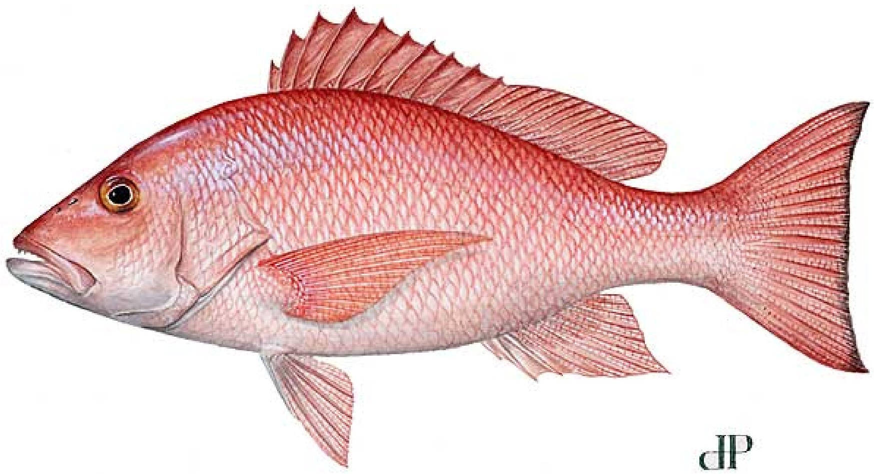
2009 Gulf of Mexico Red Snapper Update Assessment

SEDAR41-RD07

23 May 2014

Stock Assessment of Red Snapper in the Gulf of Mexico

-- SEDAR Update Assessment --



Report of the Update Assessment Workshop

Miami, Florida

August 24-28, 2009

Accepted by the Gulf of Mexico Fishery Management Council's Science and Statistical (SSC) and Reef Fish SSC Committees

December 3, 2009

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1. Introduction

A SEDAR Assessment Workshop (AW) was convened from August 24-28, 2009 at the NMFS Southeast Fisheries Science Center, Miami, Florida, by the Gulf of Mexico Fishery Management Council and the NMFS Southeast Fisheries Science Center under the SEDAR process. The objective of the AW was to update the benchmark assessment of red snapper within US waters of the Gulf of Mexico (benchmark assessment conducted in 2005 as SEDAR 7). Where appropriate the AW attempted to stay consistent with the spirit of an Assessment Update by providing a *continuity model* that is comparable to the final model adopted in SEDAR 7. Specifically, the AW updated, reviewed and incorporated into the model all data streams included in SEDAR 7. The AW was conservative in making any changes (e.g., incorporation of additional indices or data streams not included in SEDAR 7) in the continuity model. If modification to the continuity run were deemed necessary, we provide an extensive justification for incorporating any such changes. Finally, recognizing that changes in our understanding of the biology, population dynamics and fishery of red snapper have occurred in the last 5 years and the Terms of Reference encouraged the exploration of some changes, the AW developed three additional "alternative state" models. Here, we present a stock assessment update based on the continuity model and three alternative states of this model.

1.1 Terms of Reference

Terms of Reference as approved by the Reef Fish SSC and approve by the Gulf Council, Gulf of Mexico Red Snapper Assessment Update.

1. Evaluate any relevant data and parameters to be included into the stock assessment model. This evaluation should be conducted in a workshop setting with all relevant scientific input.
2. **Evaluate the relative reliability of fishery dependent and independent data sources and adjust model input appropriately.**
3. Update the approved SEDAR 7 base assessment configuration and assessment sensitivities used to illustrate uncertainty, for Gulf of Mexico red snapper with data through 2008.
4. Document the additional annual observations and note any changes or corrections made to the input datasets used in the benchmark assessment and tabulate complete updated input datasets for the update. Clarify units of measurement in all Tables.

5. Estimate and provide complete updated tables of population parameters.
6. Update measures of uncertainty and provide representative measures of precision for stock parameter estimates.
7. Update estimates of stock status and SFA parameters; provide declarations of stock status relative to current SFA criteria (See Table 1 for complete list of required values).
8. **Specify OFL, and recommend a range of ABC for review by the SSC in compliance with ACL guidelines.**
9. Evaluate future stock status for 2009-2014 according to the specifications in Table 2.
10. Review the research recommendations from the previous assessment, note any which have been completed, and make any necessary additions or clarifications.
11. Prepare a stock assessment updated report to fully document the input data, methods, and results of the stock assessment update.

NOTES:

This update assessment is intended to update those population and status measures approved for the original assessment to provide OFL and a range of ABC recommendation in compliance with ACL guidelines. A specific ABC recommendation will be the responsibility of the SSC, in compliance with Section 302 of the Magnuson-Steven Act.

It is not the intent of this update to address all issues noted in the original SEDAR 7 benchmark assessment.

Table 1. Required SFA and MSRA evaluations for Gulf of Mexico red snapper. Mortality rate criteria are reported relative to $F_{current}$ (i.e., mean F for 2006-2008). Biomass criteria are reported in terms of relative spawning potential (millions). Yields are reported in millions of pounds whole weight. Reported values come from AS3 run with shrimp effort rebuild scenario, which was accepted by SSC for OFL determination.

Criteria	Definition	Values
Mortality Rate Criteria		
F_{MSY} or proxy	$F_{SPR26\%}$	0.53
MFMT	$F_{SPR26\%}$	0.53
F_{OY}	75% of $F_{SPR26\%}$	0.39
$F_{CURRENT}$	Mean F for 2006-2008	1.00
$F_{CURRENT}$/MFMT		1.90
Base M		0.1
Biomass Criteria		
S_{MSY}	Equilibrium S @ $F_{SPR26\%}$	10.16
MSST	(1-M)*S_{MSY}, M=0.1	9.14
$S_{CURRENT}$	S_{2008}	1.78
$S_{CURRENT}$/MSST		0.19
Equilibrium MSY	Equilibrium Yield @ F_{MSY}	14.96
Equilibrium OY	Equilibrium Yield @ F_{OY}	13.35

OFL	Annual Yield @ MFMT 2009 Expected Yield 2010 Yield @ MFMT 2011 Yield @ MFMT 2012 Yield @ MFMT 2013 Yield @ MFMT 2014 Yield @ MFMT	 6.82 9.26 9.58 9.98 10.62 11.19
Annual OY (ACT) Alternative ACT:	Annual Yield @ F_{OY} 2009 Expected Yield 2010 Yield @ F_{OY} 2011 Yield @ F_{OY} 2012 Yield @ F_{OY} 2013 Yield @ F_{OY} 2014 Yield @ F_{OY} 2010 Yield @ 65% MFMT 2010 Yield @ 75% MFMT 2010 Yield @ 85% MFMT	 6.82 7.08 7.57 8.07 8.73 9.30 6.18 7.08 7.96
Generation Time **Rebuild Time** Tmin Midpoint Tmax	Years (if $S_{CURRENT}$<MSST) @ F=0 mid of Tmin, Tmax if Tmin>10y, Tmin + 1 Gen	20 2012 2022 2032
ABC ABC	Recommend Range Recommend by SSC 2010 Yield @$F_{Rebuild}$ 2011 Yield @$F_{Rebuild}$ 2012 Yield @$F_{Rebuild}$ 2013 Yield @$F_{Rebuild}$ 2014+ Yield @$F_{Rebuild}$	 **6.945** **7.185** **7.485** No recommendation* No recommendation*
* The SSC will provide 2013 and 2014 ABC recommendations at a later date.		

The spawning stock estimates, *S,* are *not* the actual number of eggs produced by the population, but should be interpreted as the effective number of fully-productive spawners, *i.e*. the number of eggs produced by the spawning population relative to the number that would have been produced if all of the spawners were 30 years old (SEDAR 7).

Values provided are from the SEDAR 7 Assessment Final Report-Gulf of Mexico Red Snapper.

All mortality rate and biomass values should be accompanied by 80 percent confidence intervals or other appropriate measures of precisions where possible.

Table 2. Projection Scenario Details

2.1 Initial Assumptions

OPTION	Value
2009 landings target	5 mp wwt
2007+ Recruits	TBD by Panel
2007+ Selectivity	TBD by Panel
Projection Period	To recovery (2009-2032)
1st year of change F, Yield	2010

2.2 Scenarios to Evaluate (preliminary, to be modified as appropriate)

1. Landings fixed at 2007 target.
2. $F_{MSY} = F_{MAX}$
3. F_{OY}= 65% $_{FMSY}$
4. F_{OY}= 75% $_{FMSY}$
5. F_{OY}= 85% $_{FMSY}$
6. $F_{REBUILD}$ (if necessary)
7. F=0 (if necessary)

2.3 Output values

1. Landings
2. Discard
3. Exploitation
4. F/F_{MSY}

1.2 Update Assessment Workshop Participants

A. SEDAR Red Snapper Update Panel

Organization		Name
GMFMC	SSC	Sean P. Powers (Chair)
GMFMC	SSC	Shannon Cass-Calay
GMFMC	Reef fish SSC	John Mareska
GMFMC	SSC	William Patterson
GMFMC	SSC	Behzad Mahmoudi
Commercial Fisherman		Mike Whitefield

B. Gulf of Mexico Fishery Management Council

GMFMC	Council Member	Kay Williams
GMFMC	Council Member	William Teehan
GMFMC	Staff	Steven Atran
GMFMC	Staff	Tina O'Hern

C. National Marine Fisheries

NMFS	SEFSC - Miami	Brian Linton
NMFS	SEFSC - Miami	Clay Porch
NMFS	SEFSC - Miami	Craig Brown
NMFS	SEFSC - Miami	David Hanisko
NMFS	SEFSC – Panama City	Gary Fitzhugh
NMFS	SEFSC – Galveston	Jim Nance
NMFS	SEFSC - Miami	John Quinlan
NMFS	SEFSC - Miami	John Walter
NMFS	SEFSC – Panama City	Kate Andrews
NMFS	SEFSC - Miami	Kevin McCarthy
NMFS	SEFSC - Miami	Refik Orhun
NMFS	SEFSC - Miami	Steve Turner
NMFS	SERO – St. Petersburg	Andy Strelcheck
NMFS	SEFSC - Pascagoula	Walter Ingram
NMFS	SEFSC - Pascagoula	Vivian Matter

C. Other Attendees

Alabama Marine Resources Division	Kevin Anson
Texas Tech University	Sandra Diamond
Gulf States Marine Fisheries Commission	Dave Donaldson
University British Columbia	Robyn Forrest
Ocean Conservancy	Claudia Friess
Texas Tech University	Kristin Kleisner

Consultant	William Gazey
Pew	Chad Hanson
Florida Fish and Wildlife Commission	Jessica McCawley
LGL Ecological Research Associates	Benny Gallaway

1.3 List of Update Workshop Working Papers & Documents

Table 3. List of documents made available for review to the AW.

Document #	Title	Authors
RedSnapper-UA01	Agenda	GMFMC
RedSnapper-UA02	Terms of Reference – 2009 Red Snapper Update Assessment	GMFMC
RedSnapper-UA03	SEDAR 7 Red Snapper Complete Stock Assessment Report	SEDAR
RedSnapper-UA04	Age Composition, Growth, and Density-Dependent Mortality in Juvenile Red Snapper Estimated from Observer Data from the Gulf of Mexico Penaeid Shrimp Fishery. North American Journal of Fisheries Management 28:1828–1842	Gazey, W.L., B.J. Gallaway and J.G. Cole
RedSnapper-UA05	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. Reviews in Fisheries Science, 17(1):48–67	Gallaway, B.J., S.T. Szedlmayer, and W.J. Gazey
RedSnapper-UA06	SEDAR Procedural Guidance Document 2 - Addressing Time-Varying Catchability	SEDAR
RedSnapper-UA07	Fishery-Independent Catch of Young-of-the-Year Red Snapper in the Texas Territorial Sea, 1985–2007	Dorf, B.A. and M. Fisher

Allman - 2003-2008 otolith report.pdf	Red snapper (Lutjanus campechanus) otolith aging summary 2003 to 2008 for the Panama City Laboratory.	Allman, R., B. Barnett, N. Evou, R. Farsky, J. Keesee and P. Colson
Burns Koenig Coleman 2002-Multiple factors in release mortality.pdf	Evaluation of Multiple Factors Involved in Release Mortality of Undersized Red Grouper, Gag, Red Snapper and Vermilion Snapper	Burns, K.M., C.C. Koenig, and F.C. Coleman
Cook - Red snapper update - maturity 2009 .pdf	Characterization of red snapper (Lutjanus campechanus) size and age at sexual maturity for the 2009 Gulf of Mexico SEDAR update	Cook, M., B.K. Barnett, M.S. Duncan, R.J. Allman, C.E Porch, G.R. Fitzhugh
Diamond and Campbell 2009.pdf	Linking ''Sink or Swim'' Indicators to Delayed Mortality in Red Snapper by Using a Condition Index	S. L. Diamond and M.D. Campbell
Direct Observations of Catch-at-Age.pdf	Direct Observations of Catch-at-Age	S.L. Cass-Calay
ICES2008.pdf	Habitat use and the effect of shrimp trawling on fish and invertebrate communities over the northern Gulf of Mexico continental shelf	Wells, R. J. D., J.H. Cowan Jr., and W. F. Patterson III
MRFSS Index.pdf	Standardized Catch Rates of Red Snapper (*Lutjanus Campechanus*) from the Recreational Fishery in the Gulf of Mexico, 1981-2008	S.L. Cass-Calay
TAFS2008.pdf	Effect of Trawling and Habitat on Mercury Concentration in Juvenile Red Snapper from the Northern Gulf of Mexico	Wells, R.J.D.,M.M. Chumchal, and J.H. Cowan, Jr.
Wellsetal2008.pdf	Effect of trawling on juvenile red snapper (*Lutjanus campechanus*) habitat selection and life history parameters	Wells, R.J.D. J.H. Cowan, Jr., W.F.Patterson III, and C.J. Walters

Biol sampling paper_red snapper SEDAR.809.doc	Biological Data Collection and Ageing Procedures Under the Fisheries Information Network (FIN)	Donaldson, D. and G. Bray
Gag 2009 Assessment Update Report.doc	Stock Assessment of Gag in the Gulf of Mexico -- SEDAR Update Assessment --	SEDAR
Red Grouper 2009 Assessment Update Report.doc	Stock Assessment of Red Grouper in the Gulf of Mexico -- SEDAR Update Assessment --	SEDAR
Red_Snapper_Hist_of_Regulations_table.doc	Table 1. Year implemented, rule-making vehicle, action, and rationale for red snapper management measures from 1984 to 2008.	NMFS/SERO
Walter.Draft.NMFS longline deepwater cryptic biomass.8.24.09.v2.doc	Exploration of the NMFS bottom longline survey for potential deepwater cryptic biomass	Walter J.and W. Ingram

2. Regulatory History

Table 4. Regulatory history of the Gulf of Mexico red snapper fishery from 1984-2008. Year implemented, rule-making vehicle, action, and rationale for red snapper management measures are given for each regulation.

Year	Rule-making Vehicle	Action	Rationale
1984 Effective: 11/8/84	FMP[1]	• 13 inch minimum TL	• Estimated 18-25% increase in yield • Some at this size sexually mature and have spawned
1990 Effective: 2/21/90	Amendment 1[1]	• 7-fish bag limit • 3.1 mp commercial quota • Rebuilding goal 20% SSBR	• Actions estimated to achieve a 20 percent reduction in harvest.
1991 Effective: 7/29/91	Amendment 3[1]	• Revise TAC framework to be more flexible	• Improve the efficiency of the TAC setting process
1991 Effective: 8/23/91	Regulatory amendment[1]	• 2.04 mp commercial quota • 1.96 mp recreational allocation • Effect 50% bycatch reduction by 1994 in the shrimp fishery • Projected to achieve 20% SPR by 2007	• Reduces TAC an additional 20 percent • Should allow stock to rebuild to 20 percent SPR by 2007 • Further control F
1992 Effective: 4/3/92	Emergency rule[2]	• Open commercial red snapper fishery from April 3 – May 14 with 1,000 lbs trip limit due to the season closing in just 53 days	• Ameliorate adverse economic caused by a short season, an influx of non-traditional vessels in the fishery, and depressed ex-vessel prices
1992	Amendment 4[1]	• Moratorium on the issuance of new reef fish commercial permits for three years	• Limit participation in an overcapitalized fishery and allow time to develop a limited-access fishery
1992 Effective: 12/30/92-3/30/93	Emergency rule[2]	• Create commercial red snapper 2,000 lbs and 200 lbs endorsement for 1993	• Limit effort primarily to those with a historical dependence in the fishery • Allow a bycatch provision • Extend the fishing year
1992	Emergency rule[2]	• Close the commercial fishery from December 30, 1992 to February 15, 1993	• Provide time to implement trip limit endorsement system
1993	Regulatory	• 3.06 mp commercial quota	• Continue rebuilding plan

Effective: 3/23/93	amendment[1]	• 2.94 mp recreational allocation • Projected to achieve 20% SPR by 2009 • Change opening day of the 1994 commercial season to February 10 • Restrict commercial vessels to landing no more than one trip limit per day	• Facilitate enforcement of the trip limits • Minimize fishing during hazardous winter weather • Ensure the commercial red snapper fishery is open during Lent
1993 Effective: 6/29/93-12/31/94	Amendment 6[1]	• Extended commercial red snapper endorsements	• Limit effort primarily to those with a historical dependence in the fishery • Allow a bycatch provision • Extend the fishing year
1994 Effective: 2/7/94	Amendment 5[1]	• Raise minimum size limit incrementally from 14 to 16 inches TL over a 5-year period • Establish Class 1 and Class 2 licenses • Create Alabama SMZs	• Increase yield per recruit and help rebuild the stock • Limit pulse and derby commercial fishery • Limit fishing on artificial reefs off Alabama
1994 Effective: 1/1/95	Regulatory amendment[1]	• Change opening day of the commercial season to February 24, 1995 • Retain 6 million pound red snapper TAC and commercial trip limits • Reduced the daily bag limit from 7 fish to 5 fish • Increase the minimum size limit for recreational fishing from 14 inches to 15 inches a year ahead of the scheduled automatic increase.	• Ensure the commercial red snapper fishery is open during Lent • Continue rebuilding plan • Because the recreational sector exceeded its 2.94 million pound red snapper allocation each year since 1992, further restrict recreational F
1994	Amendment 7[1]	• Establish dealer reporting	• Improve accountability for landings
1994 Effective: 7/27/94	Amendment 9[1]	• Allow collection of commercial landings 1990-92 for ITQ • Extend the moratorium on the issuance of new reef fish permits	• Need for historical red snapper landings for commercial fishermen to establish baseline information for an IFQ program • Allow time for evaluation and development of a more comprehensive controlled access system
1995	Regulatory	• Raise TAC from 6 mp to 9.12 mp	• Revise rebuilding plan taking into account

12/95	amendment[1]	• Start commercial season February 28	new information • Ensure the commercial red snapper fishery is open during Lent
1995	Amendment 8[1]	• Attempted to establish ITQ system (Congress repealed it)	• Reduce overcapitalization of commercial fishery • End derby fishery • Reduce user conflicts
1996 Effective: 10/16/96	Regulatory amendment[1]	• Increase TAC to 9.12 mp • Extend recovery date to 20% SPR to 2019 • Split commercial quota in a spring and fall season	• TAC recommendations based on a new stock assessment and recovery plan range from 6 to 10 mp • Provide commercial fishermen an income going into the fall holiday season
1996 Effective: 9/15/96	Amendment 13[1]	• Extend the red snapper endorsement system through the remainder of 1996 and, if necessary, through 1997, in order to give the Council time to develop a permanent limited access system	• Continue permit limitations to avoid open access to red snapper by all commercially permitted vessels
1997 Effective 1/15/97	Amendment 12[1]	• NMFS disapproved proposed provisions to cancel the automatic comm. red snapper size limit increases to 15 inches total length in 1996 and 16 inches total length in 1998	• Minimum size limit increase assumes a 33 % discard mortality rate, a rate thought to be too high.
1997 Effective 10/6/97	Regulatory amendment[1]	• Change start of fall season from 9/15 to 9/2 • Fall season first 15 days of each month until the quota is filled. • Change the recreational red snapper allocation to a quota • RA close recreational fishery in EEZ when landings projected to exceed its allocation	• Earlier opening of the season avoids bad weather and Labor Day weekend conflicts with anglers • Helps extend the season • Quota will better control angler harvest • Quota allows for quicker action by RA to close the fishery when needed
1997 Effective 1/1/98	Regulatory amendment[1]	• Cancel planned increase in the red snapper minimum size limit to 16 inches TL	• Gains to the fishery from size limit increase offset by decreases in yield per recruit
1998	Amendment	• Establish a permanent two-tier red	• Without transferability, the previous

Effective 1/29/98	15[1]	snapper license limitation system (Class 1 and Class 2) • The comm. season was split in two, with two thirds of the quota allocated to a February 1 opening and the remaining quota to a September 1 opening.	system was a closed-access system • Spread out landings over a longer period of time and give fishermen more options about when to fish
1998 1/98	Regulatory amendment[1]	• Maintain 9.12 mp TAC • Zero bag limit for the captain and crew of for-hire recreational vessels (not implemented)	• Rebuilding projected to continue to 20% SPR with current TAC • Zero bag limit for captain and crew projected to extend recreational season 1-2 weeks
1998 Effective 10/1/99	Regulatory amendment[1]	• 6 mp TAC, with release of all or part of the remaining 3.12 mp contingent upon the capability of BRDs to achieve better than a 50 percent reduction in juvenile red snapper shrimp trawl mortality • Reduce the bag limit to 4 fish and zero fish for captain and crew of for-hire vessels • Set the opening date of the rec fishing season to March 1 • Reduce the minimum size limit for red snapper to 14 inches total length for both directed fisheries • Change the opening of the fall fishing season from the first 15 days to the first 10 days of each month beginning September 1	• A 1998 NMFS study suggested BRDs could achieve bycatch mortality reductions of Age-0 and Age-1 red snapper by over 60 percent • Reduce recreational catch to avoid quota closures • Close the recreational fishery during the least favorable months for fishing to reduce effort • Previous size limits were based on a release mortality of less than 33%. New information suggested release mortality of greater than 33%
1998 Effective: 6/29/99-12/26/99	Emergency rule[2]	• Reduce the recreational bag limit for red snapper from 5 to 4 fish per person • Reopen the recreational fishing season in January 1999	• Reduce recreational F to prevent the fishery from exceeding its quota
1999 Effective: 6/4/99-8/29/99	Interim rule[2]	• Increase the minimum size of recreationally caught red snapper to 18 inches • Close the recreational red snapper	• Extend the recreational season by 2 weeks

		fishery in the EEZ on August 29, 1999	
1999 Effective 1/19/00-12/16/00	Interim rule[2]	• Change 2000 recreational season from April 24 to October 31 • Reinstate 4-fish bag limit for captain and crew • Reduce opening of spring commercial seasons from 15 to 10 days	• Allow for a fall recreational fishery • Allow flexibility for charter fishermen to manage their catch • Extend the spring commercial season
2000 Effective 8/2/00	Amendment 17[1]	• Extend the reef fish permit moratorium for another five years, from the existing expiration date of December 31, 2000 to December 31, 2005, unless replaced sooner by a comprehensive controlled access system.	• Provide a stable environment for the fishery • Prevent the fishery from further overcapitalization • Allow time for evaluation and development of a more comprehensive controlled access system
2000 Effective 9/18/00	Regulatory amendment[1]	• Maintain the TAC at 9.12 mp for the next two years • Increase the recreational minimum size limit from 15 inches to 16 inches TL • Set the red snapper recreational bag limit at 4 fish • Reinstate the for-hire captain and crew bag limit • Set the recreational red snapper season from April 15 to October 31, subject to revision by the RA 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 to 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	• Maintain stability in the fishery by maintaining TAC • Reduce the recreational F • Extend the recreational season • Extend the commercial season • Maintain price stability for the commercial fishery • Delay the fall season to increase red snapper prices • Allow more flexibility in assigning the commercial spring and fall quotas should TAC change

		commercial quota is reached • Retain the red snapper commercial minimum size limit at 15 inches TL • 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.	
2003 Effective: 7/29/02	Amendment 20[1]	• Establish a 3-year moratorium on the issuance of any additional charter vessel/headboat permits for vessels fishing the EEZ of the Gulf of Mexico (Gulf) for Reef Fish or CMP fishes • Allow permits (except those issued to historical captains) to be transferable to other persons • Require vessel captains or vessel owners to participate in data collection surveys as a permit condition.	• Cap effort in the for-hire fishery
2005 Effective: 7/5/05	Amendment 22[1]	• Establish status determination criteria and biological reference points • Establish red snapper rebuilding plan • Establish additional reef fish bycatch reporting methodologies	• Bring the red snapper fishery into compliance with requirements added to the MSFCMA through the SFA • Establish a schedule for rebuilding the overfished 1red snapper stock meets MSFCMA requirements • Document and reduce red snapper bycatch
2005 Effective: 8/17/05	Amendment 24[1]	• Extend the commercial reef fish permit moratorium indefinitely from the existing expiration date of December 31, 2005, unless replaced by a comprehensive controlled access system.	• Provide a stable environment for the fishery • Prevent the fishery from further overcapitalization • Allow time for evaluation and development of a more comprehensive controlled access system
2006	Amendment 25[1]	• Extend the recreational for-hire reef fish permit moratorium indefinitely from the expiration date of June 16, 2006 and create a limited access system.	• Cap effort in the for-hire fishery

2006 Effective: 1/1/07	Amendment 26[1]	• Establish an individual fishing quota program for the commercial red snapper fishery	• Reduce overcapacity in the commercial red snapper fishery • Eliminate, to the extent possible, the problems associated with derby fishing
2007 effective 5/2/07	Interim Rule	• Reduced catch quota to 6.5 mp (commercial 3.315 mp and recreational 3.185 mp) (effective 5/2/07) • Reduced recreational bag limit from 4 to 2 fish, and prohibits captain and crew on for hire vessels from retaining the recreational bag limit. (effective 5/2/07) • Reduced size limit for commercial 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)	•
2008 effective 2/28/08	Amendment 27/14	• Requires non-stainless steel circle hooks with use of natural baits, dehooking device required to dislodge hooks from reef fish, and venting tools required for deflating the swim bladders.(effective 6/1/08) • Size limits: recreational = 16", commercial = 13" (effective 2/28/08) • Recreational bag limit 2 fish, prohibits captain and crew on for hire vessels from retaining the recreational bag limit. (effective 2/28/08) • Recreational season June 1- September 30 (effective 2/28/08) • Established a target for the reduction of red snapper bycatch mortality in the shrimp fishery (effective 2/28/08)	• Decrease release mortality of reef fish • The June 1- September 30 recreational season was shortened to 65 days based on a projected quota overage and inconsistent state regulations.

[1]Copies of the FMP/amendment can be obtained from the Gulf of Mexico Fishery Management Council, 2203 N. Lois Ave., Tampa, FL 33607
[2]Copies of the rule can be obtained from the Southeast Regional Office, 263 13th Avenue South, St. Petersburg, FL 33701

Table 5. Changes in commercial red snapper quota, size limits, and season length by year.

Year	Size Limit (Inches TL)	Calendar Days Open	Quota (million pounds)	Commercial Harvest (million pounds)
1984-1989	13	365	na	na
1990[1]	13	365	3.1	2.65
1991	13	236[2]	2.04	2.21
1992	13	53+42=95[3]	2.04 + emergency	3.11
1993[4]	13	94	3.06	3.37
1994	14	77	3.06	3.22
1995	15	50+2=52[5]	3.06	2.93
1996	15	65+22=87[6]	4.65	4.31
1997	15	53+20=73[7]	4.65	4.81
1998[8]	15	42+30=72	4.65	4.68
1999	15	45+25=70[9]	4.65	4.88
2000	15	38+28=66[10]	4.65	4.84
2001	15	56+23=79	4.65	4.63
2002	15	64+27=91	4.65	4.78
2003	15	67+27=94	4.65	4.41
2004	15	70+35=105	4.65	4.65
2005	15	80+51=131	4.65	4.10
2006	15	126	4.65	4.65
2007	13	365 IFQ	3.315	3.18
2008	13	365 IFQ	2.55	2.48
2009	13	365 IFQ	2.55	2.55

[1] Bottom longlines prohibited within 50 fathoms west of Cape San Blas, FL, and within 20 fathoms elsewhere.[2] First year commercial red snapper fishery was closed.[3] Season re-opened April 4-May 15 with 1,000-pound trip limit.[4] First year of two-tiered system of trip limits; 2,000 pounds for boats with endorsements and 200 pounds for other boats with reef fish permits.[5] Season re-opened for 36 hours Nov 1-2. Two-tiered system of trip limits.[6] First year of planned spring (3.06 million pounds) and fall (for the remaining unfilled quota) seasons.[7] The fall season opened for the first 15 days of each month or until the quota is filled.[8] First year of license limitation system with trip limits of 2000 pounds for Class 1 boats and 200 pounds for Class 2 boats.[9] The fall season opened during the first 10 days of each month or until the quota is filled.[10] The spring and fall season opened during the first 10 days of each month or until the quota is filled.

Table 6. Changes in recreational red snapper size limits, bag limits, season length, and allocation/quota.

Year	Size Limit (Inches TL)	Daily Bag Limit (Number of Fish)	Season Length (days)	Allocation/Quota (Million Pounds)	Recreational Harvest (Million Pounds)
1984	13[1]	no bag limit[2]	365	na	3.09
1990	13	7	365	na	1.36
1991	13	7	365	1.96	*2.10*
1992	13	7	365	1.96	*3.62*
1993	13	7	365	2.94	*5.57*
1994	14	7	365	2.94	*4.53*
1995	15	5	365	2.94	*3.69*
1996	15	5	365	4.47	3.47
1997	15	5	330[3]	4.47	4.37
1998	15	4[4]	272[5]	4.47	4.35
1999	15[6]	4	240[7]	4.47	4.35
2000	16	4	194[8]	4.47	3.33
2001	16	4	194	4.47	3.56
2002	16	4	194	4.47	*4.87*
2003	16	4	194	4.47	*4.60*
2004	16	4	194	4.47	*5.02*
2005	16	4	194	4.47	4.59
2006	16	4	194	4.47	-
2007[9]	16	2	194	3.185	-
2008[10]	16	2	65	2.45	-
2009[11]	16	2	75	2.45	4.27

[1] For-hire boats exempted until 1987. [2] Allowed to keep 5 undersized fish per day. [3] Fishery closed on November 27, 1997. [4] Bag limit was 5 fish from January through April, 1998. [5] Fishery closed on September 30, 1998. [6] Size limit was 18 inches from June 4 through August 29, 1999. [7] Fishery closed on August 29, 1999. [8] Fishing season opens at 12:01 a.m. April 21 and closes at 12:00 midnight October 31. [9] Fishing season opens at 12:01 a.m. April 26 and closes at 12:00 midnight October 31. [10] Fishing season opens at 12:01 a.m. June 1 and closes at12:00 midnight August 4. [11] Fishing season opens at 12:01 a.m. June 1 and closes at12:00 midnight August 15.

Table 7. Summary of State Regulations for red snapper in the Gulf of Mexico.

Texas:

Recreational: season: all year,
4 fish bag limit, 8 fish possession limit
15 " TL min
(only caught by pole & line w/ circle hook)

Commercial: same as recreational. In addition, for commercial harvest, a federal reef fish permit and red snapper IFQ vessel endorsement is required.

Louisiana:

Recreational: season: opens June 1 and closed when federal waters close,
2 fish bag limit,
2-day limit allowed off the water or on charter/headboats on multi-day trips
Zero bag limit for captain/crew of charter/headboats
16 " TL min

Commercial: 13" TL minimum
For commercial harvest, a federal reef fish permit and red snapper IFQ vessel endorsement is required, plus IFQ allocation at least equal to the pounds of red snapper landed.

Mississippi:

Recreational: season: opens June 1 and closed when federal waters close,
2 fish bag limit,
2-day limit allowed on charter/headboats on trips over 24 hours
Zero bag limit for captain/crew of charter/headboats
16 " TL min

Commercial: 15" TL min, 200lb catch/possession limit
(******** State possession and size limits for red snapper shall not apply to federally permitted commercial red snapper fishermen or dealers legally harvesting and/or selling red snapper harvested from federal waters only.)

Alabama:

Recreational: season: opens and closes with federal waters
2 fish bag limit,
16 " TL min

Commercial: 13" TL minimum
Fishermen taking red snapper for commercial purposes from Alabama waters must fish from a vessel holding a federal reef-fish commercial vessel permit and an Individual Fishing Quota for for Red Snapper.

Florida:

Recreational: season: June 1 – August 14,
2 fish bag limit,
2-day limit allowed on charter/headboats on trips over 24 hours
Zero bag limit for captain/crew of charter/headboats
16 " TL min
Non-stainless steel, non-offset circle hook required when natural bait is used
Venting and dehooking tools required

Commercial: season: conforms to federal season
13" TL min
Non-stainless steel, non-offset circle hook required when natural bait is used
Venting and dehooking tools required
Anyone commercial fishing for red snapper must possess IFQ allocation

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3. Life History

Although several studies on various aspects of the life history of red snapper have been published since the benchmark assessment, the AW felt that no changes in the SEDAR 7 reproductive biology parameters, age and growth relationships, or meristic conversions were warranted in the update assessment. Consequently, the parameters and relationships used in the last benchmark assessment (SEDAR 7, 2005) were used for the 2009 red snapper assessment update. The AW felt that there is evidence that natural mortality (M) may have been underestimated for age-0 to age-1 red snapper in SEDAR 7 and that parameter M should be varied in alternative model runs.

3.1 Reproductive Biology

Evidence that reproductive maturity may be earlier than estimated in SEDAR 7, prompted Cook et al. (2009) to examine this issue for the update assessment. The objective of Cook et al. (2009) study was to provide additional data on size and age at sexual maturity for Gulf of Mexico (Gulf) red snapper by targeting the smaller and younger red snapper captured in research trawls. Previous studies reported that the smallest females with hydrated oocytes and postovulatory follicles (POFs), which are evidence of recent spawning, were 296 mm FL (Fitzhugh et al. 2004) and 285 mm FL (Woods et al. 2007), respectively; both fish were two years old. The smallest females with hydrated oocytes or POFs reported by Cook et al. (2009) from their examination of 111 females (size range = 132 – 648 mm FL) collected during SEAMAP trawl surveys during the peak spawning period were 196 mm FL and 216 mm FL, respectively. These lengths were considerably smaller than previously reported. The youngest sexually mature fish collected, based on the presence of vitellogenic oocytes, was one year old. Woods et al. (2007) reported that red snapper from Alabama reached maturation at smaller sizes and younger ages than those from Louisiana. This was based on results from a comparative analysis across northern Gulf regions in which similar sampling methods (hook and line gear) were utilized among regions. East (Mississippi, Alabama, Florida West Coast) and West (Louisiana and Texas) Gulf differences in maturation were also detected from samples that were collected across a broader temporal and spatial scale but again samples were taken mostly by hook and line or longline gears (SEDAR7- DW-35). Although Cook et al.'s (2009) results were limited to Texas and Louisiana, they do indicate that younger and smaller mature red snapper females are detectable with trawl gear.

The regression of the updated maturity data and calculation of the product of maturity and fecundity essentially reveals no change in the fecundity-at-age vector from the last assessment 7 (SEDAR 7). This is largely due to the use of batch fecundity as a proxy for annual fecundity and the relatively low batch fecundities of 2 and 3 year old females. However, there has been some indication that spawning frequency may be related to size or age but has been difficult to clarify due to the sampling efforts that would be required (Porch et al. 2007). Information about egg viability or parental investment as a function of age also could change our understanding regarding reproductive potential of the stock (Porch et al. 2007). Based on this analysis, the AW chose not to change the reproductive biology parameters adopted in SEDAR 7.

3.2 Natural Mortality

The AW spent a significant amount of time examining methods and parameterization for estimating natural mortality in the stock assessment. Gazey et al. (2008) conducted an analysis of juvenile red snapper sampled by observers in the western Gulf to test whether there was evidence of density-dependent mortality in juveniles. They constructed an age-structured (via length) model to estimate age composition and mortality of juvenile red snapper in the western Gulf from 81 monthly length frequency data sets (a total of 239,521 fish were measured) from July 1999 to February 2007. They concluded that natural mortality of age-0 fish appeared to be at least 70% higher than the value used in SEDAR 07 and that there was substantial evidence that mortality was strongly density-dependent. Brooks et al. (unpublished presentation) attempted to estimate natural mortality from length and abundance data collected during the SEAMAP bottom trawl surveys conducted twice a year (summer and fall) from 1987-2008 and from shrimp fishery effort. Their study used two approaches: the linear regression approach adopted by Nichols (SEDAR7DW) with data updated through 2008 (Fig. 1) and a random effects solution model. The latter approach treats the local abundance parameters as random effects, assuming they are distributed according to a normal or lognormal probability density with an estimated mean and variance. Despite the recent decline in shrimping effort, the estimates of shrimp bycatch mortality (F) and natural mortality (M) remained highly negatively correlated;

making it difficult to partition the total instantaneous mortality (Z) between M and F. Nevertheless, the estimates of Z were substantially higher than estimated during SEDAR7.

Results of both the Gazey et al. (2008) study and the work presented by Brooks et al. (unpublished presentation) indicate there is a strong likelihood that mortality in juvenile red snapper is density-dependent and perhaps quite a bit higher than was assumed during SEDAR7. The AW discussed this issue at length but density-dependent mortality was not incorporated into the assessment for two principal reasons. First, doing so would be a radical department from an update versus a benchmark assessment. And secondly, there simply was not time to explore coding the CATCHEM model to incorporate density-dependent mortality, even if only to explore its potential effect in a sensitivity run.

A review of several published studies, along with the above investigations indicates that natural mortality may have been underestimated in SEDAR7 for age 0 and 1 red snapper. The estimates of natural mortality from these studies ranged from 0.98 to 3.7 for age 0 and from 0.6 to 1.4 for age 1 red snapper (Table 8). The lower ranges are the values used in SEDAR 7. However, the AW noted that none of the studies were able to distinguish natural mortality from emigration; therefore, it is possible that some of the values in Table 8 are too high. Accordingly, the continuity run maintained the SEDAR7 values, whereas two alternative models utilized a value twice that of SEDAR 7.

Table 8. Estimates of total and natural mortality for age-0 and age1 red snapper compiled by Brooks et al. (unpublished presentation).

	Z		M		
study	age 0-1	age 1	age 0	age 1	problems
Szedlmayer, age 0-1	2.1-3.2	0.54	~2	0.54	Emigration could increase Z, no trawling, so mostly M
Nichols (2004)		1.98		0.58	Incomplete selectivity of small fish could decrease Z; Emigration could increase Z
Brooks & Porch (2004)		2.3-3.7	?	?	inefficiency, no contrast in effort, emigration
Gazey et al 2008	2.2	1.3	2	1.2	emigration to structure bias Z high
RE model est	3.3-3.7	1.6-2.25	3.3-3.7	0.76-1.4	low q for age 0, emigration to structure bias Z high, model mispec.
RE model Dens Dep			2.6-3.5	0.6-1.3	low q for age 0, emigration to structure bias Z high, model mispec.
ratios, linear reg.	3.48	3.1	NS	2.96	neg. survival, bias from error stucture, nonsensical regression
SEDAR 7	1.5	1.2	0.98	0.6	based upon VPA, ratios of surveys
1999 assessment			0.5	0.3	Substantial uncertainty

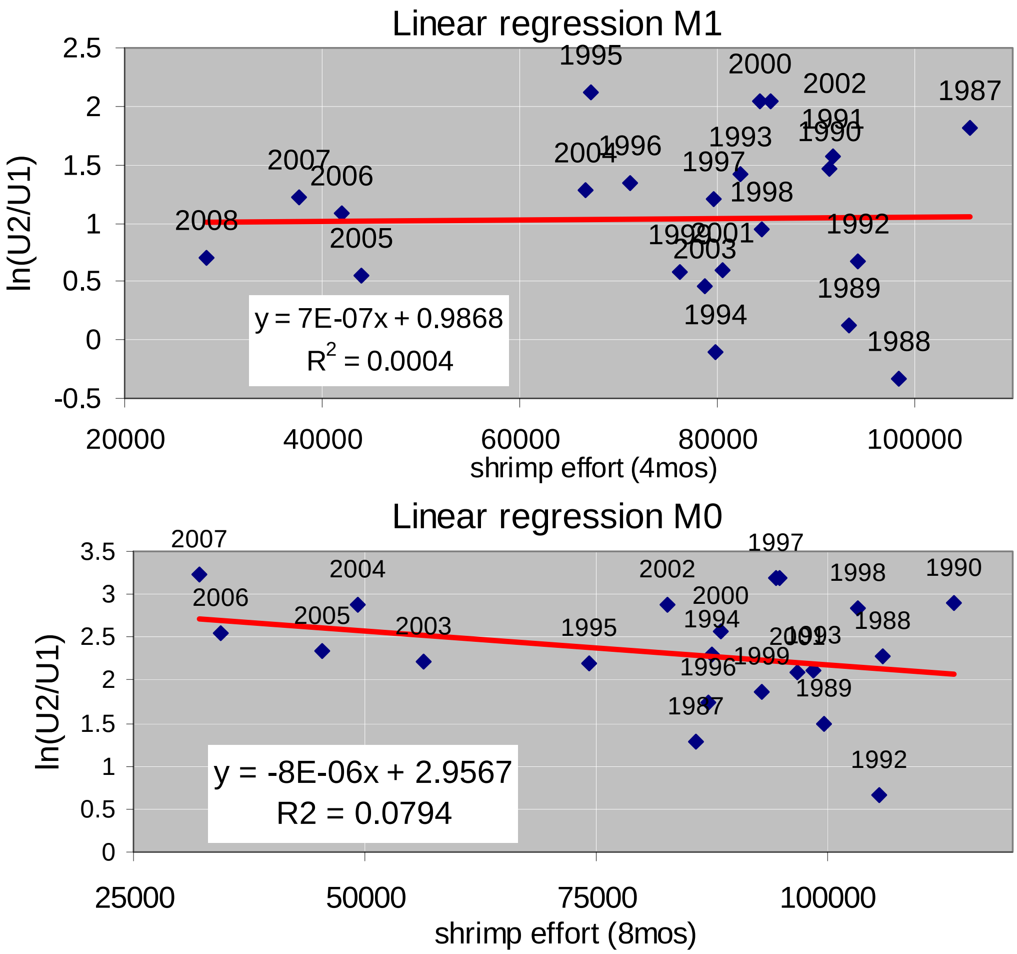


Figure 1. Estimate of M1 and M0 based on the linear regression approach of Nichols;

$$-\ln\left(\frac{U_2}{U_1}\right) = M + qE_{shrimp}$$

where M is the y intercept; q is the slope, E_{shrimp} or shrimp effort is the independent variable and U2/U1 is the change in abundance of the cohort between surveys.

3.3 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 update assessment assumes there are two sub-units of the red snapper stock within this region, separated roughly by the Mississippi River (consistent with SEDAR 7).Currently, the Council manages these substocks 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 update assessment.

4. Landings

4.1 Commercial Landings

The Gulf red snapper fishery is modeled in the CATCHEM_AD routine (base model for SEDAR 7 and consequently the update assessment) as a series of separate fisheries each associated with landings and/or discards. For the commercial fishery, landings are divided into four separate fisheries for the purpose of stock assessment: (1) handline east, (2) handline west, (3) longline east and (4) longline west (Fig. 2 and 3). Commercial landings estimates are available since 1980 for the longline fishery and 1872 for the handline; however, recent data series are relied upon more heavily because of the uncertainty associated with historic catches. For the update assessment landings data were updated through 2008 from those reported through 2003 in SEDAR 07.

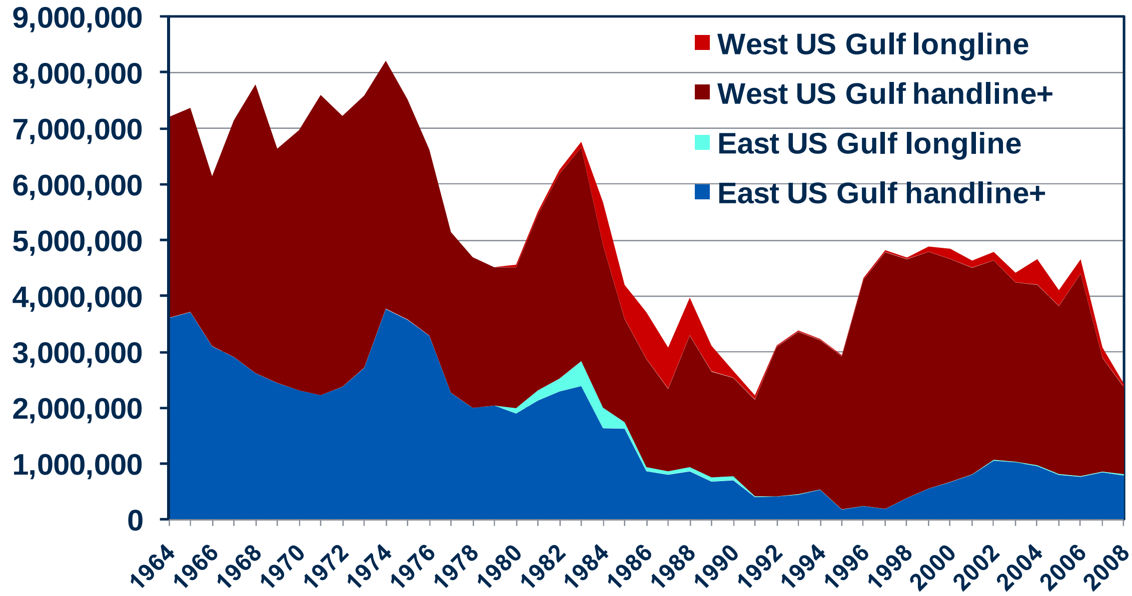


Figure 2. Estimated commercial red snapper landings in pounds (whole weight) by fishery from 1964-2008 for both handline and longline gears.

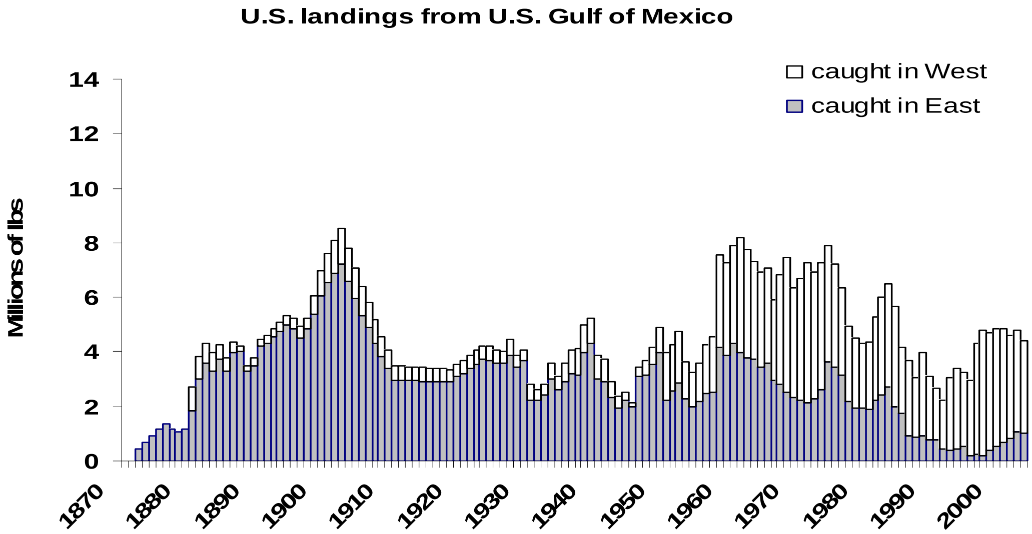


Figure 3. Commercial red snapper landings by region in pounds (whole weight) from 1872-2008.

4.2 Commercial Discards

4.2.1 Self-reported Data

The data set for calculating commercial vessel red snapper discards included all trips from vessels that reported discards to the coastal discard logbook program between January 1, 2002 and December 31, 2006 in the Gulf of Mexico. Throughout that period, red snapper regulations included numerous open and closed seasons during a year. Discard rates, as well as the size composition of discarded red snapper, may well have differed between those open and closed seasons. Beginning in 2007, however, an Individual Fishing Quota (IFQ) system was established for red snapper; effectively creating a continuous closed red snapper season for vessels without IFQ share. Those vessels with high IFQ share no longer had numerous closed seasons during a year; consequently, the change in management regime required separate calculations of red snapper discards for 2007-2008.

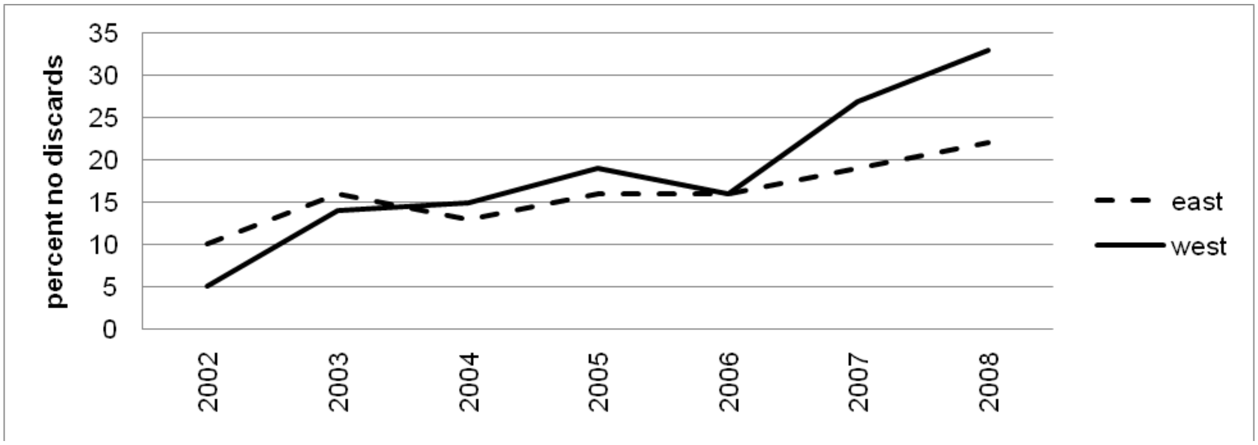
Total discards from vertical line (handline and electric reel) and longline vessels were calculated separately. The available data for other gears were too few for discards to be calculated. For each gear, separate calculations were made for red snapper open and closed seasons (for years prior to 2007) and for the eastern and western Gulf of Mexico (defined as east or west of the Mississippi River). Six factors were examined with GLM analyses for their possible influences on the red snapper discard rate. Factors included: year, area fished, days at sea, season (Jan-Apr, May-Aug, etc.), red snapper permit (2,000 pound, 200 pound, none), and number of crew. Once significant main effects were identified, the data were stratified by those factors and a mean discard rate (vertical line discards per hook hour fished; longline discards per hook fished) was calculated for each stratum. Mean rate calculations included all discard trips within each stratum, i.e. trips with no red snapper discards reported were included in the discard rate calculations to produce a mean nominal discard rate. Total effort (vertical line hook hours and longline hooks fished) was calculated from the coastal logbook data set for each stratum. Total discards for each stratum were then calculated as stratum mean discard rate*stratum total effort.

To calculate discards in years prior to 2002, the mean stratum-specific discard rate for the years 2002-2006 was applied to the yearly stratum-specific effort reported to the coastal logbook program. During the years 1990-1992, only a 20% subsample of Florida commercial fishing vessels were selected to report landings and effort data. An expansion factor of five was applied to Florida effort for those years.

For the years 2007-2008, discards were calculated following the methods described above. GLMs were used to identify factors that had significant effects on discard rates of red snapper. Data were stratified by those significant factors and stratum-specific total effort was applied to the appropriate discard rate. Separate calculations were made for vertical line and longline vessels and for the eastern and western Gulf of Mexico. Factors tested included year, area fished, days at sea, IFQ allocation, number of crew, and season (Jan-Apr, May-Aug, etc.).

Annual red snapper discard estimates are reported in Table 9 (vertical line) and Table 10 (longline). Under reporting of discards may have affected these estimates. The percentage of trips reporting “no discards” has increased over the time series (Fig. 4). The trend is particularly apparent for vertical line vessels. “No discards” trip reports have varied from 15 to more than 45% of longline trips during the years 2002-2008. This level of “no discards” has not been recorded in the reef fish observer data.

A.



B.

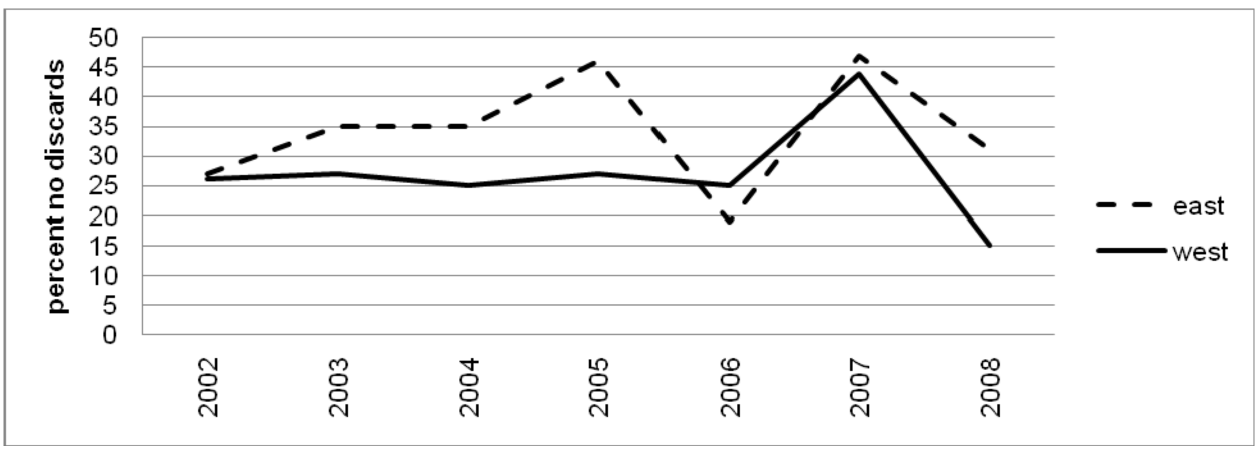


Figure 4. Percentage of “no discard” trips reported to the discard coastal logbook program for A. Vertical line trips and B. Longline trips made in the eastern and western Gulf of Mexico.

Table 9. Yearly commercial vertical line vessel red snapper discards estimated from self reported catch and effort data. Discard estimates are reported in number of fish. Beginning in 2007, vessels had various amounts of IFQ allocation rather than a series of open and closed seasons.

Year	East open	East closed	West open	West closed
1990	134,714		513,291	
1991	227,605	90,469	783,451	94,440
1992	56,865	258,278	261,767	162,503
1993	46,533	188,400	296,886	74,314
1994	45,122	295,649	301,226	48,413
1995	34,448	288,620	299,259	45,892
1996	67,658	407,907	756,616	49,768
1997	60,221	306,885	637,279	74,746
1998	80,215	322,611	751,202	75,553
1999	90,206	396,085	715,481	62,442
2000	126,271	214,221	625,083	74,877
2001	114,197	204,485	722,245	59,904
2002	166,918	141,832	721,744	164,660
2003	149,519	343,558	645,453	36,642
2004	70,602	164,189	613,519	42,021
2005	131,854	114,879	829,240	31,767
2006	101,010	82,891	417,602	17,504
	IFQ East		**IFQ West**	
2007	223,141		99,052	
2008	274,198		74,919	

Table 10. Yearly commercial longline vessel red snapper discards estimated from self reported catch and effort data. Discard estimates are reported in number of fish. Beginning in 2007, vessels had various amounts of IFQ allocation rather than a series of open and closed seasons.

Year	East open	East closed	West open	West closed
1990	6,373		712	
1991	7,711	9,129	2,138	93
1992	1,864	16,412	334	165
1993	1,281	19,590	707	317
1994	1,511	23,027	1,041	429
1995	981	19,226	1,387	799
1996	1,469	19,885	1,483	585
1997	1,413	25,105	1,344	362
1998	1,115	23,281	693	440
1999	1,475	22,473	2,345	823
2000	1,376	17,264	3,684	612
2001	1,194	16,697	1,044	421
2002	1,429	9,027	1,581	560
2003	1,356	5,014	3,454	667
2004	1,708	28,166	5,215	596
2005	1,439	9,383	4,561	494
2006	1,879	5,909	4,109	347
	IFQ East		**IFQ West**	
2007	33,942		637	
2008	31,918		543	

4.2.2 Observer Data

NOAA began a Gulf of Mexico observer program for commercial longline and vertical line (handline and bandit rig) reef fish trips in July 2006. Sample sizes (trips and vessels) are provided in Table 11. Funding cuts reduced the level of sampling possible in 2008. Also in 2008, seven of nine longline observer trips were included in a video monitoring study and were not selected randomly. Discards were calculated with those nonrandom trips excluded and recalculated with the nonrandom trips included in the analyses.

Methods were similar to those described for the self-reported data, except for defining strata. Due to small sample size, GLMs were not used to identify factors with significant effects on discard rates. Data were stratified by gear, region, red snapper season (2006 only), and year. Discard rates by strata were applied to the total effort (vertical line total hook hours; longline hooks fished) that were reported to the coastal logbook program for the appropriate strata. Discards calculated from the observer data are provided in Table 12.

Vertical line discards were higher when calculated using observer data than self-reported discard data. Those results suggest that under reporting to the discard logbook program may have affected discard calculations of those data. Small sample size of longline observer data did not allow for discard calculations to be made in the western Gulf of Mexico in either 2006 or 2007. Where calculations could be made, total discards were low and generally did not differ greatly from calculations made with the self-reported data.

Table 11. NOAA reef fish observer program sample sizes for commercial fishing trips in the northern Gulf of Mexico.

Observer data sample size		
Year	Number of vessels	Number of trips
Vertical line		
2006	15	20
2007	47	67
2008	13	14
Longline		
2006	11	12
2007	9	11
2008	8*	9**
	(*6 selected nonrandomly)	(**7 selected nonrandomly)

Table 12. Yearly commercial vessel red snapper discards estimated from observer reported catch and effort data. Discards are reported in number of fish. Beginning in 2007, vessels had various amounts of IFQ allocation rather than a series of open and closed seasons.

Year	East vertical line		East longline		East longline*	West vertical line		West longline
2006	173,085 (open)	275,375 (closed)	705 (open)	8,714 (closed)		435,987 (open)	27,506 (closed)	None reported
IFQ								
2007	612,538		34,180			385,756		None reported
2008	349,613		4,120		12,331	518,035		530

*****includes nonrandomly selected eastern Gulf longline trips during 2008.

4.2.3 Adjustments to SEDAR7 Commercial Discards

Adjustments to pre-update data (i.e., data used in SEDAR 7) for commercial discards were necessary. To calculate commercial closed season discards, vessels were categorized by permit category (class 1, 2000 pounds; class 2, 200 pounds; or no permit). Permit category-specific discard rates and total effort were then determined and discards calculated. Permitting began in 1993 with class 1 permits, followed in 1998 with the introduction of class 2 permits. Prior to 1993 no red snapper permits were required for commercial vessels. Initial discard calculations included all vessels in a single category for the period 1990-1992. In addition, no class 2 permitted vessels were defined prior to 1998 and all vessels without class 1 permits were categorized as “no permit”. During the workshop, it was noted that vessels with reef fish permits, but lacking class 1 red snapper permits, could land 200 pounds of red snapper per trip during the years 1993-1997. Such vessels were effectively functioning as class 2 permitted vessels.

In revising the commercial discard calculations, those vessels with class 1 permits during the years 1993-1995 were defined as “class 1” vessels for the period 1990-1992. Similarly, vessels with class 2 permits during the years 1998-2000 were defined as “class 2” vessels during the period 1990-1997. All other vessels were defined as “no permit” for those periods in the analysis. Results of the revised discard estimates were similar to the initial estimates of discards in the western Gulf of Mexico for both vertical line and longline. For the eastern Gulf, however, estimated discards were higher than the initial estimates for the years 1990-1997. A greater number of vessels in the eastern Gulf had class 2 permits than in the west and the discards of those vessels were better reflected in the revised estimates. In all cases, the revised method for estimating discards resulted in the same number of discards estimated for the years 1998-2006 (when class 1 and 2 permits were in effect) as was found in the initial estimates.

4.3 Recreational Landings and Discards

Matter (2009) estimated the total recreational landings and discards as well as coefficients of variation (CV) associated with the estimates by Gulf region and season (open and closed). Estimates of recreational catch for marine fish species in the Gulf of Mexico beginning in 1981 are obtained by a combination of results from three surveys: (1) the Marine Recreational Fishery Statistics Survey (MRFSS) conducted by the NOAA Fisheries (NMFS), (2) the Texas Marine Sport-Harvest Monitoring Program by the Texas Parks and Wildlife Department (TPWD), and (3) the Headboat Survey (HBS) conducted by NMFS, Southeast Fisheries Science Center, Beaufort, NC. These three surveys together provide estimates of catch in numbers (and sometimes weight), estimates of effort, length and weight samples, and catch-effort observations for shore-based and boat fishing. The combined coverage is continuous beginning in 1981 with only minor gaps (Table 13).

Table 13. Recreational surveys available for the Gulf MRFSS, Headboat, and TPWD

Survey	**Area**	**Timeframe**	**Mode***
MRFSS	1. TX (not all modes/waves) 2. LA	1. 1981-1985 2. 1981-present (except 1981, wave 1)	1. SH, HB/CH, PR 2. SH, CH, PR
Headboat	1. FLW-TX	1. 1986-present	1. HB
TPWD	TX	1983-present	CH, PR

*mode abbreviations (SH=shore, HB=headboat, CH=charterboat, PR=private/rental)

The MRFSS and the TPWD survey are both sampling-based, while the Headboat Survey strives to be a census of headboats using logbooks. The strata, data gathered and quantities estimated also differ. Strata for estimates of catch from the three surveys can be made comparable by summing (e.g., first partitioning Headboat Survey estimates into bi-monthly "waves" to match MRFSS and TPWD). Other differences, such as the lack of estimate of released fish in the Headboat Survey and different measures of effort are addressed in Matter (2009).

4.3.1 Catch Estimates and Adjustments: MRFSS

Table 14 shows the MRFSS catch estimates by Gulf region (West and East) for the Gulf of Mexico. The MRFSS survey includes the Florida Keys (Monroe County) in the estimates for West Florida. The missing estimates (landings, discards, and variances) for 1981, wave 1 was substituted using the average of wave1/waves 2-6 for 1982-1984 by state, mode, and area.

In the tables, estimated A+B1 is the catch that was killed and B2 is the catch that was released alive. In the intercepts, Type A is the catch that was seen and identified by the interviewer. Type B is the catch that was not seen by the interviewer but was reported by the angler. Type B1 is the type B catch reported dead (released dead, used as bait, eaten, etc.) and type B2 is the type B catch reported as released alive. These live discards (B2s) generated from MRFSS are not used in the assessment except for closed season discards (discussed in detail below).

Tabulated estimates use the new charterboat method (FHS) for 1998-2008. New charterboat method estimates for 1998 and 1999 are considered unofficial and are the result of the pilot study for the new method. New charterboat estimates are considered official beginning in 2000 for the Gulf of Mexico. In SEDAR 7, the old charterboat method estimates were used for 1998 and 1999 and then converted to the new method using calibration factors. In this update all years where new charterboat estimates are available (including 1998 and 1999) are used. This has been recommended by MRFSS (Patty Phares, NMFS SEFSC, personal communication) and has been used in other GOM species assessments (red grouper, gag, king mackerel). The charterboat estimates for 1986-1997 and charter+headboat estimates for 1981-1985 are calibrated to the new method using the conversion factors estimated in Diaz and Phares.

Some adjustments were made to the MRFSS Texas estimates, which appear in the early years of the survey (1981-1985). MRFSS shore mode estimates from Texas were kept as estimated by the survey. Boat mode estimates from Texas in 1981 and 1985 were excluded from this dataset. Charter and private modes for Texas for these early years are handled separately from the MRFSS using TPWD data.

Table 14. Estimated MRFSS A+B1 (fish killed) and B2 catch (released alive) by Gulf region for red snapper in the Gulf of Mexico. Charterboat and cbt/hbt estimates use the new method or are calibrated to the new method.

	West		East		Total AB1	Total B2
YEAR	AB1	B2	AB1	B2		
1981	1,263,640	8,721	870,344	45,091	2,133,984	53,812
1982	848,181	10,689	999,005	18,915	1,847,186	29,604
1983	1,709,290	2,099	1,818,440	416	3,527,729	2,515
1984	823,171	0	255,805	22,614	1,078,977	22,614
1985	395,022	39,840	596,697	16,511	991,719	56,351
1986	255,711	7,887	541,670	37,027	797,382	44,915
1987	113,073	6,895	518,216	65,254	631,289	72,149
1988	230,911	127,920	495,344	61,488	726,255	189,408
1989	182,188	100,346	474,569	166,094	656,757	266,440
1990	99,034	165,092	340,283	412,458	439,317	577,550
1991	209,420	253,011	516,415	740,845	725,834	993,856
1992	270,894	200,604	783,046	770,987	1,053,940	971,591
1993	350,960	240,045	1,185,392	818,438	1,536,352	1,058,483
1994	212,236	261,200	740,723	649,870	952,958	911,070
1995	273,486	370,595	592,112	378,500	865,598	749,095
1996	147,700	93,699	548,500	829,105	696,199	922,804
1997	159,240	93,794	923,988	1,658,535	1,083,228	1,752,329
1998	107,398	92,654	730,359	878,251	837,757	970,905
1999	85,896	199,409	687,328	1,179,241	773,224	1,378,650
2000	98,052	111,673	669,059	1,315,633	767,111	1,427,306
2001	54,999	47,973	793,022	1,758,560	848,021	1,806,533
2002	47,398	40,142	1,058,405	2,050,909	1,105,803	2,091,051
2003	70,825	165,603	921,860	1,776,034	992,685	1,941,636
2004	82,631	239,719	994,811	1,900,483	1,077,441	2,140,202
2005	104,315	308,186	724,572	1,595,352	828,887	1,903,538
2006	200,599	437,517	768,406	2,120,624	969,005	2,558,141
2007	148,397	277,120	968,971	2,477,771	1,117,368	2,754,891
2008	89,516	253,994	619,303	1,662,170	708,818	1,916,164

4.3.2 Catch Estimates and Adjustments: Headboat Survey

Table 15 shows the Headboat Survey catch estimates by year and Gulf region for red snapper for the Gulf of Mexico. Live discards are not estimated by the Headboat Survey. Live discards shown here have been estimated using the MRFSS B2/ (A+B1) ratios for all modes combined by year, Gulf region, and federal open/closed season. These ratios were applied to the HBS number of fish landed, since there is no estimate of fish released dead in the Headboat Survey. The MRFSS includes fish released dead in the B1 catch, and while the fish released dead cannot be separated from other kinds of B1 catch in the estimates, this quantity is small in the sample data relative to the total B1 samples. These headboat discards estimated using MRFSS ratios are not used in the assessment except for closed season discards (discussed in detail below).

Table 15. Headboat Survey estimated landings ("AB1") and discards ("B2") by year and Gulf region for red snapper in the Gulf of Mexico. Discards estimated using MRFSS discard ratios (B2/ (A+B1)).

	West		East		Total AB1	Total B2
YEAR	AB1	B2	AB1	B2		
1981	335,366	2,314			335,366	2,314
1982	335,366	4,227			335,366	4,227
1983	335,366	413			335,366	413
1984	335,366	0			335,366	0
1985	335,366	33,823			335,366	33,823
1986	316,090	9,750	16,364	1,119	332,454	10,868
1987	319,348	19,473	9,685	1,220	329,033	20,693
1988	423,024	234,347	13,832	1,717	436,856	236,064
1989	372,473	205,153	10,797	3,779	383,270	208,932
1990	187,006	311,744	15,539	18,835	202,545	330,579
1991	264,686	319,781	15,580	22,351	280,266	342,132
1992	413,056	305,879	33,873	33,351	446,929	339,230
1993	458,772	313,785	37,275	25,736	496,047	339,521
1994	497,738	612,570	28,998	25,441	526,736	638,011
1995	354,550	480,442	23,078	14,752	377,628	495,195
1996	349,266	221,571	28,388	42,911	377,654	264,482
1997	347,424	211,621	48,439	88,560	395,863	300,181
1998	244,738	214,796	76,759	95,037	321,497	309,833
1999	98,699	224,435	67,432	122,220	166,131	346,654
2000	111,410	109,245	57,640	122,781	169,050	232,027
2001	116,358	97,690	51,289	102,902	167,647	200,592
2002	138,475	118,395	75,121	159,174	213,596	277,569
2003	157,905	412,088	71,021	156,516	228,926	568,604
2004	110,329	354,006	63,482	126,116	173,811	480,123
2005	99,988	294,584	46,791	133,692	146,779	428,276
2006	121,177	273,437	47,882	129,786	169,059	403,223
2007	110,314	209,127	63,603	161,673	173,917	370,800
2008	57,569	158,850	61,986	145,896	119,555	304,746

4.3.3 Catch estimates and adjustments: TPWD

All TPWD landings from SEDAR 7 (2004) have been updated. Table 16 shows the TPWD catch estimates for red snapper for the state of Texas. Live discards are not estimated by TPWD. Live discards shown here have been estimated using the MRFSS B2/ (A+B1) ratios from Louisiana by year, mode, and federal open/closed season. These discards estimated using MRFSS ratios are not used in the assessment except for closed season discards (discussed in Matter 2009).

Table 16. Texas Parks and Wildlife Department estimated landings ("AB1") and discards ("B2") by year for red snapper in the state of Texas. Discards estimated using MRFSS discard ratios (B2/ (A+B1)) from Louisiana.

YEAR	AB1	B2
1981	71,227	482
1982	71,227	584
1983	71,785	54
1984	36,091	0
1985	105,806	44,324
1986	127,739	237
1987	47,396	7,155
1988	53,577	32,212
1989	24,309	14,494
1990	25,493	25,010
1991	40,500	81,184
1992	34,636	23,246
1993	46,123	29,111
1994	87,419	90,965
1995	97,397	141,268
1996	85,470	37,807
1997	80,543	48,891
1998	66,025	63,000
1999	54,043	129,470
2000	52,714	54,884
2001	48,607	42,615
2002	52,897	42,527
2003	38,349	112,331
2004	40,770	219,828
2005	55,684	191,390
2006	63,284	156,495
2007	46,797	86,774
2008	36,442	99,251

4.3.4 Open and Closed Season Live Discards Table 17 shows live discards from the recreational sector for the West Gulf and East Gulf by open and closed season. Open-season recreational discards are treated differently than closed-season discards, both in SEDAR 7 and in this update. The open-season discards shown in Table 17 are not used as an input to the assessment. Open-season discards are modeled in the aging program same as in SEDAR 7. Closed-season recreational discards are aggregated with closed-season commercial discards, adjusted for discard mortality, and inputted into the assessment as a separate fishery, same as in SEDAR 7. In SEDAR 7, the closed-season recreational discards for all three surveys (MRFSS, HBS, and TPWD) were estimated using closed-season B2/AB1B2 annual MRFSS ratios for all modes combined by Gulf region. In this update, two minor changes in methodology were made. First, MRFSS live discards as estimated by the survey (by year, wave, mode, state, area, etc) were used and summed annually by Gulf region. Second, TPWD live discards were estimated using Louisiana MRFSS discard ratios by mode.

Table 17. Total recreational live discards for red snapper by Gulf region and open and closed season.

	Open		Closed		Open Total	Closed Total
YEAR	West	East	West	East		
1981	11,517	45,091	0	0	56,608	0
1982	15,500	18,915	0	0	34,415	0
1983	2,566	416	0	0	2,982	0
1984	0	22,614	0	0	22,614	0
1985	117,987	16,511	0	0	134,498	0
1986	17,874	38,146	0	0	56,020	0
1987	33,523	66,473	0	0	99,996	0
1988	394,480	63,205	0	0	457,685	0
1989	319,993	169,872	0	0	489,866	0
1990	501,846	431,293	0	0	933,138	0
1991	653,977	763,196	0	0	1,417,173	0
1992	529,729	804,338	0	0	1,334,067	0
1993	582,942	844,174	0	0	1,427,116	0
1994	964,734	675,311	0	0	1,640,046	0
1995	992,305	393,252	0	0	1,385,557	0
1996	353,077	872,016	0	0	1,225,093	0
1997	353,566	1,668,500	740	78,596	2,022,066	79,335
1998	341,085	813,252	29,365	160,036	1,154,337	189,401
1999	512,298	1,097,992	41,016	203,469	1,610,290	244,484
2000	179,729	972,293	96,073	466,121	1,152,023	562,194
2001	122,222	1,084,759	66,056	776,702	1,206,982	842,759
2002	118,657	1,454,177	82,407	755,906	1,572,834	838,313
2003	504,886	1,406,285	185,136	526,264	1,911,170	711,400
2004	515,032	1,705,363	298,522	321,236	2,220,395	619,757
2005	645,469	1,221,219	148,691	507,824	1,866,688	656,516
2006	708,098	1,784,640	159,351	465,769	2,492,738	625,120
2007	407,776	2,232,360	165,245	407,084	2,640,136	572,329
2008	208,615	553,496	303,481	1,254,569	762,112	1,558,050

4.3.5 Total Recreational Landings and Coefficients of Variation (CV)

Table 18 shows the total landings and associated coefficients of variation estimated for the recreational sector. The CVs for MRFSS landings used were estimated by the survey for 1998-2008 when new charterboat mode estimates were made by the survey. For the years where old charterboat numbers were recalibrated to new method estimates using calibration factors, the charter and charter/headboat mode variances were adjusted using the standard error of those calibration factors. The variances for the other modes for these years were as estimated by the survey. The variance of HBS landings was assumed to be zero as in SEDAR 7. The CVs for TPWD landings on an annual basis were assumed to be 0.3 as in SEDAR 7.

Table 18. Total recreational landings and associated CVs by year and Gulf region.

	West		East		Total AB1	Total CV AB1
YEAR	AB1	CV AB1	AB1	CV_AB1		
1981	1,670,233	0.23	870,344	0.27	2,540,577	0.18
1982	1,254,774	0.31	999,005	0.34	2,253,779	0.23
1983	2,116,441	0.17	1,818,440	0.47	3,934,880	0.23
1984	1,194,628	0.23	255,805	0.33	1,450,434	0.20
1985	836,194	0.21	596,697	0.29	1,432,891	0.17
1986	699,540	0.10	558,034	0.20	1,257,575	0.10
1987	479,817	0.12	527,901	0.24	1,007,718	0.14
1988	707,512	0.06	509,176	0.23	1,216,688	0.10
1989	578,970	0.09	485,366	0.34	1,064,336	0.16
1990	311,533	0.21	355,822	0.19	667,355	0.14
1991	514,606	0.27	531,995	0.17	1,046,600	0.16
1992	718,586	0.09	816,919	0.13	1,535,505	0.08
1993	855,855	0.12	1,222,667	0.14	2,078,522	0.09
1994	797,393	0.09	769,721	0.12	1,567,113	0.08
1995	725,433	0.13	615,190	0.18	1,340,623	0.11
1996	582,436	0.12	576,888	0.18	1,159,323	0.11
1997	587,207	0.08	972,427	0.16	1,559,634	0.10
1998	418,161	0.07	807,118	0.05	1,225,279	0.04
1999	238,638	0.09	754,760	0.06	993,398	0.05
2000	262,176	0.10	726,699	0.06	988,875	0.05
2001	219,964	0.10	844,311	0.06	1,064,275	0.05
2002	238,770	0.08	1,133,526	0.05	1,372,296	0.04
2003	267,079	0.07	992,881	0.06	1,259,960	0.05
2004	233,730	0.07	1,058,293	0.06	1,292,022	0.05
2005	259,987	0.10	771,363	0.06	1,031,350	0.05
2006	385,060	0.09	816,288	0.06	1,201,348	0.05
2007	305,508	0.08	1,032,574	0.06	1,338,082	0.05
2008	183,527	0.10	681,289	0.06	864,815	0.05

Ultimately, the AW felt that the self-reported data were highly questionable based on this analysis particularly the observation that almost half the trips report no discards. In addition, the self-reported discards are consistently much lower than the observer d reported discards (see 4.2.2). For the stock assessment, both commercial and recreational discards are internally estimated by the CATCHEM models with except of closed season which are inputted. Age composition of the closed season discards are estimated from the age distributions derived in SEDAR 7.

5. Age Composition of Landings

5.1. Otolith Analysis

Allman et al. (2009) updated and summarized the estimated size and age structure of red snapper landings since the benchmark stock assessment in 2004 (SEDAR7); updated data covered landings from 2003 through 2008. Red snapper were sampled from Gulf landings from Texas to the west coast of Florida from January 2003 through December 2008. Samples were collected from the recreational hand-line, commercial hand-line, and long-line fisheries, as well as from fishery-independent surveys. All fish were measured to total length (mm) or were converted to total length from fork length with the equation TL (mm) = 1.06 x FL (mm) + 1.89 (N = 7,568, $R^2 = 0.99$). Sagittal otoliths were removed, cleaned with distilled water, dried, and weighed to the nearest 0.0001 gram prior to sectioning. Fish were weighed to the nearest g and sex was determined macroscopically if the fish was landed whole. All otoliths were processed and aged with the exception of those from the commercial hand-line fishery from Florida and Louisiana, which consist of the largest numbers and were subsequently sub-sampled. Sub-sampling was conducted by randomly selecting 100 otoliths per 2-month wave for processing and aging (600 otoliths per year).

Red snapper otoliths were processed (n = 18,559) and assigned ages (n = 18,393) from the years 2003 through 2008 from commercial, recreational and fishery-independent sources. The majority (84%) was collected through the Trip Interview Program and this was reflected in the large number of commercial samples collected annually. Commercial samples annually ranged from 74-92% of the otoliths aged. Fishery-independent survey sampling has steadily increased in recent years from 3% of collections in 2003 to 17% in 2008. Conversely, the fraction of recreational samples received by the Panama City laboratory has declined annually from 14% in 2003 to 4% in 2008. The recreational fishery is now largely sampled by the Southeast Recreational Fisheries Information Network (RecFIN). The geographic distribution of aged fish was similar to the distribution of landings with about half of the otoliths collected from the western gulf (53% from LA and TX) and half from the eastern gulf (47% from FL, AL and MS). Otoliths collected from Florida, Texas and Louisiana made up the majority of collections (36%, 25%, and 29%, respectively), while Alabama and Mississippi both contributed about 5% (Table 19).

A comparison of age distributions by fishing mode indicated differences by fishing mode and by sampling year. Red snapper aged from 2003 through 2008 collections ranged in age from 1 to 49 years. The commercial long-line selected the oldest individuals with fish first fully recruited to the fishery by age 5, a mean age of 7.7 years and 23% of individuals 10 years or older . The recreational fishery selected younger fish with fish first entering the fishery at 2 years with 93% of individuals ages 2 to 5 (mean= 3.7 years) and only 0.4% of fish 10 years or older. The commercial hand-line fishery selected for slightly older fish than the recreational fishery with a mode of 3 years, mean age of 3.9 years and 1% of fish 10 years or greater. The fishery-independent long-line survey had a modal age of 6 years a mean age of 11.6 years and 45% of ages were 10 years or greater, while samples from fishery-independent hand-line gear had a mode of 3 years, mean age of 2.8 years and 0.4% of fish 10 years or older. Size-at-age data indicated that rare and relatively old fish (ages > 20 years) were caught in all fishing sectors with the exception of the recreational and fishery-independent hand-line and were most commonly associated with long-line gear.

5.2 Catch at Age

Cass-Calay (2009a) combined recent age composition data from the 2003-2008 with previous age composition data from SEDAR 7 to generate direct observation of catch at age (CAA) matrices for the update assessment CATCHEM model runs. The data set was obtained from two sources: Panama City Laboratory: 1980-2008 (approximately 48,000 age observations) and GulfFIN: 2003-2008 (approximately 42,000 age observations). After exclusion and restrictions (see Cass-Calay 2009a), the final dataset contained approximately 78,000 age observations from age-0 to age-57 collected from 1991 to 2008. The data were assigned to region and weighted by landings among the six fisheries (COM HL East, COM HL West, COM LL East, COM LL West, REC East , and REC West).

The directly observed catch-at-age matrices are summarized in Tables 20-22. There were noticeable differences in the direct observed CAA constructed for SEDAR 7 and in 2009 among the years common to both assessments. Generally the newly estimated age composition is about 6 months younger than was estimated during SEDAR 7. The differences in the age composition are the result of:

1) The SEDAR 7 age comp used ***Annual Age*** rather than ***Biological Age***.

    a) Both age variables are calculated by Panama City using otolith increments, type of margin, average date of otolith increment deposition and date of capture.
        i) ***Annual Age*** is intended to track age classes for models such as ASAP and VPA.
        ii) ***Biological Age*** is the actual age of the fish expressed as a decimal (e.g. 3.477 years) and is most appropriate for growth curves.
    b) CATCHEM requires ***Integer Age int(Biological Age).*** Therefore, the 2009 direct observed age composition was calculated in this manner.
2) The use of TIP area fished, TIP latitude and longitude and PC and TIP county landed variables allowed improved assignment of sample to "Region". During SEDAR 7, many samples had been assigned to solely based on state landed.

Other specific differences among years and gear types are explained in Cass-Calay 2009a. For the purposes of the update assessment all data streams were updated according to Cass-Calay 2009a.

The recent (2004-2008) directly observed age composition, by gear and mode, is summarized in Fig. 6. According to this analysis, the recreational fishery typically observes red snapper at ages 2-5, with the mode at ages 2-3. Otolith samples obtained from the eastern commercial handline fishery show a similar distribution. However, in the west the age distribution extends to ages 6-8 for the commercial handline. Otolith samples from the eastern commercial longline fishery are generally somewhat older than the commercial handline and recreational fisheries. The most commonly observed ages were ages 2-6 with the mode at ages 4-5. The western commercial longline fishery has the oldest age distribution. Ages 2-15+ were commonly observed, and the mode was generally at ages 5 or 6.

Because the available otolith samples are obtained from fisheries which are subject to minimum size limits, the small number of red snapper at ages 0-1 is an artifact of the minimum size limit and not an indication that these young fish are rare in the population. However, it is evident the red snapper older than 8 are rarely observed in the recreational, commercial handline, and eastern commercial longline fisheries.

5.3. Age Composition from the Fishery NMFS Bottom Longline Survey

Walter and Ingram (2009) examined the age, length, and species composition of the NMFS bottom longline survey to explore the potential of a deepwater (>150m) reservoir of large, older red snapper in the Gulf of Mexico and to determine other trends in the data series. The hypothesis has been proposed by others in the past that there may be a large biomass of older red snapper in deep water that is relatively less vulnerable to the bottom longline fishery and therefore not 'seen' by the assessment model because these fish are not taken by the commercial fishery. The age composition of red snapper and depths fished in the NMFS survey were compared with age composition and depths of the commercial fisheries from logbook reported depths. There was little evidence from the NMFS fishery-independent survey of a large biomass in Gulf of Mexico waters beyond 150 m, because peak distributions of red snapper occurred between 50-100 m. However, the age composition of the fishery-independent survey differed from that of the various commercial fisheries, even though the fisheries span the depths where the NMFS survey encounters older fish. It appears that older red snapper may be only partially selected for by the fisheries, particularly the handline fisheries and to a lesser extent by the longline fishery. While the fishery-dependent longline gear does capture older fish, it is in a lower proportion than the fishery-independent NMFS survey, indicating that some biomass may be less selected for by this gear type. Some caution should be taken in these conclusions as the age composition only represents landed fish and not discards, which could be high if fishers do not possess red snapper quota. The results suggest that there could be additional older biomass relatively less vulnerable to the fisheries but that this reduction in vulnerability is likely a spatial issue related to movement from highly structured to relatively unstructured habitats, rather than exclusively a depth-related process. It also appears that such a reduction in relative vulnerability likely occurs in waters shallower than 150m.

Table 19. Red snapper otoliths sampled and successfully aged (in parentheses) by sector from 2003 through 2008. Sub-sampling was conducted for the commercial hand-line sector for Florida and Louisiana from Allman et al. (2009).

	2003	2004	2005	2006	2007	2008	TOTAL
COMMERCIAL							
Hand-line	2,149 (2,142)	1,765 (1,759)	1,904 (1,896)	1,955 (1,953)	2,245 (2,227)	1,920 (1,869)	**11,938 (11,846)**
Long-line	457 (456)	628 (617)	503 (499)	582 (582)	575 (561)	764 (756)	**3,509 (3,471)**
Spear						4 (4)	**4 (4)**
Trap				23 (23)			**23 (23)**
Sub-Total	**2,606 (2,598)**	**2,393 (2,376)**	**2,407 (2,395)**	**2,560 (2,558)**	**2,820 (2,788)**	**2,688 (2,629)**	**15,474 (15,344)**
RECREATIONAL							
Charter Party	319 (318)	15 (15)		2 (2)		2 (2)	**338 (337)**
Headboat	101 (101)	123 (122)	123 (123)	151 (150)	256 (254)	138 (134)	**892 (884)**
Private		3 (3)			75 (75)		**78 (78)**
Sub-Total	**420 (419)**	**141 (140)**	**123 (123)**	**153 (152)**	**331 (329)**	**140 (136)**	**1,308 (1,299)**
FISHERY INDEPENDENT							
Hand-line			5 (5)		201 (186)	82 (82)	**288 (273)**
Long-line	77 (77)	72 (72)	3 (3)	33 (33)	47 (47)	10 (10)	**242 (242)**
Trap			90 (90)	254 (250)	177 (176)	200 (198)	**721 (714)**
Trawl						284 (282)	**284 (282)**
Vertical Long-line					242 (239)		**242 (239)**
Sub-Total	**77 (77)**	**72 (72)**	**98 (98)**	**287 (283)**	**667 (648)**	**576 (572)**	**1,777 (1,750)**
TOTAL	**3,103 (3,094)**	**2,606 (2,588)**	**2,628 (2,616)**	**3,000 (2,993)**	**3,818 (3,765)**	**3,404 (3,337)**	**18,559 (18,393)**

Figure 6. Recent direct observed age composition developed for the 2009 red snapper update workshop from Cass-Calay (2009a).

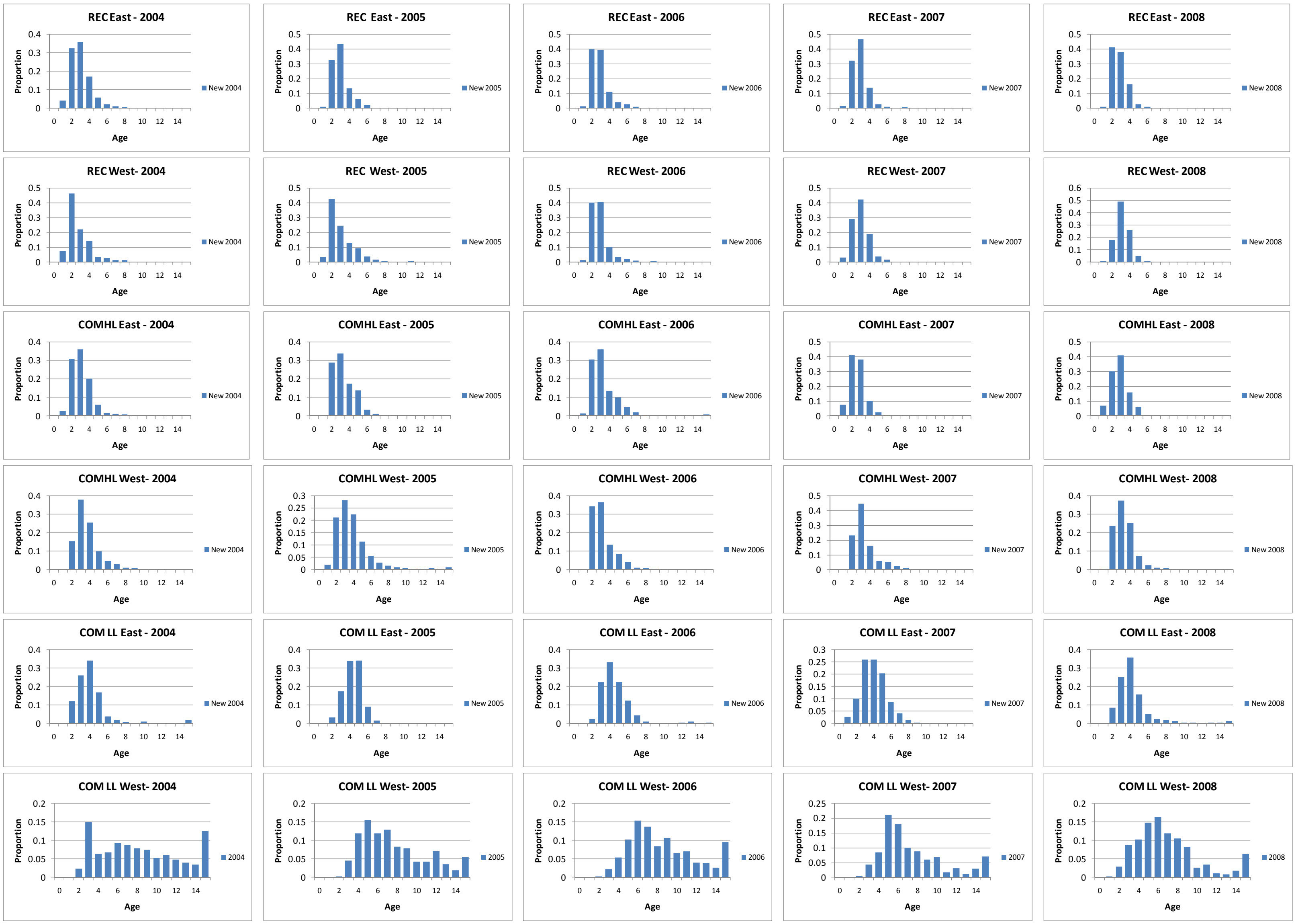


Table 20. Landings (in numbers), proportion-at-age, number of observations (N) and effective sample size (EFF N) for the recreational fishery (HB + “PR&CB”).

A) REC EAST

			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	531,995	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	816,919	0.000	0.181	0.295	0.395	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	364
REC	HL	E	1993	1,222,667	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	410
REC	HL	E	1994	769,721	0.000	0.070	0.347	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	428
REC	HL	E	1995	615,190	0.003	0.196	0.232	0.250	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	576,888	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	972,427	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	807,118	0.001	0.016	0.352	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	1328
REC	HL	E	1999	754,760	0.000	0.003	0.219	0.436	0.306	0.026	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	1429	1411
REC	HL	E	2000	726,699	0.000	0.040	0.491	0.337	0.113	0.014	0.000	0.002	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.002	647	585
REC	HL	E	2001	844,311	0.000	0.077	0.564	0.253	0.086	0.014	0.003	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	603	433
REC	HL	E	2002	1,133,526	0.003	0.044	0.258	0.410	0.176	0.062	0.027	0.015	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	2248	2186
REC	HL	E	2003	992,881	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	4939
REC	HL	E	2004	1,058,293	0.000	0.040	0.323	0.358	0.173	0.058	0.023	0.012	0.006	0.002	0.000	0.002	0.000	0.000	0.000	0.002	4087	3656
REC	HL	E	2005	771,363	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	5377	4902
REC	HL	E	2006	816,288	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	3911
REC	HL	E	2007	1,032,574	0.000	0.017	0.321	0.468	0.138	0.028	0.012	0.005	0.006	0.001	0.002	0.002	0.002	0.000	0.000	0.000	677	541
REC	HL	E	2008	681,289	0.000	0.009	0.412	0.379	0.163	0.026	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	489	417

B) REC WEST

REC	HL	W	1991	514,606	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	718,586	0.000	0.021	0.345	0.467	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	76
REC	HL	W	1993	855,855	0.000	0.075	0.583	0.253	0.069	0.015	0.004	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1128	760
REC	HL	W	1994	797,393	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	725,433	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	4
REC	HL	W	1996	582,436	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	587,207	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	418,161	0.000	0.040	0.240	0.323	0.227	0.105	0.038	0.020	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.003	924	918
REC	HL	W	1999	238,638	0.000	0.000	0.121	0.403	0.333	0.098	0.030	0.011	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	193	192
REC	HL	W	2000	262,176	0.000	0.019	0.686	0.142	0.045	0.038	0.040	0.017	0.002	0.003	0.000	0.002	0.000	0.000	0.000	0.005	247	6
REC	HL	W	2001	219,964	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	238,770	0.000	0.066	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	517
REC	HL	W	2003	267,079	0.000	0.010	0.331	0.307	0.177	0.098	0.027	0.017	0.024	0.003	0.001	0.001	0.001	0.002	0.002	0.001	944	370
REC	HL	W	2004	233,730	0.000	0.076	0.463	0.221	0.143	0.033	0.027	0.014	0.012	0.003	0.000	0.003	0.000	0.001	0.003	0.002	1187	616
REC	HL	W	2005	259,987	0.000	0.034	0.423	0.246	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	980
REC	HL	W	2006	385,060	0.000	0.015	0.400	0.405	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	1168
REC	HL	W	2007	305,508	0.000	0.030	0.290	0.423	0.192	0.036	0.017	0.004	0.002	0.003	0.001	0.002	0.000	0.000	0.000	0.001	1075	436
REC	HL	W	2008	183,527	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	610

Table 21. 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)

			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	395,176	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	406,493	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	547,530	0.000	0.002	0.196	0.373	0.236	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	665,282	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	852
CM	HL	E	2001	798,142	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	1165
CM	HL	E	2002	1,048,328	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	602
CM	HL	E	2003	1,019,086	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	631
CM	HL	E	2004	950,747	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	792,554	0.000	0.004	0.288	0.337	0.174	0.139	0.032	0.012	0.003	0.004	0.001	0.001	0.000	0.002	0.001	0.001	1170	823
CM	HL	E	2006	759,948	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	1125
CM	HL	E	2007	869,557	0.000	0.075	0.412	0.379	0.099	0.023	0.008	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	1109	900
CM	HL	E	2008	804,737	0.000	0.071	0.300	0.407	0.160	0.061	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	906	221

****** 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

			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	4,231,531	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	3,980,931	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	3,692,805	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	3,564,996	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	2333	2333
CM	HL	W	2003	3,203,664	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	3,225,570	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	3,000,354	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	3,614,990	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	2,108,689	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	1,591,356	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

Table 22. 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

			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	6,635	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	8,590	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	10,133	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	18,629	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	13,943	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	19,373	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	20,961	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	16,558	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	15,636	0.000	0.028	0.102	0.259	0.259	0.204	0.088	0.042	0.014	0.005	0.000	0.000	0.000	0.000	0.000	0.000	216	216
CM	LL	E	2008	29,068	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

B) COM LL WEST

			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	90,257	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	182,194	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	124,253	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	147,049	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	537	537
CM	LL	W	2003	171,070	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	455,664	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	282,385	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	257,718	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	188,849	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	58,441	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

6. Shrimp Bycatch and Effort

6.1. Estimates of Red Snapper Bycatch in the Shrimp Trawl Fishery

Following Nichols' method for SEDAR 7, Andrews and Nance (2009) provided the AW with bycatch estimates of red snapper in the shrimp trawl fishery. Although the methodology used is identical, including prior values and the model structure (see Nichols 2004 in SEDAR 7), there were a few notable differences between Andrews and Nance (2009) and Nicols SEDAR 7 analyses to estimate red snapper bycatch. For one, more iterations were carried out for the recent analysis to ensure convergence. In addition, Andrews and Nance updated the effort data through 2008, and included 3 depth strata in an additional model run. Previous models used 2 depth zones strata (0-10 fathoms, and 10+ fathoms), while the alternative model here included 3 depth zones strata (0-10 fathoms, 10-30 fathoms, and 30+ fathoms). This model was requested at SEDAR 7 because the majority of shrimping effort occurs in the 10-30 fathom stratum. Our results for the 2-depth strata model are consistent with the Nichols output for SEDAR 7 and they are summarized in Table 23 and Figure 7. The 3-depth strata model results (Table 24, Figure 7) indicate slightly higher bycatch of red snapper in years where the characterization of bycatch species was a priority (1993-1999, Scott-Denton 2004 in SEDAR 7).

The AW examined several alternative model runs to compare the sensitivity of the CATCHEM model to bycatch estimates derived by the 2- versus 3-depth strata models of Matter and Nance (2009). There was relatively little difference in the overall model fit to the indices of abundance between the two and three depth model.

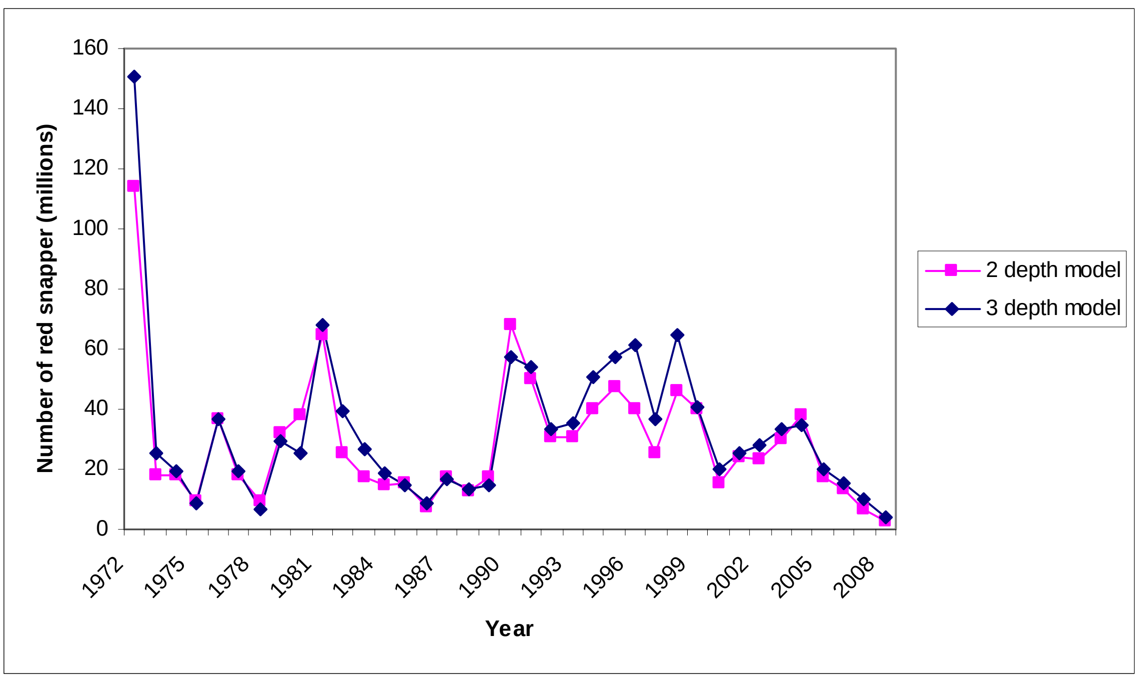


Figure 7. Estimated bycatch by year of young (ages 0-1) red snapper for both the 2-depth and the 3-depth strata models.

Table 23. Annual bycatch estimates in millions of red snapper, all ages combined, for the 2 depth strata the model.

Year	Mean	Standard Deviation	2.5% bound	Median	97.5% bound
1972	178.8	270.6	28.99	113.9	711.4
1973	22.04	16.66	7.31	17.75	63.04
1974	19.98	8.547	9.931	18.06	40.87
1975	12.9	13.51	2.943	9.021	46.6
1976	37.99	8.954	24.9	36.56	59.21
1977	18.82	4.933	12.07	17.96	30.58
1978	9.862	3.938	5.127	9.024	19.75
1979	47.47	59.6	7.226	31.82	182.1
1980	41.5	16.07	22.41	37.96	82.14
1981	91.57	106.9	30.87	64.85	322
1982	37.07	43.52	9.032	25.45	139.2
1983	25.11	30.24	4.859	17.26	94.28
1984	21.62	25.37	3.924	14.78	81.76
1985	23.44	32.01	4.305	15.66	89.68
1986	10.86	13.27	1.883	7.315	42.01
1987	25.94	31.99	4.683	17.64	94.74
1988	18.56	22.95	3.291	12.5	68.91
1989	25.95	33.15	4.764	17.5	98.57
1990	100.6	128	18.28	68.15	386.6
1991	73.37	89.62	13.08	49.72	271.3
1992	31.47	7.075	21.09	30.37	47.81
1993	30.78	4.025	24.04	30.39	39.79
1994	41.07	7.564	29.79	39.99	58.76
1995	49.33	13.15	30.66	47.1	80.88
1996	52.77	50.35	18.38	40.1	166.1
1997	28.86	14.75	13.22	25.51	64.82
1998	53.04	26.54	24.47	46.22	123.8
1999	42.85	14.88	24.85	40.06	78.1
2000	16.21	4.884	11.26	15.19	27.59
2001	25.62	9.577	16.77	23.8	45.15
2002	23.5	3.002	18.53	23.18	30.24
2003	30.84	7.111	20.39	29.73	47.95
2004	41.37	13.85	25.25	38.18	76.47
2005	27.71	39.85	6.98	17.41	109.6
2006	14.6	5.515	7.804	13.5	27.68
2007	6.826	1.366	5.004	6.634	9.735
2008	3.34	3.376	1.19	2.58	10.12

Table 24. Annual bycatch estimates in millions of red snapper, all ages combined, for the 3 depth strata the model.

Year	Mean	Standard Deviation	2.5% bound	Median	97.5% bound
1972	221	291.7	50.39	151	815.5
1973	31.23	24.34	9.91	25.05	89.42
1974	22.64	15	8.882	19.06	57.99
1975	12.9	14.93	3.287	8.788	47.18
1976	38.31	8.995	25.53	36.84	59.58
1977	20.48	5.142	13.3	19.62	32.62
1978	7.5	4.052	3.532	6.579	16.89
1979	42.1	45.73	7.844	29.61	152.4
1980	27.27	10.29	15	25.1	52.78
1981	95.09	102.9	30.3	68.1	327.6
1982	59.23	79.79	12.57	39.05	228
1983	38.88	46.15	8.095	26.9	143.5
1984	27.52	33.93	5.443	18.67	103.1
1985	21.25	25.14	4.455	14.79	77.9
1986	12.53	15.39	2.422	8.639	46.15
1987	23.89	29.15	4.525	16.36	89.09
1988	18.88	22.94	3.556	13.06	69.32
1989	21.74	26.08	4.077	14.87	80.86
1990	85.22	105.8	16.05	57.36	326.3
1991	79.41	104.3	15.36	53.98	296.1
1992	34.48	7.024	23.75	33.53	50.74
1993	37.76	10.99	26.01	35.59	62.67
1994	53.25	13.2	36.55	50.9	83.83
1995	60.57	18.68	37.44	57.06	104
1996	79.6	77.69	26.69	61.14	245
1997	41.76	21.97	17.76	36.64	95.81
1998	73.22	34.59	36.48	64.56	160.8
1999	43.71	14.31	26.29	40.95	76.84
2000	22.89	11.47	13.18	20.05	50.33
2001	26.32	5.147	19.06	25.52	38.15
2002	29.94	8.084	20.73	28.07	50.1
2003	34.74	9.046	22.11	33.05	56.92
2004	37.19	12.24	23.9	34.51	65.92
2005	27.14	28.04	9.266	19.8	89.67
2006	16.86	6.584	9.321	15.53	32.3
2007	10.67	4.251	6.88	9.752	20.15
2008	5.929	9.054	1.16	3.868	23.17

6.2 Trends in Shrimping Effort

Nance (2009) summarized recent and historical Gulf of Mexico shrimp effort trends for the AW. Effort in the offshore shrimp fishery of the Gulf of Mexico is calculated for 36 separate spatial/temporal cells each year. These cells consist of three trimester periods (January – April, May – August, and September –December); four statistical groups (subareas 1 – 9, subareas 10 – 12, subareas 13 -17, and subareas 18 – 21); and three depth strata (0 – 10 fm, 10– 30 fm, and > 30 fm). Effort is estimated for each of these unique cells by dividing the total pounds of shrimp caught in the cell by the average CPUE (pounds per day fished) for the cell. These individual effort values for each cell are additive and can be used to determine effort for combinations of seasons and locations in a given year.

Figure 8 depicts the trend in offshore shrimp fishing effort over the past 49 years (1960 – 2008). Estimated effort in 2008 was 62.69 x 10^3 days fished. This represents a 67.1% decrease in effort when compared to the baseline value (2001-2003 average). Since the red snapper assessment was an update assessment, a 2 depth strata model was used and effort in the >10 fm depth stratum was used in the assessment with the effort divided into east and west areas (eastern area was subareas 1- 12 and western area was subareas 13-21). Figure 9 depicts the trend in estimated effort for these specific areas in the Gulf of Mexico. Estimated effort in 2008 for the eastern area > 10 fm was 6.76 x 10^3 days fished. This represents a 74.89% decrease in effort when compared to the baseline value (2001-2003 average). Estimated effort in 2008 for the western area was 21.82 x 10^3 days fished in > 10 fm. This represents a 74.35% decrease in effort when compared to the baseline value (2001-2003 average).

Both the 2- and 3-depth strata models demonstrated drastic reductions in estimated bycatch mortality of red snapper owing to decreases in estimated overall shrimping effort. Predicting future trends in shrimp effort are difficult and a function of market conditions, fleet recovery from hurricanes, fuel prices, as well as host of other socio-economic conditions. However, projections of directed harvest require some effort to be assumed. The AW decided to project over two shrimp effort scenarios: effort at 2008 levels and effort consistent with the rebuilding plan.

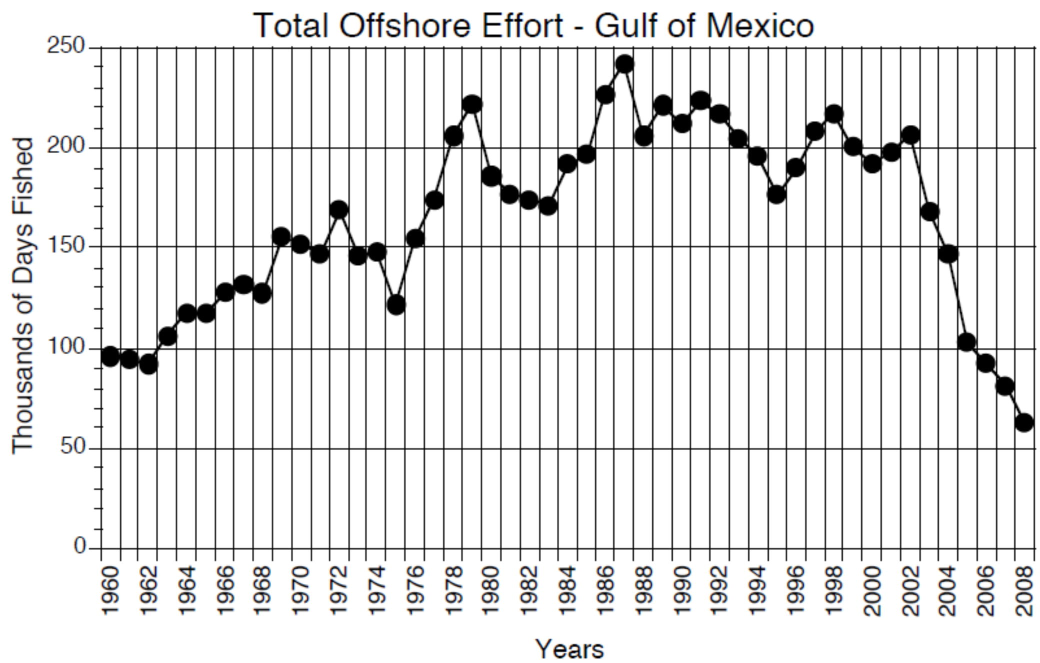


Figure 8. Estimated shrimp effort in the offshore waters of the Gulf of Mexico.

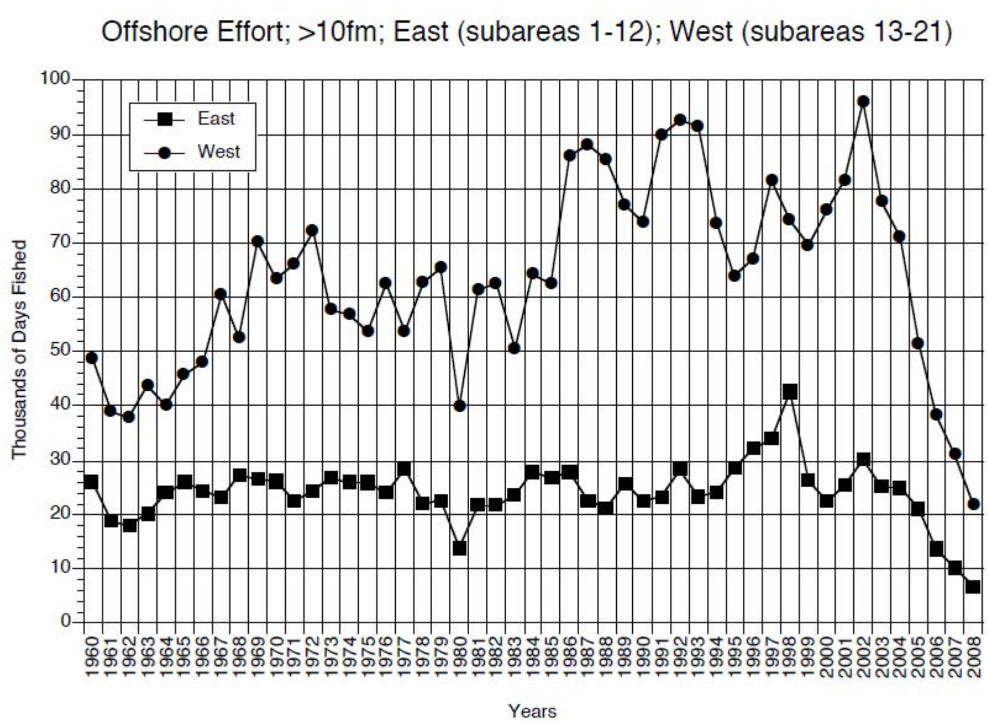


Figure 9. Estimated shrimp effort from the >10 fm depth stratum in eastern (subareas 1-12) and western (subareas 13-21) Gulf of Mexico.

7. Indices of abundance

Both fishery-dependent and fishery-independent indices of abundance were included in 2009 red snapper assessment update.

7.1 Fishery-dependent abundance indices.

- Commercial handline fishery – east
- Commercial handline fishery – west
- Recreational fishery MRFSS- east
- Recreational fishery MRFSS – west

Computation of the standardized indices of abundance was unchanged from the methods presented in SEDAR 7 with the exception of the MRFSS indices. Changes in methods employed to compute standardized MRFSS indices are summarized in Cass-Calay 2009b.

7.2 Fishery-independent abundance indices.

- SEAMAP reef fish video survey – east
- SEAMAP reef fish video survey – west
- SEAMAP larval survey – east
- SEAMAP larval survey – west
- SEAMAP bottom trawl survey age 0- east
- SEAMAP bottom trawl survey age 1- east
- SEAMAP bottom trawl survey age 0- west
- SEAMAP bottom trawl survey age 1- west
- NMFS bottom longline (used in alternative models only)

With the exception of the NMFS bottom longline survey, which was not included as an index in SEDAR 7, methods for computing the standardized indices were similar to SEDAR 7. DeVries (2009) summarized trends in the 2005-2008 video surveys for the AW. Of particular note is the observation that red snapper appear were abundant in the last year of the survey east of Cape San Blas, Florida. The overall frequency of occurrence in trap catches east of Cape San Blas was 6.5% in 2005, 7.9% in 2006, 7% in 2007, 0% in 2008, and 35.8% in 2009 (with all sampling completed). Another way to describe the change is that in the previous 4 years of sampling from 2004 through 2008, red snapper were caught only 16 times east of the Cape, while in 2009 alone they were caught 19 times. In addition, red snapper were caught in depths less than 19 m only 3 times during 2004-2008 but 10 times in 2009, and the shallowest catch in 2009 was 3 m less than during the previous 4 yr (10.7 vs 13.7 m).

The TOR for the update assessment requested the inclusion of the NMFS bottom longline data into the stock assessment. The time coverage of the bottom longline (began in 1995 and was standardized in 2000, see Henwood et al. 2004 for a complete description) was too short to be used in the SEDAR 7 assessment. The current assessment now utilizes the data series as a fishery-independent index of abundance and the aged fish as an age composition series for two alternative model runs.

8. Stock Assessment

8.1 Overview

The last benchmark assessment for red snapper, SEDAR7, utilized the CATCHEM_AD model as the base model for the assessment. The AW has adopted this same approach. A full description of the model can be found in SEDAR7 Assessment Workshop or in Porch (2007). Briefly, the CATCHEM algorithm was applied to information on red snapper populations in U.S. waters during the years from 1872 to 2008. Five fisheries were designated for each of two regions (east and west of the Mississippi River): handline, longline, recreational, closed season discards and shrimp bycatch. Three four-month seasons were modeled, starting in January. Spawning was assumed to occur during the second season. Spawning and recruitment were modeled separately for each region, essentially assuming that the eastern and western populations are relatively independent. Thirty one age classes were modeled starting with age 0, with the number of age 0 fish being computed as lognormal (bias-corrected) deviations from a Beverton and Holt function of the spawn produced during that year.

The commercial landings are estimated as described earlier and annual recreational harvest since 1981 is based on the NMFS Marine Recreational Fishery Statistical Survey (MRFSS), Texas Parks and Wildlife Survey and NMFS headboat survey as described earlier.

The recreational harvest statistics used for earlier years (1946-1980) were reconstructions based on U.S. census data using methods described in (SEDAR7). It is assumed that prior to 1946 the recreational take was negligible in comparison to the commercial take owing to the relative inaccessibility of the fishing grounds (powered vessels were few and expensive, making offshore trips mostly a pastime for the wealthy). The bycatch of juveniles from the offshore shrimp fishery is based on the series produced by Andrews and Nance (2009). The catch during the closed season was derived as described earlier. The discards from the recreational and commercial fleets during the open season were assumed to occur predominantly due to the regulations on minimum size and were inferred by the CATCHEM model based on the corresponding landings and growth parameters estimated during SEDAR 7. The discards were computed on a seasonal rather than annual basis to better accommodate the rapid growth exhibited by younger red snapper. The model accommodates uncertainty in the landings data through input coefficients of variation (CV). The CV's were fixed at 0.1 (an arbitrary low value) for the commercial fleets inasmuch as they represent a near census. The exceptions are for years when no census was taken, in which case the effective CV's were computed from the census estimates immediately before and after the year in question (absolute difference divided by the mean); the reasoning being that the true value likely lies somewhere between those values. The CV's for the recreational catches after 1981 came from the variance estimates produced by the MRFSS); the CV's for the catch inputs prior to 1982 were assigned arbitrary high CVs (1.0) inasmuch as they were not actually observed, but extrapolated based on US human census estimates of Gulf states coastal county populations. The CV's for the shrimp bycatch are based on the CV's from Andrews and Nance (ages 0-2). An additional process variance term was not included for the catch, it being assumed under that process variations in catch are adequately modeled by inter-annual deviations in recruitment and fishing mortality rates.

Twelve indices of abundance were used, 6 for each region (east or west). These include the handline CPUE series based on log books, the MRFSS recreational indices, SEAMAP larval indices, SEAMAP trawl survey (age 0 and age 1) and video surveys. In addition, the update assessment also utilized the NMFS bottom longline data series and an index of abundance in two alternative model runs (13 indices total). The CV's used to weight the indices were based on the estimates from the GLM models used to standardize them plus, in the case of the continuity run, an additional variance term estimated within the model (but see below for description of alternative runs).

Age-specific vulnerability coefficients were estimated for each fleet, but were assumed to be relatively unchanged through time. However, the truncating effect of minimum size limits on the size distribution of the landings was modeled directly based on the growth parameters used in SEDAR 7. Moreover, the relative effort of each fleet was allowed to vary by year essentially as a free parameter. Hence, the effective selectivity across the mix of fleets (*i.e.* the fishery as a whole) varied noticeably through the years. The vulnerability coefficients for the fishery-independent video surveys were fixed to 0 for ages 0-1 and 1.0 for ages 2 and older. The larval indices were taken as indicators of spawner abundance, so fecundity at age vector was used in place of vulnerability coefficients.

Where appropriate the AW attempted to stay consistent with the spirit of an Assessment Update by providing a *continuity model* that is comparable to the final model adopted in SEDAR 07 (a complete list of all data inputs for the CATCHEM continuity model run can be found in Appendix 1 of this assessment report). However, recognizing that changes in our understanding of the biology, population dynamics, and fishery of red snapper have occurred in the last 5 years, and that the Terms of Reference encouraged the exploration of some changes, the AW conducted several sensitivity analyses from which three additional “alternative state” models were developed.

8.2 Continuity Model

The continuity model is essentially a simple update of the SEDAR base model, incorporating data through 2008. Most of the data sources that were input into the model were derived using the same methodology as employed during SEDAR 7. There were, however, a few exceptions:

(1) Closed season discards (see descriptions above). Generally, the estimates of commercial closed season discards used in the SEDAR update are higher than those used during SEDAR 7; however, they are still a relatively small fraction of the fishery kill. Preliminary analyses demonstrated that the results and management implications of the SEDAR 7 base model were essentially unchanged when the new closed season discard estimates were substituted.

(2) Fishery catch per unit effort indices of abundance. The primary change here was in the use of the Stephens and MacCall (2004) method of selecting trips that could have caught red snapper. The trends from the resulting indices were very similar to those used in SEDAR 7 for the same time periods (see workshop report).

(3) SEAMAP trawl indices of abundance. The trends in the SEAMAP fall and summer indices of juvenile red snapper abundance did not exactly match the trends estimated during SEDAR 7 for the same years. Some divergence is to be expected with the addition of new data because the estimates of the fixed effects in the standardization model will be influenced by those data. Nevertheless, there do appear to have been other sources of divergence related to model convergence and choice of data sets (see workshop report). It is not expected that this change would have had a major impact on the SEDAR 7 assessment because the SEAMAP indices were not fit very closely in any case owing to the rather high variances associated with each point.

(4) Age composition. It was discovered prior to the workshop that the age composition used during SEDAR 7 was based on an "annual age" calculation that essentially attempts to track year-classes. This approach is appropriate for models where recruitment to the age class occurs at the start of the calendar year. The CATCHEM model, however, divides the year into three seasons with recruitment occurring during season 2. Accordingly, CATCHEM requires the "true age" of a fish at the time it was caught in the same sense as we typically refer to the age of a person; i.e., the integer part their true age in years. Inasmuch as recruitment typically occurs during the summer months, the "true age" of a fish typically is about a half a year younger than the "annual age", and the frequency distributions of age are shifted accordingly (see workshop report). Nevertheless, preliminary analyses showed the results and management implications of the SEDAR 7 base model were relatively unchanged when the new age composition data were used.

(5) Shrimp effort in depths greater than 10 fathoms.- The strict continuity case (run 0) followed SEDAR 7 in using the total offshore (three-area) shrimp trawl effort series to index the mortality rate of juvenile red snapper caught by offshore shrimp trawlers. The panel agreed that the effort expended outside 10 fathoms better represented the

observation that over 80% of the shrimp trawl bycatch of red snapper occurs outside of 10 fathoms, while much of the offshore shrimp effort occurs inside 10 fathoms. Accordingly, continuity model 0b and all of the other model formulations described below use the shrimp effort series from greater than 10 fathoms (two-area series).

8.2.1 Continuity Model Results and Fits to Indices

Overall, the continuity model predictions fit landings (Fig. 10), shrimp effort (Fig. 11) and age composition (not shown) well; however, fits to the indices of abundance (particularly in the east) were poor. In particular, the predicted fit did not capture the upward trend evident in the later years of the standardized MRFSS east, video east, and larval east indices (Figure 12). The continuity run indicated little change in the spawning stock biomass of red snapper and potentially a decreasing trend in age 0 recruitment (Figure 13). Apical F remained high but did indicate some recent decreases (Figure 14 and 15) and the population was dominated by snapper < 4 years old with the proportion of older fish remaining low (Fig. 16).

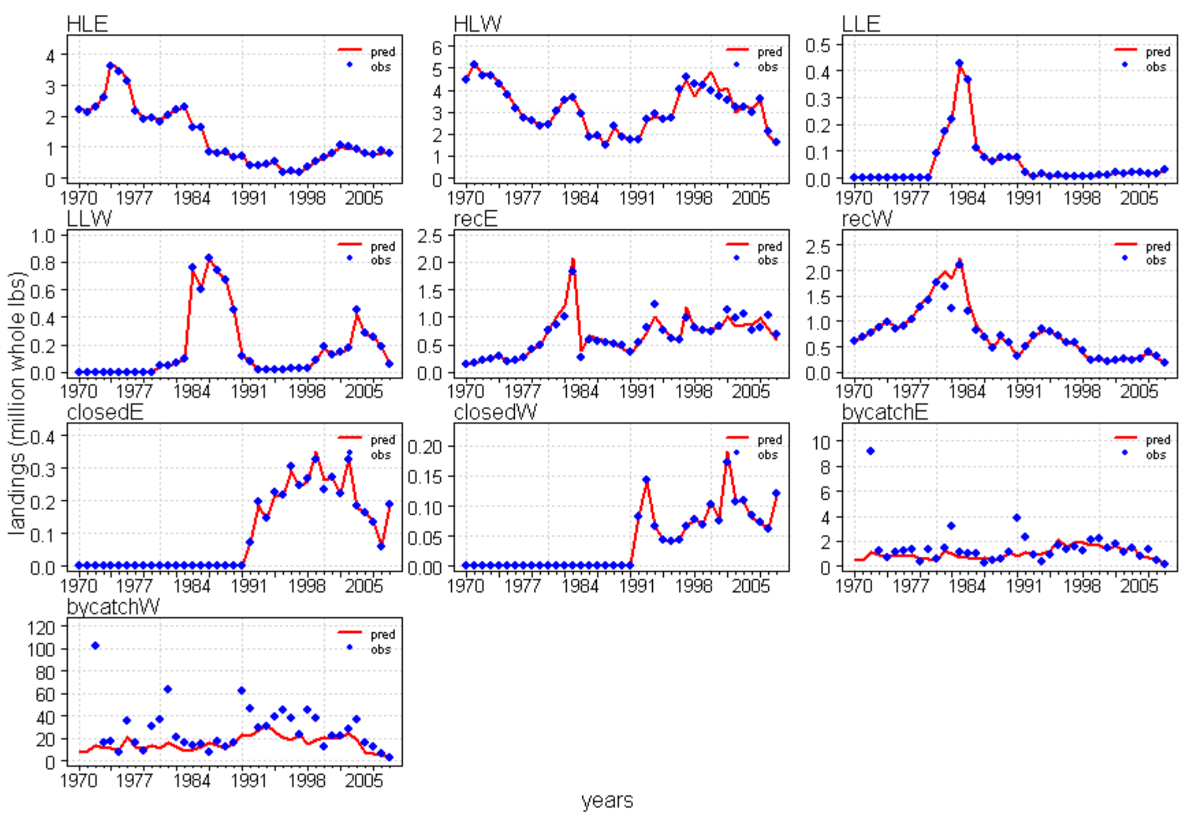


Figure 10. Scatterplots (blue diamonds) of estimated landings along with predicted fits (red lines) to the estimates from the continuity model run.

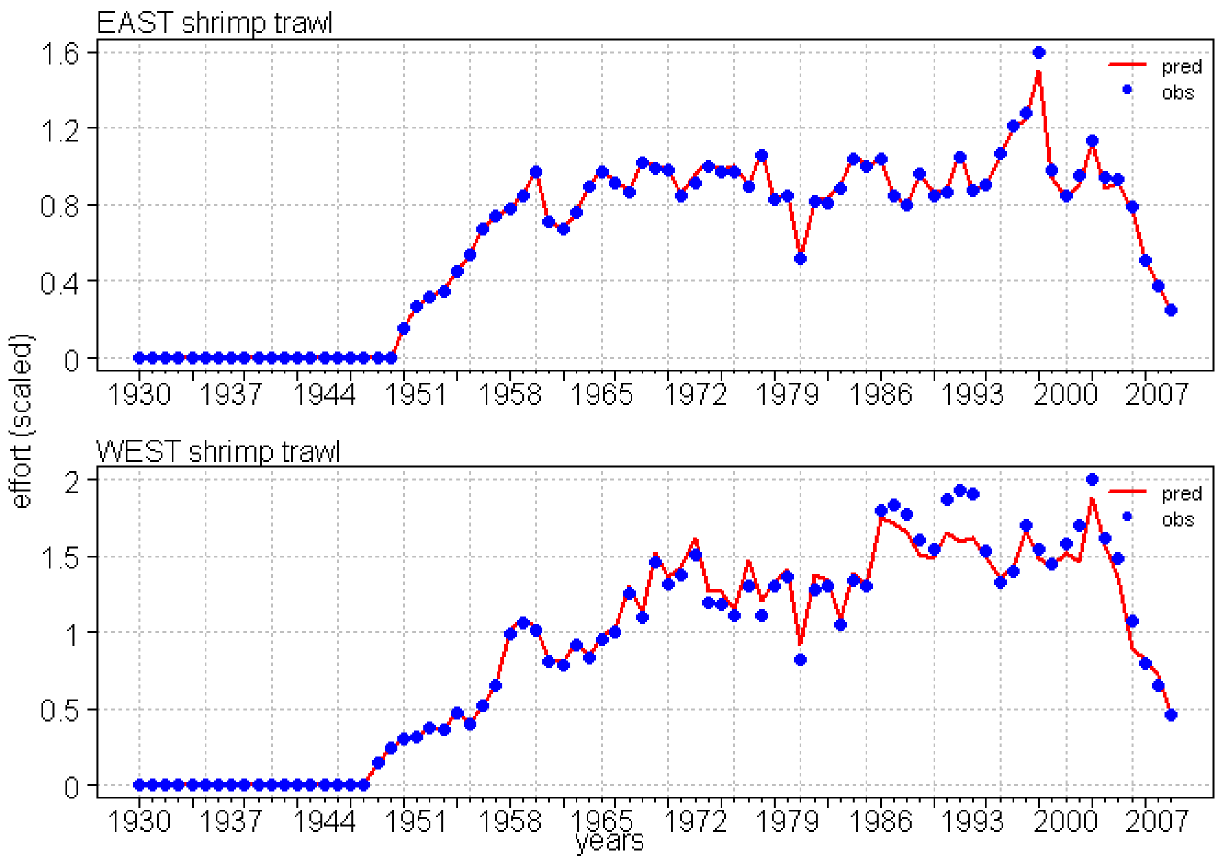


Figure 11. Scatterplots (blue diamonds) of estimated shrimping effort along with predicted fits (red lines) to the estimates from the continuity model run.

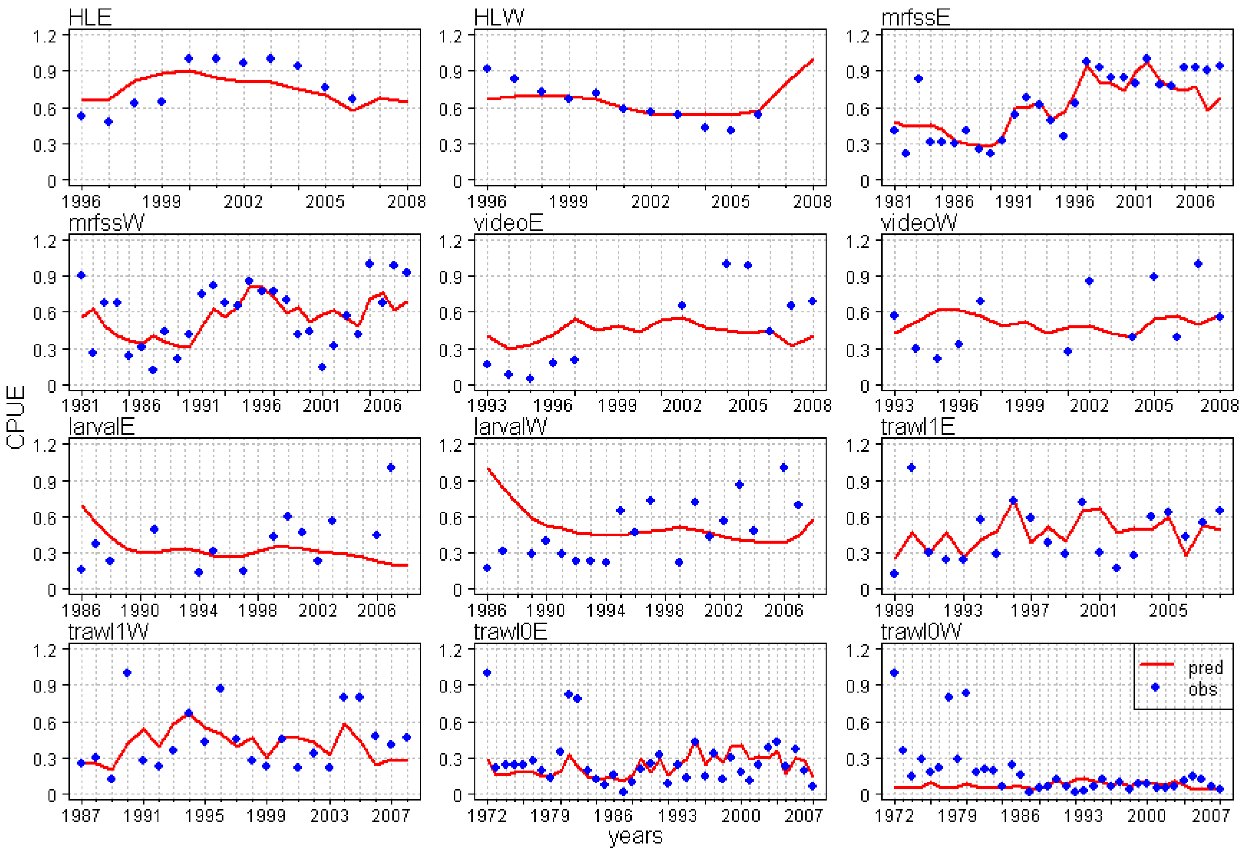


Figure 12. Scatterplots (blue diamonds) of standardized CPUE indices along with predicted fits (red lines) to the indices from the continuity model run.

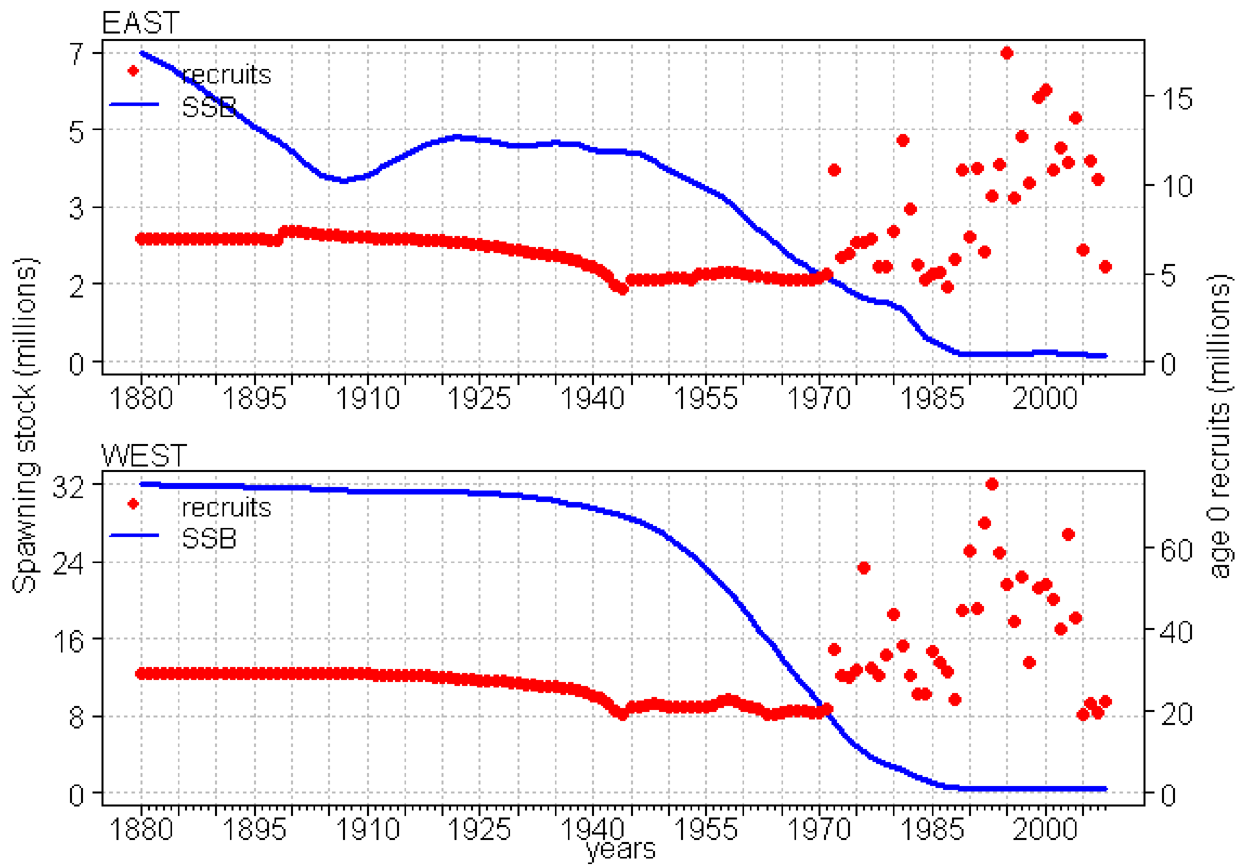


Figure 13. Age-0 recruits (red circles) and spawning stock biomass (blue lines) estimated for the eastern and western Gulf of Mexico sub-units with the continuity model.

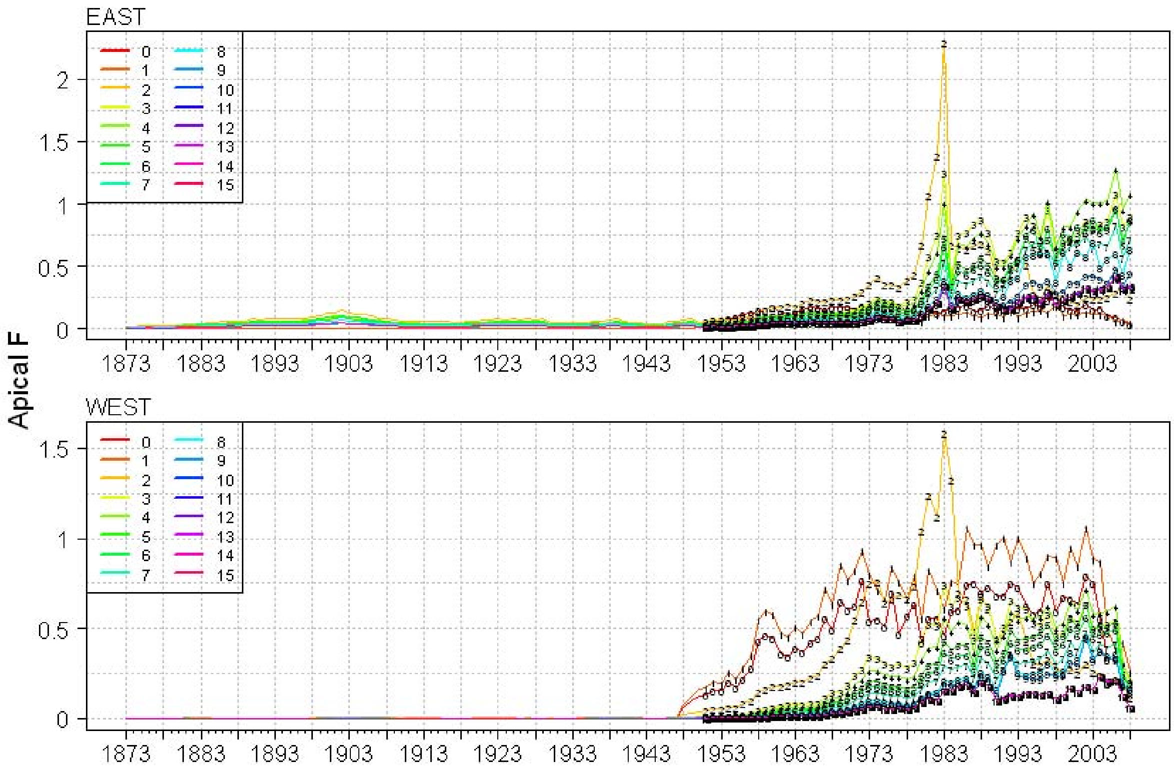


Figure 14. Age-specific estimated apical fishing mortality rate (F) estimated for the eastern and western Gulf of Mexico sub-units with the continuity model.

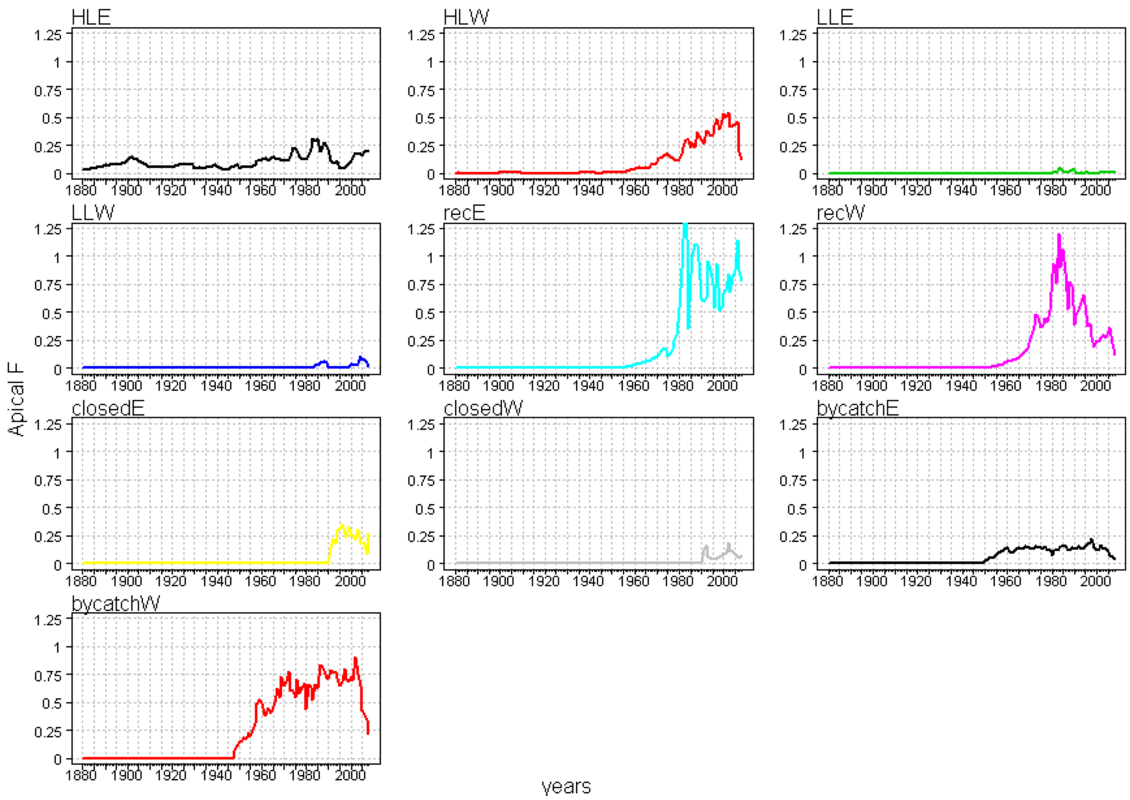


Figure 15. Fishery-specific estimates of apical F by fishery the continuity model run.

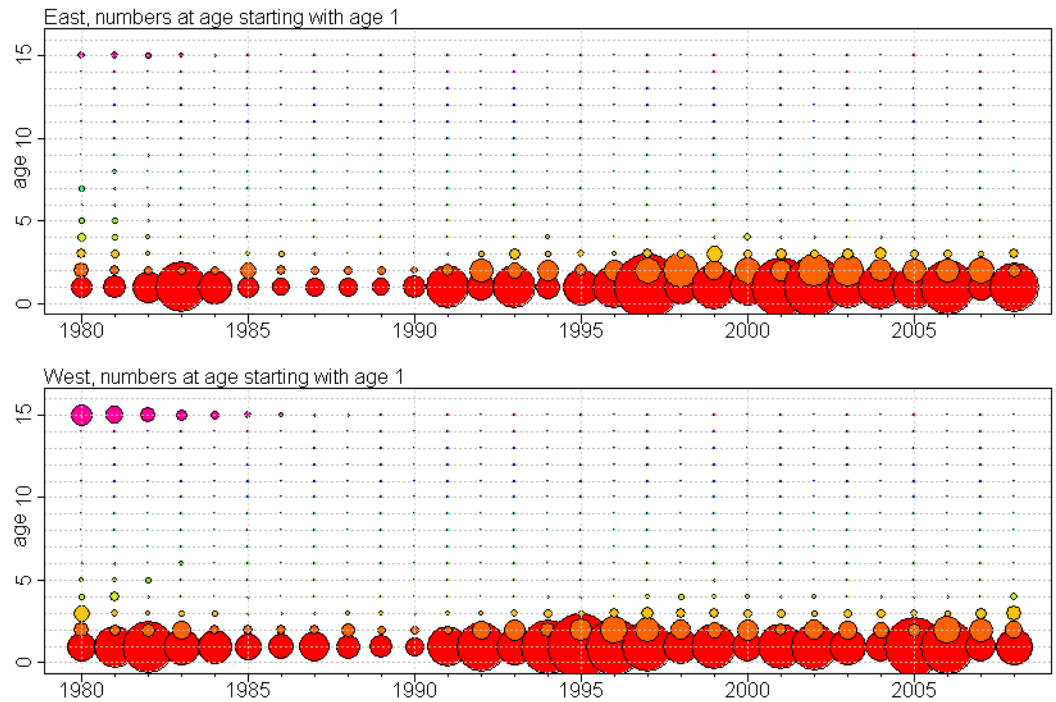


Figure 16. Estimated red snapper age composition for eastern and western Gulf of Mexico sub-units resulting from the continuity model run.

8.3. Alternative States Models

The AW spent considerable time conducting sensitivity analysis to explore several hypotheses based on the results of the continuity run, suggestions in the TOR, and various presentations to the AW during the Miami meeting. Overall, 14 different models were examined that varied in terms of natural mortality, discard mortality, relative weighting of the fishery-independent indices, and effective sampling sizes of the age composition data. Initial parameters as well as CVs for many of these parameters and inputs were varied to determine the key factors driving model fits. No projections were made during these explorations. A brief description of the 14 models is given in below. Ultimately, the AW chose to present one continuity and three alternative state models (indicated with asterisks below) to the Gulf Council's Standing and Reef Fish SSCs.

- *Model 1: Fishery-independent only.*- This model is identical to model 0b above except that the fishery-dependent catch per unit effort (CPUE) indices of abundance were omitted. This had only a minor impact on the results.
- *Model 2: Rescale CVs.*- This model rescales all indices of abundance (fishery-independent and fishery CPUE alike) so that the mean input CV for each series is 0.3 (a form of equal-weighting). To these CVs is added an additional variance term estimated internally by the model (ostensibly to account for process errors). Although the mean input CV was generally reduced by the rescaling procedure, the change had only a minor impact on the results because the additional variance term compensated to some extent for the rescaling by estimating a higher additive CV (45%) for this run than for run 0b (30%). Essentially, by estimating the additional variance term, the comparison between models 2 and 0b amounts to an analysis of the level of agreement among indices, rather than the level of agreement (conflict) between the indices and the age composition.
- *Model 3: Rescale CVs with no additional variance.*- This model duplicates Model 2, but with no additional variance term. Thus, the various indices are not only equally-weighted relative to one another, but collectively weighted much higher than in model 0b relative to the age composition data. The results were substantially more optimistic for both the east and the west in terms of status relative to 2003. Optimistic for west thus establishing an apparent conflict between the age and index data.
- *Model 4: Cap effective sample size at 200 for age composition data.*- This model caps the sample size input into the model for each year of age composition data at a maximum of 200, effectively deemphasizing the age composition in the model likelihood term (as done in base runs for the SEDAR updates of gag and red grouper). This is another way to increase the collective influence of indices on the model outcome. The results were substantially more optimistic for both the east and the west in terms of stock status, although not quite so optimistic as with Model 3.
- *Model 5: Random walk catchability.* This model allows the catchability coefficient pertaining to the MRFSS and commercial handline indices of abundance to vary from year to year according to a random walk with a log-scale variance of 0.1. As expected, the results were to those of run 1 (fishery-independent indices only). Deviations in trend between the fishery CPUE indices and fishery-independent indices are picked up in the

model as deviations in catchability, resulting in a much improved fit to the fishery CPUE indices, but an effective down-weighting of their influence on abundance estimates.

- ** Model 6:* [*Alternative State 1 (AS1)*]*: Double juvenile natural mortality rates.*- This model raises the natural mortality rate on age 0 and age 1 red snapper to 2.0 and 1.2, respectively (reflecting higher estimates by Gazey et al , Brooks et al). The main effects are, as would be expected, a large increase in estimated recruitment (age 0) and a substantial decrease in the estimated fishing mortality rate due to shrimp bycatch (especially in the west). The estimates of stock status relative to 2003 are hardly affected, however it is unclear how important the increase in M will be in terms of future TAC allocations until the projections are accomplished.
- *Model 7: Revised discard age composition.*- This run assumes the age composition of the catch during the closed season is similar to that during the open season (rather than use the age composition derived during SEDAR 7, which effectively implied fish caught during the closed season were slightly older on average than fish caught during the open season). The results are similar to those of model 0b, ostensibly because of the relatively low weight afforded to those data in the likelihood function. Interestingly, despite using similar age compositions, the estimated vulnerability patterns for the closed season are quite different from those of the corresponding open season. The reason for this is not yet clear, but the central point remains that despite this disparity, the implications of the model are essentially unchanged from model 0b.
- *Model 8: Increased discard mortality rates.*- This run increased the mortality rates assigned to fish discarded by the recreational fisheries by 50% (from 15% to 22.5% in the east and from 40% to 60% in the west). The results were relatively unchanged from model 0b.
- *Model 9: NMFS bottom longline survey.*- This run incorporated the NMFS bottom longline survey index of abundance and age compositions data for the western sub-unit (the panel agreed the samples were sparse and red snapper encounters too rare to make this data useful for the East). The index of abundance was variable from year to year, but not inconsistent with the other fishery-independent indices. The age composition data, however, indicated proportionately more large fish were caught by the longline survey than by the corresponding longline fishery. Therefore the survey was assumed to have a

logistic-type selectivity pattern where older fish are assumed to fully selected by the gear. The results showed a small decrease in the fishing mortality rate estimates for older fish with a total mortality rate that was highly consistent with independent catch curve analyses of the NMFS longline age composition (Walter and Ingram paper). The results also suggested a somewhat greater increase in spawning (stock relative to 2004) compared to the corresponding run without the NMFS longline survey data (run 0b). This run incorporated the NMFS bottom longline survey index of abundance and age compositions data for the western sub-unit (the Panel agreed the samples were too sparse and red snapper encounters too rare to make this data useful for the East). The index of abundance was variable from year to year, but not inconsistent with the other fishery-independent indices. The age composition data, however, indicated proportionately more large fish were caught by the fishery-independent longline survey than by the corresponding longline commercial fishery. Therefore the NMFS fishery-independent survey was assumed to have a logistic-type selectivity pattern where older fish (i.e., what ages?) are assumed to fully selected by the gear. The results showed a small decrease in the fishing mortality rate estimates for older fish with a total mortality rate that was highly consistent with fishery-independent catch curve analyses of the NMFS longline age composition (Walter and Ingram paper). The results also suggested a somewhat greater increase in spawning (stock relative to 2004) compared to the corresponding run without the NMFS longline survey data (*run 0b*).

- *Model 10: Fishery-independent only, indices upweighted.-* This series of three runs are like run 1 in that they exclude fishery CPUE data, like run 3 in that they do not estimate an additional process variance for the indices of abundance, and like run 4 in that they cap the maximum sample size associated with each year of age composition data. Run 10a rescales the CVs so that they have a mean of 0.3 (as in runs 2 and 3) and caps the maximum sample size of the age composition at 200. Run 10b is like 10a, but does not rescale the indices. Run 10c is like 10a, but caps maximum sample size of the age composition at 100 (an unusually low cap). All of the runs suggest more substantial reductions in F and increases in S compared with the continuity runs (0 and 0b), although the average fishing mortality rate estimates in the East are still rather high (about 0.3 yr^{-1}). Run 10c is the most optimistic, but is more extreme in its relative weighting between the indices and age data than is normally considered in SEDAR assessments. Moreover, it produces an anomalous high estimate of recreational catch in 1983 with highly unrealistic fishing mortality rate estimates in that year. Run 10c was not suggested by the Panel and is included here only to capture the extremes in model outcomes. It is not recommended for use in further analyses without further study.

- *Model 11. Cap* effective *sample size at 200 for age composition data and rescale CVs with no additional variance.* This run is a combination of runs 3 and 4 where the indices are weighted higher and equally to one another and the age composition weighting is capped at and effective sample size of 200. The model fits increasing trends to almost every index, other than the trawl survey age 0 indices which would be consistent with an increasing population.
- *Model 12. Cap sample size at 200 for age composition data, rescale CVs with no additional variance and double natural mortality on ages 0 and 1.* This model is a combination of models 3, 4 and 6. Like model 6, the bycatch fishing mortality rates are substantially reduced.
- **Model 13* [*Alternative State 2 (AS2)*]. *Cap* effective *sample size at 200 for age composition data, rescale CVs with no additional variance and NMFS bottom longline survey.* This run is a combination of runs 9 and 11. The model now provides a better fit to most of the indices, particularly the video east and larval east surveys which now show increasing trends. As a result, there is a greater increase in spawning stock biomass in the east in recent years than previously predicted.
- **Model 14* [*Alternative State 3 (AS3)*]. *Cap* effective *sample size at 200 for age composition data, rescale CVs with no additional variance, NMFS bottom longline survey and double natural mortality on ages 0 and 1.* This run is a combination of runs 6 and 11. As expected, the main difference from run 13 is a large increase in estimated recruitment (age 0) and a decrease in the estimated fishing mortality rate due to shrimp bycatch. There is also a noticeable increase in fishing mortality for the recreational west fishery in 1973.

All of the models summarized indicated improvement in the status of the western sub-unit relative to 2003 (the last year of the SEDAR 7 assessment) both in terms of the fishing mortality rate and effective number of spawners. The estimates for the east are less optimistic, ranging between slight improvements relative to 2003 to further declines. The primary of variance in estimates among models appears to be a conflicting signal between fishery-independent indices of abundance and the primarily fishery-dependent age composition data. The fishery-independent indices of abundance and MRFSS CPUE indices all indicate a generally increasing trend in the abundance of fish in both the west and the east. Only the commercial handline CPUE indices show a decrease in recent years, but these do not include 2007 and 2008. For reasons explained earlier. The age composition data, however, remain truncated relative to what would be expected in a population that had not undergone overfishing.

Models where the estimates of current status differ most from the continuity case are those where the weight placed on the age composition data is decreased relative to that placed on the indices of abundance. Reductions in the relative weight of the age composition can be achieved in the model by capping the maximum effective sample size for the age composition data or reducing the coefficients of variation (CVs) assigned to the indices of abundance. These types of changes are featured in models 2, 3, 4 and 10 (including 10b and 10c) with models 11 and 14 including both increasing weight on the indices and down-weighting of the age composition. In general, the estimate of current status relative to 2003 improves for both sub-units commensurate with the degree the age composition were down-weighted (or indices up-weighted). The effect seems to be greatest in the east, where the continuity run estimates average fishing mortality rates on the targeted age classes (ages 2 and older) of 0.6 yr^{-1} for 2008 (as opposed to 0.13 yr^{-1} in the West).

The reasons behind the apparent conflict between the age composition data and indices of abundance are as yet unclear. In the case of the age composition data there are many samples, but nearly all are fishery-dependent samples and may reflect the effects of changing fishing practices and changes in the distribution of the fishery relative to the stock that are difficult to quantify in a model. On the other hand, the fishery-independent data should be free of some of the vagaries associated with fishery data, but are based on few samples from a limited portion of the range of the stock. These sorts of tradeoffs are well-illustrated by the NMFS bottom longline survey, which encounters proportionately more old fish (on average) than the commercial longline fishery. When these data were used in the assessment model, the estimates of the fishing mortality rate on older animals in the western sub-unit were somewhat reduced. Unfortunately, the NMFS bottom longline survey samples were too sparse and the encounters of red snapper too few to be useful for the eastern sub-unit.

It is also possible that the perceived conflict between the age data and indices of abundance is a result of a misspecification in the model; as might occur if, for example, the natural mortality rate on younger adults were greater than the value of 0.1 yr^{-1} assumed during SEDAR 7. Another possibility is that the stock has been expanding back into portions of its historical range in the east that had apparently been depopulated by the 1950s (c.f. Camber, 1955). If this expansion has primarily been achieved through recruitment of very young red snapper, then the age composition data coming from fishery catches in those areas will appear truncated for at least one generation even with no overfishing (reflecting the obvious fact that it takes time for new recruits to age). The difficulty here is that there is insufficient fishery-independent sampling to clearly establish the degree to which such a range expansion may be occurring (e.g., there are essentially no SEAMAP trawl data east of Alabama).

8.3.1 Alternative State 1 (AS 1, Model 6).

The AW chose to present the results of 3 alternative state models to the SSC for discussion and opinion. In model AS1, the natural mortality rate on age 0 and age 1 red snapper was doubled to 2.0 and 1.2, respectively, reflecting higher estimates reported by Gazey et al (2009), Brooks et al. (unpublished presentation). Overall, fits to the observed data were similar to the continuity run with model 6 fits still not capturing increases in the indices in the east (Fig. 17). The main effects are a large increase in estimated recruitment (estimated age-0 abundance) and a substantial decrease in the estimated fishing mortality rate due to shrimp bycatch (especially in the west) (Figs. 18, 19 and 20). The estimates of stock status relative to 2003 are hardly affected; however, the increase in M may be important terms of future TAC allocations. AW members felt that there is compelling evidence that natural mortality on juvenile red snapper may have been underestimated in SEDAR7, thus results of this model run warranted a full consideration by the SSC.

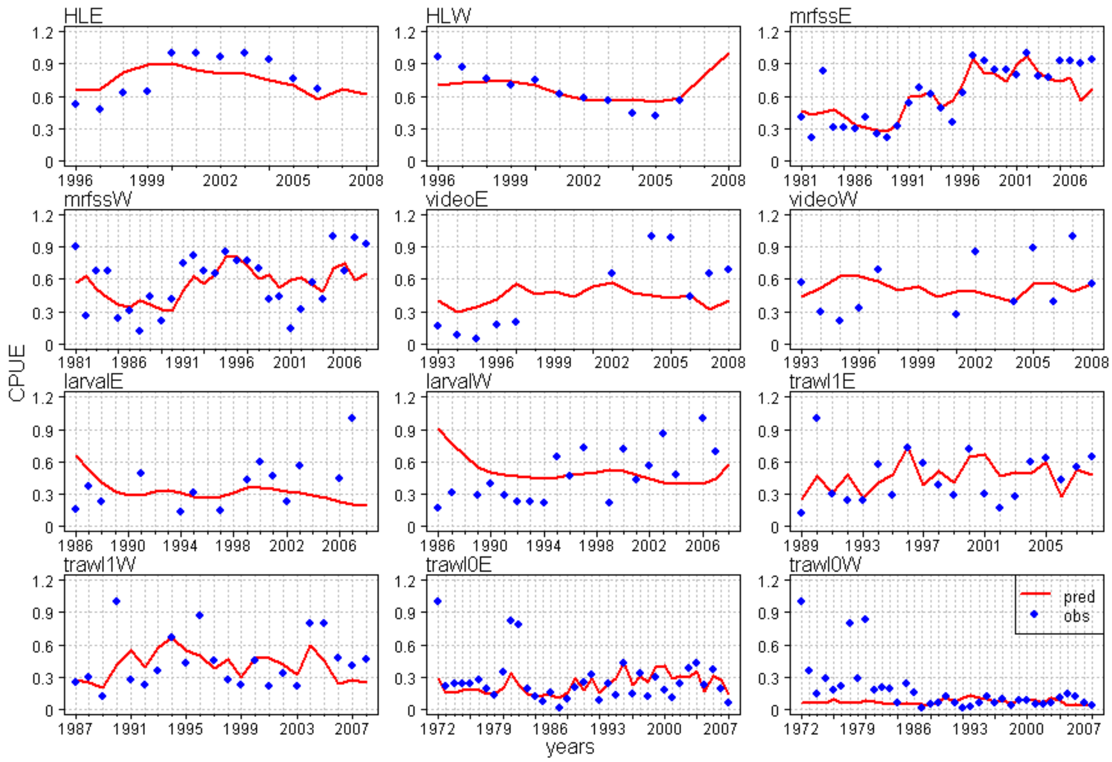


Figure 17. Scatterplots (blue diamonds) of standardized CPUE indices along with predicted fits (red lines) to the indices from model AS1.

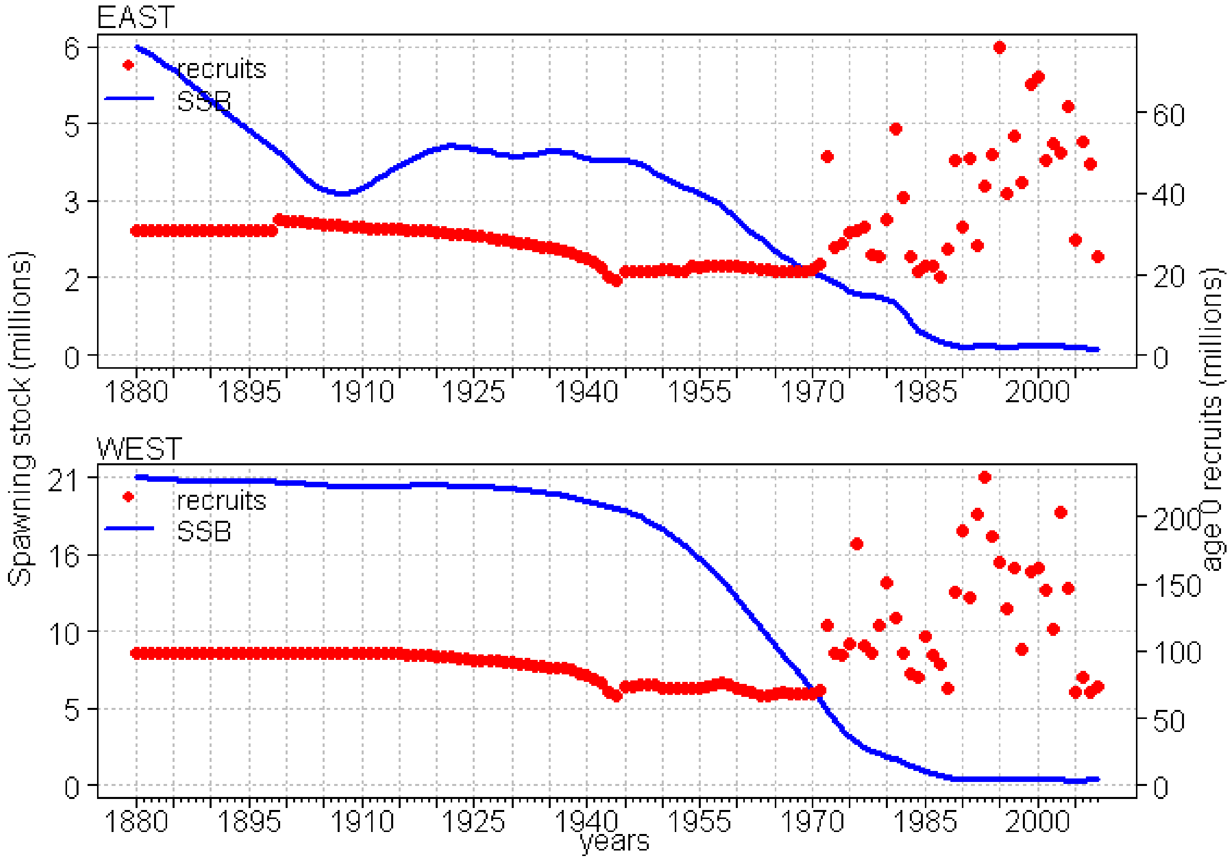


Figure 18. Age-0 recruits (red circles) and spawning stock biomass (blue lines) estimated for the eastern and western Gulf of Mexico sub-units with model AS1.

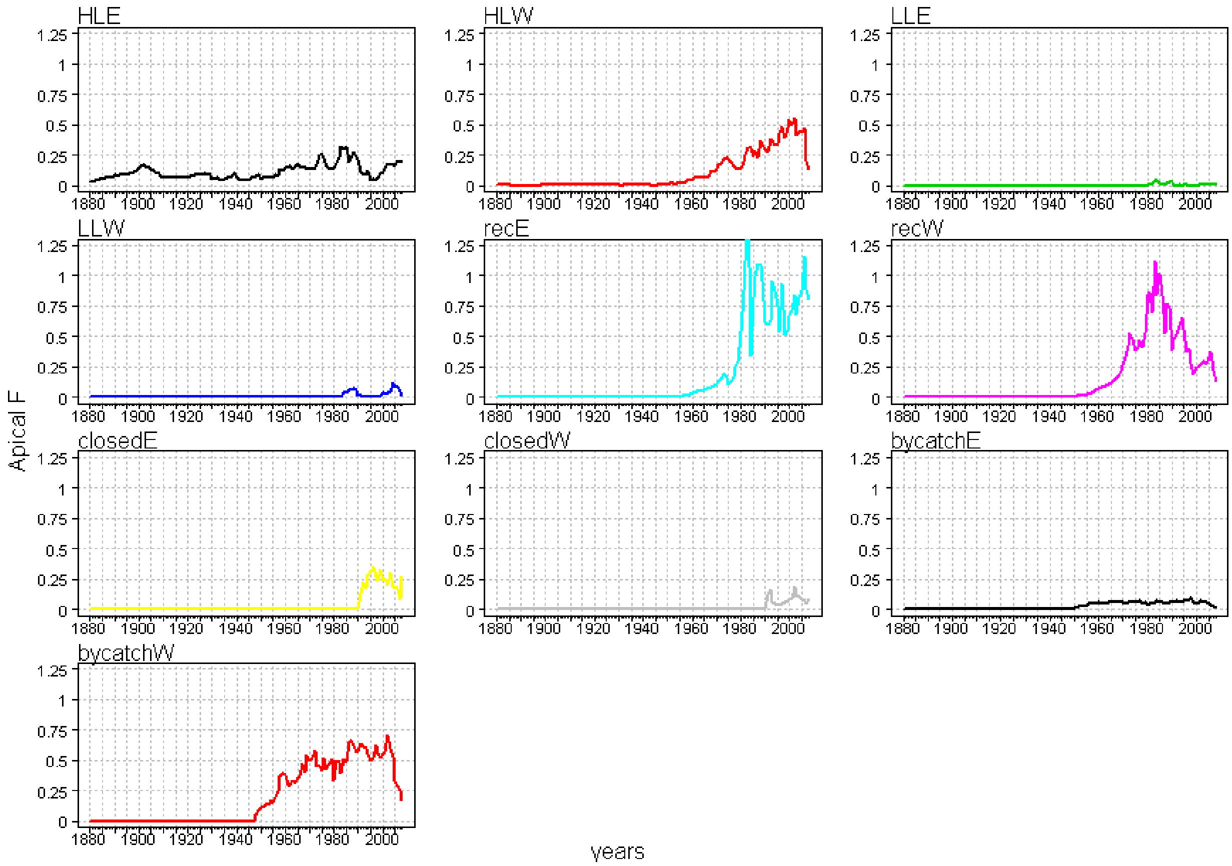


Figure 19. Apical F by the major red snapper fisheries as predicted by model AS 1.

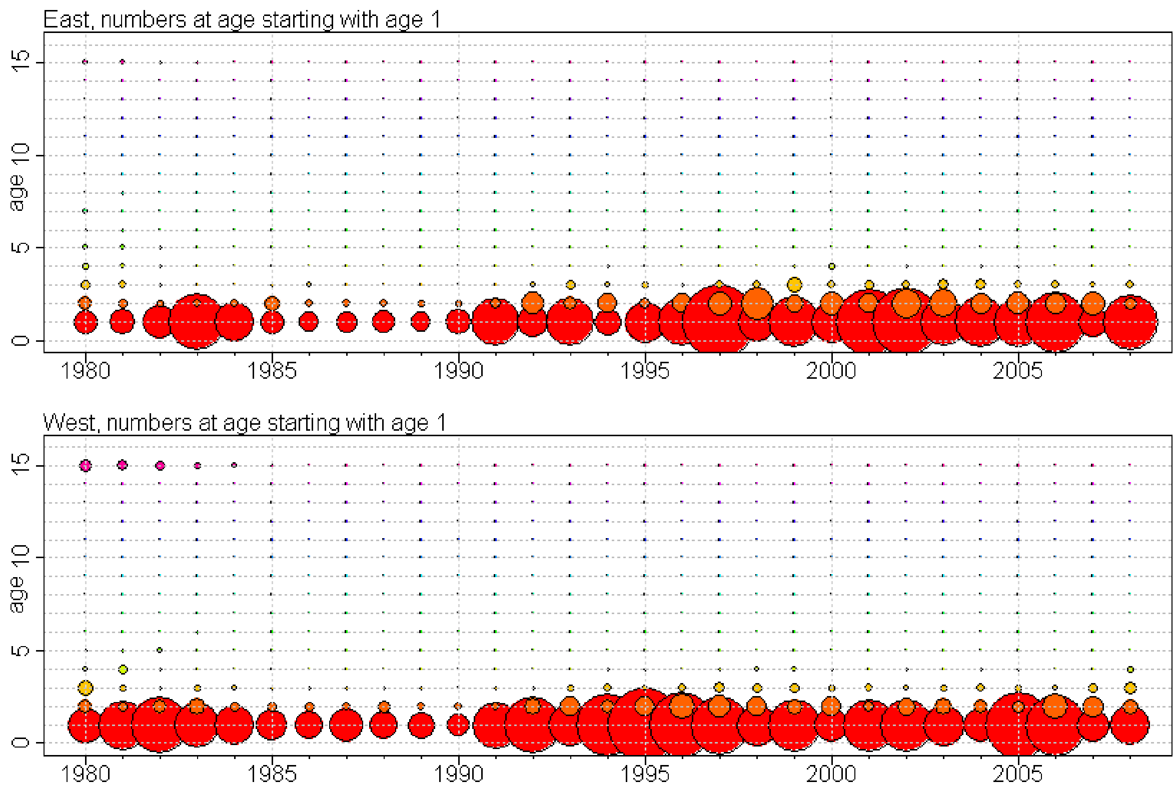


Figure 20. Estimated red snapper age composition for eastern and western Gulf of Mexico sub-units resulting from the AS1 model run.

8.3.2 Alternative State 2 (AS2, Model 13). This run is a combination of sensitivity runs 9 and 11. In this model, effective sample size was capped at 200 for age composition data, CVs of indices of abundance were rescaled with no additional variance estimated, and the NMFS bottom longline survey index was incorporated. By capping the effective sample size at 200 for the CAA data the model effectively deemphasizes the age composition in the model likelihood term (as was done in base runs for the recent SEDAR updates of Gulf of Mexico gag and red grouper). Rescaling the CV and estimating no additional variance term results in the various indices being equally-weighted relative to one another and collectively weighted much higher than in the continuity model. Finally, including the bottom longline data and age composition data for the western sub-unit (the Panel agreed the samples were too sparse and red snapper encounters too rare to make this data useful for the east) indicates proportionately more large fish. The model now provides a better fit to most of the indices of abundance (Fig. 21), particularly the video east and larval east surveys which now show increasing trends in model predictions. As a result, there is a greater increase in estimated spawning stock biomass in the east in recent years than estimated in the continuity case (Fig. 22 and 23). The results also show small decrease in the fishing mortality rate estimates for older fish.

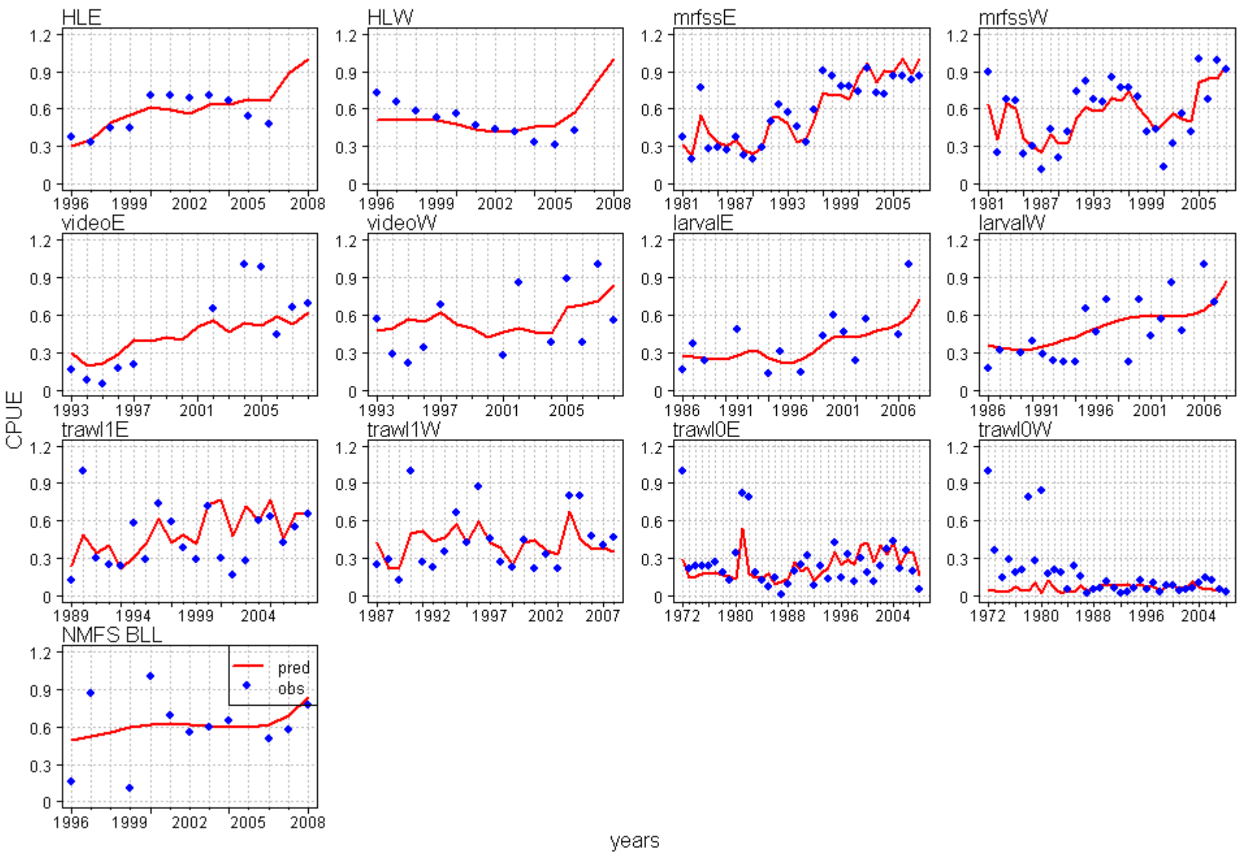


Figure 21. Scatterplots (blue diamonds) of standardized CPUE indices along with predicted fits (red lines) to the indices from model AS2.

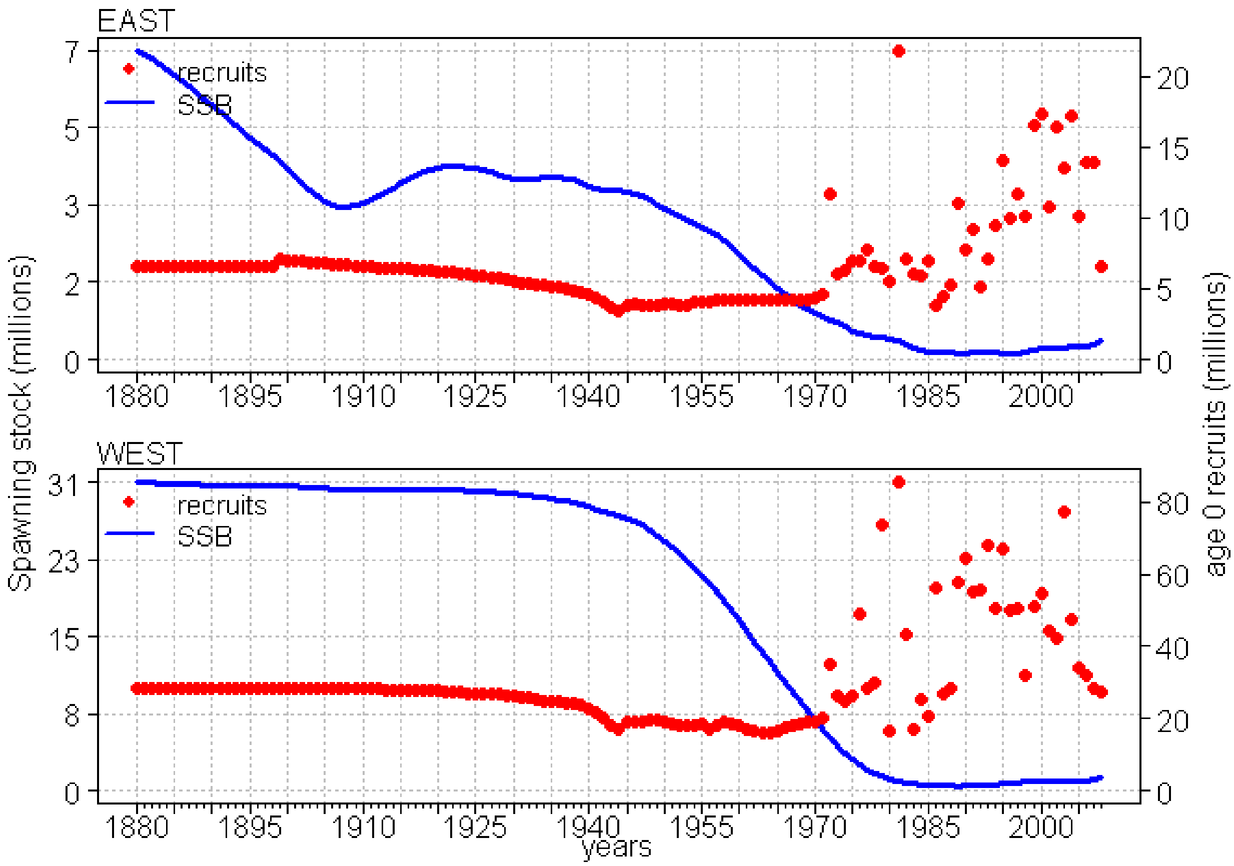


Figure 22. Age-0 recruits (red circles) and spawning stock biomass (blue lines) estimated for the eastern and western Gulf of Mexico sub-units with model AS2.

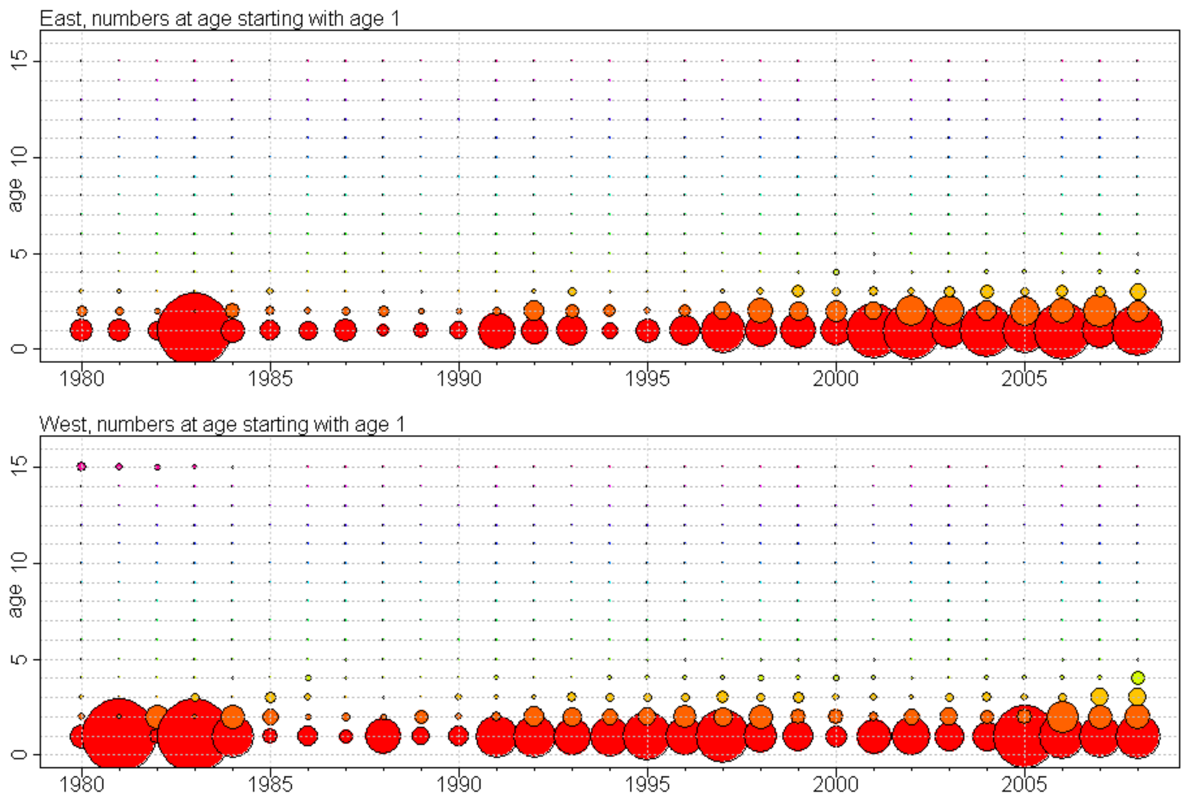


Figure 23. Estimated red snapper age composition for eastern and western Gulf of Mexico sub-units resulting from the AS2 model run.

8.3.3 Alternative State 3 (AS 3, Model 14).

In the AS3 model (model 14), the effective sample size for catch at age data was capped at 200, the CVs of indices of abundance were rescaled with no additional variance, estimated, the NMFS bottom longline survey index was incorporated, and M was doubled age-0 and -1 fish relative to SEDAR7 assumed M. The AW chose to present results of this model run to the SSC to demonstrate the results of all combinations of increasing the relative importance of the fishery-independent indices (thus decreasing the weight of the age composition data) and increasing M to a value more consistent with results of recent research. In essence, this model is a combination of sensitivity models 6 and 11. Overall, the fits to the indices of abundance were comparable to those of model 13 (Fig. 24). As expected, the main departures from run 13 is a large increase in estimated recruitment (age-0) (Figs. 25 and 26) and a decrease in estimated F due to shrimp bycatch. There is also a noticeable increase in fishing mortality for the recreational west fishery in 1973.

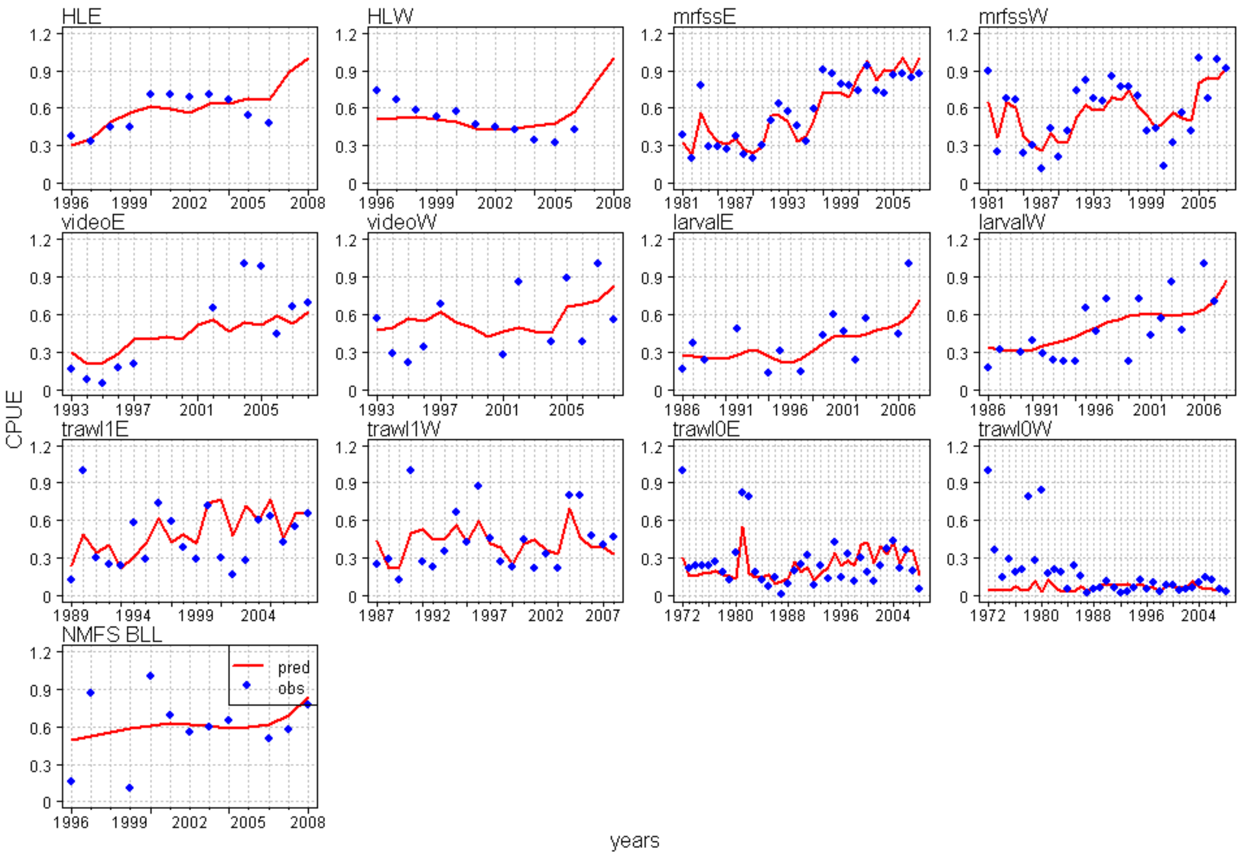


Figure 24. Scatterplots (blue diamonds) of standardized CPUE indices along with predicted fits (red lines) to the indices from model AS3.

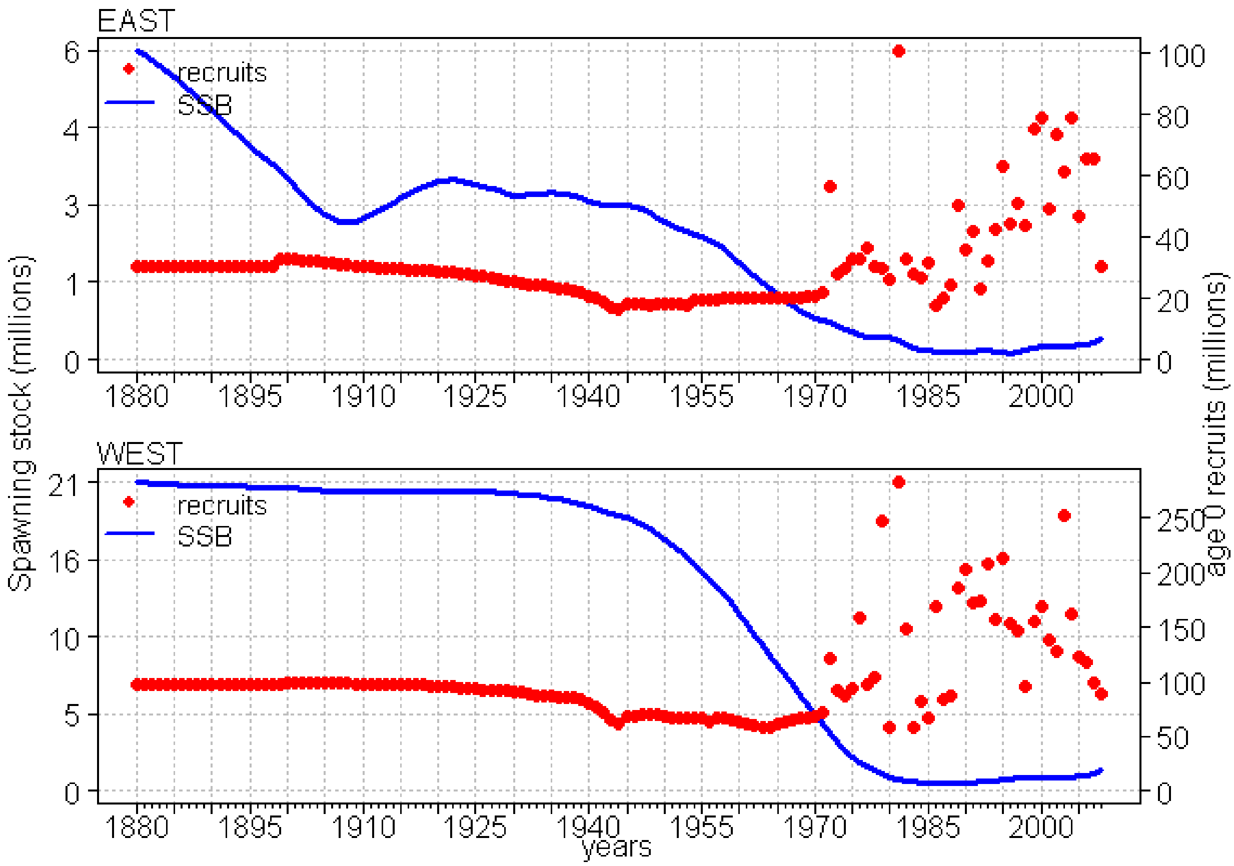


Figure 25. Age-0 recruits (red circles) and spawning stock biomass (blue lines) estimated for the eastern and western Gulf of Mexico sub-units with model AS3.

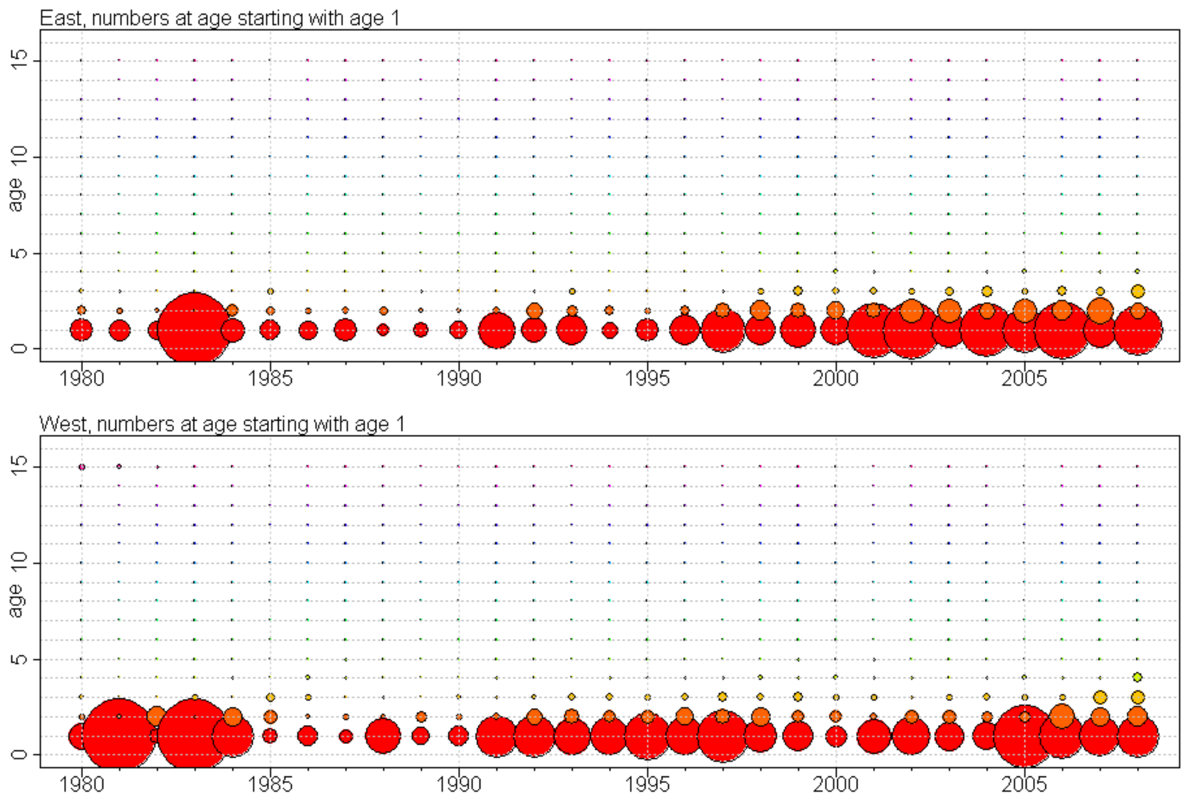


Figure 26. Estimated red snapper age composition for eastern and western Gulf of Mexico sub-units resulting from the AS3 model run.

9. Projections

The proxy for F_{msy} is the fishing mortality rate that produces a Gulf-wide long-term spawning potential ratio of 26% (consistent with the extant rebuilding plan). As implemented in the rebuilding plan, the models essentially assumes that (1) all of the directed fisheries (east and west) will incur the same proportional change in effort, and (2) the closed-season mortality rate will continue at current (2006-2008) levels. Further, the AW provides estimates under two shrimping effort scenarios.

Figures 27-30 and Tables 25-27 provide projections from the continuity model and the three alternative models under two management scenarios: shrimping effort (> 10 fathoms) remains at the 2008 level (i.e., ~75% reduction compared to 2001-2003 average) or shrimp trawl effort will resume at the higher levels specified in the rebuilding plan is consistent with the rebuilding plan (see Table 28; Fig. 31 for values used in the projection and Table 29 for historic values). For all projections the 2009 yield is set at the revised value of 6.82 and the 2010 quota is set at 5.0 million lbs. The projections are made at Fspr26%. The projections are made for various constant catch levels as well as at $F_{MSY}=F_{spr26\%}$. Note that the F_{msy} yield streams are effectively equivalent to $F_{rebuild}$ in the case where shrimp effort follows the old plan (i.e., fishing at $F_{26\%\ SPR}$ results in rebuilding by 2032). However, the yield streams for $F_{rebuild}$ are slightly higher than for F_{msy} when shrimp effort is assumed to stay at the current low levels rather than the level specified by the rebuilding plan.

Table 30 presents a decision table that includes the total quota, the quota separated into eastern and western Gulf for the different model runs and shrimp effort scenarios, and the associated probability of overfishing (assuming that the range of output from the alternative models effectively represents the major sources of uncertainty). Please note that if region-specific (i.e., east and west) quotas are selected, then they must come from the same model run and shrimp effort scenario (i.e., no mixing and matching between runs and effort scenarios) because the probabilities of overfishing were calculated based on the Gulfwide quotas not the region-specific quotas. Moreover, one must keep in mind that the rebuilding plan is based on achieving a Gulfwide SPR of 26%, even though the assessment treats the eastern and western red snapper populations as more or less independent units. Inasmuch as the western sub-unit is estimated to be much larger than the eastern sub-unit, achieving a Gulf-wide SPR of 26% generally requires bringing the SPR of the larger western sub-unit to a level close to 26%. However, the corresponding SPR of the smaller eastern sub-unit can be considerably different from 26%.

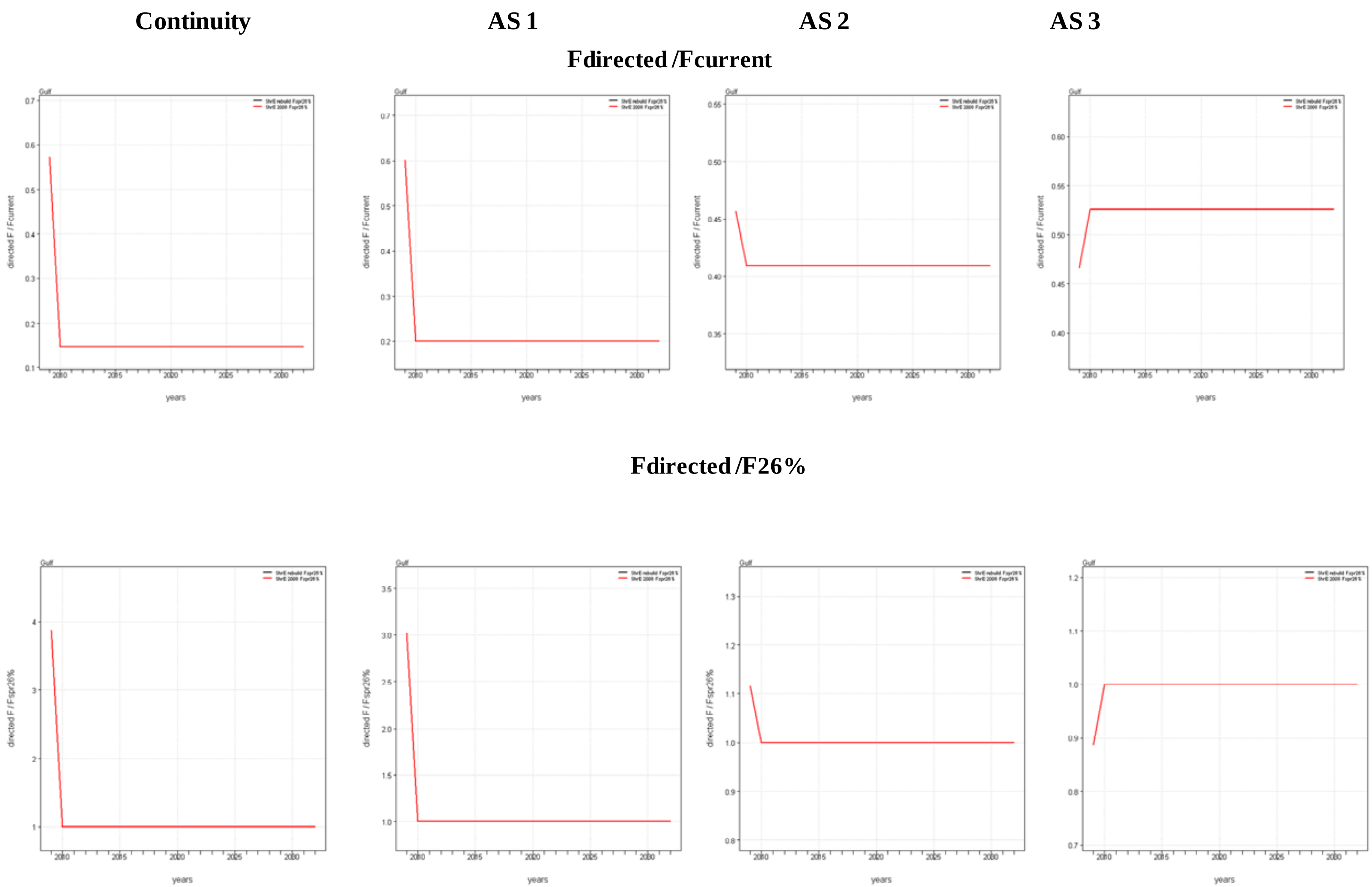


Figure 27. Deterministic projections for $F_{directed}/F_{current}$ and $F_{current}/F_{26\,\%\,SPR}$ for Gulf of Mexico red snapper from various CATCHEM_AD model parameterizations.

Continuity **AS 1** **AS 2** **AS 3**

S/S at F26%

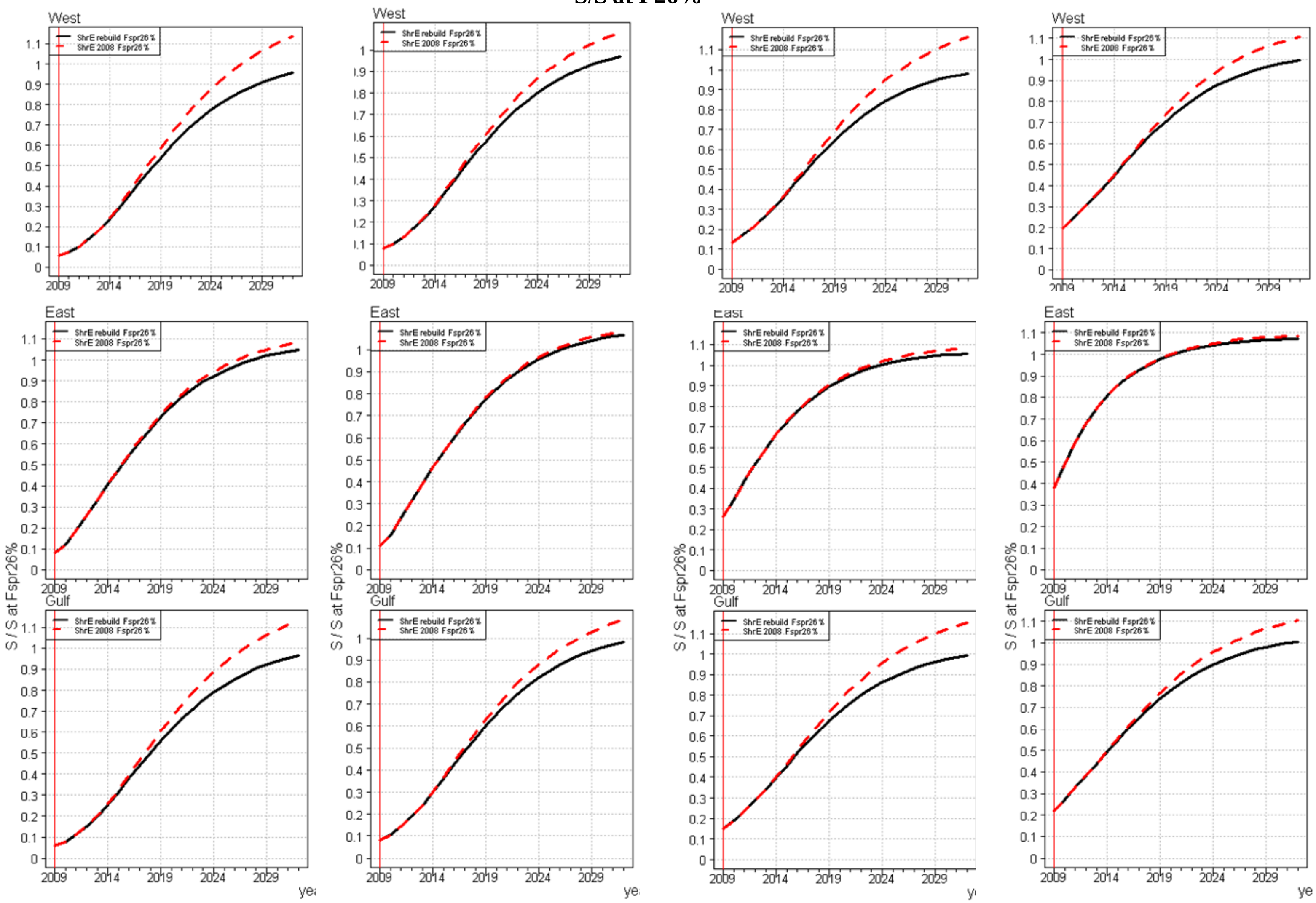


Figure 28. Deterministic projections of S/S $_{\text{at F26\%}}$ for Gulf of Mexico red snapper from the given model runs. Red assumes lines shrimp effort will remain at 2008 levels, whereas black lines assume shrimp effort reductions consistent with the rebuilding plan.

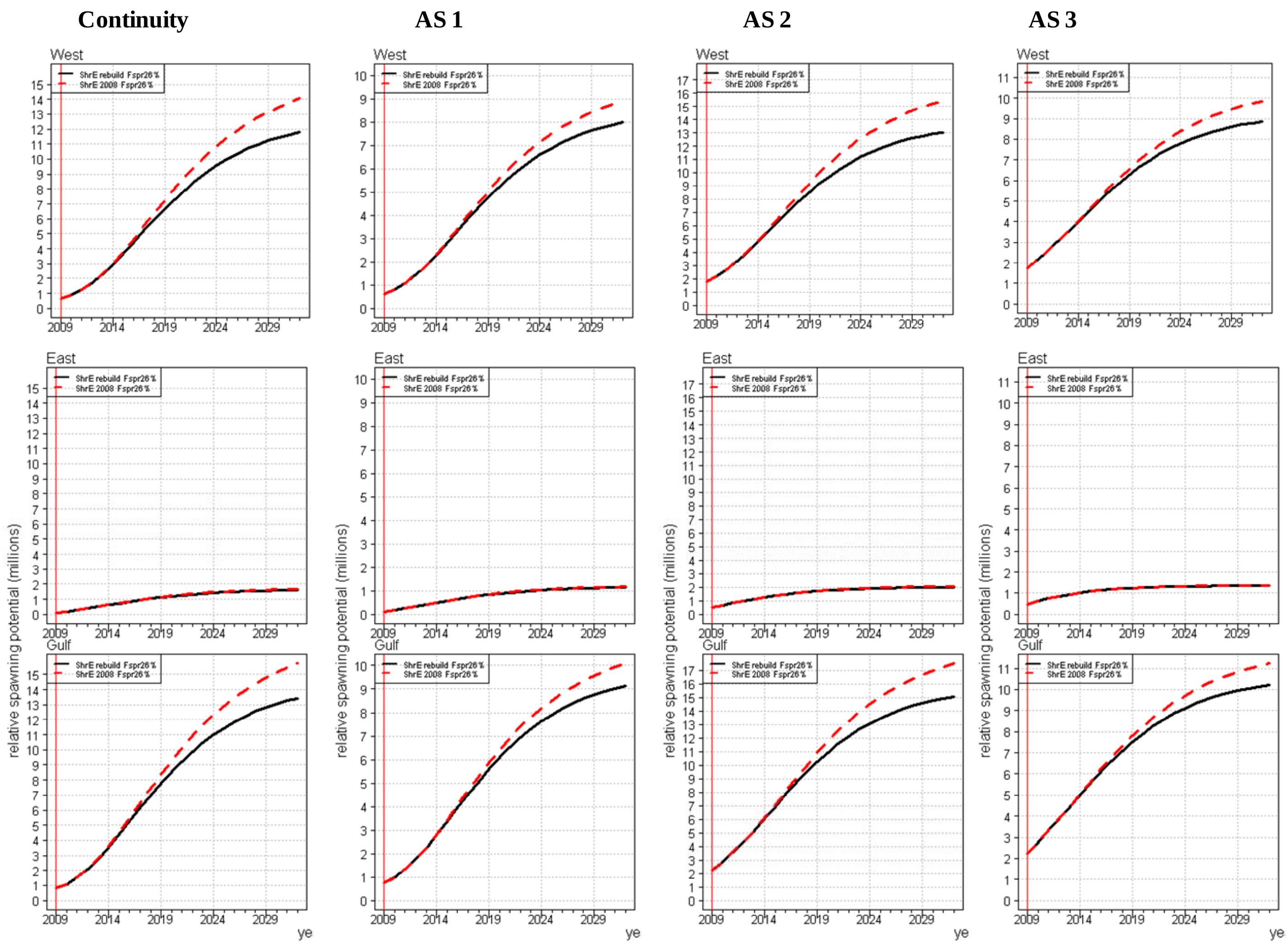


Figure 29. Deterministic projections of relative spawning potential for Gulf of Mexico red snapper from the given model runs. Red lines resulted from the assumption that shrimp effort will remain at 2008 levels, whereas black lines resulted from assuming shrimp effort reductions consistent with the rebuilding plan. Separate plots are provided for the eastern Gulf sub-unit, the western Gulf sub-unit, and the entire Gulf stock. Note 2009 and 2010 values are fixed. Note the spawning stock estimates, *S*, are *not* the actual number of eggs produced by the population, but should be interpreted as the effective number of fully-productive spawners, *i.e*. the number of eggs produced by the spawning population relative to the number that would have been produced if all of the spawners were 30 years old

Continuity **AS 1** **AS 2** **AS 3**

Directed Yield (million of lbs)

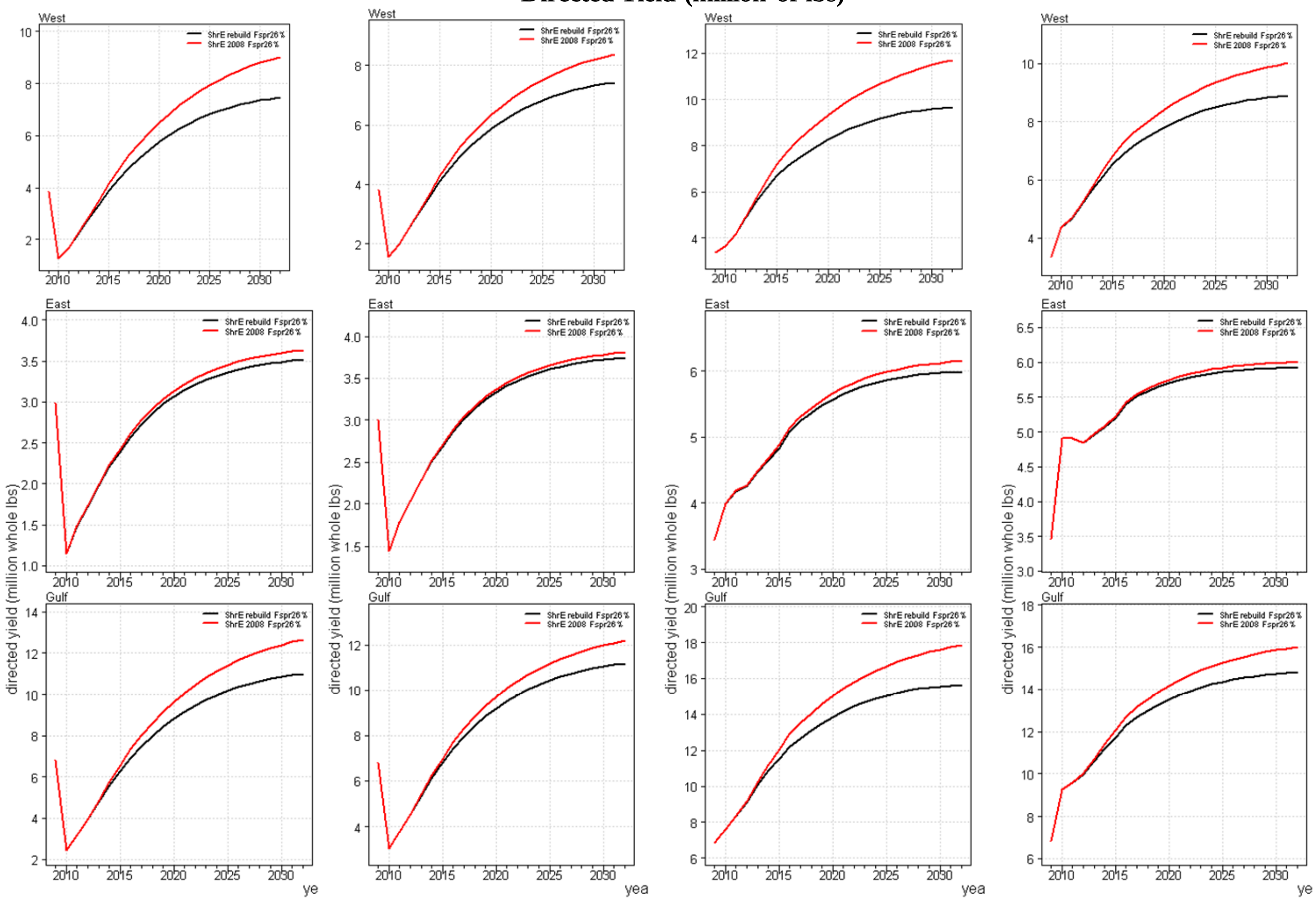


Figure 30. Deterministic projections of estimated yield at $F_{26\%SPR}$ for Gulf of Mexico red snapper from the given model runs. Red lines resulted from the assumption that shrimp effort will remain at 2008 levels, whereas black lines resulted from assuming shrimp effort reductions consistent with the rebuilding plan. Separate plots are provided for the eastern Gulf sub-unit, the western Gulf sub-unit, and the entire Gulf stock. Values for 2009 are fixed according to estimated harvest in 2009 (6.82 mp) and projections for 2010-2032 are made according to F_{spr26}.

Table 25. Projected yield of directed fisheries for Gulf of Mexico red snapper based on $F_{26\%}$. Shrimp Effort Rebuild uses the predicted shrimp effort schedule. Shrimp Effort 2008 uses 2008 shrimp effort levels. Yield reported in millions of pounds whole weight. Values for 2009 are fixed according to estimated harvest in 2009 (6.82 mp) and projections for 2010-2032 are made according to $F_{spr26.}$

	Shrimp Effort Rebuild				**Shrimp Effort 2008**			
Year	Continuity	AS 1	AS 2	AS 3	Continuity	AS 1	AS 2	AS 3
2009	6.82	6.82	6.82	6.82	6.82	6.82	6.82	6.82
2010	2.42	3.02	7.62	9.26	2.42	3.02	7.62	9.26
2011	3.16	3.76	8.33	9.58	3.17	3.77	8.34	9.59
2012	3.95	4.53	9.11	9.98	3.98	4.55	9.18	10.02
2013	4.79	5.35	10.06	10.62	4.86	5.41	10.23	10.74
2014	5.57	6.10	10.84	11.19	5.74	6.23	11.18	11.41
2015	6.28	6.79	11.53	11.73	6.56	6.99	12.06	12.06
2016	6.93	7.42	12.18	12.28	7.34	7.69	12.89	12.69
2017	7.50	7.97	12.68	12.67	8.02	8.31	13.52	13.15
2018	7.99	8.44	13.09	12.97	8.63	8.84	14.05	13.52
2019	8.43	8.84	13.49	13.26	9.16	9.30	14.55	13.85
2020	8.82	9.19	13.85	13.51	9.63	9.70	15.00	14.16
2021	9.16	9.51	14.16	13.74	10.06	10.06	15.41	14.43
2022	9.47	9.79	14.43	13.93	10.45	10.39	15.78	14.68
2023	9.74	10.03	14.67	14.10	10.80	10.68	16.11	14.90
2024	9.97	10.25	14.87	14.24	11.11	10.94	16.41	15.09
2025	10.18	10.43	15.04	14.36	11.39	11.17	16.67	15.26
2026	10.36	10.59	15.19	14.47	11.64	11.37	16.91	15.41
2027	10.51	10.73	15.31	14.55	11.86	11.55	17.12	15.55
2028	10.64	10.85	15.41	14.63	12.06	11.71	17.30	15.66
2029	10.75	10.95	15.49	14.69	12.24	11.85	17.46	15.77
2030	10.84	11.04	15.56	14.74	12.40	11.97	17.61	15.86
2031	10.92	11.11	15.61	14.77	12.54	12.08	17.74	15.94
2032	10.98	11.17	15.64	14.80	12.66	12.18	17.85	16.01

Table 26. Projected yield of directed fisheries for **Eastern** Gulf of Mexico red snapper based on $F_{26\%}$. Shrimp Effort Rebuild uses the predicted shrimp effort schedule. Shrimp effort 2008 uses 2008 shrimp effort levels. Yield reported in millions of pounds whole weight. Values for 2009 are fixed according to estimated harvest in 2009 (6.82 mp) and projections for 2010-2032 are made according to F_{spr26}.

	Shrimp Effort Rebuild				Shrimp Effort 2008			
Year	Continuity	AS 1	AS 2	AS 3	Continuity	AS 1	AS 2	AS 3
2009	2.98	3.00	3.44	3.47	2.98	3.00	3.44	3.47
2010	1.15	1.44	3.99	4.91	1.15	1.44	3.99	4.91
2011	1.48	1.79	4.18	4.91	1.48	1.79	4.18	4.91
2012	1.73	2.03	4.26	4.84	1.73	2.03	4.27	4.84
2013	1.99	2.29	4.48	4.96	2.00	2.29	4.49	4.97
2014	2.21	2.51	4.65	5.06	2.23	2.52	4.68	5.08
2015	2.39	2.69	4.84	5.20	2.42	2.71	4.88	5.23
2016	2.57	2.86	5.08	5.40	2.61	2.89	5.14	5.43
2017	2.73	3.02	5.25	5.51	2.78	3.04	5.32	5.55
2018	2.86	3.14	5.37	5.58	2.92	3.17	5.45	5.62
2019	2.97	3.25	5.48	5.65	3.04	3.28	5.56	5.69
2020	3.06	3.33	5.58	5.70	3.13	3.37	5.67	5.75
2021	3.14	3.41	5.66	5.75	3.22	3.45	5.75	5.80
2022	3.21	3.47	5.72	5.78	3.29	3.51	5.83	5.84
2023	3.27	3.52	5.78	5.82	3.35	3.57	5.89	5.87
2024	3.32	3.57	5.83	5.84	3.41	3.61	5.94	5.90
2025	3.36	3.60	5.87	5.86	3.45	3.65	5.99	5.92
2026	3.40	3.64	5.90	5.88	3.49	3.69	6.03	5.94
2027	3.43	3.66	5.92	5.89	3.53	3.72	6.06	5.95
2028	3.45	3.69	5.94	5.90	3.55	3.74	6.09	5.97
2029	3.47	3.71	5.96	5.91	3.58	3.76	6.11	5.98
2030	3.49	3.72	5.97	5.91	3.60	3.78	6.13	5.99
2031	3.51	3.73	5.98	5.92	3.62	3.79	6.14	5.99
2032	3.52	3.75	5.99	5.92	3.64	3.81	6.15	6.00

Table 27. Projected yield of directed fisheries for **Western** Gulf of Mexico red snapper based on $F_{26\%}$. Shrimp Effort Rebuild uses the predicted shrimp effort schedule. Shrimp Effort 2008 uses 2008 shrimp effort levels. Yield reported in millions of pounds whole weight. Values for 2009 are fixed according to estimated harvest in 2009 (6.82 mp) and projections for 2010-2032 are made according to F_{spr26}

	Shrimp Effort Rebuild				Shrimp Effort 2008			
Year	Continuity	AS 1	AS 2	AS 3	Continuity	AS 1	AS 2	AS 3
2009	3.84	3.82	3.38	3.35	3.84	3.82	3.38	3.35
2010	1.27	1.57	3.63	4.35	1.27	1.57	3.64	4.35
2011	1.68	1.98	4.15	4.67	1.69	1.98	4.16	4.68
2012	2.22	2.50	4.85	5.14	2.24	2.52	4.91	5.17
2013	2.80	3.06	5.59	5.66	2.87	3.12	5.74	5.76
2014	3.36	3.60	6.19	6.12	3.51	3.71	6.50	6.32
2015	3.89	4.11	6.69	6.53	4.14	4.28	7.18	6.83
2016	4.36	4.56	7.10	6.88	4.73	4.81	7.75	7.27
2017	4.77	4.95	7.43	7.15	5.24	5.26	8.20	7.60
2018	5.13	5.29	7.72	7.39	5.71	5.66	8.60	7.89
2019	5.46	5.59	8.01	7.61	6.12	6.01	8.98	8.16
2020	5.75	5.86	8.28	7.81	6.50	6.33	9.34	8.41
2021	6.02	6.10	8.51	7.99	6.85	6.62	9.66	8.64
2022	6.26	6.32	8.71	8.14	7.16	6.88	9.96	8.84
2023	6.47	6.51	8.89	8.28	7.45	7.11	10.22	9.03
2024	6.65	6.68	9.04	8.40	7.70	7.33	10.47	9.19
2025	6.82	6.83	9.18	8.50	7.94	7.51	10.68	9.34
2026	6.96	6.96	9.29	8.59	8.15	7.68	10.88	9.47
2027	7.08	7.07	9.39	8.66	8.34	7.83	11.06	9.59
2028	7.19	7.16	9.47	8.73	8.51	7.97	11.22	9.70
2029	7.28	7.25	9.53	8.78	8.66	8.09	11.36	9.79
2030	7.35	7.32	9.58	8.82	8.80	8.19	11.48	9.87
2031	7.42	7.38	9.62	8.86	8.92	8.29	11.59	9.95
2032	7.47	7.42	9.65	8.88	9.02	8.37	11.69	10.01

Table 28. Projected values for shrimp effort under the two projection scenarios (constant 2008 effort) or effort reduction consistent with the rebuilding plan. Values are expressed as proportion relative the 2001-2003 effort average.

	Projected Shrimp Effort			
	Shrimp E rebuild		Shrimp E 2008	
Year	East	West	East	West
2009	0.270	0.453	0.260	0.450
2010	0.270	0.453	0.260	0.450
2011	0.342	0.575	0.260	0.450
2012	0.345	0.581	0.260	0.450
2013	0.349	0.588	0.260	0.450
2014	0.352	0.593	0.260	0.450
2015	0.356	0.598	0.260	0.450
2016	0.360	0.605	0.260	0.450
2017	0.363	0.610	0.260	0.450
2018	0.366	0.615	0.260	0.450
2019	0.370	0.622	0.260	0.450
2020	0.373	0.628	0.260	0.450
2021	0.376	0.633	0.260	0.450
2022	0.380	0.640	0.260	0.450
2023	0.384	0.645	0.260	0.450
2024	0.387	0.650	0.260	0.450
2025	0.391	0.657	0.260	0.450
2026	0.394	0.662	0.260	0.450
2027	0.397	0.668	0.260	0.450
2028	0.401	0.675	0.260	0.450
2029	0.404	0.680	0.260	0.450
2030	0.407	0.685	0.260	0.450
2031	0.412	0.692	0.260	0.450
2032	0.415	0.697	0.260	0.450

Table 29. Observed shrimp effort values use in the stock assessment. Values are expressed as proportion relative the 2001-2003 effort average.

			Observed Shrimp Effort					
Year	East	West	Year	East	West	Year	East	West
1872	0	0	1918	0	0	1964	0.92	0.82
1873	0	0	1919	0	0	1965	1	0.94
1874	0	0	1920	0	0	1966	0.94	0.99
1875	0	0	1921	0	0	1967	0.89	1.24
1876	0	0	1922	0	0	1968	1.05	1.08
1877	0	0	1923	0	0	1969	1.02	1.44
1878	0	0	1924	0	0	1970	1.01	1.3
1879	0	0	1925	0	0	1971	0.87	1.36
1880	0	0	1926	0	0	1972	0.94	1.48
1881	0	0	1927	0	0	1973	1.03	1.18
1882	0	0	1928	0	0	1974	1	1.17
1883	0	0	1929	0	0	1975	1	1.1
1884	0	0	1930	0	0	1976	0.92	1.28
1885	0	0	1931	0	0	1977	1.09	1.1
1886	0	0	1932	0	0	1978	0.85	1.29
1887	0	0	1933	0	0	1979	0.87	1.34
1888	0	0	1934	0	0	1980	0.53	0.81
1889	0	0	1935	0	0	1981	0.84	1.26
1890	0	0	1936	0	0	1982	0.83	1.28
1891	0	0	1937	0	0	1983	0.91	1.04
1892	0	0	1938	0	0	1984	1.07	1.32
1893	0	0	1939	0	0	1985	1.03	1.28
1894	0	0	1940	0	0	1986	1.07	1.77
1895	0	0	1941	0	0	1987	0.87	1.81
1896	0	0	1942	0	0	1988	0.82	1.75
1897	0	0	1943	0	0	1989	0.99	1.58
1898	0	0	1944	0	0	1990	0.87	1.52
1899	0	0	1945	0	0	1991	0.89	1.84
1900	0	0	1946	0	0	1992	1.08	1.9
1901	0	0	1947	0	0	1993	0.9	1.88
1902	0	0	1948	0	0.15	1994	0.93	1.51
1903	0	0	1949	0	0.24	1995	1.1	1.31
1904	0	0	1950	0.16	0.3	1996	1.24	1.38
1905	0	0	1951	0.28	0.31	1997	1.31	1.67
1906	0	0	1952	0.33	0.37	1998	1.64	1.52
1907	0	0	1953	0.36	0.36	1999	1.01	1.43
1908	0	0	1954	0.46	0.47	2000	0.87	1.56
1909	0	0	1955	0.55	0.39	2001	0.98	1.67
1910	0	0	1956	0.69	0.51	2002	1.16	1.97
1911	0	0	1957	0.76	0.64	2003	0.97	1.59
1912	0	0	1958	0.8	0.98	2004	0.96	1.46
1913	0	0	1959	0.87	1.05	2005	0.81	1.06
1914	0	0	1960	1	1	2006	0.52	0.79
1915	0	0	1961	0.73	0.8	2007	0.39	0.64
1916	0	0	1962	0.69	0.78	2008	0.26	0.45
1917	0	0	1963	0.78	0.9	**Average**	0.39	0.63

Table 30. Decision table for Gulf of Mexico red snapper with the total quota for the directed fisheries, how that quota is spilt between eastern and western Gulf for the different model runs and shrimp effort scenarios, and the associated probability of overfishing. The quotas are reported in millions of pounds whole weight. Projections were deterministic, so the potential for overfishing is the proportion of the eight model runs in which overfishing occurred in a given year with a given quota. **WARNING: if region-specific (i.e., east and west) quotas are desired, then they must be selected from the same model run and shrimp effort scenario (i.e., no mixing and matching across runs and shrimp effort scenarios) because probability of overfishing was estimated based on total quotas not region-specific quotas.** This table reports projection runs with fishing at Fspr26% beginning in 2010. Model runs in which overfishing is predicted are marked in bold.

	Shrimp Effort Rebuild								Shrimp Effort 2008								Proportion o
Total	Continuity		AS 1		AS 2		AS 3		Continuity		AS 1		AS 2		AS 3		Models indic
Quota	East	West	East	West	East	West	East	West	East	West	East	West	East	West	East	West	Overfishing
									2009								
6.82	**2.98**	**3.84**	**3.00**	**3.82**	**3.44**	**3.38**	3.47	3.35	**2.98**	**3.84**	**3.00**	**3.82**	**3.44**	**3.38**	3.47	3.35	0.75
									2010								
2.00	0.95	1.05	0.96	1.04	1.06	0.94	1.08	0.92	0.95	1.05	0.97	1.03	1.06	0.94	1.08	0.92	0.00
3.00	**1.42**	**1.58**	1.44	1.56	1.59	1.41	1.62	1.38	**1.42**	**1.58**	1.44	1.56	1.59	1.41	1.62	1.38	0.25
4.00	**1.88**	**2.12**	**1.90**	**2.10**	2.11	1.89	2.68	2.32	**1.88**	**2.12**	**1.90**	**2.10**	2.11	1.89	2.15	1.85	0.50
5.00	**2.33**	**2.67**	**2.36**	**2.64**	2.64	2.36	2.68	2.32	**2.33**	**2.67**	**2.36**	**2.64**	2.64	2.36	2.68	2.32	0.50
6.00	**2.77**	**3.23**	**2.80**	**3.20**	3.15	2.85	3.21	2.79	**2.77**	**3.23**	**2.80**	**3.20**	3.15	2.85	3.21	2.79	0.50
7.00	**3.21**	**3.79**	**3.24**	**3.76**	3.67	3.33	3.74	3.26	**3.21**	**3.79**	**3.24**	**3.76**	3.67	3.33	3.74	3.26	0.50
8.00	**3.64**	**4.36**	**3.67**	**4.33**	**4.18**	**3.82**	4.26	3.74	**3.64**	**4.36**	**3.67**	**4.33**	**4.18**	**3.82**	4.26	3.74	0.75
9.00	**4.06**	**4.94**	**4.10**	**4.90**	**4.69**	**4.31**	4.77	4.23	**4.06**	**4.94**	**4.10**	**4.90**	**4.69**	**4.31**	4.77	4.23	0.75
10.00	**4.47**	**5.53**	**4.51**	**5.49**	**5.20**	**4.80**	**5.29**	**4.71**	**4.47**	**5.53**	**4.51**	**5.49**	**5.20**	**4.80**	**5.29**	**4.71**	1.00
11.00	**4.88**	**6.12**	**4.92**	**6.08**	**5.70**	**5.30**	**5.80**	**5.20**	**4.88**	**6.12**	**4.96**	**6.15**	**5.70**	**5.30**	**5.80**	**5.20**	1.00
									2011								
2.00	0.95	1.05	0.97	1.03	1.05	0.95	1.09	0.91	0.95	1.05	0.97	1.03	1.05	0.95	1.09	0.91	0.00
3.00	1.39	1.61	1.43	1.57	1.56	1.44	1.62	1.38	1.39	1.61	1.43	1.57	1.56	1.44	1.62	1.38	0.00
4.00	**1.82**	**2.18**	**1.87**	**2.13**	2.07	1.93	2.13	1.87	**1.82**	**2.18**	**1.87**	**2.13**	2.06	1.94	2.14	1.86	0.50
5.00	**2.23**	**2.77**	**2.29**	**2.71**	2.56	2.44	2.66	2.34	**2.23**	**2.77**	**2.28**	**2.72**	2.56	2.44	2.66	2.34	0.50
6.00	**2.62**	**3.38**	**2.68**	**3.32**	3.05	2.95	3.16	2.84	**2.62**	**3.38**	**2.68**	**3.32**	3.05	2.95	3.16	2.84	0.50
7.00	**2.99**	**4.01**	**3.05**	**3.95**	3.53	3.47	3.66	3.34	**2.99**	**4.01**	**3.05**	**3.95**	3.53	3.47	3.66	3.34	0.50
8.00	**3.34**	**4.66**	**3.40**	**4.60**	4.01	3.99	4.15	3.85	**3.34**	**4.66**	**3.40**	**4.60**	4.00	4.00	4.15	3.85	0.50
9.00	**3.67**	**5.33**	**3.73**	**5.27**	**4.47**	**4.53**	4.63	4.37	**3.67**	**5.33**	**3.73**	**5.27**	**4.47**	**4.53**	4.63	4.37	0.75
10.00	**3.98**	**6.02**	**4.04**	**5.96**	**4.93**	**5.07**	**5.10**	**4.90**	**3.98**	**6.02**	**4.04**	**5.96**	**4.93**	**5.07**	**5.10**	**4.90**	1.00
11.00	**4.27**	**6.73**	**4.33**	**6.67**	**5.38**	**5.62**	**5.56**	**5.44**	**4.27**	**6.73**	**4.34**	**6.75**	**5.37**	**5.63**	**5.56**	**5.44**	1.00

Table 30. (Continued)

Total	Shrimp Effort Rebuild								Shrimp Effort 2008								Proportion o
	Continuity		AS 1		AS 2		AS 3		Continuity		AS 1		AS 2		AS 3		Models indic
Quota	East	West	East	West	East	West	East	West	East	West	East	West	East	West	East	West	Overfishing
									2012								
2.00	0.90	1.10	0.93	1.07	1.00	1.00	1.06	0.94	0.89	1.11	0.93	1.07	0.99	1.01	1.05	0.95	0.00
3.00	1.31	1.69	1.37	1.63	1.48	1.52	1.57	1.43	1.31	1.69	1.36	1.64	1.47	1.53	1.56	1.44	0.00
4.00	1.71	2.29	1.77	2.23	1.95	2.05	2.06	1.94	1.70	2.30	1.77	2.23	1.95	2.05	2.06	1.94	0.25
5.00	2.07	2.93	2.15	2.85	2.42	2.58	2.56	2.44	2.07	2.93	2.14	2.86	2.41	2.59	2.55	2.45	0.50
6.00	2.42	3.58	2.50	3.50	2.87	3.13	3.03	2.97	2.41	3.59	2.49	3.51	2.86	3.14	3.03	2.97	0.50
7.00	2.74	4.26	2.82	4.18	3.31	3.69	3.50	3.50	2.73	4.27	2.82	4.18	3.30	3.70	3.49	3.51	0.50
8.00	3.03	4.97	3.12	4.88	3.74	4.26	3.95	4.05	3.02	4.98	3.11	4.89	3.73	4.27	3.94	4.06	0.50
9.00	3.30	5.70	3.38	5.62	4.17	4.83	4.39	4.61	3.28	5.72	3.37	5.63	4.15	4.85	4.38	4.62	0.75
10.00	3.54	6.46	3.62	6.38	4.57	5.43	4.82	5.18	3.52	6.48	3.61	6.39	4.56	5.44	4.81	5.19	1.00
11.00	3.76	7.24	3.83	7.17	4.97	6.03	5.23	5.77	3.74	7.26	3.83	7.25	4.95	6.05	5.22	5.78	1.00
									2013								
2.00	0.86	1.14	0.91	1.09	0.96	1.04	1.03	0.97	0.85	1.15	0.90	1.10	0.95	1.05	1.03	0.97	0.00
3.00	1.26	1.74	1.32	1.68	1.43	1.57	1.53	1.47	1.24	1.76	1.31	1.69	1.41	1.59	1.52	1.48	0.00
4.00	1.63	2.37	1.71	2.29	1.88	2.12	2.01	1.99	1.61	2.39	1.70	2.30	1.86	2.14	2.00	2.00	0.00
5.00	1.98	3.02	2.07	2.93	2.32	2.68	2.49	2.51	1.96	3.04	2.06	2.94	2.30	2.70	2.47	2.53	0.50
6.00	2.30	3.70	2.40	3.60	2.76	3.24	2.95	3.05	2.28	3.72	2.38	3.62	2.72	3.28	2.93	3.07	0.50
7.00	2.60	4.40	2.70	4.30	3.18	3.82	3.40	3.60	2.57	4.43	2.68	4.32	3.14	3.86	3.37	3.63	0.50
8.00	2.87	5.13	2.97	5.03	3.58	4.42	3.83	4.17	2.84	5.16	2.95	5.05	3.54	4.46	3.80	4.20	0.50
9.00	3.11	5.89	3.21	5.79	3.98	5.02	4.25	4.75	3.08	5.92	3.18	5.82	3.93	5.07	4.22	4.78	0.50
10.00	3.32	6.68	3.41	6.59	4.36	5.64	4.65	5.35	3.29	6.71	3.38	6.62	4.31	5.69	4.62	5.38	0.75
11.00	3.51	7.49	3.58	7.42	4.73	6.27	5.04	5.96	3.47	7.53	3.49	7.38	4.68	6.32	5.00	6.00	1.00
									2014								
2.00	0.83	1.17	0.88	1.12	0.94	1.06	1.01	0.99	0.82	1.18	0.87	1.13	0.92	1.08	1.00	1.00	0.00
3.00	1.22	1.78	1.29	1.71	1.39	1.61	1.50	1.50	1.19	1.81	1.27	1.73	1.36	1.64	1.48	1.52	0.00
4.00	1.58	2.42	1.67	2.33	1.83	2.17	1.97	2.03	1.55	2.45	1.64	2.36	1.79	2.21	1.95	2.05	0.00
5.00	1.92	3.08	2.02	2.98	2.26	2.74	2.44	2.56	1.88	3.12	1.99	3.01	2.21	2.79	2.41	2.59	0.00
6.00	2.23	3.77	2.34	3.66	2.68	3.32	2.89	3.11	2.18	3.82	2.30	3.70	2.62	3.38	2.85	3.15	0.50
7.00	2.52	4.48	2.63	4.37	3.09	3.91	3.32	3.68	2.47	4.53	2.59	4.41	3.02	3.98	3.28	3.72	0.50
8.00	2.78	5.22	2.88	5.12	3.48	4.52	3.74	4.26	2.72	5.28	2.84	5.16	3.40	4.60	3.69	4.31	0.50
9.00	3.00	6.00	3.10	5.90	3.86	5.14	4.14	4.86	2.94	6.06	3.05	5.95	3.77	5.23	4.08	4.92	0.50
10.00	3.20	6.80	3.27	6.73	4.23	5.77	4.53	5.47	3.13	6.87	3.22	6.78	4.13	5.87	4.46	5.54	0.50
11.00	3.36	7.64	3.40	7.60	4.58	6.42	4.90	6.10	3.29	7.71	3.32	7.59	4.47	6.53	4.83	6.17	1.00

10. Comments on projections, uncertainty, and recommendations

10.1 Recommended Base Model for the Update Assessment

The Assessment Panel unanimously recommends AS 3 as the base model for the update assessment and further recommends that the yield streams of this model be used to establish the OFL limit. Key to the selection of the appropriate model for projections is determining the discrepancy between the age composition data and the fishery-independent indices. In SEDAR 7 and the current continuity run the model interprets the high sample size of age data (resulting from the comparatively high number of otoliths age vs. number of sampling station for fishery-independent data)) as more informative than the lower sample sizes of the indices. In reality, sample sizes of both are probably too low. Additional fishery-independent sampling needs to be performed (particularly in the east) and more age composition (particularly of fishery-independent samples) needs to be performed. After reviewing all 14 model runs the AW was convinced that this issue was a major contributor to the uncertainty. The panel felt that the better fits to the indices of abundance produced by AS 3 supported the decision to use AS 3 as the base model.

A second decision that is needed is the forecast of shrimp effort. The reduction in shrimp effort in 2008 was even greater (~75% reduction compared to 2001-2003 average) than the reduction called for in the red snapper rebuilding plan. If the 2008 effort remains, all models project a higher possible directed yield than would be projected if effort increased to the level assumed by the rebuilding plan (Figure 30). As with the first decision, substantial uncertainty exists with projecting shrimp effort. Specifically, forecasts will rely on predictions of market conditions, fuel prices, re-capitalization of the shrimp industry following the 2005 hurricane season and other factors. The AW felt that the uncertainty in projecting yields at the reduced shrimp effort of 2008 was much higher than the alternative of projecting yields in accordance with the rebuilding plan. Specifically, the panel felt that there was no mandate for effort to remain at 2008 levels, but there was regulatory framework to maintain the shrimping effort in accordance with the rebuilding plan.

The third decision that must be made is how to incorporate uncertainty with respect to natural mortality rate. Evidence that natural mortality is higher than assumed in SEDAR7 was presented to the AW during the workshop. The AW felt that a doubling of the previous natural mortality rate was consistent with this new information. However, the AW does recognize the substantial uncertainty with estimating natural mortality for any fishery species. Model fits to indices were qualitatively similar for both the new and SEDAR7 natural mortality rates. This is largely a product of the method that the CATCHEM routine uses to parameterize the model. Higher natural mortality must be accommodated in the model by changes in recruitment and spawner abundance within the confines of the abundance and catch estimates. Changes in natural mortality do, however, affect the possible projected yield of the directed fisheries. In general, the higher natural mortality rates allow for higher yield from 2010 – 2018 then reduces the yield compared to the identical models with SEDAR7 values for M (Table 31).

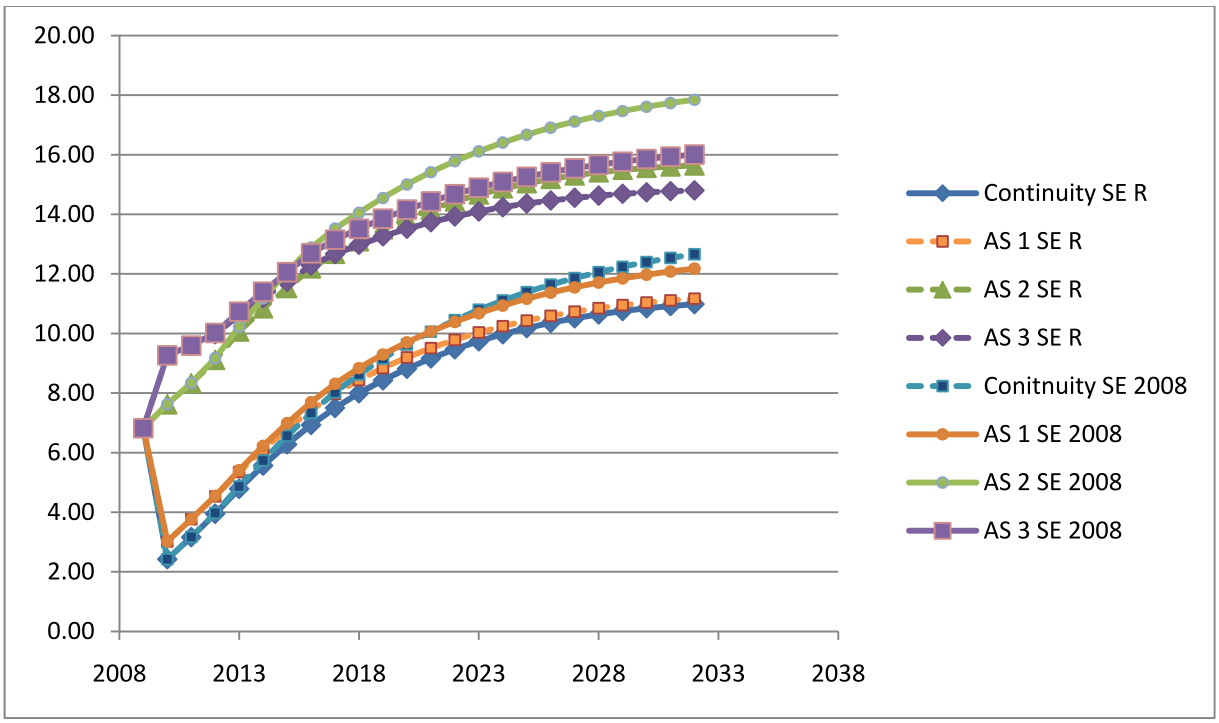


Figure 30.   Deterministic directed yield projections based on 8 combinations (4 models, two shrimp effort scenarios). Dash lines represent projections based on shrimp effort staying at 2008 levels, whereas solid lines project shrimp effort at the higher level of the rebuilding plan.

Of the three decisions, the impact of the fit to indices has the largest effect on both the recent estimates of F and projected yields, followed by shrimp effort and natural mortality. Table 31 attempts to show the potential impact by contrasting the models in terms of the one parameter in question. The percent change represents the increase for models that put greater weight on fits to the abundance indices than the age composition data (fit index), models that utilize the lower shrimp efforts observed in 2008 than the rebuilding plan (shrimp effort) and models that use the doubled natural mortality rate compared to those that use the SEDAR7 values.

The panel recommends AS 3 under the shrimp effort reduction schedule in the rebuilding plan as the base model. Although we recommend AS 3 to compute OFL limits, the panel strongly encourages the SSC to consider the large variance associated with the eight models in setting the allowable biological catch (ABC). Table 30 indicates the proportion of the eight models that indicate over fishing given different quotas. The panel felt that comparisons of the different model served as the best indicator of uncertainty and the run specific pdf would be of very limited use in assessing uncertainty.

10.2. Implications of Projections on East and West Red Snapper Sub-units

There are some relative similarities in stock dynamics projected to 2032 regardless of the underlying model from which projections were made. These similarities stem principally from incorporating two decisions made by the Gulf of Mexico Fishery Management as part of its Reef Fish FMP Amendment 27: that fishing mortality was to be reduced proportionally in all fisheries, including the $F_{BYCATCH}$ from the shrimp fleet, and that the rebuilding biomass target of 26% SPR was to be applied Gulf-wide, not for the eastern and western sub-units individually. As a result of incorporating these decisions, the western Gulf sub-unit basically will carry a disproportionate burden of stock recovery because it is currently estimated to have higher stock biomass and the average F at age is estimated to be much lower in the west than in the east. Therefore, by reducing F proportionately for the two sub-units, a still lower F was applied in projections to the west, a stock estimated to be much larger than in the east. The result is that the western sub-unit is projected to recovery slightly above the 26%SPR target by 2032 in each projection (to ~27% SPR), while the eastern sub-unit recovers to a lower target (~18% SPR) among the four models for which projections were made.

Projection results, as conducted incorporating the previous Council decisions detailed above, have several implications for red snapper stock dynamics. First, the eastern sub-unit is projected to have lower productivity than the western sub-unit into the future, even while that sub-unit appears to be expanding to the east in areas it apparently formerly occurred in much greater abundance than it has been reported to occur in recent years. Furthermore, the average F at age for the eastern sub-unit is projected to continue to be several times higher than average F at age for the western sub-unit (Fig. 31). That is precisely the reason why yield projections for the eastern and western sub-units are so similar to one another, especially in the early years of projections, despite starkly different current estimates of spawning stock biomass. The ultimate result of fishing the eastern sub-unit harder than the west is that the fishery there is projected to continue to be prosecuted on mostly small, young fish such that the population age distribution in the east is projected to continue to be severely truncated, while in the west more and more fish over time are projected to recruit to older, more highly fecund, age classes (Figs. 32-35). It is the AW's recommendation that the scientific uncertainty as to the effect of a continually truncated age distribution on the longterm viability of the stock and fishery in the east should be considered by the SSC when that body sets ABC.

Table 31. Percent change in deterministic yield projections attributable to the three decisions on down weighting index CV (index fit,), future shrimp effort assumptions, and whether to double natural mortality values. on age-0 and age-1 fish from SEDAR7 values. Note that 2009 and 2010 are assumed fixed; consequently, the decisions have no effect in these years.

	Effects of Uncertainty in 3 Parameters		
Year	**Index Fit**	**Shrimp Effort**	**Natural Mortality**
2009	0.0%	0.0%	0.0%
2010	0.0%	0.0%	0.0%
2011	193.7%	0.2%	19.3%
2012	148.1%	0.6%	13.7%
2013	118.8%	1.4%	9.6%
2014	98.7%	2.6%	6.7%
2015	85.0%	3.7%	4.8%
2016	75.8%	4.7%	3.4%
2017	68.1%	5.4%	2.2%
2018	62.1%	6.0%	1.2%
2019	57.6%	6.5%	0.3%
2020	54.0%	7.0%	-0.5%
2021	51.0%	7.4%	-1.1%
2022	48.6%	7.8%	-1.7%
2023	46.5%	8.2%	-2.2%
2024	44.7%	8.6%	-2.6%
2025	43.2%	9.0%	-3.0%
2026	41.9%	9.4%	-3.3%
2027	40.8%	9.8%	-3.6%
2028	39.9%	10.2%	-3.8%
2029	39.1%	10.5%	-4.0%
2030	38.4%	10.9%	-4.1%
2031	37.8%	11.3%	-4.3%
2032	37.2%	11.6%	-4.4%
Average	61.3%	6.4%	0.9%

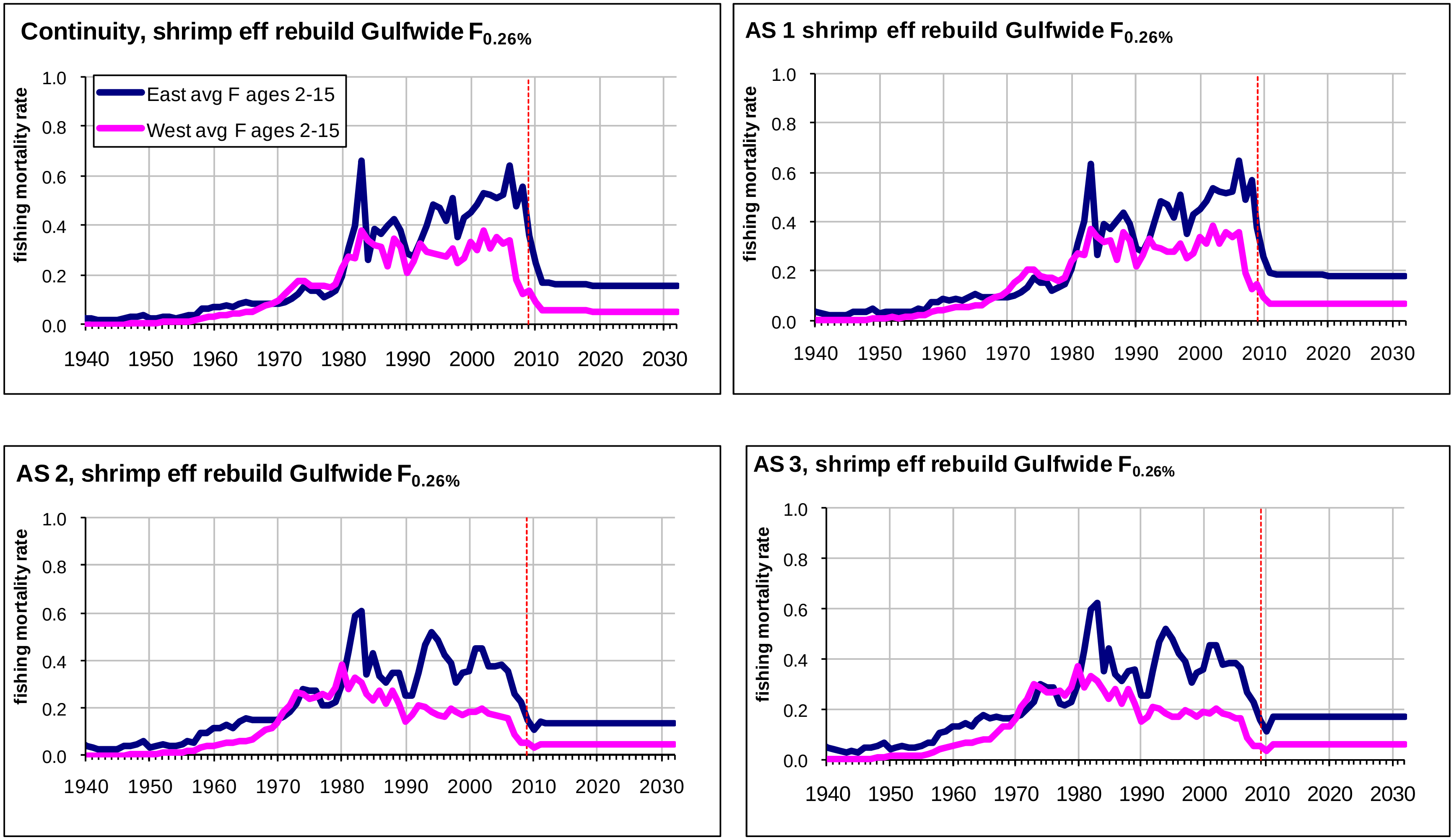
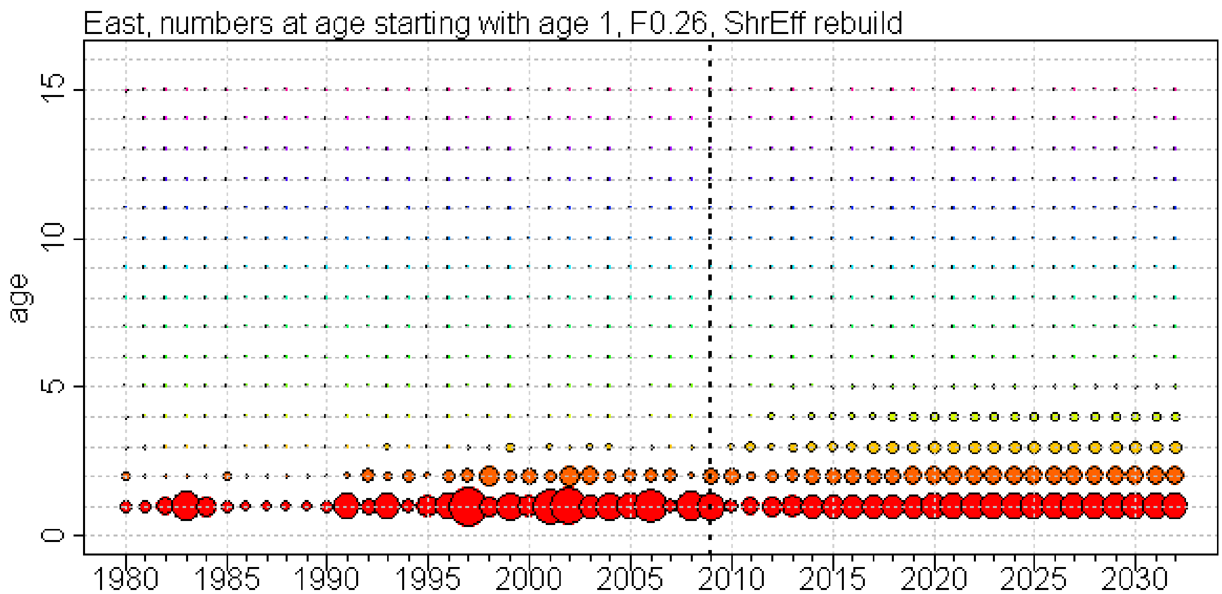


Figure 31. Historic and projected fishing mortality rates at a Gulfwide $F_{26\%SPR}$ and the rebuilding plan shrimp effort schedule. Projections begin in 2009 (dotted line).



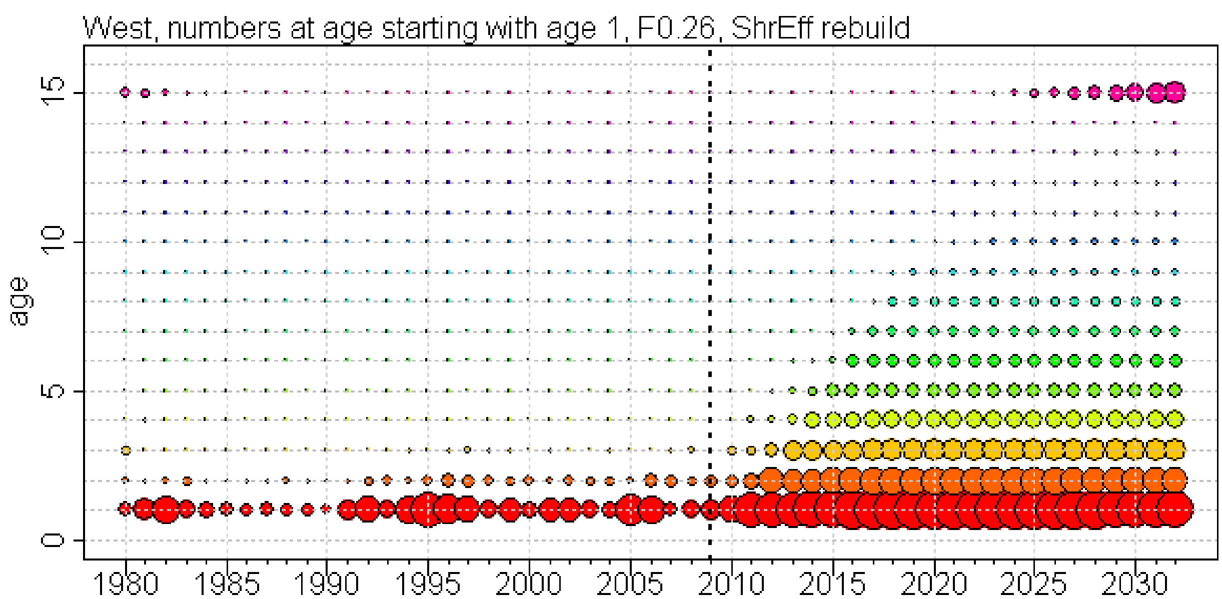
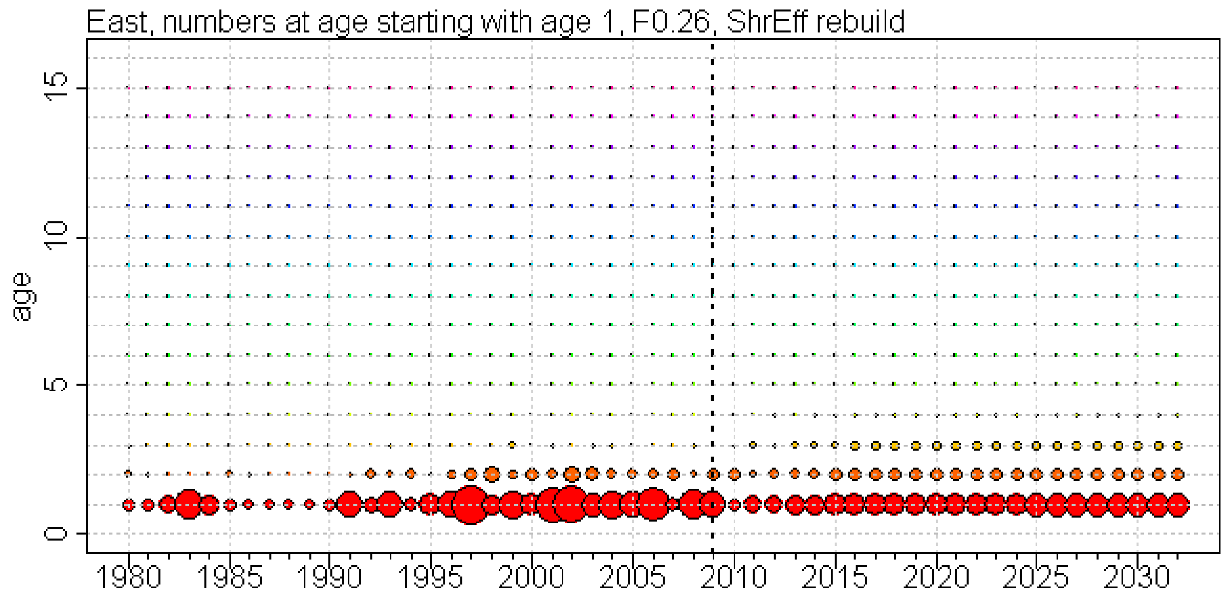


Figure 32. Historic and projected numbers at age for east and west sub-units in the Gulf of Mexico starting at age 1 at $F_{spr\ 26\%}$ and shrimp effort consistent with the rebuilding plan as predicted by the continuity run..



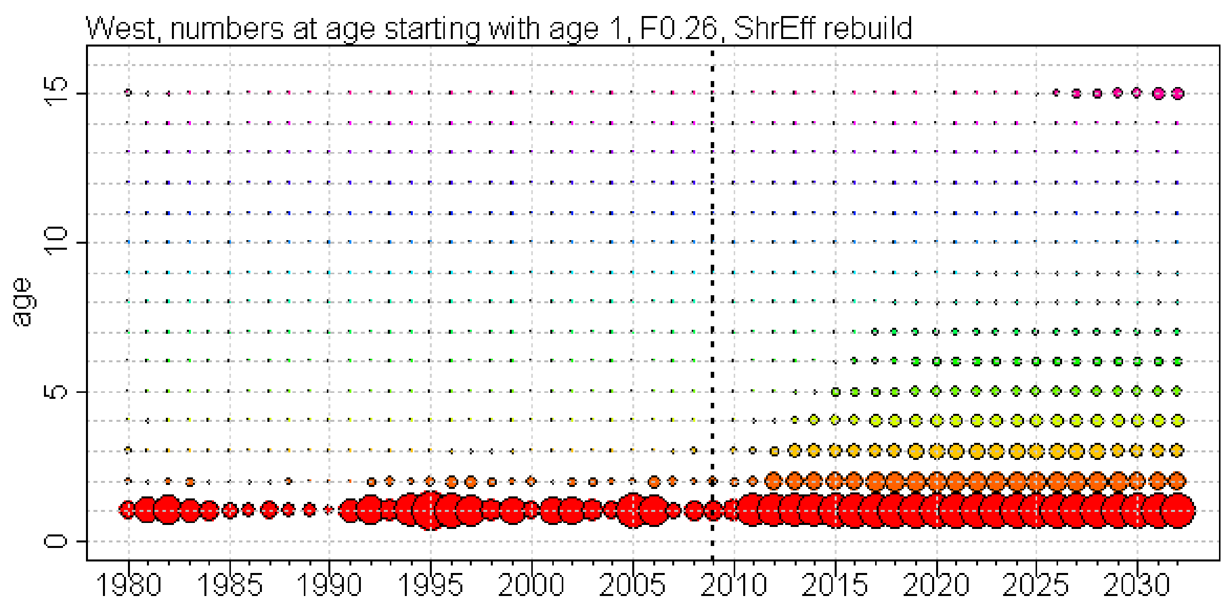
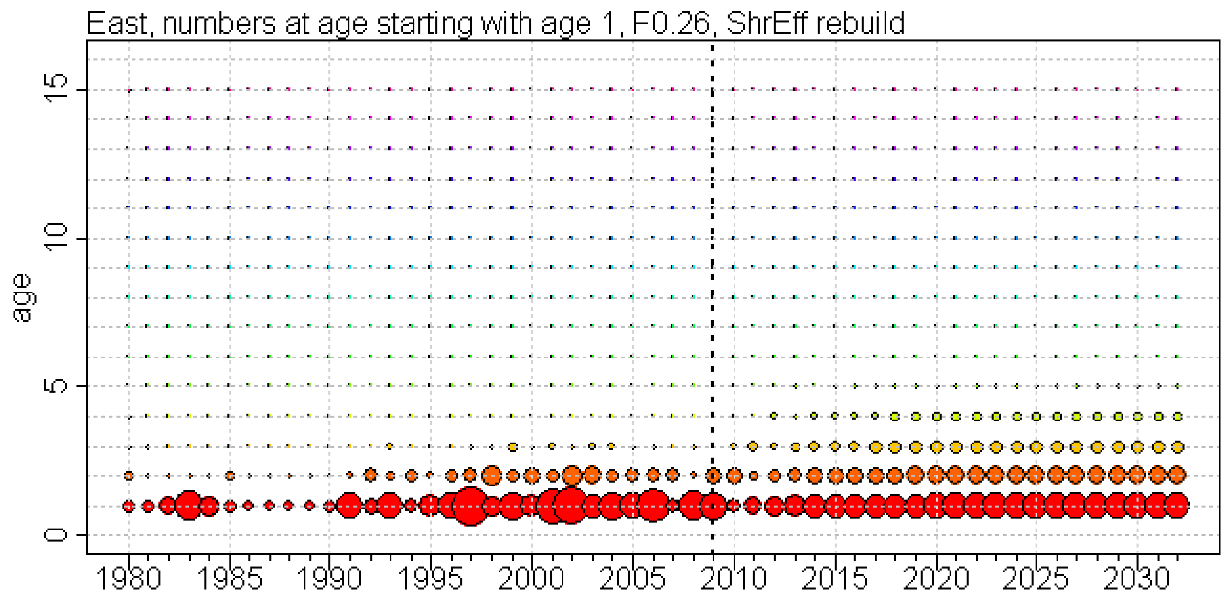


Figure 33. Historic and projected numbers at age for east and west sub-units in the Gulf of Mexico starting at age 1 at $F_{spr\ 26\%}$ and shrimp effort consistent with the rebuilding plan as predicted by the AS 1 model.



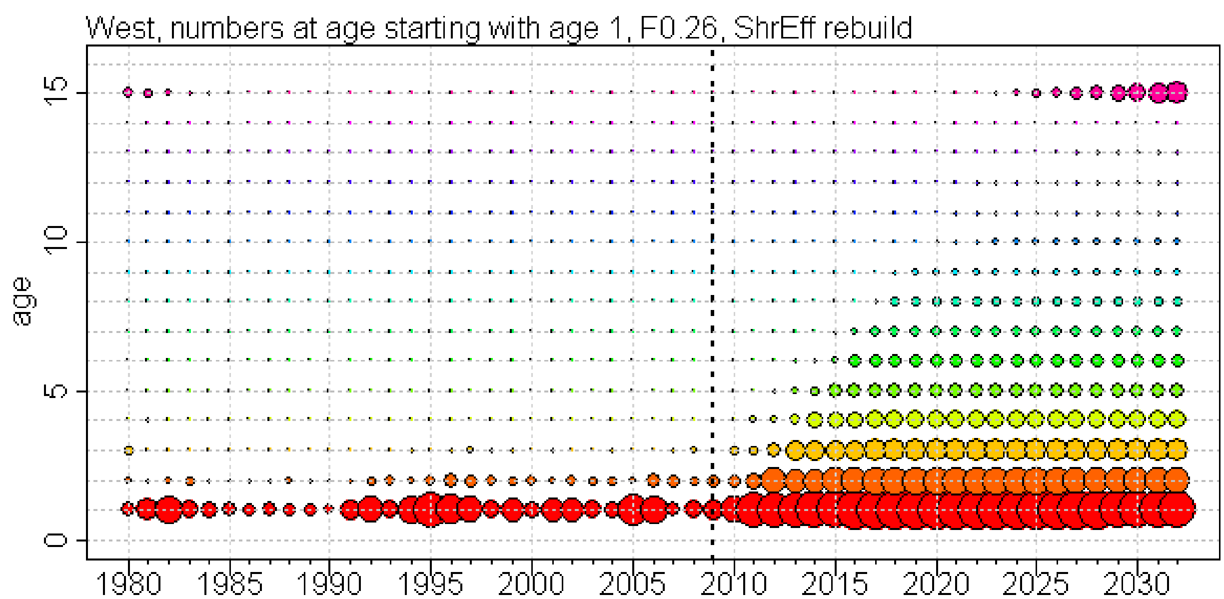


Figure 34. Historic and projected numbers at age for east and west sub-units in the Gulf of Mexico starting at age 1 at $F_{spr\ 26\%}$ and shrimp effort consistent with the rebuilding plan as predicted by the AS 2model.

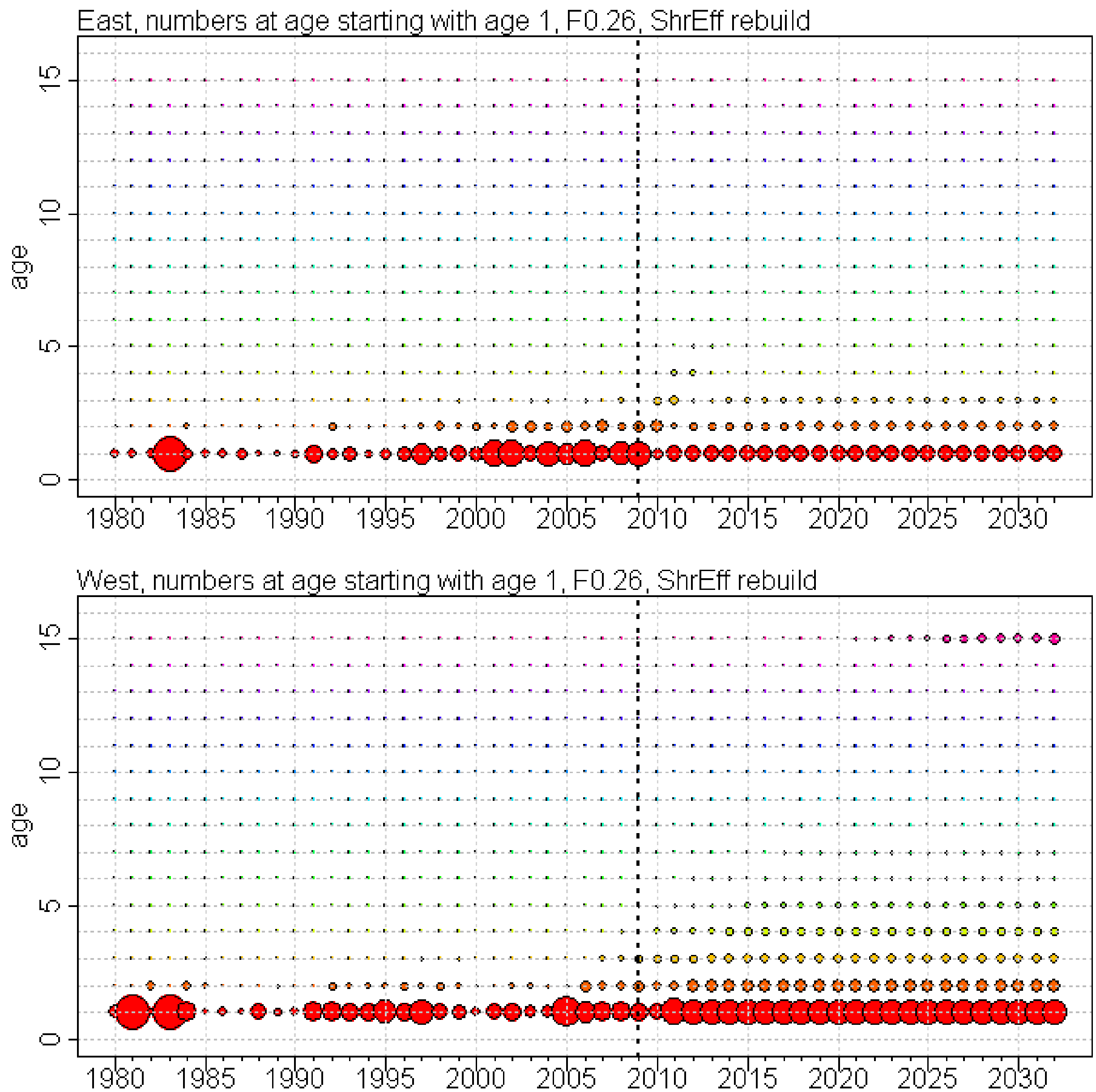


Figure 35. Historic and projected numbers at age for east and west sub-units in the Gulf of Mexico starting at age 1 at $F_{spr\ 26\%}$ and shrimp effort consistent with the rebuilding plan as predicted by the AS 3 model.

11. Recommended Research and Modeling Priorities

The AW felt that there were numerous issues (e.g., natural mortality, shrimp effort scenarios, discard fate, etc.) that should be re-examined; however, the AW also felt these were beyond the scope of an update assessment and should be addressed as recommended research priorities. In particular, the committee reiterated prior recommendations to expand fishery independent sampling for age composition and index values given that the conflict between the fit to the indices and the age composition produces the greatest uncertainty in yields. In particular fishery independent sampling needs to be expanded in the east. This would help to reconcile the conflict between the indices and the current age composition derived largely from the fishery. It is also critical that gear selectivity be estimated through experimentation for any fishery-independent sampling gear.

Specific Recommendations

- The AW panel strongly recommends that additional fishery independent monitoring be implemented as soon as possible to provide improved information to reconcile the conflicts between the CPUE indices and the fishery-dependent age composition for the next assessment.
- Documentation of the effects of IFQs upon discarding practices in the commercial fishery is needed. Discards within this fishery may be due to having no IFQ shares, no remaining IFQ or undersized fish. The assumption that all discards are below the legal size (13”) regardless of the actual reason may no longer be justified and research to document the size/age composition of discards under the IFQ regime is needed. This can likely be achieved best through expansion of the observer program on both commercial and for-hire vessels as there is an apparent discrepancy between self-reported discards and the observer based observations of discards.
- Similarly, discards within the recreational fishery need to be characterized by size/age and according to open versus closed seasons. Open season discards can be attributed to undersized fish, high grading and creel limits while targeting other

species. During the closed season all caught fish are assumed to be discarded, however the size and age distribution of these discards is not known.

- Future assessments and indices should include state sponsored fishery independent sampling programs and the state SEAMAP data. In particular, this information may be of substantial value for the east where such samples are rare.
- Natural mortality of age 0 and 1 red snapper remains an area of uncertainty that can impact yield projections. Research that examines the question of whether natural mortality is density-dependent should be a priority.
- Given the rapid decrease in shrimp effort, studies that examine the potential effect of this reduction on red snapper populations and, more broadly, the Gulf of Mexico ecosystem are of great importance.
- Expansion or repopulation of reefs by red snapper along the west coast of Florida should be monitored. Further, the potential impact on gag and red grouper populations should be studied both in terms of potential competitive interactions as well as the influence on catch based estimates of abundance of gag and red snapper in areas where the species co-occur. This monitoring could best be achieved by expanding fishery independent sampling, particularly in the Eastern Gulf of Mexico.
- Given the differences in the trajectories of western and eastern red snapper sub-units, exchange rates (via adult emigration or larval supply) in eastern and western areas of the Gulf should be quantified. The current management scheme of setting one Gulf-wide quota assumes a high degree of connectivity between the subunits. In the context of metapopulation dynamics, east and west sub units could be considered metapopulations and could be modeled as such provided connectivity is quantified.
- Future modeling development is needed to determine objective criteria for testing alternative model states, develop methods to combine various models into joint probability statements and to improve model resolution through incorporation of covariates.

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Appendices

Appendix 1: Indices of Abundance

1. FISHERY-INDEPENDENT INDICES

In preparation for the update assessment, four fishery independent surveys were analyzed and indices of relative abundance developed. These were the National Marine Fisheries Service Southeast Area Monitoring and Assessment Program (SEAMAP) shrimp/bottomfish surveys, SEAMAP icthyoplankton surveys, SEAMAP reef fish survey, and the shark/snapper/grouper bottom longline survey. All of these surveys, except the shark/snapper/grouper bottom longline survey index, were used during the previous benchmark assessment (SEDAR7). The shark/snapper/grouper bottom longline survey index was not included during the previous benchmark assessment due to the abbreviated nature of the time series.

1.1 SEAMAP Groundfish Trawl Survey

These indices were a part of the previous benchmark assessment, SEDAR 7. The data included density estimates (number caught per trawl-hour) from 1972 to 2008, in the northern Gulf of Mexico (between 88° 00´ and 91° 30´ W longitude, during the fall season in depths of 9.1 to 91.5 meters (5 to 50 fathoms), and survey from Mobile to Brownsville, Fall 1972-2008, and summer 1982-2008. Nichols calculated four indices for the previous assessment (SEDAR7-DW-1), Early SEAMAP (Summer 1981-1986), Summer SEAMAP (Summer 1987-2003), Fall Groundfish (Fall 1972-1986), and Fall SEAMAP (Fall 1987-2003). Since the data have not changed for Early SEAMAP and Fall Groundfish surveys, we did not repeat those calculations. The data were collected with standard gear and survey methods, and are explained in detail in Nichols, 2004a. Where arithmetic means were used in earlier assessments, a Bayesian analysis was employed during the last benchmark assessment (Nichols, 2004b) to fill missing cells. The Bayesian central tendency estimates closely mimic the arithmetic values, but the procedure produces estimates with nearly lognormal error distributions upon accounting for missing cells and surveys covering less than the full SEAMAP range.

Nichols performed the analysis for SEDAR 7, and his methods were followed as closely as possible for the current analysis. We calculated indices for the Summer SEAMAP and Fall SEAMAP surveys using data from 1987 to 2008. The following are the discrepancies between the current analysis and Nichols' analysis: the data set differs, in that the way the data were gathered by Nichols was not replicable for this analysis. Instead, the SEAMAP data were acquired in raw form and collated according to the Nichols code for the previous analysis. Also, Nichols input a data set that combined depth zones and shrimp statistical grid. The way he created that data set was replicated, but the resulting data set is not consistent with what Nichols used at SEDAR 7. The number of iterations run was 70,000, which is a large increase, and allowed for convergence. The indices constructed from the SEAMAP Groundfish survey data included the Fall SEAMAP Groundfish (Gulfwide, East GOM and West GOM) and

Summer SEAMAP Groundfish (Gulfwide, East GOM and West GOM). These are summarized in Tables 1-6 and Figure 1.

The update panel also requested partitioning age classes 0 and 1, for better estimates of Z. This work was completed after the update meeting, and was based on the data processing reported in SEDAR7-DW-17 (Burns et al. 2004) These indices are summarized in Table 7.

1.2 SEAMAP Ichthyoplankton Surveys

The SEAMAP larval indices were included in the previous benchmark assessment, SEDAR 7. Occurrence and abundance red snapper larvae captured during Southeast Area Monitoring and Assessment Program (SEAMAP) Summer Shrimp/Bottomfish (SB) and Fall Plankton (FP) resource surveys in the Gulf of Mexico (GOM) were used to generate indices of the relative abundance of the adult spawning stock (SEDAR7 Assessment Report 1, Appendix 1, Table 5.0; SEDAR7-RW 7 (Hanisko et al. 2004)). The larval indices for the update assessment reflect a different formulation from the SEDAR7 indices of larval abundance. A full description of the new methodology is documented in Hanisko et al. 2007.

The major differences between the current and SEDAR7 larval indices focus on (1) sample selection, (2) size of larvae used for the analysis, (3) correction for variable size composition of larvae, (4) estimation of abundance of missing samples and (5) the selection of factors included in the delta-lognormal model. Unlike the SEDAR7 indices, the current indices are based solely on samples from SEAMAP Fall Plankton surveys which began in 1986, and do not incorporate samples from SEAMAP Summer Shrimp/Bottomfish (SB) surveys. Since SEDAR7, it was determined that plankton stations from the 1985, 1988, 1989, 1990, 1991, 1995, 1996, 1999 and 2003 Summer Shrimp/Bottomfish surveys consistently dropped stations over wide areas of higher abundance for larval snapper. The 1991, 1992, 1993 surveys dropped stations in the same areas but to a lesser degree. In contrast the Fall Plankton Survey has consistent coverage over the time series.

The current indices also restrict the estimates of abundance to larvae 3.75 and 6.25 mm in body length, instead of the 3.75 to 8.25 mm range used for the SEDAR7 indices. Lyczkowski-Shultz and Hanisko (2007) found avoidance of bongo nets by larger red snapper larvae to be clearly evident during the SB and FP surveys. Examination of day/night selectivity curves indicated that larvae greater than 6.25 mm in body length larva were not fully recruited to the gear and were dropped from the calculation of abundance for the current indices. Larval abundance for the SEDAR7 indices were also adjusted to the abundance of larvae 4.0 mm in body length based on a size (as proxy for age) based mortality rate pooled across all samples from the SG and FP surveys. The size correction greatly inflated the relative abundance estimates in the later years of the survey due to the higher probability of capturing larger larvae, but did not affect the overall trend. The current indices do not account for the size composition of larvae but use the narrower size restrictions.

The SEDAR7 indices also included estimated abundance values using a negative-binomial generalized linear models for missing samples. The estimated values had little effect on the overall index, and the decision was made to include only observed data in future updates to the indices. This allowed flexibility for the inclusion additional factors in the delta-lognormal modeling procedure.

The final differences between the indices were in the factors selected for the delta-log normal models. The SEDAR7 indices only considered the effects of Year and Survey (SG or FP). In contrast, the current indices test for the effects of Year, Subregion (TX or LA for the western GOM and MS/AL or FL for the eastern GOM), Time of Day (Day or Night) and Depth on the proportion of positive tows and abundance. The inclusion of the Time of Day effect is the most important of these, as it allows us to model the day/night differences (gear avoidance) for the proportion of positive tows and abundance in the current indices.

The updated western and eastern larval indices can be found in Table 8 and Figure 2. Both the SEDAR7 and updated larval indices revealed similar trends in relative red snapper abundance over time for the western and eastern GOM.

1.3 SEAMAP Reef Fish Video Survey

Data from SEAMAP reef fish survey were analyzed and red snapper abundance indices developed as in the previous benchmark assessment (Gledhill and Ingram, 2004/SEDAR7-DW-15). This survey was designed to sample hard bottom habitat with relief; and although limited in spatial coverage, it samples a part of the population not covered by the other surveys. It was discussed during SEDAR7 that the biggest weakness of this survey was uncertainly about size and age of fish observed by the cameras. Although no red snapper were directly measured the workgroup recommended that size of individual red snappers be estimated by comparing sizes with other species of fishes either measured with lasers or captured in traps. Recently, stereo cameras have been employed to gain insight into sizes of fishes observed during this survey, and should be available for the next assessment. Two indices of abundance were developed for SEDAR7; frequency of occurrence and number of red snapper per sampling site. During SEDAR7, two estimators were examined for each index as well, one using design-based estimates of mean number (or frequency) of red snapper and associated standard errors and a second using model-based estimates. The SEDAR7 workgroup recommended that the model-based estimated of number of red snapper per site be used since it controlled the high survey mean value in 1992 that occurred as a result of a single large aggregation of red snapper being observed and that the estimated standard errors were much lower than those from the design-based estimates.

Therefore, this assessment update working group chose to continue following this recommendation. The indices (eastern and western GOM) are summarized in Table 9 and Figure 3.

1.4 NMFS Bottom Longline Survey

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, including red snapper. The evolution of these surveys has been the subject of many documents [e.g. Ingram *et al*. 2005 (LCS05/06-DW-27)] and is not described again in this document.

The indices of abundance for the eastern and western Gulf of Mexico are shown in Table 10 and Figure 4.

2. FISHERY-DEPENDENT INDICES

In preparation for the update assessment, three fishery dependent datasets were analyzed and indices of relative abundance were developed. These included the Marine Recreational Fisheries Statistical Survey (MRFSS), the Commercial Reef Fish Logbook and the NMFS Headboat Survey. These data sources were also analyzed during the previous benchmark assessment (SEDAR 7). The update assessment, like the previous assessment, used only the commercial handline index and MRFSS. Both were constructed separately for the eastern and western Gulf of Mexico.

2.1 MRFSS Recreational Indices

Although a newly revised methodology based on Stephens and MacCall (2004) was presented to the update panel and reported in Cass-Calay (2009), the panel requested that the MRFSS indices be reconstructed using the identical methodologies employed during SEDAR7 (Cass-Calay, 2004/SEDAR-AW-04). This was accomplished during the update workshop. In keeping with the panel's interpretation of an "update" assessment, the panel recommended the use of the SEDAR7 methodologies. The methods and results are described briefly below.

NOAA Fisheries initiated the Marine Recreational Fisheries Statistics Survey (MRFSS) in 1979 in order to obtain standardized estimates of participation, effort, and catch by recreational fishermen in U.S. marine waters. MRFSS data is collected using two approaches: a telephone survey of households in coastal counties, and dockside interviews of fishermen (intercept survey). MRFSS intercept data was used for the construction of catch rate indices.

Two indices were constructed (eastern and western GOM), each using MRFSS intercept data from 1981-2008. All CB and PB trips that fished in "oceanic" areas using hook and line gear were included. Shore mode and inshore fishing trips were excluded as they very seldom landed red snapper. In accordance with the recommendations of the SEDAR7 data workshop the eastern index was constructed using intercept data from trips off FL, AL and MS, and the western index was restricted to fishing trips off LA.

Ideally, fishing trips that targeted species that seldom co-occur with red snapper should be excluded from the data sets used to construct the catch rate indices. Unfortunately, no data were available regarding depth of fishing, fine-scale fishing location, gear configuration, or other information routinely used to infer the species targeted. Therefore, like SEDAR7, lists of species associated with red snapper were developed and used to exclude fishing trips that were unlikely to catch a red snapper. Two sets of species associates (east and west) were identified using an association statistic proposed by Heinemann[1]. The association statistic was calculated as follows for each species (Species X) reported by more than 50 trips during 1981-2008 (Eq. 1).

$$\text{Association Statistic} = \frac{\#\text{Trips with Red Snapper and Species } X}{\#\text{Trips with Red Snapper}} \Bigg/ \frac{\#\text{Trips with Species } X}{\#\text{Total Trips}} \qquad (1)$$

The association statistic does not provide an objective critical value at which to include or exclude a species. A value of 1.0 implies that a given species co-occurs with red snapper exactly as often as random chance would predict. Values >1.0 indicate that a species co-occurs more often with red snapper than expected, and values <1.0 indicate that a given species co-occurs with red snapper less often than expected. For this analysis (and SEDAR7), a species was assumed to be associated with red snapper if its association statistic was ≥ 3.0. Trips were excluded if they did not land any species associate of red snapper. The 2009 species association lists are summarized in Tables 11 and 12.

The other methods (e.g. factors analyzed, standardization techniques) were exactly as described in Cass-Calay, 2009. Trips during recreational closures were assigned a "Closed Season" designation. For the ***eastern index***, the

[1] Heinemann, Dennis. The Ocean Conservancy, 1725 DeSales Street, Suite 600, Washington, D.C. 20036

following factors were examined as possible influences on the proportion positive interviews, and the catch rates of interviewed trips that observed red snapper (positive interviews):

FACTOR	LEVELS	DESCRIPTION
YEAR	28	1981 – 2008
STATE	3	FL, AL, MS
MODE	2	Private, Charter
AREA	2	Shelf, Ocean
SEASON	4	Winter = Nov-Feb Spring = Mar-May Summer = Jun-Aug Autumn = Sep-Oct
RS_SEASON	2	Open, Closed

Note: The factors area and state are confounded since nearly all observations in MS, AL are in the area "Ocean" while interviewed trips off FL were in both "Ocean" and "Shelf". Therefore, both factors were tested, but once one entered the model, the other was excluded from further analysis.

For the ***western index***, the following factors were examined as possible influences on the proportion positive interviews, and the catch rates of interviewed trips that observed red snapper (positive interviews):

FACTOR	LEVELS	DESCRIPTION
YEAR	28	1981 – 2008
MODE	2	Private, Charter
AREA	2	Shelf, Ocean
SEASON	3	Winter = Nov-Feb Spring = Mar-May Summer = Jun-Oct
RS_SEASON	2	Open, Closed

The final models were:

Eastern GOM:

PPT = STATE + Mode+ Year + RS_Season + Season + Mode*RS_Season + Year*State + Year*Season

LOG (CPUE) = Year + State + Mode + RS_Season + Season + Year*State + Year*Season + Year*Mode

Western GOM:

PPT = Area + Year + Mode + RS_Season + Season + Mode*RS_Season + Year*Area + Year*Mode

LOG (CPUE) = Year + RS_Season + Mode + Mode*RS_Season

The indices of abundance are summarized in Table 13 and Figure 5. In general, the species association lists are quite similar to those constructed for SEDAR 7 (Tables 11-12). The indices are also similar, regardless of which methodology was employed to restrict trips (Fig. 5).

2.2 Commercial Handline Indices

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 2007-2008 with CPUEs of earlier years.

The index constructed from eastern Gulf of Mexico (GOM) data used the Stephen and MacCall (2004) method for identifying trips with fishing effort in red snapper habitat. This approach differed from that used in the 2004 assessment. The 2004 index used an association statistic to identify species which are frequently caught along with red snapper; this statistic was then used to identify trips with a higher probability of catching red snapper, that is, trips which might have had effort directed at species assemblages which include red snapper. Data from those trips were used to develop the eastern GOM abundance index in 2004. The association statistic approach, however, was ad hoc, while the Stephens and MacCall approach provides a statistically based method for identifying effort in red snapper habitat.

Construction of the western GOM index of abundance followed the methods used in the 2004 assessment. Initial trip selection using the Stephens and MacCall (2004) approach resulted in greater than 90% positive trips. A lognormal model was used because the proportion of positive trips exceeded 90% and such data are not appropriate for use in a delta-lognormal model. As with the eastern index, the time series spanned years with minimum size changes. The time series was limited to those years prior to IFQs (1990-2006) and the likely changes in fishing behavior.

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 cannot 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 no well 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 200 pound permitted trips included in the analysis. Trip limits likely had little effect on index construction in the eastern GOM. Indices were 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 6 (eastern GOM) and 7 (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 $\geq 1\%$. 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 Tables 14 (east) and 15 (west).

Additional analyses

A nominal yearly mean CPUE series for each region (eastern and western GOM) during the years with red snapper IFQ (2007-08) was requested during the workshop. Results are provided in Figure 8 along with nominal CPUEs from the period 1990-2006. CPUEs are presented as three series in each region: 1990-1992 (no trip limits, except for a emergency rule 1,000 pound trip limit during April 3-May 14, 1992), 1993-2006 (2,000 or 200 permits/trip limits in effect), and 2007-2008 (IFQs in effect).

Two additional standardized indices (eastern and western GOM) were constructed to include only the years 2007-2008 when IFQs were in effect. Direct comparison of the 1990-2006 series and the 2007-2008 series is not appropriate because those two periods have no years in common, therefore, the indices cannot be normalized to a common scale. Index construction methods followed those described above for each region. Results are provided in

Table 2. The delta-lognormal analysis of eastern GOM data could not provide CVs because only two years of data were included in the random effects analysis.

3. SUMMARY

The available indices of abundance for the update assessment are summarized in Table 16. The following indices were used in the CATCHEM base model.

1) Commercial HL East
2) Commercial HL West
3) MRFSS East
4) MRFSS West
5) SEAMAP Video East
6) SEAMAP Video West
7) SEAMAP Ichthyoplankton East
8) SEAMAP Ichthyoplankton West
9) SEAMAP Groundfish Trawl (72+)Age-0 East
10) SEAMAP Groundfish Trawl (72+) Age-1 East
11) SEAMAP Groundfish Trawl (72+) Age-0 West
12) SEAMAP Groundfish Trawl (72+) Age-1 West
13) NMFS Bottom Longline ***WEST ONLY***

The following indices WERE NOT USED in the CATCHEM stock assessment models:

1) Shrimp landed CPUE 1966-1979.
2) SEAMAP Groundfish Trawl (87+) East
3) SEAMAP Groundfish Trawl (87+) West
4) SEAMAP Groundfish Trawl (72+) Age-1 Gulfwide
5) NMFS Bottom Longline East

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Table 1. Results of the Bayesian calculation of SEAMAP CPUE for the Fall, Gulf-Wide.

Year	Mean	Standard Deviation	2.5% bound	Median	97.5% bound
1987	3.204	0.5655	2.239	3.155	4.443
1988	7.273	0.9369	5.617	7.211	9.29
1989	13.95	1.548	11.17	13.86	17.25
1990	16.92	1.772	13.74	16.81	20.67
1991	21	2.416	16.76	20.84	26.21
1992	6.227	0.8372	4.757	6.167	8.03
1993	12.7	1.432	10.16	12.6	15.76
1994	31.63	3.059	26.16	31.45	38.09
1995	30.72	3.029	25.29	30.56	37.12
1996	13.42	1.56	10.66	13.31	16.77
1997	23.48	2.443	19.09	23.34	28.68
1998	12.42	1.516	9.743	12.32	15.67
1999	21.88	2.425	17.54	21.73	27.07
2000	14.7	1.727	11.65	14.58	18.43
2001	13.74	1.645	10.82	13.63	17.26
2002	13.15	1.492	10.5	13.06	16.33
2003	25.66	2.569	21.04	25.52	31.14
2004	35.66	3.592	29.24	35.45	43.32
2005	23.21	2.378	18.93	23.09	28.25
2006	20.95	2.264	16.92	20.81	25.8
2007	18.48	2.232	14.57	18.32	23.3
2008	9.097	1.188	7.128	8.971	11.76

Table 2. Results of the Bayesian calculation of SEAMAP CPUE for the Fall in the eastern Gulf of Mexico.

Year	Mean	Standard Deviation	2.5% bound	Median	97.5% bound
1987	2.23	0.7384	1.149	2.112	4.001
1988	5.322	2	2.562	4.957	10.18
1989	9.891	2.898	5.616	9.456	16.68
1990	15.47	4.313	9.217	14.77	25.85
1991	15.31	4.454	8.754	14.63	25.86
1992	4.93	1.724	2.491	4.637	9.112
1993	12.06	2.448	8.023	11.79	17.53
1994	11.68	2.488	7.589	11.43	17.29
1995	18.47	5.141	10.69	17.71	30.65
1996	11.9	3.722	6.509	11.28	20.88
1997	20.65	6.487	11.13	19.57	36.16
1998	8.071	2.684	4.231	7.621	14.51
1999	16.44	5.096	9.104	15.6	28.79
2000	14.59	4.406	8.031	13.91	25.01
2001	8.728	2.983	4.5	8.223	15.97
2002	10.54	2.723	6.243	10.17	16.85
2003	17.85	3.492	12.14	17.47	25.73
2004	21.3	7.328	10.9	20.05	38.92
2005	13.26	2.643	8.821	13	19.12
2006	19.38	4.754	11.93	18.76	30.43
2007	10.89	4.095	5.189	10.15	20.8
2008	6.596	1.794	3.821	6.355	10.78

Table 3. Results of the Bayesian calculation of SEAMAP CPUE for the Fall in the western Gulf of Mexico.

Year	Mean	Standard Deviation	2.5% bound	Median	97.5% bound
1987	1.963	0.53	1.147	1.89	3.195
1988	6.413	1.328	4.248	6.26	9.431
1989	6.472	1.331	4.283	6.327	9.473
1990	15.42	3.396	10	15	23.21
1991	6.161	1.37	3.918	6.017	9.234
1992	2.509	0.6595	1.48	2.42	4.038
1993	3.72	0.9321	2.268	3.595	5.895
1994	7.535	1.759	4.738	7.318	11.59
1995	13.34	2.739	8.884	13.04	19.64
1996	6.915	1.667	4.311	6.696	10.81
1997	10.88	2.036	7.476	10.69	15.43
1998	3.968	0.9264	2.479	3.858	6.096
1999	8.68	1.955	5.557	8.446	13.17
2000	7.205	1.734	4.509	6.973	11.27
2001	4.327	1.139	2.558	4.171	6.991
2002	5.032	1.115	3.213	4.908	7.586
2003	6.109	1.394	3.859	5.957	9.278
2004	11.66	2.76	7.301	11.31	18.02
2005	16.58	4.404	10.1	15.89	27.13
2006	12.14	2.837	7.768	11.74	18.83
2007	5.927	1.408	3.691	5.751	9.189
2008	4.322	0.7561	3.033	4.257	5.981

Table 4. Results of the Bayesian calculation of SEAMAP CPUE for the Summer, Gulf-Wide.

Year	Mean	Standard Deviation	2.5% bound	Median	97.5% bound
1987	4.141	0.7782	2.861	4.058	5.901
1988	1.849	0.414	1.18	1.802	2.79
1989	1.087	0.276	0.6516	1.051	1.722
1990	10.41	1.673	7.617	10.25	14.15
1991	4.951	0.9043	3.45	4.855	6.984
1992	3.409	0.7042	2.273	3.33	5.008
1993	4.031	0.7529	2.786	3.956	5.722
1994	6.586	1.152	4.671	6.473	9.15
1995	6.719	1.213	4.725	6.592	9.458
1996	8.411	1.516	5.93	8.249	11.84
1997	6.351	1.178	4.398	6.229	8.998
1998	4.207	0.8962	2.766	4.099	6.257
1999	3.42	0.6911	2.291	3.344	4.988
2000	7.811	1.403	5.491	7.669	10.97
2001	3.304	0.8964	1.938	3.177	5.407
2002	5.382	1.039	3.692	5.266	7.744
2003	3.377	0.7721	2.165	3.274	5.163
2004	8.347	1.543	5.837	8.173	11.85
2005	7.564	1.463	5.184	7.396	10.9
2006	7.01	1.313	4.845	6.874	9.985
2007	6.471	1.275	4.387	6.328	9.361
2008	6.984	1.297	4.871	6.842	9.939

Table 5. Results of the Bayesian calculation of SEAMAP CPUE for the Summer in the eastern Gulf of Mexico.

Year	Mean	Standard Deviation	2.5% bound	Median	97.5% bound
1987	4.141	0.7782	2.861	4.058	5.901
1988	1.849	0.414	1.18	1.802	2.79
1989	1.087	0.276	0.6516	1.051	1.722
1990	10.41	1.673	7.617	10.25	14.15
1991	4.951	0.9043	3.45	4.855	6.984
1992	3.409	0.7042	2.273	3.33	5.008
1993	4.031	0.7529	2.786	3.956	5.722
1994	6.586	1.152	4.67	6.473	9.15
1995	6.719	1.213	4.725	6.592	9.458
1996	8.411	1.516	5.93	8.249	11.84
1997	6.351	1.178	4.398	6.229	8.998
1998	4.207	0.8962	2.766	4.099	6.257
1999	3.42	0.6911	2.291	3.344	4.988
2000	7.811	1.403	5.491	7.669	10.97
2001	3.304	0.8964	1.938	3.177	5.407
2002	5.382	1.039	3.692	5.266	7.744
2003	3.377	0.7721	2.165	3.274	5.163
2004	8.347	1.543	5.837	8.173	11.85
2005	7.564	1.463	5.184	7.396	10.9
2006	7.01	1.313	4.845	6.874	9.985
2007	6.471	1.275	4.387	6.328	9.361
2008	6.984	1.297	4.871	6.842	9.939

Table 6. Results of the Bayesian calculation of SEAMAP CPUE for the Summer in the western Gulf of Mexico.

Year	Mean	Standard Deviation	2.5% bound	Median	97.5% bound
1987	2.081	0.6905	1.104	1.957	3.761
1988	0.9579	0.3428	0.4785	0.8972	1.786
1989	0.6071	0.2252	0.2946	0.5667	1.155
1990	4.993	1.42	2.901	4.771	8.386
1991	2.381	0.757	1.298	2.256	4.201
1992	1.359	0.4497	0.7106	1.286	2.434
1993	2.322	0.6792	1.319	2.216	3.92
1994	4.561	1.295	2.668	4.355	7.641
1995	3.146	0.8914	1.821	3.007	5.269
1996	6.764	1.964	3.915	6.441	11.47
1997	3.33	0.9785	1.892	3.173	5.677
1998	2.222	0.7483	1.16	2.093	4.033
1999	2.099	0.6295	1.182	1.998	3.598
2000	5.096	1.496	2.918	4.863	8.672
2001	2.035	0.816	0.9593	1.875	4.062
2002	3.304	0.9989	1.87	3.136	5.702
2003	1.579	0.5177	0.836	1.493	2.828
2004	5.757	1.809	3.241	5.438	10.12
2005	4.328	1.423	2.351	4.075	7.774
2006	4.263	1.314	2.37	4.044	7.427
2007	3.398	1.066	1.861	3.223	5.962
2008	3.452	1.057	1.909	3.281	5.988

Table 7 . Updated catch rate indices of age-0 and age-1 red snapper abundance based on data collected during SEAMAP groundfish trawl surveys.

	Age-0				**Age-1**			
	East		West		East		West	
Year	Index	CV	Index	CV	Index	CV	Index	CV
1972	43.5895	0.4370	96.4760	1.7681	24.3390	1.4741	45.1430	2.4733
1973	9.5639	0.3768	34.8129	1.7058	5.3402	1.4574	16.2896	2.4291
1974	10.5372	0.3733	13.8064	1.7186	5.8836	1.4565	6.4603	2.4381
1975	10.3916	0.3787	27.6748	1.7134	5.8023	1.4579	12.9496	2.4345
1976	10.6368	0.3681	17.7080	1.7058	5.9393	1.4551	8.2859	2.4291
1977	11.8170	0.3764	20.2883	1.7083	6.5982	1.4573	9.4933	2.4309
1978	8.0619	0.3782	76.6133	1.7083	4.5015	1.4577	35.8488	2.4309
1979	5.4924	0.3750	27.4176	1.7083	3.0668	1.4569	12.8292	2.4309
1980	15.1352	0.3844	80.8607	1.7109	8.4510	1.4594	37.8363	2.4327
1981	35.7498	0.3755	16.9010	1.7134	19.9616	1.4570	7.9083	2.4345
1982	34.2516	0.3644	19.8075	1.6097	10.4267	0.9603	14.5947	0.5569
1983	8.1566	0.3954	18.5905	1.6638	4.0780	0.6929	7.2227	0.9064
1984	5.4379	0.3914	5.3671	1.6605	1.8617	0.8888	2.9987	0.6909
1985	3.2702	0.4662	23.5592	1.7659	1.8398	0.6649	7.8560	1.0765
1986	6.5389	0.6382	14.8085	1.9683	1.7950	1.1361	3.4612	1.6059
1987	0.3318	1.9347	1.5813	0.2633	6.0392	0.1983	2.1244	0.2721
1988	4.0399	0.4844	4.6955	0.2120	0.9483	1.2900	2.4708	0.2045
1989	8.7396	0.3203	5.9162	0.2063	1.7233	0.6770	1.0437	0.2586
1990	10.9317	0.3339	11.5057	0.2222	13.9339	0.2216	8.4445	0.1927
1991	14.2164	0.2978	5.7565	0.2196	4.2378	0.2736	2.3251	0.2687
1992	3.7808	0.4853	1.7689	0.2654	3.4508	0.4197	1.9367	0.2363
1993	10.4924	0.2229	2.7896	0.2503	3.3846	0.3610	2.9998	0.2259
1994	5.8400	0.2718	5.9506	0.2337	8.0827	0.1887	5.6386	0.2229
1995	18.4700	0.2867	12.1059	0.2009	4.0721	0.3869	3.6301	0.2131
1996	6.5021	0.3636	5.4744	0.2380	10.2473	0.1970	7.3677	0.2393
1997	14.7363	0.3456	9.7532	0.1875	8.2616	0.3164	3.8499	0.2309
1998	5.1293	0.4285	3.5721	0.2342	5.3844	0.3287	2.3305	0.2899
1999	12.9519	0.3283	8.5319	0.2173	4.0891	0.4715	1.8929	0.2529
2000	7.9759	0.3488	8.0979	0.2027	10.0052	0.2015	3.8210	0.2548
2001	4.8237	0.4387	4.2754	0.2343	4.2746	0.3755	1.8334	0.3045
2002	10.5400	0.3180	4.9528	0.2091	2.3066	0.9051	2.8523	0.2692
2003	16.4408	0.2032	5.7487	0.2283	3.8857	0.3007	1.8204	0.2778
2004	18.9300	0.3498	10.3988	0.2377	8.3605	0.3135	6.7319	0.2664
2005	9.6436	0.2296	13.6219	0.2621	8.7940	0.2038	6.7548	0.2229
2006	16.0620	0.2620	11.7028	0.2232	6.0105	0.3339	4.0560	0.2586
2007	8.4549	0.4720	5.5802	0.2342	7.6358	0.3582	3.4586	0.2794
2008	2.4340	0.4017	3.0373	0.1756	9.0876	0.1751	3.9444	0.2261

Table 8. Red snapper abundance indices for the Eastern and Western Gulf of Mexico developed with data from the SEAMAP Fall Plankton Survey.

	East		West	
Year	**Scaled Modeled Proportion Positive**	**CV on Modeled Proportion Positive**	**Delta-Lognormal Modeled Abundance Scaled**	**CV on Delta-Lognormal Modeled Abundance**
1985				
1986	0.4021	0.9425	0.3580	0.5778
1987	0.9369	1.3553	0.6693	0.6700
1988	0.5850	0.9434		
1989			0.6255	0.6561
1990			0.8371	0.5059
1991	1.2242	1.3594	0.6177	0.5657
1992			0.4953	0.4340
1993			0.4860	0.4326
1994	0.3375	0.9409	0.4727	0.5785
1995	0.7783	1.3437	1.3688	0.3181
1996			0.9817	0.3752
1997	0.3638	0.9415	1.5412	0.2892
1998				
1999	1.0858	1.6480	0.4671	0.4666
2000	1.5087	1.9187	1.5323	0.2960
2001	1.1693	1.6609	0.9162	0.4644
2002	0.5771	0.9438	1.1988	0.3140
2003	1.4153	1.9206	1.8273	0.2666
2004			1.0083	0.3554
2005				
2006	1.1155	1.6470	2.1168	0.3357
2007	2.5007	2.6249	1.4799	0.2758
2008				

Table 9 . Red snapper abundance indices for the Western and Eastern Gulf of Mexico developed with data from the SEAMAP Reef Fish Video Survey.

	West			East		
Year	***Index***	***Scaled Index***	***CV***	***Index***	***Scaled Index***	***CV***
1993	0.61841	1.05991	0.36734	0.02785	0.3471	1.51322
1994	0.31412	0.53837	0.43528	0.01391	0.17335	2.97591
1995	0.23545	0.40355	0.34765	0.0083	0.1034	3.2058
1996	0.36495	0.6255	0.2138	0.03043	0.37922	1.31636
1997	0.74065	1.26941	0.19388	0.03528	0.43977	1.46504
1998						
1999						
2000						
2001	0.30045	0.51495	0.384			
2002	0.93084	1.59538	0.19335	0.1135	1.41454	0.69403
2003						
2004	0.41804	0.71649	0.34052	0.17357	2.16324	0.59188
2005	0.96657	1.65662	0.17383	0.17001	2.1189	0.54922
2006	0.41833	0.71698	0.27095	0.07651	0.95358	0.7591
2007	1.08794	1.86464	0.16801	0.11393	1.41991	0.6077
2008	0.60575	1.0382	0.22395	0.11931	1.48699	0.67015

Table 10 . Red snapper abundance indices for the Western and Eastern Gulf of Mexico developed with data from the Shark/Snapper/Grouper Survey.

	Eastern Gulf				Western Gulf			
Year	*N*	*Index*	*Scaled Index*	*CV*	*N*	*Index*	*Scaled Index*	*CV*
1996	52	0.015	0.363	1.264	32	0.086	0.271	1.154
1997	72	0.009	0.210	1.283	97	0.466	1.466	0.503
1998	0							
1999	138	0.066	1.622	0.565	80	0.061	0.193	0.810
2000	110	0.009	0.218	1.242	105	0.540	1.699	0.256
2001	117	0.033	0.817	0.726	119	0.373	1.174	0.317
2002	55	0.041	1.009	0.883	142	0.298	0.939	0.290
2003	144	0.047	1.157	0.588	99	0.323	1.016	0.337
2004	121	0.051	1.239	0.643	91	0.352	1.107	0.341
2005	42	0.041	0.992	1.244				
2006	44	0.045	1.109	0.897	66	0.269	0.847	0.405
2007	51	0.093	2.263	0.882	53	0.309	0.971	0.447
2008	66	0.000	0.000	.	20	0.419	1.318	0.492

Table 11. Results of calculations used to identify species associated with red snapper in the eastern GOM (FL,AL,MS) for SEDAR 7 and the 2009 update assessment. Species were assumed to be associated with red snapper if the association statistic was ≥ 3.0 (shaded). %CO is the percent common occurrence.

Common Name of "Species X"	Trips with Red Snapper and Species X	Trips with Species X	2009 Association Statistic	2009 %CO	SEDAR7 Association Statistic
red snapper	14546	14546	8.44	100.0%	9.51
red porgy	2724	3151	7.29	86.4%	7.86
whitebone porgy	385	455	7.14	84.6%	7.44
banded rudderfish	621	736	7.12	84.4%	7.8
vermilion snapper	5132	6111	7.08	84.0%	7.69
scamp	1594	2069	6.50	77.0%	7
warsaw grouper	177	231	6.46	76.6%	6.97
gray triggerfish	6484	8548	6.40	75.9%	6.85
almaco jack	870	1209	6.07	72.0%	6.74
lesser amberjack	87	138	5.32	63.0%	6.03
queen triggerfish	72	117	5.19	61.5%	5.96
snowy grouper	115	188	5.16	61.2%	6.31
***bigeye**	***48***	***80***	***5.06***	***60.0%***	***Not included***
greater amberjack	3106	5284	4.96	58.8%	5.41
bank sea bass	381	672	4.78	56.7%	5.33
tomtate	569	1062	4.52	53.6%	4.67
sea bass genus	95	179	4.48	53.1%	4.34
sharksucker	149	286	4.40	52.1%	3.51
remora	473	990	4.03	47.8%	3.25
moray family	39	83	3.96	47.0%	4.21
black snapper	21	51	3.47	41.2%	3.81
speckled hind	49	124	3.33	39.5%	3.86
lane snapper	1453	3807	3.22	38.2%	3.12
amberjack genus	312	824	3.19	37.9%	4.48
squirrelfish	67	186	3.04	36.0%	3.33
****atlantic spadefish**	***220***	***652***	***2.85***	***33.7%***	***3.35***

* bigeye was not included in the SEDAR 7 list of species associates because bigeye was observed on less than 50 trips .
**altantic spadefish was not included in the 2009 species associates because the association statistic was less than 3.0.

Table 12. Results of calculations used to identify species associated with red snapper in the western GOM (LA) for SEDAR 7 and the 2009 update assessment. Species were assumed to be associated with red snapper if the association statistic was ≥ 3.0 (shaded). %CO is the percent common occurrence.

Common Name of "Species X"	Trips with Red Snapper and Species X	Trips with Species X	2009 Association Statistic	2009 %CO	SEDAR7 Association Statistic
red snapper	1520	1520	6.76	100.0%	7.91
lane snapper	243	257	6.39	94.6%	7.47
***scamp**	**49**	**57**	**5.81**	**86.0%**	**not included**
gag	171	210	5.50	81.4%	6.61
gray triggerfish	402	512	5.31	78.5%	6.18
atlantic sharpnose shark	93	121	5.19	76.9%	5.85
cobia	386	529	4.93	73.0%	5.51
almaco jack	89	122	4.93	73.0%	6.2
vermilion snapper	120	175	4.63	68.6%	6.31
greater amberjack	326	485	4.54	67.2%	5.85
gray snapper	369	554	4.50	66.6%	5.29
great barracuda	52	85	4.13	61.2%	5.37
king mackerel	210	367	3.87	57.2%	4.22
pinfish	101	202	3.38	50.0%	4
silver seatrout	63	126	3.38	50.0%	3.99
blue runner	166	337	3.33	49.3%	3.88
requiem shark family	25	52	3.25	48.1%	3.64
bluefish	234	513	3.08	45.6%	3.61
****unidentified (sharks)**	**108**	**239**	**3.05**	**45.2%**	**not included**
*****atlantic spadefish**	**74**	**183**	**2.73**	**40.4%**	**3.42**
*****little tunny**	**86**	**228**	**2.58**	**37.7%**	**3.15**
*****blacktip shark**	**128**	**309**	**2.80**	**41.4%**	**3.04**

* scamp was not included in the SEDAR 7 list of species associates because bigeye was observed on less than 50 trips .
**unidentified sharks were not included in the SEDAR 7species associates because the association statistic was less than 3.0.
***these species were not included in the 2009 species associates because the association statistic was less than 3.0.

Table13. Nominal CPUE, proportion positive trips, number of trips, standardized CPUE, 95% confidence intervals and the coefficient of variation for the MRFSS eastern and western GOM indices.

EASTERN GULF

YEAR	Nominal CPUE	PPT	Trips	STDCPUE	Lower 95% CI	Upper 95% CI	CV
1981	0.387	0.314	121	0.654	0.313	1.366	0.382
1982	0.174	0.353	156	0.339	0.174	0.660	0.343
1983	1.127	0.571	126	1.332	0.673	2.636	0.351
1984	0.763	0.431	123	0.495	0.225	1.090	0.411
1985	1.019	0.555	146	0.502	0.245	1.027	0.370
1986	0.547	0.498	544	0.473	0.260	0.859	0.306
1987	0.421	0.381	572	0.643	0.345	1.201	0.320
1988	0.302	0.363	493	0.403	0.213	0.761	0.326
1989	0.322	0.320	419	0.342	0.172	0.681	0.355
1990	0.549	0.454	249	0.512	0.272	0.966	0.325
1991	1.159	0.555	411	0.859	0.475	1.553	0.303
1992	1.129	0.540	883	1.092	0.630	1.895	0.281
1993	0.853	0.497	567	0.987	0.568	1.716	0.282
1994	0.806	0.462	619	0.790	0.448	1.393	0.289
1995	0.607	0.475	366	0.567	0.307	1.047	0.314
1996	1.018	0.477	493	1.013	0.573	1.792	0.291
1997	1.538	0.655	710	1.554	0.917	2.634	0.268
1998	1.162	0.625	1009	1.491	0.886	2.508	0.265
1999	1.309	0.667	1563	1.351	0.803	2.274	0.265
2000	1.184	0.724	1597	1.343	0.797	2.262	0.265
2001	0.993	0.648	1498	1.272	0.754	2.145	0.266
2002	1.251	0.685	1596	1.598	0.955	2.674	0.262
2003	1.009	0.654	1690	1.256	0.749	2.109	0.263
2004	0.953	0.680	1996	1.232	0.732	2.076	0.265
2005	0.998	0.657	1642	1.479	0.867	2.521	0.272
2006	1.103	0.712	1379	1.489	0.874	2.539	0.272
2007	1.186	0.710	1420	1.439	0.843	2.457	0.272
2008	0.853	0.616	1155	1.494	0.877	2.544	0.271

WESTERN GULF

YEAR	Nominal CPUE	PPT	Trips	STDCPUE	Lower 95% CI	Upper 95% CI	CV
1981	1.392	0.702	47	1.566	0.773	3.172	0.364
1982	0.364	0.541	61	0.445	0.191	1.034	0.441
1983	1.137	0.795	146	1.178	0.638	2.177	0.314
1984	0.983	0.774	115	1.166	0.673	2.021	0.280
1985	0.301	0.333	39	0.414	0.133	1.294	0.619
1986	0.465	0.605	147	0.523	0.265	1.032	0.350
1987	0.286	0.372	78	0.206	0.070	0.603	0.578
1988	0.762	0.258	62	0.762	0.237	2.450	0.637
1989	0.340	0.362	69	0.364	0.131	1.011	0.546
1990	0.566	0.470	83	0.719	0.304	1.701	0.451
1991	1.145	0.477	88	1.296	0.539	3.116	0.461
1992	1.168	0.536	138	1.428	0.672	3.035	0.391
1993	1.015	0.564	78	1.173	0.503	2.734	0.443
1994	0.899	0.607	84	1.142	0.589	2.216	0.341
1995	1.076	0.551	69	1.482	0.648	3.391	0.432
1996	1.096	0.643	56	1.348	0.617	2.946	0.406
1997	0.943	0.570	93	1.336	0.672	2.653	0.354
1998	0.732	0.557	70	1.213	0.569	2.585	0.392
1999	0.588	0.455	110	0.722	0.302	1.728	0.458
2000	0.522	0.500	108	0.762	0.366	1.585	0.379
2001	0.174	0.282	78	0.249	0.087	0.711	0.563
2002	0.314	0.416	154	0.563	0.259	1.227	0.404
2003	0.770	0.615	91	0.982	0.438	2.202	0.421
2004	0.636	0.481	135	0.724	0.331	1.580	0.406
2005	1.093	0.622	135	1.740	0.993	3.050	0.286
2006	0.709	0.556	216	1.176	0.636	2.174	0.315
2007	0.984	0.694	121	1.721	1.008	2.941	0.273
2008	0.755	0.580	100	1.600	0.860	2.976	0.318

Table14. Vertical line (commercial HL) standardized index of abundance and CVs for red snapper (1990-2006) in the Gulf of Mexico.

YEAR	Eastern GOM Standardized Index	Eastern GOM CV (Index)	Western GOM Standardized Index	Western GOM 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 15. Vertical line (Commercial HL) standardized index of abundance and CVs for red snapper IFQ years (1990-2006) in the Gulf of Mexico. CVs for the eastern GOM index could not be calculated with only two years of data included in the random effects delta-lognormal model.

YEAR	Eastern GOM Standardized Index	Eastern GOM CV (Index)	Western GOM Standardized Index	Western GOM CV (Index)
2007	1.074322981	-	0.921666923	0.046175
2008	0.925677019	-	1.078333077	0.053682

Table 16. Available indices of abundance for the 2009 red snapper update.

	MRFSS				LGBK_HL				Shrimp landed CPUE		VIDEO			
	Cass-Calay				McCarthy				Goodyear 1995 Fig 36		Ingram/Gledhill GLM			
	age range = 1+				age range = 2 - 15				age range = 2 - 15		age range = 2 - 15			
	Units = # fish				Units = biomass (lb)				Units = biomass (kg)		Units = # fish			
	East		West		East		West				East		West	
YEAR	Index	CV	Index	CV	Index	CV	Index	CV	Index	CV	Index	CV	Index	CV
1960														
1961														
1962														
1963														
1964														
1965														
1966														
1967									2.6790					
1968									3.3916					
1969									2.0330					
1970									2.7560					
1971									2.1512					
1972									2.5206					
1973									3.4071					
1974									2.6894					
1975									2.0636					
1976									1.4123					
1977									1.2610					
1978									0.7190					
1979									0.4694					
1980														
1981	0.7340	0.3549	0.9563	0.4054										
1982	0.3783	0.3199	0.3763	0.4167										
1983	1.4363	0.3353	1.0710	0.2112										
1984	0.6156	0.3710	0.8114	0.2821										
1985	0.6323	0.3213	0.5457	0.5258										
1986	0.5133	0.2972	0.4554	0.3278										
1987	0.7556	0.3077	0.3462	0.5475										
1988	0.4865	0.3138	1.6059	0.5161										
1989	0.3950	0.3634	0.5193	0.4702										
1990	0.5648	0.3215	0.7040	0.4379	0.265945	0.8731	0.66143	0.2429						
1991	0.8985	0.3064	1.4208	0.3951	0.420385	0.69	1.08012	0.2171						
1992	1.1320	0.2866	1.7374	0.2676	1.268586	0.631	1.76699	0.2252						
1993	1.0125	0.2826	1.3744	0.3376	0.698897	0.6026	1.15677	0.1623			0.3471	1.5132	1.0599	0.36734
1994	0.7504	0.3093	0.9884	0.2786	0.626484	0.6033	1.15504	0.1625			0.1734	2.9759	0.5384	0.43528
1995	0.5812	0.3238	1.8804	0.2590	0.745558	0.6196	1.3402	0.1624			0.1034	3.2058	0.4036	0.34765
1996	0.9835	0.3033	1.2277	0.3266	0.4489	0.6860	1.3387	0.1622			0.3792	1.3164	0.6255	0.21380
1997	1.4881	0.2696	1.1733	0.2911	0.3675	0.7141	1.1762	0.1621			0.4398	1.4650	1.2694	0.19388
1998	1.4147	0.2655	1.1732	0.3176	1.2883	0.6803	0.9335	0.1621						
1999	1.2715	0.2668	0.8477	0.4222	0.7796	0.6920	0.8658	0.1623						
2000	1.2597	0.2668	0.7826	0.3030	1.4717	0.6859	0.9879	0.1624						
2001	1.2264	0.2655	0.3416	0.5268	1.3417	0.6899	0.8514	0.1623					0.5150	0.38400
2002	1.5168	0.2619	0.5756	0.3541	1.6504	0.6720	0.8156	0.1624			1.4145	0.6940	1.5954	0.19335
2003	1.1805	0.2651	1.0156	0.3361	1.4638	0.6646	0.7899	0.1624						
2004	1.1660	0.2659	0.7245	0.3607	1.6566	0.6993	0.6571	0.1624			2.1632	0.5919	0.7165	0.34052
2005	1.4221	0.2719	1.4039	0.2266	1.3668	0.6758	0.5891	0.1625			2.1189	0.5492	1.6566	0.17383
2006	1.4290	0.2710	1.0304	0.2677	1.1386	0.6858	0.8341	0.1628			0.9536	0.7591	0.7170	0.27095
2007	1.3582	0.2723	1.4756	0.1778							1.4199	0.6077	1.8646	0.16801
2008	1.3971	0.2713	1.4354	0.2121							1.4870	0.6702	1.0382	0.22395

Table 16. … **continued.**

	LARV_B				SEAMAP_TRWL 87+				SEAMAP_TRWL72+ (Miami)			
	Hanisko				Ingram				SEDAR7_AW18rev			
	age range = 2 - 15				age range = 0 (fall)		age range = 1 (summer)		age range = 0			
	Units = reproductive output				Units = # fish				Units = # fish			
	East		West		East		West		East		West	
YEAR	Index	CV	Index	CV	Index	CV	Index	CV	Index	CV	Index	CV
1960												
1961												
1962												
1963												
1964												
1965												
1966												
1967												
1968												
1969												
1970												
1971												
1972									44.5663	0.4275	95.9005	1.7444
1973									9.7783	0.3658	34.6053	1.6812
1974									10.7733	0.3621	13.7240	1.6942
1975									10.6245	0.3677	27.5097	1.6890
1976									10.8752	0.3567	17.6023	1.6812
1977									12.0818	0.3653	20.1673	1.6838
1978									8.2426	0.3672	76.1563	1.6838
1979									5.6154	0.3639	27.2541	1.6838
1980									15.4744	0.3736	80.3784	1.6864
1981									36.5509	0.3644	16.8002	1.6890
1982									35.3051	0.3535	19.3917	1.6812
1983									8.3836	0.3810	18.7306	1.6942
1984									5.6021	0.3810	5.3327	1.7125
1985									3.3581	0.4526	23.8429	1.7908
1986	0.4021	0.9425	0.3580	0.5778					6.7429	0.6326	15.1079	1.9808
1987	0.9369	1.3553	0.6693	0.6700	3.0192	0.1739	4.0269	0.1826	3.0581	0.3769	3.2052	0.1913
1988	0.5850	0.9434			5.2646	0.1251	2.1073	0.2019	4.7849	0.3634	5.3783	0.1336
1989			0.6255	0.6561	17.1158	0.0996	1.9621	0.2108	22.1582	0.2304	16.3230	0.1092
1990			0.8371	0.5059	15.9267	0.0996	11.0674	0.1517	18.4019	0.1845	15.6689	0.1063
1991	1.2242	1.3594	0.6177	0.5657	19.7272	0.0959	4.7875	0.1694	24.1858	0.1687	19.2625	0.1039
1992			0.4953	0.4340	5.1655	0.1344	4.3536	0.1705	3.9074	0.3789	5.2906	0.1388
1993			0.4860	0.4326	11.0342	0.1174	3.8690	0.1723	9.7569	0.2060	11.0863	0.1246
1994	0.3375	0.9409	0.4727	0.5785	30.4778	0.0966	6.5864	0.1627	6.2768	0.2187	32.8431	0.0969
1995	0.7783	1.3437	1.3688	0.3181	28.6743	0.0965	5.0988	0.1712	15.6900	0.1834	29.8200	0.0993
1996			0.9817	0.3752	11.1563	0.1092	8.2071	0.1641	6.2210	0.2264	11.5775	0.1156
1997	0.3638	0.9415	1.5412	0.2892	23.1501	0.0979	5.8416	0.1672	13.6112	0.2020	23.9509	0.1027
1998					11.2571	0.1207	3.6877	0.1993	4.1622	0.3203	11.8987	0.1248
1999	1.0858	1.6480	0.4671	0.4666	20.3687	0.1044	2.2691	0.1916	11.2240	0.2101	21.1022	0.1085
2000	1.5087	1.9187	1.5323	0.2960	15.7368	0.1058	4.8988	0.1736	14.7179	0.2099	15.7031	0.1123
2001	1.1693	1.6609	0.9162	0.4644	13.7908	0.1124	2.0419	0.2534	4.2910	0.3075	14.6171	0.1151
2002	0.5771	0.9438	1.1988	0.3140	12.2803	0.1108	4.3017	0.1759	7.1785	0.2245	12.7920	0.1162
2003	1.4153	1.9206	1.8273	0.2666								
2004			1.0083	0.3554								
2005												
2006	1.1155	1.6470	2.1168	0.3357								
2007	2.5007	2.6249	1.4799	0.2758								
2008												

Table 16. … continued.

	SEAMAP_TRWL72+ (Miami)						SEAMAP Longline			
	SEDAR7_AW18rev						Ingram			
	age range = 1						age range= 1+			
	Units = # fish						Units = # fish			
	Gulf wide		East		West		East		West	
YEAR	Index	CV	Index	CV	Index	CV	Index	CV	Index	CV
1960										
1961										
1962										
1963										
1964										
1965										
1966										
1967										
1968										
1969										
1970										
1971										
1972			21.3367	1.2962	44.5108	2.5668				
1973			4.6815	1.2772	16.0615	2.5242				
1974			5.1579	1.2761	6.3698	2.5329				
1975			5.0866	1.2777	12.7682	2.5294				
1976			5.2066	1.2746	8.1699	2.5242				
1977			5.7843	1.2770	9.3604	2.5260				
1978			3.9462	1.2776	35.3468	2.5260				
1979			2.6885	1.2766	12.6496	2.5260				
1980			7.4086	1.2794	37.3064	2.5277				
1981			17.4992	1.2768	7.7976	2.5294				
1982			12.0055	0.8528	15.1087	0.5255				
1983			4.6981	0.6317	7.2690	0.8592				
1984			2.1439	0.7961	3.0736	0.6532				
1985			2.1198	0.6117	7.8273	1.0265				
1986			2.0665	1.0261	3.3437	1.5670				
1987			2.8374	0.4105	5.2969	0.1643				
1988			2.4590	0.5907	4.8798	0.1320				
1989			5.2764	0.6397	3.0912	0.1959				
1990			8.8520	0.2682	14.4018	0.1319				
1991			4.6194	0.3740	6.0748	0.1562				
1992			5.2084	0.3078	6.0429	0.1422				
1993			3.2154	0.2910	6.6184	0.1286				
1994			8.2758	0.2069	10.1821	0.1342				
1995			2.1792	0.5259	7.8244	0.1411				
1996			5.9862	0.2307	11.6878	0.1320	0.3633	1.2637	0.2707	1.1540
1997			5.5379	0.3026	7.9873	0.1457	0.2097	1.2834	1.4664	0.5033
1998			4.2282	0.3074	5.0223	0.1690				
1999			3.0751	0.4190	3.4511	0.1698	1.6223	0.5652	0.1925	0.8103
2000			9.2644	0.2523	6.6892	0.1444	0.2184	1.2418	1.6991	0.2561
2001			4.4146	0.2878	4.3670	0.1613	0.8168	0.7255	1.1741	0.3171
2002			3.2593	0.3236	5.5827	0.1571	1.0093	0.8827	0.9389	0.2901
2003							1.1566	0.5880	1.0158	0.3370
2004							1.2393	0.6430	1.1071	0.3410
2005							0.9924	1.2438		
2006							1.1094	0.8967	0.8468	0.4049
2007							2.2626	0.8823	0.9711	0.4473
2008								.	1.3176	0.4921

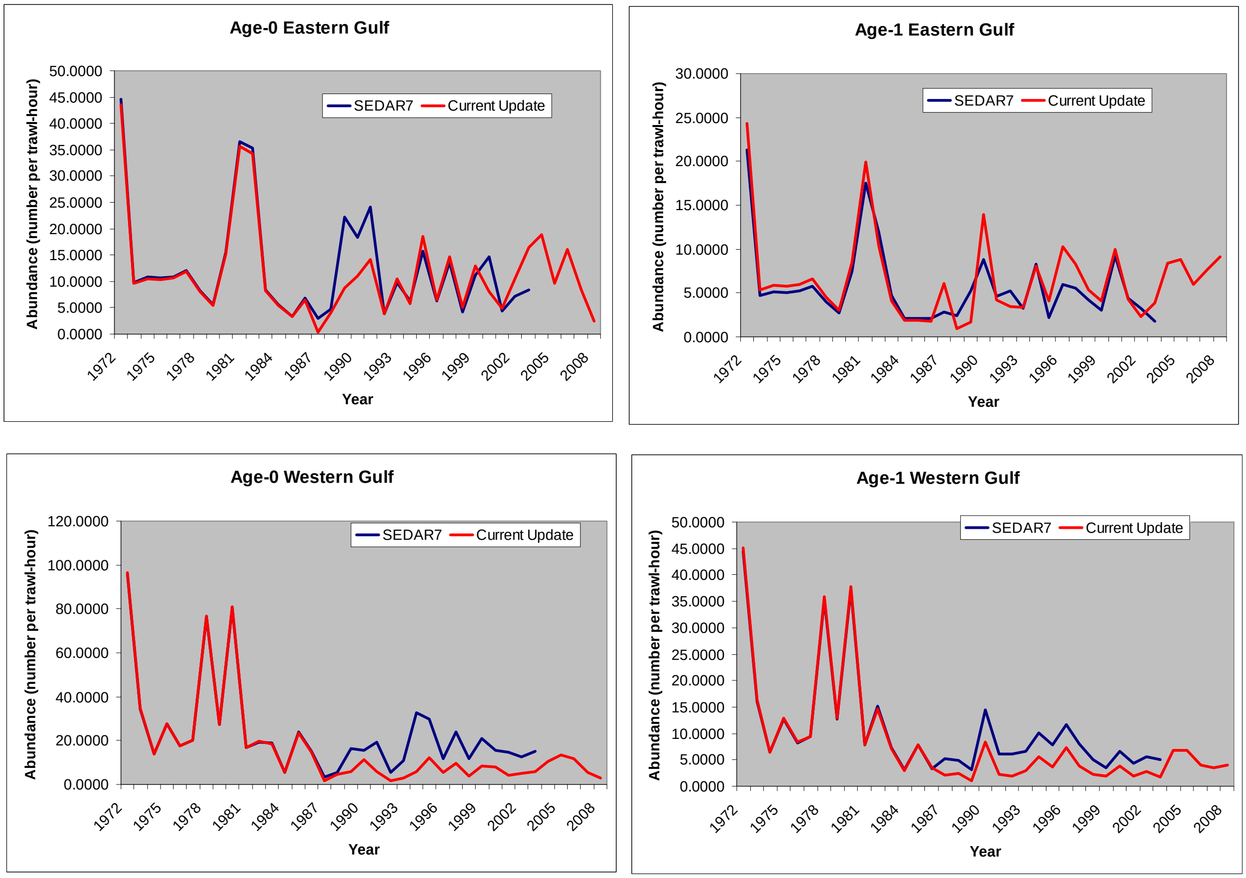

Figure 1 . Comparison of age-0 and age-1red snapper abundance indices for the Western and Eastern Gulf of Mexico developed with data from the SEAMAP Groundfish Trawl Survey during SEDAR7 and for the current assessment update.

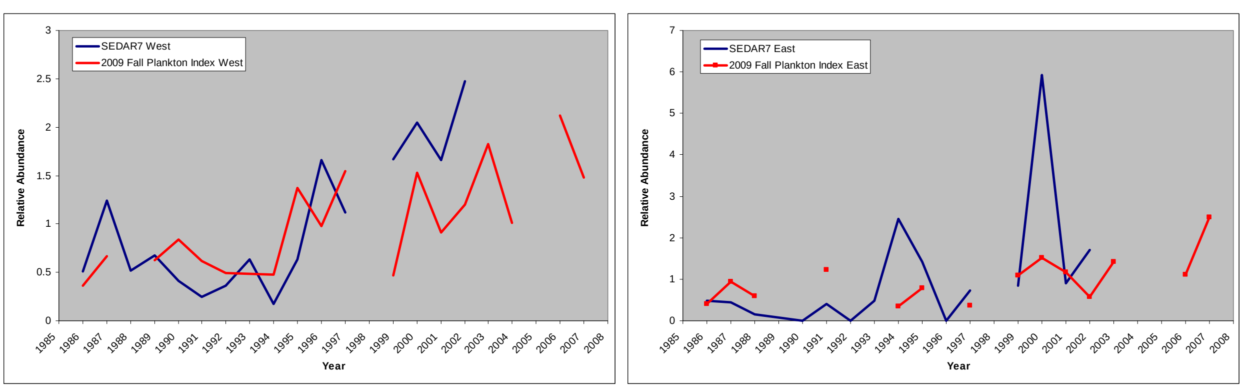

Figure 2 . Comparison of red snapper abundance indices for the Western and Eastern Gulf of Mexico developed with data from the SEAMAP Fall Plankton Survey during SEDAR7 and for the current assessment update.

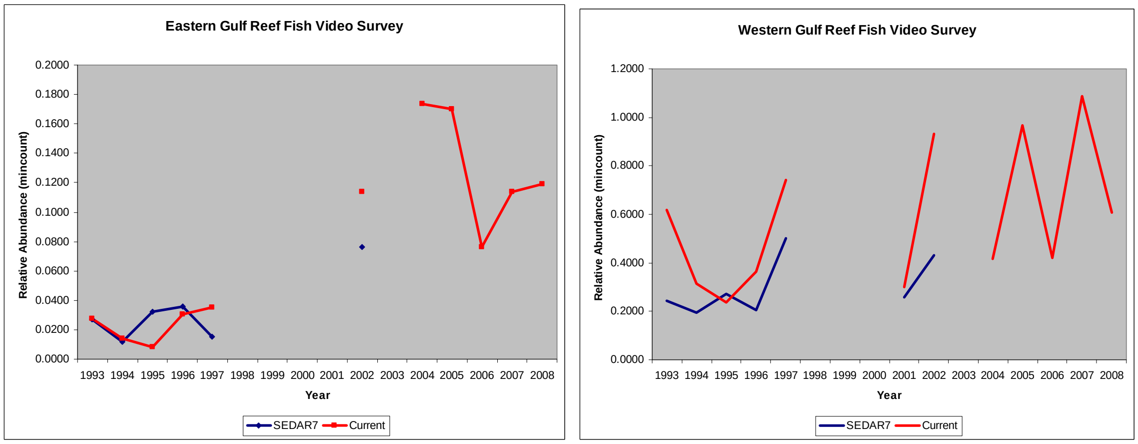

Figure 3. Comparison of red snapper abundance indices for the Western and Eastern Gulf of Mexico developed with data from the SEAMAP Reef Fish Video Survey during SEDAR7 and for the current assessment update.

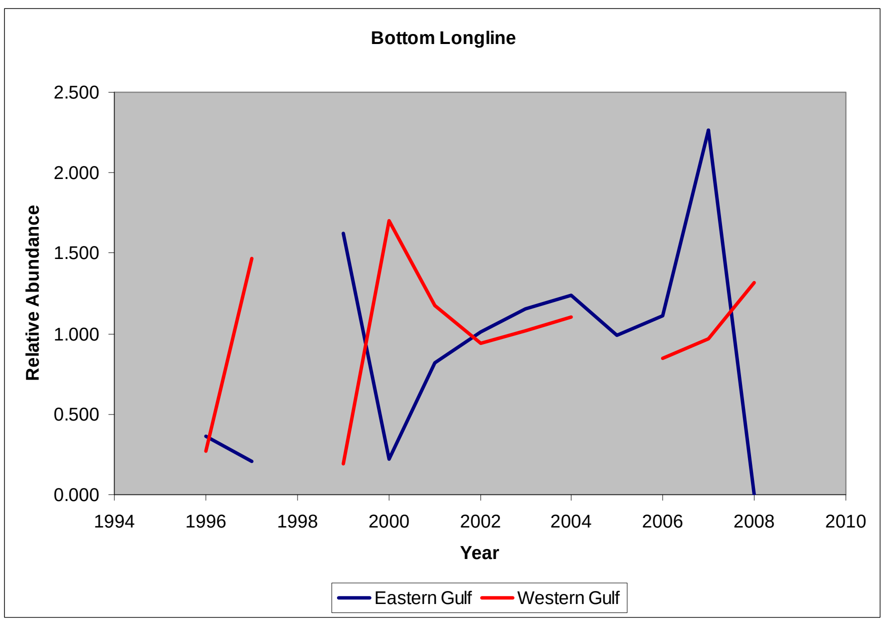

Figure 4 . Comparison of red snapper abundance indices for the Western and Eastern Gulf of Mexico developed with data from the Shark/Snapper/Grouper Survey during SEDAR7 and for the current assessment update.

MRFSS: Eastern GOM **MRFSS: Western GOM**

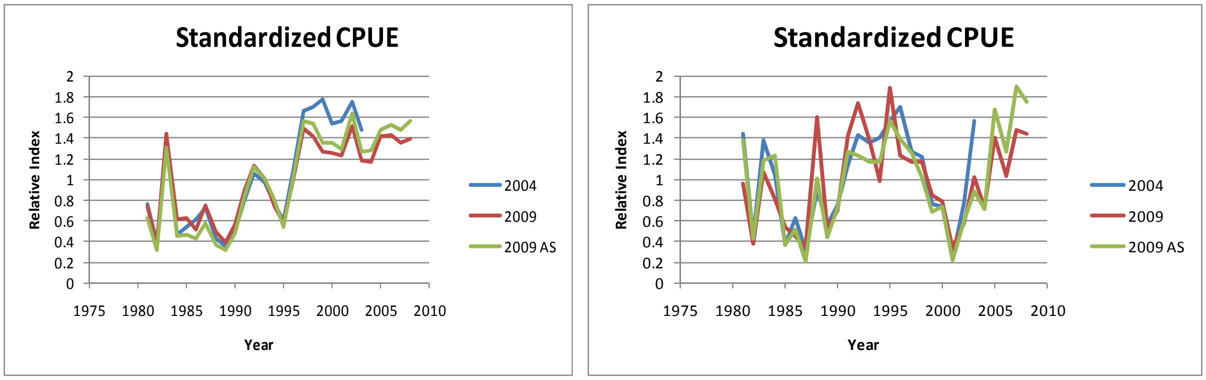

Figure 5. Comparison of MRFSS indices constructed for SEDAR 7 (2004), the 2009 revised index (using methods of Stephens and MacCall, 2004) and the 2009 index requested and preferred by the update panel (2009AS: using the association statistic).

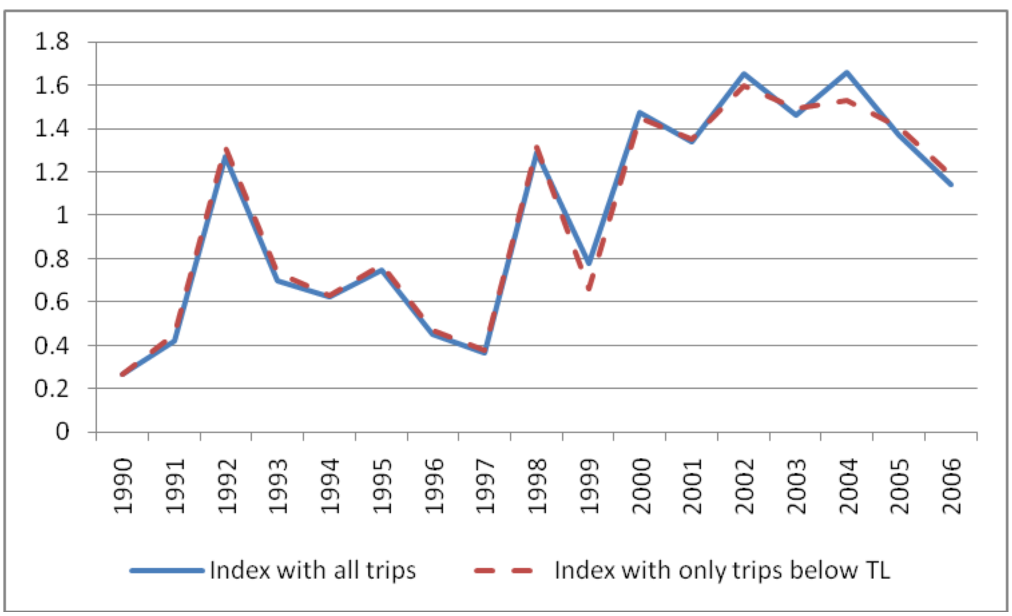

Figure 6. Eastern Gulf of Mexico vertical line (Commercial HL) index constructed with and without trips meeting or exceeding trip limits.

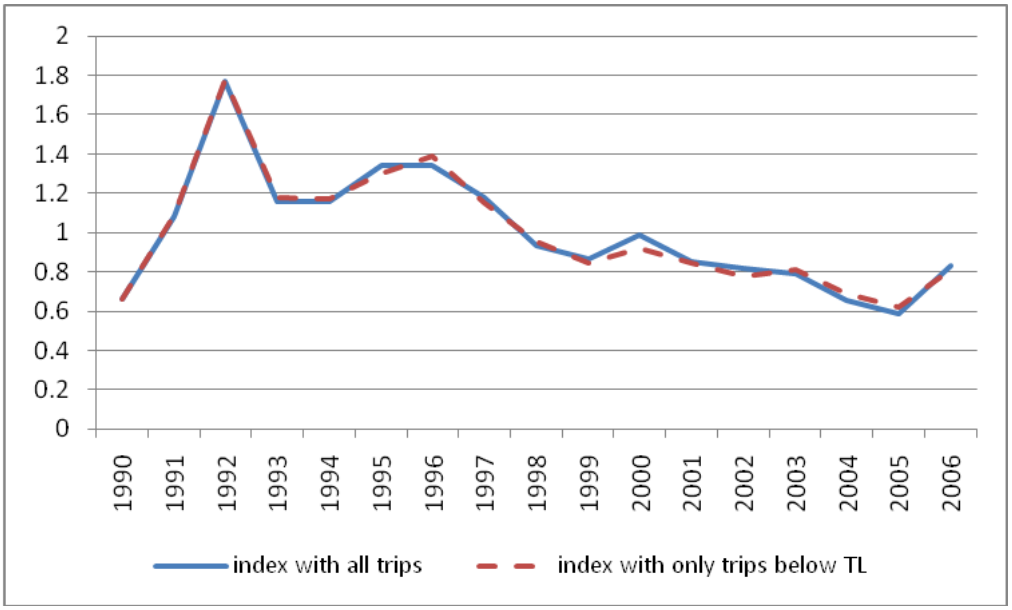

Figure 7. Western Gulf of Mexico vertical line (commercial HL) index constructed with and without trips meeting or exceeding trip limits.

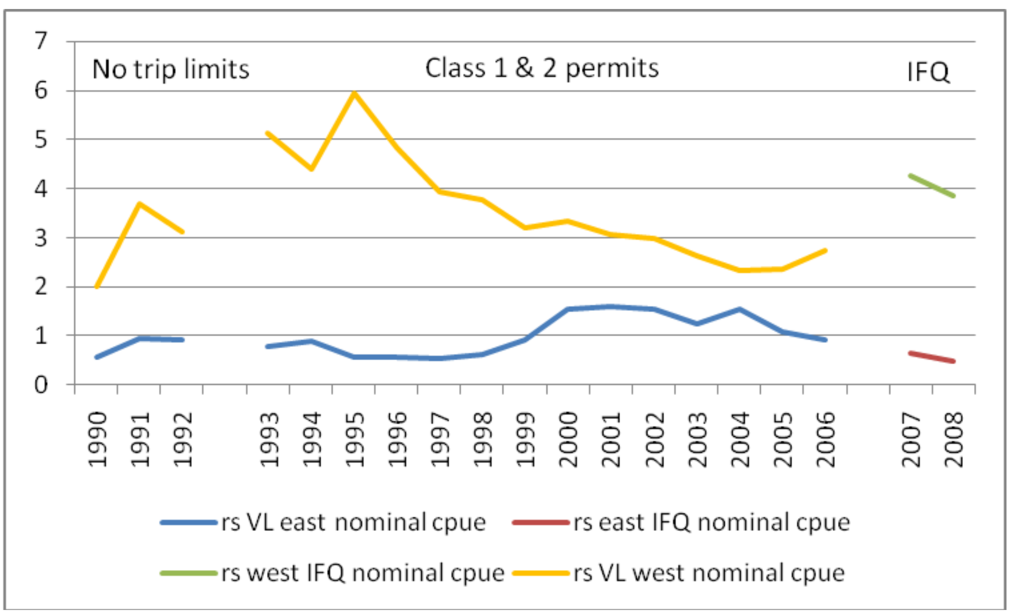

Figure 8. Nominal yearly vertical line (VL) CPUEs in the eastern and western Gulf of Mexico. No trip limits were in effect during 1990-1992. Trip limits of 2,000 and 200 pounds (class 1 and class 2 permitted vessels) were in effect during 1993-2006. IFQs were in effect during 2007-2008. A 1,000 pound trip limit was established for the period April 3-May 14, 1992 during an emergency rule following no trip limits from January 1-February 22, 1992.

Appendix 2: Projected number of discards as estimated by the AS 3

Appendix 2, Table 1. Gulf of Mexico red snapper projected dead discards for the directed fisheries (i.e., excluding shrimp trawl bycatch). Results based on AS3 run with shrimp effort rebuild scenario. Dead discards reported as numbers of fish. CATCHEM model for AS 3 produces estimates estimates of projected dead discards from the directed fisheries, which includes dead discards due to minimum size limits and closed seasons, but excludes dead discards due to shrimp trawl bycatch.

Year	East	West	Gulf
2009	443,301	379,694	822,995
2010	403,987	403,761	807,748
2011	387,000	498,251	885,251
2012	403,559	540,546	944,105
2013	414,269	549,249	963,518
2014	418,353	557,433	975,786
2015	416,776	565,250	982,026
2016	413,329	570,913	984,242
2017	414,432	575,044	989,475
2018	417,654	577,363	995,017
2019	418,829	578,302	997,132
2020	419,690	578,841	998,531
2021	420,331	579,069	999,400
2022	420,806	578,987	999,793
2023	421,155	578,474	999,629
2024	421,388	577,812	999,199
2025	421,560	577,029	998,588
2026	421,667	575,946	997,612
2027	421,732	574,823	996,554
2028	421,765	573,700	995,465
2029	421,746	572,286	994,033
2030	421,716	570,843	992,560
2031	421,657	569,470	991,128
2032	421,585	567,887	989,472

Appendix 3: Data Inputs for CATCHEM AD continuity model

APPENDIX 3

DETAILS OF CATCHEM_AD MODEL FOR CONTINUITY RUN

```
#//////////////////////////////////////////////////////////////////////////////////////////////
#//////////////////////////////////////////////////////////////////////////////////////////////
#// CONTROL FILE FOR PROGRAM CATCHEM_AD
#//
#//   Important notes:
#//    (1) Comments may be placed BEFORE or AFTER any line of data, however they MUST begin
#//        with a # symbol in the first column.
#//    (2) No comments of any kind may appear on the same line as the data (the #
#//        symbol will not save you here)
#//    (3) Blank lines without a # symbol are not allowed.
#//
#//////////////////////////////////////////////////////////////////////////////////////////////
#//////////////////////////////////////////////////////////////////////////////////////////////
#
#####################################################
# GENERAL INFORMATION
#####################################################
# first year of data, last year of data, last year of projections
  1872  2008  2008
# youngest age, oldest age, plus-group
  0  30  15
# number of stocks
  2
# number of zones (areas)
  2
# number of seasons
  3
# number of length categories
  28
# length bin boundaries (lower bound of first category followed by upper bounds of all categories)
  0 4 6 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 30 32 34 36 38 44
# variance scale (1=logscale, 2=arithmetic)
 1
# method of modifying variances (1 = additive, -1=multiplicative)
 1
# Assume virgin status at beginning of data (modern) period? (0) = no, (1)=yes
 1
# Year when recruitment deviations are permitted (zero or negative value tells the program to use default values)
# |    last year with no bias correction (if greater than the last year of data then no bias correction)
# |    |     Year when bias correction is fully phased in
# |    |     |     Year when bias phases out (last year that is fully bias corrected)
# |    |     |     |
 1899  1984  1990  2002
#####################################################
# PROJECTIONS AND BENCHMARK STATISTICS
```

```
#####################################################
# ignore the input guesses for the parameters (1 = yes, 0=no)?
#          If you choose "yes" you must start CATCHEM_AD using the parameter estimates from a previous
#    run by use of the -binp NAME-OF-FILE or -ainp NAME-OF-FILE command line options, otherwise the program will
#    initialize all the parameters at the midpoints between the boundaries you specified in the
#    CATCHEM_AD.PRM file, which usually won't work very well. If you choose "no" (a value <=0)
#    it makes no difference whether you used the -binp option; the program will use the starting
#    guesses indicated in CATCHEM_AD.PRM .

#////////////////////////////////////////////////////////////////////////////////////////////
#////////////////////////////////////////////////////////////////////////////////////////////
#// DATA FILE FOR PROGRAM CATCHEM_AD
#//
#//   Important notes:
#//    (1) Comments may be placed BEFORE or AFTER any line of data, however they MUST begin
#//        with a # symbol in the first column.
#//    (2) No comments of any kind may appear on the same line as the data (the #
#//        symbol will not save you here)
#//    (3) Blank lines without a # symbol are not allowed.
#//
#////////////////////////////////////////////////////////////////////////////////////////////
#////////////////////////////////////////////////////////////////////////////////////////////
#
#####################################################
# GENERAL FISHERY/SURVEY INFO (NOTE: Here each survey is assumed to have no catch and constant
#                    vulnerability/catchability patterns. If untrue, it
#                    should be modeled as a additional fishery)
#####################################################
#
# Number of unique fisheries and fishery-independent surveys with non-negligible catch
 10
# Number of unique surveys with negligible catches.
 8
#------------------------------------------------------------------------------------------
# Set of growth parameters corresponding to each fishery or survey
#------------------------------------------------------------------------------------------
# for each fishery
 1 1 1 1 1 1 1 1 1 1
# for each survey
 1 1 1 1 1 1 1 1
#------------------------------------------------------------------------------------------
# Probability densities used to model distribution of length at age
# (1 = gamma, 2 = Laplace)
#------------------------------------------------------------------------------------------
# for each fishery
 1 1 1 1 1 1 1 1 1 1
# for each survey
 1 1 1 1 1 1 1 1
```

```
#---------------------------------------------------------------------------------------------
# zones fishery occurs in: a matrix with values of 1 if the fishery/survey is active in a given zone and zero otherwise
#---------------------------------------------------------------------------------------------
# fishery (first column)
# |    zone entries (1 per zone)
# |    1   2
# |    |   |
  1    1   0
  2    0   1
  3    1   0
  4    0   1
  5    1   0
  6    0   1
  7    1   0
  8    0   1
  9    1   0
  10   0   1
# survey (first column)
# |    zone entries (1 per zone)
# |    1   2
# |    |   |
  1    1   0
  2    0   1
  3    1   0
  4    0   1
  5    1   0
  6    0   1
  7    1   0
  8    0   1
#---------------------------------------------------------------------------------------------
# seasons fishery is active: a matrix with values of 1 if the fishery/survey is active in a given season and zero otherwise
#---------------------------------------------------------------------------------------------
# fishery (first column)
# |    seasonal entries (1 entry per season)
# |    1   2   3   4
# |    |   |   |   |
  1    1   1   1
  2    1   1   1
  3    1   1   1
  4    1   1   1
  5    1   1   1
  6    1   1   1
  7    0   1   0
  8    0   1   0
  9    0   1   1
  10   0   1   1
#---------------------------------------------------------------------------------------------
# minimum size limits by fishery (columns) for all years in the modern period, zero entries indicate no size limit
```

#---
1872 6 6 6 6 6 6 0 0 0 0
1873 6 6 6 6 6 6 0 0 0 0
1874 6 6 6 6 6 6 0 0 0 0
1875 6 6 6 6 6 6 0 0 0 0
1876 6 6 6 6 6 6 0 0 0 0
1877 6 6 6 6 6 6 0 0 0 0
1878 6 6 6 6 6 6 0 0 0 0
1879 6 6 6 6 6 6 0 0 0 0
1880 6 6 6 6 6 6 0 0 0 0
1881 6 6 6 6 6 6 0 0 0 0
1882 6 6 6 6 6 6 0 0 0 0
1883 6 6 6 6 6 6 0 0 0 0
1884 6 6 6 6 6 6 0 0 0 0
1885 6 6 6 6 6 6 0 0 0 0
1886 6 6 6 6 6 6 0 0 0 0
1887 6 6 6 6 6 6 0 0 0 0
1888 6 6 6 6 6 6 0 0 0 0
1889 6 6 6 6 6 6 0 0 0 0
1890 6 6 6 6 6 6 0 0 0 0
1891 6 6 6 6 6 6 0 0 0 0
1892 6 6 6 6 6 6 0 0 0 0
1893 6 6 6 6 6 6 0 0 0 0
1894 6 6 6 6 6 6 0 0 0 0
1895 6 6 6 6 6 6 0 0 0 0
1896 6 6 6 6 6 6 0 0 0 0
1897 6 6 6 6 6 6 0 0 0 0
1898 6 6 6 6 6 6 0 0 0 0
1899 6 6 6 6 6 6 0 0 0 0
1900 6 6 6 6 6 6 0 0 0 0
1901 6 6 6 6 6 6 0 0 0 0
1902 6 6 6 6 6 6 0 0 0 0
1903 6 6 6 6 6 6 0 0 0 0
1904 6 6 6 6 6 6 0 0 0 0
1905 6 6 6 6 6 6 0 0 0 0
1906 6 6 6 6 6 6 0 0 0 0
1907 6 6 6 6 6 6 0 0 0 0
1908 6 6 6 6 6 6 0 0 0 0
1909 6 6 6 6 6 6 0 0 0 0
1910 6 6 6 6 6 6 0 0 0 0
1911 6 6 6 6 6 6 0 0 0 0
1912 6 6 6 6 6 6 0 0 0 0
1913 6 6 6 6 6 6 0 0 0 0
1914 6 6 6 6 6 6 0 0 0 0
1915 6 6 6 6 6 6 0 0 0 0
1916 6 6 6 6 6 6 0 0 0 0
1917 6 6 6 6 6 6 0 0 0 0
1918 6 6 6 6 6 6 0 0 0 0

1919	6	6	6	6	6	6	0	0	0	0
1920	6	6	6	6	6	6	0	0	0	0
1921	6	6	6	6	6	6	0	0	0	0
1922	6	6	6	6	6	6	0	0	0	0
1923	6	6	6	6	6	6	0	0	0	0
1924	6	6	6	6	6	6	0	0	0	0
1925	6	6	6	6	6	6	0	0	0	0
1926	6	6	6	6	6	6	0	0	0	0
1927	6	6	6	6	6	6	0	0	0	0
1928	6	6	6	6	6	6	0	0	0	0
1929	6	6	6	6	6	6	0	0	0	0
1930	6	6	6	6	6	6	0	0	0	0
1931	6	6	6	6	6	6	0	0	0	0
1932	6	6	6	6	6	6	0	0	0	0
1933	6	6	6	6	6	6	0	0	0	0
1934	6	6	6	6	6	6	0	0	0	0
1935	6	6	6	6	6	6	0	0	0	0
1936	6	6	6	6	6	6	0	0	0	0
1937	6	6	6	6	6	6	0	0	0	0
1938	6	6	6	6	6	6	0	0	0	0
1939	6	6	6	6	6	6	0	0	0	0
1940	6	6	6	6	6	6	0	0	0	0
1941	6	6	6	6	6	6	0	0	0	0
1942	6	6	6	6	6	6	0	0	0	0
1943	6	6	6	6	6	6	0	0	0	0
1944	6	6	6	6	6	6	0	0	0	0
1945	6	6	6	6	6	6	0	0	0	0
1946	6	6	6	6	6	6	0	0	0	0
1947	6	6	6	6	6	6	0	0	0	0
1948	6	6	6	6	6	6	0	0	0	0
1949	6	6	6	6	6	6	0	0	0	0
1950	6	6	6	6	6	6	0	0	0	0
1951	6	6	6	6	6	6	0	0	0	0
1952	6	6	6	6	6	6	0	0	0	0
1953	6	6	6	6	6	6	0	0	0	0
1954	6	6	6	6	6	6	0	0	0	0
1955	6	6	6	6	6	6	0	0	0	0
1956	6	6	6	6	6	6	0	0	0	0
1957	6	6	6	6	6	6	0	0	0	0
1958	6	6	6	6	6	6	0	0	0	0
1959	6	6	6	6	6	6	0	0	0	0
1960	6	6	6	6	6	6	0	0	0	0
1961	6	6	6	6	6	6	0	0	0	0
1962	6	6	6	6	6	6	0	0	0	0
1963	6	6	6	6	6	6	0	0	0	0
1964	6	6	6	6	6	6	0	0	0	0
1965	6	6	6	6	6	6	0	0	0	0
1966	6	6	6	6	6	6	0	0	0	0

1967 6 6 6 6 6 6 0 0 0 0
1968 6 6 6 6 6 6 0 0 0 0
1969 6 6 6 6 6 6 0 0 0 0
1970 6 6 6 6 6 6 0 0 0 0
1971 6 6 6 6 6 6 0 0 0 0
1972 6 6 6 6 6 6 0 0 0 0
1973 6 6 6 6 6 6 0 0 0 0
1974 6 6 6 6 6 6 0 0 0 0
1975 6 6 6 6 6 6 0 0 0 0
1976 6 6 6 6 6 6 0 0 0 0
1977 6 6 6 6 6 6 0 0 0 0
1978 6 6 6 6 6 6 0 0 0 0
1979 6 6 6 6 6 6 0 0 0 0
1980 6 6 6 6 6 6 0 0 0 0
1981 6 6 6 6 6 6 0 0 0 0
1982 6 6 6 6 6 6 0 0 0 0
1983 6 6 6 6 6 6 0 0 0 0
1984 6 6 6 6 6 6 0 0 0 0
1985 13 13 13 13 13 13 0 0 0 0
1986 13 13 13 13 13 13 0 0 0 0
1987 13 13 13 13 13 13 0 0 0 0
1988 13 13 13 13 13 13 0 0 0 0
1989 13 13 13 13 13 13 0 0 0 0
1990 13 13 13 13 13 13 0 0 0 0
1991 13 13 13 13 13 13 0 0 0 0
1992 13 13 13 13 13 13 0 0 0 0
1993 13 13 13 13 13 13 0 0 0 0
1994 14 14 14 14 14 14 0 0 0 0
1995 15 15 15 15 15 15 0 0 0 0
1996 15 15 15 15 15 15 0 0 0 0
1997 15 15 15 15 15 15 0 0 0 0
1998 15 15 15 15 15 15 0 0 0 0
1999 15 15 15 15 15 15 0 0 0 0
2000 15 15 15 15 16 16 0 0 0 0
2001 15 15 15 15 16 16 0 0 0 0
2002 15 15 15 15 16 16 0 0 0 0
2003 15 15 15 15 16 16 0 0 0 0
2004 15 15 15 15 16 16 0 0 0 0
2005 15 15 15 15 16 16 0 0 0 0
2006 15 15 15 15 16 16 0 0 0 0
2007 13 13 13 13 16 16 0 0 0 0
2008 13 13 13 13 16 16 0 0 0 0
note that size limit changes April 2007, so perhaps should use 14 inches in that year
#
##
TOTAL CATCH DATA (may be more than 1 time-series per fishery)
##
number of catch series (may be more than 1 per fishery)

```
 10
# probability densities used for catch likelihood (vector with 1 entry for each series where 0=ignore, 1=lognormal, 2=normal
 1 1 1 1 1 1 1 1 1 1
# stock of catch series (vector with 1 entry for each catch series identifying the stock the data represents;
# enter a value of 0 if the series represents all stocks combined, otherwise make sure the stock given is one of the stocks listed
 0 0 0 0 0 0 0 0 0 0
# map of catch series to fishery (vector with 1 entry for each catch series identifying the fishery it represents)
 1 2 3 4 5 6 7 8 9 10
# season of catch series (vector with 1 entry for each catch series identifying the season the data was gathered from;
# enter a value of 0 if the series represents all seasons the fishery was operating, otherwise make sure the season given is one of the seasons during which the fishery operates
 0 0 0 0 0 0 0 0 0 0
# unit of catch series (1=numbers, 2=weight)
 2 2 2 2 1 1 1 1 1 1
# type of catch series (1=total catch, 2=landed, 3=released, 4=released and died, 5=killed)
 2 2 2 2 2 2 2 2 2 2
# catch variance parameter (vector with 1 entry for each catch series linking it to a variance parameter)
 1 1 1 1 1 1 1 1 1 1
# catch data for all years in the modern period
#              series
```

# year	HL E	HL W	LL E	LL W	Rec E	Rec W	Clsd E	Clsd W	Shr E	Shr W
1872	521326	0	0	0	0	0	0	0	0	0
1873	781989	0	0	0	0	0	0	0	0	0
1874	1172984	0	0	0	0	0	0	0	0	0
1875	1433647	0	0	0	0	0	0	0	0	0
1876	1694310	0	0	0	0	0	0	0	0	0
1877	1433647	0	0	0	0	0	0	0	0	0
1878	1303315	0	0	0	0	0	0	0	0	0
1879	1433647	0	0	0	0	0	0	0	0	0
1880	1824641	891034	0	0	0	0	0	0	0	0
1881	2052381	801943	0	0	0	0	0	0	0	0
1882	2282108	711859	0	0	0	0	0	0	0	0
1883	2509861	634313	0	0	0	0	0	0	0	0
1884	2737622	556765	0	0	0	0	0	0	0	0
1885	2965390	478225	0	0	0	0	0	0	0	0
1886	3195145	400672	0	0	0	0	0	0	0	0
1887	3422926	203970	0	0	0	0	0	0	0	0
1888	3277425	212884	0	0	0	0	0	0	0	0
1889	3483431	269327	0	0	0	0	0	0	0	0
1890	4192327	242531	0	0	0	0	0	0	0	0
1891	3822273	269541	0	0	0	0	0	0	0	0
1892	4010384	293175	0	0	0	0	0	0	0	0
1893	4132232	311969	0	0	0	0	0	0	0	0
1894	4227631	324863	0	0	0	0	0	0	0	0
1895	4125291	333838	0	0	0	0	0	0	0	0
1896	4167613	340888	0	0	0	0	0	0	0	0
1897	4138252	340642	0	0	0	0	0	0	0	0
1898	4612379	544671	0	0	0	0	0	0	0	0
1899	5146576	722625	0	0	0	0	0	0	0	0

1900	5674141	889976	0	0	0	0	0	0	0	0
1901	6027029	1020372	0	0	0	0	0	0	0	0
1902	6283575	1126034	0	0	0	0	0	0	0	0
1903	5722123	1059802	0	0	0	0	0	0	0	0
1904	5286731	1011726	0	0	0	0	0	0	0	0
1905	4756040	940928	0	0	0	0	0	0	0	0
1906	4240944	867673	0	0	0	0	0	0	0	0
1907	3743104	791605	0	0	0	0	0	0	0	0
1908	3363251	735773	0	0	0	0	0	0	0	0
1909	2890857	632940	0	0	0	0	0	0	0	0
1910	2436701	538109	0	0	0	0	0	0	0	0
1911	2455472	527520	0	0	0	0	0	0	0	0
1912	2473439	517874	0	0	0	0	0	0	0	0
1913	2491078	508475	0	0	0	0	0	0	0	0
1914	2507351	498829	0	0	0	0	0	0	0	0
1915	2522773	489183	0	0	0	0	0	0	0	0
1916	2537294	478596	0	0	0	0	0	0	0	0
1917	2479260	468950	0	0	0	0	0	0	0	0
1918	2492553	459305	0	0	0	0	0	0	0	0
1919	2718931	471382	0	0	0	0	0	0	0	0
1920	2954424	483458	0	0	0	0	0	0	0	0
1921	3198932	496724	0	0	0	0	0	0	0	0
1922	3452171	508800	0	0	0	0	0	0	0	0
1923	3707316	520876	0	0	0	0	0	0	0	0
1924	3621389	503176	0	0	0	0	0	0	0	0
1925	3627316	485474	0	0	0	0	0	0	0	0
1926	3532334	467525	0	0	0	0	0	0	0	0
1927	3857579	585907	0	0	0	0	0	0	0	0
1928	3444187	426871	0	0	0	0	0	0	0	0
1929	3658800	417093	0	0	0	0	0	0	0	0
1930	2233495	553559	0	0	0	0	0	0	0	0
1931	2249781	342794	0	0	0	0	0	0	0	0
1932	2416037	411305	0	0	0	0	0	0	0	0
1933	2184361	447623	0	0	0	0	0	0	0	0
1934	1964863	464740	0	0	0	0	0	0	0	0
1935	2411025	675130	0	0	0	0	0	0	0	0
1936	2773983	871388	0	0	0	0	0	0	0	0
1937	2458439	946575	0	0	0	0	0	0	0	0
1938	3180371	935330	0	0	0	0	0	0	0	0
1939	3732701	854469	0	0	0	0	0	0	0	0
1940	2496953	815871	0	0	0	0	0	0	0	0
1941	2271791	737892	0	0	0	0	0	0	0	0
1942	1818353	544639	0	0	0	0	0	0	0	0
1943	1446274	371388	0	0	0	0	0	0	0	0
1944	1670030	279690	0	0	0	0	0	0	0	0
1945	1455205	153741	0	0	0	0	0	0	0	0
1946	2319802	323401	0	0	1722	27532	0	0	0	0
1947	2432194	478181	0	0	2367	34558	0	0	0	0

1948	2598682	595421	0	0	3220	42970	0	0	0	0
1949	3108401	869794	0	0	4339	52962	0	0	0	0
1950	1693118	1476048	0	0	5793	64739	0	0	-999	-999
1951	2016917	1477540	0	0	7565	77492	0	0	-999	-999
1952	2245040	1654176	0	0	9813	92262	0	0	-999	-999
1953	2026470	1358592	0	0	12648	109296	0	0	-999	-999
1954	1883191	1365982	0	0	16206	128866	0	0	-999	-999
1955	2106652	1492039	0	0	9813	151264	0	0	-999	-999
1956	2520865	2017420	0	0	26170	176805	0	0	-999	-999
1957	2261891	2013517	0	0	33004	205830	0	0	-999	-999
1958	3724587	3357390	0	0	41426	238701	0	0	-999	-999
1959	3407851	3431602	0	0	51765	275804	0	0	-999	-999
1960	3816825	3601182	0	0	64411	317551	0	0	-999	-999
1961	3504256	4248967	0	0	69748	329896	0	0	-999	-999
1962	3612712	4131601	0	0	75573	344705	0	0	-999	-999
1963	3009957	3677162	0	0	81936	362380	0	0	-999	-999
1964	3462403	3446689	0	0	88900	383355	0	0	-999	-999
1965	3564061	3500238	0	0	96531	408099	0	0	-999	-999
1966	2974814	2919580	0	0	104908	437113	0	0	-999	-999
1967	2790666	4061713	0	0	114117	470932	0	0	-999	-999
1968	2512844	4954451	0	0	124260	510118	0	0	-999	-999
1969	2344264	4019962	0	0	135449	555265	0	0	-999	-999
1970	2217076	4466619	0	0	147814	606992	0	0	-999	-999
1971	2134626	5151388	0	0	176852	690258	0	0	-999	-999
1972	2279349	4648105	0	0	211444	781813	0	0	9129000	102100000
1973	2604511	4672509	0	0	252638	882124	0	0	1232000	15910000
1974	3616862	4256448	0	0	301676	991649	0	0	696000	17060000
1975	3433559	3775645	0	0	195007	853441	0	0	1095000	7832000
1976	3156601	3193606	0	0	211559	914721	0	0	1226000	34790000
1977	2173199	2758173	0	0	267580	1044085	0	0	1336000	16350000
1978	1916498	2586240	0	0	404562	1283042	0	0	330000	8621000
1979	1956379	2373583	0	0	477569	1413605	0	0	1339000	29980000
1980	1819918	2415848	90245	42292	750995	1757120	0	0	598800	37080000
1981	2042549	3017571	172664	47291	870344	1670233	0	0	1446000	62610000
1982	2200231	3515073	217511	68752	999005	1254774	0	0	3180000	21220000
1983	2292038	3667340	427222	94787	1818440	2116441	0	0	1132000	15570000
1984	1631916	2906413	368449	762672	255805	1194628	0	0	1074000	13160000
1985	1623772	1846043	114339	604890	596697	836194	0	0	998600	14140000
1986	859831	1933384	75897	831375	558034	699540	0	0	292500	6899000
1987	796819	1474284	63474	734038	527901	479817	0	0	515600	16910000
1988	857959	2355109	76666	670131	509176	707512	0	0	549100	11730000
1989	673086	1891961	78572	454743	485366	578970	0	0	1180000	15690000
1990	697614	1757789	74787	120421	355822	311533	0	0	3858000	62320000
1991	395176	1724713	20704	72592	531995	514606	70714	83189	2356000	46250000
1992	406493	2674497	5689	19820	816919	718586	195030	143149	933000	29240000
1993	436981	2901388	15235	20291	1222667	855855	147673	65676	387200	29830000
1994	527124	2671460	7958	15809	769721	797393	226260	42981	923300	38770000
1995	172740	2735403	8459	17506	615190	725433	218570	41088	1710000	44510000

1996	233980	4044133	7587	27362	576888	582436	303733	44311	1308000	37850000
1997	184411	4589501	4627	31418	972427	587207	247502	66902	1593000	23110000
1998	379399	4267523	5514	27224	807118	418161	269589	76641	1217000	44820000
1999	547530	4231531	6635	90257	754760	238638	327697	68468	2144000	37110000
2000	665282	3980931	8590	182194	726699	262176	234273	102117	2192000	12800000
2001	798142	3692805	10133	124253	844311	219964	273544	75322	1409000	22310000
2002	1048328	3564996	18629	147049	1133526	238770	220495	173412	1773000	21380000
2003	1019086	3203664	13943	171070	992881	267079	326426	106843	1139000	28570000
2004	950747	3225570	19373	455664	1058293	233730	184758	109077	1463000	36670000
2005	792554	3000354	20961	282385	771363	259987	164400	83464	827000	15990000
2006	759948	3614990	16558	257718	816288	385060	132913	74026	1348000	11900000
2007	869557	2108689	15636	188849	1032574	305508	61063	61879	504000	6068000
2008	804737	1591356	29068	58441	681289	183527	188185	120928	157900	2359000

#
catch variance modifiers for the modern period
series

# year	HL E	HL W	LL E	LL W	Rec E	Rec W	Clsd E	Clsd W	Shr E	Shr W
1872	0.56	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1873	0.56	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1874	0.56	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1875	0.56	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1876	0.56	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1877	0.56	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1878	0.56	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1879	0.56	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1880	0.10	0.63	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1881	0.30	0.63	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1882	0.30	0.63	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1883	0.30	0.63	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1884	0.30	0.63	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1885	0.30	0.63	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1886	0.30	0.63	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1887	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1888	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1889	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1890	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1891	0.10	0.17	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1892	0.10	0.17	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1893	0.10	0.17	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1894	0.10	0.17	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1895	0.10	0.17	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1896	0.10	0.17	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1897	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1898	0.21	0.54	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1899	0.21	0.54	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1900	0.21	0.54	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1901	0.21	0.54	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1902	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1

1903	0.30	0.21	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1904	0.30	0.21	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1905	0.30	0.21	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1906	0.30	0.21	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1907	0.30	0.21	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1908	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1909	0.15	0.23	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1910	0.15	0.23	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1911	0.15	0.23	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1912	0.15	0.23	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1913	0.15	0.23	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1914	0.15	0.23	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1915	0.15	0.23	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1916	0.15	0.23	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1917	0.15	0.23	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1918	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1919	0.20	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1920	0.20	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1921	0.20	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1922	0.20	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1923	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1924	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1925	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1926	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1927	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1928	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1929	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1930	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1931	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1932	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1933	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1934	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1935	0.17	0.30	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1936	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1937	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1938	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1939	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1940	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1941	0.10	0.68	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1942	0.10	0.68	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1943	0.10	0.68	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1944	0.10	0.68	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1945	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1946	0.10	0.70	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1947	0.10	0.70	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1948	0.10	0.70	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1949	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1950	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1

1951	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1952	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1953	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1954	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1955	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1956	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1957	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1958	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1959	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1960	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1961	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1962	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1963	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1964	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1965	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1966	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1967	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1968	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1969	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1970	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1971	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.1	0.1
1972	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.84	1.00
1973	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	1.00	0.78
1974	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	1.00	0.46
1975	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.37	1.00
1976	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	1.00	0.24
1977	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.73	0.27
1978	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.79	0.41
1979	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	1.00	1.00
1980	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	1.00	0.40
1981	0.10	0.10	0.10	0.10	0.27	0.23	0.1	0.1	1.00	1.00
1982	0.10	0.10	0.10	0.10	0.34	0.31	0.1	0.1	0.83	1.00
1983	0.10	0.10	0.10	0.10	0.47	0.17	0.1	0.1	1.00	1.00
1984	0.10	0.10	0.10	0.10	0.33	0.23	0.1	0.1	1.00	1.00
1985	0.10	0.10	0.10	0.10	0.29	0.21	0.1	0.1	1.00	1.00
1986	0.10	0.10	0.10	0.10	0.20	0.10	0.1	0.1	1.00	1.00
1987	0.10	0.10	0.10	0.10	0.24	0.12	0.1	0.1	1.00	1.00
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1995	0.10	0.10	0.10	0.10	0.18	0.13	0.1	0.1	1.00	0.27
1996	0.10	0.10	0.10	0.10	0.18	0.12	0.1	0.1	1.00	1.00
1997	0.10	0.10	0.10	0.10	0.16	0.10	0.1	0.1	1.00	0.53
1998	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.61	0.53

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2001	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.29	0.39
2002	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.12	0.14
2003	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.15	0.24
2004	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.20	0.34
2005	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	1.00	1.00
2006	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.68	0.43
2007	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	0.70	0.31
2008	0.10	0.10	0.10	0.10	0.10	0.10	0.1	0.1	1.00	1.00

```
########################################################
# INDEX DATA   (CPUE or SURVEY: may be more than one time series per fishery)
########################################################
# number of index series
 12
# probability densities used for index likelihood (vector with 1 entry for each index series: zero=ignore, 1=lognormal, 2=normal)
 1 1 1 1 1 1 1 1 1 1 1 1
# stock of index series (vector with 1 entry for each index series identifying the stock the data represents;
# enter a value of 0 if the series represents all stocks combined, otherwise make sure the stock given is one of the stocks listed
 0 0 0 0 0 0 0 0 0 0 0 0
# vector if integers mapping each index series to a fishery (if +) or survey (if -)
 1 2 5 6 -1 -2 -3 -4 -5 -6 -7 -8
# season of index series (vector with 1 entry for each index series identifying the season the data was gathered from;
# enter a value of 0 if the series represents all seasons the fishery or survey was operating,
# otherwise make sure the season given is one of the seasons during which the fishery operates
 0 0 0 0  2  2  2  2  2  2 2 2
# unit of index series (1=numbers, 2=weight, 3=fecundity)
 2 2 1 1  1  1  3  3  1  1  1  1
# type of index series (1=total catch or survey, 2=landed, 3=released, 4=released and died, 5=killed)
 2 2 1 1  1  1  1  1  1  1  1  1
# index variance parameter (vector with 1 entry for each index series linking it to a variance parameter)
 1 1 1 1  1  1  1  1  1  1  1  1
#
# index data for all years in the modern period
#           series
#     1     2           3           4           5           6           7           8     9     10     11     12
#     fishery dependent             fishery indep adults          fishery indep juvenile (trawl)
# year  hl e          hl w        rec e       rec w   video e video w larv e  larv w  age1 e  age1 w  age0 e  age0 w
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2005	2043357	738884	2789522	6210695	2118900	1656620	-999	-999	8793999	6754826	9643636		13621874
2006	1815961	988525	2809615	4196141	953580	716980	1115472	2116800	6010485	4055985	16062023	11702790	
2007	-999	-999	2714659	6142325	1419910	1864640	2500700	1479900	7635760	3458591	8454924		5580209
2008	-999	-999	2817879	5710553	1486990	1038200	-999	-999	9087580	3944382	2433997		3037320

#
index variance modifiers for all years in the modern period
series
1 2 3 4 5 6 7 8 9 10 11 12
fishery dependent fishery indep adults fishery indep juvenile (trawl)

# year	hl e	hl w	rec e	rec w	video e	video w	larv e	larv w	age1 e	age1 w	age0 e	age0 w
1872	1	1	1	1	1	1	1	1	1	1	1	1
1873	1	1	1	1	1	1	1	1	1	1	1	1
1874	1	1	1	1	1	1	1	1	1	1	1	1
1875	1	1	1	1	1	1	1	1	1	1	1	1
1876	1	1	1	1	1	1	1	1	1	1	1	1
1877	1	1	1	1	1	1	1	1	1	1	1	1
1878	1	1	1	1	1	1	1	1	1	1	1	1
1879	1	1	1	1	1	1	1	1	1	1	1	1
1880	1	1	1	1	1	1	1	1	1	1	1	1
1881	1	1	1	1	1	1	1	1	1	1	1	1
1882	1	1	1	1	1	1	1	1	1	1	1	1

1883	1	1	1	1	1	1	1	1	1	1	1	1
1884	1	1	1	1	1	1	1	1	1	1	1	1
1885	1	1	1	1	1	1	1	1	1	1	1	1
1886	1	1	1	1	1	1	1	1	1	1	1	1
1887	1	1	1	1	1	1	1	1	1	1	1	1
1888	1	1	1	1	1	1	1	1	1	1	1	1
1889	1	1	1	1	1	1	1	1	1	1	1	1
1890	1	1	1	1	1	1	1	1	1	1	1	1
1891	1	1	1	1	1	1	1	1	1	1	1	1
1892	1	1	1	1	1	1	1	1	1	1	1	1
1893	1	1	1	1	1	1	1	1	1	1	1	1
1894	1	1	1	1	1	1	1	1	1	1	1	1
1895	1	1	1	1	1	1	1	1	1	1	1	1
1896	1	1	1	1	1	1	1	1	1	1	1	1
1897	1	1	1	1	1	1	1	1	1	1	1	1
1898	1	1	1	1	1	1	1	1	1	1	1	1
1899	1	1	1	1	1	1	1	1	1	1	1	1
1900	1	1	1	1	1	1	1	1	1	1	1	1
1901	1	1	1	1	1	1	1	1	1	1	1	1
1902	1	1	1	1	1	1	1	1	1	1	1	1
1903	1	1	1	1	1	1	1	1	1	1	1	1
1904	1	1	1	1	1	1	1	1	1	1	1	1
1905	1	1	1	1	1	1	1	1	1	1	1	1
1906	1	1	1	1	1	1	1	1	1	1	1	1
1907	1	1	1	1	1	1	1	1	1	1	1	1
1908	1	1	1	1	1	1	1	1	1	1	1	1
1909	1	1	1	1	1	1	1	1	1	1	1	1
1910	1	1	1	1	1	1	1	1	1	1	1	1
1911	1	1	1	1	1	1	1	1	1	1	1	1
1912	1	1	1	1	1	1	1	1	1	1	1	1
1913	1	1	1	1	1	1	1	1	1	1	1	1
1914	1	1	1	1	1	1	1	1	1	1	1	1
1915	1	1	1	1	1	1	1	1	1	1	1	1
1916	1	1	1	1	1	1	1	1	1	1	1	1
1917	1	1	1	1	1	1	1	1	1	1	1	1
1918	1	1	1	1	1	1	1	1	1	1	1	1
1919	1	1	1	1	1	1	1	1	1	1	1	1
1920	1	1	1	1	1	1	1	1	1	1	1	1
1921	1	1	1	1	1	1	1	1	1	1	1	1
1922	1	1	1	1	1	1	1	1	1	1	1	1
1923	1	1	1	1	1	1	1	1	1	1	1	1
1924	1	1	1	1	1	1	1	1	1	1	1	1
1925	1	1	1	1	1	1	1	1	1	1	1	1
1926	1	1	1	1	1	1	1	1	1	1	1	1
1927	1	1	1	1	1	1	1	1	1	1	1	1
1928	1	1	1	1	1	1	1	1	1	1	1	1
1929	1	1	1	1	1	1	1	1	1	1	1	1
1930	1	1	1	1	1	1	1	1	1	1	1	1

1931	1	1	1	1	1	1	1	1	1	1	1	1	
1932	1	1	1	1	1	1	1	1	1	1	1	1	
1933	1	1	1	1	1	1	1	1	1	1	1	1	
1934	1	1	1	1	1	1	1	1	1	1	1	1	
1935	1	1	1	1	1	1	1	1	1	1	1	1	
1936	1	1	1	1	1	1	1	1	1	1	1	1	
1937	1	1	1	1	1	1	1	1	1	1	1	1	
1938	1	1	1	1	1	1	1	1	1	1	1	1	
1939	1	1	1	1	1	1	1	1	1	1	1	1	
1940	1	1	1	1	1	1	1	1	1	1	1	1	
1941	1	1	1	1	1	1	1	1	1	1	1	1	
1942	1	1	1	1	1	1	1	1	1	1	1	1	
1943	1	1	1	1	1	1	1	1	1	1	1	1	
1944	1	1	1	1	1	1	1	1	1	1	1	1	
1945	1	1	1	1	1	1	1	1	1	1	1	1	
1946	1	1	1	1	1	1	1	1	1	1	1	1	
1947	1	1	1	1	1	1	1	1	1	1	1	1	
1948	1	1	1	1	1	1	1	1	1	1	1	1	
1949	1	1	1	1	1	1	1	1	1	1	1	1	
1950	1	1	1	1	1	1	1	1	1	1	1	1	
1951	1	1	1	1	1	1	1	1	1	1	1	1	
1952	1	1	1	1	1	1	1	1	1	1	1	1	
1953	1	1	1	1	1	1	1	1	1	1	1	1	
1954	1	1	1	1	1	1	1	1	1	1	1	1	
1955	1	1	1	1	1	1	1	1	1	1	1	1	
1956	1	1	1	1	1	1	1	1	1	1	1	1	
1957	1	1	1	1	1	1	1	1	1	1	1	1	
1958	1	1	1	1	1	1	1	1	1	1	1	1	
1959	1	1	1	1	1	1	1	1	1	1	1	1	
1960	1	1	1	1	1	1	1	1	1	1		1	1
1961	1	1	1	1	1	1	1	1	1	1		1	1
1962	1	1	1	1	1	1	1	1	1	1		1	1
1963	1	1	1	1	1	1	1	1	1	1		1	1
1964	1	1	1	1	1	1	1	1	1	1		1	1
1965	1	1	1	1	1	1	1	1	1	1		1	1
1966	1	1	1	1	1	1	1	1	1	1		1	1
1967	1	1	1	1	1	1	1	1	1	1		1	1
1968	1	1	1	1	1	1	1	1	1	1		1	1
1969	1	1	1	1	1	1	1	1	1	1		1	1
1970	1	1	1	1	1	1	1	1	1	1		1	1
1971	1	1	1	1	1	1	1	1	1	1		1	1
1972	1	1	1	1	1	1	1	1	1	1		0.44	1
1973	1	1	1	1	1	1	1	1	1	1		0.38	1
1974	1	1	1	1	1	1	1	1	1	1		0.37	1
1975	1	1	1	1	1	1	1	1	1	1		0.38	1
1976	1	1	1	1	1	1	1	1	1	1		0.37	1
1977	1	1	1	1	1	1	1	1	1	1		0.38	1
1978	1	1	1	1	1	1	1	1	1	1		0.38	1

1979	1	1	1	1	1	1	1	1	1	1	0.37	1
1980	1	1	1	1	1	1	1	1	1	1	0.38	1
1981	1	1	0.38	0.36	1	1	1	1	1	1	0.38	1
1982	1	1	0.34	0.44	1	1	1	1	0.96	0.56	0.36	1
1983	1	1	0.35	0.31	1	1	1	1	0.69	0.91	0.4	1
1984	1	1	0.41	0.28	1	1	1	1	0.89	0.69	0.39	1
1985	1	1	0.37	0.62	1	1	1	1	0.66	1	0.47	1
1986	1	1	0.31	0.35	1	1	0.94	0.58	1	1	0.64	1
1987	1	1	0.32	0.58	1	1	1	0.67	0.2	0.27	1	0.26
1988	1	1	0.33	0.64	1	1	0.94	1	1	0.2	0.48	0.21
1989	1	1	0.35	0.55	1	1	1	0.66	0.68	0.26	0.32	0.21
1990	1	1	0.33	0.45	1	1	1	0.51	0.22	0.19	0.33	0.22
1991	1	1	0.3	0.46	1	1	1	0.57	0.27	0.27	0.3	0.22
1992	1	1	0.28	0.39	1	1	1	0.43	0.42	0.24	0.49	0.27
1993	1	1	0.28	0.44	1	0.37	1	0.43	0.36	0.23	0.22	0.25
1994	1	1	0.29	0.34	1	0.44	0.94	0.58	0.19	0.22	0.27	0.23
1995	1	1	0.31	0.43	1	0.35	1	0.32	0.39	0.21	0.29	0.2
1996	0.38	0.12	0.29	0.41	1	0.21	1	0.38	0.2	0.24	0.36	0.24
1997	0.39	0.12	0.27	0.35	1	0.19	0.94	0.29	0.32	0.23	0.35	0.19
1998	0.38	0.12	0.26	0.39	1	1	1	1	0.33	0.29	0.43	0.23
1999	0.37	0.12	0.26	0.46	1	1	1	0.47	0.47	0.25	0.33	0.22
2000	0.37	0.12	0.27	0.38	1	1	1	0.3	0.2	0.25	0.35	0.2
2001	0.37	0.12	0.27	0.56	1	0.38	1	0.46	0.38	0.3	0.44	0.23
2002	0.37	0.12	0.26	0.4	0.69	0.19	0.94	0.31	0.91	0.27	0.32	0.21
2003	0.36	0.12	0.26	0.42	1	1	1	0.27	0.3	0.28	0.2	0.23
2004	0.37	0.12	0.27	0.41	0.59	0.34	1	0.36	0.31	0.27	0.35	0.24
2005	0.36	0.12	0.27	0.29	0.55	0.17	1	1	0.2	0.22	0.23	0.26
2006	0.37	0.12	0.27	0.31	0.76	0.27	1	0.34	0.33	0.26	0.26	0.22
2007	1	1	0.27	0.27	0.61	0.17	1	0.28	0.36	0.28	0.47	0.23
2008	1	1	0.27	0.32	0.67	0.22	1	1	0.18	0.23	0.4	0.18

```
#
####################################################
# EFFORT DATA   (may be more than 1 set time series fishery)
####################################################
# number of effort series
  2
# probability densities used for effort likelihood (vector with 1 entry for each effort series: zero=ignore, 1=lognormal, 2=normal)
  1 1
# map of effort series to fishery (vector with 1 entry for each index series identifying the fishery it represents)
  9 10
# effort variance parameter
  1 1
# effort data for all years in the modern period
#            series
# year  shr e           shr w
1872    0.00    0.00
1873    0.00    0.00
1874    0.00    0.00
```

1875	0.00	0.00
1876	0.00	0.00
1877	0.00	0.00
1878	0.00	0.00
1879	0.00	0.00
1880	0.00	0.00
1881	0.00	0.00
1882	0.00	0.00
1883	0.00	0.00
1884	0.00	0.00
1885	0.00	0.00
1886	0.00	0.00
1887	0.00	0.00
1888	0.00	0.00
1889	0.00	0.00
1890	0.00	0.00
1891	0.00	0.00
1892	0.00	0.00
1893	0.00	0.00
1894	0.00	0.00
1895	0.00	0.00
1896	0.00	0.00
1897	0.00	0.00
1898	0.00	0.00
1899	0.00	0.00
1900	0.00	0.00
1901	0.00	0.00
1902	0.00	0.00
1903	0.00	0.00
1904	0.00	0.00
1905	0.00	0.00
1906	0.00	0.00
1907	0.00	0.00
1908	0.00	0.00
1909	0.00	0.00
1910	0.00	0.00
1911	0.00	0.00
1912	0.00	0.00
1913	0.00	0.00
1914	0.00	0.00
1915	0.00	0.00
1916	0.00	0.00
1917	0.00	0.00
1918	0.00	0.00
1919	0.00	0.00
1920	0.00	0.00
1921	0.00	0.00
1922	0.00	0.00

1923	0.00	0.00
1924	0.00	0.00
1925	0.00	0.00
1926	0.00	0.00
1927	0.00	0.00
1928	0.00	0.00
1929	0.00	0.00
1930	0.00	0.00
1931	0.00	0.00
1932	0.00	0.00
1933	0.00	0.00
1934	0.00	0.00
1935	0.00	0.00
1936	0.00	0.00
1937	0.00	0.00
1938	0.00	0.00
1939	0.00	0.00
1940	0.00	0.00
1941	0.00	0.00
1942	0.00	0.00
1943	0.00	0.00
1944	0.00	0.00
1945	0.00	0.00
1946	0.00	0.00
1947	0.00	0.00
1948	0.00	0.15
1949	0.00	0.24
1950	0.16	0.30
1951	0.28	0.31
1952	0.33	0.37
1953	0.36	0.36
1954	0.46	0.47
1955	0.55	0.39
1956	0.69	0.51
1957	0.76	0.64
1958	0.80	0.98
1959	0.87	1.05
1960	1.00	1.00
1961	0.73	0.80
1962	0.69	0.78
1963	0.78	0.90
1964	0.92	0.82
1965	1.00	0.94
1966	0.94	0.99
1967	0.89	1.24
1968	1.05	1.08
1969	1.02	1.44
1970	1.01	1.30

1971	0.87	1.36
1972	0.94	1.48
1973	1.03	1.18
1974	1.00	1.17
1975	1.00	1.10
1976	0.92	1.28
1977	1.09	1.10
1978	0.85	1.29
1979	0.87	1.34
1980	0.53	0.81
1981	0.84	1.26
1982	0.83	1.28
1983	0.91	1.04
1984	1.07	1.32
1985	1.03	1.28
1986	1.07	1.77
1987	0.87	1.81
1988	0.82	1.75
1989	0.99	1.58
1990	0.87	1.52
1991	0.89	1.84
1992	1.08	1.90
1993	0.90	1.88
1994	0.93	1.51
1995	1.10	1.31
1996	1.24	1.38
1997	1.31	1.67
1998	1.64	1.52
1999	1.01	1.43
2000	0.87	1.56
2001	0.98	1.67
2002	1.16	1.97
2003	0.97	1.59
2004	0.96	1.46
2005	0.81	1.06
2006	0.52	0.79
2007	0.39	0.64
2008	0.26	0.45

#
effort variance modifiers for all years in the modern period
series
year shr e shr w
1872 0.1 0.1
1873 0.1 0.1
1874 0.1 0.1
1875 0.1 0.1
1876 0.1 0.1
1877 0.1 0.1

1878	0.1	0.1
1879	0.1	0.1
1880	0.1	0.1
1881	0.1	0.1
1882	0.1	0.1
1883	0.1	0.1
1884	0.1	0.1
1885	0.1	0.1
1886	0.1	0.1
1887	0.1	0.1
1888	0.1	0.1
1889	0.1	0.1
1890	0.1	0.1
1891	0.1	0.1
1892	0.1	0.1
1893	0.1	0.1
1894	0.1	0.1
1895	0.1	0.1
1896	0.1	0.1
1897	0.1	0.1
1898	0.1	0.1
1899	0.1	0.1
1900	0.1	0.1
1901	0.1	0.1
1902	0.1	0.1
1903	0.1	0.1
1904	0.1	0.1
1905	0.1	0.1
1906	0.1	0.1
1907	0.1	0.1
1908	0.1	0.1
1909	0.1	0.1
1910	0.1	0.1
1911	0.1	0.1
1912	0.1	0.1
1913	0.1	0.1
1914	0.1	0.1
1915	0.1	0.1
1916	0.1	0.1
1917	0.1	0.1
1918	0.1	0.1
1919	0.1	0.1
1920	0.1	0.1
1921	0.1	0.1
1922	0.1	0.1
1923	0.1	0.1
1924	0.1	0.1
1925	0.1	0.1

1926	0.1	0.1
1927	0.1	0.1
1928	0.1	0.1
1929	0.1	0.1
1930	0.1	0.1
1931	0.1	0.1
1932	0.1	0.1
1933	0.1	0.1
1934	0.1	0.1
1935	0.1	0.1
1936	0.1	0.1
1937	0.1	0.1
1938	0.1	0.1
1939	0.1	0.1
1940	0.1	0.1
1941	0.1	0.1
1942	0.1	0.1
1943	0.1	0.1
1944	0.1	0.1
1945	0.1	0.1
1946	0.1	0.1
1947	0.1	0.1
1948	0.1	0.1
1949	0.1	0.1
1950	0.1	0.1
1951	0.1	0.1
1952	0.1	0.1
1953	0.1	0.1
1954	0.1	0.1
1955	0.1	0.1
1956	0.1	0.1
1957	0.1	0.1
1958	0.1	0.1
1959	0.1	0.1
1960	0.1	0.1
1961	0.1	0.1
1962	0.1	0.1
1963	0.1	0.1
1964	0.1	0.1
1965	0.1	0.1
1966	0.1	0.1
1967	0.1	0.1
1968	0.1	0.1
1969	0.1	0.1
1970	0.1	0.1
1971	0.1	0.1
1972	0.1	0.1
1973	0.1	0.1

```
1974  0.1 0.1
1975  0.1 0.1
1976  0.1 0.1
1977  0.1 0.1
1978  0.1 0.1
1979  0.1 0.1
1980  0.1 0.1
1981  0.1 0.1
1982  0.1 0.1
1983  0.1 0.1
1984  0.1 0.1
1985  0.1 0.1
1986  0.1 0.1
1987  0.1 0.1
1988  0.1 0.1
1989  0.1 0.1
1990  0.1 0.1
1991  0.1 0.1
1992  0.1 0.1
1993  0.1 0.1
1994  0.1 0.1
1995  0.1 0.1
1996  0.1 0.1
1997  0.1 0.1
1998  0.1 0.1
1999  0.1 0.1
2000  0.1 0.1
2001  0.1 0.1
2002  0.1 0.1
2003  0.1 0.1
2004  0.1 0.1
2005  0.1 0.1
2006  0.1 0.1
2007  0.1 0.1
2008  0.1 0.1
##################################################
# AGE COMPOSITION DATA   (may be more than 1 set time series fishery, multinomial distribution assumed)
##################################################
# number of age-composition series (If there are no series,there should be no more entries in this section)
  10
# first year in age-composition series
  1984
# probability densities used for age-comp. series (0 = ignore, 3 = multinomial, 8 = robustified normal)
  3 3 3 3 3 3 3 3 3 3
# stock represented in age-comp. series (0 = all stocks)
  0 0 0 0 0 0 0 0 0 0
# fishery represented by age-comp. series (0 = all fisheries)
  1 2 3 4 5 6 7 8 9 10
```

```
# season represented by age-comp. series (0 = all seasons)
 0 0 0 0 0 0 0 0 0 0
# type of age-comp series (1=total catch, 2=landed, 3=released, 4=released and died, 5=killed)
 2 2 2 2 2 2 2 1 1 1 1
# age composition data for all years in the modern period
# series year sample    data (by age)
# |     |     |     0     1     2     3     4     5     6     7     8     9     10     11     12     13     14     15
1	1984	0	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
1	1985	0	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
1	1986	0	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
1	1987	0	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
1	1988	0	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
1	1989	0	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
1	1990	0	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
1	1991	61	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
1	1992	128	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
1	1993	151	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
1	1994	136	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
1	1995	89	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
1	1996	10	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
1	1997	1	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
1	1998	152	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
1	1999	509	0.000	0.002	0.196	0.373	0.236	0.093	0.057	0.026	0.012	0.002	0.004	0.000	0.000	0.000	0.000	0.000
1	2000	852	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
1	2001	1000	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
1	2002	602	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
1	2003	631	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
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1	2004	1000	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
1	2005	823	0.000	0.004	0.288	0.337	0.174	0.139	0.032	0.012	0.003	0.004	0.001	0.001	0.000	0.002	0.001	0.001
1	2006	1000	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
1	2007	900	0.000	0.075	0.412	0.379	0.099	0.023	0.008	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000
1	2008	221	0.000	0.071	0.300	0.407	0.160	0.061	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
2	1984	0	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
2	1985	0	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
2	1986	0	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
2	1987	0	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
2	1988	0	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
2	1989	0	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
2	1990	0	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
2	1991	0	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
2	1992	214	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
2	1993	344	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
2	1994	507	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
2	1995	97	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
2	1996	0	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
2	1997	0	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
2	1998	1000	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
2	1999	1000	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
2	2000	1000	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
2	2001	1000	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
2	2002	1000	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

2	2003	1000	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
2	2004	1000	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
2	2005	1000	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
2	2006	1000	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
2	2007	1000	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
2	2008	1000	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
3	1984	0	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
3	1985	0	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
3	1986	0	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
3	1987	0	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
3	1988	0	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
3	1989	0	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
3	1990	0	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
3	1991	12	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
3	1992	15	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
3	1993	30	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
3	1994	8	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
3	1995	19	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
3	1996	6	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
3	1997	10	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
3	1998	25	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
3	1999	102	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
3	2000	84	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
3	2001	91	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

3	2002	183	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
3	2003	197	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
3	2004	253	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
3	2005	346	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
3	2006	202	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
3	2007	216	0.000	0.028	0.102	0.259	0.259	0.204	0.088	0.042	0.014	0.005	0.000	0.000	0.000	0.000	0.000	0.000
3	2008	487	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
4	1984	0	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
4	1985	0	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
4	1986	0	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
4	1987	0	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
4	1988	0	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
4	1989	0	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
4	1990	0	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
4	1991	0	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
4	1992	0	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
4	1993	29	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
4	1994	0	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
4	1995	0	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
4	1996	0	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
4	1997	0	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
4	1998	332	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
4	1999	76	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
4	2000	345	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

4	2001	179	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
4	2002	337	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
4	2003	259	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
4	2004	674	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
4	2005	304	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
4	2006	496	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
4	2007	351	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
4	2008	344	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
5	1984	0	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
5	1985	0	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
5	1986	0	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
5	1987	0	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
5	1988	0	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
5	1989	0	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
5	1990	0	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
5	1991	84	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
5	1992	364	0.000	0.181	0.295	0.395	0.094	0.023	0.007	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5	1993	410	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
5	1994	428	0.000	0.070	0.347	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
5	1995	374	0.003	0.196	0.232	0.250	0.160	0.085	0.043	0.008	0.005	0.013	0.000	0.000	0.000	0.000	0.000	0.005
5	1996	111	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
5	1997	62	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
5	1998	1000	0.001	0.016	0.352	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
5	1999	1000	0.000	0.003	0.219	0.436	0.306	0.026	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001

5	2000	585	0.000	0.040	0.491	0.337	0.113	0.014	0.000	0.002	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.002
5	2001	433	0.000	0.077	0.564	0.253	0.086	0.014	0.003	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000
5	2002	1000	0.003	0.044	0.258	0.410	0.176	0.062	0.027	0.015	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000
5	2003	1000	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
5	2004	1000	0.000	0.040	0.323	0.358	0.173	0.058	0.023	0.012	0.006	0.002	0.000	0.002	0.000	0.000	0.000	0.002
5	2005	1000	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
5	2006	1000	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
5	2007	541	0.000	0.017	0.321	0.468	0.138	0.028	0.012	0.005	0.006	0.001	0.002	0.002	0.002	0.000	0.000	0.000
5	2008	417	0.000	0.009	0.412	0.379	0.163	0.026	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	1984	0	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
6	1985	0	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
6	1986	0	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
6	1987	0	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
6	1988	0	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
6	1989	0	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
6	1990	0	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
6	1991	0	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
6	1992	76	0.000	0.021	0.345	0.467	0.086	0.029	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022
6	1993	760	0.000	0.075	0.583	0.253	0.069	0.015	0.004	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	1994	7	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
6	1995	4	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
6	1996	0	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
6	1997	0	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
6	1998	918	0.000	0.040	0.240	0.323	0.227	0.105	0.038	0.020	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.003

6	1999	192	0.000	0.000	0.121	0.403	0.333	0.098	0.030	0.011	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	2000	6	0.000	0.019	0.686	0.142	0.045	0.038	0.040	0.017	0.002	0.003	0.000	0.002	0.000	0.000	0.000	0.005
6	2001	4	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
6	2002	517	0.000	0.066	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
6	2003	370	0.000	0.010	0.331	0.307	0.177	0.098	0.027	0.017	0.024	0.003	0.001	0.001	0.001	0.002	0.002	0.001
6	2004	616	0.000	0.076	0.463	0.221	0.143	0.033	0.027	0.014	0.012	0.003	0.000	0.003	0.000	0.001	0.003	0.002
6	2005	980	0.000	0.034	0.423	0.246	0.126	0.093	0.037	0.016	0.008	0.002	0.004	0.006	0.001	0.001	0.001	0.002
6	2006	1000	0.000	0.015	0.400	0.405	0.101	0.034	0.022	0.010	0.003	0.005	0.001	0.001	0.000	0.000	0.000	0.003
6	2007	436	0.000	0.030	0.290	0.423	0.192	0.036	0.017	0.004	0.002	0.003	0.001	0.002	0.000	0.000	0.000	0.001
6	2008	610	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
7	1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1991	20	0	0	0.039	0.432	0.398	0.056	0.023	0.014	0.002	0.004	0.008	0.006	0.006	0.002	0.002	0.009
7	1992	20	0	0	0.002	0.783	0.08	0.09	0.017	0.008	0.005	0.001	0.001	0.003	0.002	0.002	0.001	0.005
7	1993	20	0	0	0.015	0.286	0.502	0.046	0.073	0.019	0.012	0.009	0.002	0.003	0.007	0.006	0.005	0.014
7	1994	20	0	0	0.002	0.698	0.082	0.138	0.015	0.027	0.008	0.005	0.004	0.001	0.002	0.004	0.003	0.011
7	1995	20	0	0	0.045	0.37	0.341	0.041	0.093	0.013	0.03	0.01	0.008	0.007	0.002	0.003	0.008	0.031
7	1996	20	0	0	0.014	0.547	0.148	0.143	0.021	0.055	0.009	0.02	0.007	0.005	0.005	0.001	0.002	0.024
7	1997	20	0	0	0.029	0.381	0.359	0.075	0.069	0.011	0.03	0.005	0.012	0.004	0.003	0.003	0.001	0.019

7	1998	20	0	0.076	0.204	0.576	0.07	0.039	0.009	0.009	0.002	0.005	0.001	0.003	0.001	0.001	0.001	0.004
7	1999	20	0	0.183	0.157	0.277	0.296	0.035	0.024	0.006	0.007	0.001	0.004	0.001	0.002	0.001	0.001	0.004
7	2000	20	0	0.282	0.198	0.101	0.185	0.183	0.021	0.014	0.004	0.004	0.001	0.003	0	0.001	0.001	0.003
7	2001	20	0	0.125	0.516	0.092	0.031	0.094	0.108	0.014	0.009	0.003	0.003	0.001	0.002	0	0.001	0.001
7	2002	20	0	0.137	0.263	0.432	0.031	0.009	0.048	0.06	0.008	0.006	0.002	0.002	0	0.001	0	0.002
7	2003	20	0	0.187	0.229	0.27	0.21	0.011	0.003	0.032	0.042	0.006	0.004	0.001	0.002	0	0.001	0.001
7	2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1991	20	0	0	0.092	0.356	0.36	0.064	0.031	0.021	0.004	0.007	0.015	0.011	0.011	0.003	0.005	0.02
8	1992	20	0	0	0.001	0.73	0.087	0.109	0.023	0.012	0.008	0.002	0.003	0.006	0.004	0.004	0.001	0.009
8	1993	20	0	0	0.003	0.238	0.522	0.054	0.088	0.023	0.014	0.011	0.002	0.004	0.009	0.007	0.007	0.017
8	1994	20	0	0	0	0.615	0.09	0.174	0.021	0.04	0.012	0.008	0.007	0.001	0.003	0.006	0.005	0.018
8	1995	20	0	0	0.012	0.345	0.352	0.045	0.111	0.017	0.039	0.013	0.01	0.009	0.002	0.004	0.009	0.034
8	1996	20	0	0	0.008	0.557	0.164	0.141	0.019	0.047	0.007	0.017	0.006	0.004	0.004	0.001	0.002	0.022

8	1997	20	0	0	0.02	0.353	0.352	0.082	0.08	0.013	0.036	0.006	0.016	0.006	0.004	0.004	0.001	0.026
8	1998	20	0	0.015	0.044	0.591	0.131	0.103	0.027	0.031	0.005	0.017	0.003	0.008	0.003	0.003	0.002	0.016
8	1999	20	0	0.058	0.048	0.258	0.417	0.068	0.059	0.018	0.023	0.004	0.014	0.003	0.007	0.003	0.002	0.017
8	2000	20	0	0.053	0.06	0.153	0.322	0.311	0.037	0.027	0.007	0.009	0.002	0.006	0.001	0.003	0.001	0.008
8	2001	20	0	0.037	0.239	0.219	0.071	0.184	0.19	0.023	0.016	0.004	0.005	0.001	0.003	0.001	0.002	0.005
8	2002	20	0	0.03	0.075	0.58	0.066	0.018	0.09	0.106	0.014	0.01	0.003	0.003	0.001	0.002	0	0.004
8	2003	20	0	0.141	0.155	0.27	0.293	0.015	0.004	0.043	0.057	0.008	0.006	0.002	0.002	0	0.001	0.003
8	2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1992	50	0.8762	0.1238	0.0001	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1993	50	0.8337	0.1659	0.0004	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1994	50	0.5327	0.4557	0.0116	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1995	50	0.7922	0.2077	0.0001	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1996	50	0.8217	0.1781	0.0002	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1997	50	0.7756	0.2241	0.0002	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1998	50	0.6783	0.3207	0.0010	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1999	31	0.911	0.080	0.009	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
9	2000	200	0.619	0.368	0.013	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
9	2001	200	0.614	0.379	0.007	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
9	2002	200	0.956	0.026	0.018	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

9	2003	200	0.757	0.203	0.040	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
9	2004	200	0.896	0.093	0.011	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
9	2005	200	0.585	0.390	0.024	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
9	2006	200	0.951	0.045	0.003	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
9	2007	200	0.864	0.082	0.053	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
9	2008	107	0.704	0.282	0.014	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	1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1992	50	0.8329	0.1595	0.0076	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1993	50	0.7610	0.2389	0.0001	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1994	50	0.5736	0.4260	0.0004	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1995	50	0.7969	0.2029	0.0002	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1996	50	0.8553	0.1447	0.0000	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1997	147	0.810	0.190	0.001	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	1998	36	0.921	0.074	0.004	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	1999	200	0.924	0.072	0.004	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	2000	200	0.786	0.206	0.008	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	2001	200	0.653	0.326	0.021	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	2002	200	0.798	0.178	0.024	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	2003	200	0.777	0.202	0.021	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	2004	200	0.452	0.538	0.010	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	2005	200	0.517	0.462	0.021	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	2006	200	0.815	0.175	0.010	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	2007	200	0.700	0.261	0.040	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

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10	2008	200	0.733	0.234	0.032	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
#
####################################################
# LENGTH COMPOSITION DATA   (may be more than 1 set time series fishery, multinomial distribution assumed)
####################################################
# number of length-composition series (If there are no series,there should be no more entries in this section)
 18
# first year in length-composition series
 1981
# probability densities used to model length composition series (0 = ignore, 3 = multinomial, 8 = robustified normal)
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
# stock represented in len-comp. series (0 = all stocks)
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
# fishery represented by len-comp. series (0 = all fisheries)
 1 1 1 2 2 2 3 3 3 4 4 4 5 5 5 6 6 6
# season represented by len-comp. series (0 = all seasons)
 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3
# type of len-comp series (1=total catch, 2=landed, 3=released, 4=released and died, 5=killed)
 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
# length composition data for all years in the modern period
# series year data (by age)
1	1981	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
1	1982	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
1	1983	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
1	1984	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
1	1985	397.58	0	0	0	0	0	0	0	0.00154	0	0.00154	0.0077	0.04731	0.04369	0.09943	0.09441
	0.08351	0.05661	0.1092	0.09053	0.09194	0.05902	0.04276	0.04315	0.02395	0.02395	0.02228	0.03982	0.01766
1	1986	147.86	0	0	0	0	0	0	0	0	0.00543	0.00543	0.02717	0.02174	0.02717	0.04891	0.00543
	0.05435	0.03804	0.04348	0.06522	0.05978	0.15761	0.08696	0.22283	0.05434	0.02717	0.0326	0.01087	0.00543
1	1987	53.73	0	0	0	0	0.00003	0.00033	0.00209	0.00129	0.00075	0.00048	0.00037	0.03183	0.03171	0.06318	0.04736
	0.03157	0.03157	0.06316	0.04738	0.09466	0.04734	0.04735	0.2051	0.09466	0.06311	0.04733	0.01578	0.03155
1	1988	37.82	0	0	0	0	0	0	0	0	0	0.01961	0.03922	0.05882	0.07843	0.07843	0.05882
	0	0	0.01961	0	0.03922	0.09804	0.03922	0.09804	0.07844	0.09804	0.09804	0.07844	0.01961
1	1989	0.81	0	0	0	0.17105	0.35526	0.30263	0.02632	0.02632	0.03947	0.07895	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1990	193.48	0	0	0	0	0.00271	0.00271	0.03616	0.10655	0.13539	0.12068	0.07304	0.05279	0.06219	0.09369	0.08624
	0.07038	0.03028	0.02734	0.03028	0.0169	0.00501	0.00981	0.02152	0.009	0	0	0	0.00732
1	1991	1078.57	0	0	0	0	0	0.0009	0.04579	0.22104	0.15	0.11397	0.14623	0.08165	0.07628	0.04308	0.0261
	0.01709	0.00452	0.00631	0.01169	0.009	0.00723	0.01531	0.00537	0.00627	0.00448	0.0009	0.00678	0
1	1992	879.83	0	0	0	0	0	0	0.09241	0.20822	0.20346	0.15029	0.09464	0.07495	0.04828	0.02615	0.01183
	0.0228	0.00799	0.02371	0.00266	0.00533	0.00633	0.01747	0.00175	0.00175	0	0	0	0
1	1993	1679.58	0	0	0	0	0	0.00144	0.0158	0.11355	0.14126	0.16725	0.14848	0.10565	0.07771	0.05255	0.04651
	0.0316	0.02615	0.01681	0.0201	0.00544	0.00947	0.00897	0.00526	0.0024	0.00096	0.00006	0.00257	0
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1	1994	3242.56	0	0	0	0	0	0	0.00101	0.02566	0.18642	0.22738	0.16604	0.09711	0.06972	0.04736	0.0474
	0.04026	0.02155	0.01456	0.01079	0.015	0.005	0.00626	0.00654	0.00425	0.0005	0.00497	0.00223	0				
1	1995	876.14	0	0	0	0	0	0.00061	0.00061	0.0477	0.1749	0.16577	0.11563	0.08994	0.09234	0.0643	0.04954
	0.03486	0.02756	0.0159	0.01717	0.02332	0.02027	0.00489	0.0104	0.01223	0.00738	0.01358	0.00555	0.00554				
1	1996	1807.08	0	0	0	0	0	0	0	0.00077	0.06291	0.1396	0.11723	0.09669	0.06291	0.09325	0.09644
	0.07474	0.06249	0.05348	0.03688	0.02954	0.02119	0.02081	0.0192	0.00728	0.00268	0.00153	0.00038	0				
1	1997	1190.99	0	0	0	0	0	0	0	0.00282	0.03971	0.15134	0.16342	0.15883	0.14649	0.06182	0.05867
	0.04752	0.03222	0.02691	0.03071	0.01864	0.01628	0.01719	0.01483	0.01076	0.00184	0	0	0				
1	1998	1547.58	0	0	0	0	0	0.00356	0	0	0.09421	0.34065	0.23934	0.09494	0.0582	0.03162	0.02537
	0.01932	0.00849	0.01116	0.00385	0.01216	0.0049	0.01941	0.02881	0.00106	0.00098	0.00147	0.00049	0				
1	1999	2137.5	0	0	0	0	0	0	0	0.00035	0.04165	0.16423	0.15908	0.11407	0.11794	0.11053	0.06399
	0.0626	0.04462	0.02581	0.02592	0.02236	0.01832	0.00808	0.01219	0.0037	0.00317	0.00087	0.00035	0.00017				
1	2000	2186.53	0	0	0	0	0	0	0	0.00038	0.05243	0.16571	0.14097	0.11505	0.11216	0.07372	0.06554
	0.04815	0.03747	0.03301	0.03663	0.02672	0.02046	0.02004	0.02285	0.01694	0.00647	0.00532	0	0				
1	2001	2128.22	0	0	0	0	0	0	0	0.00037	0.05443	0.10272	0.11563	0.11319	0.11992	0.10728	0.07681
	0.05062	0.04566	0.05174	0.0555	0.03328	0.02577	0.01328	0.0264	0.00444	0.00259	0	0.00037	0				
1	2002	1076.65	0	0	0	0	0	0	0	0.00059	0.03196	0.13077	0.15622	0.13891	0.07036	0.04964	0.03753
	0.06642	0.04369	0.06524	0.06256	0.03955	0.02656	0.02419	0.04693	0.00769	0.00118	0	0	0				
1	2003	1490.98	0	0	0	0	0	0	0	0.01219	0.16241	0.26222	0.1884	0.10288	0.0615	0.04772	0.03655
	0.04691	0.01671	0.01557	0.00537	0.0084	0.01688	0.0071	0.00589	0.00303	0.00026	0	0	0				
1	2004	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				
1	2005	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				
1	2006	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				
1	2007	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				
1	2008	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				
2	1981	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				
2	1982	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				
2	1983	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				
2	1984	1392.67	0	0	0	0.00392	0.02499	0.02597	0.03234	0.03528	0.03283	0.04406	0.05227	0.06044	0.08222	0.12626	0.12087
	0.10111	0.07179	0.06597	0.05	0.02119	0.00723	0.00531	0.00776	0.0049	0.00586	0.00923	0.00578	0.00241				
2	1985	229.55	0	0	0	0	0	0	0	0	0	0	0.00386	0.00386	0.00386	0	0.01931
	0.06564	0.09266	0.11197	0.12355	0.16602	0.10039	0.05792	0.10039	0.03475	0.00386	0.04634	0.03861	0.02702				
2	1986	119.06	0	0	0	0	0	0	0	0	0.00726	0.02903	0.02903	0.05805	0.04354	0.00726	0.04354
	0.07451	0.05805	0.08177	0.05805	0.04354	0.07982	0.07982	0.12336	0.03628	0.02177	0.08903	0.02177	0.01452				
2	1987	48.04	0	0	0	0	0	0.00005	0.00026	0.00021	0.03147	0.00011	0.04686	0.07804	0.09372	0.04697	0.07807
	0.09364	0.04689	0.07801	0.03121	0.03121	0.04681	0.03123	0.09362	0.07801	0.04681	0.0312	0.0156	0				
2	1988	28	0	0	0	0	0	0	0.03571	0.03571	0	0	0.10714	0.10714	0.14286	0.03571	0.07143
	0.10714	0.10714	0	0.10714	0.03571	0.10714	0	0	0	0	0	0	0				
2	1989	7.63	0	0	0	0	0.0009	0.00632	0.01985	0.01985	0.01354	0.01083	0.00361	0.00271	0.0009	0.13203	0.00361
	0.0018	0.0018	0.0009	0	0.26045	0	0.26045	0.13022	0	0	0.13022	0	0				

2	1990	459.99	0	0	0	0	0.00091	0.00091	0.04244	0.17203	0.13811	0.13066	0.07808	0.04477	0.04639	0.04653	0.05525
	0.04196	0.04095	0.02377	0.01282	0.02271	0.02174	0.01074	0.01074	0.0184	0.01896	0.01566	0.00457	0.00091				
2	1991	236.03	0	0	0	0	0	0.00015	0.02477	0.08127	0.11415	0.04995	0.05718	0.06995	0.12205	0.05436	0.06417
	0.08393	0.02937	0.04261	0.07525	0.03054	0.01641	0.0447	0.03269	0.00649	0	0	0	0				
2	1992	32.42	0	0	0	0	0	0	0.00239	0.00478	0.00239	0.00716	0.04334	0.04812	0.11809	0.07713	0.19522
	0.07713	0	0.03857	0.1157	0.07713	0.03857	0	0.03857	0.07713	0.03857	0	0	0				
2	1993	320.21	0	0	0	0	0	0	0.02225	0.14242	0.11208	0.14851	0.08316	0.07788	0.04005	0.05728	0.02753
	0.0253	0.02975	0.07087	0.04088	0.06337	0.00223	0.01558	0.01781	0.00445	0.00445	0.00223	0.01195	0				
2	1994	154.19	0	0	0	0	0	0	0	0	0.01739	0.15473	0.08333	0.14059	0.0634	0.06375	0.07209
	0.03732	0.01739	0.01739	0.01159	0.06885	0.01739	0.0058	0.03732	0.02863	0.08299	0.08009	0	0				
2	1995	50.12	0	0	0	0.28556	0.21417	0	0.0357	0.0101	0.01515	0.01515	0.0101	0.0404	0.0505	0.0303	0.01515
	0.0303	0.0202	0.03535	0.04545	0.0202	0.0101	0.01515	0.03535	0.0202	0.02525	0.01515	0.00505	0				
2	1996	87.12	0	0	0	0	0	0	0	0.0046	0.02803	0.08868	0.14013	0.22881	0.08868	0.23112	0.01611
	0.10939	0.00921	0.01611	0.0023	0.01151	0.0046	0.0046	0.0069	0.0069	0	0.0023	0	0				
2	1997	19.99	0	0	0	0	0	0	0	0	0	0	0	0.02187	0.17813	0.04375	0.24375
	0.04375	0.26876	0.17813	0	0	0	0	0.02187	0	0	0	0	0				
2	1998	22.22	0	0	0	0	0	0	0	0	0	0.07046	0.1236	0.07327	0	0	0
	0.2198	0.29307	0.07327	0	0.07327	0.07327	0	0	0	0	0	0	0				
2	1999	29.86	0	0	0	0	0	0	0	0	0	0	0.03333	0	0.06667	0.1	0.1
	0.23333	0.13333	0.16667	0.06667	0.06667	0.03333	0	0	0	0	0	0	0				
2	2000	372.21	0	0	0	0	0	0	0	0	0.0423	0.08102	0.05782	0.05204	0.09549	0.1347	0.0828
	0.16764	0.11009	0.0505	0.02948	0.01756	0.00282	0.01756	0.00705	0.01192	0.01051	0.0273	0	0.00141				
2	2001	786.66	0	0	0	0	0	0	0	0.00059	0.03842	0.06398	0.06306	0.07206	0.11814	0.11336	0.10008
	0.08317	0.06711	0.07939	0.05811	0.05366	0.03473	0.01926	0.02254	0.00589	0.00353	0.00177	0.00059	0.00059				
2	2002	2249.65	0	0	0	0	0	0	0	0.00082	0.05527	0.11828	0.14084	0.11071	0.10246	0.05301	0.05407
	0.0382	0.03709	0.04997	0.05416	0.03557	0.05821	0.03176	0.05008	0.00652	0.00218	0.00027	0	0.00054				
2	2003	1312.61	0	0	0	0	0	0	0	0.00075	0.04986	0.14043	0.17084	0.13815	0.10456	0.06765	0.07032
	0.06124	0.03776	0.03354	0.02845	0.02325	0.03317	0.01628	0.0189	0.00412	0.00037	0.00037	0	0				
2	2004	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				
2	2005	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				
2	2006	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				
2	2007	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				
2	2008	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				
3	1981	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				
3	1982	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				
3	1983	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				
3	1984	518.73	0	0	0	0	0.00948	0.0245	0.02055	0.02055	0.02134	0.02888	0.03855	0.03388	0.05389	0.06989	0.13619
	0.10821	0.10225	0.143	0.05912	0.04391	0.03193	0.00438	0.00998	0.00919	0.00158	0.01198	0.0084	0.00839				
3	1985	319.45	0	0	0	0	0	0	0	0.00256	0	0.00512	0.01023	0.02046	0.02046	0.03581	0.06138
	0.05627	0.06905	0.06394	0.13811	0.11253	0.13555	0.08951	0.13555	0.01534	0.00256	0.01024	0.01024	0.00512				

3	1986	7.45	0	0	0	0	0	0.07692	0.61538	0.15385	0.05769	0.05769	0.01923	0.01923	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0				
3	1987	43.16	0	0	0	0	0	0	0	0.01724	0	0.03448	0.10345	0	0.01724	0.03448	0.01724
	0.05172	0.08621	0.12069	0.05172	0.05172	0.08621	0.03448	0.06896	0.05172	0.06896	0.01724	0.0862	0				
3	1988	67.07	0	0	0	0	0	0.01531	0.15309	0.26025	0.12247	0.12247	0.07654	0.07654	0.06123	0.01531	0
	0.00593	0.01185	0.00395	0.0079	0.00198	0	0.00198	0.03259	0.03062	0	0	0	0				
3	1989	38.79	0	0	0	0	0	0	0.06227	0.0089	0	0.0089	0.08838	0.02669	0.18565	0.03558	0.11506
	0.04448	0.01779	0.08838	0	0	0.15897	0.07948	0.07948	0	0	0	0	0				
3	1990	485.68	0	0	0	0	0	0.00318	0.03571	0.11188	0.13809	0.18966	0.15481	0.14251	0.06878	0.03121	0.02442
	0.01254	0.00794	0.00673	0.00794	0.01751	0.01096	0.01496	0.01074	0.00295	0.00053	0.00215	0.00431	0.00049				
3	1991	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				
3	1992	11.75	0	0	0	0	0	0	0	0	0	0	0	0	0.13681	0.13681	0
	0	0.27362	0	0.27362	0	0.13681	0	0.00847	0.01694	0.01694	0	0	0				
3	1993	53.2	0	0	0	0	0	0	0	0.07814	0.02605	0.0521	0.04662	0.00868	0.01737	0.0521	0.07267
	0.17459	0.06399	0.14855	0.09324	0.04662	0.0553	0.00868	0	0.00868	0.04662	0	0	0				
3	1994	144.47	0	0	0	0	0	0	0	0.06144	0.1536	0.11059	0.11059	0.03072	0.07373	0.07987	0.04301
	0.14598	0.03686	0.03072	0.02458	0.01843	0.01843	0.01843	0.00614	0.03072	0.00614	0	0	0				
3	1995	421.3	0	0	0	0	0	0	0	0.01292	0.13633	0.10763	0.11624	0.07319	0.08467	0.06745	0.07913
	0.06908	0.08353	0.05186	0.0288	0.02163	0.01148	0.00861	0.01436	0.02019	0.01148	0	0.00144	0				
3	1996	812.63	0	0	0	0	0	0	0	0.00221	0.11486	0.31698	0.22531	0.1007	0.08875	0.04327	0.00773
	0.00552	0.00552	0.03794	0.00884	0.01566	0.01566	0.0011	0.00442	0.00221	0.0022	0.0011	0	0				
3	1997	249.47	0	0	0	0	0	0	0	0	0.02132	0.17326	0.08796	0.09406	0.0834	0.1409	0.05941
	0.04531	0.04303	0.04874	0.01599	0.06245	0.02437	0.01066	0.03466	0.03808	0.01638	0	0	0				
3	1998	1273.49	0	0	0	0	0	0	0	0.00276	0.06075	0.20047	0.18032	0.14554	0.089	0.06729	0.0536
	0.0378	0.04383	0.02721	0.01333	0.01449	0.01518	0.00882	0.02559	0.00716	0.00524	0.00161	0	0				
3	1999	1341.48	0	0	0	0	0	0	0	0	0.04633	0.1401	0.19606	0.15109	0.14336	0.09367	0.05816
	0.04498	0.02817	0.0256	0.01561	0.01082	0.01253	0.00782	0.01678	0.00613	0.00112	0.00168	0	0				
3	2000	501.57	0	0	0	0	0	0	0	0	0.02916	0.0896	0.09072	0.1057	0.10795	0.1116	0.09988
	0.07083	0.08418	0.07033	0.02293	0.04515	0.03791	0.01896	0.01172	0.00112	0.00224	0	0	0				
3	2001	822.49	0	0	0	0	0	0	0	0	0.09908	0.18705	0.18961	0.11452	0.07244	0.04985	0.05832
	0.04738	0.03328	0.03268	0.0348	0.03102	0.02163	0.01378	0.00927	0.00318	0.00106	0.00106	0	0				
3	2002	916.25	0	0	0	0	0	0	0	0.0027	0.05875	0.13336	0.13642	0.08235	0.09001	0.06673	0.04854
	0.06197	0.02796	0.04377	0.04814	0.03603	0.01986	0.04544	0.08179	0.01482	0.00136	0	0	0				
3	2003	1161.44	0	0	0	0	0	0	0.00037	0.00149	0.03441	0.12075	0.14072	0.12568	0.14682	0.10707	0.09457
	0.0884	0.05574	0.03158	0.02169	0.01356	0.00604	0.00321	0.00148	0.00321	0.00283	0.00037	0	0				
3	2004	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				
3	2005	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				
3	2006	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				
3	2007	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				
3	2008	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				
4	1981	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				

4	1982	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			
4	1983	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				
4	1984	1.66	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	0.8	0.2	0			
4	1985	581.82	0	0	0	0.00828	0.00398	0.02577	0.09311	0.14804	0.15478	0.10297	0.0821	0.05451	0.05579	0.03952	0.03314
	0.03126	0.03248	0.02818	0.02209	0.01289	0.01226	0.00704	0.01746	0.01594	0.0138	0.0046	0	0			
4	1986	446.34	0	0	0	0	0	0.00427	0.09326	0.18287	0.15164	0.10873	0.08091	0.05508	0.05605	0.03425	0.03391
	0.03249	0.02754	0.02839	0.01764	0.01491	0.01491	0.01064	0.01274	0.01776	0.01064	0.00995	0.00142	0			
4	1987	129.66	0	0	0	0	0	0	0.08725	0.30671	0.13483	0.14045	0.09516	0.04852	0.06694	0.0203	0.0252
	0.00771	0.00677	0.00583	0.00094	0	0.02332	0.0126	0.01166	0	0.00583	0	0	0			
4	1988	299.27	0	0	0	0.00037	0.00075	0.00037	0.01561	0.2949	0.10561	0.08856	0.14595	0.06853	0.05483	0.02372	0.03927
	0.03223	0.00817	0.02666	0.02334	0.00482	0.01815	0.00704	0.01186	0.01149	0.01556	0.00222	0	0			
4	1989	344.54	0	0	0	0	0.03896	0.0751	0.07749	0.21101	0.12211	0.14766	0.09898	0.08438	0.01377	0.00605	0.04099
	0.01703	0.00931	0.00649	0.01134	0.00852	0.00852	0.00203	0.01664	0.0012	0.00203	0	0.0004	0			
4	1990	441.59	0	0	0	0	0.00268	0	0.02246	0.225	0.13504	0.12071	0.1451	0.08981	0.05087	0.0694	0.05063
	0.02412	0.01876	0.01313	0.01179	0.00724	0.00763	0.00402	0.00053	0.00107	0	0	0	0			
4	1991	1418.05	0	0	0	0	0.00081	0.00067	0.04047	0.1982	0.13478	0.11579	0.09571	0.08876	0.07177	0.04626	0.03119
	0.02694	0.02472	0.02113	0.01254	0.01634	0.00793	0.00675	0.01471	0.01273	0.01773	0.0085	0.00518	0.00041			
4	1992	3421.77	0	0	0	0.00055	0.00003	0.00093	0.0245	0.17577	0.1999	0.16813	0.13544	0.0933	0.05582	0.03217	0.0224
	0.01887	0.01278	0.0137	0.00806	0.00703	0.00623	0.00506	0.00976	0.00532	0.00282	0.00115	0.0002	0.0001			
4	1993	3269.87	0	0	0	0	0	0.00011	0.00542	0.08621	0.13143	0.13969	0.14389	0.11942	0.09401	0.06885	0.05267
	0.03955	0.02969	0.02194	0.01553	0.01195	0.00962	0.00654	0.01137	0.00686	0.0027	0.00225	0.00029	0			
4	1994	2998.52	0	0	0	0	0	0.00022	0.00155	0.02161	0.14036	0.15065	0.15908	0.11725	0.08428	0.05458	0.04665
	0.04196	0.03961	0.02935	0.02634	0.01871	0.0142	0.0163	0.01849	0.01025	0.00473	0.00317	0.00067	0			
4	1995	2194.92	0	0	0	0	0	0	0.00028	0.01659	0.11696	0.14922	0.12565	0.11351	0.07346	0.04983	0.04383
	0.04679	0.04692	0.03253	0.03243	0.02442	0.02606	0.03253	0.04152	0.02057	0.00351	0.00225	0.00112	0			
4	1996	1825.55	0	0	0	0	0	0	0.00003	0.00055	0.03254	0.21646	0.16192	0.12346	0.10143	0.07087	0.06064
	0.0558	0.03611	0.02532	0.01885	0.01325	0.01557	0.01294	0.03692	0.01394	0.00205	0.0007	0.00033	0.00033			
4	1997	3397.53	0	0	0	0	0	0	0	0.0006	0.04252	0.18453	0.15412	0.12675	0.0898	0.07013	0.06983
	0.05561	0.04394	0.03057	0.02208	0.01976	0.01794	0.01553	0.0274	0.0203	0.00679	0.00126	0.00055	0			
4	1998	2861.7	0	0	0	0	0	0	0.00005	0.00028	0.0254	0.16669	0.14987	0.1098	0.08888	0.07265	0.07284
	0.05618	0.0487	0.04129	0.03144	0.02691	0.02456	0.01957	0.0284	0.02342	0.0108	0.0016	0.00069	0			
4	1999	2224.69	0	0	0	0	0	0	0	0.00105	0.02003	0.09993	0.12777	0.11383	0.1057	0.08586	0.06844
	0.06675	0.05799	0.04948	0.03917	0.03101	0.02604	0.02822	0.0442	0.02663	0.00663	0.00031	0.00031	0.00063			
4	2000	1145.63	0	0	0	0	0	0.00057	0	0.00057	0.06539	0.19887	0.20752	0.14461	0.11011	0.07905	0.04467
	0.03335	0.02275	0.01697	0.01122	0.01107	0.01366	0.01006	0.01609	0.01032	0.00171	0.00143	0	0			
4	2001	1019.89	0	0	0	0	0	0	0	0	0.02507	0.17282	0.16023	0.13542	0.1171	0.07977	0.05602
	0.05112	0.03977	0.02829	0.03023	0.01935	0.02328	0.01348	0.02698	0.01317	0.00657	0.00132	0	0			
4	2002	1201.28	0	0	0	0	0.00048	0	0	0.00276	0.08669	0.17911	0.17702	0.14103	0.11208	0.0691	0.05063
	0.03556	0.03148	0.02815	0.02172	0.0188	0.01331	0.01556	0.01022	0.00532	0	0.00096	0	0			
4	2003	1525.66	0	0	0	0.00001	0	0	0	0.00149	0.08671	0.18104	0.17439	0.1252	0.0993	0.07061	0.05882
	0.03928	0.03585	0.03294	0.02214	0.02187	0.01139	0.01266	0.01183	0.0104	0.00335	0.00037	0.00037	0			
4	2004	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			
4	2005	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			

4	2006	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				
4	2007	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				
4	2008	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				
5	1981	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				
5	1982	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				
5	1983	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				
5	1984	271.77	0	0	0	0.00674	0.03639	0.08872	0.13952	0.16018	0.09366	0.08102	0.10886	0.0663	0.03898	0.03889	0.02128
	0.01807	0.0065	0.01157	0.00785	0.00836	0.00971	0.00692	0.01249	0.01022	0.01756	0.00929	0.00093	0				
5	1985	828.26	0	0	0	0.00199	0.00199	0.0182	0.08735	0.15649	0.11062	0.08662	0.08494	0.04873	0.03584	0.03758	0.02669
	0.02761	0.03017	0.03017	0.02618	0.02194	0.02327	0.01729	0.03657	0.04122	0.03524	0.00997	0.00332	0				
5	1986	637.93	0	0	0	0	0	0.00186	0.14046	0.25401	0.17355	0.09072	0.05748	0.04164	0.0507	0.02511	0.0114
	0.01236	0.0135	0.01674	0.00861	0.01233	0.01023	0.01209	0.01326	0.01116	0.02697	0.01302	0.00279	0				
5	1987	134.38	0	0	0	0	0	0	0.01201	0.17109	0.18732	0.06616	0.09545	0.06194	0.04214	0.05678	0.03698
	0.02149	0.04214	0.03097	0.02065	0.01549	0.02065	0.02065	0.03097	0.01032	0.0413	0.01549	0	0				
5	1988	146.95	0	0	0	0	0.00063	0.00125	0.0025	0.22545	0.06843	0.04012	0.14861	0.04757	0.07928	0.04291	0.07524
	0.06405	0.02768	0.04228	0.01057	0.03234	0.03234	0.00529	0.02114	0.01586	0.01586	0.00063	0	0				
5	1989	312.08	0	0	0	0	0	0.00065	0.02206	0.14543	0.08063	0.06362	0.1403	0.12807	0.06584	0.04286	0.09274
	0.0634	0.01819	0.02454	0.02881	0.02015	0.03681	0.003	0.0198	0.00301	0.00009	0	0	0				
5	1990	678.64	0	0	0	0	0	0.00141	0.02398	0.17851	0.16962	0.14476	0.11142	0.07481	0.07475	0.05907	0.03683
	0.03238	0.02402	0.01667	0.00854	0.00781	0.01013	0.00769	0.00872	0.00294	0.00283	0.00226	0.00085	0				
5	1991	1737.57	0	0	0	0.00003	0.00104	0.00391	0.06073	0.25554	0.15566	0.10703	0.09187	0.0618	0.06211	0.05201	0.02858
	0.0248	0.01521	0.01435	0.00912	0.00793	0.01026	0.00441	0.01091	0.01269	0.0061	0.00185	0.00208	0				
5	1992	530.61	0	0	0	0	0	0	0.04873	0.22109	0.16884	0.14474	0.1229	0.06371	0.05845	0.04128	0.02712
	0.02888	0.00917	0.01014	0.01399	0.00878	0.01178	0.00578	0.00691	0.00578	0.00096	0.00096	0	0				
5	1993	372.42	0	0	0	0	0	0	0.00767	0.06972	0.11596	0.10607	0.09866	0.09764	0.10458	0.07754	0.05573
	0.05412	0.03563	0.04837	0.03811	0.02409	0.01497	0.01105	0.02054	0.01485	0.00157	0.00314	0	0				
5	1994	0.34	0	0	0	0	0	0	0	0	0	0	0	0	0.13176	0.13176	0.13176
	0.32941	0.06588	0	0	0	0	0.07765	0.13176	0	0	0	0	0				
5	1995	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				
5	1996	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				
5	1997	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				
5	1998	2.27	0	0	0	0	0	0	0	0	0	0	0.06705	0.13328	0.13328	0.13328	0
	0	0.26656	0.13328	0	0	0.13328	0	0	0	0	0	0	0				
5	1999	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				
5	2000	97.42	0	0	0	0	0	0	0	0	0.05437	0.21747	0.1285	0.11368	0.0895	0.10873	0.0346
	0.03514	0	0.01537	0.02471	0.02965	0.01483	0.01977	0.08896	0.01977	0.00494	0	0	0				
5	2001	264.78	0	0	0	0	0	0	0	0.00202	0.07377	0.20451	0.14784	0.16248	0.07949	0.06429	0.05208
	0.05561	0.03166	0.03175	0.02231	0.00615	0.01752	0.01019	0.02453	0.01179	0.00202	0	0	0				

5	2002	974.47	0	0	0	0	0	0	0	0.00544	0.09671	0.1782	0.15534	0.1206	0.10444	0.05581	0.05739
	0.04672	0.03755	0.03157	0.02808	0.01704	0.01519	0.01257	0.01615	0.01353	0.00647	0.0006	0	0.0006				
5	2003	379.16	0	0	0	0	0	0	0.00137	0.00547	0.0758	0.17871	0.16151	0.15031	0.10927	0.0771	0.05562
	0.04988	0.04084	0.02764	0.01353	0.01771	0.01191	0.00687	0.00552	0.0041	0.00274	0.00273	0.00137	0				
5	2004	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				
5	2005	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				
5	2006	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				
5	2007	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				
5	2008	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				
6	1981	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				
6	1982	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				
6	1983	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				
6	1984	740.32	0	0	0	0.03049	0.04263	0.06417	0.10337	0.13176	0.09344	0.08891	0.09781	0.07128	0.06109	0.04327	0.0302
	0.02769	0.01884	0.01101	0.00851	0.01575	0.01743	0.01153	0.01539	0.00719	0.00571	0.00208	0.00046	0				
6	1985	747.46	0	0	0	0	0	0.00597	0.1769	0.25498	0.16698	0.08936	0.0827	0.03472	0.03184	0.02145	0.02056
	0.01327	0.00663	0.01017	0.00642	0.0073	0.01283	0.00663	0.02079	0.00995	0.01393	0.0053	0.00133	0				
6	1986	360.06	0	0	0	0.00223	0.00191	0.00191	0.0656	0.15064	0.16778	0.09495	0.10002	0.06438	0.05798	0.05671	0.02738
	0.02356	0.02324	0.02865	0.01719	0.01146	0.01369	0.00987	0.01974	0.02865	0.01337	0.01337	0.00573	0				
6	1987	250.44	0	0	0	0	0.00062	0.00185	0.05414	0.30603	0.15006	0.09425	0.12784	0.08341	0.0678	0.0276	0.03297
	0.0186	0.003	0.01499	0.00599	0.00423	0.00599	0	0.00062	0	0	0	0	0				
6	1988	276.71	0	0	0	0	0.00023	0.00047	0.04433	0.3636	0.06913	0.05033	0.12882	0.07387	0.03803	0.03225	0.07909
	0.02936	0.02046	0.00914	0.00929	0.01311	0.01468	0.00359	0.01241	0.00616	0.00117	0.00023	0.00023	0				
6	1989	295.98	0	0	0	0	0.00528	0.01055	0.01351	0.08269	0.09938	0.1586	0.10231	0.08415	0.08207	0.09908	0.0639
	0.05012	0.0302	0.0217	0.01583	0.02668	0.01847	0.01085	0.0217	0.00293	0	0	0	0				
6	1990	1746.72	0	0	0	0.00105	0.00174	0.00383	0.03819	0.14465	0.12706	0.14131	0.13475	0.09141	0.07689	0.06282	0.03043
	0.02969	0.02228	0.01955	0.0156	0.00986	0.01166	0.00756	0.01453	0.00469	0.00604	0.00289	0.00155	0				
6	1991	1.45	0	0	0	0	0.00342	0.02051	0.04616	0.07607	0.30874	0.11575	0.0859	0.10809	0.06022	0.03248	0.05167
	0.01539	0.01368	0.04312	0.00342	0.00684	0.00171	0.00171	0.00513	0	0	0	0	0				
6	1992	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.4
	0.3	0	0.1	0	0	0	0	0.1	0	0	0	0	0				
6	1993	9.51	0	0	0	0	0	0	0	0	0.1	0.2	0.1	0	0.1	0	0
	0	0.2	0.2	0	0	0	0.1	0	0	0	0	0	0				
6	1994	0.01	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0				
6	1995	243.56	0	0	0	0	0	0	0	0.00466	0.09616	0.25059	0.15449	0.10855	0.07486	0.07969	0.06449
	0.04306	0.03315	0.01852	0.01495	0.00997	0.00614	0.00451	0.02065	0.01169	0.00129	0.00129	0.00129	0				
6	1996	1065.63	0	0	0	0	0	0.00049	0	0.00099	0.02713	0.22293	0.17525	0.13162	0.09277	0.06546	0.07183
	0.04787	0.04471	0.02358	0.02108	0.01361	0.01388	0.00891	0.02205	0.01509	0.00037	0.00037	0	0				
6	1997	1106.84	0	0	0	0	0.00002	0.00003	0.00002	0.00129	0.03779	0.24507	0.16258	0.12561	0.06964	0.06967	0.06701
	0.04723	0.03968	0.02908	0.02033	0.0208	0.01506	0.01416	0.0183	0.01198	0.00362	0.00106	0	0				

6	1998	1547.41	0	0	0	0	0	0	0.00044	0.00119	0.02152	0.11969	0.16841	0.14476	0.10853	0.08835	0.07988
	0.06125	0.03953	0.0334	0.02407	0.02683	0.01908	0.0164	0.02347	0.01627	0.00462	0.00188	0.00044	0				
6	1999	730.56	0	0	0	0.00001	0.00092	0	0	0.00001	0.07299	0.20944	0.2116	0.13895	0.10217	0.044	0.03622
	0.02841	0.02894	0.02146	0.01197	0.01746	0.02363	0.00864	0.02387	0.01012	0.00825	0.00092	0	0				
6	2000	384.76	0	0	0	0	0	0.00185	0	0.00003	0.06094	0.2843	0.19823	0.15843	0.07136	0.0835	0.03685
	0.0212	0.01168	0.01165	0.01157	0.01689	0.00793	0.00391	0.00817	0.00406	0.00559	0.00187	0	0				
6	2001	796.65	0	0	0	0	0	0	0.00159	0.00398	0.08581	0.26119	0.21368	0.13389	0.08182	0.06176	0.03946
	0.02763	0.02475	0.01142	0.01185	0.00847	0.00572	0.00642	0.0141	0.00566	0.0008	0.00001	0	0				
6	2002	697.31	0	0	0	0	0	0.00083	0	0.00168	0.11729	0.27649	0.20198	0.13212	0.05995	0.06015	0.02823
	0.02118	0.02265	0.01233	0.02234	0.01171	0.00341	0.00668	0.01066	0.00586	0.00167	0.00197	0	0.00083				
6	2003	685.34	0	0	0	0	0	0.00002	0	0.00515	0.12121	0.24587	0.17615	0.13098	0.09423	0.05851	0.0401
	0.03011	0.01996	0.02005	0.01782	0.00737	0.01041	0.00663	0.01029	0.00292	0.00222	0	0.00001	0				
6	2004	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				
6	2005	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				
6	2006	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				
6	2007	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				
6	2008	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				
7	1981	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				
7	1982	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				
7	1983	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				
7	1984	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				
7	1985	289.06	0	0	0	0	0	0	0	0	0	0.00006	0.00006	0.00012	0.00692	0.01026	0.0102
	0.051	0.06459	0.15299	0.15299	0.17679	0.13939	0.07825	0.0544	0.0068	0.0068	0.017	0.0408	0.0306				
7	1986	220.53	0	0	0	0	0	0	0	0	0	0.00417	0	0	0	0.02083	0.00833
	0.02917	0.01667	0.04583	0.075	0.1	0.1125	0.10417	0.27917	0.07917	0.0375	0.04583	0.0375	0.00417				
7	1987	183	0	0	0	0	0	0	0	0	0	0	0.01093	0.00546	0.01639	0.02186	0.03825
	0.06557	0.05464	0.0765	0.05464	0.06557	0.04372	0.04918	0.10928	0.12022	0.06558	0.08197	0.06557	0.05464				
7	1988	174.79	0	0	0	0	0	0	0	0.00565	0	0	0.0113	0.0339	0.0791	0.0452	0.0678
	0.07345	0.0791	0.06215	0.0678	0.0452	0.0565	0.0113	0.0565	0.06215	0.113	0.10735	0.01695	0.00565				
7	1989	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				
7	1990	66.77	0	0	0	0	0	0	0	0.00046	0.00093	0.00093	0.00093	0.00093	0.01422	0.00046	0
	0.02844	0.05688	0.05688	0.09954	0.02844	0.02844	0.02844	0.12798	0.18486	0.19908	0.05688	0.05688	0.02844				
7	1991	38.09	0	0	0	0	0	0	0	0	0.01587	0	0.03175	0.04762	0.03175	0.04762	0.07937
	0.11111	0.04762	0.04762	0.07937	0.1746	0.09524	0.09524	0.03174	0.01587	0.03175	0	0.01587	0				
7	1992	76.37	0	0	0	0	0	0	0	0.20225	0.08989	0.01124	0.16854	0.17978	0.05618	0.02247	0.02247
	0.01124	0.02247	0.01124	0.01124	0.05618	0.03371	0	0.03371	0.03371	0.01124	0.01124	0	0.01124				
7	1993	56.94	0	0	0	0	0	0	0	0	0	0	0.01587	0.01587	0.01587	0.01587	0.11111
	0.09524	0.15873	0.14286	0.06349	0.11111	0.04762	0.09524	0.04762	0	0.04762	0	0.01587	0				

7	1994	54.6	0	0	0	0	0	0	0	0	0	0	0.01429	0.01429	0.02857	0	0.04286
	0.05714	0.07143	0.07143	0.12857	0.07143	0.1	0.07143	0.08572	0.04286	0.02857	0.08571	0.08571	0				
7	1995	44.37	0	0	0	0	0	0	0	0	0	0	0	0	0.02222	0.04444	0.02222
	0.04444	0.04444	0.13333	0.08889	0.02222	0.02222	0.02222	0.08889	0.17778	0.11111	0.11111	0.02222	0.02222				
7	1996	61.02	0	0	0	0	0	0	0	0	0	0	0	0.03226	0.03226	0.04839	0.06452
	0.17742	0.17742	0.19355	0.04839	0.08065	0.01613	0	0.09678	0.01613	0.01613	0	0	0				
7	1997	17.5	0	0	0	0	0	0	0	0	0	0	0.10526	0	0	0	0.10526
	0	0.10526	0.05263	0	0.05263	0.26316	0.10526	0	0.05263	0	0.10526	0.05263	0				
7	1998	2.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25
	0	0	0.25	0.25	0	0	0.25	0	0	0	0	0	0				
7	1999	123.95	0	0	0	0	0	0	0	0	0	0.00794	0.03968	0.07143	0.12698	0.19048	0.07143
	0.07937	0.03968	0.07143	0.0873	0.06349	0.05556	0.01587	0.03968	0.01587	0.00794	0.00794	0.00794	0				
7	2000	126	0	0	0	0	0	0	0	0	0	0.00794	0.00794	0	0.02381	0.03968	0.11111
	0.07937	0.11111	0.19048	0.11111	0.09524	0.04762	0.03968	0.07936	0.03175	0	0.00794	0.00794	0.00794				
7	2001	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0339	0.11864
	0.0678	0.0678	0.15254	0.15254	0.15254	0.13559	0.0678	0.01695	0.01695	0	0.01695	0	0				
7	2002	54.15	0	0	0	0	0	0	0	0	0	0.01449	0.02899	0.02899	0.05797	0.02899	0.02899
	0.07246	0.05797	0.04348	0.15942	0.07246	0.08696	0.10145	0.14492	0.05797	0.01449	0	0	0				
7	2003	112.96	0	0	0	0	0	0	0	0	0	0	0.0177	0.04425	0.0885	0.21239	0.15044
	0.15929	0.07965	0.06195	0.0354	0.0177	0.0354	0.02655	0.0708	0	0	0	0	0				
7	2004	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				
7	2005	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				
7	2006	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				
7	2007	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				
7	2008	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				
8	1981	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				
8	1982	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				
8	1983	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				
8	1984	414.3	0	0	0	0	0	0	0	0	0	0	0	0.00241	0.03133	0.04578	0.06506
	0.15181	0.13012	0.10602	0.07711	0.06265	0.03133	0.01928	0.02892	0.02169	0.04338	0.11566	0.0506	0.01687				
8	1985	139.82	0	0	0	0	0	0	0	0	0	0	0	0	0.00709	0.01418	0.03546
	0.02837	0.07801	0.08511	0.0922	0.13475	0.13475	0.06383	0.0851	0.02836	0.03546	0.07092	0.07802	0.02836				
8	1986	275	0	0	0	0	0	0	0	0	0	0	0.00727	0.02182	0.03273	0.03273	0.03636
	0.02545	0.03273	0.09091	0.08727	0.09455	0.09091	0.06909	0.11272	0.05818	0.08728	0.08364	0.03273	0.00364				
8	1987	109	0	0	0	0	0	0	0	0	0	0	0.01835	0.00917	0.06422	0.00917	0.02752
	0.02752	0.07339	0.0367	0.00917	0.06422	0.06422	0.06422	0.18349	0.13761	0.11009	0.09175	0.00917	0				
8	1988	11.86	0	0	0	0	0	0	0	0	0	0	0	0.08333	0.16667	0.08333	0
	0.16667	0	0	0	0	0.16667	0.08333	0.16667	0.08333	0	0	0	0				
8	1989	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				

8	1990	129.16	0	0	0	0	0	0	0	0	0	0.0073	0	0.0073	0.0365	0.0292	0.0292
	0.07299	0.07299	0.08759	0.07299	0.12409	0.11679	0.09489	0.06569	0.0511	0.0292	0.0146	0.0438	0.0438				
8	1991	37.23	0	0	0	0	0	0	0	0	0	0	0.01667	0.01667	0	0.13333	0.08333
	0.03333	0.03333	0.05	0.05	0.08333	0.08333	0.03333	0.1	0.05	0.11667	0.06666	0.01667	0.03334				
8	1992	51.92	0	0	0	0	0	0	0	0	0	0	0.01724	0	0.06897	0	0.06897
	0.10345	0.06897	0.06897	0	0.05172	0.03448	0.12069	0.12069	0.01724	0.06896	0.0862	0.05172	0.05172				
8	1993	47.03	0	0	0	0	0	0	0	0.01961	0	0	0	0.01961	0	0.01961	0.03922
	0.03922	0.13725	0.17647	0.17647	0.11765	0.07843	0.05882	0.01961	0.03922	0.03922	0.01961	0	0				
8	1994	22.85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.04348
	0.08696	0.08696	0.17391	0	0.21739	0.08696	0.13043	0.04348	0.08696	0	0.04348	0	0				
8	1995	36.97	0	0	0	0	0	0	0	0	0	0	0	0.02703	0.05405	0.05405	0.10811
	0.18919	0.18919	0.02703	0	0.05405	0.02703	0.02703	0.05406	0.05405	0	0.08108	0.05405	0				
8	1996	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
	0	0.2	0	0	0	0.4	0	0.1	0	0	0.1	0.1	0				
8	1997	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0.66667	0.33333	0	0				
8	1998	34.61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05556
	0.05556	0.05556	0.08333	0.13889	0.08333	0.08333	0.08333	0.19445	0.11111	0.02778	0.02778	0	0				
8	1999	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0.15789	0.15789
	0.21053	0.10526	0.10526	0.15789	0.05263	0	0	0	0	0	0.05263	0	0				
8	2000	48	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0625	0.02083
	0.16667	0.14583	0.14583	0.16667	0.125	0.04167	0.08333	0	0.02083	0.02083	0	0	0				
8	2001	138	0	0	0	0	0	0	0	0	0	0	0	0.00725	0	0.01449	0.08696
	0.07971	0.04348	0.13768	0.12319	0.10145	0.13043	0.10145	0.1087	0.02898	0.01449	0.00725	0.00725	0.00725				
8	2002	111.55	0	0	0	0	0	0	0	0	0	0	0	0	0.02547	0.02261	0.02404
	0.00754	0.06783	0.06029	0.09044	0.10083	0.0933	0.0768	0.19841	0.10147	0.06926	0.04665	0.01507	0				
8	2003	120.96	0	0	0	0	0	0	0	0	0	0	0.01653	0.05785	0.02479	0.06612	0.1157
	0.07438	0.10744	0.05785	0.04132	0.08264	0.07438	0.07438	0.13223	0.04132	0.02479	0	0.00826	0				
8	2004	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				
8	2005	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				
8	2006	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				
8	2007	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				
8	2008	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				
9	1981	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				
9	1982	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				
9	1983	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				
9	1984	449	0	0	0	0	0	0	0	0	0	0.01336	0.02004	0.01336	0.02673	0.03563	0.06236
	0.098	0.13586	0.16258	0.17372	0.07127	0.03786	0.02673	0.0245	0.049	0.04008	0.00445	0.00223	0.00223				
9	1985	305.9	0	0	0	0	0	0	0	0	0	0	0	0.00286	0.01714	0.02286	0.04
	0.03714	0.06	0.09429	0.09429	0.12571	0.12571	0.04	0.14	0.05429	0.03429	0.05429	0.04286	0.01428				

9	1986	461.24	0	0	0	0	0	0	0	0.00202	0.00403	0.0121	0.01613	0.02419	0.04032	0.05847	0.06452
	0.0625	0.03427	0.05242	0.05444	0.06855	0.05847	0.07863	0.16533	0.11693	0.01815	0.0121	0.03427	0.02218				
9	1987	105	0	0	0	0	0	0	0	0	0	0.00952	0	0.02857	0.01905	0	0.02857
	0.02857	0.01905	0.08571	0.11429	0.05714	0.14286	0.05714	0.15238	0.09524	0.01904	0.03809	0.10476	0				
9	1988	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				
9	1989	28.72	0	0	0	0	0	0	0	0	0	0	0	0	0.10345	0.03448	0.06897
	0.03448	0.03448	0.06897	0.03448	0.13793	0	0.10345	0.03448	0.10345	0.06897	0.06896	0.10345	0				
9	1990	74.75	0	0	0	0	0	0	0	0	0.03846	0.20513	0.29487	0.08974	0.02564	0	0.01282
	0	0.01282	0.01282	0.02564	0.05128	0	0.01282	0.02564	0.01282	0.05128	0.11538	0.01282	0				
9	1991	6.93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0.14286	0	0	0.14286	0	0	0	0.14286	0.57143	0	0				
9	1992	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.18182	0.09091	0	0.27273	0	0	0.18182	0	0.09091	0.09091	0	0.09091	0				
9	1993	29	0	0	0	0	0	0	0	0	0	0	0	0	0.06897	0.06897	0.06897
	0.10345	0.10345	0.17241	0.06897	0.06897	0.06897	0.03448	0.03448	0	0.03448	0.10345	0	0				
9	1994	2	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0.5	0	0	0				
9	1995	50.84	0	0	0	0	0	0	0	0.03922	0.01961	0	0.01961	0	0.03922	0.09804	0.09804
	0.23529	0.11765	0.05882	0.05882	0.01961	0.01961	0.07843	0	0.03922	0	0.03922	0.01961	0				
9	1996	6.86	0	0	0	0	0	0	0	0	0	0	0	0	0	0.14286	0
	0	0.14286	0.14286	0.14286	0.28571	0	0	0.14286	0	0	0	0	0				
9	1997	42.02	0	0	0	0	0	0	0	0	0	0	0.04348	0.04348	0.02174	0	0
	0	0.02174	0.02174	0.02174	0.06522	0.02174	0.13043	0.1087	0.2174	0.26087	0.02174	0	0				
9	1998	136.25	0	0	0	0	0	0	0	0	0	0	0.00971	0.01942	0.02427	0.02427	0.03883
	0.04369	0.02913	0.08252	0.03398	0.02427	0.01942	0.02427	0.20388	0.27185	0.1165	0.01941	0.01456	0				
9	1999	143.24	0	0	0	0	0	0	0	0	0.0069	0	0.0069	0	0.06207	0.06897	0.09655
	0.13103	0.11724	0.09655	0.02759	0.02069	0.04138	0.0069	0.04138	0.07587	0.08966	0.08966	0.02069	0				
9	2000	109	0	0	0	0	0	0	0	0	0	0	0	0.00917	0.02752	0.02752	0.06422
	0.04587	0.11009	0.17431	0.20183	0.11009	0.08257	0.0367	0.00917	0.04587	0.01835	0.01834	0.01835	0				
9	2001	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02941	0.02941
	0.08824	0.17647	0.20588	0.08824	0.08824	0.02941	0.11765	0.08823	0.05882	0	0	0	0				
9	2002	44.91	0	0	0	0	0	0	0	0	0	0.01786	0.01786	0.03571	0.07143	0.08929	0.16071
	0.08929	0.03571	0.03571	0	0.03571	0.125	0.03571	0.08928	0.08929	0.01786	0.03572	0.01786	0				
9	2003	77.98	0	0	0	0	0	0	0	0	0	0	0.01282	0.01282	0.14103	0.0641	0.0641
	0.17949	0.08974	0.08974	0.10256	0.03846	0.01282	0.03846	0.05128	0.03846	0.01282	0.05128	0	0				
9	2004	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				
9	2005	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				
9	2006	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				
9	2007	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				
9	2008	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				
10	1981	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				

10	1982	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				
10	1983	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				
10	1984	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				
10	1985	11.33	0	0	0	0	0	0	0	0.01245	0.0332	0.0166	0.02075	0.04979	0.05809	0.07884	0.02905
	0.05394	0.06224	0.02905	0.0249	0.02905	0.02905	0.0166	0.0332	0.09544	0.22407	0.09959	0.00415	0				
10	1986	2.36	0	0	0	0	0	0	0.07752	0.10853	0.09302	0.03101	0.07752	0.10853	0.05426	0.02326	0.04651
	0.05426	0.02326	0.02326	0.00775	0.02326	0.0155	0.0155	0.03101	0.03876	0.11628	0.02325	0.00775	0				
10	1987	15.29	0	0	0	0	0.02	0	0.02	0.08	0.04	0.04	0.1	0.04	0.04	0.02	0.02
	0.06	0.06	0.04	0.06	0.02	0.02	0.02	0.08	0.06	0.12	0.04	0	0				
10	1988	1.45	0	0	0	0	0	0	0	0	0.07143	0.07143	0.07143	0.14286	0.07143	0	0.14286
	0.07143	0.07143	0.14286	0	0.07143	0	0	0.07143	0	0	0	0	0				
10	1989	2.84	0	0	0	0	0	0	0	0.22523	0.01802	0.03604	0.12613	0.08559	0.02252	0.02252	0.12162
	0.06757	0.04955	0.01351	0.05405	0.04955	0.04054	0	0.05406	0.01351	0	0	0	0				
10	1990	1.16	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5
	0	0	0	0	0	0	0	0	0	0	0	0	0				
10	1991	65.19	0	0	0	0	0	0	0	0	0.07981	0.11402	0.09122	0.05701	0.03421	0.0114	0.0114
	0	0.05701	0.0114	0.02451	0.0228	0.1165	0.05744	0.06714	0.1056	0.04731	0.09121	0	0				
10	1992	31.47	0	0	0	0	0	0	0	0.28571	0.18367	0.12245	0.10204	0.10204	0.10204	0.02041	0
	0	0.02041	0.02041	0.02041	0	0	0	0	0	0	0	0.02041	0				
10	1993	12.73	0	0	0	0	0	0	0	0.01917	0.11499	0.07666	0.20237	0.10654	0.07666	0.03833	0.03833
	0.06821	0.01071	0	0	0	0.02142	0.01071	0.04284	0.01071	0.1133	0.01917	0.01071	0.01917				
10	1994	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				
10	1995	1.64	0	0	0	0	0	0	0	0	0	0	0	0.03244	0.00811	0.00811	0.01622
	0.01622	0.08111	0.12977	0.09733	0.04055	0.04055	0.03244	0.04866	0.21612	0.21613	0.01622	0	0				
10	1996	2.46	0	0	0	0	0	0	0	0	0.18182	0.09091	0.09091	0	0	0	0.09091
	0	0	0	0	0	0.09091	0	0	0.18182	0.27273	0	0	0				
10	1997	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				
10	1998	72.81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00794
	0.02381	0.04762	0.0873	0.04762	0.10317	0.06349	0.10317	0.20635	0.24603	0.03175	0.02381	0	0.00794				
10	1999	108.6	0	0	0	0	0	0	0	0	0	0.00007	0.00019	0.00014	0.00003	0.00003	0.00003
	0.03668	0.04585	0.04585	0.16505	0.22007	0.21091	0.10086	0.08253	0.04585	0.03668	0.00917	0	0				
10	2000	92	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01351	0.03378
	0.05404	0.08782	0.08782	0.04053	0.07431	0.08796	0.14949	0.19692	0.10954	0.04976	0.01453	0	0				
10	2001	17.91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0.08501	0.08333	0.41667	0.2775	0.055	0.055	0.0275	0				
10	2002	112.38	0	0	0	0	0	0	0	0	0	0.01152	0.03455	0.10364	0.09788	0.09212	0.05182
	0.08636	0.04606	0.0403	0.05182	0.0403	0.0264	0.03487	0.1056	0.09887	0.05486	0.02303	0	0				
10	2003	4.48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.01389	0	0	0.01389	0.01389	0.01389	0.01389	0.22223	0.38889	0.22222	0.09722	0	0				
10	2004	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				
10	2005	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				

10	2006	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				
10	2007	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				
10	2008	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				
11	1981	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				
11	1982	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				
11	1983	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				
11	1984	10.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02273	0
	0	0.02273	0	0.04545	0	0	0	0.04545	0.25	0.34091	0.25	0.02273	0				
11	1985	7.76	0	0	0	0	0	0.00988	0.00741	0.01481	0.05185	0.07654	0.0716	0.07654	0.0642	0.03704	0.04691
	0.04444	0.03951	0.0321	0.05185	0.02222	0.02963	0.01481	0.05432	0.08889	0.10864	0.03457	0.02222	0				
11	1986	30.6	0	0	0	0	0	0	0.05682	0.17045	0.05682	0.02273	0.05682	0.04545	0.05682	0.02273	0.01136
	0.03409	0.06818	0.01136	0.02273	0.03409	0	0.03409	0.04545	0.05682	0.125	0.06818	0	0				
11	1987	2.82	0	0	0	0	0	0	0	0	0	0	0.22222	0.11111	0	0	0
	0	0.11111	0	0	0.22222	0	0	0	0	0.33333	0	0	0				
11	1988	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				
11	1989	0.6	0	0	0	0	0	0	0	0	0	0	0.05333	0.14667	0.01333	0.04	0.13333
	0.12	0.02667	0.04	0.14667	0.02667	0.01333	0	0.09334	0.08	0.04	0.02667	0	0				
11	1990	25.35	0	0	0	0	0	0	0	0	0	0.09524	0.02381	0.04762	0.04762	0.07143	0.02381
	0.04762	0.09524	0.09524	0.19048	0.09524	0	0	0.11905	0	0.04762	0	0	0				
11	1991	115.36	0	0	0	0	0	0	0.05922	0.28954	0.07989	0.03948	0.0329	0.04606	0.01974	0.07423	0.04699
	0.0329	0.0329	0.02632	0.01974	0.01316	0.0329	0.02159	0.0291	0.02632	0.06765	0.00842	0.00092	0				
11	1992	20.57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00103
	0	0.09667	0	0.1289	0.08056	0	0.14501	0.19335	0.35448	0	0	0	0				
11	1993	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				
11	1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.33333	0.33333	0.33333	0	0	0	0	0	0	0	0	0	0				
11	1995	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				
11	1996	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				
11	1997	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				
11	1998	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				
11	1999	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				
11	2000	92.79	0	0	0	0	0	0	0	0	0.01443	0.00962	0.03368	0.01443	0.00481	0.00481	0.02591
	0.03616	0.03801	0.0211	0.03258	0.07059	0.09775	0.10861	0.22141	0.16291	0.07602	0.02715	0	0				
11	2001	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				

11	2002	215.79	0	0	0	0	0	0	0	0	0.00907	0.00605	0.03482	0.06668	0.12562	0.07864	0.09073
	0.05296	0.05149	0.01969	0.03179	0.03193	0.03946	0.03193	0.13667	0.12738	0.05444	0.01062	0	0				
11	2003	71.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01276	0.01276
	0.00144	0.01276	0.02552	0.02985	0.02841	0.01492	0.05393	0.29713	0.3063	0.15315	0.05104	0	0				
11	2004	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				
11	2005	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				
11	2006	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				
11	2007	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				
11	2008	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				
12	1981	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				
12	1982	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				
12	1983	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				
12	1984	117.82	0	0	0	0	0	0	0.00369	0.01659	0.02949	0.01843	0.0129	0.02028	0.02765	0.03871	0.04977
	0.03318	0.03134	0.03134	0.02396	0.01475	0.01708	0.0129	0.06968	0.15767	0.29188	0.08948	0.00737	0.00184				
12	1985	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				
12	1986	0.97	0	0	0	0	0	0	0	0.08333	0	0.08333	0.08333	0	0	0	0
	0	0	0	0	0	0.08333	0	0.08333	0.16667	0.25	0.08333	0.08333	0				
12	1987	0.55	0	0	0	0	0	0	0	0	0.33333	0	0	0	0	0	0.33333
	0.33333	0	0	0	0	0	0	0	0	0	0	0	0				
12	1988	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				
12	1989	0.08	0	0	0	0	0	0	0.01316	0.23684	0.14474	0.14474	0.14474	0.15789	0.02632	0.06579	0.03947
	0.02632	0	0	0	0	0	0	0	0	0	0	0	0				
12	1990	78.54	0	0	0	0	0.00414	0.0069	0.11047	0.07211	0.09895	0.08851	0.08636	0.05032	0.03819	0.07868	0.00997
	0.01994	0.00997	0.04433	0.04126	0.04295	0.04433	0.00552	0.02132	0.04433	0.02715	0.03712	0.01718	0				
12	1991	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				
12	1992	0.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.05	0	0.1	0.05	0.1	0.3	0.25	0.15	0	0				
12	1993	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				
12	1994	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				
12	1995	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				
12	1996	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				
12	1997	3.23	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01587	0.01587
	0.03175	0	0.06349	0.04762	0.04762	0.14286	0.12698	0.28572	0.17461	0.04762	0	0	0				

12	1998	117.53	0	0	0	0	0	0	0	0	0.00533	0.02132	0.04797	0.05946	0.03814	0.0367	0.04819
	0.05885	0.04593	0.05885	0.1216	0.09781	0.07484	0.05577	0.10457	0.07792	0.03752	0.00615	0.00308	0				
12	1999	32.89	0	0	0	0	0	0	0	0	0	0	0	0.0303	0	0	0
	0.0303	0	0	0.06061	0.12121	0.15152	0.18182	0.24242	0.12121	0.0606	0	0	0				
12	2000	107.3	0	0	0	0	0	0	0	0	0.01899	0.06962	0.05063	0.01266	0.00633	0.00633	0.03165
	0.05063	0.06329	0.0443	0.06329	0.03797	0.10127	0.11392	0.24683	0.03165	0.03797	0.01266	0	0				
12	2001	21.85	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02083	0
	0	0.02083	0.04167	0.02083	0.02083	0	0	0.125	0.5	0.25	0	0	0				
12	2002	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				
12	2003	78.66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02326
	0.02326	0.03488	0.06977	0.10465	0.10465	0.06977	0.19767	0.18605	0.11628	0.04651	0.02326	0	0				
12	2004	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				
12	2005	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				
12	2006	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				
12	2007	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				
12	2008	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				
13	1981	8.14	0	0	0	0.09524	0.09524	0.19048	0.04762	0.09524	0.14286	0	0.14286	0	0.04762	0.14286	0
	0	0	0	0	0	0	0	0	0	0	0	0	0				
13	1982	15.26	0	0	0	0.01428	0.00031	0.10193	0.05189	0.00062	0.16718	0.35677	0.05127	0.00062	0.10224	0	0
	0	0.10193	0.05097	0	0	0	0	0	0	0	0	0	0				
13	1983	51.55	0	0	0	0.01929	0.09734	0.25973	0.08769	0.20755	0.05361	0.08529	0.02921	0.04205	0.03957	0.026	0.00964
	0.01382	0	0.00953	0.00953	0	0	0	0.01015	0	0	0	0	0				
13	1984	12.99	0	0	0	0.21954	0	0.00015	0.11301	0.17496	0.08747	0.07626	0.127	0.05105	0.05074	0.04795	0.05074
	0	0.00031	0.00015	0	0.00067	0	0	0	0	0	0	0	0				
13	1985	0.9	0	0	0	0.00102	0.00102	0	0	0	0.00102	0	0.00102	0.00102	0.00102	0.49188	0.32826
	0.00307	0.00102	0	0	0	0	0	0.16962	0	0	0	0	0				
13	1986	4.22	0	0	0	0	0	0.01061	0.03182	0.06543	0.21968	0.05218	0.08368	0.35152	0.07485	0	0.01061
	0	0	0.01239	0.05185	0	0	0.02122	0.00178	0.00178	0.01061	0	0	0				
13	1987	18.76	0	0	0	0.03885	0.02871	0.06162	0.06631	0.15672	0.15597	0.10362	0.1643	0.04592	0.07406	0.01368	0.01398
	0.01761	0.0088	0.01856	0.01321	0	0	0	0.01808	0	0	0	0	0				
13	1988	8.02	0	0	0	0	0	0.00002	0.01183	0.57846	0.02366	0	0	0.09486	0.28331	0	0
	0	0	0	0.00745	0	0	0.00042	0	0	0	0	0	0				
13	1989	20.26	0	0	0	0	0	0	0	0.17525	0.16348	0.16348	0.16348	0.13623	0.13623	0.02725	0.02725
	0	0	0	0	0	0	0.00735	0	0	0	0	0	0				
13	1990	2.45	0	0	0	0	0	0.05105	0.05105	0.23885	0.03652	0.39479	0	0.03652	0	0.05105	0
	0	0	0.11942	0	0	0	0.02076	0	0	0	0	0	0				
13	1991	309.85	0	0	0	0.00265	0.00081	0.00346	0.03065	0.21187	0.29539	0.19565	0.1115	0.05841	0.03586	0.01911	0.01309
	0.00637	0.00393	0.00221	0.0027	0.00122	0.00042	0.00041	0.00148	0.0028	0	0	0	0				
13	1992	302.37	0	0	0	0.00142	0	0.00058	0.02776	0.22412	0.22391	0.15819	0.1018	0.08132	0.05781	0.04434	0.03203
	0.02043	0.00685	0.00425	0.00276	0.00502	0.00296	0.00095	0.00153	0.00132	0.00044	0	0	0.00022				
13	1993	59.88	0	0	0	0	0	0.01532	0.07828	0.27584	0.20388	0.09597	0.08963	0.0819	0.04443	0.04252	0.03257
	0.00967	0.01328	0.0051	0.00174	0.0017	0	0	0.00815	0	0	0	0	0				

13	1994	166	0	0	0	0.00003	0.00048	0	0.00357	0.02848	0.14086	0.21471	0.19172	0.12346	0.08093	0.04645	0.0349
	0.02892	0.02959	0.02823	0.02036	0.00991	0.00595	0.00563	0.0052	0.00013	0.00003	0.00048	0	0				
13	1995	40.18	0	0	0	0	0	0.01171	0.02396	0.10063	0.20606	0.06496	0.13738	0.11714	0.02982	0.07082	0.02343
	0.03514	0.02343	0.02996	0.00028	0.01245	0.02943	0.01757	0.05338	0.00659	0	0.00586	0	0				
13	1996	19.97	0	0	0	0	0	0.01561	0	0.07803	0.07484	0.12589	0.0721	0.07649	0.21536	0.05383	0.01943
	0.00764	0.06492	0.01269	0.05094	0.01531	0.01531	0	0.06209	0.02393	0	0.01561	0	0				
13	1997	29.83	0	0	0	0	0	0	0	0.00156	0.0401	0.07048	0.05847	0.06643	0.11695	0.09326	0.09061
	0.0779	0.08846	0.078	0.03584	0.02566	0.03571	0.00887	0.05525	0.03187	0.00946	0.0151	0	0				
13	1998	340.22	0	0	0	0	0	0.00295	0.00285	0.00814	0.11332	0.30483	0.24595	0.15171	0.06418	0.02423	0.01335
	0.00905	0.01363	0.00749	0.0072	0.00546	0.00663	0.00909	0.00688	0.00138	0.00167	0	0	0				
13	1999	1244.3	0	0	0.00029	0.00029	0.00029	0	0.00029	0.00141	0.04307	0.16353	0.19233	0.1585	0.11884	0.09719	0.06751
	0.05945	0.04	0.01973	0.01283	0.00655	0.00495	0.00415	0.00554	0.00151	0.00108	0.0004	0.00026	0				
13	2000	602.29	0	0	0	0	0	0.00207	0	0	0.0033	0.13823	0.31362	0.21346	0.12813	0.06529	0.04686
	0.03323	0.01855	0.01012	0.00621	0.00794	0.00532	0.00162	0.00547	0.0004	0	0.0002	0	0				
13	2001	173.46	0	0	0	0	0	0	0	0.01172	0.00732	0.06317	0.14075	0.14546	0.13049	0.10588	0.07887
	0.06401	0.05586	0.0449	0.03804	0.02996	0.02524	0.02412	0.02231	0.01193	0	0	0	0				
13	2002	697.49	0	0	0	0	0	0	0.00015	0.00015	0.00431	0.0775	0.21133	0.20063	0.13847	0.08336	0.06679
	0.0426	0.03478	0.02954	0.01962	0.01799	0.01643	0.01279	0.02515	0.00897	0.00726	0.00138	0.00079	0				
13	2003	2306.19	0	0	0	0	0	0	0.00027	0.00027	0.00373	0.09826	0.22606	0.1786	0.12614	0.09016	0.0587
	0.06186	0.03494	0.02966	0.02119	0.01521	0.01498	0.01346	0.01637	0.00603	0.0023	0.00108	0.00043	0.00029				
13	2004	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				
13	2005	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				
13	2006	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				
13	2007	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				
13	2008	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				
14	1981	27.2	0	0	0	0.00476	0.05834	0.35358	0.06687	0.16511	0.04407	0.16863	0.03735	0.06192	0.0057	0.02912	0
	0.00003	0	0	0	0.00452	0	0	0	0	0	0	0	0				
14	1982	22.78	0	0	0.00007	0.02761	0.03035	0.11232	0.21752	0.28002	0.09539	0.03344	0.02482	0.03589	0.04372	0.01447	0.02963
	0.00341	0.00724	0.01897	0.00724	0.00724	0	0.00341	0	0	0.00724	0	0	0				
14	1983	0.41	0	0	0	0.00558	0.23428	0.47136	0.00559	0.0014	0.23987	0.00699	0.00559	0.00559	0.00978	0.00559	0.00279
	0.00279	0	0	0	0	0	0	0	0	0	0.0014	0.0014	0				
14	1984	73.77	0	0	0	0.0234	0.00585	0.0143	0.03537	0.09463	0.15388	0.18313	0.10466	0.0831	0.05851	0.03695	0.03078
	0.01541	0.03078	0.01847	0.00616	0.03078	0.00923	0.00616	0.03386	0.02462	0	0	0	0				
14	1985	1.26	0	0	0	0.00492	0	0	0	0	0	0	0	0	0.33169	0.33169	0
	0.33169	0	0	0	0	0	0	0	0	0	0	0	0				
14	1986	18.13	0	0	0	0.00499	0.00998	0.05634	0.05512	0.28161	0.07591	0.07166	0.18396	0.01027	0.1571	0.01843	0.00665
	0.0069	0	0.01616	0.00166	0.00242	0.00242	0.03269	0.00575	0	0	0	0	0				
14	1987	90.89	0	0	0	0.01449	0.04121	0.095	0.06201	0.10881	0.11502	0.11019	0.13559	0.07067	0.03391	0.02717	0.05068
	0.06068	0.01404	0.02532	0.0107	0.00528	0.00484	0.00413	0.00276	0.00311	0	0.00346	0	0.00094				
14	1988	31.84	0	0	0	0	0.0004	0.01707	0.03219	0.21212	0.1439	0.08122	0.15317	0.07951	0.0484	0.13639	0.01274
	0.02057	0.01362	0.00088	0.00088	0.01185	0	0.01628	0.0188	0	0	0	0	0				
14	1989	28.32	0	0	0	0.02069	0.0538	0.04552	0.06265	0.19258	0.12004	0.08727	0.09358	0.09787	0.08657	0.02483	0.03294
	0.05059	0.00414	0.00828	0.00414	0.00098	0.01241	0	0.00113	0	0	0	0	0				

14	1990	71.96	0	0	0	0.0009	0.00903	0.01345	0.0422	0.19656	0.28414	0.16227	0.11499	0.05113	0.04965	0.02635	0.01101
	0.00627	0.01012	0.00179	0.00442	0.00557	0.0009	0.00461	0	0.00463	0	0.00002	0	0				
14	1991	8142.5	0	0	0.00015	0.00148	0.00283	0.00415	0.03081	0.19621	0.27287	0.20779	0.12667	0.06433	0.03806	0.02238	0.01175
	0.0073	0.00368	0.00253	0.00215	0.00164	0.00098	0.00057	0.00082	0.00042	0.00015	0.0002	0.00005	0				
14	1992	3596.92	0	0	0	0.00045	0.00105	0.00307	0.03577	0.24933	0.24817	0.1652	0.10794	0.06552	0.04181	0.02669	0.02213
	0.01252	0.00645	0.00427	0.00313	0.00223	0.00175	0.0006	0.00105	0.00052	0.00027	0.00009	0	0				
14	1993	2386.36	0	0	0	0.00013	0.00069	0.00209	0.02527	0.33127	0.21062	0.1229	0.07317	0.06732	0.04686	0.02964	0.02604
	0.01457	0.01261	0.00922	0.00768	0.00788	0.00433	0.00364	0.0018	0.00153	0.00034	0.00027	0	0.00013				
14	1994	2208.97	0	0	0	0.00037	0.00146	0.00209	0.0056	0.04821	0.18574	0.18263	0.17093	0.12872	0.08302	0.05032	0.0353
	0.02552	0.02356	0.01617	0.01148	0.00954	0.00621	0.00465	0.00602	0.00162	0.00026	0.00029	0.0003	0				
14	1995	618.94	0	0	0	0.00059	0.00059	0.00474	0.006	0.02157	0.16615	0.25205	0.15434	0.08478	0.06358	0.0449	0.04429
	0.03888	0.02238	0.02164	0.01779	0.01719	0.012	0.00851	0.01045	0.00564	0.00118	0.00073	0	0				
14	1996	75.28	0	0	0	0.00196	0	0	0.01316	0.00418	0.09741	0.15561	0.14541	0.15122	0.0819	0.10362	0.04859
	0.05998	0.03188	0.01685	0.02588	0.00614	0.01126	0.01126	0.01655	0.00759	0.00084	0.00479	0	0.00392				
14	1997	79.53	0	0	0	0.00063	0.00063	0	0.00588	0.01883	0.205	0.21609	0.10267	0.06874	0.08282	0.06899	0.05046
	0.04079	0.04584	0.0189	0.00522	0.01827	0.01322	0.01479	0.01596	0.00627	0	0	0	0				
14	1998	693.23	0	0	0	0	0	0.00145	0.00043	0.00555	0.08758	0.23927	0.24988	0.16435	0.10371	0.0523	0.02417
	0.02008	0.0156	0.00826	0.00381	0.00833	0.00412	0.00192	0.00608	0.00266	0.00043	0	0	0				
14	1999	1087.94	0	0	0	0.00057	0.00073	0.00122	0.00035	0.00017	0.03093	0.17018	0.22227	0.17353	0.12941	0.09267	0.05438
	0.03942	0.02716	0.01768	0.01126	0.00925	0.00502	0.00306	0.0066	0.00184	0.00156	0.00017	0.00041	0.00015				
14	2000	1298.89	0	0	0	0.00006	0	0	0.00039	0.00159	0.01305	0.15921	0.27949	0.20203	0.10967	0.06858	0.05057
	0.03539	0.02238	0.01639	0.01344	0.00842	0.00655	0.00644	0.00412	0.00119	0.00039	0.0004	0.00025	0				
14	2001	941.41	0	0	0	0	0.00028	0.00057	0.00131	0.00211	0.00945	0.16629	0.23812	0.15505	0.11895	0.08523	0.05948
	0.04862	0.03081	0.02431	0.01598	0.01337	0.01023	0.00825	0.00766	0.00214	0.00129	0.0002	0.00028	0.00003				
14	2002	1400.71	0	0	0	0	0	0	0.00021	0.00088	0.0077	0.11706	0.25059	0.22867	0.16247	0.0747	0.04111
	0.02778	0.02263	0.01735	0.01323	0.01152	0.00715	0.00531	0.00477	0.00443	0.00109	0.0007	0.00042	0.00021				
14	2003	1910.03	0	0	0	0	0	0	0.00054	0.00096	0.0148	0.15005	0.24634	0.20051	0.12408	0.08137	0.0542
	0.03772	0.02223	0.01839	0.01275	0.0085	0.00649	0.00488	0.00866	0.00514	0.00149	0.00033	0.00057	0				
14	2004	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				
14	2005	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				
14	2006	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				
14	2007	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				
14	2008	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				
15	1981	35.68	0	0	0	0	0.0828	0.21612	0.0758	0.2211	0.05052	0.00701	0.15232	0.09404	0.05052	0	0
	0.04351	0	0	0	0	0.00275	0	0	0.0035	0	0	0	0				
15	1982	3.18	0	0	0.19146	0.12764	0	0.14898	0.45386	0.06382	0	0	0	0	0.00711	0	0.00711
	0	0	0	0	0	0	0	0	0	0	0	0	0				
15	1983	0.86	0	0	0	0.00134	0	0	0	0	0.332	0.11044	0.33133	0.11044	0	0.00133	0.00133
	0.11111	0	0	0.00067	0	0	0	0	0	0	0	0	0				
15	1984	16.8	0	0	0	0	0.00709	0.02128	0.07801	0.06383	0.11347	0.09219	0.05674	0.14184	0.11347	0.07092	0.05674
	0.02841	0.02128	0.04964	0.04964	0.02837	0	0.00709	0	0	0	0	0	0				
15	1985	9.79	0	0	0	0	0	0	0.02477	0.22355	0.3042	0.05589	0.19561	0.02794	0.08383	0.02794	0
	0	0	0.02794	0.02794	0.00019	0.00019	0	0	0	0	0	0	0				

15	1986	32.45	0	0	0	0.00001	0	0.01351	0.00529	0.07237	0.09024	0.19155	0.1359	0.15575	0.06501	0.08786	0.09079
	0.02108	0.02108	0.00563	0	0.00088	0.00088	0.02108	0.02108	0	0	0	0	0			
15	1987	55.24	0	0	0	0.02745	0.08423	0.23491	0.07922	0.08102	0.08441	0.04236	0.07286	0.02846	0.11541	0.01691	0.0047
	0.00027	0.06956	0.0288	0.0001	0.01382	0.01373	0	0.00018	0.00018	0.00134	0	0.00009	0			
15	1988	102.86	0	0	0	0.00807	0.0547	0.05697	0.11809	0.19193	0.08008	0.13189	0.13767	0.09053	0.05474	0.03871	0.0181
	0.00534	0.00023	0.00103	0.00023	0.00638	0	0	0.00534	0	0	0	0	0			
15	1989	18.09	0	0	0	0.02802	0.01006	0.02322	0.07217	0.21659	0.22328	0.07796	0.12611	0.05703	0.08231	0.04292	0.02314
	0.0006	0.0012	0	0.0006	0	0.00065	0	0.0006	0	0	0.0135	0	0			
15	1990	22.09	0	0	0.0032	0.00218	0	0.01584	0.02353	0.25216	0.19513	0.11349	0.08887	0.10096	0.05101	0.03923	0.03017
	0.00907	0.00907	0.017	0.00907	0.02216	0.00881	0	0.00907	0	0	0	0	0			
15	1991	956.46	0	0	0	0.00019	0.00076	0.00233	0.0606	0.26136	0.21452	0.16347	0.10786	0.08304	0.04453	0.02394	0.01441
	0.00784	0.0056	0.00349	0.00191	0.00122	0.0008	0.00076	0.00098	0.00019	0	0.00019	0	0			
15	1992	497.41	0	0	0	0.00083	0.00076	0.00481	0.07624	0.25059	0.21488	0.1613	0.10462	0.06878	0.03963	0.02527	0.0166
	0.01019	0.00736	0.00574	0.00521	0.00203	0.00089	0.00076	0.00197	0.00092	0.00028	0	0.00035	0			
15	1993	558.5	0	0	0	0	0.00033	0.00142	0.01151	0.19078	0.21324	0.19791	0.12667	0.09383	0.03923	0.03846	0.02671
	0.01831	0.01029	0.00782	0.00492	0.00538	0.00376	0.00364	0.00392	0.00133	0.00033	0.00021	0	0			
15	1994	724.98	0	0	0.00573	0.00164	0.00082	0.00191	0.00448	0.0534	0.22497	0.16055	0.14168	0.12832	0.08382	0.05842	0.03793
	0.02522	0.01699	0.0135	0.0117	0.01002	0.00837	0.00352	0.00525	0.00141	0.00036	0	0	0			
15	1995	51.62	0	0	0	0	0	0	0.00067	0.01214	0.10332	0.15808	0.16635	0.15208	0.07079	0.09646	0.074
	0.02307	0.0116	0.0218	0.00546	0.01402	0.01949	0.02186	0.03041	0.01226	0	0.00067	0	0.00546			
15	1996	27.5	0	0	0	0.00127	0	0	0.00127	0.01741	0.06308	0.12951	0.09751	0.11168	0.17317	0.06015	0.09905
	0.04052	0.01721	0.15075	0.0074	0.00127	0.01214	0.00127	0.01408	0.00127	0	0	0	0			
15	1997	416.19	0	0	0	0.00102	0	0.00267	0.00051	0.00805	0.18513	0.3481	0.21278	0.10058	0.04288	0.02232	0.01374
	0.01297	0.012	0.0105	0.00444	0.00401	0.00774	0.00381	0.00357	0.00159	0.00051	0.00108	0	0			
15	1998	430.42	0	0	0	0	0	0	0	0.00773	0.04982	0.19406	0.29097	0.16621	0.11688	0.08058	0.04386
	0.02066	0.00804	0.00336	0.00466	0.0052	0.0052	0.0026	0.00014	0	0	0	0	0			
15	1999	312.13	0	0	0	0	0	0.00487	0	0.00162	0.02112	0.2037	0.26927	0.21437	0.11713	0.054	0.04292
	0.01917	0.01652	0.01562	0.00969	0.00169	0.00201	0.00266	0.002	0	0.00162	0	0	0			
15	2000	861.26	0	0	0	0	0.00182	0.00136	0.00346	0.00409	0.02376	0.20849	0.2686	0.17436	0.11885	0.06868	0.03895
	0.03375	0.01779	0.01072	0.00929	0.00333	0.00369	0.00446	0.0043	0.00024	0	0	0	0			
15	2001	682.45	0	0	0	0	0	0	0.00053	0.00266	0.01046	0.20602	0.29154	0.15483	0.09056	0.06363	0.04991
	0.0404	0.02476	0.01533	0.00823	0.00651	0.01136	0.00642	0.01217	0.00228	0.00172	0.00067	0	0			
15	2002	874.99	0	0	0	0	0	0	0.00142	0.00049	0.01255	0.19581	0.26521	0.17789	0.11667	0.08244	0.05605
	0.03104	0.01356	0.01148	0.00876	0.00839	0.00648	0.00279	0.0064	0.00184	0.00025	0.00046	0	0			
15	2003	843.82	0	0	0	0	0	0	0	0	0.01562	0.19902	0.28288	0.18116	0.11509	0.07335	0.03582
	0.03098	0.0184	0.01267	0.00876	0.00709	0.00383	0.00469	0.00537	0.00454	0.00061	0.00011	0	0			
15	2004	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			
15	2005	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			
15	2006	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			
15	2007	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			
15	2008	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			
16	1981	1.55	0	0	0	0	0	0.4	0.2	0.2	0.05	0.05	0	0	0	0	0.05
	0	0	0	0	0	0	0	0	0.05	0	0	0	0			

16	1982	13.61	0	0	0	0	0	0	0.14286	0	0.07143	0.07143	0	0.07143	0	0.28571	0
	0.35714	0	0	0	0	0	0	0	0	0	0	0	0				
16	1983	54.11	0	0	0.0361	0.1266	0.01805	0.07344	0.2894	0.14615	0.07432	0.03667	0.0905	0.07245	0.0361	0	0
	0	0	0	0	0	0.00021	0	0	0	0	0	0	0				
16	1984	20.51	0	0	0	0.05693	0.02301	0.12957	0.19854	0.15923	0.1011	0.12386	0.09641	0.0532	0.02157	0	0.0092
	0.02276	0.0046	0	0	0	0	0	0	0	0	0	0	0				
16	1985	41.97	0	0	0	0.01915	0.04843	0.25344	0.13556	0.18949	0.23385	0.03654	0	0.06852	0.00044	0	0
	0.0137	0.00044	0	0	0	0.00044	0	0	0	0	0	0	0				
16	1986	75.74	0	0	0.00062	0.06237	0.17442	0.16713	0.13976	0.13941	0.15933	0.03737	0.0572	0.01746	0.01746	0	0.005
	0	0.005	0	0	0.01	0	0	0	0.00746	0	0	0	0				
16	1987	44.35	0	0	0	0.03288	0.12455	0.20361	0.14743	0.20509	0.09015	0.08936	0.05156	0.02177	0.00191	0.00191	0
	0.00993	0	0	0	0	0	0	0.01986	0	0	0	0	0				
16	1988	25	0	0	0.04	0.2	0.12	0.28	0.08	0.04	0.04	0	0	0.04	0.08	0.04	0.04
	0	0	0	0	0	0	0	0	0	0	0	0	0				
16	1989	22.8	0	0	0	0.01734	0.01734	0.35084	0.10505	0.01734	0.13157	0.21111	0.10555	0	0.00867	0	0
	0	0	0.03518	0	0	0	0	0	0	0	0	0	0				
16	1990	18.57	0	0	0	0.005	0	0.15605	0.29709	0.15605	0.29709	0.0687	0.005	0	0.01001	0	0
	0.005	0	0	0	0	0	0	0	0	0	0	0	0				
16	1991	9.59	0	0	0	0	0	0.07316	0.03266	0.45832	0.16436	0.0601	0.10713	0.00653	0.05357	0	0
	0	0	0	0	0	0	0.04417	0	0	0	0	0	0				
16	1992	39.36	0	0	0	0	0.00792	0.01585	0.13323	0.21514	0.17817	0.09529	0.09759	0.08346	0.05835	0.04481	0.02142
	0.01748	0.00394	0	0.01551	0	0	0.00394	0	0.00394	0.00197	0.00197	0	0				
16	1993	36.83	0	0	0	0.00936	0.01872	0.0468	0.07303	0.15357	0.17838	0.06113	0.05396	0.04588	0.08332	0.08975	0.02808
	0.05266	0.03744	0.04753	0.00551	0	0.00936	0.00551	0	0	0	0	0	0				
16	1994	77.45	0	0	0	0	0	0.01724	0.08012	0.15666	0.08159	0.16347	0.06506	0.11679	0.0715	0.04563	0.00862
	0.01724	0.03701	0.04311	0.01367	0.03878	0.00252	0.02839	0	0.00756	0.00252	0.00252	0	0				
16	1995	46.03	0	0	0	0.00312	0.00624	0.00936	0.00312	0.0095	0.085	0.10637	0.15912	0.1682	0.08642	0.05224	0.00752
	0.09039	0.02185	0.04357	0.00871	0.01847	0.01847	0.0488	0.04288	0.00532	0.0022	0.00312	0	0				
16	1996	22.97	0	0	0	0	0	0	0	0.00092	0.04333	0.11915	0.41067	0.08837	0.19062	0.05468	0.01222
	0.04429	0.0113	0.00092	0.01038	0.00092	0	0	0	0.01222	0	0	0	0				
16	1997	359.15	0	0	0	0	0	0	0	0.00022	0.05911	0.17983	0.11192	0.12481	0.09731	0.07782	0.07983
	0.05263	0.04304	0.04128	0.01779	0.02658	0.01726	0.0207	0.02226	0.01498	0.00914	0.00176	0.00176	0				
16	1998	755.05	0	0	0	0.00138	0.00069	0	0.00006	0.00147	0.06031	0.21659	0.19643	0.14918	0.08744	0.05043	0.03168
	0.03781	0.02768	0.02202	0.01245	0.01594	0.0148	0.01358	0.02398	0.02146	0.00972	0.00418	0.00069	0				
16	1999	509.25	0	0	0	0	0	0	0	0.0003	0.02539	0.20543	0.18303	0.12409	0.09338	0.08202	0.03605
	0.03278	0.04148	0.01594	0.0166	0.01841	0.01613	0.01265	0.03927	0.03677	0.01549	0.00413	0.00067	0				
16	2000	22.75	0	0	0	0	0	0	0	0.00507	0.01434	0.0398	0.12955	0.1924	0.10229	0.19222	0.0596
	0.01918	0.01358	0.03068	0.01283	0.00863	0.00559	0.04106	0.08264	0.04633	0	0.0042	0	0				
16	2001	21.77	0	0	0	0	0	0	0	0.01906	0.01985	0.19119	0.11497	0.11792	0.15056	0.07471	0.07471
	0.04098	0.0732	0.05047	0.03293	0.01754	0.00439	0.00439	0.01316	0	0	0	0	0				
16	2002	185.26	0	0	0	0	0	0	0	0	0.00856	0.05448	0.13831	0.20367	0.16321	0.10036	0.08606
	0.04192	0.03938	0.04297	0.03284	0.0382	0.01551	0.01429	0.00712	0.00776	0.00059	0.00418	0.00059	0				
16	2003	143.13	0	0	0	0	0	0	0	0	0.00409	0.0964	0.11007	0.1753	0.14883	0.13017	0.05159
	0.04105	0.05742	0.01807	0.03125	0.01317	0.02465	0.03122	0.02804	0.02986	0.00881	0	0	0				
16	2004	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				
16	2005	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				

16	2006	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				
16	2007	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				
16	2008	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				
17	1981	7.5	0	0	0	0.09501	0.0441	0.13492	0.3592	0.14904	0.04581	0	0.03991	0	0.0165	0	0.0165
	0.033	0.0165	0	0	0	0	0.0165	0.033	0	0	0	0	0				
17	1982	70.84	0	0	0.02374	0.05822	0.07212	0.26732	0.21541	0.13478	0.06433	0.04765	0.03745	0.01724	0.0089	0.00593	0
	0.01483	0.00297	0	0.00593	0.00297	0.00593	0	0.01131	0.00297	0	0	0	0				
17	1983	200.22	0	0	0.00625	0.10177	0.0915	0.24649	0.12863	0.18997	0.08277	0.05831	0.05556	0.01509	0.00625	0.00116	0.00155
	0.0026	0.00063	0.00182	0.0017	0.00057	0.00005	0.00021	0.00398	0	0.00199	0	0.00057	0.00057				
17	1984	310.49	0	0	0.01077	0.09845	0.13874	0.1944	0.18577	0.10383	0.0634	0.05475	0.05466	0.03034	0.00701	0.01533	0.00704
	0.00247	0.00805	0.00385	0.00104	0.0041	0.00124	0.00039	0.00521	0.00254	0.00141	0.00074	0	0.00446				
17	1985	45.93	0	0	0.00231	0.01933	0.03313	0.17008	0.26151	0.12605	0.1153	0.01831	0.07982	0.045	0.04142	0.02415	0.00562
	0.00533	0.00086	0.00086	0.00086	0.01327	0.00436	0	0.00723	0.01643	0.00548	0	0	0.0033				
17	1986	1049.27	0	0	0.01292	0.09002	0.10657	0.17725	0.22352	0.1429	0.0787	0.04492	0.03116	0.02047	0.0147	0.01138	0.00708
	0.01087	0.00849	0.00499	0.00189	0.00344	0.00062	0.00096	0.00241	0.00253	0.00222	0	0	0				
17	1987	1299.73	0	0	0.00296	0.06011	0.07537	0.18051	0.27362	0.17741	0.10141	0.05275	0.02275	0.0153	0.00905	0.00513	0.00403
	0.00367	0.00314	0.0013	0.00108	0.00161	0.0011	0.00272	0.00324	0.00068	0.00052	0	0.00052	0				
17	1988	890.88	0	0	0.00139	0.04146	0.08276	0.14452	0.22047	0.1631	0.10394	0.0747	0.0446	0.03318	0.02287	0.01074	0.00655
	0.00496	0.00687	0.0037	0.00317	0.00198	0.00313	0.00887	0.01234	0.0047	0	0	0	0				
17	1989	746.4	0	0	0.00122	0.03619	0.07845	0.13484	0.2392	0.21048	0.11392	0.06062	0.03611	0.03629	0.02099	0.00807	0.00581
	0.00175	0.00102	0.00092	0.00257	0.00002	0.00132	0.00574	0.00366	0.00082	0	0	0	0				
17	1990	863.39	0	0	0.00127	0.00135	0.00929	0.06141	0.2348	0.2616	0.16316	0.10502	0.07873	0.03024	0.01767	0.01354	0.00715
	0.00536	0.00319	0.00289	0.00032	0.00115	0.00096	0.0009	0	0	0	0	0	0				
17	1991	1443.36	0	0	0.00003	0.00039	0.00144	0.00947	0.11406	0.29871	0.27129	0.07868	0.0965	0.06402	0.03479	0.00977	0.00331
	0.00422	0.00221	0.00059	0.00196	0.0009	0.00189	0.0013	0.00245	0.0008	0.0004	0.0004	0.00042	0				
17	1992	1513.54	0	0	0	0.00061	0.00457	0.01526	0.02203	0.15345	0.26494	0.23818	0.11753	0.05815	0.03719	0.02292	0.01272
	0.00898	0.01039	0.00527	0.00247	0.00456	0.00447	0.00566	0.00642	0.0032	0.00022	0.0005	0.0003	0				
17	1993	1218.48	0	0	0	0.0011	0.00325	0.00573	0.04432	0.16978	0.17995	0.18224	0.09979	0.07933	0.04908	0.04917	0.03257
	0.02402	0.01489	0.01411	0.01553	0.01166	0.00581	0.00455	0.00727	0.00396	0.0009	0.00067	0.0003	0				
17	1994	1933.63	0	0	0.00017	0.00047	0.00011	0.00079	0.01087	0.12196	0.27256	0.23363	0.13586	0.07323	0.04031	0.02928	0.01727
	0.01206	0.00902	0.00721	0.0067	0.00628	0.0049	0.00546	0.00864	0.00259	0.00033	0.0003	0	0				
17	1995	2033.7	0	0	0	0.00008	0.00021	0.00115	0.0009	0.0076	0.07536	0.24482	0.22681	0.15247	0.09446	0.05406	0.03342
	0.02138	0.01254	0.01135	0.01051	0.00633	0.00679	0.00786	0.02097	0.00739	0.00316	0.00005	0.00031	0.00003				
17	1996	1317.77	0	0	0	0.00018	0.00052	0.00116	0.00226	0.00684	0.05312	0.25319	0.22144	0.13362	0.10391	0.05834	0.03415
	0.03292	0.02107	0.02091	0.01081	0.00975	0.0074	0.0043	0.01239	0.00743	0.00214	0.0011	0.00104	0				
17	1997	837.43	0	0	0	0	0	0.00018	0.00151	0.00567	0.07362	0.22848	0.15338	0.11493	0.08942	0.07729	0.06664
	0.05179	0.04307	0.02202	0.02063	0.01858	0.01451	0.00672	0.00764	0.00332	0.00045	0.00015	0	0				
17	1998	1309.24	0	0	0	0.00038	0	0.00081	0.00195	0.0093	0.10782	0.2231	0.16868	0.1244	0.08783	0.06298	0.04098
	0.03733	0.0288	0.01905	0.0111	0.01317	0.01355	0.01143	0.0192	0.00828	0.00637	0.00199	0.0012	0.0003				
17	1999	365.85	0	0	0	0	0.00125	0.00188	0.00501	0.00893	0.07014	0.12239	0.08886	0.11466	0.12997	0.10695	0.08239
	0.05922	0.03921	0.02919	0.02862	0.02083	0.01733	0.01446	0.02862	0.01881	0.00698	0.00325	0.00104	0				
17	2000	382.36	0	0	0	0	0.00094	0.00141	0.00141	0.00911	0.06326	0.16155	0.19567	0.13151	0.0972	0.08493	0.05945
	0.03726	0.03246	0.02823	0.01626	0.0145	0.01527	0.00976	0.02215	0.01254	0.0043	0.00038	0.00044	0				
17	2001	489.73	0	0	0	0.0005	0	0.0005	0.00099	0.00706	0.05861	0.19086	0.20746	0.16975	0.0998	0.07765	0.04669
	0.0391	0.02319	0.01237	0.01395	0.00933	0.00925	0.00868	0.01087	0.00903	0.00345	0.00092	0	0				

17	2002	609.24	0	0	0	0.0003	0	0	0.00127	0.00425	0.02001	0.08382	0.18442	0.17514	0.13311	0.10032	0.06713
	0.05384	0.04678	0.02896	0.02375	0.01558	0.01447	0.00347	0.01802	0.01461	0.00722	0.0015	0.00135	0.00068				
17	2003	328.26	0	0	0	0	0	0	0	0.00373	0.00736	0.04567	0.16727	0.19746	0.20403	0.08364	0.09305
	0.02034	0.01071	0.0164	0.03461	0.00481	0.00779	0.02738	0.03317	0.03162	0.00715	0.00197	0	0.00186				
17	2004	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				
17	2005	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				
17	2006	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				
17	2007	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				
17	2008	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				
18	1981	11.42	0	0	0	0.125	0.0625	0	0	0.0625	0.125	0.25	0.125	0	0.0625	0	0.0625
	0.0625	0	0	0	0.0625	0	0	0	0	0	0	0	0				
18	1982	2.88	0	0	0	0.15573	0	0.19467	0.23361	0.07787	0.03893	0	0.07787	0.05686	0.10399	0.01076	0
	0	0.01076	0	0	0	0	0	0.03893	0	0	0	0	0				
18	1983	825.65	0	0	0.00158	0.14951	0.17627	0.20112	0.16084	0.10167	0.0697	0.04396	0.04051	0.01767	0.00948	0.00685	0.00474
	0.00369	0.00134	0.00263	0.00474	0.00053	0	0	0.00158	0.00053	0.00053	0.00053	0	0				
18	1984	42.43	0	0	0.00487	0.06984	0.09796	0.25922	0.25103	0.10575	0.06027	0.09336	0.02007	0.01471	0.01021	0	0.00072
	0.00712	0.00139	0.0007	0.0007	0.00139	0	0.0007	0	0	0	0	0	0				
18	1985	76.2	0	0	0.012	0.18027	0.10219	0.08244	0.07585	0.10121	0.16825	0.08901	0.06812	0.03927	0.03482	0.01353	0.00093
	0.02129	0	0	0.00541	0.00271	0	0.00271	0	0	0	0	0	0				
18	1986	1718.3	0	0	0.00419	0.18766	0.23537	0.17886	0.12409	0.09054	0.05981	0.0379	0.02478	0.01791	0.0085	0.0056	0.00557
	0.00438	0.0024	0.00074	0.00069	0.00137	0.00195	0.00153	0.0014	0.00204	0.00135	0.00034	0.00103	0				
18	1987	1317.67	0	0	0.00145	0.10601	0.13346	0.15497	0.15929	0.1555	0.10577	0.0668	0.03068	0.02759	0.01568	0.0129	0.0059
	0.00451	0.00493	0.00351	0.00233	0.00064	0.00115	0	0.00233	0.00288	0.00173	0	0	0				
18	1988	400.19	0	0	0	0.06645	0.10576	0.09463	0.12704	0.12186	0.10865	0.10187	0.07087	0.0453	0.03598	0.0184	0.00984
	0.01841	0.00682	0.00268	0.00361	0.00804	0.00536	0.00466	0.01072	0.00804	0.01521	0.00716	0.00268	0				
18	1989	891.59	0	0	0.00042	0.04213	0.09329	0.17019	0.19801	0.15874	0.15043	0.07845	0.0446	0.03127	0.01474	0.00389	0.00393
	0.00224	0.00004	0.00055	0.00013	0.00055	0.0011	0.00122	0.00134	0.0011	0.00165	0	0	0				
18	1990	317.35	0	0	0.00017	0.00253	0.00426	0.01974	0.24672	0.31737	0.2037	0.08012	0.05546	0.01847	0.01721	0.01148	0.00829
	0.0031	0.00017	0.00411	0.00139	0	0.00139	0.00139	0.00279	0	0.00016	0	0	0				
18	1991	500.6	0	0	0	0.00702	0.01692	0.02156	0.08955	0.23588	0.32208	0.09989	0.0791	0.04848	0.0262	0.01117	0.00583
	0.0079	0.00507	0.00431	0.00222	0.00288	0.00327	0.00283	0.0042	0.00303	0.00058	0	0	0				
18	1992	1178.83	0	0	0	0.00016	0.00054	0.00278	0.01871	0.12707	0.20307	0.19677	0.17504	0.11426	0.04124	0.02813	0.0203
	0.01067	0.00974	0.00885	0.00432	0.00804	0.00356	0.00597	0.01035	0.00705	0.00108	0.00224	0	0.00008				
18	1993	1333.99	0	0	0	0	0.00145	0.00517	0.03416	0.194	0.22537	0.18699	0.10597	0.06295	0.03379	0.02625	0.01554
	0.01898	0.01052	0.01457	0.01097	0.01584	0.01399	0.0103	0.01103	0.0013	0.00023	0.00061	0	0				
18	1994	747.68	0	0	0	0.00122	0.00122	0.00039	0.00948	0.09128	0.2422	0.2028	0.14789	0.08563	0.05493	0.03631	0.0285
	0.02231	0.01954	0.00659	0.0083	0.0061	0.00699	0.00738	0.01358	0.00555	0.00183	0	0	0				
18	1995	859.27	0	0	0	0	0	0.001	0.00073	0.00571	0.10122	0.27694	0.2042	0.13671	0.07098	0.03749	0.0409
	0.02429	0.01947	0.01448	0.00754	0.01266	0.01112	0.00832	0.0135	0.00951	0.00112	0.0021	0	0				
18	1996	524.3	0	0	0.00093	0.00016	0	0.00016	0	0.00101	0.04959	0.18525	0.17476	0.17354	0.09022	0.09724	0.0696
	0.04269	0.02948	0.01454	0.017	0.01245	0.0047	0.00648	0.01227	0.01217	0.00485	0.00091	0	0				
18	1997	277.43	0	0	0	0	0	0.00051	0	0.00687	0.06833	0.25697	0.21567	0.16383	0.10366	0.05133	0.04255
	0.0234	0.02401	0.01166	0.01098	0.00411	0.00362	0.0049	0.00297	0.00267	0.00192	0.00004	0	0				

```
18	1998	253.8	0	0	0	0	0	0.00159	0.00159	0.00978	0.12178	0.24251	0.1843	0.10294	0.08245	0.04865	0.03943
	0.03689	0.01637	0.01539	0.01596	0.00978	0.01194	0.00769	0.00686	0.01275	0.01009	0.01487	0.00636	0
18	1999	81.07	0	0	0	0.00868	0	0	0	0	0.15626	0.29516	0.22337	0.10576	0.07421	0.0379	0.02604
	0.02763	0.02604	0.00868	0	0	0.00159	0.00868	0	0	0	0	0	0
18	2000	129.71	0	0	0	0.01066	0.00178	0	0	0.00034	0.04112	0.12344	0.29789	0.15242	0.086	0.05395	0.03669
	0.03558	0.0093	0.03054	0.02705	0.00933	0.02705	0.01629	0.03435	0.00137	0.00034	0.00449	0	0
18	2001	241.02	0	0	0	0	0	0	0	0.0046	0.01472	0.14045	0.20543	0.18038	0.12897	0.09244	0.05261
	0.05833	0.03562	0.01875	0.01436	0.01707	0.00994	0.00546	0.01129	0.00717	0.00018	0	0.00221	0
18	2002	178.3	0	0	0	0.00083	0	0.00083	0	0.00107	0.02135	0.10336	0.13711	0.14179	0.07543	0.09142	0.08242
	0.05035	0.08436	0.04334	0.01835	0.02046	0.03963	0.01998	0.03544	0.02583	0.00392	0.00274	0	0
18	2003	307.53	0	0	0	0	0	0	0	0	0.00053	0.08068	0.28452	0.15168	0.12387	0.09804	0.08204
	0.06988	0.02307	0.02258	0.0159	0	0.00673	0.00678	0.00673	0.01795	0.00902	0	0	0
18	2004	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
18	2005	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
18	2006	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
18	2007	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
18	2008	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
#####################################################
# STOCK COMPOSITION DATA   (may be more than 1 set time series fishery, multinomial distribution assumed)
#####################################################
# number of series (If there are no series,there should be no more entries in this section)
 8
# series
# |  pdf (0=don't use)
# |  |  zone where caught
# |  |  |  year
# |  |  |  |   season
# |  |  |  |   |    age
# |  |  |  |   |    |    number observed from each stock
# |  |  |  |   |    |    |
 1  0       1  2001 2    1    27.69 2.31
 2  0  1  2001 2    2    27.21        2.79
 3  0       1  2001 2    4    13.3          0.7
 4  0       1  2001 2    5    24.6          5.4
 5  0       2  2001 2    1     0             35
 6  0       2  2001 2    2     0     59
 7  0       2  2001 2    4     2.484               36.516
 8  0       2  2001 2    5    10.74 35.26
#####################################################
# FECUNDITY INFORMATION
#####################################################
# integer vector identifying spawning zone of each stock: should be one entry
# for each stock. If you wish to specify spawning as dependent on origin rather than location, enter 0
```

```
 1 2
# integer vector mapping fecundity of each stock to growth parameters: should be one entry (growth parameter set number)
# for each stock. If you wish to specify fecundity using only the product of the two input matrices below, enter 0
 0 0
# seasonal effect on relative fecundity (if only 1 season, just enter 1.0)
# stock (first column)
# |    seasonal entries (1 per season)
# |    1     2     3     4
# |    |     |     |     |
 1   0.0   1.0   0.0
 2   0.0   1.0   0.0
# age effect on relative fecundity (may include things like maturity)
# stock (first column)
# |    age entries (one entry for each age class in the analysis, including ages older than the plus group if there are any )
# |  0  1    2    3    4    5    6    7    8    9    10   11   12   13   14   15   16   17   18   19   20   21   22   23   24   25   26   27   28   29   30
# |  |  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
 1  0  0.000   0.005   0.033   0.100   0.202   0.324   0.448   0.571   0.667   0.746   0.809   0.857   0.894   0.922   0.942   0.958   0.969
       0.977   0.983   0.988   0.991   0.994   0.995   0.997   0.997   0.998   0.999   0.999   0.999   1
 2  0  0.000   0.005   0.033   0.100   0.202   0.324   0.448   0.571   0.667   0.746   0.809   0.857   0.894   0.922   0.942   0.958   0.969
       0.977   0.983   0.988   0.991   0.994   0.995   0.997   0.997   0.998   0.999   0.999   0.999   1
####################################################
# PROJECTION AND BENCHMARK SPECIFICATIONS
####################################################
# Estimate all parameters?
#   0=no, fix to initial values (recommend using -binp "filename" or -ainp "filename" command line options)
#   1=yes (make this choice if you wish to incorporate parameter uncertainty or don't have good initial values) )
 1
# Input first and last years of the range used to compute "current" levels of effort (current effort = geometric mean of the efforts observed during those years)
#   (Make sure the years selected are less than or equal to the last year of the modern period defined in the control file.)
 2006 2008
# Integer value indicating whether to define benchmarks based on (0) all stocks combined or (i) stock i
 0
# Integer values indicating whether the effort level of each fishery is to be
#   (0) held at current levels (e.g., bycatch of a fishery that cannot be controlled)
#   (1) scaled up or down by benchmark multiplier
# when computing benchmark statistics
 1 1 1 1 1 1 0 0 0 0
# Effort modifiers to use when computing benchmark statistics. Enter a vector with one entry per fishery.
#   (The benchmark routine assumes the relative effort allocation among fleets is at current levels multiplied by these modifiers)  init_vector   opt_effort_modifier(1,n_fisheries)     // multipliers to
increase or decrease effort of each fishery relative to 'current' levels
 1 1 1 1 1 1 .9 .9 .4 .4
# Number of spawning potential ratios to evaluate (must be at least 1)
 3
# Spawning potential ratios (in percent) to evaluate
#   (The benchmark routine assumes the relative effort allocation among fleets is at current levels multiplied by these modifiers)  init_vector   opt_effort_modifier(1,n_fisheries)     // multipliers to
increase or decrease effort of each fishery relative to 'current' levels
 26 30 30
# 'Variance' of penalty for estimating F_SPR using objective function (negative value means don't do it, lower value means greater penalty)
```

```
 -0.01001
# Allow recruitment deviations in projections (0 = no, + = yes)
  0
# Effort controls reflecting policies to project
#   year
#   |      type of effort control (0 = no fishing, 1=current level, 2=MSY level, 3=SPR level corresponding to first entry on preceding line, >100 TAC for landings of directed fleet in weight)
#   |      |     effort modifiers- program multiplies current effort allocation by these values
#   |      |     | (a vector with one entry per fishery)
    2009   5234849    1 1 1 1 1 1 .9 .9 .26 .26
    2010   6749780    1 1 1 1 1 1 .9 .9 .26 .26
    2011   3          1 1 1 1 1 1 .9 .9 0.330  0.330
    2012   3          1 1 1 1 1 1 .9 .9 0.333  0.333
    2013   3          1 1 1 1 1 1 .9 .9 0.337  0.337
    2014   3          1 1 1 1 1 1 .9 .9 0.340  0.340
    2015   3          1 1 1 1 1 1 .9 .9 0.343  0.343
    2016   3          1 1 1 1 1 1 .9 .9 0.347  0.347
    2017   3          1 1 1 1 1 1 .9 .9 0.350  0.350
    2018   3          1 1 1 1 1 1 .9 .9 0.353  0.353
    2019   3          1 1 1 1 1 1 .9 .9 0.357  0.357
    2020   3          1 1 1 1 1 1 .9 .9 0.360  0.360
    2021   3          1 1 1 1 1 1 .9 .9 0.363  0.363
    2022   3          1 1 1 1 1 1 .9 .9 0.367  0.367
    2023   3          1 1 1 1 1 1 .9 .9 0.370  0.370
    2024   3          1 1 1 1 1 1 .9 .9 0.373  0.373
    2025   3          1 1 1 1 1 1 .9 .9 0.377  0.377
    2026   3          1 1 1 1 1 1 .9 .9 0.380  0.380
    2027   3          1 1 1 1 1 1 .9 .9 0.383  0.383
    2028   3          1 1 1 1 1 1 .9 .9 0.387  0.387
    2029   3          1 1 1 1 1 1 .9 .9 0.390  0.390
    2030   3          1 1 1 1 1 1 .9 .9 0.393  0.393
    2031   3          1 1 1 1 1 1 .9 .9 0.397  0.397
    2032   3          1 1 1 1 1 1 .9 .9 0.400  0.400
# Minimum size limits for projections
#   year
#   |      size limit for each fishery
#   |      |
    2009   13 13 13 13 16 16 0 0 0 0
    2010   13 13 13 13 16 16 0 0 0 0
    2011   13 13 13 13 16 16 0 0 0 0
    2012   13 13 13 13 16 16 0 0 0 0
    2013   13 13 13 13 16 16 0 0 0 0
    2014   13 13 13 13 16 16 0 0 0 0
    2015   13 13 13 13 16 16 0 0 0 0
    2016   13 13 13 13 16 16 0 0 0 0
    2017   13 13 13 13 16 16 0 0 0 0
    2018   13 13 13 13 16 16 0 0 0 0
    2019   13 13 13 13 16 16 0 0 0 0
    2020   13 13 13 13 16 16 0 0 0 0
```

```
2021   13 13 13 13 16 16 0 0 0 0
2022   13 13 13 13 16 16 0 0 0 0
2023   13 13 13 13 16 16 0 0 0 0
2024   13 13 13 13 16 16 0 0 0 0
2025   13 13 13 13 16 16 0 0 0 0
2026   13 13 13 13 16 16 0 0 0 0
2027   13 13 13 13 16 16 0 0 0 0
2028   13 13 13 13 16 16 0 0 0 0
2029   13 13 13 13 16 16 0 0 0 0
2030   13 13 13 13 16 16 0 0 0 0
2031   13 13 13 13 16 16 0 0 0 0
2032   13 13 13 13 16 16 0 0 0 0


#////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////
#// PREHISTORIC EFFORT FILE FOR PROGRAM CATCHEM_AD
#//
#//   Important notes:
#//    (1) Comments may be placed BEFORE or AFTER any line of data, however they MUST begin
#//        with a # symbol in the first column.
#//    (2) No comments of any kind may appear on the same line as the data (the #
#//        symbol will not save you here)
#//    (3) Blank lines without a # symbol are not allowed.
#//
#/////////////////////////////////////////////////////////////////////////////
#/////////////////////////////////////////////////////////////////////////////
#
#-------------------------------------------------------------------------------------------
# Number of years included in this file
# (must be greater than or equal to the number of annual age classes)
#-------------------------------------------------------------------------------------------
 137
#
#-------------------------------------------------------------------------------------------
# 'Prehistoric' effort data
#-------------------------------------------------------------------------------------------
# Year (must be entered sequentially in ascending order starting from the first year
# |     of the data period minus the number of age classes (or earlier) and
# |     ending with the year prior to the data period (or later)
# |
# |     Fisheries -------->
# |     1     2     3 ...
# |     |     |     |
# -     -     -     -
1872    0.03    0    0    0    0    0    0.00    0.00    0.00    0.00
1873    0.04    0    0    0    0    0    0.00    0.00    0.00    0.00
1874    0.06    0    0    0    0    0    0.00    0.00    0.00    0.00
1875    0.08    0    0    0    0    0    0.00    0.00    0.00    0.00
```

1876	0.09	0	0	0	0	0	0.00	0.00	0.00	0.00
1877	0.08	0	0	0	0	0	0.00	0.00	0.00	0.00
1878	0.07	0	0	0	0	0	0.00	0.00	0.00	0.00
1879	0.08	0	0	0	0	0	0.00	0.00	0.00	0.00
1880	0.10	0.01	0	0	0	0	0.00	0.00	0.00	0.00
1881	0.15	0.02	0	0	0	0	0.00	0.00	0.00	0.00
1882	0.18	0.02	0	0	0	0	0.00	0.00	0.00	0.00
1883	0.17	0.03	0	0	0	0	0.00	0.00	0.00	0.00
1884	0.18	0.04	0	0	0	0	0.00	0.00	0.00	0.00
1885	0.19	0.04	0	0	0	0	0.00	0.00	0.00	0.00
1886	0.23	0.05	0	0	0	0	0.00	0.00	0.00	0.00
1887	0.24	0.05	0	0	0	0	0.00	0.00	0.00	0.00
1888	0.24	0.06	0	0	0	0	0.00	0.00	0.00	0.00
1889	0.25	0.08	0	0	0	0	0.00	0.00	0.00	0.00
1890	0.24	0.08	0	0	0	0	0.00	0.00	0.00	0.00
1891	0.24	0.08	0	0	0	0	0.00	0.00	0.00	0.00
1892	0.24	0.09	0	0	0	0	0.00	0.00	0.00	0.00
1893	0.24	0.09	0	0	0	0	0.00	0.00	0.00	0.00
1894	0.24	0.09	0	0	0	0	0.00	0.00	0.00	0.00
1895	0.24	0.10	0	0	0	0	0.00	0.00	0.00	0.00
1896	0.21	0.09	0	0	0	0	0.00	0.00	0.00	0.00
1897	0.19	0.10	0	0	0	0	0.00	0.00	0.00	0.00
1898	0.20	0.09	0	0	0	0	0.00	0.00	0.00	0.00
1899	0.20	0.09	0	0	0	0	0.00	0.00	0.00	0.00
1900	0.22	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1901	0.22	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1902	0.22	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1903	0.21	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1904	0.20	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1905	0.19	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1906	0.18	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1907	0.16	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1908	0.16	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1909	0.14	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1910	0.12	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1911	0.13	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1912	0.14	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1913	0.15	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1914	0.16	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1915	0.16	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1916	0.17	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1917	0.18	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1918	0.19	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1919	0.20	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1920	0.21	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1921	0.22	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1922	0.23	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1923	0.24	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1924	0.24	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1925	0.26	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1926	0.26	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1927	0.27	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1928	0.24	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1929	0.24	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1930	0.16	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1931	0.15	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1932	0.16	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1933	0.15	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1934	0.14	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1935	0.18	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1936	0.30	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1937	0.27	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1938	0.29	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1939	0.37	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1940	0.26	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1941	0.24	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1942	0.20	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1943	0.15	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1944	0.18	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1945	0.16	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1946	0.26	0.16	0.00	0.00	0.52	0.64	0.00	0.00	0.00	0.00
1947	0.29	0.17	0.00	0.00	0.54	0.66	0.00	0.00	0.00	0.00
1948	0.28	0.17	0.00	0.00	0.56	0.69	0.00	0.00	0.00	0.15
1949	0.33	0.19	0.00	0.00	0.58	0.71	0.00	0.00	0.00	0.24
1950	0.31	0.19	0.00	0.00	0.60	0.73	0.00	0.00	0.16	0.30
1951	0.38	0.14	0.00	0.00	0.64	0.76	0.00	0.00	0.28	0.31
1952	0.30	0.10	0.00	0.00	0.68	0.78	0.00	0.00	0.33	0.37
1953	0.30	0.09	0.00	0.00	0.72	0.81	0.00	0.00	0.36	0.36
1954	0.37	0.21	0.00	0.00	0.76	0.84	0.00	0.00	0.46	0.47
1955	0.47	0.32	0.00	0.00	0.80	0.86	0.00	0.00	0.55	0.39
1956	0.58	0.50	0.00	0.00	0.84	0.89	0.00	0.00	0.69	0.51
1957	0.42	0.69	0.00	0.00	0.88	0.92	0.00	0.00	0.76	0.64
1958	0.67	0.71	0.00	0.00	0.92	0.95	0.00	0.00	0.80	0.98
1959	1.46	1.20	0.00	0.00	0.96	0.97	0.00	0.00	0.87	1.05
1960	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00
1961	1.00	1.00	0.00	0.00	1.03	1.02	0.00	0.00	0.73	0.80
1962	1.00	1.00	0.00	0.00	1.06	1.04	0.00	0.00	0.69	0.78
1963	1.00	1.00	0.00	0.00	1.09	1.05	0.00	0.00	0.78	0.90
1964	1.00	1.00	0.00	0.00	1.12	1.07	0.00	0.00	0.92	0.82
1965	1.00	1.00	0.00	0.00	1.15	1.09	0.00	0.00	1.00	0.94
1966	1.00	1.00	0.00	0.00	1.18	1.11	0.00	0.00	0.94	0.99
1967	1.00	1.00	0.00	0.00	1.20	1.13	0.00	0.00	0.89	1.24
1968	1.00	1.00	0.00	0.00	1.23	1.14	0.00	0.00	1.05	1.08
1969	1.00	1.00	0.00	0.00	1.26	1.16	0.00	0.00	1.02	1.44
1970	1.00	1.00	0.00	0.00	1.29	1.18	0.00	0.00	1.01	1.30
1971	1.00	1.00	0.00	0.00	1.35	1.21	0.00	0.00	0.87	1.36

1972	1.00	1.00	0.00	0.00	1.40	1.23	0.00	0.00	0.94	1.48
1973	1.00	1.00	0.00	0.00	1.45	1.26	0.00	0.00	1.03	1.18
1974	1.00	1.00	0.00	0.00	1.51	1.29	0.00	0.00	1.00	1.17
1975	1.00	1.00	0.00	0.00	1.56	1.31	0.00	0.00	1.00	1.10
1976	1.00	1.00	0.00	0.00	1.61	1.34	0.00	0.00	0.92	1.28
1977	1.00	1.00	0.00	0.00	1.67	1.37	0.00	0.00	1.09	1.10
1978	1.00	1.00	0.00	0.00	1.72	1.39	0.00	0.00	0.85	1.29
1979	1.00	1.00	0.00	0.00	1.77	1.42	0.00	0.00	0.87	1.34
1980	1.00	1.00	1.00	1.00	1.83	1.45	0.00	0.00	0.53	0.81
1981	1.00	1.00	1.00	1.00	1.88	1.45	0.00	0.00	0.84	1.26
1982	1.00	1.00	1.00	1.00	1.88	1.45	0.00	0.00	0.83	1.28
1983	1.00	1.00	1.00	1.00	1.88	1.45	0.00	0.00	0.91	1.04
1984	1.00	1.00	1.00	1.00	1.88	1.45	0.00	0.00	1.07	1.32
1985	1.00	1.00	1.00	1.00	1.88	1.45	0.00	0.00	1.03	1.28
1986	1.00	1.00	1.00	1.00	1.88	1.45	0.00	0.00	1.07	1.77
1987	1.00	1.00	1.00	1.00	1.88	1.45	0.00	0.00	0.87	1.81
1988	1.00	1.00	1.00	1.00	1.88	1.45	0.00	0.00	0.82	1.75
1989	1.00	1.00	1.00	1.00	1.88	1.45	0.00	0.00	0.99	1.58
1990	1.00	1.00	1.00	1.00	1.88	1.45	0.00	0.00	0.87	1.52
1991	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	0.89	1.84
1992	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	1.08	1.90
1993	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	0.90	1.88
1994	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	0.93	1.51
1995	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	1.10	1.31
1996	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	1.24	1.38
1997	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	1.31	1.67
1998	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	1.64	1.52
1999	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	1.01	1.43
2000	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	0.87	1.56
2001	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	0.98	1.67
2002	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	1.16	1.97
2003	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	0.97	1.59
2004	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	0.96	1.46
2005	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	0.81	1.06
2006	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	0.52	0.79
2007	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	0.39	0.64
2008	1.00	1.00	1.00	1.00	1.88	1.45	1.00	1.00	0.26	0.45

Integer values indicating whether the effort level of each fishery is to be
(0) held at current levels (e.g., bycatch of a fishery that cannot be controlled)
(1) scaled up or down by benchmark multiplier
when computing benchmark statistics
 1 1 1 1 1 1 0 0 0 0
Effort modifiers to use when computing benchmark statistics. Enter a vector with one entry per fishery.
(The benchmark routine assumes the relative effort allocation among fleets is at current levels multiplied by these modifiers) init_vector   opt_effort_modifier(1,n_fisheries)   // multipliers to increase or decrease effort of each fishery relative to 'current' levels
 1 1 1 1 1 1 .9 .9 .36 .36
note here I am computing F26% based on an average reduction in shrimping after 2010 of 65% (start 67%, end 60%)
just rying to get the time series to converge to 26% SPR right at 2032

AD

```
2009   5234849
2010   6749780
2011   3
2012   3
2013   3
2014   3
2015   3
2016   3
2017   3
2018   3
2019   3
2020   3
2021   3
2022   3
2023   3
2024   3
2025   3
2026   3
2027   3
2028   3
2029   3
2030   3
2031   3
2032   3
```

 //
#///
#// PARAMETER FILE FOR PROGRAM CATCHEM_AD
#//
#//   Important notes:
#//   (1) Comments may be placed BEFORE or AFTER any line of data, however they MUST begin
#//   with a # symbol in the first column.
#//   (2) No comments of any kind may appear on the same line as the data (the #

```
#//        symbol will not save you here)
#//    (3) Blank lines without a # symbol are not allowed.
#//
#/////////////////////////////////////////////////////////////////////////////////////////////
#/////////////////////////////////////////////////////////////////////////////////////////////
#______________________________________________________________________________________________
#
# PRELIMINARIES
#______________________________________________________________________________________________
#
#============================================================================================
# Scale of variance parameters (1 = logarithmic scale, 2 = arithmetic scale)
#============================================================================================
 1
#============================================================================================
# Total number of process parameters in this file (estimated or not)
# note: if this number is wrong the program will either abort after
# the message "Initializing parameters" appears on your screen or
# flash a message like "variable out of bounds in bound pin: ...."
#============================================================================================
 90
#============================================================================================
# Number of sets of each class of parameters
# growth (g)  catch obs. variance  index obs. variance  effort obs. variance
# |          |                  |                  |
#============================================================================================
  1          1                  1                  1
#______________________________________________________________________________________________
#
# SPECIFICATIONS FOR PROCESS PARAMETERS
#
#            nature of function (1=constant, 2-3=polynomials, 13=process correlation, 14=process variance scaling parameter
#            |            best guess of parameter value (central tendency of prior)
#            |            |            lower bound for parameter
#            |            |            |            upper bound for parameter
#            |            |            |            |            phase of estimation (enter -1 to fix at best guess and not estimate)
#            |            |            |            |            |            probability density function of prior (0=none, 1=lognormal, 2=normal)
#            |            |            |            |            |            |            standard error (or negative CV) of prior
#            1            0.2          0.01         0.5    -3    1            0.25
#______________________________________________________________________________________________
#
#============================================================================================
# Natural mortality rate
#============================================================================================
             49           0.9833  0.01          1.0    -3    0            0.25
             49           0.59    0.01          1.0    -3    0            0.25
             49           0.1          0.01         0.5    -3    0            0.25
             49           0.1          0.01         0.5    -3    0            0.25
```

```
        49          0.1          0.01         1.0    -3    0            0.25
        49          0.1   0.01   0.5    -3    0            0.25
        49          0.1          0.01         0.5    -3    0            0.25
        49          0.1          0.01         0.5    -3    0            0.25
        49          0.1          0.01         1.0    -3    0            0.25
        49          0.1   0.01   0.5    -3    0            0.25
        49          0.1          0.01         0.5    -3    0            0.25
        49          0.1          0.01         0.5    -3    0            0.25
        49          0.1          0.01         1.0    -3    0            0.25
        49          0.1   0.01   0.5    -3    0            0.25
        49          0.1          0.01         0.5    -3    0            0.25
        49          0.1          0.01         0.5    -3    0            0.25
#==========================================================================================
# Recruitment (natures: 1=constant, 2=Bev-Holt, 3=Ricker, 4=Power)
#==========================================================================================
#   stock 1
#     prehistoric
        1           7.0e+07   1.0e+06   1.0e+10   -1      0          0.6630e-01
#     modern
        2           7.0e+07   1.0e+06   1.0e+10   1      0          0.6630e-01
        2    13.3     0.01          150.0      3      1           1.28
#-----------------------------------------------------------------------------------------
#   stock 2
#     prehistoric
        1           7.0e+07   1.0e+06   1.0e+10   -1      0          0.6630e-01
#     modern
        2           7.0e+07   1.0e+06   1.0e+10   1      0          0.6630e-01
        2    13.3     0.01          150.0      3      1           1.28
#==========================================================================================
# Growth (natures: 1 = constant, 2=Chapman-Richards, 3=Gompertz, 4=Power)
#==========================================================================================
     2   0.0004398   0      10      -1      0       0.1
     2   3.056       0      10      -1      0       0.1
     2   34.522      0      1000    -1      0       0.1
     2   0.220       0      10      -1      0       0.1
     2   0.366      -3      10      -1      0       0.1
     2   0.1000E+01  0      10      -1      0       0.1
#
# std. dev. in length at age (natures: 1 = constant, 2=linear)
     2   0         -0.01    1       -1      0       0.1
     2   0.16       0       1       -1      0       0.1
#==========================================================================================
# Fishery related parameters
#==========================================================================================
#   fishery 1 = Com HL E
#     q_fishery = catchability coefficient (1 = constant)
      1  0.1        1.e-4    1       1       0       0.1
#     q_index   = proportionality coefficient (1 = constant)
```

```
        1  0.1         1.e-4    1      1       0       0.1
#     vulnerability (not used)
        1  0.02000E+00 0        10     -1      0       0.1
#     discard mortality
        1  0.71       -1.e-5    1.001  -1      0       0.1
#------------------------------------------------------------------------------------------------------------------------
#   fishery 2 = Com HL W
#     q_fishery = catchability coefficient (1 = constant)
        1  0.1         1.e-4    1      1       0       0.1
#     q_index   = proportionality coefficient (1 = constant)
        1  0.1         1.e-4    1      1       0       0.1
#     vulnerability (not used)
        1  0.02000E+00 0        10     -1      0       0.1
#     discard mortality
        1  0.82       -1.e-5    1.001  -1      0       0.1
#------------------------------------------------------------------------------------------------------------------------
#   fishery 3 = Com LL E
#     q_fishery = catchability coefficient (1 = constant)
        1  0.01        1.e-4    1      1       0       0.1
#     q_index   = proportionality coefficient (1 = constant)
        1  0.1         1.e-4    1      -1      0       0.1
#     vulnerability (not used)
        1  0.02000E+00 0        10     -1      0       0.1
#     discard mortality
        1  0.71       -1.e-5    1.001  -1      0       0.1
#------------------------------------------------------------------------------------------------------------------------
#   fishery 4 = Com LL W
#     q_fishery = catchability coefficient (1 = constant)
        1  0.01        1.e-4    1      1       0       0.1
#     q_index   = proportionality coefficient (1 = constant)
        1  0.1         1.e-4    1      -1      0       0.1
#     vulnerability (not used)
        1  0.02000E+00 0        10     -1      0       0.1
#     discard mortality
        1  0.82       -1.e-5    1.001  -1      0       0.1
#------------------------------------------------------------------------------------------------------------------------
#   fishery 5 = Rec E
#     q_fishery = catchability coefficient (1 = constant)
        1  0.03        1.e-4    1      1       0       0.1
#     q_index   = proportionality coefficient (1 = constant)
        1  0.1         1.e-4    1      1       0       0.1
#     vulnerability (not used)
        1  0.02000E+00 0        10     -1      0       0.1
#     discard mortality
        1  0.150      -1.e-5    1.001  -1      0       0.1
#------------------------------------------------------------------------------------------------------------------------
#   fishery 6 = Rec W
#     q_fishery = catchability coefficient (1 = constant)
```

```
        1  0.03        1.e-4    1      1       0       0.1
#     q_index   = proportionality coefficient (1 = constant)
        1  0.1         1.e-4    1      1       0       0.1
#     vulnerability (not used)
        1  0.02000E+00 0        10     -1      0       0.1
#     discard mortality
        1  0.400      -1.e-5    1.001  -1      0       0.1
#--------------------------------------------------------------------------------------------------------------------------
#   fishery 7 = Closed season E
#     q_fishery = catchability coefficient (1 = constant)
        1  0.01        1.e-4    1      1       0       0.1
#     q_index   = proportionality coefficient (1 = constant)
        1  0.1         1.e-4    1      -1      0       0.1
#     vulnerability (not used)
        1  0.02000E+00 0        1      -1      0       0.1
#     discard mortality
        1  1.000E+00  -1.e-5    1.001  -1      0       0.1
#--------------------------------------------------------------------------------------------------------------------------
#   fishery 8 = Closed season W
#     q_fishery = catchability coefficient (1 = constant)
        1  0.01        1.e-4    1      1       0       0.1
#     q_index   = proportionality coefficient (1 = constant)
        1  0.1         1.e-4    1      -1      0       0.1
#     vulnerability (not used)
        1  0.02000E+00 0        10     -1      0       0.1
#     discard mortality
        1  1.000E+00  -1.e-5    1.001  -1      0       0.1
#--------------------------------------------------------------------------------------------------------------------------
#   fishery 9 = bycatch E
#     q_fishery = catchability coefficient (1 = constant)
        1  0.1         1.e-4    1      1       0       0.1
#     q_index   = proportionality coefficient (1 = constant)
        1  0.1         1.e-4    1      -1      0       0.1
#     vulnerability (not used)
        1  0.02000E+00 0        10     -1      0       0.1
#     discard mortality
        1  1.000E+00  -1.e-5    1.001  -1      0       0.1
#--------------------------------------------------------------------------------------------------------------------------
#   fishery 10 = bycatch W
#     q_fishery = catchability coefficient (1 = constant)
        1  0.1         1.e-4    1      1       0       0.1
#     q_index   = proportionality coefficient (1 = constant)
        1  0.1         1.e-4    1      -1      0       0.1
#     vulnerability (not used)
        1  0.02000E+00 0        10     -1      0       0.1
#     discard mortality
        1  1.000E+00  -1.e-5    1.001  -1      0       0.1
#==========================================================================================================
```

```
# Survey related parameters
#=============================================================================================
#   Survey 1 = Video E
#     q (catchability)
        1  0.1        1.e-3    100      1      0      0.1
#     vulnerability (not used)
        1  0.02000E+00 0       10     -1      0      0.1
#------------------------------------------------------------------------------------------------------------------------
#   Survey 2 = Video W
#     q (catchability)
        1  0.1        1.e-3    100      1      0      0.1
#     vulnerability (not used)
        1  0.02000E+00 0       10     -1      0      0.1
#------------------------------------------------------------------------------------------------------------------------
#   Survey 3 = Larval E
#     q (catchability)
        1  1.0        1.e-3    100      1      0      0.1
#     vulnerability (not used)
        1  0.02000E+00 0       10     -1      0      0.1
#------------------------------------------------------------------------------------------------------------------------
#   Survey 4 = Larval W
#     q (catchability)
        1  1.0        1.e-3    100      1      0      0.1
#     vulnerability (not used)
        1  0.02000E+00 0       10     -1      0      0.1
#------------------------------------------------------------------------------------------------------------------------
#   Survey 5 = Trawl Age 1 E
#     q (catchability)
        1  0.1        1.e-3    100      1      0      0.1
#     vulnerability (not used)
        1  0.02000E+00 0       10     -1      0      0.1
#------------------------------------------------------------------------------------------------------------------------
#   Survey 6 = Trawl Age 1 W
#     q (catchability)
        1  0.1        1.e-3    100      1      0      0.1
#     vulnerability (not used)
        1  0.02000E+00 0       10     -1      0      0.1
#------------------------------------------------------------------------------------------------------------------------
#   Survey 7 = Trawl Age 0 E
#     q (catchability)
        1  0.1        1.e-3    100      1      0      0.1
#     vulnerability (not used)
        1  0.02000E+00 0       10     -1      0      0.1
#------------------------------------------------------------------------------------------------------------------------
#   Survey 8 = Trawl Age 0 W
#     q (catchability)
        1  0.1        1.e-3    100      1      0      0.1
#     vulnerability (not used)
```

```
        1  0.02000E+00 0        10     -1      0       0.1
#------------------------------------------------------------------------------------------------------------------------
#
# observation error parameters
#_cdv_
      14  0.1000E+00  0       2       -1      0       0.1
#_idv_
      14  1.0000E+00  0       2       -1      0       0.1
#_edv_
      14  0.1000E+00  0       2       -1      0       0.1
#------------------------------------------------------------------------------------------------------------------------
#
#_over all variance
      1   -0.1      -10       -0.001      4       0     0.1
#
#___________________________________________________________________________________________________________________________
#
# SPECIFICATIONS FOR PROCESS DEVIATION PARAMETERS
#___________________________________________________________________________________________________________________________
#
#              best guess of parameter value (central tendency of prior)
#              |               lower bound for parameter
#              |                |       upper bound for parameter
#              |                |               |             phase of estimation (enter -1 to fix at best guess and not estimate)
#              |                |               |               |             probability density function of prior
#              |                |               |               |             |             standard error or negative CV of prior (superfluous in case of deviations)
#------------------------------------------------------------------------------------------------------------------------
#
# RECRUITMENT
#  r correlation coefficients
      0.0      -0.001    1.0      -1     0      0.1
#  r variances
      0.1484      0        100.0    -1     0              0.1
#  r deviations (1 line for each stock)
      0.0000   -5        5        4     1      0.016
      0.0000   -5        5        4     1      0.016
#------------------------------------------------------------------------------------------------------------------------
#
# EFFORT
#  effort correlation coefficients
      0.5      -0.001    1.0      -1     0      0.1
#  effort variances
      0.5       0        100.0    -1     0                  0.1
#  effort deviations for each fishery
      0.0000   -5        5        2     1      10.0
      0.0000   -5        5        2     1      10.0
      0.0000   -5        5        2     1      10.0
      0.0000   -5        5        2     1      10.0
```

```
      0.0000   -5        5        2     1       10.0
      0.0000   -5        5        2     1       10.0
      0.0000   -5        5        2     1       10.0
      0.0000   -5        5        2     1       10.0
      0.0000   -5        5        2     1       10.0
      0.0000   -5        5        2     1       10.0
#-------------------------------------------------------------------------------------------------------------------------------
#
# CATCHABILITY
#  catchability correlation coefficients
      0.0      -0.001    1.0      -1     0      0.1
#  catchability variances
      0.1       0        100.0    -1     0                  0.1
#  catchability deviations for each fishery
      0.0000   -5        5       -1     1       0.1
      0.0000   -5        5       -1     1       0.1
      0.0000   -5        5       -1     1       0.1
      0.0000   -5        5       -1     1       0.1
      0.0000   -5        5       -1     1       0.1
      0.0000   -5        5       -1     1       0.1
      0.0000   -5        5       -1     1       0.1
      0.0000   -5        5       -1     1       0.1
      0.0000   -5        5       -1     1       0.1
      0.0000   -5        5       -1     1       0.1
#-------------------------------------------------------------------------------------------------------------------------------
#
# End of file #

#//////////////////////////////////////////////////////////////////////////////////////////////////
#//////////////////////////////////////////////////////////////////////////////////////////////////
#// VULNERABILITY PARAMETER FILE FOR PROGRAM CATCHEM_AD
#//
#//   Important notes:
#//    (1) Comments may be placed before or after any line of data, however they MUST begin
#//         with a # symbol in the first column.
#//    (3) Blank lines without a # symbol are not allowed.
#//
#//////////////////////////////////////////////////////////////////////////////////////////////////
#//////////////////////////////////////////////////////////////////////////////////////////////////
#
#==================================================================================================
# VULNERABILITY MODEL SPECIFICATIONS
#==================================================================================================
#
#-------------------------------------------------------------------------------------------
# Enter two vectors of integers giving the method of modeling vulnerability/selection
#   0 = use functions specified in CATCHEM.PAR
#   1 = use age-specific coefficients specified in this file)
```

```
#------------------------------------------------------------------------------------------
# one entry for each FISHERY:
  1 1 1 1 1 1 1 1 1 1
# one entry for each SURVEY:
  1 1 1 1 1 1 1 1
#
#------------------------------------------------------------------------------------------
# Enter two vectors of reals giving the maximum 'variance' of the curvature penalty on
# vulnerability (expected squared difference between the two youngest age classes if
# the attenuation coefficient below is positive, and two oldest otherwise)
#   Notes: -this is irrelevant if method 0 above is chosen
#          -a value of zero tells the program not to use the curvature penalty
#------------------------------------------------------------------------------------------
# one entry for each FISHERY:
  0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3
# one entry for each SURVEY:
  0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3
#------------------------------------------------------------------------------------------
# Enter two vectors of reals giving the attenuation coefficient which controls how the
# curvature penalty variance changes with age.
#   Notes: -this is irrelevant if method 0 above is chosen
#          -a value of zero causes the penalty to be the same for all ages
#          -positive values cause the variance to decrease exponentially with age from the maximum set above
#          -negative values cause the variance to increase exponentially with age to the maximum set above
#          -generally one expects a positive value on the order of the growth coefficient K
#------------------------------------------------------------------------------------------
# one entry for each FISHERY:
  0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4
# one entry for each SURVEY:
  0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4
#
#------------------------------------------------------------------------------------------
# Enter a single integer specifying whether to use (0) annual or (1) seasonal age classes
#------------------------------------------------------------------------------------------
  0
#
#==========================================================================================
# VULNERABILITY PARAMETER SPECIFICATIONS
# Note that these must be input even if you specified all 0's w.r.t. the method of
# modeling vulnerability because they will be used to determine the age range of each
# fishery (i.e., if you specify below that the first several age classes (or last several)
# have zero vulnerability to the fishery, then the model will use the parameters of the
# estimated functions to calculate values only for the age range with nonzero entries below).
#==========================================================================================
#
#------------------------------------------------------------------------------------------
# FISHERY (must be entered in ascending order)
#------------------------------------------------------------------------------------------
```

```
# |   age (must be entered in ascending order by annual or seasonal age classes as specified above)
# |   |   starting guess of vulnerability coefficient
# |   |   |   phase of estimation (- = do not estimate)
# |   |   |   |
# -   -   -   -
# COM HL E
1	0	0	-3
1	1	0.05	1
1	2	0.2	1
1	3	0.3	1
1	4	0.4	1
1	5	0.5	1
1	6	0.6	1
1	7	0.7	1
1	8	0.8	1
1	9	0.9	1
1	10	1	-1
1	11	1	-3
1	12	1	-3
1	13	1	-3
1	14	1	-3
1	15	1	-3
# COM HL W
2	0	0	-3
2	1	0.02 1
2	2	0.2	1
2	3	0.3	1
2	4	0.4	1
2	5	0.5	1
2	6	0.6	1
2	7	0.7	1
2	8	0.8	1
2	9	0.9	1
2	10	1	-1
2	11	1	-3
2	12	1	-3
2	13	1	-3
2	14	1	-3
2	15	1	-3
# COM LL E
3	0	0	-3
3	1	0	-3
3	2	0.2	1
3	3	0.3	1
3	4	0.4	1
3	5	0.5	1
3	6	0.6	1
3	7	0.7	1
```

3	8	0.8	1
3	9	0.9	1
3	10	1	-1
3	11	1	-3
3	12	1	-3
3	13	1	-3
3	14	1	-3
3	15	1	-3
# COM LL W			
4	0	0	-3
4	1	0	-3
4	2	0.2	1
4	3	0.3	1
4	4	0.4	1
4	5	0.5	1
4	6	0.6	1
4	7	0.7	1
4	8	0.8	1
4	9	0.9	1
4	10	1	-1
4	11	1	-3
4	12	1	-3
4	13	1	-3
4	14	1	-3
4	15	1	-3
# REC E			
5	0	0	-3
5	1	0.5	1
5	2	0.6	1
5	3	0.7	1
5	4	0.8	1
5	5	0.9	1
5	6	0.9	1
5	7	1	1
5	8	1	1
5	9	1	-3
5	10	1	-3
5	11	1	-3
5	12	1	-3
5	13	1	-3
5	14	1	-3
5	15	1	-3
# REC W			
6	0	0	-3
6	1	0.5	1
6	2	0.6	1
6	3	0.7	1
6	4	0.8	1

6	5	0.9	1
6	6	0.9	1
6	7	1	1
6	8	1	1
6	9	1	-3
6	10	1	-3
6	11	1	-3
6	12	1	-3
6	13	1	-3
6	14	1	-3
6	15	1	-3
# Closed season E			
7	0	0	-3
7	1	0.1	-3
7	2	0.2	1
7	3	0.3	1
7	4	0.4	1
7	5	0.5	1
7	6	0.6	1
7	7	0.7	1
7	8	0.8	1
7	9	0.9	1
7	10	1	-1
7	11	1	-3
7	12	1	-3
7	13	1	-3
7	14	1	-3
7	15	1	-3
# Closed season w			
8	0	0	-3
8	1	0.1	-3
8	2	0.2	1
8	3	0.3	1
8	4	0.4	1
8	5	0.5	1
8	6	0.6	1
8	7	0.7	1
8	8	0.8	1
8	9	0.9	1
8	10	1	-1
8	11	1	-3
8	12	1	-3
8	13	1	-3
8	14	1	-3
8	15	1	-3
# SHRIMP BYCATCH E			
9	0	1	1
9	1	1	-3

9	2	0.1	1
9	3	0	-3
9	4	0	-3
9	5	0	-3
9	6	0	-3
9	7	0	-3
9	8	0	-3
9	9	0	-3
9	10	0	-3
9	11	0	-3
9	12	0	-3
9	13	0	-3
9	14	0	-3
9	15	0	-3
SHRIMP BYCATCH w
10	0	1	1
10	1	1	-3
10	2	0.1	1
10	3	0	-3
10	4	0	-3
10	5	0	-3
10	6	0	-3
10	7	0	-3
10	8	0	-3
10	9	0	-3
10	10	0	-3
10	11	0	-3
10	12	0	-3
10	13	0	-3
10	14	0	-3
10	15	0	-3
#
#--
SURVEY (must be entered in ascending order)
#--
# |	age (must be entered in ascending order by annual or seasonal age classes as specified above)
# |	|	starting guess of vulnerability coefficient
# |	|	|	phase of estimation (- = do not estimate)
# |	|	|	|
# -	-	-	-
VIDEO E
1	0	0	-3
1	1	0	-3
1	2	1	-3
1	3	1	-3
1	4	1	-3
1	5	1	-3
1	6	1	-3

1	7	1	-3
1	8	1	-3
1	9	1	-3
1	10	1	-3
1	11	1	-3
1	12	1	-3
1	13	1	-3
1	14	1	-3
1	15	1	-3
# VIDEO W			
2	0	0	-3
2	1	0	-3
2	2	1	-3
2	3	1	-3
2	4	1	-3
2	5	1	-3
2	6	1	-3
2	7	1	-3
2	8	1	-3
2	9	1	-3
2	10	1	-3
2	11	1	-3
2	12	1	-3
2	13	1	-3
2	14	1	-3
2	15	1	-3
# LARVAL E			
3	0	0	-3
3	1	0	-3
3	2	1	-3
3	3	1	-3
3	4	1	-3
3	5	1	-3
3	6	1	-3
3	7	1	-3
3	8	1	-3
3	9	1	-3
3	10	1	-3
3	11	1	-3
3	12	1	-3
3	13	1	-3
3	14	1	-3
3	15	1	-3
# LARVAL W			
4	0	0	-3
4	1	0	-3
4	2	1	-3
4	3	1	-3

4	4	1	-3
4	5	1	-3
4	6	1	-3
4	7	1	-3
4	8	1	-3
4	9	1	-3
4	10	1	-3
4	11	1	-3
4	12	1	-3
4	13	1	-3
4	14	1	-3
4	15	1	-3
# SEAMAP TRAWL AGE 1 (E)			
5	0	0	-3
5	1	1	-3
5	2	0	-3
5	3	0	-3
5	4	0	-3
5	5	0	-3
5	6	0	-3
5	7	0	-3
5	8	0	-3
5	9	0	-3
5	10	0	-3
5	11	0	-3
5	12	0	-3
5	13	0	-3
5	14	0	-3
5	15	0	-3
# SEAMAP TRAWL AGE 1 W			
6	0	0	-3
6	1	1	-3
6	2	0	-3
6	3	0	-3
6	4	0	-3
6	5	0	-3
6	6	0	-3
6	7	0	-3
6	8	0	-3
6	9	0	-3
6	10	0	-3
6	11	0	-3
6	12	0	-3
6	13	0	-3
6	14	0	-3
6	15	0	-3
# SEAMAP TRAWL AGE 0 (E)			
7	0	1	-3

7	1	0	-3
7	2	0	-3
7	3	0	-3
7	4	0	-3
7	5	0	-3
7	6	0	-3
7	7	0	-3
7	8	0	-3
7	9	0	-3
7	10	0	-3
7	11	0	-3
7	12	0	-3
7	13	0	-3
7	14	0	-3
7	15	0	-3
# SEAMAP TRAWL AGE 0 W			
8	0	1	-3
8	1	0	-3
8	2	0	-3
8	3	0	-3
8	4	0	-3
8	5	0	-3
8	6	0	-3
8	7	0	-3
8	8	0	-3
8	9	0	-3
8	10	0	-3
8	11	0	-3
8	12	0	-3
8	13	0	-3
8	14	0	-3
8	15	0	-3