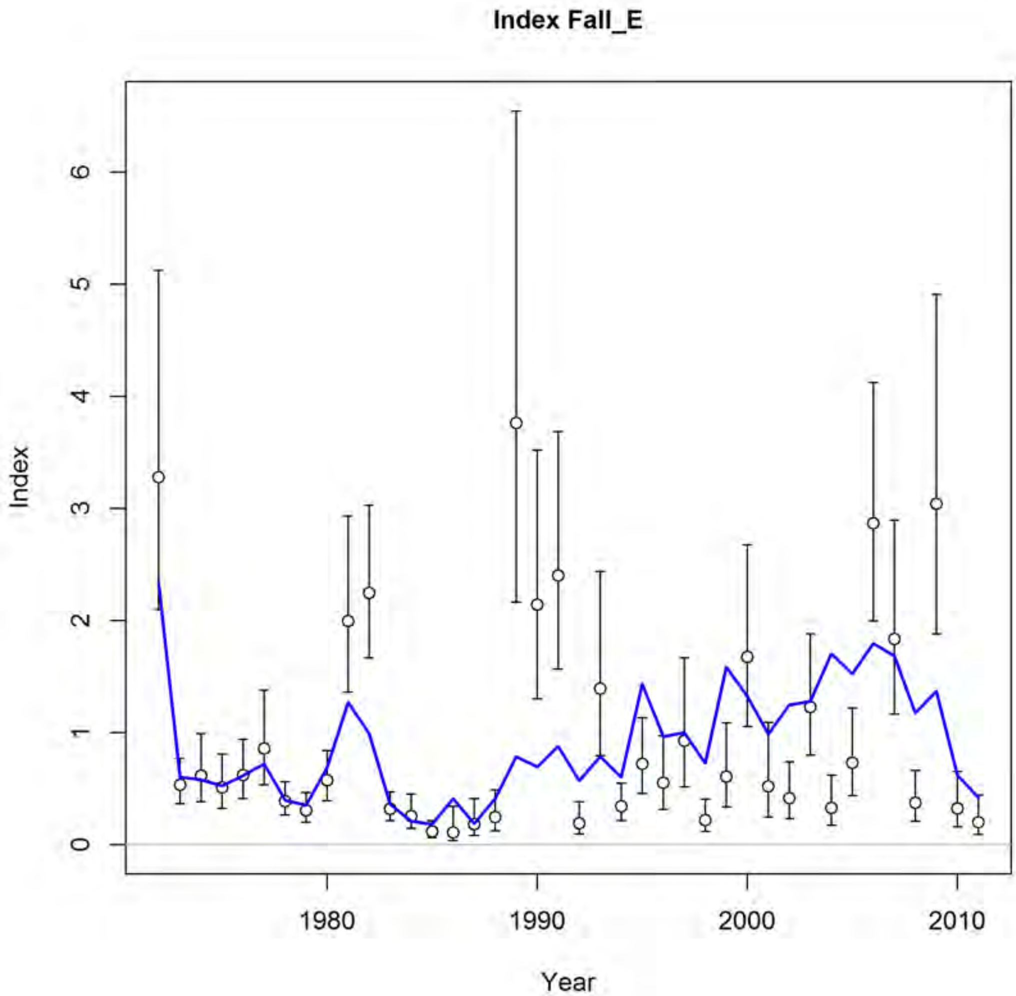



Figure 2.4.15. Observed and predicted index of abundance for red snapper in the eastern Gulf of Mexico from the SEAMAP groundfish fall survey, 1972-2011.

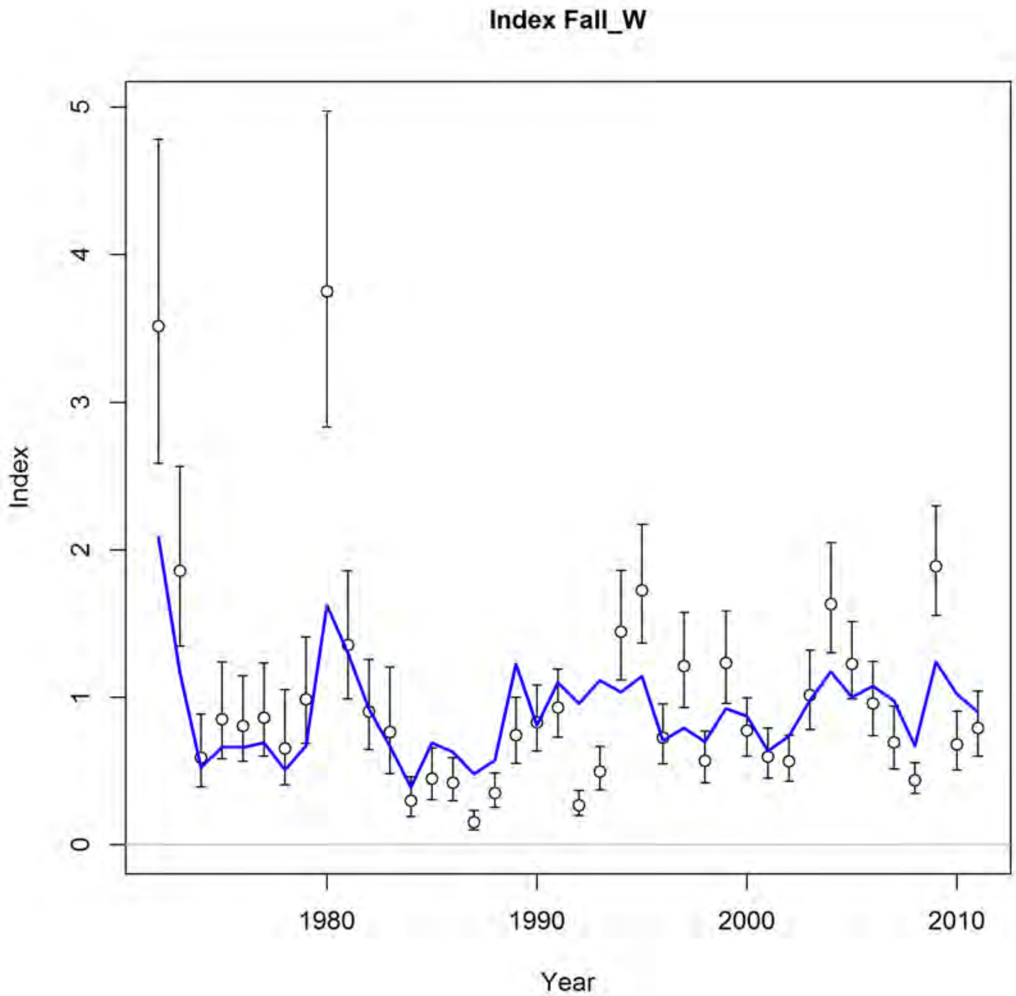



Figure 2.4.16. Observed and predicted index of abundance for red snapper in the western Gulf of Mexico from the SEAMAP groundfish fall survey, 1972-2011.

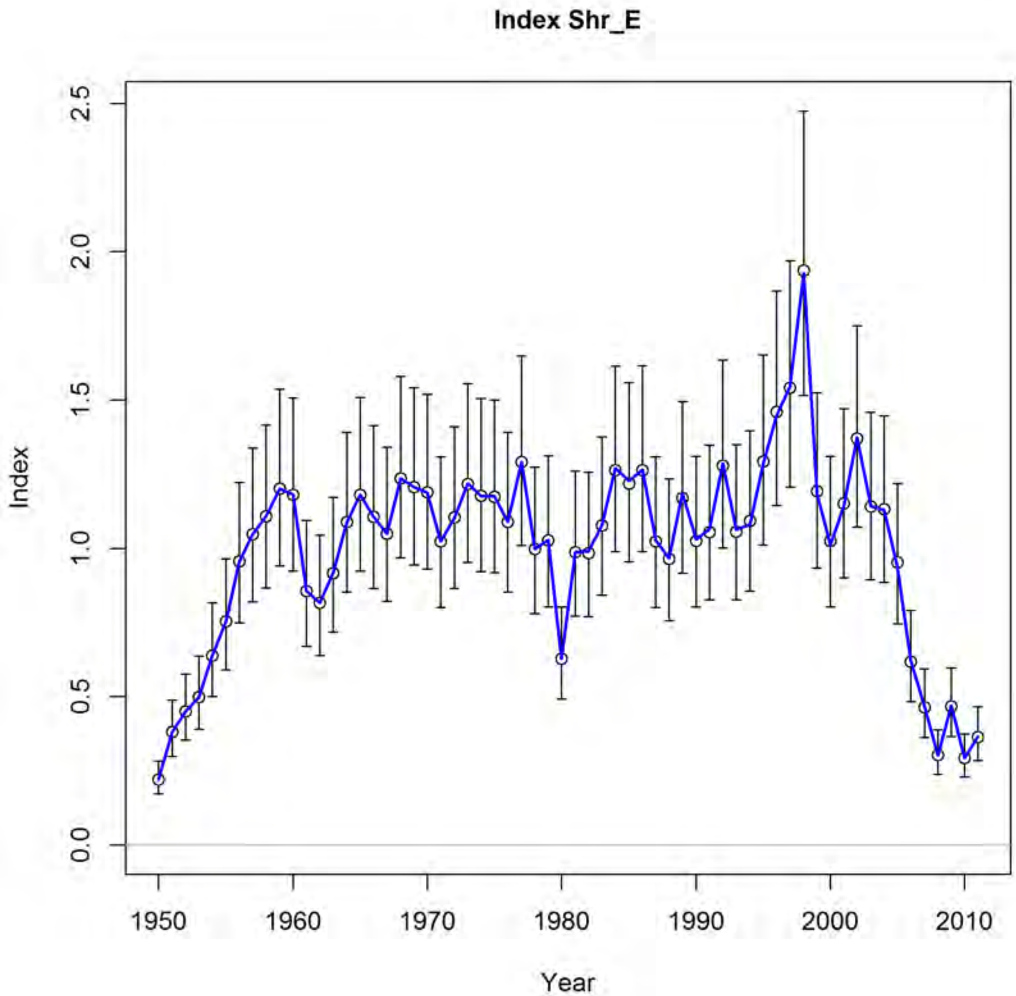



Figure 2.4.17. Observed and predicted index of fishing effort for the shrimp fishery in the eastern Gulf of Mexico, 1950-2011.

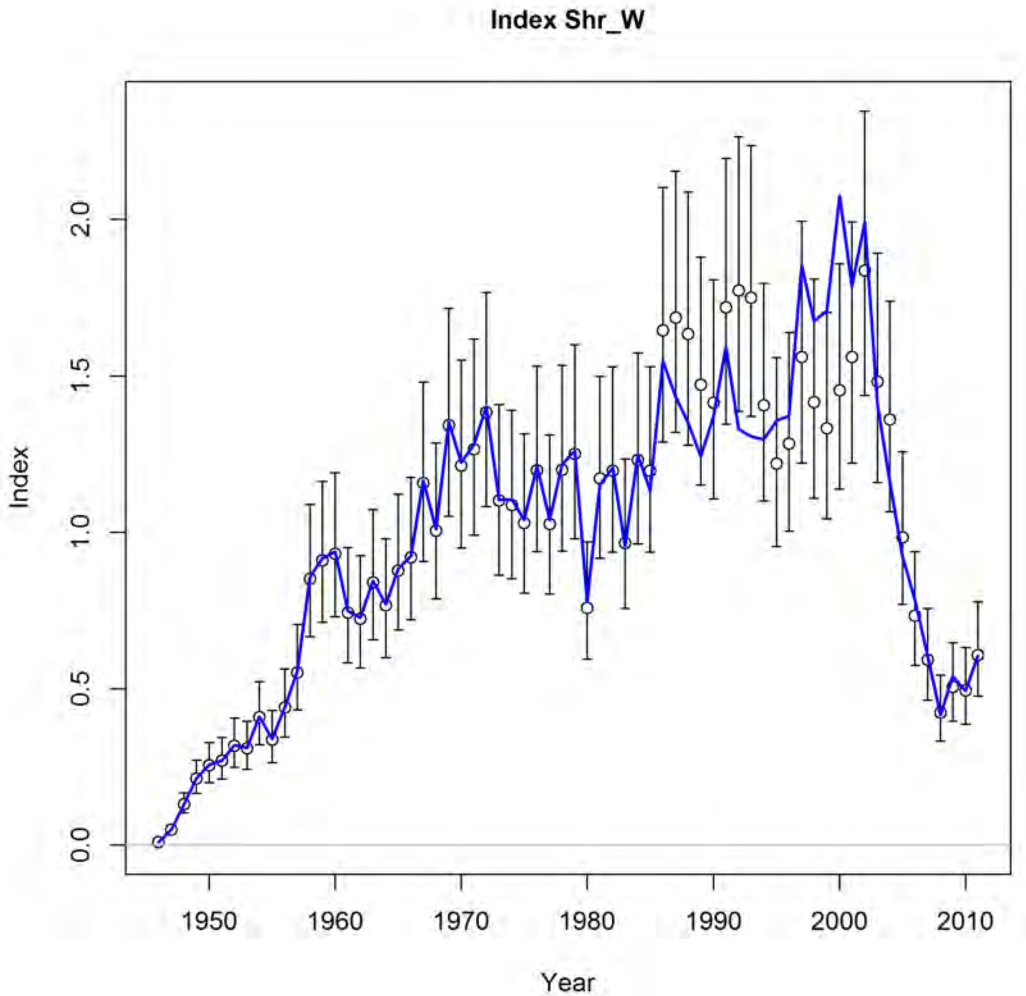



Figure 2.4.18. Observed and predicted index of fishing effort for the shrimp fishery in the western Gulf of Mexico, 1946-2011.

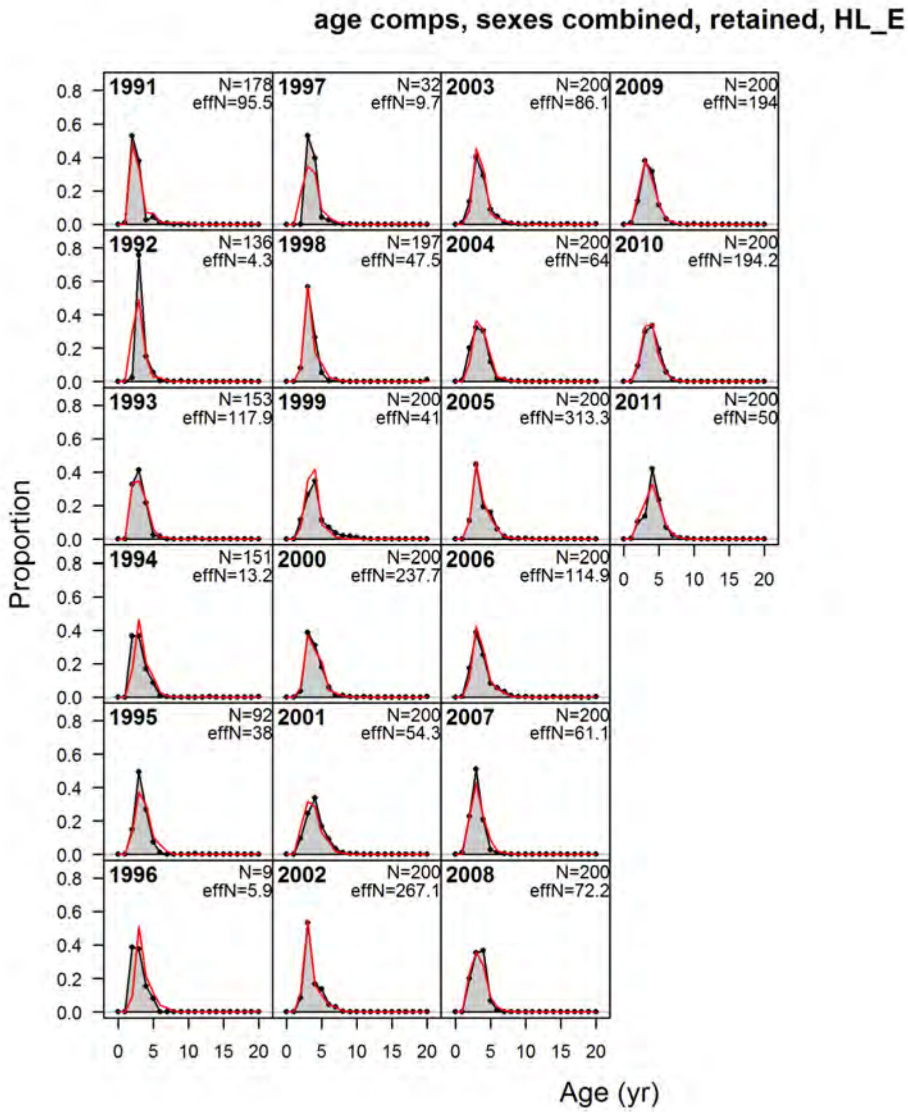



Figure 2.5.1. Observed and predicted age composition of red snapper landed from the commercial handline fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

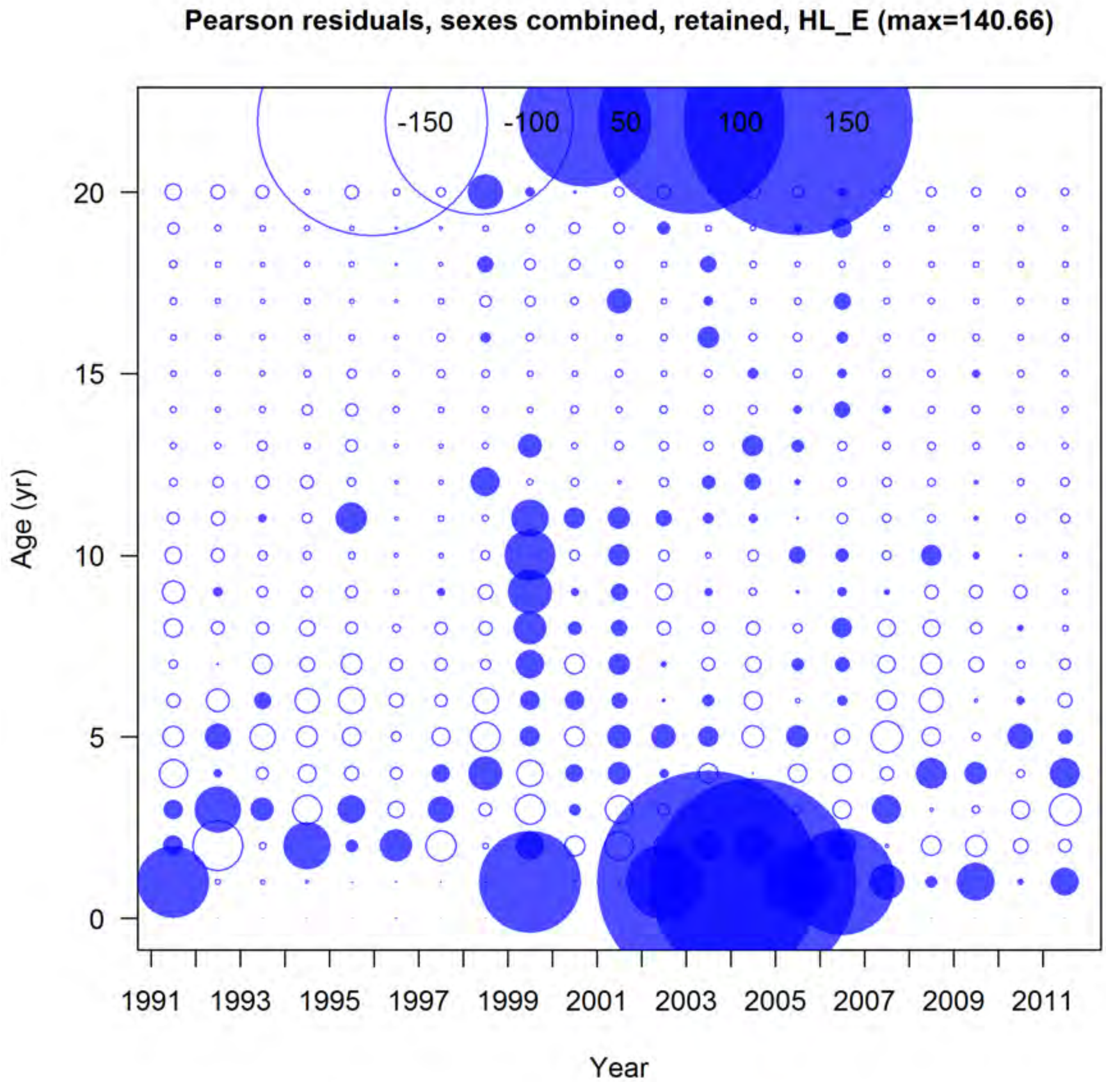



Figure 2.5.2. Pearson residuals of age composition fits for landed red snapper from the commercial handline fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

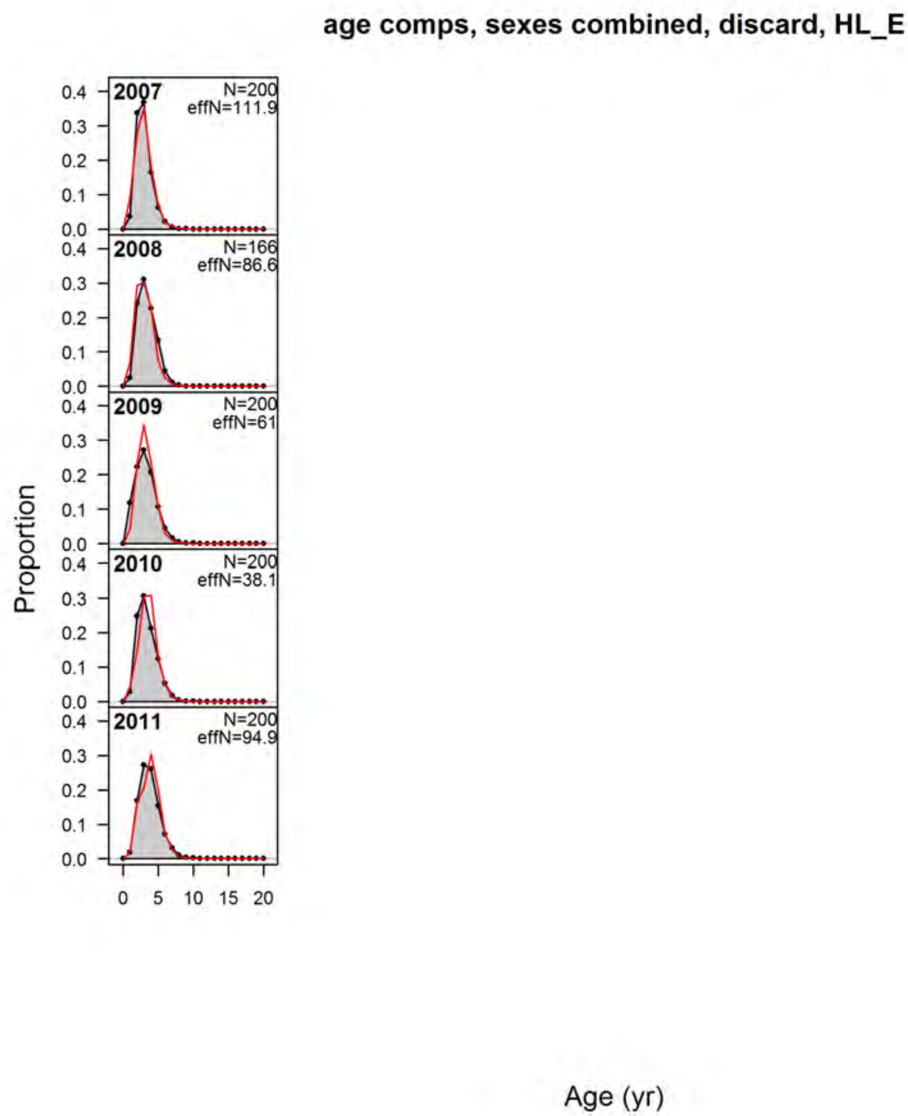



Figure 2.5.3. Observed and predicted age composition of red snapper discarded from the commercial handline fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

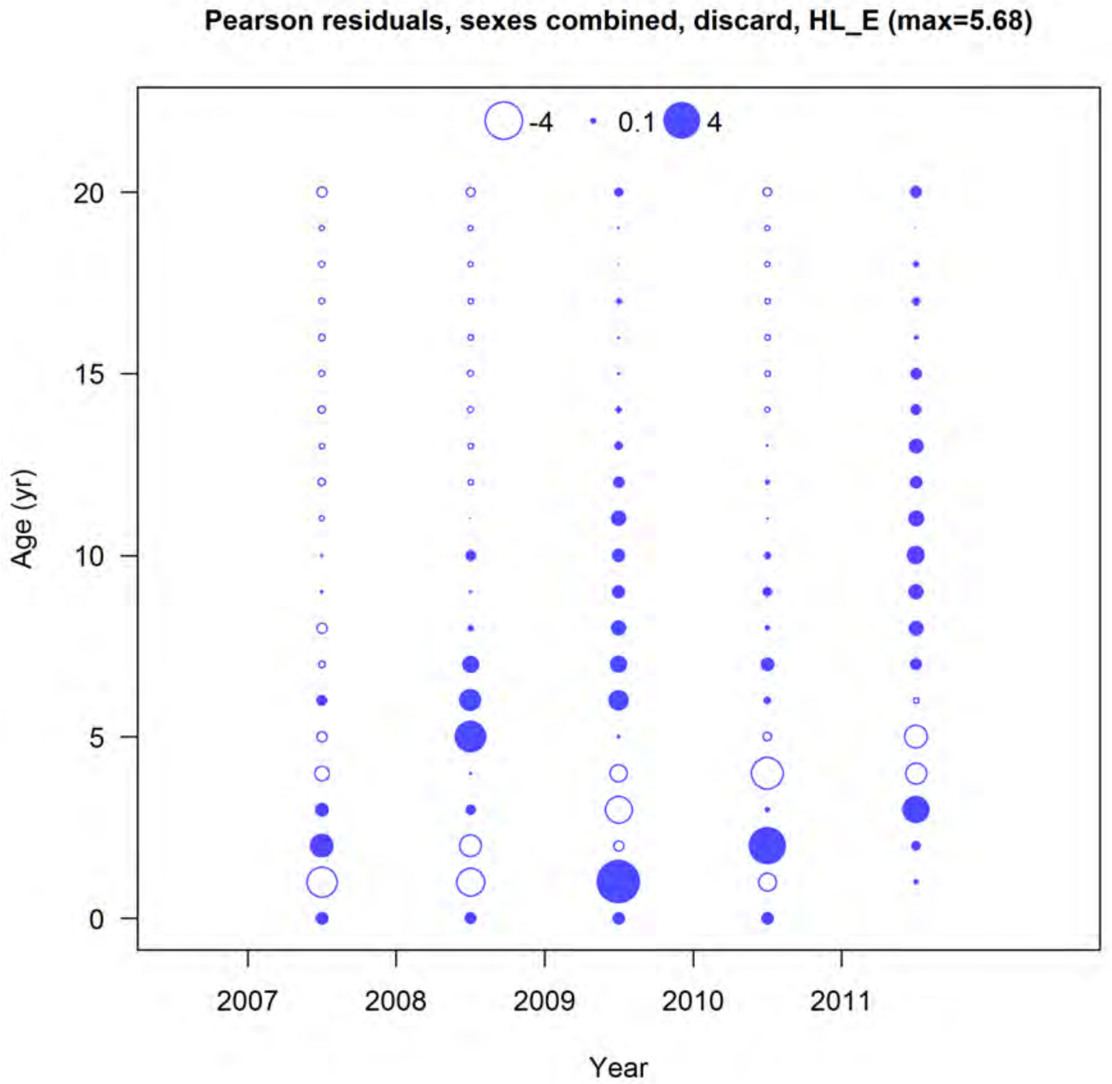



Figure 2.5.4. Pearson residuals of age composition fits for discarded red snapper from the commercial handline fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

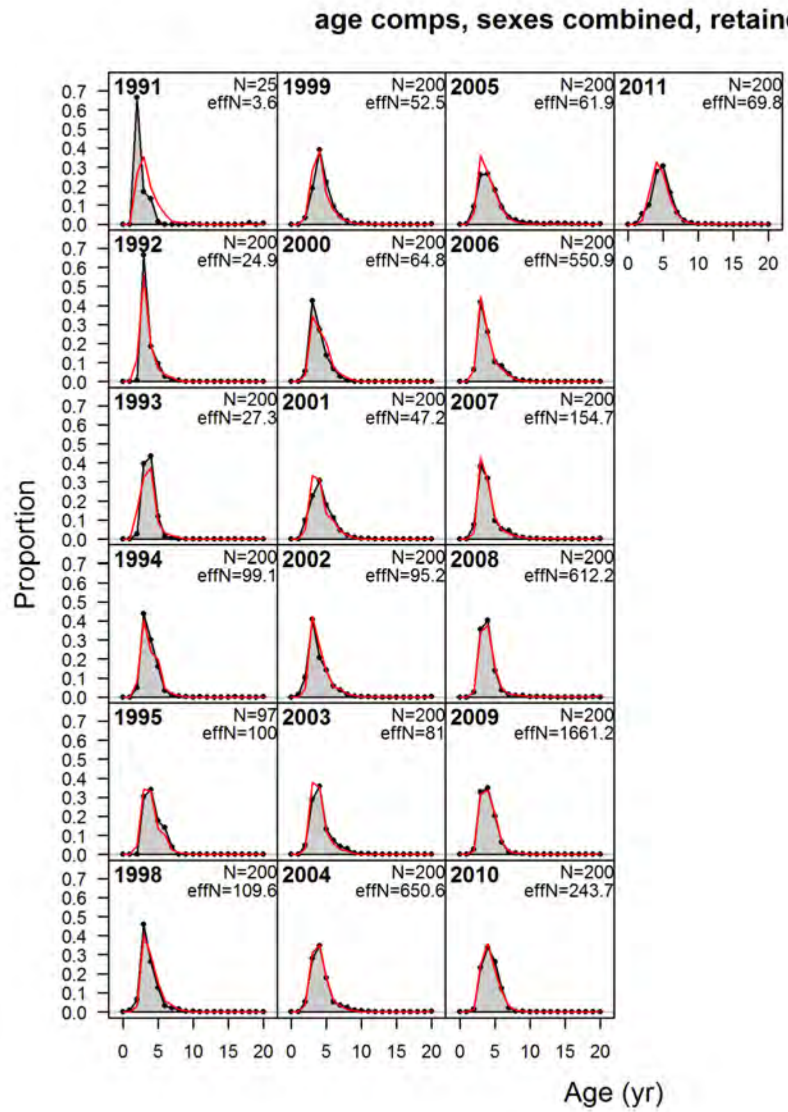



Figure 2.5.5. Observed and predicted age composition of red snapper landed from the commercial handline fishery in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

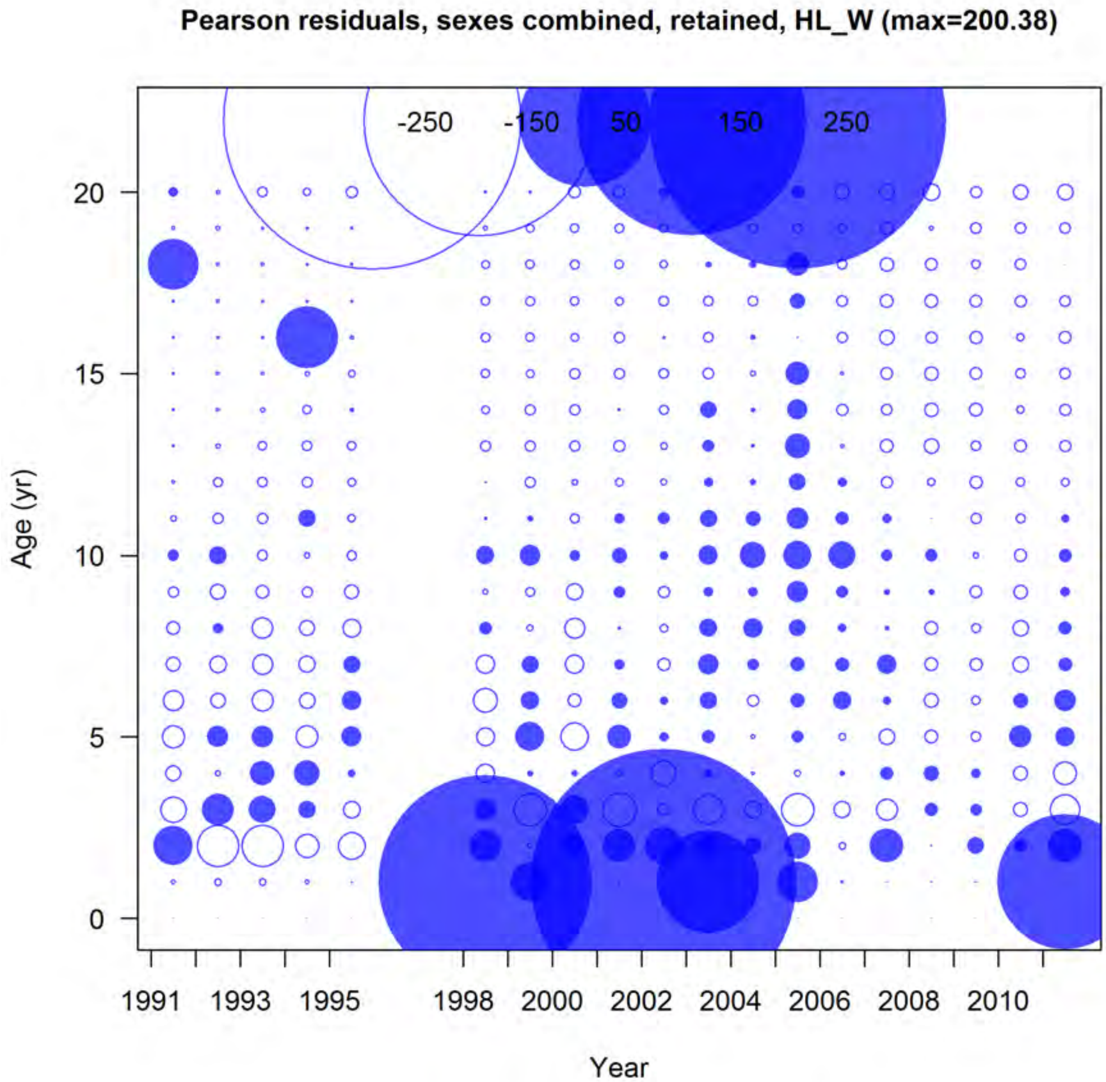



Figure 2.5.6. Pearson residuals of age composition fits for landed red snapper from the commercial handline fishery in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

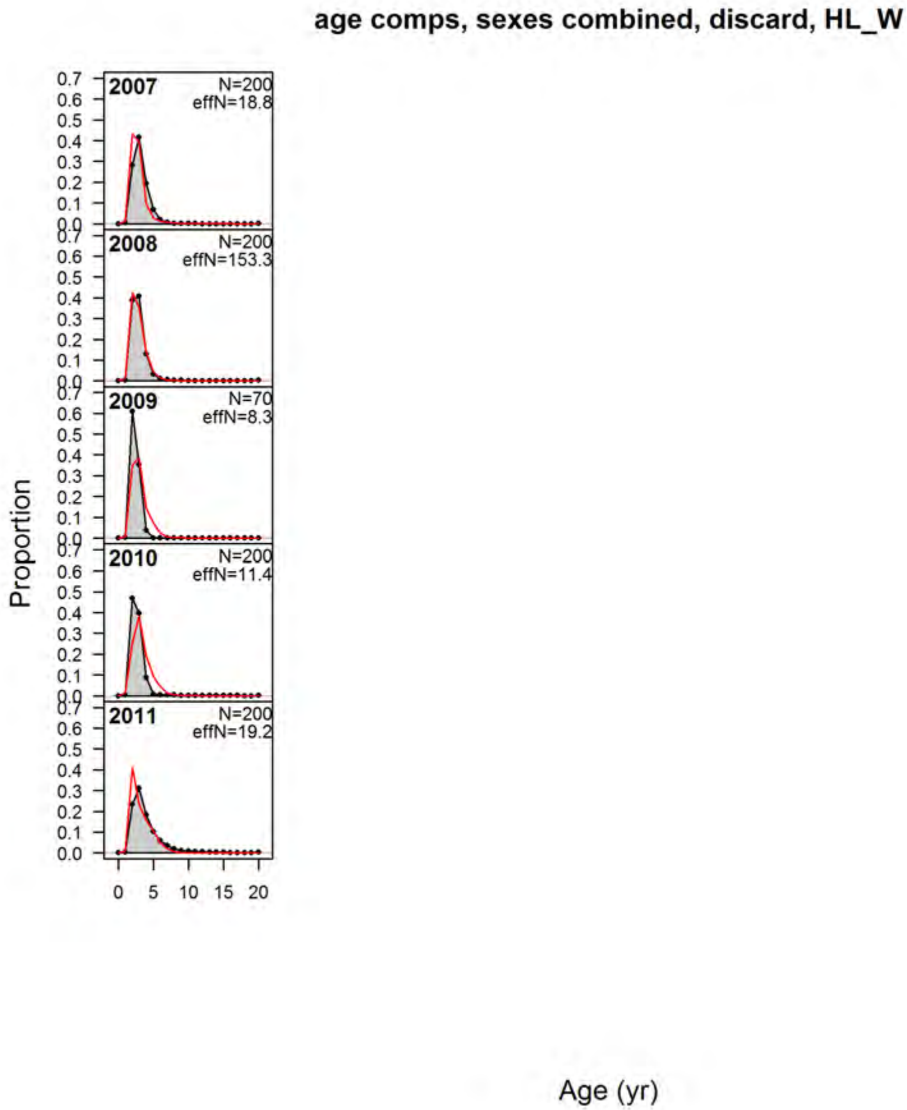



Figure 2.5.7. Observed and predicted age composition of red snapper discarded from the commercial handline fishery in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

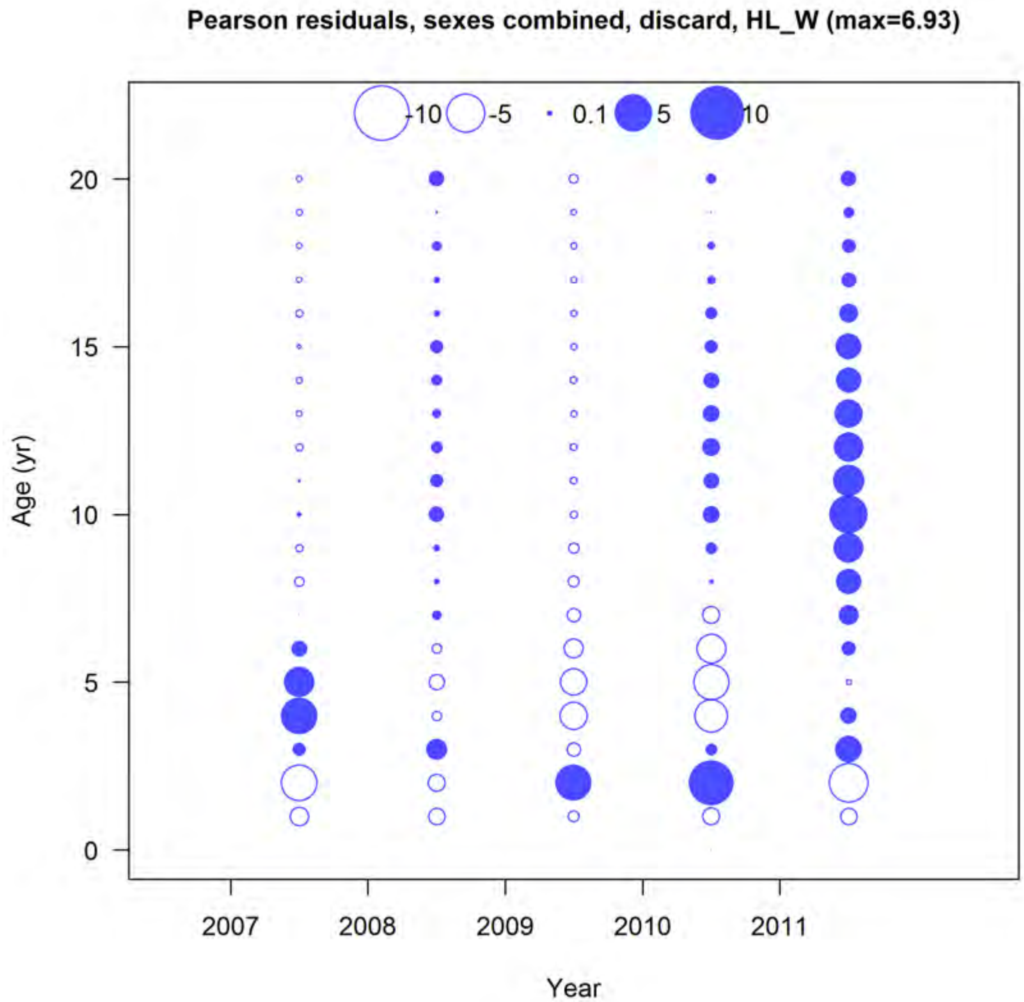



Figure 2.5.8. Pearson residuals of age composition fits for discarded red snapper from the commercial handline fishery in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

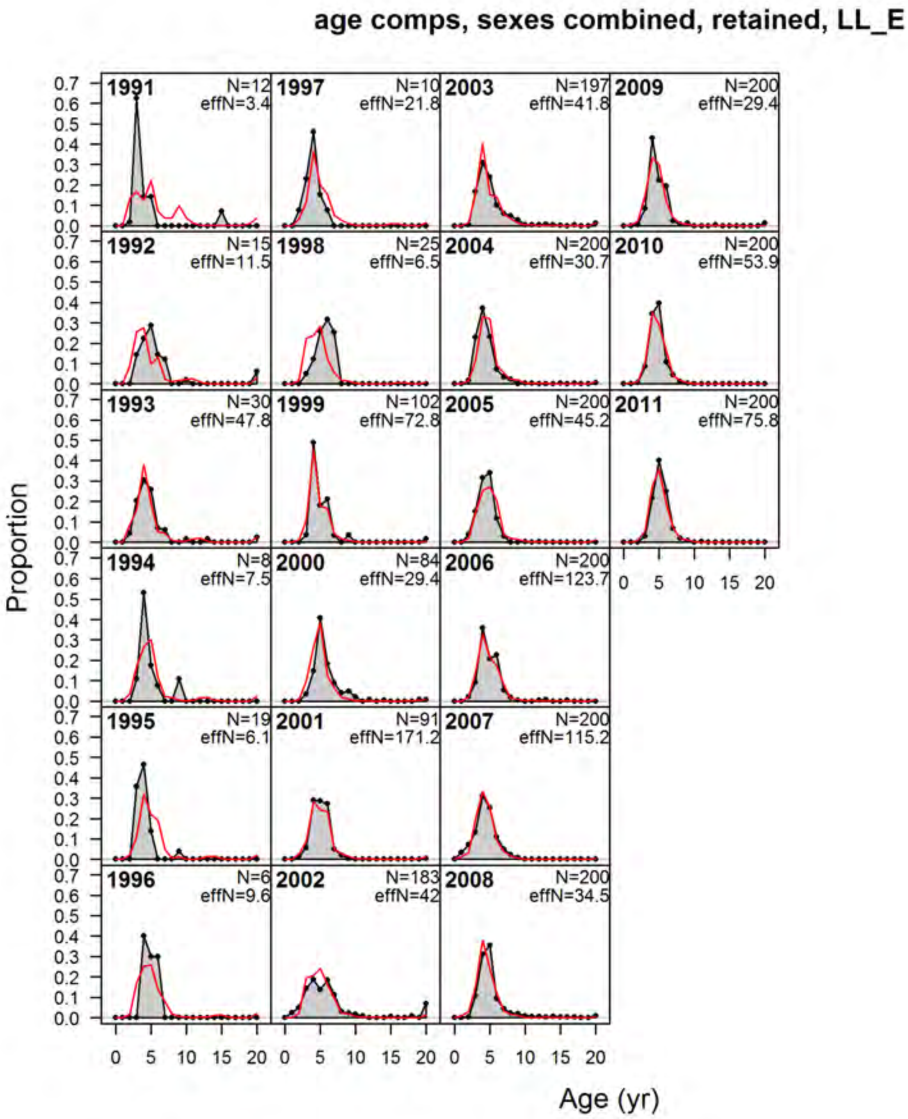



Figure 2.5.9. Observed and predicted age composition of red snapper landed from the commercial longline fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

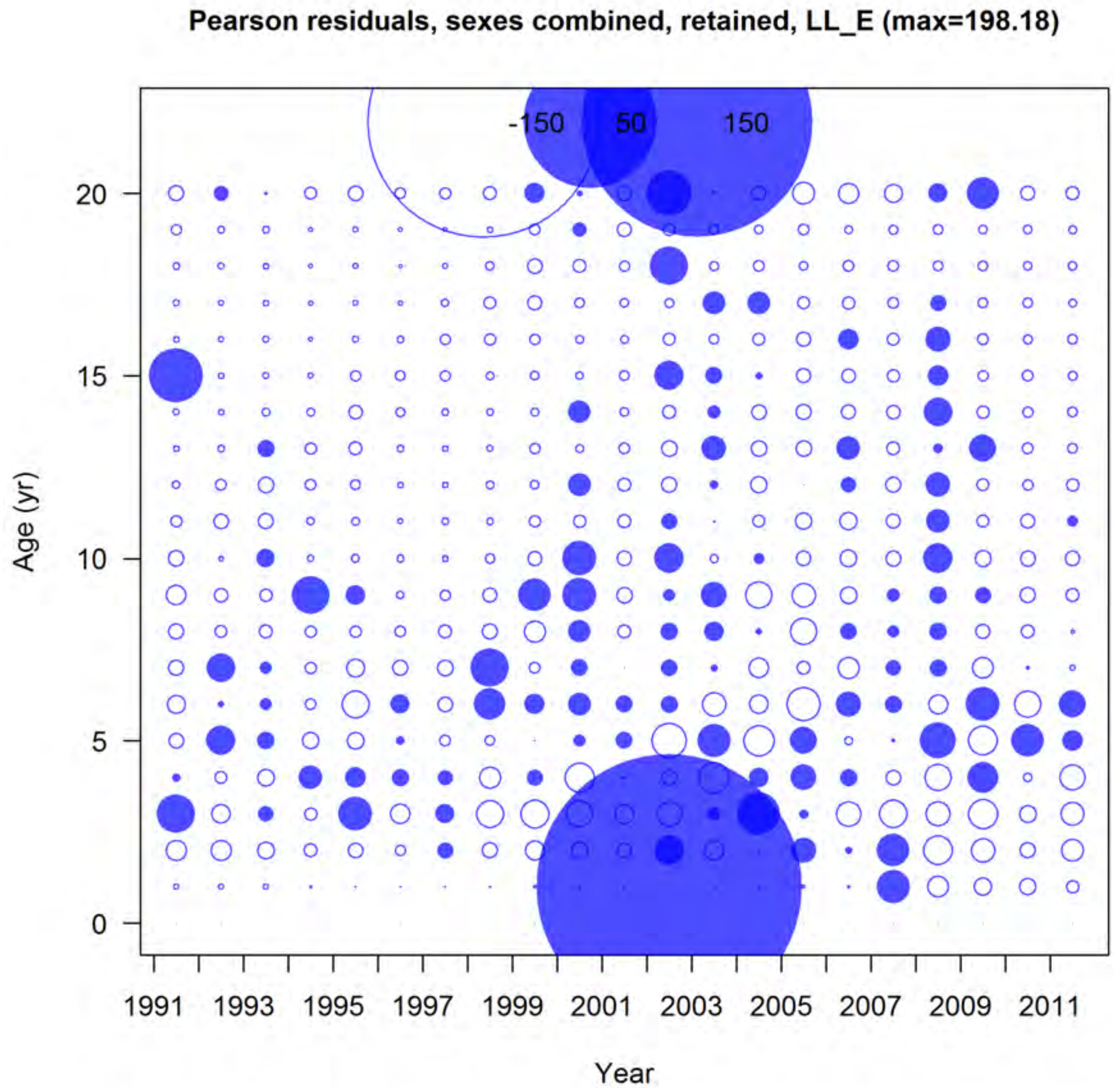



Figure 2.5.10. Pearson residuals of age composition fits for landed red snapper from the commercial longline fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

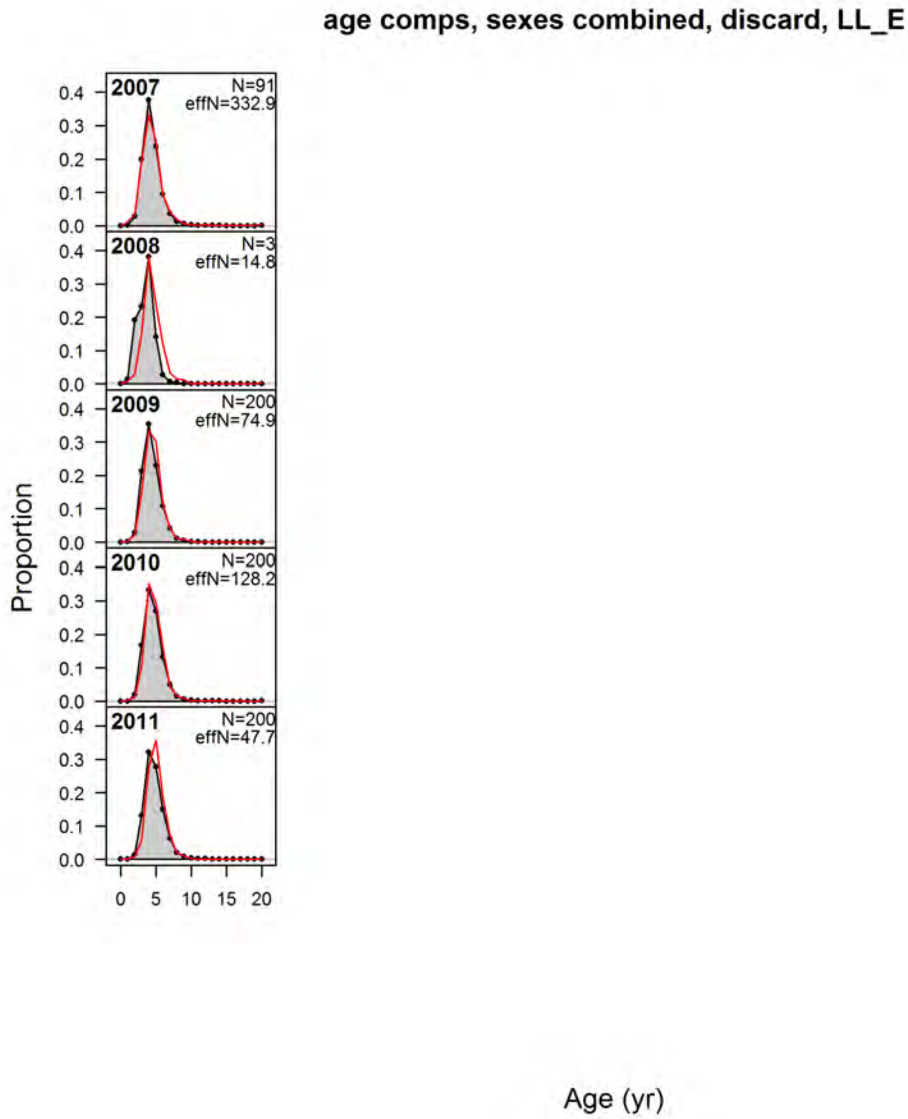



Figure 2.5.11. Observed and predicted age composition of red snapper discarded from the commercial longline fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

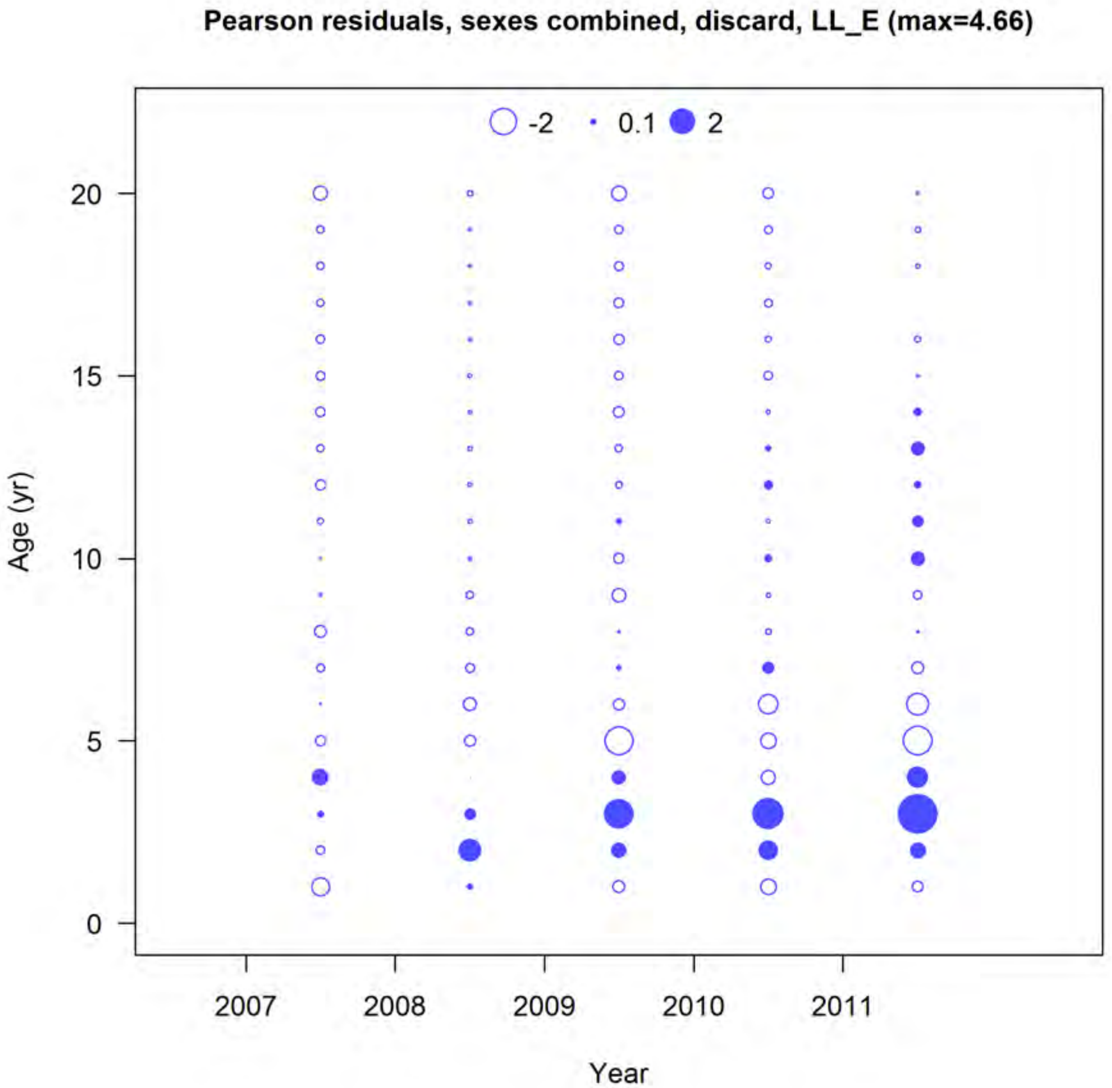



Figure 2.5.12. Pearson residuals of age composition fits for discarded red snapper from the commercial longline fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

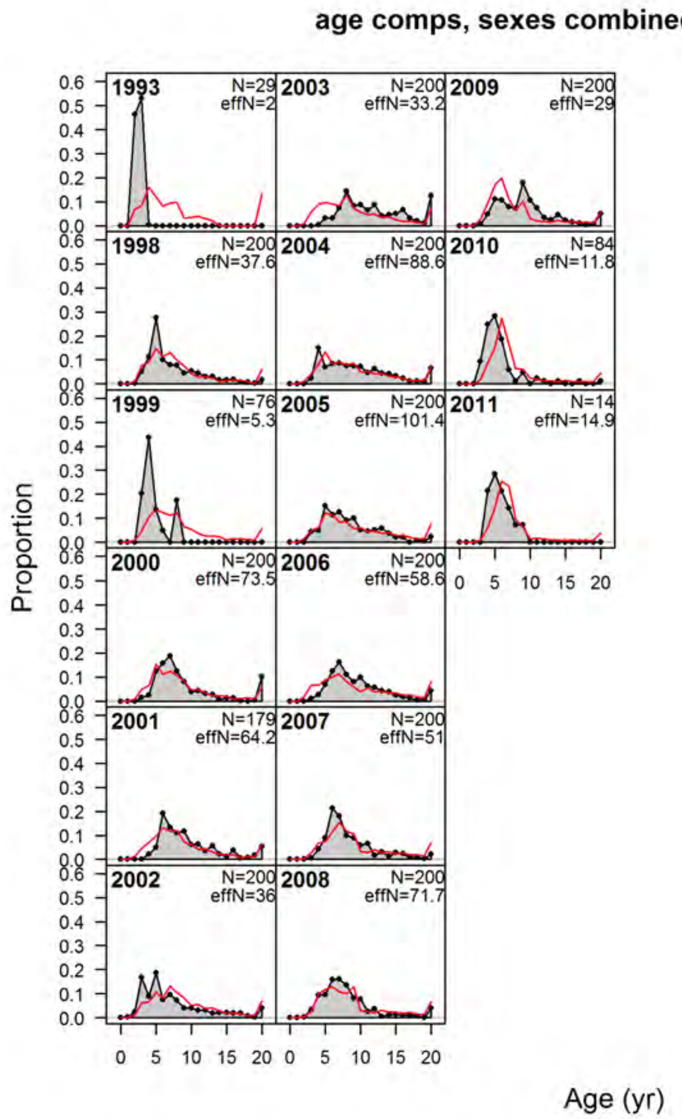



Figure 2.5.13. Observed and predicted age composition of red snapper landed from the commercial longline fishery in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

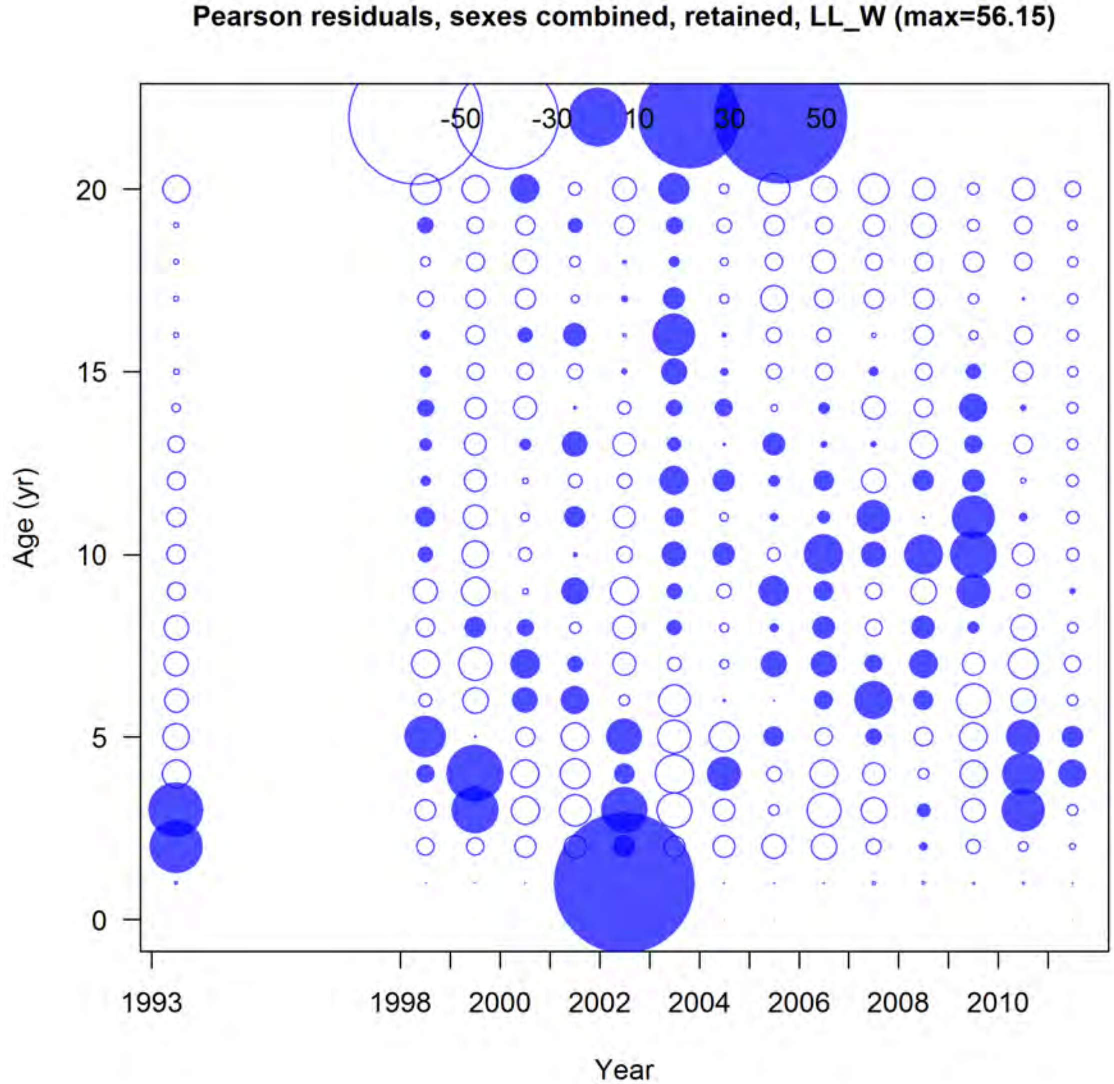



Figure 2.5.14. Pearson residuals of age composition fits for landed red snapper from the commercial longline fishery in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

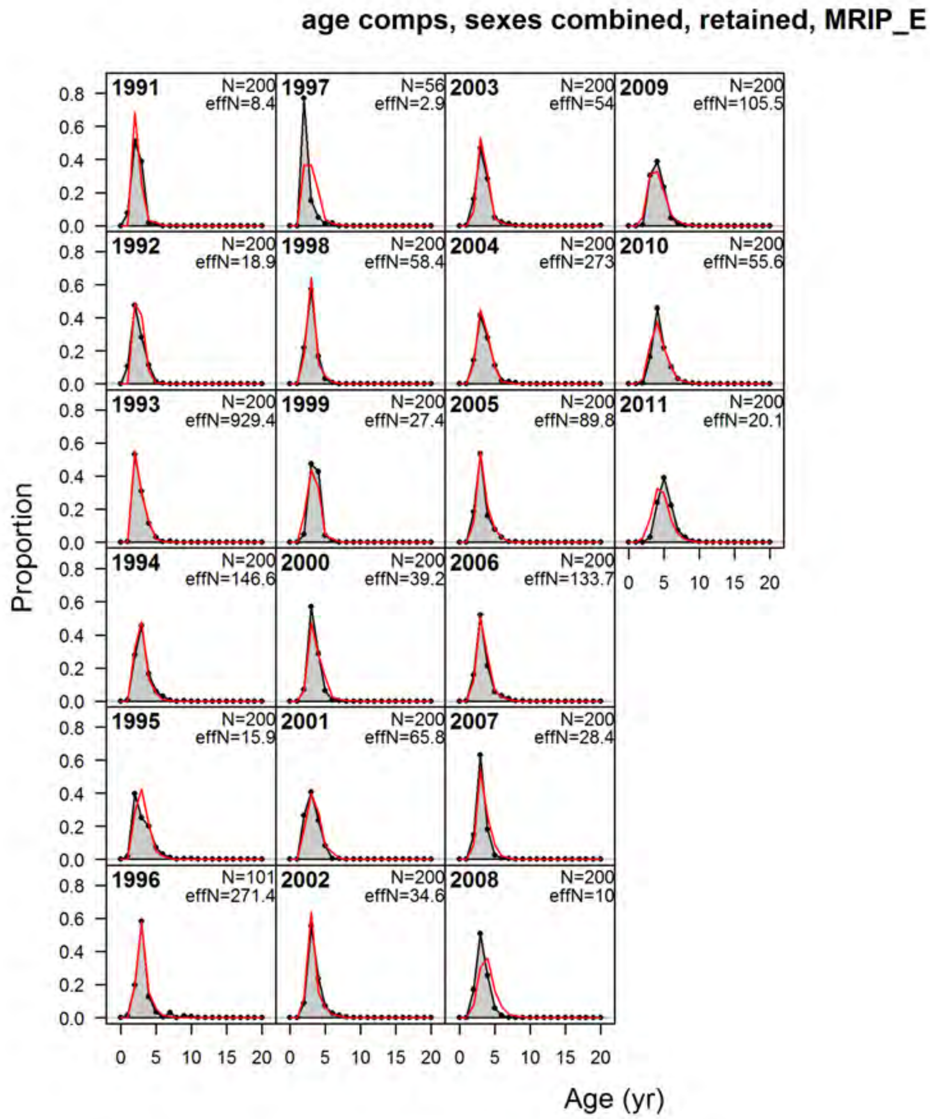



Figure 2.5.15. Observed and predicted age composition of red snapper landed from the private recreational fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

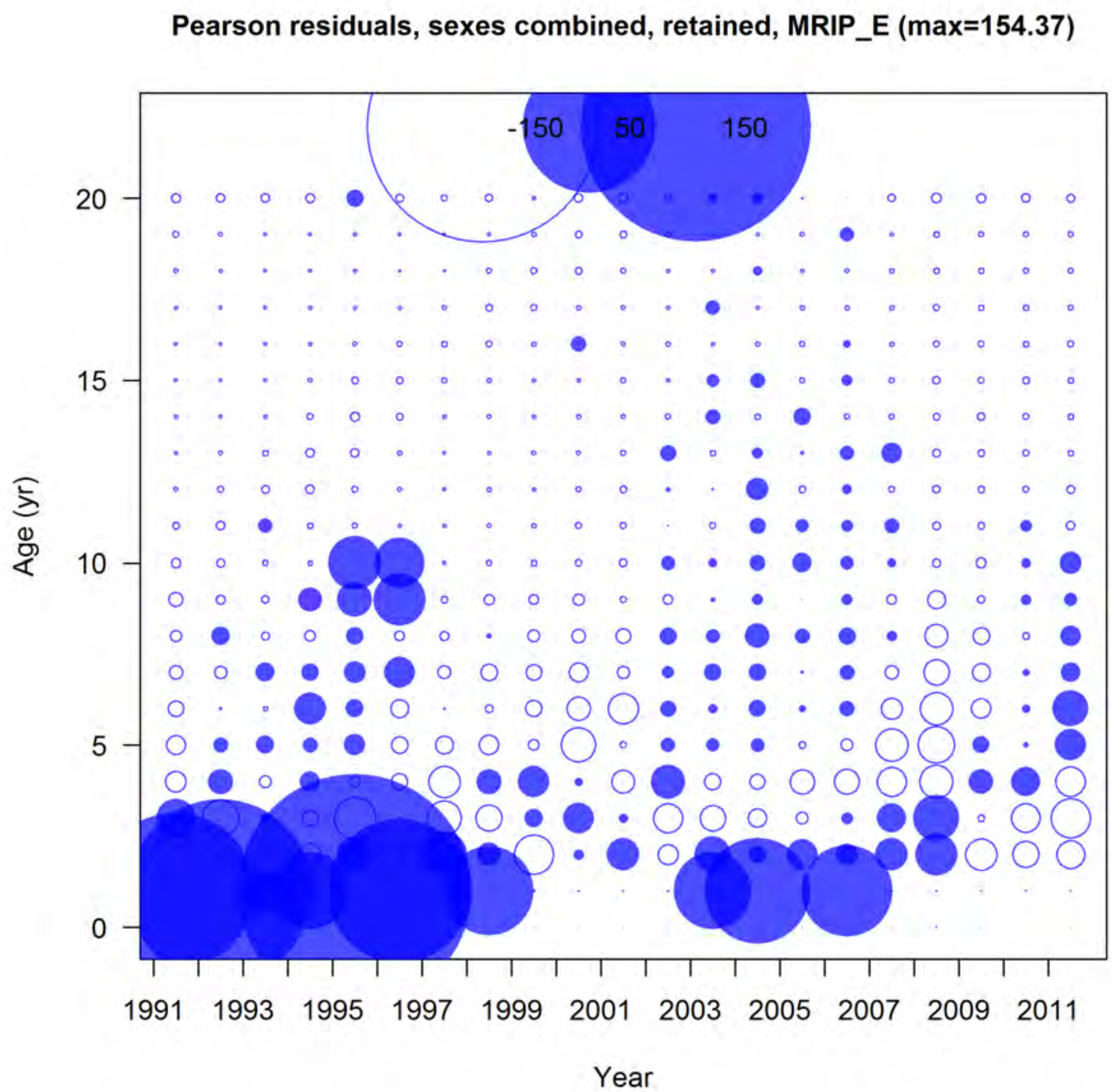



Figure 2.5.16. Pearson residuals of age composition fits for landed red snapper from the private recreational fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

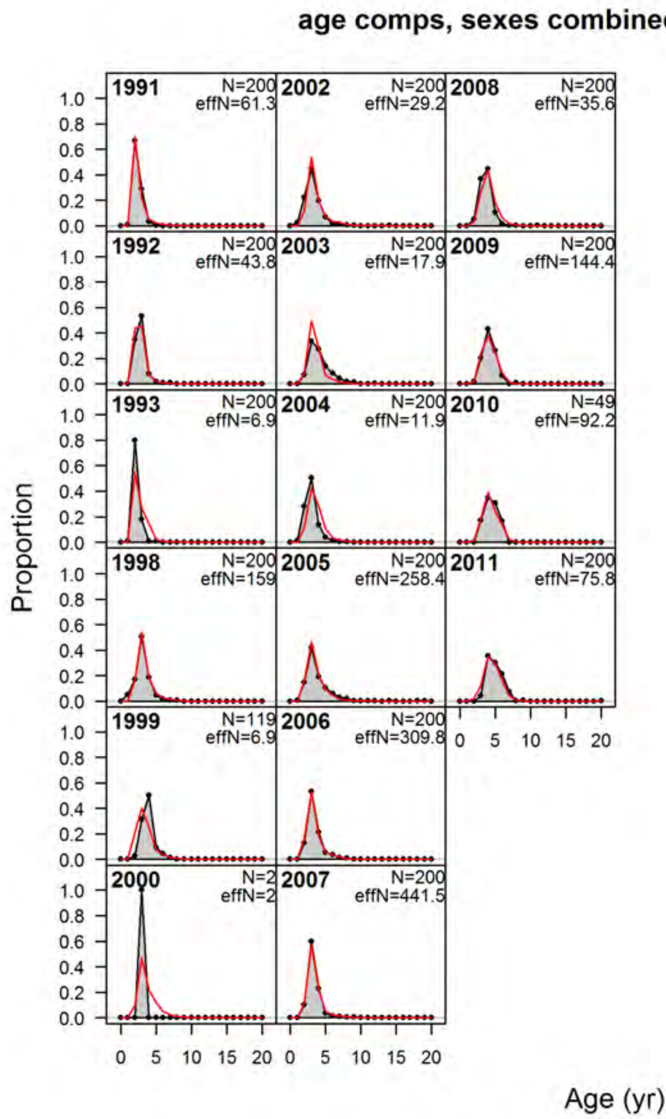



Figure 2.5.17. Observed and predicted age composition of red snapper landed from the private recreational fishery in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

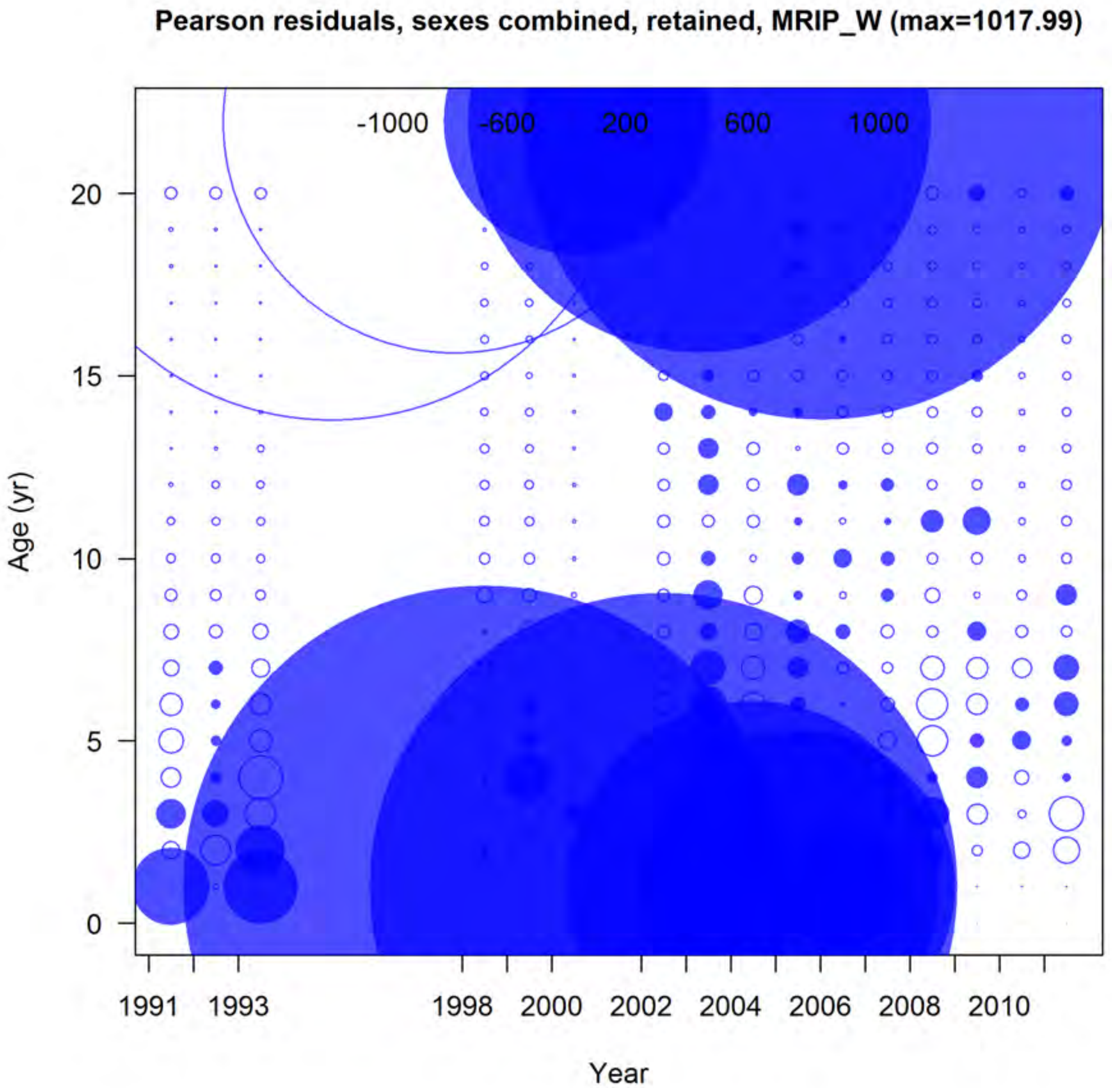



Figure 2.5.18. Pearson residuals of age composition fits for landed red snapper from the private recreational fishery in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

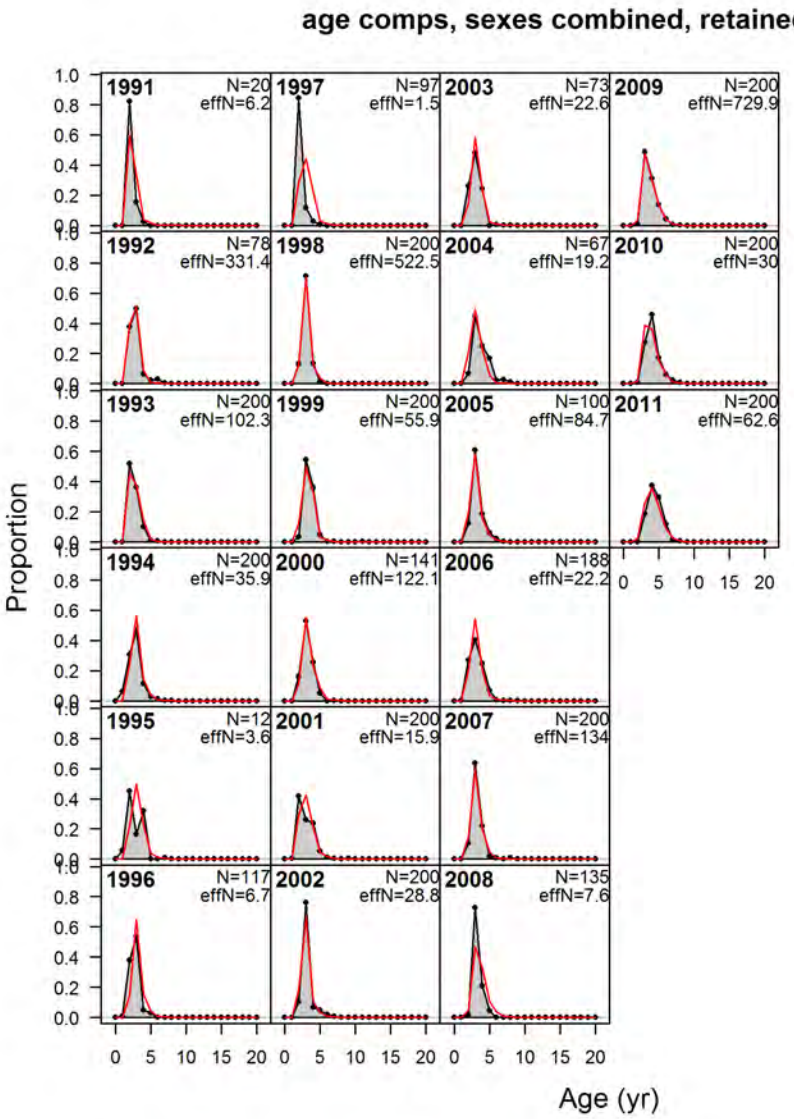



Figure 2.5.19. Observed and predicted age composition of red snapper landed from the recreational headboat fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

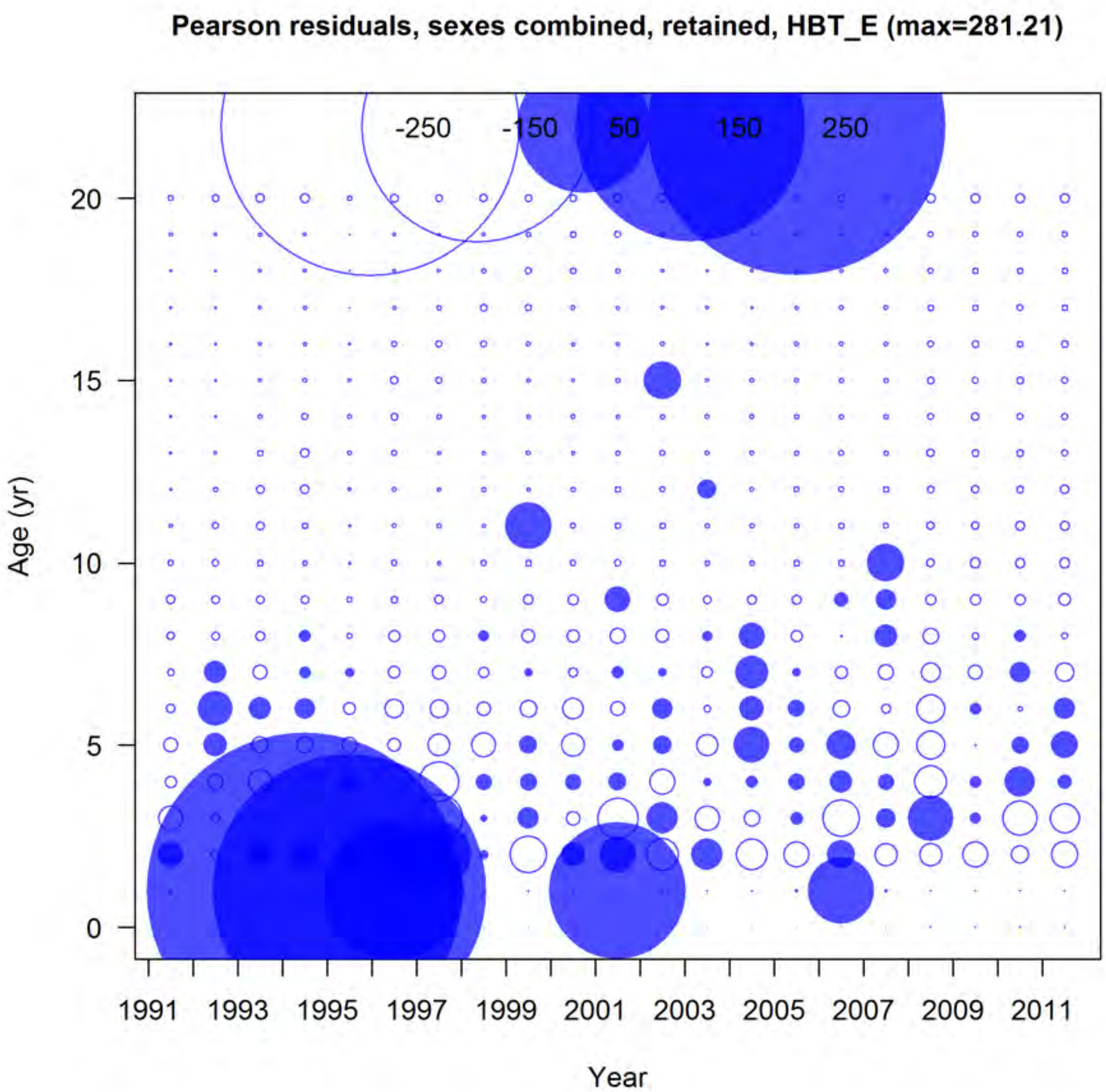



Figure 2.5.20. Pearson residuals of age composition fits for landed red snapper from the recreational headboat fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

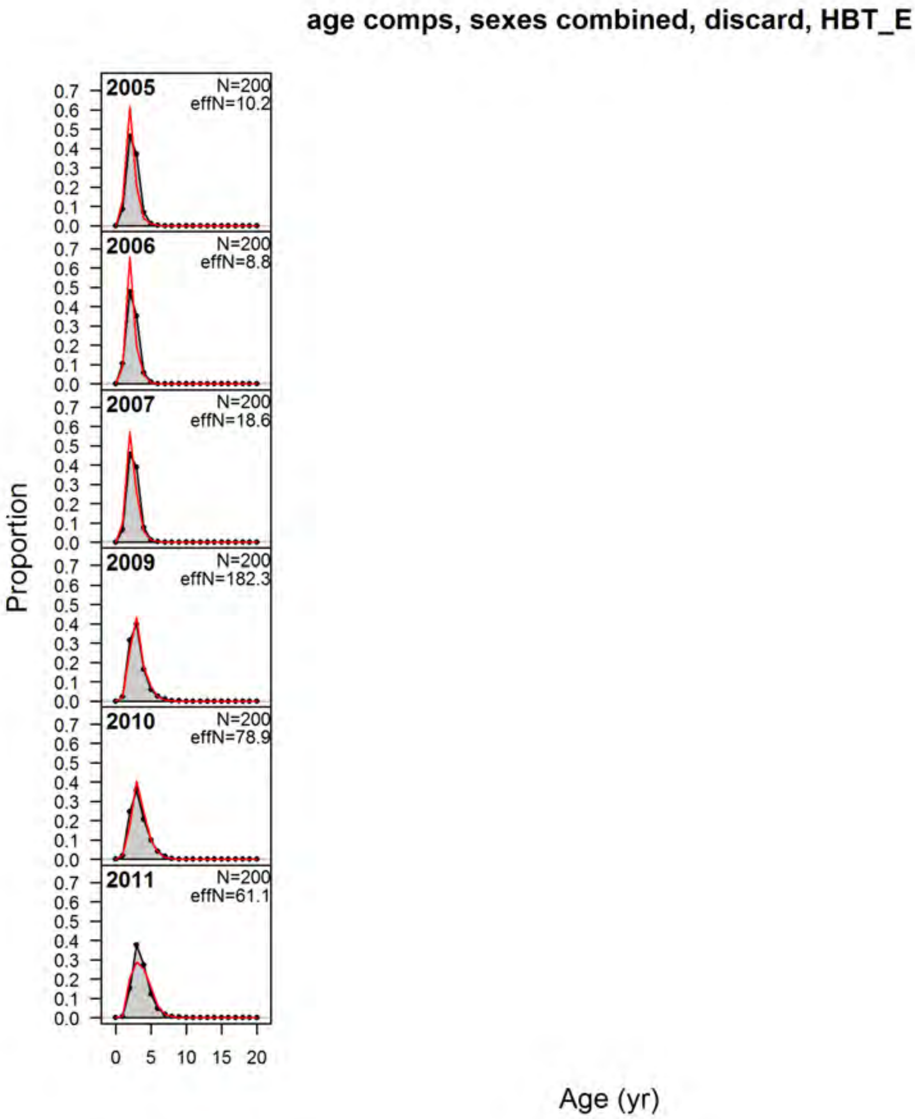



Figure 2.5.21. Observed and predicted age composition of discarded red snapper from the recreational headboat fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

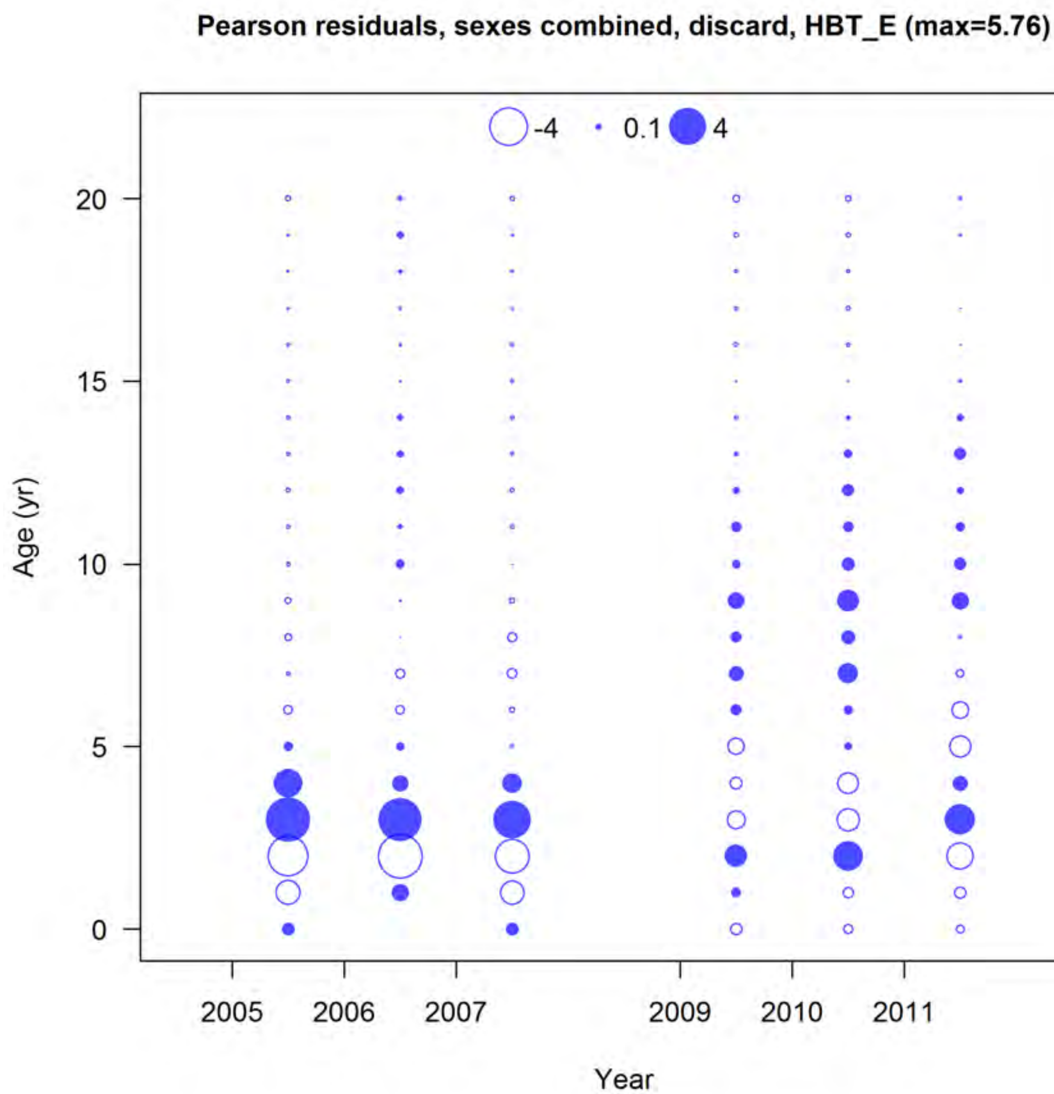



Figure 2.5.22. Pearson residuals of age composition fits for discarded red snapper from the recreational headboat fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

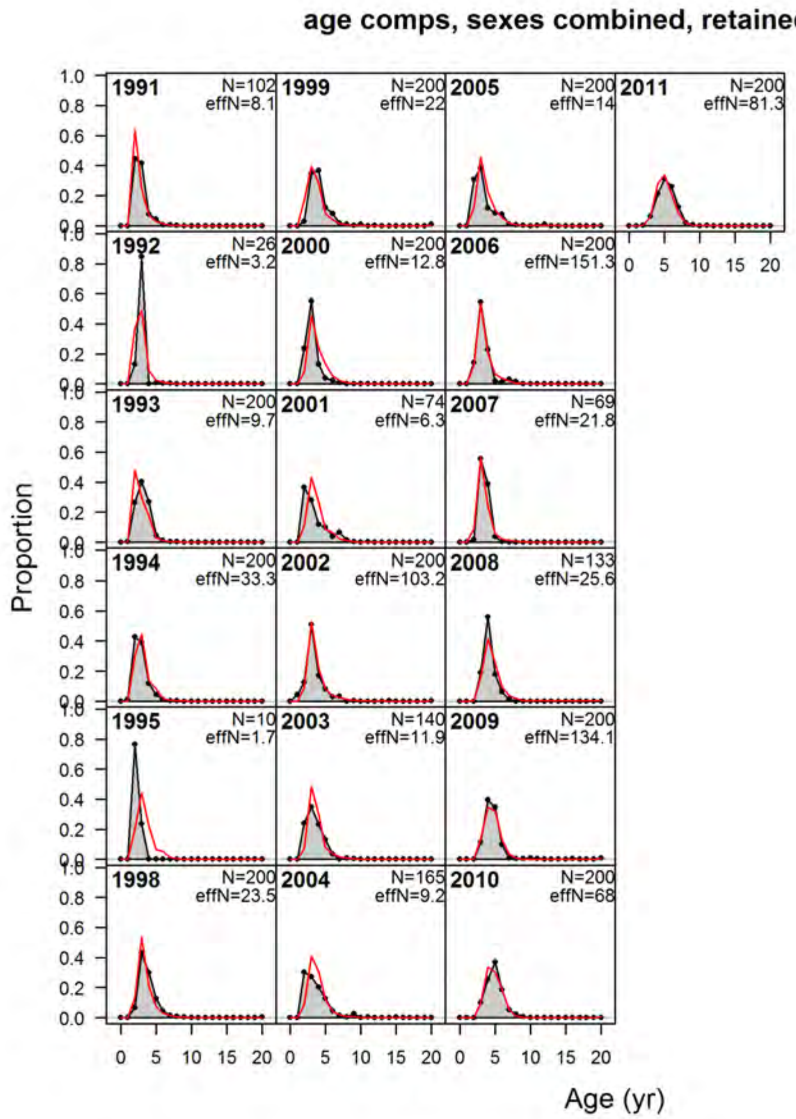



Figure 2.5.23. Observed and predicted age composition of red snapper landed from the recreational headboat fishery in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

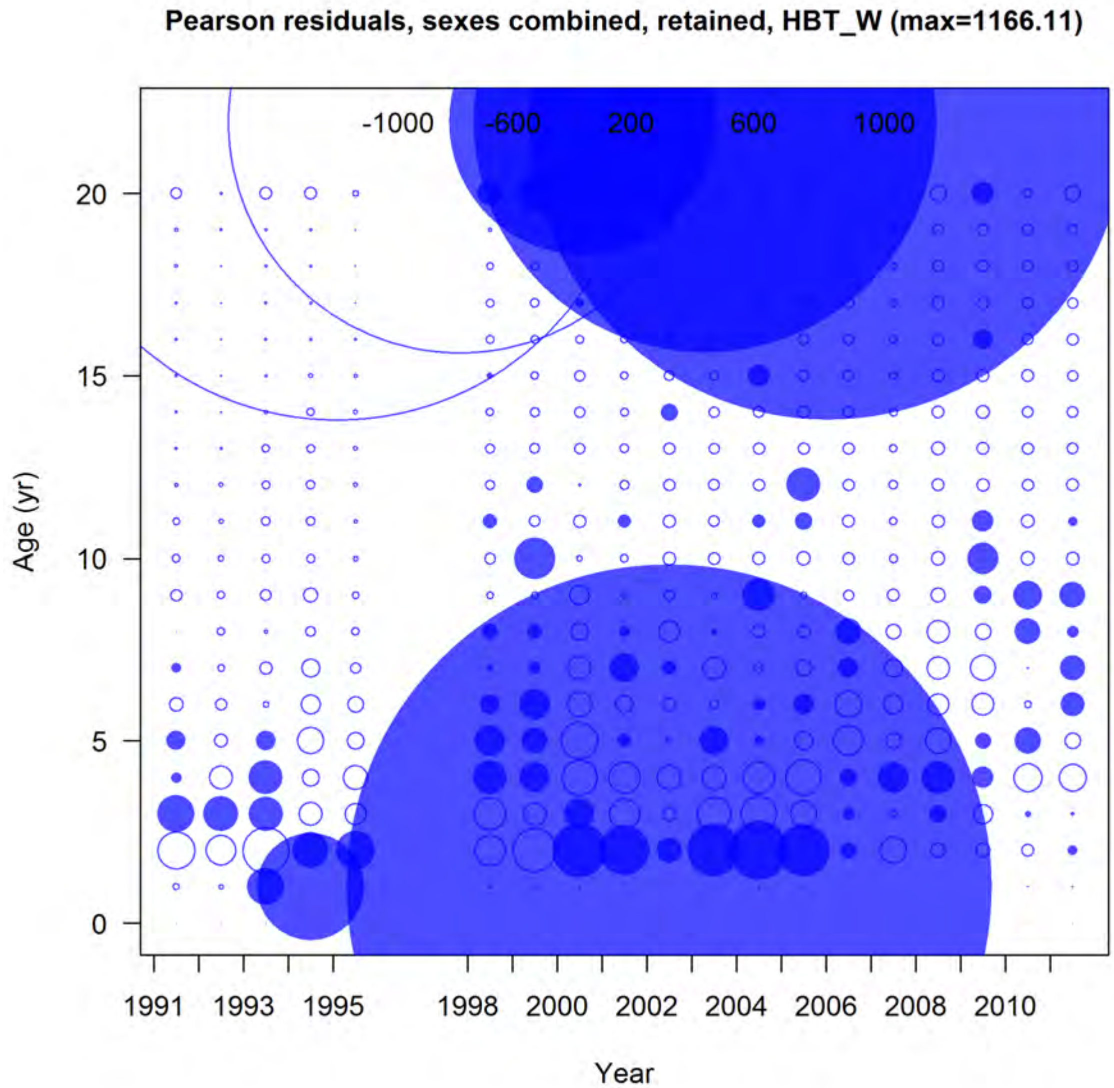



Figure 2.5.24. Pearson residuals of age composition fits for landed red snapper from the recreational headboat fishery in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

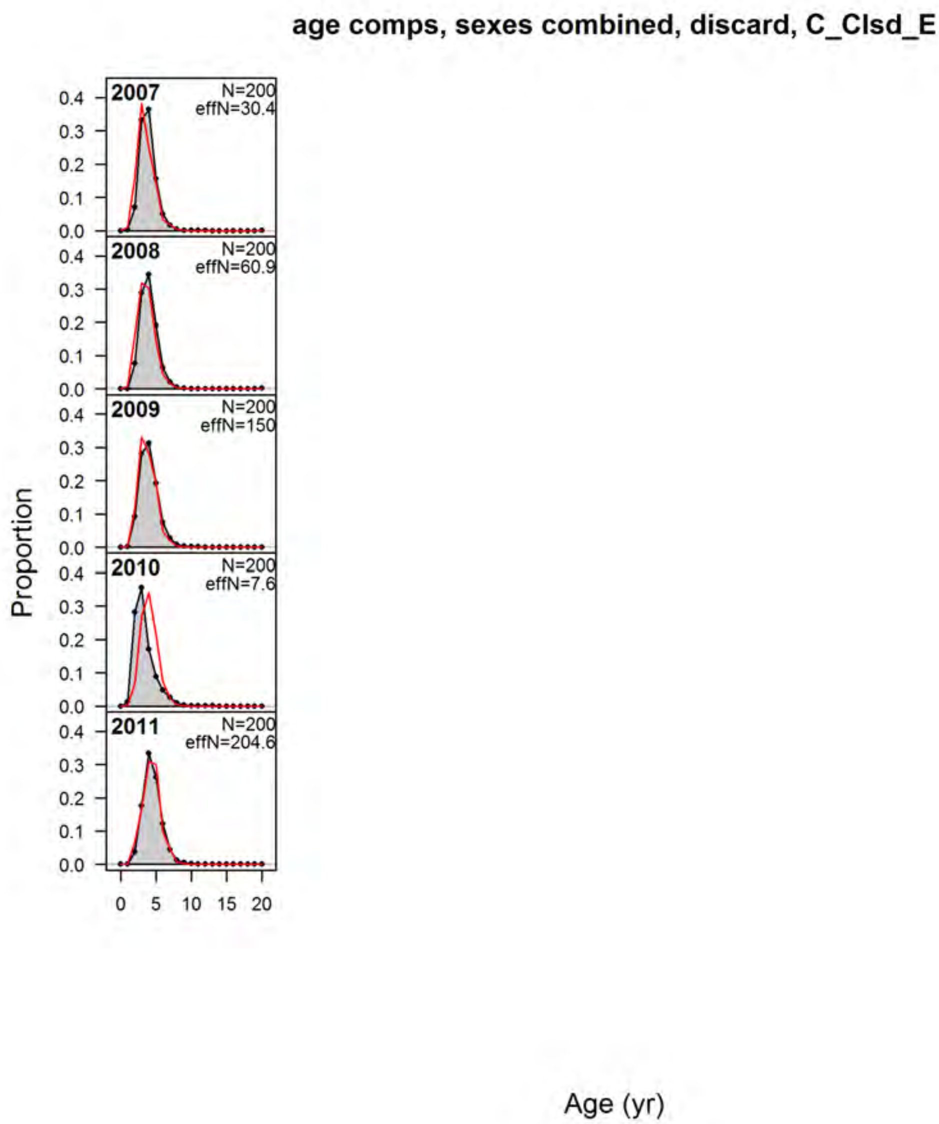



Figure 2.5.25. Observed and predicted age composition of red snapper discarded from the commercial closed season fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

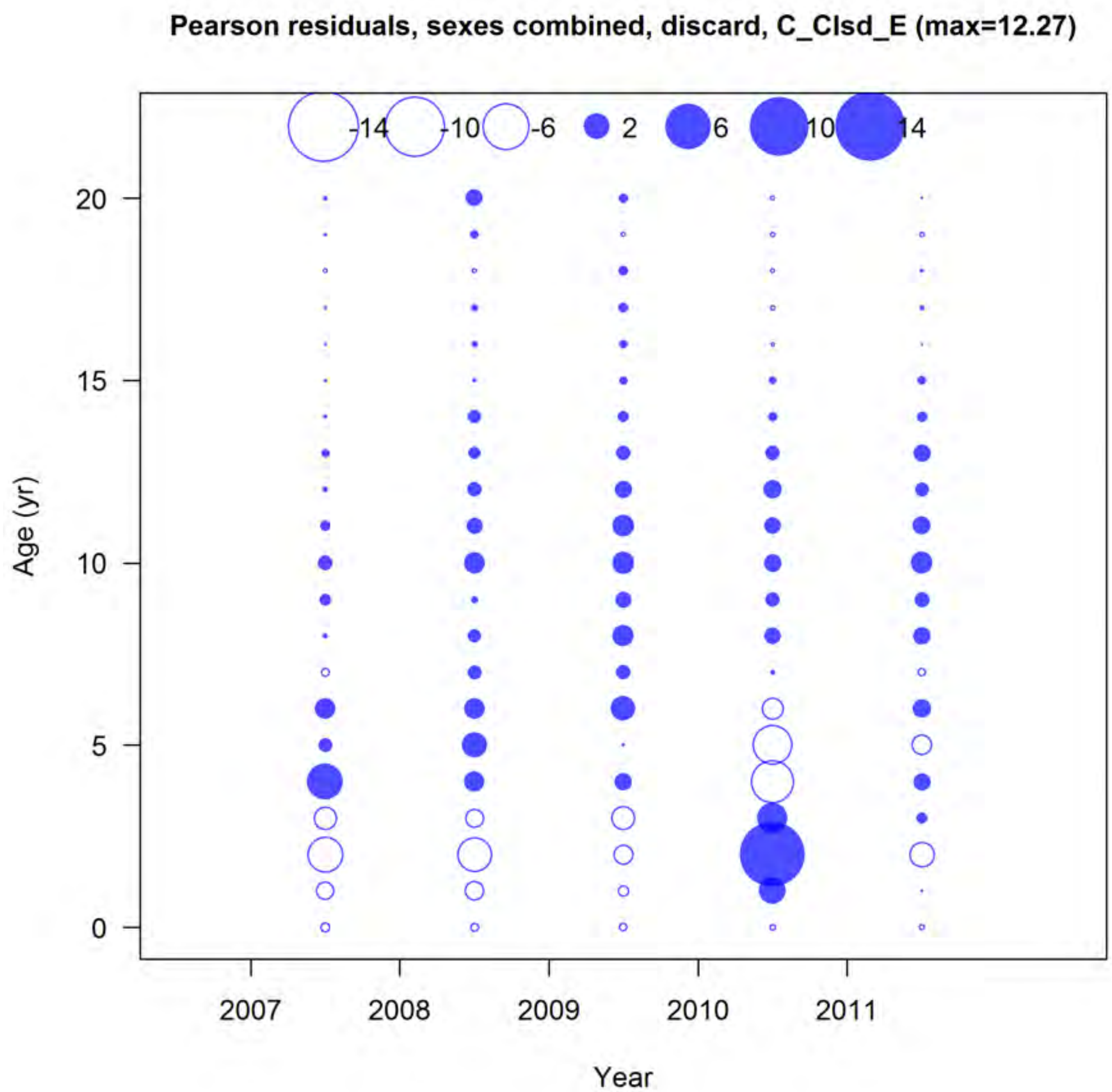



Figure 2.5.26. Pearson residuals of age composition fits for of red snapper discarded from the commercial closed season fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

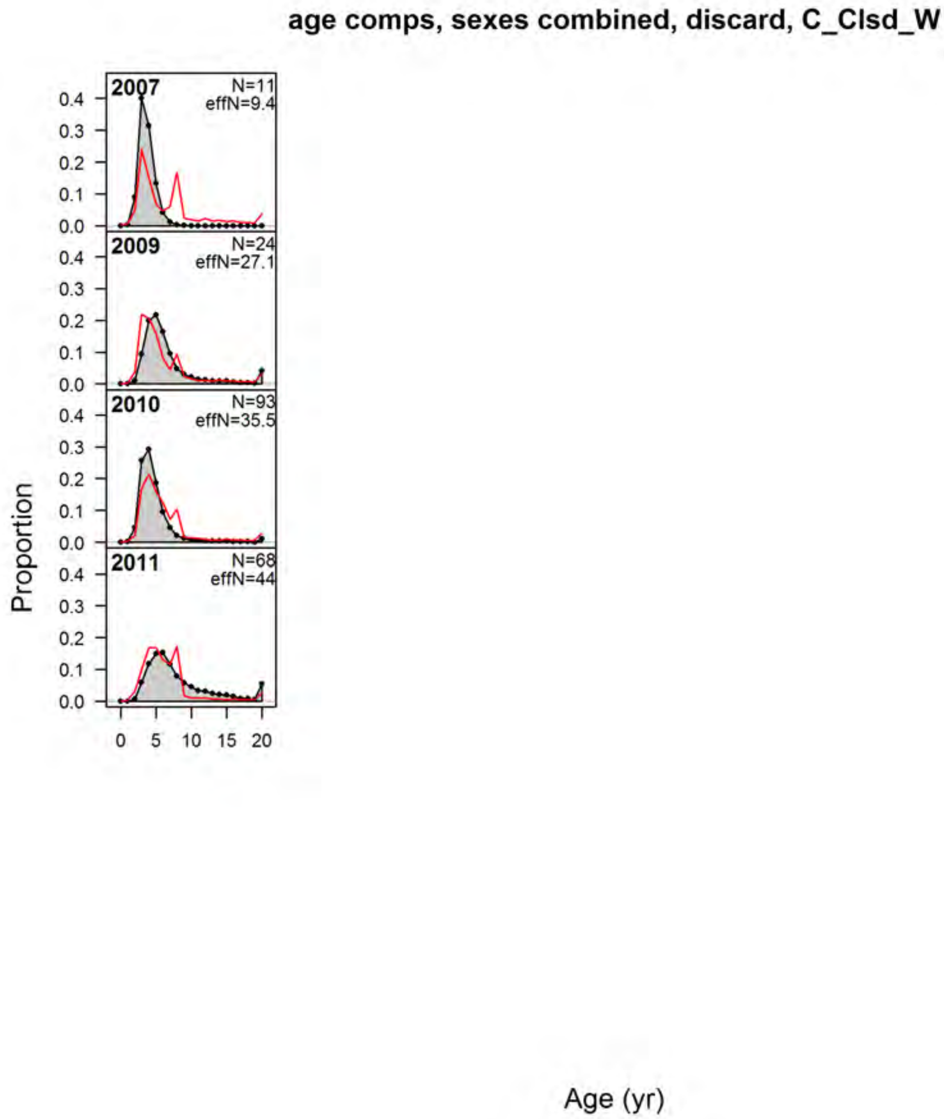



Figure 2.5.27. Observed and predicted age composition of red snapper discarded from the commercial closed season fishery in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

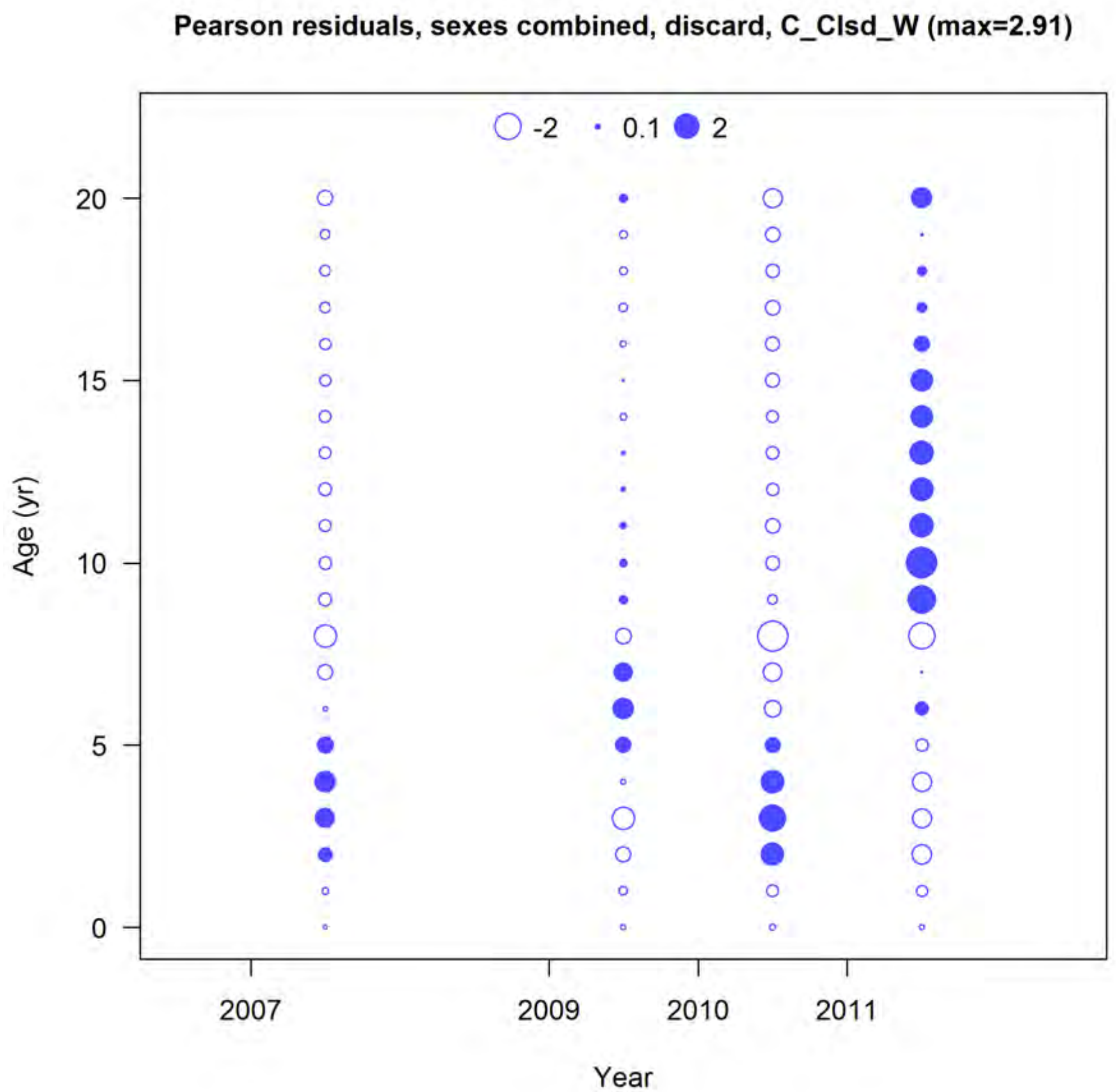



Figure 2.5.28. Pearson residuals of age composition fits for of red snapper discarded from the commercial closed season fishery in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

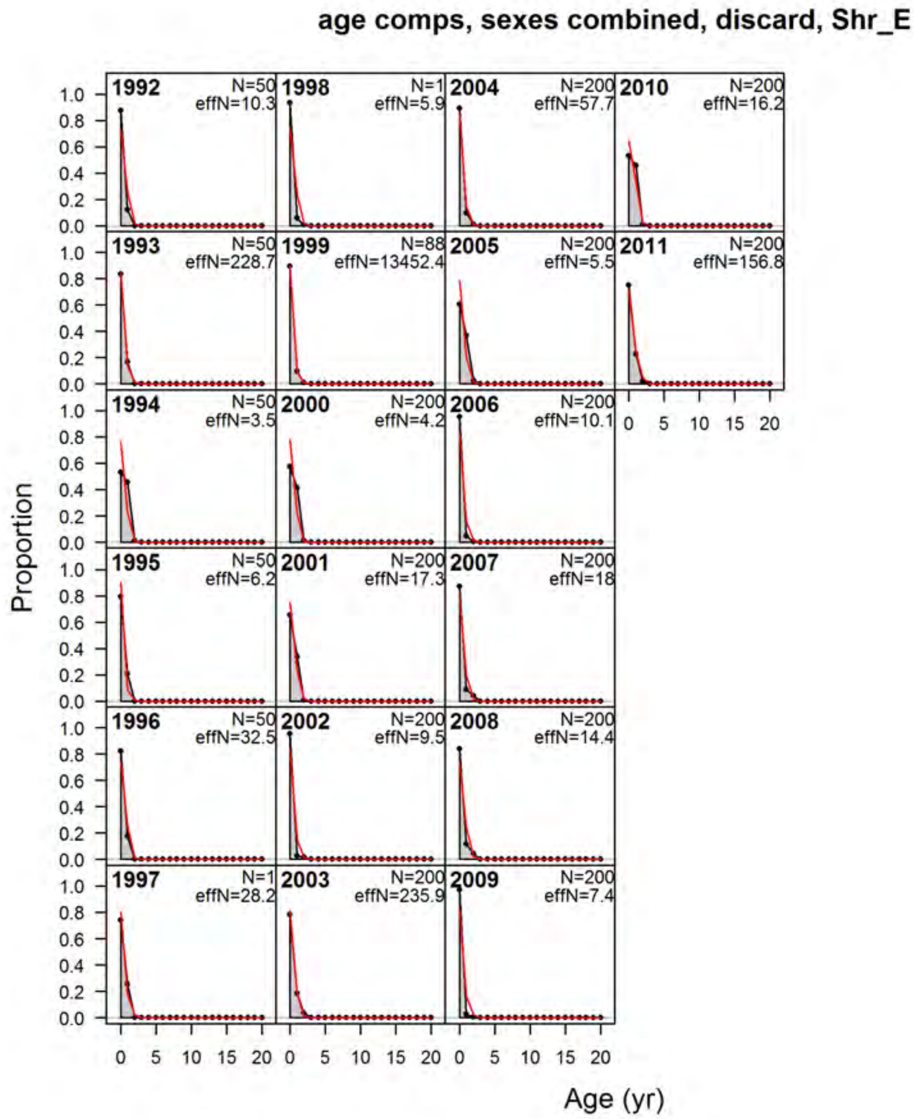



Figure 2.5.29. Observed and predicted age composition of red snapper discarded from the shrimp fishery in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

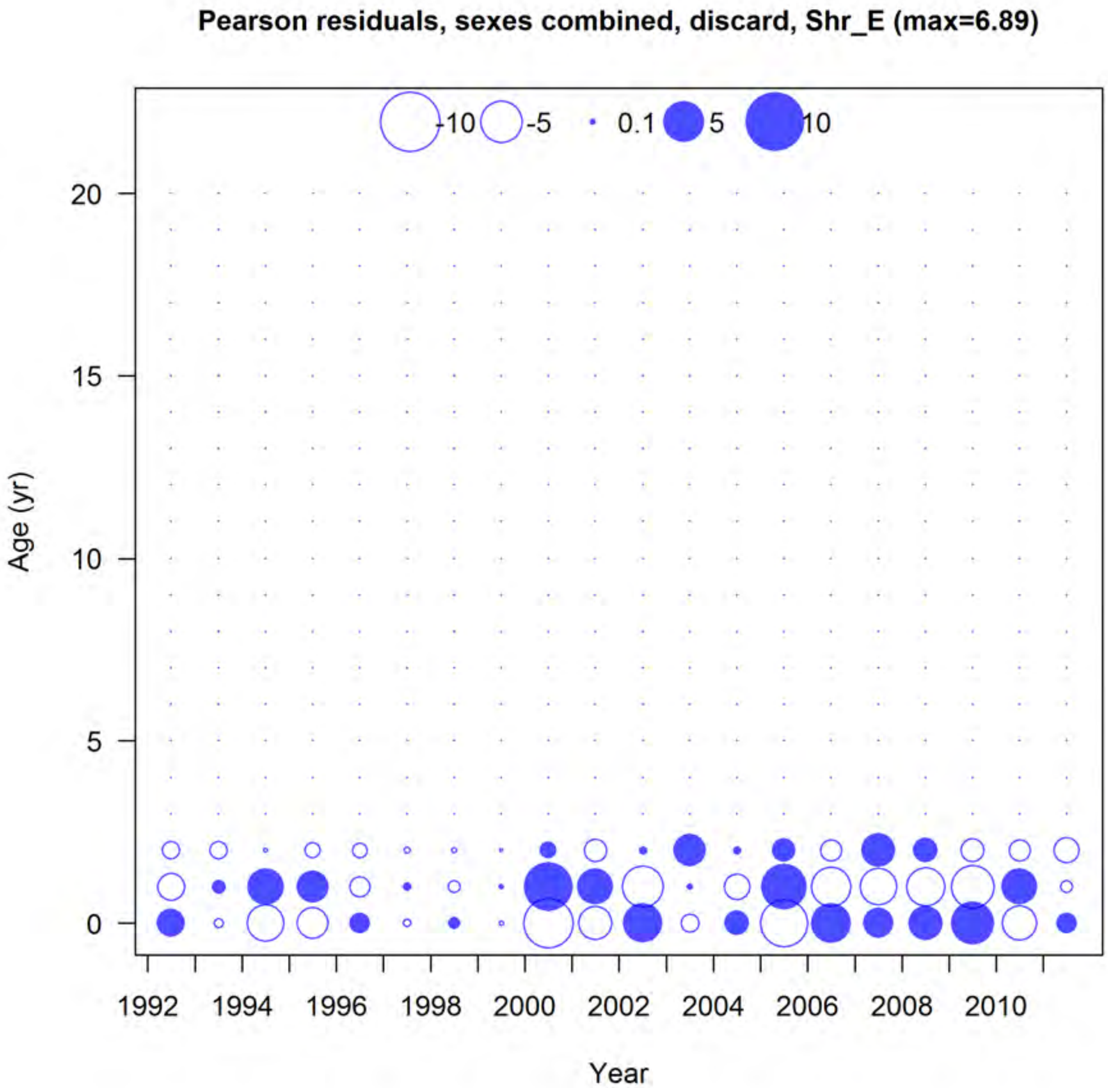



Figure 2.5.30. Pearson residuals of age composition fits for of red snapper discarded from the shrimp fishery in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

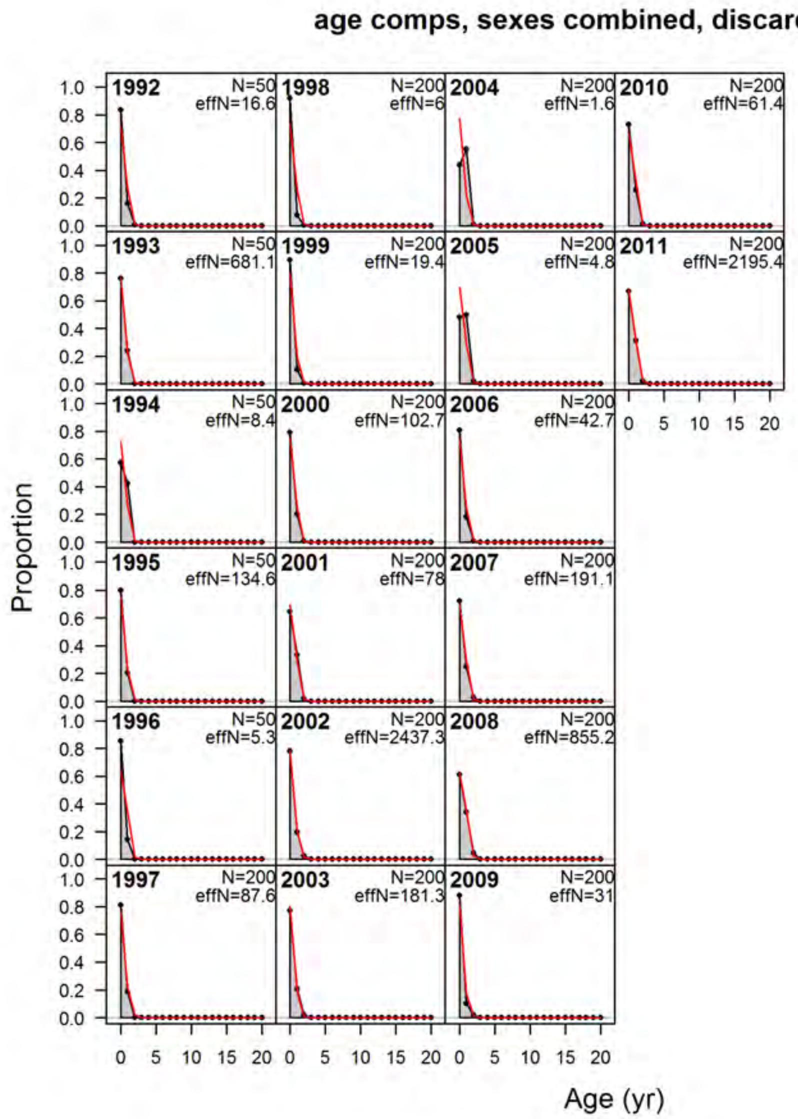



Figure 2.5.31. Observed and predicted age composition of red snapper discarded from the shrimp fishery in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

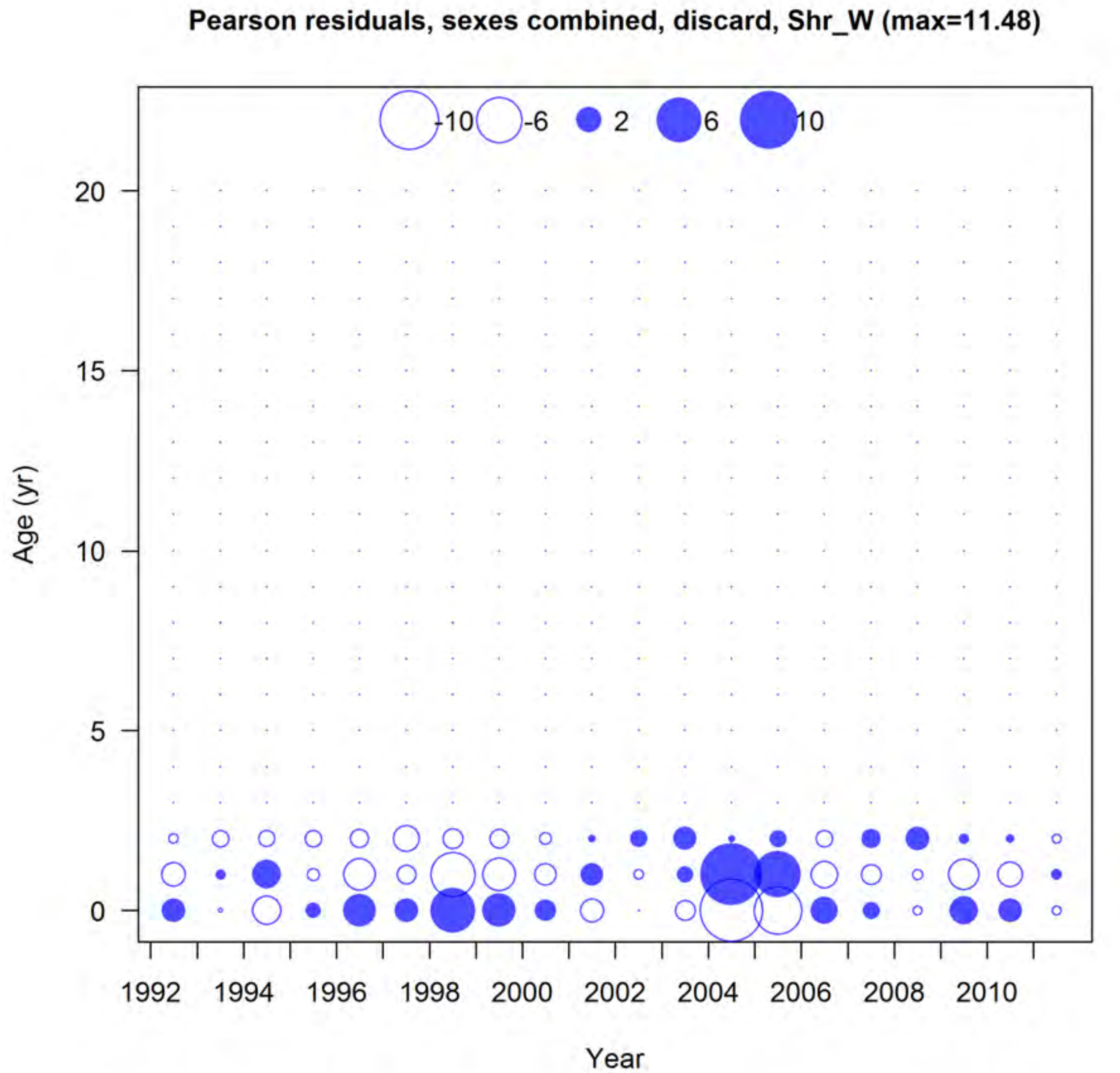



Figure 2.5.32. Pearson residuals of age composition fits for of red snapper discarded from the shrimp fishery in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

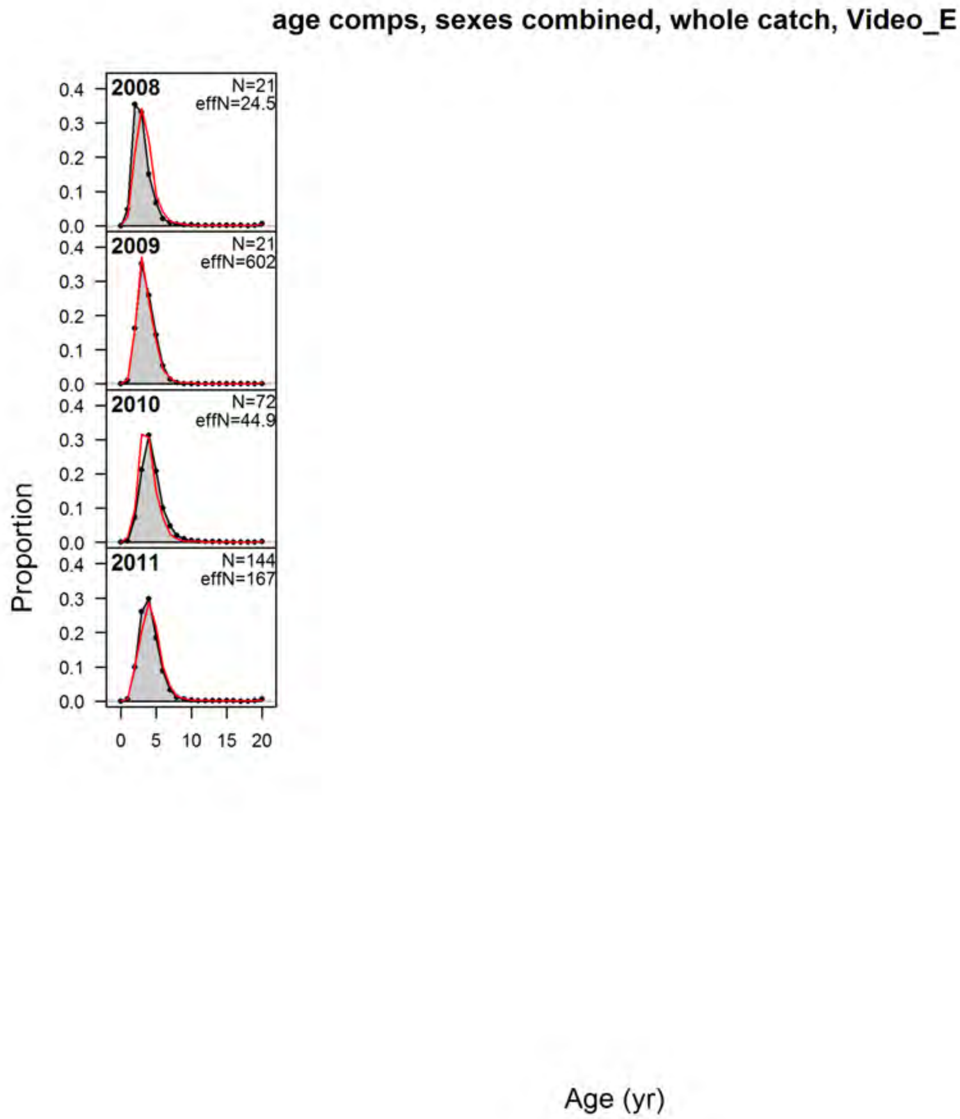



Figure 2.5.33. Observed and predicted age composition of red snapper from the SEAMAP reef fish video survey in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

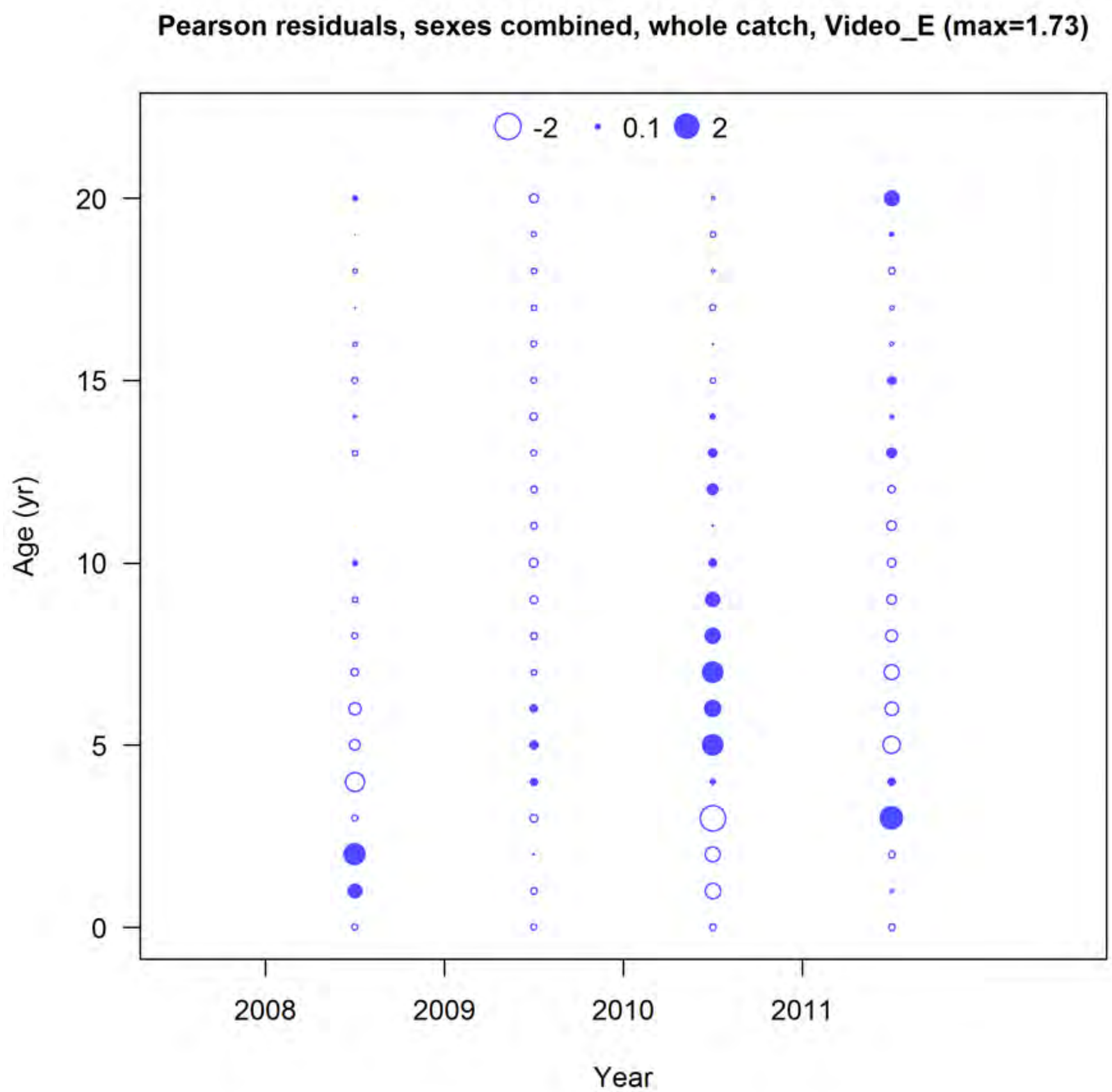



Figure 2.5.34. Pearson residuals of age composition fits for red snapper from the SEAMAP reef fish video survey in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

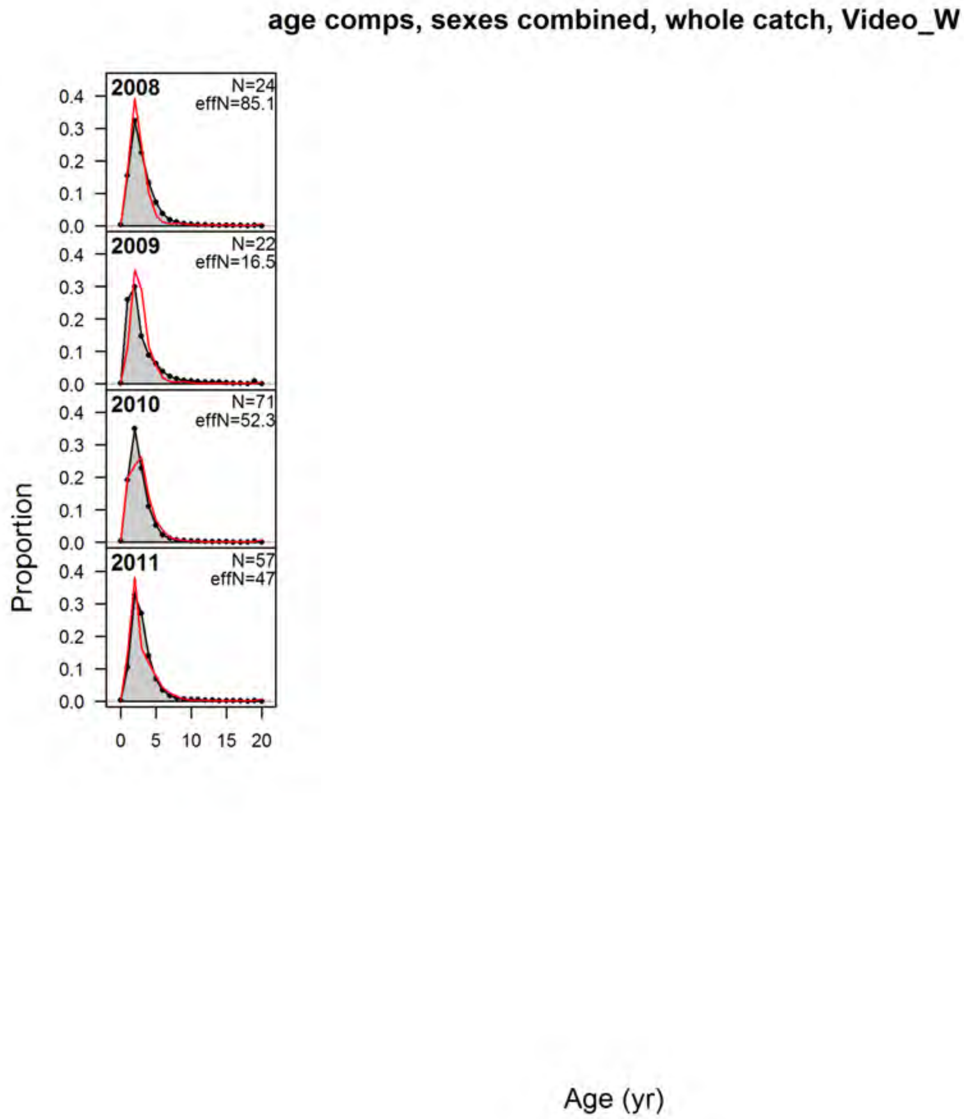



Figure 2.5.35. Observed and predicted age composition of red snapper from the SEAMAP reef fish video survey in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

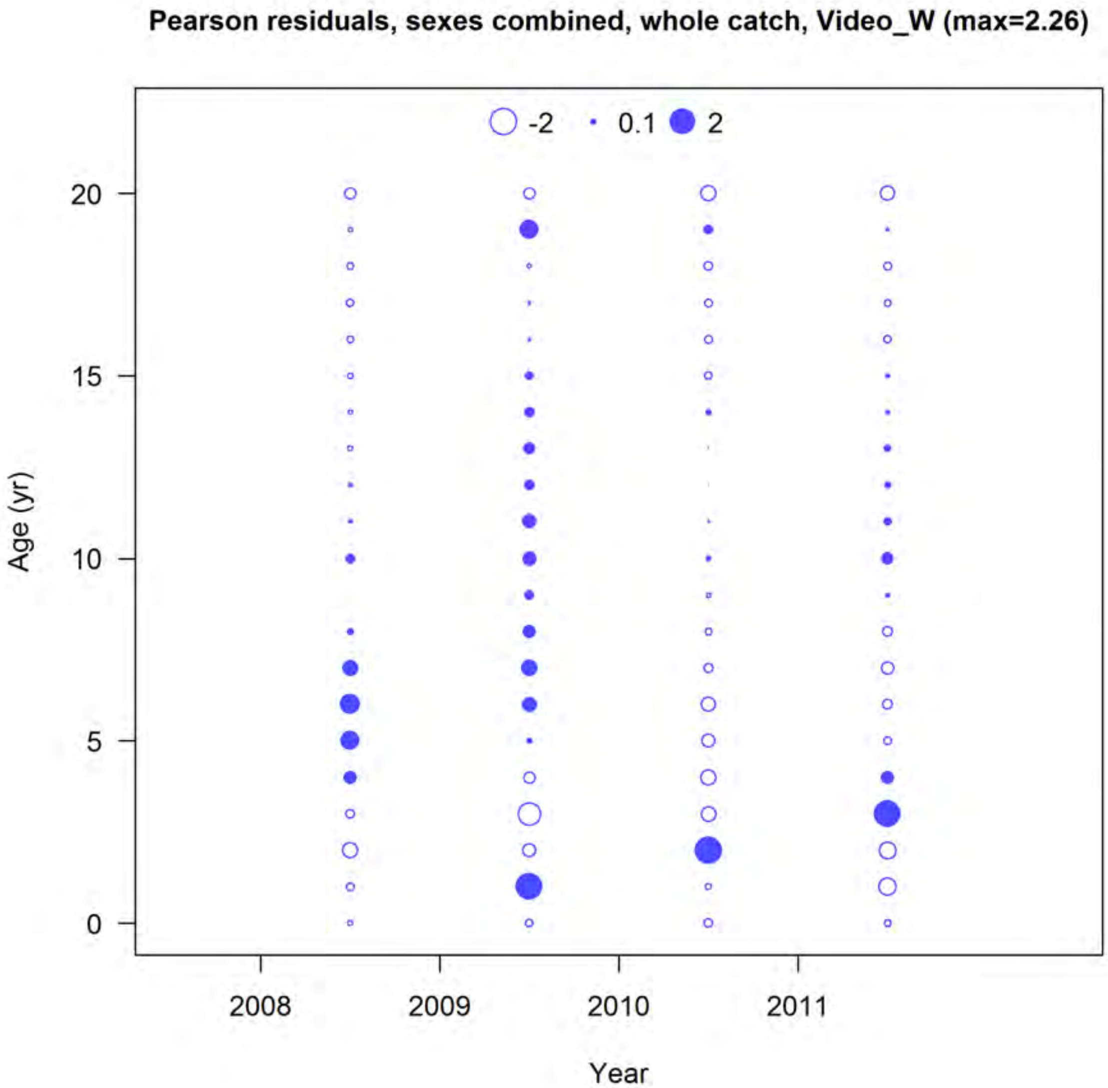



Figure 2.5.36. Pearson residuals of age composition fits for red snapper from the SEAMAP reef fish video survey in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

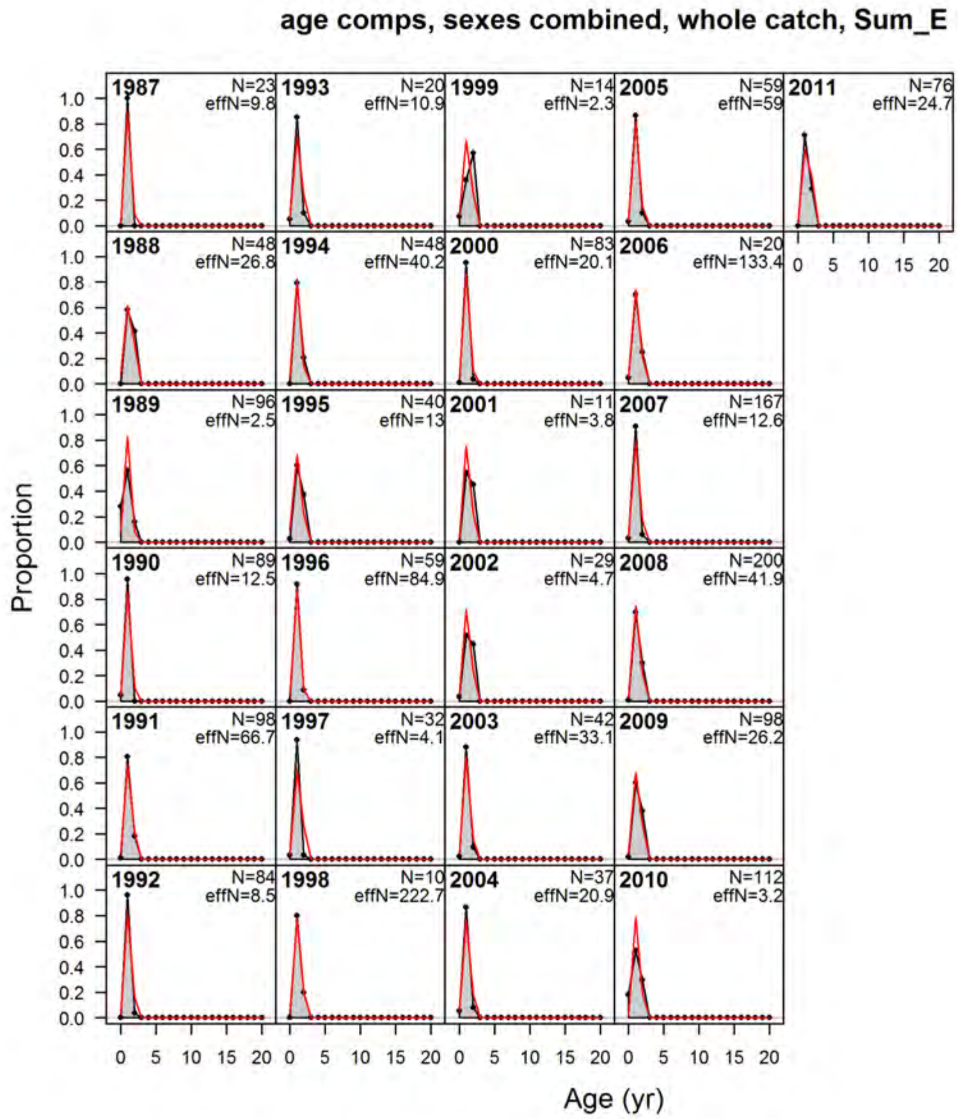



Figure 2.5.37. Observed and predicted age composition of red snapper from the SEAMAP groundfish summer survey in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

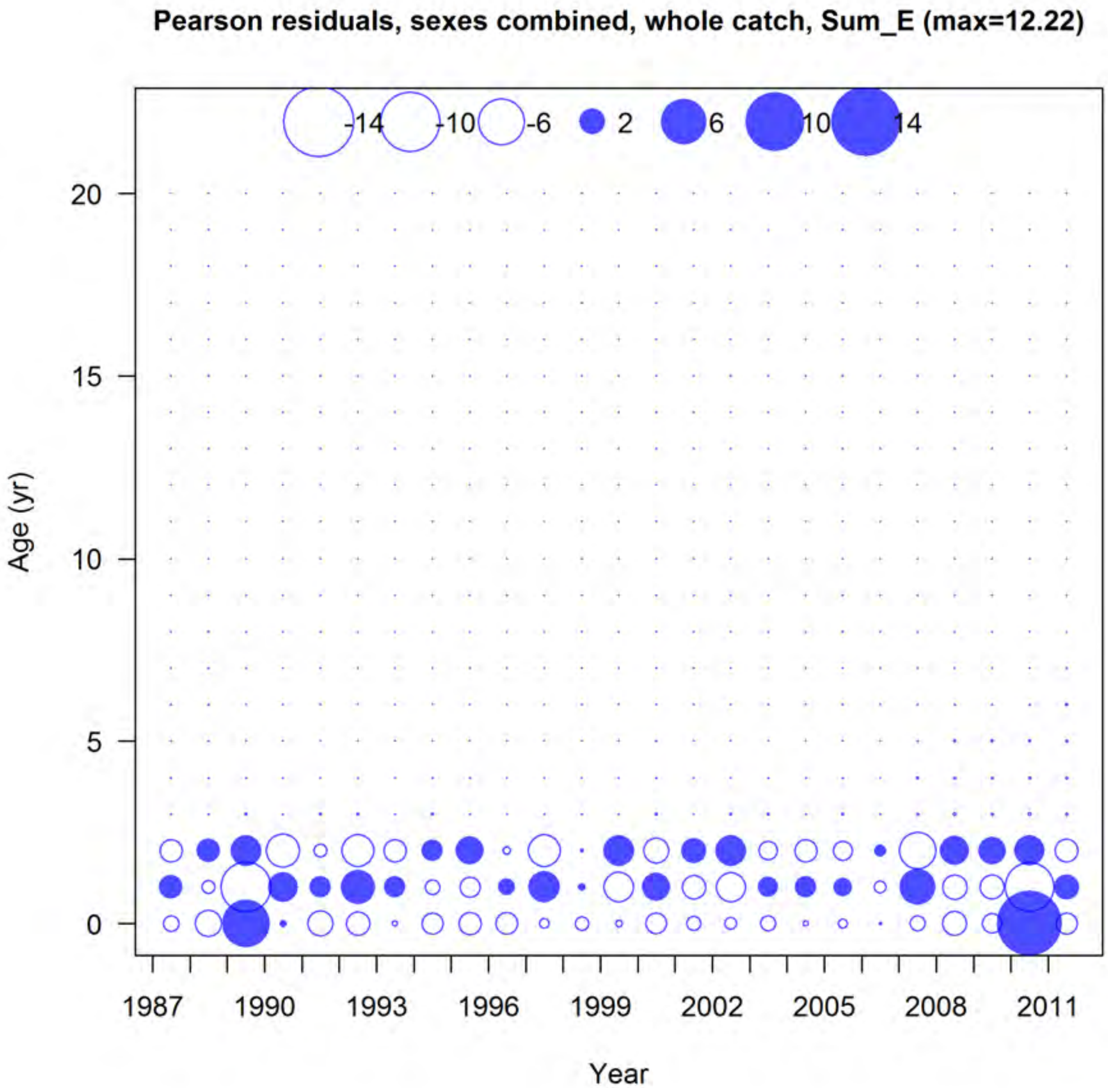



Figure 2.5.38. Pearson residuals of age composition fits for red snapper from the SEAMAP groundfish summer survey in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

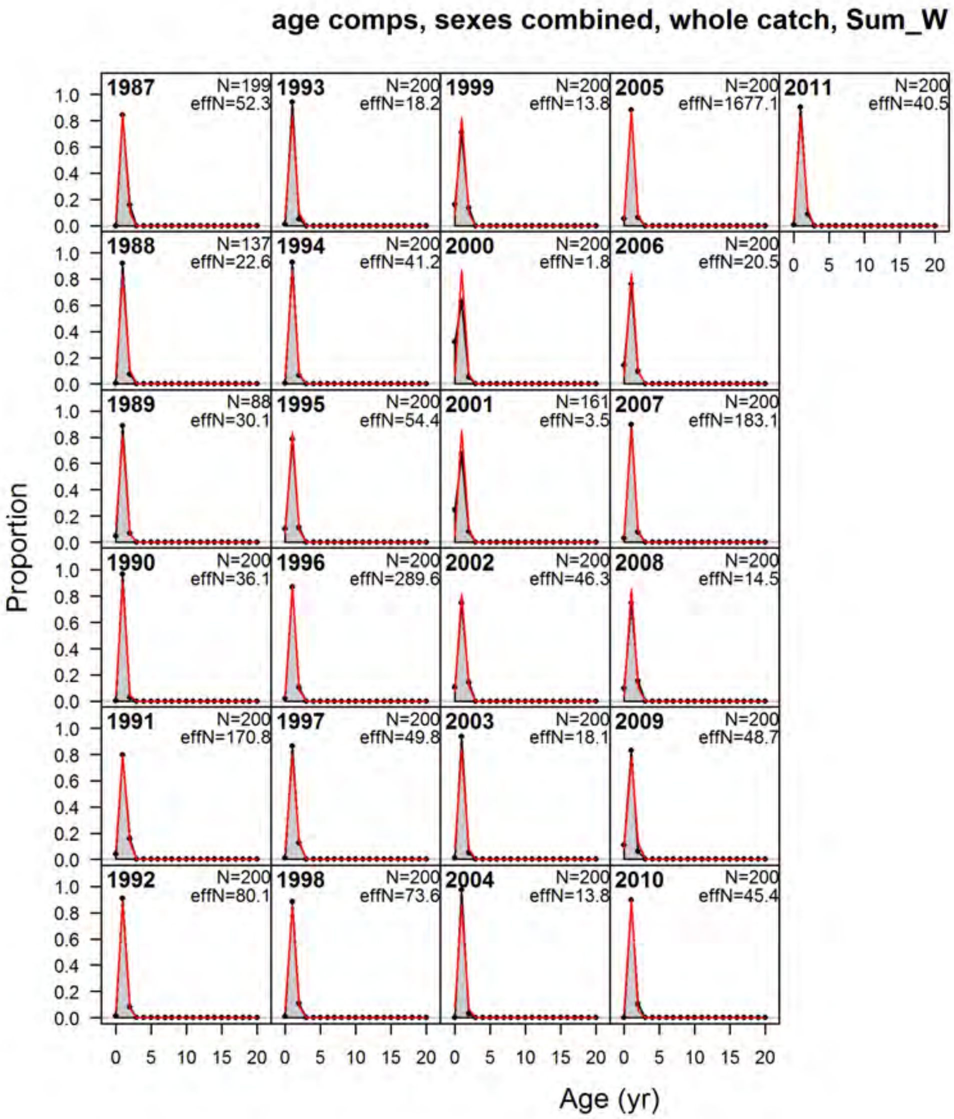



Figure 2.5.39. Observed and predicted age composition of red snapper from the SEAMAP groundfish summer survey in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

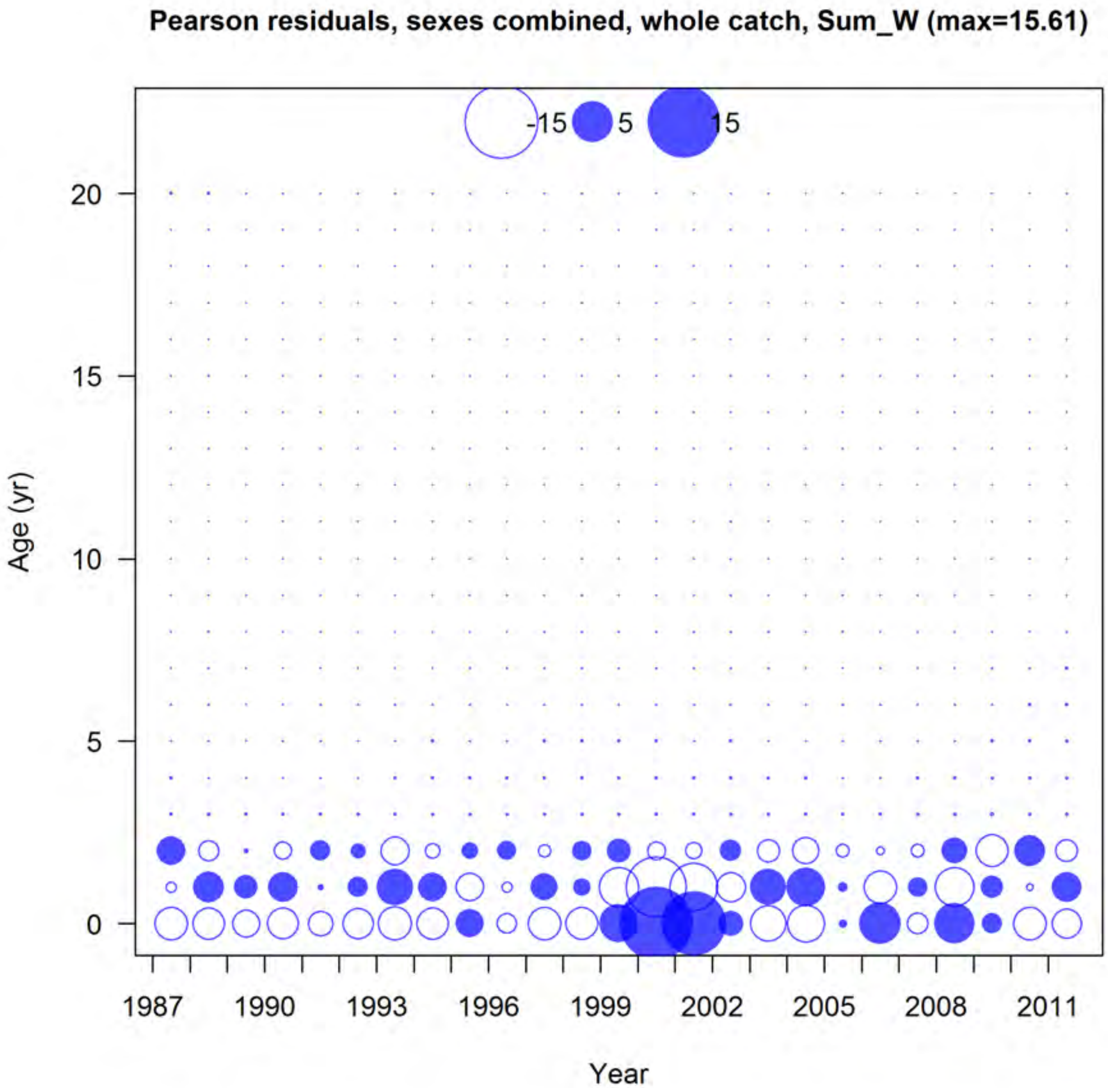



Figure 2.5.40. Pearson residuals of age composition fits for red snapper from the SEAMAP groundfish summer survey in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

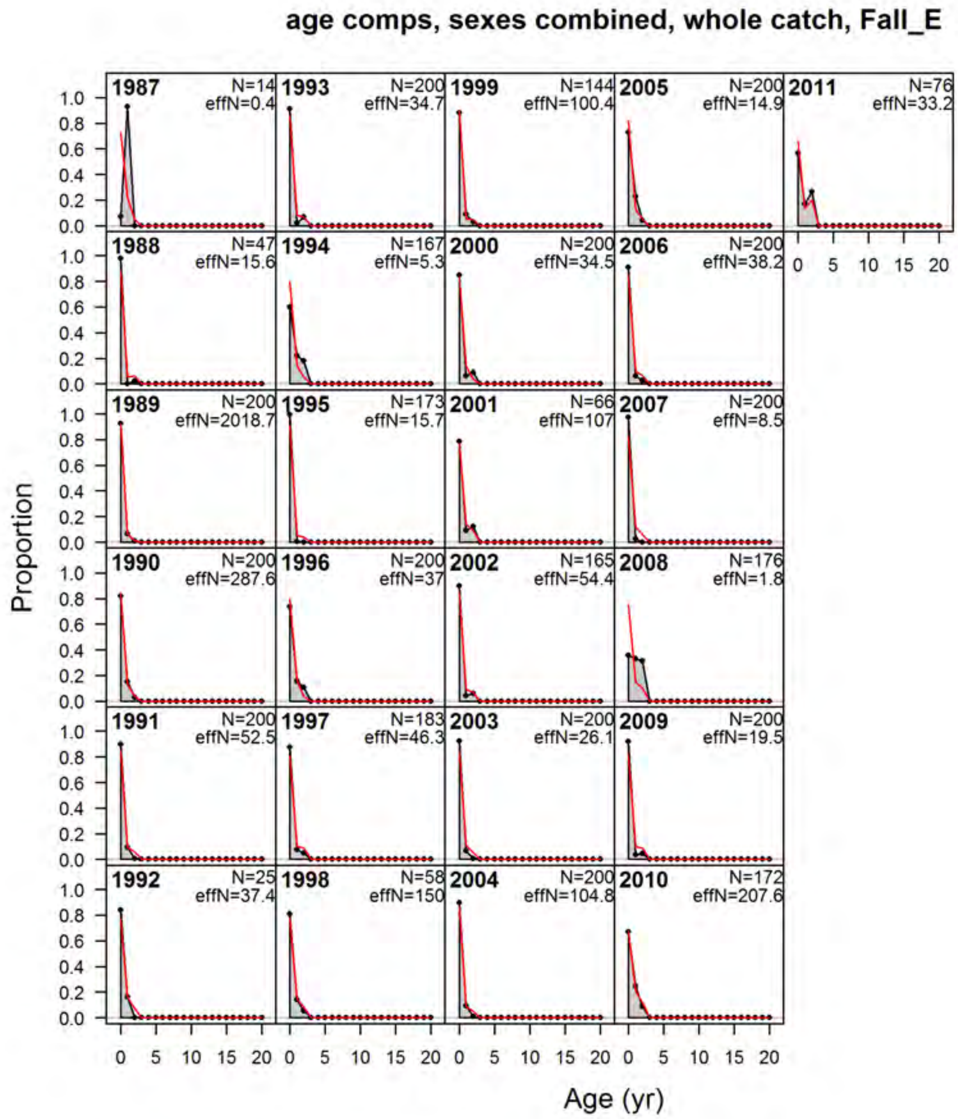



Figure 2.5.41. Observed and predicted age composition of red snapper from the SEAMAP groundfish fall survey in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

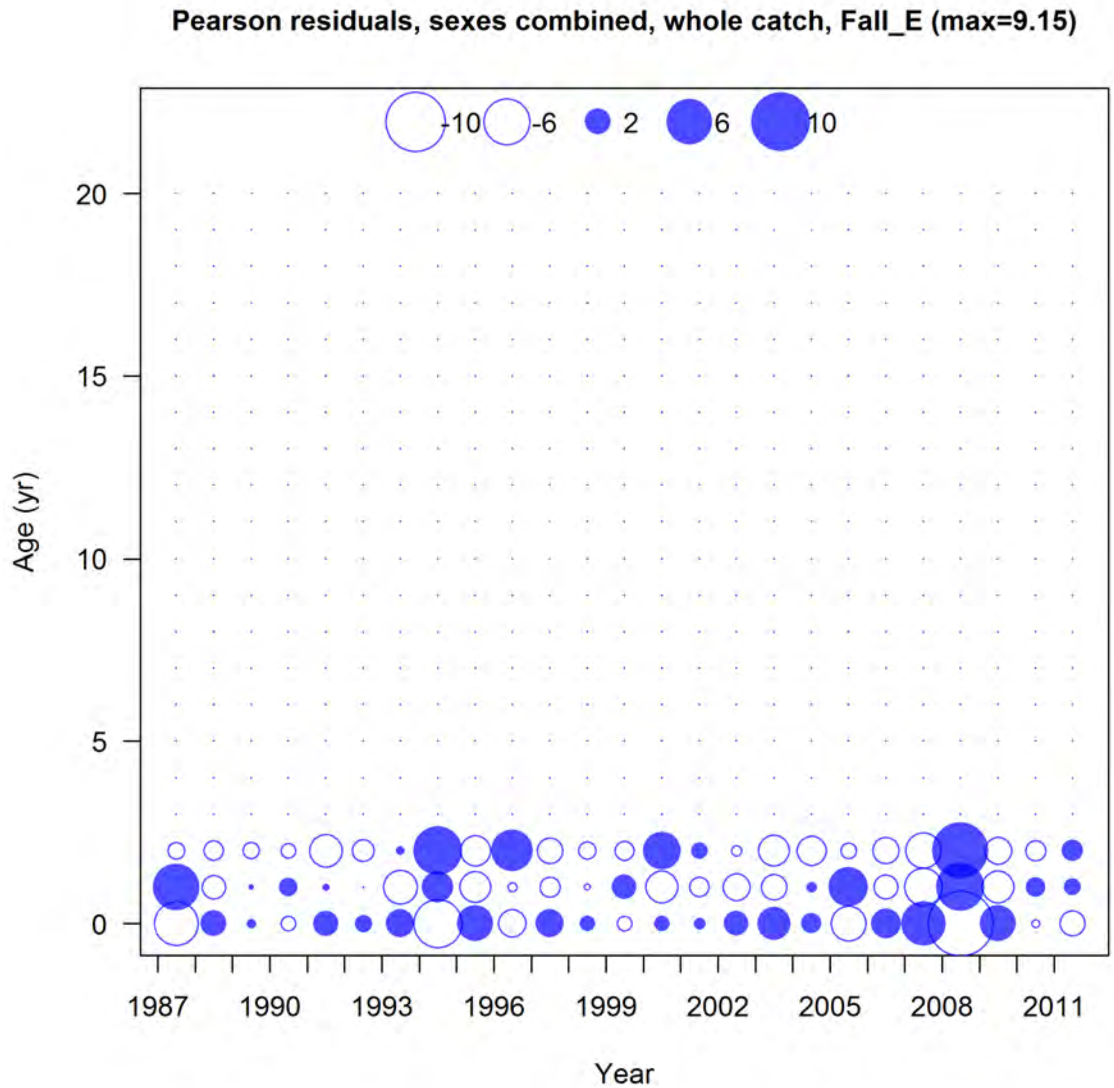



Figure 2.5.42. Pearson residuals of age composition fits for red snapper from the SEAMAP groundfish fall survey in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

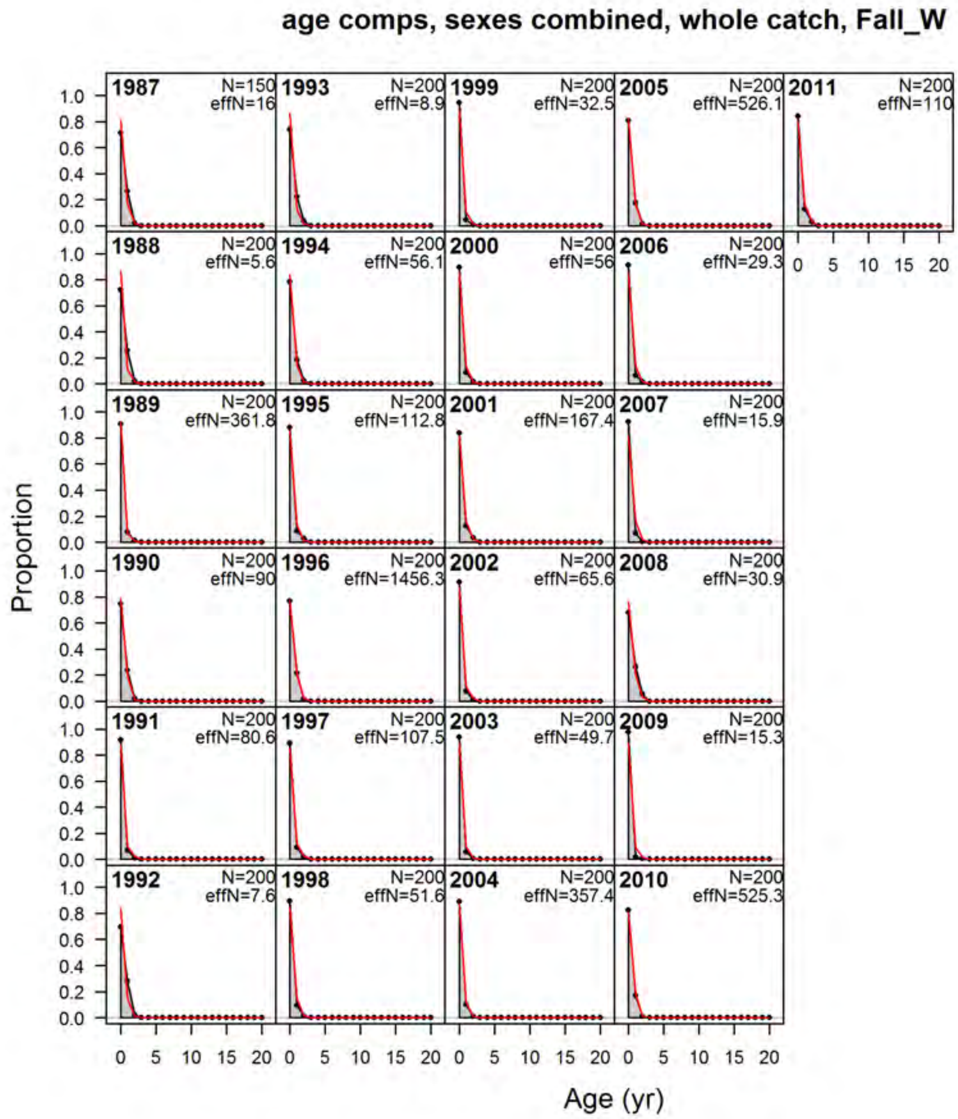



Figure 2.5.43. Observed and predicted age composition of red snapper from the SEAMAP groundfish fall survey in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

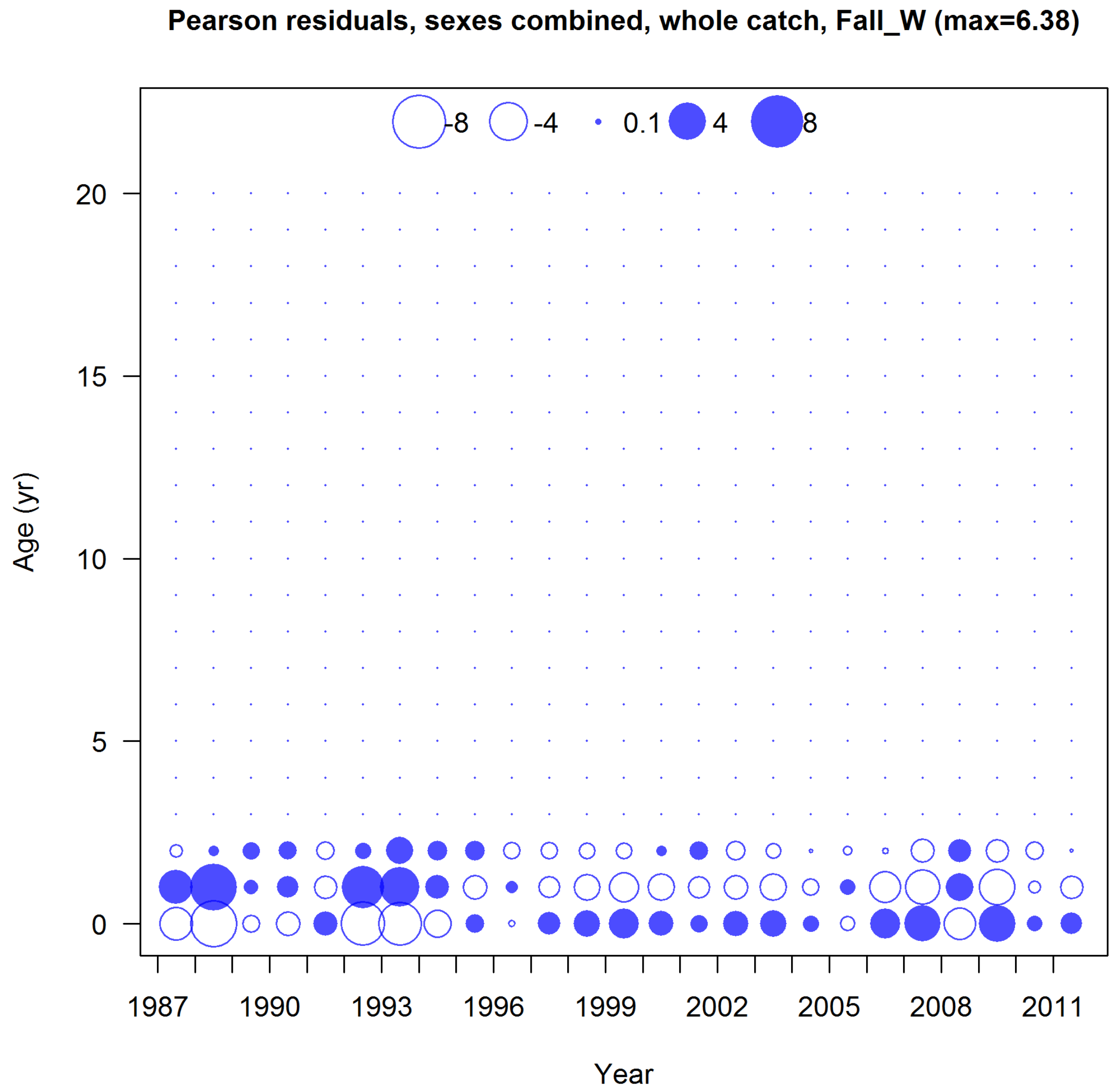



Figure 2.5.44. Pearson residuals of age composition fits for red snapper from the SEAMAP groundfish fall survey in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

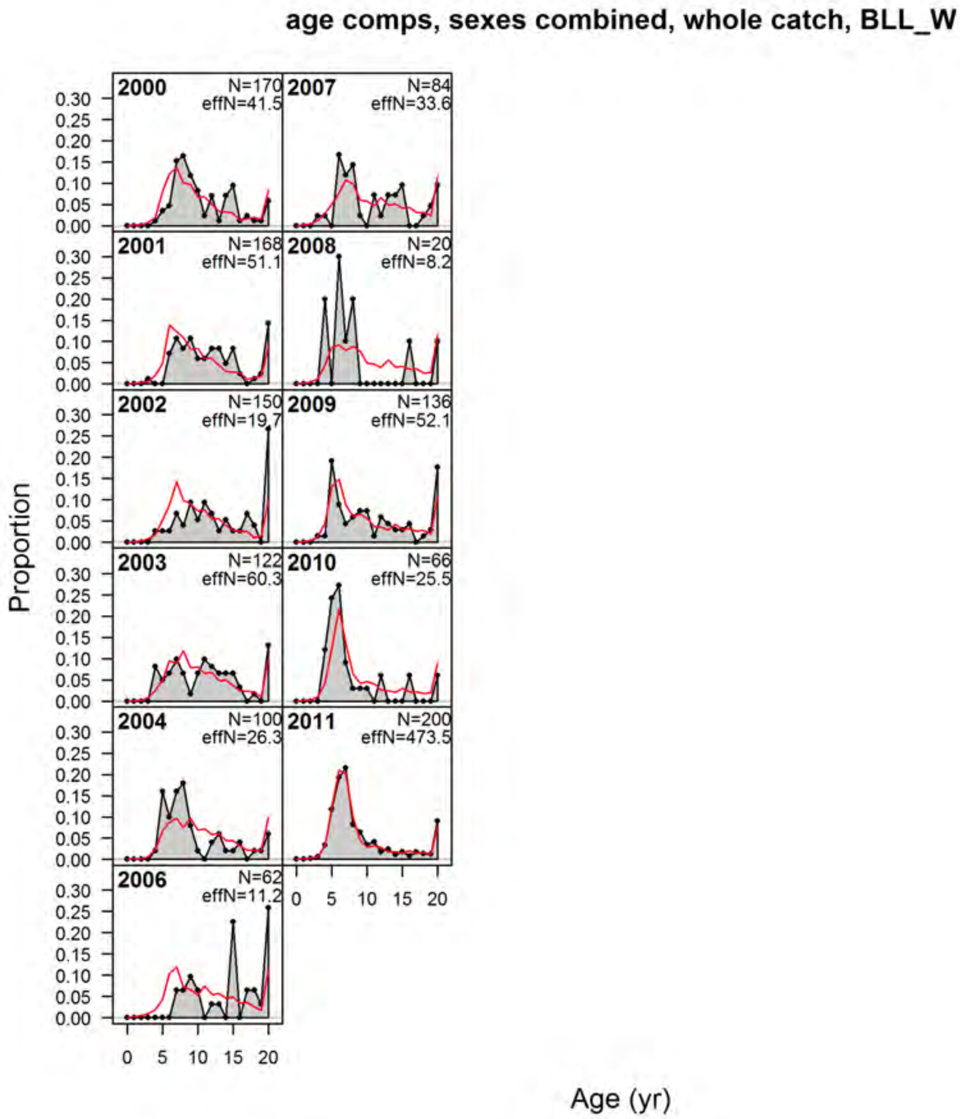



Figure 2.5.45. Observed and predicted age composition of red snapper from the NMFS bottom longline survey in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

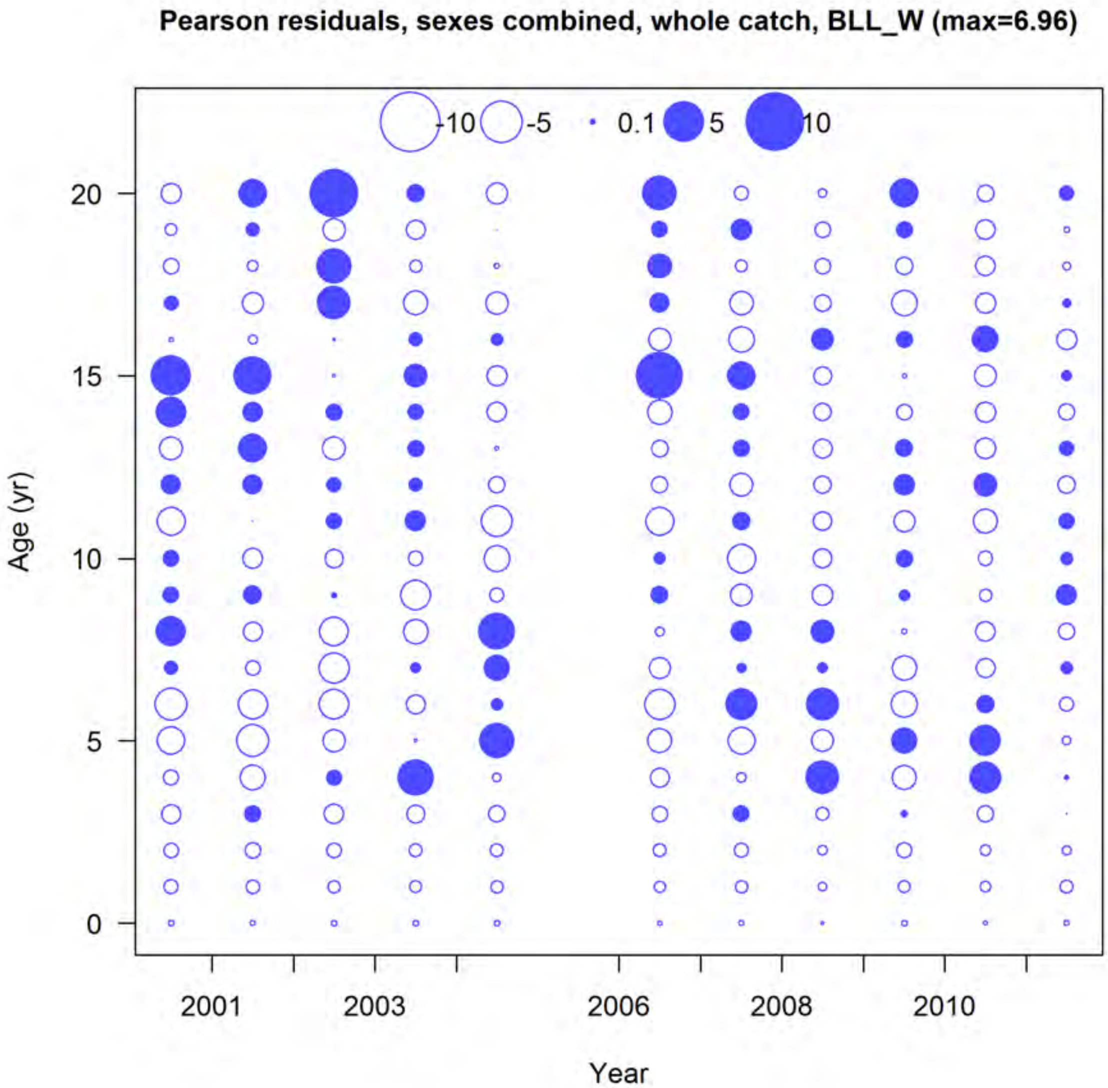



Figure 2.5.46. Pearson residuals of age composition fits for red snapper from the NMFS bottom longline survey in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

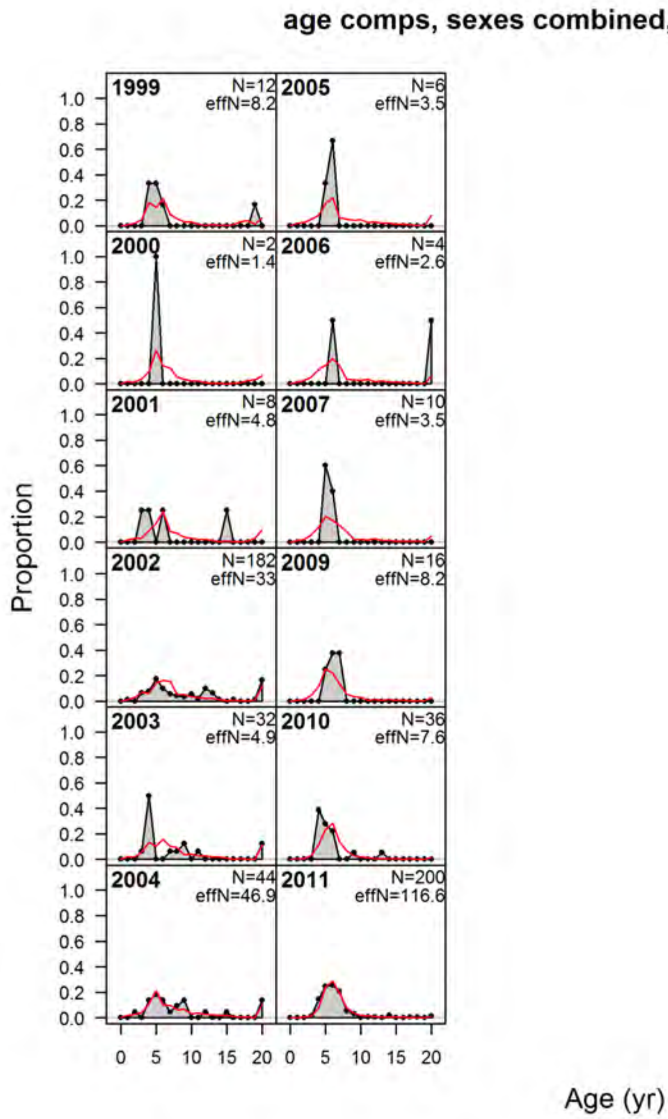



Figure 2.5.47. Observed and predicted age composition of red snapper from the NMFS bottom longline survey in the western Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

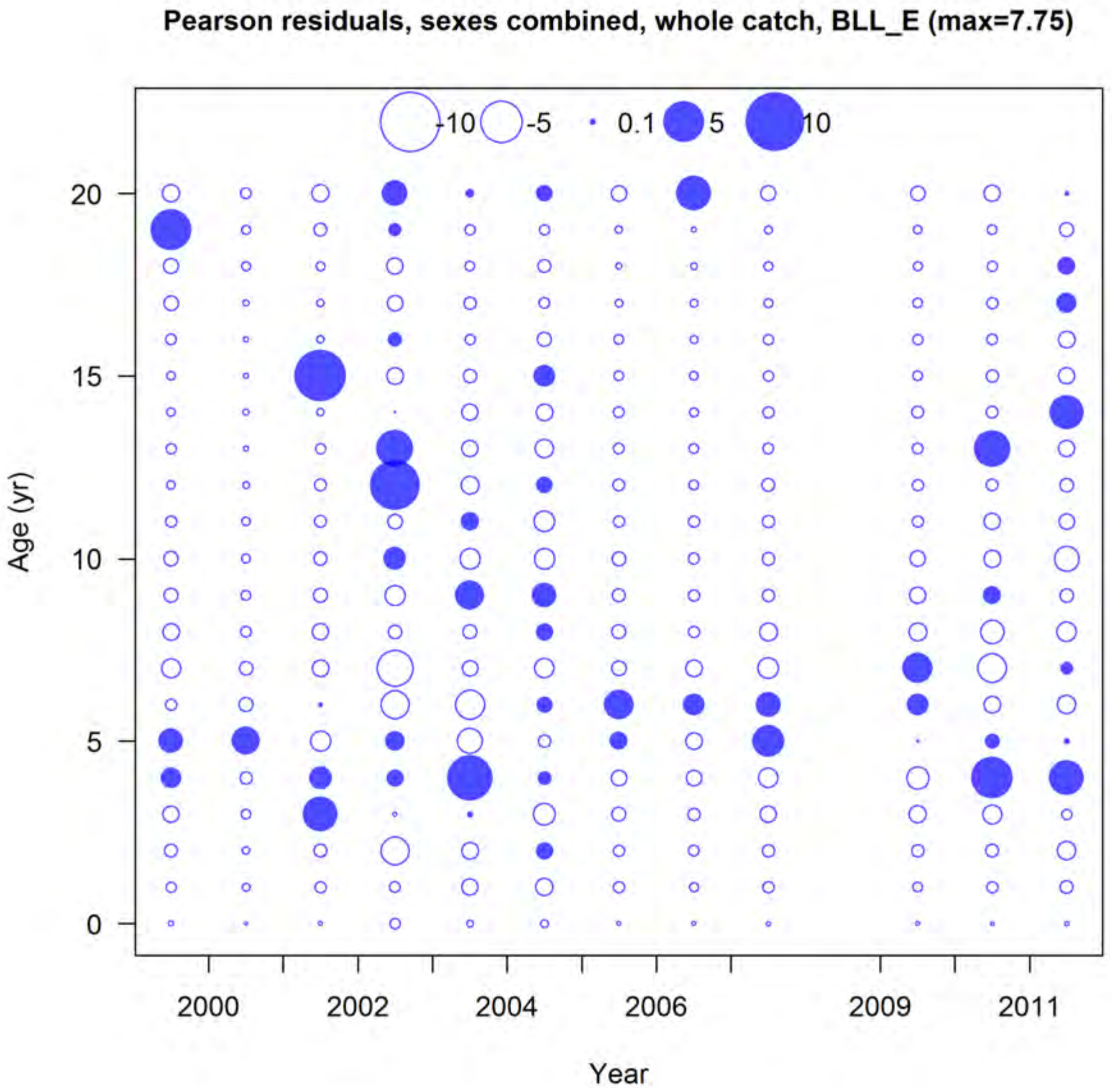



Figure 2.5.48. Pearson residuals of age composition fits for red snapper from the NMFS bottom longline fall survey in the western Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

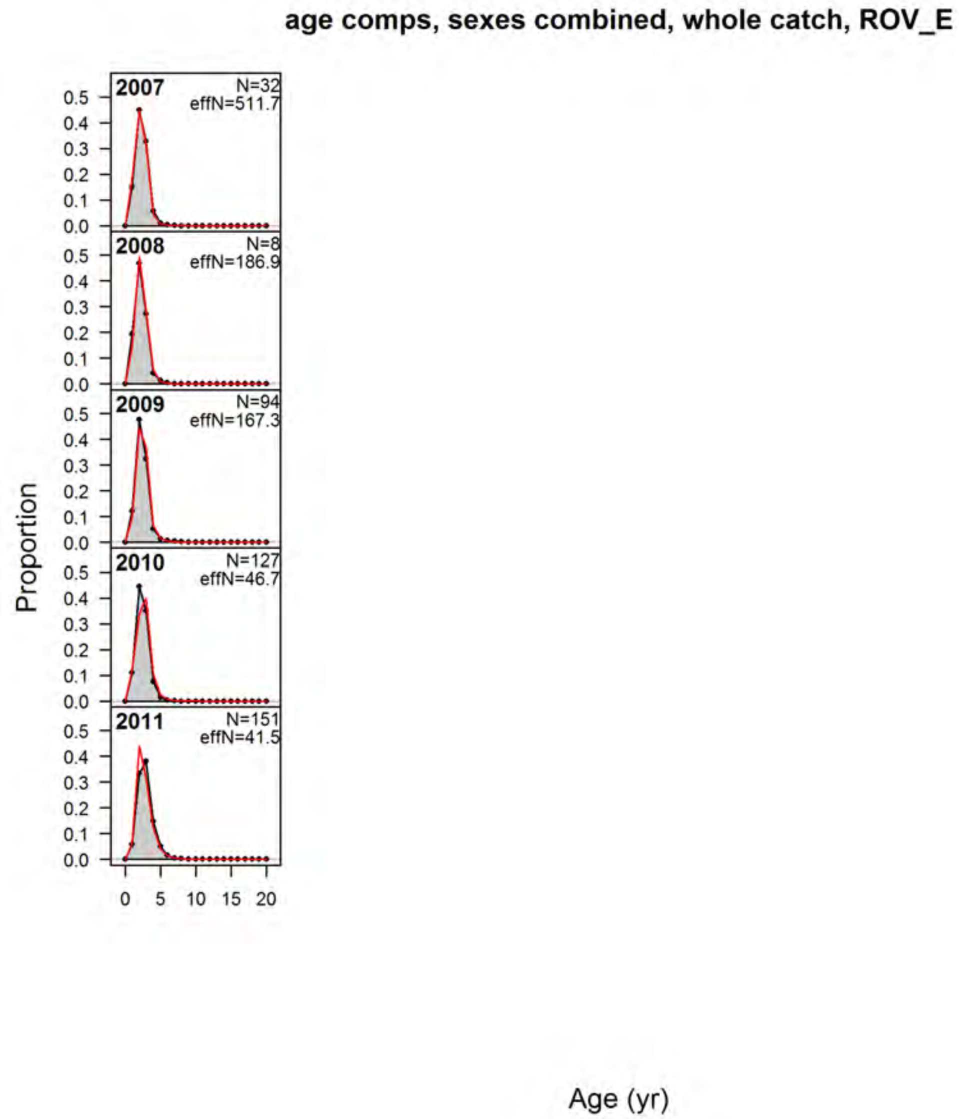



Figure 2.5.49. Observed and predicted age composition of red snapper from ROV survey in the eastern Gulf of Mexico. Observed (N) sample sizes and effective sample sizes (effN) estimated by SS are also reported. Observed sample sizes were capped at a maximum of 200 fish.

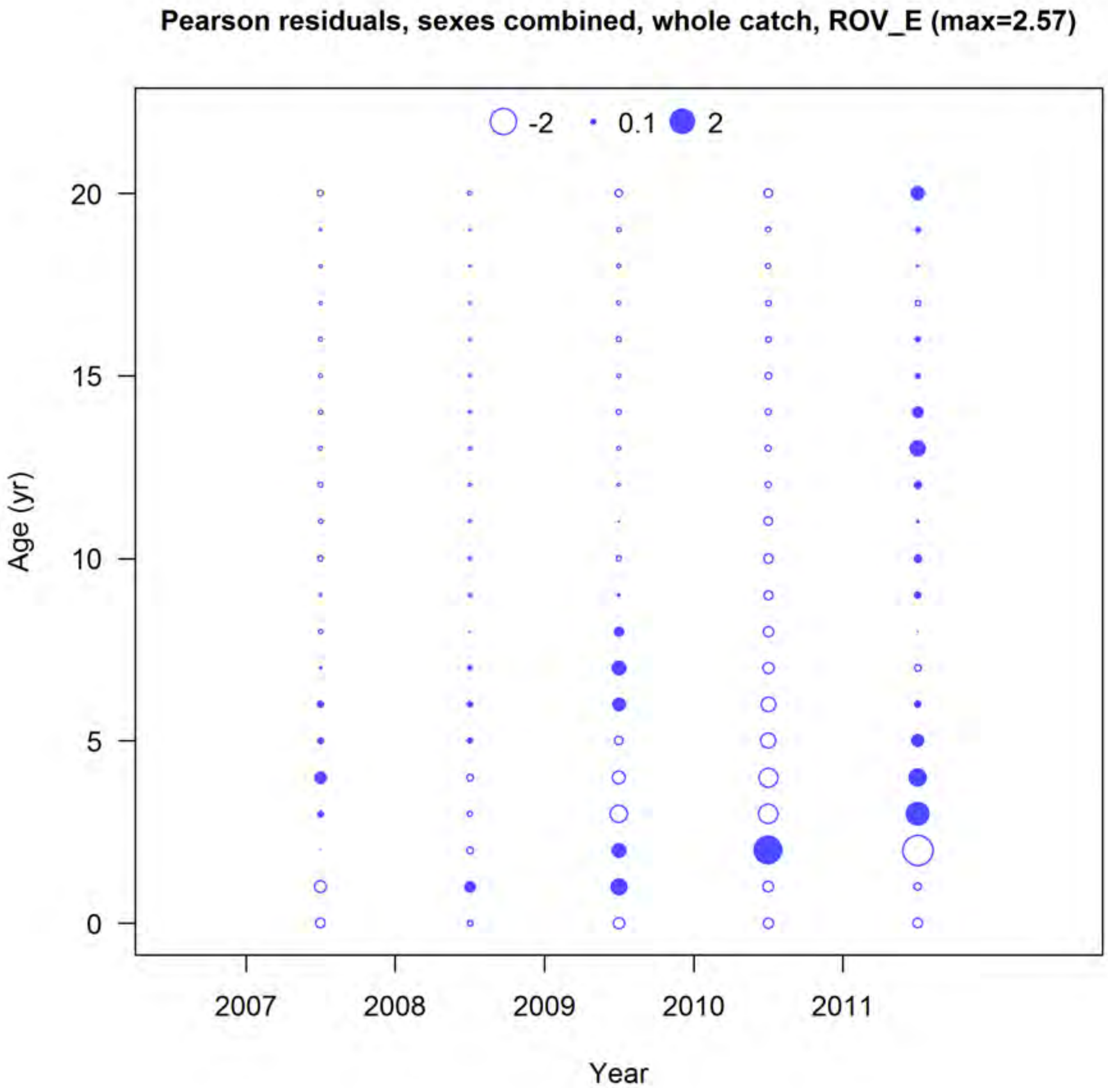
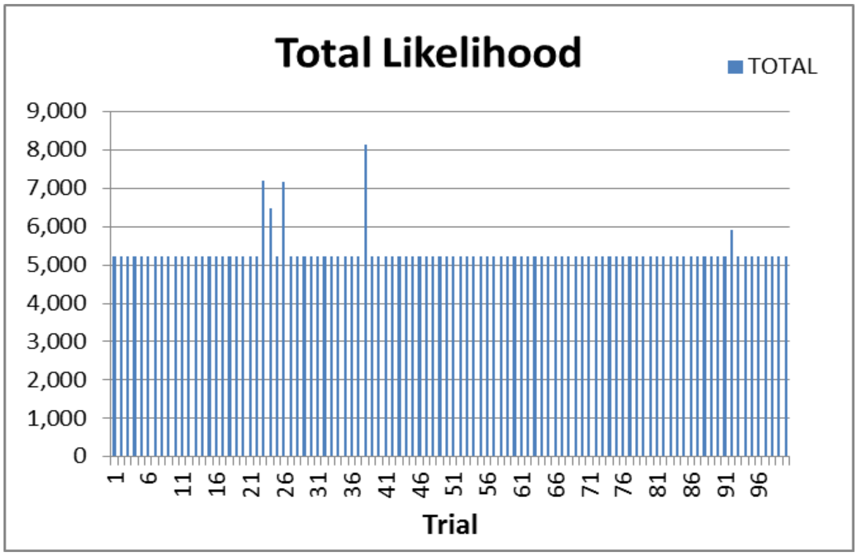



Figure 2.5.50. Pearson residuals of age composition fits for red snapper from the ROV survey in the eastern Gulf of Mexico. Solid circles are positive residuals (i.e., observed greater than predicted) and open circles are negative residuals (i.e., predicted greater than observed).

a.




b.

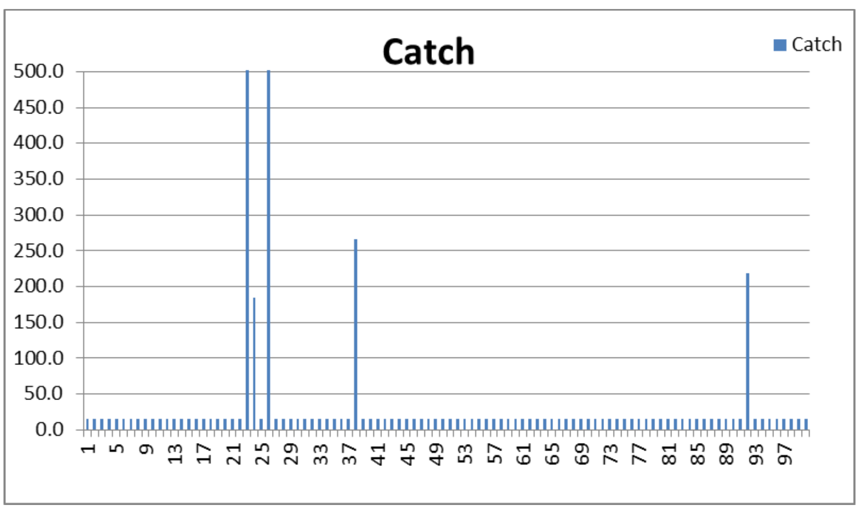
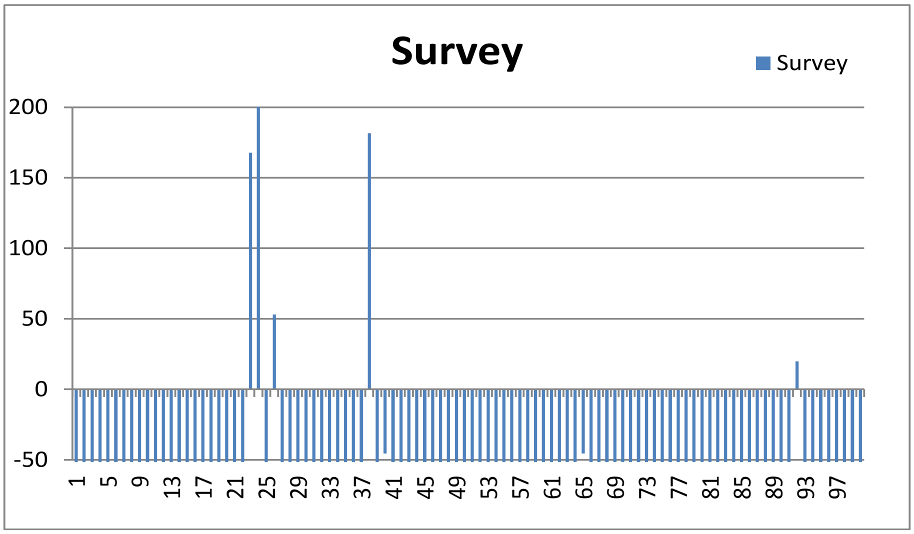



Figure 2.6.1 (a and b). Summary results of model likelihood estimates for 100 jittered runs of the SS red snapper stock assessment base model. The top panel (a) is the total model likelihood, while the bottom panel (b) is the catch likelihood.

c.




d.

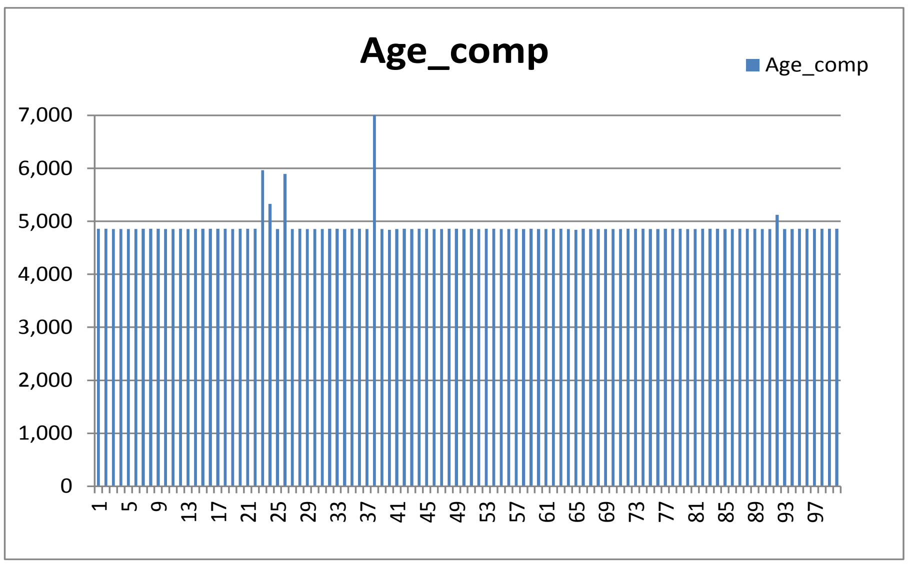
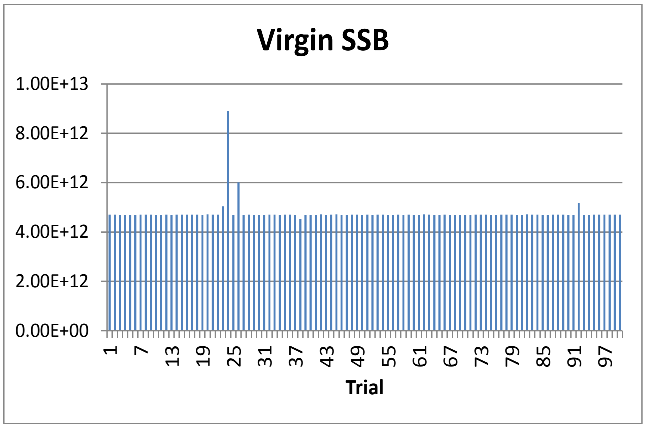
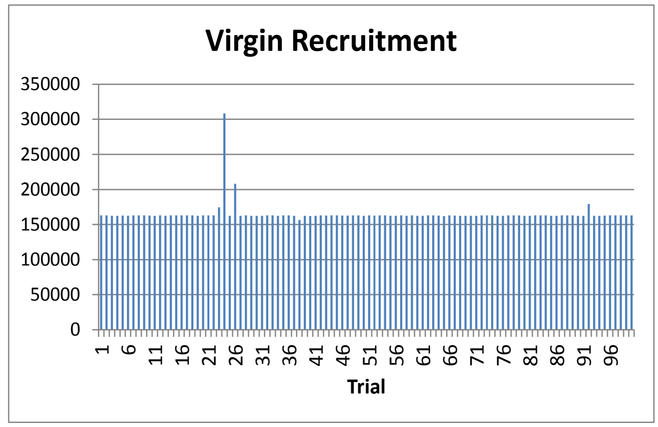



Figure 2.6.1 (c and d). Summary results of model likelihood estimates for 100jittered runs of the SS red snapper stock assessment base model. The top panel (c) is the survey Likelihood, while the bottom panel (d) is the age composition likelihood.

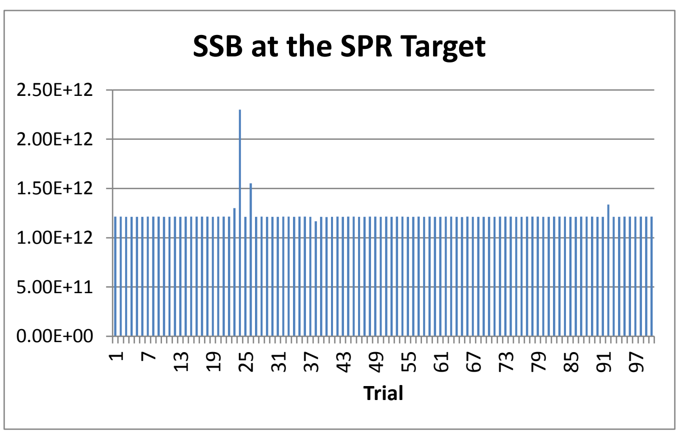
a.




b.




c.




d.

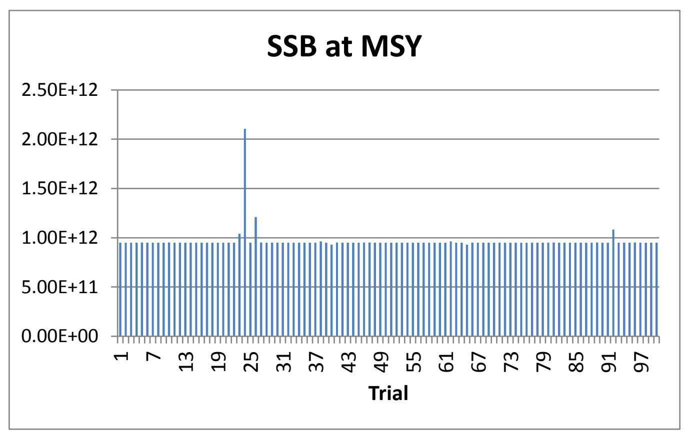
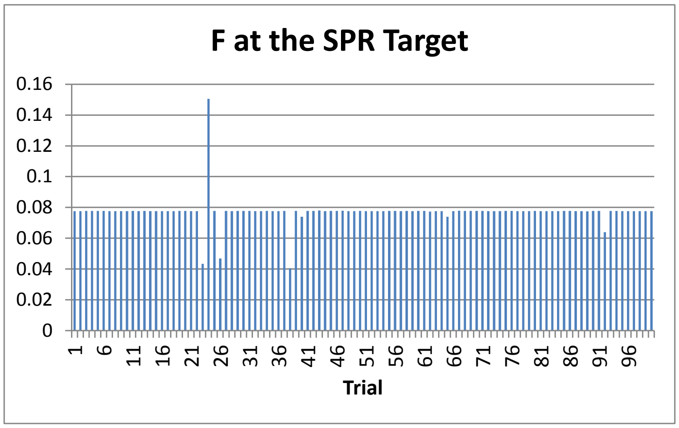
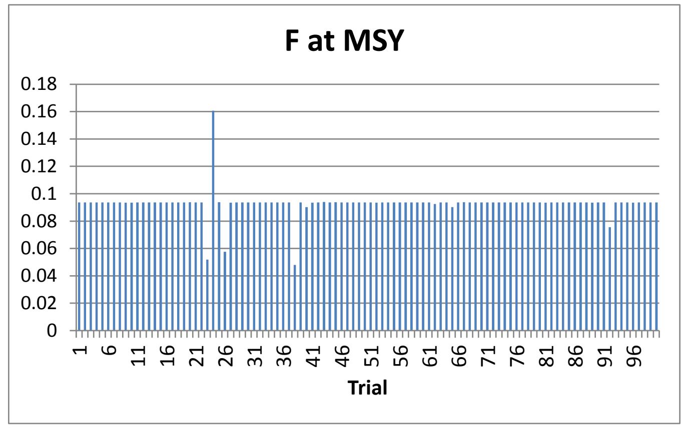



Figure 2.6.2. Summary results for key SS model parameters for 100 jitter runs from the SS stock assessment base model for Gulf of Mexico red snapper.

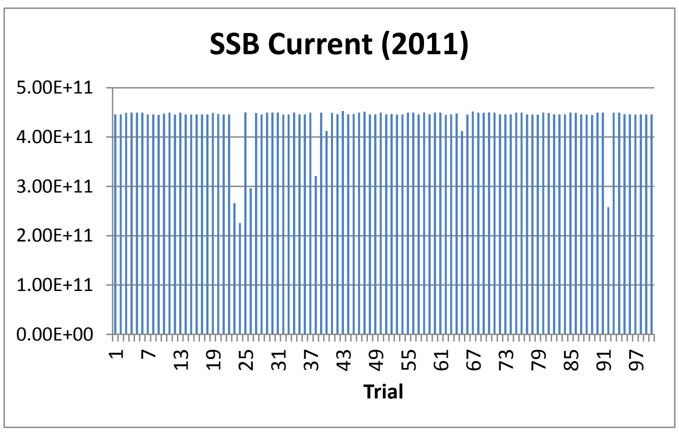
a.




b.




c.




d.

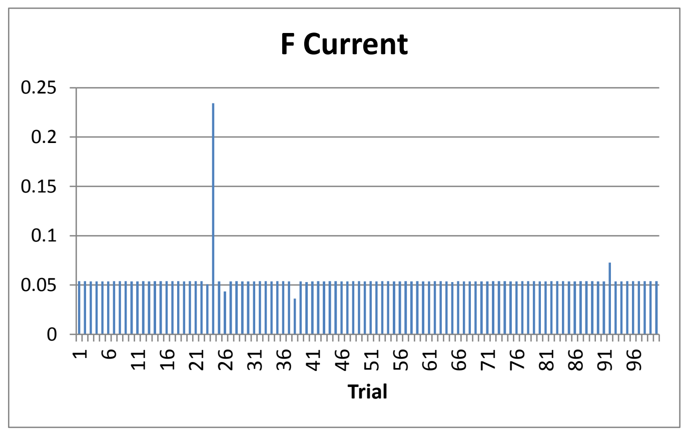
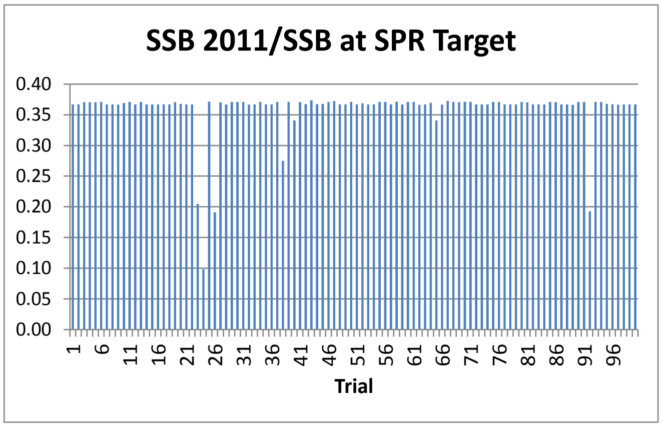
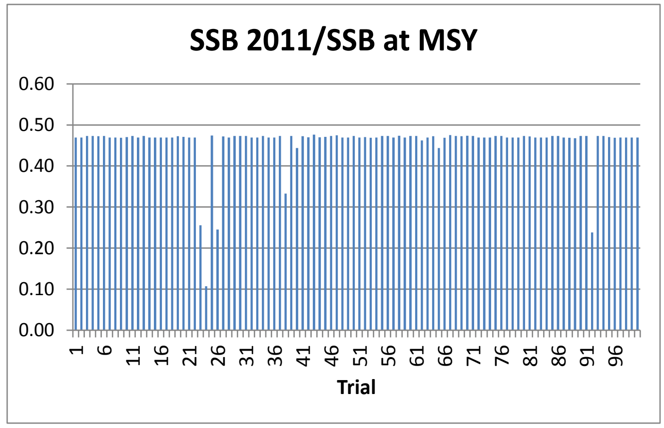



Figure 2.6.3. Summary results for key SS model parameters for 100 jitter runs from the SS stock assessment base model for Gulf of Mexico red snapper.

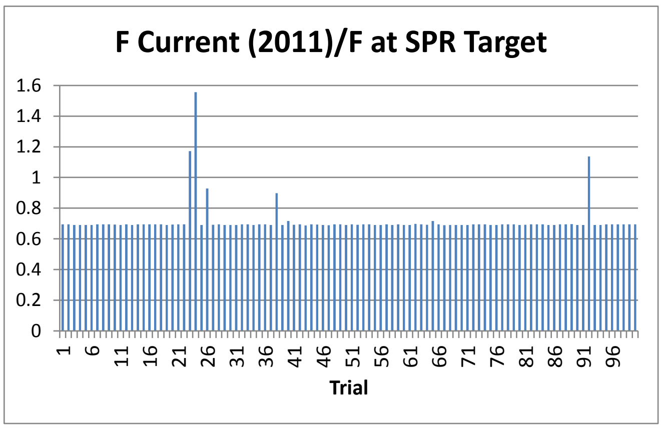
a.




b.




c.




d.

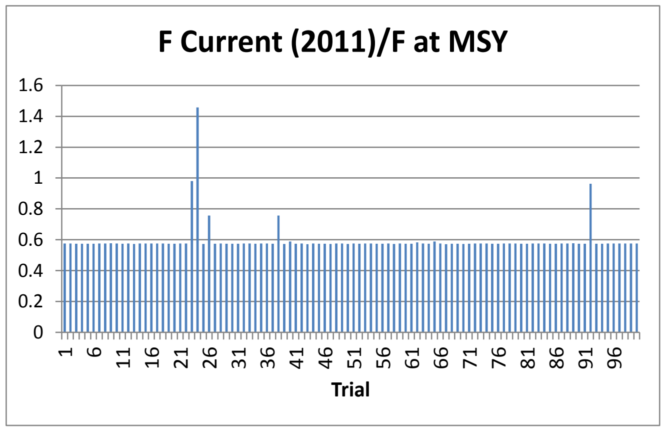



Figure 2.6.4. Summary results for key SS model parameters for 100 jitter runs from the SS stock assessment base model for Gulf of Mexico red snapper.

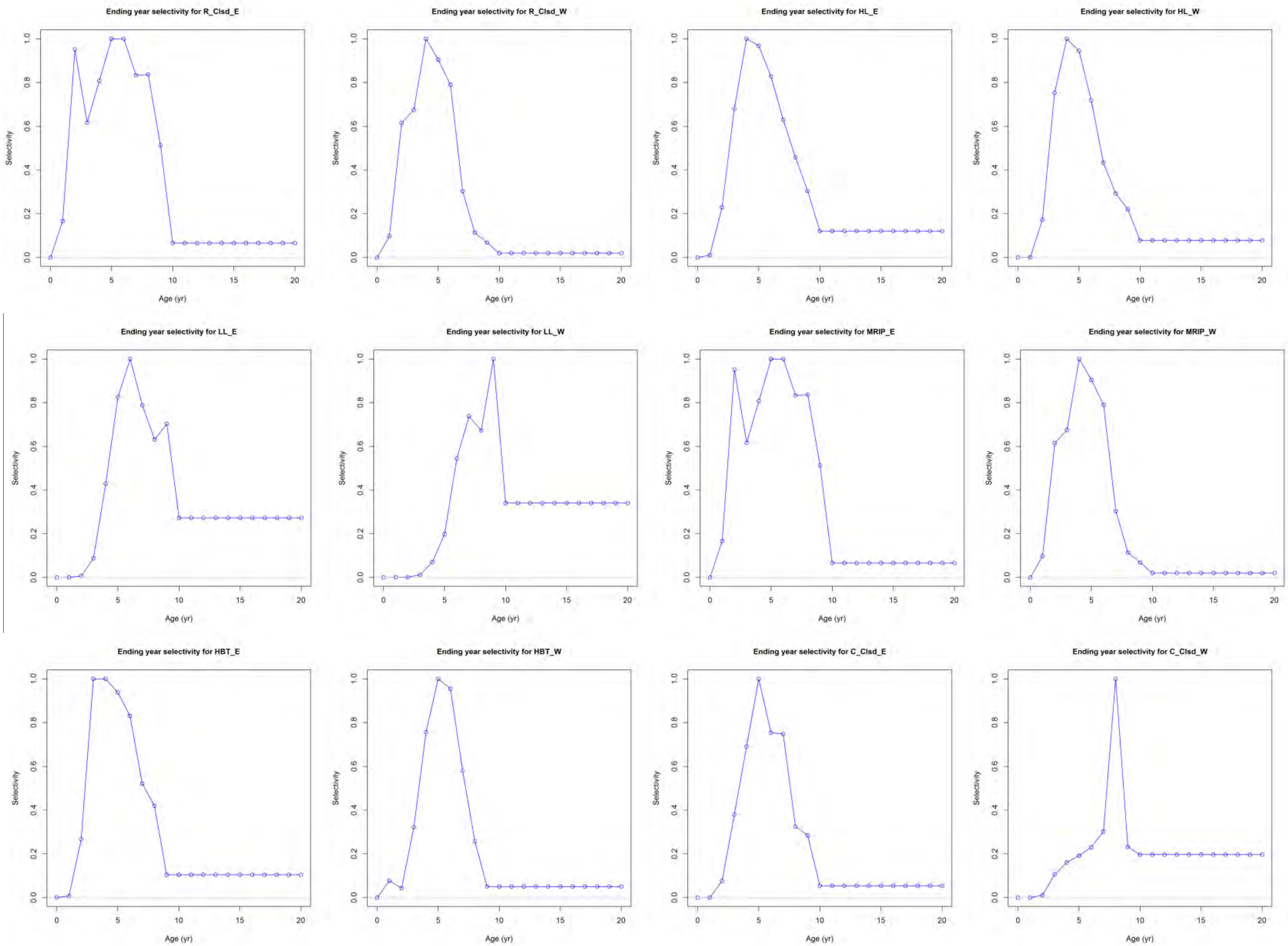



Figure 2.7.1a. Ending year (2011) age-based selectivity by fleet for the red snapper SS base model (continued on next page).

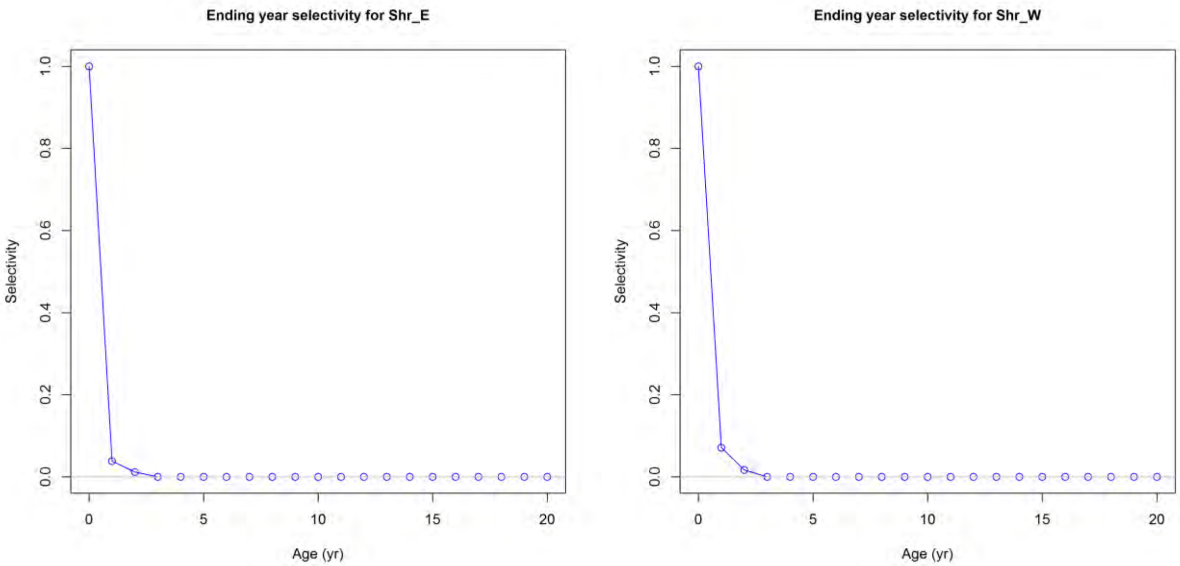



Figure 2.7.1b. Ending year (2011) age-based selectivity by fleet for the red snapper SS base model (continued from previous page).

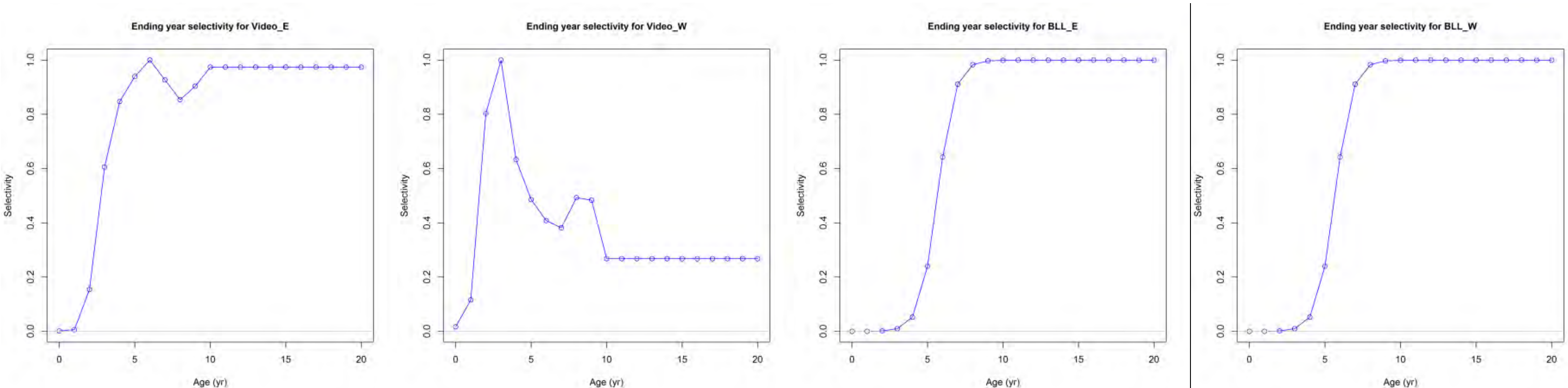



Figure 2.7.2. Ending year (2011) age-based selectivity by survey for the red snapper SS base model (continued on next page).

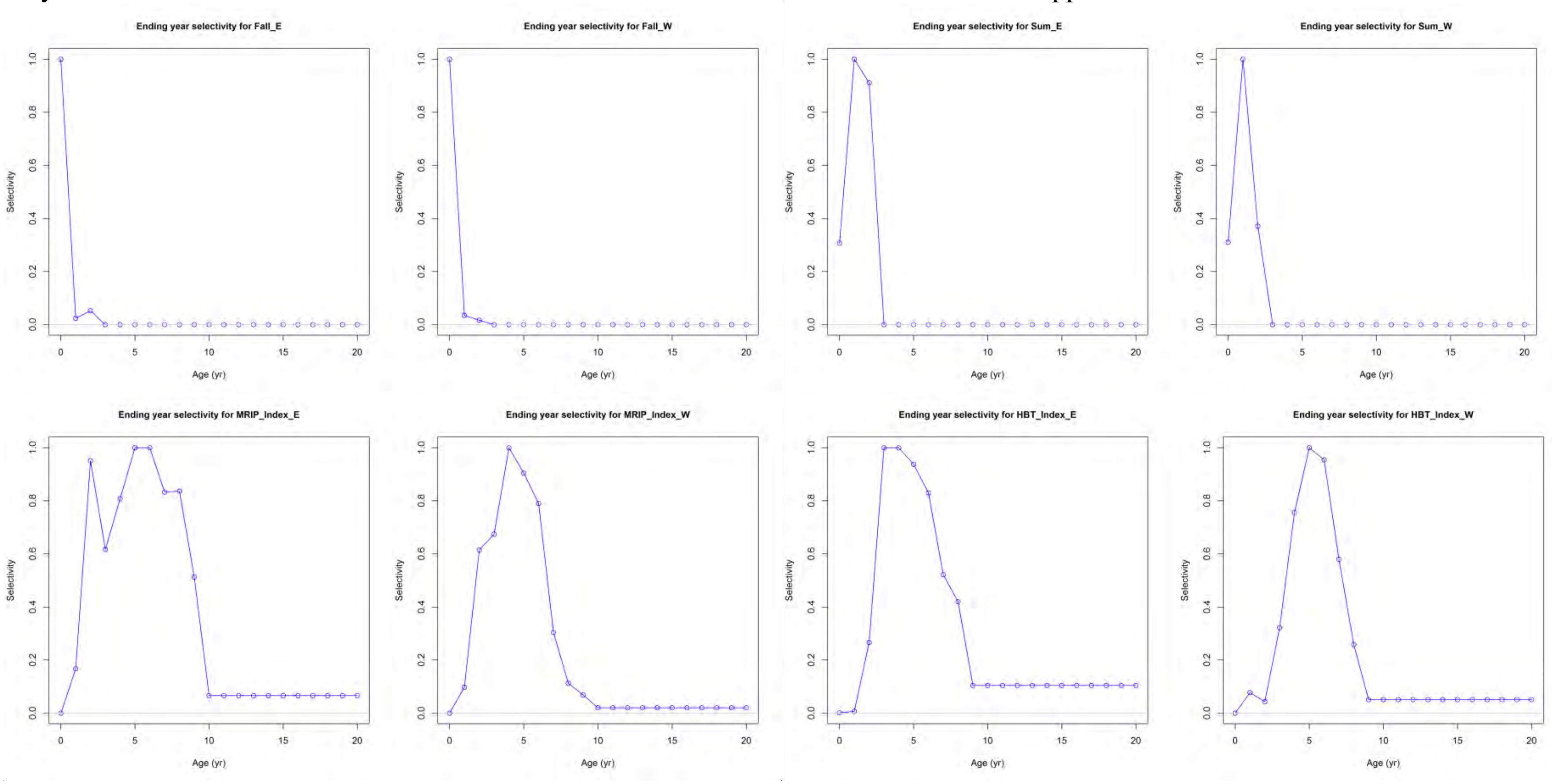



Figure 2.7.2b. Ending year (2011) age-based selectivity by survey for the red snapper SS base model (continued from previous page).

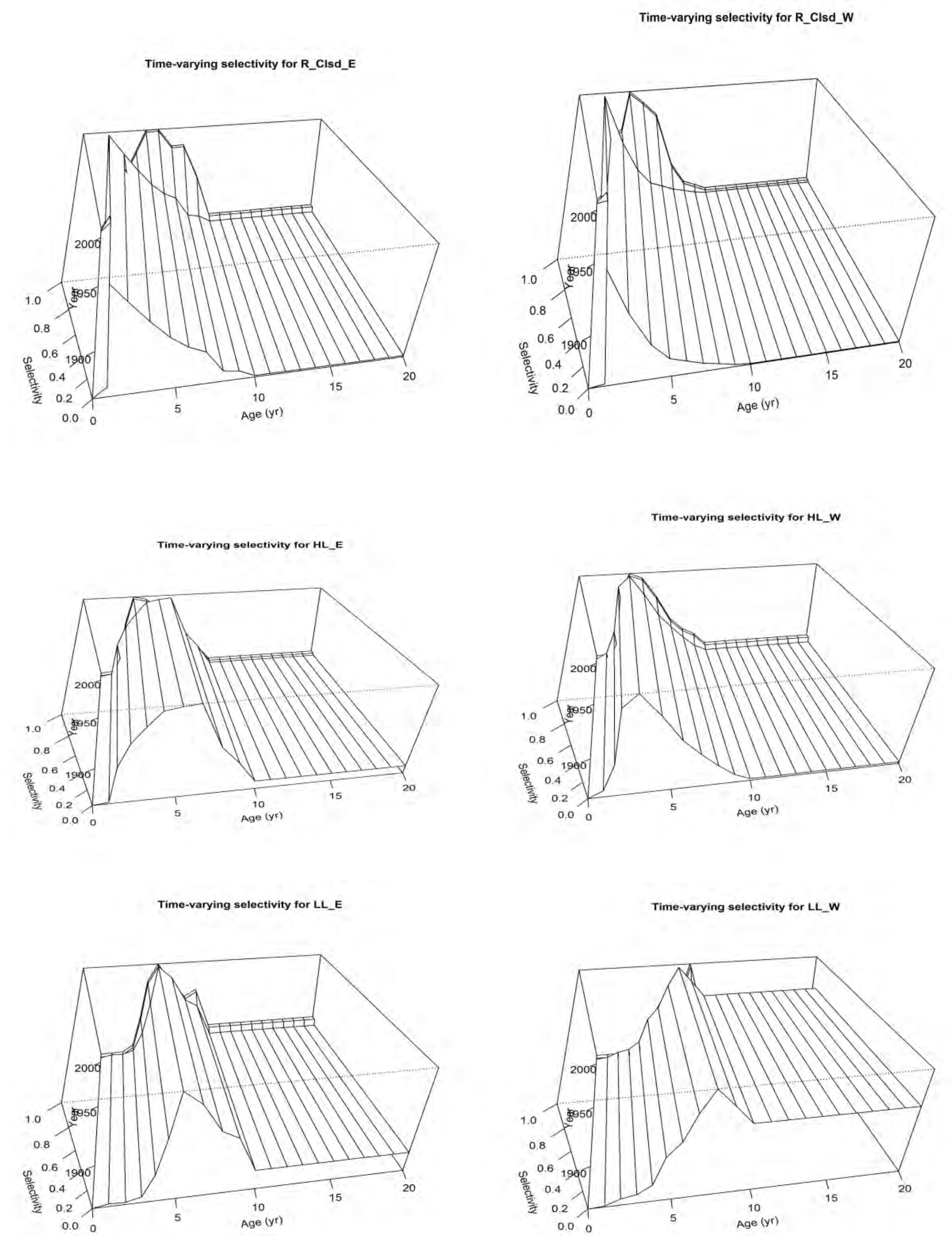



Figure 2.7.3a. Time-varying age-based selectivity by fleet (continued on next page).

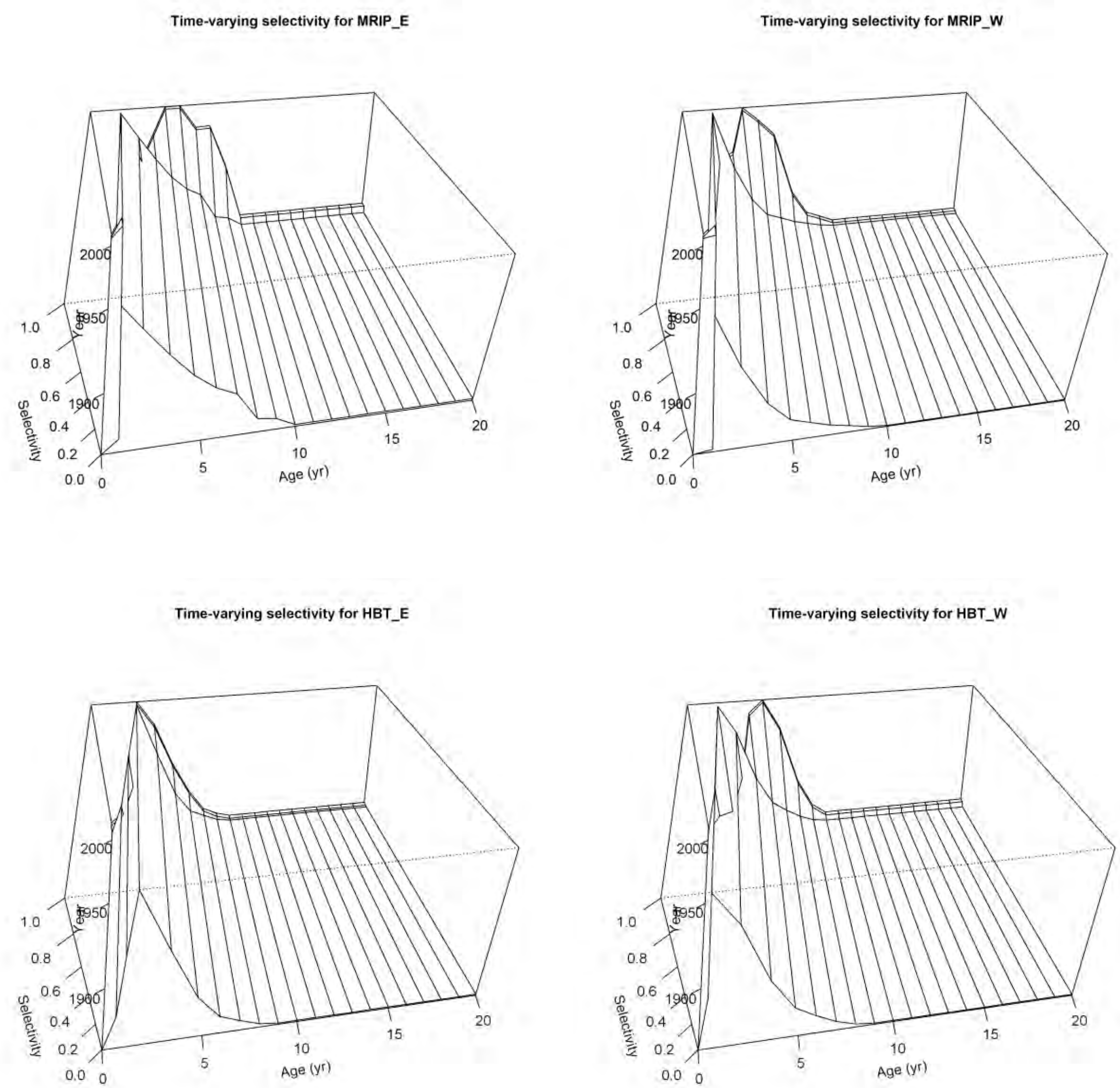



Figure 2.7.3b. Time-varying age-based selectivity by fleet (continued from previous page).

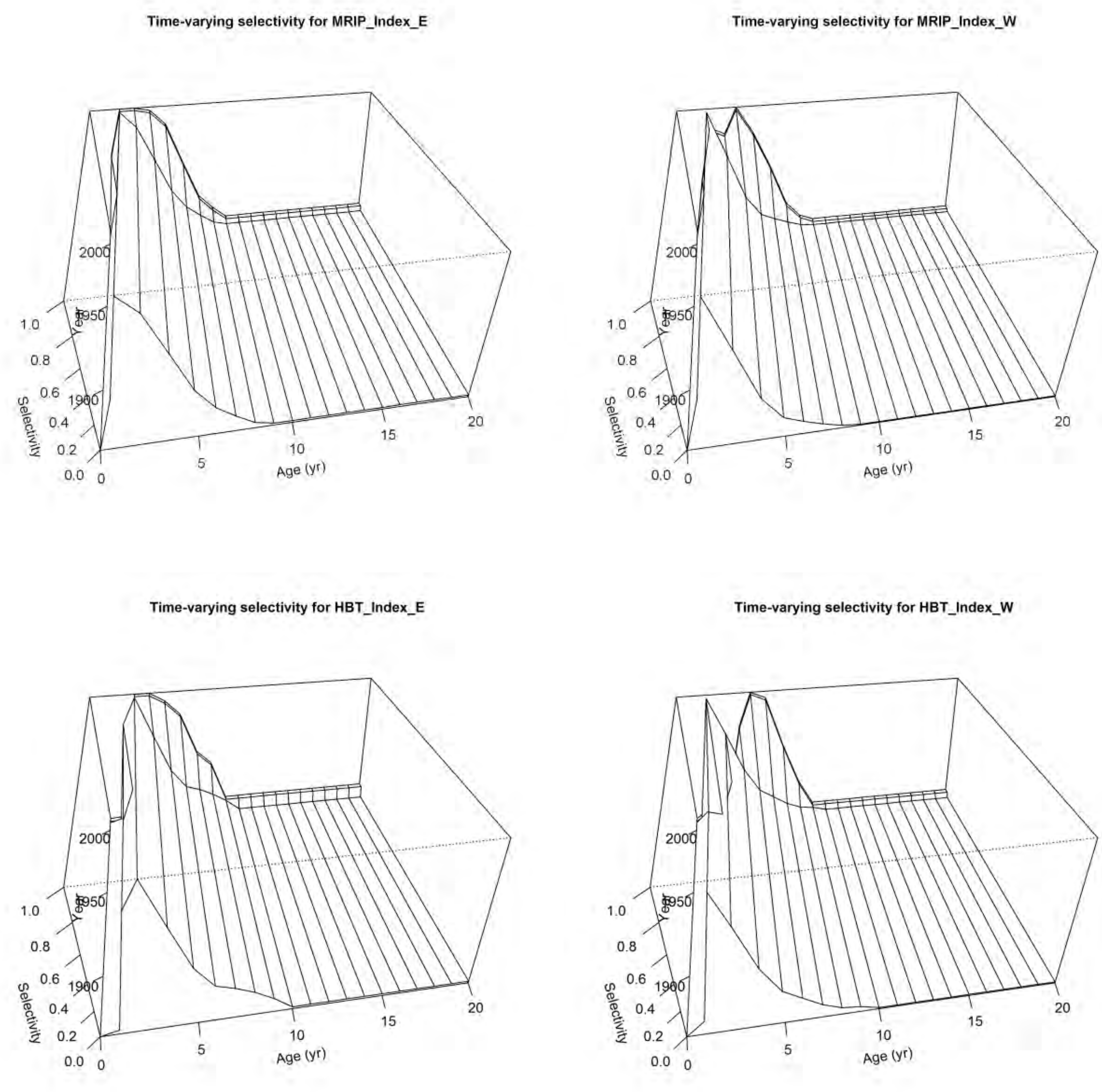



Figure 2.7.4. Time-varying age-based selectivity by survey.

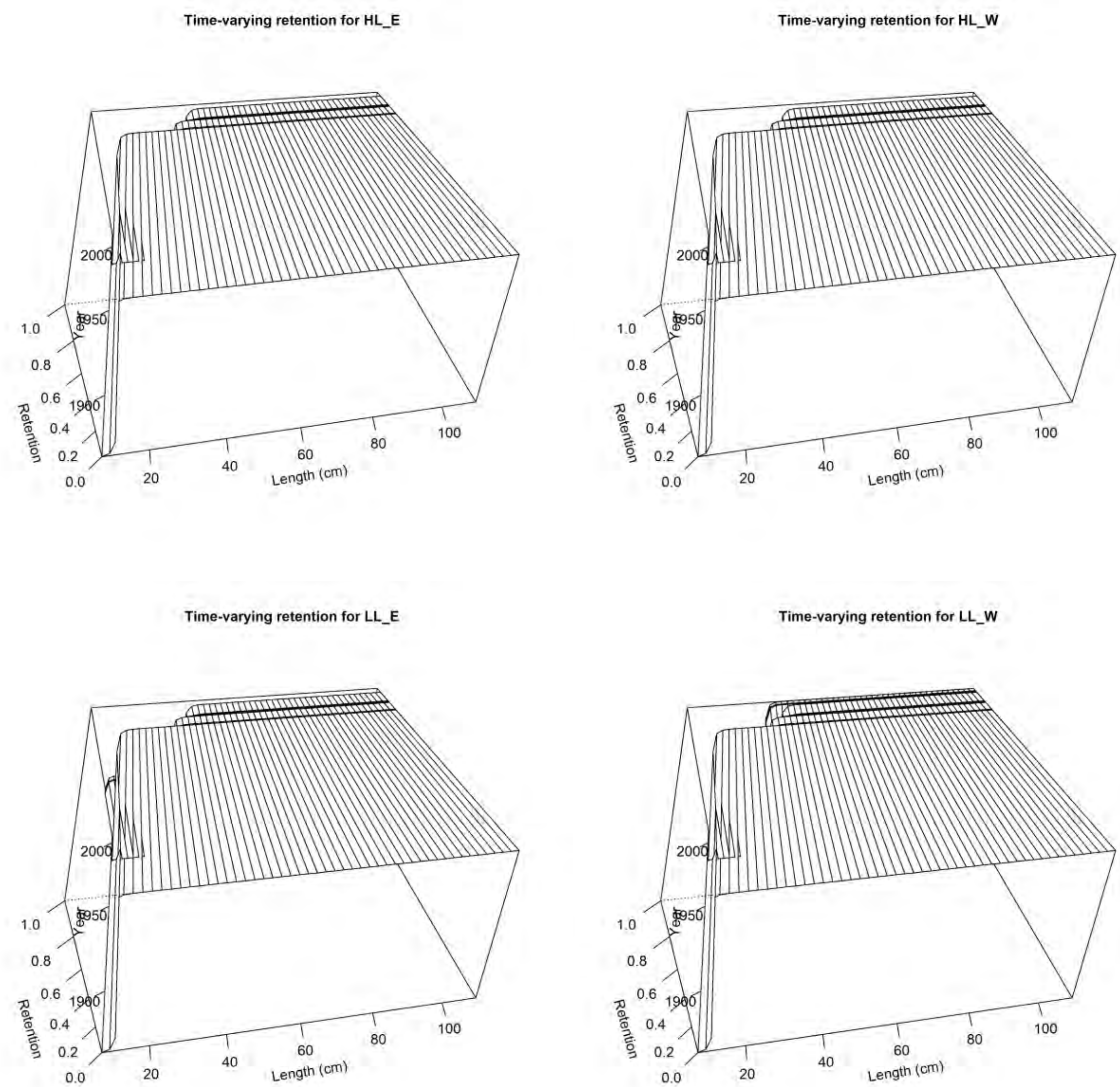



Figure 2.7.5a. Time-varying retention by fleet (continued on next page).

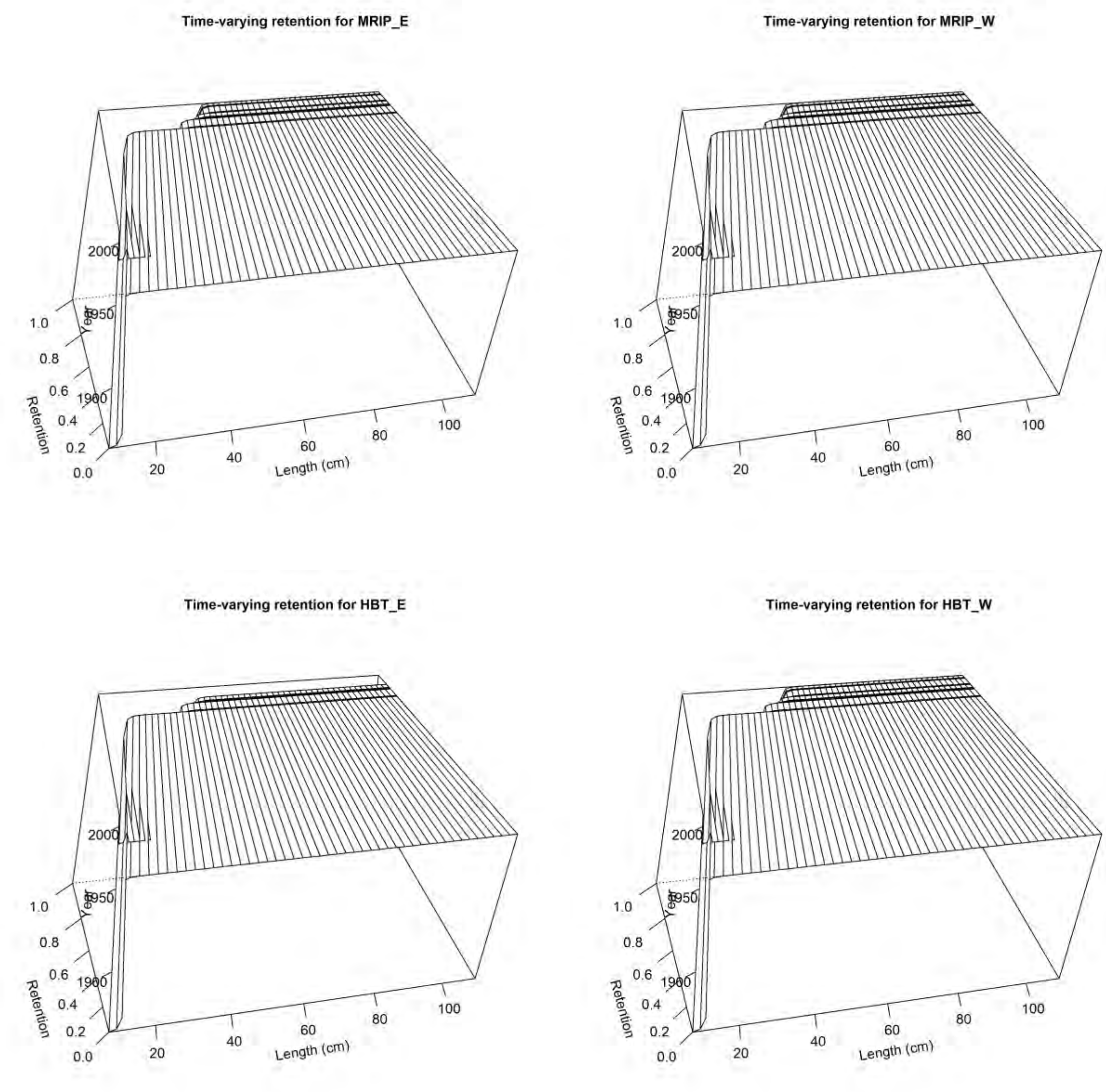



Figure 2.7.5b. Time-varying retention by fleet (continued from previous page).

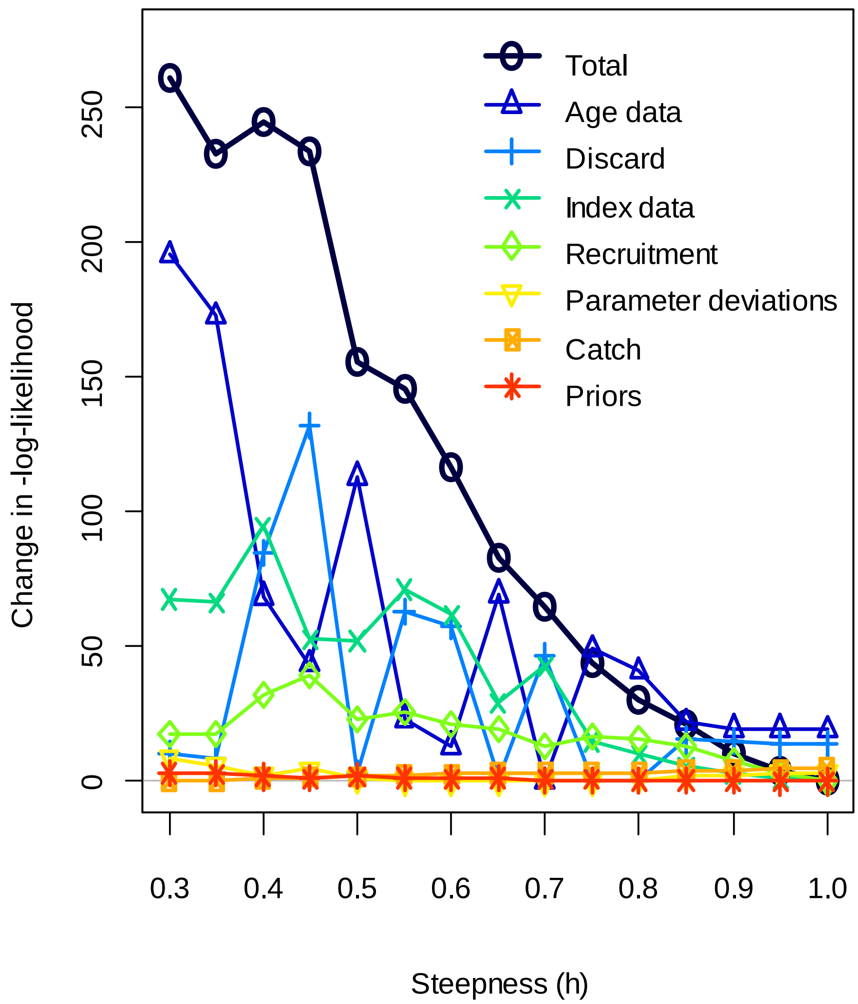



Figure 2.8.1. SS profile of Beverton – Holt steepness parameter for Gulf of Mexico red snapper for the base model configuration. The black line represents the change in total model data likelihood, the blue line is the change in discard data likelihood, the green line is the change in age likelihood, the aqua colored line is the change in index data likelihood, the red line is the change in catch data likelihood, and the yellow line is the change in recruitment data likelihood.

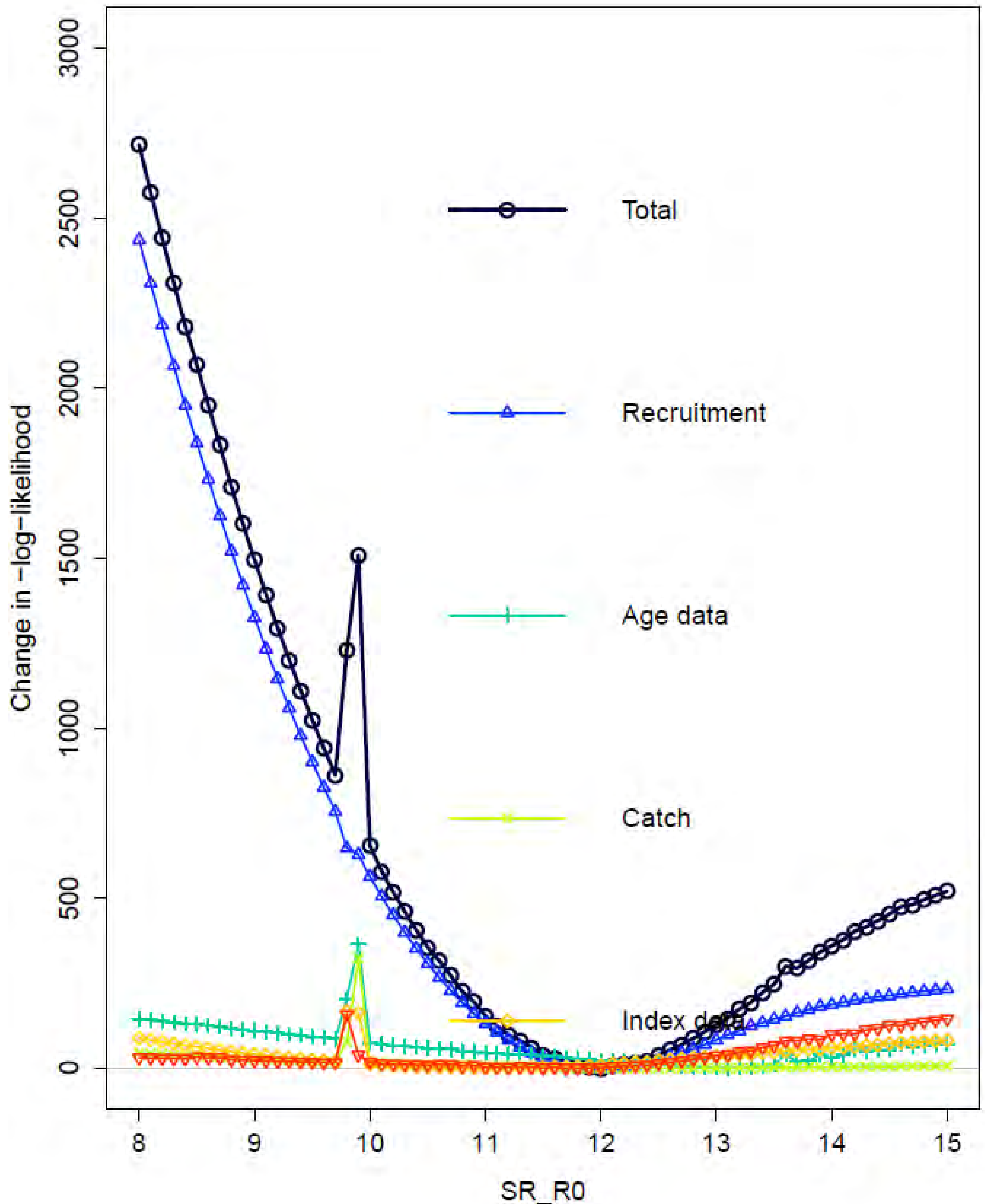



Figure 2.8.2. SS profile of virgin biomass ($R_0$) for the Gulf of Mexico red snapper base model configuration. The black line represents the change in total model data likelihood, the blue line is the change in recruitment data likelihood, the green line is the change in age likelihood, the orange/mustard colored line is the change in index data likelihood, and the yellow line is the change in recruitment data likelihood. The SS base model estimated $R_0$ for the early period as 12.0011 (SD= 0.0587).

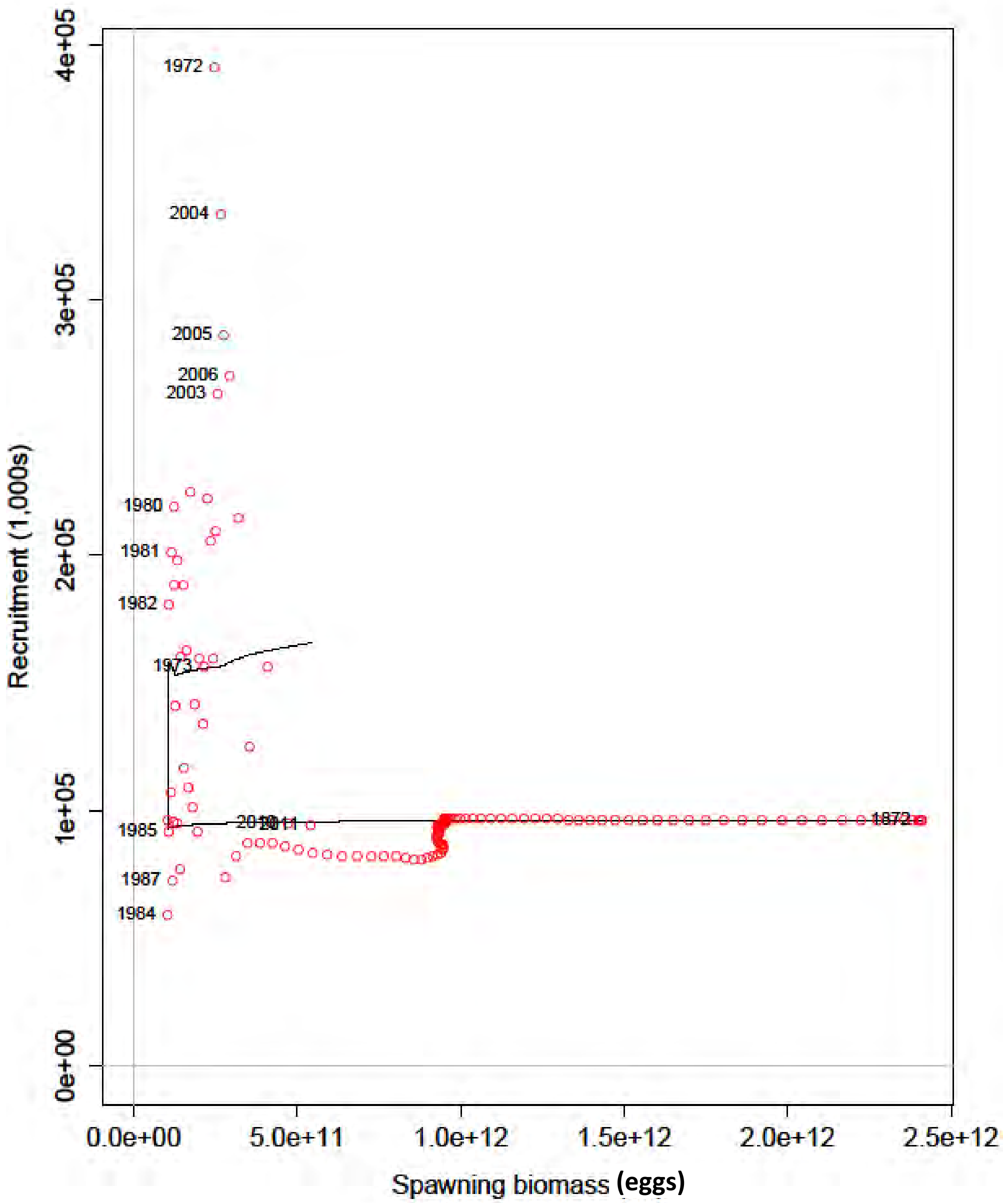



Figure 2.8.3. Predicted stock-recruitment relationship for Gulf of Mexico red snapper from SS base model configuration (steepness = 0.99, σR=0.3). Plotted are predicted annual recruitments from SS (circles) and expected recruitment from the stock recruit relationship (black line). Labels are included on the first year, last year, and years with natural log deviations > 0.5.

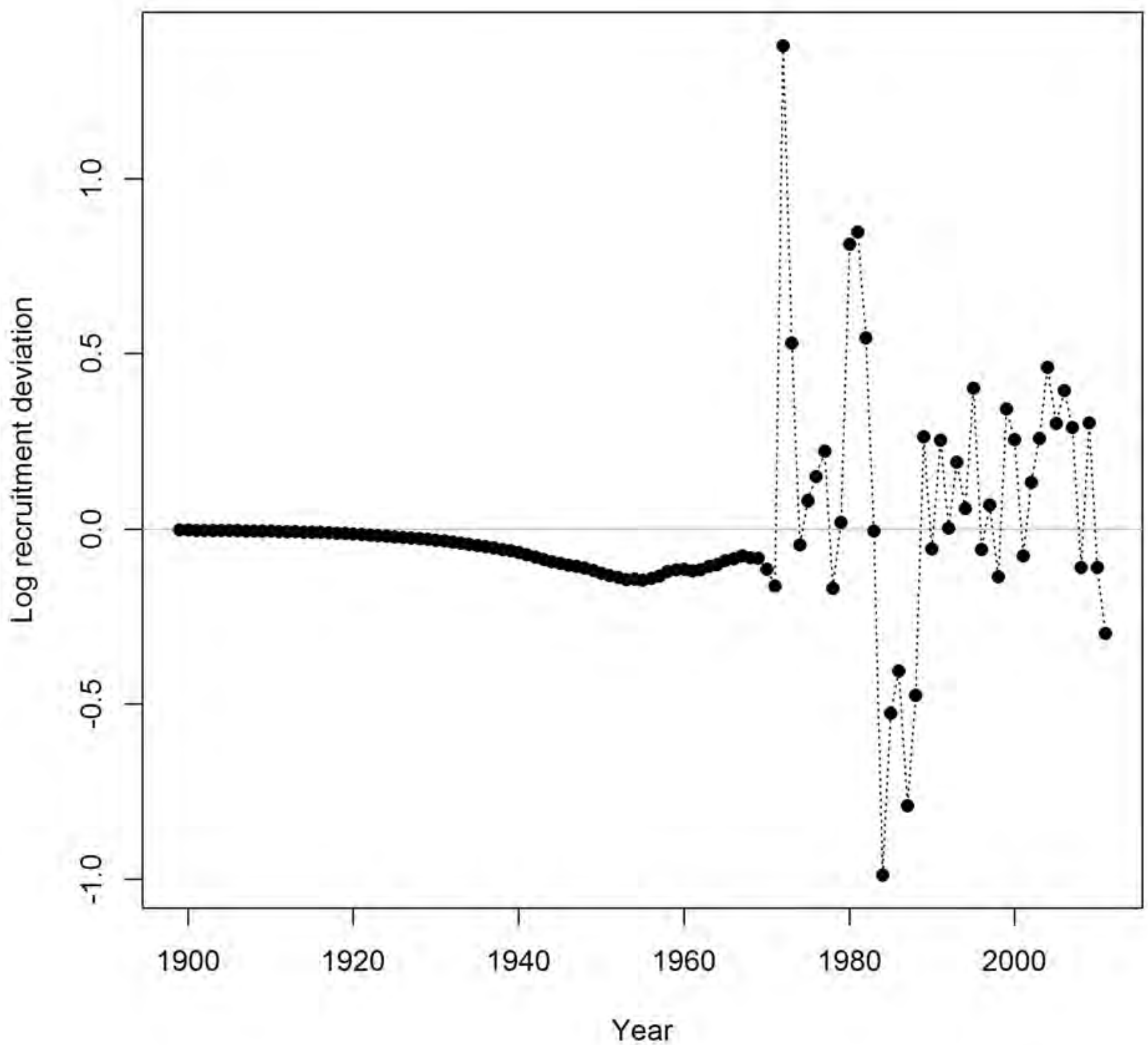



Figure 2.8.4. Log recruitment deviations (1985-2010) for Gulf of Mexico red snapper from the SS base model configuration (steepness = 0.99, $\sigma_R$ = 0.3).

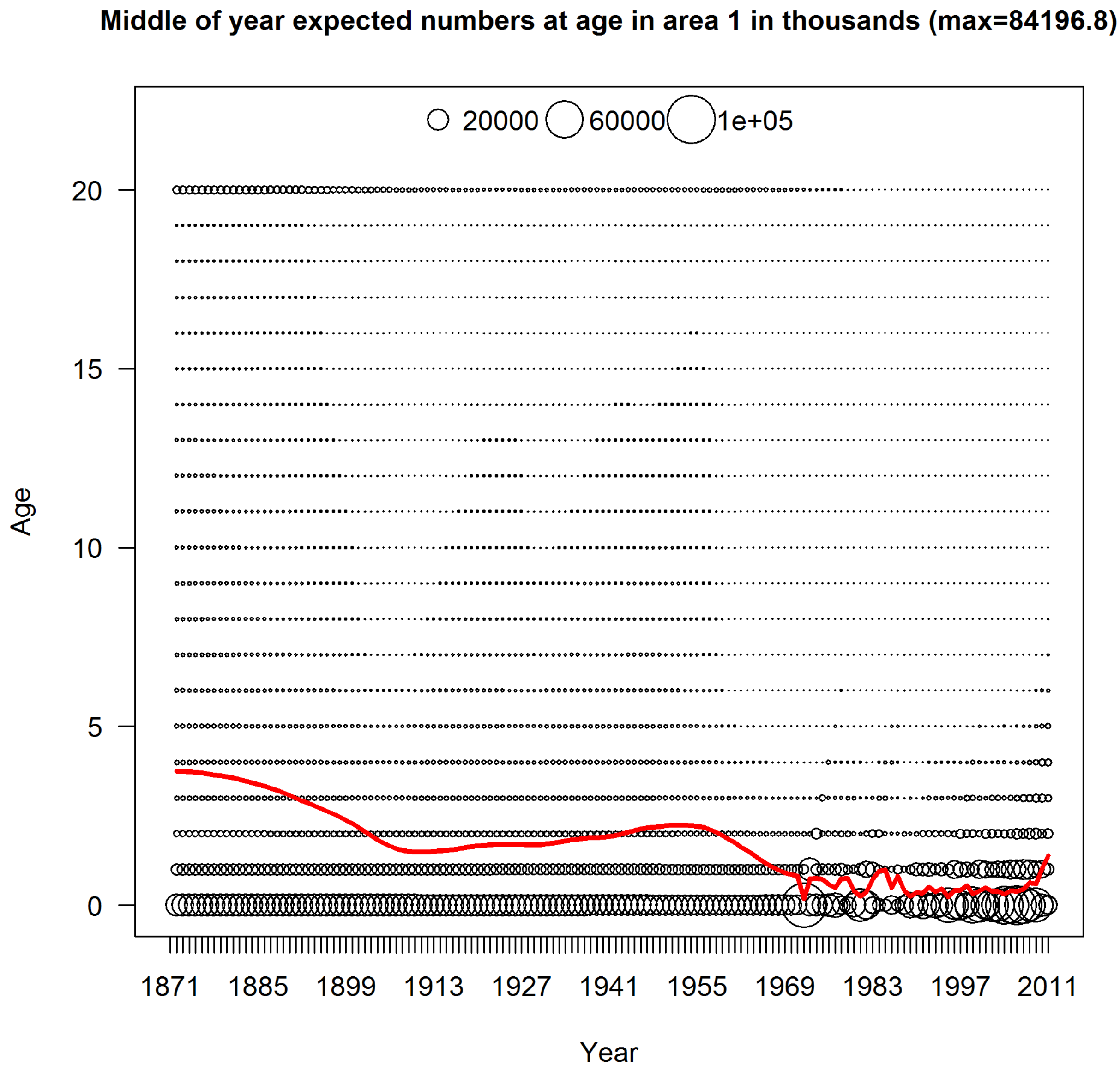



Figure 2.8.5. Predicted abundance at age (circles) and mean age (line) for Gulf of Mexico red snapper for the east area, from the SS base model configuration (steepness = 0.99, $\sigma_R$ = 0.3). Units are abundance in thousands of fish.

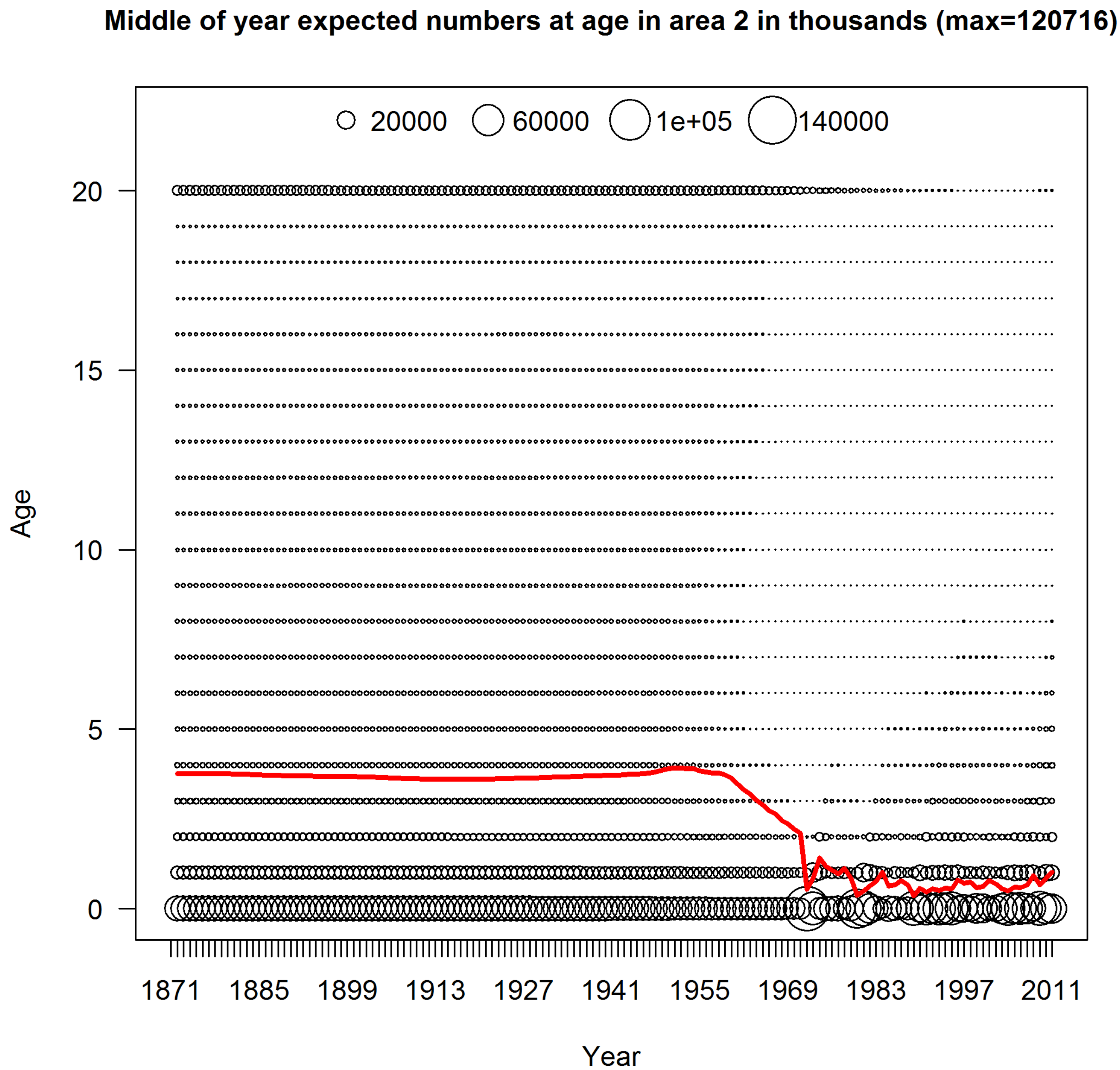
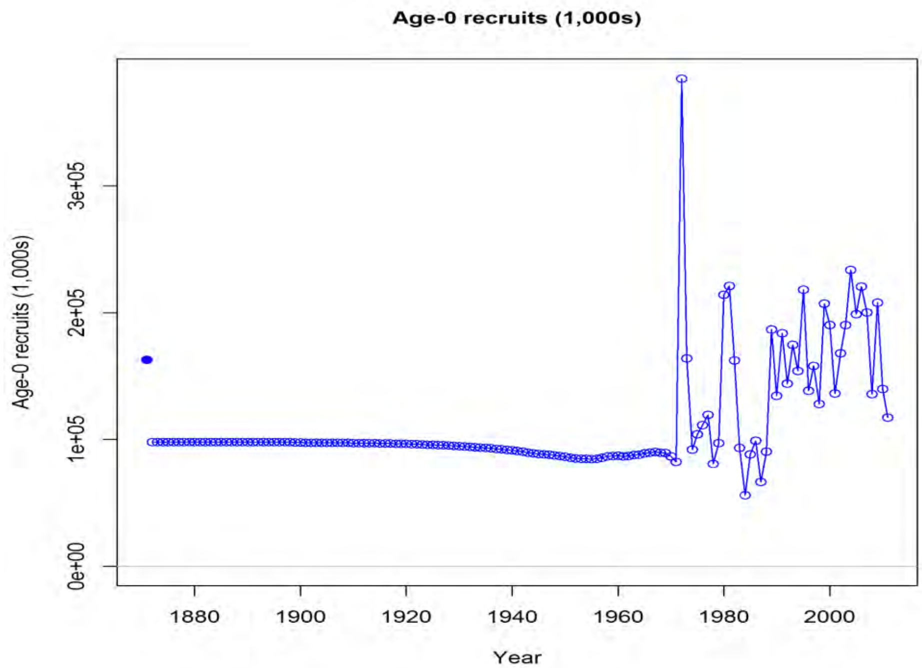



Figure 2.8.6. Predicted abundance at age (circles) and mean age (line) for Gulf of Mexico Red snapper for the west area, for the SS base model configuration (steepness = 0.99, $\sigma_R$ = 0.3). Units are abundance in thousands of fish.

a. Age 0 recruits, all areas combined.




b. Age 0 Recruits by area (area 1 represents the eastern Gulf of Mexico and area 2 represents the western Gulf of Mexico).

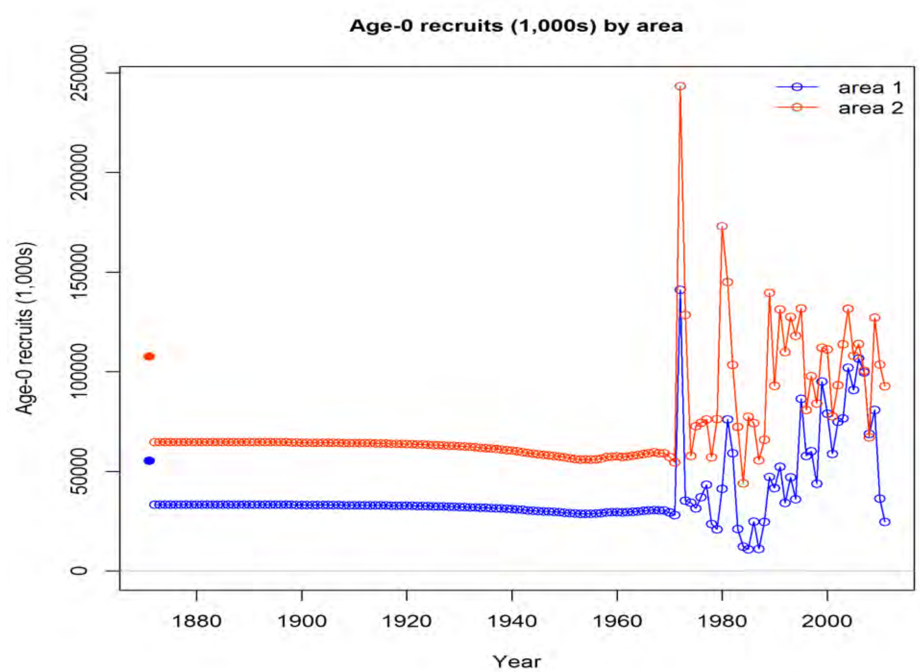



Figure 2.8.7. Predicted age-0 recruits in thousands of fish for the Gulf of Mexico red snapper SS base model configuration (steepness = 0.99, $\sigma_R$ = 0.3).

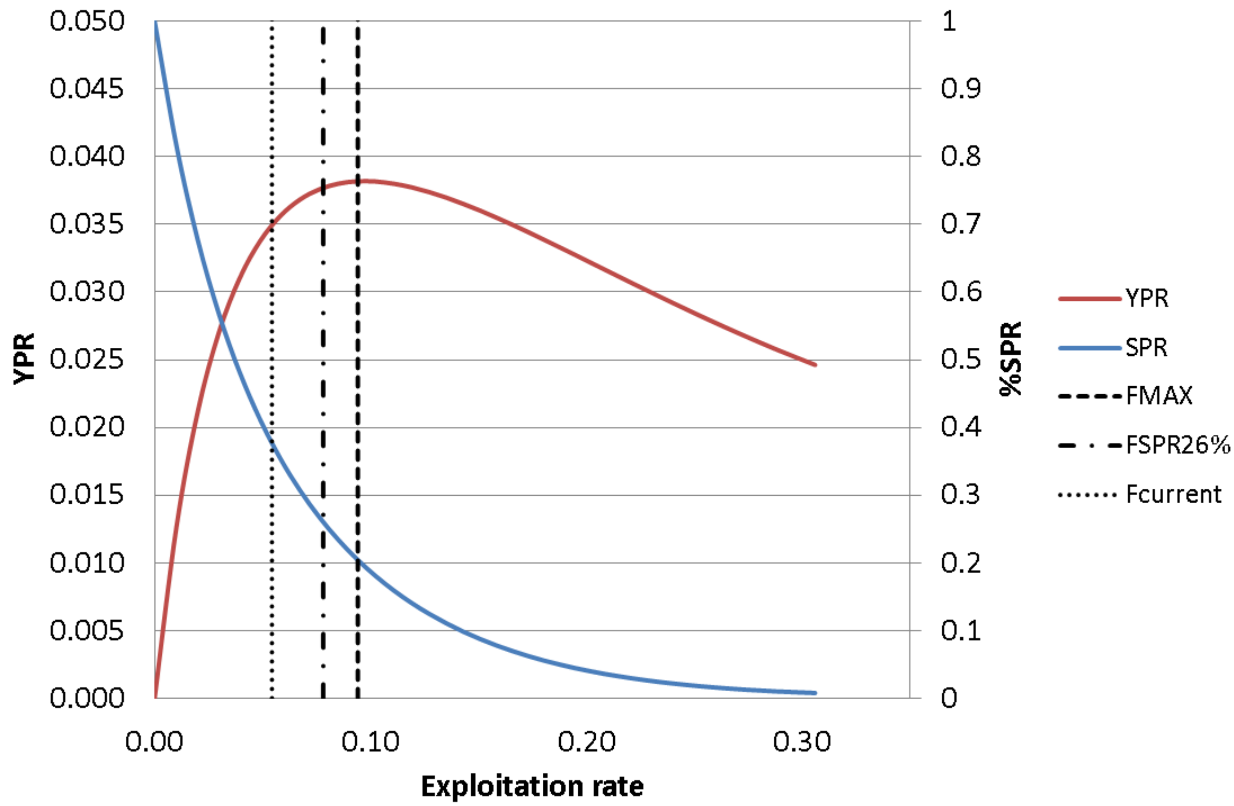
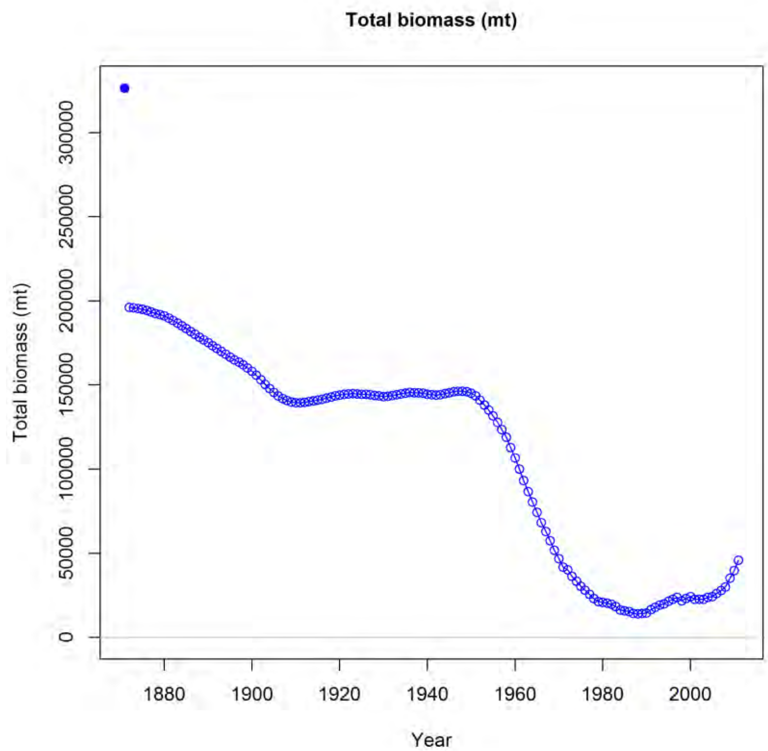



Figure 2.8.8. Yield per recruit (red line, in metric tons) and equilibrium spawning potential ratio (blue line) as a function of exploitation rate for Gulf of Mexico red snapper from the base model configuration (steepness = 0.99, σR = 0.3). Vertical lines represent $F_{MAX}$ (0.094), $F_{SPR26\%}$ (0.078), and $F_{CURRENT}$ (0.054).



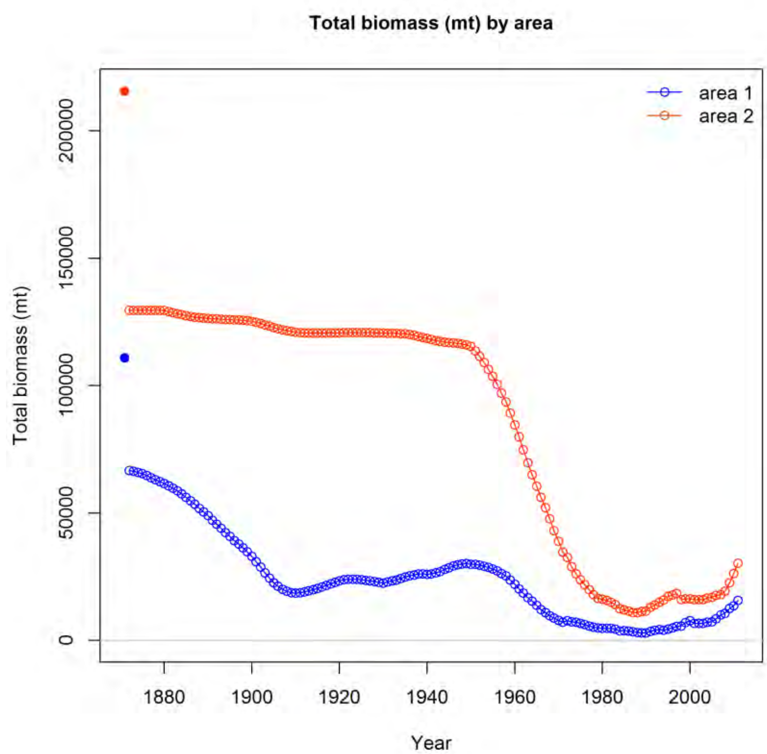
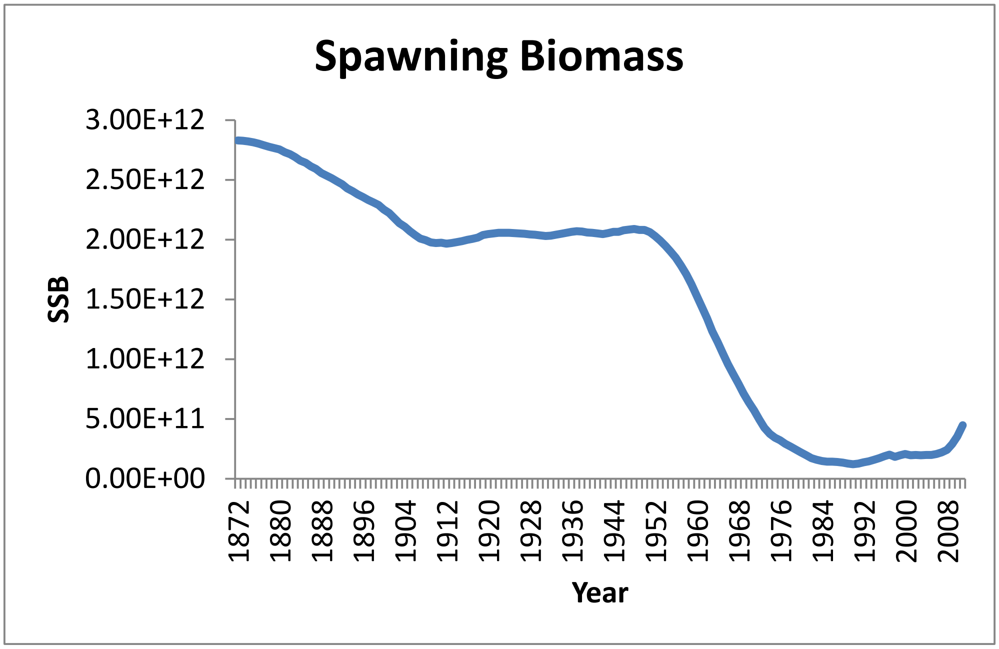




Figure 2.9.1. SS predicted total biomass for Gulf of Mexico red snapper from the base model run. The top panel represents east and west combined and bottom panel represents east and west separate.



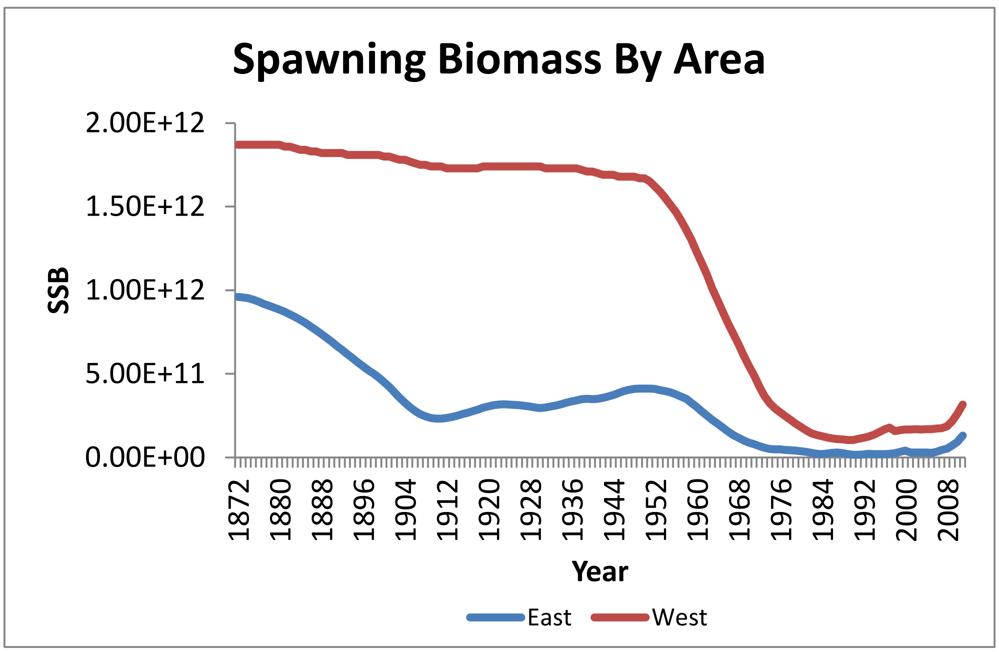




Figure 2.9.2. Spawning biomass for Gulf of Mexico red snapper from the base model run. The top panel represents east and west combined and bottom panel represents east and west separate.

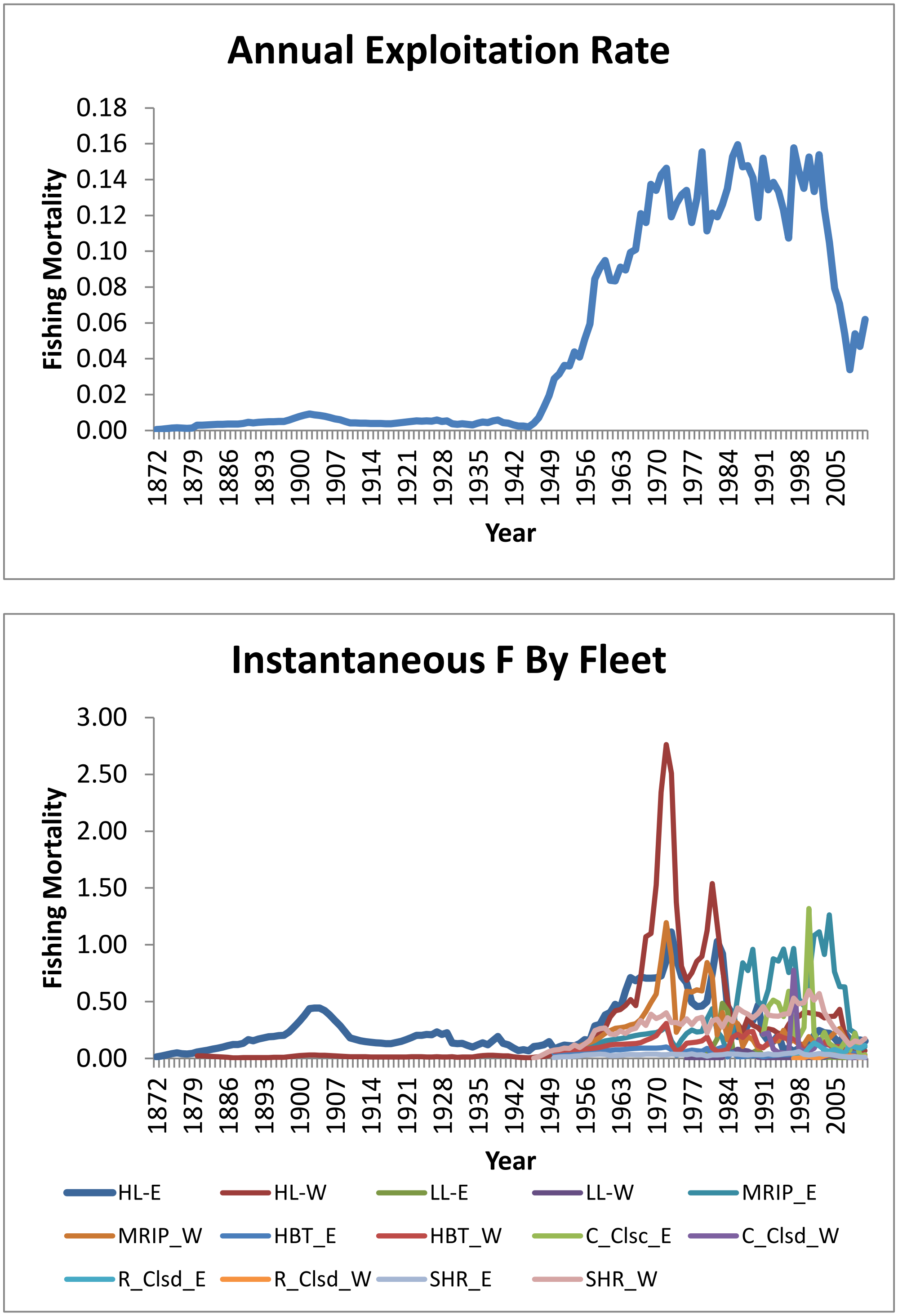



Figure 2.10.1. Predicted fishing mortality for Gulf of Mexico red snapper from SS for the base model configuration. This represents the fishing mortality level on the most vulnerable age class for each fleet. The top panel is annual exploitation rate and the bottom panel is fleet specific continuous fishing mortality.

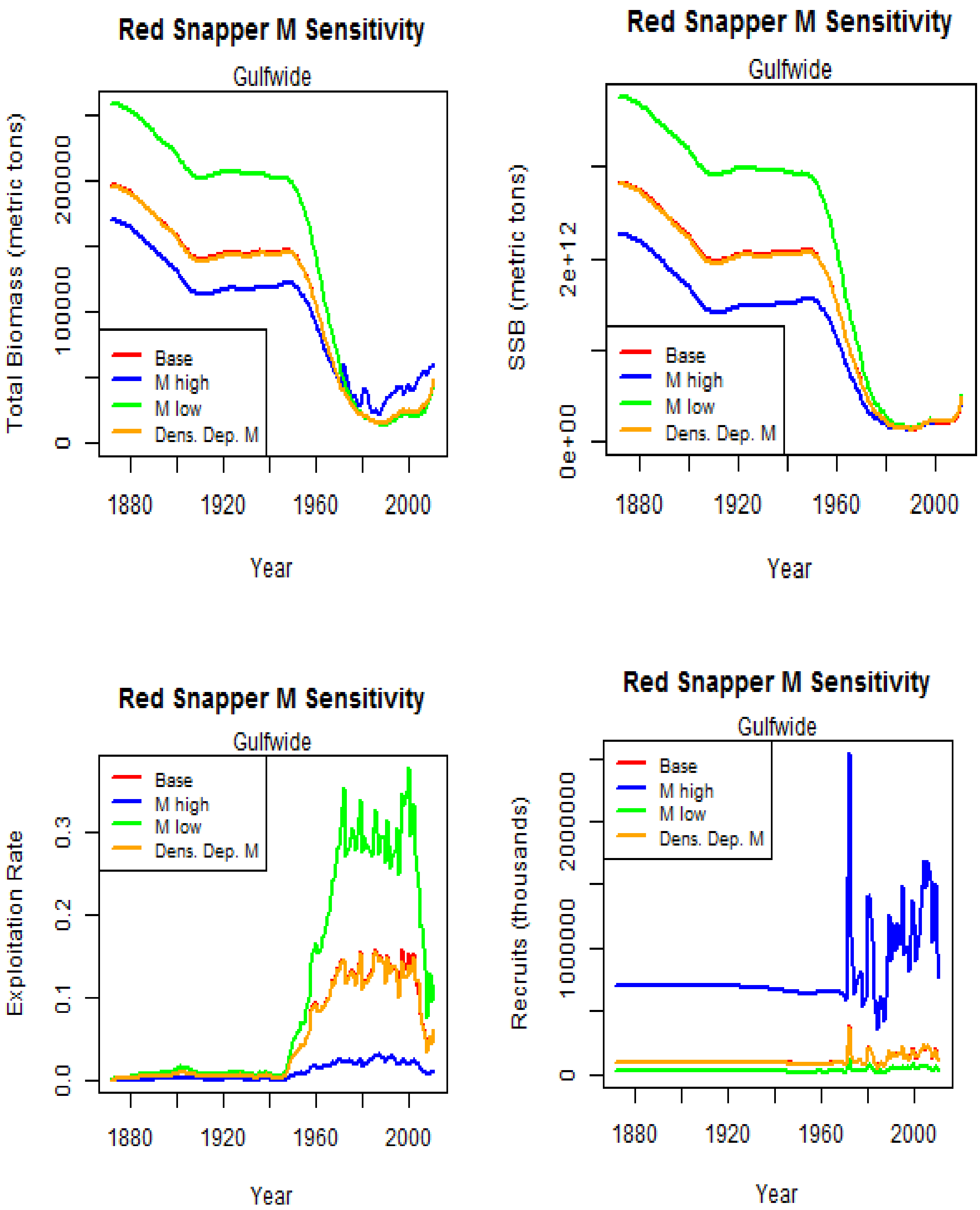



Figure 2.12.1. Model estimated total biomass, spawning biomass and recruitment (age 0) for the Gulf of Mexico red snapper base model run and three alternative model runs examining assumptions in natural mortality.

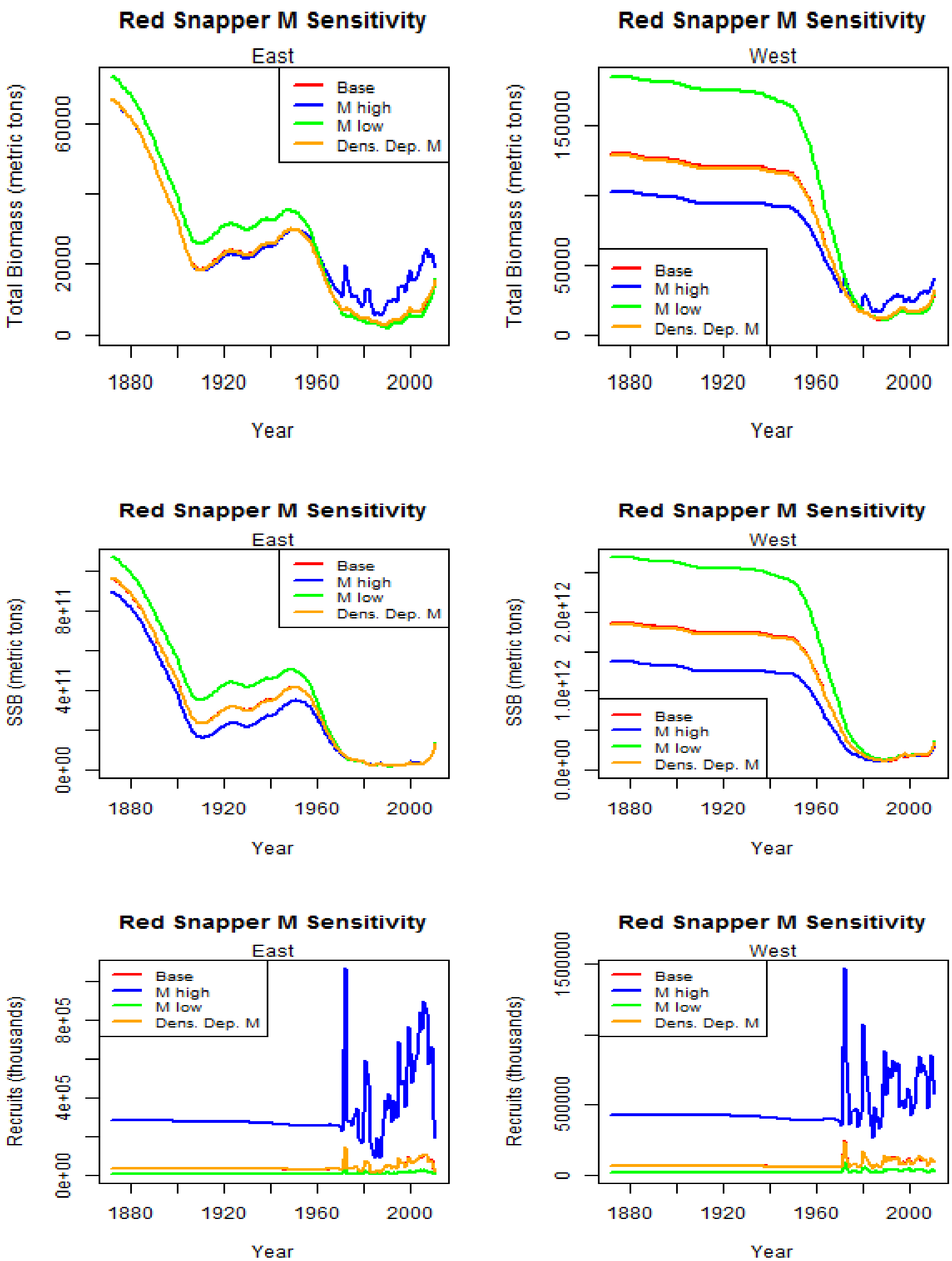



Figure 2.12.2 Model estimated total biomass, spawning biomass and recruitment (age 0) for the Gulf of Mexico red snapper base model run and three alternative model runs examining assumptions in natural mortality.

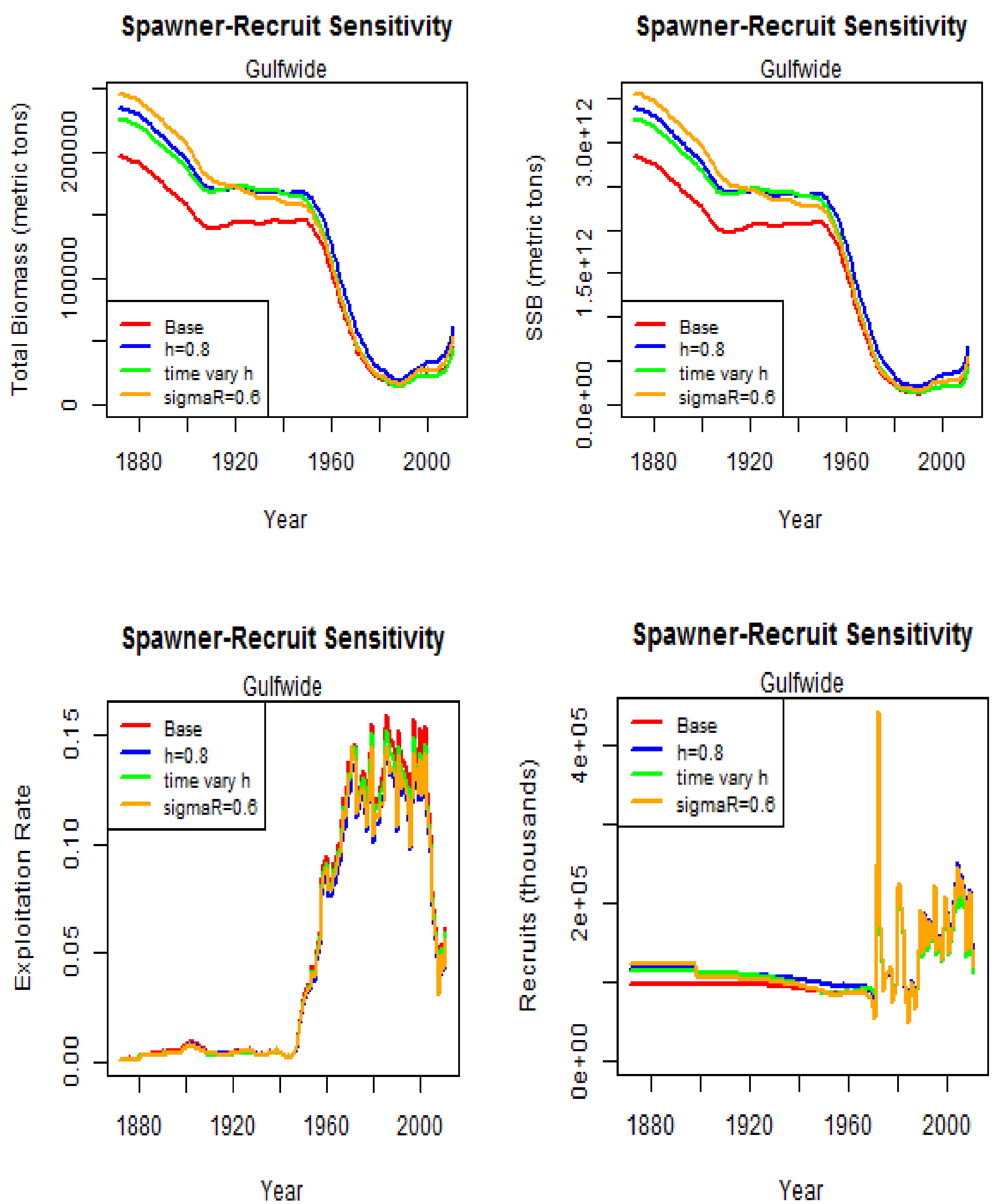



Figure 2.12.3. Model estimated total biomass, spawning biomass and recruitment (age 0) for the Gulf of Mexico red snapper base model run and three alternative model runs examining assumptions in the spawner recruit relationship.

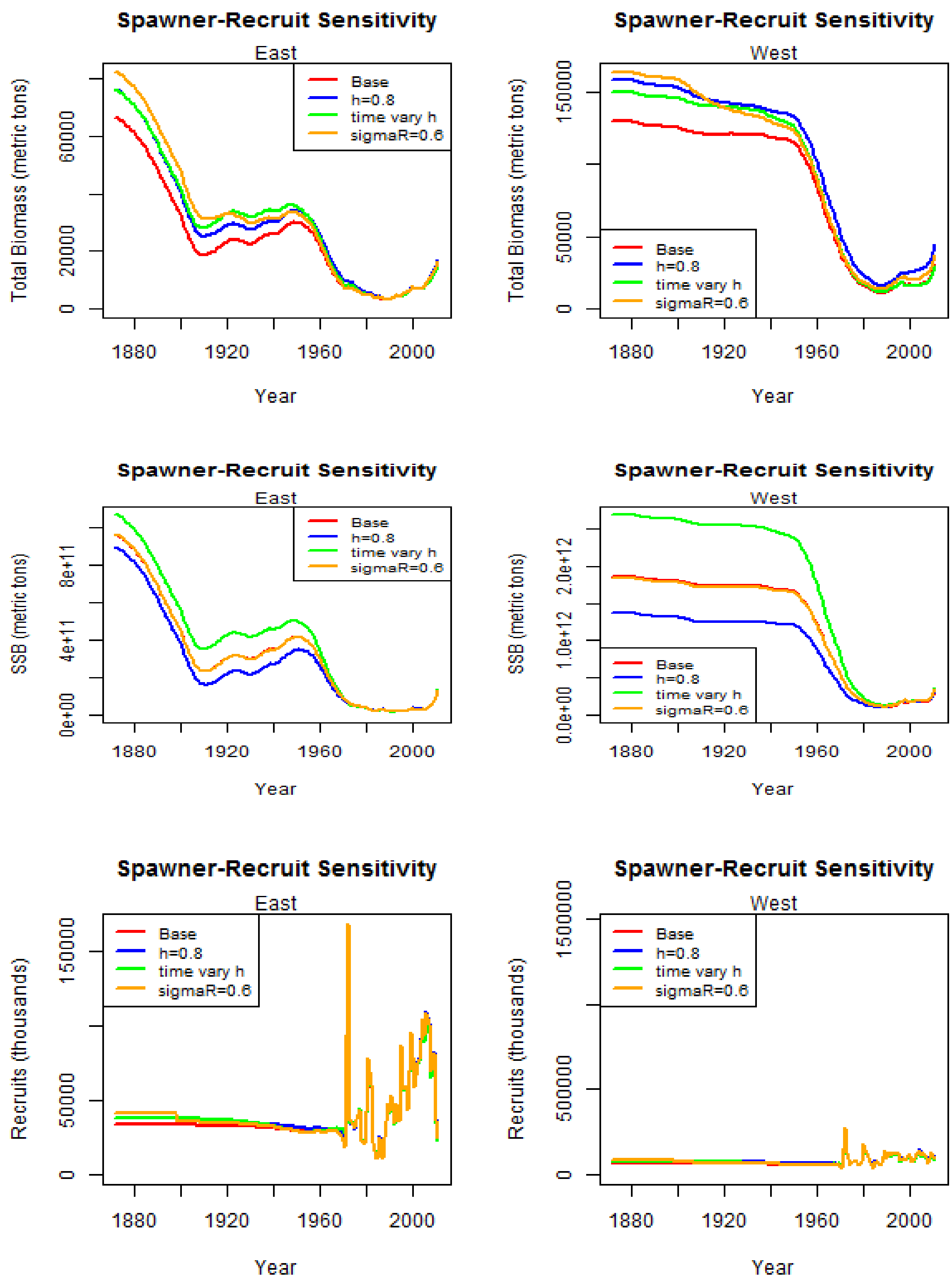



Figure 2.12.4 Model estimated total biomass, spawning biomass and recruitment (age 0) for the Gulf of Mexico red snapper base model run and three alternative model runs examining assumptions in the spawner recruit relationship.

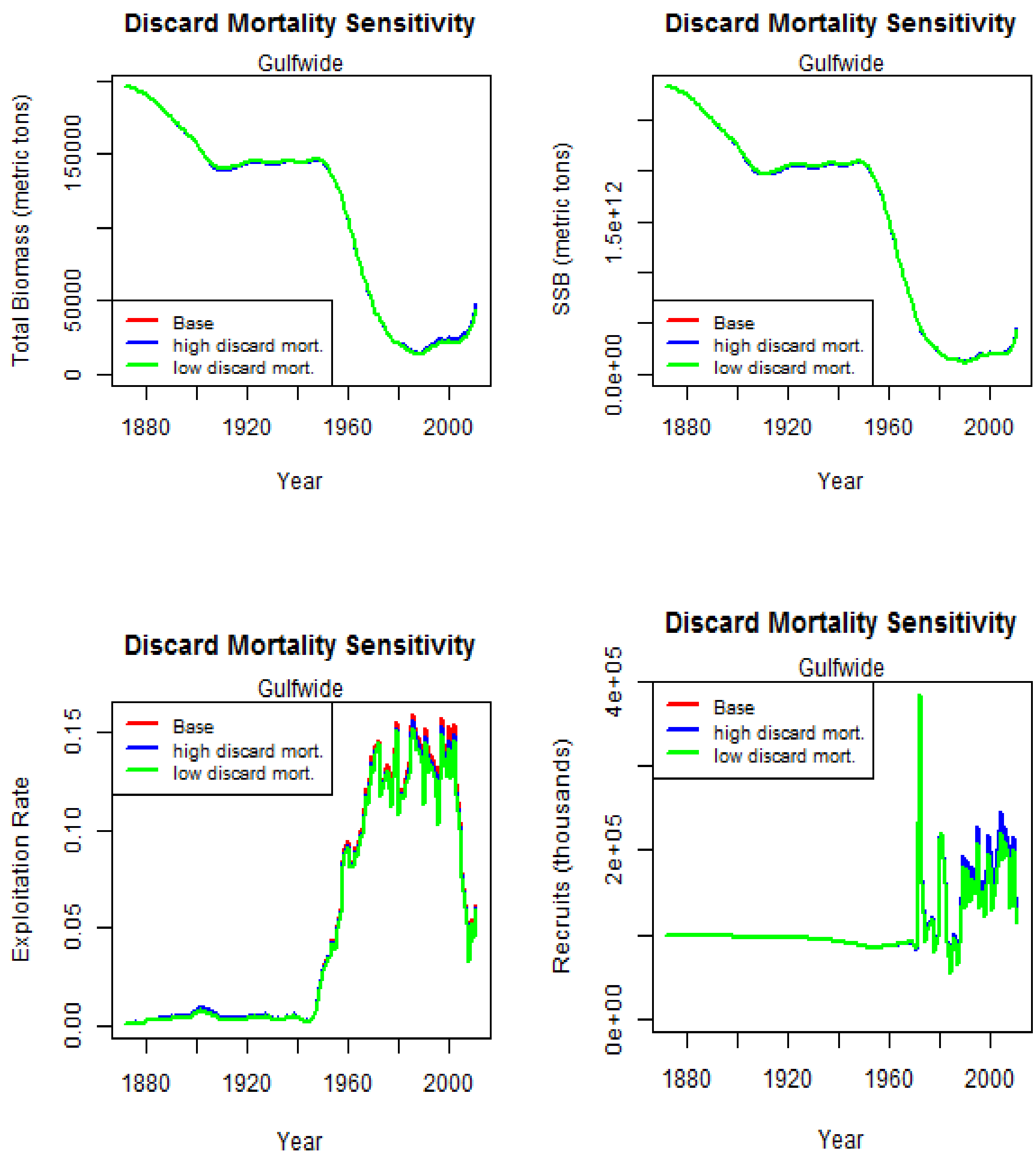



Figure 2.12.5. Model estimated total biomass, spawning biomass and recruitment (age 0) for the Gulf of Mexico red snapper base model run and three alternative model runs examining assumptions in discard mortality.

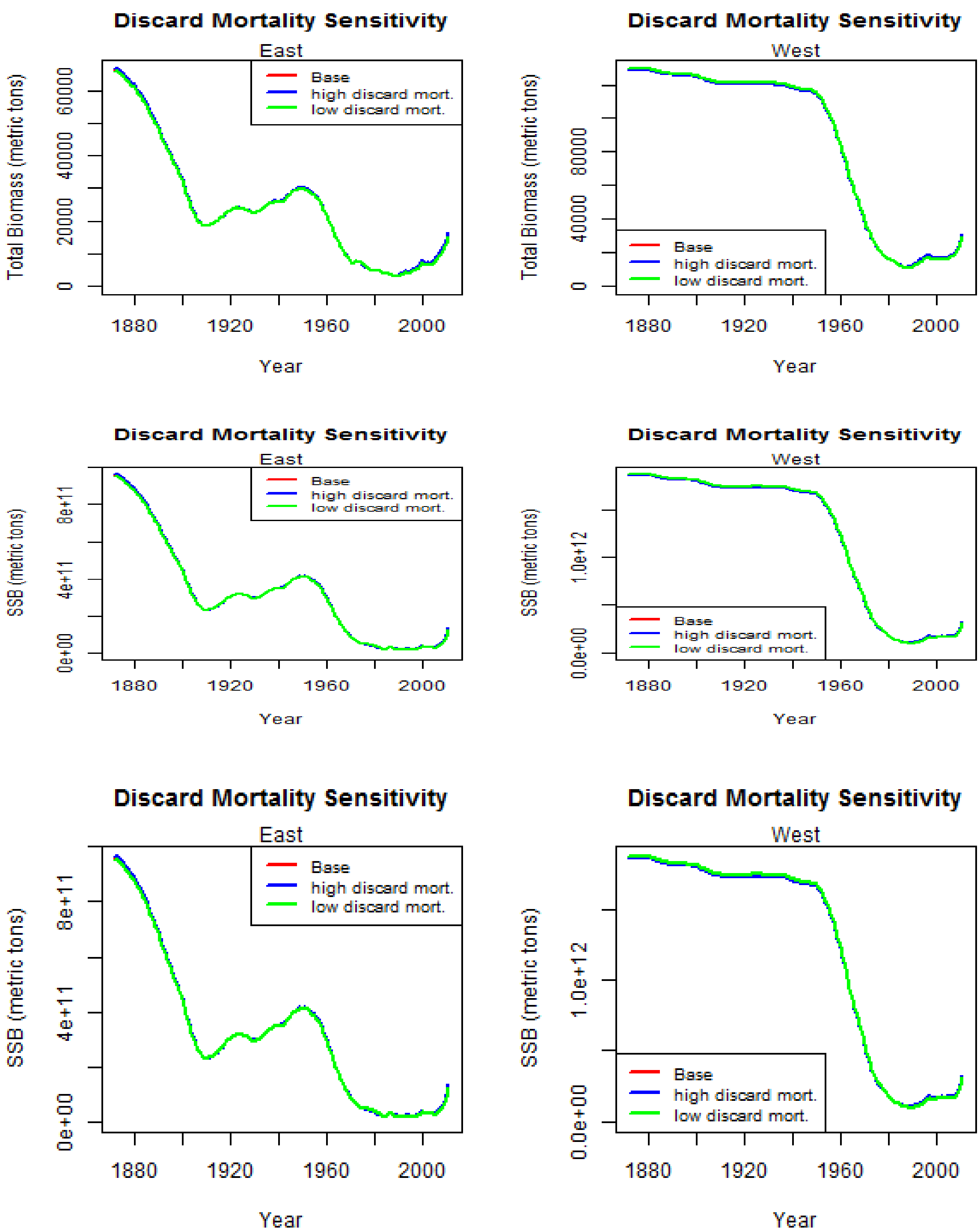



Figure 2.12.6. Model estimated total biomass, spawning biomass and recruitment (age 0) for the Gulf of Mexico red snapper base model run and three alternative model runs examining assumptions in discard mortality.

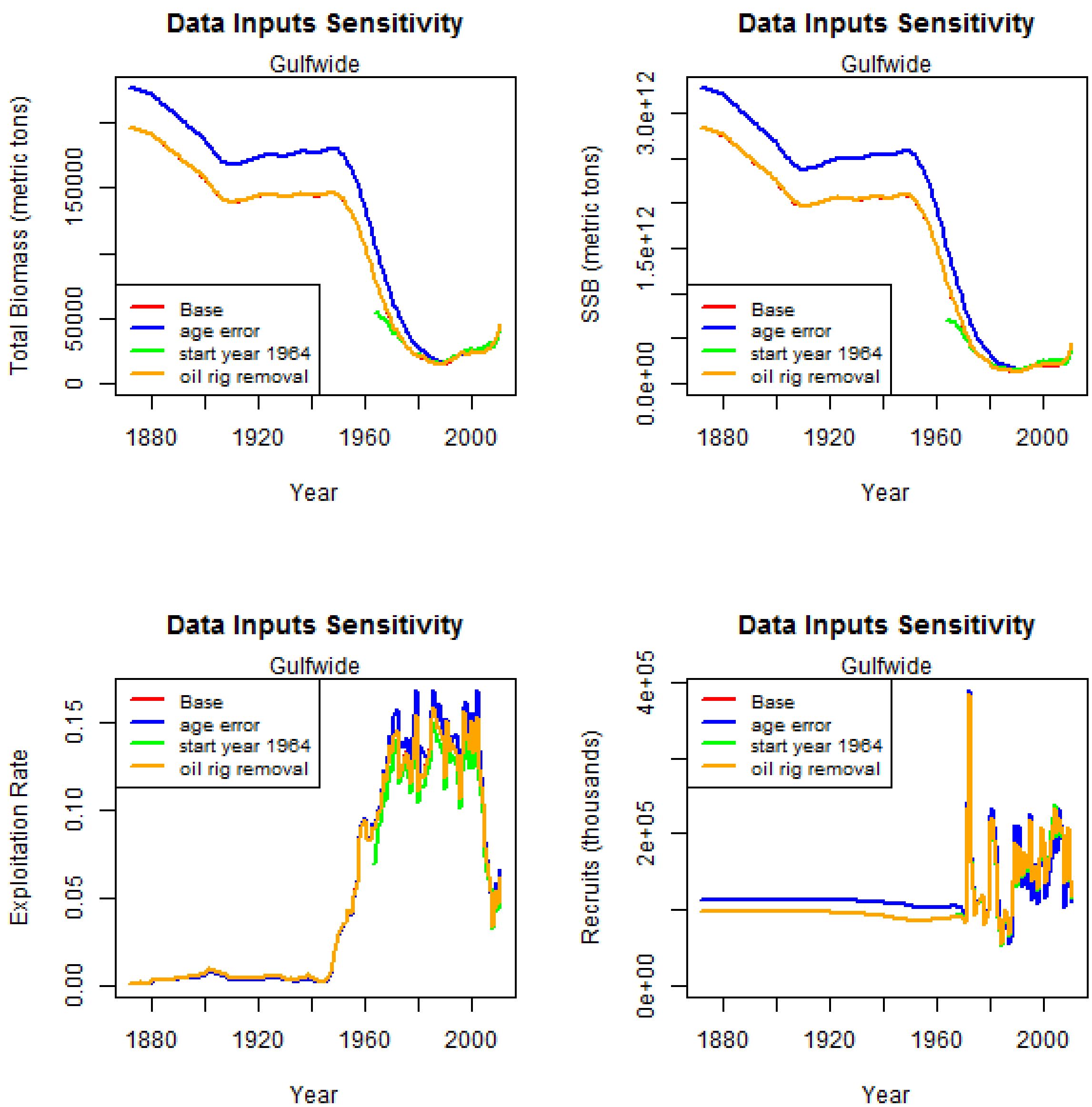



Figure 2.12.7. Model estimated total biomass, spawning biomass and recruitment (age 0) for the Gulf of Mexico red snapper base model run and three alternative model runs examining assumptions in data inputs relating to ageing error, beginning year of model and addition of mortality from oil rig removals.

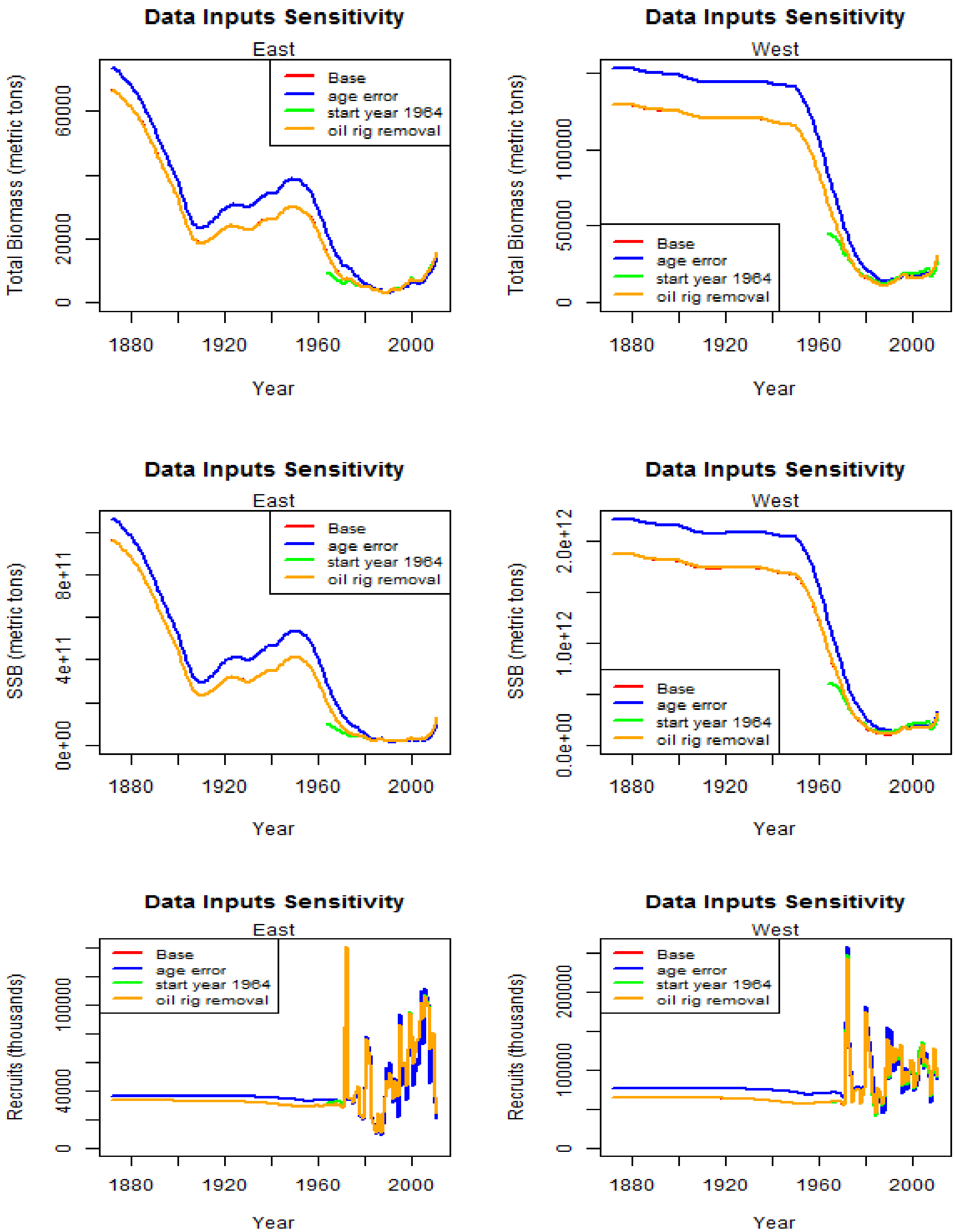



Figure 2.12.8. Model estimated total biomass, spawning biomass and recruitment (age 0) for the Gulf of Mexico red snapper base model run and three alternative model runs examining assumptions in data inputs relating to ageing error, beginning year of model and addition of mortality from oil rig removals.

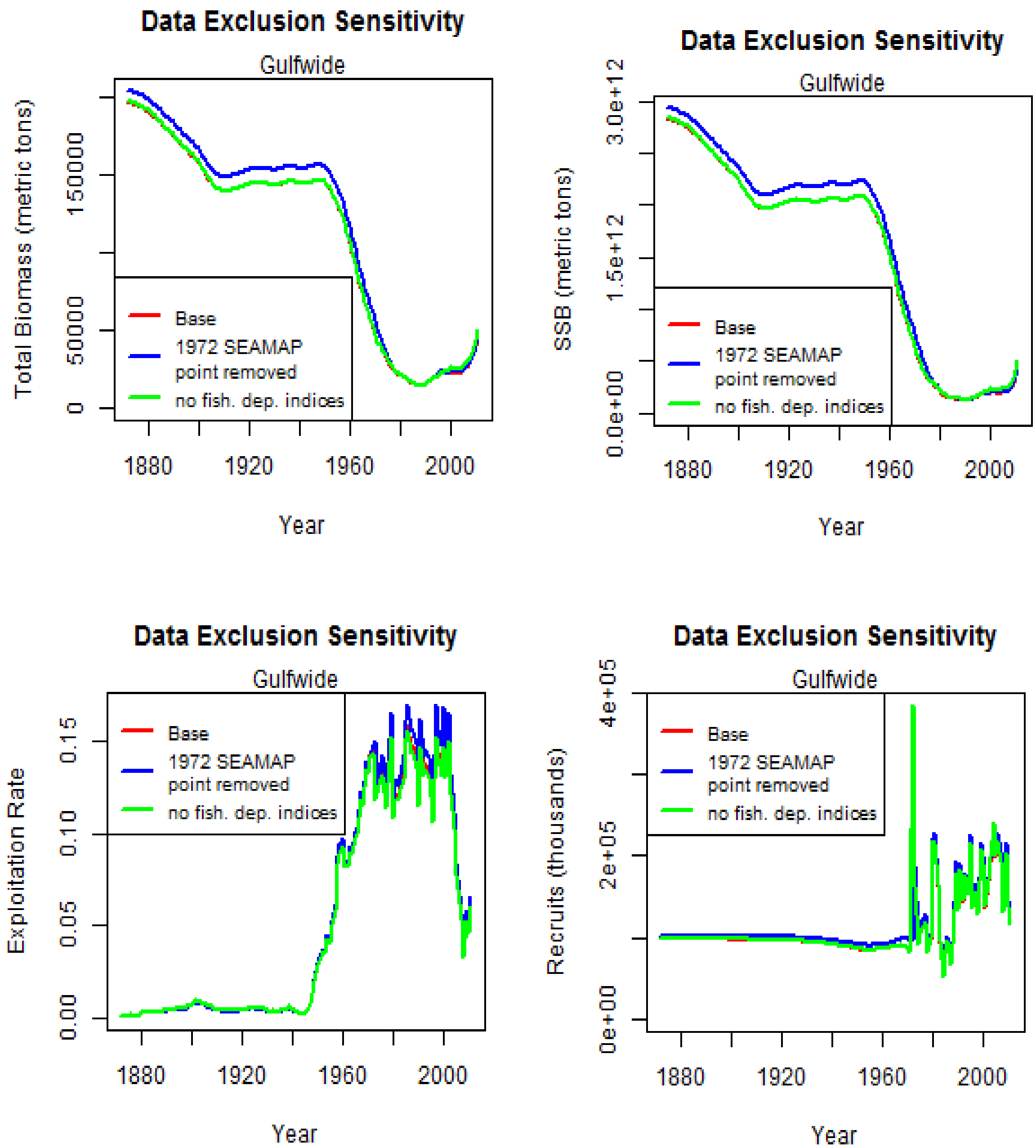



Figure 2.12.9. Model estimated total biomass, spawning biomass and recruitment (age 0) for the Gulf of Mexico red snapper base model run and three alternative model runs examining assumptions in assumptions index inclusion.

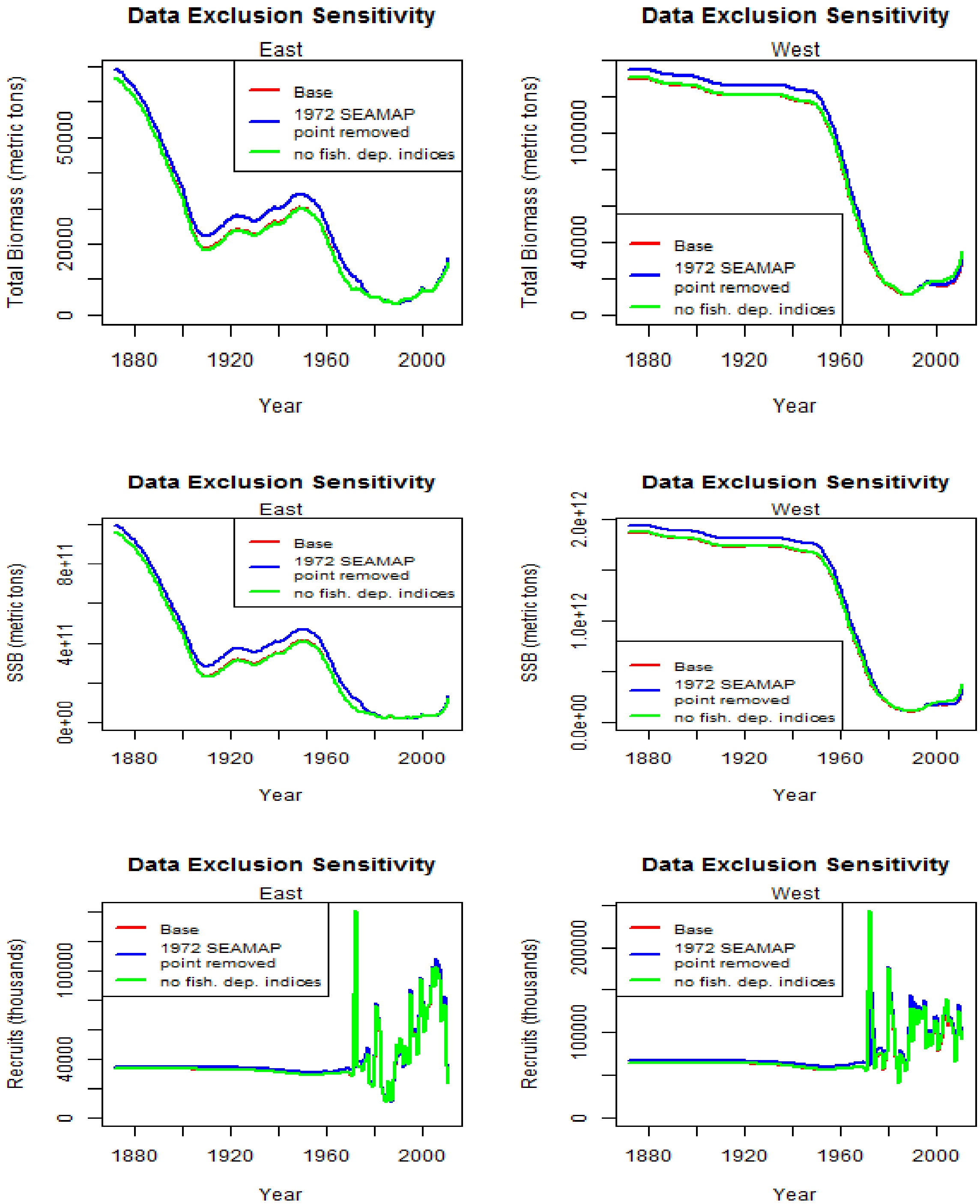



Figure 2.12.10. Model estimated total biomass, spawning biomass and recruitment (age 0) for the Gulf of Mexico red snapper base model run and three alternative model runs examining assumptions in assumptions index inclusion.

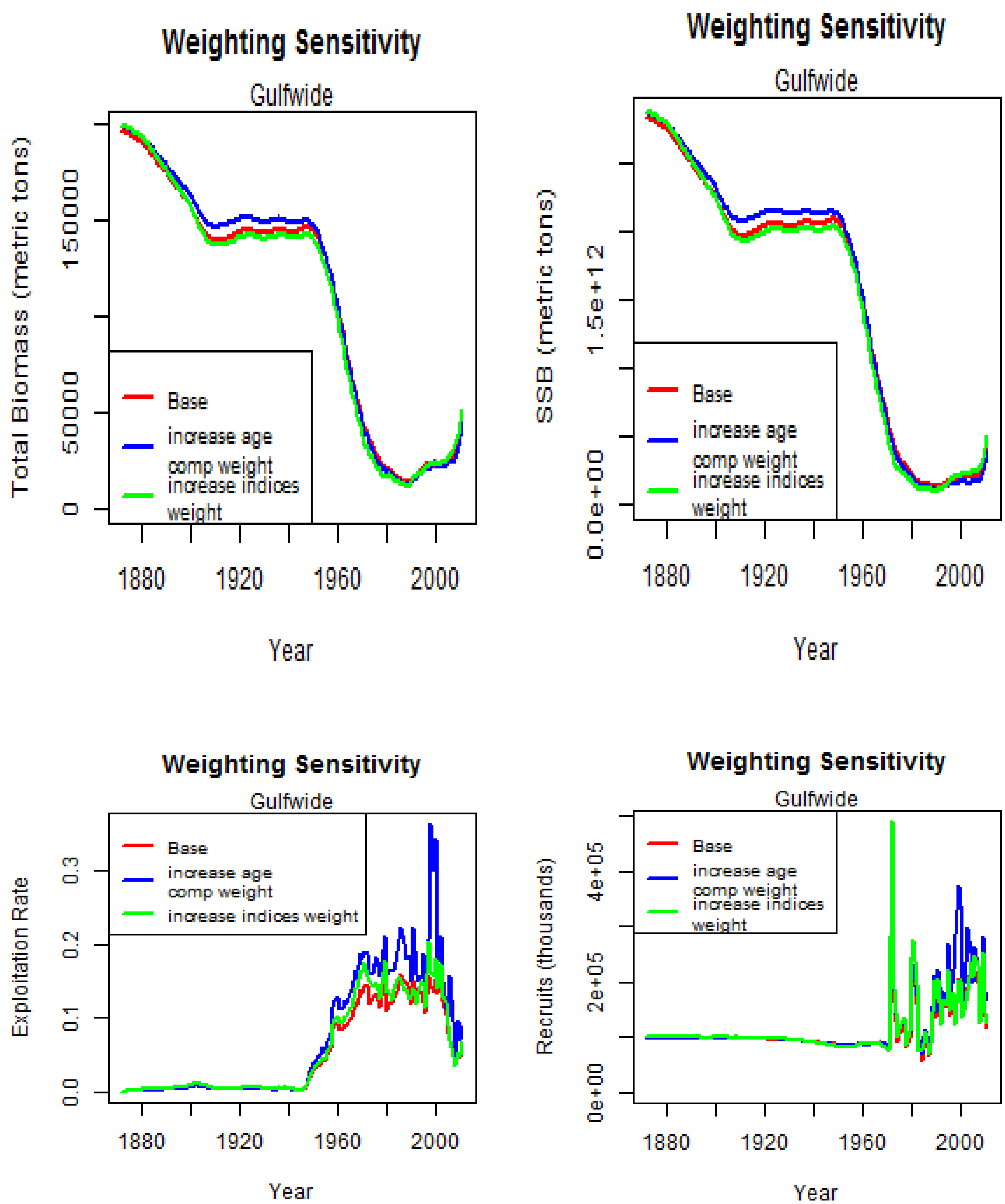



Figure 2.12.11. Model estimated total biomass, spawning biomass and recruitment (age 0) for the Gulf of Mexico red snapper base model run and three alternative model runs examining assumptions in model component weightings.

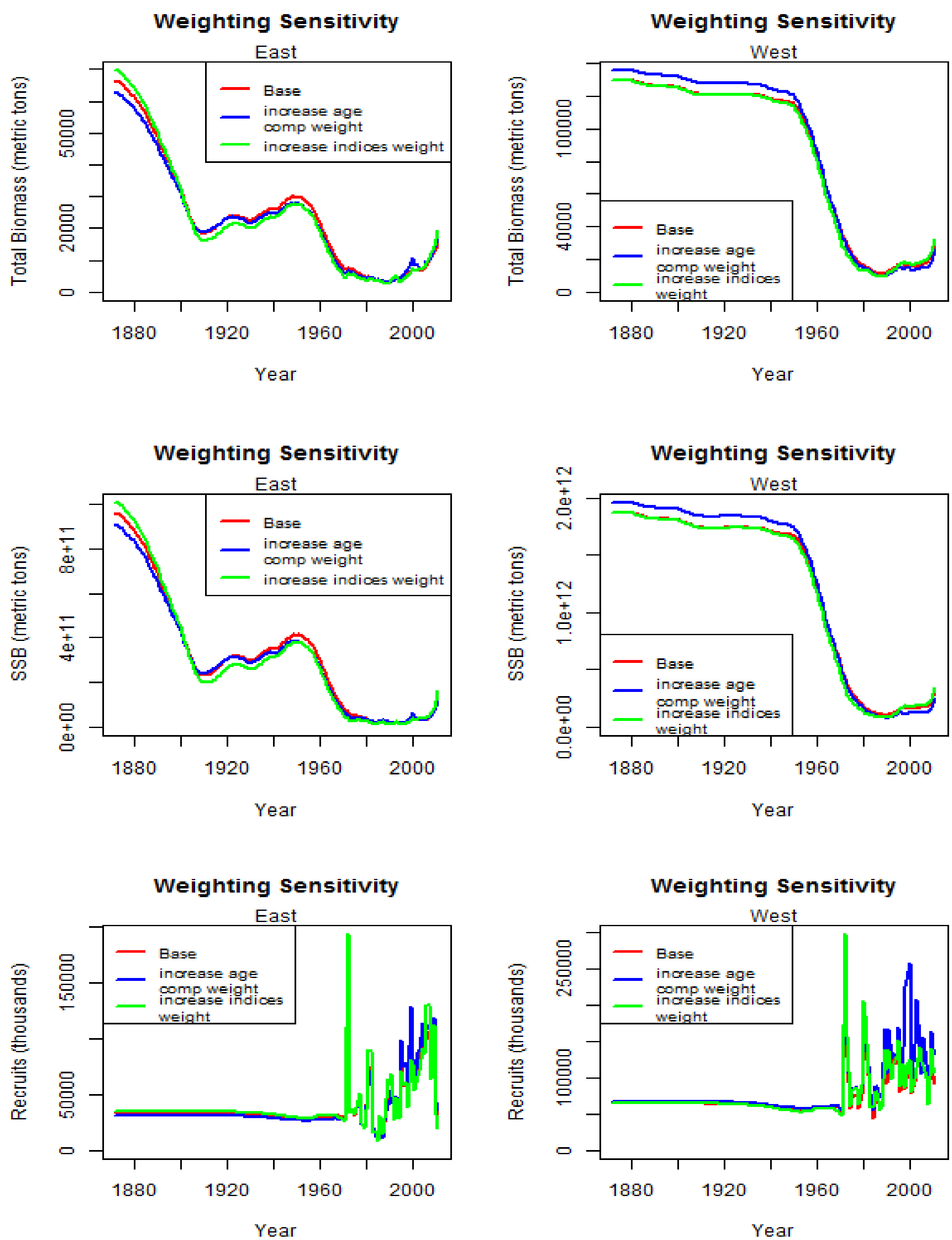



Figure 2.12.12 Model estimated total biomass, spawning biomass and recruitment (age 0) for the Gulf of Mexico red snapper base model run and three alternative model runs examining assumptions in model component weighting.

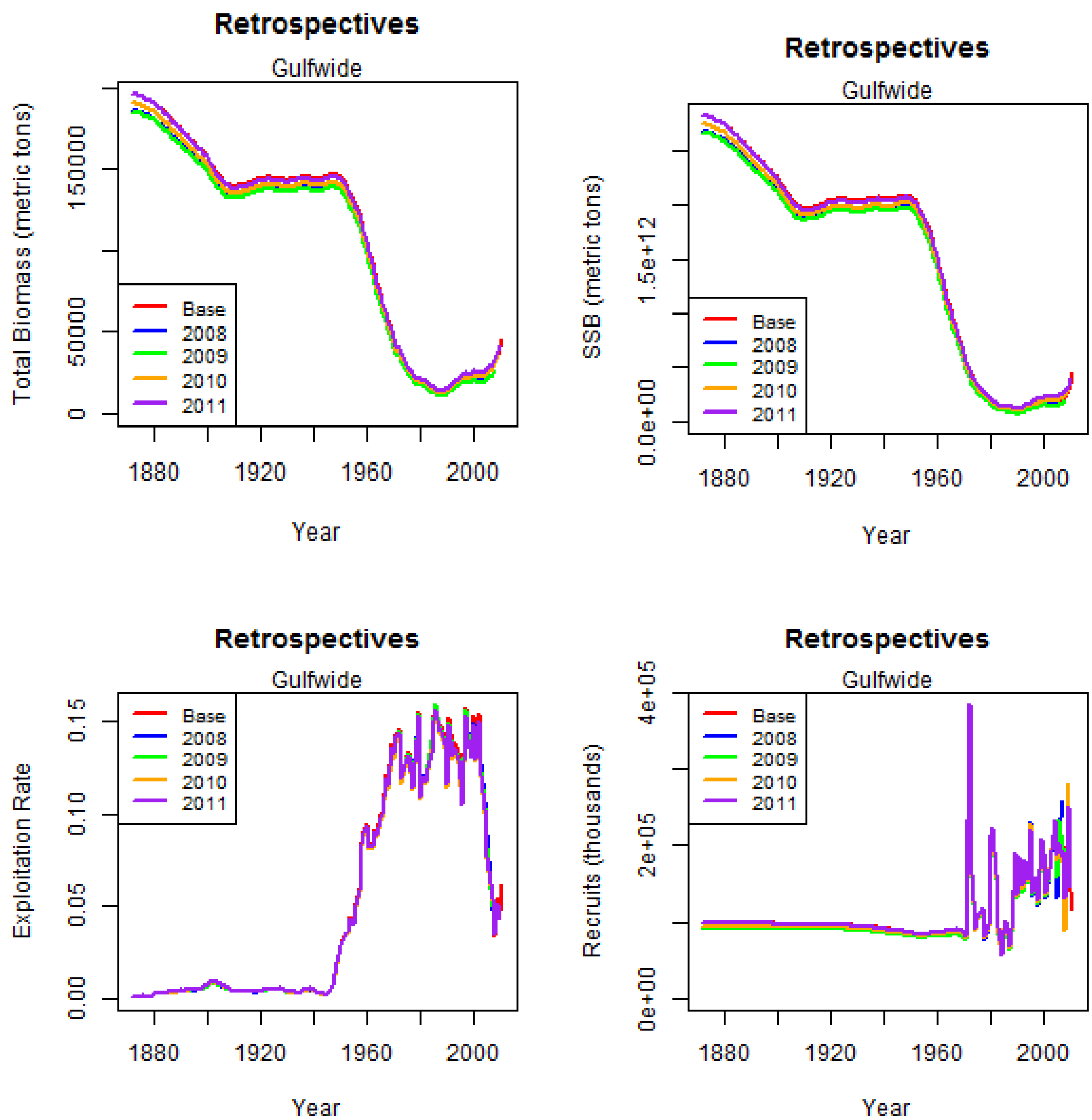



Figure 2.13.1 Model estimated total biomass, spawning biomass and recruitment (age 0) for the Gulf of Mexico red snapper base model run and four retrospective analyses.

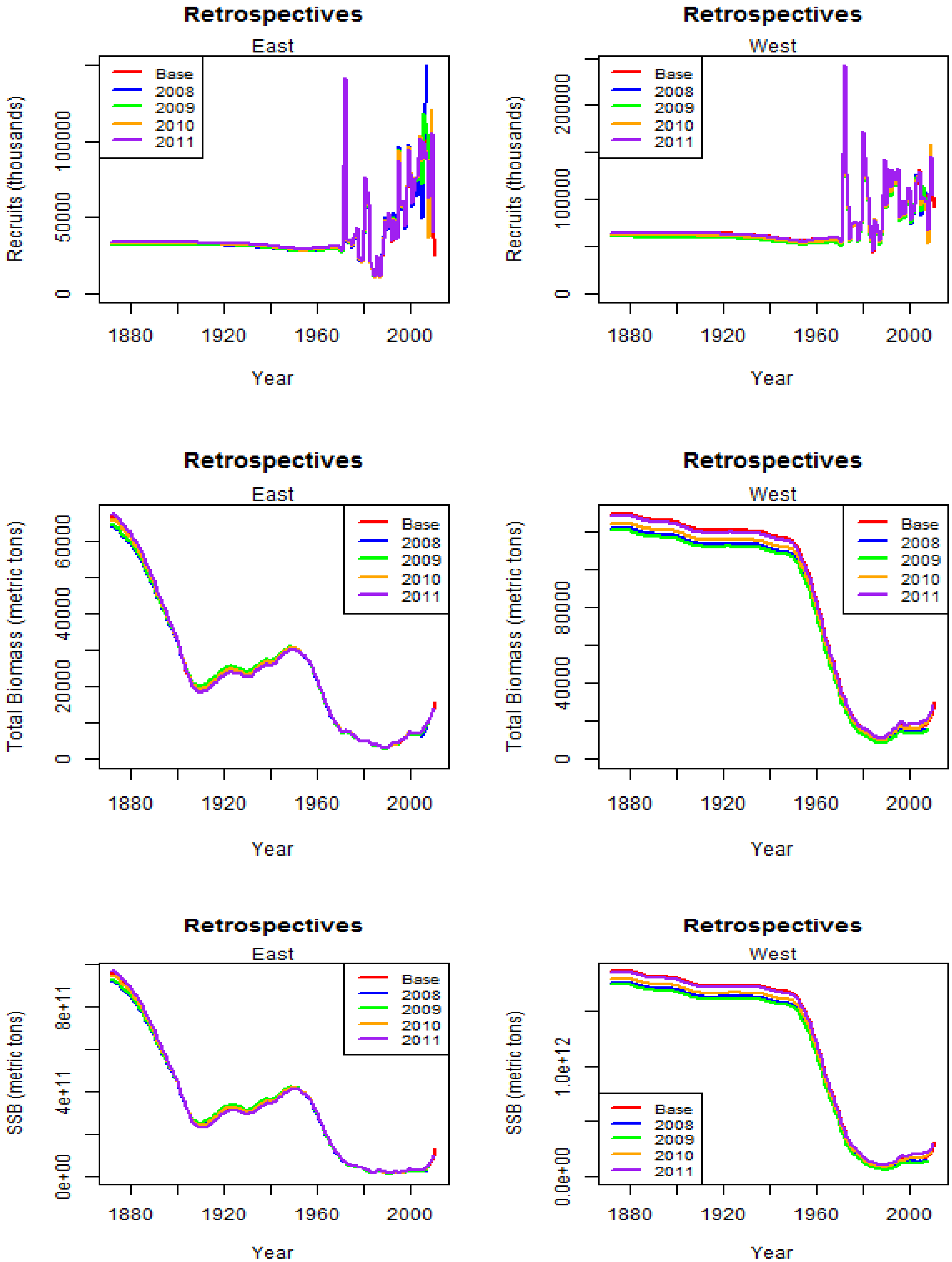
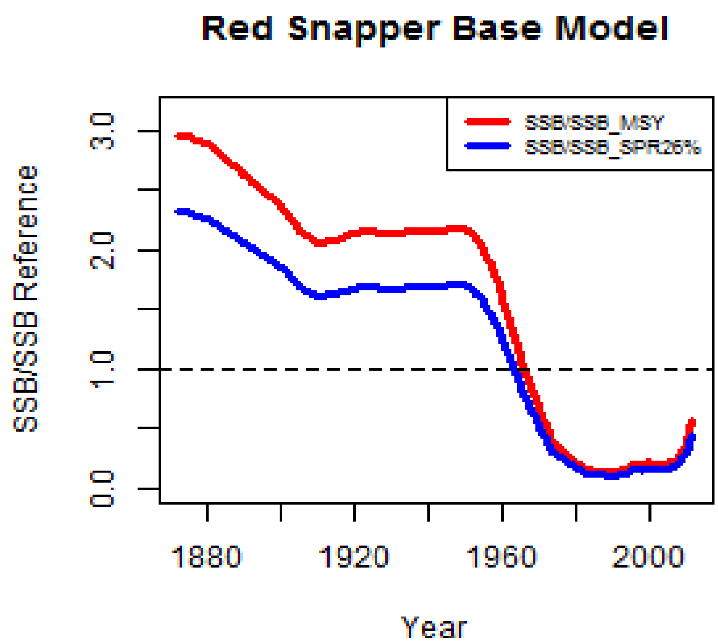



Figure 2.13.2 Model estimated total biomass, spawning biomass and recruitment (age 0) for the Gulf of Mexico red snapper base model run and three alternative model runs examining assumptions in model component weighting.



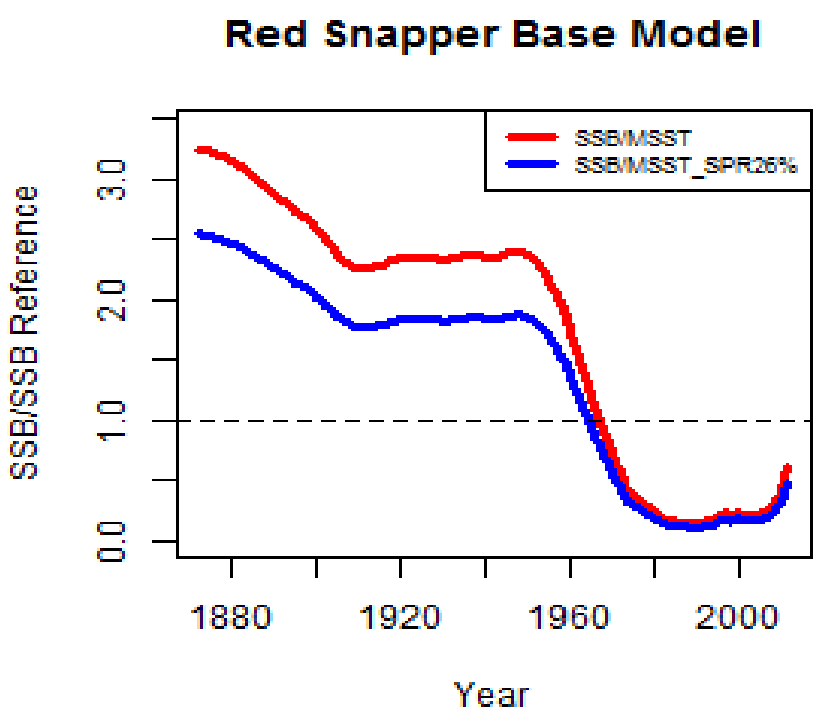




Figure 2.14.1. Estimated red snapper spawning stock biomass benchmarks for two MSRA scenarios (MSST at $F_{MAX}$ and MSST at $F_{26\%SPR}$).

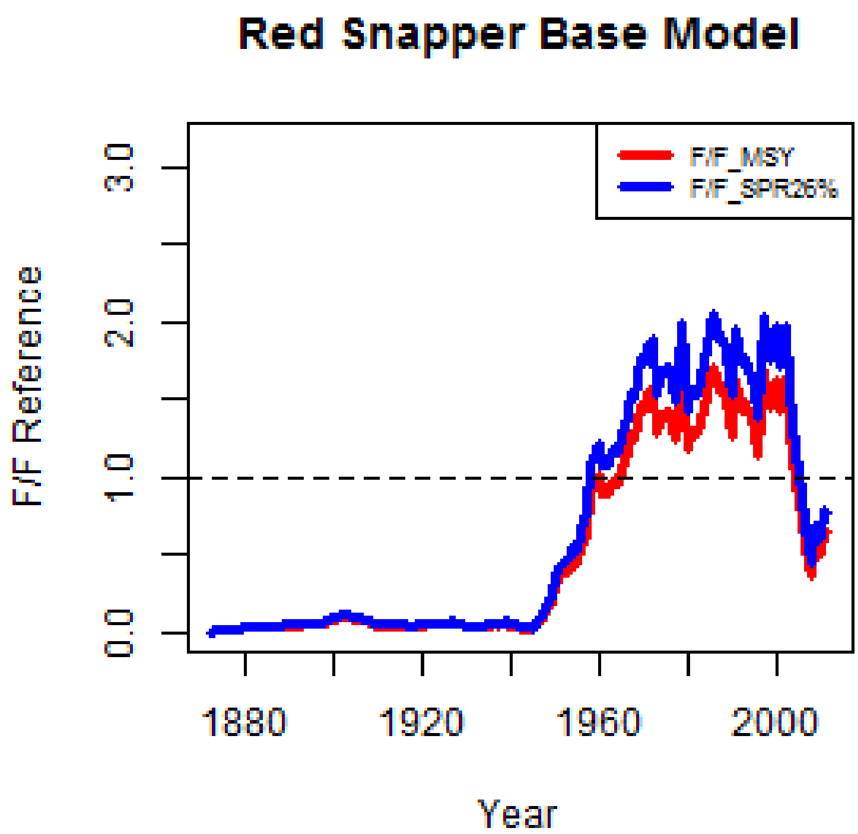



Figure 2.14.2 Estimated red snapper fishing mortality benchmarks for two MSRA scenarios (MSST at $F_{MAX}$ and MSST at $F_{26\%SPR}$).

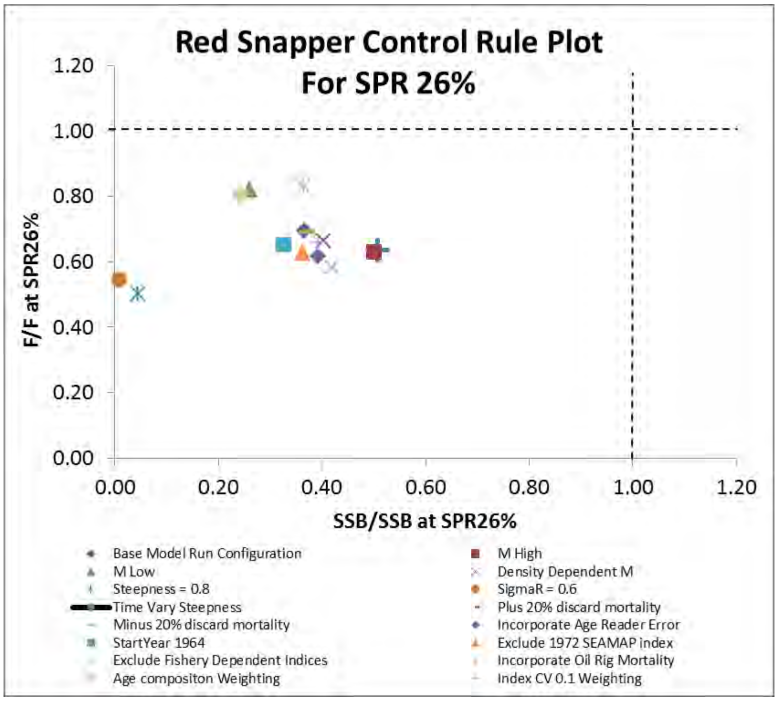



Figure 2.14.3. Gulf of Mexico red snapper control rule plot for the base SS model and 15 alternative sensitivity SS runs under the SPR26% status definition.

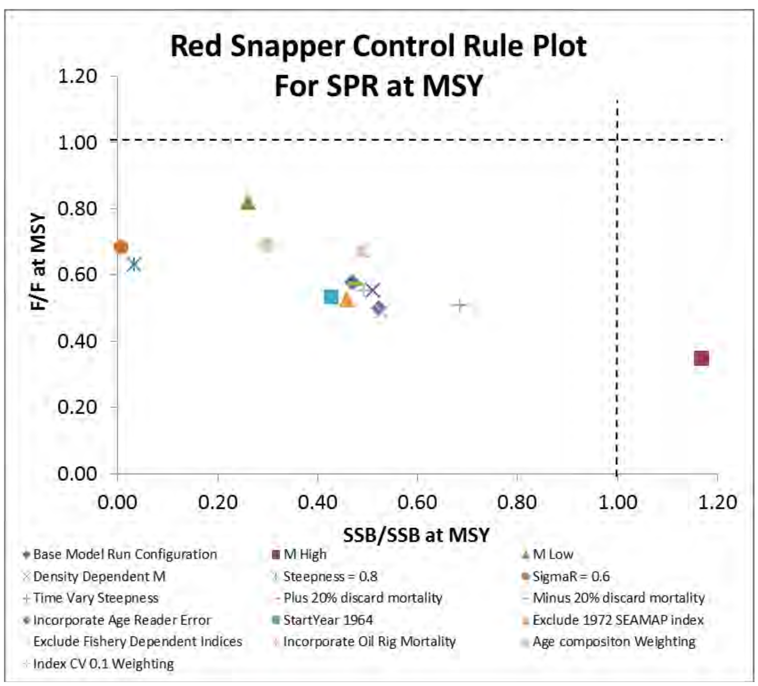



Figure 2.14.4. Gulf of Mexico red snapper control rule plot for the base SS model and 15 alternative sensitivity SS runs under the SPR_MSY=$SPR_{MAX}$ status definition.

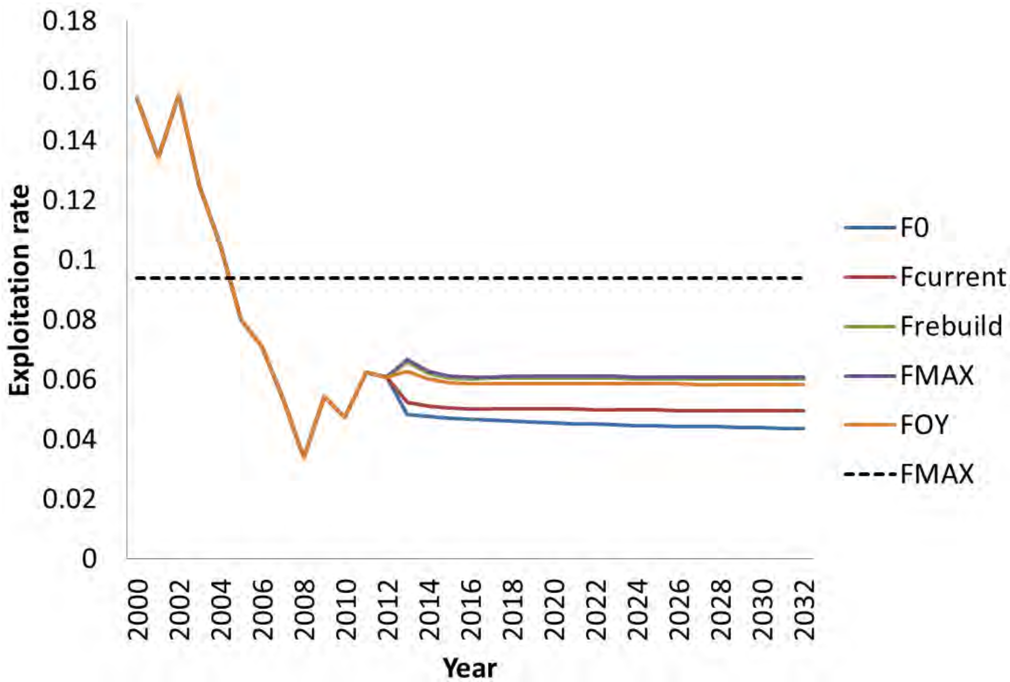



Figure 3.1.1 Projected fishing mortality rate for the Gulf of Mexico red snapper base model under five fishing mortality scenarios related to maximum yield per recruit: $F_{0}$, $F_{CURRENT}$, $F_{REBUILD}$, $F_{MAX}$, and $F_{OY}$.

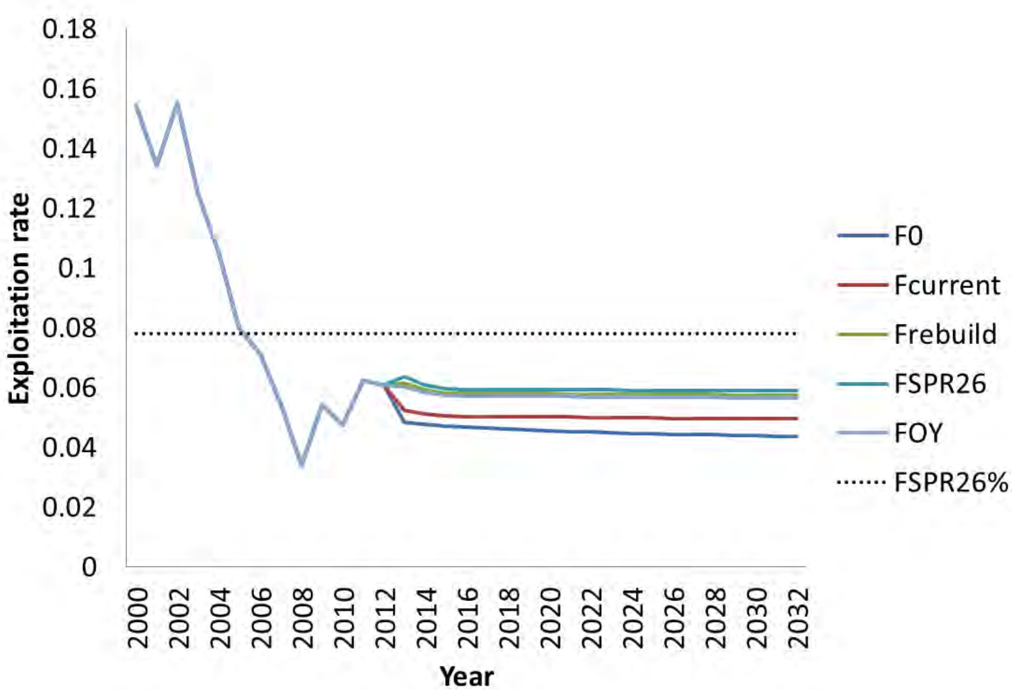



Figure 3.1.2. Projected fishing mortality rate for the Gulf of Mexico red snapper base model under five fishing mortality scenarios related to SPR26%: $F_{0}$, $F_{CURRENT}$, $F_{REBUILD}$, $F_{SPR26\%}$, and $F_{OY}$.

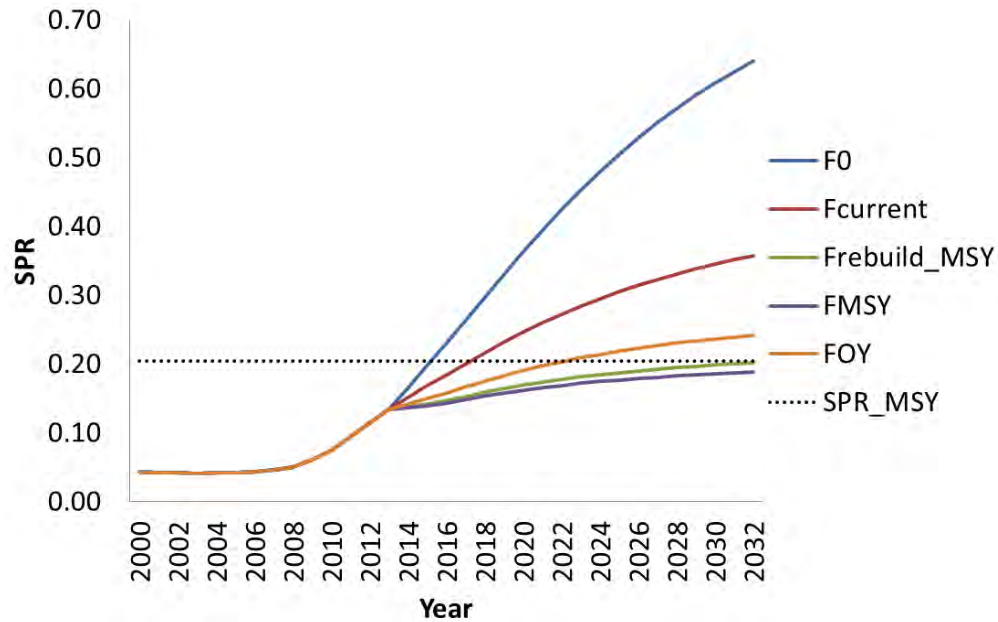



Figure 3.1.3. Projected SPR for the Gulf of Mexico red snapper base model under five fishing mortality scenarios related to maximum yield per recruit: $F_{0,}$ $F_{CURRENT}$, $F_{REBUILD}$, $F_{MAX}$, and $F_{OY}$.

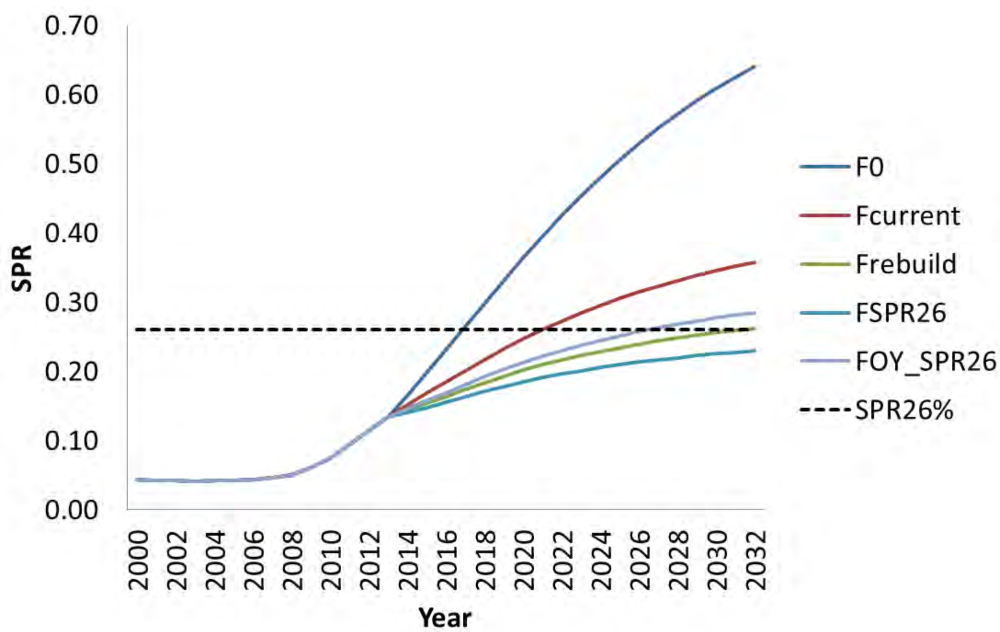



Figure 3.1.4. Projected SPR for the Gulf of Mexico red snapper base model under five fishing mortality scenarios related to SPR26%: $F_{0,}$ $F_{CURRENT}$, $F_{REBUILD}$, $F_{SPR26\%}$,and $F_{OY}$.

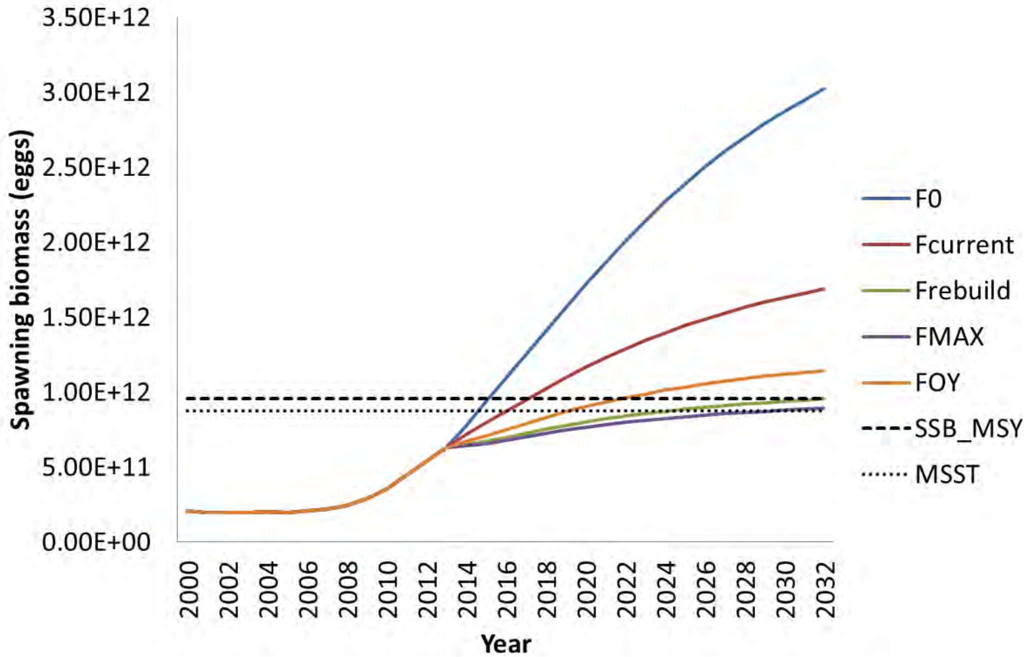



Figure 3.1.5. Projected spawning biomass of red snapper in the Gulf of Mexico for the base model under five fishing mortality scenarios related to maximum yield per recruit: $F_0$, $F_{CURRENT}$, $F_{REBUILD}$, $F_{MAX}$, and $F_{OY}$. The black dashed line represents SSB at $F_{MAX}$. The black dotted line represents the minimum stock size threshold (MSST).

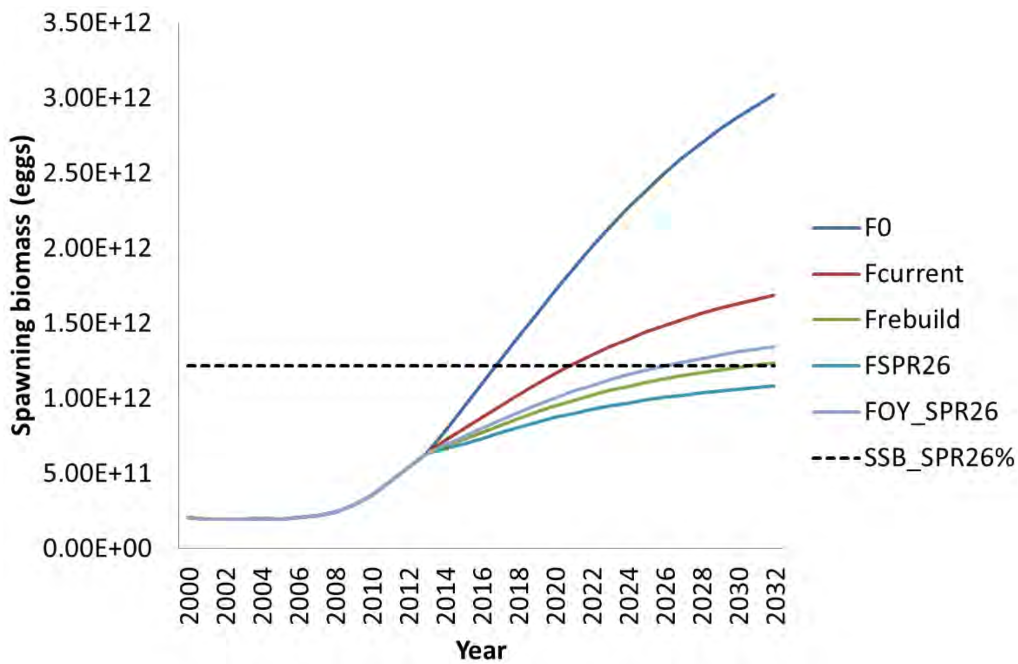
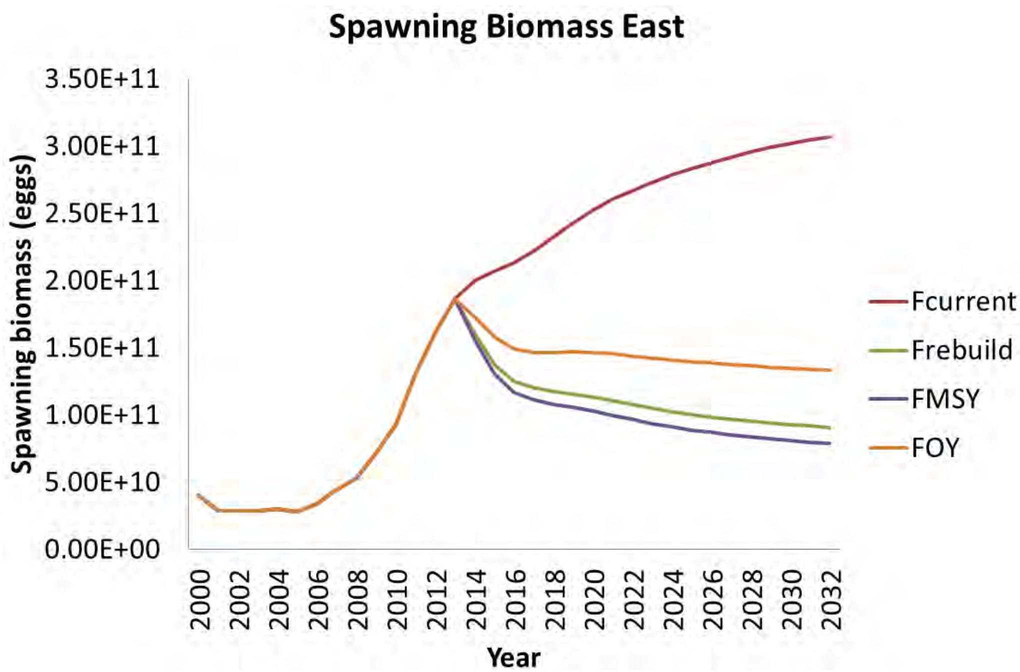



Figure 3.1.6. Projected spawning biomass of red snapper in the Gulf of Mexico for the base model under five fishing mortality scenarios related to SPR26%: $F_0$, $F_{CURRENT}$, $F_{REBUILD}$, $F_{SPR26\%}$, and $F_{OY}$. The black dashed line represents SSB at $F_{SPR26\%}$. The black dotted line represents the minimum stock size threshold (MSST).



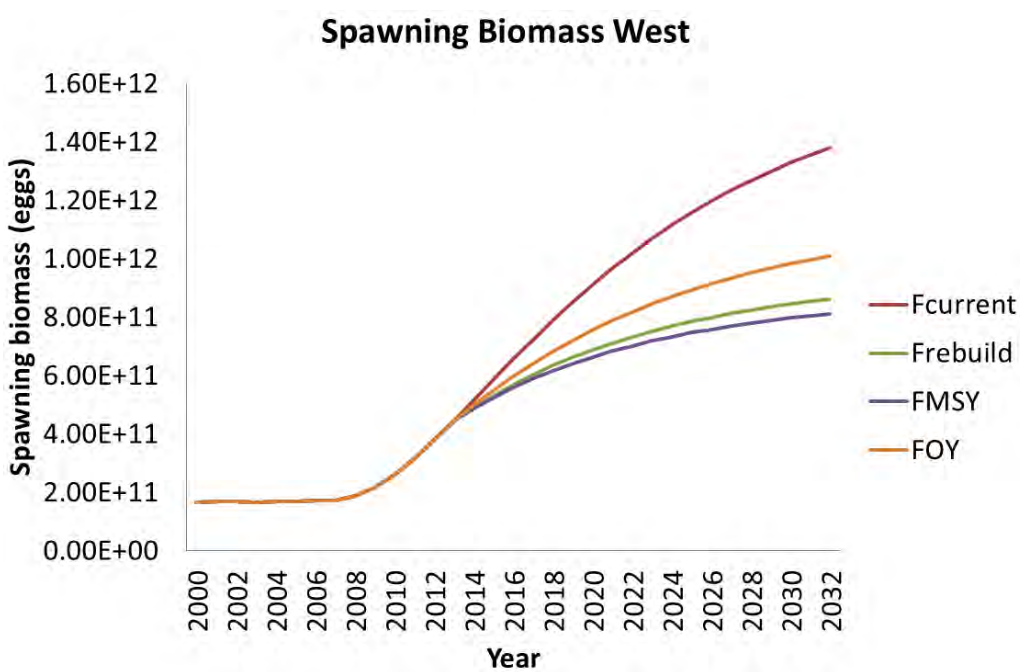




Figure 3.1.7. Projected spawning biomass of red snapper split into the Eastern (top) and Western (bottom) Gulf of Mexico for the base model under five fishing mortality scenarios related to maximum yield per recruit: $F_0$, $F_{CURRENT}$, $F_{REBUILD}$, $F_{MAX}$, and $F_{OY}$.

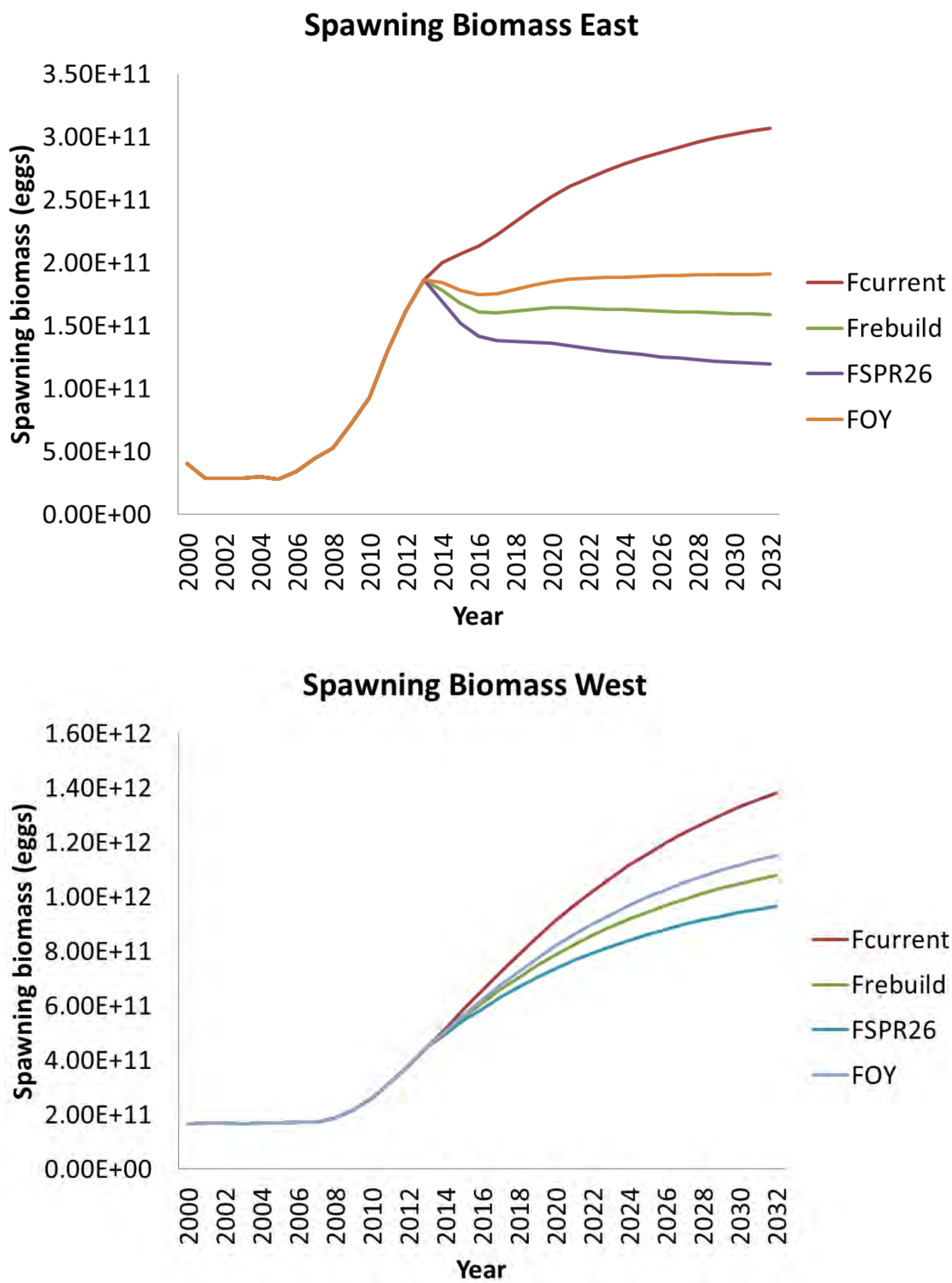



Figure 3.1.8. Projected spawning biomass of red snapper split into the Eastern and Western Gulf of Mexico for the base model under five fishing mortality scenarios related to SPR26%: $F_0$, $F_{CURRENT}$, $F_{REBUILD}$, $F_{SPR26\%}$,and $F_{OY}$.

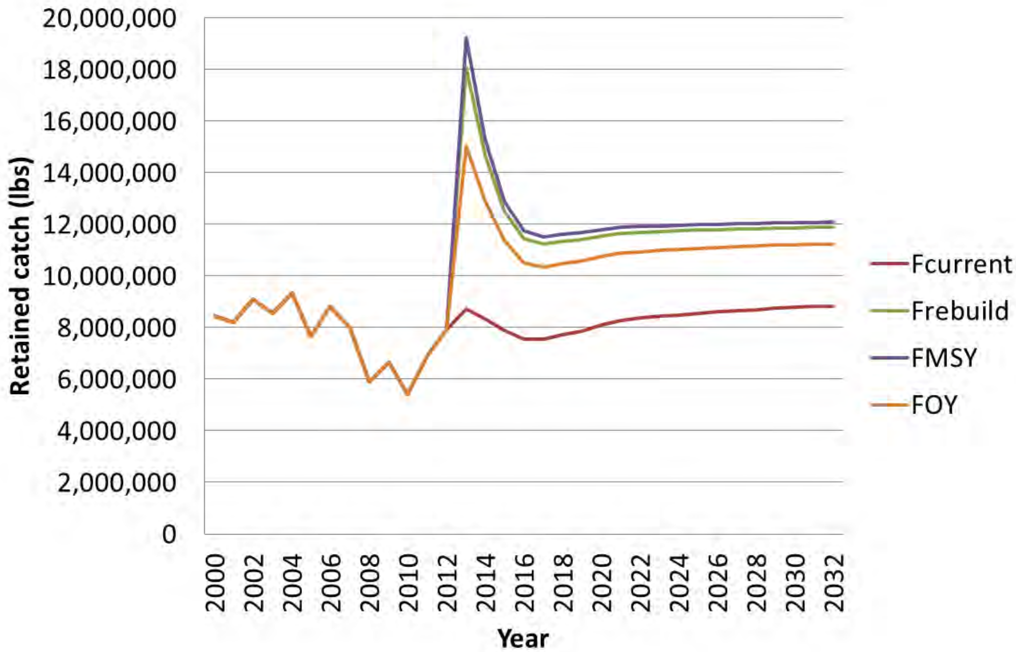



Figure 3.1.9. Projected retained yield (lbs) for the Gulf of Mexico red snapper base model under four fishing mortality scenarios related to maximum yield per recruit: $F_{CURRENT}$, $F_{REBUILD}$, $F_{MAX}$, and $F_{OY}$.

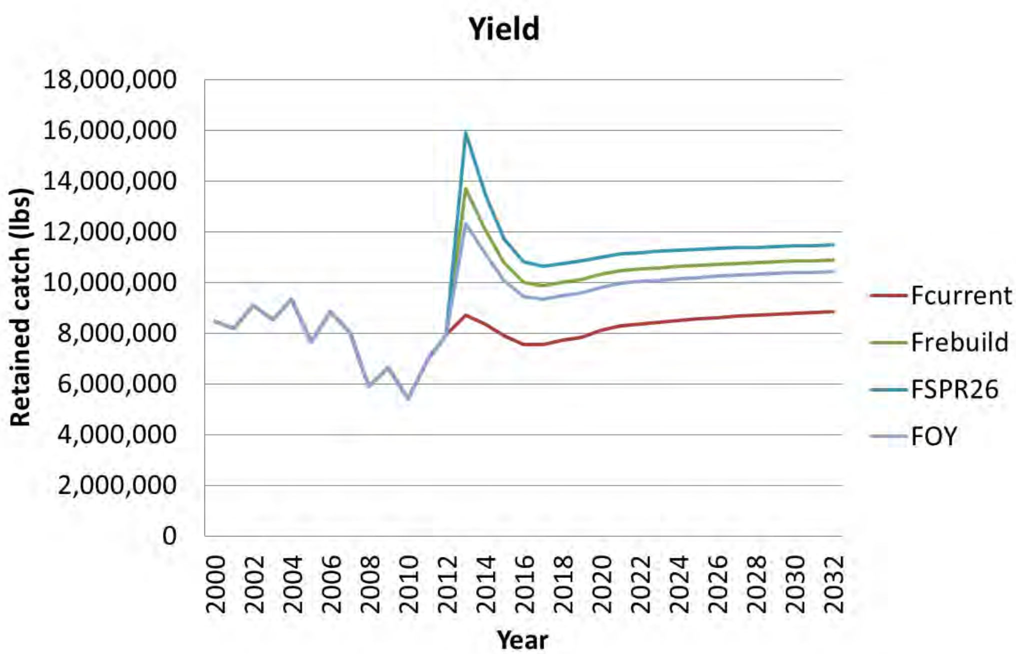



Figure 3.1.10. Projected retained yield for the Gulf of Mexico red snapper base model under four fishing mortality scenarios related to SPR26%: $F_{CURRENT}$, $F_{REBUILD}$, $F_{SPR26\%}$,and $F_{OY}$.

***Appendix A: Stock Synthesis Data Input File***

```
#V3.224j                                                                                                                   .

#C Run1, age data only, single season

1872      #_styr

2011      #_endyr

1         #_nseas

12        #_months/season

1         #_spawn_seas

14        #_Nfleet

15        #_Nsurveys

2         #_N_areas

# below are the fishery and survey names, separated by a % delimiter; later the data from first survey will have index number 2 and survey 2 will have index number 3

HL_E%HL_W%LL_E%LL_W%MRIP_E%MRIP_W%HBT_E%HBT_W%C_Clsd_E%C_Clsd_W%R_Clsd_E%R_Clsd_W%Shr_E%Shr_W%Video_E%Video_W%Larv_E%Larv_W%Sum_E%Sum_W%Fall_E%Fall_W%BLL_W%BLL_E%ROV_E%MRIP_Index_
E%MRIP_Index_W%HBT_Index_E%HBT_Index_W
-1        -1        -1        -1        -1        -1        -1        -1        -1        -1        -1        -1        -1        -1        0.5       0.5       0.5       0.5
          0.5       0.5       0.5       0.5       0.5       0.5       0.5   0.5   0.5   0.5   0.5 #_surveytiming_in_season;  but use -1 for a fishery so that the expected value
will be same as the whole season catch-at-age, rather than a midseason sample

1         2         1         2         1         2         1         2         1         2         1         2         1         2         1         2         1         2
          1         2       1       2      2       1        1     1     2     1     2    #_area_assignments_for_each_fishery_and_survey; so in a multi-area setup, each fleet and
survey only occurs in one area

1         1         1         1         2         2         2         2         2         2         2         2         2         2
          #_units_of_Catch_for_each_Fleet:_1=biomass;_2=numbers; It is OK to have some fleets with catch in biomass and some in numbers
```

0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 -1 -1 -1 -1 -1 -1 #_se_of_log(catch) for each fleet. This is used for init_eq_catch_and_for_Fmethod_2_and_3;_do_not_make_this_overly_small. Year specific values can be input in the control file if needed.

1 #_Ngenders: if 2 genders are used, females will be gender=1 and their data will be entered first

20 #_Nages: this accumulator age should be large enough so that little growth occurs after reaching this age

0 0 0 0 0 0 0 0 0 0 0 0 0 0 #_init_equil_catch_for_each_fishery

140 #_N_lines_of_catch_to_read

| #_HL_E | HL_W | LL_E | LL_W | MRIP_E | MRIP_W | HBT_E | HBT_W | C_Clsd_E | C_Clsd_W | R_Clsd_E | R_Clsd_W | Shr_E | Shr_W | Year | Season |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 236.469 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1872 | 1 |
| 354.704 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1873 | 1 |
| 532.057 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1874 | 1 |
| 650.291 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1875 | 1 |
| 768.526 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1876 | 1 |
| 650.291 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1877 | 1 |
| 591.174 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1878 | 1 |
| 650.291 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1879 | 1 |
| 827.643 | 404.166 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1880 | 1 |
| 930.944 | 363.755 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1881 | 1 |
| 1035.147 | 322.894 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1882 | 1 |
| 1138.454 | 287.72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1883 | 1 |
| 1241.764 | 252.544 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1884 | 1 |
| 1345.078 | 216.919 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1885 | 1 |
| 1449.293 | 181.742 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1886 | 1 |
| 1552.613 | 92.519 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1887 | 1 |
| 1486.615 | 96.563 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1888 | 1 |
| 1580.058 | 122.165 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1889 | 1 |
| 1901.608 | 110.01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1890 | 1 |
| 1733.754 | 122.262 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1891 | 1 |
| 1819.08 | 132.982 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1892 | 1 |
| 1874.349 | 141.507 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1893 | 1 |
| 1917.621 | 147.355 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1894 | 1 |
| 1871.201 | 151.426 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1895 | 1 |
| 1890.397 | 154.624 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1896 | 1 |
| 1877.08 | 154.513 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1897 | 1 |
| 2092.14 | 247.059 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1898 | 1 |
| 2334.448 | 327.777 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1899 | 1 |
| 2573.747 | 403.686 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1900 | 1 |
| 2733.814 | 462.833 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1901 | 1 |
| 2850.182 | 510.76 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1902 | 1 |
| 2595.511 | 480.718 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1903 | 1 |
| 2398.021 | 458.911 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1904 | 1 |
| 2157.303 | 426.798 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1905 | 1 |
| 1923.66 | 393.57 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1906 | 1 |
| 1697.843 | 359.066 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1907 | 1 |
| 1525.545 | 333.741 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1908 | 1 |
| 1311.271 | 287.097 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1909 | 1 |
| 1105.269 | 244.082 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1910 | 1 |
| 1113.783 | 239.279 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1911 | 1 |
| 1121.933 | 234.904 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1912 | 1 |
| 1129.934 | 230.64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1913 | 1 |
| 1137.315 | 226.265 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1914 | 1 |
| 1144.311 | 221.89 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1915 | 1 |
| 1150.897 | 217.087 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1916 | 1 |
| 1124.573 | 212.712 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1917 | 1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1130.603 | 208.337 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1918 | 1 |
| 1233.286 | 213.815 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1919 | 1 |
| 1340.104 | 219.293 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1920 | 1 |
| 1451.011 | 225.31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1921 | 1 |
| 1565.878 | 230.788 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1922 | 1 |
| 1681.61 | 236.265 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1923 | 1 |
| 1642.634 | 228.237 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1924 | 1 |
| 1645.323 | 220.207 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1925 | 1 |
| 1602.24 | 212.066 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1926 | 1 |
| 1749.768 | 265.763 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1927 | 1 |
| 1562.257 | 193.625 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1928 | 1 |
| 1659.604 | 189.19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1929 | 1 |
| 1013.096 | 251.09 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1930 | 1 |
| 1020.483 | 155.489 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1931 | 1 |
| 1095.896 | 186.565 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1932 | 1 |
| 990.809 | 203.038 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1933 | 1 |
| 891.247 | 210.803 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1934 | 1 |
| 1093.623 | 306.234 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1935 | 1 |
| 1258.258 | 395.255 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1936 | 1 |
| 1115.129 | 429.359 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1937 | 1 |
| 1442.592 | 424.259 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1938 | 1 |
| 1693.125 | 387.581 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1939 | 1 |
| 1132.599 | 370.073 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1940 | 1 |
| 1030.467 | 334.702 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1941 | 1 |
| 824.791 | 247.044 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1942 | 1 |
| 656.019 | 168.459 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1943 | 1 |
| 757.513 | 126.865 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1944 | 1 |
| 660.07 | 69.736 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1945 | 1 |
| 1052.244 | 146.692 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.001 | 1946 | 1 |
| 1103.225 | 216.899 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.001 | 1947 | 1 |
| 1178.742 | 270.078 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.001 | 1948 | 1 |
| 1409.947 | 394.532 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.001 | 1949 | 1 |
| 767.985 | 669.524 | 0 | 0 | 163.8740931 | 230.836805 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1950 | 1 |
| 914.858 | 670.201 | 0 | 0 | 188.2718121 | 273.2406133 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1951 | 1 |
| 1018.333 | 750.322 | 0 | 0 | 212.6695311 | 315.6444217 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1952 | 1 |
| 919.191 | 616.247 | 0 | 0 | 237.0672502 | 358.04823 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1953 | 1 |
| 854.201 | 619.599 | 0 | 0 | 261.4649692 | 400.4520383 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1954 | 1 |
| 955.561 | 676.778 | 0 | 0 | 285.8626882 | 442.8558467 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1955 | 1 |
| 1143.445 | 915.086 | 0 | 0 | 310.2604073 | 485.259655 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1956 | 1 |
| 1025.976 | 913.316 | 0 | 0 | 334.6581263 | 527.6634633 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1957 | 1 |
| 1689.444 | 1522.886 | 0 | 0 | 359.0558454 | 570.0672717 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1958 | 1 |
| 1545.775 | 1556.548 | 0 | 0 | 383.4535644 | 612.47108 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1959 | 1 |
| 1731.283 | 1633.469 | 0 | 0 | 407.8512834 | 654.8748883 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1960 | 1 |
| 1589.504 | 1927.299 | 0 | 0 | 412.1997075 | 667.6926936 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1961 | 1 |
| 1638.699 | 1874.063 | 0 | 0 | 416.5481315 | 680.5104988 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1962 | 1 |
| 1365.294 | 1667.933 | 0 | 0 | 420.8965555 | 693.328304 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1963 | 1 |
| 1635.958 | 1628.533 | 0 | 0 | 425.2449796 | 706.1461093 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1964 | 1 |
| 1683.991 | 1653.835 | 0 | 0 | 429.5934036 | 718.9639145 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1965 | 1 |
| 1405.576 | 1379.478 | 0 | 0 | 440.121674 | 749.6151118 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1966 | 1 |
| 1318.568 | 1919.127 | 0 | 0 | 450.6499443 | 780.266309 | 148.1652877 | 416.2298968 | 0 | 0 | 0 | 0 | 0.001 | 0.001 | 1967 | 1 |

```
1187.299  2340.939  0        0        461.1782147        810.9175063        148.1652877        416.2298968        0        0        0        0        0.001    0.001
          1968      1
1107.646  1899.4    0        0        471.7064851        841.5687035        148.1652877        416.2298968        0        0        0        0        0.001    0.001
          1969      1
1047.551  2110.442  0        0        482.2347554        872.2199008        148.1652877        416.2298968        0        0        0        0        0.001    0.001
          1970      1
1008.594  2433.99   0        0        507.907431         960.2911658        148.1652877        416.2298968        0        0        0        0        0.001    0.001
          1971      1
1076.974  2196.193  0        0        533.5801066        1048.362431        148.1652877        416.2298968        0        0        0        0        0.001    0.001
          1972      1
1230.611  2207.723  0        0        559.2527822        1136.433696        148.1652877        416.2298968        0        0        0        0        0.001    0.001
          1973      1
1708.939  2011.138  0        0        584.9254578        1224.504961        148.1652877        416.2298968        0        0        0        0        0.001    0.001
          1974      1
1622.329  1783.962  0        0        610.5981334        1312.576226        148.1652877        416.2298968        0        0        0        0        0.001    0.001
          1975      1
1491.469  1508.466  0        0.487    626.5253762        1298.242222        148.1652877        416.2298968        0        0        0        0        0.001    0.001
          1976      1
1026.819  1303.215  0        0        642.4526191        1283.908218        148.1652877        416.2298968        0        0        0        0        0.001    0.001
          1977      1
905.53    1221.978  0        0        658.3798619        1269.574214        148.1652877        416.2298968        0        0        0        0        0.001    0.001
          1978      1
924.374   1121.499  0        0        674.3071048        1255.24021         148.1652877        416.2298968        0        0        0        0        0.001    0.001
          1979      1
859.897   1141.469  42.64    19.983   690.2343476        1240.906206        148.1652877        416.2298968        0        0        0        0        0.001    0.001
          1980      1
965.088   1425.778  81.582   22.344   800.8137606        1446.453354        47.78031999        344.2520058        0        0        0        0        0.001    0.001
          1981      1
1039.592  1660.844  102.772  32.485   714.3988929        1070.947571        153.8230256        388.2474776        0        0        0        0        0.001    0.001
          1982      1
1082.97   1732.789  201.859  44.786   781.4011802        1871.322401        301.7901615        370.50009 0        0        0        0        0.001    0.001    1983
          1
740.225   1318.327  167.126  345.942  145.70364 649.4160468        40.84213878        373.2178774        0        0        0        0        0.001    0.001    1984
          1
736.531   837.351   51.863   274.373  400.1327095        589.5885057        90.2343129         368.6049395        0        0        0        0        0.001    0.001
          1985      1
390.013   876.968   34.426   377.106  558.4660968        397.2324893        16.364   316.09   0        0        0        0        0.001    0.001    1986     1
361.431   668.724   28.791   332.954  538.0023492        164.7116171        9.685    319.348  0        0        0        0        0.001    0.001    1987     1
389.164   1068.26   34.775   303.966  509.4928464        301.6810221        13.832   423.024  0        0        0        0        0.001    0.001    1988     1
305.307   858.179   35.64    206.268  462.5192986        219.2916611        10.797   372.473  0        0        0        0        0.001    0.001    1989     1
316.432   797.32    33.923   54.622   305.1307864        128.9756973        15.539   187.006  0        0        0        0        0.001    0.001    1990     1
179.249   782.317   9.391    32.927   533.0869612        254.5001924        15.58    264.686  0.001    0.001    0        0        0.001    0.001    1991     1
184.382   1213.132  2.58     8.99     830.9607683        318.4869281        33.873   413.056  0.001    0.001    0        0        0.001    0.001    1992     1
198.211   1316.047  6.91     9.204    1235.076419        416.0116675        37.275   458.772  0.001    0.001    0        0        0.001    0.001    1993     1
239.1     1211.754  3.61     7.171    772.8320665        311.8985931        28.998   497.738  0.001    0.001    0        0        0.001    0.001    1994     1
78.354    1240.758  3.837    7.94     617.4837293        386.1209981        23.078   354.55   0.001    0.001    0        0        0.001    0.001    1995     1
106.132   1834.388  3.442    12.411   570.5690071        241.8846121        28.388   349.266  0.001    0.001    0        0        0.001    0.001    1996     1
83.647    2081.763  2.099    14.251   961.7805461        248.8867682        48.439   347.424  0.001    0.001    0.001    0.001    0.001    0.001    1997     1
172.093   1935.716  2.501    12.349   754.3286879        180.8237779        76.759   244.738  0.001    0.001    0.001    0.001    0.001    0.001    1998     1
248.76    1918.9    2.936    41.083   721.8827369        146.0185585        67.432   98.699   0.001    0.001    0.001    0.001    0.001    0.001    1999     1
301.768   1805.154  3.91     83.251   697.9807083        157.5912334        57.64    111.41   0.001    0.001    0.001    0.001    0.001    0.001    2000     1
361.933   1675.012  4.595    56.451   833.1294816        107.5658317        51.289   116.358  0.001    0.001    0.001    0.001    0.001    0.001    2001     1
475.685   1617.493  8.221    66.313   1108.290488        102.0921118        75.121   138.475  0.001    0.001    0.001    0.001    0.001    0.001    2002     1
462.327   1453.422  6.284    77.687   967.57738 112.5934756        71.021   157.905  0.001    0.001    0.001    0.001    0.001    0.001    2003     1
431.337   1462.943  8.778    206.761  1190.621924        129.1754529        63.482   110.329  0.001    0.001    0.001    0.001    0.001    0.001    2004     1
359.25    1360.924  9.58     128.271  724.6629138        166.187208         46.791   99.988   0.001    0.001    0.001    0.001    0.001    0.001    2005     1
344.879   1638.234  7.409    118.23   793.645715         236.2178074        47.882   121.177  0.001    0.001    0.001    0.001    0.001    0.001    2006     1
397.002   954.023   7.134    85.504   1064.179522        206.4353258        63.603   110.314  0.001    0.001    0.001    0.001    0.001    0.001    2007     1
378.522   707.21    15.479   25.332   591.6374724        120.7530441        61.986   57.569   0.001    0        0.001    0.001    0.001    0.001    2008     1
416.794   679.616   6.635    23.481   698.3349386        131.636978         81.59    75.998   0.001    0.001    0.001    0.001    0.001    0.001    2009     1
633.962   853.143   34.251   17.324   327.0127363        36.87349948        35.943   51.514   0.001    0.001    0.001    0.001    0.001    0.001    2010     1
731.693   851.987   38.231   8.55     488.9193338        67.480174 69.187   50.656   0.001    0.001    0.001    0.001    0.001    0.001    2011     1


580       #_N_cpue_and_surveyabundance_observations
```

```
#_Units:  0=numbers;          1=biomass;          2=F

#_Errtype:          -1=normal;          0=lognormal;        >0=T

#_Fleet/ Survey     Units     Errtype

1         1         0
2         1         0
3         1         0
4         1         0
5         0         0
6         0         0
7         0         0
8         0         0
9         0         0
10        0         0
11        0         0
12        0         0
13        2         0
14        2         0
15        0         0
16        0         0
17        0         0
18        0         0
19        0         0
20        0         0
21        0         0
22        0         0
23        0         0
24        0         0
25      0       0
26      0       0
27      0       0
28      0       0
29      0       0

#_year    seas      Fleet/ Survey       obs       err       # comment
1990      1         1         0.2659    0.7527    #_HL_E_index
1991      1         1         0.4204    0.624     #_HL_E_index
1992      1         1         1.2686    0.5789    #_HL_E_index
1993      1         1         0.6989    0.5566    #_HL_E_index
1994      1         1         0.6265    0.5571    #_HL_E_index
1995      1         1         0.7456    0.57      #_HL_E_index
1996      1         1         0.4489    0.621     #_HL_E_index
1997      1         1         0.3675    0.6419    #_HL_E_index
1998      1         1         1.2883    0.6167    #_HL_E_index
1999      1         1         0.7796    0.6255    #_HL_E_index
2000      1         1         1.4717    0.6209    #_HL_E_index
2001      1         1         1.3417    0.6239    #_HL_E_index
2002      1         1         1.6504    0.6105    #_HL_E_index
2003      1         1         1.4638    0.6048    #_HL_E_index
2004      1         1         1.6566    0.631     #_HL_E_index
2005      1         1         1.3668    0.6133    #_HL_E_index
2006      1         1         1.1386    0.6209    #_HL_E_index
1990      1         2         0.6614    0.2394    #_HL_W_index
1991      1         2         1.0801    0.2146    #_HL_W_index
1992      1         2         1.767     0.2224    #_HL_W_index
1993      1         2         1.1568    0.1612    #_HL_W_index
1994      1         2         1.155     0.1614    #_HL_W_index
```

| | | | | | |
|---|---|---|---|---|---|
| 1995 | 1 | 2 | 1.3402 | 0.1613 | #_HL_W_index |
| 1996 | 1 | 2 | 1.3387 | 0.1611 | #_HL_W_index |
| 1997 | 1 | 2 | 1.1762 | 0.1611 | #_HL_W_index |
| 1998 | 1 | 2 | 0.9335 | 0.1611 | #_HL_W_index |
| 1999 | 1 | 2 | 0.8658 | 0.1612 | #_HL_W_index |
| 2000 | 1 | 2 | 0.9879 | 0.1613 | #_HL_W_index |
| 2001 | 1 | 2 | 0.8514 | 0.1612 | #_HL_W_index |
| 2002 | 1 | 2 | 0.8156 | 0.1613 | #_HL_W_index |
| 2003 | 1 | 2 | 0.7899 | 0.1613 | #_HL_W_index |
| 2004 | 1 | 2 | 0.6571 | 0.1613 | #_HL_W_index |
| 2005 | 1 | 2 | 0.5891 | 0.1614 | #_HL_W_index |
| 2006 | 1 | 2 | 0.8341 | 0.1617 | #_HL_W_index |
| 1950 | 1 | 13 | 0.2218 | 0.125 | #_Shr_E_effort |
| 1951 | 1 | 13 | 0.3821 | 0.125 | #_Shr_E_effort |
| 1952 | 1 | 13 | 0.4515 | 0.125 | #_Shr_E_effort |
| 1953 | 1 | 13 | 0.4987 | 0.125 | #_Shr_E_effort |
| 1954 | 1 | 13 | 0.6394 | 0.125 | #_Shr_E_effort |
| 1955 | 1 | 13 | 0.7552 | 0.125 | #_Shr_E_effort |
| 1956 | 1 | 13 | 0.9565 | 0.125 | #_Shr_E_effort |
| 1957 | 1 | 13 | 1.0473 | 0.125 | #_Shr_E_effort |
| 1958 | 1 | 13 | 1.1079 | 0.125 | #_Shr_E_effort |
| 1959 | 1 | 13 | 1.2023 | 0.125 | #_Shr_E_effort |
| 1960 | 1 | 13 | 1.1801 | 0.125 | #_Shr_E_effort |
| 1961 | 1 | 13 | 0.8561 | 0.125 | #_Shr_E_effort |
| 1962 | 1 | 13 | 0.8172 | 0.125 | #_Shr_E_effort |
| 1963 | 1 | 13 | 0.917 | 0.125 | #_Shr_E_effort |
| 1964 | 1 | 13 | 1.0887 | 0.125 | #_Shr_E_effort |
| 1965 | 1 | 13 | 1.1809 | 0.125 | #_Shr_E_effort |
| 1966 | 1 | 13 | 1.1061 | 0.125 | #_Shr_E_effort |
| 1967 | 1 | 13 | 1.0498 | 0.125 | #_Shr_E_effort |
| 1968 | 1 | 13 | 1.2367 | 0.125 | #_Shr_E_effort |
| 1969 | 1 | 13 | 1.2062 | 0.125 | #_Shr_E_effort |
| 1970 | 1 | 13 | 1.1886 | 0.125 | #_Shr_E_effort |
| 1971 | 1 | 13 | 1.0241 | 0.125 | #_Shr_E_effort |
| 1972 | 1 | 13 | 1.1044 | 0.125 | #_Shr_E_effort |
| 1973 | 1 | 13 | 1.2174 | 0.125 | #_Shr_E_effort |
| 1974 | 1 | 13 | 1.1776 | 0.125 | #_Shr_E_effort |
| 1975 | 1 | 13 | 1.1743 | 0.125 | #_Shr_E_effort |
| 1976 | 1 | 13 | 1.0893 | 0.125 | #_Shr_E_effort |
| 1977 | 1 | 13 | 1.2908 | 0.125 | #_Shr_E_effort |
| 1978 | 1 | 13 | 0.9976 | 0.125 | #_Shr_E_effort |
| 1979 | 1 | 13 | 1.0267 | 0.125 | #_Shr_E_effort |
| 1980 | 1 | 13 | 0.6286 | 0.125 | #_Shr_E_effort |
| 1981 | 1 | 13 | 0.9868 | 0.125 | #_Shr_E_effort |
| 1982 | 1 | 13 | 0.9833 | 0.125 | #_Shr_E_effort |
| 1983 | 1 | 13 | 1.0771 | 0.125 | #_Shr_E_effort |
| 1984 | 1 | 13 | 1.2637 | 0.125 | #_Shr_E_effort |
| 1985 | 1 | 13 | 1.2196 | 0.125 | #_Shr_E_effort |
| 1986 | 1 | 13 | 1.2642 | 0.125 | #_Shr_E_effort |
| 1987 | 1 | 13 | 1.0244 | 0.125 | #_Shr_E_effort |
| 1988 | 1 | 13 | 0.9658 | 0.125 | #_Shr_E_effort |
| 1989 | 1 | 13 | 1.1707 | 0.125 | #_Shr_E_effort |
| 1990 | 1 | 13 | 1.0255 | 0.125 | #_Shr_E_effort |
| 1991 | 1 | 13 | 1.0555 | 0.125 | #_Shr_E_effort |
| 1992 | 1 | 13 | 1.2798 | 0.125 | #_Shr_E_effort |
| 1993 | 1 | 13 | 1.057 | 0.125 | #_Shr_E_effort |
| 1994 | 1 | 13 | 1.0933 | 0.125 | #_Shr_E_effort |
| 1995 | 1 | 13 | 1.2933 | 0.125 | #_Shr_E_effort |
| 1996 | 1 | 13 | 1.4612 | 0.125 | #_Shr_E_effort |
| 1997 | 1 | 13 | 1.541 | 0.125 | #_Shr_E_effort |
| 1998 | 1 | 13 | 1.9362 | 0.125 | #_Shr_E_effort |
| 1999 | 1 | 13 | 1.1931 | 0.125 | #_Shr_E_effort |
| 2000 | 1 | 13 | 1.0252 | 0.125 | #_Shr_E_effort |
| 2001 | 1 | 13 | 1.1516 | 0.125 | #_Shr_E_effort |
| 2002 | 1 | 13 | 1.37 | 0.125 | #_Shr_E_effort |
| 2003 | 1 | 13 | 1.1419 | 0.125 | #_Shr_E_effort |
| 2004 | 1 | 13 | 1.1325 | 0.125 | #_Shr_E_effort |
| 2005 | 1 | 13 | 0.9538 | 0.125 | #_Shr_E_effort |

| | | | | | |
|---|---|---|---|---|---|
| 2006 | 1 | 13 | 0.6183 | 0.125 | #_Shr_E_effort |
| 2007 | 1 | 13 | 0.4644 | 0.125 | #_Shr_E_effort |
| 2008 | 1 | 13 | 0.3036 | 0.125 | #_Shr_E_effort |
| 2009 | 1 | 13 | 0.4676 | 0.125 | #_Shr_E_effort |
| 2010 | 1 | 13 | 0.2933 | 0.125 | #_Shr_E_effort |
| 2011 | 1 | 13 | 0.3652 | 0.125 | #_Shr_E_effort |
| 1946 | 1 | 14 | 0.0098 | 0.125 | #_Shr_W_effort |
| 1947 | 1 | 14 | 0.05 | 0.125 | #_Shr_W_effort |
| 1948 | 1 | 14 | 0.1314 | 0.125 | #_Shr_W_effort |
| 1949 | 1 | 14 | 0.2123 | 0.125 | #_Shr_W_effort |
| 1950 | 1 | 14 | 0.2564 | 0.125 | #_Shr_W_effort |
| 1951 | 1 | 14 | 0.2696 | 0.125 | #_Shr_W_effort |
| 1952 | 1 | 14 | 0.3182 | 0.125 | #_Shr_W_effort |
| 1953 | 1 | 14 | 0.3103 | 0.125 | #_Shr_W_effort |
| 1954 | 1 | 14 | 0.4093 | 0.125 | #_Shr_W_effort |
| 1955 | 1 | 14 | 0.3378 | 0.125 | #_Shr_W_effort |
| 1956 | 1 | 14 | 0.4407 | 0.125 | #_Shr_W_effort |
| 1957 | 1 | 14 | 0.5525 | 0.125 | #_Shr_W_effort |
| 1958 | 1 | 14 | 0.852 | 0.125 | #_Shr_W_effort |
| 1959 | 1 | 14 | 0.9104 | 0.125 | #_Shr_W_effort |
| 1960 | 1 | 14 | 0.9321 | 0.125 | #_Shr_W_effort |
| 1961 | 1 | 14 | 0.744 | 0.125 | #_Shr_W_effort |
| 1962 | 1 | 14 | 0.7237 | 0.125 | #_Shr_W_effort |
| 1963 | 1 | 14 | 0.8394 | 0.125 | #_Shr_W_effort |
| 1964 | 1 | 14 | 0.7658 | 0.125 | #_Shr_W_effort |
| 1965 | 1 | 14 | 0.8777 | 0.125 | #_Shr_W_effort |
| 1966 | 1 | 14 | 0.92 | 0.125 | #_Shr_W_effort |
| 1967 | 1 | 14 | 1.158 | 0.125 | #_Shr_W_effort |
| 1968 | 1 | 14 | 1.0056 | 0.125 | #_Shr_W_effort |
| 1969 | 1 | 14 | 1.343 | 0.125 | #_Shr_W_effort |
| 1970 | 1 | 14 | 1.213 | 0.125 | #_Shr_W_effort |
| 1971 | 1 | 14 | 1.2664 | 0.125 | #_Shr_W_effort |
| 1972 | 1 | 14 | 1.3829 | 0.125 | #_Shr_W_effort |
| 1973 | 1 | 14 | 1.1026 | 0.125 | #_Shr_W_effort |
| 1974 | 1 | 14 | 1.0879 | 0.125 | #_Shr_W_effort |
| 1975 | 1 | 14 | 1.0294 | 0.125 | #_Shr_W_effort |
| 1976 | 1 | 14 | 1.1977 | 0.125 | #_Shr_W_effort |
| 1977 | 1 | 14 | 1.0259 | 0.125 | #_Shr_W_effort |
| 1978 | 1 | 14 | 1.2005 | 0.125 | #_Shr_W_effort |
| 1979 | 1 | 14 | 1.2516 | 0.125 | #_Shr_W_effort |
| 1980 | 1 | 14 | 0.7586 | 0.125 | #_Shr_W_effort |
| 1981 | 1 | 14 | 1.1719 | 0.125 | #_Shr_W_effort |
| 1982 | 1 | 14 | 1.1969 | 0.125 | #_Shr_W_effort |
| 1983 | 1 | 14 | 0.9665 | 0.125 | #_Shr_W_effort |
| 1984 | 1 | 14 | 1.231 | 0.125 | #_Shr_W_effort |
| 1985 | 1 | 14 | 1.1964 | 0.125 | #_Shr_W_effort |
| 1986 | 1 | 14 | 1.6459 | 0.125 | #_Shr_W_effort |
| 1987 | 1 | 14 | 1.6859 | 0.125 | #_Shr_W_effort |
| 1988 | 1 | 14 | 1.6333 | 0.125 | #_Shr_W_effort |
| 1989 | 1 | 14 | 1.4713 | 0.125 | #_Shr_W_effort |
| 1990 | 1 | 14 | 1.4144 | 0.125 | #_Shr_W_effort |
| 1991 | 1 | 14 | 1.7185 | 0.125 | #_Shr_W_effort |
| 1992 | 1 | 14 | 1.7724 | 0.125 | #_Shr_W_effort |
| 1993 | 1 | 14 | 1.7508 | 0.125 | #_Shr_W_effort |
| 1994 | 1 | 14 | 1.4062 | 0.125 | #_Shr_W_effort |
| 1995 | 1 | 14 | 1.2205 | 0.125 | #_Shr_W_effort |
| 1996 | 1 | 14 | 1.2832 | 0.125 | #_Shr_W_effort |
| 1997 | 1 | 14 | 1.5609 | 0.125 | #_Shr_W_effort |
| 1998 | 1 | 14 | 1.4164 | 0.125 | #_Shr_W_effort |
| 1999 | 1 | 14 | 1.3332 | 0.125 | #_Shr_W_effort |
| 2000 | 1 | 14 | 1.4545 | 0.125 | #_Shr_W_effort |
| 2001 | 1 | 14 | 1.5595 | 0.125 | #_Shr_W_effort |
| 2002 | 1 | 14 | 1.8364 | 0.125 | #_Shr_W_effort |
| 2003 | 1 | 14 | 1.4817 | 0.125 | #_Shr_W_effort |
| 2004 | 1 | 14 | 1.361 | 0.125 | #_Shr_W_effort |
| 2005 | 1 | 14 | 0.9839 | 0.125 | #_Shr_W_effort |
| 2006 | 1 | 14 | 0.7344 | 0.125 | #_Shr_W_effort |
| 2007 | 1 | 14 | 0.5925 | 0.125 | #_Shr_W_effort |

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|---|---|---|---|---|---|
| 2008 | 1 | 14 | 0.425 | 0.125 | #_Shr_W_effort |
| 2009 | 1 | 14 | 0.5059 | 0.125 | #_Shr_W_effort |
| 2010 | 1 | 14 | 0.4949 | 0.125 | #_Shr_W_effort |
| 2011 | 1 | 14 | 0.6082 | 0.125 | #_Shr_W_effort |
| 1993 | 1 | 15 | 0.1451 | 1.3527 | #_Video_E_index |
| 1994 | 1 | 15 | 0.0405 | 1.9222 | #_Video_E_index |
| 1995 | 1 | 15 | 0.0424 | 1.7055 | #_Video_E_index |
| 1996 | 1 | 15 | 0.1011 | 1.4224 | #_Video_E_index |
| 1997 | 1 | 15 | 0.121 | 1.4579 | #_Video_E_index |
| 2002 | 1 | 15 | 1.0414 | 0.7035 | #_Video_E_index |
| 2004 | 1 | 15 | 1.0998 | 0.6893 | #_Video_E_index |
| 2005 | 1 | 15 | 1.4742 | 0.6135 | #_Video_E_index |
| 2006 | 1 | 15 | 0.6298 | 0.7885 | #_Video_E_index |
| 2007 | 1 | 15 | 1.1209 | 0.6463 | #_Video_E_index |
| 2008 | 1 | 15 | 1.0571 | 0.7098 | #_Video_E_index |
| 2009 | 1 | 15 | 1.4792 | 0.6308 | #_Video_E_index |
| 2010 | 1 | 15 | 2.4086 | 0.5628 | #_Video_E_index |
| 2011 | 1 | 15 | 3.2389 | 0.5252 | #_Video_E_index |
| 1993 | 1 | 16 | 0.5543 | 0.4443 | #_Video_W_index |
| 1994 | 1 | 16 | 0.699 | 0.4005 | #_Video_W_index |
| 1995 | 1 | 16 | 0.5374 | 0.2926 | #_Video_W_index |
| 1996 | 1 | 16 | 0.56 | 0.2454 | #_Video_W_index |
| 1997 | 1 | 16 | 1.5053 | 0.1543 | #_Video_W_index |
| 2001 | 1 | 16 | 0.7038 | 0.3424 | #_Video_W_index |
| 2002 | 1 | 16 | 0.9325 | 0.2179 | #_Video_W_index |
| 2004 | 1 | 16 | 0.9505 | 0.2927 | #_Video_W_index |
| 2005 | 1 | 16 | 1.136 | 0.1744 | #_Video_W_index |
| 2006 | 1 | 16 | 0.4674 | 0.2935 | #_Video_W_index |
| 2007 | 1 | 16 | 1.3083 | 0.1608 | #_Video_W_index |
| 2008 | 1 | 16 | 0.6849 | 0.231 | #_Video_W_index |
| 2009 | 1 | 16 | 1.1012 | 0.169 | #_Video_W_index |
| 2010 | 1 | 16 | 2.2338 | 0.1794 | #_Video_W_index |
| 2011 | 1 | 16 | 1.6255 | 0.1613 | #_Video_W_index |
| 1987 | 1 | 17 | 0.881 | 1.111 | #_Larv_E_index |
| 1988 | 1 | 17 | 0.4313 | 1.256 | #_Larv_E_index |
| 1991 | 1 | 17 | 0.8782 | 0.7566 | #_Larv_E_index |
| 1994 | 1 | 17 | 0.1971 | 0.4177 | #_Larv_E_index |
| 1995 | 1 | 17 | 0.4904 | 0.8411 | #_Larv_E_index |
| 1997 | 1 | 17 | 0.568 | 0.7747 | #_Larv_E_index |
| 1999 | 1 | 17 | 0.7901 | 0.3144 | #_Larv_E_index |
| 2000 | 1 | 17 | 1.0029 | 0.9128 | #_Larv_E_index |
| 2001 | 1 | 17 | 0.9772 | 0.5626 | #_Larv_E_index |
| 2002 | 1 | 17 | 0.8339 | 1.1653 | #_Larv_E_index |
| 2003 | 1 | 17 | 1.0435 | 0.6694 | #_Larv_E_index |
| 2004 | 1 | 17 | 0.2115 | 1.3981 | #_Larv_E_index |
| 2006 | 1 | 17 | 0.7547 | 0.8488 | #_Larv_E_index |
| 2007 | 1 | 17 | 1.8977 | 0.3174 | #_Larv_E_index |
| 2009 | 1 | 17 | 1.1842 | 0.7678 | #_Larv_E_index |
| 2010 | 1 | 17 | 3.8585 | 0.309 | #_Larv_E_index |
| 1986 | 1 | 18 | 0.5131 | 0.7164 | #_Larv_W_index |
| 1987 | 1 | 18 | 0.6456 | 0.6103 | #_Larv_W_index |
| 1989 | 1 | 18 | 0.9543 | 0.6716 | #_Larv_W_index |
| 1990 | 1 | 18 | 0.6357 | 0.5045 | #_Larv_W_index |
| 1991 | 1 | 18 | 0.1633 | 0.6797 | #_Larv_W_index |
| 1992 | 1 | 18 | 0.2809 | 0.4066 | #_Larv_W_index |
| 1993 | 1 | 18 | 0.3673 | 0.4485 | #_Larv_W_index |
| 1994 | 1 | 18 | 0.2854 | 0.5957 | #_Larv_W_index |
| 1995 | 1 | 18 | 1.1469 | 0.3342 | #_Larv_W_index |
| 1996 | 1 | 18 | 0.6556 | 0.3931 | #_Larv_W_index |
| 1997 | 1 | 18 | 1.2344 | 0.321 | #_Larv_W_index |
| 1999 | 1 | 18 | 0.5658 | 0.4201 | #_Larv_W_index |
| 2000 | 1 | 18 | 1.8084 | 0.3271 | #_Larv_W_index |
| 2001 | 1 | 18 | 1.4411 | 0.4581 | #_Larv_W_index |
| 2002 | 1 | 18 | 1.04 | 0.3753 | #_Larv_W_index |
| 2003 | 1 | 18 | 2.3357 | 0.3625 | #_Larv_W_index |
| 2004 | 1 | 18 | 1.066 | 0.3548 | #_Larv_W_index |
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| 2007 | 1 | 18 | 1.5888 | 0.3083 | #_Larv_W_index |

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|---|---|---|---|---|---|
| 2009 | 1 | 18 | 1.6099 | 0.2614 | #_Larv_W_index |
| 2010 | 1 | 18 | 0.6138 | 0.4128 | #_Larv_W_index |
| -1982 | 1 | 19 | 1.0925 | 0.5059 | #_Summer_E_index |
| -1983 | 1 | 19 | 0.8106 | 0.5388 | #_Summer_E_index |
| -1984 | 1 | 19 | 0.0821 | 0.9255 | #_Summer_E_index |
| -1985 | 1 | 19 | 0.566 | 0.4395 | #_Summer_E_index |
| -1986 | 1 | 19 | 0.0665 | 0.9476 | #_Summer_E_index |
| -1987 | 1 | 19 | 0.7576 | 0.3087 | #_Summer_E_index |
| -1988 | 1 | 19 | 0.5971 | 0.4212 | #_Summer_E_index |
| -1989 | 1 | 19 | 1.5778 | 0.3659 | #_Summer_E_index |
| -1990 | 1 | 19 | 1.2186 | 0.2686 | #_Summer_E_index |
| -1991 | 1 | 19 | 1.2724 | 0.3374 | #_Summer_E_index |
| -1992 | 1 | 19 | 2.6585 | 0.3734 | #_Summer_E_index |
| -1993 | 1 | 19 | 0.4352 | 0.4623 | #_Summer_E_index |
| -1994 | 1 | 19 | 1.0018 | 0.3079 | #_Summer_E_index |
| -1995 | 1 | 19 | 0.3872 | 0.4892 | #_Summer_E_index |
| -1996 | 1 | 19 | 0.7369 | 0.3956 | #_Summer_E_index |
| -1997 | 1 | 19 | 0.7938 | 0.3501 | #_Summer_E_index |
| -1998 | 1 | 19 | 0.2617 | 0.7374 | #_Summer_E_index |
| -1999 | 1 | 19 | 0.1891 | 0.62 | #_Summer_E_index |
| -2000 | 1 | 19 | 0.7721 | 0.3634 | #_Summer_E_index |
| -2001 | 1 | 19 | 0.3235 | 0.6009 | #_Summer_E_index |
| -2002 | 1 | 19 | 0.3075 | 0.6039 | #_Summer_E_index |
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| -2004 | 1 | 19 | 0.7284 | 0.4504 | #_Summer_E_index |
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| -2007 | 1 | 19 | 2.8421 | 0.2634 | #_Summer_E_index |
| -2008 | 1 | 19 | 4.4579 | 0.2784 | #_Summer_E_index |
| -2009 | 1 | 19 | 0.7116 | 0.284 | #_Summer_E_index |
| -2010 | 1 | 19 | 1.764 | 0.3557 | #_Summer_E_index |
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| 1982 | 1 | 20 | 2.7604 | 0.218 | #_Summer_W_index |
| 1983 | 1 | 20 | 0.7463 | 0.2811 | #_Summer_W_index |
| 1984 | 1 | 20 | 0.7414 | 0.2787 | #_Summer_W_index |
| 1985 | 1 | 20 | 1.0036 | 0.3014 | #_Summer_W_index |
| 1986 | 1 | 20 | 0.275 | 0.4231 | #_Summer_W_index |
| 1987 | 1 | 20 | 0.6449 | 0.2202 | #_Summer_W_index |
| 1988 | 1 | 20 | 0.3054 | 0.2491 | #_Summer_W_index |
| 1989 | 1 | 20 | 0.264 | 0.3032 | #_Summer_W_index |
| 1990 | 1 | 20 | 2.2675 | 0.163 | #_Summer_W_index |
| 1991 | 1 | 20 | 0.8919 | 0.1906 | #_Summer_W_index |
| 1992 | 1 | 20 | 0.5548 | 0.2001 | #_Summer_W_index |
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| 1995 | 1 | 20 | 1.0623 | 0.1733 | #_Summer_W_index |
| 1996 | 1 | 20 | 1.1433 | 0.174 | #_Summer_W_index |
| 1997 | 1 | 20 | 0.8891 | 0.176 | #_Summer_W_index |
| 1998 | 1 | 20 | 0.7765 | 0.1944 | #_Summer_W_index |
| 1999 | 1 | 20 | 0.6045 | 0.1965 | #_Summer_W_index |
| 2000 | 1 | 20 | 1.2735 | 0.1597 | #_Summer_W_index |
| 2001 | 1 | 20 | 0.715 | 0.2618 | #_Summer_W_index |
| 2002 | 1 | 20 | 0.9813 | 0.1731 | #_Summer_W_index |
| 2003 | 1 | 20 | 0.5011 | 0.2156 | #_Summer_W_index |
| 2004 | 1 | 20 | 1.2281 | 0.1663 | #_Summer_W_index |
| 2005 | 1 | 20 | 1.3698 | 0.1721 | #_Summer_W_index |
| 2006 | 1 | 20 | 1.2859 | 0.152 | #_Summer_W_index |
| 2007 | 1 | 20 | 1.0014 | 0.1856 | #_Summer_W_index |
| 2008 | 1 | 20 | 0.9855 | 0.1594 | #_Summer_W_index |
| 2009 | 1 | 20 | 0.5551 | 0.1615 | #_Summer_W_index |
| 2010 | 1 | 20 | 1.4043 | 0.1593 | #_Summer_W_index |
| 2011 | 1 | 20 | 1.8601 | 0.1579 | #_Summer_W_index |
| -1972 | 1 | 21 | 3.2744 | 0.2263 | #_Fall_E_index |
| -1973 | 1 | 21 | 0.5383 | 0.1862 | #_Fall_E_index |
| -1974 | 1 | 21 | 0.6326 | 0.2413 | #_Fall_E_index |
| -1975 | 1 | 21 | 0.5233 | 0.2196 | #_Fall_E_index |
| -1976 | 1 | 21 | 0.6325 | 0.2043 | #_Fall_E_index |
| -1977 | 1 | 21 | 0.8727 | 0.2405 | #_Fall_E_index |

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-1978	1	21	0.3951	0.1843	#_Fall_E_index
-1979	1	21	0.3126	0.2131	#_Fall_E_index
-1980	1	21	0.5844	0.1974	#_Fall_E_index
-1981	1	21	2.0198	0.1905	#_Fall_E_index
-1982	1	21	2.2453	0.1505	#_Fall_E_index
-1983	1	21	0.323	0.1951	#_Fall_E_index
-1984	1	21	0.265	0.2934	#_Fall_E_index
-1985	1	21	0.1218	0.2987	#_Fall_E_index
-1986	1	21	0.1147	0.6042	#_Fall_E_index
-1987	1	21	0.1913	0.4125	#_Fall_E_index
-1988	1	21	0.2506	0.3648	#_Fall_E_index
-1989	1	21	3.7366	0.2776	#_Fall_E_index
-1990	1	21	2.0826	0.258	#_Fall_E_index
-1991	1	21	2.384	0.2255	#_Fall_E_index
-1992	1	21	0.1947	0.3295	#_Fall_E_index
-1993	1	21	1.4128	0.2926	#_Fall_E_index
-1994	1	21	0.3466	0.2421	#_Fall_E_index
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-1996	1	21	0.5483	0.2783	#_Fall_E_index
-1997	1	21	0.9211	0.2987	#_Fall_E_index
-1998	1	21	0.2249	0.2984	#_Fall_E_index
-1999	1	21	0.5978	0.2834	#_Fall_E_index
-2000	1	21	1.6395	0.2292	#_Fall_E_index
-2001	1	21	0.5169	0.3698	#_Fall_E_index
-2002	1	21	0.4204	0.2956	#_Fall_E_index
-2003	1	21	1.2318	0.22	#_Fall_E_index
-2004	1	21	0.3355	0.3122	#_Fall_E_index
-2005	1	21	0.7299	0.2441	#_Fall_E_index
-2006	1	21	2.8423	0.1829	#_Fall_E_index
-2007	1	21	1.8403	0.2456	#_Fall_E_index
-2008	1	21	0.3737	0.2692	#_Fall_E_index
-2009	1	21	3.0438	0.2322	#_Fall_E_index
-2010	1	21	0.3534	0.354	#_Fall_E_index
-2011	1	21	0.2038	0.427	#_Fall_E_index
1972	1	22	3.5159	0.1569	#_Fall_W_index
1973	1	22	1.8579	0.1642	#_Fall_W_index
1974	1	22	0.5893	0.2069	#_Fall_W_index
1975	1	22	0.8492	0.193	#_Fall_W_index
1976	1	22	0.8068	0.1792	#_Fall_W_index
1977	1	22	0.8605	0.1827	#_Fall_W_index
1978	1	22	0.6528	0.2437	#_Fall_W_index
1979	1	22	0.9858	0.1826	#_Fall_W_index
1980	1	22	3.7524	0.1437	#_Fall_W_index
1981	1	22	1.3545	0.1607	#_Fall_W_index
1982	1	22	0.9019	0.1692	#_Fall_W_index
1983	1	22	0.7632	0.2335	#_Fall_W_index
1984	1	22	0.2977	0.2224	#_Fall_W_index
1985	1	22	0.4488	0.1949	#_Fall_W_index
1986	1	22	0.4198	0.1742	#_Fall_W_index
1987	1	22	0.1542	0.209	#_Fall_W_index
1988	1	22	0.3524	0.1643	#_Fall_W_index
1989	1	22	0.7427	0.1521	#_Fall_W_index
1990	1	22	0.8295	0.1365	#_Fall_W_index
1991	1	22	0.9302	0.1253	#_Fall_W_index
1992	1	22	0.2689	0.1597	#_Fall_W_index
1993	1	22	0.4971	0.1486	#_Fall_W_index
1994	1	22	1.4425	0.1302	#_Fall_W_index
1995	1	22	1.7244	0.1177	#_Fall_W_index
1996	1	22	0.7252	0.1407	#_Fall_W_index
1997	1	22	1.2111	0.1338	#_Fall_W_index
1998	1	22	0.5698	0.1538	#_Fall_W_index
1999	1	22	1.2337	0.1282	#_Fall_W_index
2000	1	22	0.7732	0.1287	#_Fall_W_index
2001	1	22	0.5977	0.1441	#_Fall_W_index
2002	1	22	0.5656	0.1393	#_Fall_W_index
2003	1	22	1.0151	0.1341	#_Fall_W_index
2004	1	22	1.6319	0.1159	#_Fall_W_index
2005	1	22	1.2243	0.1083	#_Fall_W_index
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|---|---|---|---|---|---|
| 2006 | 1 | 22 | 0.9597 | 0.1322 | #_Fall_W_index |
| 2007 | 1 | 22 | 0.6961 | 0.1542 | #_Fall_W_index |
| 2008 | 1 | 22 | 0.4379 | 0.1201 | #_Fall_W_index |
| 2009 | 1 | 22 | 1.8892 | 0.0999 | #_Fall_W_index |
| 2010 | 1 | 22 | 0.6795 | 0.1478 | #_Fall_W_index |
| 2011 | 1 | 22 | 0.7917 | 0.1401 | #_Fall_W_index |
| 1996 | 1 | 24 | 0.3197 | 0.9198 | #_NMFS_BLL_E_index |
| 1997 | 1 | 24 | 0.2061 | 0.9211 | #_NMFS_BLL_E_index |
| 1999 | 1 | 24 | 1.1974 | 0.4896 | #_NMFS_BLL_E_index |
| 2000 | 1 | 24 | 0.1187 | 0.9225 | #_NMFS_BLL_E_index |
| 2001 | 1 | 24 | 0.4705 | 0.6116 | #_NMFS_BLL_E_index |
| 2002 | 1 | 24 | 0.5237 | 0.7163 | #_NMFS_BLL_E_index |
| 2003 | 1 | 24 | 0.7802 | 0.4908 | #_NMFS_BLL_E_index |
| 2004 | 1 | 24 | 0.8383 | 0.5409 | #_NMFS_BLL_E_index |
| 2005 | 1 | 24 | 0.6538 | 0.9196 | #_NMFS_BLL_E_index |
| 2006 | 1 | 24 | 0.5971 | 0.7157 | #_NMFS_BLL_E_index |
| 2007 | 1 | 24 | 1.1281 | 0.7172 | #_NMFS_BLL_E_index |
| 2009 | 1 | 24 | 1.7333 | 0.4156 | #_NMFS_BLL_E_index |
| 2010 | 1 | 24 | 2.5694 | 0.3175 | #_NMFS_BLL_E_index |
| 2011 | 1 | 24 | 2.8638 | 0.2194 | #_NMFS_BLL_E_index |
| 1996 | 1 | 23 | 0.0878 | 0.9637 | #_NMFS_BLL_W_index |
| 1997 | 1 | 23 | 1.0248 | 0.4844 | #_NMFS_BLL_W_index |
| 1999 | 1 | 23 | 0.1861 | 0.7486 | #_NMFS_BLL_W_index |
| 2000 | 1 | 23 | 1.3118 | 0.2427 | #_NMFS_BLL_W_index |
| 2001 | 1 | 23 | 0.9689 | 0.2515 | #_NMFS_BLL_W_index |
| 2002 | 1 | 23 | 0.8728 | 0.2112 | #_NMFS_BLL_W_index |
| 2003 | 1 | 23 | 0.9471 | 0.2748 | #_NMFS_BLL_W_index |
| 2004 | 1 | 23 | 1.0931 | 0.2732 | #_NMFS_BLL_W_index |
| 2006 | 1 | 23 | 0.8043 | 0.3523 | #_NMFS_BLL_W_index |
| 2007 | 1 | 23 | 0.8349 | 0.401 | #_NMFS_BLL_W_index |
| 2008 | 1 | 23 | 0.9418 | 0.4665 | #_NMFS_BLL_W_index |
| 2009 | 1 | 23 | 1.7631 | 0.2489 | #_NMFS_BLL_W_index |
| 2010 | 1 | 23 | 0.7251 | 0.4311 | #_NMFS_BLL_W_index |
| 2011 | 1 | 23 | 2.4383 | 0.1452 | #_NMFS_BLL_W_index |
| 1981 | 1 | 26 | 0.498 | 0.5711 | #_MRIP_E_index |
| 1982 | 1 | 26 | 0.328 | 0.6051 | #_MRIP_E_index |
| 1983 | 1 | 26 | 1.101 | 0.5719 | #_MRIP_E_index |
| 1984 | 1 | 26 | 0.645 | 0.7341 | #_MRIP_E_index |
| 1985 | 1 | 26 | 0.793 | 0.582 | #_MRIP_E_index |
| 1986 | 1 | 26 | 0.308 | 0.5632 | #_MRIP_E_index |
| 1987 | 1 | 26 | 0.545 | 0.301 | #_MRIP_E_index |
| 1988 | 1 | 26 | 0.172 | 0.3682 | #_MRIP_E_index |
| 1989 | 1 | 26 | 0.103 | 0.3879 | #_MRIP_E_index |
| 1990 | 1 | 26 | 0.106 | 0.4251 | #_MRIP_E_index |
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| 1992 | 1 | 26 | 0.56 | 0.2747 | #_MRIP_E_index |
| 1993 | 1 | 26 | 0.465 | 0.3113 | #_MRIP_E_index |
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| 1996 | 1 | 26 | 0.381 | 0.3636 | #_MRIP_E_index |
| 1997 | 1 | 26 | 1.033 | 0.3001 | #_MRIP_E_index |
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| 1999 | 1 | 26 | 1.207 | 0.1727 | #_MRIP_E_index |
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| 2002 | 1 | 26 | 1.517 | 0.201 | #_MRIP_E_index |
| 2003 | 1 | 26 | 1.277 | 0.1971 | #_MRIP_E_index |
| 2004 | 1 | 26 | 1.083 | 0.1756 | #_MRIP_E_index |
| 2005 | 1 | 26 | 0.845 | 0.1922 | #_MRIP_E_index |
| 2006 | 1 | 26 | 0.988 | 0.2077 | #_MRIP_E_index |
| 2007 | 1 | 26 | 2.866 | 0.2155 | #_MRIP_E_index |
| 2008 | 1 | 26 | 2.69 | 0.1795 | #_MRIP_E_index |
| 2009 | 1 | 26 | 1.708 | 0.2366 | #_MRIP_E_index |
| 2010 | 1 | 26 | 3.439 | 0.229 | #_MRIP_E_index |
| 2011 | 1 | 26 | 1.781 | 0.2328 | #_MRIP_E_index |
| 1981 | 1 | 27 | 0.253 | 0.7507 | #_MRIP_W_index |
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| 1983 | 1 | 27 | 1.206 | 0.2889 | #_MRIP_W_index |

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|---|---|---|---|---|---|
| 1984 | 1 | 27 | 0.574 | 0.3206 | #_MRIP_W_index |
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| 2007 | 1 | 27 | 1.866 | 0.2453 | #_MRIP_W_index |
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| 1989 | 1 | 28 | 0.188 | 0.690782393 | #_HBT_E_index |
| 1990 | 1 | 28 | 0.204 | 0.694288533 | #_HBT_E_index |
| 1991 | 1 | 28 | 0.243 | 0.697084503 | #_HBT_E_index |
| 1992 | 1 | 28 | 0.359 | 0.690079673 | #_HBT_E_index |
| 1993 | 1 | 28 | 0.468 | 0.679478977 | #_HBT_E_index |
| 1994 | 1 | 28 | 0.372 | 0.689376455 | #_HBT_E_index |
| 1995 | 1 | 28 | 0.313 | 0.690782393 | #_HBT_E_index |
| 1996 | 1 | 28 | 0.468 | 0.675920382 | #_HBT_E_index |
| 1997 | 1 | 28 | 0.783 | 0.672349228 | #_HBT_E_index |
| 1998 | 1 | 28 | 1.2 | 0.677345326 | #_HBT_E_index |
| 1999 | 1 | 28 | 1.149 | 0.673064465 | #_HBT_E_index |
| 2000 | 1 | 28 | 1.145 | 0.673779199 | #_HBT_E_index |
| 2001 | 1 | 28 | 1.1 | 0.674493429 | #_HBT_E_index |
| 2002 | 1 | 28 | 1.602 | 0.675920382 | #_HBT_E_index |
| 2003 | 1 | 28 | 1.443 | 0.675207157 | #_HBT_E_index |
| 2004 | 1 | 28 | 1.147 | 0.675920382 | #_HBT_E_index |
| 2005 | 1 | 28 | 1.165 | 0.681608117 | #_HBT_E_index |
| 2006 | 1 | 28 | 0.68 | 0.680189191 | #_HBT_E_index |
| 2007 | 1 | 28 | 1.44 | 0.701263592 | #_HBT_E_index |
| 2008 | 1 | 28 | 1.819 | 0.700568314 | #_HBT_E_index |
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| 2011 | 1 | 28 | 1.798 | 0.810651078 | #_HBT_E_index |
| 1986 | 1 | 29 | 0.642 | 0.227042423 | #_HBT_W_index |
| 1987 | 1 | 29 | 0.768 | 0.200954069 | #_HBT_W_index |
| 1988 | 1 | 29 | 0.929 | 0.199013104 | #_HBT_W_index |
| 1989 | 1 | 29 | 0.812 | 0.194155801 | #_HBT_W_index |
| 1990 | 1 | 29 | 0.587 | 0.193183512 | #_HBT_W_index |
| 1991 | 1 | 29 | 0.949 | 0.212575746 | #_HBT_W_index |
| 1992 | 1 | 29 | 1.667 | 0.215474556 | #_HBT_W_index |
| 1993 | 1 | 29 | 1.691 | 0.206770131 | #_HBT_W_index |
| 1994 | 1 | 29 | 1.331 | 0.194155801 | #_HBT_W_index |
| 1995 | 1 | 29 | 1.4 | 0.213542315 | #_HBT_W_index |
| 1996 | 1 | 29 | 1.457 | 0.241438383 | #_HBT_W_index |
| 1997 | 1 | 29 | 1.577 | 0.213542315 | #_HBT_W_index |
| 1998 | 1 | 29 | 1.343 | 0.219335421 | #_HBT_W_index |
| 1999 | 1 | 29 | 0.421 | 0.21160888 | #_HBT_W_index |

```
2000	1	29	0.567	0.226080136	#_HBT_W_index
2001	1	29	0.821	0.289807082	#_HBT_W_index
2002	1	29	0.711	0.267161184	#_HBT_W_index
2003	1	29	0.609	0.247176132	#_HBT_W_index
2004	1	29	0.459	0.24430876	#_HBT_W_index
2005	1	29	0.507	0.242395508	#_HBT_W_index
2006	1	29	0.598	0.270950212	#_HBT_W_index
2007	1	29	1.098	0.308511365	#_HBT_W_index
2008	1	29	1.185	0.517368499	#_HBT_W_index
2009	1	29	1.24	0.290745981	#_HBT_W_index
2010	1	29	1.253	0.364546382	#_HBT_W_index
2011	1	29	1.376	0.525536175	#_HBT_W_index
#_SEAMAP groundfish index with DISL data
1982	1	19	1.2795	0.5567	#_DISL_Sum_E_index
1983	1	19	1.0482	0.6401	#_DISL_Sum_E_index
1984	1	19	0.0534	0.8136	#_DISL_Sum_E_index
1985	1	19	0.3899	0.399	#_DISL_Sum_E_index
1986	1	19	0.046	0.919	#_DISL_Sum_E_index
1987	1	19	0.585	0.2739	#_DISL_Sum_E_index
1988	1	19	0.684	0.4683	#_DISL_Sum_E_index
1989	1	19	2.4489	0.4525	#_DISL_Sum_E_index
1990	1	19	1.0921	0.2693	#_DISL_Sum_E_index
1991	1	19	1.1373	0.34	#_DISL_Sum_E_index
1992	1	19	3.0769	0.4212	#_DISL_Sum_E_index
1993	1	19	0.3517	0.4772	#_DISL_Sum_E_index
1994	1	19	0.9481	0.3132	#_DISL_Sum_E_index
1995	1	19	0.3593	0.506	#_DISL_Sum_E_index
1996	1	19	0.5434	0.3517	#_DISL_Sum_E_index
1997	1	19	0.7403	0.3457	#_DISL_Sum_E_index
1998	1	19	0.3116	0.8449	#_DISL_Sum_E_index
1999	1	19	0.1385	0.564	#_DISL_Sum_E_index
2000	1	19	0.6111	0.3355	#_DISL_Sum_E_index
2001	1	19	0.2328	0.5349	#_DISL_Sum_E_index
2002	1	19	0.204	0.5145	#_DISL_Sum_E_index
2003	1	19	0.7617	0.4981	#_DISL_Sum_E_index
2004	1	19	0.6962	0.4502	#_DISL_Sum_E_index
2005	1	19	1.6259	0.4769	#_DISL_Sum_E_index
2006	1	19	0.3275	0.3703	#_DISL_Sum_E_index
2007	1	19	2.9675	0.2804	#_DISL_Sum_E_index
2008	1	19	3.7999	0.2662	#_DISL_Sum_E_index
2009	1	19	0.5502	0.2608	#_DISL_Sum_E_index
2010	1	19	2.4658	0.3644	#_DISL_Sum_E_index
2011	1	19	0.5233	0.3849	#_DISL_Sum_E_index
1972	1	21	3.279	0.2279	#_DISL_Fall_E_index
1973	1	21	0.5331	0.1894	#_DISL_Fall_E_index
1974	1	21	0.6179	0.2411	#_DISL_Fall_E_index
1975	1	21	0.5142	0.2322	#_DISL_Fall_E_index
1976	1	21	0.6228	0.2111	#_DISL_Fall_E_index
1977	1	21	0.8583	0.2425	#_DISL_Fall_E_index
1978	1	21	0.3874	0.1904	#_DISL_Fall_E_index
1979	1	21	0.3081	0.2114	#_DISL_Fall_E_index
1980	1	21	0.5748	0.1934	#_DISL_Fall_E_index
1981	1	21	1.9983	0.1961	#_DISL_Fall_E_index
1982	1	21	2.2476	0.1523	#_DISL_Fall_E_index
1983	1	21	0.3182	0.2021	#_DISL_Fall_E_index
1984	1	21	0.2587	0.2851	#_DISL_Fall_E_index
1985	1	21	0.1183	0.3016	#_DISL_Fall_E_index
1986	1	21	0.1097	0.579	#_DISL_Fall_E_index
1987	1	21	0.1852	0.4056	#_DISL_Fall_E_index
1988	1	21	0.2453	0.3525	#_DISL_Fall_E_index
1989	1	21	3.7635	0.2824	#_DISL_Fall_E_index
1990	1	21	2.1418	0.2538	#_DISL_Fall_E_index
1991	1	21	2.4028	0.2184	#_DISL_Fall_E_index
1992	1	21	0.1932	0.3493	#_DISL_Fall_E_index
1993	1	21	1.3914	0.2864	#_DISL_Fall_E_index
1994	1	21	0.3439	0.2398	#_DISL_Fall_E_index
1995	1	21	0.7211	0.2317	#_DISL_Fall_E_index
1996	1	21	0.5548	0.2874	#_DISL_Fall_E_index
```

```
1997	1	21	0.9297	0.2988	#_DISL_Fall_E_index
1998	1	21	0.2211	0.3095	#_DISL_Fall_E_index
1999	1	21	0.6077	0.298	#_DISL_Fall_E_index
2000	1	21	1.6791	0.2376	#_DISL_Fall_E_index
2001	1	21	0.5215	0.3769	#_DISL_Fall_E_index
2002	1	21	0.4148	0.2964	#_DISL_Fall_E_index
2003	1	21	1.2279	0.2177	#_DISL_Fall_E_index
2004	1	21	0.3297	0.323	#_DISL_Fall_E_index
2005	1	21	0.7323	0.2597	#_DISL_Fall_E_index
2006	1	21	2.8692	0.1853	#_DISL_Fall_E_index
2007	1	21	1.8366	0.2324	#_DISL_Fall_E_index
2008	1	21	0.3735	0.2942	#_DISL_Fall_E_index
2009	1	21	3.0412	0.2445	#_DISL_Fall_E_index
2010	1	21	0.3246	0.3558	#_DISL_Fall_E_index
2011	1	21	0.2019	0.4042	#_DISL_Fall_E_index
#

14	#_N_fleets_with_discard

#_discard_units (1=same_as_catchunits(bio/num); 2=fraction; 3=numbers)

#_discard_errtype:  >0 for DF of T-dist(read CV below); 0 for normal with CV; -1 for normal with se; -2 for lognormal

#Fleet	Disc_units	err_type
1	3	-2
2	3	-2
3	3	-2
4	3	-2
5	1	-2
6	1	-2
7	1	-2
8	1	-2
9	1	-2
10	1	-2
11	1	-2
12	1	-2
13	1	-2
14	1	-2

355	#N_discard_observations

#_year	seas	index	obs	err

1990	1	1	160.529	0.5
1991	1	1	283.019	0.5
1992	1	1	70.130	0.5
1993	1	1	51.412	0.5
1994	1	1	51.153	0.5
1995	1	1	38.470	0.5
1996	1	1	75.826	0.5
1997	1	1	70.864	0.5
1998	1	1	95.073	0.5
1999	1	1	104.236	0.5
2000	1	1	142.410	0.5
2001	1	1	131.998	0.5
```

| | | | | |
|---|---|---|---|---|
| 2002 | 1 | 1 | 178.383 | 0.5 |
| 2003 | 1 | 1 | 168.982 | 0.5 |
| 2004 | 1 | 1 | 77.097 | 0.5 |
| 2005 | 1 | 1 | 135.848 | 0.5 |
| 2006 | 1 | 1 | 106.061 | 0.5 |
| 2007 | 1 | 1 | 676.711 | 0.5 |
| 2008 | 1 | 1 | 166.436 | 0.5 |
| 2009 | 1 | 1 | 1936.860 | 0.5 |
| 2010 | 1 | 1 | 1243.613 | 0.5 |
| 2011 | 1 | 1 | 771.486 | 0.5 |
| 1990 | 1 | 2 | 514.832 | 0.5 |
| 1991 | 1 | 2 | 789.015 | 0.5 |
| 1992 | 1 | 2 | 268.014 | 0.5 |
| 1993 | 1 | 2 | 316.531 | 0.5 |
| 1994 | 1 | 2 | 314.558 | 0.5 |
| 1995 | 1 | 2 | 313.774 | 0.5 |
| 1996 | 1 | 2 | 780.752 | 0.5 |
| 1997 | 1 | 2 | 665.234 | 0.5 |
| 1998 | 1 | 2 | 780.944 | 0.5 |
| 1999 | 1 | 2 | 735.395 | 0.5 |
| 2000 | 1 | 2 | 650.846 | 0.5 |
| 2001 | 1 | 2 | 749.238 | 0.5 |
| 2002 | 1 | 2 | 729.981 | 0.5 |
| 2003 | 1 | 2 | 678.232 | 0.5 |
| 2004 | 1 | 2 | 615.041 | 0.5 |
| 2005 | 1 | 2 | 848.414 | 0.5 |
| 2006 | 1 | 2 | 434.172 | 0.5 |
| 2007 | 1 | 2 | 332.439 | 0.5 |
| 2008 | 1 | 2 | 557.104 | 0.5 |
| 2009 | 1 | 2 | 103.320 | 0.5 |
| 2010 | 1 | 2 | 267.798 | 0.5 |
| 2011 | 1 | 2 | 190.414 | 0.5 |
| 1990 | 1 | 3 | 9.785 | 0.5 |
| 1991 | 1 | 3 | 11.759 | 0.5 |
| 1992 | 1 | 3 | 2.891 | 0.5 |
| 1993 | 1 | 3 | 1.955 | 0.5 |
| 1994 | 1 | 3 | 2.330 | 0.5 |
| 1995 | 1 | 3 | 1.522 | 0.5 |
| 1996 | 1 | 3 | 2.206 | 0.5 |
| 1997 | 1 | 3 | 2.177 | 0.5 |
| 1998 | 1 | 3 | 1.701 | 0.5 |
| 1999 | 1 | 3 | 2.283 | 0.5 |
| 2000 | 1 | 3 | 2.019 | 0.5 |
| 2001 | 1 | 3 | 1.833 | 0.5 |
| 2002 | 1 | 3 | 2.214 | 0.5 |
| 2003 | 1 | 3 | 2.054 | 0.5 |
| 2004 | 1 | 3 | 2.658 | 0.5 |
| 2005 | 1 | 3 | 2.239 | 0.5 |
| 2006 | 1 | 3 | 2.911 | 0.5 |
| 2007 | 1 | 3 | 17.188 | 0.5 |
| 2008 | 1 | 3 | 2.449 | 0.5 |
| 2009 | 1 | 3 | 6.030 | 0.5 |
| 2010 | 1 | 3 | 8.337 | 0.5 |
| 2011 | 1 | 3 | 15.046 | 0.5 |
| 1990 | 1 | 4 | 0.830 | 0.5 |
| 1991 | 1 | 4 | 2.521 | 0.5 |
| 1992 | 1 | 4 | 0.400 | 0.5 |
| 1993 | 1 | 4 | 0.851 | 0.5 |
| 1994 | 1 | 4 | 1.248 | 0.5 |
| 1995 | 1 | 4 | 1.635 | 0.5 |
| 1996 | 1 | 4 | 1.398 | 0.5 |
| 1997 | 1 | 4 | 0.818 | 0.5 |
| 1998 | 1 | 4 | 0.834 | 0.5 |
| 1999 | 1 | 4 | 2.979 | 0.5 |
| 2000 | 1 | 4 | 2.137 | 0.5 |
| 2001 | 1 | 4 | 1.261 | 0.5 |
| 2002 | 1 | 4 | 1.889 | 0.5 |
| 2003 | 1 | 4 | 4.289 | 0.5 |

| | | | | |
|---|---|---|---|---|
| 2004 | 1 | 4 | 6.574 | 0.5 |
| 2005 | 1 | 4 | 5.853 | 0.5 |
| 2006 | 1 | 4 | 5.174 | 0.5 |
| -2007 | 1 | 4 | 0.000 | 0.5 |
| 2008 | 1 | 4 | 0.491 | 0.5 |
| 2009 | 1 | 4 | 0.166 | 0.5 |
| 2010 | 1 | 4 | 0.043 | 0.5 |
| 2011 | 1 | 4 | 0.006 | 0.5 |
| 1981 | 1 | 5 | 51.548 | 0.5 |
| 1982 | 1 | 5 | 16.659 | 0.5 |
| 1983 | 1 | 5 | 0.479 | 0.5 |
| 1984 | 1 | 5 | 25.159 | 0.5 |
| 1985 | 1 | 5 | 15.349 | 0.5 |
| 1986 | 1 | 5 | 39.599 | 0.5 |
| 1987 | 1 | 5 | 62.666 | 0.5 |
| 1988 | 1 | 5 | 64.040 | 0.5 |
| 1989 | 1 | 5 | 168.435 | 0.5 |
| 1990 | 1 | 5 | 424.721 | 0.5 |
| 1991 | 1 | 5 | 769.651 | 0.5 |
| 1992 | 1 | 5 | 847.379 | 0.5 |
| 1993 | 1 | 5 | 900.495 | 0.5 |
| 1994 | 1 | 5 | 709.312 | 0.5 |
| 1995 | 1 | 5 | 393.610 | 0.5 |
| 1996 | 1 | 5 | 878.667 | 0.5 |
| 1997 | 1 | 5 | 1703.537 | 0.5 |
| 1998 | 1 | 5 | 781.128 | 0.5 |
| 1999 | 1 | 5 | 1083.969 | 0.5 |
| 2000 | 1 | 5 | 978.455 | 0.5 |
| 2001 | 1 | 5 | 1095.368 | 0.5 |
| 2002 | 1 | 5 | 1501.272 | 0.5 |
| 2003 | 1 | 5 | 1447.141 | 0.5 |
| 2004 | 1 | 5 | 2042.088 | 0.5 |
| 2005 | 1 | 5 | 1330.296 | 0.5 |
| 2006 | 1 | 5 | 1913.881 | 0.5 |
| 2007 | 1 | 5 | 2525.639 | 0.5 |
| 2008 | 1 | 5 | 668.307 | 0.5 |
| 2009 | 1 | 5 | 937.089 | 0.5 |
| 2010 | 1 | 5 | 381.545 | 0.5 |
| 2011 | 1 | 5 | 343.198 | 0.5 |
| 1981 | 1 | 6 | 10.551 | 0.5 |
| 1982 | 1 | 6 | 14.963 | 0.5 |
| 1983 | 1 | 6 | 3.671 | 0.5 |
| -1984 | 1 | 6 | 0.000 | 0.5 |
| 1985 | 1 | 6 | 93.093 | 0.5 |
| 1986 | 1 | 6 | 5.272 | 0.5 |
| 1987 | 1 | 6 | 15.463 | 0.5 |
| 1988 | 1 | 6 | 181.540 | 0.5 |
| 1989 | 1 | 6 | 130.008 | 0.5 |
| 1990 | 1 | 6 | 199.581 | 0.5 |
| 1991 | 1 | 6 | 343.038 | 0.5 |
| 1992 | 1 | 6 | 239.695 | 0.5 |
| 1993 | 1 | 6 | 290.434 | 0.5 |
| 1994 | 1 | 6 | 377.895 | 0.5 |
| 1995 | 1 | 6 | 558.554 | 0.5 |
| 1996 | 1 | 6 | 139.802 | 0.5 |
| 1997 | 1 | 6 | 151.141 | 0.5 |
| 1998 | 1 | 6 | 155.640 | 0.5 |
| 1999 | 1 | 6 | 333.250 | 0.5 |
| 2000 | 1 | 6 | 123.306 | 0.5 |
| 2001 | 1 | 6 | 71.470 | 0.5 |
| 2002 | 1 | 6 | 82.585 | 0.5 |
| 2003 | 1 | 6 | 266.414 | 0.5 |
| 2004 | 1 | 6 | 401.279 | 0.5 |
| 2005 | 1 | 6 | 407.268 | 0.5 |
| 2006 | 1 | 6 | 511.576 | 0.5 |
| 2007 | 1 | 6 | 292.363 | 0.5 |
| 2008 | 1 | 6 | 226.577 | 0.5 |
| 2009 | 1 | 6 | 112.597 | 0.5 |

| | | | | |
|---|---|---|---|---|
| 2010 | 1 | 6 | 8.681 | 0.5 |
| 2011 | 1 | 6 | 67.660 | 0.5 |
| 1990 | 1 | 7 | 33.485 | 0.5 |
| 1991 | 1 | 7 | 32.514 | 0.5 |
| 1992 | 1 | 7 | 25.686 | 0.5 |
| 1993 | 1 | 7 | 27.191 | 0.5 |
| 1994 | 1 | 7 | 19.137 | 0.5 |
| -1995 | 1 | 7 | 0.000 | 0.5 |
| 1996 | 1 | 7 | 47.357 | 0.5 |
| 1997 | 1 | 7 | 145.427 | 0.5 |
| 1998 | 1 | 7 | 163.609 | 0.5 |
| 1999 | 1 | 7 | 109.930 | 0.5 |
| 2000 | 1 | 7 | 182.937 | 0.5 |
| 2001 | 1 | 7 | 166.822 | 0.5 |
| 2002 | 1 | 7 | 247.894 | 0.5 |
| 2003 | 1 | 7 | 217.624 | 0.5 |
| 2004 | 1 | 7 | 76.453 | 0.5 |
| 2005 | 1 | 7 | 43.765 | 0.5 |
| 2006 | 1 | 7 | 267.267 | 0.5 |
| 2007 | 1 | 7 | 310.466 | 0.5 |
| 2008 | 1 | 7 | 265.668 | 0.5 |
| 2009 | 1 | 7 | 332.307 | 0.5 |
| 2010 | 1 | 7 | 103.884 | 0.5 |
| 2011 | 1 | 7 | 243.191 | 0.5 |
| 1981 | 1 | 8 | 180.326 | 0.5 |
| 1982 | 1 | 8 | 181.278 | 0.5 |
| 1983 | 1 | 8 | 180.780 | 0.5 |
| 1984 | 1 | 8 | 180.326 | 0.5 |
| 1985 | 1 | 8 | 180.326 | 0.5 |
| 1986 | 1 | 8 | 172.405 | 0.5 |
| 1987 | 1 | 8 | 172.164 | 0.5 |
| 1988 | 1 | 8 | 228.068 | 0.5 |
| 1989 | 1 | 8 | 214.371 | 0.5 |
| 1990 | 1 | 8 | 167.931 | 0.5 |
| 1991 | 1 | 8 | 194.253 | 0.5 |
| 1992 | 1 | 8 | 277.476 | 0.5 |
| 1993 | 1 | 8 | 307.239 | 0.5 |
| 1994 | 1 | 8 | 409.424 | 0.5 |
| 1995 | 1 | 8 | 260.663 | 0.5 |
| 1996 | 1 | 8 | 252.035 | 0.5 |
| 1997 | 1 | 8 | 218.917 | 0.5 |
| 1998 | 1 | 8 | 150.965 | 0.5 |
| 1999 | 1 | 8 | 56.959 | 0.5 |
| 2000 | 1 | 8 | 59.240 | 0.5 |
| 2001 | 1 | 8 | 67.759 | 0.5 |
| 2002 | 1 | 8 | 79.538 | 0.5 |
| 2003 | 1 | 8 | 90.954 | 0.5 |
| 2004 | 1 | 8 | 71.153 | 0.5 |
| 2005 | 1 | 8 | 65.633 | 0.5 |
| 2006 | 1 | 8 | 94.376 | 0.5 |
| 2007 | 1 | 8 | 90.361 | 0.5 |
| 2008 | 1 | 8 | 49.594 | 0.5 |
| 2009 | 1 | 8 | 24.940 | 0.5 |
| 2010 | 1 | 8 | 21.956 | 0.5 |
| 2011 | 1 | 8 | 17.364 | 0.5 |
| 1991 | 1 | 9 | 119.128 | 0.5 |
| 1992 | 1 | 9 | 322.519 | 0.5 |
| 1993 | 1 | 9 | 267.299 | 0.5 |
| 1994 | 1 | 9 | 395.348 | 0.5 |
| 1995 | 1 | 9 | 373.652 | 0.5 |
| 1996 | 1 | 9 | 503.041 | 0.5 |
| 1997 | 1 | 9 | 405.851 | 0.5 |
| 1998 | 1 | 9 | 418.597 | 0.5 |
| 1999 | 1 | 9 | 499.850 | 0.5 |
| 2000 | 1 | 9 | 274.811 | 0.5 |
| 2001 | 1 | 9 | 261.631 | 0.5 |
| 2002 | 1 | 9 | 153.115 | 0.5 |
| 2003 | 1 | 9 | 466.757 | 0.5 |

| | | | | |
|---|---|---|---|---|
| 2004 | 1 | 9 | 223.617 | 0.5 |
| 2005 | 1 | 9 | 144.575 | 0.5 |
| 2006 | 1 | 9 | 100.835 | 0.5 |
| 2007 | 1 | 9 | 224.966 | 0.5 |
| 2008 | 1 | 9 | 210.951 | 0.5 |
| 2009 | 1 | 9 | 696.804 | 0.5 |
| 2010 | 1 | 9 | 51.708 | 0.5 |
| 2011 | 1 | 9 | 170.873 | 0.5 |
| 1991 | 1 | 10 | 94.685 | 0.5 |
| 1992 | 1 | 10 | 164.140 | 0.5 |
| 1993 | 1 | 10 | 78.035 | 0.5 |
| 1994 | 1 | 10 | 52.136 | 0.5 |
| 1995 | 1 | 10 | 51.757 | 0.5 |
| 1996 | 1 | 10 | 54.827 | 0.5 |
| 1997 | 1 | 10 | 80.809 | 0.5 |
| 1998 | 1 | 10 | 81.316 | 0.5 |
| 1999 | 1 | 10 | 66.659 | 0.5 |
| 2000 | 1 | 10 | 82.290 | 0.5 |
| 2001 | 1 | 10 | 65.146 | 0.5 |
| 2002 | 1 | 10 | 164.643 | 0.5 |
| 2003 | 1 | 10 | 43.403 | 0.5 |
| 2004 | 1 | 10 | 45.313 | 0.5 |
| 2005 | 1 | 10 | 32.566 | 0.5 |
| 2006 | 1 | 10 | 17.996 | 0.5 |
| 2007 | 1 | 10 | 50.944 | 0.5 |
| -2008 | 1 | 10 | 0.000 | 0.5 |
| 2009 | 1 | 10 | 0.229 | 0.5 |
| 2010 | 1 | 10 | 3.401 | 0.5 |
| 2011 | 1 | 10 | 1.282 | 0.5 |
| 1997 | 1 | 11 | 96.636 | 0.5 |
| 1998 | 1 | 11 | 166.715 | 0.5 |
| 1999 | 1 | 11 | 194.850 | 0.5 |
| 2000 | 1 | 11 | 486.259 | 0.5 |
| 2001 | 1 | 11 | 857.661 | 0.5 |
| 2002 | 1 | 11 | 810.308 | 0.5 |
| 2003 | 1 | 11 | 549.490 | 0.5 |
| 2004 | 1 | 11 | 379.867 | 0.5 |
| 2005 | 1 | 11 | 528.889 | 0.5 |
| 2006 | 1 | 11 | 505.109 | 0.5 |
| 2007 | 1 | 11 | 468.469 | 0.5 |
| 2008 | 1 | 11 | 1308.445 | 0.5 |
| 2009 | 1 | 11 | 1036.408 | 0.5 |
| 2010 | 1 | 11 | 1097.405 | 0.5 |
| 2011 | 1 | 11 | 1160.255 | 0.5 |
| 1997 | 1 | 12 | 4.330 | 0.5 |
| 1998 | 1 | 12 | 11.571 | 0.5 |
| 1999 | 1 | 12 | 28.425 | 0.5 |
| 2000 | 1 | 12 | 76.976 | 0.5 |
| 2001 | 1 | 12 | 33.609 | 0.5 |
| 2002 | 1 | 12 | 32.776 | 0.5 |
| 2003 | 1 | 12 | 75.882 | 0.5 |
| 2004 | 1 | 12 | 110.642 | 0.5 |
| 2005 | 1 | 12 | 127.018 | 0.5 |
| 2006 | 1 | 12 | 104.763 | 0.5 |
| 2007 | 1 | 12 | 97.917 | 0.5 |
| 2008 | 1 | 12 | 190.687 | 0.5 |
| 2009 | 1 | 12 | 167.291 | 0.5 |
| 2010 | 1 | 12 | 27.372 | 0.5 |
| 2011 | 1 | 12 | 177.106 | 0.5 |
| 1972 | -1 | 13 | 1118.000 | 0.1 |
| 1973 | 1 | -13 | 1270.000 | 0.5 |
| 1974 | 1 | -13 | 731.100 | 0.5 |
| 1975 | 1 | -13 | 1188.000 | 0.5 |
| 1976 | 1 | -13 | 1108.000 | 0.5 |
| 1977 | 1 | -13 | 1517.000 | 0.5 |
| 1978 | 1 | -13 | 257.400 | 0.5 |
| 1979 | 1 | -13 | 1133.000 | 0.5 |
| 1980 | 1 | -13 | 450.000 | 0.5 |

| | | | | |
|---|---|---|---|---|
| 1981 | 1 | -13 | 1283.000 | 0.5 |
| 1982 | 1 | -13 | 1590.000 | 0.5 |
| 1983 | 1 | -13 | 1203.000 | 0.5 |
| 1984 | 1 | -13 | 864.800 | 0.5 |
| 1985 | 1 | -13 | 715.300 | 0.5 |
| 1986 | 1 | -13 | 234.500 | 0.5 |
| 1987 | 1 | -13 | 338.800 | 0.5 |
| 1988 | 1 | -13 | 409.200 | 0.5 |
| 1989 | 1 | -13 | 678.500 | 0.5 |
| 1990 | 1 | -13 | 2225.000 | 0.5 |
| 1991 | 1 | -13 | 1897.000 | 0.5 |
| 1992 | 1 | -13 | 1286.000 | 0.5 |
| 1993 | 1 | -13 | 752.900 | 0.5 |
| 1994 | 1 | -13 | 1155.000 | 0.5 |
| 1995 | 1 | -13 | 1566.000 | 0.5 |
| 1996 | 1 | -13 | 1200.000 | 0.5 |
| 1997 | 1 | -13 | 1793.000 | 0.5 |
| 1998 | 1 | -13 | 1611.000 | 0.5 |
| 1999 | 1 | -13 | 1799.000 | 0.5 |
| 2000 | 1 | -13 | 2183.000 | 0.5 |
| 2001 | 1 | -13 | 2308.000 | 0.5 |
| 2002 | 1 | -13 | 2178.000 | 0.5 |
| 2003 | 1 | -13 | 1265.000 | 0.5 |
| 2004 | 1 | -13 | 1402.000 | 0.5 |
| 2005 | 1 | -13 | 615.200 | 0.5 |
| 2006 | 1 | -13 | 1855.000 | 0.5 |
| 2007 | 1 | -13 | 1229.000 | 0.5 |
| 2008 | 1 | -13 | 165.300 | 0.5 |
| 2009 | 1 | -13 | 351.400 | 0.5 |
| 2010 | 1 | -13 | 191.700 | 0.5 |
| 2011 | -1 | -13 | 329.900 | 0.5 |
| 1972 | -1 | 14 | 20680.000 | 0.1 |
| 1973 | 1 | -14 | 14820.000 | 0.5 |
| 1974 | 1 | -14 | 18120.000 | 0.5 |
| 1975 | 1 | -14 | 8205.000 | 0.5 |
| 1976 | 1 | -14 | 30050.000 | 0.5 |
| 1977 | 1 | -14 | 11440.000 | 0.5 |
| 1978 | 1 | -14 | 6706.000 | 0.5 |
| 1979 | 1 | -14 | 23550.000 | 0.5 |
| 1980 | 1 | -14 | 25660.000 | 0.5 |
| 1981 | 1 | -14 | 54870.000 | 0.5 |
| 1982 | 1 | -14 | 24640.000 | 0.5 |
| 1983 | 1 | -14 | 18460.000 | 0.5 |
| 1984 | 1 | -14 | 13400.000 | 0.5 |
| 1985 | 1 | -14 | 10860.000 | 0.5 |
| 1986 | 1 | -14 | 5984.000 | 0.5 |
| 1987 | 1 | -14 | 12440.000 | 0.5 |
| 1988 | 1 | -14 | 10110.000 | 0.5 |
| 1989 | 1 | -14 | 10790.000 | 0.5 |
| 1990 | 1 | -14 | 40820.000 | 0.5 |
| 1991 | 1 | -14 | 41610.000 | 0.5 |
| 1992 | 1 | -14 | 31720.000 | 0.5 |
| 1993 | 1 | -14 | 34920.000 | 0.5 |
| 1994 | 1 | -14 | 34750.000 | 0.5 |
| 1995 | 1 | -14 | 48220.000 | 0.5 |
| 1996 | 1 | -14 | 37760.000 | 0.5 |
| 1997 | 1 | -14 | 27080.000 | 0.5 |
| 1998 | 1 | -14 | 56130.000 | 0.5 |
| 1999 | 1 | -14 | 23980.000 | 0.5 |
| 2000 | 1 | -14 | 12320.000 | 0.5 |
| 2001 | 1 | -14 | 24160.000 | 0.5 |
| 2002 | 1 | -14 | 22210.000 | 0.5 |
| 2003 | 1 | -14 | 30610.000 | 0.5 |
| 2004 | 1 | -14 | 27990.000 | 0.5 |
| 2005 | 1 | -14 | 12220.000 | 0.5 |
| 2006 | 1 | -14 | 11630.000 | 0.5 |
| 2007 | 1 | -14 | 6837.000 | 0.5 |
| 2008 | 1 | -14 | 2714.000 | 0.5 |

```
2009      1         -14       3736.000  0.5
2010      1         -14       2785.000  0.5
2011      -1        -14       6273.000  0.5

#

0         #_N_meanbodywt_obs

30        #_DF_for_meanbodywt_T-distribution_like

#

#Population length bins are needed even if there are no size data

#  These define the resolution at which the mean weight-at-length, maturity-at-length and size-selectivity are based.  Calculations use the mid-length of the population bins.

2         # length bin method: 1=use databins(read below); 2=generate from binwidth,min,max below; 3=read vector

2         # binwidth for population size comp

8         # minimum size in the population (lower edge of first bin and size at age 0.00)

110       # maximum size in the population (lower edge of last bin)

#

-0.001    #_comp_tail_compression

1.00E-07  #_add_to_comp

0         #_combine males into females at or below this bin number

50        #_Nbins for length composition data

#lower edge of each length data bin (in cm)
```

```
12      14      16      18      20      22      24      26      28      30      32      34      36      38      40      42      44      46
        48      50      52      54      56      58      60      62      64      66      68      70      72      74      76      78      80
        82      84      86      88      90      92      94      96      98      100     102     104     106     108     110

0       #_N_Length_obs;  this can be 0 if there are no length data
#year   Seas    Flt_Svy Gender  Part    Nsamp   N.12    N.14    N.16    N.18    N.20    N.22    N.24    N.26    N.28    N.30    N.32    N.34
        N.36    N.38    N.40    N.42    N.44    N.46    N.48    N.50    N.52    N.54    N.56    N.58    N.60    N.62    N.64    N.66    N.68
        N.70    N.72    N.74    N.76    N.78    N.80    N.82    N.84    N.86    N.88    N.90    N.92    N.94    N.96    N.98    N.100   N.102
        N.104   N.106   N.108   N.110
#

21      #_N_age'_bins;  these are in terms of age', not true age.  Age' is estimated age taking into account any ageing bias and imprecision

# following vector is the lower edge of the integer age' for each age' bin; by starting at age' = 1, any zero-year-old fish that are in the expected values will be accumulated up
into the age 1 bin.

0       1       2       3       4       5       6       7       8       9       10      11      12      13      14      15      16   17   18
19   20

2       #_N_ageerror_definitions;  these define how SS will convert true age into a distribution of expected ages to represent the effect of ageing bias and imprecision

#true_age=0     1       2       etc.,
-1      -1      -1      -1      -1      -1      -1      -1      -1      -1      -1      -1      -1      -1      -1      -1      -1      -1
        -1      -1      -1
0.001   0.845   0.552   0.517   0.661   0.860   0.800   1.035   1.008   1.141   1.579   2.019   2.019   2.019   2.019   2.019   2.310   2.310
        2.310   2.310   4.489


-1      -1      -1      -1      -1      -1      -1      -1      -1      -1      -1      -1      -1      -1      -1      -1      -1      -1
        -1      -1      -1
0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001
        0.001   0.001   0.001
#

419     #_N_Agecomp_obs

2       #_Lbin_method:  1=poplenbins;   2=datalenbins;  3=lengths This is needed because agecomp data can be entered for a subset of the entire length range

0       #_combine males into females at or below this bin number

# the age composition data vectors below are by age' bins, not by true age
```

| #Yr | Seas | Flt/Svy | Gender | Part | Ageerr | Lbin_lo | Lbin_hi | Nsamp | datavector(female, then male) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1991 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 178 | 0.00000 | 0.00970 | 0.52720 | 0.37950 | 0.02670 | 0.04150 | 0.00840 | 0.00670 | 0.00030 | |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 1992 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 136 | 0.00000 | 0.00000 | 0.02330 | 0.75810 | 0.15170 | 0.05560 | 0.00310 | 0.00500 | 0.00000 | |
| | 0.00320 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 1993 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 153 | 0.00000 | 0.00000 | 0.32770 | 0.41270 | 0.21590 | 0.02330 | 0.01700 | 0.00080 | 0.00000 | |
| | 0.00000 | 0.00000 | 0.00230 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00040 | | | | | | |
| 1994 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 151 | 0.00000 | 0.00000 | 0.36540 | 0.36690 | 0.17050 | 0.08660 | 0.00490 | 0.00170 | 0.00000 | |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00170 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00240 | | | | | | |
| 1995 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 92 | 0.00000 | 0.00000 | 0.14860 | 0.49560 | 0.26640 | 0.07400 | 0.00980 | 0.00000 | 0.00000 | |
| | 0.00000 | 0.00000 | 0.00540 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 1996 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 9 | 0.00000 | 0.00000 | 0.38720 | 0.37770 | 0.15340 | 0.08170 | 0.00000 | 0.00000 | 0.00000 | |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 1997 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 32 | 0.00000 | 0.00000 | 0.00000 | 0.52970 | 0.39530 | 0.04080 | 0.02530 | 0.00560 | 0.00000 | |
| | 0.00330 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 1998 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 197 | 0.00000 | 0.00000 | 0.07990 | 0.56630 | 0.26570 | 0.05290 | 0.00580 | 0.01250 | 0.00130 | |
| | 0.00000 | 0.00000 | 0.00000 | 0.00270 | 0.00000 | 0.00000 | 0.00000 | 0.00130 | 0.00000 | 0.00110 | 0.00000 | 0.01020 | | | | | | |
| 1999 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00130 | 0.11470 | 0.26600 | 0.34600 | 0.11270 | 0.06880 | 0.03510 | 0.02000 | |
| | 0.01700 | 0.01100 | 0.00430 | 0.00000 | 0.00160 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00150 | | | | | | |
| 2000 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.03650 | 0.38550 | 0.31000 | 0.17940 | 0.06040 | 0.01360 | 0.00810 | |
| | 0.00310 | 0.00000 | 0.00240 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00120 | | | | | | |
| 2001 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.09700 | 0.24360 | 0.33730 | 0.16900 | 0.09180 | 0.03400 | 0.01280 | |
| | 0.00600 | 0.00310 | 0.00280 | 0.00040 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00130 | 0.00000 | 0.00000 | 0.00100 | | | | | | |
| 2002 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00090 | 0.08420 | 0.53370 | 0.16690 | 0.13720 | 0.04260 | 0.03010 | 0.00210 | |
| | 0.00000 | 0.00000 | 0.00170 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00050 | 0.00020 | | | | | | |
| 2003 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00840 | 0.13700 | 0.40310 | 0.29090 | 0.08890 | 0.04420 | 0.01320 | 0.00550 | |
| | 0.00270 | 0.00050 | 0.00100 | 0.00120 | 0.00000 | 0.00000 | 0.00000 | 0.00080 | 0.00030 | 0.00040 | 0.00000 | 0.00180 | | | | | | |
| 2004 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00770 | 0.20100 | 0.32570 | 0.30590 | 0.11890 | 0.01710 | 0.01150 | 0.00300 | |
| | 0.00320 | 0.00000 | 0.00110 | 0.00180 | 0.00230 | 0.00000 | 0.00070 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2005 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00100 | 0.11100 | 0.44730 | 0.19240 | 0.16090 | 0.05890 | 0.01590 | 0.00390 | |
| | 0.00270 | 0.00270 | 0.00040 | 0.00070 | 0.00100 | 0.00060 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00020 | 0.00040 | | | | | | |
| 2006 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00190 | 0.17390 | 0.38710 | 0.25080 | 0.08160 | 0.05490 | 0.03250 | 0.00830 | |
| | 0.00280 | 0.00120 | 0.00000 | 0.00000 | 0.00000 | 0.00110 | 0.00050 | 0.00050 | 0.00090 | 0.00000 | 0.00050 | 0.00160 | | | | | | |
| 2007 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.01040 | 0.22720 | 0.51130 | 0.20790 | 0.02820 | 0.01050 | 0.00330 | 0.00000 | |
| | 0.00090 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00040 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2008 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00180 | 0.19930 | 0.35480 | 0.36540 | 0.06670 | 0.01050 | 0.00000 | 0.00000 | |
| | 0.00000 | 0.00150 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2009 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00730 | 0.13910 | 0.37950 | 0.31500 | 0.11670 | 0.03300 | 0.00640 | 0.00160 | |
| | 0.00000 | 0.00060 | 0.00020 | 0.00020 | 0.00000 | 0.00000 | 0.00020 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2010 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00070 | 0.09290 | 0.29950 | 0.33510 | 0.19380 | 0.05920 | 0.01290 | 0.00550 | |
| | 0.00000 | 0.00040 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2011 | 1 | 1 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00270 | 0.10450 | 0.13640 | 0.42020 | 0.23280 | 0.06910 | 0.02490 | 0.00690 | |
| | 0.00210 | 0.00030 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00010 | | | | | | |
| 2007 | 1 | 1 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.03583 | 0.33730 | 0.36779 | 0.16476 | 0.06317 | 0.02151 | 0.00671 | 0.00185 | |
| | 0.00066 | 0.00020 | 0.00011 | 0.00005 | 0.00004 | 0.00001 | 0.00001 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2008 | 1 | 1 | 0 | 1 | 2 | -1 | -1 | 166 | 0.00001 | 0.02470 | 0.24167 | 0.31125 | 0.22743 | 0.13313 | 0.04448 | 0.01204 | 0.00331 | |
| | 0.00125 | 0.00045 | 0.00018 | 0.00004 | 0.00006 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2009 | 1 | 1 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.11872 | 0.22248 | 0.27216 | 0.20656 | 0.10737 | 0.04509 | 0.01645 | 0.00524 | |
| | 0.00236 | 0.00101 | 0.00064 | 0.00042 | 0.00026 | 0.00023 | 0.00009 | 0.00007 | 0.00012 | 0.00006 | 0.00005 | 0.00062 | | | | | | |
| 2010 | 1 | 1 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.02848 | 0.24901 | 0.30729 | 0.21311 | 0.12369 | 0.05293 | 0.01764 | 0.00479 | |
| | 0.00190 | 0.00051 | 0.00030 | 0.00015 | 0.00012 | 0.00003 | 0.00003 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00001 | | | | | | |
| 2011 | 1 | 1 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.01875 | 0.16916 | 0.27195 | 0.26102 | 0.15424 | 0.07213 | 0.03147 | 0.01077 | |
| | 0.00453 | 0.00177 | 0.00117 | 0.00075 | 0.00049 | 0.00031 | 0.00030 | 0.00014 | 0.00014 | 0.00012 | 0.00004 | 0.00075 | | | | | | |
| 1991 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 25 | 0.00000 | 0.00000 | 0.66550 | 0.17010 | 0.13460 | 0.01340 | 0.00000 | 0.00000 | 0.00000 | |
| | 0.00000 | 0.00270 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00750 | 0.00000 | 0.00620 | | | | | | |
| 1992 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00610 | 0.66360 | 0.18570 | 0.09580 | 0.02710 | 0.01160 | 0.00600 | |
| | 0.00000 | 0.00220 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00190 | | | | | | |
| 1993 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.02560 | 0.39620 | 0.43710 | 0.11860 | 0.01450 | 0.00640 | 0.00060 | |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00090 | | | | | | |
| 1994 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.04850 | 0.43810 | 0.29910 | 0.15920 | 0.03400 | 0.01000 | 0.00420 | |
| | 0.00190 | 0.00020 | 0.00180 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00160 | 0.00000 | 0.00000 | 0.00000 | 0.00120 | | | | | | |
| 1995 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 97 | 0.00000 | 0.00000 | 0.00000 | 0.30300 | 0.34050 | 0.17570 | 0.14110 | 0.03910 | 0.00000 | |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00050 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| -1996 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -1997 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1998 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00870 | 0.06440 | 0.45920 | 0.26410 | 0.12650 | 0.03100 | 0.02090 | 0.01610 |
| | 0.00440 | 0.00280 | 0.00060 | 0.00050 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00110 | | | | | |
| 1999 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00030 | 0.03290 | 0.19000 | 0.39020 | 0.22140 | 0.09490 | 0.04420 | 0.01650 |
| | 0.00350 | 0.00420 | 0.00100 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00110 | | | | | |
| 2000 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.05380 | 0.42610 | 0.27360 | 0.13950 | 0.06800 | 0.02780 | 0.00600 |
| | 0.00210 | 0.00180 | 0.00050 | 0.00060 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00030 | | | | | |
| 2001 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.09850 | 0.22620 | 0.30610 | 0.17710 | 0.11060 | 0.04580 | 0.02080 |
| | 0.00850 | 0.00320 | 0.00180 | 0.00060 | 0.00000 | 0.00050 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00040 | | | | | |
| 2002 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.01390 | 0.10310 | 0.41000 | 0.20720 | 0.14230 | 0.05870 | 0.03730 | 0.01520 |
| | 0.00420 | 0.00170 | 0.00230 | 0.00060 | 0.00060 | 0.00020 | 0.00000 | 0.00040 | 0.00000 | 0.00000 | 0.00000 | 0.00250 | | | | | |
| 2003 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00220 | 0.04910 | 0.28930 | 0.35850 | 0.13370 | 0.07380 | 0.04160 | 0.02970 |
| | 0.00690 | 0.00420 | 0.00300 | 0.00170 | 0.00160 | 0.00240 | 0.00000 | 0.00000 | 0.00000 | 0.00050 | 0.00000 | 0.00180 | | | | | |
| 2004 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.05270 | 0.28130 | 0.34910 | 0.17990 | 0.05240 | 0.03610 | 0.02300 |
| | 0.00900 | 0.00620 | 0.00280 | 0.00130 | 0.00120 | 0.00090 | 0.00060 | 0.00070 | 0.00000 | 0.00060 | 0.00000 | 0.00230 | | | | | |
| 2005 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00050 | 0.09370 | 0.25880 | 0.26470 | 0.18100 | 0.09340 | 0.03730 | 0.02240 |
| | 0.01140 | 0.00800 | 0.00450 | 0.00320 | 0.00510 | 0.00370 | 0.00390 | 0.00070 | 0.00160 | 0.00260 | 0.00000 | 0.00340 | | | | | |
| 2006 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.06130 | 0.41690 | 0.26050 | 0.10430 | 0.08360 | 0.04230 | 0.01380 |
| | 0.00650 | 0.00540 | 0.00240 | 0.00140 | 0.00080 | 0.00000 | 0.00070 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2007 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.07190 | 0.38010 | 0.31970 | 0.09580 | 0.05190 | 0.04340 | 0.01720 |
| | 0.00820 | 0.00380 | 0.00290 | 0.00150 | 0.00050 | 0.00110 | 0.00050 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00160 | | | | | |
| 2008 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.02690 | 0.35550 | 0.40330 | 0.14050 | 0.03780 | 0.01250 | 0.00810 |
| | 0.00840 | 0.00300 | 0.00170 | 0.00090 | 0.00000 | 0.00000 | 0.00000 | 0.00030 | 0.00000 | 0.00000 | 0.00080 | 0.00030 | | | | | |
| 2009 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.02790 | 0.32850 | 0.34780 | 0.20350 | 0.06510 | 0.01290 | 0.00600 |
| | 0.00370 | 0.00160 | 0.00040 | 0.00000 | 0.00030 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00040 | 0.00000 | 0.00180 | | | | | |
| 2010 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.01490 | 0.23120 | 0.33950 | 0.26240 | 0.12310 | 0.02040 | 0.00360 |
| | 0.00170 | 0.00040 | 0.00070 | 0.00040 | 0.00000 | 0.00040 | 0.00040 | 0.00040 | 0.00000 | 0.00000 | 0.00000 | 0.00060 | | | | | |
| 2011 | 1 | 2 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00130 | 0.05370 | 0.10040 | 0.27590 | 0.30690 | 0.16560 | 0.06230 | 0.02090 |
| | 0.00690 | 0.00240 | 0.00190 | 0.00070 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00070 | 0.00000 | 0.00040 | | | | | |
| 2007 | 1 | 2 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.00349 | 0.28274 | 0.41549 | 0.19545 | 0.06777 | 0.01924 | 0.00741 | 0.00280 |
| | 0.00132 | 0.00079 | 0.00051 | 0.00038 | 0.00033 | 0.00030 | 0.00037 | 0.00017 | 0.00017 | 0.00018 | 0.00010 | 0.00098 | | | | | |
| 2008 | 1 | 2 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.00356 | 0.38950 | 0.40843 | 0.12872 | 0.03268 | 0.01074 | 0.00644 | 0.00400 |
| | 0.00278 | 0.00195 | 0.00143 | 0.00106 | 0.00105 | 0.00101 | 0.00127 | 0.00054 | 0.00056 | 0.00062 | 0.00030 | 0.00337 | | | | | |
| 2009 | 1 | 2 | 0 | 1 | 2 | -1 | -1 | 70 | 0.00000 | 0.00229 | 0.60849 | 0.35197 | 0.03724 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2010 | 1 | 2 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.00423 | 0.47110 | 0.39726 | 0.08777 | 0.00817 | 0.00424 | 0.00446 | 0.00389 |
| | 0.00316 | 0.00268 | 0.00200 | 0.00206 | 0.00179 | 0.00133 | 0.00127 | 0.00094 | 0.00065 | 0.00052 | 0.00028 | 0.00221 | | | | | |
| 2011 | 1 | 2 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.00267 | 0.23462 | 0.31133 | 0.18306 | 0.10292 | 0.06086 | 0.03538 | 0.01904 |
| | 0.01225 | 0.00846 | 0.00620 | 0.00516 | 0.00373 | 0.00306 | 0.00283 | 0.00208 | 0.00110 | 0.00102 | 0.00062 | 0.00358 | | | | | |
| 1991 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 12 | 0.00000 | 0.00000 | 0.01790 | 0.62500 | 0.14290 | 0.14290 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.07140 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1992 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 15 | 0.00000 | 0.00000 | 0.00000 | 0.14290 | 0.22450 | 0.28570 | 0.14290 | 0.12240 | 0.00000 |
| | 0.00000 | 0.02040 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.06120 | | | | | |
| 1993 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 30 | 0.00000 | 0.00000 | 0.04270 | 0.20430 | 0.30600 | 0.25900 | 0.06840 | 0.05980 | 0.00000 |
| | 0.00000 | 0.01710 | 0.00000 | 0.00000 | 0.01710 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.02560 | | | | | |
| 1994 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 8 | 0.00000 | 0.00000 | 0.00000 | 0.10870 | 0.53260 | 0.17390 | 0.07610 | 0.00000 | 0.00000 |
| | 0.10870 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1995 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 19 | 0.00000 | 0.00000 | 0.00000 | 0.35780 | 0.46470 | 0.13820 | 0.00000 | 0.00000 | 0.00000 |
| | 0.03920 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1996 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 6 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.40000 | 0.30000 | 0.30000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1997 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 10 | 0.00000 | 0.00000 | 0.07690 | 0.23080 | 0.46150 | 0.15380 | 0.07690 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1998 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 25 | 0.00000 | 0.00000 | 0.00000 | 0.04920 | 0.12300 | 0.25820 | 0.31560 | 0.25410 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1999 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 102 | 0.00000 | 0.00000 | 0.00000 | 0.03560 | 0.48900 | 0.18010 | 0.21120 | 0.03360 | 0.00000 |
| | 0.03460 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.01580 | | | | | |
| 2000 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 84 | 0.00000 | 0.00000 | 0.00000 | 0.03380 | 0.14650 | 0.40840 | 0.18200 | 0.09100 | 0.03990 |
| | 0.04920 | 0.02080 | 0.00000 | 0.00750 | 0.00000 | 0.00560 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00750 | 0.00760 | | | | | |
| 2001 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 91 | 0.00000 | 0.00000 | 0.01550 | 0.05600 | 0.28900 | 0.28530 | 0.27400 | 0.05170 | 0.01900 |
| | 0.00480 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00480 | | | | | |
| 2002 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 183 | 0.00000 | 0.02460 | 0.05090 | 0.14330 | 0.18740 | 0.13700 | 0.18530 | 0.11330 | 0.03160 |
| | 0.02250 | 0.01690 | 0.00730 | 0.00000 | 0.00000 | 0.00000 | 0.00460 | 0.00000 | 0.00000 | 0.00730 | 0.00000 | 0.06780 | | | | | |
| 2003 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 197 | 0.00000 | 0.00000 | 0.00560 | 0.16630 | 0.30890 | 0.23670 | 0.10090 | 0.05980 | 0.04960 |
| | 0.02800 | 0.00400 | 0.00360 | 0.00400 | 0.00840 | 0.00400 | 0.00320 | 0.00000 | 0.00400 | 0.00000 | 0.00000 | 0.01280 | | | | | |
| 2004 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.01840 | 0.22930 | 0.37130 | 0.23030 | 0.07290 | 0.03500 | 0.02320 |
| | 0.00000 | 0.00490 | 0.00240 | 0.00000 | 0.00000 | 0.00000 | 0.00240 | 0.00000 | 0.00240 | 0.00000 | 0.00000 | 0.00720 | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2005 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.03880 | 0.15070 | 0.31480 | 0.34060 | 0.11800 | 0.03050 | 0.00000 |
| | 0.00000 | 0.00280 | 0.00000 | 0.00370 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2006 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.02210 | 0.09200 | 0.35760 | 0.20730 | 0.22780 | 0.05290 | 0.01940 |
| | 0.00420 | 0.00000 | 0.00000 | 0.00420 | 0.00840 | 0.00000 | 0.00000 | 0.00420 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2007 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.03520 | 0.07260 | 0.13190 | 0.31220 | 0.25460 | 0.11140 | 0.05070 | 0.02300 |
| | 0.00840 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2008 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00190 | 0.10730 | 0.31060 | 0.35390 | 0.09480 | 0.04330 | 0.02350 |
| | 0.01880 | 0.00800 | 0.00600 | 0.00580 | 0.00240 | 0.00580 | 0.00390 | 0.00430 | 0.00190 | 0.00000 | 0.00000 | 0.00770 | | | | | |
| 2009 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00470 | 0.08430 | 0.43000 | 0.22390 | 0.19470 | 0.02330 | 0.00770 |
| | 0.01360 | 0.00000 | 0.00000 | 0.00000 | 0.00510 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.01270 | | | | | |
| 2010 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00560 | 0.08610 | 0.34440 | 0.39610 | 0.10900 | 0.04430 | 0.01150 |
| | 0.00310 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2011 | 1 | 3 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.03020 | 0.21830 | 0.40220 | 0.25090 | 0.06920 | 0.01980 |
| | 0.00710 | 0.00000 | 0.00220 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2007 | 1 | 3 | 0 | 1 | 2 | -1 | -1 | 91 | 0.00000 | 0.00041 | 0.02863 | 0.19848 | 0.37748 | 0.23854 | 0.09511 | 0.03678 | 0.01264 |
| | 0.00539 | 0.00236 | 0.00133 | 0.00078 | 0.00058 | 0.00037 | 0.00020 | 0.00017 | 0.00017 | 0.00017 | 0.00000 | 0.00042 | | | | | |
| 2008 | 1 | 3 | 0 | 1 | 2 | -1 | -1 | 3 | 0.00000 | 0.01456 | 0.19118 | 0.23192 | 0.38203 | 0.14117 | 0.02788 | 0.00700 | 0.00343 |
| | 0.00041 | 0.00041 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2009 | 1 | 3 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.00201 | 0.02830 | 0.21270 | 0.35425 | 0.22927 | 0.10946 | 0.04197 | 0.01260 |
| | 0.00516 | 0.00159 | 0.00107 | 0.00060 | 0.00042 | 0.00019 | 0.00014 | 0.00004 | 0.00004 | 0.00004 | 0.00000 | 0.00014 | | | | | |
| 2010 | 1 | 3 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.00032 | 0.01938 | 0.16668 | 0.33295 | 0.26909 | 0.13251 | 0.04961 | 0.01520 |
| | 0.00683 | 0.00245 | 0.00150 | 0.00098 | 0.00079 | 0.00041 | 0.00024 | 0.00017 | 0.00010 | 0.00012 | 0.00003 | 0.00064 | | | | | |
| 2011 | 1 | 3 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.00025 | 0.01447 | 0.13140 | 0.32072 | 0.27750 | 0.15065 | 0.06346 | 0.02072 |
| | 0.00934 | 0.00346 | 0.00230 | 0.00154 | 0.00114 | 0.00069 | 0.00039 | 0.00025 | 0.00023 | 0.00018 | 0.00008 | 0.00123 | | | | | |
| -1991 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1992 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1993 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 29 | 0.00000 | 0.00000 | 0.46410 | 0.53090 | 0.00500 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1994 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1995 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1996 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1997 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1998 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00340 | 0.05140 | 0.11340 | 0.27570 | 0.10160 | 0.08020 | 0.07750 |
| | 0.04510 | 0.05330 | 0.04430 | 0.03180 | 0.03190 | 0.01700 | 0.01820 | 0.01980 | 0.00770 | 0.00780 | 0.00250 | 0.01730 | | | | | |
| 1999 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 76 | 0.00000 | 0.00000 | 0.00000 | 0.20360 | 0.43730 | 0.13540 | 0.04890 | 0.00000 | 0.17480 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2000 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.01450 | 0.02610 | 0.12640 | 0.15730 | 0.18780 | 0.12440 |
| | 0.08170 | 0.03900 | 0.04370 | 0.03260 | 0.02720 | 0.00630 | 0.01300 | 0.01310 | 0.00260 | 0.00000 | 0.00290 | 0.10140 | | | | | |
| 2001 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 179 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.02080 | 0.04890 | 0.19110 | 0.13380 | 0.10980 |
| | 0.11710 | 0.06170 | 0.06330 | 0.03530 | 0.05770 | 0.02200 | 0.01350 | 0.03710 | 0.00660 | 0.00840 | 0.01790 | 0.05490 | | | | | |
| 2002 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00200 | 0.02280 | 0.16860 | 0.08780 | 0.18690 | 0.07500 | 0.09630 | 0.07180 |
| | 0.03960 | 0.04050 | 0.03140 | 0.02940 | 0.01790 | 0.02220 | 0.02070 | 0.01820 | 0.01890 | 0.00760 | 0.00190 | 0.04030 | | | | | |
| 2003 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00390 | 0.03090 | 0.03090 | 0.07340 | 0.14290 |
| | 0.08400 | 0.08840 | 0.06550 | 0.08840 | 0.04230 | 0.04600 | 0.04950 | 0.06670 | 0.03090 | 0.01910 | 0.01140 | 0.12600 | | | | | |
| 2004 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.02310 | 0.14930 | 0.07180 | 0.08420 | 0.08610 | 0.07510 |
| | 0.07560 | 0.07390 | 0.04780 | 0.06400 | 0.04460 | 0.04380 | 0.03430 | 0.02390 | 0.01360 | 0.01350 | 0.00910 | 0.06610 | | | | | |
| 2005 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.04340 | 0.04990 | 0.15220 | 0.11380 | 0.12660 | 0.09210 |
| | 0.09930 | 0.05250 | 0.04760 | 0.05180 | 0.05930 | 0.03750 | 0.01990 | 0.02040 | 0.00000 | 0.00650 | 0.00370 | 0.02350 | | | | | |
| 2006 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.01000 | 0.02790 | 0.06970 | 0.12580 | 0.16230 | 0.11050 |
| | 0.08070 | 0.09960 | 0.06260 | 0.05750 | 0.04300 | 0.03870 | 0.02420 | 0.01850 | 0.01420 | 0.00400 | 0.00610 | 0.04480 | | | | | |
| 2007 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.00550 | 0.04220 | 0.08850 | 0.21320 | 0.17980 | 0.09900 |
| | 0.08900 | 0.05930 | 0.06730 | 0.01670 | 0.03050 | 0.01160 | 0.02800 | 0.02520 | 0.00850 | 0.01100 | 0.00280 | 0.02220 | | | | | |
| 2008 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00310 | 0.03200 | 0.09270 | 0.09520 | 0.15950 | 0.16070 | 0.13640 |
| | 0.08250 | 0.07820 | 0.02690 | 0.03670 | 0.00560 | 0.01210 | 0.01450 | 0.00870 | 0.00870 | 0.00660 | 0.00000 | 0.03970 | | | | | |
| 2009 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.00700 | 0.04900 | 0.11080 | 0.10560 | 0.07930 | 0.07220 |
| | 0.17830 | 0.10730 | 0.07340 | 0.03480 | 0.02510 | 0.04700 | 0.02230 | 0.01450 | 0.01130 | 0.00420 | 0.00720 | 0.05090 | | | | | |
| 2010 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 84 | 0.00000 | 0.00000 | 0.00000 | 0.09410 | 0.24710 | 0.28240 | 0.18820 | 0.05880 | 0.01180 |
| | 0.04710 | 0.00000 | 0.02350 | 0.01180 | 0.00000 | 0.01180 | 0.00000 | 0.00000 | 0.01180 | 0.00000 | 0.00000 | 0.01180 | | | | | |
| 2011 | 1 | 4 | 0 | 2 | 2 | -1 | -1 | 14 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.21430 | 0.28570 | 0.21430 | 0.14290 | 0.07140 |
| | 0.07140 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -2008 | 1 | 4 | 0 | 1 | 2 | -1 | -1 | 7 | 0.00000 | 0.00335 | 0.10426 | 0.44043 | 0.30561 | 0.10879 | 0.02976 | 0.00663 | 0.00104 |
| | 0.00012 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -2010 | 1 | 4 | 0 | 1 | 2 | -1 | -1 | 6 | 0.00000 | 0.00090 | 0.14171 | 0.18468 | 0.15822 | 0.14357 | 0.12084 | 0.08101 | 0.04443 |
| | 0.02937 | 0.02220 | 0.01600 | 0.01406 | 0.01138 | 0.00746 | 0.00635 | 0.00586 | 0.00307 | 0.00194 | 0.00097 | 0.00598 | | | | | |
| 1991 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.07580 | 0.50960 | 0.38810 | 0.01700 | 0.00930 | 0.00020 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1992 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.10540 | 0.47530 | 0.28210 | 0.11590 | 0.01370 | 0.00610 | 0.00000 | 0.00150 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1993 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00440 | 0.53000 | 0.30890 | 0.11600 | 0.03150 | 0.00250 | 0.00590 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00070 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1994 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00700 | 0.27540 | 0.45550 | 0.16410 | 0.06120 | 0.03090 | 0.00410 | 0.00000 |
| | 0.00180 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1995 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.01900 | 0.39860 | 0.25270 | 0.20220 | 0.07150 | 0.03120 | 0.01220 | 0.00170 |
| | 0.00600 | 0.00330 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00170 | | | | | |
| 1996 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 101 | 0.00000 | 0.01460 | 0.19650 | 0.58110 | 0.12380 | 0.03360 | 0.00280 | 0.03080 | 0.00000 |
| | 0.01120 | 0.00560 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1997 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 56 | 0.00000 | 0.00000 | 0.77030 | 0.15140 | 0.05060 | 0.01340 | 0.01430 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1998 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00250 | 0.21660 | 0.57370 | 0.16560 | 0.03180 | 0.00860 | 0.00030 | 0.00080 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1999 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.04760 | 0.47450 | 0.42570 | 0.03920 | 0.01180 | 0.00110 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00010 | | | | | |
| 2000 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.06990 | 0.57200 | 0.28710 | 0.06240 | 0.00520 | 0.00310 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00020 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2001 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.26380 | 0.40660 | 0.23560 | 0.08400 | 0.00400 | 0.00530 | 0.00000 |
| | 0.00070 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2002 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.08840 | 0.55460 | 0.23780 | 0.07240 | 0.02730 | 0.01460 | 0.00330 |
| | 0.00030 | 0.00050 | 0.00010 | 0.00010 | 0.00050 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00020 | | | | | |
| 2003 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00080 | 0.16170 | 0.46500 | 0.28290 | 0.04880 | 0.02120 | 0.01300 | 0.00380 |
| | 0.00080 | 0.00030 | 0.00000 | 0.00010 | 0.00000 | 0.00040 | 0.00020 | 0.00000 | 0.00020 | 0.00000 | 0.00000 | 0.00070 | | | | | |
| 2004 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00160 | 0.14340 | 0.41500 | 0.27710 | 0.11400 | 0.02210 | 0.01380 | 0.00680 |
| | 0.00220 | 0.00060 | 0.00070 | 0.00110 | 0.00030 | 0.00000 | 0.00040 | 0.00000 | 0.00000 | 0.00010 | 0.00000 | 0.00080 | | | | | |
| 2005 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.18350 | 0.53400 | 0.16070 | 0.07840 | 0.03180 | 0.00500 | 0.00300 |
| | 0.00080 | 0.00120 | 0.00040 | 0.00000 | 0.00010 | 0.00060 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00030 | | | | | |
| 2006 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00110 | 0.15710 | 0.52100 | 0.21220 | 0.05560 | 0.03230 | 0.01510 | 0.00260 |
| | 0.00120 | 0.00040 | 0.00040 | 0.00020 | 0.00040 | 0.00000 | 0.00020 | 0.00010 | 0.00000 | 0.00000 | 0.00010 | 0.00020 | | | | | |
| 2007 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.14750 | 0.63020 | 0.18170 | 0.02390 | 0.00710 | 0.00570 | 0.00280 |
| | 0.00000 | 0.00020 | 0.00040 | 0.00000 | 0.00060 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2008 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.16870 | 0.50690 | 0.25260 | 0.05830 | 0.01350 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2009 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00660 | 0.30460 | 0.38780 | 0.23280 | 0.04770 | 0.01420 | 0.00360 |
| | 0.00290 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2010 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00430 | 0.16460 | 0.45940 | 0.21930 | 0.10420 | 0.03030 | 0.01210 |
| | 0.00460 | 0.00060 | 0.00070 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2011 | 1 | 5 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00100 | 0.03160 | 0.24120 | 0.39050 | 0.22320 | 0.07070 | 0.03150 |
| | 0.00830 | 0.00210 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1991 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00690 | 0.66640 | 0.28940 | 0.03500 | 0.00230 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1992 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.34710 | 0.53110 | 0.08010 | 0.02130 | 0.01200 | 0.00840 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1993 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00690 | 0.79800 | 0.17890 | 0.00900 | 0.00720 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1994 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1995 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1996 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1997 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1998 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.05270 | 0.17160 | 0.50890 | 0.18740 | 0.04620 | 0.01810 | 0.00860 | 0.00600 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00040 | | | | | |
| 1999 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 119 | 0.00000 | 0.00000 | 0.02680 | 0.31430 | 0.50420 | 0.09500 | 0.04560 | 0.01400 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2000 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 2 | 0.00000 | 0.00000 | 0.00000 | 1.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -2001 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2002 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.02640 | 0.22440 | 0.44680 | 0.19710 | 0.06810 | 0.01490 | 0.01120 | 0.00660 |
| | 0.00210 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00240 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2003 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.07270 | 0.33400 | 0.27380 | 0.14160 | 0.08560 | 0.04600 | 0.01920 |
| | 0.01390 | 0.00260 | 0.00000 | 0.00400 | 0.00320 | 0.00180 | 0.00120 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00040 | | | | | |
| 2004 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.01200 | 0.27970 | 0.50480 | 0.13780 | 0.04150 | 0.01270 | 0.00380 | 0.00280 |
| | 0.00000 | 0.00080 | 0.00000 | 0.00000 | 0.00000 | 0.00110 | 0.00000 | 0.00100 | 0.00000 | 0.00000 | 0.00000 | 0.00220 | | | | | |
| 2005 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00900 | 0.14900 | 0.42200 | 0.18990 | 0.10570 | 0.05880 | 0.02880 | 0.02050 |
| | 0.00380 | 0.00240 | 0.00140 | 0.00430 | 0.00070 | 0.00140 | 0.00000 | 0.00000 | 0.00000 | 0.00100 | 0.00130 | 0.00000 | | | | | |
| 2006 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00130 | 0.12910 | 0.53160 | 0.21430 | 0.05520 | 0.03480 | 0.01440 | 0.01030 |
| | 0.00200 | 0.00270 | 0.00070 | 0.00120 | 0.00000 | 0.00000 | 0.00000 | 0.00070 | 0.00000 | 0.00000 | 0.00070 | 0.00100 | | | | | |
| 2007 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.09970 | 0.59900 | 0.23080 | 0.03410 | 0.01480 | 0.01000 | 0.00400 |
| | 0.00340 | 0.00150 | 0.00070 | 0.00160 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00040 | | | | | |
| 2008 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.05170 | 0.36880 | 0.44840 | 0.10610 | 0.01650 | 0.00120 | 0.00360 |
| | 0.00060 | 0.00000 | 0.00320 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2009 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.01760 | 0.20300 | 0.43200 | 0.26080 | 0.06540 | 0.00360 | 0.00830 |
| | 0.00180 | 0.00000 | 0.00360 | 0.00000 | 0.00000 | 0.00000 | 0.00080 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00320 | | | | | |
| 2010 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 49 | 0.00000 | 0.00000 | 0.00000 | 0.17200 | 0.35100 | 0.30880 | 0.16820 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2011 | 1 | 6 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.04300 | 0.35620 | 0.30200 | 0.21330 | 0.07180 | 0.00510 |
| | 0.00620 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00240 | | | | | |
| 1991 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.82340 | 0.15360 | 0.02300 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1992 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 78 | 0.00000 | 0.00000 | 0.37660 | 0.49720 | 0.06540 | 0.02460 | 0.03070 | 0.00550 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1993 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.51830 | 0.36360 | 0.10050 | 0.01080 | 0.00680 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1994 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.06050 | 0.30830 | 0.47060 | 0.11330 | 0.02990 | 0.01370 | 0.00190 | 0.00190 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1995 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 12 | 0.00000 | 0.05870 | 0.44890 | 0.16290 | 0.32200 | 0.00000 | 0.00000 | 0.00760 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1996 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 117 | 0.00000 | 0.00680 | 0.37740 | 0.53350 | 0.04860 | 0.03170 | 0.00000 | 0.00200 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1997 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 97 | 0.00000 | 0.00000 | 0.84440 | 0.11930 | 0.03010 | 0.00630 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1998 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.12990 | 0.71360 | 0.13550 | 0.01420 | 0.00310 | 0.00160 | 0.00170 |
| | 0.00030 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1999 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.03450 | 0.54510 | 0.36030 | 0.04820 | 0.00560 | 0.00380 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00240 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2000 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 141 | 0.00000 | 0.00000 | 0.16400 | 0.52860 | 0.25430 | 0.04910 | 0.00000 | 0.00410 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2001 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00480 | 0.41820 | 0.26140 | 0.24000 | 0.05280 | 0.01240 | 0.00570 | 0.00000 |
| | 0.00470 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2002 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.10260 | 0.75910 | 0.06730 | 0.04670 | 0.01730 | 0.00620 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00080 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2003 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 73 | 0.00000 | 0.00000 | 0.26380 | 0.47950 | 0.24410 | 0.00000 | 0.00680 | 0.00100 | 0.00390 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00100 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2004 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 67 | 0.00000 | 0.00000 | 0.06900 | 0.44880 | 0.25050 | 0.16700 | 0.02480 | 0.02790 | 0.01190 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2005 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 100 | 0.00000 | 0.00000 | 0.12140 | 0.60790 | 0.18570 | 0.05810 | 0.02360 | 0.00340 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2006 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 188 | 0.00000 | 0.00100 | 0.27130 | 0.40320 | 0.24650 | 0.06870 | 0.00460 | 0.00240 | 0.00090 |
| | 0.00140 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2007 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.10620 | 0.63450 | 0.22010 | 0.01920 | 0.00760 | 0.00130 | 0.00710 |
| | 0.00200 | 0.00200 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2008 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 135 | 0.00000 | 0.00000 | 0.01920 | 0.72750 | 0.20960 | 0.04370 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2009 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00850 | 0.48900 | 0.31180 | 0.13680 | 0.04470 | 0.00660 | 0.00270 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2010 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00980 | 0.27030 | 0.45610 | 0.17250 | 0.06030 | 0.02390 | 0.00710 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2011 | 1 | 7 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.18440 | 0.37660 | 0.29780 | 0.11900 | 0.01520 | 0.00700 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2005 | 1 | 7 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.08562 | 0.46375 | 0.36916 | 0.06762 | 0.01126 | 0.00199 | 0.00043 | 0.00011 |
| | 0.00003 | 0.00001 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2006 | 1 | 7 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.10412 | 0.47613 | 0.35058 | 0.05775 | 0.00868 | 0.00162 | 0.00048 | 0.00020 |
| | 0.00012 | 0.00007 | 0.00004 | 0.00004 | 0.00004 | 0.00003 | 0.00001 | 0.00001 | 0.00000 | 0.00001 | 0.00001 | 0.00006 | | | | | |
| 2007 | 1 | 7 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.06505 | 0.45446 | 0.38980 | 0.07557 | 0.01232 | 0.00216 | 0.00047 | 0.00011 |
| | 0.00003 | 0.00001 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2009 | 1 | 7 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.02170 | 0.31418 | 0.39974 | 0.16356 | 0.06108 | 0.02506 | 0.00935 | 0.00288 |
| | 0.00120 | 0.00044 | 0.00027 | 0.00017 | 0.00011 | 0.00006 | 0.00004 | 0.00002 | 0.00002 | 0.00002 | 0.00000 | 0.00006 | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2010 | 1 | 7 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.01767 | 0.24806 | 0.35730 | 0.20705 | 0.10092 | 0.04286 | 0.01676 | 0.00524 |
| | 0.00212 | 0.00071 | 0.00050 | 0.00029 | 0.00020 | 0.00009 | 0.00007 | 0.00002 | 0.00002 | 0.00002 | 0.00000 | 0.00008 | | | | | |
| 2011 | 1 | 7 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.00673 | 0.14961 | 0.37620 | 0.27334 | 0.12158 | 0.04647 | 0.01652 | 0.00504 |
| | 0.00210 | 0.00077 | 0.00046 | 0.00030 | 0.00027 | 0.00014 | 0.00008 | 0.00006 | 0.00003 | 0.00004 | 0.00002 | 0.00025 | | | | | |
| 1991 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 102 | 0.00000 | 0.00000 | 0.44730 | 0.41600 | 0.07670 | 0.04520 | 0.00800 | 0.00480 | 0.00200 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1992 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 26 | 0.00000 | 0.00000 | 0.13350 | 0.84770 | 0.00260 | 0.00790 | 0.00370 | 0.00380 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00080 | | | | | |
| 1993 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00380 | 0.26410 | 0.40400 | 0.26800 | 0.04470 | 0.01040 | 0.00290 | 0.00220 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1994 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.01130 | 0.42840 | 0.38880 | 0.11700 | 0.04310 | 0.00870 | 0.00090 | 0.00180 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1995 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 10 | 0.00000 | 0.00000 | 0.76400 | 0.23600 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1996 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1997 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 0 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1998 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.06620 | 0.42950 | 0.29940 | 0.12750 | 0.04530 | 0.01590 | 0.00800 |
| | 0.00260 | 0.00000 | 0.00120 | 0.00000 | 0.00000 | 0.00000 | 0.00030 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00440 | | | | | |
| 1999 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.02680 | 0.34720 | 0.36880 | 0.12180 | 0.08180 | 0.01910 | 0.01070 |
| | 0.00280 | 0.01070 | 0.00000 | 0.00150 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00890 | | | | | |
| 2000 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.23680 | 0.55170 | 0.13230 | 0.04040 | 0.02550 | 0.00780 | 0.00240 |
| | 0.00000 | 0.00080 | 0.00000 | 0.00070 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00050 | 0.00030 | 0.00000 | 0.00070 | | | | | |
| 2001 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 74 | 0.00000 | 0.00000 | 0.36670 | 0.28100 | 0.11920 | 0.10240 | 0.03900 | 0.06870 | 0.01400 |
| | 0.00450 | 0.00060 | 0.00280 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00100 | | | | | |
| 2002 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.04450 | 0.12660 | 0.51080 | 0.16910 | 0.08210 | 0.02960 | 0.03070 | 0.00000 |
| | 0.00380 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00200 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00090 | | | | | |
| 2003 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 140 | 0.00000 | 0.00000 | 0.23860 | 0.34650 | 0.23270 | 0.13260 | 0.03490 | 0.00000 | 0.01070 |
| | 0.00410 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2004 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 165 | 0.00000 | 0.00000 | 0.30360 | 0.27210 | 0.20010 | 0.12540 | 0.04670 | 0.01600 | 0.00370 |
| | 0.02610 | 0.00000 | 0.00250 | 0.00000 | 0.00000 | 0.00000 | 0.00370 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2005 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.30610 | 0.38560 | 0.11820 | 0.08550 | 0.07530 | 0.00980 | 0.00450 |
| | 0.00350 | 0.00000 | 0.00310 | 0.00850 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2006 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.14420 | 0.54680 | 0.22880 | 0.01890 | 0.01180 | 0.03060 | 0.01660 |
| | 0.00230 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2007 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 69 | 0.00000 | 0.00000 | 0.01990 | 0.55470 | 0.38670 | 0.03590 | 0.00270 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2008 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 133 | 0.00000 | 0.00000 | 0.00000 | 0.18830 | 0.55950 | 0.17750 | 0.06230 | 0.01230 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2009 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.11150 | 0.39490 | 0.34770 | 0.09860 | 0.01000 | 0.00440 |
| | 0.00520 | 0.01010 | 0.00450 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00360 | 0.00000 | 0.00000 | 0.00000 | 0.00950 | | | | | |
| 2010 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.10080 | 0.25760 | 0.36960 | 0.18740 | 0.05110 | 0.02400 |
| | 0.00750 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00190 | | | | | |
| 2011 | 1 | 8 | 0 | 2 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00230 | 0.06140 | 0.21000 | 0.31330 | 0.25920 | 0.12420 | 0.02090 |
| | 0.00700 | 0.00000 | 0.00170 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2007 | 1 | 9 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.00329 | 0.06930 | 0.33213 | 0.36446 | 0.15571 | 0.04931 | 0.01613 | 0.00492 |
| | 0.00191 | 0.00080 | 0.00047 | 0.00032 | 0.00027 | 0.00018 | 0.00008 | 0.00007 | 0.00005 | 0.00003 | 0.00005 | 0.00052 | | | | | |
| 2008 | 1 | 9 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.00117 | 0.07696 | 0.28802 | 0.34322 | 0.19126 | 0.06465 | 0.02018 | 0.00612 |
| | 0.00281 | 0.00123 | 0.00077 | 0.00060 | 0.00053 | 0.00041 | 0.00014 | 0.00013 | 0.00014 | 0.00002 | 0.00015 | 0.00149 | | | | | |
| 2009 | 1 | 9 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.00241 | 0.09181 | 0.28107 | 0.31363 | 0.19134 | 0.07447 | 0.02624 | 0.00902 |
| | 0.00415 | 0.00205 | 0.00106 | 0.00067 | 0.00047 | 0.00035 | 0.00015 | 0.00018 | 0.00018 | 0.00017 | 0.00001 | 0.00054 | | | | | |
| 2010 | 1 | 9 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00001 | 0.01267 | 0.28254 | 0.35550 | 0.17050 | 0.08834 | 0.04861 | 0.02565 | 0.00884 |
| | 0.00357 | 0.00113 | 0.00101 | 0.00067 | 0.00041 | 0.00020 | 0.00018 | 0.00002 | 0.00001 | 0.00001 | 0.00000 | 0.00014 | | | | | |
| 2011 | 1 | 9 | 0 | 1 | 2 | -1 | -1 | 200 | 0.00000 | 0.00147 | 0.03684 | 0.17567 | 0.33449 | 0.26217 | 0.12167 | 0.04411 | 0.01311 |
| | 0.00557 | 0.00184 | 0.00114 | 0.00065 | 0.00049 | 0.00022 | 0.00015 | 0.00007 | 0.00006 | 0.00006 | 0.00000 | 0.00021 | | | | | |
| 2007 | 1 | 10 | 0 | 1 | 2 | -1 | -1 | 11 | 0.00000 | 0.00277 | 0.09002 | 0.40073 | 0.31407 | 0.13385 | 0.04253 | 0.01236 | 0.00258 |
| | 0.00061 | 0.00028 | 0.00019 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2009 | 1 | 10 | 0 | 1 | 2 | -1 | -1 | 24 | 0.00000 | 0.00039 | 0.01077 | 0.09367 | 0.19996 | 0.21738 | 0.16450 | 0.09582 | 0.04889 |
| | 0.03134 | 0.02246 | 0.01467 | 0.01254 | 0.01016 | 0.00938 | 0.00883 | 0.00676 | 0.00369 | 0.00474 | 0.00269 | 0.04136 | | | | | |
| 2010 | 1 | 10 | 0 | 1 | 2 | -1 | -1 | 93 | 0.00000 | 0.00142 | 0.04620 | 0.25766 | 0.29161 | 0.18718 | 0.09589 | 0.04552 | 0.02051 |
| | 0.01206 | 0.00767 | 0.00515 | 0.00390 | 0.00327 | 0.00304 | 0.00318 | 0.00181 | 0.00131 | 0.00151 | 0.00079 | 0.01031 | | | | | |
| 2011 | 1 | 10 | 0 | 1 | 2 | -1 | -1 | 68 | 0.00000 | 0.00027 | 0.00706 | 0.05896 | 0.11818 | 0.14884 | 0.15293 | 0.11654 | 0.07832 |
| | 0.05673 | 0.04483 | 0.03374 | 0.03083 | 0.02362 | 0.02077 | 0.01891 | 0.01510 | 0.00804 | 0.00812 | 0.00471 | 0.05350 | | | | | |
| -1991 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.64706 | 0.30588 | 0.03529 | 0.01176 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1992 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.04847 | 0.33345 | 0.33348 | 0.23238 | 0.02727 | 0.02157 | 0.00054 | 0.00285 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -1993 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00251 | 0.44399 | 0.34077 | 0.14426 | 0.04812 | 0.00526 | 0.01509 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1994 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00916 | 0.26416 | 0.41488 | 0.18394 | 0.08105 | 0.03925 | 0.00499 | 0.00013 |
| | 0.00243 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1995 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.02431 | 0.27263 | 0.22170 | 0.26799 | 0.11184 | 0.05326 | 0.02431 | 0.00266 |
| | 0.01065 | 0.00533 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00533 | | | | | |
| -1996 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.01927 | 0.25483 | 0.53159 | 0.10699 | 0.02089 | 0.00943 | 0.02870 | 0.00000 |
| | 0.00943 | 0.01886 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1997 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.73213 | 0.11041 | 0.08846 | 0.01799 | 0.05100 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1998 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00081 | 0.00244 | 0.23878 | 0.61671 | 0.12015 | 0.01503 | 0.00407 | 0.00100 | 0.00100 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1999 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.03069 | 0.47396 | 0.44627 | 0.03588 | 0.01100 | 0.00147 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00073 | | | | | |
| -2000 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.08136 | 0.59251 | 0.26080 | 0.05628 | 0.00362 | 0.00181 | 0.00000 |
| | 0.00000 | 0.00181 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00181 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -2001 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00053 | 0.32186 | 0.42377 | 0.19356 | 0.05186 | 0.00271 | 0.00298 | 0.00000 |
| | 0.00271 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -2002 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00321 | 0.08391 | 0.52179 | 0.23009 | 0.08951 | 0.03960 | 0.02282 | 0.00518 |
| | 0.00043 | 0.00086 | 0.00043 | 0.00043 | 0.00130 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00043 | | | | | |
| -2003 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00072 | 0.16528 | 0.45808 | 0.28289 | 0.04678 | 0.02348 | 0.01367 | 0.00545 |
| | 0.00086 | 0.00029 | 0.00000 | 0.00108 | 0.00000 | 0.00029 | 0.00014 | 0.00000 | 0.00014 | 0.00000 | 0.00000 | 0.00086 | | | | | |
| -2004 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00165 | 0.13197 | 0.40516 | 0.27735 | 0.12191 | 0.02636 | 0.01833 | 0.00855 |
| | 0.00283 | 0.00094 | 0.00118 | 0.00142 | 0.00047 | 0.00000 | 0.00047 | 0.00000 | 0.00000 | 0.00024 | 0.00000 | 0.00118 | | | | | |
| -2005 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.18279 | 0.53235 | 0.16080 | 0.07804 | 0.03224 | 0.00577 | 0.00356 |
| | 0.00125 | 0.00125 | 0.00053 | 0.00000 | 0.00018 | 0.00089 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00036 | | | | | |
| -2006 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00283 | 0.14940 | 0.50540 | 0.22122 | 0.05870 | 0.03527 | 0.01900 | 0.00308 |
| | 0.00157 | 0.00051 | 0.00051 | 0.00051 | 0.00051 | 0.00025 | 0.00025 | 0.00025 | 0.00000 | 0.00000 | 0.00051 | 0.00025 | | | | | |
| -2007 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.09648 | 0.60144 | 0.23053 | 0.03684 | 0.01130 | 0.01130 | 0.00685 |
| | 0.00027 | 0.00185 | 0.00158 | 0.00000 | 0.00158 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -2008 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.16204 | 0.52824 | 0.24616 | 0.05266 | 0.01090 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -2009 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00158 | 0.00547 | 0.30249 | 0.39557 | 0.21723 | 0.05402 | 0.01541 | 0.00504 |
| | 0.00317 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -2010 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.00441 | 0.16408 | 0.47254 | 0.21643 | 0.09783 | 0.02875 | 0.01092 |
| | 0.00378 | 0.00063 | 0.00063 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -2011 | 1 | 11 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.00097 | 0.06375 | 0.24498 | 0.38012 | 0.21835 | 0.06187 | 0.02221 |
| | 0.00581 | 0.00097 | 0.00097 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1991 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1992 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.25341 | 0.56087 | 0.05122 | 0.05506 | 0.02887 | 0.02887 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.02172 | | | | | |
| -1993 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00672 | 0.51788 | 0.27461 | 0.15779 | 0.03266 | 0.00574 | 0.00230 | 0.00230 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1994 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00515 | 0.27062 | 0.32732 | 0.25773 | 0.10825 | 0.02577 | 0.00258 | 0.00258 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1995 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.60000 | 0.40000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1996 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1997 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -1998 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00491 | 0.08162 | 0.41201 | 0.29265 | 0.12521 | 0.04797 | 0.02176 | 0.00866 |
| | 0.00199 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00322 | | | | | |
| -1999 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.01504 | 0.31458 | 0.46654 | 0.12514 | 0.06279 | 0.00501 | 0.00545 |
| | 0.00545 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -2000 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.05409 | 0.75150 | 0.06593 | 0.04733 | 0.04902 | 0.01690 | 0.00507 |
| | 0.00000 | 0.00338 | 0.00000 | 0.00169 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00169 | 0.00169 | 0.00000 | 0.00169 | | | | | |
| -2001 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.13699 | 0.20548 | 0.20548 | 0.10959 | 0.09589 | 0.15068 | 0.01370 |
| | 0.01370 | 0.01370 | 0.02740 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.02740 | | | | | |
| -2002 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.03978 | 0.18243 | 0.44155 | 0.17292 | 0.07882 | 0.03027 | 0.03583 | 0.00225 |
| | 0.00706 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00631 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00278 | | | | | |
| -2003 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.18692 | 0.31491 | 0.24057 | 0.13200 | 0.06178 | 0.01916 | 0.02652 |
| | 0.01090 | 0.00104 | 0.00000 | 0.00207 | 0.00155 | 0.00104 | 0.00104 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00052 | | | | | |
| -2004 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00686 | 0.26955 | 0.38157 | 0.17144 | 0.09875 | 0.03146 | 0.01328 | 0.00996 |
| | 0.00838 | 0.00053 | 0.00279 | 0.00000 | 0.00000 | 0.00053 | 0.00279 | 0.00053 | 0.00000 | 0.00000 | 0.00000 | 0.00158 | | | | | |
| -2005 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00357 | 0.16333 | 0.42610 | 0.17039 | 0.10807 | 0.07129 | 0.02428 | 0.01506 |
| | 0.00384 | 0.00204 | 0.00283 | 0.00616 | 0.00051 | 0.00102 | 0.00000 | 0.00000 | 0.00000 | 0.00051 | 0.00102 | 0.00000 | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -2006 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00105 | 0.12048 | 0.54283 | 0.22824 | 0.04507 | 0.02873 | 0.01335 | 0.01073 |
| | 0.00323 | 0.00262 | 0.00052 | 0.00052 | 0.00000 | 0.00000 | 0.00000 | 0.00052 | 0.00000 | 0.00000 | 0.00105 | 0.00105 | | | | | |
| -2007 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.07437 | 0.55370 | 0.28839 | 0.04610 | 0.01736 | 0.00972 | 0.00324 |
| | 0.00324 | 0.00130 | 0.00065 | 0.00130 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00065 | | | | | |
| -2008 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.01326 | 0.29586 | 0.53322 | 0.12856 | 0.02072 | 0.00396 | 0.00110 |
| | 0.00110 | 0.00000 | 0.00221 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| -2009 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.00742 | 0.13294 | 0.40825 | 0.33212 | 0.08717 | 0.00724 | 0.00765 |
| | 0.00468 | 0.00256 | 0.00382 | 0.00000 | 0.00000 | 0.00000 | 0.00148 | 0.00085 | 0.00000 | 0.00000 | 0.00000 | 0.00382 | | | | | |
| -2010 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.00000 | 0.08175 | 0.30265 | 0.36626 | 0.19608 | 0.03106 | 0.01627 |
| | 0.00444 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00148 | | | | | |
| -2011 | 1 | 12 | 0 | 1 | 2 | -1 | -1 | 20 | 0.00000 | 0.00000 | 0.00130 | 0.03529 | 0.17873 | 0.33789 | 0.30960 | 0.11464 | 0.01255 |
| | 0.00665 | 0.00000 | 0.00065 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00270 | | | | | |
| 1992 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 50 | 0.87620 | 0.12380 | 0.00010 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1993 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 50 | 0.83370 | 0.16590 | 0.00040 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1994 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 50 | 0.53270 | 0.45570 | 0.01160 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1995 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 50 | 0.79220 | 0.20770 | 0.00010 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1996 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 50 | 0.82170 | 0.17810 | 0.00020 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1997 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 1 | 0.74104 | 0.25702 | 0.00195 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1998 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 1 | 0.93543 | 0.05793 | 0.00663 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1999 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 88 | 0.89501 | 0.09449 | 0.01050 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2000 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.57539 | 0.41119 | 0.01338 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2001 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.65289 | 0.34095 | 0.00617 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2002 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.95645 | 0.02634 | 0.01721 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2003 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.78377 | 0.18146 | 0.03477 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2004 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.89318 | 0.09473 | 0.01210 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2005 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.60592 | 0.36878 | 0.02530 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2006 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.95100 | 0.04533 | 0.00359 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2007 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.87154 | 0.08646 | 0.04193 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2008 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.84018 | 0.11695 | 0.04287 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2009 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.96814 | 0.02643 | 0.00552 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2010 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.53115 | 0.45819 | 0.01056 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2011 | 1 | 13 | 0 | 1 | 2 | -1 | -1 | 200 | 0.75106 | 0.22872 | 0.02022 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1992 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 50 | 0.83290 | 0.15950 | 0.00760 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1993 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 50 | 0.76100 | 0.23890 | 0.00010 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1994 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 50 | 0.57360 | 0.42600 | 0.00040 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1995 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 50 | 0.79690 | 0.20290 | 0.00020 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1996 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 50 | 0.85530 | 0.14470 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1997 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.81204 | 0.18742 | 0.00054 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1998 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.91873 | 0.07693 | 0.00425 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1999 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.89357 | 0.10208 | 0.00429 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.78995 | 0.20209 | 0.00798 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2001 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.64356 | 0.33567 | 0.02083 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2002 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.77877 | 0.19625 | 0.02498 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2003 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.77165 | 0.20639 | 0.02195 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2004 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.43975 | 0.55015 | 0.01010 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2005 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.48291 | 0.49598 | 0.02111 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2006 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.80686 | 0.18362 | 0.00953 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2007 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.72176 | 0.25095 | 0.02729 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2008 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.61280 | 0.34238 | 0.04490 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2009 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.87985 | 0.10080 | 0.01934 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2010 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.72841 | 0.25796 | 0.01359 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2011 | 1 | 14 | 0 | 1 | 2 | -1 | -1 | 200 | 0.66636 | 0.31182 | 0.02175 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2008 | 1 | 15 | 0 | 0 | 2 | -1 | -1 | 21 | 0.00000 | 0.04752 | 0.35414 | 0.33010 | 0.14922 | 0.06647 | 0.02024 | 0.00872 | 0.00447 |
| | 0.00343 | 0.00260 | 0.00177 | 0.00156 | 0.00086 | 0.00136 | 0.00030 | 0.00036 | 0.00088 | 0.00019 | 0.00052 | 0.00529 | | | | | |
| 2009 | 1 | 15 | 0 | 0 | 2 | -1 | -1 | 21 | 0.00001 | 0.01046 | 0.16332 | 0.35078 | 0.25883 | 0.14291 | 0.05358 | 0.01446 | 0.00358 |
| | 0.00139 | 0.00042 | 0.00012 | 0.00006 | 0.00009 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2010 | 1 | 15 | 0 | 0 | 2 | -1 | -1 | 72 | 0.00000 | 0.00373 | 0.07195 | 0.21032 | 0.31283 | 0.20824 | 0.09955 | 0.04829 | 0.01888 |
| | 0.00928 | 0.00448 | 0.00283 | 0.00227 | 0.00190 | 0.00118 | 0.00062 | 0.00056 | 0.00024 | 0.00032 | 0.00016 | 0.00234 | | | | | |
| 2011 | 1 | 15 | 0 | 0 | 2 | -1 | -1 | 144 | 0.00001 | 0.00558 | 0.09909 | 0.26204 | 0.29818 | 0.18416 | 0.08708 | 0.03220 | 0.01034 |
| | 0.00541 | 0.00235 | 0.00131 | 0.00145 | 0.00145 | 0.00092 | 0.00116 | 0.00070 | 0.00031 | 0.00025 | 0.00051 | 0.00551 | | | | | |
| 2008 | 1 | 16 | 0 | 0 | 2 | -1 | -1 | 24 | 0.00227 | 0.15418 | 0.32341 | 0.22592 | 0.13209 | 0.07239 | 0.03710 | 0.01803 | 0.01084 |
| | 0.00708 | 0.00506 | 0.00305 | 0.00259 | 0.00181 | 0.00140 | 0.00102 | 0.00044 | 0.00040 | 0.00012 | 0.00080 | 0.00000 | | | | | |
| 2009 | 1 | 16 | 0 | 0 | 2 | -1 | -1 | 22 | 0.00293 | 0.25894 | 0.29875 | 0.14674 | 0.08898 | 0.06186 | 0.03894 | 0.02335 | 0.01551 |
| | 0.01164 | 0.01002 | 0.00800 | 0.00498 | 0.00528 | 0.00587 | 0.00388 | 0.00220 | 0.00196 | 0.00108 | 0.00909 | 0.00000 | | | | | |
| 2010 | 1 | 16 | 0 | 0 | 2 | -1 | -1 | 71 | 0.00278 | 0.19218 | 0.35062 | 0.22809 | 0.11101 | 0.05128 | 0.02315 | 0.01140 | 0.00699 |
| | 0.00476 | 0.00387 | 0.00273 | 0.00183 | 0.00184 | 0.00192 | 0.00122 | 0.00067 | 0.00064 | 0.00032 | 0.00271 | 0.00000 | | | | | |
| 2011 | 1 | 16 | 0 | 0 | 2 | -1 | -1 | 57 | 0.00234 | 0.10354 | 0.32772 | 0.26941 | 0.13947 | 0.06893 | 0.03316 | 0.01654 | 0.01057 |
| | 0.00723 | 0.00521 | 0.00398 | 0.00330 | 0.00234 | 0.00182 | 0.00150 | 0.00072 | 0.00059 | 0.00029 | 0.00133 | 0.00000 | | | | | |
| 1987 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 23 | 0.00000 | 1.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1988 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 48 | 0.00000 | 0.58333 | 0.41667 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1989 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 96 | 0.28125 | 0.56250 | 0.15625 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1990 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 89 | 0.04494 | 0.95506 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1991 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 98 | 0.01020 | 0.80612 | 0.18367 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1992 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 84 | 0.00000 | 0.96429 | 0.03571 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1993 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 20 | 0.05000 | 0.85000 | 0.10000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1994 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 48 | 0.00000 | 0.79167 | 0.20833 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1995 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 40 | 0.02500 | 0.60000 | 0.37500 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1996 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 59 | 0.00000 | 0.91525 | 0.08475 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1997 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 32 | 0.03125 | 0.93750 | 0.03125 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1998 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 10 | 0.00000 | 0.80000 | 0.20000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1999 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 14 | 0.07143 | 0.35714 | 0.57143 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2000 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 83 | 0.01205 | 0.95181 | 0.03614 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2001 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 11 | 0.00000 | 0.54545 | 0.45455 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2002 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 29 | 0.03448 | 0.51724 | 0.44828 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2003 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 42 | 0.02381 | 0.88095 | 0.09524 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2004 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 37 | 0.05405 | 0.86486 | 0.08108 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2005 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 59 | 0.03390 | 0.86441 | 0.10169 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2006 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 20 | 0.05000 | 0.70000 | 0.25000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2007 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 167 | 0.02994 | 0.91018 | 0.05988 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2008 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 200 | 0.00802 | 0.69519 | 0.29679 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2009 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 98 | 0.02041 | 0.60204 | 0.37755 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2010 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 112 | 0.17857 | 0.52679 | 0.29464 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2011 | 1 | 19 | 0 | 0 | 2 | -1 | -1 | 76 | 0.00000 | 0.71053 | 0.28947 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1987 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 199 | 0.00000 | 0.84422 | 0.15578 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1988 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 137 | 0.00730 | 0.91971 | 0.07299 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1989 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 88 | 0.04545 | 0.88636 | 0.06818 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1990 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.00146 | 0.96793 | 0.03061 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1991 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.04110 | 0.79726 | 0.16164 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1992 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.01200 | 0.90800 | 0.08000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1993 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.01136 | 0.94034 | 0.04830 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1994 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.00789 | 0.92702 | 0.06509 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1995 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.10280 | 0.78505 | 0.11215 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1996 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.02170 | 0.87145 | 0.10684 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1997 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.01064 | 0.86383 | 0.12553 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1998 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.00798 | 0.88298 | 0.10904 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1999 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.15976 | 0.70710 | 0.13314 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2000 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.32021 | 0.62842 | 0.05137 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2001 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 161 | 0.24845 | 0.67081 | 0.08075 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2002 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.10470 | 0.75000 | 0.14530 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2003 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.01230 | 0.93852 | 0.04918 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2004 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.00000 | 0.97175 | 0.02825 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2005 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.05206 | 0.88330 | 0.06463 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2006 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.14209 | 0.76259 | 0.09532 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2007 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.02951 | 0.89508 | 0.07541 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2008 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.09862 | 0.75087 | 0.15052 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2009 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.10969 | 0.82908 | 0.06122 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2010 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.00000 | 0.89560 | 0.10440 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2011 | 1 | 20 | 0 | 0 | 2 | -1 | -1 | 200 | 0.00745 | 0.90559 | 0.08696 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1987 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 14 | 0.07143 | 0.92857 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1988 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 47 | 0.97872 | 0.00000 | 0.02128 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1989 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.92549 | 0.06667 | 0.00784 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1990 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.81882 | 0.15331 | 0.02787 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1991 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.89806 | 0.09466 | 0.00728 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1992 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 25 | 0.84000 | 0.16000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1993 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.91051 | 0.01946 | 0.07004 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1994 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 167 | 0.59880 | 0.22156 | 0.17964 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1995 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 173 | 0.99422 | 0.00578 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1996 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.73500 | 0.15500 | 0.11000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1997 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 183 | 0.87432 | 0.07650 | 0.04918 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1998 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 58 | 0.81034 | 0.13793 | 0.05172 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1999 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 144 | 0.88194 | 0.09028 | 0.02778 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2000 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.84868 | 0.06250 | 0.08882 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2001 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 66 | 0.78788 | 0.09091 | 0.12121 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2002 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 165 | 0.89697 | 0.04242 | 0.06061 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2003 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.92506 | 0.06718 | 0.00775 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2004 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.89604 | 0.09406 | 0.00990 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2005 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.72642 | 0.23113 | 0.04245 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2006 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.90855 | 0.06163 | 0.02982 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2007 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.97436 | 0.02564 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2008 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 176 | 0.35795 | 0.32955 | 0.31250 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2009 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 200 | 0.91789 | 0.03519 | 0.04692 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2010 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 172 | 0.66860 | 0.24419 | 0.08721 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 2011 | 1 | 21 | 0 | 0 | 2 | -1 | -1 | 76 | 0.56579 | 0.17105 | 0.26316 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1987 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 150 | 0.71333 | 0.26667 | 0.02000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1988 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.72174 | 0.25652 | 0.02174 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1989 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.90865 | 0.07917 | 0.01218 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1990 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.74521 | 0.23467 | 0.02011 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1991 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.91746 | 0.07012 | 0.01242 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1992 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.69852 | 0.28007 | 0.02142 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |
| 1993 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.73905 | 0.22298 | 0.03797 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1994 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.78377 | 0.18829 | 0.02794 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 1995 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.88325 | 0.08698 | 0.02977 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 1996 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.77026 | 0.21322 | 0.01652 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 1997 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.89253 | 0.09002 | 0.01745 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 1998 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.89577 | 0.09288 | 0.01135 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 1999 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.94367 | 0.04762 | 0.00871 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2000 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.89746 | 0.08585 | 0.01669 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2001 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.83887 | 0.12532 | 0.03581 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2002 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.91552 | 0.07438 | 0.01010 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2003 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.93784 | 0.05541 | 0.00676 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2004 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.89183 | 0.09756 | 0.01060 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2005 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.80809 | 0.17662 | 0.01529 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2006 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.91409 | 0.06631 | 0.01959 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2007 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.92457 | 0.07037 | 0.00505 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2008 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.67985 | 0.26712 | 0.05304 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2009 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.97829 | 0.01676 | 0.00494 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2010 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.82593 | 0.16702 | 0.00705 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2011 | 1 | 22 | 0 | 0 | 2 | -1 | -1 | 200 | 0.84113 | 0.12825 | 0.03062 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 1999 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 12 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.33333 | 0.33333 | 0.16667 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.16667 | 0.00000 | | | | | | |
| 2000 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 2 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 1.00000 | 0.00000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2001 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 8 | 0.00000 | 0.00000 | 0.00000 | 0.25000 | 0.25000 | 0.00000 | 0.25000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.25000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2002 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 182 | 0.00000 | 0.01099 | 0.00000 | 0.06593 | 0.07692 | 0.17582 | 0.09890 | 0.05495 | 0.04396 |
| | 0.03297 | 0.05495 | 0.02198 | 0.09890 | 0.06593 | 0.01099 | 0.00000 | 0.01099 | 0.00000 | 0.00000 | 0.01099 | 0.16484 | | | | | | |
| 2003 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 32 | 0.00000 | 0.00000 | 0.00000 | 0.06250 | 0.50000 | 0.00000 | 0.00000 | 0.06250 | 0.06250 |
| | 0.12500 | 0.00000 | 0.06250 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.12500 | | | | | | |
| 2004 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 44 | 0.00000 | 0.00000 | 0.04545 | 0.00000 | 0.13636 | 0.18182 | 0.13636 | 0.04545 | 0.09091 |
| | 0.13636 | 0.00000 | 0.00000 | 0.04545 | 0.00000 | 0.00000 | 0.04545 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.13636 | | | | | | |
| 2005 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 6 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.33333 | 0.66667 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2006 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 4 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.50000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.50000 | | | | | | |
| 2007 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 10 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.60000 | 0.40000 | 0.00000 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2009 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 16 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.25000 | 0.37500 | 0.37500 | 0.00000 |
| | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2010 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 36 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.38889 | 0.27778 | 0.22222 | 0.00000 | 0.00000 |
| | 0.05556 | 0.00000 | 0.00000 | 0.00000 | 0.05556 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | | | | | | |
| 2011 | 1 | 24 | 0 | 0 | 2 | -1 | -1 | 200 | 0.00000 | 0.00000 | 0.00000 | 0.01176 | 0.14706 | 0.24706 | 0.25294 | 0.20588 | 0.05294 |
| | 0.02941 | 0.00000 | 0.00588 | 0.00588 | 0.00000 | 0.01765 | 0.00000 | 0.00000 | 0.00588 | 0.00588 | 0.00000 | 0.01176 | | | | | | |
| 2000 | 1 | 23 | 0 | 0 | 2 | -1 | -1 | 170 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.01176 | 0.03529 | 0.04706 | 0.15294 | 0.16471 |
| | 0.11765 | 0.08235 | 0.02353 | 0.07059 | 0.01176 | 0.07059 | 0.09412 | 0.01176 | 0.02353 | 0.01176 | 0.01176 | 0.05882 | | | | | | |
| 2001 | 1 | 23 | 0 | 0 | 2 | -1 | -1 | 168 | 0.00000 | 0.00000 | 0.00000 | 0.01190 | 0.00000 | 0.00000 | 0.07143 | 0.10714 | 0.08333 |
| | 0.10714 | 0.05952 | 0.05952 | 0.08333 | 0.08333 | 0.04762 | 0.08333 | 0.02381 | 0.00000 | 0.01190 | 0.02381 | 0.14286 | | | | | | |
| 2002 | 1 | 23 | 0 | 0 | 2 | -1 | -1 | 150 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.02667 | 0.02667 | 0.02667 | 0.06667 | 0.04000 |
| | 0.09333 | 0.05333 | 0.09333 | 0.06667 | 0.02667 | 0.05333 | 0.02667 | 0.02667 | 0.06667 | 0.04000 | 0.00000 | 0.26667 | | | | | | |
| 2003 | 1 | 23 | 0 | 0 | 2 | -1 | -1 | 122 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.08197 | 0.04918 | 0.06557 | 0.09836 | 0.06557 |
| | 0.01639 | 0.06557 | 0.09836 | 0.08197 | 0.06557 | 0.06557 | 0.06557 | 0.03279 | 0.00000 | 0.01639 | 0.00000 | 0.13115 | | | | | | |

```
2004	1	23	0	0	2	-1	-1	100	0.00000	0.00000	0.00000	0.00000	0.02000	0.16000	0.10000	0.16000	0.18000
	0.08000	0.02000	0.00000	0.04000	0.06000	0.02000	0.02000	0.04000	0.00000	0.02000	0.02000	0.06000
2006	1	23	0	0	2	-1	-1	62	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.06452	0.06452
	0.09677	0.06452	0.00000	0.03226	0.03226	0.00000	0.22581	0.00000	0.06452	0.06452	0.03226	0.25806
2007	1	23	0	0	2	-1	-1	84	0.00000	0.00000	0.00000	0.02381	0.02381	0.00000	0.16667	0.11905	0.14286
	0.02381	0.00000	0.07143	0.02381	0.07143	0.07143	0.09524	0.00000	0.00000	0.02381	0.04762	0.09524
2008	1	23	0	0	2	-1	-1	20	0.00000	0.00000	0.00000	0.00000	0.20000	0.00000	0.30000	0.10000	0.20000
	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.10000	0.00000	0.00000	0.00000	0.10000
2009	1	23	0	0	2	-1	-1	136	0.00000	0.00000	0.00000	0.01471	0.01471	0.19118	0.08824	0.04412	0.05882
	0.07353	0.07353	0.01471	0.05882	0.04412	0.02941	0.02941	0.04412	0.00000	0.01471	0.02941	0.17647
2010	1	23	0	0	2	-1	-1	66	0.00000	0.00000	0.00000	0.00000	0.12121	0.24242	0.27273	0.09091	0.03030
	0.03030	0.03030	0.00000	0.06061	0.00000	0.00000	0.00000	0.06061	0.00000	0.00000	0.00000	0.06061
2011	1	23	0	0	2	-1	-1	200	0.00000	0.00000	0.00174	0.00521	0.03299	0.11806	0.19271	0.21528	0.08160
	0.06424	0.03472	0.04167	0.01736	0.02431	0.01042	0.01736	0.00868	0.01736	0.01389	0.01215	0.09028
2007	1	25	0	0	2	-1	-1	32	0.00000	0.15023	0.44842	0.32701	0.05856	0.01087	0.00339	0.00108	0.00027
	0.00011	0.00002	0.00002	0.00001	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2008	1	25	0	0	2	-1	-1	8	0.00000	0.19501	0.46845	0.27231	0.04283	0.01358	0.00546	0.00168	0.00042
	0.00017	0.00004	0.00002	0.00001	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2009	1	25	0	0	2	-1	-1	94	0.00000	0.12132	0.47615	0.32482	0.05150	0.01292	0.00709	0.00357	0.00129
	0.00058	0.00024	0.00017	0.00011	0.00007	0.00005	0.00003	0.00002	0.00002	0.00002	0.00000	0.00005
2010	1	25	0	0	2	-1	-1	127	0.00000	0.11109	0.44544	0.35061	0.07525	0.01398	0.00285	0.00059	0.00013
	0.00003	0.00002	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2011	1	25	0	0	2	-1	-1	151	0.00001	0.05783	0.33367	0.38069	0.14824	0.05029	0.01518	0.00417	0.00198
	0.00173	0.00110	0.00058	0.00077	0.00091	0.00053	0.00023	0.00030	0.00000	0.00008	0.00015	0.00158
2012	1	25	0	0	2	-1	-1	44	0.00001	0.07947	0.33316	0.34555	0.14563	0.05639	0.02114	0.00857	0.00317
	0.00165	0.00095	0.00061	0.00050	0.00026	0.00035	0.00025	0.00016	0.00025	0.00010	0.00015	0.00169
#


0	#_N_MeanSize-at-Age_obs


#


1	#_N_environ_variables


140	#_N_environ_obs
#_year	variable	value
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1873	1	1
1874	1	1
1875	1	1
1876	1	1
1877	1	1
1878	1	1
1879	1	1
1880	1	1
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1889	1	1
1890	1	1
1891	1	1
1892	1	1
1893	1	1
1894	1	1
1895	1	1
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| 1898 | 1 | 1 |
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| 1900 | 1 | 1 |
| 1901 | 1 | 1 |
| 1902 | 1 | 1 |
| 1903 | 1 | 1 |
| 1904 | 1 | 1 |
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| 1956 | 1 | 1 |
| 1957 | 1 | 1 |
| 1958 | 1 | 1 |
| 1959 | 1 | 1 |
| 1960 | 1 | 1 |
| 1961 | 1 | 1 |
| 1962 | 1 | 1 |
| 1963 | 1 | 1 |

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2005      1         0
2006      1         0
2007      1         0
2008      1         0
2009      1         0
2010      1         0
2011      1         0
#
0         # N sizefreq methods to read
#
0         # no tag data
#
0         # no morph composition data
#
999       # end of file marker
```

## Appendix B: Stock Synthesis Control File

```
#V3.24f
#_data_and_control_files: data.ss // control.ss
#_SS-V3.24f-safe;_08/03/2012;_Stock_Synthesis_by_Richard_Methot_(NOAA)_using_ADMB_10.1
1  #_N_Growth_Patterns
1 #_N_Morphs_Within_GrowthPattern
#_Cond 1 #_Morph_between/within_stdev_ratio (no read if N_morphs=1)
#_Cond  1 #vector_Morphdist_(-1_in_first_val_gives_normal_approx)
#
2  #  N recruitment designs goes here if N_GP*nseas*area>1
0  #  placeholder for recruitment interaction request
1 1 1  #_recruitment design element for GP=1, seas=1, area=1
1 1 2  #_recruitment design element for GP=1, seas=1, area=2
#
0 # N_movement_definitions goes here if N_areas > 1
#_Cond 1.0 # first age that moves (real age at begin of season, not integer) also cond on do_migration>0
#_Cond 1 1 1 2 4 10 # example move definition for seas=1, morph=1, source=1 dest=2, age1=4, age2=10
#
4 #_Nblock_Patterns
4 4 1 1 #_blocks_per_pattern
# begin and end years of blocks
1985 1993 1994 1994 1995 2006 2007 2011
1985 1993 1994 1994 1995 1999 2000 2011
2007 2011
2008 2011
#
0.5 #_fracfemale
3 #_natM_type:_0=1Parm; 1=N_breakpoints;_2=Lorenzen;_3=agespecific;_4=agespec_withseasinterpolate
#3 #_reference age for Lorenzen function
#_Age_natmort_by gender x growthpattern
1.000   1.600   0.695   0.170   0.140   0.122   0.110   0.103   0.097   0.093   0.090   0.087   0.085   0.084   0.083   0.082   0.081   0.080
        0.080   0.079   0.079
#0.725 0.522773 0.431125 0.38 0.348236 0.327179 0.312616 0.30225 0.294718 0.289164 0.285023 0.278818
#0.341 0.506661 0.425543 0.38 0.351759 0.333168 0.320444 0.311505 0.305108 0.300469 0.297074 0.292321
#0.495 0.62 0.43 0.37 0.35 0.34 0.33 0.325 0.321 0.32 0.32 0.32
1 # GrowthModel: 1=vonBert with L1&L2; 2=Richards with L1&L2; 3=age_speciific_K; 4=not implemented
0.75 #_Growth_Age_for_L1
999 #_Growth_Age_for_L2 (999 to use as Linf)
0 #_SD_add_to_LAA (set to 0.1 for SS2 V1.x compatibility)
0 #_CV_Growth_Pattern:  0 CV=f(LAA); 1 CV=F(A); 2 SD=F(LAA); 3 SD=F(A); 4 logSD=F(A)
4 #_maturity_option:  1=length logistic; 2=age logistic; 3=read age-maturity matrix by growth_pattern; 4=read age-fecundity; 5=read fec and wt from
wtatage.ss
0       0       350000   2620000  9070000  20300000 34710000 49950000 64270000 76760000 87150000 95530000 102150000        107300000        111270000
        114300000        116610000        118360000        119680000        120670000        123234591
2 #_First_Mature_Age
3 #_fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b; (4)eggs=a+b*L; (5)eggs=a+b*W
0 #_hermaphroditism option:  0=none; 1=age-specific fxn
1 #_parameter_offset_approach (1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)
2 #_env/block/dev_adjust_method (1=standard; 2=logistic transform keeps in base parm bounds; 3=standard w/ no bound check)
#
# Prior types (-1 = none, 0=normal, 1=symmetric beta, 2=full beta, 3=lognormal)
#_growth_parms
#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
# 0.2 0.5 0.38 0.4 0 1 -3 0 0 0 0 0 0 0 # NatM_p_1_Fem_GP_1
7       21      9.96    9.96    -1      1       -3      0       0       0       0       0       0       0       # L_at_Amin_Fem_GP_1
70      100     85.64   85.64   -1      1       -3      0       0       0       0       0       0       0       # L_at_Amax_Fem_GP_1
```

```
0.05     0.8      0.1919   0.1919   -1       1        -3       0        0        0        0        0        0        0        # VonBert_K_Fem_GP_1
0.01     0.5      0.1735   0.1735   -1       1        -5       0        0        0        0        0        0        0        # CV_young_Fem_GP_1
0.01     0.5      0.0715   0.0715   -1       1        -5       0        0        0        0        0        0        0        # CV_old_Fem_GP_1
0        1        0.00001673        0.00001673        -1       1        -3       0        0        0        0        0        0        0        # Wtlen_1_Fem
0        4        2.953    2.953    -1       1        -3       0        0        0        0        0        0        0        # Wtlen_2_Fem
50       1000     999      999      -1       1        -3       0        0        0        0        0        0        0        # Mat50%_Fem
-1       1000     999      999      -1       1        -3       0        0        0        0        0        0        0        # Mat_slope_Fem
0        1000     999      999      -1       1        -3       0        0        0        0        0        0        0        # Eggs/kg_inter_Fem
0        1000     999      999      -1       1        -3       0        0        0        0        0        0        0        # Eggs/kg_slope_wt_Fem
0        0        0        0        -1       0        -4       0        0        0        0        0        0        0        # RecrDist_GP_1
-4       4        -0.8     -0.8     -1       1        4        0        2        1972     2011     0.1      0        0        # RecrDist_Area1
-4       4        0        0        -1       1        -4       0        0        0        0        0        0        0        # RecrDist_Area2
0        0        0        0        -1       0        -4       0        0        0        0        0        0        0        # RecrDist_Seas_1
0        0        1        1        -1       0        -4       0        0        0        0        0        0        0        # CohortGrowDev
#
#_Cond 0  #custom_MG-env_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no MG-environ parameters
#
#_Cond 0  #custom_MG-block_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no MG-block parameters
#_Cond No MG parm trends
#
#_seasonal_effects_on_biology_parms
 0 0 0 0 0 0 0 0 0 0 #_femwtlen1,femwtlen2,mat1,mat2,fec1,fec2,Malewtlen1,malewtlen2,L1,K
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no seasonal MG parameters
#
5 #_MGparm_Dev_Phase
#
#_Spawner-Recruitment
3 #_SR_function: 2=Ricker; 3=std_B-H; 4=SCAA; 5=Hockey; 6=B-H_flattop; 7=survival_3Parm
#_LO HI INIT PRIOR PR_type SD PHASE
 1       20       11.8     11.8     -1       1        1        # SR_LN(R0)
 0.2     1        0.99     0.99     -1       1        -4       # SR_BH_steep
 0       2        0.3      0.3      -1       1        -4       # SR_sigmaR
 -5      5        0        0        -1       1        3        # SR_envlink
 -5      5        0        0        -1       1        -4       # SR_R1_offset
 0       0        0        0        -1       0        -99      # SR_autocorr
1 #_SR_env_link
2 #_SR_env_target_0=none;1=devs;_2=R0;_3=steepness
1 #do_recdev:  0=none; 1=devvector; 2=simple deviations
1899 # first year of main recr_devs; early devs can preceed this era
2011 # last year of main recr_devs; forecast devs start in following year
4 #_recdev phase
1 # (0/1) to read 13 advanced options
0 #_recdev_early_start (0=none; neg value makes relative to recdev_start)
-5 #_recdev_early_phase
-5 #_forecast_recruitment phase (incl. late recr) (0 value resets to maxphase+1)
1 #_lambda for Fcast_recr_like occurring before endyr+1
1984 #_last_early_yr_nobias_adj_in_MPD
1990 #_first_yr_fullbias_adj_in_MPD
2005 #_last_yr_fullbias_adj_in_MPD
2011 #_first_recent_yr_nobias_adj_in_MPD
1 #_max_bias_adj_in_MPD (-1 to override ramp and set biasadj=1.0 for all estimated recdevs)
0 #_period of cycles in recruitment (N parms read below)
-5 #min rec_dev
5 #max rec_dev
0 #_read_recdevs
#_end of advanced SR options
#
```

```
#Fishing Mortality info
0.3 # F ballpark for tuning early phases
-2001 # F ballpark year (neg value to disable)
2 # F_Method:  1=Pope; 2=instan. F; 3=hybrid (hybrid is recommended)
2.9 # max F or harvest rate, depends on F_Method
# no additional F input needed for Fmethod 1
# if Fmethod=2; read overall start F value; overall phase; N detailed inputs to read
# 5 # if Fmethod=3; read N iterations for tuning for Fmethod 3
0.05 1 14 # overall start F value; overall phase; N detailed inputs to read
#Fleet Year Seas F_value se phase (for detailed setup of F_Method=2)
1       1872    1       0.05    0.05    1
2       1880    1       0.05    0.05    1
3       1980    1       0.05    0.05    1
4       1976    1       0.05    0.05    1
5       1950    1       0.05    0.05    1
6       1950    1       0.05    0.05    1
7       1950    1       0.05    0.05    1
8       1950    1       0.05    0.05    1
9       1991    1       0.05    0.05    1
10      1991    1       0.05    0.05    1
11      1997    1       0.05    0.05    1
12      1997    1       0.05    0.05    1
13      1950    1       0.05    0.05    1
14      1946    1       0.05    0.05    1
#
#_initial_F_parms
#_LO HI INIT PRIOR PR_type SD PHASE
0       1       0       0.01    0       99      -1      #_HLE
0       1       0       0.01    0       99      -1      #_HL_W
0       1       0       0.01    0       99      -1      #_LL_E
0       1       0       0.01    0       99      -1      #_LL_W
0       1       0       0.01    0       99      -1      #_MRIP_E
0       1       0       0.01    0       99      -1      #_MRIP_W
0       1       0       0.01    0       99      -1      #_HBT_E
0       1       0       0.01    0       99      -1      #_HBT_W
0       1       0       0.01    0       99      -1      #_C_Clsd_E
0       1       0       0.01    0       99      -1      #_C_Clsd_W
0       1       0       0.01    0       99      -1      #_R_Clsd_E
0       1       0       0.01    0       99      -1      #_R_Clsd_W
0       1       0       0.01    0       99      -1      #_Shr_E
0       1       0       0.01    0       99      -1      #_Shr_W
#
#_Q_setup
# Q_type options:  <0=mirror, 0=float_nobiasadj, 1=float_biasadj, 2=parm_nobiasadj, 3=parm_w_random_dev, 4=parm_w_randwalk,
5=mean_unbiased_float_assign_to_parm
#_for_env-var:_enter_index_of_the_env-var_to_be_linked
#_Den-dep  env-var  extra_se  Q_type
0       0       0       0       #_HLE
0       0       0       0       #_HL_W
0       0       0       0       #_LL_E
0       0       0       0       #_LL_W
0       0       0       0       #_MRIP_E
0       0       0       0       #_MRIP_W
0       0       0       0       #_HBT_E
0       0       0       0       #_HBT_W
0       0       0       0       #_C_Clsd_E
0       0       0       0       #_C_Clsd_W
0       0       0       0       #_R_Clsd_E
0       0       0       0       #_R_Clsd_W
```

```
0	0	0	2	#_Shr_E
0	0	0	2	#_Shr_W
0	0	0	0	#_Video_E
0	0	0	0	#_Video_W
0	0	0	0	#_Larv_E
0	0	0	0	#_Larv_W
0	0	0	0	#_Sum_E
0	0	0	0	#_Sum_W
0	0	0	0	#_Fall_E
0	0	0	0	#_Fall_W
0	0	0	0	#_BLL_W
0	0	0	0	#_BLL_E
0	0	0	0	#_ROV_E
0	0	0	0	#_MRIP_Index_E
0	0	0	0	#_MRIP_Index_W
0	0	0	0	#_HBT_Index_E
0	0	0	0	#_HBT_Index_W
#
#_Cond 0 #_If q has random component, then 0=read one parm for each fleet with random q; 1=read a parm for each year of index
#_Q_parms(if_any)
# LO HI INIT PRIOR PR_type SD PHASE
 -10	20	1	1	-1	1	1	#_Shr_E
 -10	20	1	1	-1	1	1	#_Shr_W
#
#_size_selex_types
#discard_options:_0=none;_1=define_retention;_2=retention&mortality;_3=all_discarded_dead
#_Pattern Discard Male Special
0	2	0	0	#_HLE
0	2	0	0	#_HL_W
0	2	0	0	#_LL_E
0	2	0	0	#_LL_W
0	2	0	0	#_MRIP_E
0	2	0	0	#_MRIP_W
0	2	0	0	#_HBT_E
0	2	0	0	#_HBT_W
0	2	0	0	#_C_Clsd_E
0	2	0	0	#_C_Clsd_W
0	2	0	0	#_R_Clsd_E
0	2	0	0	#_R_Clsd_W
0	3	0	0	#_Shr_E
0	3	0	0	#_Shr_W
0	0	0	0	#_Video_E
0	0	0	0	#_Video_W
30	0	0	0	#_Larv_E
30	0	0	0	#_Larv_W
0	0	0	0	#_Sum_E
0	0	0	0	#_Sum_W
0	0	0	0	#_Fall_E
0	0	0	0	#_Fall_W
0	0	0	0	#_BLL_W
0	0	0	0	#_BLL_E
0	0	0	0	#_ROV_E
0	0	0	0	#_MRIP_Index_E
0	0	0	0	#_MRIP_Index_W
0	0	0	0	#_HBT_Index_E
0	0	0	0	#_HBT_Index_W
#
#_age_selex_types
#_Pattern ___ Male Special
```

```
17      0       0       0       #_HLE
17      0       0       0       #_HL_W
17      0       0       0       #_LL_E
17      0       0       0       #_LL_W
17      0       0       0       #_MRIP_E
17      0       0       0       #_MRIP_W
17      0       0       0       #_HBT_E
17      0       0       0       #_HBT_W
17      0       0       0       #_C_Clsd_E
17      0       0       0       #_C_Clsd_W
15      0       0       5       #_R_Clsd_E
15      0       0       6       #_R_Clsd_W
17      0       0       0       #_Shr_E
17      0       0       0       #_Shr_W
17      0       0       0       #_Video_E
17      0       0       0       #_Video_W
10      0       0       0       #_Larv_E
10      0       0       0       #_Larv_W
17      0       0       0       #_Sum_E
17      0       0       0       #_Sum_W
17      0       0       0       #_Fall_E
17      0       0       0       #_Fall_W
12      0       0       0       #_BLL_W
15      0       0       23      #_BLL_E
17      0       0       0       #_ROV_E
15      0       0       5       #_MRIP_Index_E
15      0       0       6       #_MRIP_Index_W
15      0       0       7       #_HBT_Index_E
15      0       0       8       #_HBT_Index_W
#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
10      100     15.24   15.24   -1      1       -3      0       0       0       0       0       1       2       #_Retain_1P_HL_E
-1      20      1       1       -1      1       -3      0       0       0       0       0       1       2       #_Retain_2P_HL_E
0       1       1       1       -1      1       -2      0       0       0       0       0       1       2       #_Retain_3P_HL_E
-1      2       0       0       -1      1       -4      0       0       0       0       0       0       0       #_Retain_4P_HL_E
-10     10      -5      -5      -1      1       -2      0       0       0       0       0       0       0       #_DiscMort_1P_HL_E
-1      2       1       1       -1      1       -4      0       0       0       0       0       0       0       #_DiscMort_2P_HL_E
-1      2       0.75    0.75    -1      1       -2      0       0       0       0       0       4       2       #_DiscMort_3P_HL_E
-1      2       0       0       -1      1       -4      0       0       0       0       0       0       0       #_DiscMort_4P_HL_E
10      100     15.24   15.24   -1      1       -3      0       0       0       0       0       1       2       #_Retain_1P_HL_W
-1      20      1       1       -1      1       -3      0       0       0       0       0       1       2       #_Retain_2P_HL_W
0       1       1       1       -1      1       -2      0       0       0       0       0       1       2       #_Retain_3P_HL_W
-1      2       0       0       -1      1       -4      0       0       0       0       0       0       0       #_Retain_4P_HL_W
-10     10      -5      -5      -1      1       -2      0       0       0       0       0       0       0       #_DiscMort_1P_HL_W
-1      2       1       1       -1      1       -4      0       0       0       0       0       0       0       #_DiscMort_2P_HL_W
-1      2       0.78    0.78    -1      1       -2      0       0       0       0       0       4       2       #_DiscMort_3P_HL_W
-1      2       0       0       -1      1       -4      0       0       0       0       0       0       0       #_DiscMort_4P_HL_W
10      100     15.24   15.24   -1      1       -3      0       0       0       0       0       1       2       #_Retain_1P_LL_E
-1      20      1       1       -1      1       -3      0       0       0       0       0       1       2       #_Retain_2P_LL_E
0       1       1       1       -1      1       -2      0       0       0       0       0       1       2       #_Retain_3P_LL_E
-1      2       0       0       -1      1       -4      0       0       0       0       0       0       0       #_Retain_4P_LL_E
-10     10      -5      -5      -1      1       -2      0       0       0       0       0       0       0       #_DiscMort_1P_LL_E
-1      2       1       1       -1      1       -4      0       0       0       0       0       0       0       #_DiscMort_2P_LL_E
-1      2       0.81    0.81    -1      1       -2      0       0       0       0       0       4       2       #_DiscMort_3P_LL_E
-1      2       0       0       -1      1       -4      0       0       0       0       0       0       0       #_DiscMort_4P_LL_E
10      100     15.24   15.24   -1      1       -3      0       0       0       0       0       1       2       #_Retain_1P_LL_W
-1      20      1       1       -1      1       -3      0       0       0       0       0       1       2       #_Retain_2P_LL_W
0       1       1       1       -1      1       -2      0       0       0       0       0       1       2       #_Retain_3P_LL_W
-1      2       0       0       -1      1       -4      0       0       0       0       0       0       0       #_Retain_4P_LL_W
-10     10      -5      -5      -1      1       -2      0       0       0       0       0       0       0       #_DiscMort_1P_LL_W
```

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -1 | 2 | 1 | 1 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_2P_LL_W |
| -1 | 2 | 0.91 | 0.91 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_DiscMort_3P_LL_W |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_4P_LL_W |
| 10 | 100 | 15.24 | 15.24 | -1 | 1 | -3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | #_Retain_1P_MRIP_E |
| -1 | 20 | 1 | 1 | -1 | 1 | -3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | #_Retain_2P_MRIP_E |
| 0 | 1 | 1 | 1 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_3P_MRIP_E |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_4P_MRIP_E |
| -10 | 10 | -5 | -5 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_1P_MRIP_E |
| -1 | 2 | 1 | 1 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_2P_MRIP_E |
| -1 | 2 | 0.21 | 0.21 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_DiscMort_3P_MRIP_E |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_4P_MRIP_E |
| 10 | 100 | 15.24 | 15.24 | -1 | 1 | -3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | #_Retain_1P_MRIP_W |
| -1 | 20 | 1 | 1 | -1 | 1 | -3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | #_Retain_2P_MRIP_W |
| 0 | 1 | 1 | 1 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_3P_MRIP_W |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_4P_MRIP_W |
| -10 | 10 | -5 | -5 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_1P_MRIP_W |
| -1 | 2 | 1 | 1 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_2P_MRIP_W |
| -1 | 2 | 0.22 | 0.22 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_DiscMort_3P_MRIP_W |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_4P_MRIP_W |
| 10 | 100 | 15.24 | 15.24 | -1 | 1 | -3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | #_Retain_1P_HBT_E |
| -1 | 20 | 1 | 1 | -1 | 1 | -3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | #_Retain_2P_HBT_E |
| 0 | 1 | 1 | 1 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | #_Retain_3P_HBT_E |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_4P_HBT_E |
| -10 | 10 | -5 | -5 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_1P_HBT_E |
| -1 | 2 | 1 | 1 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_2P_HBT_E |
| -1 | 2 | 0.21 | 0.21 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_DiscMort_3P_HBT_E |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_4P_HBT_E |
| 10 | 100 | 15.24 | 15.24 | -1 | 1 | -3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | #_Retain_1P_HBT_W |
| -1 | 20 | 1 | 1 | -1 | 1 | -3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | #_Retain_2P_HBT_W |
| 0 | 1 | 1 | 1 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_3P_HBT_W |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_4P_HBT_W |
| -10 | 10 | -5 | -5 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_1P_HBT_W |
| -1 | 2 | 1 | 1 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_2P_HBT_W |
| -1 | 2 | 0.22 | 0.22 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_DiscMort_3P_HBT_W |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_4P_HBT_W |
| 10 | 100 | 10 | 10 | -1 | 1 | -3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_1P_C_Clsd_E |
| -1 | 20 | 1 | 1 | -1 | 1 | -3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_2P_C_Clsd_E |
| 0 | 1 | 0 | 0 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_3P_C_Clsd_E |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_4P_C_Clsd_E |
| -10 | 10 | -5 | -5 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_1P_C_Clsd_E |
| -1 | 2 | 1 | 1 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_2P_C_Clsd_E |
| -1 | 2 | 0.74 | 0.74 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_DiscMort_3P_C_Clsd_E |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_4P_C_Clsd_E |
| 10 | 100 | 10 | 10 | -1 | 1 | -3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_1P_C_Clsd_W |
| -1 | 20 | 1 | 1 | -1 | 1 | -3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_2P_C_Clsd_W |
| 0 | 1 | 0 | 0 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_3P_C_Clsd_W |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_4P_C_Clsd_W |
| -10 | 10 | -5 | -5 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_1P_C_Clsd_W |
| -1 | 2 | 1 | 1 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_2P_C_Clsd_W |
| -1 | 2 | 0.87 | 0.87 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_DiscMort_3P_C_Clsd_W |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_4P_C_Clsd_W |
| 10 | 100 | 10 | 10 | -1 | 1 | -3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_1P_R_Clsd_E |
| -1 | 20 | 1 | 1 | -1 | 1 | -3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_2P_R_Clsd_E |
| 0 | 1 | 0 | 0 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_3P_R_Clsd_E |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_4P_R_Clsd_E |
| -10 | 10 | -5 | -5 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_1P_R_Clsd_E |
| -1 | 2 | 1 | 1 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_2P_R_Clsd_E |
| -1 | 2 | 0.21 | 0.21 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_DiscMort_3P_R_Clsd_E |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_4P_R_Clsd_E |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 100 | 10 | 10 | -1 | 1 | -3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_1P_R_Clsd_W |
| -1 | 20 | 1 | 1 | -1 | 1 | -3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_2P_R_Clsd_W |
| 0 | 1 | 0 | 0 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_3P_R_Clsd_W |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_Retain_4P_R_Clsd_W |
| -10 | 10 | -5 | -5 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_1P_R_Clsd_W |
| -1 | 2 | 1 | 1 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_2P_R_Clsd_W |
| -1 | 2 | 0.22 | 0.22 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_DiscMort_3P_R_Clsd_W |
| -1 | 2 | 0 | 0 | -1 | 1 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_DiscMort_4P_R_Clsd_W |
| -1 | 1 | -1000 | -1000 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P0 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P1 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P2 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P3 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P4 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P5 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P6 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P7 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P8 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P9 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P10 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P11 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P12 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P13 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P14 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P15 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P16 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P17 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P18 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P19 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_E_P20 |
| -1 | 1 | -1000 | -1000 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P0 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P1 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P2 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P3 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P4 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P5 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P6 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P7 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P8 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P9 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P10 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P11 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P12 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P13 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P14 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P15 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P16 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P17 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P18 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P19 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_HL_W_P20 |
| -1 | 1 | -1000 | -1000 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P0 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P1 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P2 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P3 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P4 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P5 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P6 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P7 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P8 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P9 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P10 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P11 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P12 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P13 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P14 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P15 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P16 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P17 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P18 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P19 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_E_P20 |
| -1 | 1 | -1000 | -1000 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P0 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P1 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P2 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P3 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P4 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P5 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P6 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P7 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P8 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P9 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P10 |
| -1 | 1 | 0 | 0 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P11 |
| -1 | 1 | -999 | -999 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P12 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P13 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P14 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P15 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P16 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P17 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P18 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P19 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | #_AgeSel_LL_W_P20 |
| -1 | 1 | -1000 | -1000 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P0 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P1 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P2 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P3 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P4 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P5 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P6 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P7 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P8 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P9 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P10 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P11 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P12 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P13 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P14 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P15 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P16 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P17 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P18 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P19 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_E_P20 |
| -1 | 1 | -1000 | -1000 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P0 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P1 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P2 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P3 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P4 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P5 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P6 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P7 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P8 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P9 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P10 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P11 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P12 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P13 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P14 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P15 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P16 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P17 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P18 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P19 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_MRIP_W_P20 |
| -1 | 1 | -1000 | -1000 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P0 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P1 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P2 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P3 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P4 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P5 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P6 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P7 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P8 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P9 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P10 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P11 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P12 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P13 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P14 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P15 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P16 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P17 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P18 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P19 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_E_P20 |
| -1 | 1 | -1000 | -1000 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P0 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P1 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P2 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P3 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P4 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P5 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P6 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P7 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P8 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P9 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P10 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P11 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P12 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P13 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P14 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P15 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P16 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P17 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P18 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P19 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | #_AgeSel_HBT_W_P20 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P0 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P1 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P2 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P3 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P4 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P5 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P6 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P7 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P8 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P9 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P10 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P11 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P12 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P13 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P14 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P15 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P16 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P17 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P18 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P19 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_E_P20 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P0 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P1 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P2 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P3 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P4 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P5 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P6 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P7 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P8 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P9 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P10 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P11 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P12 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P13 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P14 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P15 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P16 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P17 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P18 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P19 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_C_Clsd_W_P20 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P0 |
| -20 | 20 | -0.1 | -0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P1 |
| -20 | 20 | -0.1 | -0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P2 |
| -30 | 0 | -20 | -20 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P3 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P4 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P5 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P6 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P7 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P8 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P9 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P10 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P11 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P12 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P13 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P14 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P15 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P16 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P17 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P18 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P19 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_E_P20 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P0 |
| -20 | 20 | -0.1 | -0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P1 |
| -20 | 20 | -0.1 | -0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P2 |
| -30 | 0 | -20 | -20 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P3 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P4 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P5 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P6 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P7 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P8 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P9 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P10 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P11 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P12 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P13 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P14 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P15 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P16 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P17 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P18 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P19 |
| -20 | 20 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Shr_W_P20 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P0 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P1 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P2 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P3 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P4 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P5 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P6 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P7 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P8 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P9 |
| -1 | 1 | 0 | 0 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P10 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P11 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P12 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P13 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P14 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P15 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P16 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P17 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P18 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P19 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_E_P20 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_W_P0 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_W_P1 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_W_P2 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_W_P3 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_W_P4 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_W_P5 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_W_P6 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_W_P7 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_W_P8 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_W_P9 |
| -1 | 1 | 0 | 0 | -1 | 1 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_W_P10 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_W_P11 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_W_P12 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | #_AgeSel_Video_W_P13 |

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-1    1    -999  -999  -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Video_W_P14
-1    1    -999  -999  -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Video_W_P15
-1    1    -999  -999  -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Video_W_P16
-1    1    -999  -999  -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Video_W_P17
-1    1    -999  -999  -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Video_W_P18
-1    1    -999  -999  -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Video_W_P19
-1    1    -999  -999  -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Video_W_P20
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P0
-20   20   -0.1  -0.1  -1  1  2   0  0  0  0  0  0  0    #_AgeSel_Sum_E_P1
-20   20   -0.1  -0.1  -1  1  2   0  0  0  0  0  0  0    #_AgeSel_Sum_E_P2
-30   0    -10   -10   -1  1  2   0  0  0  0  0  0  0    #_AgeSel_Sum_E_P3
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P4
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P5
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P6
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P7
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P8
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P9
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P10
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P11
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P12
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P13
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P14
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P15
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P16
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P17
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P18
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P19
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_E_P20
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P0
-20   20   -0.1  -0.1  -1  1  2   0  0  0  0  0  0  0    #_AgeSel_Sum_W_P1
-20   20   -0.1  -0.1  -1  1  2   0  0  0  0  0  0  0    #_AgeSel_Sum_W_P2
-30   0    -10   -10   -1  1  2   0  0  0  0  0  0  0    #_AgeSel_Sum_W_P3
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P4
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P5
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P6
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P7
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P8
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P9
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P10
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P11
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P12
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P13
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P14
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P15
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P16
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P17
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P18
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P19
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Sum_W_P20
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Fall_E_P0
-20   20   -0.1  -0.1  -1  1  2   0  0  0  0  0  0  0    #_AgeSel_Fall_E_P1
-20   20   -0.1  -0.1  -1  1  2   0  0  0  0  0  0  0    #_AgeSel_Fall_E_P2
-30   0    -20   -20   -1  1  2   0  0  0  0  0  0  0    #_AgeSel_Fall_E_P3
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Fall_E_P4
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Fall_E_P5
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Fall_E_P6
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Fall_E_P7
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Fall_E_P8
-20   20   0     0     -1  1  -1  0  0  0  0  0  0  0    #_AgeSel_Fall_E_P9
```

```
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_E_P10
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_E_P11
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_E_P12
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_E_P13
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_E_P14
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_E_P15
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_E_P16
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_E_P17
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_E_P18
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_E_P19
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_E_P20
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P0
-20 20 -0.1 -0.1 -1 1 2 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P1
-20 20 -0.1 -0.1 -1 1 2 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P2
-30 0 -20 -20 -1 1 2 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P3
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P4
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P5
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P6
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P7
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P8
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P9
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P10
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P11
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P12
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P13
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P14
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P15
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P16
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P17
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P18
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P19
-20 20 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_Fall_W_P20
4 18 12 12 -1 1 2 0 0 0 0 0 0 0 #_AgeSel_BLL_W_P1
-1 5 2 2 -1 1 2 0 0 0 0 0 0 0 #_AgeSel_BLL_W_P2
-1 1 0 0 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P0
-1 1 0.1 0.1 -1 1 2 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P1
-1 1 0.1 0.1 -1 1 2 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P2
-1 1 0.1 0.1 -1 1 2 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P3
-1 1 0.1 0.1 -1 1 2 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P4
-1 1 0.1 0.1 -1 1 2 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P5
-1 1 0.1 0.1 -1 1 2 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P6
-1 1 0.1 0.1 -1 1 2 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P7
-1 1 0.1 0.1 -1 1 2 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P8
-1 1 0.1 0.1 -1 1 2 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P9
-1 1 0 0 -1 1 -2 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P10
-1 1 -999 -999 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P11
-1 1 -999 -999 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P12
-1 1 -999 -999 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P13
-1 1 -999 -999 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P14
-1 1 -999 -999 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P15
-1 1 -999 -999 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P16
-1 1 -999 -999 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P17
-1 1 -999 -999 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P18
-1 1 -999 -999 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P19
-1 1 -999 -999 -1 1 -1 0 0 0 0 0 0 0 #_AgeSel_ROV_E_P20
#_Cond 0 #_custom_sel-env_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no enviro fxns
1 #_custom_sel-blk_setup (0/1)
10 100 33.02 33.02 -1 1 -4 #_Retain_1P_HL_E_1985
```

```
10      100     35.56   35.56   -1      1       -4      #_Retain_1P_HL_E_1994
10      100     38.1    38.1    -1      1       -4      #_Retain_1P_HL_E_1995
10      100     33.02   33.02   -1      1       6       #_Retain_1P_HL_E_2007
-1      20      1       1       -1      1       -4      #_Retain_2P_HL_E_1985
-1      20      1       1       -1      1       -4      #_Retain_2P_HL_E_1994
-1      20      1       1       -1      1       -4      #_Retain_2P_HL_E_1995
-1      20      1       1       -1      1       -4      #_Retain_2P_HL_E_2007
0       1       1       1       -1      1       -4      #_Retain_3P_HL_E_1985
0       1       1       1       -1      1       -4      #_Retain_3P_HL_E_1994
0       1       1       1       -1      1       -4      #_Retain_3P_HL_E_1995
0       1       0.5     0.5     -1      1       6       #_Retain_3P_HL_E_2007
-1      2       0.56    0.56    -1      1       -4      #_DiscMort_3P_HL_E_2008
10      100     33.02   33.02   -1      1       -4      #_Retain_1P_HL_W_1985
10      100     35.56   35.56   -1      1       -4      #_Retain_1P_HL_W_1994
10      100     38.1    38.1    -1      1       -4      #_Retain_1P_HL_W_1995
10      100     33.02   33.02   -1      1       6       #_Retain_1P_HL_W_2007
-1      20      1       1       -1      1       -4      #_Retain_2P_HL_W_1985
-1      20      1       1       -1      1       -4      #_Retain_2P_HL_W_1994
-1      20      1       1       -1      1       -4      #_Retain_2P_HL_W_1995
-1      20      1       1       -1      1       -4      #_Retain_2P_HL_W_2007
0       1       1       1       -1      1       -4      #_Retain_3P_HL_W_1985
0       1       1       1       -1      1       -4      #_Retain_3P_HL_W_1994
0       1       1       1       -1      1       -4      #_Retain_3P_HL_W_1995
0       1       0.5     0.5     -1      1       6       #_Retain_3P_HL_W_2007
-1      2       0.6     0.6     -1      1       -4      #_DiscMort_3P_HL_W_2008
10      100     33.02   33.02   -1      1       -4      #_Retain_1P_LL_E_1985
10      100     35.56   35.56   -1      1       -4      #_Retain_1P_LL_E_1994
10      100     38.1    38.1    -1      1       -4      #_Retain_1P_LL_E_1995
10      100     33.02   33.02   -1      1       6       #_Retain_1P_LL_E_2007
-1      20      1       1       -1      1       -4      #_Retain_2P_LL_E_1985
-1      20      1       1       -1      1       -4      #_Retain_2P_LL_E_1994
-1      20      1       1       -1      1       -4      #_Retain_2P_LL_E_1995
-1      20      1       1       -1      1       -4      #_Retain_2P_LL_E_2007
0       1       1       1       -1      1       -4      #_Retain_3P_LL_E_1985
0       1       1       1       -1      1       -4      #_Retain_3P_LL_E_1994
0       1       1       1       -1      1       -4      #_Retain_3P_LL_E_1995
0       1       0.5     0.5     -1      1       6       #_Retain_3P_LL_E_2007
-1      2       0.64    0.64    -1      1       -4      #_DiscMort_3P_LL_E_2008
10      100     33.02   33.02   -1      1       -4      #_Retain_1P_LL_W_1985
10      100     35.56   35.56   -1      1       -4      #_Retain_1P_LL_W_1994
10      100     38.1    38.1    -1      1       -4      #_Retain_1P_LL_W_1995
10      100     33.02   33.02   -1      1       -6      #_Retain_1P_LL_W_2007
-1      20      1       1       -1      1       -4      #_Retain_2P_LL_W_1985
-1      20      1       1       -1      1       -4      #_Retain_2P_LL_W_1994
-1      20      1       1       -1      1       -4      #_Retain_2P_LL_W_1995
-1      20      1       1       -1      1       -4      #_Retain_2P_LL_W_2007
0       1       1       1       -1      1       -4      #_Retain_3P_LL_W_1985
0       1       1       1       -1      1       -4      #_Retain_3P_LL_W_1994
0       1       1       1       -1      1       -4      #_Retain_3P_LL_W_1995
0       1       1       1       -1      1       -6      #_Retain_3P_LL_W_2007
-1      2       0.81    0.81    -1      1       -4      #_DiscMort_3P_LL_W_2008
10      100     33.02   33.02   -1      1       -4      #_Retain_1P_MRIP_E_1985
10      100     35.56   35.56   -1      1       -4      #_Retain_1P_MRIP_E_1994
10      100     38.1    38.1    -1      1       -4      #_Retain_1P_MRIP_E_1995
10      100     40.64   40.64   -1      1       -4      #_Retain_1P_MRIP_E_2000
-1      20      1       1       -1      1       -4      #_Retain_2P_MRIP_E_1985
-1      20      1       1       -1      1       -4      #_Retain_2P_MRIP_E_1994
-1      20      1       1       -1      1       -4      #_Retain_2P_MRIP_E_1995
-1      20      1       1       -1      1       -4      #_Retain_2P_MRIP_E_2000
```

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| -1 | 2 | 0.1 | 0.1 | -1 | 1 | -4 | #_DiscMort_3P_MRIP_E_2008 |
| 10 | 100 | 33.02 | 33.02 | -1 | 1 | -4 | #_Retain_1P_MRIP_W_1985 |
| 10 | 100 | 35.56 | 35.56 | -1 | 1 | -4 | #_Retain_1P_MRIP_W_1994 |
| 10 | 100 | 38.1 | 38.1 | -1 | 1 | -4 | #_Retain_1P_MRIP_W_1995 |
| 10 | 100 | 40.64 | 40.64 | -1 | 1 | -4 | #_Retain_1P_MRIP_W_2000 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_MRIP_W_1985 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_MRIP_W_1994 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_MRIP_W_1995 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_MRIP_W_2000 |
| -1 | 2 | 0.1 | 0.1 | -1 | 1 | -4 | #_DiscMort_3P_MRIP_W_2008 |
| 10 | 100 | 33.02 | 33.02 | -1 | 1 | -4 | #_Retain_1P_HBT_E_1985 |
| 10 | 100 | 35.56 | 35.56 | -1 | 1 | -4 | #_Retain_1P_HBT_E_1994 |
| 10 | 100 | 38.1 | 38.1 | -1 | 1 | -4 | #_Retain_1P_HBT_E_1995 |
| 10 | 100 | 40.64 | 40.64 | -1 | 1 | 6 | #_Retain_1P_HBT_E_2000 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_HBT_E_1985 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_HBT_E_1994 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_HBT_E_1995 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_HBT_E_2000 |
| 0 | 1 | 1 | 1 | -1 | 1 | -4 | #_Retain_3P_HBT_E_1985 |
| 0 | 1 | 1 | 1 | -1 | 1 | -4 | #_Retain_3P_HBT_E_1994 |
| 0 | 1 | 1 | 1 | -1 | 1 | -4 | #_Retain_3P_HBT_E_1995 |
| 0 | 1 | 0.5 | 0.5 | -1 | 1 | 6 | #_Retain_3P_HBT_E_2000 |
| -1 | 2 | 0.1 | 0.1 | -1 | 1 | -4 | #_DiscMort_3P_HBT_E_2008 |
| 10 | 100 | 33.02 | 33.02 | -1 | 1 | -4 | #_Retain_1P_HBT_W_1985 |
| 10 | 100 | 35.56 | 35.56 | -1 | 1 | -4 | #_Retain_1P_HBT_W_1994 |
| 10 | 100 | 38.1 | 38.1 | -1 | 1 | -4 | #_Retain_1P_HBT_W_1995 |
| 10 | 100 | 40.64 | 40.64 | -1 | 1 | -4 | #_Retain_1P_HBT_W_2000 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_HBT_W_1985 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_HBT_W_1994 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_HBT_W_1995 |
| -1 | 20 | 1 | 1 | -1 | 1 | -4 | #_Retain_2P_HBT_W_2000 |
| -1 | 2 | 0.1 | 0.1 | -1 | 1 | -4 | #_DiscMort_3P_HBT_W_2008 |
| -1 | 2 | 0.55 | 0.55 | -1 | 1 | -4 | #_DiscMort_3P_C_Clsd_E_2008 |
| -1 | 2 | 0.74 | 0.74 | -1 | 1 | -4 | #_DiscMort_3P_C_Clsd_W_2008 |
| -1 | 2 | 0.1 | 0.1 | -1 | 1 | -4 | #_DiscMort_3P_R_Clsd_E_2008 |
| -1 | 2 | 0.11 | 0.11 | -1 | 1 | -4 | #_DiscMort_3P_R_Clsd_W_2008 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | #_AgeSel_HL_E_P0_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P1_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P2_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P3_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P4_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P5_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P6_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P7_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P8_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P9_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_E_P10_2008 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | #_AgeSel_HL_E_P11_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P12_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P13_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P14_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P15_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P16_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P17_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P18_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P19_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_E_P20_2008 |
| -1 | 1 | -1000 | -1000 | -1 | 1 | -1 | #_AgeSel_HL_W_P0_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P1_2008 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P2_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P3_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P4_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P5_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P6_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P7_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P8_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P9_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_HL_W_P10_2008 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | #_AgeSel_HL_W_P11_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P12_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P13_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P14_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P15_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P16_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P17_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P18_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P19_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_HL_W_P20_2008 |
| -1 | 1 | -1000 | -1000 | -1 | 1 | -1 | #_AgeSel_LL_E_P0_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P1_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P2_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P3_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P4_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P5_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P6_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P7_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P8_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P9_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_E_P10_2008 |
| -1 | 1 | 0 | 0 | -1 | 1 | -1 | #_AgeSel_LL_E_P11_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P12_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P13_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P14_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P15_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P16_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P17_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P18_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P19_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_E_P20_2008 |
| -1 | 1 | -1000 | -1000 | -1 | 1 | -1 | #_AgeSel_LL_W_P0_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P1_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P2_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P3_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P4_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P5_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P6_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P7_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P8_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P9_2008 |
| -1 | 1 | 0.1 | 0.1 | -1 | 1 | 2 | #_AgeSel_LL_W_P10_2008 |
| -1 | 1 | 0 | 0 | -1 | 1 | -2 | #_AgeSel_LL_W_P11_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -2 | #_AgeSel_LL_W_P12_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_W_P13_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_W_P14_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_W_P15_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_W_P16_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_W_P17_2008 |
| -1 | 1 | -999 | -999 | -1 | 1 | -1 | #_AgeSel_LL_W_P18_2008 |

```
-1	1	-999	-999	-1	1	-1	#_AgeSel_LL_W_P19_2008
-1	1	-999	-999	-1	1	-1	#_AgeSel_LL_W_P20_2008
-1	1	-1000	-1000	-1	1	-1	#_AgeSel_MRIP_E_P0_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_E_P1_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_E_P2_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_E_P3_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_E_P4_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_E_P5_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_E_P6_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_E_P7_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_E_P8_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_E_P9_2007
-1	1	0	0	-1	1	-1	#_AgeSel_MRIP_E_P10_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_E_P11_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_E_P12_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_E_P13_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_E_P14_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_E_P15_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_E_P16_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_E_P17_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_E_P18_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_E_P19_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_E_P20_2007
-1	1	-1000	-1000	-1	1	-1	#_AgeSel_MRIP_W_P0_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_W_P1_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_W_P2_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_W_P3_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_W_P4_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_W_P5_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_W_P6_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_W_P7_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_W_P8_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_MRIP_W_P9_2007
-1	1	0	0	-1	1	-1	#_AgeSel_MRIP_W_P10_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_W_P11_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_W_P12_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_W_P13_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_W_P14_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_W_P15_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_W_P16_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_W_P17_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_W_P18_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_W_P19_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_MRIP_W_P20_2007
-1	1	0	0	-1	1	-1	#_AgeSel_HBT_E_P0_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_HBT_E_P1_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_HBT_E_P2_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_HBT_E_P3_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_HBT_E_P4_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_HBT_E_P5_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_HBT_E_P6_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_HBT_E_P7_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_HBT_E_P8_2007
-1	1	0.1	0.1	-1	1	2	#_AgeSel_HBT_E_P9_2007
-1	1	0	0	-1	1	-1	#_AgeSel_HBT_E_P10_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_HBT_E_P11_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_HBT_E_P12_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_HBT_E_P13_2007
-1	1	-999	-999	-1	1	-1	#_AgeSel_HBT_E_P14_2007
```

```
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_E_P15_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_E_P16_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_E_P17_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_E_P18_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_E_P19_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_E_P20_2007
-1      1       -1000   -1000   -1      1       -1      #_AgeSel_HBT_W_P0_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P1_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P2_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P3_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P4_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P5_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P6_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P7_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P8_2007
-1      1       0.1     0.1     -1      1       2       #_AgeSel_HBT_W_P9_2007
-1      1       0       0       -1      1       -1      #_AgeSel_HBT_W_P10_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P11_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P12_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P13_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P14_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P15_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P16_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P17_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P18_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P19_2007
-1      1       -999    -999    -1      1       -1      #_AgeSel_HBT_W_P20_2007
#_Cond No selex parm trends
#_Cond -4 # placeholder for selparm_Dev_Phase
3 #_env/block/dev_adjust_method (1=standard; 2=logistic trans to keep in base parm bounds; 3=standard w/ no bound check)
#
# Tag loss and Tag reporting parameters go next
0  # TG_custom:  0=no read; 1=read if tags exist
#_Cond -6 6 1 1 2 0.01 -4 0 0 0 0 0 0 0  #_placeholder if no parameters
#
1 #_Variance_adjustments_to_input_values
#_fleet: 1 2 3 4 5 6 7 8 9 10 11 12 13 14  survey: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0 0 0 0 0  #_add_to_survey_CV
0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0 0 0 0 0  #_add_to_discard_stddev
0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0 0 0 0 0  #_add_to_bodywt_CV
1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1
        1       1       1       1       1       1       1 1 1 1 1  #_mult_by_lencomp_N
1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1
        1       1       1       1       1       1       1 1 1 1 1  #_mult_by_agecomp_N
1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1
        1       1       1       1       1       1       1 1 1 1 1  #_mult_by_size-at-age_N
#
7 #_maxlambdaphase
1 #_sd_offset
#
0 # number of changes to make to default Lambdas (default value is 1.0)
# Like_comp codes:  1=surv; 2=disc; 3=mnwt; 4=length; 5=age; 6=SizeFreq; 7=sizeage; 8=catch;
# 9=init_equ_catch; 10=recrdev; 11=parm_prior; 12=parm_dev; 13=CrashPen; 14=Morphcomp; 15=Tag-comp; 16=Tag-negbin
#like_comp fleet/survey  phase  value  sizefreq_method
# 2 7 1 0.6 1
# 2 8 1 0.6 1
```

```
#
# lambdas (for info only; columns are phases)
#  0 #_CPUE/survey:_1
#  1 #_CPUE/survey:_2
#  1 #_CPUE/survey:_3
#  1 #_CPUE/survey:_4
#  1 #_discard:_1
#  1 #_discard:_2
#  1 #_discard:_3
#  0 #_discard:_4
#  1 #_lencomp:_1
#  1 #_lencomp:_2
#  1 #_lencomp:_3
#  0 #_lencomp:_4
#  0 #_agecomp:_1
#  1 #_agecomp:_2
#  0 #_agecomp:_3
#  0 #_agecomp:_4
#  1 #_init_equ_catch
#  1 #_recruitments
#  1 #_parameter-priors
#  1 #_parameter-dev-vectors
#  1 #_crashPenLambda
0 # (0/1) read specs for more stddev reporting
 # 0 1 -1 5 1 5 1 -1 5 # placeholder for selex type, len/age, year, N selex bins, Growth pattern, N growth ages, NatAge_area(-1 for all), NatAge_yr, N
Natages
 # placeholder for vector of selex bins to be reported
 # placeholder for vector of growth ages to be reported
 # placeholder for vector of NatAges ages to be reported
999
```

## Appendix C: Stock Synthesis Starter File

```
#Control file for red snapper
#Stock Synthesis Version 3.24j
rsnapper.dat
rsnapper.ctl
0 # 0=use init values in control file; 1=use ss3.par
1 # run display detail (0,1,2)
1 # detailed age-structured reports in REPORT.SSO (0,1)
0 # write detailed checkup.sso file (0,1)
0 # write parm values to ParmTrace.sso
0 # report level in CUMREPORT.SSO (0,1,2)
1 # Include prior_like for non-estimated parameters (0,1)
1 # Use Soft Boundaries to aid convergence
1 # Number of bootstrap datafiles to produce
10 # Turn off estimation for parameters entering after this phase
1000 # MCMC burn interval
100  # MCMC thin interval
0  # jitter initial parm value by this fraction
-1 # min yr for sdreport outputs (-1 for styr)
-2 # max yr for sdreport outputs (-1 for endyr; -2 for endyr+Nforecastyrs
0 # N individual STD years
0.0001 # final convergence criteria
0 # retrospective year relative to end year
2 # min age for calc of summary biomass
1 # Depletion basis:  denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
1 # Fraction (X) for Depletion denominator
4 # (1-SPR)_reporting:  0=skip; 1=rel(1-SPR); 2=rel(1-SPR_MSY); 3=rel(1-SPR_Btarget); 4=notrel
2 # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num); 3=sum(frates)
0 # F_report_basis: 0=raw; 1=rel Fspr; 2=rel Fmsy ; 3=rel Fbtgt
999
```

## Appendix D: Stock Synthesis Forecast File

```
#C generic forecast file
#V3.20b
# for all year entries except rebuilder; enter either: actual year, -999 for styr, 0 for endyr, neg number for rel.endyr
1 # Benchmarks: 0=skip; 1=calc F_spr,F_btgt,F_msy
#it calculates targets at MSY, SPR, and biomass targets all independently during model run
2 # MSY: 1= set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt); 4=set to F(endyr)
0.26 # SPR target (e.g. 0.40)
0.3 # Biomass target (e.g. 0.40)
2008 2011 2008 2011 2008 2011 #_Bmark_years: beg_bio, end_bio, beg_selex, end_selex, beg_relF, end_relF (enter actual year, or values of 0 or -integer to
be rel. endyr) - use range of year where there was not change in any time varying processies, i.e. time varying change in selectivity, chagne in R0, etc.
1 #Bmark_relF_Basis: 1 = use year range; 2 = set relF same as forecast below
0 # Forecast: 0=none; 1=F(SPR); 2=F(MSY) 3=F(Btgt); 4=Ave F (uses first-last relF yrs); 5=input annual F scalar
21 # N forecast years
0.2 # F scalar (only used for Do_Forecast==5)
2009 2011 2009 2011 #_Fcast_years: beg_selex, end_selex, beg_relF, end_relF (enter actual year, or values of 0 or -integer to be rel.endyr) # the last
years to use F - typically use the last three years!
2 # Control rule method (1=catch=f(SSB) west coast; 2=F=f(SSB) )   # leave alone
0.01 # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40) - leave this alone, this is west coast thing
0.001 # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)   - leave this alone, this is west coast thing
1.0 # Control rule target as fraction of Flimit (e.g. 0.75)   # this is to do the F at OY - i.e. the 75 percent of Fmsy
3 #_N forecast loops (1-3) (fixed at 3 for now)   # leave alone
3 #_First forecast loop with stochastic recruitment        # leave alone
0 #_Forecast loop control #3 (reserved for future bells&whistles)     # leave alone
0 #_Forecast loop control #4 (reserved for future bells&whistles)     # leave alone
0 #_Forecast loop control #5 (reserved for future bells&whistles)    # leave alone
#get final 2012 landings info from data:  commecial get from IFQ page, recreation may not be final and may have to do some hole filling - get with Vivian
on this.
2013 #FirstYear for caps and allocations (should be after years with fixed inputs)  # thsi is the year when to start the projections - remember
triggefish, when we added the landings from the last year sicne they wanted manamagement advice from current year
0 # stddev of log(realized catch/target catch) in forecast (set value>0.0 to cause active impl_error)
0 # Do West Coast gfish rebuilder output (0/1)
2013 # Rebuilder: first year catch could have been set to zero (Ydecl)(-1 to set to 1999)
2012 # Rebuilder: year for current age structure (Yinit) (-1 to set to endyear+1)
#this is how we allocate fishing effort and mortality with the fleets - i.e  we want a fixed effort for the shrimp fleets and constant level of closed
season discards in the projections going forward - talk with Jake about how to do this
1 # fleet relative F: 1=use first-last alloc year; 2=read seas(row) x fleet(col) below
# Note that fleet allocation is used directly as average F if Do_Forecast=4
# this will just give you retained biomass and won't have to back out the discards
3 # basis for fcast catch tuning and for fcast catch caps and allocation (2=deadbio; 3=retainbio; 5=deadnum;6=retainnum)
# Conditional input if relative F choice = 2
# Fleet relative F: rows are seasons, columns are fleets
#_Fleet: FISHERY1
# 1
# max totalcatch by fleet (-1 to have no max)
-1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1
# max totalcatch by area (-1 to have no max)
-1 -1
# fleet assignment to allocation group (enter group ID# for each fleet, 0 for not included in an alloc group)
0 0 0 0 0 0 0 0 0 0 0 0 0 0
#_Conditional on >1 allocation group
# allocation fraction for each of: 0 allocation groups
# no allocation groups
0 # Number of forecast catch levels to input (else calc catch from forecast F)
3 # basis for input Fcast catch: 2=dead catch; 3=retained catch; 99=input Hrate(F) (units are from fleetunits; note new codes in SSV3.20)
# Input fixed catch values
```

```
#Year Seas Fleet Catch(or_F)
#2012   1     1     112.565
#2012   1     2     68.27
#2012   1     3     48.6321
999 # verify end of input
```