SEDAR

Southeast Data, Assessment, and Review

SEDAR 52
Stock Assessment Report

Gulf of Mexico Red Snapper

April 2018

SECTION I – INTRODUCTION UPDATED 9 MAY 2018

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

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SECTION I: Introduction

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Introduction

SEDAR 52 addressed the stock assessment for Gulf of Mexico Red Snapper. The assessment process consisted of an in-person workshops, held in Miami, Florida November 29-December 1, 2017, as well as a series of webinars.

The Stock Assessment Report is organized into 2 sections. Section I – Introduction contains a brief description of the SEDAR Process, Assessment and Management Histories for the species of interest, and the management specifications requested by the Cooperator. Section II is the Assessment Process report. This section details the assessment model, as well as documents any data recommendations that arise for new data sets presented during this assessment process, or changes to data sets used previously.

The final Stock Assessment Reports (SAR) for Gulf of Mexico red snapper was disseminated to the public in April 2018. The Council's Scientific and Statistical Committee (SSC) will review the SAR. The SSCs are tasked with recommending whether the assessments represent Best Available Science, whether the results presented in the SARs are useful for providing management advice and developing fishing level recommendations for the Council. An SSC may request additional analyses be conducted or may use the information provided in the SAR as the basis for their Fishing Level Recommendations (e.g., Overfishing Limit and Acceptable Biological Catch). The Gulf of Mexico Fishery Management Council's SSC will review the assessment at its May 2018 meeting, followed by the Council receiving that information at its June 2018. Documentation on SSC recommendations is not part of the SEDAR process and is handled through each Council.

1 SEDAR PROCESS DESCRIPTION

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

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

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

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

2 MANAGEMENT OVERVIEW

2.1 Management Parameters and Projection Specifications

Table 2.1.1. General Management Information, status as of 2014 SEDAR 31 update

Species	Red Snapper
Management Unit	Reef Fish
Management Unit Definition	Gulf of Mexico
Management Entity	Gulf of Mexico Fishery Management Council
Management Contacts SERO / Council	Steven Atran, Ryan Rindone SERO Staff
Stock exploitation status (as of 2014 SEDAR 31 update)	Not undergoing overfishing
Stock biomass status (as of 2014 SEDAR 31 update)	Overfished

Table 2.1.2. Specific Management Criteria, as of 2014 SEDAR 31 update, new values pending SEDAR 52 review.

(Provide details on the management criteria to be estimated in this assessment)

iteria	Current (as of 2014 SEDAR 31 Update)		Proposed	
	Definition	Value	Definition	Value
MSST	Value from the most recent stock assessment based on MSST = [(1-M) or 0.5 whichever is greater]*BMSY, in 1000s of eggs	1.16E+12 (2013)	Value from the most recent assessment based on MSST = 0.5 * BMSY	SEDAR 52
MFMT	FMSY or proxy from the most recent stock assessment (median from probabilistic analysis)	$F_{SPR26\%}$ 0.0497 (2013)	FMSY or proxy from the most recent assessment	SEDAR 52

MSY	Yield at F_{MSY}, retained landings in million lbs	12.91	Yield at F_{MSY}, landings and discards, pounds and numbers	SEDAR 52
F_{MSY}		$F_{SPR26\%}$		SEDAR 52
B_{MSY}	Thousands of eggs (median from probabilistic analysis)	$SSB_{FSPR26\%}$ 1.27E+12 (2013)	eggs	SEDAR 52
F Targets (i.e., F_{OY})	75% F_{MSY}	0.0472	75% F_{MSY}	SEDAR 52
Yield at F_{Target} (Equilibrium)	landings and discards, lbs and numbers	-	landings and discards, lbs and numbers	SEDAR 52
M	Natural Mortality, mean across ages	0.09	Natural mortality, mean across ages	SEDAR 52
Terminal F	Exploitation (2013)	0.049	Exploitation (2016)	SEDAR 52
Terminal Biomass[1]	Thousands of eggs (2013)	6.90E11	Biomass (2016)	SEDAR 52
Exploitation Status	F/MFMT (2013)	0.994	F/MFMT (2016)	SEDAR 52
Biomass Status[1]	B/MSST (2013) B/B_{MSY} (2013)	0.59 0.54	B/MSST (2016) B/B_{MSY} (2016)	SEDAR 52
Generation Time		15 years		SEDAR 52
$T_{Rebuild}$ (if appropriate)		2032	2032	SEDAR 52

Table 2.1.3. General projection information.

(This provides the basic information necessary to bridge the gap between the terminal year of the assessment and the year in which any changes may take place or specific alternative exploitation rates should be evaluated, and guidance for the information managers required from the projection analyses.)

Requested Information	Value
First Year of Management	2018 Fishing Year
Interim basis	ACL, if ACL is met average exploitation, if ACL is not met
Projection Outputs - By migratory group and Fishing Year	
Landings	pounds whole weight and numbers
Discards	pounds whole weight and numbers
Exploitation	F & Probability F>MFMT
Biomass (total or SSB, as appropriate)	B & Probability B>MSST (and Prob. $B>B_{MSY}$ if under rebuilding plan)
Recruits	Number

Table 2.1.4. Quota Calculation Details

If the stock is managed by an annual catch limit (ACL), please provide the following information (millions of pounds, whole weight):

2017 ACL Value	Commercial ACL: 6, 312,613 lbs gw Rec for-hire ACL: 2,848,000 lbs ww Rec private ACL: 3,755,094 lbs ww
Next Scheduled Quota Change	2018
Annual or averaged quota?	Annual
If averaged, number of years to average	-
Does the quota include bycatch/discard?	No

2.2. Management and Regulatory Timeline

Tables 2.2.1. Pertinent Federal management information.

Harvest Restrictions: Trip Limits
*Trip limits do not apply during closures (if season is closed, then trip limit is 0)

First Yr In Effect	Effective Date	End Date	Fishery	Bag Limit Per Person/Day	Bag Limit Per Boat/Day	Region Affected	FR Reference	Amendment Number or Rule Type	* Notes
1984	11/1/84	4/22/90	Rec	none	none	Gulf of Mexico EEZ	55 FR 2078	Original Reef Fish FMP	
1990	4/23/90	12/31/94	Rec	7 fish*	none	Gulf of Mexico EEZ	55 FR 2078	Reef Fish Amendment 1	Within 10 snapper recreational aggregate bag limit
1995	10/1/94	12/31/97	Rec	5 fish*	none	Gulf of Mexico EEZ		Oct 1994 Reg Amendment	"
1999	1/1/99	1/31/00	Rec	4 fish*	none	Gulf of Mexico EEZ		Interim Rule	"
2000	2/1/00	5/1/07	Rec	5 fish*	none	Gulf of Mexico EEZ		Feb 2000 Reg Amendment	"
2007	5/2/07	Present	Rec	2 fish*	none	Gulf of Mexico EEZ		Interim Rule/RF Amendment 27	"
2007	5/2/07	Present	For-hire	0 capt/crew	none	Gulf of Mexico EEZ		Interim Rule/RF Amendment 27	

Harvest Restrictions: Size Limits
*Size limits do not apply during closures

First Yr In Effect	Effective Date	End Date	Fishery	Size Limit	Length Type	Region Affected	FR Reference	Amendment Number or Rule Type	* Notes
1984	11/1/84	2/20/90	Both*	13"	Minimum TL	Gulf of Mexico EEZ		Original Reef Fish FMP	For-hire exempted until 1987; each angler could keep 5 undersized red snapper per day
1990	2/21/90	6/18/00	Both	13"	Minimum TL	Gulf of Mexico EEZ	55 FR 2078	Reef Fish Amendment 1	
1994	10/1/94	1/31/00	Both	15"	Minimum TL	Gulf of Mexico EEZ		Oct 1994 Reg Amendment	
2000	2/1/00	Present	Rec	16"	Minimum TL	Gulf of Mexico EEZ		Feb 2000 Reg Amendment	
2000	2/1/00	1/31/08	Com	15"	Minimum TL	Gulf of Mexico EEZ		Feb 2000 Reg Amendment	
2008	2/1/08	Present	Com	13"	Minimum TL	Gulf of Mexico EEZ		RF Amendment 27	

Quota History – Recreational

First Yr In Effect	Effective Date	End Date	Quota or ACL	Region Affected	FR Reference	Amendment Number or Rule Type
1990	4/23/90	2/28/91	NA	Gulf of Mexico EEZ		
1991	3/1/91	9/30/92	1.96 mp ww	Gulf of Mexico EEZ	55 FR 2078	Reef Fish Amendment 1
1992	10/1/92	11/30/95	2.94 mp ww	Gulf of Mexico EEZ		Oct 1992 Reg Amendment
1996	12/1/95	12/31/96	4.65 mp ww	Gulf of Mexico EEZ		Dec 1995 Reg Amendment
1997	1/1/97	11/27/97	4.47 mp ww	Gulf of Mexico EEZ		
1998	1/1/98	12/31/98	"	Gulf of Mexico EEZ		
1999	1/1/99	12/31/99	"	Gulf of Mexico EEZ		
2000	2/1/00	12/31/00	"	Gulf of Mexico EEZ		Feb 2000 Reg Amendment
2001	1/1/01	12/31/01	"	Gulf of Mexico EEZ		
2002	1/1/02	12/31/02	"	Gulf of Mexico EEZ		
2003	1/1/03	12/31/03	"	Gulf of Mexico EEZ		
2004	1/1/04	12/31/04	"	Gulf of Mexico EEZ		
2005	1/1/05	12/31/05	"	Gulf of Mexico EEZ		
2006	1/1/06	12/31/06	"	Gulf of Mexico EEZ		
2007	1/1/07	12/31/07	3.185 mp ww	Gulf of Mexico EEZ		
2008	2/1/08	12/31/08	2.45 mp ww	Gulf of Mexico EEZ		RF Amendment 27
2009	1/1/09	12/31/09	2.45 mp ww	Gulf of Mexico EEZ		
2010	1/1/10	12/31/10	3.403 mp ww	Gulf of Mexico EEZ		2010 Reg Amendment
2011	1/1/11	12/31/11	3.867 mp ww	Gulf of Mexico EEZ		2011 Reg Amendment
2012	1/1/12	12/31/12	3.959 mp ww	Gulf of Mexico EEZ		2012 Reg Amendment
2013	1/1/13	12/31/13	5.39 mp ww	Gulf of Mexico EEZ		2013 Framework Action
2014	1/1/14	12/31/14	"	Gulf of Mexico EEZ		
2015	1/1/15	12/31/15	7.007 mp ww	Gulf of Mexico EEZ		2015 Framework Action
2016	1/1/16	12/31/16	7.192 mp ww	Gulf of Mexico EEZ		
2017	1/1/17	12/31/17	6.603 mp ww	Gulf of Mexico EEZ		

Quota History – Commercial

First Yr In Effect	Effective Date	End Date	Quota or ACL	Region Affected	FR Reference	Amendment Number or Rule Type	Notes
1990	4/23/90	2/28/91	3.1 mp ww	Gulf of Mexico EEZ	55 FR 2078	Reef Fish Amendment 1	
1991	3/1/91	9/30/92	2.04 mp ww	Gulf of Mexico EEZ		March 1991 Reg Amendment	
1992	10/1/92	11/30/95	3.06 mp ww	Gulf of Mexico EEZ		Oct 1992 Reg Amendment	
1996	3/1/96	12/31/96	season 1 = 3.06 mp ww; season 2 = 1.59 mp ww plus season 1 remainder	Gulf of Mexico EEZ		Dec 1995 Reg Amendment	
1997	1/1/97	12/31/97	"	Gulf of Mexico EEZ			
1998	1/1/98	12/31/98	"	Gulf of Mexico EEZ			
1999	1/1/99	12/31/99	"	Gulf of Mexico EEZ			
2000	2/1/00	12/31/00	"	Gulf of Mexico EEZ		Feb 2000 Reg Amendment	
2001	1/1/01	12/31/01	"	Gulf of Mexico EEZ			
2002	1/1/02	12/31/02	"	Gulf of Mexico EEZ			
2003	1/1/03	12/31/03	"	Gulf of Mexico EEZ			
2004	1/1/04	12/31/04	"	Gulf of Mexico EEZ			
2005	1/1/05	12/31/05	"	Gulf of Mexico EEZ			
2006	1/1/06	12/31/06	"	Gulf of Mexico EEZ			
2007	1/1/07	12/31/07	2,986,486 lbs gw*	Gulf of Mexico EEZ			In-season quota increase of 689,189 lbs gw on June 1
2008	2/1/08	12/31/08	2,297,297 lbs gw	Gulf of Mexico EEZ		RF Amendment 27	
2009	1/1/09	12/31/09	2,297,297 lbs gw	Gulf of Mexico EEZ			
2010	1/1/10	12/31/10	3,190,991 lbs gw*	Gulf of Mexico EEZ		2010 Reg Amendment	In-season quota increase of 893,694 lbs gw on June 2
2011	1/1/11	12/31/11	3,300,901 lbs gw*	Gulf of Mexico EEZ		2011 Reg Amendment	In-season quota increase of 109,910 lbs gw on May 31
2012	1/1/12	12/31/12	3,712,613 lbs gw*	Gulf of Mexico EEZ		2012 Reg Amendment	In-season quota increase of 411,712 lbs gw on June 29
2013	1/1/13	12/31/13	5,054,054 lbs gw*	Gulf of Mexico EEZ		2013 Framework Action	In-season quota increases of 174,774 lbs gw on May 29; and 1,166,667 on September 30
2014	1/1/14	12/31/14	5,054,054 lbs gw	Gulf of Mexico EEZ			
2015	1/1/15	12/31/15	6,570,270 lbs gw*	Gulf of Mexico EEZ		2015 Framework Action	In-season quota increase of 1,516,216 lbs gw on June 1
2016	1/1/16	12/31/16	6.771 mp ww	Gulf of Mexico EEZ			
2017	1/1/17	12/31/17	7.007 mp ww	Gulf of Mexico EEZ			

Harvest Restrictions (Fishery Closures*)
*Area specific regulations are documented under spatial restrictions

First Yr In Effect	Effective Date	End Date	Fishery	Closure Type	First Day Closed	Last Day Closed	Region Affected	FR Reference	Amendment Number or Rule Type	* Notes
1991	8/24/91	12/31/91	Com	Quota	24-Aug	31-Dec	Gulf of Mexico EEZ		Notice of Closure	
1992	2/22/92	12/31/92	Com	Quota	23-Feb	31-Dec	Gulf of Mexico EEZ	65 FR 31827	Reef Fish Regulatory Amendment	
1993			Com	Seasonal			Gulf of Mexico EEZ			
1994	10/1/93	9/30/94	Com	Seasonal	1-Jan	9-Feb	Gulf of Mexico EEZ		Oct 1993 Reg Amendment	
1995	10/1/94	12/31/95	Com	Seasonal	1-Jan	24-Feb	Gulf of Mexico EEZ		Oct 1994 Reg Amendment	
1996	3/1/96	2/28/97	Com	Seasonal*	1-Jan	31-Jan	Gulf of Mexico EEZ		Dec 1995 Reg Amendment*	Set up two season structure. Season 1 opened on February 1, and season 2 on September 15
1997	3/1/97	1/31/00	Com	Seasonal*	*	*	Gulf of Mexico EEZ		March 1997 Reg Amendment	Changed the opening date of the second 1997 commercial red snapper season from September 15 to September 2 at noon and closed the season on September 15 at noon; thereafter the commercial season was opened from noon of the first day to noon of the fifteenth day of each month until the 1997 quota was reached.
1997	11/27/97	12/31/97	Rec	Quota	27-Nov	31-Dec	Gulf of Mexico EEZ		March 1997 Reg Amendment	
2000	2/1/00	1/31/08	Rec	Seasonal	1-Jan	14-Apr	Gulf of Mexico EEZ		Feb 2000 Reg Amendment	
2000	2/1/00	1/31/08	Rec	Seasonal	1-Nov	31-Dec	Gulf of Mexico EEZ		Feb 2000 Reg Amendment	
2000	2/1/00	12/31/07	Com	Seasonal*	1-Jan	31-Jan	Gulf of Mexico EEZ		Feb 2000 Reg Amendment	Open from noon on the 1st until noon on the 10th of each month until the Spring sub-quota is reached; October 1 and be open from noon on the 1st to noon on the 10th of each month until the remaining commercial quota is reached
2000	2/1/00	12/31/07	Com	Seasonal*	1-Jan	31-Jan	Gulf of Mexico EEZ		Feb 2000 Reg Amendment	
2007	1/1/07	Present	Com	IFQ	-	-	Gulf of Mexico EEZ		RF Amendment 26	Established the Commercial IFQ program
2008	2/1/08	12/31/11	Rec	Seasonal	1-Jan	31-May	Gulf of Mexico EEZ		RF Amendment 27	
2008	2/1/08	12/31/11	Rec	Seasonal	1-Oct	31-Dec	Gulf of Mexico EEZ		RF Amendment 27	
2012	1/1/12	Present	Rec	Seasonal	1-Jan	31-May	Gulf of Mexico EEZ		2012 Reg Amendment	

Harvest Restrictions (Spatial restrictions)

Area	First Yr In Effect	Effective Date	End Date	Fishery	First Day Closed	Last Day Closed	Restriction in Area	FR Reference	Amendment Number or Rule Type
Gulf of Mexico Stressed Areas	1984	11/8/84	Ongoing	Both	Year round		Prohibited powerheads for Reef FMP	49 FR 39548	Original Reef Fish FMP
	1984	11/8/84	Ongoing	Both	Year round		Prohibited pots and traps for Reef FMP	49 FR 39548	Original Reef Fish FMP
EEZ, inside 50 fathoms west of Cape San Blas, FL	1990	2/21/90	Ongoing	Both	Year round		Prohibited longline and buoy gear for Reef FMP	55 FR 2078	Reef Fish Amendment 1
EEZ, inside 20 fathoms east of Cape San Blas, FL	1990	2/21/90	4/17/09	Both	Year round		Prohibited longline and buoy gear for Reef FMP	55 FR 2078	Reef Fish Amendment 1
Alabama Special Management Zones	1994	2/7/94	Ongoing	Both	Year round		Allow only hook-and line gear with three or less hooks per line and spearfishing gear for fish in Reef FMP	59 FR 966	Reef Fish Amendment 5
EEZ, inside 50 fathoms east of Cape San Blas, FL	2009	5/18/09	10/15/09	Both	18-May	28-Oct	Prohibited bottom longline for Reef FMP	74 FR 20229	Emergency Rule
EEZ, inside 35 fathoms east of Cape San Blas, FL	2009	10/16/09	4/25/10	Both	Year round		Prohibited bottom longline for Reef FMP	74 FR 53889	Sea Turtle ESA Rule
	2010	4/26/10	Ongoing	Rec	Year round		Prohibited bottom longline for Reef FMP	75 FR 21512	Reef Fish Amendment 31
	2010	4/26/10	Ongoing	Com	1-Jun	31-Aug	Prohibited bottom longline for Reef FMP	75 FR 21512	Reef Fish Amendment 31
Madison-Swanson	2000	6/19/00	6/2/04	Both	Year round		Fishing prohibited except HMS[1]	65 FR 31827	Reef Fish Regulatory Amendment
	2004	6/3/04	Ongoing	Both	1-May	31-Oct	Fishing prohibited except surface trolling	70 FR 24532 74 FR 17603	Reef Fish Amendment 21 Reef Fish Amendment 30B
	2004	6/3/04	Ongoing	Both	1-Nov	30-Apr	Fishing prohibited	70 FR 24532 74 FR 17603	Reef Fish Amendment 21 Reef Fish Amendment 30B
Steamboat Lumps	2000	6/19/00	6/2/04	Both	Year round		Fishing prohibited except HMS[1]	65 FR 31827	Reef Fish Regulatory Amendment
	2004	6/3/04	Ongoing	Both	1-May	31-Oct	Fishing prohibited except surface trolling	70 FR 24532 74 FR 17603	Reef Fish Amendment 21 Reef Fish Amendment 30B
	2004	6/3/04	Ongoing	Both	1-Nov	30-Apr	Fishing prohibited	70 FR 24532 74 FR 17603	Reef Fish Amendment 21 Reef Fish Amendment 30B
The Edges	2010	7/24/09	Ongoing	Both	1-Jan	30-Apr	Fishing prohibited	74 FR 30001	Reef Fish Amendment 30B Supplement
20 Fathom Break	2014	7/5/13	Ongoing	Rec	1-Feb	31-Mar	Fishing for SWG prohibited[2]	78 FR 33259	Reef Fish Framework Action
Flower Garden	1992	1/17/92	Ongoing	Both	Year round		Fishing with bottom gears prohibited[3]	56 FR 63634	Sanctuary Designation
Riley's Hump	1994	2/7/94	8/18/02	Both	1-May	30-Jun	Fishing prohibited	59 FR 966	Reef Fish Amendment 5
Tortugas Reserves	2002	8/19/02	Ongoing	Both	Year round		Fishing prohibited	67 FR 47467	Tortugas Amendment

Pulley Ridge	2006	1/23/06	Ongoing	Both	Year round	Fishing with bottom gears prohibited[3]	70 FR 76216	Essential Fish Habitat (EFH) Amendment 3
DWH Oil Spill closure	2010	5/2/10	11/15/10	Both		All fishing prohibited in designated areas	75 FR 24822	

[1]HMS: highly migratory species (tuna species, marlin, oceanic sharks, sailfishes, and swordfish)

[2]SWG: shallow-water grouper (black, gag, red, red hind, rock hind, scamp, yellowfin, and yellowmouth)

[3]Bottom gears: Bottom longline, bottom trawl, buoy gear, pot, or trap

Harvest Restrictions (Gear Restrictions*)

*Area specific gear regulations are documented under spatial restrictions

Gear Type	First Yr In Effect	Effective Date	End Date	Gear/Harvesting Restrictions	Region Affected	FR Reference	Amendment Number or Rule Type
Poison	1984	11/8/84	Ongoing	Prohibited for Reef FMP	Gulf of Mexico EEZ	49 FR 39548	Original Reef Fish FMP
Explosives	1984	11/8/84	Ongoing	Prohibited for Reef FMP	Gulf of Mexico EEZ	49 FR 39548	Original Reef Fish FMP
Pots and Traps	1984	11/23/84	2/3/94	Established fish trap permit	Gulf of Mexico EEZ	50 FR 39548	Original Reef Fish FMP
	1984	11/23/84	2/20/90	Set max number of traps fish by a vessel at 200	Gulf of Mexico EEZ	50 FR 39548	Original Reef Fish FMP
	1990	2/21/90	2/3/94	Set max number of traps fish by a vessel at 100	Gulf of Mexico EEZ	55 FR 2078	Reef Fish Amendment 1
	1994	2/4/94	2/7/97	Moratorium on additional commercial trap permits	Gulf of Mexico EEZ	59 FR 966	Reef Fish Amendment 5
	1997	3/25/97	2/6/07	Phase out of fish traps begins	Gulf of Mexico EEZ	62 FR 13983	Reef Fish Amendment 14
	1997	12/30/97	2/6/07	Prohibited harvest of reef fish from traps other than permited reef fish, stone crab, or spiny lobster traps.	Gulf of Mexico EEZ	62 FR 67714	Reef Fish Amendment 15
	2007	2/7/07	Ongoing	Traps prohibited	Gulf of Mexico EEZ	62 FR 13983	Reef Fish Amendment 14
All	1992	4/8/92	12/31/95	Moratorium on commercial permits for Reef FMP	Gulf of Mexico EEZ	68 FR 11914 59 FR 39301	Reef Fish Amendment 4 Reef Fish Amendment 9
	1994	2/7/94	Ongoing	Finfish must have head and fins intact through landing, can be eviscerated, gilled, and scaled but must otherwise be whole (HMS and bait exceptions)	Gulf of Mexico EEZ	59 FR 39301	Reef Fish Amendment 9
	1996	6/1/96	12/31/05	Moratorium on commercial permits for Gulf reef fish.	Gulf of Mexico EEZ	61 FR 34930 65 FR 41016	Interim Rule Reef Fish Amendment 17
	2006	9/8/06	Ongoing	Use of Gulf reef fish as bait prohibited.[1]	Gulf of Mexico EEZ	71 FR 45428	Reef Fish Amendment 18A
Vertical Line	2008	6/1/08	Ongoing	Requires non-stainless steel circle hooks and dehooking devices	Gulf of Mexico EEZ	74 FR 5117	Reef Fish Amendment 27
	2008	6/1/08	9/3/13	Requires venting tools	Gulf of Mexico EEZ	74 FR 5117 78 FR 46820	Reef Fish Amendment 27 Framework Action
Longline	2009	10/16/09		750 hooks fishing	Gulf of Mexico EEZ		Endangered Species Act and regulatory action

[1]Except when, purchased from a fish processor, filleted carcasses may be used as bait crab and lobster traps.

3 ASSESSMENT HISTORY AND REVIEW

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

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

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

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

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

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

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

The SEDAR 31 benchmark assessment (2013) transitioned modeling environments from CATCHEM to Stock Synthesis (SS). Other substantial modifications included the integration of depth-related discard mortality rates by sector, integration of the Marine Recreational Information Program into the recreational landings data, and the utilization of remotely operated vehicle (ROV) derived age composition surveys. The SEDAR 31 benchmark assessment indicated that gulfwide SSB had increased since the previous assessment; however, the stock remained overfished (SSB/MSST = 0.4). Notably, the benchmark assessment indicated that overfishing was no longer occurring (F/MFMT = 0.69). Comparisons between modeling platform (SS and CATCHEM) were completed to ensure that any changes in model fit and subsequent stock status were not the result of changes in modeling platform alone.

The SS modeling platform was used again during an update to the SEDAR 31 benchmark assessment completed in 2015. A description of that assessment can be found in SEDAR (2015). The update assessment retained the base model configuration from SEDAR 31 except for the addition of a selectivity time block (2011 – 2013), which was added to all recreational fleets to accommodate a perceived change in recent fishing behavior. The model estimated there to have been continued growth in gulfwide SSB; however the stock remained overfished (SSB/MSST =

0.593). As was the case during the benchmark assessment, overfishing was determined to have not been occurring in the terminal assessment year (F/MFMT = 0.994).

The following is a chronological list of selected stock assessment documents pertaining to Gulf of Mexico red snapper:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SEDAR. 2013. SEDAR 31 - Gulf of Mexico Red Snapper Stock Assessment Report. SEDAR, North Charleston SC. 1103 pp.

SEDAR. 2015. Stock Assessment of Red Snapper in the Gulf of Mexico 1872 – 2013 – with Provisional 2014 Landings. SEDAR 31 Update Assessment, North Charleston SC. 242 pp.

4 REGIONAL MAPS

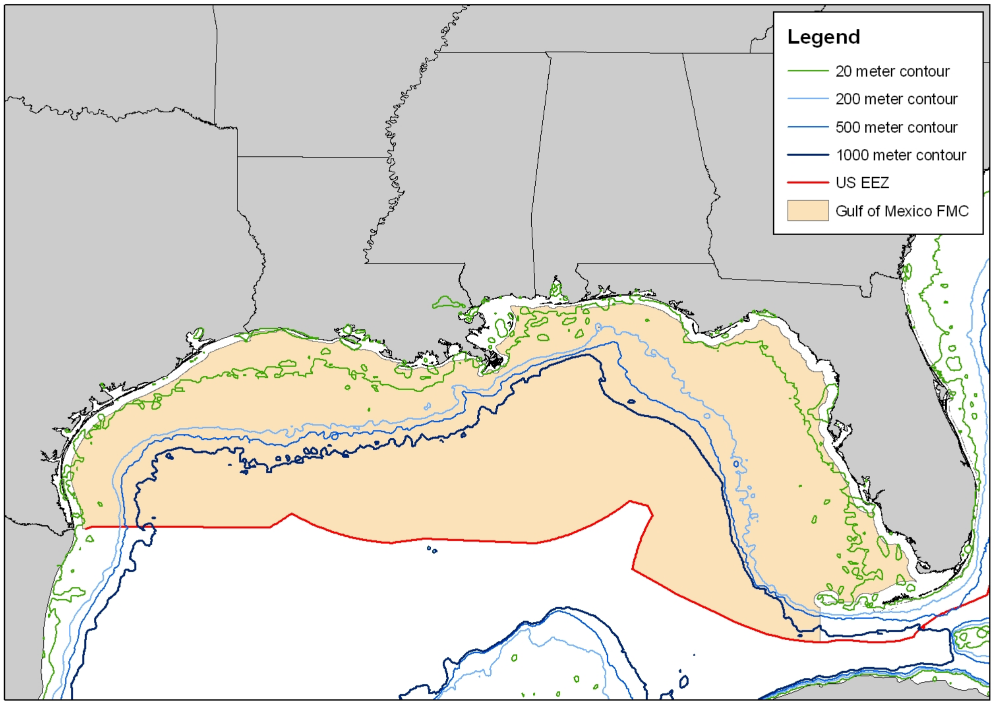

Figure 4.1 Southeast Region including Council and EEZ Boundaries.

5 SEDAR ABBREVIATIONS

ABC	Acceptable Biological Catch
ACCSP	Atlantic Coastal Cooperative Statistics Program
ADMB	AD Model Builder software program
ALS	Accumulated Landings System; SEFSC fisheries data collection program
AMRD	Alabama Marine Resources Division
ASMFC	Atlantic States Marine Fisheries Commission
B	stock biomass level
BAM	Beaufort Assessment Model
BMSY	value of B capable of producing MSY on a continuing basis
CFMC	Caribbean Fishery Management Council
CIE	Center for Independent Experts
CPUE	catch per unit of effort
EEZ	exclusive economic zone
F	fishing mortality (instantaneous)
FMSY	fishing mortality to produce MSY under equilibrium conditions
FOY	fishing mortality rate to produce Optimum Yield under equilibrium
FXX% SPR	fishing mortality rate that will result in retaining XX% of the maximum spawning production under equilibrium conditions
FMAX	fishing mortality that maximizes the average weight yield per fish recruited to the fishery
F0	a fishing mortality close to, but slightly less than, Fmax
FL FWCC	Florida Fish and Wildlife Conservation Commission
FWRI	(State of) Florida Fish and Wildlife Research Institute
GA DNR	Georgia Department of Natural Resources
GLM	general linear model
GMFMC	Gulf of Mexico Fishery Management Council
GSMFC	Gulf States Marine Fisheries Commission
GULF FIN	GSMFC Fisheries Information Network
HMS	Highly Migratory Species
LDWF	Louisiana Department of Wildlife and Fisheries
M	natural mortality (instantaneous)
MARMAP	Marine Resources Monitoring, Assessment, and Prediction

MDMR	Mississippi Department of Marine Resources
MFMT	maximum fishing mortality threshold, a value of F above which overfishing is deemed to be occurring
MRFSS	Marine Recreational Fisheries Statistics Survey
MRIP	Marine Recreational Information Program
MSST	minimum stock size threshold, a value of B below which the stock is deemed to be overfished
MSY	maximum sustainable yield
NC DMF	North Carolina Division of Marine Fisheries
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
OY	optimum yield
SAFMC	South Atlantic Fishery Management Council
SAS	Statistical Analysis Software, SAS Corporation
SC DNR	South Carolina Department of Natural Resources
SEAMAP	Southeast Area Monitoring and Assessment Program
SEDAR	Southeast Data, Assessment and Review
SEFIS	Southeast Fishery-Independent Survey
SEFSC	Fisheries Southeast Fisheries Science Center, National Marine Fisheries Service
SERO	Fisheries Southeast Regional Office, National Marine Fisheries Service
SPR	spawning potential ratio, stock biomass relative to an unfished state of the stock
SSB	Spawning Stock Biomass
SS	Stock Synthesis
SSC	Science and Statistics Committee
TIP	Trip Incident Program; biological data collection program of the SEFSC and Southeast States.
TPWD	Texas Parks and Wildlife Department
Z	total mortality, the sum of M and F

SEDAR

Southeast Data, Assessment, and Review

SEDAR 52

Gulf of Mexico Red Snapper

SECTION II: Assessment Process Report

April 2018

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

Table of Contents

1. INTRODUCTION

This document summarizes the SEDAR 52 standard assessment of red snapper in the U.S. Gulf of Mexico using updated data inputs through 2016 as implemented in the Stock Synthesis 3 modeling framework (Methot and Wetzel 2013). The standard assessment approach updates the SEDAR 31 benchmark assessment, but allows for updated methodology and new data. Except as otherwise noted, the specifications of the model and data streams are identical to those of the base model identified in the SEDAR 31 final report and as updated in the 2014 SEDAR 31 Update Assessment (SEDAR 2015). The only major changes include updated commercial and recreational discard calculations as recommended by the SEDAR 52 panel, and refined parametrization of the selectivity functions in the final base assessment model. Final acceptable biological catch (ABC) projections are awaiting approval of the SEDAR 52 Base Model by the Gulf of Mexico Science and Statistical Committee and will be submitted in a separate projections document.

1.1 Workshop Time and Place

The SEDAR 52 Gulf of Mexico red snapper assessment process was conducted via a series of webinars held between August 2017 and March 2018, as well as an in-person workshop held November 29 – December 1, 2017 in Miami, Florida.

1.2 Terms of Reference

The terms of reference approved by the Gulf of Mexico Fishery Management Council are listed below.

1) Update the approved SEDAR 31 Gulf of Mexico red snapper model, as modified and approved by the SSC during the 2014 update assessment, with data through 2016. Provide a model consistent with the previous assessment configuration to incorporate and evaluate any changes allowed for during this assessment.

2) Evaluate and document the following specific changes in input data or deviations from the benchmark model or previous assessment model.

    A) Investigate the use of Louisiana hydroacoustics/stereo camera length frequency
    B) Use best available recreational catch and effort estimates (e.g. APAIS, FES)
    C) Explore the effect of the IFQ program on commercial CPUE, and the sensitivity of model results to plausible alternative commercial CPUE series
    D) Investigate the use of FL, MS and AL survey data collected through the NFWF Gulf Environmental Benefit Fund

3) Document any revisions or corrections made to the model and input datasets, and provide updated input data tables. Provide commercial and recreational landings and discards in numbers and weight (pounds).

4) Update model parameter estimates and their variances, model uncertainties, and estimates of stock status and management benchmarks. In addition to the base model,

conduct sensitivity analyses to address uncertainty in data inputs and model configuration and consider runs that represent plausible, alternate states of nature.

5) Project future stock conditions regardless of the status of the stock. Use provisional 2017 catch estimates if available. Develop rebuilding schedules, if warranted. Provide the estimated generation time for each unit stock. Stock projections shall be developed in accordance with the following:

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

   A) Project F_{MSY} or proxy ($F_{26\%}$ Spawning Potential Ratio, SPR)
   B) Project F_{OY} (75% of $F_{26\%}$ SPR)
   C) Project $F_{Rebuild}$ (to SPR 26% in 2032)
   D) Project F = 0

   For all scenarios (except F=0), use current sector allocations (51% COM: 49% REC) and retain shrimp bycatch at recent levels of exploitation (as in SEDAR31 and 2014 update).

6) Develop a stock assessment report to address these TORs and fully document the input data, methods, and results.

NOTE: The intent of a standard assessment is to provide a timely update of the benchmark assessment of the stock, while improving the assessment by incorporating any new data or methodology highlighted in the TORs and that can be addressed during the allotted project schedule.

1.3 List of Participants

Panelists

Daniel Goethel (Co-lead analyst)........NMFS Miami
Matthew Smith (Co-lead analyst)........NMFS Miami
Shannon Cass-Calay........NMFS Miami
Gary Fitzhugh........NMFS Panama City
David Hanisko........NMFS Pascagoula
Jeff Isely........NMFS Miami
Kai Lorenzen........SSC/UF
Linda Lombardi........NMFS Panama City
Will Patterson........SSC/UF
Clay Porch........NMFS Miami
Sean Powers........SSC/USA-DISL
Vivian Matter........NMFS Miami
Kevin McCarthy........NMFS Miami
Adyan Rios........NMFS Miami
Jim Tolan........TPWD
Beth Wrege........NMFS Miami

Appointed Observers

Shane Cantrell .... Industry Rep- CFH/Commercial
Gene Proulx ....
Mike Thierry ....Industry Rep - CFH
Jim Zurbrick ....Industry Rep – Commercial/Dealer

Attendees
J.P. Brooker ....Ocean Conservancy
Ching-Ping Chih ....NMFS Miami
Alisha Gray-DiLeone ....SERO
Michael Drexler ....Ocean Conservancy/USF Mike Larkin
Benny Gallaway ....LGL
Martha Guyas ....FWC
Dominique Lazarre ....FWC/FWRI
Patrick Lynch ....NMFS Silver Spring
Brett Pierce ....JPS
Skyler Sagarese ....NMFS Miami
Beverly Sauls ....FWC/FWRI
Alex Shenton ....FL International Univ.
Allison Shideler..Univ. of Miami, CIMAS
Kevin Thompson ....FWC
John Walter ....NMFS SEFSC
Yuying Zhang...FIU

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Julie Neer..SEDAR
Leann Bosarge..GMFMC
Ryan Rindone...GMFMC Staff
Charlotte Schiaffo ....GMFMC Staff
Carrie Simmons..GMFMC Staff

Webinar Attendees
Robert Allman ....NMFS Panama City
Kevin Anson...GMFMC/DCNR Alabama
Steven Atran ....GMFMC Staff
Eric Brazer... Shareholders Alliance
Ken Brennan... NMFS Beaufort
James Bruce...Fisherman
Daniel Buckley.. Shareholders Alliance
James Cowan ....LSU
Nancie Cummings...NMFS Miami
Judd Curtis...TAMUCC
Jane DiCosimo ....NOAA
Kelly Fitzpatrick .... NMFS Beaufort
Chris Gardner ....NMFS Panama City
Robert Gill ....SSC
Buddy Guindon ....Industry Rep

Chad Hanson ....Pew Charitable Trust
Jill Hendon .... USM
Erik Lang ....LA WLF
Cecelia Linder .... NOAA
John Mareska ....DCNR Alabama
Paul Mickle ....MS DMR
Refik Orhun ....NMFS Miami
Adam Pollack ....NMFS Pascagoula
Liz Scott-Denton ....NMFS Galveston
Jessica Stephen ....NMFS SERO
Matt Streich ....TAMUCC
Ted Switzer ....FWC/FWRI
Steve Turner ....NMFS Miami

1.4 List of Assessment Workshop Working Papers and Reference Documents

Document #	Title	Authors	Date Submitted
Documents Prepared for the Assessment Process			
SEDAR52-WP-01	Indices of abundance for Red Snapper (*Lutjanus campechanus*) using combined data from three independent video surveys	Kevin A. Thompson, Theodore S. Switzer, Mary C. Christman, Sean F. Keenan, Christopher Gardner, Matt Campbell	14 September 2017
SEDAR52-WP-02	Indices of abundance for Red Snapper (*Lutjanus campechanus*) from the Florida Fish and Wildlife Research Institute (FWRI) video survey on the West Florida Shelf	Kevin A. Thompson, Theodore S. Switzer, Sean F. Keenan, and James P. McDermott	27 July 2017
SEDAR52-WP-03	SEAMAP Reef Fish Video Survey: Relative Indices of Abundance of Gulf of Mexico - Red Snapper	Matthew D. Campbell, Kevin R. Rademacher, Michael Hendon, Paul Felts, Brandi Noble, Ryan Caillouet, Joseph Salisbury, and John Moser	31 July 2017

SEDAR52-WP-04	Indices of abundance for Red Snapper (*Lutjanus campechanus*) from the NFWF-expanded Florida Fish and Wildlife Research Institute (FWRI) video survey in the eastern Gulf of Mexico	Kevin A. Thompson, Theodore S. Switzer, Sean F. Keenan	12 October 2017
SEDAR52-WP-05	Indices of abundance for Red Snapper (*Lutjanus campechanus*) from the Florida Fish and Wildlife Research Institute (FWRI) repetitive time drop survey in the eastern Gulf of Mexico	Heather M. Christiansen, Theodore S. Switzer, and Kevin Thompson	17 October 2017
SEDAR52-WP-06	Indices of abundance for Red Snapper (*Lutjanus campechanus*) from the Florida Fish and Wildlife Research Institute (FWRI) vertical longline survey in the eastern Gulf of Mexico	Heather Christiansen, Theodore S. Switzer, and Kevin Thompson	17 October 2017
SEDAR52-WP-07	A Comparison of Sampling Methods and Continuation of Red Snapper Life History Metrics	Erik T. Lang and Brett J. Falterman	8 November 2017
SEDAR52-WP-08	A Continuation of Results in the Spatial Distribution and Occurrence of Red Snapper, *Lutjanus campechanus*, Sampled off the Louisiana Coast During Nearshore Trawl Sampling Efforts	Erik T. Lang and Brett J. Falterman	8 November 2017
SEDAR52-WP-09	Red Snapper Discard Mortality in Florida's Recreational Fisheries	B. Sauls, O. Ayala, R. Germeroth, J. Solomon, R. Brody	13 November 2017
SEDAR52-WP-10	Red snapper *Lutjanus campechanus* Findings from the NMFS Panama City Laboratory Camera & Trap Fishery-Independent Survey 2004-2016	C.L. Gardner and K.E. Overly	13 November 2017

SEDAR52-WP-11	Red Snapper (*Lutjanus campechanus*) larval indices of relative abundance from SEAMAP Fall Plankton Surveys, 1986 to 2016	David S. Hanisko, Adam G. Pollack, Denice M. Drass, Pamela J. Bond, Christina Stepongzi, Taniya Wallace, Andrew Millet, Consuela Cowan, Christian M. Jones, Glenn Zapfe and G. Walter Ingram, Jr.	14 November 2017
SEDAR52-WP-12	SEAMAP Vertical Line Survey: Relative Indices of Abundance of Gulf of Mexico - Red Snapper	Matthew D. Campbell, Ted Switzer, John Mareska, Jill Hendon, Jeff Rester, Chloe Dean, Fernando Martinez-Andrade	15 November 2017
SEDAR52-WP-13	Using a Censored Regression Modeling Approach to Standardize Red Snapper Catch per Unit Effort Using Recreational Fishery Data Affected by a Bag Limit	Skyler Sagarese and Adyan Rios	15 November 2017
SEDAR52-WP-14	Summary of Red Snapper age-length data by data providers for SEDAR52	Linda Lombardi	16 November 2017
SEDAR52-WP-15	Reproductive data compiled for the Gulf of Mexico Red Snapper, *Lutjanus campechanus*, SEDAR 52	G.R. Fitzhugh, H.M. Lyon, V.C. Beech, P.M. Colson	17 November 2017
SEDAR52-WP-16	Red Snapper Abundance Indices from Bottom Longline Surveys in the Northern Gulf of Mexico	Adam G. Pollack, David S. Hanisko and G. Walter Ingram, Jr.	21 November 2017
SEDAR52-WP-17	Continuity run – Bottom Longline	Adam G. Pollack	1 August 2017
SEDAR52-WP-18	Continuity run - Groundfish	Adam G. Pollack	1 August 2017
SEDAR52-WP-19	A Summary of Data on the Size Distribution and Release Condition	Dominique Lazarre, Beverly	27 November 2017

	of Red Snapper Discards from Recreational Fishery Surveys in the Eastern Gulf of Mexico	Sauls, and Rachel Germeroth	
SEDAR52-WP-20	Use of the Connectivity Modeling System to estimate movements of red snapper (*Lutjanus campechanus*) recruits in the northern Gulf of Mexico	M. Karnauskas, J. F. Walter III, and C. B. Paris	27 November 2017
SEDAR52-WP-21	Discards of red snapper (*Lutjanus campechanus*) for the headboat fishery in the US Gulf of Mexico	Kelly Fitzpatrick	1 December 2017
SEDAR52-WP-22	A multinomial predictive model to incorporate visual surveys of red snapper lengths	John Walter, Marcus Drymon, Chris Gardner, Crystal Hightower, Will Patterson, Sean Powers, Kevin Thompson and Ted Switzer	29 November 2017
SEDAR52-WP-23	Updated shrimp bycatch estimates for SEDAR 52	Jeff Isely	1 December 2017
SEDAR52-WP-24	Red Snapper Abundance Indices from Groundfish Surveys in the Northern Gulf of Mexico	Adam G. Pollack[1], David S. Hanisko[2] and G. Walter Ingram, Jr.[2]	13 December 2017
Final Stock Assessment Reports			
SEDAR52-SAR1	Gulf of Mexico Red Snapper	SEDAR 52 Panel	
Reference Documents			
SEDAR52-RD01	A Comparison of Red Snapper Reproductive Potential in the Northwestern Gulf of Mexico: Natural versus Artificial Habitats	Hilary D. Glenn, James H. Cowan Jr. & Joseph E. Powers	
SEDAR52-RD02	Investigation of the relative habitat value of oil/gas platforms and natural banks in enhancing stock building of reef fish in the western Gulf of Mexico	Gregory W. Stunz, Matthew J. Ajemian, Matthew K. Streich, Rachel Brewton, Charles Downey, and Quentin Hall	

SEDAR52-RD03	Red Snapper Distribution on Natural Habitats and Artificial Structures in the Northern Gulf of Mexico	Mandy Karnauskas, John F. Walter III, Matthew D. Campbell, Adam G. Pollack, J. Marcus Drymon & Sean Powers
SEDAR52-RD04	A Comparison of Size Structure, Age, and Growth of Red Snapper from Artificial and Natural Habitats in the Western Gulf of Mexico	Matthew K. Streich, Matthew J. Ajemian, Jennifer J. Wetz, Jason A. Williams, J. Brooke Shipley & Gregory W. Stunz
SEDAR52-RD05	An Updated Description of the Benefits and Consequences of Red Snapper Shrimp Trawl Bycatch Management Actions in the Gulf of Mexico	Benny J. Gallaway, W. J. Gazey & J. G. Cole
SEDAR52-RD06	Establishing stock status determination criteria for fisheries with high discards and uncertain recruitment	Daniel R. Goethel, Matthew W. Smith, Shannon L. Cass-Calay, and Clay E. Porch
SEDAR52-RD07	Headboat Collaborative Pilot Program 2014 Annual Report	NMFS - SERO
SEDAR52-RD08	Effects of the Two-Year Exempted Fishing Permit for the Gulf of Mexico Headboat Collaborative	Joshua K. Abbott
SEDAR52-RD09	Rights-based management for recreational for-hire fisheries: Evidence from a policy trial	Joshua K. Abbott and Daniel Willard
SEDAR52-RD10	Release mortality in the red snapper (Lutjanus campechanus) fishery: a meta-analysis of 3 decades of research	Matthew D. Campbell, William B. Driggers III, Beverly Sauls2, John F. Walter

2. INPUT DATA

2.1 Stock Structure and Management Unit

The management unit for Gulf of Mexico red snapper extends from the United States–Mexico border in the west through the northern Gulf of Mexico waters and west of the Dry Tortugas and the Florida Keys (waters within the Gulf of Mexico Fishery Management Council boundaries). Consistent with the findings of SEDAR 31, this update assessment assumes there are two primary sub-stocks of red snapper within this region, separated roughly by the Mississippi River. Currently, the Council manages these sub-stocks as one unit, but the option of eastern and western management units remains viable. For practical purposes, the eastern Gulf and western Gulf were defined based on Gulf shrimp grids (grids 1 to 12 for the eastern Gulf and 13 to 21 for the western Gulf). The areas are illustrated in **Figure 2.1**.

2.2 Life History Parameters

The life history parameters used in the assessment were identical to those adopted during SEDAR 31. They are summarized briefly in the subsections below (for more details see the SEDAR 31 final report).

2.2.1 Natural Mortality

The SEDAR 31 assessment and review panels agreed that the average natural mortality rate (M) over the fishable lifespan of Gulf red snapper was best based upon observations of maximum age using the Hoenig method. The highest estimated age for red snapper to date was 57 years based on counting otolith rings, but this was based on a single fish and there is some uncertainty in that estimate. Noting that the oldest age that has been validated by bomb radiocarbon dating was 38 years old, the SEDAR 31 Panel adopted an intermediate value of 48 years for the maximum age (5 fish have been aged at 48 years old). The corresponding value of the average natural mortality rate ($\overline{M}$) over the fishable lifespan of red snapper (age 2 and older) was 0.094277 yr^{-1}.

The values of M for age-0 and age-1 fish were set equal 2.0 yr^{-1} and 1.2 yr^{-1}, respectively (based on estimates derived from several different sources, see section 2.4 of the SEDAR 31 DW report and section 2.1.1 of the SEDAR AW report). Age-specific M values for ages 2 and older followed the Lorenzen curve (Lorenzen 1996) rescaled to an average equal to $\overline{M}$. The age-specific M values were adjusted to account for the fact that the Stock Synthesis algorithm advances the age of fish on January 1 of each year regardless of when recruitment occurs. Therefore, red snapper with an assumed birth date of July 1 are only assigned to age class 0 for six months and, after their sixth month (January of the following calendar year) are advanced to age-class 1. The vector of natural mortality by age is given in **Table 2.1 and Figure 2.2**.

2.2.2 Release Mortality

A meta-analysis was developed for SEDAR 31 (and used for the update assessment) to model depth-dependent discard mortality rates for Gulf of Mexico red snapper (Campbell et al. 2014). Data used in this meta-analysis were compiled from 11 studies that produced 70 distinct estimates (some studies produced estimates for multiple fishing depths and/or seasons). Separate discard mortality relationships were developed for each sector (i.e., commercial and recreational) and for vented and unvented fish. The results from this model were used during SEDAR 31 to select appropriate discard mortality rates for each fishery, based on the average depth fished, over different time periods. No venting was assumed to occur prior to 2008 (i.e., when venting became mandatory), and venting was assumed to occur from 2008 onward. An average seasonal effect was assumed in the relationships. For the commercial sector, average depths at which discards occurred for each gear (vertical line or long line), region (eastern or western Gulf), and season (open or closed) were calculated using commercial observer program data. Consistent with how commercial discards have been treated in other parts of the assessment, discards from trips with IFQ allocation were considered open season discards, while discards from trips with no IFQ allocation were considered equivalent to closed season discards. For the recreational sector, average depths at which discards occurred for each region (eastern or western Gulf) and season (open or closed) were calculated using self-reported data from the iSnapper program. The average depths in the iSnapper data were similar to depths reported by recreational fishers.

Discussions at the SEDAR 52 data and assessment meetings highlighted the availability of new estimates for discard mortality from the recreational for-hire fishery collected by the state of Florida (SEDAR52-WP-09). Results from this study include estimates of discard mortality at 10 meter depth intervals and integrated estimates for discards observed within the for-hire fishery off the west coast of Florida. Estimated discard mortality for charter and headboat segments of the fishery were > 20% and higher than what was estimated for SEDAR 31. The assessment panel requested that mortality estimates from this new study for each 10 meter depth interval (Figure 5 in SEDAR52-WP-09) be incorporated into the meta-analysis used for SEDAR 31. The first run of the meta-analysis used all tagged fish in the study as the sample size variable and recreational discard mortality at the depths fished for the recreational fishery was estimated to be 15.8%. The assessment panel requested that the meta-analysis be re-run using only recaptured fish for the sample size variable and the results suggested a new recreational discard mortality for the recent period (post 2008) of 11.8% (both East and West). The decision made by the assessment panel was to use 11.8% in all of the SEDAR 52 models and to use the higher 15.8% in a base model sensitivity run. The resulting release mortality rates, by fleet, region, open/closed season and venting requirement are summarized in **Table 2.2**.

2.2.3 Reproduction

The fecundity of each age class, in eggs per female, was based on Porch et al. (2013). Fecundity for the age-20 plus group was calculated as the weighted average of fecundity for ages 20-39, where the weights are the fraction surviving to each age without fishing (assuming the age-specific Lorenzen *M* values). The final vector of per-capita fecundity-at-age, which was also used for the 2014 SEDAR 31 Update Assessment, is shown in **Table 2.3** and **Figure 2.3**.

2.2.4 Growth

The growth parameters estimated from SEDAR 31 were:

L_{inf} (max TL cm) = 85.6374,
K = 0.191852,
t_0 = -0.394525.

Inasmuch as the growth curve was fit to readings of the biological age at size (**Figure 2.4a**), but Stock Synthesis advances age of fish after six months (so a 0.5 year old fish is called age 1 on January 1 of each year), the growth curve was converted from biological age to SS age-class by adding 0.5 to t_0 ($t_{0adjusted}$ = 0.10547) (**Figure 2.4b**). The variation in size with age was assumed to be normally distributed with the coefficient of variation in age changing linearly with the mean size at age from 0.1735 for age 0.75 or younger to 0.0715 for age 20 and older.

2.2.5 Conversion Factors

The meristic regressions were not updated for the SEDAR 52 assessment. However, a number of new conversions were estimated to predict fork length, because these were not provided in previous assessments. A strict update approach was utilized wherein the SEDAR 31 data, models, and methods were used to determine the FL conversion factors. The SEDAR 52 updated conversion factors are summarized below and the mean weight-at-length used in the assessment is provided in **Figure 2.5**:

WW (kg) = 1.673E-05 * Max TL (cm) ^ 2.953
Max TL (cm) = 1.079 * FL (cm)
Max TL (in) = 0.1325 + Nat TL (in) * 1.022
Max TL (in) = 2.0303 + SL (in) * 1.162
FL (cm) = 0.0879 + Max TL (cm) * 0.9249
FL (cm) = -0.3827 + Nat TL (cm) * 0.9339
WW (lbs) = 4.47E-04 * Max TL (in) ^ 2.994
WW (lbs) = 6.90E-04 * FL (in) ^ 2.968
GW (lbs) = 4.63E-04 * Max TL (in) ^ 3.009
GW (lbs) = 5.69E-04 * FL (in) ^ 3.012
WW (lbs) = 1.11 * GW (lbs) – 0.264
GW (lbs) = 0.89 * WW(lbs) + 0.2837

2.2.6 Age-Length Keys

Since the 2014 SEDAR 31 Update Assessment, over 49,000 new age-length records have been included in the red snapper database largely representing samples from 2014-2016 from the Gulf States Marine Fisheries Commission Fisheries Information Network (GulfFIN) and the National Fish and Wildlife Foundation (NFWF) Gulf Environmental Fund survey data (SEDAR52-WP-14). The updated age-length data was used in combination with the growth curve to assign the probability that a given length class belonged in a given age class. Separate age-length keys for the eastern and western Gulf were developed, which included length and age data from the commercial fisheries, the recreational fisheries, the NMFS bottom long line survey, NFWF, and GulfFIN. The updated age-length keys demonstrated only minor differences from those utilized in the 2014 SEDAR 31 Update Assessment and are provided in **Table 2.4**.

2.3 Fishery Data

2.3.1 Commercial

The primary commercial gears used for Gulf of Mexico red snapper are vertical hook and line (vertical lines, bandit rigs, rod and reel, etc.) and longline. The data collected from these fisheries include landings, discards, catch per unit effort (CPUE), size composition, and age composition. All of these data were updated for each area (east and west of the Mississippi) through 2016.

Landings:

Estimates of commercial landings (pounds, whole weight) are available since the inception of the major fisheries (1872 for the vertical line and 1980 for the longline fishery; **Table 2.5**). With the exception of the additional three years of data, the commercial estimates have not changed significantly since SEDAR 31 (**Figure 2.6**).

Size and Age Composition of Landings:

Size and frequency distributions were developed from observations of maximum total length recorded in the Trip Interview Program (TIP) and the Gulf Fisheries Information Network (GulfFIN) as described in SEDAR31-DW-10. Age frequency distributions were constructed from readings of otolith samples recorded in the same data bases. However, it was observed that the length frequency distributions of the red snapper age samples differed from the length frequency distributions of the larger set of red snapper length samples, particularly prior to 2000, suggesting the age samples were not representative in the earlier years. Accordingly, the age frequency distributions were reweighted by the length frequency distributions as done in SEDAR 31 (**Table 2.6**).

Discards:

Data available for the calculation of red snapper discards from the commercial fishery during the years prior to Individual Fishing Quotas (IFQs) were limited to fisher-reported discard rates through the discard logbook program and fishing effort through the coastal logbook program. Complete years of observer reported data (2007-2016) coincide with management through IFQs. Commercial fishers report significant changes in fisher behavior under IFQ management; therefore, use of observer reported discard rates to calculate discards prior to 2007 would be inappropriate as discard rates prior to IFQs were likely different than discard rates under IFQs. Commercial discard estimates were not updated for the years prior to 2007. Methods for calculating commercial discards for the years prior to 2007 are included in SEDAR (2015).

Management through Individual Fishing Quotas (IFQ) began in January 2007 and fishery observer data were available beginning in July 2006. Observer data were used to calculate discard rates for the years 2007-2016. Total effort reported by the commercial fishery was available from fisher-reported coastal logbooks. Data were stratified by gear (vertical line or bottom longline), year, region (east or west of the Mississippi River), and, to account for discard rate differences due to availability of allocation, IFQ allocation (0, 1+ pounds). Discard rates were calculated using observer reported data and total effort was summed, by strata, using coastal logbook data. Red snapper discards were calculated as the product of the stratum-specific discard rate and the stratum-specific total effort. The strata-specific discards were summed within years to calculate yearly total discards. The continuity version of the commercial discards is provided in **Figure 2.7** (vertical line) and **Figure 2.8** (longline) for both the open and closed seasons.

SEDAR 52 Recommended Methods

A new method for calculating commercial discards for the period 2007-2016 was recommended at the SEDAR 52 data/assessment workshop. Prior to SEDAR 52 it was noted that calculation of annual gear specific landings of a species using the product of observer reported kept rates and total effort reported to the coastal logbook program may result in an overestimate of landings compared to landings summed from dealer reports. This result suggests that discards calculated using similar methods may be overestimated. To improve the discard calculation, discards were initially calculated as described above. Landings of red snapper were then calculated as the product of the kept rate and total effort for each gear/year/region/IFQ allocation stratum. The ratio of those calculated landings to landings from dealer reports were calculated and discards were estimated as: (discard rate * total effort)/landings ratio.

The final commercial discards by season (open/closed) in numbers of fish (using the SEDAR 52 recommended methods) are summarized in **Table 2.7** (vertical line) and **Table 2.8** (longline). A comparison of the discards calculated using the SEDAR 52 recommended method to the values used in the 2014 SEDAR 31 Update Assessment for years with IFQ implemented (values prior to 2007 did not vary from the 2014 SEDAR 31 Update Assessment) are provided in **Figures 2.9-2.10**. As was done in the 2014 SEDAR 31 Update Assessment, the SEDAR 52 assessment summed the closed season/no-IFQ discards across fleets and treated these combined region-specific discards as unique fleets with their own selectivity patterns

Size and Age Composition of Discards:

Commercial discard age compositions for both the open and closed seasons were constructed by applying the region-specific age-length keys to the length frequencies from the commercial observer program. Very few discarded red snapper were sampled from the long line fishery in the western Gulf of Mexico; therefore, no longline discard age compositions were utilized for the western Gulf of Mexico. Similarly, the closed season discard age composition only utilized the size composition data from the vertical line (HL) fleet as this comprised the bulk of the available length measurements. The computed annual age composition of the commercial discards by fleet, region, and red snapper season (Open or Closed/no-IFQ) are summarized in **Table 2.9** (open season) and **Table 2.10** (closed season).

Catch Per Unit Effort:

All fishery CPUE indices used in the update assessment are summarized in **Table 2.11**.

Data from the National Marine Fisheries Service reef fish logbook program were used during SEDAR 31 to construct standardized CPUE indices of abundance for the populations of red snapper in the eastern and western Gulf of Mexico. The indices used the self-reported catch rate information for the vertical line fishery from the conception of the logbook program in 1990 through 2006 (after which fishing behavior appears to have changed substantially owing to the implementation of Individual Fishing Quotas, IFQs). Accordingly, the commercial CPUE indices were not updated for this assessment. Due to the difficulty in obtaining CPUE indices that accurately reflect resource abundance, particularly for fisheries with highly complex regulations that may impact the relationship between catch rates and abundance, a sensitivity run was carried out with no CPUE indices incorporated (i.e., satisfying TOR 2c).

2.3.2 Recreational

The primary recreational modes of fishing for Gulf of Mexico red snapper are private, charter, and headboat vessels. Estimates of the catch of these species come from a combination of results from four surveys: (1) the Marine Recreational Information Program (MRIP), formerly the Marine Recreational Fishery Statistics Survey (MRFSS), conducted by NOAA Fisheries (NMFS); (2) the Texas Marine Sport-Harvest Monitoring Program by the Texas Parks and Wildlife Department (TPWD); and (3) the Southeast Region Headboat Survey (SRHS) conducted by NMFS, Southeast Fisheries Science Center, Beaufort, NC; and (4) the Louisiana Creel Fish Survey (LA Creel). The MRIP, TPWD, and LA Creel surveys are sampling-based, while the SRHS strives to be a census of headboats using logbooks. The four surveys together provide estimates of catch in numbers, estimates of effort, length and weight samples, and catch-effort observations for shore-based and boat fishing. Length samples were also obtained from the Fisheries Information Network, Trip Interview Program and observer programs operating in Florida, Alabama, and Louisiana.

Recreational statistics were split out into charter/private boat landings and headboat landings by region to allow for the use of both the MRIP (i.e., charter/private) indices of abundance and the headboat indices of abundance in the assessment model (each index must be assigned to a fleet in the model). The methods for filling gaps and combining series are as described in the SEDAR 31 assessment report (SEDAR 2013a).

The MRIP time series of estimates were adjusted to account for the changes in the Access Point Angler Intercept Survey (APAIS) and the weighted estimation methodology. This follows the methodology used in the 2014 SEDAR 31 Update Assessment (SEDAR 2015).

Landings:

Recreational landings by fishing mode (Private + Charter, Headboat) and region are summarized in **Table 2.12**. Although landings for the private/charter for the 2014 SEDAR 31 Update Assessment were 10-20% greater than the landings used in the SEDAR 31 assessment (due to the APAIS adjustment), recreational landings did not differ between the 2014 SEDAR 31 Update Assessment and SEDAR 52 (**Figure 2.11**). Historical landings utilize the methodology laid out in SEDAR 31, which estimates landings based on historical effort records from the US Fish and Wildlife Service, National Survey of Fishing, Hunting, and Wildlife Associated Recreation (SEDAR31-RD25) for the private/charter modes. Due to an incomplete spatial overlap of available landings and effort data for red snapper during 1981- 1985, the FHWAR method was modified to estimate landings by Gulf region and to use average estimates of CPUE calculated from 1986-1990.

Size and Age Composition of Landings:

Length samples from recreational landings were obtained from the Marine Recreational Fisheries Statistics Survey, the Southeast Region Headboat Survey, the Texas Parks and Wildlife Department, the Fisheries Information Network, and the Trip Interview Program. Additionally, length data were available from observer programs operating in Florida, Alabama, and Louisiana. During SEDAR 31, it was observed that the length frequency distributions of the red snapper age samples differed from the length frequency distributions of the larger set of red snapper length samples, particularly prior to 2000, suggesting the age samples were not representative in the earlier years. Accordingly, the age frequency distributions were reweighted by the length frequency distributions as done in SEDAR 31 (**Table 2.13**).

Discards:

Methods for estimating discards in the recreational fishery are described in the SEDAR 31 assessment report. Recreational discards are calculated by wave and season (open or closed), but if the season closes within a given wave the reported discards are not adjusted accordingly (i.e., they are assigned to the season that corresponds to the beginning of the wave). Therefore, discards occurring within a wave where the recreational fishing season was initially open but subsequently closed require additional partitioning to prorate discards adequately between open and closed seasons. The process essentially involves calculating the length of the open season (based on exact season closure dates) for any wave during which a closure occurred and prorating the discards for that wave between open and closed seasons based on the proportion of the wave that the season was open or closed. Discards are then summed for each season in a given year to provide the total open and closed season discards for that year. These calculations are only needed since 1997, because prior to this the recreational season lasted year round. Additionally, since 2014 the two modes within the MRIP 'fleet' (private and for-hire/charter) have been assigned separate quotas resulting in different season lengths. As such, partitioning between open and closed seasons must be calculated independently for each mode. Because these modes make up a single 'fleet' in the assessment, the total discards (partitioned between open and closed seasons) must then be summed across mode after they are partitioned.

All recommendations from SEDAR 31 as implemented in the 2014 SEDAR 31 Update Assessment were incorporated in the SEDAR 52 model. In general, the MRIP open and closed season discard estimates were nearly identical to those from the 2014 SEDAR 31 Update Assessment (**Figure 2.12**). The largest discrepancy was a slight downward adjustment in the 2008 estimates, which was due to a small issue in the specified duration of the open season during Wave 4. The recreational discards (in numbers of fish) are summarized by region and red snapper season (open/closed) in **Table 2.14** (MRIP Private + Charter).

To estimate discards for the headboat fleet, discard rates from SRHS headboats with consistent patterns of reporting for 2004-2016 were scaled using observer data. To hind-cast headboat rates for 1981-2003, the recommendation was to use data from MRIP as a proxy. The MRIP proxy was developed from the mode or modes (charterboat, private, or both) whose discard rates had the strongest positive correlation to the 2004-2016 headboat discard rates. These decisions were done by Gulf region, in accordance with SEDAR 31 recommendations. Previously (SEDAR 31), the MRIP proxy having the best linear correlations with the SRHS during 2004-2011 was the “all modes combined” proxy in the East Gulf of Mexico and the charter boat mode in the West Gulf of Mexico. During the 2014 SEDAR 31 Update Assessment, the additional years of data from 2012 and 2013 had the effect of changing the proxy with the best linear correlation in the East Gulf of Mexico to the charter boat mode. The MRIP APAIS adjustment had the effect of changing the proxy with the best linear correlation in the West Gulf of Mexico to “all modes combined”.

The consistently reporting vessel discard ratio method (SEDAR 31) relies on vessels that consistently reported the magnitude of their discards in order to account for underreported discards, particularly in 2004-2007 (Matter and Walter, 2013). The term ‘consistent’ was defined by reporting discards in two of the four years in the year groups 2004-2007 and 2008-2011. This list of ‘consistent’ vessels was not updated through 2016, which eliminates any vessels that were added to the survey from 2011-2016. This method also excluded vessels that were new to the survey in those year groups. The grouping of years was arbitrary and could eliminate vessels that reported across year groups or were added to the SRHS after 2011, but were in fact consistently reporting vessels. Therefore, the consistently reporting vessel discard ratio was not recommended for consideration.

The SRHS discard proportions were compared to the MRIP At-Sea Observer program discard proportions for validation purposes and to determine whether the SRHS discard estimates should be used for a full or partial time series (2004-2016). It was determined that the SRHS discard estimates should be used for a partial time series (2008-2016; SEDAR52-WP-21).

The mean MRIP CH : SRHS discard ratio method developed in SEDAR 28 was used (SEDAR 2013b). A ratio of the mean ratio of SRHS discard : landings (2008-2016) to the mean ratio of MRFSS CH discard : landings (2008-2016) was applied to the yearly MRIP charter boat discard : landings ratio (1986-2007, 1981-2007 in TX) in order to estimate the yearly SRHS discard : landings ratio (1986-2007, 1981-2007 in TX). This ratio was then applied to the SRHS landings (1986-2007, 1981-2007 in TX) in order to estimate headboat discards (1986-2007, 1981-2007 in TX). The recreational headboat discards (in numbers of fish) using the recommended methods for SEDAR 52 are summarized by region and red snapper season (open/closed) in **Table 2.15**. Not surprisingly, headboat discard estimates have changed dramatically with the eastern open season discards decreasing by 1-6 orders of magnitude (maximum of ~250,000 fish) over the last two decades (**Figure 2.13**). As was done in the 2014 SEDAR 31 Update Assessment, the SEDAR 52 assessment model combined recreational closed season discards across fishing mode (Private+Charter+Headboat) and treated these combined region-specific discards as unique fleets.

Size and Age Composition of Discards:

The age composition for the Eastern Gulf headboat fishery during the open fishing season was developed by applying a regional age-length key to the length frequency from the headboat observer program in Florida (SEDAR-52-WP19). The resulting annual age composition is summarized in **Table 2.16.** Length data collected on charter boats monitored in the Florida observer survey were also provided (SEDAR-52-WP19) but not used, because the model considers the private and charter mode as a single fleet. In the future, use of the relative magnitude of estimated charter and private boat discards should be explored to appropriately weight available data within this combined fleet. No length or age composition was available for the closed season recreational fleet.

Catch Per Unit Effort:

The MRIP/MRFSS intercept data and SRHS logbook data were used to develop standardized CPUE indices of abundance consistent with the methods adopted during SEDAR 31. However, the SEDAR 52 panel decided to truncate the MRIP east and west along with the HBT east indices in 2013. The major justification for truncating the MRIP indices was related to changing state and federal regulations since 2013. Specific concerns included open seasons differing among states and between states and federal as well as recent modifications to territorial seas in LA, MS, and AL. Truncation was recommended for the HBT east index due to evidence of changing fishing behavior. Fisher testimony suggested that headboat targeting has changed in recent years, where trips tend to be shorter, closer to shore, and multi-species in nature. Given the difficulties in trying to standardize an index to the changing management regime while maintaining a relationship between catch rates and abundance, the panel decided that it was best to truncate the indices. The resulting indices are compared with the 2014 SEDAR 31Update Assessment indices in **Figure 2.14** (MRIP) and **Figure 2.15** (headboat) and all fishery-dependent CPUE indices used in the assessment are summarized in **Table 2.11**. Slight discrepancies occurred in the final indices due to corrected regulatory factors in the MRFSS east index during the 2014 SEDAR 31 Update Assessment (i.e., the closed season was not properly accounted for in 2013) along with issues linked to the species association that prevented estimation of a standardized CPUE value in the 2011 headboat east index. The former issue led to a change in trend from downward in the most recent period to relatively stable since the late 2000s that has some influence on the final assessment models. The lack of an index value during 2011 was due to all positive trips (100% proportion positive), which prevented the binomial component of the delta model to be fit. Although this was not an issue during the 2014 SEDAR 31 Update Assessment, 2011 had a proportion positive of 99.74% due to only 3 trips included from the Stephens and MacCall subsetting procedure (Stephens and MacCall 2004) that did not catch red snapper.

2.3.3 Shrimp Fishery Bycatch

Shrimp bycatch estimates for Gulf of Mexico red snapper were generated using the same approach developed in the SEDAR 7 Gulf of Mexico red snapper assessment (Nichols 2004a,b). The primary data on CPUE in the shrimp fishery came from a series of shrimp observer programs, which began in 1972 and extend to the current shrimp observer program. Additional CPUE data were obtained from the SEAMAP groundfish survey. Point estimates and associated standard errors of shrimp effort were generated by the NMFS Galveston Lab using their SN-pooled model (Nance 2004). Most CPUE data were reported in fish per net hour, while the shrimp effort data were reported in vessel-days. Therefore, data from the Vessel Operating Units

File were needed to estimate the average number of nets per vessel for the shrimp fishery to convert total shrimp effort to net-hours. A detailed description of the data and methods used to produce the shrimp bycatch estimates can be found in Linton (2012). The resulting regional bycatch estimates (in numbers of fish) are summarized in **Table 2.17**. Bycatch estimates were very similar to the 2014 SEDAR 31 Update Assessment (**Figure 2.16**). The panel decided to not include the 2016 data point in the assessment (or the observed median value) as it was believed to be estimated at an unreasonably high value.

Regional shrimp effort was used as an index of shrimp fishing mortality in the assessment. Shrimp effort for depths greater than 10 fathoms was chosen, because effort from these depths is thought to best represent the fishing pressure experienced by red snapper in the shrimp fishery (**Table 2.18**). Shrimp effort estimates have not changed since the 2014 SEDAR 31 Update Assessment, except for the addition of the 2014-2016 data points (**Figure 2.17**).

Age compositions for the shrimp bycatch were derived through modal analysis of length frequencies from both the voluntary (1992-1996) and mandatory (1997-2016) shrimp observer program (as described in Linton 2013a; **Table 2.19**).

2.4 Fishery-Independent Data

There are five main sources of fishery-independent data used in this assessment. Three are conducted as part of the Southeast Area Monitoring and Assessment Program (SEAMAP), a collaborative effort between federal, state and university programs, designed to collect, manage and distribute fishery independent data throughout the region: a trawl survey, a video survey on natural structure, and a larval survey. The fourth survey is conducted using bottom longlines deployed away from structure, and the fifth is a combination of ROV surveys. The methodologies used to standardize and incorporate these data into the assessment are identical to those employed during SEDAR 31 and therefore are only briefly reviewed below. Additionally, five new indices were presented, but the SEDAR 52 panel decided not to use them for varying reasons. These included a SEAMAP vertical long line index, a combined video index, a NFWF-expanded video index, a FWC repetitive time drop and vertical long line index, and an index of recruitment obtained from a larval individual-based modeling program (i.e., the connectivity modeling system; CMS).

All fishery-independent indices that were used in the SEDAR 52 assessment are summarized in **Table 2.20**. Indices that were discussed for inclusion, but not used in the Base Model can be found in the associated working papers submitted for SEDAR 52 and can be downloaded from: http://sedarweb.org/sedar-52-dataassessment-workshop.

2.4.1 SEAMAP Reef Fish Video Survey

The primary objective of the SEAMAP reef fish video survey is to provide an index of the relative abundances of fish species associated with natural topographic features (e.g. reefs, banks, and ledges) located on the continental shelf of the Gulf of Mexico (GOM) from Brownsville, TX to the Dry Tortugas, FL. Secondary objectives include quantification of habitat types sampled (video and side-scan), and collection of environmental data throughout the survey.

Because the survey is conducted on topographic features, the species assemblages targeted are typically classified as reef fish (e.g., red snapper). The survey has been executed from 1992-1997, 2001-2002, and 2004-2016 and historically takes place from May – August. Types of data collected on the survey include diversity, abundance (minimum count), fish length, habitat type, habitat coverage, and bottom topography. The size of fish sampled with the video gear is species specific however red snapper sampled over the history of the survey had fork lengths ranging from 146 – 917 mm. Beginning with the 2012 survey, a vertical line component was coupled with video drops to collect hard parts, fin clips, and gonads.

Regional abundance indices were developed using methods similar to those described in SEDAR31-DW08 and updated in SEDAR52-WP-03. In general, the indices were similar to those developed for SEDAR31 and the 2014 SEDAR 31 Update Assessment, although some disparities were noted, which were due to updated quality assurance and quality control (QA/QC) measures applied to the video index database (**Figure 2.18**).

Age compositions were constructed by applying the regional age-length keys to the length frequencies from the survey. The resulting age compositions are summarized in **Table 2.21**.

2.4.2 SEAMAP Larval Survey

Ichthyoplankton samples have been collected by SEAMAP surveys in the Gulf of Mexico (GOM) since 1982, with the goal of producing a long-term database on the early life stages of fishes. These surveys are the only Gulf-wide survey of U.S. continental shelf and coastal waters during the red snapper spawning season. The occurrence and abundance of red snapper larvae captured during SEAMAP surveys in the Gulf of Mexico have been used to reflect trends in relative spawning stock size of red snapper since 2004. A full review of the survey design and methodologies are described in SEDAR31-DW27 and SEDAR52-WP-11.

Indices developed using the SEAMAP Fall Plankton Survey were recommended for use in the SEDAR 31 assessment model, and were used for the 2014 SEDAR 31 Update Assessment along with the current SEDAR 52 assessment. The abundance indices recommended for use by the SEDAR 31 assessment were the age adjusted index for the western GOM that included all larvae between 3.75 and 9.25 mm, and the frequency of occurrence model for the eastern GOM. The frequency of occurrence model was chosen over the delta-lognormal index due to extremely low catches and occurrence of red snapper in the eastern GOM. However, the eastern index used in the 2014 SEDAR 31 Update Assessment was based on age adjusted abundances not frequency of occurrence. The western and eastern indices submitted for SEDAR 52 are based on age corrected abundances to remain consistent with the 2014 SEDAR 31 Update assessment. Modification to the site selection protocol for the eastern Gulf of Mexico larval index was also implemented for the SEDAR 52 assessment. Samples from surveys conducted during 1988, 1989, 2002 and 2004 were previously included in the eastern index formulation, but have since been determined to lack consistent spatial coverage and are now excluded. However, these changes did not impact index trends and only slightly altered index values (**Figure 2.19**).

The SEAMAP larval survey was modeled as an index of spawning stock biomass. Therefore, no age composition was necessary as the selectivity was fixed using the age-based fecundity estimate.

2.4.3 SEAMAP Groundfish Survey

Standardized trawl surveys have been conducted in the Gulf of Mexico (GOM) since 1972 and continued under the Southeast Area Monitoring and Assessment Program (SEAMAP) in 1982 and 1987 for the summer and fall, respectively. The primary objective of this trawl survey, which is conducted semi-annually (summer and fall), is to collect data on the abundance and distribution of demersal organisms in the northern GOM. A full review of the survey design and methodologies are described in SEDAR31-DW20. At the request of the panel for SEDAR 31, data from a Dauphin Island Sea Lab trawl survey was included with SEAMAP trawl data in the eastern GOM as detailed in SEDAR31-AW07.

As in SEDAR 31 and the 2014 SEDAR 31 Update Assessment model, indices developed from the SEAMAP Groundfish Survey and Dauphin Island data (in the east) were included in the SEDAR 52 assessment model. Separate indices were developed for the eastern and western GOM and for the summer and fall surveys and were similar to those submitted for the 2014 SEDAR 31 Update Assessment (SEDAR52-WP-18; **Figure 2.20**). The decision to split the indices into summer and fall was based on the age structure of each survey, with the summer generally representative of age-1 fish and the fall representative of age-0 fish. Age compositions for the SEAMAP Groundfish and Dauphin Island surveys were derived through modal analysis of length frequencies from the surveys (**Tables 2.22 – 2.23**).

2.4.4 NMFS Bottom Longline

The Southeast Fisheries Science Center (SEFSC) Mississippi Laboratories has conducted standardized bottom longline surveys since 1995. The objective of these surveys is to provide fisheries independent data for stock assessment purposes for as many species as possible. These surveys are conducted annually in U.S. waters of the Gulf of Mexico (GOM) and/or the Atlantic Ocean, and they provide an important source of fisheries independent information on large coastal sharks, snappers and groupers from the GOM and Atlantic. In 2011, a Congressional Supplement Sampling Program (CSSP) was conducted where high levels of survey effort were maintained from April through October. For this analysis, only CSSP data collected during the same time period as the annual survey (August/September) were used to supplement missing data from the NMFS BLL survey in 2011. As in SEDAR 31, two standardized indices (Eastern GOM and Western GOM) were developed using NMFS bottom longline survey data (SEDAR52-WP-17; **Figure 2.21**). The eastern GOM index also included data from a bottom longline survey collected by Dauphin Island Sea Lab (see SEDAR52-WP16 for details).

Direct age compositions were used for the NMFS bottom long line survey, which included age data from the 2011 supplemental sampling (**Table 2.24**). Direct age compositions were considered to be representative, because the otoliths were extracted and read for the majority of red snapper caught in the survey.

There continues to be 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 survey tends to capture a greater proportion of older fish than any of the fisheries (including commercial longline). This result suggests that older biomass is relatively less vulnerable to the fisheries (i.e., a dome-shaped selection/availability pattern).

2.4.5 ROV Reef Survey

This survey combines ROV and stationary camera observations of red snapper length from four different ROV or stationary camera surveys for the years 2005-2016. Separate surveys are conducted by the University of Florida's Marine Fisheries Laboratory, the Panama City NMFS lab, and the Florida Fish and Wildlife Research Institute, which are combined into a single index using a multinomial regression model (SEDAR 52-WP22). Predicted length compositions in each year were then obtained by predicting across a balanced grid of all factors, which were equally weighted. Sample sizes for the length comps were calculated as the number of individual sample sites rather than the number of red snapper measured. The combined ROV length compositions include lengths of fish observed on artificial reefs.

Age compositions for the combined ROV survey were constructed by applying the eastern region age-length key (because the ROV data only applied to the eastern area) to length frequencies from the survey. The resulting age compositions are summarized in **Table 2.25**.

2.4.6 SEAMAP Vertical Line Survey

The primary purpose of the SEAMAP Vertical Line Survey is to characterize the spatial and temporal distribution, age and size distributions, and analyze relative abundances of commercially and recreationally important reef fish species in the coastal waters of the Gulf of Mexico. The vertical line gear used in this survey is often referred to as bandit reels and the gear has been in use in the commercial fishery for a long period of time. NMFS Mississippi Laboratories (MS Labs) began conducting standardized sampling with vertical line gear in 2005 to sample oil production platforms in Mississippi and Louisiana. Due to the ease of deployment and the number of samples that can be quickly obtained MS Labs replaced traps with vertical line gears as a piggyback component of the SEAMAP reef fish video survey in 2010. The primary intent of the gear for the SEAMAP reef fish video survey is to collect otoliths and gonads as supplemental data that otherwise cannot be obtained from video. The original experimental design that made use of three hook sizes, and is still in use today, was focused on collecting hook selectivity data. In 2010 standardized sampling was initiated by Alabama MRD to sample coastal waters in their region and sampling effort used similar gears and standardized approaches as the previous NMFS study. Louisiana began vertical line sampling in 2011, Florida started in 2014, and Texas started in 2015. By 2012 all groups sampling with vertical line were following the gear standardization and deployment protocols established by the SEAMAP vertical line subcommittee with minor exceptions. Standardized indices were developed for the eastern, western, and combined gulf by combining data across state surveys resulting in indices spanning 2011-2016 (SEDAR52-WP-12). However, the indices were not included in the assessment due to concerns over the representativeness of the indices (e.g., lack of standardized gear, spatial coverage, and habitat type sampled across the timeseries) and the short timeseries available. It was suggested that further analysis be conducted to ensure the validity of the weighting methods used to combine the individual surveys into a single index, particularly regarding the combination of length composition data.

2.4.7 Combined Video Survey

There are currently three reef fish video surveys conducted in the GOM that submitted individual indices for potential inclusion into this assessment: the SEAMAP video survey (SEDAR52-WP-03); the NMFS Panama City survey (SEDAR52-WP-10); and the FWRI video survey (SEDAR-52-WP-02). While the surveys vary spatially and in length of the time series, the gear, methods, and population length composition sampled are similar among the surveys. As such, previous SEDARs have noted the potential advantages of a single, combined index and used it in the final assessment (SEDAR51-DW-15). A combined video index that incorporates habitat information for Red Snapper was prepared for the eastern GOM (SEDAR52-WP-01). However, the index was not included in the assessment due to lingering questions regarding the representativeness of the indices (e.g., due to limited spatial coverage of some surveys and associated recent spatial expansions). The length data from all three surveys was utilized as part of the combined ROV reef survey (SEDAR52-WP-22). It was suggested that further analyses be conducted to ensure that methods used to combine the individual surveys were valid, particularly due to strong variation in observed size composition.

2.4.8 Recruitment Index Based on the Connectivity Modeling System (CMS)

The Connectivity Modeling System (CMS) is a biophysical modeling system based on a Lagrangian framework, and was developed to study complex larval migrations. The CMS uses outputs from hydrodynamic models and tracks the three-dimensional movements of advected particles through time, given a specified set of release points and particle behaviors, while simulating realistic larval behaviors such as ontogenetic vertical migration. Specifics on the hydrodynamic model forcing the simulation, and other details on how the simulation was parameterized specific to red snapper biology, are described in SEDAR52-WP-20.

The recruitment index is a measure of the proportion of larvae that are expected to successfully settle to suitable recruitment habitat within the given biological constraints, due to the effects of oceanographic currents. The index thus represents a scalar on the total larval supply expected each year, prior to any density-dependent processes that act on the larvae upon settlement. Variance estimates for the index are obtained by running a range of sensitivities to the assumed larval depth distribution, providing a mean and annual standard deviation for the index.

3. STOCK ASSESSMENT METHODS

3.1 Overview

Similar to SEDAR 31 and the 2014 SEDAR 31 Update Assessment, the assessment model selected for SEDAR 52 was Stock Synthesis (SS) version 3.24P. Descriptions of SS algorithms and options are available in the SS user's manual (Methot 2015), the NOAA Fisheries Toolbox website (http://nft.nefsc.noaa.gov/), and Methot and Wetzel (2013). Stock Synthesis is an integrated statistical catch-at-age (SCAA) model, which projects forward from initial conditions using age-structured population dynamics equations. SCAA models are comprised of three modeling modules: the population dynamics module, an observation module, and a likelihood function. Each of the modules is closely linked. Stock synthesis uses biological parameters (e.g., growth, fecundity, and natural mortality) to propagate abundance and biomass forward from initial conditions (population dynamics model) and develops predicted data sets based on estimates of fishing mortality, selectivity, and catchability (the observation model). Finally, the observed and predicted data are compared (the likelihood module) to determine best fit parameter estimates using a statistical maximum likelihood framework (see Methot and Wetzel, 2013 for a description of equations and complete modeling framework). The integrated approach to natural resource modeling aims to utilize available data in the least processed form possible in order to maintain consistency in error structure across data analysis and modeling assumptions, while more reliably propagating uncertainty estimates, especially in critical population parameters such as stock status and projected yield (Maunder and Punt, 2013).

Because of its extreme flexibility, there is not a single prototypical Stock Synthesis model. Depending on the life history and data availability of the modeled species, SS3 models can range from highly complex and data rich individual-based models to relatively simple age-structured production models. The flexibility allows the user to input all data sources that are available, but can also lead to overparametrization if careful attention is not paid to model configuration and diagnostics. Although SS3 makes it relatively easy to implement highly complex models, models of moderate complexity are often best given the data limitations in most fisheries. Many of the modeling assumptions in Stock Synthesis have been thoroughly simulation tested. The framework is used for fisheries management of a wide variety of marine species worldwide, most notably for United States federally managed fish stocks in the northwest Pacific and Gulf of Mexico.

For red snapper a model of moderate complexity was implemented. The model produces predicted data for 14 modeled fleets (including landings, length or age compositions, and discards), 6 CPUE indices, 9 fishery-independent surveys (including length or age compositions), 2 indices of shrimp fishing effort, 1 fishery-independent survey of size composition, and 2 indices of spawning stock biomass. Estimated parameters include fishing mortality for each fleet for each year it was operating, time-varying selectivity parameters for fleets or surveys with length or age composition data, virgin recruitment and a virgin recruit offset parameter (to account for a productivity regime shift in the recent time period), time-varying stock-recruit deviations, and a scaling parameter for the shrimp effort series. A variety of derived quantities are produced including full timeseries of recruitment, abundance, biomass, spawning stock biomass, and harvest rate. Projections are implemented within SS3 starting from the year succeeding the terminal year of the assessment model utilizing the same population dynamics equations and modeling assumptions.

The r4ss software (www.cran.r-project.org/web/packages/r4ss/index.html) was utilized extensively to develop various graphics for the SS outputs and was also used to summarize various SS output files and perform diagnostic runs.

Detailed descriptions of the data inputs can be found in the various SEDAR 52 working papers on the SEDAR website (http://sedarweb.org/sedar-52), while the specific model and parameter settings are provided by the SS3 input and output files in the appendix. The final base model SS3 files are provided in Appendix A, which describe the model configuration (starter file, A.1; control file, A.3), the input data sources (data file, A.2), the projection settings (forecast file, A.4), and the estimated parameters (parameter file, A.5).

3.2 Model Configuration

Except as noted, the base model configuration was identical to the 2014 SEDAR 31 Update Assessment model. Revisions made were evaluated and approved by the SEDAR 52 assessment panel. The most significant revision was that many of the selectivity functions were reparametrized using double normal functions (as opposed to a random walk with age), because the expansion of the age composition during recent rebuilding allowed the parameters of the double normal function to be freely estimated, and produced improved model stability and diagnostics compared to the random walk approach. Minor changes included alternate approaches to data weighting: an iterative reweighting scheme for the assumed effective sample sizes (ESS) to improve model diagnostics; and scaling the index standard errors to a mean of 0.2 to avoid undue influence of any single index of abundance.

General Structure

- Age structured model: ages 0 to 20+, 1872-2016.
- 2 region model : East and West of the Mississippi River
- Time-varying recruitment in each region allowing a change in average productivity in recent years (1984-2016)
- Time-varying selectivity to account for implementation of IFQ program and circle hooks
- Time-varying retention to account for changes in size limits and IFQ
- Time-varying discard mortality to account for venting

Fishing fleets definitions (14)

Directed fleet landings and discards (8)

- Commercial Vertical line (HL) E/W 1872-2016
- Commercial Longline (LL) E/W 1980-2016
- Recreational Private/Charter (MRFSS/MRIP) E/W 1950-2016
- Recreational Headboat (HBT) E/W 1950-2016

Bycatch fleets (discards only) (6)

- Commercial Closed Season or zero IFQ allocation (C_Closed) E/W 1991-2016
- Recreational Closed Season (R_Closed) E/W 1997-2016
- Shrimp Bycatch (SHR) E/W 1950/1946 (respectively)-2015

Indices of fishing effort (2)

- Shrimp Fishing Effort (SHR) E/W 1950-2016

Indices of abundance (14)

Fishery catch-per-unit effort (6)

- Commercial Vertical line (HL) E/W 1990-2006
- Recreational Private/Charter (MRFSS/MRIP) E/W 1981-2013
- Recreational Headboat (HBT) E/W 1986-2013/2016 (respectively)

Fishery-independent surveys (8)

- SEAMAP Video (VID) E/W 1993-2016
- SEAMAP Summer Groundfish Trawl (SUM) E/W 1982-2016
- SEAMAP Fall Groundfish Trawl (FALL) E/W 1972-2016
- NFMS bottom longline (BLL) E/W 1986-2016

Survey of length composition (1)

- Artificial reef size composition (ROV) E 2005-2016

Survey of spawning stock biomass (2)

- SEAMAP Plankton (Larval) E/W 1987-2016

3.2.1 Spatiotemporal Structure

The base model for the SEDAR 52 assessment included red snapper age classes from age zero through age 20, where age 20 was a plus group. Two areas were modeled assuming a single spawning population and associated stock-recruit function. The time series in the model started in 1872, when the stock was assumed to be in a virgin, unfished state. The terminal year of data was 2016.

3.2.2 Life History

As in SEDAR 31, the weight-length relationship, the maturity schedule, fecundity estimates, natural mortality vector, and growth (**Section 2.2**) were incorporated into the base model as fixed parameters and these processes were neither estimated nor updated. The Stock Synthesis 3 (SS3) framework is capable of estimating many of these parameters internally if given the appropriate data. However, the ability to estimate growth parameters had not been widely tested for SEFSC assessed stocks and little is known about potential overparametrization in regards to SS3 life history parameter estimation.

Stock Synthesis 3 uses these parameters to move fish among age classes and length bins on January 1st of each modeled year starting from birth at age-0. Because the 'true' birth date often does not occur until later in the year (i.e., the average spawning date for red snapper is assumed to occur half way through the year on June 1st), some slight alterations in growth and natural mortality parameters are required to account for the approximately half year difference between true age and modeled age when parameters are input instead of estimated (e.g., age-0 natural mortality and t_0, age at zero size, must be prorated to account for 'birth' occurring six months later than modeled in SS3).

3.2.3 Recruitment Dynamics

Despite the fact that the red snapper Stock Synthesis model contains two areas (east and west of the Mississippi River), the model assumes a single spawning population utilizing one stock recruitment relationship for the entire Gulf of Mexico. A Beverton-Holt stock-recruit function was used to parametrize the relationship between spawning output and resulting age-0 fish. The stock-recruit function (representing the arithmetic mean spawner-recruit levels) requires three parameters: steepness (*h*) characterizes the initial slope of the ascending limb (i.e., the fraction of virgin recruits produced at 20% of the equilibrium spawning biomass); the virgin recruitment (R_0; estimated in log space) represents the asymptote or unfished recruitment levels; and the variance term ('sigma_R', σ_R) is the standard deviation of the log of recruitment (it both penalizes deviations from the spawner-recruit curve and defines the offset between the arithmetic mean spawner-recruit curve and the expected geometric mean from which the deviations are calculated). Although these parameters are often highly correlated, they can be simultaneously estimated in SS3.

A critical limitation for assessing and managing Red Snapper has been the inability to accurately determine the productivity of the stock. Productivity depends, in part, on the relationship between egg production (spawners, S) and subsequent recruitment (R), which in the case of Gulf of Mexico Red Snapper has not been well estimated though productivity is known to be high (SEDAR 2015). When an asymptotic Beverton-Holt relationship was assumed in previous stock assessment models, the estimates of steepness were typically near the mathematical limit of 1.0, because the estimates of recruitment tended to increase after 1980 despite decreases in the corresponding estimates of spawners. However, it is possible that the lower level of recruitment estimated prior to the 1980s is largely an artifact of the relative dearth of information available compared to the recent period (Porch 2007). SEDAR 31 and the 2014 SEDAR 31 Update Assessment assumed fixed values of both steepness ($h = 0.99$) and the stock-recruit variance term ($\sigma_R = 0.3$). Exploratory analysis for SEDAR 52 investigated the ability to simultaneously estimate all three of the stock-recruit parameters. Although feasible, the estimated parameters were very close to the fixed values used in previous assessments and model diagnostics were comparatively poor.

Therefore, the long term recruitment potential (i.e., spawner-recruit steepness) is regarded as high but the exact level is indeterminate (due to difficulty in independently estimating the various stock-recruit parameters), and, for SEDAR 52, the SEDAR 31 approach was maintained with the same fixed values of steepness and stock-recruit variance. Similarly, the parameter controlling recruitment at virgin levels (R_0) was estimated as a time-varying process for two blocks of the time series: one prior to 1984 (historic) and another from 1984 to the present (current). The time-varying component was accomplished by using a multiplicative adjustment (offset) to the R_0 parameter (i.e., $R_{0Historic} = R_{0Current} * e^{Offset}$), where $ln(R_{0Current})$ and the offset parameters were both estimated. Incorporating a time-varying R_0 accommodates the apparent change in productivity during the 1980s estimated in previous assessments and exploratory runs for SEDAR 52, while allowing the use of the more recent estimate of stock productivity in the projections and the calculation of reference points.

Annual deviations from the stock-recruit function were estimated in SS3 as a vector of deviations forced to sum to zero and assuming a lognormal error structure. Deviations are estimated for the entire assessment timeseries (as recommend by Methot, 2015, to ensure that uncertainty in associated recruitment is not underestimated) and a lognormal bias adjustment factor is applied to recruitment estimates for the relatively data-rich years in the assessment. This is done so that SS will apply the full bias-correction only to those recruitment deviations that have enough data to inform the model about the full range of recruitment variability (Methot 2015). Full bias adjustment was implemented from 1972 to 2016. From 1899 to 1972, recruitment is essentially estimated as a function of spawning stock biomass based on the stock-recruit function (i.e., there are only slight deviations estimated and so recruitment estimates are close to those from the stock-recruit curve).

Total annual recruitment is estimated for the entire Gulf of Mexico, and then allocated to each area using region-specific apportionment factors (*p*). A logit transform is utilized to estimate the proportion of recruits apportioned to each region, which is given by:

$$\boldsymbol{Apportionment_i = e^{p_i} / \sum_{i=1}^{N} e^{p_i}} \; . \quad \textbf{(1)}$$

Because the logit transform ensures automatic scaling and summation to 1.0 across the estimated parameters (i.e., ensuring that all recruits are apportioned to an area, *N*), only one of the apportionment factors needs to be estimated while the remaining parameter is fixed at 0. The recruitment distribution parameter was allowed to vary over time according to a white noise model (i.e., annual deviations around the baseline parameter value) from 1972-2016 (i.e., the data rich period of the assessment). Fixing the steepness near 1.0, in conjunction with a time-varying recruitment distribution parameter, accommodates the independent recruitment that is thought to exist between the eastern and western stocks. Accordingly, the eastern and western populations are effectively assessed as separate populations, although they are managed currently as though they were a single population.

3.2.4 Fleet Structure

Fourteen fishing fleets and eleven fishery-independent surveys were used (**Section 2.3**). The fishing fleets in the model were separated into east and west and included both directed [i.e., commercial vertical line (HL) and longline (LL) along with recreational headboat (HBT) and private/charter fleets (MRFSS/MRIP)] and discard [i.e., shrimp bycatch (SHR), commercial closed season/no-IFQ (C_Closed), and recreational closed season (R_Closed)] fleets. The directed fleets represented the fleets that target and land red snapper. These fleets historically represent the bulk of red snapper removals, and both landings and open season discards were estimated and fit for these fleets. The commercial and recreational closed season fleets represented fishery discards for those years when strict closed seasons were in place for each of these fishing sectors. In addition, the commercial closed season fleet also includes the component of the commercial fishing fleet that has had no red snapper quota allocation since 2007 when IFQs were implemented. Note that due to low age composition sample sizes, both the recreational and commercial discard fleets are not fleet specific (i.e., they represent discards summed across fleets within a given sector). Sector-specific discard fleets were necessary to account for the differential discarding practices that occur between fleets operating in open seasons (i.e., discards due to management regulations such as minimum size limits by directed fleets) versus closed seasons (i.e., discards in non-directed fisheries when there is zero retention of red snapper). Open season discards are included in the model as part of the directed fleets catch through the use of retention functions (see description of discards below). Finally, the shrimp bycatch fleet represented dead discards of juvenile red snapper by the Gulf of Mexico shrimp fleet.

3.2.5 CPUE Indices

Six fishery catch-per-unit effort (CPUE) indices were fit in the model including: commercial vertical line (HL), recreational charter/private (MRFSS/MRIP), and the Southeast Regional Headboat Survey (HBT; **Section 2.3, Table 2.11**). CPUE was treated as an index of biomass or abundance (depending on whether the corresponding catch was in weight or numbers) where the observed standardized CPUE timeseries was assumed to reflect annual variation in population trajectories. Each modeled CPUE index assumes the same selectivity as the associated fleet. As noted in Section 2.3, the commercial vertical line index was truncated in 2006 due to the implementation of IFQs, while the recreational charter/private and eastern headboat indices were truncated in 2013 due to concerns that regulatory impacts may be impeding CPUE from reflecting abundance.

3.2.6 Surveys

Eleven fishery-independent surveys were fit in the model. Eight of these were indices of abundance including: the SEAMAP video survey (VID); the SEAMAP summer groundfish trawl survey (SUM); the SEAMAP fall groundfish trawl survey (FALL); and the NMFS bottom longline survey (BLL). These surveys were treated in the same way as CPUE indices, except that each survey had its own unique selectivity function estimated from either age or length composition data (unless otherwise noted in the selectivity section below). There was also a SEAMAP larval survey, which indexed spawning stock biomass (i.e., the larval survey acted as a scalar that was directly linked to model estimated spawning stock biomass and did not require an estimate of selectivity). All indices were developed separately for the eastern and western GOM (**Section 2.4**; **Table 2.20**). Finally, the combined ROV survey was treated as survey of size composition in the eastern Gulf of Mexico, which was fit by estimating an independent selectivity function for this survey.

3.2.7 Selectivity

Selectivity represents the probability of capture by age or length for a given fishery and subsumes a number of interrelated dynamics (e.g., gear type, targeting, and availability of fish due to spatial structure). For the SEDAR 52 assessment three types of selectivity functions were utilized: a two parameter logistic function, a six parameter double normal function, and an age-based random walk (see Methot 2015). The double normal is a combination of two normal distributions; the first describes the ascending limb, while the second describes the descending limb, and the maximum selectivity of the two functions is joined by a line segment. The double normal function is extremely flexible and can allow for domed or essentially logistic selectivity. However, due to the increased number of parameters, it can be more unstable than other selectivity functions. It is appropriate when robust age compositions are available with sufficient numbers of older fish to freely estimate all parameters (especially the descending limb). In the age-based random walk selectivity approach, the age-specific selectivity parameters represent the rate of change from the selectivity value for the previous age. Because each parameter is constrained, the number of estimated parameters is effectively much less than the number of ages and selectivity values can be fixed for ages with limited information (e.g., at the value for the oldest estimated age). The age-based random walk function can be useful when dome-shaped selectivity is suspected, but limited or truncated age compositions are present that may lead to instability in parameter estimates from the double normal function.

Previously, in SEDAR 31 and the 2014 SEDAR 31 Update Assessment, selectivity for all fleets was based on the age-based random walk approach (except the bottom longline survey). However, given the extra years of data and expanded age compositions associated with red snapper rebuilding, the panel suggested that switching to the double normal selectivity function for many of the fleets may be appropriate. Based on this suggestion, the SEDAR 52 continuity model maintained the 2014 SEDAR 31 Update Assessment parametrization of selectivity for all fleets, but for the SEDAR 52 base model the double normal selectivity parametrization was utilized for many fleets (the model bridging exercise demonstrates the minor differences produced by switching to the double normal parametrizations).

Except for the shrimp bycatch fleet, the SEAMAP trawl surveys, and the NMFS bottom longline survey, the double normal parametrization was used for all other fleets and surveys. The shrimp bycatch fleet and the SEAMAP trawl surveys all catch only juvenile red snapper ages 0-2. Therefore, the age-based random walk parametrization was retained for these fleets and surveys, where selectivity was fixed at 0 for ages 3+. The NMFS bottom longline survey was estimated using a two parameter logistic function (as was done in the 2014 SEDAR 31 Update Assessment), because all older ages of red snapper are assumed to be vulnerable to this survey. In the previous assessment, the selectivity pattern in the east was assumed to be identical to (mirrored off) that in the west, because there were insufficient samples in the east to estimate a separate selectivity function. However, based on the increase in sample sizes for the eastern survey, a unique selectivity pattern was estimated for each regional bottom longline survey, but still assuming logistic selectivity.

For the recreational closed season fisheries, it was assumed that selectivity was identical to (i.e., mirrored) the associated region-specific open season private/charter (MRFSS/MRIP) fleet (due to lack of age composition data for the closed season), with the difference being that no red snapper were retained during the closed season. For the commercial closed season fisheries, it was assumed that selectivity was constant before and after IFQ implementation (but not mirrored to the open season selectivity). In other words, selectivity during the true closed season period (i.e., prior to IFQs in 2007) was the same as selectivity for fishermen with no IFQ allocation during the IFQ period. This assumption was necessary because discard age or size data was only available from the observer program for the period when IFQs were also in place. Finally, the CPUE indices were assumed to have identical (mirrored) selectivity patterns as their respective fisheries.

Time-varying selectivity was included to account for altered fleet dynamics caused by changes in fishing regulations. The commercial fleet was assumed to have two selectivity time-blocks, which were split in 2007 when the implementation of red snapper individual fishing quotas (IFQs) occurred. It was believed that IFQs likely altered fishermen's targeting habits, and therefore, one selectivity timeblock represented the pre-IFQ fishery, fishery start date to 2006, and one selectivity timeblock represented the IFQ fishery, 2007-2016. For the recreational fishery, three selectivity timeblocks were included in the model to account for the switch to circle hooks along with a shift in targeting to older, bigger fish in recent years. The first timeblock, fishery start date to 2007, represented the pre-circle hook fishery, the second timeblock, 2008-2010, represented the requirement to use circle hooks, and the final timeblock, 2011-2016, represented the recent time period when targeting has appeared to focus more on older fish. Although other management actions could have acted to alter selectivity patterns, exploratory analysis did not uncover any major changes in fishing patterns in either the commercial or recreational fisheries that were deemed significant enough to develop alternate selectivity timeblocks.

3.2.8 Landings and Age Composition

Landings by fleet and associated age compositions were calculated based on estimated fleet specific continuous fishing mortality rates and age-specific selectivity curves using Baranov's catch equation, and fit directly in the model. Similarly, age compositions for surveys were calculated by estimating survey-specific selectivity functions and fit directly in the model. For fleets where only length compositions were available, these were converted to age compositions using region-specific age-length keys (see **Section 2**), because only age compositions were fit in the model.

3.2.9 Discards

Both open season and closed season discards were calculated and fit within the model. Open season dead discards from the directed fleets were estimated using retention curves to account for discards that resulted from the implementation of minimum size regulations and assumed discard mortality rates (to calculate dead discards from total discards). The retention function was specified as a four parameter logistic function. Generally, these parameters were not estimated in the base model and the logistic function parameters were fixed to represent knife-edged retention at the minimum size limit. Retention functions changed over time as the size limits changed. For the commercial fleets five retention timeblocks were assumed (start of the fishery to 1984, 1985-1993, 1994, 1995-2006, 2007-2016), while the recreational fleets assumed three retention timeblocks (start of the fishery to 2007, 2008-2010, 2011-2016).

For fleets and retention timeblocks where open season discard age composition data were available (i.e., commercial vertical line east and west and long line east and west for 2007-2016), the asymptote of the retention functions were estimated to allow for less than 100% retention of legal size fish when IFQs were implemented (e.g., due to highgrading). Exploratory runs attempted to also estimate the inflection point of the retention functions (for timeblocks with age composition data including the headboat east fishery during the recent timeblock), but resulted in poor model convergence owing to the low age composition sample sizes available. Therefore, these parameters were fixed with an infinite slope, because knife edge retention represented the best assumption available in the absence of further information.

The model estimated total discards based on the selectivity and retention functions, then calculated (and fit) dead discards based on the discard mortality rate for the associated timeblock. Region and fleet-specific discard mortality were treated as fixed model inputs (see **Section 2.2.5**), but allowed to vary over time to account for changes in discard practices (e.g., venting). Discard mortality timeblocks were split in 2008 (i.e., start of the fishery to 2007 and 2008-2016), which was the year that venting became mandatory. Although mandatory venting has not been required since 2013, limited information was available to determine a discard mortality rate for the most recent timeblock and it was assumed that mortality rates were similar to values determined for the mandatory venting period.

Closed season discards were modeled using estimated fleet-specific continuous fishing mortality rates and age-specific selectivity curves using Baranov's catch equation, and fit directly in the model.

3.2.10 Shrimp Bycatch

Discards from the shrimp fishery in the Gulf of Mexico were included by fitting median shrimp bycatch levels and indices of shrimp fishing effort. Shrimp bycatch was assumed to be 100% dead discards with no landings. For shrimp discards the 'super-year' approach was utilized to avoid fitting to the extremely noisy and uncertain yearly estimates of shrimp bycatch. The premise of a super-year is that, instead of fitting each observation directly, a measure of central tendency for the entire timeseries is fit. In the case of shrimp bycatch, the median has typically been utilized (i.e., the observed median is fit to the predicted median). The model still predicts annual bycatch values, but does not attempt to fit the annual observations owing to the high uncertainty associated with them. The super-year covers years 1972-2015 (i.e., the median values correspond to observed and predicted bycatch values for these years), which are the years that estimates of shrimp bycatch were available.

Region-specific shrimp effort was incorporated into the model as an index of shrimp bycatch fishing mortality (the observed effort series helps inform annual estimates of shrimp fishing mortality and stabilizes annual estimates of shrimp bycatch; **Section 2.3.3**). Essentially, region-specific catchability parameters (q) were estimated to scale the effort series into the fishing mortality rates that produce the best agreement between the median of the annual region-specific bycatch values predicted by the assessment model and the median of the observed annual bycatch values. Because annual estimates of shrimp bycatch are not fit directly, the super-year approach can create an unstable model if there is no information on annual variability (e.g., in fishing mortality or catch) for the fleet that contains the super-year. Essentially there is an infinite combination of annual values that could lead to the given median, which can create a flat likelihood response surface and cause model instability. Using the super-year approach while fitting to a timeseries of effort allows the model the flexibility to fit the median without being forced to fit uncertain annual bycatch estimates. Yet, it constrains the model enough to maintain the bycatch estimates within feasible fishing mortality bounds and avoids overly strong year to year deviations.

3.3 Maximum Likelihood and Uncertainty

A maximum likelihood approach was used to assess goodness of fit to each of the data sources. Each data set had an assumed error distribution and an associated likelihood component, the value of which was determined by the difference in observed and predicted values along with the assumed variance of the error distribution. The total likelihood was the sum of each individual component. A nonlinear iterative search algorithm was used to minimize the total negative log-likelihood across the multidimensional parameter space in order to determine the parameter values that provided the global best fit to all the data. With this type of integrated modeling approach data weighting (i.e., the variance associated with each data set) can greatly impact model results, particularly if the various data sets indicate differing population trends. Ideally, the model would allow the data to 'self-weight' in order to determine the relative variance among data sets. However, it is seldom possible to freely estimate all the variance terms in addition to the set of model parameters, and variance terms must be input based on calculated variance from the observed data. The latter approach suffers from a lack of information regarding relative variance among different data sets. Ultimately, expert judgement usually must be used to input relative variance components, and this is the approach used in SS3.

3.3.1 Error Structure

The landings data, discards, CPUE indices, surveys, and shrimp bycatch super-year all assumed a lognormal error structure. The commercial landings were assumed to be the most reliable data source in the model, especially over the most recent timeperiod, because this information was collected in the form of a census, as opposed to being collected as part of a survey like most other input data. The recreational landings were likely slightly less reliable, because the charter/private component was collected using the MRIP survey, albeit with a relatively large sample size. Discards were assumed to be the least reliable data given the limited sampling that occurs and the large number of assumptions needed to calculate them. Therefore, comparatively high variance terms were assigned to both open and closed season discards. Although the annual estimates of shrimp bycatch were assumed to be extremely noisy, the median was expected to be fairly representative of the scale of discards of the shrimp fleet. The CPUE and survey indices were assumed to be noisy, mainly due to lower sample sizes and uncertainty in the relationship between CPUE and abundance trends, but more reliable than discards.

The landings and discard data were assumed to have a constant variance, while interannual variation in the CPUE and survey indices was estimated through the standardization techniques used to determine the final observed index values. For the indices, if the variance of the observations was available only as a coefficient of variation (*CV*; standard error divided by mean), it was converted to a standard error (*SE*) in log space (required for input to SS3 for lognormal error structures) using:

$$\boldsymbol{SE = \sqrt{log_e(1 + CV)^2}}. \qquad (2)$$

The shrimp effort series was treated in a similar manner to the other indices, but a normal error structure was assumed instead of lognormal. It was given a slightly lower average variance than the other indices to stabilize estimates of shrimp fishing mortality. No estimates of interannual variation in effort were available so a time-invariant error structure was assumed.

The age composition data for the various fisheries and surveys were assumed to follow a multinomial error structure where the variance was determined by the input effective sample size (N_{eff}). For the multinomial likelihood a smaller sample size represents higher variance and vice versa, because N_{eff} is meant to represent the number of fish sampled each year to determine the composition. Observed sample sizes are often overestimated for fisheries data, because samples are rarely truly random or independent (Hulson *et al*., 2012). In addition, using higher effective sample sizes can lead to the composition data dominating the likelihood resulting in reduced fit to other data sources. Iterative reweighting is often undertaken in order to adjust the effective sample size to better represent the residual variance between observed and predicted values (Methot and Wetzel, 2013).

A penalty on deviations from the stock-recruit curve was also included (essentially a Bayesian prior) in order to limit recruitment deviations from differing too greatly from the assumed stock-recruit relationship. The variance term was controlled by the fixed σ_R parameter.

Weak penalty functions were implemented to keep parameter estimates from hitting their bounds, which includes a symmetric-beta penalty on selectivity parameters (Methot, 2015). Parameter bounds were set to be relatively wide and were unlikely to truncate the search algorithm.

3.3.2 Data Weighting

The input standard error for the landings for each fleet was set to 0.05. Although there may be reason to downweight the recreational landings in relation to the commercial landings, this was not done in the previous assessments and was not implemented for SEDAR 52 either. Discards were given a standard error of 0.3. The 2014 SEDAR 31 Update Assessment assumed a SE of 0.5, but exploratory runs for SEDAR 52 indicated slightly degraded diagnostics for models maintaining the higher SE for discards (a sensitivity run with higher discard SE is provided). The super-year median bycatch was assumed to have a standard error of 0.10. Each of the indices was scaled to an average standard error of 0.2 across the entire timeseries, but the relative annual variation was maintained in the scaling. Although this approach differed from the 2014 SEDAR 31 Update Assessment, which used the output SE from the standardization routine directly in SS3, the panel deemed it a more appropriate approach because indices are standardized using different techniques and the output SEs are not directly comparable, nor do they adequately characterize the relative confidence in the various indices. Scaling each index to a common mean allows them to be placed on equal footing within the assessment (the impact of scaling the SE is demonstrated in the model bridging exercise). The shrimp effort series was given an average standard error of 0.1 to ensure stability of shrimp fishing mortality estimates. It was believed based on exploratory runs, expert opinion from the analysts, and feedback from the SEDAR 52 Data and Assessment Panel that these input standard errors would best reflect the relative representativeness of each of the error sources.

For the SEDAR 52 assessment model, observed sample sizes for the age composition data were used in the initial model run, but capped at 200 to prevent overfitting the compositional data. The iterative reweighting process described by MacAllister and Ianelli (1997) was then utilized to determine the effective sample sizes that most accurately reflected the data (i.e., the input effective sample size converged to the estimated effective sample size based on residual variance). However, a cap of 200 individuals was kept regardless of estimated effective sample size. The final effective sample sizes for each year are provided on the figures illustrating the age composition and length composition (given by *N* in each panel).

3.3.3 Uncertainty Estimation

Uncertainty estimates for estimated and derived quantities were calculated based on the asymptotic standard error determined from the inversion of the Hessian matrix (i.e., the matrix of second derivatives was used to determine the level of curvature in the parameter phase space and to calculate parameter correlation; Methot and Wetzel, 2013). Asymptotic standard errors provided a minimum estimate of uncertainty in parameter values.

3.3.4 Estimated Parameters

A total of 1199 parameters were estimated for the base model (**Table 4.3**). These include year specific fishing mortality for the 14 fleets (855 parameters), selectivity parameters for both fleets and surveys including all timeblocks (172 parameters), the commercial fishery retention function asymptotes for the most recent (IFQ) timeblock (4 parameters), catchability coefficients for the shrimp effort series (2 parameters), the parameters used to define the stock-recruit relationship (1 parameter), the virgin recruitment offset for the productivity regime change in 1984 (1 parameter), the stock-recruit deviations (118 parameters), and the recruit apportionment parameters including the random annual deviations (46 parameters).

3.4 Model Diagnostics

3.4.1 Residual Analysis

A wide variety of model diagnostics were implemented and analyzed to determine model performance, stability, uncertainty, and fit to the data. The primary mode used to address model fit and performance was residual analysis of the model fit to each of the data sets. Any temporal trends in model residuals (or trends with age for compositional data) can be indicative of model misspecification and poor performance. It is not expected that any model will perfectly fit any of the observed data sets, but, ideally, residuals will be randomly distributed and conform to the assumed error structure for that data source. Any extreme patterns of positive or negative residuals are indicative of poor model performance and potential unaccounted for process or observation error.

3.4.2 Correlation Analysis

High correlation among parameters can lead to flat likelihood response surfaces and poor model stability. By performing a correlation analysis, modeling assumptions that lead to inadequate model parametrizations can be highlighted. Because of the highly parametrized nature of stock assessment models, it is expected that some parameters will always be correlated (e.g., stock-recruit parameters). However, a large number of extremely correlated parameters warrant reconsideration of modeling assumptions and parametrization. A correlation analysis was carried out and correlations with an absolute value greater than 0.7 were examined and those greater than 0.95 are reported here.

3.4.3 Profile Likelihood

Profile likelihoods are used to examine the change in log-likelihood for each data source in order to address the stability of a given parameter estimate, and to visualize the effect of various data components on parameter estimation. The analysis is performed by holding the given parameter at a constant value and rerunning the model. This is done for a range of reasonable parameter values. Ideally, the graph of likelihood value against parameter value will give a well-defined minimum indicating that each data source is in agreement. When a given parameter is not well estimated, the profile plot will show conflicting signals across the data sources. The resulting total likelihood surface will often be flat, indicating that multiple parameter values are equally likely given the data. In such instances, the model assumptions need to be reconsidered as the model is unstable and generally unreliable.

Typically, profiling is carried out for a handful of problematic (and often correlated) parameters, particularly those defining the stock-recruit relationship. Profiles were carried out for steepness, virgin recruitment, and stock-recruit variance. Even though steepness and the stock-recruit variance were not estimated in the Base model, it is important to know the most likely values of these parameters given that they influence the potential productivity of the resource and, therefore, the biological reference points. Additionally, there is interest in having these be freely estimated parameters along with knowing whether the fixed values utilized are supported by the data.

3.4.4 Bootstrap

Parametric bootstrap analysis is a convenient way to analyze model performance and variance estimation. With bootstrapping, the assumed error structure is used to create a new random set of observations using the same variance characteristics as the original data. Because the bootstrapped data strictly conform to the error distribution and no process error is included, the resulting fit to the data should be randomly distributed according to the assumed error distribution (i.e., there is no autocorrelation among data points, which is often an issue with observed data; Methot and Wetzel 2013). Therefore, analysis of residual patterns in bootstrapped data can elucidate potentially detrimental modeling assumptions. Similarly, if parameter estimates differ between bootstrap runs and the base model fit to the observed data, it can be indicative of data conflict (similar to flat profile likelihood surfaces). Generally, consistency across bootstrap runs and base model runs indicates that the model is performing well and relatively stable. 700 bootstrap runs were carried out and summary statistics were generated to characterize model performance.

3.4.5 Jitter Analysis

Jitter analysis is a relatively simple method that can be used to assess model stability and to determine whether a global as opposed to local minima has been found by the search algorithm. The premise is that all of the starting values are randomly altered (or 'jittered') by an input constant value and the model is rerun from the new starting values. If the resulting population trajectories across a number of runs converge to the same final solution, it can be reasonably assured that a global minima has been obtained. Of course, this process is not fault-proof and no guarantee can ever be made that the 'true' solution has been found or that the model does not contain misspecification. However, if the jitter analysis results are consistent, it provides additional support that the model is performing well and has come to a stable solution. For this assessment, a jitter value of 15% was applied to the starting values and 200 runs were completed.

3.4.6 Retrospective Analysis

A retrospective analysis is a useful approach for addressing the consistency of terminal year model estimates. The analysis sequentially removes a year of data at a time and reruns the model. If the resulting estimates of derived quantities such as SSB or recruitment differ significantly, particularly if there is serial over- or underestimation of any important quantities, it can indicate that the model has some unidentified process error, and requires reassessing model assumptions. It is expected that removing data will lead to slight differences between the new terminal year estimates and the updated estimates for that year in the model with the full data. Oftentimes additional data, especially compositional data, will improve estimates in years prior to the new terminal year, because the information on cohort strength becomes more reliable. Therefore, slight differences are expected between model runs as more years of data are peeled away. Ideally, the difference in estimates will be slight and more or less randomly distributed above and below the estimates from the model with the complete data sets.

Typically, 5-10 year retrospective analyses are completed. Care must be taken when timeblocks exist for selectivity parameters or when there are any short data timeseries that span only the last few years of the model, because removing a few years of data may cause the model to become unstable when not enough data are available to estimate parameters for these short data sets. The instability is not a reflection of poor model performance, but simply an issue of overparametrization caused by a short timeseries. A five year retrospective was carried out, but care should be taken when analyzing more than the first few years of data peels due to the limited data available to estimate some of the selectivity timeblocks (e.g., the most recent recreational selectivity timeblock). Also, due to the computational demand of the Bayesian analysis used to estimate shrimp bycatch, it was not feasible to reestimate the median bycatch level for each retrospective peel. Therefore, the median bycatch was retained from the Base model for each run.

3.4.7 Index Jack-knife

Another type of data exclusion analysis is the jack-knife approach where individual data sets are removed and the model is rerun with the remaining data. When a survey was removed any associated estimated parameters (e.g., selectivity parameters) were no longer estimated. The goal of this analysis was to determine if any single data set was having undue influence on the model and causing tension with other data in terms of estimating parameters. The approach can be especially useful for identifying indices that may be giving conflicting abundance trend signals compared to the other indices. If removing a data set leads to dramatically different results, it suggests that the data set should be reexamined to determine if the sampling procedures are consistent and appropriate (e.g., an index may only be sampling a sub-unit of the stock and resulting abundance signals may only reflect a local sub-population and not the trend in the entire stock). A full index jack-knife was done for the survey data where each survey was removed (including associated age composition data) and the model rerun. Additionally, groups of indices were removed simultaneously (e.g., all recreational CPUE indices, all commercial CPUE indices, all fishery-dependent CPUE indices, and all fishery-independent surveys). Other data sets (i.e., landings and compositional data) were deemed fundamentally necessary to stabilize the assessment and were not included in the analysis.

3.4.8 Continuity Model and Model Bridging Exercise

The first step in model development was to create a continuity model that attempted to replicate, in as feasible a way as possible, the 2014 SEDAR 31 Update Assessment, but using updated values for each of the data sets through the new terminal year (2016). Developing a continuity model is a useful tool for comparing model performance and addressing the impact of any changes in model assumptions. For SEDAR 52, development of a true continuity model was difficult due to fundamental changes to thee important input data sets: recreational CPUE indices; commercial discards; and recreational discards. The changes are described in Section 2.

A continuity model that best represented the final 2014 SEDAR 31 Update Assessment was developed, which required using the 2014 recreational indices (without updating or including the 2014-2016 data points) and using the same methodology for calculating discards as was done in 2014. An extensive model building exercise was then undertaken to provide a comprehensive bridge between the 2014 SEDAR 31 Update Assessment and the SEDAR 52 Base Model. The results were presented in two stages: building to the SEDAR 52 'Update' Model, then building from the 'Update' Model to the Base Model. The first stage of model building developed an 'Update' Model, which maintained all of the desired changes to data (i.e., updated recreational CPUE indices, updated discard methodology, and rescaled index standard errors to a mean of 0.2). A stepwise, single factor approach was undertaken to compare the impact of each factor in isolation. In the second stage of model building, the 'Update' Model was then altered to include (again in a single factor stepwise manner) the desired changes utilized in the Base Model (i.e., updated selectivity functions and rescaled effective sample sizes for the age composition data).

3.4.9 Sensitivity Runs

Several sensitivity runs were also implemented with the base model in order to investigate critical uncertainty in data, reactivity to modeling assumptions, and influence of potential new data sources. An exhaustive evaluation of model uncertainty was not carried out, but the aspects of model uncertainty judged to be the most important for model performance and accuracy were investigated. Only the most important sensitivity runs are presented here, but many additional exploratory runs were also implemented. Focus of the sensitivity runs were on population trajectories and important parameter estimates (e.g., recruitment). The runs presented here include increasing the discard standard error to 0.5, increasing the recreational discard mortality in the recent period to 15.8%, removing all fishery dependent indices, and incorporating the data from the connectivity modeling system (CMS) as an index of recruitment.

Concerns that the Base Model was overfitting uncertain discard estimates motivated the run with increased discard SE, which matched the SE values used in the 2014 SEDAR 31 Update Assessment. New information on recreational discard practices suggested that current estimates of recreational discard mortality may be too low. Therefore, a new meta-analysis was run with the new data included, which indicated a discard mortality of 15.8%, and this value was utilized in a sensitivity run. Progressively more complex regulations implemented in both the commercial and recreational fisheries have made CPUE standardization increasingly difficult. Given that fishery CPUE is less likely to reflect actual abundance or biomass than fishery-independent abundance indices, there was interest in whether removal of all fishery CPUE indices would impact model results, especially considering the large number of fishery-independent indices currently available for red snapper. Thus, the Base Model was run with all fishery-dependent indices removed to see if there was an impact on population trajectories. Finally, because recent recruitment is one of the most difficult model parameters to estimate, including auxiliary information to help improve these estimates can be beneficial for integrated assessments. The CMS index has been shown to correlate closely with strong and weak red snapper yearclasses and has been suggested as a useful tool to help reduce uncertainty in terminal year recruitment estimates by including it as an index of recruitment in the SS3 model. Within Stock Synthesis, the index is linked using the data method, such that the expected value is equal to the exponent of the recruitment deviation (akin to an environmental index affecting recruitment). A model run with the CMS index included (2003-2016) was undertaken to see if it impacts recruitment estimates and associated uncertainty.

4. MODEL RESULTS

4.1 Landings

Due to the comparatively small standard error assumed for the landings data for each of the directed fleets, these data sources were fit relatively well (total negative log-likelihood = 34.63; **Figure 4.1a-d**). The commercial landings (HL and LL) were fit almost exactly in both regions. On the other hand, the recreational landings were not fit nearly as well, with a tendency to overestimate landings in the recent time period (post 1980). The larger of the recreational fleets (i.e., HBT west and MRIP east) tended to show stronger patterns of overestimation. Although the patterns in the recreational landings residuals are not ideal, these patterns are consistent with those observed in the 2014 SEDAR 31 Update Assessment (**Figure 4.1a-d**). Given that there are concerns about the accuracy of the recreational landings estimates, it is not surprising that they are not fit as well as the commercial landings. Additionally, these patterns of overestimating recreational landings may lend credence to preliminary estimates from the most recent MRIP calibration study based on the Fishing Effort Survey (FES), which suggested that recreational fishing effort has been underestimated by previous methods (i.e., the Coastal Household Telephone Survey, CHTS; NOAA 2017).

4.2 Discards

4.2.1 Open Season Discards

The quality of the model fits to the discard data varied by fishing fleet and open/closed season, but generally fit the observed discards moderately well (total negative log-likelihood including shrimp bycatch super-year = 447.21). The observed and predicted open season discards are shown in **Figure 4.2a-h**. With few exceptions, the 2014 SEDAR 31 Update Model and the SEDAR 52 assessment fit the discards similarly well. However, as mentioned in **Section 2.3.2**, the update in both commercial and recreational discard methodology caused moderate changes to the observed discards (and to a lesser degree the fixing of the closed season dates in the recreational private/charter discard partitioning calculations), which makes comparison of the fits to the discard data across models difficult. Changes are particularly evident in the vertical line east open season discards, where post IFQ discarding is now an order of magnitude less than in previous models. The result is a noisy but generally stable trend in discards pre and post IFQ implementation, whereas in the 2014 SEDAR 31 Update Assessment an increasing trend was present after IFQ implementation (**Figure 4.2a**). The new headboat discards similarly declined compared to the 2014 SEDAR 31 Update Assessment, particularly for the east (with a slight increase in the west during the 1990s). Despite the moderate changes in observed discards since the 2014 SEDAR 31 Update Assessment, there was limited effect on the overall population trajectories of the two assessments (see Continuity Model comparisons below), partially due to the relatively low discard mortality for the fleets and timeblocks where discards were altered the most.

The model fit the open season discards moderately well, with some larger discrepancies between observed and predicted values for the headboat and private/charter east fleets and to a lesser extent in the vertical line east fleet. Given that the discards were given a larger standard error than other data sets, it is not surprising that they are not fit exactly. Because discard data is one of the least reliable of the input data sources, minor lack of fit to discards may not be detrimental. Additionally, the SEDAR 52 model fits all of the discard data sets better than the 2014 SEDAR 31 Update Assessment, particularly the open season discards from the recreational fleets (**Figure 4.2a-h**).

4.2.2 Closed Season Discards

The SEDAR 52 model fit the closed season commercial and recreational discards remarkably well (**Figure 4.2i-l**). The reason for this is likely that the fishing mortality for these discard fleets is estimated solely from these discards (i.e., there is little other information in the model to inform these parameter estimates). Whereas the open season discards are a function of the associated open season fishing mortality and the fixed retention parameters, these fishing mortalities are essentially freely estimated (in much the same way that the shrimp effort index is used to estimate the shrimp effort, see the next two sections). Further support for this hypothesis is given by the fact that the 2014 SEDAR 31 Update Model showed similarly good fits to the closed season discard data with even higher standard errors (SE = 0.5 as opposed to SE = 0.3 in SEDAR 52), and these results are also supported by the sensitivity run using the higher discard standard errors.

4.2.3 Shrimp Bycatch

Because of the small standard error assumed for the shrimp bycatch super-year median, the fit to the observed median was quite good (**Figure 4.2m-n**). As expected, the predicted annual estimates of bycatch did not vary as strongly as the observed values, but instead closely followed the trend in the shrimp effort series.

4.3 Indices

A comparison of the fits to the indices for the 2014 SEDAR 31 Update Assessment and the SEDAR 52 assessment are shown in **Figure 4.3**. The quality of the model fits to the indices of abundance varied by data source, but were generally good (total negative log-likelihood = 301.33).

4.3.1 Fishery CPUE, Adult Stock

With few exceptions, the model fits to the fisheries-dependent CPUE indices were similar between the 2014 SEDAR 31 Update Assessment and SEDAR 52 (**Figure 4.3 a-f**). The commercial vertical line indices (**Figure 4.3a-b**) were truncated at the IFQ period (2007) and were not updated for this assessment. The eastern index suggested a general increase in abundance since 1990, with the only major discrepancies between observed and predicted indices occurring in the terminal years of the index where the model predicts continued upward trends in abundance (likely influenced by the strong increases in the MRIP/MRFSS index at this time) and the observed points suggest slight declines. For the western Gulf, there appears to be a slight increase in abundance trends through 1995 with small declines thereafter. The model tends to have strong negative residuals (underestimates abundance) during the first half of the timeseries, while the opposite is true for the second half of the timeseries. The MRIP/MRFSS (charter/private boat) CPUE indices both suggest increasing abundance until about 2010 (with sharp increases around 2005), then a decline in abundance, particularly in the eastern Gulf, since 2010 (though the predicted index in the west is relatively stable since 2010; **Figure 4.3c-d**). The decline in eastern MRIP CPUE was not nearly as strong as in SEDAR 31 due to the correction of management regulation coding issues, which led to more optimistic population trajectories for the eastern region in SEDAR 52 (also note that these indices were truncated in 2013). The decline in abundance around 2010 was also seen in the headboat CPUE in the eastern Gulf, although the model predictions did not decline as significantly as the observed values (**Figure 4.3e**; this index was also truncated in 2013). Meanwhile, the western headboat index indicated continued upward trends and strong model fit through 2016 (**Figure 4.3e**). The fit to the recreational CPUE indices was relatively good given the noisy data, particularly over the second half of the timeseries, and residual patterns were balanced. The lack of fit of the MRIP east index in the last few years of the timeseries is likely due to disparate signals between the various eastern indices (MRIP and BLL indicate upward trends, while HBT and VID have generally declining trends over the last five years; see below).

4.3.2 Fishery-Independent Surveys, Adult Stock

Once again, the SEDAR 52 model fits to the fisheries-independent indices of adult red snapper were similar to those in the 2014 SEDAR 31 Update Assessment (**Figure 4.3 g-l**; note that updated quality control measures applied to the video index resulted in slightly different observed values since the last assessment). The SEAMAP Video indices both suggested increasing abundance of adult red snapper from 2006-2011, however abundance appears to have declined in the eastern Gulf since that time with slight declines in the western Gulf in recent years (**Figure 4.3g-h**). The NMFS Bottom Longline (**Figure 4.3e**) and SEAMAP Ichthyoplankton (Larval) indices (**Figure 4.3f**) exhibited similarly increasing trends in both regions, with slight declines in the larval index over the last few years. The predicted video indices both tend to overestimate abundance in the early and latter part of the timeseries, particularly recently in the eastern gulf leading to strong positive residuals over the last 5 years (likely due to the model trying to balance the strong eastern BLL increases over this time period). The BLL and larval indices demonstrate well balanced residuals, although the eastern larval index had some strong positive residuals in the terminal two years. In general, both the model predicted fishery-independent surveys of the adult stock and fishery-dependent CPUE indices agree that red snapper appear to be steadily rebuilding since the mid-2000s in both regions, but rebuilding in the east appears to have leveled off or declined over the last 3-5 years.

4.3.3 Fishery-Independent Surveys, Ages 0 and 1

The model fits to the fishery-independent indices referencing Ages 0 and 1 were also similar between the 2014 SEDAR 31 Update Assessment and SEDAR 52 (**Figure 4.3 m-p**). The SEAMAP Fall Groundfish Survey was used to index primarily Age-0 recruits and generally varied with little trend throughout the time series for both regions (**Figure 4.3m-n**). The SEAMAP Summer Groundfish survey was used to primarily index Age-1 red snapper and also varied with little trend during the time series (**Figure 4.3o-p**). Although neither survey had any significant residual patterns for the western indices, the eastern indices demonstrated a pattern of overestimation of abundance during the middle third of the timeseries. Given the noise in the observed data, the residual patterning is unlikely to be indicative of any significant process error.

4.3.4 Shrimp Effort

Model fit to the shrimp effort series is extremely good and match the values estimated in the 2014 SEDAR 31 Update Assessment, which is to be expected given the relatively small standard error the effort timeseries received compared to other indices (**Figure 4.3q-r**). Additionally, because the effort timeseries are utilized to provide signals of interannual variation in shrimp bycatch, they must be fit closely to stabilize the estimates of shrimp bycatch fishing mortality (similar to the recreational and commercial closed season discards).

4.4 Age Composition

Model fits to the age composition of the landings (**Figure 4.4**), discards (**Figure 4.5**), and indices (**Figure 4.6**) used annual sample sizes to determine relative data weighting, which were capped at N=200 to prevent overfitting the age composition at the expense of other model components (e.g., indices of abundance). The SS3 model also estimated effective N (N_{eff}; **Figures 4.4-4.6**) using the McAllister-Ianelli tuning method, which can be used to iteratively reweight age composition. Although previous assessments did not use any iterative reweighting methods, the SEDAR 52 model utilized these reweightings as they generally improved overall model diagnostics. Despite the reweighting, the age composition was the most dominant component of the overall likelihood (negative log-likelihood = 1749.11).

It should be noted for strata with less than 10 aged samples, annual age composition was not used (following the approach of the 2014 SEDAR 31 Update Assessment). Additionally, the addition of new age-length data for SEDAR 52 resulted in updated age-length keys. Therefore, small discrepancies among observed age compositions between SEDAR 52 and the 2014 SEDAR 31 Update assessment were relatively common as additional samples were either added or the new age-length keys were applied to the length compositions.

For strata (fishery, year) with sufficient sample size (e.g., sample size > 50), the model fit the age composition quite well. Model fits to strata with low sample sizes were not as good, as was expected given their low relative weight in the model. As such, the retained catch and fishery-independent surveys often had better sampling than the discards and illustrated better fit to the age composition. Similarly, the commercial fleets were often better sampled than the recreational fleets and showed generally better fits.

Although model fit to age compositions in any given year for a fleet or survey might show some large residuals, aggregated fit over all years of available age compositions demonstrated strong fit and aligned with results from the 2014 SEDAR 31 Update Assessment (**Figure 4.7**). The one exception was the age composition of the eastern bottom longline survey, which illustrated poor model fit. One possible reason for the lack of fit of the eastern BLL age composition was the shift from younger to older fish throughout the timeseries, which the model could not account for with a time-invariant selectivity pattern. A possible reason for these changes over time may be attributed to different length compositions seen in samples taken east and west of Cape San Blas, FL, and the SEDAR 52 panel noted that a critical future research need is to investigate sampling methodology and index standardization methods for the BLL surveys.

Despite some significant patterns in the Pearson residuals (**Figure 4.8**), poor performance was generally observed either for fleets or surveys that are poorly sampled (e.g., discards) or for age groups that are not typically caught in a given fishery or survey (e.g., young-of-the-year fish in the retained catch and adult fish in the shrimp bycatch fishery or SEAMAP trawl surveys). Patterns have not changed greatly since the 2014 SEDAR 31 Update Assessment, but appear to be slightly less pronounced for certain fisheries and years.

4.5 Fishery Selectivity and Retention

Estimated age-based terminal year selectivity is illustrated for each fishing fleet (**Figure 4.9**) and survey (**Figure 4.10)**. Given that a majority of the selectivity functions were reparametrized to double normal in SEDAR 52 compared to age-based random walks in the 2014 SEDAR 31 Update Assessment (i.e., the only fleets or surveys that maintained the same parametrization were the SEAMAP trawl, shrimp bycatch, and bottom longline), there are discrepancies among selectivity functions (**Figures 4.9-Figure 4.10**). However, most functions maintained similar shapes with the SEDAR 52 versions being typically smoother (e.g., the western LL selectivity, western recreational MRIP selectivity, eastern Video survey selectivity, and eastern ROV; **Figure 4.9d**, **Figure 4.9f**, **Figure 4.10a**, and **Figure 4.10**, respectively). As was done in previous assessments, the recreational closed season discard fleet selectivity was mirrored to the associated region-specific recreational MRIP open season selectivity, because no age or length compositions are available for these fleets to estimate selectivity directly. On the other hand, given the additional years of age composition data for the eastern bottom longline survey, the selectivity was allowed to be estimated directly in SEDAR 52, whereas it was previously mirrored (fixed) to the western bottom longline survey selectivity in the 2014 SEDAR 31 Update Assessment. However, there were only minimal differences between the estimated eastern and western bottom longline selectivities estimated in SEDAR 52 (**Figure 4.10c-d**).

In the terminal year (2016) red snapper were at least 50% selected at:

- Age-0 for the eastern and western shrimp discard fleets (SHR_E and SHR_W)
- Age-0 for the fall groundfish trawl survey in the east and west (Fall_E, Fall_W)
- Age-1 for the summer groundfish trawl survey in the east and west (SUM_E, SUM_W)
- Ages 2-20 for the eastern artificial reef survey (ROV_E)
- Ages 3-6 for the western commercial closed season/No-IFQ discard fleet (C_Closed_W)
- Ages 3-7 for the commercial western vertical line fleet (HL_W)
- Ages 3-7 for the western SEAMAP Video Survey (VID_W)
- Ages 3-8 for the western private/charter fleet (MRIP_W)
- Ages 3-8 for the western recreational closed season discard fleet (R_Closed_W)
- Ages 3-8 for the commercial eastern vertical line fleet (HL_E)
- Ages 3-8 for the eastern headboat fleet (HBT_E)
- Ages 3-8 for the eastern commercial closed season/No-IFQ discard fleet (C_Closed_E)
- Ages 3-10 for the eastern SEAMAP Video Survey (VID_E)
- Ages 3-10 for the eastern charter/private fleet (MRIP_E)
- Ages 3-10 for the eastern recreational closed season discard fleet (R_Closed_E)
- Ages 4-7 for the western headboat fleet (HBT_W)
- Ages 4-10 for the eastern commercial longline fleet (LL_E)
- Ages 7-19 for the western commercial longline fleet (LL_W)
- Ages 7-20 for the NMFS western Bottom Longline fleets (BLL_W)
- Ages 9-20 for the NMFS eastern Bottom Longline fleet (BLL_E)

As expected, the longline fleet landed the oldest fish (ages 4-20+), while younger fish (predominately ages 0 and 1) were discarded by the shrimp bycatch fleet. The directed and discard commercial vertical line and recreational fleets in the eastern and western Gulf generally landed red snapper of intermediate ages (ages 2-8; **Figure 4.9).** The surveys each sampled varying segments of the population. The SEAMAP trawl surveys focused on young-of-the-year fish (ages 0 and 1), the video surveys (VID and ROV) tended to select both juveniles and adults (ages 2-10), and the bottom longline survey targeted mostly older adults (ages 7+; **Figure 4.10**).

Time-varying selectivity functions were estimated for the commercial fleets to accommodate potential changes in selectivity due to the implementation of the IFQ program in 2007 (**Figure 4.11**). During the IFQ period, commercial selectivity generally shifted toward older, larger red snapper. The exception was the eastern vertical line selectivity which shifted toward somewhat smaller, younger fish (**Figure 4.9 a**). The largest shift was seen for the western longline fleet, which selected old fish at a much higher rate after implementation of IFQs. Time-varying selectivity functions were also estimated for the recreational fisheries to allow two changes, one due to a regulatory mandate requiring the use of circle-hooks beginning in 2008, and a second apparent change in fishing behavior resulting in a shift in age composition toward larger, older fish during the recent period 2011-2016 (**Figure 4.12**). For most fleets, a shift in selectivity toward older red snapper was estimated for both 2008-2010 and 2011-2016. The one exception was the eastern headboat fleet, which had a much broader selection pattern in the historical period, although in the recent timeblocks selectivity was greater for fish ages 10+. Recently, some anglers have proposed that the apparent shift in selectivity could have been due to high grading (effectively a change in retention rather than selection). This hypothesis could have implications, and can be explored in future work.

Overall, selectivity estimates throughout the SEDAR 52 model are similar to those estimated in the 2014 SEDAR 31 Update Assessment, but the reparametrized functions appear to better accommodate the expanding age composition for many fleets and surveys. The model fits the age composition slightly better and appears to be generally more stable than previous assessments, which may, in part, be associated with the new selectivity parametrizations.

Multiple length-based time-varying retention functions (logistic in form) were modeled for the commercial and recreational fisheries to account for the changes in the size of fish retained due to various minimum size limits and quota limitations (**Figure 4.13**). As expected, increases in the minimum size limit resulted in larger red snapper retained by the fisheries, while red snapper below the size limit were generally discarded. Similarly, for the commercial fleets, retention during the IFQ period is estimated to be generally lower than 100%, which reflects legal size fish being thrown back as quota limitations are being met. The retention functions estimated for the 2014 SEDAR 31 Update Assessment and the SEDAR 52 Assessment were nearly identical, which is not surprising given that only the asymptotes for the recent timeperiod for the commercial fisheries (to account for potential highgrading under IFQs) are being estimated. There are slight differences in the eastern headboat retention functions, because the 2014 SEDAR 31 Update Assessment estimated multiple asymptote parameters even though limited data was available to inform these parameters. The SEDAR 52 Assessment no longer estimates these parameters (they are now fixed at 100% retention), because these estimated parameters were not well informed and caused some model instability.

4.6 Recruitment

Based on the assumptions utilized in SEDAR 31 and the previous assessment, both the stock-recruit steepness and recruitment variance terms were fixed (0.99 and 0.3, respectively). Exploratory runs with both of these parameters estimated resulted in estimates similar to the fixed values (results not shown), and profile likelihoods for both parameters did not indicate a strong tendency for the model to estimate these parameters at values different from the fixed values (see **Section 4.10.1**). The estimated value of the virgin recruitment in log-space, $ln(R_0)$, during the recent time period (1984-2016) was 12.00 (SD = 0.052), which equates to 163 million fish. Because a regime shift is implemented in the model where productivity is assumed to have increased over the recent timeperiod, the virgin recruitment for the historical period (1872-1983) was estimated to be lower (110 million fish) due to the estimated R_0 offset parameter being negative (-0.39).

The spawner-recruit relationship estimated by SS3 (assuming a steepness = 0.99 and σ_R = 0.3) is essentially flat (due to the steepness being fixed near 1.0) with estimated recruitments varying widely with no strong trends about the curve, but with the largest recruitment events being associated with some of the smallest spawning stock biomass levels (**Figure 4.14**). Recruitment estimates have fluctuated without apparent trend since 1972 when the SEAMAP recruitment surveys became available to help estimate recruitment deviations (**Figure 4.15**). Recruitment estimates have been slightly elevated and less extreme since 1984 when the model assumes a productivity regime shift (based on the estimation of a virgin recruitment offset parameter). Recruitment deviations varied without trend over the data rich part of the time series (late 1990s) when age composition data became available (**Figure 4.16**). The high estimated recruitment deviation value for 1972 corresponds to observed high recruitment index values from the Fall SEAMAP groundfish trawl survey indices, which were at timeseries highs in the initial year of the survey. Subsequent strong negative residual patterns in the early 1980s may partially be explained by the model parametrization (i.e., the use of a deviation vector), which constrains the deviations to sum to one over the timeseries to stabilize parameter estimates. Therefore, the series of large negative deviations may be balancing the abnormally large 1972 deviation.

Regional apportionment of recruits has typically favored the western Gulf (on average approximately 64% of total recruits go to the west compared to 36% to the east), except for a few years in the early 2000s (**Figure 4.17**). Regional estimates of recruitment suggest that recruitment in the west has generally increased since the 1980s, and has recently been above average, while recruitment in the east peaked in the mid-2000s, and has since declined (**Figure 4.18**). Since the last assessment, recruitment in both stocks showed strong increases, but then declined in the terminal year with the estimated eastern recruitment being on par with the low values estimated in the late-1980s. Although recent recruitment estimates are extremely important as they drive the dynamics of catch projections, they are among the most uncertain in the timeseries. Recent years in the model (e.g., since 2013) contain less information from which to estimate levels of recruitment, because not all cohorts have fully contributed to the fishery and so signals in the data are relatively weak as to the ultimate size of recent yearclasses. Recent recruitment estimates should be treated with care, but estimates from the terminal few years of the 2014 SEDAR 31 Update Assessment appear to be well supported by the updated estimates in the SEDAR 52 Base Model. As mentioned, historically some of the largest recruitment events have resulted from relatively small spawning biomass, but recent spikes in recruitment in the western area appear to be associated with a strongly increasing SSB (**Figure 4.19**).

4.7 Population Trajectories

Total biomass and spawning biomass show a steady declining trend from the late 1880's through the early 1900s, followed by a flat trend until the 1940s (**Figure 4.20, Table 4.1**). Total biomass showed strong declines starting in the 1940s and 1950s when both the recreational and shrimp bycatch fisheries began to emerge, which lasted through the late 1980s when both biomass and SSB hit timeseries lows. Beginning in the early 1990s, concomitant with the implementation of regulations to limit red snapper catches (e.g., quotas, trip limits, size limits, area closures, etc.), total and spawning stock biomass began to slowly increase despite increasing discards over this period. The population has been steadily increasing since the mid-2000s coinciding with increasingly stringent management measures and declines in shrimp effort (**Figure 4.3q**).

Biomass levels are now consistent with those seen in the 1960s. Region-specific trends are fairly consistent across both areas, though the western Gulf is estimated to have been at much higher historical levels and exhibited a more precipitous decline (**Figure 4.21**). Area-specific biomass levels were at similarly low levels during the 1980s, but the western area has shown more rapid increases in recent years likely aided by much larger recruitment events. The SEDAR 52 Base Model results support both the trends and magnitude of biomass estimates presented in the 2014 SEDAR 31 Update Assessment, while suggesting that the western area has continued its ascension with the eastern area continuing to level off (though not decline as suggested in the previous assessment).

Total abundance has shown similar trends as biomass and SSB, but is slightly more volatile because of sensitivity to large recruitment events (**Figure 4.22**). Abundance trends are characterized by periodic troughs due to below average recruitment, and, recently, differences in regional abundance have sharply increased driven by steadily diverging trends in recruitment apportionment over the last three years (**Figure 4.17**).

After a truncation of the age structure from the 1960s through 1980s, continued rebuilding has helped expand the age structure over the last decade (**Figure 4.23**; note that gulfwide numbers-at-age can be calculated by summing the two area-specific matrices). In the eastern Gulf, the estimated mean age (based on abundance) of red snapper was approximately age-4 in the unfished state in 1872. The mean age showed a steady decline until around 1910, after which it remained stable at around age-2 until the early 1950s, followed by another steady decline. After 1972, average age fluctuated between about 0.5 and 0.9, until the mid-2000s when it started increasing slowly. In the western Gulf, the estimated mean age (based on abundance) of red snapper was approximately age-4 in the unfished state in 1872. The mean age remained stable at age-4 until the 1950s, and then steeply declined until the 1970s. After 1972, average age fluctuated between about 0.5 and 0.9, until the mid-2000s when it started increasing slowly. The decline in mean age in the earliest years of the time series corresponds with increasing landings and the development of the commercial vertical line fishery. The sharp decline in mean age that began in the early 1950s corresponds to the increasing popularity of red snapper by recreational anglers. Slowly the mean age has been increasing recently and is somewhere between age-1 and age-2.

4.8 Fishing Mortality

The fraction of the stock killed by fishing (i.e., harvest rate in numbers killed by fishing / total numbers) was used as the proxy for annual fishing mortality rate. Predicted annual harvest rate estimates (all fleets combined) suggest low levels of fishing mortality through the mid-1940s (**Table 4.2**; **Figure 4.24**). From the late 1940s through the mid-1990s, a steadily increasing F was predicted. Since about 2000, estimated annual F has largely declined corresponding to the reduction in shrimp effort and associated estimated mortality of age-0 red snapper. Since the last assessment in 2014, the harvest rate has been maintained at relatively low levels (around 5%) commensurate with those seen during the development of the shrimp and recreational fisheries in the 1950s and 1960s.

In general, fleet-specific fishing mortality rates (i.e., instantaneous apical rates representing the fishing mortality level on the most vulnerable age class) steadily increased from the 1950s until the early 2000s (**Figure 4.25**). An increasing trend in fishing mortality was observed for the commercial vertical line fleet in the east beginning in the early 1880s as the fishery developed, which lasted until the early 1900s. Vertical line fishing mortality remained variable without trend until the late 1950s, after which a significant increase in fishing mortality was observed for the vertical line fleet in both the east and the west. Commercial fishing mortality declined rapidly in the 1980s as population sizes declined, at which point the recreational fleets, particularly the recreational private/charter (MRIP), began to represent the most significant source of mortality. Concomitantly, mortality due to shrimp bycatch, especially in the west, rose slowly until the mid-2000s when it rapidly declined. Around this time period, closed season discards took over as the largest source of fishing mortality led by the eastern recreational fishery, and has remained so in the recent time period.

4.9 Measures of Uncertainty

The estimated parameters and derived quantities as well as the SS3 estimated asymptotic standard errors are summarized in **Table 4.3**. Most parameter estimates appear reasonable and coefficients of variation (*CV*; standard error divided by parameter estimate) were low indicating relatively well estimated parameters.

Given the highly parametrized nature of this model, many of the parameters were mildly correlated (correlation coefficient > 70%). Fishing mortality estimates demonstrated minor autocorrelation within a given fleet, especially for early parts of timeseries, as did the recruitment deviations. Mild correlation was also seen between the estimated catchability coefficient for the shrimp fleets and associated estimates of shrimp bycatch fishing mortality. The virgin recruitment was generally negatively correlated with the recruitment deviations (correlation coefficient = -0.85). Based on model estimated correlation factors, only a few of the double normal selectivity parameters and a handful of fishing mortality parameters demonstrated issues with high correlation (correlation coefficient > 95%; **Table 4.4**). Correlation among these parameters is not surprising, especially for the double normal parameters (which demonstrated the most severe correlation), because the parameters of selectivity functions are inherently correlated (i.e., as the value of one parameter changes the other value will compensate). The most severe correlations occurred between the parameter defining the peak of the double normal selectivity function and the parameter defining the width of the ascending limb of the double normal function. Often, priors are used to inform selectivity parameter estimates and stabilize an assessment model. However, priors were not used here, but given the relative stability of the model (see diagnostics sections below), it was not deemed necessary to put priors on the double normal parameters and the correlation was not problematic.

4.10 Diagnostic Runs

4.10.1 Profile Likelihoods

Profile likelihoods were done for each of the stock-recruit parameters even though the SEDAR 52 Base Model only estimated the virgin recruitment parameter. Given that the approach for profile likelihoods is to fix important model parameters across a range of potential values most of which are not supported by the data, there is often tension among fits to the different data sets that can create jagged profile surfaces. The non-smooth nature of these curves results from the profile representing only a single model run iteration, which often causes the model to not find a true minimum for that run. These curves can often be smoothed out by jittering the initial starting parameter values, but the process can be extremely time consuming (especially for a model with over a thousand parameters to estimate), and was not done for SEDAR 52. However, even with non-smooth profile curves it is often possible to get an idea of where the minima occurs based on the general trend of the curve, while also being able to easily note what data sets are creating the greatest tension in the model.

Each of the profile runs illustrated non-smooth response surfaces. However, one of the most salient features of these surfaces was the tradeoff in model fit between the age composition data compared with the index and discard data (**Figures 4.26-4.28**). Almost universally across profile runs, when the discard and index data were fit the best, the age composition data was fit the worst and vice versa. Although it is difficult to make any specific conclusions from this result, almost all of the tradeoff in model fit is due to the western headboat data with some runs showing similar (though not as extreme) tradeoffs in the fit to the eastern MRIP data. When the western headboat (or eastern MRIP) discards were fit well there was generally a slight improvement in the fit to the western headboat (or eastern MRIP) CPUE index and a similarly slight decline in the western headboat (or eastern MRIP) retained age composition. Given the uncertainty in recreational discard data, it is not surprising that the model has difficulty reconciling the various recreational data sources.

Despite the limitations of the profile runs, the results generally support the values of the stock-recruit parameters for the base model. After accounting for the tradeoffs in data fit mentioned above, the general profile response surface for the virgin recruitment parameter (**Figure 4.26**) was fairly flat for most data sources with the index and discard data favoring a value of $\ln(R_0)$ between 11.9 and 12.2 (the base model estimate was 12.003). Similarly, there were no strong trends in the profile for the stock-recruit variance term (**Figure 4.28**), though the age composition data (probably the most information-rich data source for stock-recruit parameters) appears to favor values less than 0.5 (similar to the fixed value of 0.3). On the other hand, there appeared to be moderate agreement among data sources that the steepness value should be above 0.9 (similar to the fixed value of 0.99; **Figure 4.27**). Both the index and age composition data demonstrated declining profile surfaces up until this point, but both were relatively flat for all values above 0.9.

Across the range of parameter values tested in the various profile likelihood runs, the model provided very similar trends in spawning stock biomass estimates (**Figure 4.29**). Terminal year estimates in SSB also appear relatively consistent across parameter values, with some divergence for more extreme steepness parameters (that are likely unrealistic for red snapper). In general, the model appears somewhat robust to the values of the stock-recruit parameters.

An important caveat of these profile runs was that the approach was to use the base model parametrization for the profiles. Therefore, neither steepness nor the stock-recruit variance was estimated in any profile runs, which may be one reason why the profiles generally support the base model parameters. Although exploratory runs were carried out that estimated all of the stock-recruit parameters and the results generally supported the parametrization of the base model, they were more unstable than the base model. In the future, a more detailed analysis of the stock-recruit parametrization should be carried out to explore the potential of estimating all parameters and to perform profile likelihoods with all stock-recruit parameters estimated to see if different values are supported than were used for SEDAR 52.

4.10.2 Bootstrap Analysis

Results of the 700 bootstraps indicate that the model performed well and was relatively stable, because parameter estimates for the runs fit to the bootstrapped data sets converged towards the same solutions as the base model fit to the observed data (**Figure 4.30**). Additionally, all of the derived quantities are closely distributed around the base model estimates. Although some slight spread exists, this is to be expected when fitting the model to 700 randomly simulated data sets.

4.10.3 Retrospective Analysis

Results of the retrospective analysis illustrate a strong level of consistency within the model. As years of data are peeled off, the model estimates of spawning potential ratio (SPR) in each successive terminal year do not change by a large margin and show no pathological trend of over or underestimation (**Figure 4.31**). Recruitment estimates are slightly more variable with some peels demonstrating overestimation and others underestimation. However, the magnitude of differences compared to the base model with the full data timeseries is minimal and there is no constant trend that might indicate model issues. Care should be taken when analyzing the longer data peels as limited data was available to estimate some of the selectivity timeblocks (e.g., the most recent recreational selectivity timeblock) within these runs.

4.10.4 Jitter Analysis

A relatively large jitter value (0.15) was randomly added to each of the starting parameter values, which illustrated that there was some model instability (**Figure 4.32**). It is worth noting that an earlier jitter run uncovered a solution with a lower negative log-likelihood value (than the base being used at the time) and was subsequently used as the base model. The current jitter analysis indicated that no run had a lower negative log-likelihood than the base model (-LL = 2595.38). The results of the jitter runs provided similar insight as the profile likelihoods in that when the model demonstrated large discrepancies in fit from the base model, it was primarily due to worsened fit to the discard and index data. However, there remained good consistency in parameter estimates (e.g., virgin recruitment), which indicates that the moderate instability indicated by the jitter analysis was unlikely to have a large impact on model results.

4.10.5 Index Jack-knife Analysis

The results of the index jack-knife analysis, which ran the model with one index (or a group of indices) removed, indicated that no one index or group of indices appeared to be having undue influence on the assessment results (**Figure 4.33**). Removing all of the fishery-independent indices resulted in slightly higher historical SPR and recruitment levels, but results generally converged with the base model in the recent timeperiod.

4.10.6 Continuity Model Comparison

The 2014 SEDAR 31 Update Model and the strict SEDAR 52 continuity model (i.e., using the 2014 recreational CPUE indices and the same discard methodology as the previous assessment) demonstrated almost identical trends for both regional and gulfwide biomass (**Figure 4.34**). However, the SEDAR 52 Update Model estimated that the eastern biomass was much higher over the last five years with continued increases in the terminal year, as opposed to decreases seen in the previous assessment and the continuity model run. The stepwise model building illustrated the impact of each updated data set (**Figure 4.35**). Updating the recreational CPUE indices (i.e., fixing management coding issues and adding new data points) led to moderate increases in eastern biomass (red to green lines; **Figure 4.35**). The biggest impact was scaling the index standard errors to a common mean of 0.2 (green to blue lines; **Figure 4.35**), which led to a large increase in estimated eastern Gulf biomass. Updating the discard methodology for both the headboat and commercial fisheries had a relatively minimal impact (blue to aqua lines; **Figure 4.35**) that caused a small increase in estimated eastern Gulf biomass. The final continuity model incorporated all of these changes along with truncating the recreational CPUE indices in 2013, which also had a moderate change (aqua to yellow lines; **Figure 4.35**) but acting in the opposite direction to decrease estimated eastern Gulf biomass.

In the second stage of model building, the 'Update' Model was then altered to include (again in a single factor stepwise manner) the desired changes utilized in the Base Model (i.e., updated selectivity functions and rescaled effective sample sizes for the age composition data). Updating the model to utilize double normal selectivity function had little overall impact except to decrease the eastern Gulf biomass slightly (**Figure 4.36**). Finally, reweighting the age composition effective sample size led to a moderate decrease in the estimated eastern Gulf biomass. Overall, most of the model building runs are in general agreement, though some slight differences are observed for the eastern Gulf. The final SEDAR 52 base model utilizes the recommended practices for each of the updated data sources as identified by the SEDAR 52 assessment panel and provides the best fit to the various data sources, and is believed to be the most appropriate model for the basis of management advice from the suite of models investigated.

4.10.7 Sensitivity Model Runs

Four sensitivity runs were carried out for SEDAR 52 including: increasing the discard CVs to 0.5; increasing the recreational discard mortality in the recent period to 15.8%; removing all fishery dependent indices; and incorporating the data from the connectivity modeling system (CMS) as an index of recruitment. None of the modeling changes had a strong impact on the model (**Figure 4.37**). In terms of biomass, reducing the discard CVs had a minimal impact on historical estimates. Given that removing the fishery-dependent CPUE indices has no impact on results, this run indicates that there may not be a need to update or include these indices in future assessments, especially given the increasing difficulty in accounting for changing management regulations. Adding the CMS data as an index of recruitment helped to reduce the CV of the recruitment estimates, and also reduced the variability in recent recruitment; most notably the 2015 estimate was reduced substantially with moderate increases in the 2016 estimate (**Figure 4.38**).

5. REFERENCE POINTS

$F_{SPR26\%}$ was chosen as the proxy for F_{MSY} during the 2014 SEDAR 31 Update Assessment process and projections were undertaken using this value and assuming fixed levels of bycatch and discards (i.e., the MSY|fixed_discards method; Goethel et al. 2018) to define rebuilding targets (following the methods of the 2014 SEDAR 31 Update Assessment; SEDAR 2015). Therefore, the maximum fishing mortality threshold (MFMT) was assumed to be equal to the fishing mortality rate that produces a spawning potential ratio (SPR) of 26% in equilibrium. However, since the 2014 SEDAR 31 Update Assessment, there has been a change in the minimum stock size threshold (MSST) value based on Amendment 44 to the Gulf of Mexico Reef Fish Fishery Management Plan (SERO 2017). Previously MSST was calculated as (1-M) * $SSB_{FSPR26\%,}$ where M = 0.09 (i.e., the average value of M from the Lorenzen M curve for fully selected ages). The new value for MSST is simply 0.5 * $SSB_{FSPR26\%}$. Therefore, stock status is provided based on both values of MSST to provide continuity from the previous assessment. Additionally, all projections of reference points provided in this document do not contain the provisional landings data for 2017, which will be available in the coming months. Thus, a separate document will be submitted with the final acceptable biological catch (ABC) projections based on the red snapper rebuilding plan that include the 2017 provisional landings. However, the reference point and stock status values will not be altered.

5.1 Methods

Deterministic projections were run using the Stock Synthesis 3 model to evaluate stock status. Equilibrium projections were run from 2017 to 2076 using the same parameter values and population dynamics as the base model where equilibrium was assumed to be obtained over the last 10 years (2067-2076; see **Table 5.1** for a summary of projection settings). Because the base model assumes a fixed steepness of essentially 1.0, the projections assumed that forecasted recruitment would continue at recent average levels (i.e., projected recruitment was near the 'virgin' recruitment level for the recent productivity regime, 1984 – 2016, of 163 million fish) and recent average recruitment apportionment levels were assumed (i.e., 23% to the east and 77% to the west based on the 2016 value). For all years of the projections it was assumed that recent fishery dynamics would continue indefinitely including maintaining a 51% to 49% allocation of commercial to recreational catch. The selectivity for each fleet was taken from the terminal year of the assessment and relative harvest rates for the directed fisheries were assumed to stay in proportion to the terminal three year average (2013 – 2016) values. Similarly, discarding and retention practices were assumed to continue as they had in the three most recent years (2013 - 2016). The expected fishing effort levels for the six bycatch fleets (shrimp bycatch, recreational closed season, and commercial closed season/no-IFQ) were assumed to be the same as in 2016 (i.e., fixed at their associated 2016 values; see **Figure 5.1** for terminal year relative fishing mortality rates by fleet).

For SPR-based analysis, the harvest rate (total number killed / total abundance) that led to a SPR of 26% (i.e., $SPR = \frac{\frac{SSB}{R}}{\frac{SSB_0}{R_0}} = 0.26$, which is equivalent to $\frac{SSB}{SSB_0}$ when steepness = 1.0 and recruitment is constant) was obtained by iteratively adjusting yield streams. Basically, the fishing mortality rates exerted by the directed fleets were scaled up or down by the same proportional amount (with the fishing mortality rates exerted by the bycatch and discard fleets held constant at assessment terminal year values) until the fishing mortality that achieved a SPR of 26% in equilibrium was obtained.

As currently implemented, the OFL projections do not utilize constant fleet-specific fishing mortalities (i.e., a constant set of fleet-specific $F_{SPR26\%}$ values are not implemented for the entire timeseries of the projections). Although SPR 26% is achieved in equilibrium, it is accomplished with time-varying fleet-specific fishing mortalities (instead of fixed values as is typically assumed for single fleet SPR projections). The main reason for this is that it is not necessarily possible to conform to each constraint of the OFL projections (i.e., a constant sector allocation, maintenance of proportional fishing mortalities across directed fleets, and obtaining SPR 26% with constant fleet-specific fishing mortality rates). SS3 performs projections in multiple phases with different constraints being adhered to in each phase to create a final set of projections that best abide by all of the desired constraints. The final projections maintain the desired sector allocation and the input directed fleet relative effort. Despite being constrained to achieve essentially the same population trajectories as projections that maintain constant fleet-specific fishing mortalities in each year (as achieved in earlier projection phases), the fleet-specific fishing mortalities are not constant in the final projections (see Methot and Wetzel 2013 or Methot 2015 for further details). Further work is being explored to develop alternate OFL projection that maintain constant fleet-specific fishing mortalities and may be provided in the final ABC projections document submitted to the SSC upon acceptance of the SEDAR 52 Base Model.

Additionally, F_{MAX_Global} (i.e., the fishing mortality corresponding to the global maximum yield-per-recruit), which is identical to F_{MSY_Global} in this case (because steepness is fixed at 1.0 and no relationship is incorporated between spawners and recruits), was calculated using one 'optimal' fleet with near infinite fishing mortality and knife-edge selectivity at the age that produced the highest yield-per-recruit. The resulting maximum yield-per-recruit was the global maximum possible given the life history characteristics of red snapper, and balanced gains due to growth and recruitment versus losses due to natural mortality. The value of F_{MAX_Global} can be used as comparison for $F_{SPR26\%}$ to see if the latter falls in the vicinity of F_{MSY} as stipulated in the Magnuson-Stevens Reauthorization Act (MSRA 2007; Goethel et al. 2018).

Stock status for red snapper was determined based on comparison of the given year fishing mortality to the MFMT (i.e., $F_{SPR26\%}$) and the given year SSB compared to the MSST (i.e., 0.5 * $SSB_{SPR26\%}$). As mentioned, the approach for calculating MSST used in the 2014 SEDAR 31 Update Assessment MSST [i.e., (1-M) * $SSB_{FSPR26\%,}$ where M = 0.09] was also provided as a bridge to the results of the previous assessment. Corresponding overfishing limits (OFLs) were calculated as the median (50th percentile) of the probability density function (PDF) of retained yield (millions of pounds) using the projection of $F_{SPR26\%}$ (i.e., the yields that achieved the SSB target in equilibrium). Uncertainty in derived quantities (including retained yield) was carried through the projections from the parameter estimation phase in the stock assessment model and represented the approximate variance from the inversion of the Hessian matrix. The PDF and 95% confidence intervals are calculated assuming a normal distribution of the derived quantity.

Per the terms of reference, additional projection runs included projecting optimal yield (i.e., F_{OY} = 75% * $F_{SPR26\%}$) and F = 0. For the optimal yield run, the directed fishing mortality was decreased to 75% of the directed fishing mortality at $F_{SPR26\%}$, while the bycatch and discard fleet fishing mortality rates were held constant as in the $F_{SPR26\%}$ runs (following the methods outlined in the 2014 SEDAR 31 Update Assessment projections; SEDAR 2015). For the F = 0 run all fishing mortality was eliminated including bycatch and discards and the population was projected until equilibrium. Given that the provisional landings are not yet provided and the base model has not yet been accepted by the SSC, projections of $F_{Rebuild}$ are not shown here and will be provided in a separate document upon acceptance of the SEDAR 52 Base Model.

5.2 Stock Status

The harvest rate that results in SPR 26% in equilibrium was around 0.0588, while the resulting SSB at SPR 26% was 1.23E+15 eggs with an MSST of 6.15E+14 eggs (see **Table 5.2** for the relevant MSRA management reference points and benchmarks). The continuity value for MSST was equal to 1.12E+15. All of the calculated MSRA benchmarks compare favorably with the 2014 SEDAR 31 Update Assessment values. Virgin recruitment was estimated to be slightly lower along with virgin SSB. The result has been a decrease in MSST benchmarks, but a slight increase in MFMT. The latter result is likely due to larger estimated recent recruitment events than in the 2014 SEDAR 31 Update Assessment and higher terminal year SSB along with a lower SSB_0, which decreases the level of rebuilding required to achieve $SSB_{SPR26\%}$ and allows the stock to rebuild faster even at higher harvest rates.

The SEDAR 52 Base assessment model indicates that the Gulf of Mexico red snapper stock is recovering and based on current definitions of MSST and MFMT the stock is not overfished and there is no overfishing occurring (SSB_{2016}/ $MSST_{NEW}$ = 1.41; $F_{CURRENT}$ / MFMT = 0.823; **Table 5.2**). An important caveat to this result is that under the previous definition of MSST the red snapper resource would still be considered overfished (SSB_{2016}/ $MSST_{OLD}$ = 0.77). If both MSST values were being presented during the 2014 SEDAR 31 Update Assessment, a similar situation would have occurred (i.e., based on the results of that model SSB_{2014}/ $MSST_{NEW}$ = 1.08 and SSB_{2014}/ $MSST_{OLD}$ = 0.59 with $F_{CURRENT}$ / MFMT = 0.994). However, the SEDAR 52 model estimates that the stock was actually in slightly better condition in 2014 than estimated by the previous assessment (i.e., a SPR of 15% instead of 14% and a slightly lower relative harvest rate; **See Figure 5.2**). Regardless of MSST a definition, the resource has been steadily rebuilding since the 2014 SEDAR 31 Update Assessment was undertaken (see **Table 5.3** for a summary of stock status over the entire assessment timeseries). Following a period of strong overfishing of a highly depleted resource during the 1980s-early 2000s, overfishing has not occurred since 2005 (**Figure 5.2**). Although relative harvest rates have increased slightly in recent years they remain below the MFMT, while the stock continues to increase towards the long-term rebuilding goal of $SSB_{SPR26\%}$. Projections aimed at achieving an SSB ratio of 26% in equilibrium suggest that the stock should continue to increase and be within a few percentage points of 26% SSB_0 within a decade (see **Table 5.4** for a summary of projected stock status).

There are a number of important caveats for these projections. First, these calculations do not account for the highly variable nature of recruitment events nor the fundamental relation between adult spawners and subsequent recruits. Projections are completely deterministic and based on the assumption that future recruitment will remain constant at recent averages (i.e., steepness is approximately 1.0). Despite uncertainty about the nature of the spawner recruit relationship for red snapper, it should not be presumed that one does not exist. The assumptions utilized are likely to be adequate for short-term projections, but long-term equilibrium conditions are unlikely to hold for any resource and should only be utilized for general comparative purposes.

Similarly, the benchmarks and associated stock status are calculated for the entire gulfwide stock, which ignores the regional impact on the eastern or western component of the stock complex individually. When biomass trends are viewed regionally highly disparate outlooks are projected (**Figure 5.3**). These results support the projections undertaken for the 2014 SEDAR 31 Update Assessment (see Appendix 3, Figure 12 in SEDAR 2015), albeit suggesting a more precipitous decline in the eastern component of the population (**Figure 5.3**). Again long-term predictions should be interpreted cautiously, but the leveling off in SSB and biomass for the eastern region predicted by the 2014 SEDAR 31 Update Projections has been generally corroborated with the SEDAR 52 assessment estimates for 2014-2016 (**Figure 5.3**).

The reasons for the discrepancy in regional biomass trends are well documented in SEDAR (2015) and Goethel et al. (2018) and are largely caused by the discrepancy in recruitment and removals (fishing mortality) within the eastern stock. The recruitment discrepancy between regions has become even more pronounced in SEDAR 52 as the eastern region only receives 23% of the total recruitment during the projection period (compared to 38% in the 2014 SEDAR 31 Update Assessment). Similarly, the time-invariant recreational closed season fishing mortality assumed in the projections (based on the terminal year estimate) has increased from 0.34 in the 2014 SEDAR 31 Update projections to 0.42 for the SEDAR 52 projections (see **Figure 5.1**). Because the eastern region is assumed to receive so few recruits and undergoes a high rate of discard fishing mortality, it is not surprising that the projections forecast large declines. However, recruitment and mortality are more balanced in the western region, which allows the biomass to consistently increase. The outcome is a gulfwide trend that more closely reflects the western trend than that in the eastern region. Although the projection assumptions (i.e., constant recruitment, constant relative F, and constant bycatch F) are unlikely to remain stationary in the long-term, it may be reasonable to assume that they will remain at or near recent averages during the short-term forecasts (i.e., three years) used to develop management advice.

5.3 Overfishing Limits

The OFL is based on the median catches from the projections that achieve a SPR ratio of 26% in equilibrium. Catches based on the overfishing limit start at relatively high levels (20.7 million pounds) before leveling off (around 13.4 million pounds; **Table 5.4**). Near-term OFLs are higher than predicted by the 2014 SEDAR 31 Update projections (i.e., by about 4.5 million pounds; **Figure 5.4**). There are 2 primary factors controlling these differences. The SEDAR 52 projections begin from a relatively better off position (i.e., larger stock size, partially due to lower removals than estimated and projected in the 2014 SEDAR 31 Update Assessment) and benefit from a large estimated 2015 yearclass that supports higher catches in the near-term (**Figure 5.5**). In the first few years of the SEDAR 52 projections the 2015 yearclass is just beginning to enter the various fisheries. Because the projections do not need to rebuild to a SPR of 26% until equilibrium, the model can fish the yearclass down and allows initial catches to be high in the first few years of the projections (**Figure 5.4**). Once this recruitment event has been fished out and the projections begin to rely on constant average recruitment levels, associated OFLs begin to decrease and level out (nearly overlapping with those from the 2014 SEDAR 31 Update Assessment; **Figure 5.4**). Large near-term projected catches become more subdued as the model is forced to rebuild in shorter timeframes (e.g., 2032). It is worth noting that if the results of the sensitivity run using the CMS data had been used as the basis of projections, near-term catches would likely not have been as large given the relatively less variable recent recruitment events (**Figure 4.38**).

5.4 Other Projection Runs

Projections of global F_{MAX} (i.e., global MSY with steepness = 1.0) indicate that maximum yield was obtained when knife-edge selectivity occurred at age 10 and resulted in a SPR of 24% (**Figure 5.6**). These results match what was estimated for the 2014 SEDAR 31 Update Assessment (SEDAR 2015) and subsequent analyses (Goethel et al. 2018). The SPR corresponding to the global F_{MAX} should be considered a lower limit for sustainable spawning stock biomass, because it represents the SPR that results when maximizing yield in the absence of any relationship between spawners and recruits. Accounting for the decline in recruitment as the number of spawners decreases (i.e., including a stock-recruit relationship) would generally result in a higher equilibrium SPR if global MSY could be calculated directly (Goethel et al. 2018). However, these results generally support the use of a SPR of 26% as chosen for red snapper during the 2014 SEDAR 31 Update Assessment process.

Results of the F_{OY} projections were not substantially different from the OFL projections. Initial catches were high and leveled off as the 2015 yearclass was fished out (**Figure 5.7**). It is important to reiterate that the forecasts of optimal yield assumed the fishing mortality by the directed fisheries would be reduced by 25% (i.e., $F_{OY, Directed} = 0.75 * F_{SPRtarget, Directed}$), but not that of the bycatch fleets (the latter's F values were input and held constant). The result was that the realized total harvest rate (i.e., total removals in numbers / total abundance) in the OY projections was around 96% of the F_{Proxy} instead of 75% (**Table 5.2**). The disparity between realized and intended harvest rate is due to the substantial contribution of the bycatch fleets to the total annual removals (as detailed in SEDAR 2015). Given the many approaches to calculating optimal yield when multiple directed and bycatch fleets exist (e.g., average directed F is 75% of the target F, average F across all directed and bycatch fleets is 75% of target F, or total harvest rate is 75% of that at the biomass target), consideration of a standard OY approach should be undertaken in the future to avoid further confusion.

In the absence of any fishery removals (including bycatch or discards) the Gulf of Mexico red snapper population would be expected to rebuild rapidly and achieve a SPR target of 26% in 2019 (**Figure 5.8**).

6. DISCUSSION

Overall the SEDAR 52 Base Model appears to perform well and improves some minor deficiencies in data inputs and model settings from the 2014 SEDAR 31 Update Assessment (SEDAR 2015). Changes in data inputs included: new recommended methodology for calculating observed discards for the commercial and recreational headboat fleets; truncated recreational CPUE indices; an updated estimate of recreational discard mortality; and general updates to each of the data sets to reflect the new terminal year of 2016. Minor changes to the assessment model included: rescaling of input index standard errors to a common mean of 0.2 to avoid undue influence of any single index; reweighting the age composition effective sample sizes to avoid overfitting the age data at the expense of other data inputs; and reparametrizing many of the selectivity functions from a random walk by age to double normal. Although none of the changes appeared to have a large impact on population estimates and trajectories, it is believed that each improved the overall performance and reliability of the assessment.

Model diagnostics indicate that the SEDAR 52 model is able to fit the available data sources with relatively limited residual pattern (except for some poorly sampled age composition data sets). Diagnostic runs did not show any pathological trends. On the contrary, there were no issues with retrospective patterning and both bootstrap and jack-knife analyses demonstrated that the model was able to obtain a similar solution for all runs. However, the model may have some minor stability issues as demonstrated with the jitter analysis, but this is not unexpected for a model that is so highly parametrized.

Perhaps the biggest uncertainty for the Gulf of Mexico red snapper stock assessment, and most assessment models in general, is the relationship between spawning stock biomass and resulting recruitment (i.e., the stock-recruit relationship). Although the SEDAR 52 model maintains the assumption of a steepness value of 1.0, this is due to difficulty in directly estimating all of the parameters of the Beverton-Holt stock-recruit function and allows performing projections assuming recent average recruitment. The constant recruitment approach for projections is not necessarily ideal because it eliminates the dependency of recruitment on spawners, which implies that recruitment never falters even at extremely low stock sizes (i.e., recruitment overfishing is not possible). Clearly, some relationship must exist between mature fish and resulting recruits (i.e., there must be spawning fish to make progeny). The constant recruitment assumption is appropriate for short-term projections where SSB is not likely to decrease rapidly, but can lead to inappropriate long-term or equilibrium projections. Therefore, the current projections must be interpreted carefully due to the strong assumptions that were made, and should not be used for equilibrium calculations (i.e., catch limits should be updated regularly to account for changes in recruitment dynamics).

Although exploratory runs that investigated the potential for estimating all of the stock-recruit parameters were carried out, these initial models were unstable and there was insufficient time to investigate their performance further. Profile likelihoods of the stock-recruit parameters indicated that the fixed values utilized by the SEDAR 52 Base Model were generally supported by the data. However, these diagnostic runs were not performed with all of the stock-recruit parameters estimable and, therefore, should be interpreted cautiously. Further work is needed to explore model parametrizations of the stock-recruit function for red snapper including more detailed diagnostic runs and continued biological research to determine whether evidence exists for alternate stock-recruit parameter values or parametrizations.

The sensitivity runs undertaken during SEDAR 52 indicated a handful of important modeling suggestions that should be considered in future Gulf of Mexico red snapper stock assessments. Given the trouble with estimating recent recruitment in integrated models, the results of the run incorporating the connectivity modeling system (CMS) as an index of recruitment suggested that the CMS index could be a useful tool to help reduce variability in estimates for the most recent yearclasses. There may be added benefit to using the CMS index as it may be a useful tool for informing recruitment estimates during the lag year between the assessment terminal year and the first year of future catch projections, during which provisional catches may be available but no other data sources have been finalized. The CMS index often requires less processing time than other data sources reliant on *in situ* sampling and it may be possible to make it available on shorter timeframes than other data sources. Determining a way to link near-term forecasted recruitment estimates to the CMS index (as opposed to using constant average recruitment) may enhance the reliability of projections.

Similarly, the sensitivity run with the CPUE indices removed demonstrated that these indices may no longer be necessary for the model, because their removal had very limited effect on model performance or estimated population trends. Given that the commercial CPUE was truncated in 2006 (i.e., when the IFQ fishery was implemented) during SEDAR 31 (SEDAR 2013a) and that the SEDAR 52 panel recommended truncating three out of the four recreational CPUE indices due to concerns over whether these indices were still able to reflect trends in abundance, it may be appropriate to remove the CPUE indices altogether. There are always concerns whether fishery CPUE can accurately reflect population trends (Maunder et al. 2006), but these issues can be enhanced when complex regulatory regimes exist that may impact or alter fishing dynamics (as is the case in the Gulf of Mexico). Because of these limitations and the increasing number and timeseries length of fishery-independent indices for Gulf of Mexico red snapper, it may be appropriate to remove CPUE indices in future red snapper stock assessments.

Overall, the SEDAR 52 model corroborated and agreed with many of the estimates and projections from the 2014 SEDAR 31 Update Assessment. The Gulf of Mexico red snapper resource continues to rebuild from severely overfished and depleted conditions during the 1980s and 1990s. Under current conditions, it is expected that the resource will continue to rebuild. However, projections demonstrate opposing trends in regional population sizes with the eastern region expected to decline rapidly, while the western region continues to steadily rebuild. These outcomes may simply be the result of imperfect projection assumptions, but the eastern region may warrant careful monitoring over time.

6.1 Future Research

Life History

- Additional spawning fraction and fecundity collections from all areas of the Gulf have been called for in previous SEDARs (e.g., SEDAR 31). In response, more data have been collected (e.g., SEDAR 52- WP-15). This SEDAR echoes past requests and calls for such data collection to continue to expand in time and space.

- Additional research and analysis is necessary to clarify regional reproductive and demographic differences and, as importantly, trends over time.
- Additional work is needed to improve the SS3 model regarding incorporation of spatial and temporal changes in life history data.

Recreational Discards

- Given the increasing magnitude of removals from the recreational closed season fleets, attempts to improve discard estimates and obtain age composition samples (to help estimate selectivity patterns in the assessment) should be undertaken
- Use of the relative magnitude of estimated charter and private boat discards should be explored to appropriately weight available length composition data from FWC observer survey program within the combined charter-private boat fleet.

Surveys

- Develop SEDAR best practices for recreational CPUE standardization
- Explore removal of CPUE indices from the red snapper assessment
- For the NMFS bottom longline survey conduct paired j and circle hook sets to estimate the hook type effect so as to be able to use the older data from when only j-hooks were used
- Assign current and historical age and length data to habitat type at the finest resolution possible to investigate whether differential catch rates occur among artificial and natural reefs.
- Examine survey design changes during NMFS bottom longline surveys (e.g., the use of Dauphin Island data in the index)
- Examine survey design changes during SEAMAP Groundfish surveys
- Further examine survey design for the combined video index to determine whether it can be used in future red snapper assessments
- Evaluate the use of the SEAMAP vertical line survey in the red snapper assessment as the timeseries expands

Age Composition

- Explore and update the modal analysis methods used to determine the age composition of the SEAMAP groundfish trawl survey length frequency and the shrimp bycatch observer length frequency
- Investigate fitting length composition data directly within the SS3 model as opposed to developing age-length keys and converting length frequency to age composition external to the modeling process

Recruitment

- Explore alternate parametrizations of the stock-recruit function and/or develop informative priors for these parameters
- Incorporate the CMS recruitment index into the base model and investigate ways to use the index to improve recruitment forecasting in the projections

Spatial Modeling

- Explore the potential for developing a fully spatial model of red snapper that can account for differential recruitment and life history patterns across the Gulf of Mexico including differential dynamics on and around artificial versus natural reef habitat

Juvenile Mortality

- Further explore the relationship among shrimp bycatch and juvenile red snapper mortality with emphasis on investigation of incorporating the potential for density-dependent juvenile mortality

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9. TABLES

Table 2.1. Age-specific natural mortality rates (*M*) for Gulf of Mexico red snapper assuming a Lorenzen mortality curve rescaled to an average M = 0.0943. The column labeled *M* represents the average natural mortality experienced from July 1-June 30 (i.e., a birth year). The label *Adj. M* indicates the values used in the SS3 model to account for SS advancing age on January 1.

Age	M	Adj. M
0	2	1
1	1.2	1.6
2	0.19	0.695
3	0.15	0.17
4	0.129	0.14
5	0.115	0.122
6	0.106	0.11
7	0.099	0.103
8	0.095	0.097
9	0.091	0.093
10	0.088	0.09
11	0.086	0.087
12	0.085	0.085
13	0.083	0.084
14	0.082	0.083
15	0.081	0.082
16	0.081	0.081
17	0.08	0.08
18	0.08	0.08
19	0.079	0.079
20	0.078	0.079

Table 2.2. The fraction of discarded red snapper that die (release mortality rate) has been found to increase with depth and decrease with venting. Accordingly, the release mortality rates used in the stock assessment were computed based on the average depth fished and whether or not venting was required (venting became mandatory in 2008). The values used are summarized by sector, season (open or closed), and region (east and west of the Mississippi River). Although venting has not been mandatory since 2013, limited information was available to determine discard mortality rates for the most recent timeblock. Therefore, the values from the mandatory venting period were maintained from 2013 - 2016 (see text for more information).

Sector	Venting (Y/N)	Year (Pre/Post 2008)	East		West	
			Closed	Open	Closed	Open
Recreational	N	Pre	0.21	0.21	0.22	0.22
Recreational	Y	Post	0.118	0.118	0.118	0.118
Commercial vertical line	N	Pre	0.74	0.75	0.87	0.78
Commercial vertical line	Y	Post	0.55	0.56	0.74	0.6
Commercial longline	N	Pre	0.74	0.81	0.87	0.91
Commercial longline	Y	Post	0.55	0.64	0.74	0.81

Table 2.3. Annual fecundity-at-age (number of eggs) for Gulf of Mexico red snapper.

Age	Fecundity
0	0
1	0
2	350,000
3	2,620,000
4	9,070,000
5	20,300,000
6	34,710,000
7	49,950,000
8	64,270,000
9	76,760,000
10	87,150,000
11	95,530,000
12	102,150,000
13	107,300,000
14	111,270,000
15	114,300,000
16	116,610,000
17	118,360,000
18	119,680,000
19	120,670,000
20	123,234,591

Table 2.4. Age-length keys used to convert size composition to age composition. Entries are the probability that a given length class belongs in a given age class (therefore the sum across ages is 1.0). Data bars indicate the relative magnitude of the probability.

a) Eastern Gulf of Mexico

Length (cm)	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
24	0.81	0.14	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.38	0.51	0.09	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	0.06	0.60	0.29	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	0.01	0.40	0.47	0.10	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	0.00	0.21	0.56	0.17	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
44	0.00	0.06	0.50	0.30	0.09	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48	0.00	0.02	0.29	0.41	0.16	0.06	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
52	0.00	0.01	0.13	0.43	0.24	0.09	0.05	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
56	0.00	0.00	0.05	0.34	0.32	0.15	0.07	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60	0.00	0.00	0.03	0.22	0.36	0.22	0.10	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
64	0.00	0.00	0.01	0.12	0.32	0.29	0.14	0.07	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
68	0.00	0.00	0.00	0.04	0.21	0.34	0.22	0.11	0.06	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72	0.00	0.00	0.00	0.00	0.10	0.27	0.29	0.18	0.10	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76	0.00	0.00	0.00	0.00	0.00	0.14	0.29	0.26	0.17	0.08	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.26	0.23	0.17	0.07	0.03	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.01
84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.28	0.19	0.10	0.06	0.08	0.06	0.02	0.01	0.00	0.00	0.01	0.07
88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.17	0.11	0.05	0.05	0.06	0.01	0.01	0.05	0.03	0.02	0.35
92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.10	0.12	0.04	0.06	0.06	0.02	0.54
96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.07	0.71
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.75
104	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
108	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

Table 2.4. (Age-length keys continued)

b) Western Gulf

Length (cm)	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14	Age 15	Age 16	Age 17	Age 18	Age 19	Age 20
20	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	0.000	0.000	0.000	0.000	0.000	0.000
24	0.071	0.857	0.071	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
28	0.014	0.730	0.257	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
32	0.011	0.464	0.420	0.096	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	0.000	0.000
36	0.005	0.211	0.501	0.225	0.055	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	0.000
40	0.005	0.117	0.476	0.291	0.088	0.021	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
44	0.003	0.053	0.392	0.359	0.137	0.042	0.011	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
48	0.001	0.018	0.264	0.397	0.212	0.072	0.028	0.007	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
52	0.000	0.009	0.131	0.397	0.289	0.116	0.036	0.013	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
56	0.000	0.004	0.053	0.303	0.371	0.176	0.060	0.021	0.006	0.004	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
60	0.000	0.000	0.029	0.208	0.343	0.246	0.100	0.040	0.018	0.008	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
64	0.000	0.000	0.007	0.111	0.277	0.290	0.171	0.073	0.033	0.017	0.009	0.005	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000
68	0.000	0.000	0.000	0.040	0.172	0.274	0.213	0.125	0.072	0.041	0.025	0.008	0.010	0.007	0.005	0.003	0.002	0.001	0.001	0.001
72	0.000	0.000	0.000	0.000	0.090	0.192	0.219	0.168	0.109	0.069	0.040	0.034	0.022	0.015	0.009	0.011	0.004	0.005	0.004	0.007
76	0.000	0.000	0.000	0.000	0.000	0.104	0.164	0.154	0.138	0.108	0.076	0.067	0.045	0.030	0.025	0.024	0.016	0.011	0.005	0.033
80	0.000	0.000	0.000	0.000	0.000	0.000	0.070	0.115	0.101	0.117	0.093	0.085	0.055	0.060	0.061	0.055	0.026	0.026	0.019	0.119
84	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.041	0.063	0.066	0.055	0.063	0.046	0.066	0.083	0.046	0.048	0.061	0.026	0.336
88	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.031	0.026	0.036	0.031	0.051	0.046	0.041	0.015	0.046	0.020	0.648
92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.031	0.000	0.000	0.031	0.047	0.016	0.047	0.031	0.016	0.047	0.734
96	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.111	0.000	0.000	0.000	0.000	0.000	0.889
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000

Table 2.5. Commercial landings of Gulf of Mexico red snapper in kg whole weight. East and West refer to the division at the Mississippi River.

	Eastern Gulf of Mexico		Western Gulf of Mexico		
Year	Vertical Line	Longline	Vertical Line	Longline	Total
1872	236,470	-	-	-	236,470
1873	354,704	-	-	-	354,704
1874	532,057	-	-	-	532,057
1875	650,291	-	-	-	650,291
1876	768,526	-	-	-	768,526
1877	650,291	-	-	-	650,291
1878	591,174	-	-	-	591,174
1879	650,291	-	-	-	650,291
1880	827,643	-	404,166	-	1,231,809
1881	930,944	-	363,755	-	1,294,699
1882	1,035,150	-	322,894	-	1,358,044
1883	1,138,450	-	287,719	-	1,426,169
1884	1,241,760	-	252,544	-	1,494,304
1885	1,345,080	-	216,919	-	1,561,999
1886	1,449,290	-	181,742	-	1,631,032
1887	1,552,610	-	92,519	-	1,645,129
1888	1,486,620	-	96,563	-	1,583,183
1889	1,580,060	-	122,165	-	1,702,225
1890	1,901,610	-	110,010	-	2,011,620
1891	1,733,750	-	122,262	-	1,856,012
1892	1,819,080	-	132,982	-	1,952,062
1893	1,874,350	-	141,507	-	2,015,857
1894	1,917,620	-	147,355	-	2,064,975
1895	1,871,200	-	151,426	-	2,022,626
1896	1,890,400	-	154,624	-	2,045,024
1897	1,877,080	-	154,513	-	2,031,593
1898	2,092,140	-	247,059	-	2,339,199
1899	2,334,450	-	327,777	-	2,662,227
1900	2,573,750	-	403,686	-	2,977,436
1901	2,733,810	-	462,833	-	3,196,643
1902	2,850,180	-	510,760	-	3,360,940
1903	2,595,510	-	480,718	-	3,076,228
1904	2,398,020	-	458,911	-	2,856,931
1905	2,157,300	-	426,798	-	2,584,098
1906	1,923,660	-	393,570	-	2,317,230
1907	1,697,840	-	359,066	-	2,056,906
1908	1,525,550	-	333,741	-	1,859,291

1909	1,311,270	-	287,097	-	1,598,367
1910	1,105,270	-	244,082	-	1,349,352
1911	1,113,780	-	239,279	-	1,353,059
1912	1,121,930	-	234,904	-	1,356,834
1913	1,129,930	-	230,640	-	1,360,570
1914	1,137,320	-	226,265	-	1,363,585
1915	1,144,310	-	221,890	-	1,366,200
1916	1,150,900	-	217,088	-	1,367,988
1917	1,124,570	-	212,712	-	1,337,282
1918	1,130,600	-	208,337	-	1,338,937
1919	1,233,290	-	213,815	-	1,447,105
1920	1,340,100	-	219,293	-	1,559,393
1921	1,451,010	-	225,310	-	1,676,320
1922	1,565,880	-	230,788	-	1,796,668
1923	1,681,610	-	236,265	-	1,917,875
1924	1,642,630	-	228,237	-	1,870,867
1925	1,645,320	-	220,207	-	1,865,527
1926	1,602,240	-	212,066	-	1,814,306
1927	1,749,770	-	265,763	-	2,015,533
1928	1,562,260	-	193,625	-	1,755,885
1929	1,659,600	-	189,190	-	1,848,790
1930	1,013,100	-	251,090	-	1,264,190
1931	1,020,480	-	155,489	-	1,175,969
1932	1,095,900	-	186,565	-	1,282,465
1933	990,809	-	203,038	-	1,193,847
1934	891,247	-	210,803	-	1,102,050
1935	1,093,620	-	306,234	-	1,399,854
1936	1,258,260	-	395,255	-	1,653,515
1937	1,115,130	-	429,359	-	1,544,489
1938	1,442,590	-	424,259	-	1,866,849
1939	1,693,120	-	387,581	-	2,080,701
1940	1,132,600	-	370,073	-	1,502,673
1941	1,030,470	-	334,702	-	1,365,172
1942	824,791	-	247,044	-	1,071,835
1943	656,019	-	168,459	-	824,478
1944	757,513	-	126,865	-	884,378
1945	660,070	-	69,736	-	729,806
1946	1,052,240	-	146,692	-	1,198,932
1947	1,103,220	-	216,899	-	1,320,119
1948	1,178,740	-	270,078	-	1,448,818
1949	1,409,950	-	394,532	-	1,804,482
1950	767,985	-	669,524	-	1,437,509
1951	914,858	-	670,201	-	1,585,059

1952	1,018,330	-	750,322	-	1,768,652
1953	919,191	-	616,247	-	1,535,438
1954	854,201	-	619,599	-	1,473,800
1955	955,561	-	676,778	-	1,632,339
1956	1,143,450	-	915,086	-	2,058,536
1957	1,025,980	-	913,316	-	1,939,296
1958	1,689,440	-	1,522,890	-	3,212,330
1959	1,545,780	-	1,556,550	-	3,102,330
1960	1,731,280	-	1,633,470	-	3,364,750
1961	1,589,500	-	1,927,300	-	3,516,800
1962	1,638,700	-	1,874,060	-	3,512,760
1963	1,365,290	-	1,667,930	-	3,033,220
1964	1,635,970	-	1,628,550	-	3,264,520
1965	1,684,010	-	1,653,850	-	3,337,860
1966	1,405,590	-	1,379,490	-	2,785,080
1967	1,318,580	-	1,919,150	-	3,237,730
1968	1,187,310	-	2,340,960	-	3,528,270
1969	1,107,660	-	1,899,420	-	3,007,080
1970	1,047,560	-	2,110,460	-	3,158,020
1971	1,008,600	-	2,434,010	-	3,442,610
1972	1,076,990	-	2,196,220	-	3,273,210
1973	1,230,620	-	2,207,750	-	3,438,370
1974	1,708,960	-	2,011,160	-	3,720,120
1975	1,622,350	-	1,783,980	-	3,406,330
1976	1,491,480	-	1,508,480	487	3,000,447
1977	1,026,830	-	1,303,230	-	2,330,060
1978	905,539	-	1,221,990	-	2,127,529
1979	924,383	-	1,121,510	-	2,045,893
1980	859,906	42,641	1,141,480	19,983	2,064,010
1981	965,098	81,583	1,425,790	22,345	2,494,816
1982	1,039,600	102,773	1,660,860	32,485	2,835,718
1983	1,082,980	201,861	1,732,810	44,786	3,062,437
1984	740,232	167,128	1,318,340	345,946	2,571,646
1985	736,538	51,864	837,360	274,376	1,900,138
1986	390,017	34,427	876,977	377,109	1,678,530
1987	361,435	28,791	668,731	332,957	1,391,914
1988	389,168	34,776	1,068,270	303,969	1,796,183
1989	305,310	35,640	858,188	206,270	1,405,408
1990	316,436	33,923	797,328	54,623	1,202,310
1991	179,251	9,391	782,325	32,927	1,003,895
1992	184,384	2,581	1,213,140	8,990	1,409,095
1993	198,213	6,911	1,316,060	9,204	1,530,387
1994	239,102	3,610	1,211,770	7,171	1,461,653

1995	78,354	3,837	1,240,770	7,941	1,330,902
1996	106,133	3,442	1,834,410	12,411	1,956,396
1997	83,648	2,099	2,081,780	14,251	2,181,778
1998	172,094	2,501	1,935,740	12,349	2,122,684
1999	249,609	2,956	1,917,730	41,423	2,211,717
2000	301,471	3,882	1,805,100	83,655	2,194,108
2001	355,885	4,572	1,680,870	56,687	2,098,014
2002	477,386	8,246	1,617,300	66,539	2,169,470
2003	463,471	6,337	1,453,670	77,186	2,000,664
2004	430,213	8,779	1,462,450	207,211	2,108,653
2005	362,591	9,593	1,360,910	128,328	1,861,422
2006	347,170	7,539	1,639,970	116,552	2,111,231
2007	396,246	7,118	954,342	85,972	1,443,677
2008	367,855	15,065	718,129	25,507	1,126,556
2009	416,799	6,635	679,623	23,481	1,126,538
2010	633,875	34,319	853,175	17,327	1,538,696
2011	732,100	37,668	852,367	8,343	1,630,478
2012	839,337	23,562	961,874	6,125	1,830,899
2013	1,038,950	50,024	1,359,380	23,081	2,471,436
2014	972,723	54,343	1,473,420	25,066	2,525,552
2015	1,318,640	113,448	1,803,960	22,690	3,258,738
2016	1,139,200	79,839	1,806,810	24,050	3,049,898

Table 2.6. Age composition of landings for each commercial fleet (reweighted by the length frequency to account for non-representative sampling). Effective sample sizes (EFF N) were capped at 200 (but rescaled during the assessment process using iterative reweighting techniques). Data bars indicate the relative magnitude of the annual age frequency.

a) Commercial Vertical Line East

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
1991	178	0.00	0.01	0.53	0.38	0.03	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	136	0.00	0.00	0.02	0.74	0.16	0.06	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	152	0.00	0.00	0.33	0.42	0.21	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	151	0.00	0.00	0.36	0.37	0.17	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1995	92	0.00	0.00	0.15	0.50	0.27	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1996	9	0.00	0.00	0.39	0.38	0.15	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1997	32	0.00	0.00	0.00	0.53	0.39	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1998	197	0.00	0.00	0.10	0.66	0.16	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1999	200	0.00	0.00	0.11	0.26	0.35	0.11	0.07	0.04	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000	200	0.00	0.00	0.04	0.39	0.31	0.18	0.06	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2001	200	0.00	0.00	0.10	0.24	0.34	0.17	0.09	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2002	200	0.00	0.00	0.08	0.53	0.17	0.14	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	200	0.00	0.01	0.11	0.38	0.33	0.09	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	200	0.00	0.01	0.21	0.32	0.31	0.12	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	200	0.00	0.00	0.11	0.45	0.19	0.16	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	200	0.00	0.01	0.19	0.38	0.24	0.08	0.05	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007	200	0.00	0.01	0.22	0.51	0.21	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	200	0.00	0.00	0.20	0.36	0.36	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	200	0.00	0.01	0.14	0.38	0.32	0.12	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	200	0.00	0.00	0.09	0.31	0.33	0.18	0.06	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	200	0.00	0.00	0.08	0.13	0.42	0.25	0.07	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	200	0.00	0.01	0.07	0.25	0.14	0.27	0.18	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	200	0.00	0.00	0.16	0.15	0.24	0.12	0.18	0.10	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	200	0.00	0.00	0.10	0.28	0.16	0.13	0.10	0.13	0.07	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	200	0.00	0.03	0.12	0.30	0.21	0.09	0.06	0.05	0.07	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	200	0.00	0.01	0.29	0.23	0.19	0.10	0.04	0.04	0.02	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 2.6 (Commercial landings age composition continued)

b) Commercial Vertical Line West

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
1991	25	0.00	0.00	0.66	0.17	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
1992	200	0.00	0.00	0.01	0.66	0.19	0.10	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	200	0.00	0.00	0.02	0.40	0.44	0.12	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	200	0.00	0.00	0.05	0.44	0.30	0.16	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1995	97	0.00	0.00	0.00	0.30	0.34	0.18	0.14	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1998	200	0.00	0.01	0.07	0.46	0.26	0.13	0.03	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1999	200	0.00	0.00	0.03	0.19	0.39	0.22	0.09	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000	200	0.00	0.00	0.05	0.43	0.27	0.14	0.07	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2001	200	0.00	0.00	0.10	0.23	0.31	0.18	0.11	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2002	200	0.00	0.02	0.10	0.41	0.21	0.15	0.06	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	200	0.00	0.00	0.05	0.28	0.36	0.14	0.07	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	200	0.00	0.00	0.04	0.27	0.35	0.19	0.06	0.04	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	200	0.00	0.00	0.10	0.26	0.26	0.18	0.09	0.04	0.02	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	200	0.00	0.00	0.06	0.43	0.26	0.10	0.08	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007	200	0.00	0.00	0.07	0.37	0.32	0.10	0.05	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	200	0.00	0.00	0.03	0.30	0.38	0.15	0.06	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	200	0.00	0.00	0.03	0.33	0.35	0.20	0.07	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	200	0.00	0.00	0.01	0.23	0.34	0.26	0.12	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	200	0.00	0.00	0.06	0.10	0.28	0.30	0.16	0.06	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	200	0.00	0.00	0.03	0.31	0.14	0.22	0.16	0.07	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	200	0.00	0.00	0.03	0.17	0.45	0.12	0.10	0.07	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	200	0.00	0.00	0.03	0.16	0.27	0.35	0.07	0.06	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	200	0.00	0.00	0.03	0.22	0.30	0.22	0.14	0.04	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	200	0.00	0.00	0.03	0.15	0.35	0.24	0.11	0.07	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 2.6 (Commercial landings age composition continued)

c) Commercial Longline East

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
1991	12	0.00	0.00	0.01	0.64	0.13	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00
1992	15	0.00	0.00	0.00	0.13	0.20	0.29	0.16	0.14	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
1993	31	0.00	0.00	0.04	0.20	0.32	0.25	0.07	0.06	0.00	0.00	0.02	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.03
1994	8	0.00	0.00	0.00	0.12	0.66	0.11	0.07	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1995	19	0.00	0.00	0.00	0.38	0.46	0.14	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1996	6	0.00	0.00	0.00	0.00	0.40	0.30	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1997	10	0.00	0.00	0.20	0.12	0.40	0.19	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1998	25	0.00	0.00	0.00	0.05	0.12	0.24	0.34	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1999	102	0.00	0.00	0.00	0.04	0.49	0.18	0.21	0.04	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
2000	84	0.00	0.00	0.00	0.03	0.16	0.45	0.15	0.08	0.04	0.06	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2001	91	0.00	0.00	0.02	0.05	0.33	0.30	0.26	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2002	183	0.00	0.04	0.08	0.20	0.18	0.14	0.18	0.08	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
2003	197	0.00	0.00	0.01	0.13	0.23	0.20	0.14	0.09	0.10	0.05	0.01	0.00	0.01	0.02	0.01	0.00	0.00	0.01	0.00	0.00	0.01
2004	200	0.00	0.00	0.01	0.11	0.19	0.12	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.33
2005	200	0.00	0.00	0.04	0.21	0.33	0.30	0.10	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	200	0.00	0.00	0.02	0.10	0.37	0.21	0.22	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007	200	0.00	0.04	0.11	0.15	0.29	0.22	0.11	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	200	0.00	0.00	0.01	0.11	0.31	0.33	0.10	0.04	0.02	0.02	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.01
2009	200	0.00	0.00	0.00	0.09	0.42	0.23	0.20	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2010	200	0.00	0.00	0.00	0.06	0.32	0.42	0.12	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	200	0.00	0.00	0.00	0.03	0.22	0.38	0.24	0.09	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	200	0.00	0.01	0.09	0.17	0.12	0.24	0.23	0.09	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	200	0.00	0.00	0.00	0.06	0.08	0.25	0.22	0.21	0.14	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	200	0.00	0.00	0.01	0.08	0.17	0.14	0.19	0.13	0.14	0.10	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	200	0.00	0.01	0.04	0.14	0.21	0.15	0.12	0.13	0.08	0.07	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	200	0.00	0.00	0.05	0.06	0.08	0.21	0.17	0.13	0.13	0.09	0.06	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 2.6 (Commercial landings age composition continued)

d) Commercial Longline West

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
1993	29	0.00	0.00	0.47	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1998	200	0.00	0.00	0.00	0.05	0.11	0.28	0.10	0.08	0.08	0.05	0.05	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.00	0.02
1999	76	0.00	0.00	0.00	0.20	0.44	0.14	0.05	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000	200	0.00	0.00	0.00	0.01	0.03	0.13	0.16	0.19	0.12	0.08	0.04	0.04	0.03	0.03	0.01	0.01	0.01	0.00	0.00	0.00	0.10
2001	179	0.00	0.00	0.00	0.00	0.02	0.05	0.19	0.13	0.11	0.12	0.06	0.06	0.04	0.06	0.02	0.01	0.04	0.01	0.01	0.02	0.05
2002	200	0.00	0.00	0.02	0.17	0.09	0.19	0.08	0.09	0.07	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.00	0.04
2003	200	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.07	0.14	0.08	0.09	0.07	0.09	0.04	0.05	0.05	0.07	0.03	0.02	0.01	0.13
2004	200	0.00	0.00	0.00	0.03	0.17	0.08	0.08	0.08	0.07	0.07	0.07	0.04	0.06	0.04	0.04	0.03	0.02	0.01	0.01	0.01	0.06
2005	200	0.00	0.00	0.00	0.05	0.06	0.14	0.12	0.10	0.10	0.11	0.06	0.05	0.05	0.05	0.04	0.02	0.02	0.00	0.00	0.00	0.03
2006	200	0.00	0.00	0.00	0.01	0.06	0.09	0.13	0.16	0.10	0.07	0.09	0.06	0.05	0.04	0.04	0.02	0.02	0.01	0.00	0.01	0.04
2007	200	0.00	0.00	0.00	0.01	0.05	0.09	0.19	0.18	0.10	0.09	0.06	0.07	0.02	0.03	0.01	0.03	0.03	0.01	0.01	0.00	0.02
2008	200	0.00	0.00	0.00	0.03	0.09	0.10	0.16	0.16	0.14	0.08	0.08	0.03	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.04
2009	200	0.00	0.00	0.00	0.01	0.05	0.11	0.11	0.08	0.07	0.18	0.11	0.07	0.03	0.03	0.05	0.02	0.01	0.01	0.00	0.01	0.05
2010	84	0.00	0.00	0.00	0.09	0.25	0.28	0.19	0.06	0.01	0.05	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01
2011	14	0.00	0.00	0.00	0.00	0.21	0.29	0.21	0.14	0.07	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	149	0.00	0.00	0.00	0.08	0.04	0.08	0.19	0.18	0.09	0.06	0.09	0.05	0.01	0.02	0.03	0.01	0.01	0.03	0.01	0.01	0.03
2013	116	0.00	0.00	0.01	0.07	0.10	0.02	0.03	0.09	0.14	0.18	0.05	0.05	0.02	0.03	0.05	0.05	0.02	0.02	0.00	0.04	0.03
2014	76	0.00	0.00	0.00	0.00	0.00	0.02	0.06	0.11	0.18	0.19	0.18	0.01	0.03	0.04	0.04	0.04	0.00	0.02	0.02	0.04	0.02
2015	140	0.00	0.00	0.00	0.05	0.06	0.06	0.07	0.11	0.13	0.13	0.12	0.09	0.04	0.03	0.03	0.01	0.02	0.00	0.01	0.01	0.03
2016	109	0.00	0.00	0.01	0.08	0.13	0.12	0.07	0.13	0.04	0.07	0.15	0.11	0.05	0.03	0.01	0.00	0.00	0.01	0.00	0.00	0.00

Table 2.7. Commercial vertical line discards (number of fish) by region (East/West) and red snapper season (Open = "vessels with allocation", Closed = "vessels without allocation").

	Open Season		Closed Season	
Year	**East**	**West**	**East**	**West**
1990	160,529	514,832	-	-
1991	283,019	789,015	110,132	94,552
1992	70,130	268,014	306,349	163,905
1993	51,412	316,531	222,746	77,583
1994	51,153	314,558	341,137	51,525
1995	38,470	313,774	338,125	50,618
1996	75,826	780,752	468,420	53,995
1997	70,864	665,234	357,005	80,294
1998	95,073	780,944	369,511	80,691
1999	104,236	735,395	451,302	65,489
2000	142,410	650,846	245,565	81,421
2001	131,998	749,238	234,182	64,550
2002	178,383	729,981	144,089	163,848
2003	168,982	678,232	461,119	42,437
2004	77,097	615,041	195,082	44,474
2005	135,848	848,414	126,734	31,865
2006	106,061	434,172	94,408	17,504
2007	30,748	55,059	63,335	28,165
2008	20,622	56,098	173,359	-
2009	172,213	27,247	218,551	0
2010	256,976	18,175	46,044	2,881
2011	87,536	77,199	1,417,387	-
2012	95,494	81,501	22,173	260,195
2013	51,370	38,489	8,413	127
2014	43,404	38,983	58,351	600,587
2015	48,406	221,470	54,418	-
2016	70,560	28,103	11,522	5,772

Table 2.8. Commercial longline discards (number of fish) by region (East/West) and red snapper season (Open = “vessels with allocation”, Closed = “vessels without allocation”).

	Open Season		Closed Season	
Year	**East**	**West**	**East**	**West**
1990	9,785	830	-	-
1991	11,759	2,521	8,996	133
1992	2,891	400	16,170	235
1993	1,955	851	44,553	452
1994	2,330	1,248	54,211	611
1995	1,522	1,635	35,527	1,139
1996	2,206	1,398	34,621	832
1997	2,177	818	48,846	515
1998	1,701	834	49,086	625
1999	2,283	2,979	48,548	1,170
2000	2,019	2,137	29,246	869
2001	1,833	1,261	27,449	596
2002	2,214	1,889	9,026	795
2003	2,054	4,289	5,638	966
2004	2,658	6,574	28,535	839
2005	2,239	5,853	17,841	701
2006	2,911	5,174	6,427	492
2007	4,705	-	7,199	-
2008	-	411	30,235	-
2009	139	26	44,867	361
2010	9,260	122	3,066	78
2011	19,396	1,088	5,895	718
2012	37,904	53	4,433	-
2013	31,233	661	1,294	29
2014	4,357	4,534	2,207	-
2015	16,644	119	13,696	1,723
2016	35,737	653	4,042	2,886

Table 2.9. Age composition of OPEN SEASON commercial fleet discards by fleet and region. Effective sample sizes (EFF N) were capped at 200 (but rescaled during the assessment process using iterative reweighting techniques). Data bars indicate the relative magnitude of the annual age frequency.

a) Commercial Vertical Line, Eastern Gulf, Open Season

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
2007	200	0.00	0.12	0.47	0.31	0.08	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	146	0.00	0.17	0.42	0.21	0.09	0.05	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	152	0.00	0.03	0.18	0.29	0.21	0.13	0.08	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	200	0.00	0.02	0.09	0.26	0.27	0.17	0.10	0.05	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	200	0.00	0.04	0.15	0.21	0.22	0.16	0.10	0.06	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	200	0.00	0.04	0.12	0.20	0.22	0.16	0.11	0.07	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	200	0.00	0.14	0.27	0.24	0.16	0.09	0.05	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	200	0.00	0.18	0.35	0.20	0.10	0.06	0.04	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	200	0.00	0.21	0.36	0.17	0.08	0.05	0.04	0.03	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	200	0.00	0.19	0.47	0.24	0.07	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

b) Commercial Vertical Line, Western Gulf, Open Season

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
2007	200	0.00	0.01	0.32	0.41	0.18	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	200	0.00	0.02	0.41	0.40	0.13	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	70	0.00	0.03	0.61	0.31	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	200	0.00	0.03	0.49	0.36	0.08	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	200	0.00	0.01	0.25	0.29	0.18	0.11	0.06	0.04	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	200	0.00	0.01	0.31	0.27	0.15	0.10	0.06	0.04	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	200	0.00	0.01	0.32	0.32	0.14	0.09	0.06	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	200	0.00	0.01	0.45	0.31	0.10	0.05	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	200	0.00	0.01	0.21	0.26	0.19	0.12	0.08	0.05	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	200	0.00	0.01	0.47	0.27	0.07	0.04	0.04	0.03	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 2.9. (Age composition of OPEN SEASON commercial fleet discards continued)

c) Commercial Longline, Eastern Gulf, Open Season

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
2009	9	0.00	0.09	0.02	0.07	0.28	0.27	0.14	0.07	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	200	0.00	0.00	0.02	0.14	0.25	0.24	0.16	0.09	0.05	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	200	0.00	0.00	0.01	0.11	0.24	0.24	0.17	0.11	0.06	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	200	0.00	0.00	0.01	0.05	0.17	0.23	0.21	0.15	0.09	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	200	0.00	0.00	0.01	0.07	0.16	0.21	0.20	0.15	0.10	0.06	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	200	0.00	0.00	0.01	0.07	0.15	0.19	0.19	0.16	0.11	0.07	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	200	0.00	0.00	0.02	0.09	0.18	0.18	0.15	0.13	0.10	0.07	0.04	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2016	200	0.00	0.00	0.06	0.14	0.18	0.18	0.15	0.11	0.08	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

d) Commercial Longline, Western Gulf, Open Season

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
2008	7	0.00	0.00	0.10	0.43	0.32	0.12	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	6	0.00	0.00	0.14	0.17	0.15	0.14	0.13	0.09	0.05	0.03	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01
2012	1	0.00	0.00	0.00	0.00	0.04	0.17	0.27	0.21	0.12	0.07	0.04	0.03	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
2013	37	0.00	0.00	0.00	0.03	0.10	0.14	0.15	0.13	0.10	0.07	0.06	0.04	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.04
2014	10	0.00	0.00	0.00	0.02	0.10	0.15	0.14	0.12	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.08
2015	1	0.00	0.01	0.73	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	57	0.00	0.00	0.00	0.00	0.02	0.05	0.11	0.14	0.13	0.10	0.08	0.06	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.01	0.08

Table 2.10. Age composition of CLOSED SEASON commercial fleet discards, by region. Effective sample sizes (EFF N) were capped at 200 (but rescaled during the assessment process using iterative reweighting techniques). Data bars indicate the relative magnitude of the annual age frequency.

a) Commercial Vertical Line + Longline, Eastern Gulf, Closed Season

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
2007	200	0.00	0.04	0.24	0.36	0.20	0.09	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	200	0.00	0.00	0.09	0.27	0.27	0.18	0.09	0.05	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	200	0.00	0.01	0.10	0.27	0.25	0.17	0.10	0.05	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	197	0.00	0.03	0.32	0.34	0.13	0.07	0.04	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	200	0.00	0.00	0.04	0.15	0.26	0.23	0.15	0.08	0.05	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	200	0.00	0.03	0.14	0.26	0.22	0.15	0.09	0.05	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	33	0.00	0.05	0.27	0.31	0.16	0.10	0.06	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	200	0.00	0.00	0.07	0.18	0.22	0.18	0.13	0.09	0.06	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	200	0.00	0.01	0.12	0.27	0.21	0.13	0.09	0.07	0.05	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	200	0.00	0.09	0.27	0.25	0.14	0.08	0.05	0.04	0.04	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

b) Commercial Vertical Line + Longline, Western Gulf, Closed Season

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
2007	200	0.00	0.00	0.17	0.37	0.26	0.12	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	53	0.00	0.00	0.05	0.25	0.31	0.20	0.10	0.04	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2012	200	0.00	0.00	0.10	0.24	0.27	0.20	0.10	0.04	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	22	0.00	0.00	0.05	0.24	0.30	0.22	0.11	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	169	0.00	0.00	0.07	0.30	0.34	0.19	0.07	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	8	0.00	0.00	0.04	0.21	0.35	0.25	0.10	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 2.11. Fishery-dependent indices with associated log-scale standard errors. All indices were scaled to the series mean, while the standard errors were scaled to a common mean of 0.2 (to provide equal weighting of all indices in the assessment model).

a) Eastern Gulf

	Commercial Vertical Line		Recreational Charter-Private (MRIP)		Recreational Headboat	
Year	Index	SE	Index	SE	Index	SE
1981	-	-	0.451	0.354	-	-
1982	-	-	0.285	0.367	-	-
1983	-	-	1.015	0.357	-	-
1984	-	-	0.623	0.385	-	-
1985	-	-	0.722	0.363	-	-
1986	-	-	0.281	0.351	0.128	0.207
1987	-	-	0.461	0.185	0.123	0.184
1988	-	-	0.142	0.226	0.172	0.137
1989	-	-	0.087	0.237	0.202	0.141
1990	0.266	0.244	0.090	0.261	0.204	0.125
1991	0.420	0.203	0.222	0.216	0.257	0.124
1992	1.269	0.188	0.483	0.168	0.392	0.118
1993	0.699	0.181	0.405	0.191	0.538	0.111
1994	0.626	0.181	0.246	0.205	0.396	0.118
1995	0.746	0.185	0.261	0.225	0.318	0.119
1996	0.449	0.202	0.311	0.218	0.519	0.123
1997	0.368	0.208	0.879	0.179	0.909	0.130
1998	1.288	0.200	1.489	0.127	1.438	0.173
1999	0.780	0.203	1.182	0.108	1.501	0.160
2000	1.472	0.202	1.093	0.122	1.323	0.143
2001	1.342	0.203	0.913	0.130	1.284	0.152
2002	1.650	0.198	1.407	0.127	1.907	0.166
2003	1.464	0.196	1.179	0.124	1.710	0.159
2004	1.657	0.205	1.010	0.111	1.358	0.166
2005	1.367	0.199	0.782	0.122	1.390	0.197
2006	1.139	0.202	0.926	0.131	0.808	0.188
2007	-	-	2.555	0.137	1.677	0.287
2008	-	-	2.642	0.108	2.110	0.280
2009	-	-	1.655	0.150	2.877	0.385
2010	-	-	2.737	0.153	1.264	0.445
2011	-	-	1.745	0.148	-	-
2012	-	-	2.780	0.146	0.564	0.452
2013	-	-	1.941	0.166	1.630	0.411
2014	-	-	-	-	-	-
2015	-	-	-	-	-	-
2016	-	-	-	-	-	-

b) Western Gulf

	Commercial Vertical Line		Recreational Charter-Private (MRIP)		Recreational Headboat	
Year	Index	SE	Index	SE	Index	SE
1981	-	-	0.219	0.508	-	-
1982	-	-	0.549	0.310	-	-
1983	-	-	1.121	0.194	-	-
1984	-	-	0.480	0.217	-	-
1985	-	-	0.226	0.224	-	-
1986	-	-	0.455	0.213	0.530	0.147
1987	-	-	0.530	0.231	0.638	0.131
1988	-	-	0.568	0.222	0.761	0.128
1989	-	-	0.528	0.238	0.674	0.126
1990	0.661	0.277	0.325	0.214	0.473	0.124
1991	1.080	0.249	0.817	0.218	0.787	0.137
1992	1.767	0.258	0.858	0.182	1.398	0.140
1993	1.157	0.187	0.948	0.189	1.405	0.134
1994	1.155	0.187	1.035	0.183	1.094	0.125
1995	1.340	0.187	1.209	0.167	1.134	0.136
1996	1.339	0.187	0.937	0.169	1.200	0.156
1997	1.176	0.187	0.810	0.170	1.267	0.138
1998	0.934	0.187	0.868	0.170	1.094	0.140
1999	0.866	0.187	0.529	0.172	0.480	0.179
2000	0.988	0.187	0.653	0.173	0.457	0.145
2001	0.851	0.187	0.635	0.180	0.663	0.187
2002	0.816	0.187	0.788	0.172	0.583	0.171
2003	0.790	0.187	0.643	0.171	0.500	0.158
2004	0.657	0.187	0.595	0.168	0.384	0.158
2005	0.589	0.187	0.878	0.170	0.421	0.156
2006	0.834	0.187	0.698	0.154	0.495	0.175
2007	-	-	1.871	0.165	0.946	0.198
2008	-	-	1.857	0.164	0.979	0.334
2009	-	-	2.482	0.166	1.048	0.201
2010	-	-	3.304	0.204	1.101	0.313
2011	-	-	2.618	0.175	1.122	0.339
2012	-	-	1.334	0.180	1.255	0.362
2013	-	-	1.634	0.167	1.830	0.330
2014	-	-	-	-	1.397	0.483
2015	-	-	-	-	2.759	0.223
2016	-	-	-	-	2.124	0.322

Table 2.12. Recreational landings (numbers of fish) by fishing mode and region.

	Eastern GOM		Western GOM		
Year	**Private + Charter**	**Headboat**	**Private + Charter**	**Headboat**	**Total**
1950	146,342	148,165	195,484	416,230	906,221
1951	187,338	148,165	268,523	416,230	1,020,256
1952	228,334	148,165	341,562	416,230	1,134,291
1953	269,330	148,165	414,600	416,230	1,248,326
1954	310,326	148,165	487,639	416,230	1,362,361
1955	351,322	148,165	560,678	416,230	1,476,396
1956	392,317	148,165	633,717	416,230	1,590,429
1957	421,348	148,165	688,317	416,230	1,674,060
1958	450,378	148,165	742,916	416,230	1,757,689
1959	479,409	148,165	797,516	416,230	1,841,320
1960	508,440	148,165	852,115	416,230	1,924,950
1961	513,614	148,165	868,619	416,230	1,946,629
1962	518,788	148,165	885,124	416,230	1,968,307
1963	523,962	148,165	901,628	416,230	1,989,985
1964	529,136	148,165	918,132	416,230	2,011,664
1965	534,310	148,165	934,637	416,230	2,033,342
1966	546,838	148,165	974,104	416,230	2,085,337
1967	559,365	148,165	1,013,570	416,230	2,137,331
1968	571,893	148,165	1,053,037	416,230	2,189,325
1969	584,420	148,165	1,092,504	416,230	2,241,319
1970	596,948	148,165	1,131,971	416,230	2,293,314
1971	627,495	148,165	1,245,372	416,230	2,437,262
1972	658,043	148,165	1,358,773	416,230	2,581,212
1973	688,590	148,165	1,472,175	416,230	2,725,160
1974	719,138	148,165	1,585,576	416,230	2,869,109
1975	749,686	148,165	1,698,977	416,230	3,013,059
1976	768,637	148,165	1,680,521	416,230	3,013,553
1977	787,589	148,165	1,662,064	416,230	3,014,048
1978	806,540	148,165	1,643,607	416,230	3,014,543
1979	825,492	148,165	1,625,151	416,230	3,015,038
1980	844,444	148,165	1,606,694	416,230	3,015,534
1981	972,097	47,780	1,740,325	344,252	3,104,455
1982	869,406	153,823	1,289,480	388,247	2,700,956
1983	952,299	301,790	2,258,348	370,500	3,882,937
1984	177,342	40,842	784,056	373,218	1,375,458
1985	486,696	90,234	696,148	368,605	1,641,683
1986	681,505	16,364	455,628	316,090	1,469,587
1987	655,604	9,685	190,440	319,348	1,175,077
1988	621,312	13,832	354,726	423,024	1,412,894

1989	563,097	10,797	261,098	372,473	1,207,465
1990	371,307	15,539	151,553	187,006	725,405
1991	648,857	15,580	301,956	264,686	1,231,079
1992	1,010,227	33,873	380,290	413,056	1,837,446
1993	1,504,395	37,275	496,208	458,772	2,496,650
1994	940,898	28,998	360,443	497,738	1,828,077
1995	752,396	23,078	448,643	354,550	1,578,667
1996	695,459	28,388	275,679	349,266	1,348,792
1997	1,172,204	48,439	285,304	347,424	1,853,371
1998	920,307	76,759	205,460	244,738	1,447,264
1999	878,792	67,432	165,732	98,699	1,210,655
2000	850,440	57,640	180,088	111,410	1,199,578
2001	1,014,182	51,289	120,192	116,358	1,302,021
2002	1,349,549	75,121	112,878	138,475	1,676,023
2003	1,177,991	71,021	128,754	157,905	1,535,671
2004	1,427,234	63,482	139,725	110,329	1,740,770
2005	909,126	46,791	153,529	99,988	1,209,434
2006	853,426	47,882	202,928	121,177	1,225,413
2007	1,299,093	63,603	285,309	110,314	1,758,319
2008	689,451	61,986	132,235	57,569	941,241
2009	788,910	81,590	194,777	75,998	1,141,275
2010	353,317	35,943	46,017	51,514	486,791
2011	798,266	69,187	95,937	50,656	1,014,046
2012	704,945	54,178	244,903	54,283	1,058,309
2013	1,158,944	43,985	133,214	43,743	1,379,886
2014	391,079	42,757	107,272	35,511	576,619
2015	584,008	45,462	201,659	63,033	894,162
2016	824,804	38,449	174,341	61,137	1,098,731

Table 2.13. Age frequency of landings by recreational fishing modes (reweighted by the length frequency to account for non-representative sampling). Effective sample sizes (EFF N) were capped at 200 (but rescaled during the assessment process using iterative reweighting techniques). Data bars indicate the relative magnitude of the annual age frequency.

a) Private + Charter (MRIP), Eastern Gulf

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
1991	200	0.00	0.06	0.43	0.49	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	200	0.00	0.09	0.43	0.30	0.15	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	200	0.00	0.00	0.53	0.32	0.11	0.03	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	200	0.00	0.01	0.28	0.45	0.16	0.06	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1995	200	0.00	0.02	0.38	0.25	0.21	0.08	0.04	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1996	101	0.00	0.01	0.21	0.57	0.13	0.03	0.00	0.03	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1997	56	0.00	0.00	0.77	0.13	0.07	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1998	200	0.00	0.00	0.24	0.58	0.13	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1999	200	0.00	0.00	0.05	0.49	0.41	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000	200	0.00	0.00	0.07	0.59	0.28	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2001	200	0.00	0.00	0.30	0.43	0.20	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2002	200	0.00	0.01	0.15	0.50	0.19	0.09	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	200	0.00	0.00	0.15	0.43	0.27	0.06	0.05	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	200	0.00	0.00	0.12	0.40	0.32	0.13	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	200	0.00	0.00	0.18	0.52	0.17	0.08	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	200	0.00	0.00	0.15	0.49	0.22	0.06	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007	200	0.00	0.00	0.09	0.65	0.20	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	200	0.00	0.00	0.13	0.47	0.26	0.10	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	200	0.00	0.00	0.00	0.28	0.43	0.21	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	200	0.00	0.00	0.01	0.14	0.47	0.23	0.10	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	200	0.00	0.00	0.00	0.04	0.20	0.42	0.24	0.08	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	200	0.00	0.00	0.00	0.08	0.11	0.27	0.31	0.16	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	200	0.00	0.00	0.03	0.06	0.14	0.10	0.30	0.22	0.10	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	200	0.00	0.00	0.01	0.19	0.17	0.14	0.08	0.20	0.15	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	200	0.00	0.00	0.01	0.17	0.18	0.15	0.13	0.06	0.16	0.09	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	200	0.00	0.00	0.14	0.20	0.23	0.12	0.06	0.05	0.04	0.08	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 2.13. (Age frequency of landings by recreational fishing modes continued)

b) Private + Charter (MRIP), Western Gulf

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
1991	200	0.00	0.01	0.67	0.29	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	200	0.00	0.00	0.35	0.53	0.08	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	200	0.00	0.01	0.80	0.18	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1998	200	0.00	0.05	0.16	0.52	0.19	0.05	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1999	172	0.00	0.00	0.04	0.59	0.26	0.06	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000	3	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00
2002	200	0.00	0.03	0.23	0.44	0.20	0.07	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	200	0.00	0.00	0.06	0.32	0.30	0.14	0.08	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	200	0.00	0.01	0.28	0.51	0.13	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	200	0.00	0.01	0.15	0.44	0.18	0.11	0.05	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	200	0.00	0.00	0.14	0.55	0.20	0.05	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007	200	0.00	0.00	0.10	0.60	0.22	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	200	0.00	0.00	0.05	0.38	0.43	0.11	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	200	0.00	0.00	0.01	0.24	0.39	0.26	0.08	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	200	0.00	0.00	0.00	0.18	0.37	0.25	0.16	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	200	0.00	0.00	0.04	0.07	0.28	0.29	0.23	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	200	0.00	0.00	0.00	0.19	0.13	0.23	0.26	0.12	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	200	0.00	0.00	0.05	0.11	0.43	0.10	0.13	0.12	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	200	0.00	0.00	0.03	0.26	0.12	0.28	0.05	0.12	0.09	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	200	0.00	0.00	0.01	0.24	0.26	0.11	0.16	0.06	0.07	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	200	0.00	0.00	0.02	0.08	0.32	0.19	0.10	0.09	0.07	0.04	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 2.13. (Age frequency of landings by recreational fishing modes continued)

c) Headboat, Eastern Gulf

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
1991	20	0.00	0.00	0.65	0.33	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	78	0.00	0.00	0.37	0.51	0.07	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	200	0.00	0.00	0.47	0.39	0.11	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	200	0.00	0.04	0.25	0.49	0.13	0.06	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1995	12	0.00	0.33	0.48	0.06	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1996	117	0.00	0.01	0.41	0.50	0.06	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1997	97	0.00	0.00	0.58	0.41	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1998	200	0.00	0.00	0.19	0.70	0.10	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1999	200	0.00	0.00	0.02	0.27	0.41	0.29	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000	141	0.00	0.00	0.16	0.53	0.25	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2001	200	0.00	0.00	0.20	0.13	0.12	0.03	0.01	0.00	0.00	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2002	200	0.00	0.00	0.09	0.76	0.07	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	71	0.00	0.00	0.19	0.48	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	64	0.00	0.00	0.01	0.49	0.29	0.14	0.02	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	101	0.00	0.00	0.06	0.56	0.23	0.06	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	188	0.00	0.00	0.15	0.33	0.35	0.11	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007	196	0.00	0.00	0.06	0.62	0.25	0.02	0.00	0.00	0.01	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	191	0.00	0.00	0.11	0.58	0.23	0.06	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	200	0.00	0.00	0.01	0.48	0.31	0.14	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	200	0.00	0.00	0.01	0.27	0.45	0.18	0.07	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	200	0.00	0.00	0.00	0.13	0.42	0.31	0.10	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	200	0.00	0.00	0.00	0.14	0.22	0.30	0.20	0.08	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	200	0.00	0.00	0.01	0.14	0.23	0.11	0.25	0.16	0.06	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	200	0.00	0.00	0.01	0.22	0.12	0.20	0.08	0.18	0.12	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	200	0.00	0.00	0.01	0.19	0.25	0.09	0.11	0.06	0.12	0.11	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	200	0.00	0.00	0.05	0.17	0.37	0.14	0.09	0.07	0.04	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 2.13. (Age frequency of landings by recreational fishing modes continued)

d) Headboat, Western Gulf

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
1991	102	0.00	0.00	0.44	0.42	0.08	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	26	0.00	0.00	0.13	0.85	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	200	0.00	0.00	0.25	0.41	0.27	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	200	0.00	0.01	0.43	0.38	0.12	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1995	10	0.00	0.00	0.75	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1998	200	0.00	0.00	0.08	0.44	0.28	0.12	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1999	200	0.00	0.00	0.02	0.34	0.39	0.13	0.07	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000	200	0.00	0.00	0.23	0.55	0.13	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2001	74	0.00	0.00	0.37	0.29	0.12	0.10	0.03	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2002	200	0.00	0.04	0.13	0.52	0.16	0.08	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	140	0.00	0.00	0.24	0.32	0.24	0.13	0.04	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	168	0.00	0.00	0.29	0.28	0.20	0.13	0.05	0.02	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
2005	200	0.00	0.00	0.30	0.39	0.12	0.09	0.08	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	200	0.00	0.00	0.14	0.54	0.23	0.02	0.01	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007	69	0.00	0.00	0.02	0.55	0.39	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	133	0.00	0.00	0.00	0.19	0.56	0.18	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	200	0.00	0.00	0.00	0.11	0.40	0.35	0.10	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2010	200	0.00	0.00	0.00	0.10	0.26	0.37	0.19	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	200	0.00	0.00	0.00	0.06	0.21	0.31	0.26	0.12	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	200	0.00	0.00	0.00	0.06	0.08	0.34	0.34	0.11	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	200	0.00	0.00	0.00	0.07	0.42	0.20	0.18	0.08	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	200	0.00	0.00	0.00	0.03	0.20	0.45	0.15	0.08	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	200	0.00	0.00	0.00	0.03	0.26	0.37	0.22	0.07	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	200	0.00	0.00	0.00	0.02	0.33	0.31	0.20	0.08	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 2.14. Recreational private + charter boat (MRIP) discards (in numbers of fish) by region and red snapper season (open, closed).

	Open Season		Closed Season		
Year	East	West	East	West	Total
1981	79,632	16,246	0	0	95,878
1982	19,394	16,990	0	0	36,384
1983	743	3,731	0	0	4,474
1984	38,093	0	0	0	38,093
1985	22,541	131,690	0	0	154,231
1986	51,525	5,788	0	0	57,312
1987	85,119	21,599	0	0	106,719
1988	90,579	272,482	0	0	363,061
1989	241,915	194,562	0	0	436,477
1990	634,919	246,220	0	0	881,139
1991	1,117,630	401,143	0	0	1,518,772
1992	1,235,157	312,692	0	0	1,547,849
1993	1,271,217	386,178	0	0	1,657,394
1994	973,773	493,327	0	0	1,467,100
1995	484,711	764,032	0	0	1,248,743
1996	1,131,039	177,691	0	0	1,308,730
1997	2,290,150	203,996	126,189	2,582	2,622,917
1998	987,367	219,075	213,357	15,343	1,435,142
1999	1,479,606	484,619	234,849	36,338	2,235,411
2000	1,340,448	173,389	645,406	103,126	2,262,369
2001	1,499,459	95,346	1,250,875	38,755	2,884,436
2002	2,121,282	100,156	1,166,890	33,215	3,421,543
2003	2,052,489	364,073	782,875	71,585	3,271,020
2004	2,470,008	1,942,997	448,651	440,407	5,302,063
2005	1,537,799	1,325,834	601,051	332,241	3,796,924
2006	2,042,838	1,428,197	509,713	282,775	4,263,522
2007	3,264,413	972,314	558,053	264,814	5,059,595
2008	628,910	479,819	1,786,662	786,905	3,682,297
2009	1,059,119	537,855	1,166,717	804,160	3,567,851
2010	458,043	6,520	1,285,910	16,318	1,766,790
2011	529,558	218,973	1,650,626	503,204	2,902,361
2012	311,723	416,735	1,252,760	785,614	2,766,831
2013	756,211	97,982	1,843,203	267,969	2,965,366
2014	83,446	22,679	1,702,914	330,930	2,139,969
2015	157,985	9,945	1,385,013	300,084	1,853,027
2016	298,270	54,589	2,876,447	481,300	3,710,606

Table 2.15. Recreational headboat discards (in numbers of fish) by region and red snapper season (open, closed).

	Open Season		Closed Season		
Year	**East**	**West**	**East**	**West**	**Total**
1990	3,273	137,210	0	0	140,483
1991	5,843	110,919	0	0	116,762
1992	12,887	117,002	0	0	129,889
1993	7,558	128,656	0	0	136,214
1994	11,218	297,496	0	0	308,715
1995	8,739	147,612	0	0	156,351
1996	21,348	138,330	0	0	159,677
1997	34,010	71,480	962	986	107,439
1998	35,222	43,403	3,136	429	82,190
1999	53,800	12,066	4,999	501	71,366
2000	33,069	14,514	5,693	1,801	55,078
2001	38,416	27,249	254	617	66,536
2002	39,220	31,204	0	255	70,679
2003	39,415	58,170	48	1,591	99,224
2004	37,891	97,003	63	35	134,993
2005	35,568	91,337	165	674	127,744
2006	51,717	69,909	197	717	122,540
2007	46,849	69,010	131	1,528	117,518
2008	35,994	11,748	61,977	29,786	139,505
2009	52,151	14,909	47,891	16,065	131,016
2010	8,439	7,014	45,891	11,397	72,741
2011	31,250	12,051	57,149	11,041	111,491
2012	24,504	7,889	49,171	8,019	89,583
2013	29,977	3,227	51,611	6,622	91,437
2014	14,974	3,175	46,673	5,392	70,214
2015	13,466	2,618	41,369	7,096	64,549
2016	48,845	3,698	44,321	6,084	102,948

Table 2.16. Derived age frequency of discards for the recreational headboat fishing mode during the open season. Age composition was estimated from length composition by applying region-specific ALKs (**Table 2.4**). Effective sample sizes (EFF N) were capped at 200 (but rescaled during the assessment process using iterative reweighting techniques). Data bars indicate the relative magnitude of the annual age frequency.

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
2005	200	0.00	0.13	0.41	0.34	0.10	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	200	0.00	0.14	0.46	0.32	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007	200	0.00	0.11	0.41	0.35	0.10	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	200	0.00	0.03	0.31	0.40	0.16	0.05	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	200	0.00	0.04	0.31	0.37	0.15	0.06	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	200	0.00	0.01	0.17	0.39	0.23	0.11	0.05	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	200	0.00	0.02	0.23	0.40	0.20	0.08	0.04	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	200	0.00	0.03	0.27	0.39	0.18	0.07	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	200	0.00	0.02	0.26	0.43	0.17	0.06	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	200	0.00	0.05	0.30	0.38	0.16	0.06	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	200	0.00	0.09	0.35	0.35	0.13	0.04	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 2.17. Estimated shrimp bycatch (numbers of fish) by region through 2015 (the 2016 data point was estimated to be very large and the panel decided not to include it in the analysis). Bycatch was modeled using a super-year approach where only the median bycatch value is fit in the assessment.

Year	East	West
MEDIAN (1972 - 2015)	923,800	16,020,000
1972	-	106,200,000
1973	1,217,000	14,460,000
1974	692,500	17,550,000
1975	1,216,000	8,357,000
1976	1,083,000	30,000,000
1977	1,508,000	11,320,000
1978	242,400	6,575,000
1979	1,088,000	21,970,000
1980	446,700	25,550,000
1981	1,310,000	53,210,000
1982	1,618,000	23,920,000
1983	1,144,000	17,560,000
1984	819,200	12,510,000
1985	697,200	10,440,000
1986	217,500	5,441,000
1987	325,000	11,760,000
1988	380,800	9,602,000
1989	655,300	10,500,000
1990	2,182,000	40,970,000
1991	1,838,000	40,890,000
1992	1,290,000	31,660,000
1993	751,000	34,900,000
1994	1,091,000	34,400,000
1995	1,462,000	47,470,000
1996	1,061,000	36,260,000
1997	1,689,000	26,290,000
1998	1,618,000	56,070,000
1999	1,864,000	23,870,000
2000	2,127,000	11,960,000
2001	2,316,000	23,970,000
2002	2,181,000	22,140,000
2003	1,273,000	30,510,000
2004	1,413,000	27,840,000
2005	625,500	12,250,000
2006	1,838,000	11,430,000
2007	1,217,000	6,812,000
2008	160,500	2,710,000
2009	351,400	3,726,000
2010	190,200	2,779,000
2011	605,400	6,389,000
2012	386,500	8,494,000
2013	509,000	5,979,000
2014	127,500	20,170,000
2015	726,400	17,260,000

Table 2.18. Relative shrimp effort for depths greater than 10 fathoms by region.

Year	East	West
1946	-	0.010
1947	-	0.052
1948	-	0.135
1949	-	0.219
1950	0.234	0.264
1951	0.402	0.278
1952	0.475	0.328
1953	0.525	0.320
1954	0.673	0.422
1955	0.795	0.348
1956	1.007	0.454
1957	1.103	0.569
1958	1.167	0.878
1959	1.266	0.938
1960	1.243	0.960
1961	0.901	0.766
1962	0.860	0.745
1963	0.966	0.865
1964	1.146	0.789
1965	1.243	0.904
1966	1.165	0.948
1967	1.105	1.193
1968	1.302	1.036
1969	1.270	1.383
1970	1.252	1.249
1971	1.078	1.304
1972	1.163	1.424
1973	1.282	1.136
1974	1.240	1.121
1975	1.237	1.060
1976	1.147	1.234
1977	1.368	1.057
1978	1.050	1.237
1979	1.081	1.289
1980	0.662	0.781
1981	1.039	1.207
1982	1.035	1.233
1983	1.134	0.996
1984	1.331	1.268
1985	1.284	1.232

1986	1.331	1.695
1987	1.079	1.737
1988	1.017	1.682
1989	1.233	1.515
1990	1.080	1.457
1991	1.111	1.770
1992	1.348	1.826
1993	1.113	1.803
1994	1.151	1.448
1995	1.362	1.257
1996	1.539	1.322
1997	1.623	1.608
1998	2.039	1.459
1999	1.256	1.373
2000	1.080	1.498
2001	1.213	1.606
2002	1.443	1.891
2003	1.202	1.526
2004	1.193	1.402
2005	1.004	1.013
2006	0.651	0.756
2007	0.489	0.610
2008	0.320	0.438
2009	0.492	0.521
2010	0.309	0.510
2011	0.385	0.626
2012	0.379	0.503
2013	0.441	0.554
2014	0.329	0.608
2015	0.273	0.659
2016	0.286	0.696

Table 2.19. Age composition of red snapper inferred from a modal analysis of annual length frequency sampled by the shrimp observer program. Effective sample sizes (EFF N) were capped at 200 (but rescaled during the assessment process using iterative reweighting techniques). Data bars indicate the relative magnitude of the annual age frequency.

a) Eastern Gulf

Year	EffN	Age-0	Age-1	Age-2
1992	50	0.876	0.124	0.0001
1993	50	0.834	0.166	0.0004
1994	50	0.533	0.456	0.0116
1995	50	0.792	0.208	0.0001
1996	50	0.822	0.178	0.0002
1999	88	0.898	0.091	0.011364
2000	200	0.521	0.468	0.011047
2001	200	0.693	0.302	0.004402
2002	200	0.948	0.027	0.025052
2003	200	0.763	0.197	0.040176
2004	200	0.910	0.075	0.014704
2005	200	0.702	0.273	0.025684
2006	200	0.955	0.041	0.003658
2007	200	0.875	0.080	0.044929
2008	200	0.773	0.166	0.0615
2009	200	0.915	0.073	0.011976
2010	200	0.532	0.460	0.007426
2011	200	0.625	0.351	0.023554
2012	200	0.844	0.132	0.023413
2013	200	0.554	0.441	0.005198
2014	200	0.911	0.080	0.008991
2015	200	0.874	0.115	0.010976
2016	200	0.635	0.343	0.022858

Table 2.19. (Age composition of the shrimp bycatch continued).

b) Western Gulf

Year	EffN	Age-0	Age-1	Age-2
1992	50	0.833	0.160	0.008
1993	50	0.761	0.239	0.000
1994	50	0.574	0.426	0.000
1995	50	0.797	0.203	0.000
1996	50	0.855	0.145	0.000
1997	200	0.835	0.165	0.000
1998	200	0.735	0.259	0.006
1999	200	0.910	0.086	0.004
2000	200	0.807	0.185	0.008
2001	200	0.603	0.374	0.023
2002	200	0.738	0.235	0.027
2003	200	0.781	0.196	0.022
2004	200	0.398	0.591	0.011
2005	200	0.332	0.646	0.023
2006	200	0.738	0.250	0.012
2007	200	0.747	0.224	0.029
2008	200	0.634	0.322	0.044
2009	200	0.916	0.065	0.020
2010	200	0.760	0.228	0.012
2011	200	0.713	0.267	0.020
2012	200	0.881	0.103	0.015
2013	200	0.592	0.381	0.027
2014	200	0.883	0.095	0.022
2015	200	0.925	0.064	0.011
2016	200	0.816	0.154	0.030

Table 2.20. Fishery-independent indices and associated log-scale standard error for the eastern and western Gulf of Mexico. All indices were scaled to the series mean, while the standard errors were scaled to a common mean of 0.2 (to provide equal weighting of all indices in the assessment model).

a) Eastern Gulf

	SEAMAP Video		SEAMAP Larval		NMFS Bottom Longline		SEAMAP Summer Trawl		SEAMAP Fall Trawl	
Year	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE
1972	-	-	-	-	-	-	-	-	3.028	0.1316
1973	-	-	-	-	-	-	-	-	0.644	0.1212
1974	-	-	-	-	-	-	-	-	0.663	0.1475
1975	-	-	-	-	-	-	-	-	0.671	0.1471
1976	-	-	-	-	-	-	-	-	0.778	0.1345
1977	-	-	-	-	-	-	-	-	0.869	0.1444
1978	-	-	-	-	-	-	-	-	0.488	0.1206
1979	-	-	-	-	-	-	-	-	0.404	0.1429
1980	-	-	-	-	-	-	-	-	0.699	0.128
1981	-	-	-	-	-	-	-	-	2.069	0.116
1982	-	-	-	-	-	-	0.988	0.24594	2.353	0.0928
1983	-	-	-	-	-	-	0.736	0.25966	0.431	0.133
1984	-	-	-	-	-	-	0.075	0.39997	0.279	0.178
1985	-	-	-	-	-	-	0.519	0.21015	0.189	0.2139
1986	-	-	0.102	0.338	-	-	0.060	0.40019	0.143	0.3828
1987	-	-	0.339	0.268	-	-	0.729	0.15303	0.249	0.2874
1988	-	-	-	-	-	-	0.501	0.21164	0.363	0.2533
1989	-	-	-	-	-	-	1.450	0.17841	3.070	0.1538
1990	-	-	-	-	-	-	1.050	0.13607	1.533	0.136
1991	-	-	0.272	0.265	-	-	1.175	0.16403	2.463	0.1352
1992	-	-	-	-	-	-	2.427	0.18271	0.296	0.2376
1993	0.160	0.300	-	-	-	-	0.400	0.21924	0.955	0.157
1994	0.174	0.438	0.024	0.339	-	-	0.906	0.14943	0.519	0.1761
1995	0.042	0.570	0.099	0.268	-	-	0.356	0.23179	1.057	0.1736
1996	0.263	0.262	-	-	0.059	0.341	0.669	0.19065	0.709	0.1823
1997	0.307	0.321	0.135	0.268	0.037	0.341	0.731	0.16916	1.080	0.1918
1998	-	-	-	-	-	-	0.237	0.34539	0.318	0.2049
1999	-	-	0.411	0.23	0.231	0.189	0.173	0.28408	0.756	0.1871
2000	-	-	1.002	0.205	0.023	0.342	0.709	0.17549	2.158	0.1574
2001	-	-	0.215	0.228	0.101	0.234	0.302	0.2833	0.346	0.2102
2002	0.931	0.166	-	-	0.123	0.271	0.280	0.28419	0.516	0.1908
2003	-	-	0.381	0.204	0.170	0.189	0.640	0.21933	1.106	0.1263
2004	1.563	0.146	-	-	0.176	0.208	0.666	0.21753	0.461	0.2155
2005	1.461	0.112	-	-	0.116	0.341	1.504	0.21502	0.826	0.1537
2006	0.637	0.170	0.929	0.229	0.113	0.271	0.422	0.209	3.073	0.1147
2007	1.068	0.119	0.916	0.171	0.236	0.271	2.516	0.12973	2.314	0.1687
2008	1.226	0.156	-	-	-	-	4.023	0.13688	0.597	0.1911
2009	1.163	0.123	1.425	0.169	0.366	0.162	0.638	0.13677	2.311	0.1209
2010	1.920	0.105	3.664	0.136	0.987	0.108	1.341	0.17428	0.351	0.2143
2011	2.300	0.083	2.787	0.132	0.931	0.069	0.747	0.20374	0.376	0.2811
2012	1.072	0.135	1.271	0.156	2.594	0.107	2.116	0.1503	1.292	0.2493
2013	1.376	0.148	1.097	0.167	1.816	0.12	1.797	0.19357	0.772	0.208
2014	1.213	0.127	2.169	0.171	4.045	0.079	1.173	0.14818	0.538	0.2548
2015	0.892	0.170	-	-	2.350	0.081	1.911	0.14832	0.600	0.2216
2016	1.232	0.147	1.760	0.129	4.525	0.079	1.035	0.18464	0.287	0.4486

Table 2.20. (Fishery-independent indices continued).

b) Western Gulf

	SEAMAP Video		SEAMAP Larval		NMFS Bottom Longline		SEAMAP Summer Trawl		SEAMAP Fall Trawl	
Year	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE
1972	-	-	-	-	-	-	-	-	3.406	0.2246
1973	-	-	-	-	-	-	-	-	1.811	0.2311
1974	-	-	-	-	-	-	-	-	0.577	0.2909
1975	-	-	-	-	-	-	-	-	0.829	0.2722
1976	-	-	-	-	-	-	-	-	0.790	0.2518
1977	-	-	-	-	-	-	-	-	0.836	0.2617
1978	-	-	-	-	-	-	-	-	0.642	0.322
1979	-	-	-	-	-	-	-	-	0.962	0.2641
1980	-	-	-	-	-	-	-	-	3.638	0.2042
1981	-	-	-	-	-	-	-	-	1.318	0.2225
1982	-	-	-	-	-	-	2.412	0.2495	0.876	0.2353
1983	-	-	-	-	-	-	0.655	0.3188	0.746	0.3185
1984	-	-	-	-	-	-	0.652	0.3162	0.292	0.306
1985	-	-	-	-	-	-	0.898	0.3433	0.434	0.2701
1986	-	-	0.321	0.3294	-	-	0.242	0.4732	0.401	0.2494
1987	-	-	0.531	0.3302	-	-	0.591	0.2487	0.147	0.2959
1988	-	-	-	-	-	-	0.281	0.2781	0.334	0.2296
1989	-	-	0.627	0.3236	-	-	0.240	0.3376	0.703	0.2173
1990	-	-	0.532	0.2699	-	-	2.085	0.1852	0.782	0.1948
1991	-	-	0.149	0.3684	-	-	0.817	0.2157	0.874	0.1875
1992	-	-	0.276	0.257	-	-	0.506	0.2255	0.254	0.2299
1993	0.136	0.5628	0.294	0.2564	-	-	0.578	0.2211	0.470	0.2176
1994	0.325	0.3369	0.204	0.3298	-	-	1.165	0.2049	1.358	0.1929
1995	0.368	0.3175	0.842	0.1859	-	-	0.972	0.1965	1.621	0.1739
1996	0.426	0.1957	0.571	0.2254	0.025	0.5499	1.039	0.1972	0.685	0.2035
1997	1.218	0.1256	0.937	0.1781	0.316	0.2342	0.808	0.1993	1.146	0.1971
1998	-	-	-	-	-	-	0.709	0.2198	0.540	0.2193
1999	-	-	0.453	0.2391	0.076	0.4304	0.545	0.2218	1.165	0.1845
2000	-	-	1.326	0.1748	0.577	0.1379	1.165	0.1812	0.728	0.1878
2001	-	-	0.941	0.2543	0.476	0.1462	0.639	0.2957	0.565	0.2091
2002	0.859	0.1709	0.722	0.1923	0.434	0.1231	0.894	0.1961	0.533	0.2095
2003	-	-	1.323	0.1654	0.483	0.1603	0.457	0.2427	0.956	0.1914
2004	0.703	0.256	0.807	0.1958	0.555	0.1595	1.120	0.1885	1.530	0.1729
2005	0.882	0.1488	-	-	-	-	1.262	0.1951	1.155	0.1583
2006	0.349	0.2239	1.247	0.1948	0.451	0.1965	1.169	0.1723	0.904	0.1949
2007	0.974	0.1394	1.209	0.1644	0.450	0.1964	0.901	0.2102	0.657	0.2237
2008	0.516	0.1894	-	-	0.454	0.2723	0.894	0.1804	0.417	0.1666
2009	0.815	0.1453	1.446	0.1601	0.892	0.1457	0.520	0.1817	1.824	0.1446
2010	1.563	0.1611	0.587	0.2392	0.349	0.2505	1.362	0.1802	0.667	0.2154
2011	1.346	0.1378	1.975	0.1918	1.295	0.0864	1.802	0.1791	0.807	0.202
2012	1.439	0.1087	2.243	0.1605	2.282	0.152	1.409	0.1697	1.804	0.1955
2013	2.244	0.1007	1.167	0.1646	2.038	0.1369	1.951	0.2005	0.813	0.2919
2014	1.764	0.1272	1.727	0.1766	1.367	0.1753	1.204	0.1966	1.033	0.205
2015	1.150	0.2375	-	-	3.648	0.1192	1.556	0.1868	1.811	0.195
2016	1.924	0.1149	3.543	0.1506	2.834	0.1273	1.501	0.1828	1.161	0.2477

Table 2.21. Derived age frequency of the SEAMAP reef fish video survey by region. Age composition was estimated from length composition by applying a region-specific ALK (**Table 2.4**). Effective sample sizes (EFF N) were capped at 200 (but rescaled during the assessment process using iterative reweighting techniques). Data bars indicate the relative magnitude of the annual age frequency.

a) East

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
2008	36	0	0.18	0.33	0.21	0.14	0.06	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	92	0	0.02	0.17	0.30	0.23	0.14	0.08	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	119	0	0.01	0.19	0.25	0.19	0.12	0.08	0.06	0.04	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	231	0	0.01	0.10	0.22	0.24	0.17	0.11	0.06	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	171	0	0.00	0.04	0.15	0.19	0.19	0.15	0.11	0.08	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	146	0	0.00	0.07	0.18	0.21	0.18	0.15	0.10	0.06	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	189	0	0.04	0.12	0.16	0.16	0.16	0.14	0.10	0.06	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	211	0	0.04	0.02	0.18	0.27	0.16	0.12	0.09	0.06	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	414	0	0.14	0.21	0.10	0.14	0.14	0.09	0.06	0.04	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01

b) West

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
2008	24	0	0.00	0.17	0.31	0.22	0.13	0.08	0.04	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	22	0	0.01	0.26	0.28	0.14	0.09	0.07	0.04	0.03	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2010	71	0	0.00	0.19	0.33	0.23	0.12	0.06	0.03	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	57	0	0.02	0.12	0.30	0.26	0.14	0.07	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	62	0	0.00	0.11	0.16	0.22	0.21	0.14	0.07	0.04	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	96	0	0.00	0.09	0.26	0.27	0.18	0.10	0.05	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	117	0	0.02	0.25	0.28	0.19	0.13	0.07	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	38	0	0.01	0.23	0.36	0.22	0.10	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	128	0	0.00	0.11	0.25	0.24	0.16	0.09	0.05	0.03	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01

Table 2.22. Derived age composition for the SEAMAP Summer trawl survey by region inferred from a modal analysis of annual length frequency. Effective sample sizes (EFF N) were capped at 200 (but rescaled during the assessment process using iterative reweighting techniques). Data bars indicate the relative magnitude of the annual age frequency.

a) East

Year	EFF N	Age-0	Age-1	Age-2
1987	24	0.00	1.00	0.00
1988	47	0.00	0.51	0.49
1989	121	0.25	0.54	0.22
1990	106	0.03	0.97	0.00
1991	98	0.01	0.81	0.18
1992	124	0.00	0.94	0.06
1993	23	0.04	0.80	0.15
1994	73	0.00	0.52	0.48
1995	41	0.02	0.61	0.37
1996	85	0.00	0.91	0.09
1997	32	0.03	0.94	0.03
1998	10	0.00	0.80	0.20
1999	14	0.07	0.36	0.57
2000	84	0.01	0.95	0.04
2001	11	0.00	0.55	0.45
2002	29	0.03	0.52	0.45
2003	42	0.02	0.88	0.10
2004	37	0.05	0.86	0.08
2005	64	0.02	0.87	0.12
2006	20	0.05	0.70	0.25
2007	167	0.03	0.91	0.06
2008	200	0.01	0.70	0.30
2009	104	0.02	0.57	0.41
2010	144	0.36	0.41	0.23
2011	84	0.00	0.71	0.29
2012	115	0.02	0.71	0.27
2013	122	0.04	0.81	0.15
2014	62	0.05	0.77	0.18
2015	200	0.00	0.81	0.19
2016	200	0.01	0.54	0.45

Table 2.22. (Age composition for the SEAMAP Summer trawl survey continued).

b) West

Year	EFF N	Age-0	Age-1	Age-2
1987	200	0.00	0.85	0.15
1988	158	0.01	0.93	0.06
1989	121	0.04	0.87	0.10
1990	200	0.00	0.96	0.04
1991	200	0.08	0.78	0.14
1992	200	0.02	0.87	0.11
1993	200	0.01	0.96	0.03
1994	200	0.01	0.88	0.11
1995	200	0.09	0.81	0.10
1996	200	0.01	0.91	0.08
1997	200	0.04	0.85	0.12
1998	200	0.01	0.89	0.11
1999	200	0.18	0.69	0.13
2000	200	0.31	0.63	0.06
2001	150	0.27	0.68	0.05
2002	200	0.08	0.79	0.12
2003	200	0.01	0.92	0.07
2004	200	0.00	0.99	0.01
2005	200	0.04	0.86	0.10
2006	200	0.15	0.76	0.09
2007	200	0.03	0.90	0.08
2008	200	0.08	0.73	0.19
2009	200	0.11	0.83	0.06
2010	200	0.00	0.90	0.10
2011	200	0.01	0.91	0.08
2012	200	0.02	0.76	0.22
2013	9	1.00	0.00	0.00
2015	31	0.16	0.75	0.08

Table 2.23. Derived age composition for the SEAMAP Fall trawl survey by region inferred from a modal analysis of annual length frequency. Effective sample sizes (EFF N) were capped at 200

(but rescaled during the assessment process using iterative reweighting techniques). Data bars indicate the relative magnitude of the annual age frequency. The 2016 data point in the west was not used in the assessment due to low sample sizes.

a) East

Year	EFF N	Age-0	Age-1	Age-2
1987	14	0.07	0.93	0.00
1988	71	0.99	0.00	0.01
1989	200	0.92	0.08	0.01
1990	200	0.86	0.13	0.01
1991	200	0.89	0.11	0.00
1992	29	0.86	0.14	0.00
1993	200	0.93	0.03	0.04
1994	200	0.63	0.21	0.16
1995	187	0.99	0.01	0.00
1996	200	0.73	0.18	0.09
1997	200	0.90	0.06	0.03
1998	81	0.86	0.10	0.04
1999	150	0.88	0.09	0.03
2000	200	0.86	0.06	0.08
2001	98	0.86	0.06	0.08
2002	196	0.88	0.05	0.07
2003	200	0.90	0.10	0.01
2004	200	0.90	0.09	0.01
2005	200	0.74	0.22	0.04
2006	200	0.99	0.01	0.00
2007	200	0.96	0.04	0.00
2008	167	0.38	0.33	0.29
2009	200	0.94	0.03	0.03
2010	200	0.71	0.21	0.08
2011	79	0.56	0.16	0.28
2012	200	0.75	0.14	0.10
2013	151	0.96	0.01	0.03
2014	200	0.91	0.06	0.03
2015	103	0.48	0.28	0.24
2016	17	1.00	0.00	0.00

Table 2.23. (Age composition for the SEAMAP Fall trawl survey continued).

b) West

Year	EFF N	Age-0	Age-1	Age-2
1987	192	0.64	0.34	0.02
1988	200	0.65	0.32	0.03
1989	200	0.93	0.06	0.01
1990	200	0.77	0.20	0.03
1991	200	0.94	0.06	0.01
1992	200	0.71	0.27	0.02
1993	200	0.76	0.21	0.03
1994	200	0.92	0.07	0.01
1995	200	0.92	0.06	0.02
1996	200	0.76	0.22	0.02
1997	200	0.92	0.07	0.01
1998	200	0.90	0.09	0.01
1999	200	0.94	0.05	0.01
2000	200	0.91	0.08	0.02
2001	200	0.85	0.12	0.03
2002	200	0.93	0.07	0.01
2003	200	0.96	0.03	0.00
2004	200	0.91	0.08	0.01
2005	200	0.84	0.14	0.01
2006	200	0.94	0.05	0.02
2007	200	0.92	0.07	0.01
2008	200	0.67	0.28	0.05
2009	200	0.98	0.02	0.00
2010	200	0.77	0.22	0.01
2011	200	0.83	0.13	0.03
2012	200	0.93	0.06	0.01
2013	36	0.77	0.17	0.06
2014	38	0.95	0.00	0.05
-2016	4	0.75	0.00	0.25

Table 2.24. Age frequency of the NMFS bottom longline survey by region. Age composition was directly sampled. Effective sample sizes (EFF N) were capped at 200 (but rescaled during the assessment process using iterative reweighting techniques). Data bars indicate the relative magnitude of the annual age frequency.

a) East

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
2000	1	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2001	3	0.00	0.00	0.00	0.00	0.33	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00
2002	89	0.00	0.01	0.00	0.07	0.08	0.18	0.09	0.06	0.04	0.03	0.06	0.02	0.10	0.07	0.01	0.00	0.01	0.00	0.00	0.01	0.16
2003	17	0.00	0.00	0.00	0.06	0.47	0.00	0.00	0.06	0.12	0.12	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12
2004	22	0.00	0.00	0.05	0.00	0.14	0.18	0.14	0.05	0.09	0.14	0.00	0.00	0.05	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.14
2005	3	0.00	0.00	0.00	0.00	0.00	0.33	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	2	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
2007	6	0.00	0.00	0.00	0.00	0.17	0.50	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	8	0.00	0.00	0.00	0.00	0.00	0.25	0.38	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	25	0.00	0.00	0.00	0.00	0.48	0.24	0.16	0.04	0.00	0.04	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	182	0.00	0.00	0.00	0.01	0.14	0.25	0.27	0.20	0.05	0.03	0.00	0.01	0.01	0.00	0.02	0.00	0.00	0.01	0.01	0.00	0.01
2012	14	0.00	0.00	0.00	0.00	0.00	0.07	0.21	0.36	0.07	0.07	0.00	0.00	0.00	0.07	0.00	0.07	0.00	0.07	0.00	0.00	0.00
2013	17	0.00	0.00	0.00	0.00	0.00	0.06	0.18	0.65	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	11	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.18	0.18	0.18	0.00	0.00	0.27	0.00	0.00	0.00	0.00	0.09	0.00	0.00
2015	23	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.04	0.22	0.35	0.04	0.13	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.09

b) West

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
2000	85	0.00	0.00	0.00	0.00	0.01	0.04	0.05	0.15	0.16	0.12	0.08	0.02	0.07	0.01	0.07	0.09	0.01	0.02	0.01	0.01	0.06
2001	81	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.09	0.14	0.07	0.06	0.06	0.10	0.06	0.06	0.04	0.09	0.01	0.01	0.01	0.17
2002	72	0.00	0.00	0.00	0.01	0.00	0.04	0.06	0.06	0.07	0.08	0.07	0.11	0.04	0.00	0.10	0.01	0.04	0.01	0.04	0.04	0.21
2003	60	0.00	0.00	0.00	0.00	0.08	0.05	0.07	0.10	0.05	0.02	0.07	0.10	0.08	0.07	0.07	0.07	0.03	0.00	0.02	0.00	0.13
2004	50	0.00	0.00	0.00	0.00	0.02	0.16	0.10	0.16	0.18	0.08	0.02	0.00	0.04	0.06	0.02	0.02	0.04	0.00	0.02	0.02	0.06
2006	31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.10	0.06	0.00	0.03	0.03	0.00	0.23	0.00	0.06	0.06	0.03	0.26
2007	41	0.00	0.00	0.00	0.02	0.00	0.00	0.17	0.12	0.15	0.02	0.00	0.07	0.02	0.07	0.07	0.10	0.00	0.00	0.02	0.05	0.10
2008	10	0.00	0.00	0.00	0.00	0.20	0.00	0.30	0.10	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.10
2009	68	0.00	0.00	0.00	0.01	0.01	0.19	0.09	0.04	0.06	0.07	0.07	0.01	0.06	0.04	0.03	0.03	0.04	0.00	0.01	0.03	0.18
2010	33	0.00	0.00	0.00	0.00	0.12	0.24	0.27	0.09	0.03	0.03	0.03	0.00	0.06	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.06
2011	200	0.00	0.00	0.00	0.01	0.03	0.11	0.18	0.22	0.08	0.07	0.04	0.04	0.02	0.03	0.01	0.02	0.01	0.02	0.01	0.01	0.10
2012	126	0.00	0.00	0.00	0.00	0.00	0.09	0.14	0.27	0.13	0.05	0.06	0.02	0.03	0.02	0.01	0.02	0.03	0.00	0.03	0.02	0.10
2013	86	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.13	0.20	0.26	0.07	0.05	0.03	0.03	0.01	0.02	0.02	0.00	0.01	0.02	0.09
2014	48	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.06	0.25	0.15	0.17	0.04	0.04	0.00	0.02	0.02	0.00	0.02	0.02	0.00	0.08
2015	200	0.00	0.00	0.00	0.00	0.01	0.01	0.06	0.04	0.11	0.24	0.15	0.11	0.05	0.02	0.03	0.00	0.00	0.01	0.03	0.01	0.12
2016	200	0.00	0.00	0.01	0.00	0.00	0.02	0.04	0.10	0.05	0.11	0.19	0.14	0.12	0.05	0.03	0.01	0.04	0.01	0.02	0.00	0.06

Table 2.25. Derived age frequency of the ROV survey in the east. Age composition was estimated from length composition by applying a region-specific ALK (**Table 2.4**). Effective sample sizes (EFF N) were capped at 200 (but rescaled during the assessment process using iterative reweighting techniques). Data bars indicate the relative magnitude of the annual age frequency.

Year	EFF N	Age-0	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	Age-13	Age-14	Age-15	Age-16	Age-17	Age-18	Age-19	Age-20
2005	40	0.00	0.18	0.33	0.32	0.11	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2006	71	0.00	0.25	0.37	0.23	0.08	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007	89	0.00	0.18	0.41	0.28	0.08	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	36	0.00	0.20	0.36	0.29	0.10	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	92	0.00	0.07	0.22	0.31	0.20	0.10	0.05	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	119	0.00	0.09	0.21	0.29	0.20	0.10	0.05	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	200	0.00	0.04	0.16	0.28	0.22	0.12	0.07	0.04	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
2012	171	0.00	0.05	0.16	0.24	0.19	0.12	0.07	0.04	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
2013	146	0.00	0.06	0.19	0.32	0.20	0.09	0.05	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2014	189	0.00	0.07	0.16	0.25	0.19	0.11	0.07	0.05	0.04	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2015	200	0.00	0.08	0.15	0.20	0.17	0.11	0.07	0.05	0.04	0.03	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.03
2016	200	0.00	0.12	0.29	0.26	0.13	0.06	0.04	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01

Table 4.1. Predicted biomass (whole weight metric tons), spawning biomass (eggs), abundance (1000s of fish), age-0 recruits (thousands of fish), and depletion (SSB/SSB_0) for each region and the entire Gulf of Mexico.

	East					West					Gulfwide				
Year	Biomass (mt)	Spawning Output (Eggs)	Abundance (1000s)	Recruits (1000s)	SSB/SSB_0	Biomass (mt)	Spawning Output (Eggs)	Abundance (1000s)	Recruits (1000s)	SSB/SSB_0	Biomass (mt)	Spawning Output (Eggs)	Abundance (1000s)	Recruits (1000s)	SSB/SSB_0
Virgin	113,683	1.62E+15	102,565	56,186	100%	216,552	3.09E+15	195,372	107,026	100%	330,235	4.72E+15	297,937	163,212	100%
1872	76,707	1.10E+15	69,205	37,911	67%	146,117	2.09E+15	131,826	72,215	67%	222,824	3.18E+15	201,031	110,126	67%
1873	76,464	1.09E+15	69,140	37,911	67%	146,117	2.09E+15	131,826	72,215	67%	222,581	3.18E+15	200,966	110,126	67%
1874	76,089	1.09E+15	69,050	37,911	67%	146,117	2.09E+15	131,825	72,215	67%	222,206	3.17E+15	200,875	110,126	67%
1875	75,519	1.08E+15	68,921	37,910	66%	146,117	2.09E+15	131,825	72,214	67%	221,636	3.16E+15	200,746	110,125	67%
1876	74,815	1.07E+15	68,771	37,910	66%	146,117	2.09E+15	131,824	72,214	67%	220,932	3.15E+15	200,595	110,124	67%
1877	73,981	1.06E+15	68,603	37,910	65%	146,117	2.09E+15	131,823	72,213	67%	220,098	3.14E+15	200,426	110,123	67%
1878	73,265	1.04E+15	68,482	37,909	64%	146,117	2.09E+15	131,822	72,212	67%	219,382	3.13E+15	200,304	110,122	66%
1879	72,623	1.03E+15	68,387	37,909	64%	146,117	2.09E+15	131,821	72,212	67%	218,740	3.12E+15	200,208	110,121	66%
1880	71,944	1.02E+15	68,282	37,909	63%	146,117	2.09E+15	131,820	72,211	67%	218,061	3.11E+15	200,102	110,120	66%
1881	71,107	1.01E+15	68,136	37,908	62%	145,685	2.08E+15	131,652	72,210	67%	216,792	3.09E+15	199,788	110,118	66%
1882	70,183	9.97E+14	67,973	37,908	61%	145,242	2.08E+15	131,521	72,209	67%	215,425	3.07E+15	199,494	110,116	65%
1883	69,170	9.82E+14	67,795	37,907	61%	144,808	2.07E+15	131,419	72,208	67%	213,978	3.05E+15	199,214	110,114	65%
1884	68,073	9.66E+14	67,603	37,906	59%	144,395	2.06E+15	131,341	72,206	67%	212,468	3.03E+15	198,944	110,112	64%
1885	66,892	9.48E+14	67,397	37,905	58%	144,019	2.06E+15	131,283	72,205	67%	210,911	3.00E+15	198,680	110,110	64%
1886	65,631	9.29E+14	67,179	37,905	57%	143,691	2.05E+15	131,244	72,203	66%	209,322	2.98E+15	198,423	110,108	63%
1887	64,292	9.09E+14	66,948	37,904	56%	143,419	2.05E+15	131,221	72,201	66%	207,711	2.96E+15	198,169	110,105	63%
1888	62,879	8.88E+14	66,706	37,903	55%	143,268	2.04E+15	131,236	72,200	66%	206,147	2.93E+15	197,942	110,103	62%
1889	61,568	8.68E+14	66,501	37,902	53%	143,149	2.04E+15	131,245	72,198	66%	204,717	2.91E+15	197,746	110,100	62%
1890	60,208	8.48E+14	66,284	37,901	52%	143,032	2.04E+15	131,242	72,197	66%	203,240	2.89E+15	197,526	110,098	61%
1891	58,564	8.23E+14	65,988	37,900	51%	142,950	2.04E+15	131,243	72,195	66%	201,514	2.86E+15	197,231	110,095	61%
1892	57,126	8.01E+14	65,765	37,899	49%	142,874	2.04E+15	131,239	72,193	66%	200,000	2.84E+15	197,004	110,093	60%
1893	55,654	7.79E+14	65,531	37,899	48%	142,800	2.04E+15	131,230	72,192	66%	198,454	2.82E+15	196,761	110,090	60%
1894	54,177	7.57E+14	65,296	37,898	47%	142,726	2.04E+15	131,217	72,190	66%	196,903	2.79E+15	196,513	110,087	59%
1895	52,709	7.35E+14	65,064	37,897	45%	142,652	2.03E+15	131,204	72,188	66%	195,361	2.77E+15	196,268	110,085	59%
1896	51,343	7.14E+14	64,861	37,896	44%	142,579	2.03E+15	131,189	72,187	66%	193,922	2.75E+15	196,050	110,082	58%
1897	50,017	6.94E+14	64,665	37,895	43%	142,506	2.03E+15	131,175	72,185	66%	192,523	2.73E+15	195,840	110,080	58%
1898	48,766	6.75E+14	64,484	37,894	42%	142,437	2.03E+15	131,162	72,183	66%	191,203	2.71E+15	195,646	110,078	57%
1899	47,352	6.54E+14	64,095	37,740	40%	142,270	2.03E+15	130,819	71,890	66%	189,622	2.68E+15	194,914	109,631	57%
1900	45,734	6.30E+14	63,735	37,730	39%	142,007	2.03E+15	130,615	71,871	66%	187,741	2.66E+15	194,350	109,601	56%
1901	43,900	6.04E+14	63,362	37,718	37%	141,644	2.02E+15	130,464	71,848	65%	185,544	2.62E+15	193,826	109,566	56%
1902	41,924	5.75E+14	62,966	37,704	35%	141,194	2.01E+15	130,303	71,822	65%	183,118	2.59E+15	193,269	109,526	55%
1903	39,849	5.44E+14	62,555	37,689	34%	140,667	2.01E+15	130,130	71,792	65%	180,516	2.55E+15	192,685	109,481	54%
1904	38,062	5.17E+14	62,245	37,672	32%	140,149	2.00E+15	129,978	71,760	65%	178,211	2.52E+15	192,223	109,432	53%
1905	36,533	4.94E+14	62,006	37,654	30%	139,646	1.99E+15	129,840	71,726	64%	176,179	2.49E+15	191,846	109,380	53%

Table 4.1. (Predicted biomass, SSB, abundance, and recruitment continued).

	East					West					Gulfwide				
Year	Biomass (mt)	Spawning Output (Eggs)	Abundance (1000s)	Recruits (1000s)	SSB/SSB_0	Biomass (mt)	Spawning Output (Eggs)	Abundance (1000s)	Recruits (1000s)	SSB/SSB_0	Biomass (mt)	Spawning Output (Eggs)	Abundance (1000s)	Recruits (1000s)	SSB/SSB_0
1906	35,326	4.75E+14	61,848	37,635	29%	139,181	1.98E+15	129,718	71,689	64%	174,507	2.46E+15	191,566	109,323	52%
1907	34,448	4.61E+14	61,766	37,614	28%	138,764	1.98E+15	129,611	71,650	64%	173,212	2.44E+15	191,377	109,265	52%
1908	33,903	4.51E+14	61,755	37,594	28%	138,406	1.97E+15	129,520	71,612	64%	172,309	2.42E+15	191,275	109,206	51%
1909	33,642	4.46E+14	61,793	37,573	28%	138,101	1.97E+15	129,438	71,572	64%	171,743	2.41E+15	191,231	109,145	51%
1910	33,707	4.46E+14	61,894	37,551	28%	137,874	1.96E+15	129,373	71,529	63%	171,581	2.41E+15	191,267	109,080	51%
1911	34,090	4.51E+14	62,049	37,527	28%	137,726	1.96E+15	129,319	71,483	63%	171,816	2.41E+15	191,368	109,010	51%
1912	34,563	4.58E+14	62,181	37,501	28%	137,615	1.96E+15	129,259	71,435	63%	172,178	2.42E+15	191,440	108,936	51%
1913	35,100	4.66E+14	62,295	37,474	29%	137,535	1.96E+15	129,194	71,383	63%	172,635	2.42E+15	191,489	108,857	51%
1914	35,679	4.75E+14	62,393	37,446	29%	137,482	1.96E+15	129,124	71,329	63%	173,161	2.43E+15	191,517	108,774	52%
1915	36,282	4.85E+14	62,478	37,416	30%	137,450	1.96E+15	129,050	71,273	63%	173,732	2.44E+15	191,528	108,689	52%
1916	36,894	4.95E+14	62,551	37,386	30%	137,435	1.96E+15	128,974	71,216	63%	174,329	2.45E+15	191,525	108,602	52%
1917	37,503	5.04E+14	62,612	37,356	31%	137,434	1.96E+15	128,894	71,157	63%	174,937	2.46E+15	191,506	108,513	52%
1918	38,134	5.14E+14	62,672	37,323	32%	137,443	1.96E+15	128,811	71,096	63%	175,577	2.47E+15	191,483	108,419	52%
1919	38,748	5.24E+14	62,720	37,289	32%	137,461	1.96E+15	128,722	71,031	63%	176,209	2.48E+15	191,442	108,320	53%
1920	39,237	5.31E+14	62,725	37,252	33%	137,474	1.96E+15	128,623	70,961	63%	176,711	2.49E+15	191,348	108,213	53%
1921	39,586	5.37E+14	62,687	37,212	33%	137,479	1.96E+15	128,509	70,883	63%	177,065	2.50E+15	191,196	108,095	53%
1922	39,781	5.41E+14	62,610	37,167	33%	137,473	1.96E+15	128,382	70,799	63%	177,254	2.50E+15	190,992	107,966	53%
1923	39,812	5.42E+14	62,493	37,119	33%	137,455	1.96E+15	128,240	70,707	63%	177,267	2.50E+15	190,733	107,826	53%
1924	39,676	5.40E+14	62,338	37,065	33%	137,421	1.96E+15	128,082	70,604	63%	177,097	2.50E+15	190,420	107,670	53%
1925	39,534	5.38E+14	62,191	37,003	33%	137,387	1.96E+15	127,905	70,486	63%	176,921	2.50E+15	190,096	107,489	53%
1926	39,354	5.35E+14	62,034	36,933	33%	137,352	1.96E+15	127,707	70,352	63%	176,706	2.49E+15	189,741	107,285	53%
1927	39,191	5.33E+14	61,880	36,853	33%	137,317	1.96E+15	127,486	70,200	63%	176,508	2.49E+15	189,366	107,053	53%
1928	38,858	5.28E+14	61,672	36,771	33%	137,217	1.96E+15	127,227	70,044	63%	176,075	2.48E+15	188,899	106,815	53%
1929	38,694	5.25E+14	61,530	36,691	32%	137,177	1.96E+15	126,997	69,891	63%	175,871	2.48E+15	188,527	106,581	53%
1930	38,426	5.21E+14	61,350	36,606	32%	137,137	1.95E+15	126,759	69,730	63%	175,563	2.48E+15	188,109	106,337	53%
1931	38,820	5.26E+14	61,377	36,521	32%	137,024	1.95E+15	126,485	69,568	63%	175,844	2.48E+15	187,862	106,090	53%
1932	39,251	5.32E+14	61,382	36,438	33%	136,996	1.95E+15	126,254	69,410	63%	176,247	2.49E+15	187,636	105,849	53%
1933	39,632	5.38E+14	61,346	36,351	33%	136,932	1.95E+15	125,998	69,244	63%	176,564	2.49E+15	187,344	105,596	53%
1934	40,133	5.45E+14	61,321	36,253	34%	136,840	1.95E+15	125,707	69,057	63%	176,973	2.50E+15	187,028	105,310	53%
1935	40,748	5.54E+14	61,302	36,146	34%	136,726	1.95E+15	125,385	68,853	63%	177,474	2.50E+15	186,687	104,999	53%
1936	41,159	5.61E+14	61,187	36,023	35%	136,495	1.95E+15	124,984	68,619	63%	177,654	2.51E+15	186,171	104,642	53%
1937	41,380	5.65E+14	60,984	35,874	35%	136,139	1.94E+15	124,487	68,335	63%	177,519	2.51E+15	185,471	104,208	53%
1938	41,715	5.71E+14	60,801	35,712	35%	135,709	1.94E+15	123,935	68,026	63%	177,424	2.51E+15	184,736	103,738	53%
1939	41,687	5.71E+14	60,499	35,545	35%	135,247	1.93E+15	123,367	67,709	62%	176,934	2.50E+15	183,866	103,254	53%
1940	41,351	5.67E+14	60,118	35,374	35%	134,795	1.92E+15	122,803	67,383	62%	176,146	2.49E+15	182,921	102,757	53%

Table 4.1. (Predicted biomass, SSB, abundance, and recruitment continued).

	East					West					Gulfwide				
Year	Biomass (mt)	Spawning Output (Eggs)	Abundance (1000s)	Recruits (1000s)	SSB/SSB_0	Biomass (mt)	Spawning Output (Eggs)	Abundance (1000s)	Recruits (1000s)	SSB/SSB_0	Biomass (mt)	Spawning Output (Eggs)	Abundance (1000s)	Recruits (1000s)	SSB/SSB_0
1941	41,538	5.70E+14	59,923	35,210	35%	134,343	1.92E+15	122,253	67,070	62%	175,881	2.49E+15	182,176	102,280	53%
1942	41,823	5.74E+14	59,750	35,047	35%	133,915	1.91E+15	121,721	66,759	62%	175,738	2.49E+15	181,471	101,806	53%
1943	42,319	5.81E+14	59,634	34,889	36%	133,574	1.91E+15	121,233	66,458	62%	175,893	2.49E+15	180,867	101,347	53%
1944	42,995	5.91E+14	59,552	34,728	36%	133,322	1.90E+15	120,768	66,152	62%	176,317	2.49E+15	180,320	100,879	53%
1945	43,573	5.99E+14	59,411	34,559	37%	133,126	1.90E+15	120,294	65,829	61%	176,699	2.50E+15	179,705	100,388	53%
1946	44,239	6.10E+14	59,280	34,385	38%	133,002	1.90E+15	119,819	65,499	61%	177,241	2.51E+15	179,099	99,884	53%
1947	44,482	6.14E+14	58,996	34,194	38%	132,803	1.90E+15	119,208	65,135	61%	177,285	2.51E+15	178,204	99,329	53%
1948	44,621	6.17E+14	58,670	33,983	38%	132,510	1.89E+15	118,333	64,734	61%	177,131	2.51E+15	177,003	98,717	53%
1949	44,630	6.18E+14	58,358	33,817	38%	132,112	1.89E+15	117,244	64,417	61%	176,742	2.51E+15	175,602	98,233	53%
1950	44,349	6.15E+14	57,981	33,638	38%	131,516	1.88E+15	116,054	64,077	61%	175,865	2.50E+15	174,035	97,715	53%
1951	43,944	6.10E+14	57,463	33,457	38%	129,173	1.85E+15	114,372	63,732	60%	173,117	2.46E+15	171,835	97,189	52%
1952	43,215	6.01E+14	56,935	33,325	37%	126,407	1.82E+15	112,974	63,479	59%	169,622	2.42E+15	169,909	96,803	51%
1953	42,210	5.87E+14	56,419	33,206	36%	123,176	1.77E+15	111,458	63,252	57%	165,386	2.36E+15	167,877	96,458	50%
1954	41,148	5.72E+14	56,025	33,174	35%	119,767	1.73E+15	110,446	63,192	56%	160,915	2.30E+15	166,471	96,366	49%
1955	40,013	5.56E+14	55,616	33,117	34%	116,084	1.67E+15	108,957	63,083	54%	156,097	2.23E+15	164,573	96,200	47%
1956	38,655	5.36E+14	55,266	33,164	33%	112,148	1.61E+15	108,398	63,173	52%	150,803	2.15E+15	163,664	96,337	46%
1957	36,991	5.12E+14	54,853	33,205	32%	107,764	1.55E+15	107,068	63,250	50%	144,755	2.06E+15	161,921	96,455	44%
1958	35,365	4.88E+14	54,622	33,351	30%	103,227	1.48E+15	105,830	63,529	48%	138,592	1.97E+15	160,452	96,879	42%
1959	33,002	4.54E+14	54,120	33,378	28%	97,889	1.41E+15	103,295	63,580	46%	130,890	1.86E+15	157,415	96,958	39%
1960	30,719	4.21E+14	53,611	33,371	26%	92,338	1.33E+15	101,601	63,567	43%	123,056	1.75E+15	155,212	96,938	37%
1961	28,222	3.84E+14	52,993	33,284	24%	86,556	1.24E+15	100,017	63,402	40%	114,778	1.63E+15	153,010	96,686	35%
1962	25,906	3.50E+14	52,661	33,336	22%	80,460	1.15E+15	99,585	63,501	37%	106,366	1.51E+15	152,246	96,837	32%
1963	23,603	3.16E+14	52,374	33,451	19%	74,457	1.07E+15	98,906	63,720	34%	98,059	1.38E+15	151,279	97,171	29%
1964	21,649	2.87E+14	52,130	33,515	18%	68,799	9.81E+14	97,662	63,842	32%	90,449	1.27E+15	149,792	97,357	27%
1965	19,507	2.56E+14	51,879	33,709	16%	63,413	9.00E+14	97,446	64,212	29%	82,920	1.16E+15	149,325	97,921	25%
1966	17,388	2.25E+14	51,586	33,800	14%	58,190	8.22E+14	96,409	64,384	27%	75,578	1.05E+15	147,995	98,184	22%
1967	15,625	1.99E+14	51,476	33,929	12%	53,446	7.50E+14	95,764	64,630	24%	69,071	9.49E+14	147,240	98,559	20%
1968	14,035	1.75E+14	51,272	33,920	11%	48,301	6.76E+14	93,754	64,614	22%	62,336	8.51E+14	145,026	98,534	18%
1969	12,658	1.55E+14	51,126	34,038	10%	42,852	5.98E+14	93,288	64,839	19%	55,510	7.53E+14	144,414	98,877	16%
1970	11,436	1.37E+14	50,915	33,976	8%	37,895	5.27E+14	91,024	64,720	17%	49,331	6.64E+14	141,939	98,696	14%
1971	10,351	1.21E+14	51,660	34,906	7%	32,975	4.55E+14	92,127	66,491	15%	43,326	5.76E+14	143,787	101,396	12%
1972	10,698	1.06E+14	167,247	150,291	7%	29,960	3.79E+14	282,002	257,123	12%	40,658	4.86E+14	449,249	407,414	10%
1973	9,990	9.16E+13	95,458	37,426	6%	25,634	3.07E+14	206,135	131,276	10%	35,624	3.99E+14	301,593	168,702	8%
1974	9,553	7.96E+13	62,186	36,552	5%	22,152	2.52E+14	115,944	64,119	8%	31,705	3.31E+14	178,130	100,670	7%
1975	8,972	7.51E+13	58,233	37,997	5%	20,335	2.29E+14	110,086	79,973	7%	29,307	3.04E+14	168,319	117,970	6%
1976	8,563	7.45E+13	62,800	43,443	5%	18,569	2.10E+14	112,664	81,466	7%	27,132	2.85E+14	175,464	124,909	6%
1977	7,773	6.86E+13	68,918	48,261	4%	16,559	1.88E+14	115,521	85,325	6%	24,332	2.56E+14	184,439	133,587	5%
1978	6,994	6.16E+13	50,712	28,323	4%	14,577	1.64E+14	100,250	68,591	5%	21,571	2.26E+14	150,962	96,914	5%
1979	6,323	5.52E+13	41,629	25,947	3%	13,094	1.42E+14	117,727	91,781	5%	19,417	1.98E+14	159,356	117,728	4%

Table 4.1. (Predicted biomass, SSB, abundance, and recruitment continued).

	East					West					Gulfwide				
Year	Biomass (mt)	Spawning Output (Eggs)	Abundance (1000s)	Recruits (1000s)	SSB/SSB_0	Biomass (mt)	Spawning Output (Eggs)	Abundance (1000s)	Recruits (1000s)	SSB/SSB_0	Biomass (mt)	Spawning Output (Eggs)	Abundance (1000s)	Recruits (1000s)	SSB/SSB_0
1980	5,853	4.97E+13	58,083	44,596	3%	12,880	1.24E+14	215,795	184,859	4%	18,733	1.73E+14	273,878	229,455	4%
1981	5,699	4.22E+13	102,487	82,959	3%	13,079	1.04E+14	265,258	202,042	3%	18,779	1.47E+14	367,745	285,001	3%
1982	5,250	3.08E+13	100,926	67,075	2%	12,369	9.06E+13	162,763	93,783	3%	17,619	1.21E+14	263,689	160,858	3%
1983	4,561	2.29E+13	44,010	13,151	1%	11,920	8.73E+13	101,412	60,950	3%	16,482	1.10E+14	145,422	74,101	2%
1984	3,864	1.91E+13	35,282	24,107	1%	10,694	8.68E+13	57,691	29,899	3%	14,558	1.06E+14	92,972	54,006	2%
1985	3,946	2.28E+13	24,296	11,965	1%	10,579	8.88E+13	80,677	64,445	3%	14,525	1.12E+14	104,974	76,410	2%
1986	3,877	2.62E+13	34,719	26,970	2%	10,375	9.16E+13	86,360	62,664	3%	14,253	1.18E+14	121,079	89,633	2%
1987	3,422	2.55E+13	28,732	16,757	2%	9,813	9.15E+13	62,061	39,635	3%	13,235	1.17E+14	90,793	56,392	2%
1988	2,918	2.05E+13	33,644	24,780	1%	9,917	9.30E+13	78,916	62,373	3%	12,836	1.13E+14	112,559	87,152	2%
1989	2,860	1.46E+13	71,458	60,397	1%	10,162	8.74E+13	160,909	139,871	3%	13,022	1.02E+14	232,367	200,268	2%
1990	3,017	1.11E+13	73,305	49,284	1%	10,228	8.42E+13	139,129	95,988	3%	13,245	9.53E+13	212,434	145,272	2%
1991	3,745	1.07E+13	87,222	64,396	1%	11,539	8.81E+13	157,310	121,241	3%	15,284	9.88E+13	244,532	185,637	2%
1992	4,269	1.37E+13	62,490	33,918	1%	12,439	9.52E+13	133,075	92,810	3%	16,708	1.09E+14	195,565	126,728	2%
1993	4,484	1.65E+13	61,432	42,724	1%	13,335	1.04E+14	138,166	103,799	3%	17,819	1.21E+14	199,598	146,523	3%
1994	3,999	1.54E+13	62,440	42,632	1%	13,941	1.14E+14	141,642	105,446	4%	17,940	1.29E+14	204,082	148,078	3%
1995	4,331	1.45E+13	106,891	87,031	1%	14,862	1.24E+14	155,708	117,381	4%	19,193	1.38E+14	262,599	204,412	3%
1996	4,802	1.48E+13	99,294	63,493	1%	15,261	1.32E+14	122,146	79,040	4%	20,062	1.47E+14	221,440	142,533	3%
1997	5,633	1.74E+13	99,591	68,917	1%	15,490	1.38E+14	119,439	85,930	4%	21,123	1.55E+14	219,030	154,847	3%
1998	5,800	2.01E+13	71,572	39,508	1%	14,886	1.40E+14	93,667	61,912	5%	20,686	1.60E+14	165,239	101,420	3%
1999	6,903	2.84E+13	105,425	83,177	2%	15,033	1.44E+14	117,254	91,451	5%	21,935	1.73E+14	222,679	174,628	4%
2000	7,850	3.61E+13	128,604	92,238	2%	15,117	1.49E+14	114,568	81,793	5%	22,967	1.85E+14	243,172	174,031	4%
2001	8,436	4.15E+13	106,642	64,400	3%	14,831	1.50E+14	90,135	59,505	5%	23,267	1.92E+14	196,777	123,905	4%
2002	8,563	4.16E+13	103,963	70,342	3%	14,960	1.52E+14	105,283	80,958	5%	23,524	1.94E+14	209,246	151,299	4%
2003	8,332	4.01E+13	103,716	69,682	2%	15,069	1.53E+14	123,916	96,711	5%	23,401	1.93E+14	227,632	166,392	4%
2004	8,554	4.21E+13	119,493	85,622	3%	15,795	1.56E+14	159,303	125,700	5%	24,349	1.98E+14	278,796	211,322	4%
2005	8,516	4.01E+13	130,809	91,468	2%	16,176	1.55E+14	156,533	113,461	5%	24,693	1.95E+14	287,342	204,929	4%
2006	9,847	4.66E+13	156,218	113,068	3%	17,085	1.58E+14	155,565	110,642	5%	26,932	2.05E+14	311,783	223,710	4%
2007	11,591	5.89E+13	152,884	100,122	4%	17,753	1.63E+14	132,572	85,550	5%	29,344	2.22E+14	285,456	185,672	5%
2008	12,639	7.04E+13	118,453	67,917	4%	19,384	1.81E+14	98,162	56,363	6%	32,023	2.51E+14	216,615	124,280	5%
2009	15,115	1.00E+14	103,282	63,228	6%	22,596	2.11E+14	164,835	131,518	7%	37,711	3.11E+14	268,117	194,746	7%
2010	17,535	1.38E+14	86,411	49,341	9%	26,361	2.56E+14	164,422	107,711	8%	43,896	3.94E+14	250,833	157,052	8%
2011	20,833	1.91E+14	81,070	48,968	12%	31,157	3.14E+14	181,045	126,922	10%	51,990	5.05E+14	262,115	175,890	11%
2012	20,238	2.03E+14	81,744	51,981	12%	36,161	3.75E+14	217,578	157,161	12%	56,399	5.78E+14	299,322	209,142	12%
2013	21,175	2.26E+14	87,114	56,767	14%	40,134	4.31E+14	165,252	91,750	14%	61,309	6.57E+14	252,366	148,517	14%
2014	20,280	2.17E+14	117,806	86,478	13%	45,103	5.01E+14	155,835	100,366	16%	65,382	7.19E+14	273,641	186,844	15%
2015	21,220	2.28E+14	117,716	75,114	14%	50,093	5.68E+14	223,420	167,823	18%	71,313	7.96E+14	341,136	242,937	17%
2016	20,754	2.24E+14	72,231	31,685	14%	54,846	6.42E+14	184,046	107,107	21%	75,600	8.67E+14	256,277	138,792	18%

Table 4.2. Estimates of annual exploitation rate (total numbers killed / total numbers) combined across all fleets and regions, which was used as the proxy for annual fishing mortality rate.

Year	2014 SEDAR 31 Update	SEDAR 52
1872	0.000	0.000
1873	0.001	0.001
1874	0.001	0.001
1875	0.001	0.001
1876	0.002	0.001
1877	0.001	0.001
1878	0.001	0.001
1879	0.001	0.001
1880	0.003	0.002
1881	0.003	0.002
1882	0.003	0.002
1883	0.003	0.002
1884	0.003	0.003
1885	0.003	0.003
1886	0.004	0.003
1887	0.004	0.003
1888	0.003	0.003
1889	0.004	0.003
1890	0.004	0.003
1891	0.004	0.003
1892	0.004	0.003
1893	0.005	0.003
1894	0.005	0.004
1895	0.005	0.004
1896	0.005	0.004
1897	0.005	0.004
1898	0.006	0.004
1899	0.007	0.005
1900	0.007	0.006
1901	0.008	0.006
1902	0.009	0.007
1903	0.008	0.006
1904	0.008	0.006
1905	0.007	0.005
1906	0.007	0.005
1907	0.006	0.004
1908	0.005	0.004
1909	0.005	0.003
1910	0.004	0.003
1911	0.004	0.003
1912	0.004	0.003
1913	0.004	0.003
1914	0.004	0.003
1915	0.004	0.003
1916	0.004	0.003
1917	0.004	0.003
1918	0.004	0.003
1919	0.004	0.003
1920	0.004	0.003
1921	0.004	0.003
1922	0.005	0.003
1923	0.005	0.004

1924	0.005	0.004
1925	0.005	0.004
1926	0.005	0.003
1927	0.005	0.004
1928	0.005	0.003
1929	0.005	0.004
1930	0.003	0.003
1931	0.003	0.002
1932	0.003	0.003
1933	0.003	0.002
1934	0.003	0.002
1935	0.004	0.003
1936	0.004	0.003
1937	0.004	0.003
1938	0.005	0.004
1939	0.006	0.004
1940	0.004	0.003
1941	0.004	0.003
1942	0.003	0.002
1943	0.002	0.002
1944	0.002	0.002
1945	0.002	0.001
1946	0.004	0.003
1947	0.007	0.005
1948	0.012	0.010
1949	0.018	0.015
1950	0.026	0.023
1951	0.029	0.025
1952	0.033	0.029
1953	0.033	0.029
1954	0.040	0.036
1955	0.038	0.034
1956	0.048	0.042
1957	0.055	0.049
1958	0.078	0.069
1959	0.084	0.074
1960	0.087	0.078
1961	0.078	0.069
1962	0.077	0.069
1963	0.084	0.075
1964	0.083	0.074
1965	0.092	0.082
1966	0.094	0.084
1967	0.111	0.100
1968	0.107	0.097
1969	0.126	0.114
1970	0.123	0.112
1971	0.130	0.119
1972	0.134	0.119
1973	0.109	0.096
1974	0.116	0.108
1975	0.121	0.110
1976	0.123	0.110
1977	0.107	0.097
1978	0.121	0.110
1979	0.142	0.130
1980	0.100	0.091

1981	0.109	0.106
1982	0.108	0.091
1983	0.117	0.113
1984	0.127	0.102
1985	0.140	0.128
1986	0.145	0.133
1987	0.137	0.119
1988	0.137	0.139
1989	0.130	0.122
1990	0.107	0.095
1991	0.137	0.122
1992	0.125	0.123
1993	0.129	0.136
1994	0.121	0.118
1995	0.110	0.095
1996	0.098	0.084
1997	0.137	0.111
1998	0.128	0.103
1999	0.117	0.098
2000	0.128	0.086
2001	0.115	0.088
2002	0.136	0.119
2003	0.111	0.104
2004	0.093	0.102
2005	0.069	0.070
2006	0.059	0.052
2007	0.048	0.040
2008	0.032	0.029
2009	0.052	0.045
2010	0.041	0.037
2011	0.049	0.053
2012	0.049	0.045
2013	0.049	0.041
2014		0.041
2015		0.052
2016		0.052

Table 4.3. Estimated parameter values and their associated standard deviations.

Parameter	Value	Standard Deviation
RecrDist_Area_1	-0.64441	0.04937

RecrDist_Area_1_DEVadd_1972	0.02746	0.05048
RecrDist_Area_1_DEVadd_1973	-0.16217	0.05401
RecrDist_Area_1_DEVadd_1974	0.02108	0.06107
RecrDist_Area_1_DEVadd_1975	-0.02572	0.05908
RecrDist_Area_1_DEVadd_1976	0.00402	0.05617
RecrDist_Area_1_DEVadd_1977	0.01908	0.05751
RecrDist_Area_1_DEVadd_1978	-0.06231	0.06065
RecrDist_Area_1_DEVadd_1979	-0.16450	0.05537
RecrDist_Area_1_DEVadd_1980	-0.20919	0.04386
RecrDist_Area_1_DEVadd_1981	-0.06380	0.03517
RecrDist_Area_1_DEVadd_1982	0.07853	0.04006
RecrDist_Area_1_DEVadd_1983	-0.24151	0.05121
RecrDist_Area_1_DEVadd_1984	0.10864	0.05668
RecrDist_Area_1_DEVadd_1985	-0.28634	0.05413
RecrDist_Area_1_DEVadd_1986	-0.05145	0.03947
RecrDist_Area_1_DEVadd_1987	-0.05612	0.04616
RecrDist_Area_1_DEVadd_1988	-0.07249	0.03190
RecrDist_Area_1_DEVadd_1989	-0.05060	0.02175
RecrDist_Area_1_DEVadd_1990	-0.00571	0.02327
RecrDist_Area_1_DEVadd_1991	0.00300	0.02277
RecrDist_Area_1_DEVadd_1992	-0.09465	0.02678
RecrDist_Area_1_DEVadd_1993	-0.06316	0.02503
RecrDist_Area_1_DEVadd_1994	-0.06787	0.02577
RecrDist_Area_1_DEVadd_1995	0.08759	0.02010
RecrDist_Area_1_DEVadd_1996	0.10771	0.02209
RecrDist_Area_1_DEVadd_1997	0.10731	0.02244
RecrDist_Area_1_DEVadd_1998	0.04974	0.02530
RecrDist_Area_1_DEVadd_1999	0.13881	0.02108
RecrDist_Area_1_DEVadd_2000	0.19257	0.02160
RecrDist_Area_1_DEVadd_2001	0.18229	0.02329
RecrDist_Area_1_DEVadd_2002	0.12736	0.02281
RecrDist_Area_1_DEVadd_2003	0.08039	0.02095
RecrDist_Area_1_DEVadd_2004	0.06623	0.02100
RecrDist_Area_1_DEVadd_2005	0.10860	0.02037
RecrDist_Area_1_DEVadd_2006	0.16794	0.01861
RecrDist_Area_1_DEVadd_2007	0.20186	0.01974
RecrDist_Area_1_DEVadd_2008	0.20917	0.02176
RecrDist_Area_1_DEVadd_2009	-0.02267	0.01978
RecrDist_Area_1_DEVadd_2010	-0.03519	0.02166
RecrDist_Area_1_DEVadd_2011	-0.08024	0.02265
RecrDist_Area_1_DEVadd_2012	-0.12148	0.02464
RecrDist_Area_1_DEVadd_2013	0.04191	0.02875
RecrDist_Area_1_DEVadd_2014	0.12527	0.03456
RecrDist_Area_1_DEVadd_2015	-0.04123	0.04125
RecrDist_Area_1_DEVadd_2016	-0.15195	0.05872
SR_LN(R0)	12.00280	0.05218
SR_envlink	-0.39342	0.07441
Main_RecrDev_1899	-0.00404	0.29826
Main_RecrDev_1900	-0.00428	0.29822
Main_RecrDev_1901	-0.00457	0.29818
Main_RecrDev_1902	-0.00489	0.29813
Main_RecrDev_1903	-0.00525	0.29808
Main_RecrDev_1904	-0.00565	0.29802
Main_RecrDev_1905	-0.00610	0.29796

Main_RecrDev_1906	-0.00658	0.29789
Main_RecrDev_1907	-0.00708	0.29781
Main_RecrDev_1908	-0.00760	0.29774
Main_RecrDev_1909	-0.00815	0.29766
Main_RecrDev_1910	-0.00874	0.29757
Main_RecrDev_1911	-0.00938	0.29748
Main_RecrDev_1912	-0.01007	0.29738
Main_RecrDev_1913	-0.01080	0.29727
Main_RecrDev_1914	-0.01157	0.29716
Main_RecrDev_1915	-0.01237	0.29704
Main_RecrDev_1916	-0.01318	0.29692
Main_RecrDev_1917	-0.01402	0.29679
Main_RecrDev_1918	-0.01490	0.29666
Main_RecrDev_1919	-0.01583	0.29652
Main_RecrDev_1920	-0.01683	0.29637
Main_RecrDev_1921	-0.01792	0.29621
Main_RecrDev_1922	-0.01912	0.29603
Main_RecrDev_1923	-0.02043	0.29583
Main_RecrDev_1924	-0.02187	0.29562
Main_RecrDev_1925	-0.02355	0.29537
Main_RecrDev_1926	-0.02544	0.29510
Main_RecrDev_1927	-0.02760	0.29479
Main_RecrDev_1928	-0.02982	0.29447
Main_RecrDev_1929	-0.03201	0.29416
Main_RecrDev_1930	-0.03430	0.29383
Main_RecrDev_1931	-0.03663	0.29349
Main_RecrDev_1932	-0.03891	0.29316
Main_RecrDev_1933	-0.04131	0.29280
Main_RecrDev_1934	-0.04402	0.29241
Main_RecrDev_1935	-0.04699	0.29198
Main_RecrDev_1936	-0.05041	0.29150
Main_RecrDev_1937	-0.05456	0.29092
Main_RecrDev_1938	-0.05908	0.29030
Main_RecrDev_1939	-0.06375	0.28965
Main_RecrDev_1940	-0.06856	0.28899
Main_RecrDev_1941	-0.07321	0.28836
Main_RecrDev_1942	-0.07785	0.28772
Main_RecrDev_1943	-0.08237	0.28711
Main_RecrDev_1944	-0.08700	0.28648
Main_RecrDev_1945	-0.09190	0.28581
Main_RecrDev_1946	-0.09694	0.28511
Main_RecrDev_1947	-0.10252	0.28437
Main_RecrDev_1948	-0.10869	0.28362
Main_RecrDev_1949	-0.11360	0.28299
Main_RecrDev_1950	-0.11888	0.28234
Main_RecrDev_1951	-0.12424	0.28168
Main_RecrDev_1952	-0.12815	0.28119
Main_RecrDev_1953	-0.13165	0.28074
Main_RecrDev_1954	-0.13250	0.28060
Main_RecrDev_1955	-0.13411	0.28034
Main_RecrDev_1956	-0.13257	0.28051
Main_RecrDev_1957	-0.13118	0.28069
Main_RecrDev_1958	-0.12662	0.28134
Main_RecrDev_1959	-0.12556	0.28154

Main_RecrDev_1960	-0.12549	0.28160
Main_RecrDev_1961	-0.12775	0.28130
Main_RecrDev_1962	-0.12579	0.28164
Main_RecrDev_1963	-0.12187	0.28241
Main_RecrDev_1964	-0.11944	0.28304
Main_RecrDev_1965	-0.11305	0.28433
Main_RecrDev_1966	-0.10965	0.28543
Main_RecrDev_1967	-0.10505	0.28685
Main_RecrDev_1968	-0.10434	0.28794
Main_RecrDev_1969	-0.09965	0.29026
Main_RecrDev_1970	-0.10005	0.29360
Main_RecrDev_1971	-0.07124	0.29375
Main_RecrDev_1972	1.36365	0.12925
Main_RecrDev_1973	0.48550	0.13942
Main_RecrDev_1974	-0.02675	0.14902
Main_RecrDev_1975	0.13397	0.14726
Main_RecrDev_1976	0.19285	0.13815
Main_RecrDev_1977	0.26307	0.14134
Main_RecrDev_1978	-0.05374	0.15799
Main_RecrDev_1979	0.14572	0.13771
Main_RecrDev_1980	0.81852	0.10271
Main_RecrDev_1981	1.04338	0.09139
Main_RecrDev_1982	0.48210	0.09622
Main_RecrDev_1983	-0.28667	0.12725
Main_RecrDev_1984	-0.96014	0.12633
Main_RecrDev_1985	-0.61828	0.10794
Main_RecrDev_1986	-0.46379	0.09054
Main_RecrDev_1987	-0.92654	0.09972
Main_RecrDev_1988	-0.48838	0.07574
Main_RecrDev_1989	0.35433	0.05966
Main_RecrDev_1990	0.04053	0.06169
Main_RecrDev_1991	0.28184	0.06262
Main_RecrDev_1992	-0.11005	0.06856
Main_RecrDev_1993	0.02531	0.06583
Main_RecrDev_1994	0.03021	0.06415
Main_RecrDev_1995	0.34698	0.05662
Main_RecrDev_1996	-0.01853	0.05969
Main_RecrDev_1997	0.06044	0.06061
Main_RecrDev_1998	-0.36473	0.06430
Main_RecrDev_1999	0.17344	0.05853
Main_RecrDev_2000	0.16570	0.05912
Main_RecrDev_2001	-0.17622	0.06152
Main_RecrDev_2002	0.02294	0.06100
Main_RecrDev_2003	0.11823	0.05842
Main_RecrDev_2004	0.35590	0.05889
Main_RecrDev_2005	0.32594	0.05712
Main_RecrDev_2006	0.41096	0.05412
Main_RecrDev_2007	0.22038	0.05571
Main_RecrDev_2008	-0.18708	0.05884
Main_RecrDev_2009	0.25328	0.05813
Main_RecrDev_2010	0.03037	0.06155
Main_RecrDev_2011	0.13717	0.06290
Main_RecrDev_2012	0.30742	0.06594
Main_RecrDev_2013	-0.03735	0.07305

Main_RecrDev_2014	0.19071	0.08282
Main_RecrDev_2015	0.45163	0.09876
Main_RecrDev_2016	-0.11316	0.14037
F_fleet_1_YR_1872_s_1	0.00807	0.00121
F_fleet_1_YR_1873_s_1	0.01219	0.00184
F_fleet_1_YR_1874_s_1	0.01848	0.00281
F_fleet_1_YR_1875_s_1	0.02290	0.00351
F_fleet_1_YR_1876_s_1	0.02752	0.00426
F_fleet_1_YR_1877_s_1	0.02364	0.00368
F_fleet_1_YR_1878_s_1	0.02174	0.00339
F_fleet_1_YR_1879_s_1	0.02414	0.00376
F_fleet_1_YR_1880_s_1	0.03106	0.00483
F_fleet_1_YR_1881_s_1	0.03539	0.00551
F_fleet_1_YR_1882_s_1	0.03993	0.00623
F_fleet_1_YR_1883_s_1	0.04463	0.00700
F_fleet_1_YR_1884_s_1	0.04957	0.00782
F_fleet_1_YR_1885_s_1	0.05477	0.00871
F_fleet_1_YR_1886_s_1	0.06030	0.00968
F_fleet_1_YR_1887_s_1	0.06611	0.01070
F_fleet_1_YR_1888_s_1	0.06471	0.01055
F_fleet_1_YR_1889_s_1	0.07020	0.01150
F_fleet_1_YR_1890_s_1	0.08663	0.01431
F_fleet_1_YR_1891_s_1	0.08108	0.01352
F_fleet_1_YR_1892_s_1	0.08705	0.01461
F_fleet_1_YR_1893_s_1	0.09184	0.01552
F_fleet_1_YR_1894_s_1	0.09621	0.01638
F_fleet_1_YR_1895_s_1	0.09596	0.01644
F_fleet_1_YR_1896_s_1	0.09887	0.01703
F_fleet_1_YR_1897_s_1	0.09997	0.01729
F_fleet_1_YR_1898_s_1	0.11373	0.01981
F_fleet_1_YR_1899_s_1	0.13064	0.02311
F_fleet_1_YR_1900_s_1	0.14977	0.02715
F_fleet_1_YR_1901_s_1	0.16699	0.03134
F_fleet_1_YR_1902_s_1	0.18411	0.03630
F_fleet_1_YR_1903_s_1	0.17681	0.03675
F_fleet_1_YR_1904_s_1	0.17008	0.03703
F_fleet_1_YR_1905_s_1	0.15698	0.03545
F_fleet_1_YR_1906_s_1	0.14120	0.03266
F_fleet_1_YR_1907_s_1	0.12363	0.02886
F_fleet_1_YR_1908_s_1	0.10865	0.02526
F_fleet_1_YR_1909_s_1	0.09027	0.02066
F_fleet_1_YR_1910_s_1	0.07277	0.01622
F_fleet_1_YR_1911_s_1	0.06995	0.01516
F_fleet_1_YR_1912_s_1	0.06755	0.01430
F_fleet_1_YR_1913_s_1	0.06562	0.01366
F_fleet_1_YR_1914_s_1	0.06409	0.01319
F_fleet_1_YR_1915_s_1	0.06295	0.01289
F_fleet_1_YR_1916_s_1	0.06213	0.01270
F_fleet_1_YR_1917_s_1	0.05979	0.01222
F_fleet_1_YR_1918_s_1	0.05936	0.01214
F_fleet_1_YR_1919_s_1	0.06424	0.01316
F_fleet_1_YR_1920_s_1	0.06968	0.01435
F_fleet_1_YR_1921_s_1	0.07577	0.01573
F_fleet_1_YR_1922_s_1	0.08256	0.01732

F_fleet_1_YR_1923_s_1	0.09001	0.01914
F_fleet_1_YR_1924_s_1	0.08940	0.01925
F_fleet_1_YR_1925_s_1	0.09091	0.01976
F_fleet_1_YR_1926_s_1	0.08968	0.01961
F_fleet_1_YR_1927_s_1	0.09928	0.02182
F_fleet_1_YR_1928_s_1	0.08966	0.01976
F_fleet_1_YR_1929_s_1	0.09599	0.02114
F_fleet_1_YR_1930_s_1	0.05828	0.01268
F_fleet_1_YR_1931_s_1	0.05744	0.01219
F_fleet_1_YR_1932_s_1	0.06045	0.01255
F_fleet_1_YR_1933_s_1	0.05358	0.01090
F_fleet_1_YR_1934_s_1	0.04714	0.00940
F_fleet_1_YR_1935_s_1	0.05683	0.01119
F_fleet_1_YR_1936_s_1	0.06494	0.01276
F_fleet_1_YR_1937_s_1	0.05737	0.01130
F_fleet_1_YR_1938_s_1	0.07442	0.01475
F_fleet_1_YR_1939_s_1	0.08880	0.01789
F_fleet_1_YR_1940_s_1	0.06012	0.01222
F_fleet_1_YR_1941_s_1	0.05458	0.01103
F_fleet_1_YR_1942_s_1	0.04329	0.00862
F_fleet_1_YR_1943_s_1	0.03383	0.00659
F_fleet_1_YR_1944_s_1	0.03834	0.00730
F_fleet_1_YR_1945_s_1	0.03283	0.00613
F_fleet_1_YR_1946_s_1	0.05184	0.00957
F_fleet_1_YR_1947_s_1	0.05445	0.01007
F_fleet_1_YR_1948_s_1	0.05860	0.01090
F_fleet_1_YR_1949_s_1	0.07117	0.01341
F_fleet_1_YR_1950_s_1	0.03974	0.00760
F_fleet_1_YR_1951_s_1	0.04914	0.00957
F_fleet_1_YR_1952_s_1	0.05743	0.01140
F_fleet_1_YR_1953_s_1	0.05475	0.01104
F_fleet_1_YR_1954_s_1	0.05380	0.01097
F_fleet_1_YR_1955_s_1	0.06393	0.01314
F_fleet_1_YR_1956_s_1	0.08215	0.01711
F_fleet_1_YR_1957_s_1	0.07960	0.01683
F_fleet_1_YR_1958_s_1	0.14433	0.03144
F_fleet_1_YR_1959_s_1	0.14869	0.03398
F_fleet_1_YR_1960_s_1	0.18941	0.04571
F_fleet_1_YR_1961_s_1	0.19933	0.05105
F_fleet_1_YR_1962_s_1	0.23556	0.06396
F_fleet_1_YR_1963_s_1	0.22280	0.06362
F_fleet_1_YR_1964_s_1	0.30335	0.09140
F_fleet_1_YR_1965_s_1	0.36366	0.11827
F_fleet_1_YR_1966_s_1	0.35149	0.12256
F_fleet_1_YR_1967_s_1	0.37445	0.13745
F_fleet_1_YR_1968_s_1	0.37779	0.14423
F_fleet_1_YR_1969_s_1	0.38904	0.15257
F_fleet_1_YR_1970_s_1	0.40334	0.16162
F_fleet_1_YR_1971_s_1	0.42684	0.17429
F_fleet_1_YR_1972_s_1	0.51483	0.21637
F_fleet_1_YR_1973_s_1	0.69453	0.29862
F_fleet_1_YR_1974_s_1	0.64067	0.14183
F_fleet_1_YR_1975_s_1	0.41673	0.06876
F_fleet_1_YR_1976_s_1	0.42306	0.08363

F_fleet_1_YR_1977_s_1	0.34221	0.07776
F_fleet_1_YR_1978_s_1	0.33602	0.07669
F_fleet_1_YR_1979_s_1	0.35636	0.07187
F_fleet_1_YR_1980_s_1	0.37598	0.07358
F_fleet_1_YR_1981_s_1	0.64698	0.15191
F_fleet_1_YR_1982_s_1	1.09469	0.25117
F_fleet_1_YR_1983_s_1	0.95859	0.13414
F_fleet_1_YR_1984_s_1	0.38574	0.03782
F_fleet_1_YR_1985_s_1	0.30095	0.02661
F_fleet_1_YR_1986_s_1	0.17700	0.01809
F_fleet_1_YR_1987_s_1	0.20389	0.02270
F_fleet_1_YR_1988_s_1	0.32980	0.04003
F_fleet_1_YR_1989_s_1	0.34105	0.03569
F_fleet_1_YR_1990_s_1	0.44240	0.04200
F_fleet_1_YR_1991_s_1	0.18183	0.01586
F_fleet_1_YR_1992_s_1	0.11093	0.00841
F_fleet_1_YR_1993_s_1	0.11171	0.00857
F_fleet_1_YR_1994_s_1	0.14769	0.01107
F_fleet_1_YR_1995_s_1	0.05963	0.00485
F_fleet_1_YR_1996_s_1	0.07277	0.00581
F_fleet_1_YR_1997_s_1	0.04982	0.00383
F_fleet_1_YR_1998_s_1	0.06536	0.00468
F_fleet_1_YR_1999_s_1	0.07174	0.00497
F_fleet_1_YR_2000_s_1	0.07542	0.00512
F_fleet_1_YR_2001_s_1	0.09151	0.00646
F_fleet_1_YR_2002_s_1	0.11997	0.00836
F_fleet_1_YR_2003_s_1	0.10935	0.00740
F_fleet_1_YR_2004_s_1	0.10402	0.00721
F_fleet_1_YR_2005_s_1	0.08785	0.00622
F_fleet_1_YR_2006_s_1	0.06936	0.00490
F_fleet_1_YR_2007_s_1	0.07018	0.00505
F_fleet_1_YR_2008_s_1	0.05035	0.00361
F_fleet_1_YR_2009_s_1	0.04463	0.00311
F_fleet_1_YR_2010_s_1	0.05294	0.00365
F_fleet_1_YR_2011_s_1	0.05464	0.00370
F_fleet_1_YR_2012_s_1	0.06538	0.00466
F_fleet_1_YR_2013_s_1	0.08599	0.00663
F_fleet_1_YR_2014_s_1	0.09036	0.00775
F_fleet_1_YR_2015_s_1	0.13187	0.01249
F_fleet_1_YR_2016_s_1	0.12640	0.01346
F_fleet_2_YR_1880_s_1	0.01680	0.00145
F_fleet_2_YR_1881_s_1	0.01528	0.00133
F_fleet_2_YR_1882_s_1	0.01369	0.00119
F_fleet_2_YR_1883_s_1	0.01226	0.00107
F_fleet_2_YR_1884_s_1	0.01079	0.00094
F_fleet_2_YR_1885_s_1	0.00926	0.00081
F_fleet_2_YR_1886_s_1	0.00775	0.00067
F_fleet_2_YR_1887_s_1	0.00393	0.00034
F_fleet_2_YR_1888_s_1	0.00408	0.00035
F_fleet_2_YR_1889_s_1	0.00515	0.00044
F_fleet_2_YR_1890_s_1	0.00463	0.00040
F_fleet_2_YR_1891_s_1	0.00514	0.00044
F_fleet_2_YR_1892_s_1	0.00559	0.00048
F_fleet_2_YR_1893_s_1	0.00595	0.00051

F_fleet_2_YR_1894_s_1	0.00620	0.00054
F_fleet_2_YR_1895_s_1	0.00638	0.00055
F_fleet_2_YR_1896_s_1	0.00652	0.00056
F_fleet_2_YR_1897_s_1	0.00652	0.00056
F_fleet_2_YR_1898_s_1	0.01044	0.00090
F_fleet_2_YR_1899_s_1	0.01391	0.00121
F_fleet_2_YR_1900_s_1	0.01723	0.00150
F_fleet_2_YR_1901_s_1	0.01990	0.00176
F_fleet_2_YR_1902_s_1	0.02213	0.00211
F_fleet_2_YR_1903_s_1	0.02098	0.00225
F_fleet_2_YR_1904_s_1	0.02012	0.00244
F_fleet_2_YR_1905_s_1	0.01876	0.00248
F_fleet_2_YR_1906_s_1	0.01730	0.00238
F_fleet_2_YR_1907_s_1	0.01577	0.00220
F_fleet_2_YR_1908_s_1	0.01462	0.00204
F_fleet_2_YR_1909_s_1	0.01255	0.00175
F_fleet_2_YR_1910_s_1	0.01063	0.00148
F_fleet_2_YR_1911_s_1	0.01039	0.00144
F_fleet_2_YR_1912_s_1	0.01017	0.00141
F_fleet_2_YR_1913_s_1	0.00997	0.00138
F_fleet_2_YR_1914_s_1	0.00977	0.00135
F_fleet_2_YR_1915_s_1	0.00958	0.00132
F_fleet_2_YR_1916_s_1	0.00937	0.00129
F_fleet_2_YR_1917_s_1	0.00918	0.00127
F_fleet_2_YR_1918_s_1	0.00899	0.00124
F_fleet_2_YR_1919_s_1	0.00923	0.00127
F_fleet_2_YR_1920_s_1	0.00947	0.00130
F_fleet_2_YR_1921_s_1	0.00974	0.00134
F_fleet_2_YR_1922_s_1	0.00999	0.00137
F_fleet_2_YR_1923_s_1	0.01024	0.00141
F_fleet_2_YR_1924_s_1	0.00990	0.00136
F_fleet_2_YR_1925_s_1	0.00956	0.00131
F_fleet_2_YR_1926_s_1	0.00922	0.00126
F_fleet_2_YR_1927_s_1	0.01157	0.00158
F_fleet_2_YR_1928_s_1	0.00844	0.00115
F_fleet_2_YR_1929_s_1	0.00825	0.00112
F_fleet_2_YR_1930_s_1	0.01096	0.00149
F_fleet_2_YR_1931_s_1	0.00680	0.00092
F_fleet_2_YR_1932_s_1	0.00816	0.00110
F_fleet_2_YR_1933_s_1	0.00889	0.00120
F_fleet_2_YR_1934_s_1	0.00925	0.00125
F_fleet_2_YR_1935_s_1	0.01348	0.00182
F_fleet_2_YR_1936_s_1	0.01752	0.00236
F_fleet_2_YR_1937_s_1	0.01919	0.00259
F_fleet_2_YR_1938_s_1	0.01912	0.00259
F_fleet_2_YR_1939_s_1	0.01758	0.00237
F_fleet_2_YR_1940_s_1	0.01686	0.00227
F_fleet_2_YR_1941_s_1	0.01529	0.00205
F_fleet_2_YR_1942_s_1	0.01130	0.00151
F_fleet_2_YR_1943_s_1	0.00770	0.00102
F_fleet_2_YR_1944_s_1	0.00578	0.00076
F_fleet_2_YR_1945_s_1	0.00317	0.00041
F_fleet_2_YR_1946_s_1	0.00666	0.00086
F_fleet_2_YR_1947_s_1	0.00989	0.00127

F_fleet_2_YR_1948_s_1	0.01239	0.00159
F_fleet_2_YR_1949_s_1	0.01830	0.00235
F_fleet_2_YR_1950_s_1	0.03221	0.00420
F_fleet_2_YR_1951_s_1	0.03459	0.00467
F_fleet_2_YR_1952_s_1	0.04188	0.00586
F_fleet_2_YR_1953_s_1	0.03720	0.00537
F_fleet_2_YR_1954_s_1	0.04017	0.00595
F_fleet_2_YR_1955_s_1	0.04694	0.00713
F_fleet_2_YR_1956_s_1	0.06808	0.01066
F_fleet_2_YR_1957_s_1	0.07319	0.01186
F_fleet_2_YR_1958_s_1	0.13333	0.02268
F_fleet_2_YR_1959_s_1	0.15234	0.02763
F_fleet_2_YR_1960_s_1	0.18115	0.03531
F_fleet_2_YR_1961_s_1	0.24838	0.05280
F_fleet_2_YR_1962_s_1	0.28479	0.06634
F_fleet_2_YR_1963_s_1	0.29358	0.07372
F_fleet_2_YR_1964_s_1	0.32251	0.08619
F_fleet_2_YR_1965_s_1	0.36534	0.10454
F_fleet_2_YR_1966_s_1	0.33461	0.10162
F_fleet_2_YR_1967_s_1	0.52529	0.17382
F_fleet_2_YR_1968_s_1	0.80545	0.30829
F_fleet_2_YR_1969_s_1	0.85081	0.36569
F_fleet_2_YR_1970_s_1	1.22323	0.55336
F_fleet_2_YR_1971_s_1	1.96297	0.90061
F_fleet_2_YR_1972_s_1	2.39449	1.02565
F_fleet_2_YR_1973_s_1	2.42636	0.78342
F_fleet_2_YR_1974_s_1	1.08961	0.21922
F_fleet_2_YR_1975_s_1	0.61204	0.15674
F_fleet_2_YR_1976_s_1	0.56117	0.19665
F_fleet_2_YR_1977_s_1	0.66473	0.30373
F_fleet_2_YR_1978_s_1	0.81260	0.40696
F_fleet_2_YR_1979_s_1	0.89836	0.44022
F_fleet_2_YR_1980_s_1	1.20410	0.61764
F_fleet_2_YR_1981_s_1	1.60845	0.49331
F_fleet_2_YR_1982_s_1	0.96218	0.15902
F_fleet_2_YR_1983_s_1	0.53183	0.07010
F_fleet_2_YR_1984_s_1	0.29736	0.03312
F_fleet_2_YR_1985_s_1	0.17549	0.01854
F_fleet_2_YR_1986_s_1	0.18322	0.01776
F_fleet_2_YR_1987_s_1	0.15560	0.01453
F_fleet_2_YR_1988_s_1	0.26788	0.02231
F_fleet_2_YR_1989_s_1	0.25501	0.02102
F_fleet_2_YR_1990_s_1	0.26649	0.02205
F_fleet_2_YR_1991_s_1	0.22502	0.01771
F_fleet_2_YR_1992_s_1	0.24729	0.01796
F_fleet_2_YR_1993_s_1	0.23628	0.01676
F_fleet_2_YR_1994_s_1	0.20253	0.01412
F_fleet_2_YR_1995_s_1	0.20787	0.01432
F_fleet_2_YR_1996_s_1	0.30968	0.02032
F_fleet_2_YR_1997_s_1	0.36892	0.02385
F_fleet_2_YR_1998_s_1	0.35376	0.02306
F_fleet_2_YR_1999_s_1	0.35494	0.02286
F_fleet_2_YR_2000_s_1	0.34487	0.02247
F_fleet_2_YR_2001_s_1	0.34533	0.02301

F_fleet_2_YR_2002_s_1	0.33465	0.02225
F_fleet_2_YR_2003_s_1	0.30308	0.02019
F_fleet_2_YR_2004_s_1	0.31351	0.02114
F_fleet_2_YR_2005_s_1	0.29823	0.02085
F_fleet_2_YR_2006_s_1	0.32567	0.02430
F_fleet_2_YR_2007_s_1	0.15948	0.01384
F_fleet_2_YR_2008_s_1	0.08988	0.00739
F_fleet_2_YR_2009_s_1	0.06168	0.00528
F_fleet_2_YR_2010_s_1	0.06000	0.00494
F_fleet_2_YR_2011_s_1	0.05549	0.00444
F_fleet_2_YR_2012_s_1	0.05766	0.00462
F_fleet_2_YR_2013_s_1	0.07267	0.00579
F_fleet_2_YR_2014_s_1	0.07242	0.00579
F_fleet_2_YR_2015_s_1	0.08490	0.00689
F_fleet_2_YR_2016_s_1	0.07461	0.00623
F_fleet_3_YR_1980_s_1	0.02549	0.00728
F_fleet_3_YR_1981_s_1	0.06321	0.01886
F_fleet_3_YR_1982_s_1	0.12313	0.04135
F_fleet_3_YR_1983_s_1	0.35071	0.11956
F_fleet_3_YR_1984_s_1	0.31399	0.08768
F_fleet_3_YR_1985_s_1	0.06818	0.01381
F_fleet_3_YR_1986_s_1	0.03172	0.00552
F_fleet_3_YR_1987_s_1	0.02562	0.00410
F_fleet_3_YR_1988_s_1	0.04321	0.00690
F_fleet_3_YR_1989_s_1	0.06996	0.01174
F_fleet_3_YR_1990_s_1	0.08992	0.01589
F_fleet_3_YR_1991_s_1	0.02819	0.00510
F_fleet_3_YR_1992_s_1	0.00643	0.00107
F_fleet_3_YR_1993_s_1	0.01405	0.00223
F_fleet_3_YR_1994_s_1	0.00756	0.00118
F_fleet_3_YR_1995_s_1	0.00783	0.00121
F_fleet_3_YR_1996_s_1	0.00671	0.00102
F_fleet_3_YR_1997_s_1	0.00382	0.00057
F_fleet_3_YR_1998_s_1	0.00354	0.00053
F_fleet_3_YR_1999_s_1	0.00263	0.00039
F_fleet_3_YR_2000_s_1	0.00237	0.00033
F_fleet_3_YR_2001_s_1	0.00243	0.00031
F_fleet_3_YR_2002_s_1	0.00466	0.00057
F_fleet_3_YR_2003_s_1	0.00380	0.00048
F_fleet_3_YR_2004_s_1	0.00509	0.00068
F_fleet_3_YR_2005_s_1	0.00523	0.00070
F_fleet_3_YR_2006_s_1	0.00340	0.00044
F_fleet_3_YR_2007_s_1	0.00338	0.00033
F_fleet_3_YR_2008_s_1	0.00525	0.00052
F_fleet_3_YR_2009_s_1	0.00142	0.00013
F_fleet_3_YR_2010_s_1	0.00554	0.00050
F_fleet_3_YR_2011_s_1	0.00501	0.00043
F_fleet_3_YR_2012_s_1	0.00312	0.00027
F_fleet_3_YR_2013_s_1	0.00658	0.00058
F_fleet_3_YR_2014_s_1	0.00716	0.00067
F_fleet_3_YR_2015_s_1	0.01633	0.00163
F_fleet_3_YR_2016_s_1	0.01365	0.00152
F_fleet_4_YR_1976_s_1	0.00009	0.00002
F_fleet_4_YR_1980_s_1	0.00650	0.00168

F_fleet_4_YR_1981_s_1	0.00858	0.00223
F_fleet_4_YR_1982_s_1	0.01423	0.00363
F_fleet_4_YR_1983_s_1	0.02113	0.00515
F_fleet_4_YR_1984_s_1	0.16773	0.03730
F_fleet_4_YR_1985_s_1	0.12349	0.02335
F_fleet_4_YR_1986_s_1	0.14342	0.02328
F_fleet_4_YR_1987_s_1	0.10624	0.01590
F_fleet_4_YR_1988_s_1	0.08726	0.01227
F_fleet_4_YR_1989_s_1	0.05864	0.00800
F_fleet_4_YR_1990_s_1	0.01443	0.00194
F_fleet_4_YR_1991_s_1	0.00876	0.00116
F_fleet_4_YR_1992_s_1	0.00225	0.00029
F_fleet_4_YR_1993_s_1	0.00223	0.00029
F_fleet_4_YR_1994_s_1	0.00164	0.00021
F_fleet_4_YR_1995_s_1	0.00165	0.00021
F_fleet_4_YR_1996_s_1	0.00233	0.00030
F_fleet_4_YR_1997_s_1	0.00250	0.00031
F_fleet_4_YR_1998_s_1	0.00213	0.00027
F_fleet_4_YR_1999_s_1	0.00687	0.00086
F_fleet_4_YR_2000_s_1	0.01297	0.00164
F_fleet_4_YR_2001_s_1	0.00862	0.00110
F_fleet_4_YR_2002_s_1	0.01010	0.00129
F_fleet_4_YR_2003_s_1	0.01195	0.00154
F_fleet_4_YR_2004_s_1	0.03135	0.00411
F_fleet_4_YR_2005_s_1	0.01974	0.00263
F_fleet_4_YR_2006_s_1	0.01787	0.00241
F_fleet_4_YR_2007_s_1	0.01273	0.00184
F_fleet_4_YR_2008_s_1	0.00352	0.00051
F_fleet_4_YR_2009_s_1	0.00264	0.00039
F_fleet_4_YR_2010_s_1	0.00170	0.00025
F_fleet_4_YR_2011_s_1	0.00071	0.00010
F_fleet_4_YR_2012_s_1	0.00038	0.00005
F_fleet_4_YR_2013_s_1	0.00122	0.00016
F_fleet_4_YR_2014_s_1	0.00119	0.00014
F_fleet_4_YR_2015_s_1	0.00084	0.00009
F_fleet_4_YR_2016_s_1	0.00082	0.00009
F_fleet_5_YR_1950_s_1	0.02843	0.00389
F_fleet_5_YR_1951_s_1	0.03779	0.00526
F_fleet_5_YR_1952_s_1	0.04814	0.00683
F_fleet_5_YR_1953_s_1	0.05931	0.00857
F_fleet_5_YR_1954_s_1	0.07104	0.01043
F_fleet_5_YR_1955_s_1	0.08374	0.01252
F_fleet_5_YR_1956_s_1	0.09819	0.01506
F_fleet_5_YR_1957_s_1	0.11072	0.01742
F_fleet_5_YR_1958_s_1	0.12659	0.02072
F_fleet_5_YR_1959_s_1	0.14567	0.02502
F_fleet_5_YR_1960_s_1	0.16698	0.03029
F_fleet_5_YR_1961_s_1	0.18158	0.03476
F_fleet_5_YR_1962_s_1	0.19605	0.03954
F_fleet_5_YR_1963_s_1	0.20769	0.04360
F_fleet_5_YR_1964_s_1	0.22181	0.04900
F_fleet_5_YR_1965_s_1	0.24240	0.05743
F_fleet_5_YR_1966_s_1	0.26439	0.06617
F_fleet_5_YR_1967_s_1	0.28287	0.07380

F_fleet_5_YR_1968_s_1	0.29915	0.08050
F_fleet_5_YR_1969_s_1	0.31338	0.08630
F_fleet_5_YR_1970_s_1	0.32927	0.09253
F_fleet_5_YR_1971_s_1	0.35777	0.10277
F_fleet_5_YR_1972_s_1	0.39939	0.11950
F_fleet_5_YR_1973_s_1	0.44817	0.13529
F_fleet_5_YR_1974_s_1	0.14639	0.01846
F_fleet_5_YR_1975_s_1	0.19459	0.02453
F_fleet_5_YR_1976_s_1	0.26801	0.03752
F_fleet_5_YR_1977_s_1	0.32356	0.04644
F_fleet_5_YR_1978_s_1	0.33494	0.04449
F_fleet_5_YR_1979_s_1	0.32659	0.03823
F_fleet_5_YR_1980_s_1	0.43669	0.05520
F_fleet_5_YR_1981_s_1	0.76583	0.11217
F_fleet_5_YR_1982_s_1	0.62650	0.08720
F_fleet_5_YR_1983_s_1	0.36961	0.03928
F_fleet_5_YR_1984_s_1	0.06164	0.00496
F_fleet_5_YR_1985_s_1	0.24473	0.01928
F_fleet_5_YR_1986_s_1	0.46762	0.03783
F_fleet_5_YR_1987_s_1	0.63550	0.05695
F_fleet_5_YR_1988_s_1	0.76843	0.06650
F_fleet_5_YR_1989_s_1	0.86176	0.06610
F_fleet_5_YR_1990_s_1	0.61872	0.04984
F_fleet_5_YR_1991_s_1	0.57700	0.04456
F_fleet_5_YR_1992_s_1	0.65299	0.04456
F_fleet_5_YR_1993_s_1	0.95455	0.06430
F_fleet_5_YR_1994_s_1	0.78238	0.05085
F_fleet_5_YR_1995_s_1	0.83164	0.05942
F_fleet_5_YR_1996_s_1	0.68625	0.04827
F_fleet_5_YR_1997_s_1	0.89874	0.05855
F_fleet_5_YR_1998_s_1	0.47767	0.03115
F_fleet_5_YR_1999_s_1	0.40110	0.02548
F_fleet_5_YR_2000_s_1	0.44122	0.02817
F_fleet_5_YR_2001_s_1	0.57086	0.03864
F_fleet_5_YR_2002_s_1	0.70953	0.04592
F_fleet_5_YR_2003_s_1	0.57347	0.03603
F_fleet_5_YR_2004_s_1	0.74354	0.04547
F_fleet_5_YR_2005_s_1	0.47461	0.03102
F_fleet_5_YR_2006_s_1	0.37407	0.02452
F_fleet_5_YR_2007_s_1	0.45224	0.02831
F_fleet_5_YR_2008_s_1	0.19613	0.01584
F_fleet_5_YR_2009_s_1	0.17591	0.01453
F_fleet_5_YR_2010_s_1	0.06708	0.00611
F_fleet_5_YR_2011_s_1	0.13014	0.00842
F_fleet_5_YR_2012_s_1	0.12229	0.00813
F_fleet_5_YR_2013_s_1	0.22357	0.01533
F_fleet_5_YR_2014_s_1	0.08195	0.00625
F_fleet_5_YR_2015_s_1	0.13264	0.01106
F_fleet_5_YR_2016_s_1	0.20320	0.01959
F_fleet_6_YR_1950_s_1	0.02355	0.00382
F_fleet_6_YR_1951_s_1	0.03441	0.00570
F_fleet_6_YR_1952_s_1	0.04611	0.00780
F_fleet_6_YR_1953_s_1	0.05830	0.01002
F_fleet_6_YR_1954_s_1	0.07112	0.01239

F_fleet_6_YR_1955_s_1	0.08450	0.01495
F_fleet_6_YR_1956_s_1	0.09991	0.01796
F_fleet_6_YR_1957_s_1	0.11220	0.02063
F_fleet_6_YR_1958_s_1	0.12831	0.02419
F_fleet_6_YR_1959_s_1	0.14829	0.02888
F_fleet_6_YR_1960_s_1	0.17455	0.03516
F_fleet_6_YR_1961_s_1	0.19510	0.04126
F_fleet_6_YR_1962_s_1	0.21479	0.04773
F_fleet_6_YR_1963_s_1	0.22488	0.05203
F_fleet_6_YR_1964_s_1	0.23507	0.05610
F_fleet_6_YR_1965_s_1	0.25141	0.06214
F_fleet_6_YR_1966_s_1	0.26730	0.06820
F_fleet_6_YR_1967_s_1	0.30146	0.08228
F_fleet_6_YR_1968_s_1	0.36567	0.11361
F_fleet_6_YR_1969_s_1	0.44652	0.15542
F_fleet_6_YR_1970_s_1	0.52881	0.20624
F_fleet_6_YR_1971_s_1	0.80601	0.37059
F_fleet_6_YR_1972_s_1	1.10472	0.55457
F_fleet_6_YR_1973_s_1	1.05150	0.39694
F_fleet_6_YR_1974_s_1	0.23724	0.04853
F_fleet_6_YR_1975_s_1	0.29792	0.05821
F_fleet_6_YR_1976_s_1	0.50057	0.12789
F_fleet_6_YR_1977_s_1	0.55646	0.15417
F_fleet_6_YR_1978_s_1	0.61286	0.18420
F_fleet_6_YR_1979_s_1	0.60554	0.18647
F_fleet_6_YR_1980_s_1	0.84127	0.31356
F_fleet_6_YR_1981_s_1	0.73874	0.16214
F_fleet_6_YR_1982_s_1	0.21185	0.02885
F_fleet_6_YR_1983_s_1	0.27489	0.02516
F_fleet_6_YR_1984_s_1	0.12905	0.01130
F_fleet_6_YR_1985_s_1	0.21088	0.01672
F_fleet_6_YR_1986_s_1	0.17885	0.01543
F_fleet_6_YR_1987_s_1	0.08279	0.00644
F_fleet_6_YR_1988_s_1	0.16306	0.01183
F_fleet_6_YR_1989_s_1	0.14960	0.01105
F_fleet_6_YR_1990_s_1	0.08470	0.00611
F_fleet_6_YR_1991_s_1	0.09493	0.00611
F_fleet_6_YR_1992_s_1	0.10072	0.00650
F_fleet_6_YR_1993_s_1	0.12604	0.00807
F_fleet_6_YR_1994_s_1	0.11669	0.00773
F_fleet_6_YR_1995_s_1	0.18466	0.01262
F_fleet_6_YR_1996_s_1	0.11012	0.00747
F_fleet_6_YR_1997_s_1	0.11271	0.00752
F_fleet_6_YR_1998_s_1	0.08317	0.00565
F_fleet_6_YR_1999_s_1	0.07622	0.00531
F_fleet_6_YR_2000_s_1	0.10841	0.00799
F_fleet_6_YR_2001_s_1	0.07919	0.00589
F_fleet_6_YR_2002_s_1	0.07001	0.00494
F_fleet_6_YR_2003_s_1	0.08311	0.00586
F_fleet_6_YR_2004_s_1	0.10523	0.00776
F_fleet_6_YR_2005_s_1	0.11143	0.00838
F_fleet_6_YR_2006_s_1	0.12226	0.00952
F_fleet_6_YR_2007_s_1	0.12616	0.01065
F_fleet_6_YR_2008_s_1	0.03367	0.00271

F_fleet_6_YR_2009_s_1	0.03792	0.00308
F_fleet_6_YR_2010_s_1	0.00703	0.00056
F_fleet_6_YR_2011_s_1	0.01506	0.00119
F_fleet_6_YR_2012_s_1	0.03472	0.00275
F_fleet_6_YR_2013_s_1	0.01643	0.00127
F_fleet_6_YR_2014_s_1	0.01176	0.00092
F_fleet_6_YR_2015_s_1	0.01923	0.00154
F_fleet_6_YR_2016_s_1	0.01684	0.00137
F_fleet_7_YR_1950_s_1	0.02843	0.00416
F_fleet_7_YR_1951_s_1	0.02975	0.00448
F_fleet_7_YR_1952_s_1	0.03139	0.00487
F_fleet_7_YR_1953_s_1	0.03316	0.00529
F_fleet_7_YR_1954_s_1	0.03492	0.00571
F_fleet_7_YR_1955_s_1	0.03684	0.00618
F_fleet_7_YR_1956_s_1	0.03928	0.00679
F_fleet_7_YR_1957_s_1	0.04195	0.00749
F_fleet_7_YR_1958_s_1	0.04573	0.00857
F_fleet_7_YR_1959_s_1	0.05083	0.01013
F_fleet_7_YR_1960_s_1	0.05664	0.01207
F_fleet_7_YR_1961_s_1	0.06306	0.01438
F_fleet_7_YR_1962_s_1	0.06963	0.01693
F_fleet_7_YR_1963_s_1	0.07538	0.01925
F_fleet_7_YR_1964_s_1	0.08180	0.02209
F_fleet_7_YR_1965_s_1	0.09157	0.02685
F_fleet_7_YR_1966_s_1	0.10084	0.03160
F_fleet_7_YR_1967_s_1	0.10816	0.03547
F_fleet_7_YR_1968_s_1	0.11435	0.03878
F_fleet_7_YR_1969_s_1	0.11921	0.04135
F_fleet_7_YR_1970_s_1	0.12406	0.04392
F_fleet_7_YR_1971_s_1	0.13027	0.04706
F_fleet_7_YR_1972_s_1	0.14162	0.05325
F_fleet_7_YR_1973_s_1	0.14588	0.05058
F_fleet_7_YR_1974_s_1	0.07253	0.01197
F_fleet_7_YR_1975_s_1	0.04858	0.00734
F_fleet_7_YR_1976_s_1	0.06833	0.01172
F_fleet_7_YR_1977_s_1	0.08640	0.01579
F_fleet_7_YR_1978_s_1	0.09282	0.01591
F_fleet_7_YR_1979_s_1	0.09115	0.01370
F_fleet_7_YR_1980_s_1	0.10405	0.01655
F_fleet_7_YR_1981_s_1	0.05400	0.01025
F_fleet_7_YR_1982_s_1	0.21962	0.03791
F_fleet_7_YR_1983_s_1	0.28219	0.03773
F_fleet_7_YR_1984_s_1	0.02271	0.00245
F_fleet_7_YR_1985_s_1	0.05118	0.00465
F_fleet_7_YR_1986_s_1	0.01353	0.00133
F_fleet_7_YR_1987_s_1	0.01067	0.00111
F_fleet_7_YR_1988_s_1	0.02405	0.00264
F_fleet_7_YR_1989_s_1	0.02080	0.00211
F_fleet_7_YR_1990_s_1	0.03477	0.00340
F_fleet_7_YR_1991_s_1	0.02211	0.00210
F_fleet_7_YR_1992_s_1	0.02767	0.00229
F_fleet_7_YR_1993_s_1	0.03020	0.00248
F_fleet_7_YR_1994_s_1	0.02754	0.00220
F_fleet_7_YR_1995_s_1	0.02997	0.00250

F_fleet_7_YR_1996_s_1	0.03265	0.00269
F_fleet_7_YR_1997_s_1	0.04861	0.00390
F_fleet_7_YR_1998_s_1	0.04551	0.00352
F_fleet_7_YR_1999_s_1	0.03378	0.00241
F_fleet_7_YR_2000_s_1	0.02972	0.00207
F_fleet_7_YR_2001_s_1	0.03052	0.00219
F_fleet_7_YR_2002_s_1	0.04197	0.00308
F_fleet_7_YR_2003_s_1	0.03537	0.00251
F_fleet_7_YR_2004_s_1	0.03436	0.00246
F_fleet_7_YR_2005_s_1	0.02515	0.00182
F_fleet_7_YR_2006_s_1	0.02187	0.00156
F_fleet_7_YR_2007_s_1	0.02341	0.00166
F_fleet_7_YR_2008_s_1	0.01968	0.00162
F_fleet_7_YR_2009_s_1	0.01923	0.00155
F_fleet_7_YR_2010_s_1	0.00668	0.00052
F_fleet_7_YR_2011_s_1	0.01270	0.00085
F_fleet_7_YR_2012_s_1	0.01102	0.00077
F_fleet_7_YR_2013_s_1	0.01032	0.00076
F_fleet_7_YR_2014_s_1	0.01126	0.00090
F_fleet_7_YR_2015_s_1	0.01291	0.00112
F_fleet_7_YR_2016_s_1	0.01252	0.00122
F_fleet_8_YR_1950_s_1	0.04996	0.00768
F_fleet_8_YR_1951_s_1	0.05392	0.00861
F_fleet_8_YR_1952_s_1	0.05801	0.00957
F_fleet_8_YR_1953_s_1	0.06182	0.01047
F_fleet_8_YR_1954_s_1	0.06525	0.01130
F_fleet_8_YR_1955_s_1	0.06869	0.01214
F_fleet_8_YR_1956_s_1	0.07278	0.01321
F_fleet_8_YR_1957_s_1	0.07736	0.01440
F_fleet_8_YR_1958_s_1	0.08340	0.01614
F_fleet_8_YR_1959_s_1	0.09208	0.01873
F_fleet_8_YR_1960_s_1	0.10322	0.02223
F_fleet_8_YR_1961_s_1	0.11854	0.02731
F_fleet_8_YR_1962_s_1	0.13592	0.03362
F_fleet_8_YR_1963_s_1	0.14982	0.03904
F_fleet_8_YR_1964_s_1	0.15972	0.04358
F_fleet_8_YR_1965_s_1	0.17182	0.04954
F_fleet_8_YR_1966_s_1	0.18222	0.05471
F_fleet_8_YR_1967_s_1	0.20205	0.06600
F_fleet_8_YR_1968_s_1	0.25350	0.09680
F_fleet_8_YR_1969_s_1	0.32593	0.14302
F_fleet_8_YR_1970_s_1	0.41361	0.19810
F_fleet_8_YR_1971_s_1	0.61196	0.32592
F_fleet_8_YR_1972_s_1	0.86980	0.46084
F_fleet_8_YR_1973_s_1	0.93785	0.42489
F_fleet_8_YR_1974_s_1	0.21850	0.04946
F_fleet_8_YR_1975_s_1	0.14626	0.03745
F_fleet_8_YR_1976_s_1	0.19535	0.06561
F_fleet_8_YR_1977_s_1	0.28884	0.11582
F_fleet_8_YR_1978_s_1	0.35461	0.15570
F_fleet_8_YR_1979_s_1	0.39031	0.17051
F_fleet_8_YR_1980_s_1	0.53552	0.27865
F_fleet_8_YR_1981_s_1	0.47087	0.15274
F_fleet_8_YR_1982_s_1	0.20765	0.03773

F_fleet_8_YR_1983_s_1	0.10725	0.01331
F_fleet_8_YR_1984_s_1	0.09482	0.00951
F_fleet_8_YR_1985_s_1	0.12108	0.01171
F_fleet_8_YR_1986_s_1	0.12299	0.01129
F_fleet_8_YR_1987_s_1	0.15780	0.01466
F_fleet_8_YR_1988_s_1	0.20756	0.01717
F_fleet_8_YR_1989_s_1	0.21157	0.01734
F_fleet_8_YR_1990_s_1	0.12353	0.01032
F_fleet_8_YR_1991_s_1	0.12493	0.00978
F_fleet_8_YR_1992_s_1	0.12773	0.00884
F_fleet_8_YR_1993_s_1	0.13560	0.00947
F_fleet_8_YR_1994_s_1	0.15573	0.01076
F_fleet_8_YR_1995_s_1	0.12491	0.00882
F_fleet_8_YR_1996_s_1	0.12379	0.00855
F_fleet_8_YR_1997_s_1	0.12243	0.00841
F_fleet_8_YR_1998_s_1	0.08351	0.00581
F_fleet_8_YR_1999_s_1	0.03561	0.00255
F_fleet_8_YR_2000_s_1	0.04887	0.00363
F_fleet_8_YR_2001_s_1	0.05862	0.00449
F_fleet_8_YR_2002_s_1	0.06719	0.00495
F_fleet_8_YR_2003_s_1	0.07634	0.00552
F_fleet_8_YR_2004_s_1	0.05983	0.00453
F_fleet_8_YR_2005_s_1	0.05525	0.00429
F_fleet_8_YR_2006_s_1	0.05821	0.00460
F_fleet_8_YR_2007_s_1	0.04016	0.00335
F_fleet_8_YR_2008_s_1	0.02036	0.00179
F_fleet_8_YR_2009_s_1	0.01942	0.00176
F_fleet_8_YR_2010_s_1	0.01041	0.00093
F_fleet_8_YR_2011_s_1	0.00974	0.00083
F_fleet_8_YR_2012_s_1	0.01031	0.00087
F_fleet_8_YR_2013_s_1	0.00740	0.00064
F_fleet_8_YR_2014_s_1	0.00561	0.00047
F_fleet_8_YR_2015_s_1	0.00888	0.00075
F_fleet_8_YR_2016_s_1	0.00781	0.00066
F_fleet_9_YR_1991_s_1	0.10764	0.03495
F_fleet_9_YR_1992_s_1	0.24944	0.08195
F_fleet_9_YR_1993_s_1	0.21765	0.07677
F_fleet_9_YR_1994_s_1	0.28803	0.08435
F_fleet_9_YR_1995_s_1	0.23403	0.06480
F_fleet_9_YR_1996_s_1	0.22521	0.05854
F_fleet_9_YR_1997_s_1	0.13517	0.03592
F_fleet_9_YR_1998_s_1	0.11227	0.03038
F_fleet_9_YR_1999_s_1	0.14431	0.04034
F_fleet_9_YR_2000_s_1	0.09020	0.02763
F_fleet_9_YR_2001_s_1	0.07596	0.02213
F_fleet_9_YR_2002_s_1	0.03998	0.01190
F_fleet_9_YR_2003_s_1	0.11378	0.03199
F_fleet_9_YR_2004_s_1	0.06192	0.01811
F_fleet_9_YR_2005_s_1	0.04089	0.01243
F_fleet_9_YR_2006_s_1	0.02360	0.00714
F_fleet_9_YR_2007_s_1	0.01366	0.00410
F_fleet_9_YR_2008_s_1	0.03151	0.00937
F_fleet_9_YR_2009_s_1	0.03480	0.01057
F_fleet_9_YR_2010_s_1	0.00586	0.00179

F_fleet_9_YR_2011_s_1	0.22253	0.06224
F_fleet_9_YR_2012_s_1	0.00376	0.00115
F_fleet_9_YR_2013_s_1	0.00156	0.00048
F_fleet_9_YR_2014_s_1	0.01082	0.00334
F_fleet_9_YR_2015_s_1	0.01264	0.00394
F_fleet_9_YR_2016_s_1	0.00283	0.00088
F_fleet_10_YR_1991_s_1	0.04338	0.01344
F_fleet_10_YR_1992_s_1	0.05238	0.01617
F_fleet_10_YR_1993_s_1	0.02322	0.00718
F_fleet_10_YR_1994_s_1	0.01445	0.00444
F_fleet_10_YR_1995_s_1	0.01449	0.00444
F_fleet_10_YR_1996_s_1	0.01520	0.00463
F_fleet_10_YR_1997_s_1	0.02304	0.00709
F_fleet_10_YR_1998_s_1	0.02415	0.00761
F_fleet_10_YR_1999_s_1	0.02079	0.00648
F_fleet_10_YR_2000_s_1	0.02778	0.00866
F_fleet_10_YR_2001_s_1	0.02307	0.00707
F_fleet_10_YR_2002_s_1	0.05358	0.01585
F_fleet_10_YR_2003_s_1	0.01492	0.00458
F_fleet_10_YR_2004_s_1	0.01656	0.00503
F_fleet_10_YR_2005_s_1	0.01161	0.00356
F_fleet_10_YR_2006_s_1	0.00562	0.00175
F_fleet_10_YR_2007_s_1	0.00683	0.00214
F_fleet_10_YR_2008_s_1	0.07252	0.10962
F_fleet_10_YR_2009_s_1	0.00005	0.00002
F_fleet_10_YR_2010_s_1	0.00040	0.00012
F_fleet_10_YR_2011_s_1	0.00010	0.00003
F_fleet_10_YR_2012_s_1	0.03100	0.00967
F_fleet_10_YR_2013_s_1	0.00002	0.00001
F_fleet_10_YR_2014_s_1	0.05923	0.01837
F_fleet_10_YR_2015_s_1	0.00016	0.00005
F_fleet_10_YR_2016_s_1	0.00079	0.00025
F_fleet_11_YR_1997_s_1	0.03140	0.00944
F_fleet_11_YR_1998_s_1	0.04859	0.01446
F_fleet_11_YR_1999_s_1	0.04974	0.01497
F_fleet_11_YR_2000_s_1	0.15911	0.04789
F_fleet_11_YR_2001_s_1	0.22346	0.06255
F_fleet_11_YR_2002_s_1	0.18867	0.05368
F_fleet_11_YR_2003_s_1	0.14154	0.04080
F_fleet_11_YR_2004_s_1	0.08823	0.02597
F_fleet_11_YR_2005_s_1	0.11713	0.03481
F_fleet_11_YR_2006_s_1	0.08105	0.02394
F_fleet_11_YR_2007_s_1	0.07342	0.02123
F_fleet_11_YR_2008_s_1	0.17668	0.05340
F_fleet_11_YR_2009_s_1	0.11082	0.03410
F_fleet_11_YR_2010_s_1	0.12459	0.03775
F_fleet_11_YR_2011_s_1	0.20000	0.06188
F_fleet_11_YR_2012_s_1	0.16323	0.04968
F_fleet_11_YR_2013_s_1	0.24948	0.07369
F_fleet_11_YR_2014_s_1	0.27465	0.08613
F_fleet_11_YR_2015_s_1	0.23269	0.07452
F_fleet_11_YR_2016_s_1	0.41359	0.13016
F_fleet_12_YR_1997_s_1	0.00052	0.00016
F_fleet_12_YR_1998_s_1	0.00275	0.00083

F_fleet_12_YR_1999_s_1	0.00693	0.00210
F_fleet_12_YR_2000_s_1	0.02341	0.00708
F_fleet_12_YR_2001_s_1	0.00760	0.00229
F_fleet_12_YR_2002_s_1	0.00660	0.00199
F_fleet_12_YR_2003_s_1	0.01711	0.00518
F_fleet_12_YR_2004_s_1	0.10029	0.03038
F_fleet_12_YR_2005_s_1	0.06239	0.01893
F_fleet_12_YR_2006_s_1	0.04124	0.01257
F_fleet_12_YR_2007_s_1	0.03331	0.01019
F_fleet_12_YR_2008_s_1	0.07171	0.02273
F_fleet_12_YR_2009_s_1	0.06041	0.01930
F_fleet_12_YR_2010_s_1	0.00212	0.00069
F_fleet_12_YR_2011_s_1	0.04747	0.01459
F_fleet_12_YR_2012_s_1	0.06690	0.02066
F_fleet_12_YR_2013_s_1	0.02053	0.00632
F_fleet_12_YR_2014_s_1	0.02418	0.00742
F_fleet_12_YR_2015_s_1	0.02144	0.00657
F_fleet_12_YR_2016_s_1	0.03232	0.00994
F_fleet_13_YR_1950_s_1	0.00566	0.00081
F_fleet_13_YR_1951_s_1	0.00975	0.00140
F_fleet_13_YR_1952_s_1	0.01152	0.00165
F_fleet_13_YR_1953_s_1	0.01272	0.00182
F_fleet_13_YR_1954_s_1	0.01631	0.00233
F_fleet_13_YR_1955_s_1	0.01927	0.00276
F_fleet_13_YR_1956_s_1	0.02440	0.00349
F_fleet_13_YR_1957_s_1	0.02672	0.00382
F_fleet_13_YR_1958_s_1	0.02827	0.00405
F_fleet_13_YR_1959_s_1	0.03068	0.00439
F_fleet_13_YR_1960_s_1	0.03011	0.00431
F_fleet_13_YR_1961_s_1	0.02184	0.00313
F_fleet_13_YR_1962_s_1	0.02085	0.00298
F_fleet_13_YR_1963_s_1	0.02340	0.00335
F_fleet_13_YR_1964_s_1	0.02777	0.00398
F_fleet_13_YR_1965_s_1	0.03013	0.00431
F_fleet_13_YR_1966_s_1	0.02822	0.00404
F_fleet_13_YR_1967_s_1	0.02678	0.00383
F_fleet_13_YR_1968_s_1	0.03155	0.00452
F_fleet_13_YR_1969_s_1	0.03077	0.00440
F_fleet_13_YR_1970_s_1	0.03032	0.00434
F_fleet_13_YR_1971_s_1	0.02612	0.00374
F_fleet_13_YR_1972_s_1	0.02817	0.00377
F_fleet_13_YR_1973_s_1	0.03107	0.00441
F_fleet_13_YR_1974_s_1	0.03004	0.00426
F_fleet_13_YR_1975_s_1	0.02996	0.00425
F_fleet_13_YR_1976_s_1	0.02778	0.00394
F_fleet_13_YR_1977_s_1	0.03314	0.00469
F_fleet_13_YR_1978_s_1	0.02545	0.00362
F_fleet_13_YR_1979_s_1	0.02620	0.00373
F_fleet_13_YR_1980_s_1	0.01604	0.00228
F_fleet_13_YR_1981_s_1	0.02524	0.00356
F_fleet_13_YR_1982_s_1	0.02524	0.00358
F_fleet_13_YR_1983_s_1	0.02757	0.00395
F_fleet_13_YR_1984_s_1	0.03238	0.00462
F_fleet_13_YR_1985_s_1	0.03121	0.00446

F_fleet_13_YR_1986_s_1	0.03222	0.00458
F_fleet_13_YR_1987_s_1	0.02617	0.00374
F_fleet_13_YR_1988_s_1	0.02466	0.00352
F_fleet_13_YR_1989_s_1	0.03010	0.00427
F_fleet_13_YR_1990_s_1	0.02624	0.00373
F_fleet_13_YR_1991_s_1	0.02707	0.00384
F_fleet_13_YR_1992_s_1	0.03271	0.00465
F_fleet_13_YR_1993_s_1	0.02698	0.00383
F_fleet_13_YR_1994_s_1	0.02788	0.00395
F_fleet_13_YR_1995_s_1	0.03281	0.00458
F_fleet_13_YR_1996_s_1	0.03711	0.00520
F_fleet_13_YR_1997_s_1	0.03923	0.00549
F_fleet_13_YR_1998_s_1	0.04921	0.00692
F_fleet_13_YR_1999_s_1	0.03030	0.00424
F_fleet_13_YR_2000_s_1	0.02612	0.00367
F_fleet_13_YR_2001_s_1	0.02923	0.00411
F_fleet_13_YR_2002_s_1	0.03476	0.00486
F_fleet_13_YR_2003_s_1	0.02903	0.00408
F_fleet_13_YR_2004_s_1	0.02876	0.00403
F_fleet_13_YR_2005_s_1	0.02421	0.00340
F_fleet_13_YR_2006_s_1	0.01578	0.00223
F_fleet_13_YR_2007_s_1	0.01185	0.00168
F_fleet_13_YR_2008_s_1	0.00774	0.00110
F_fleet_13_YR_2009_s_1	0.01195	0.00170
F_fleet_13_YR_2010_s_1	0.00748	0.00107
F_fleet_13_YR_2011_s_1	0.00931	0.00133
F_fleet_13_YR_2012_s_1	0.00919	0.00131
F_fleet_13_YR_2013_s_1	0.01067	0.00152
F_fleet_13_YR_2014_s_1	0.00796	0.00113
F_fleet_13_YR_2015_s_1	0.00660	0.00094
F_fleet_13_YR_2016_s_1	0.00692	0.00099
F_fleet_14_YR_1946_s_1	0.00225	0.00030
F_fleet_14_YR_1947_s_1	0.01149	0.00151
F_fleet_14_YR_1948_s_1	0.03019	0.00398
F_fleet_14_YR_1949_s_1	0.04878	0.00643
F_fleet_14_YR_1950_s_1	0.05893	0.00777
F_fleet_14_YR_1951_s_1	0.06198	0.00817
F_fleet_14_YR_1952_s_1	0.07314	0.00965
F_fleet_14_YR_1953_s_1	0.07134	0.00941
F_fleet_14_YR_1954_s_1	0.09413	0.01242
F_fleet_14_YR_1955_s_1	0.07766	0.01024
F_fleet_14_YR_1956_s_1	0.10135	0.01337
F_fleet_14_YR_1957_s_1	0.12709	0.01677
F_fleet_14_YR_1958_s_1	0.19610	0.02589
F_fleet_14_YR_1959_s_1	0.20955	0.02766
F_fleet_14_YR_1960_s_1	0.21457	0.02833
F_fleet_14_YR_1961_s_1	0.17121	0.02260
F_fleet_14_YR_1962_s_1	0.16654	0.02198
F_fleet_14_YR_1963_s_1	0.19320	0.02551
F_fleet_14_YR_1964_s_1	0.17624	0.02326
F_fleet_14_YR_1965_s_1	0.20200	0.02667
F_fleet_14_YR_1966_s_1	0.21176	0.02796
F_fleet_14_YR_1967_s_1	0.26665	0.03521
F_fleet_14_YR_1968_s_1	0.23153	0.03057

F_fleet_14_YR_1969_s_1	0.30943	0.04087
F_fleet_14_YR_1970_s_1	0.27947	0.03692
F_fleet_14_YR_1971_s_1	0.29168	0.03853
F_fleet_14_YR_1972_s_1	0.31520	0.03879
F_fleet_14_YR_1973_s_1	0.25105	0.03247
F_fleet_14_YR_1974_s_1	0.25040	0.03285
F_fleet_14_YR_1975_s_1	0.23624	0.03090
F_fleet_14_YR_1976_s_1	0.27486	0.03590
F_fleet_14_YR_1977_s_1	0.23534	0.03075
F_fleet_14_YR_1978_s_1	0.27514	0.03592
F_fleet_14_YR_1979_s_1	0.28406	0.03659
F_fleet_14_YR_1980_s_1	0.17364	0.02248
F_fleet_14_YR_1981_s_1	0.26004	0.03258
F_fleet_14_YR_1982_s_1	0.27489	0.03569
F_fleet_14_YR_1983_s_1	0.22042	0.02866
F_fleet_14_YR_1984_s_1	0.29065	0.03887
F_fleet_14_YR_1985_s_1	0.27298	0.03535
F_fleet_14_YR_1986_s_1	0.37520	0.04826
F_fleet_14_YR_1987_s_1	0.38546	0.04991
F_fleet_14_YR_1988_s_1	0.36589	0.04648
F_fleet_14_YR_1989_s_1	0.31845	0.03917
F_fleet_14_YR_1990_s_1	0.31640	0.04000
F_fleet_14_YR_1991_s_1	0.38969	0.04905
F_fleet_14_YR_1992_s_1	0.37726	0.04586
F_fleet_14_YR_1993_s_1	0.37757	0.04609
F_fleet_14_YR_1994_s_1	0.33031	0.04308
F_fleet_14_YR_1995_s_1	0.29570	0.03947
F_fleet_14_YR_1996_s_1	0.29800	0.03890
F_fleet_14_YR_1997_s_1	0.37655	0.05001
F_fleet_14_YR_1998_s_1	0.33683	0.04459
F_fleet_14_YR_1999_s_1	0.31911	0.04240
F_fleet_14_YR_2000_s_1	0.34563	0.04558
F_fleet_14_YR_2001_s_1	0.36592	0.04794
F_fleet_14_YR_2002_s_1	0.43325	0.05619
F_fleet_14_YR_2003_s_1	0.34006	0.04358
F_fleet_14_YR_2004_s_1	0.31893	0.04153
F_fleet_14_YR_2005_s_1	0.22865	0.02998
F_fleet_14_YR_2006_s_1	0.16865	0.02205
F_fleet_14_YR_2007_s_1	0.13657	0.01797
F_fleet_14_YR_2008_s_1	0.09757	0.01284
F_fleet_14_YR_2009_s_1	0.11684	0.01538
F_fleet_14_YR_2010_s_1	0.11232	0.01462
F_fleet_14_YR_2011_s_1	0.13735	0.01776
F_fleet_14_YR_2012_s_1	0.11174	0.01459
F_fleet_14_YR_2013_s_1	0.12365	0.01623
F_fleet_14_YR_2014_s_1	0.13648	0.01798
F_fleet_14_YR_2015_s_1	0.14706	0.01920
F_fleet_14_YR_2016_s_1	0.15488	0.02039
LnQ_base_13_Shr_E	3.72030	0.10238
LnQ_base_14_Shr_W	1.50034	0.08591
AgeSel_1P_1_HL_E	2.70007	0.10713
AgeSel_1P_2_HL_E	-1.45326	0.63554
AgeSel_1P_3_HL_E	-0.57869	0.26235
AgeSel_1P_4_HL_E	3.07418	0.97698

AgeSel_1P_5_HL_E	-11.55280	7.85625
AgeSel_1P_6_HL_E	-1.97029	0.38889
AgeSel_2P_1_HL_W	3.21866	0.14952
AgeSel_2P_2_HL_W	-7.10072	2.94016
AgeSel_2P_3_HL_W	0.50290	0.18682
AgeSel_2P_4_HL_W	2.37626	0.14842
AgeSel_2P_5_HL_W	-10.44900	9.70845
AgeSel_2P_6_HL_W	-3.62472	0.36787
AgeSel_3P_1_LL_E	6.33046	0.33833
AgeSel_3P_2_LL_E	-1.96299	0.64494
AgeSel_3P_3_LL_E	1.53870	0.19691
AgeSel_3P_4_LL_E	-1.18997	2.30838
AgeSel_3P_5_LL_E	-5.16240	0.20369
AgeSel_3P_6_LL_E	-0.17709	0.67105
AgeSel_4P_1_LL_W	7.87551	0.35540
AgeSel_4P_2_LL_W	-4.23754	2.58729
AgeSel_4P_3_LL_W	2.06142	0.16433
AgeSel_4P_4_LL_W	3.23833	0.51991
AgeSel_4P_5_LL_W	-5.82525	0.19900
AgeSel_4P_6_LL_W	-0.37592	0.32609
AgeSel_5P_1_MRIP_E	2.24090	0.23847
AgeSel_5P_2_MRIP_E	-1.94692	0.56693
AgeSel_5P_3_MRIP_E	-2.01966	2.04862
AgeSel_5P_4_MRIP_E	2.10624	0.74971
AgeSel_5P_5_MRIP_E	-6.40693	0.17929
AgeSel_5P_6_MRIP_E	-4.91069	1.64476
AgeSel_6P_1_MRIP_W	1.29783	0.02397
AgeSel_6P_2_MRIP_W	-7.27482	2.46903
AgeSel_6P_3_MRIP_W	-4.75711	2.89439
AgeSel_6P_4_MRIP_W	2.20380	0.14467
AgeSel_6P_5_MRIP_W	-13.64820	5.94229
AgeSel_6P_6_MRIP_W	-3.58177	0.50079
AgeSel_7P_1_HBT_E	3.19257	0.09740
AgeSel_7P_2_HBT_E	-0.84110	0.46810
AgeSel_7P_3_HBT_E	-0.07316	0.11910
AgeSel_7P_4_HBT_E	-0.21389	3.02557
AgeSel_7P_5_HBT_E	-12.43890	6.33166
AgeSel_7P_6_HBT_E	-4.45326	5.44904
AgeSel_8P_1_HBT_W	2.77722	0.19636
AgeSel_8P_2_HBT_W	-6.00716	5.28414
AgeSel_8P_3_HBT_W	-0.77709	0.48093
AgeSel_8P_4_HBT_W	2.21218	0.29128
AgeSel_8P_5_HBT_W	-11.57660	7.81149
AgeSel_8P_6_HBT_W	-3.01222	0.60361
AgeSel_9P_1_C_Clsd_E	3.31734	0.14892
AgeSel_9P_2_C_Clsd_E	-3.15750	1.74851
AgeSel_9P_3_C_Clsd_E	0.16296	0.15399
AgeSel_9P_4_C_Clsd_E	3.05136	0.54832
AgeSel_9P_5_C_Clsd_E	-10.75490	9.16963
AgeSel_9P_6_C_Clsd_E	-2.54553	1.02336
AgeSel_10P_1_C_Clsd_W	3.52794	0.15028
AgeSel_10P_2_C_Clsd_W	-4.84310	3.20211
AgeSel_10P_3_C_Clsd_W	0.03852	0.17375
AgeSel_10P_4_C_Clsd_W	1.88114	0.46894

AgeSel_10P_5_C_Clsd_W	-11.28000	8.30046
AgeSel_10P_6_C_Clsd_W	-1.99935	0.45380
AgeSel_13P_2_Shr_E	-3.33021	0.08671
AgeSel_13P_3_Shr_E	-1.14745	0.21834
AgeSel_13P_4_Shr_E	-20.00000	1.00000
AgeSel_14P_2_Shr_W	-2.78555	0.05843
AgeSel_14P_3_Shr_W	-1.43976	0.17964
AgeSel_14P_4_Shr_W	-20.00000	1.00000
AgeSel_15P_1_Video_E	3.80209	0.13827
AgeSel_15P_2_Video_E	-1.23123	0.36089
AgeSel_15P_3_Video_E	0.70749	0.12514
AgeSel_15P_4_Video_E	1.33704	1.15231
AgeSel_15P_5_Video_E	-9.77245	10.77420
AgeSel_15P_6_Video_E	-1.13157	0.61429
AgeSel_16P_1_Video_W	2.72755	0.09773
AgeSel_16P_2_Video_W	-3.30776	1.96094
AgeSel_16P_3_Video_W	-0.51696	0.17969
AgeSel_16P_4_Video_W	2.23243	0.73105
AgeSel_16P_5_Video_W	-9.64119	11.08890
AgeSel_16P_6_Video_W	-1.60973	0.39857
AgeSel_19P_2_Sum_E	2.37903	0.20764
AgeSel_19P_3_Sum_E	-0.02218	0.06439
AgeSel_19P_4_Sum_E	-10.02070	0.98944
AgeSel_20P_2_Sum_W	1.72634	0.11853
AgeSel_20P_3_Sum_W	-0.90625	0.07340
AgeSel_20P_4_Sum_W	-10.01060	0.99415
AgeSel_21P_2_Fall_E	-3.92843	0.09205
AgeSel_21P_3_Fall_E	0.05213	0.18132
AgeSel_21P_4_Fall_E	-20.00000	1.00000
AgeSel_22P_2_Fall_W	-3.44795	0.07556
AgeSel_22P_3_Fall_W	-0.58860	0.18781
AgeSel_22P_4_Fall_W	-20.00000	1.00000
AgeSel_23P_1_BLL_W	6.33889	0.15404
AgeSel_23P_2_BLL_W	1.95624	0.12604
AgeSel_24P_1_BLL_E	8.67398	0.33382
AgeSel_24P_2_BLL_E	2.45167	0.15277
AgeSel_25P_1_ROV_E	2.19422	0.20677
AgeSel_25P_2_ROV_E	-2.65813	1.35422
AgeSel_25P_3_ROV_E	-2.00899	2.20340
AgeSel_25P_4_ROV_E	-0.64404	3.40080
AgeSel_25P_5_ROV_E	-10.71770	9.26306
AgeSel_25P_6_ROV_E	0.39061	0.29890
Retain_1P_3_HL_E_BLK1repl_2007	0.91634	0.00893
Retain_2P_3_HL_W_BLK1repl_2007	0.96669	0.00453
Retain_3P_3_LL_E_BLK1repl_2007	0.56119	0.02521
Retain_4P_3_LL_W_BLK1repl_2007	0.95023	0.00941
AgeSel_1P_1_HL_E_BLK3repl_2007	3.48186	0.08438
AgeSel_1P_2_HL_E_BLK3repl_2007	-4.74711	0.99571
AgeSel_1P_3_HL_E_BLK3repl_2007	0.40117	0.06848
AgeSel_1P_4_HL_E_BLK3repl_2007	2.88738	0.27691
AgeSel_1P_5_HL_E_BLK3repl_2007	-12.23700	6.67693
AgeSel_1P_6_HL_E_BLK3repl_2007	-2.48887	0.91576
AgeSel_2P_1_HL_W_BLK3repl_2007	3.65515	0.06061
AgeSel_2P_2_HL_W_BLK3repl_2007	-4.86849	0.53863

AgeSel_2P_3_HL_W_BLK3repl_2007	0.06758	0.06392
AgeSel_2P_4_HL_W_BLK3repl_2007	2.20330	0.15854
AgeSel_2P_5_HL_W_BLK3repl_2007	-12.95620	5.38072
AgeSel_2P_6_HL_W_BLK3repl_2007	-2.80802	0.33466
AgeSel_3P_1_LL_E_BLK3repl_2007	5.09253	0.11845
AgeSel_3P_2_LL_E_BLK3repl_2007	-1.73503	0.32978
AgeSel_3P_3_LL_E_BLK3repl_2007	0.88493	0.08694
AgeSel_3P_4_LL_E_BLK3repl_2007	1.35488	0.66229
AgeSel_3P_5_LL_E_BLK3repl_2007	-12.45890	6.28102
AgeSel_3P_6_LL_E_BLK3repl_2007	-1.06978	0.35523
AgeSel_4P_1_LL_W_BLK3repl_2007	9.08482	0.49693
AgeSel_4P_2_LL_W_BLK3repl_2007	-0.35247	1.98516
AgeSel_4P_3_LL_W_BLK3repl_2007	2.40561	0.17218
AgeSel_4P_4_LL_W_BLK3repl_2007	4.49824	4.57950
AgeSel_4P_5_LL_W_BLK3repl_2007	-13.19670	4.92117
AgeSel_4P_6_LL_W_BLK3repl_2007	-0.40372	0.51194
AgeSel_5P_1_MRIP_E_BLK5repl_2008	2.00574	0.48061
AgeSel_5P_1_MRIP_E_BLK5repl_2011	2.38063	0.49048
AgeSel_5P_2_MRIP_E_BLK5repl_2008	-3.32854	1.82280
AgeSel_5P_2_MRIP_E_BLK5repl_2011	-0.93854	0.19692
AgeSel_5P_3_MRIP_E_BLK5repl_2008	-1.78626	2.60415
AgeSel_5P_3_MRIP_E_BLK5repl_2011	-1.64224	2.57852
AgeSel_5P_4_MRIP_E_BLK5repl_2008	2.44248	0.80160
AgeSel_5P_4_MRIP_E_BLK5repl_2011	1.86788	0.57596
AgeSel_5P_5_MRIP_E_BLK5repl_2008	-8.42263	13.42150
AgeSel_5P_5_MRIP_E_BLK5repl_2011	-10.31000	9.95636
AgeSel_5P_6_MRIP_E_BLK5repl_2008	-4.39638	2.09640
AgeSel_5P_6_MRIP_E_BLK5repl_2011	-3.53317	1.53230
AgeSel_6P_1_MRIP_W_BLK5repl_2008	2.14489	0.32815
AgeSel_6P_1_MRIP_W_BLK5repl_2011	4.03784	0.28990
AgeSel_6P_2_MRIP_W_BLK5repl_2008	-1.60107	0.24237
AgeSel_6P_2_MRIP_W_BLK5repl_2011	-4.52497	1.67375
AgeSel_6P_3_MRIP_W_BLK5repl_2008	-1.87770	2.59042
AgeSel_6P_3_MRIP_W_BLK5repl_2011	1.31040	0.28310
AgeSel_6P_4_MRIP_W_BLK5repl_2008	0.09075	0.95081
AgeSel_6P_4_MRIP_W_BLK5repl_2011	2.85374	0.28713
AgeSel_6P_5_MRIP_W_BLK5repl_2008	-3.29015	0.82033
AgeSel_6P_5_MRIP_W_BLK5repl_2011	-10.19880	10.15420
AgeSel_6P_6_MRIP_W_BLK5repl_2008	-3.54909	0.80278
AgeSel_6P_6_MRIP_W_BLK5repl_2011	-2.83295	0.70848
AgeSel_7P_1_HBT_E_BLK5repl_2008	3.31942	0.21658
AgeSel_7P_1_HBT_E_BLK5repl_2011	3.73682	0.10923
AgeSel_7P_2_HBT_E_BLK5repl_2008	-4.68747	1.20869
AgeSel_7P_2_HBT_E_BLK5repl_2011	-4.64394	1.34560
AgeSel_7P_3_HBT_E_BLK5repl_2008	-0.00266	0.29063
AgeSel_7P_3_HBT_E_BLK5repl_2011	0.32296	0.11295
AgeSel_7P_4_HBT_E_BLK5repl_2008	1.90836	0.48348
AgeSel_7P_4_HBT_E_BLK5repl_2011	2.96843	0.28751
AgeSel_7P_5_HBT_E_BLK5repl_2008	-9.63278	11.11570
AgeSel_7P_5_HBT_E_BLK5repl_2011	-8.81063	8.44550
AgeSel_7P_6_HBT_E_BLK5repl_2008	-3.95158	3.28751
AgeSel_7P_6_HBT_E_BLK5repl_2011	-2.93938	1.40049
AgeSel_8P_1_HBT_W_BLK5repl_2008	3.56895	0.87141
AgeSel_8P_1_HBT_W_BLK5repl_2011	4.59473	0.14550

AgeSel_8P_2_HBT_W_BLK5repl_2008	-2.99660	1.49249
AgeSel_8P_2_HBT_W_BLK5repl_2011	-4.86782	0.54604
AgeSel_8P_3_HBT_W_BLK5repl_2008	-1.29555	3.05887
AgeSel_8P_3_HBT_W_BLK5repl_2011	0.37259	0.19275
AgeSel_8P_4_HBT_W_BLK5repl_2008	0.59722	1.10452
AgeSel_8P_4_HBT_W_BLK5repl_2011	1.56048	0.24873
AgeSel_8P_5_HBT_W_BLK5repl_2008	-10.67270	9.28140
AgeSel_8P_5_HBT_W_BLK5repl_2011	-11.25410	8.32176
AgeSel_8P_6_HBT_W_BLK5repl_2008	-2.40354	0.49620
AgeSel_8P_6_HBT_W_BLK5repl_2011	-3.54662	0.70226

Table 4.4. Summary of highly correlated (correlation coefficient > 95%) parameters.

Parameter 1	Parameter 2	Correlation Coefficient
AgeSel_8P_3_HBT_W_BLK5repl_2008	AgeSel_8P_1_HBT_W_BLK5repl_2008	0.998769
AgeSel_5P_3_MRIP_E	AgeSel_5P_1_MRIP_E	0.997044
AgeSel_5P_3_MRIP_E_BLK5repl_2011	AgeSel_5P_1_MRIP_E_BLK5repl_2011	0.995008
AgeSel_8P_3_HBT_W	AgeSel_8P_1_HBT_W	0.988478
AgeSel_25P_3_ROV_E	AgeSel_25P_1_ROV_E	0.986842
AgeSel_1P_3_HL_E	AgeSel_1P_1_HL_E	0.968274
AgeSel_9P_3_C_Clsd_E	AgeSel_9P_1_C_Clsd_E	0.957078
F_fleet_1_YR_1968_s_1	F_fleet_1_YR_1967_s_1	0.956842
F_fleet_1_YR_1967_s_1	F_fleet_1_YR_1966_s_1	0.956683
F_fleet_1_YR_1966_s_1	F_fleet_1_YR_1965_s_1	0.955604
F_fleet_1_YR_1969_s_1	F_fleet_1_YR_1968_s_1	0.955558
F_fleet_3_YR_1983_s_1	F_fleet_3_YR_1982_s_1	0.954081
AgeSel_2P_3_HL_W	AgeSel_2P_1_HL_W	0.953996
F_fleet_1_YR_1970_s_1	F_fleet_1_YR_1969_s_1	0.953557
F_fleet_8_YR_1980_s_1	F_fleet_2_YR_1980_s_1	0.951963
F_fleet_1_YR_1965_s_1	F_fleet_1_YR_1964_s_1	0.951734
F_fleet_4_YR_1982_s_1	F_fleet_4_YR_1981_s_1	0.951672
F_fleet_1_YR_1971_s_1	F_fleet_1_YR_1970_s_1	0.950648

Table 5.1. Summary of projection settings and equations.

Derived quantity	Equation	Parameter values
Recruitment (R)	$R_{Reg,Year} = P_{Area}\frac{4hR_0 SSB_{Year}}{SSB_0(1-h)+SSB_{Year}(5h-1)}$	P_{East} = 0.23, P_{West} = 0.77, h = 0.99, R_0 = 163 million fish
Growth Curve	$L(t) = L_\infty\left[1-e^{-k(t-t_0)}\right]$	L_∞ = 85.64cm, k = 0.19yr^{-1}, t_0 = -0.39, See **Figure 2.4**
Weight-Length Relationship	$Weight = aL^b$	a = 1.7E-5, b = 3, See **Figure 2.5**
Fecundity-at-Age (Fec)	Input	See **Table 2.3**
Selectivity (S)	Input	See **Figure 4.9**
Retention (Ret)	Input	See **Figure 4.13**
Discard Mortality (DM)	Input	See **Table 2.2**
Natural Mortality (M)	Input	See **Table 2.1**
Directed Fishing Mortality (F_{Dir}) by Fleet	$F^{Fleet}_{Dir,Reg,Age,Year} = S^{Fleet}_{Dir,Reg,Age}F^{Fleet}_{Dir\_Mult,Reg,year}Ret^{Fleet}_{Dir,Reg,Age}$	Directed Fleets are HL, LL, HBT, and MRIP
Directed Discard Fishing Mortality (F_{Disc}) by Fleet	$F^{Fleet}_{Disc,Reg,Age,Year} = F^{Fleet}_{Dir\_Mult,Reg,year}(1-Ret^{Fleet}_{Dir,Reg,Age})\,DM^{Fleet}_{Dir}$	Fishing mortality due to open season discards for a directed fleet
Total Directed Fishing Mortality (F_{Tot_Dir}) by Fleet	$F^{Fleet}_{Tot\_Dir,Reg,Age,Year} = F^{Fleet}_{Dir,Reg,Age,Year} + F^{Fleet}_{Disc,Reg,Age,Year}$	Total fishing mortality for a directed fleet
Bycatch/Closed Season Discard Fishing Mortality (F_{Byc}) by Fleet	$F^{Fleet}_{Byc,Reg,Age,Year} = S^{Fleet}_{Byc,Reg,Age}F^{Fleet}_{Byc\_Mult,Reg,year}$	Bycatch and Closed Season Discard Fleets are C_No_IFQ, R_Closed, and SHR
Total Fishing Mortality (F_{Tot})	$F_{Tot,Reg,Age,Year} = \sum_{Fleet} F^{Fleet}_{Tot\_Dir,Reg,Age,Year} + F^{Fleet}_{Byc,Reg,Age,Year}$	Total Fishing Mortality Summed Across All Fleets
Total Mortality (Z)	$Z_{Reg,Age,Year} = F_{Tot,Reg,Age,Year} + M_{Age}$	Total Mortality Summed Across All Fleets
Abundance-at-Age (N)	$N_{Reg,Age+1,Year+1} = N_{Reg,Age,Year}e^{-Z_{Reg,Age,Year}}$	Total Abundance by Region
Spawning Stock Biomass (SSB)	$SSB_{Year} = \sum_{Reg}\sum_{Age=0}^{20}(Fec_{Age}N_{Reg,Age,Year}e^{-0.5Z_{Reg,Age,Year}})$	Note that Mortality is Discounted for Midyear Spawning
Retained Catch-at-Age (C) by Fleet	$C^{Fleet}_{Dir,Reg,Age,Year} = N_{Reg,Age,Year}(1-e^{-Z_{Reg,Age,Year}})\frac{F^{Fleet}_{Dir,Reg,Age,Year}}{Z_{Reg,Age,Year}}$	Retained Catch for a Directed Fleet
Retained Yield (Y) by Fleet	$Y^{Fleet}_{Dir,Reg,Year} = \sum_{Age=0}^{20}\overline{W^{Fleet}_{Age}}C^{Fleet}_{Dir,Reg,Age,Year}$	See SS3 Manual (Methot 2015) for a Complete Description of the Length Integrated Fleet-Specific Weight-at-Age (W)
Spawning Potential Ratio (SPR)	$SPR = \frac{\frac{SSB}{R}}{\frac{SSB_0}{R_0}}$	SSB_0 = 4.72E+15 eggs

Table 5.2. Summary of MSRA benchmarks and reference points for the SEDAR 52 Gulf of Mexico red snapper assessment. Stock status is provided relative to both the current and old definitions of MSST. SSB is in number of eggs, whereas F is a harvest rate (total numbers killed / total numbers)

Criteria	Definition	2014 SEDAR 31 Update	SEDAR 52
Base M	Average M for Fully Selected Ages	0.09	0.09
Steepness	SR Parameter (*h*)	0.99	0.99
Virgin Recruitment	SR Parameter (R_0)	1.70E+08	1.63E+08
SSB Unfished (Eggs)		4.91E+15	4.72E+15
Generation Time	Fecundity-Weighted Mean Age	15	15
SPR target		0.26	0.26
	Mortality Rate Criteria		
F_{MSY} or Proxy	$F_{SPR26\%}$	0.0494	0.0588
MFMT	$F_{SPR26\%}$	0.0494	0.0588
F_{OY}	0.75 * Directed F at $F_{SPR26\%}$	0.0472	0.0564
$F_{Current}$	Average F Over Terminal 3 Years of Assessment	0.0491	0.0484
$F_{Current}$/MFMT		0.994	0.823
	Biomass Criteria		
SSB_{MSY} or Proxy	$SSB_{SPR26\%}$	1.28E+15	1.23E+15
$MSST_{OLD}$	(1-M) * $SSB_{SPR26\%}$	1.16E+15	1.12E+15
$MSST_{NEW}$	0.5 * $SSB_{SPR26\%}$	6.40E+14	6.15E+14
SSB_0	Virgin SSB	4.91E+15	4.72E+15
$SSB_{Current}$	Terminal Year SSB	6.90E+14	8.67E+14
$SSB_{Current}/SSB_{FSPR26\%}$		0.54	0.70
$SSB_{Current}/MSST_{OLD}$		0.59	0.77
$SSB_{Current}/MSST_{NEW}$		1.08	1.41
$SSB_{Current}/SSB_0$		0.14	0.18

Table 5.3. Summary of annual stock status estimates (gulfwide) for Gulf of Mexico red snapper (F_{MSY} proxy = $F_{SPR26\%}$). SSB is in number of eggs, whereas F is the harvest rate (total numbers killed / total number).

Year	F	F/MFMT	SSB	$SSB/SSB_{SPR26\%}$	$SSB/MSST_{OLD}$	$SSB/MSST_{NEW}$	SSB/SSB_0
1872	0.000	0.006	3.18E+15	2.59	2.84	5.17	0.67
1873	0.001	0.009	3.18E+15	2.58	2.84	5.17	0.67
1874	0.001	0.013	3.17E+15	2.58	2.83	5.16	0.67
1875	0.001	0.016	3.16E+15	2.57	2.83	5.15	0.67
1876	0.001	0.019	3.15E+15	2.56	2.82	5.13	0.67
1877	0.001	0.017	3.14E+15	2.55	2.81	5.11	0.67
1878	0.001	0.015	3.13E+15	2.55	2.80	5.09	0.66
1879	0.001	0.017	3.12E+15	2.54	2.79	5.07	0.66
1880	0.002	0.038	3.11E+15	2.53	2.78	5.06	0.66
1881	0.002	0.039	3.09E+15	2.51	2.76	5.03	0.66
1882	0.002	0.040	3.07E+15	2.50	2.75	5.00	0.65
1883	0.002	0.042	3.05E+15	2.48	2.73	4.96	0.65
1884	0.003	0.043	3.03E+15	2.46	2.71	4.92	0.64
1885	0.003	0.045	3.00E+15	2.44	2.68	4.89	0.64
1886	0.003	0.046	2.98E+15	2.42	2.66	4.85	0.63
1887	0.003	0.046	2.96E+15	2.40	2.64	4.81	0.63
1888	0.003	0.044	2.93E+15	2.38	2.62	4.77	0.62
1889	0.003	0.048	2.91E+15	2.37	2.60	4.73	0.62
1890	0.003	0.057	2.89E+15	2.35	2.58	4.69	0.61
1891	0.003	0.053	2.86E+15	2.33	2.56	4.65	0.61
1892	0.003	0.057	2.84E+15	2.31	2.54	4.62	0.60
1893	0.003	0.059	2.82E+15	2.29	2.52	4.58	0.60
1894	0.004	0.061	2.79E+15	2.27	2.49	4.54	0.59
1895	0.004	0.060	2.77E+15	2.25	2.47	4.50	0.59
1896	0.004	0.062	2.75E+15	2.23	2.45	4.47	0.58
1897	0.004	0.062	2.73E+15	2.22	2.44	4.43	0.58
1898	0.004	0.072	2.71E+15	2.20	2.42	4.40	0.57
1899	0.005	0.084	2.68E+15	2.18	2.40	4.36	0.57
1900	0.006	0.095	2.66E+15	2.16	2.37	4.32	0.56
1901	0.006	0.104	2.62E+15	2.13	2.34	4.27	0.56
1902	0.007	0.111	2.59E+15	2.11	2.31	4.21	0.55
1903	0.006	0.103	2.55E+15	2.07	2.28	4.15	0.54
1904	0.006	0.098	2.52E+15	2.05	2.25	4.09	0.53
1905	0.005	0.090	2.49E+15	2.02	2.22	4.04	0.53
1906	0.005	0.082	2.46E+15	2.00	2.20	4.00	0.52
1907	0.004	0.074	2.44E+15	1.98	2.18	3.96	0.52
1908	0.004	0.067	2.42E+15	1.97	2.16	3.94	0.51
1909	0.003	0.057	2.41E+15	1.96	2.16	3.92	0.51
1910	0.003	0.048	2.41E+15	1.96	2.15	3.92	0.51
1911	0.003	0.048	2.41E+15	1.96	2.15	3.92	0.51
1912	0.003	0.047	2.42E+15	1.96	2.16	3.93	0.51
1913	0.003	0.047	2.42E+15	1.97	2.17	3.94	0.51
1914	0.003	0.046	2.43E+15	1.98	2.17	3.95	0.52
1915	0.003	0.046	2.44E+15	1.99	2.18	3.97	0.52
1916	0.003	0.046	2.45E+15	1.99	2.19	3.99	0.52
1917	0.003	0.044	2.46E+15	2.00	2.20	4.00	0.52
1918	0.003	0.044	2.47E+15	2.01	2.21	4.02	0.52
1919	0.003	0.047	2.48E+15	2.02	2.22	4.03	0.53
1920	0.003	0.051	2.49E+15	2.02	2.22	4.05	0.53

1921	0.003	0.054	2.50E+15	2.03	2.23	4.06	0.53
1922	0.003	0.058	2.50E+15	2.03	2.23	4.06	0.53
1923	0.004	0.062	2.50E+15	2.03	2.23	4.07	0.53
1924	0.004	0.061	2.50E+15	2.03	2.23	4.06	0.53
1925	0.004	0.061	2.50E+15	2.03	2.23	4.06	0.53
1926	0.003	0.059	2.49E+15	2.03	2.23	4.05	0.53
1927	0.004	0.067	2.49E+15	2.02	2.22	4.05	0.53
1928	0.003	0.058	2.48E+15	2.02	2.22	4.04	0.53
1929	0.004	0.061	2.48E+15	2.02	2.22	4.03	0.53
1930	0.003	0.043	2.48E+15	2.01	2.21	4.03	0.53
1931	0.002	0.040	2.48E+15	2.02	2.22	4.03	0.53
1932	0.003	0.043	2.49E+15	2.02	2.22	4.04	0.53
1933	0.002	0.040	2.49E+15	2.02	2.22	4.05	0.53
1934	0.002	0.037	2.50E+15	2.03	2.23	4.06	0.53
1935	0.003	0.048	2.50E+15	2.04	2.24	4.07	0.53
1936	0.003	0.057	2.51E+15	2.04	2.24	4.08	0.53
1937	0.003	0.054	2.51E+15	2.04	2.24	4.08	0.53
1938	0.004	0.064	2.51E+15	2.04	2.24	4.08	0.53
1939	0.004	0.070	2.50E+15	2.03	2.24	4.07	0.53
1940	0.003	0.052	2.49E+15	2.03	2.23	4.05	0.53
1941	0.003	0.048	2.49E+15	2.02	2.22	4.04	0.53
1942	0.002	0.037	2.49E+15	2.02	2.22	4.04	0.53
1943	0.002	0.029	2.49E+15	2.02	2.22	4.04	0.53
1944	0.002	0.030	2.49E+15	2.03	2.23	4.05	0.53
1945	0.001	0.024	2.50E+15	2.03	2.23	4.06	0.53
1946	0.003	0.049	2.51E+15	2.04	2.24	4.08	0.53
1947	0.005	0.090	2.51E+15	2.04	2.24	4.08	0.53
1948	0.010	0.169	2.51E+15	2.04	2.24	4.08	0.53
1949	0.015	0.255	2.51E+15	2.04	2.24	4.07	0.53
1950	0.023	0.388	2.50E+15	2.03	2.23	4.06	0.53
1951	0.025	0.428	2.46E+15	2.00	2.20	4.01	0.52
1952	0.029	0.497	2.42E+15	1.97	2.16	3.93	0.51
1953	0.029	0.500	2.36E+15	1.92	2.11	3.84	0.50
1954	0.036	0.611	2.30E+15	1.87	2.05	3.74	0.49
1955	0.034	0.578	2.23E+15	1.81	1.99	3.62	0.47
1956	0.042	0.718	2.15E+15	1.75	1.92	3.50	0.46
1957	0.049	0.837	2.06E+15	1.68	1.84	3.35	0.44
1958	0.069	1.181	1.97E+15	1.60	1.76	3.21	0.42
1959	0.074	1.267	1.86E+15	1.51	1.66	3.03	0.39
1960	0.078	1.327	1.75E+15	1.42	1.56	2.84	0.37
1961	0.069	1.176	1.63E+15	1.32	1.45	2.65	0.35
1962	0.069	1.173	1.51E+15	1.22	1.34	2.45	0.32
1963	0.075	1.282	1.38E+15	1.12	1.23	2.25	0.29
1964	0.074	1.263	1.27E+15	1.03	1.13	2.06	0.27
1965	0.082	1.398	1.16E+15	0.94	1.03	1.88	0.25
1966	0.084	1.427	1.05E+15	0.85	0.94	1.70	0.22
1967	0.100	1.706	9.49E+14	0.77	0.85	1.54	0.20
1968	0.097	1.651	8.51E+14	0.69	0.76	1.38	0.18
1969	0.114	1.946	7.53E+14	0.61	0.67	1.23	0.16
1970	0.112	1.900	6.64E+14	0.54	0.59	1.08	0.14
1971	0.119	2.016	5.76E+14	0.47	0.51	0.94	0.12
1972	0.119	2.028	4.86E+14	0.39	0.43	0.79	0.10
1973	0.096	1.625	3.99E+14	0.32	0.36	0.65	0.08
1974	0.108	1.831	3.31E+14	0.27	0.30	0.54	0.07
1975	0.110	1.868	3.04E+14	0.25	0.27	0.49	0.06
1976	0.110	1.874	2.85E+14	0.23	0.25	0.46	0.06
1977	0.097	1.655	2.56E+14	0.21	0.23	0.42	0.05

1978	0.110	1.878	2.26E+14	0.18	0.20	0.37	0.05
1979	0.130	2.205	1.98E+14	0.16	0.18	0.32	0.04
1980	0.091	1.554	1.73E+14	0.14	0.15	0.28	0.04
1981	0.106	1.811	1.47E+14	0.12	0.13	0.24	0.03
1982	0.091	1.541	1.21E+14	0.10	0.11	0.20	0.03
1983	0.113	1.913	1.10E+14	0.09	0.10	0.18	0.02
1984	0.102	1.738	1.06E+14	0.09	0.09	0.17	0.02
1985	0.128	2.175	1.12E+14	0.09	0.10	0.18	0.02
1986	0.133	2.255	1.18E+14	0.10	0.11	0.19	0.02
1987	0.119	2.023	1.17E+14	0.10	0.10	0.19	0.02
1988	0.139	2.369	1.13E+14	0.09	0.10	0.18	0.02
1989	0.122	2.076	1.02E+14	0.08	0.09	0.17	0.02
1990	0.095	1.610	9.53E+13	0.08	0.09	0.16	0.02
1991	0.122	2.074	9.88E+13	0.08	0.09	0.16	0.02
1992	0.123	2.096	1.09E+14	0.09	0.10	0.18	0.02
1993	0.136	2.305	1.21E+14	0.10	0.11	0.20	0.03
1994	0.118	2.006	1.29E+14	0.10	0.12	0.21	0.03
1995	0.095	1.614	1.38E+14	0.11	0.12	0.22	0.03
1996	0.084	1.436	1.47E+14	0.12	0.13	0.24	0.03
1997	0.111	1.882	1.55E+14	0.13	0.14	0.25	0.03
1998	0.103	1.746	1.60E+14	0.13	0.14	0.26	0.03
1999	0.098	1.660	1.73E+14	0.14	0.15	0.28	0.04
2000	0.086	1.467	1.85E+14	0.15	0.17	0.30	0.04
2001	0.088	1.489	1.92E+14	0.16	0.17	0.31	0.04
2002	0.119	2.027	1.94E+14	0.16	0.17	0.32	0.04
2003	0.104	1.769	1.93E+14	0.16	0.17	0.31	0.04
2004	0.102	1.728	1.98E+14	0.16	0.18	0.32	0.04
2005	0.070	1.193	1.95E+14	0.16	0.17	0.32	0.04
2006	0.052	0.884	2.05E+14	0.17	0.18	0.33	0.04
2007	0.040	0.676	2.22E+14	0.18	0.20	0.36	0.05
2008	0.029	0.493	2.51E+14	0.20	0.22	0.41	0.05
2009	0.045	0.774	3.11E+14	0.25	0.28	0.51	0.07
2010	0.037	0.627	3.94E+14	0.32	0.35	0.64	0.08
2011	0.053	0.908	5.05E+14	0.41	0.45	0.82	0.11
2012	0.045	0.768	5.78E+14	0.47	0.52	0.94	0.12
2013	0.041	0.690	6.57E+14	0.53	0.59	1.07	0.14
2014	0.041	0.699	7.19E+14	0.58	0.64	1.17	0.15
2015	0.052	0.892	7.96E+14	0.65	0.71	1.29	0.17
2016	0.052	0.877	8.67E+14	0.70	0.77	1.41	0.18

Table 5.4. Results of projections that achieve SPR 26% in equilibrium. Recruitment is in numbers of age-0 fish, SSB is in number of eggs, F is the harvest rate (total numbers killed / total number), and OFL is the overfishing limit in millions of pounds. Reference points are provided in **Table 5.2**. Due to uncertainty in forecasted recruitment, results are only shown for the rebuilding period (i.e., until 2032).

Year	Recruitment	F	F/MFMT	SSB	$SSB/SSB_{SPR26\%}$	$SSB/MSST_{OLD}$	$SSB/MSST_{NEW}$	SSB/SSB_0	OFL
2017	1.62E+08	0.065	1.11	9.32E+14	0.76	0.83	1.52	0.20	20.71
2018	1.62E+08	0.064	1.08	9.53E+14	0.77	0.85	1.55	0.20	19.11
2019	1.62E+08	0.062	1.05	9.76E+14	0.79	0.87	1.59	0.21	17.31
2020	1.62E+08	0.060	1.03	9.95E+14	0.81	0.89	1.62	0.21	15.67
2021	1.62E+08	0.060	1.02	1.01E+15	0.82	0.90	1.64	0.21	14.65
2022	1.62E+08	0.059	1.01	1.03E+15	0.83	0.92	1.67	0.22	14.02
2023	1.62E+08	0.059	1.01	1.04E+15	0.85	0.93	1.69	0.22	13.68
2024	1.62E+08	0.059	1.01	1.06E+15	0.86	0.94	1.72	0.22	13.49
2025	1.62E+08	0.059	1.00	1.07E+15	0.87	0.96	1.74	0.23	13.41
2026	1.62E+08	0.059	1.00	1.08E+15	0.88	0.97	1.76	0.23	13.38
2027	1.62E+08	0.059	1.00	1.09E+15	0.89	0.98	1.78	0.23	13.37
2028	1.62E+08	0.059	1.00	1.11E+15	0.90	0.99	1.80	0.23	13.37
2029	1.62E+08	0.059	1.00	1.12E+15	0.91	1.00	1.81	0.24	13.37
2030	1.62E+08	0.059	1.00	1.12E+15	0.91	1.01	1.83	0.24	13.38
2031	1.62E+08	0.059	1.00	1.13E+15	0.92	1.01	1.84	0.24	13.38
2032	1.62E+08	0.059	1.00	1.14E+15	0.93	1.02	1.86	0.24	13.39

10. FIGURES

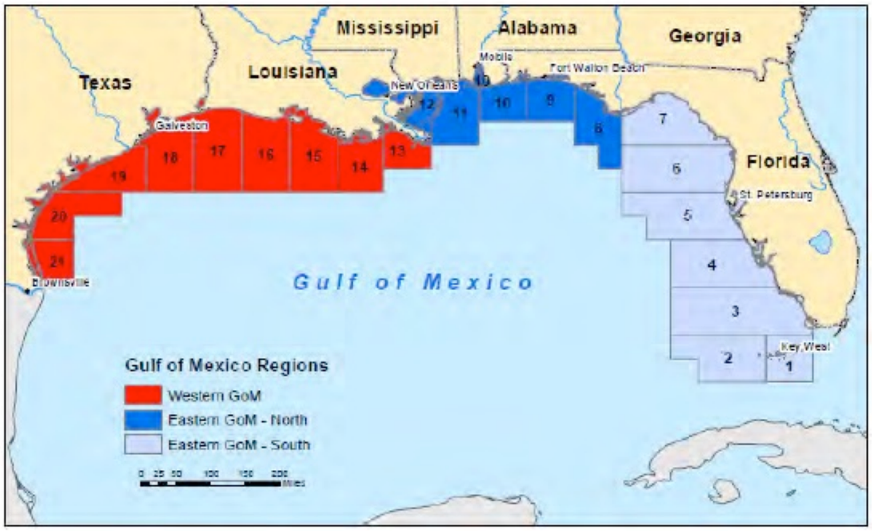


Figure 2.1. Regional designations assumed for red snapper: eastern gulf (grids 1 to 12) and western gulf (grids 13 to 21). Northeastern and southeastern subregions are used only for commercial vertical line landings.

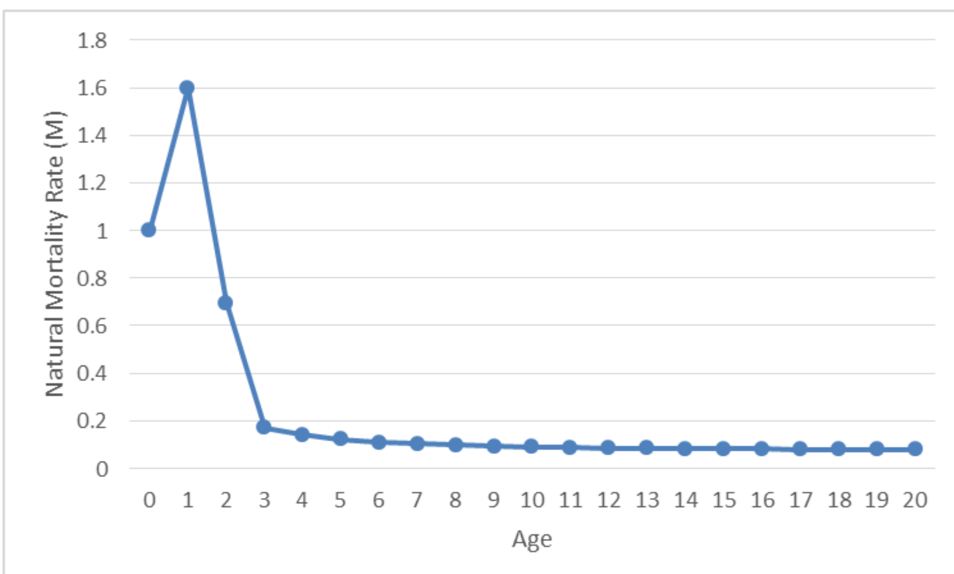


Figure 2.2. Age-specific natural mortality rates for Gulf of Mexico red snapper assuming an adjusted Lorenzen mortality curve. Age-0 mortality is adjusted to account for the SS3 assessment model advancing age on January 1 (i.e., age-0 fish only undergo a half year of natural mortality).

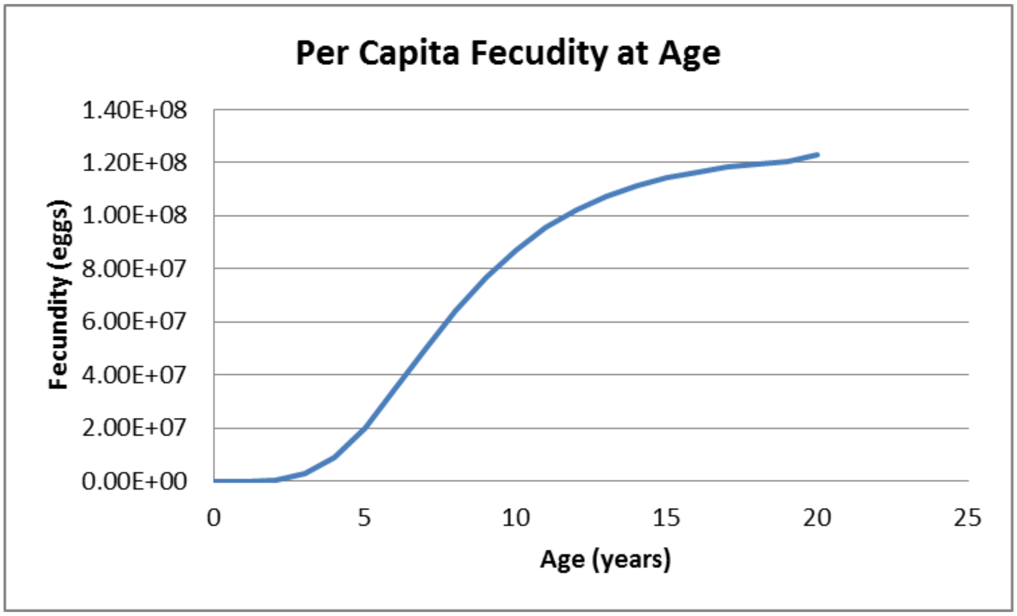
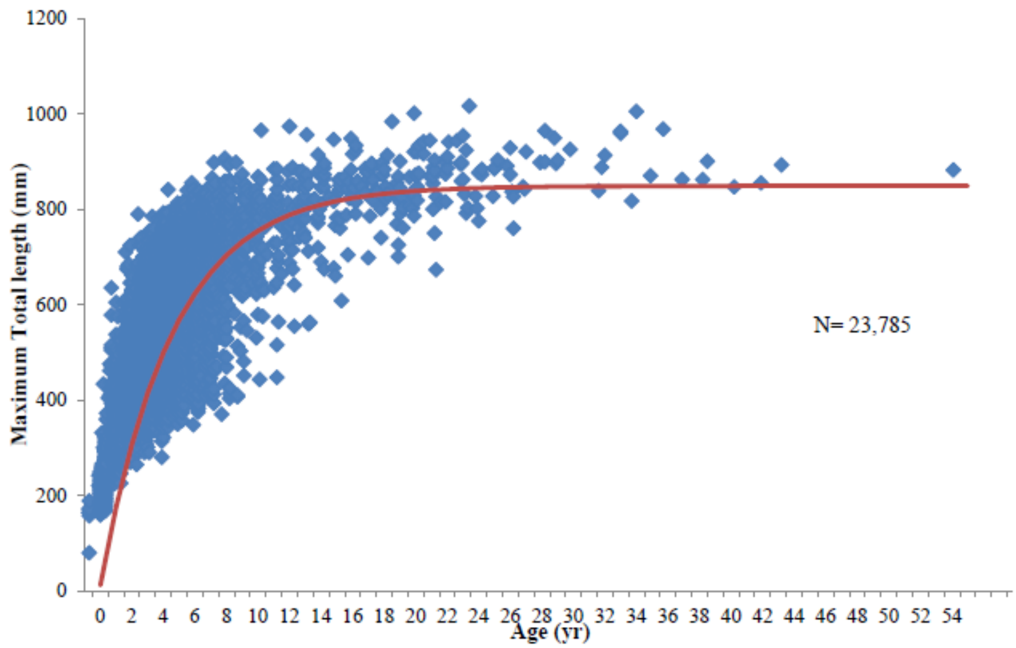


Figure 2.3. Per-capita fecundity (number of eggs)-at-age.

A)



B)

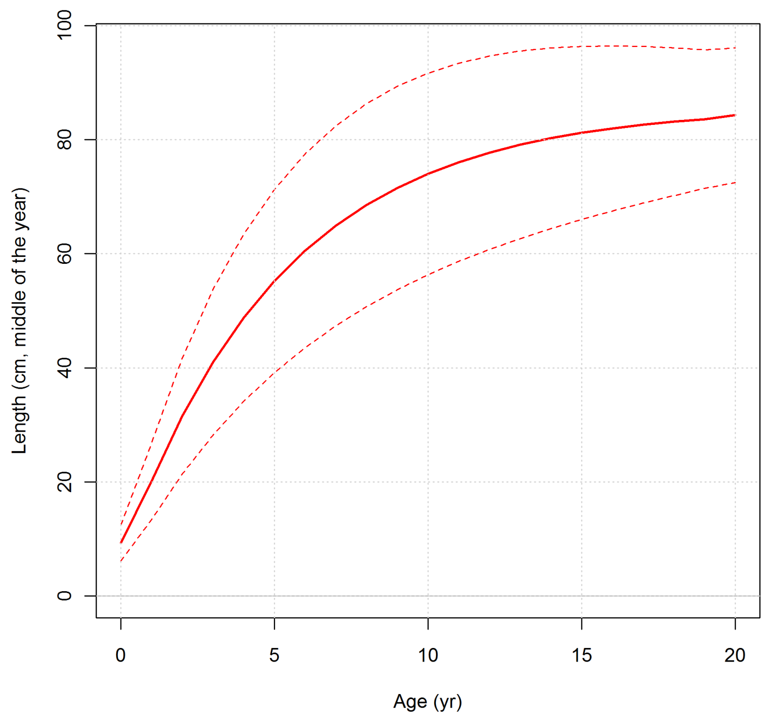


Figure 2.4. The initial growth curve fit to readings of the biological age at size (**A**) and the adjusted SS growth curve (**B**). The coefficients of variation were modeled as a function of age (dotted lines).

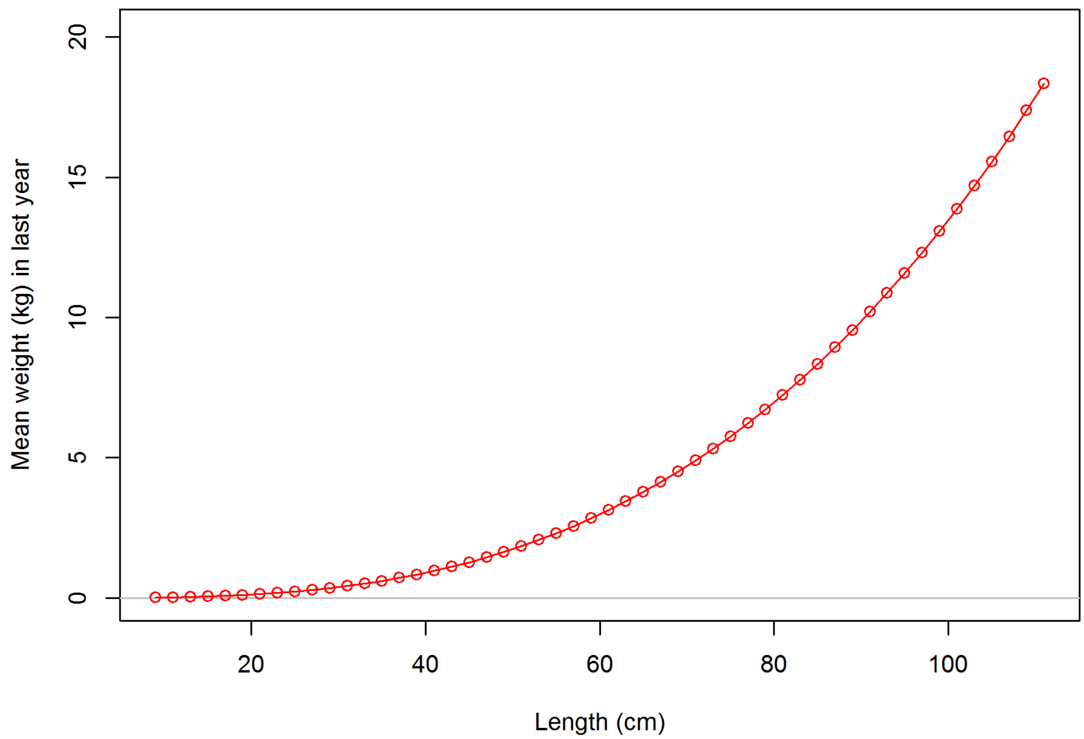


Figure 2.5. Mean weight-at-length for Gulf of Mexico red snapper.

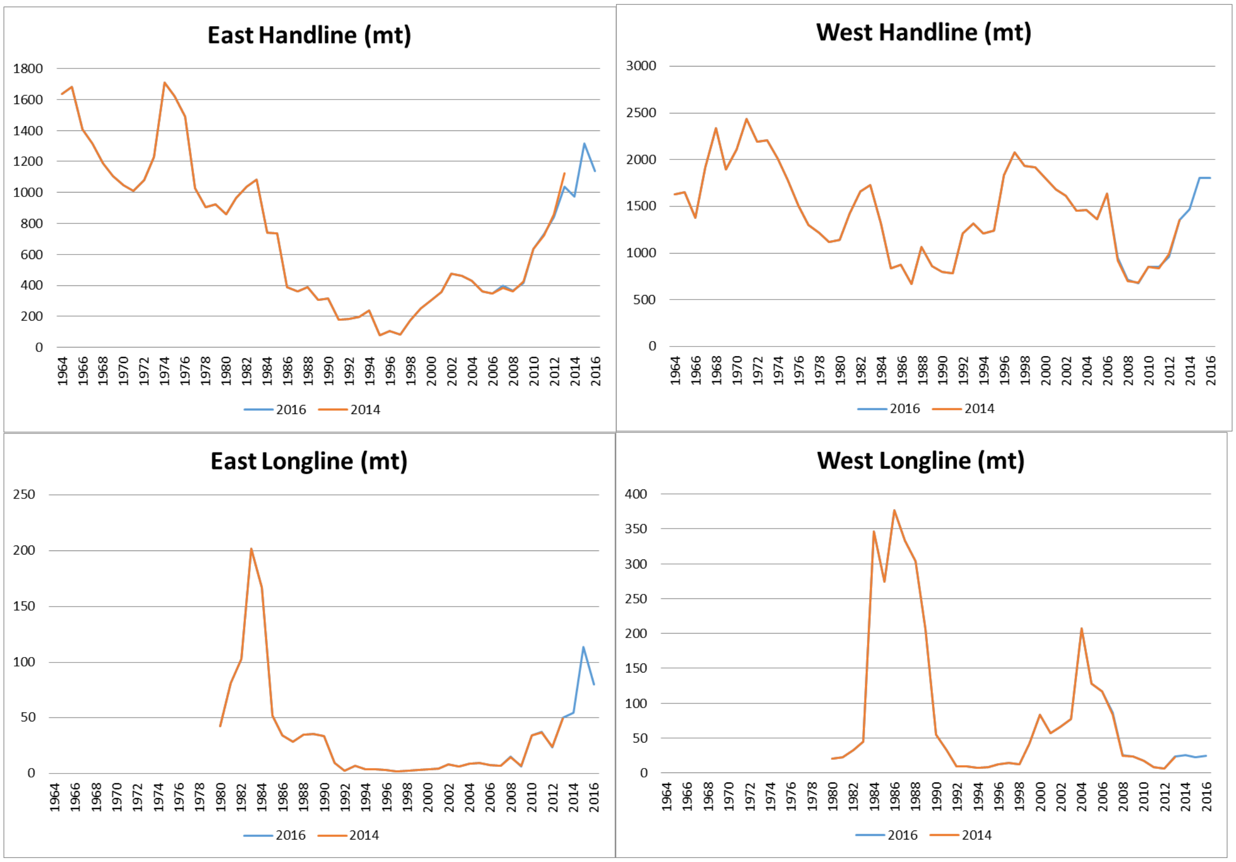


Figure 2.6. Commercial landings for the vertical line (HL) fleet (Top Panel) and the longline fleet (Bottom Panel) in the eastern (Left Panels) and western regions (Right Panel). Data used for the SEDAR 52 Base Model are provided by the blue line and the data used for the 2014 SEDAR 31 Update Assessment are provided by the orange line.

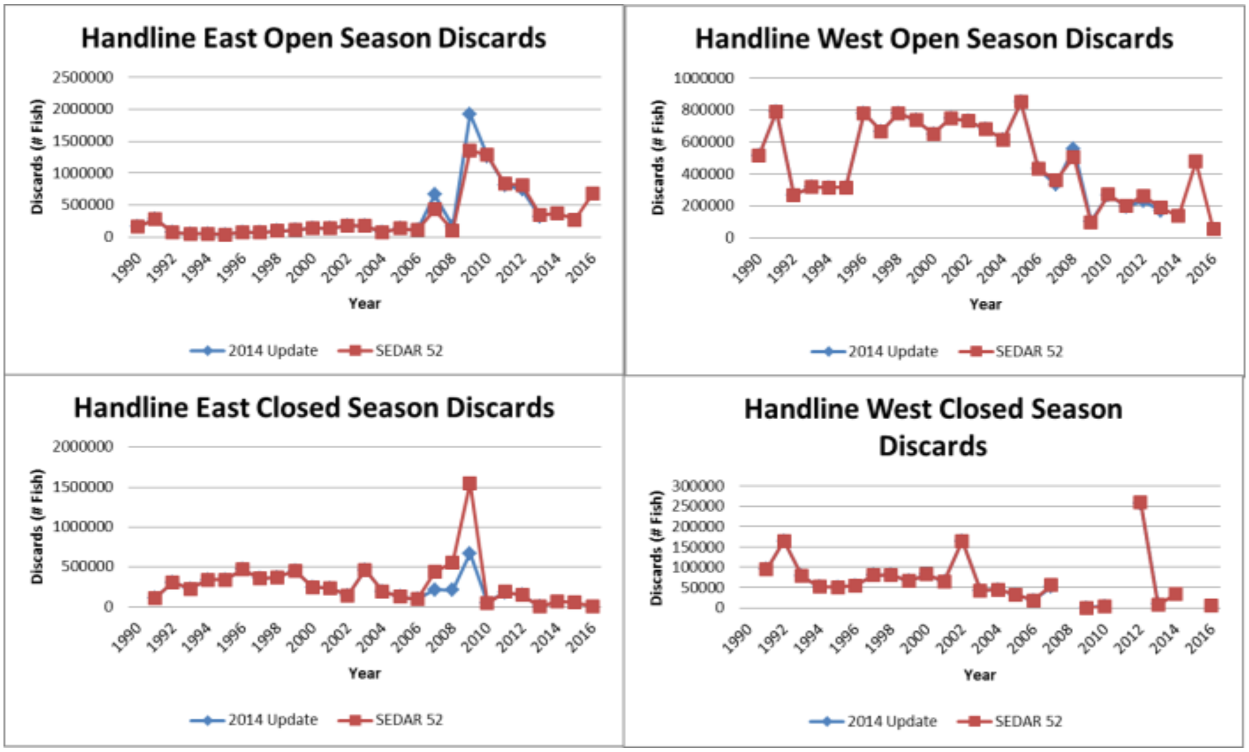


Figure 2.7. Continuity version of the commercial discards for the vertical line (HL) fleet in the eastern (Left Panels) and western regions (Right Panel) by open (Top Panel) or closed/no-IFQ (Bottom Panel) season. Data used for the SEDAR 52 Continuity Model are provided by the red line and the data used for the 2014 SEDAR 31 Update Assessment are provided by the blue line.

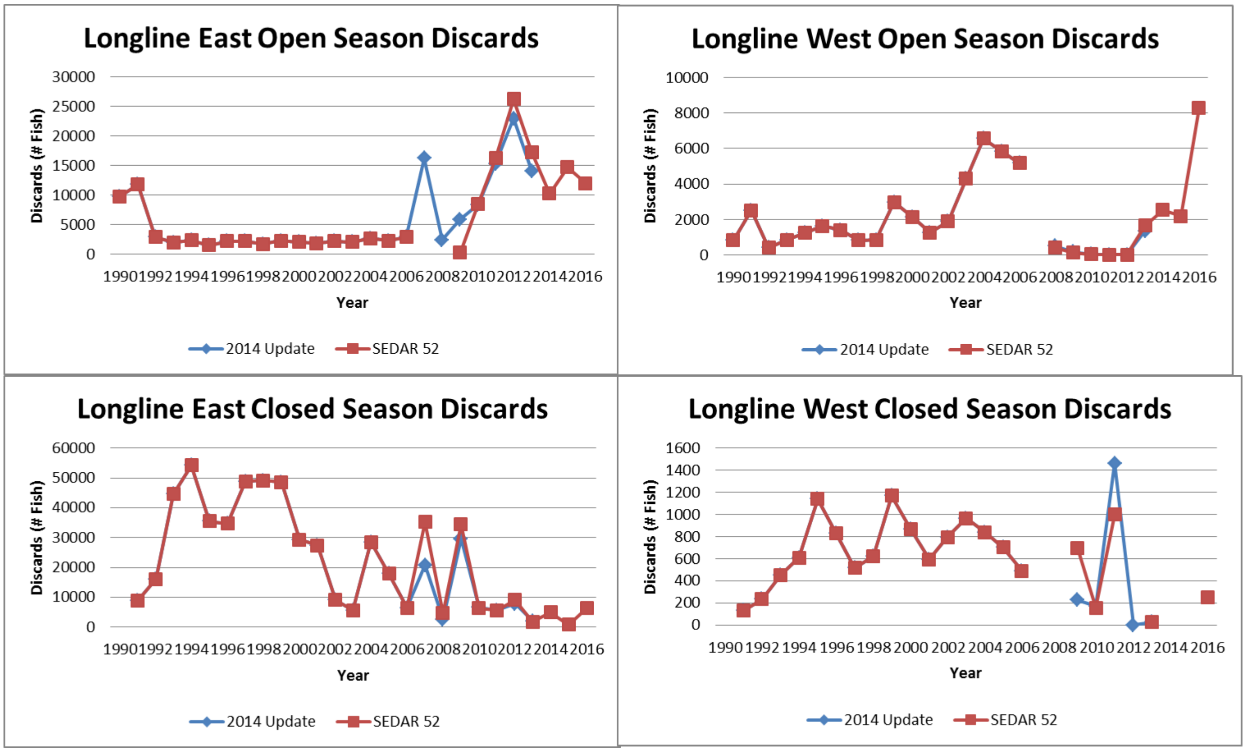


Figure 2.8. Continuity version of the commercial discards for the longline (LL) fleet in the eastern (Left Panels) and western regions (Right Panel) by open (Top Panel) or closed/no-IFQ (Bottom Panel) season. Data used for the SEDAR 52 Continuity Model are provided by the red line and the data used for the 2014 SEDAR 31 Update Assessment are provided by the blue line.

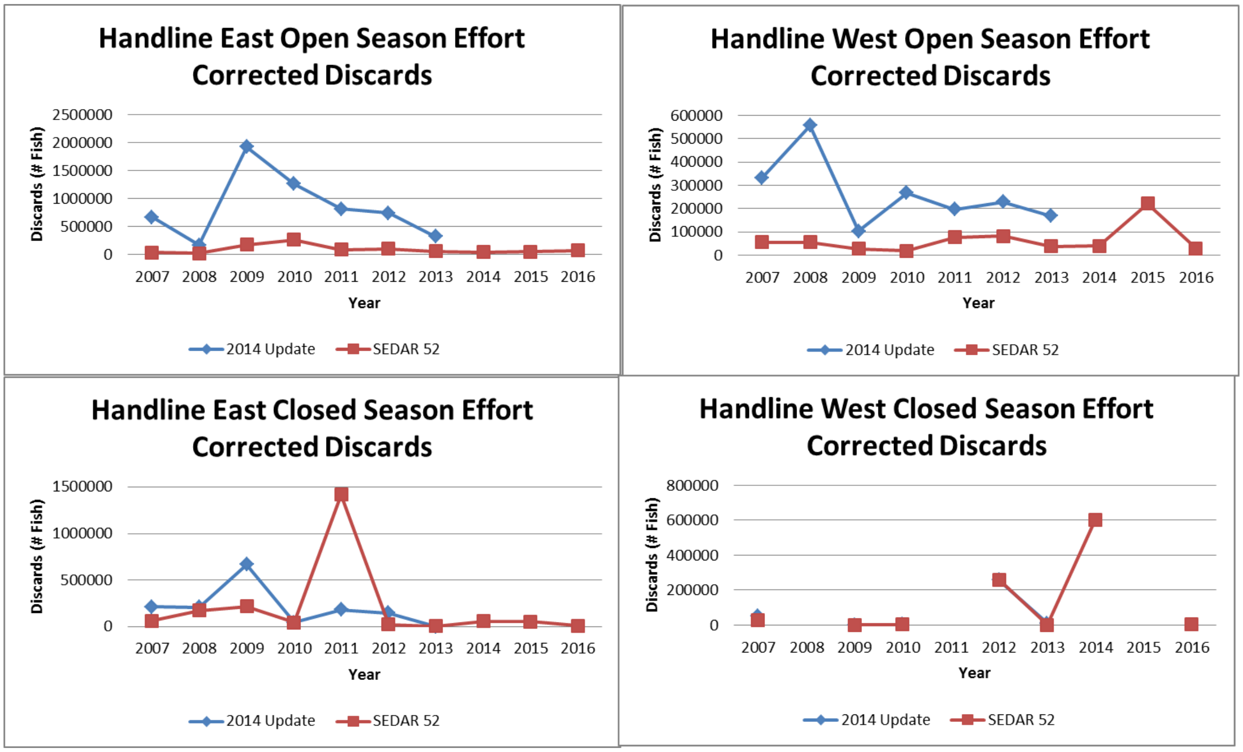


Figure 2.9. Final commercial discards based on SEDAR 52 recommended methods for the vertical line (HL) fleet in the eastern (Left Panels) and western regions (Right Panel) by open (Top Panel) or closed/no-IFQ (Bottom Panel) season. Data used for the SEDAR 52 Base Model are provided by the red line and the data used for the 2014 SEDAR 31 Update Assessment are provided by the blue line. Note that discards prior to 2007 were unchanged since the 2014 SEDAR 31 Update Assessment and are provided in **Figure 2.7**.

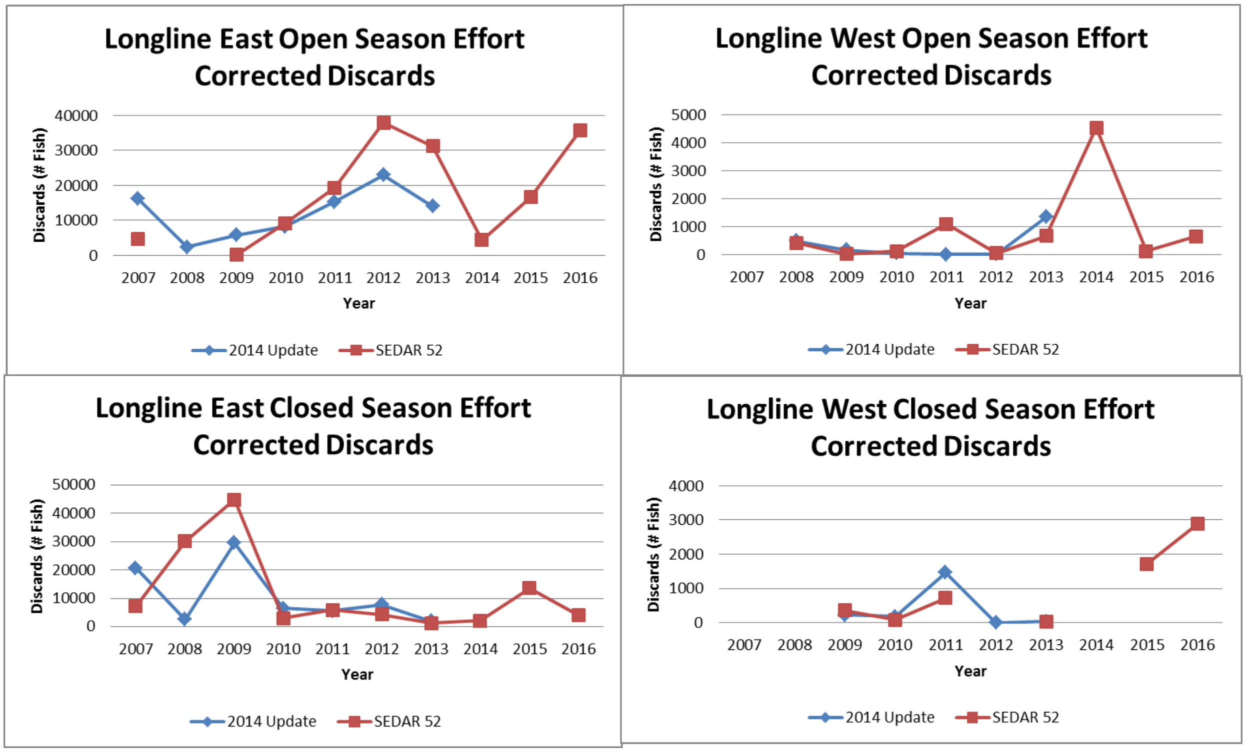


Figure 2.10. Final commercial discards based on SEDAR 52 recommended methods for the longline (LL) fleet in the eastern (Left Panels) and western regions (Right Panel) by open (Top Panel) or closed/no-IFQ (Bottom Panel) season. Data used for the SEDAR 52 Base Model are provided by the red line and the data used for the 2014 SEDAR 31 Update Assessment are provided by the blue line. Note that discards prior to 2007 were unchanged since the 2014 SEDAR 31 Update Assessment and are provided in **Figure 2.8**.

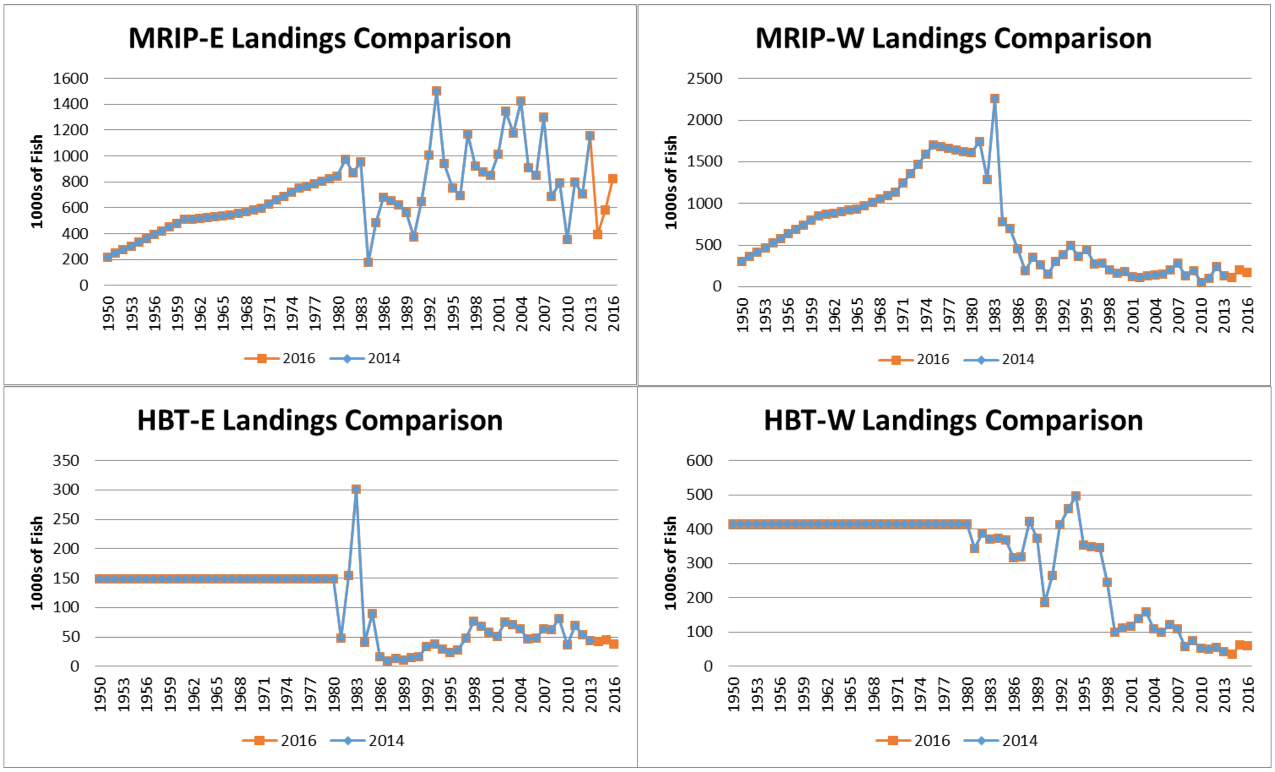


Figure 2.11. Recreational landings for the private-charter (MRIP) fleet (Top Panel) and the headboat fleet (Bottom Panel) in the eastern (Left Panels) and western regions (Right Panel). Data used for the SEDAR 52 Base Model are provided by the orange line and the data used for the 2014 SEDAR 31 Update Assessment are provided by the blue line.

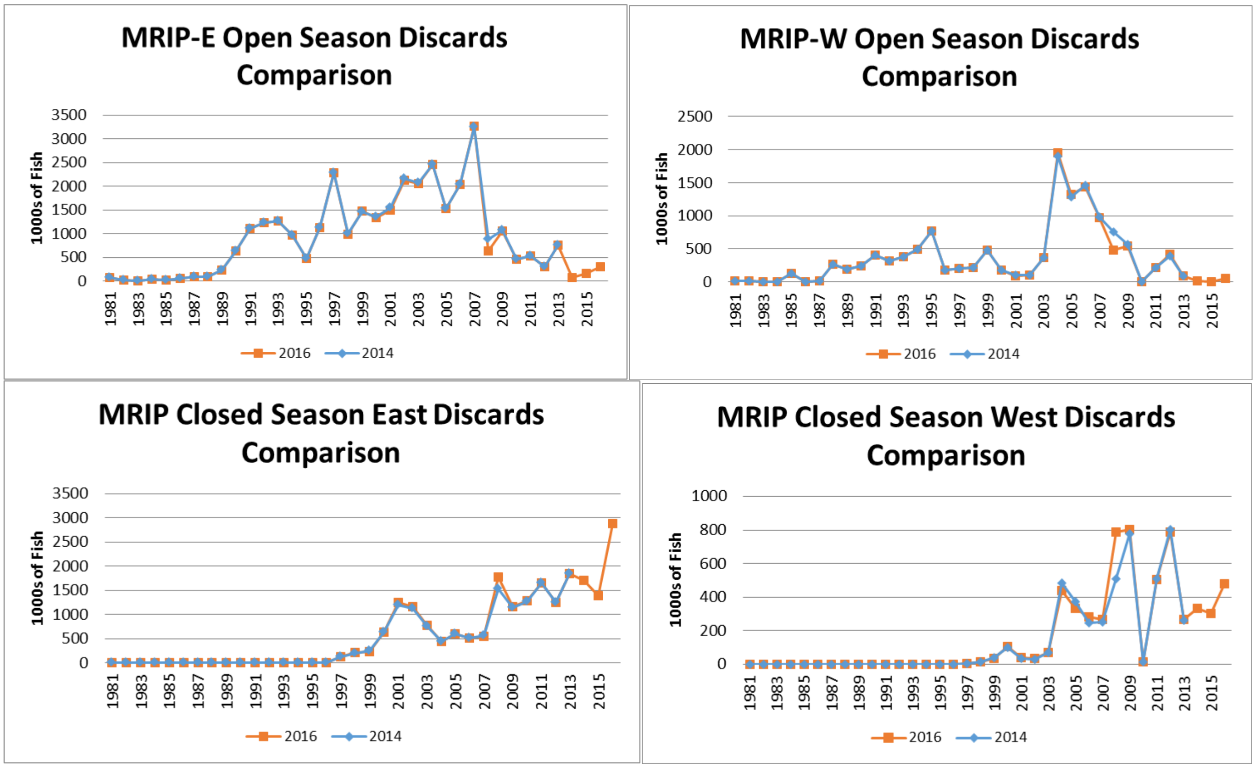


Figure 2.12. Charter-private fleet (MRIP) discards by open (Top Panels) and closed season (Bottom Panels) and eastern (Left Panels) and western (Right Panels) region. Data used for the SEDAR 52 Base Model are provided by the orange line and the data used for the 2014 SEDAR 31 Update Assessment are provided by the blue line.

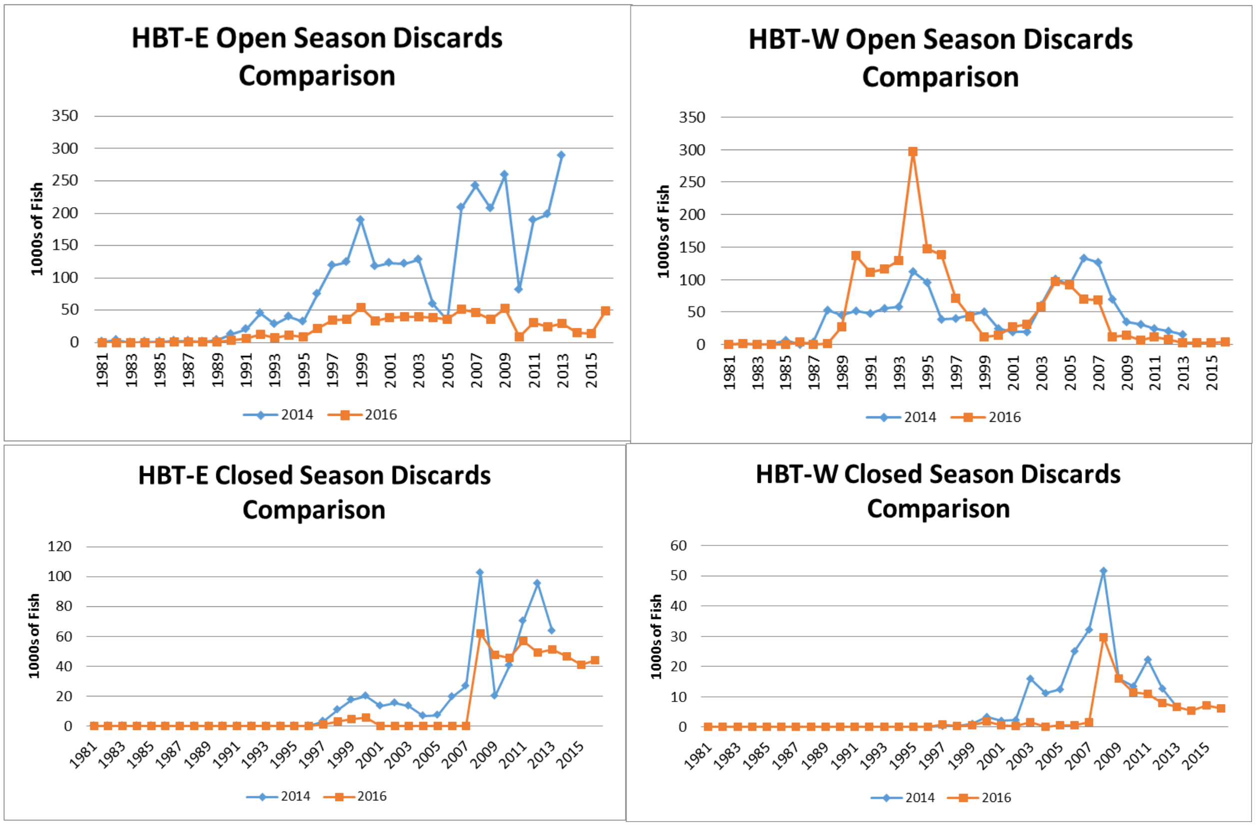


Figure 2.13. Headboat discards by open (Top Panels) and closed season (Bottom Panels) and eastern (Left Panels) and western (Right Panels) region. Data used for the SEDAR 52 Base Model are provided by the orange line and the data used for the 2014 SEDAR 31 Update Assessment are provided by the blue line. Discrepancies are due to the use of a new recommended approach in SEDAR 52 for estimating headboat discards (see text).

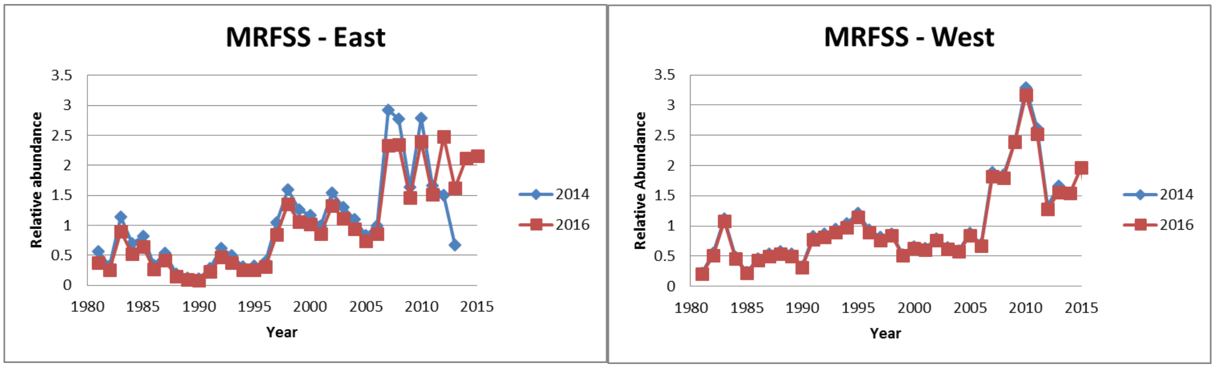


Figure 2.14. Recreational private-charter (MRIP/MRFSS) CPUE indices of abundance by region. The 2014 SEDAR 31 Update Assessment values (blue) are compared to the SEDAR 52 Base Model values (red).

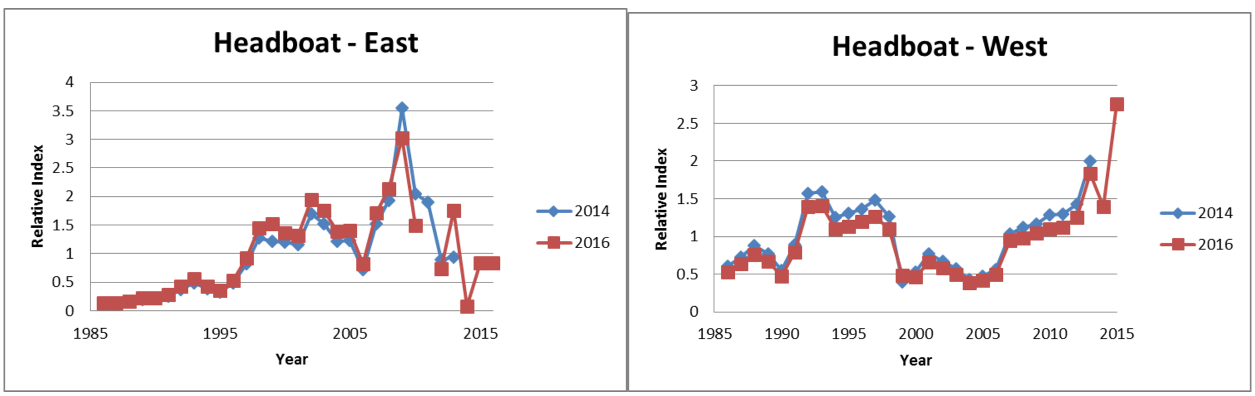


Figure 2.15. Recreational headboat CPUE indices of abundance by region. The 2014 SEDAR 31 Update Assessment values (blue) are compared to the SEDAR 52 Base Model values (red).

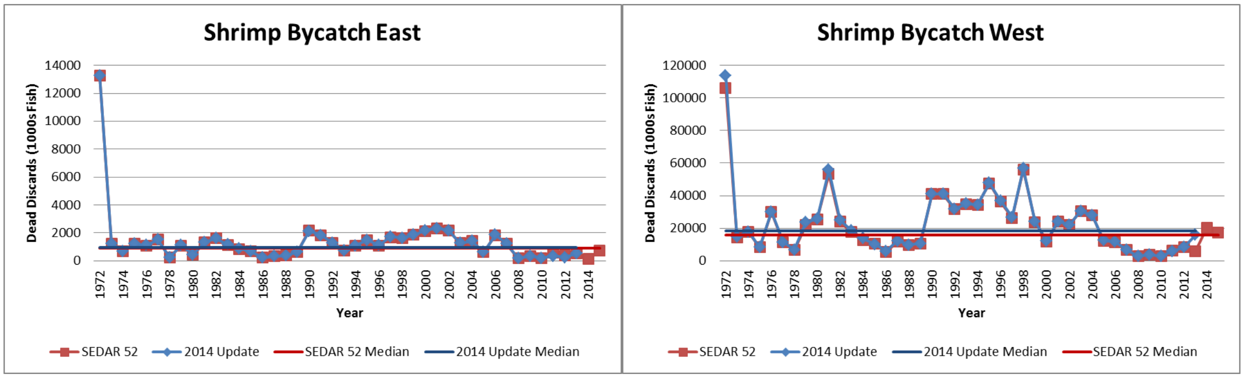


Figure 2.16. Shrimp bycatch by region including the median values fit in the assessment model using the super-year approach (see text). The 2014 SEDAR 31 Update Assessment values (blue) are compared to the SEDAR 52 Base Model values (red).

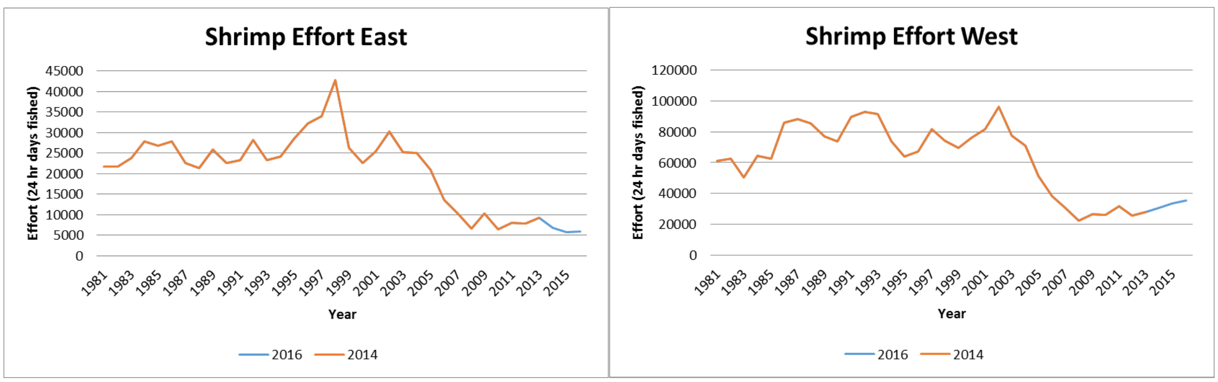


Figure 2.17. Shrimp effort by region for depths greater than 10 fathoms. The 2014 SEDAR 31 Update Assessment values (orange) are compared to the SEDAR 52 Base Model values (blue).

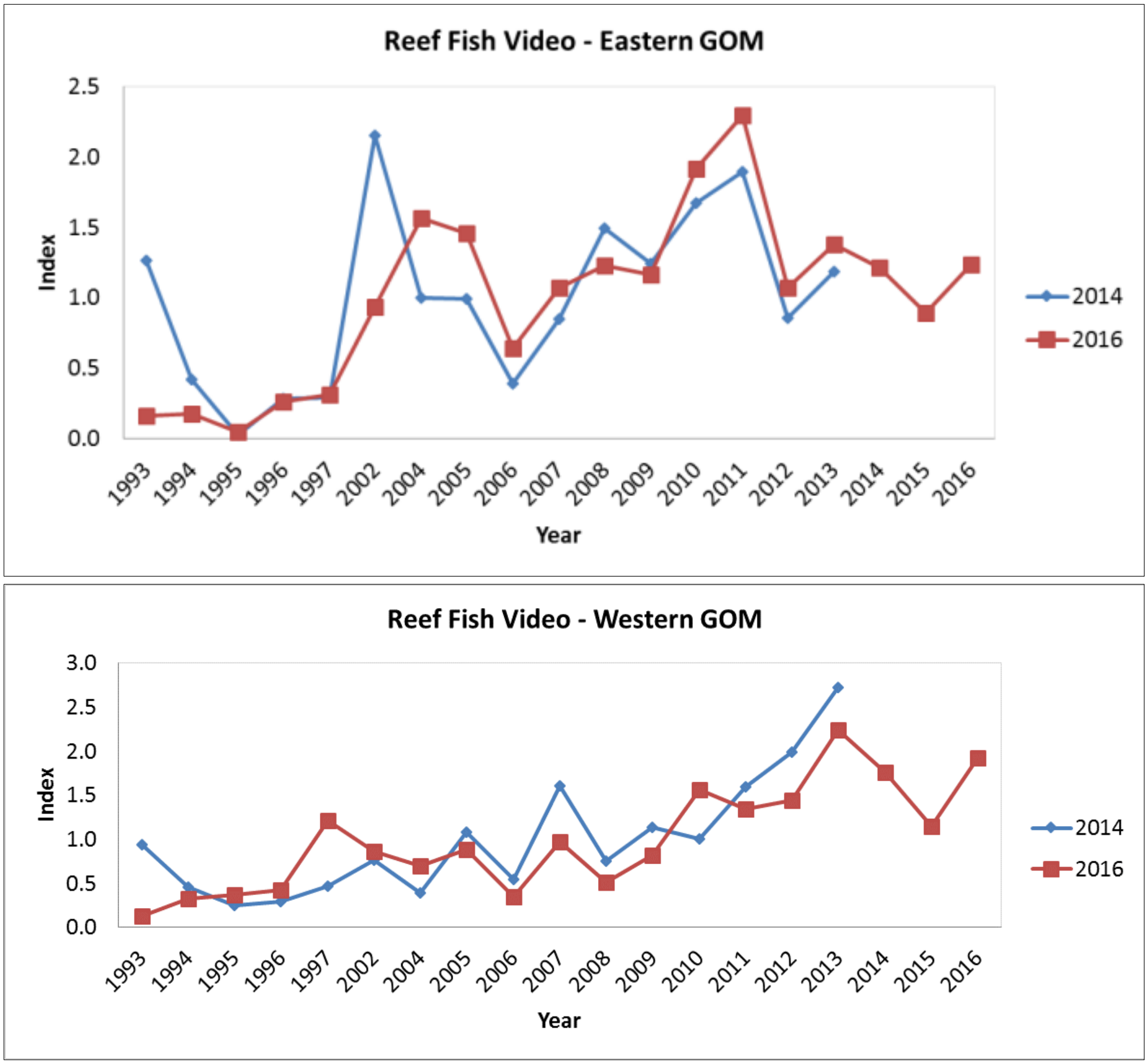


Figure 2.18. Reef Fish Video indices of abundance by region. The 2014 SEDAR 31 Update Assessment values (blue) are compared to the SEDAR 52 values (red). Discrepancies in indices are largely due to updated quality control measures applied during the SEDAR 52 assessment.

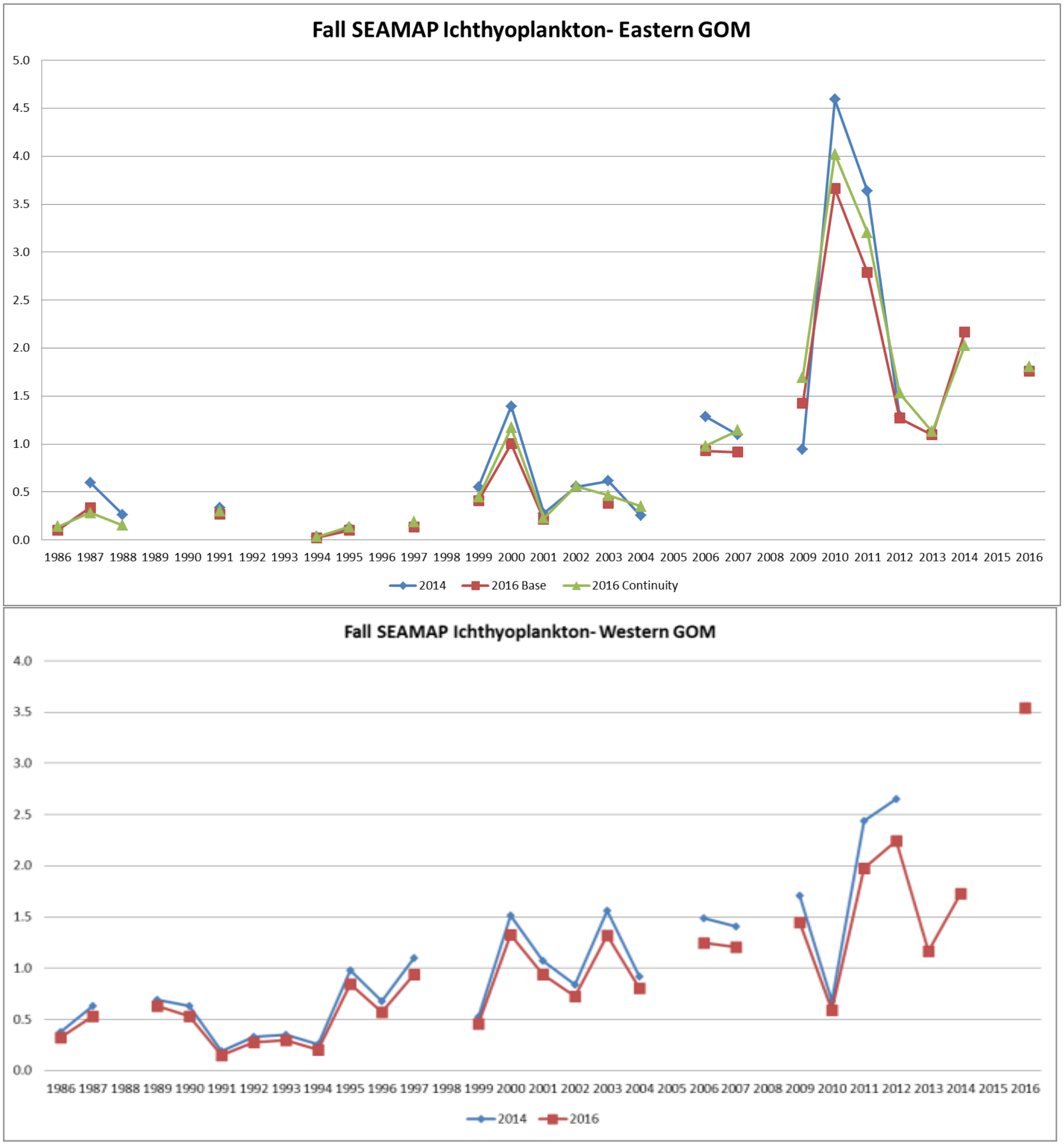


Figure 2.19. SEAMAP Ichthyoplankton (larval survey) indices by region. The 2014 SEDAR 31 Update Assessment values (blue) are compared to the SEDAR 52 values (red). For the eastern index the continuity data set (old site selection) is also included for comparison (green line).

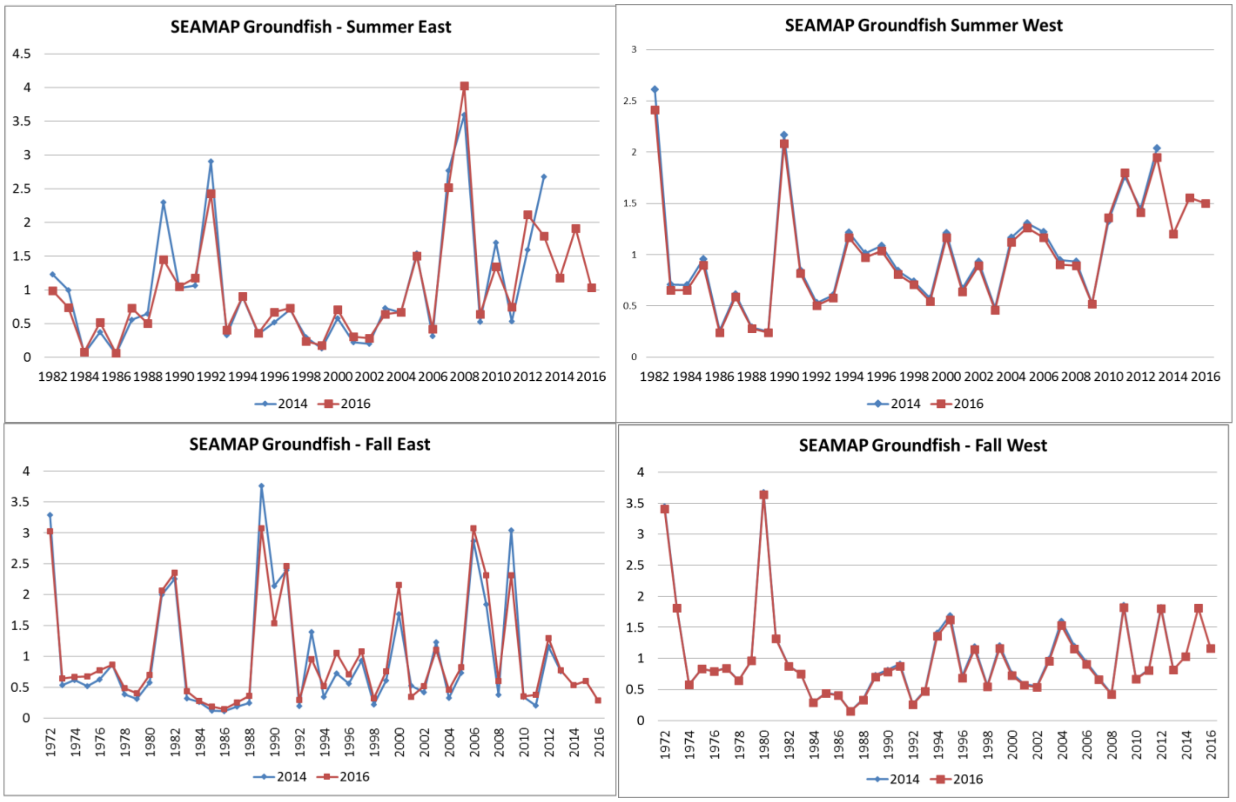


Figure 2.20. SEAMAP Groundfish indices of abundance by season (summer in Top Panels and fall in Bottom Panels) and region (east in Left Panels and west in Right Panels). The 2014 SEDAR 31 Update Assessment values (blue) are compared to the SEDAR 52 values (red).

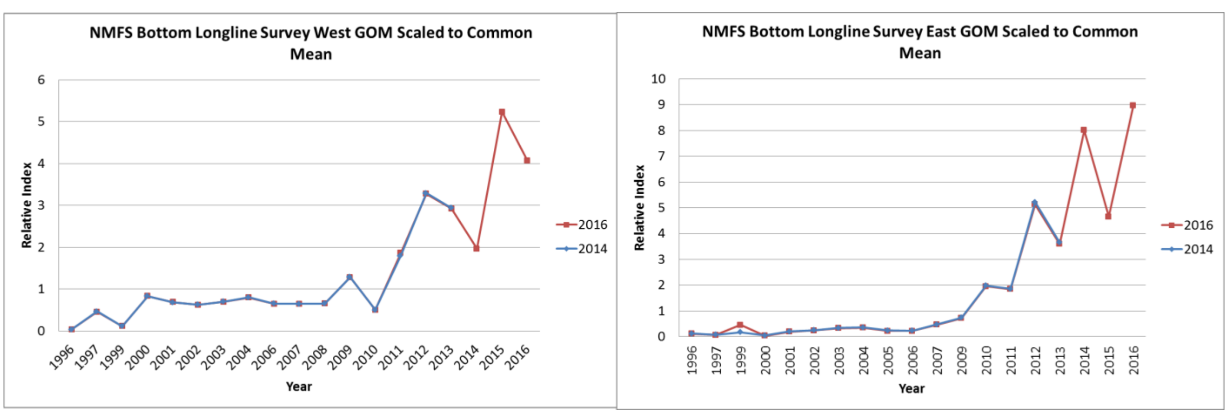
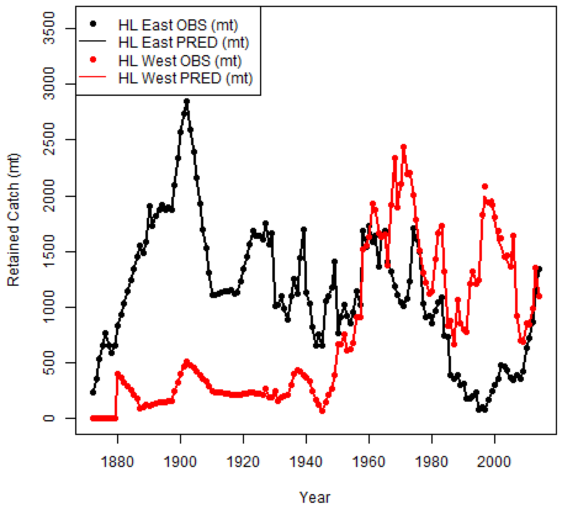


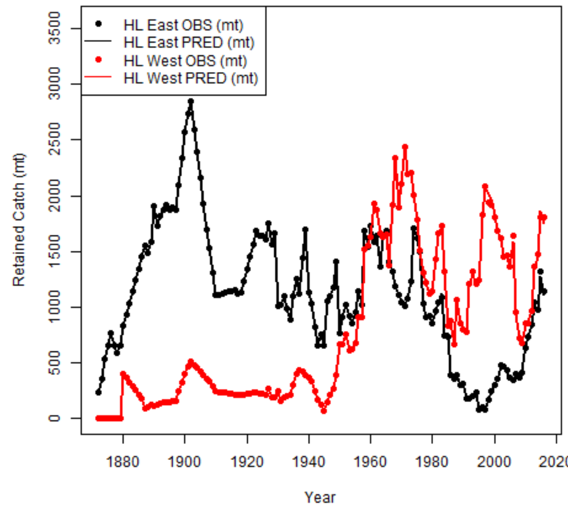
Figure 2.21. NMFS Bottom Longline indices of abundance by region scaled to a common mean (1996-2013). The 2014 SEDAR 31 Update Assessment values (blue) are compared to the SEDAR 52 values (red).

Figure 4.1. Observed and predicted landings by fleet in either metric tons (commercial fleets) or 1000s of fish (recreational fleets) for the 2014 SEDAR 31 Update Assessment (left panel) and the SEDAR 52 Base Model (right panel).

a) Commercial Vertical Line (HL)

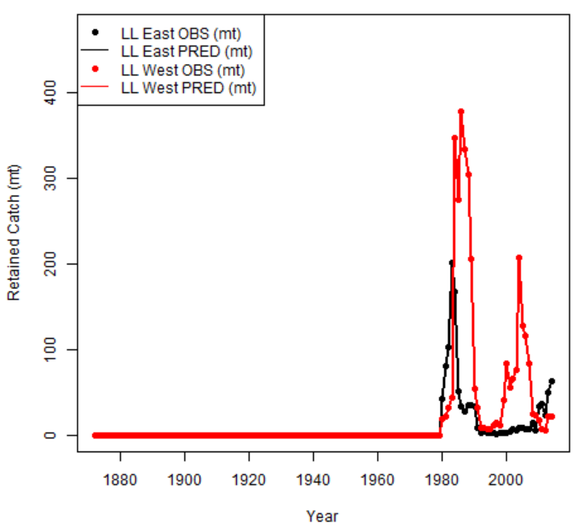
2014 SEDAR 31 Update **SEDAR 52**





b) Commercial Long Line (LL):

2014 SEDAR 31 Update **SEDAR 52**



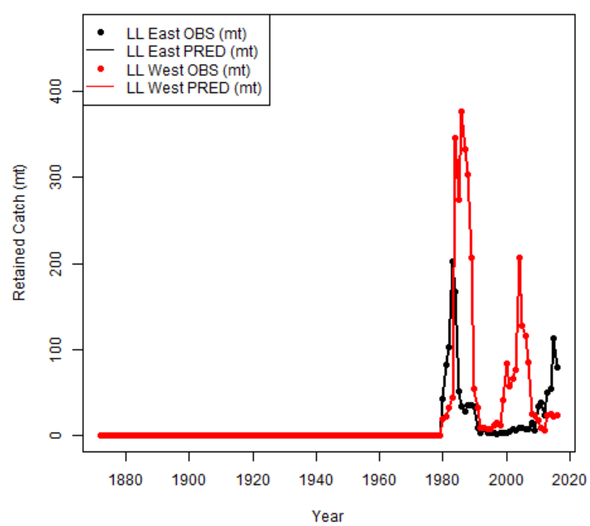
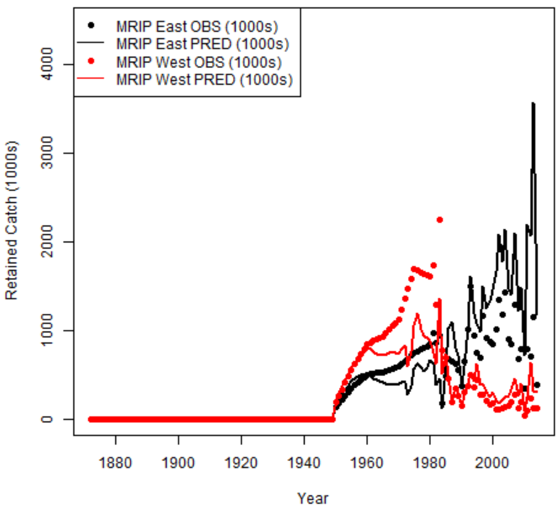


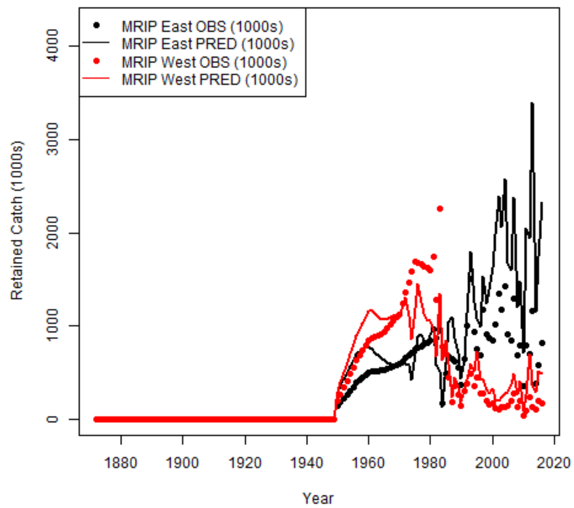
Figure 4.1 (fits to landings continued).

c) Recreational Private/Charter (MRIP/MRFSS):

2014 SEDAR 31 Update

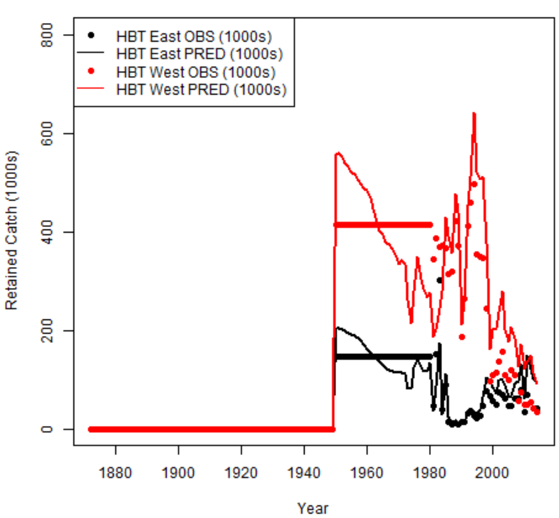


SEDAR 52



d) Recreational headboat (HBT):

2014 SEDAR 31 Update



SEDAR 52

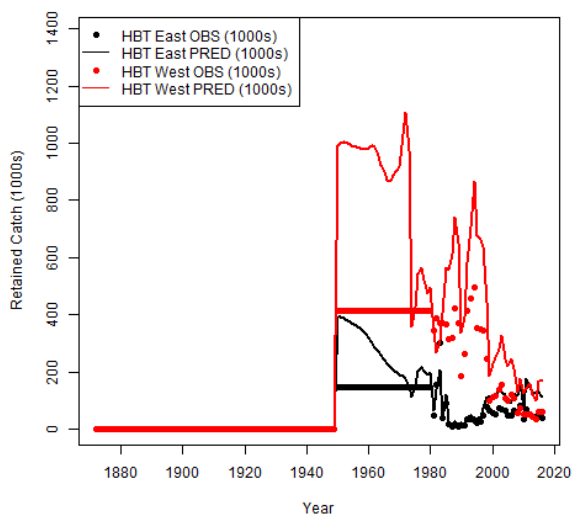
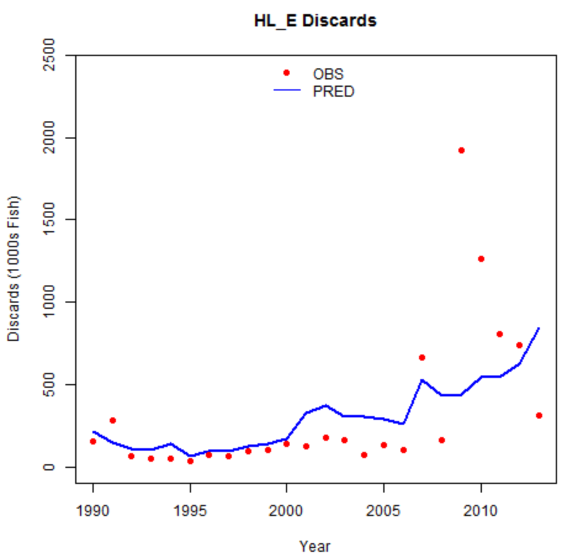


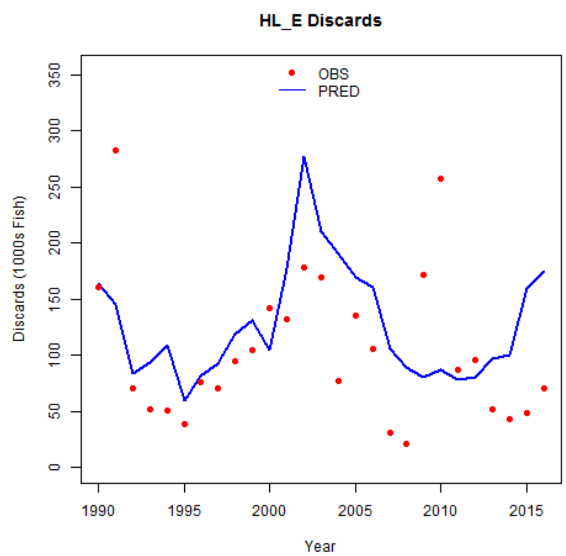
Figure 4.2. Observed and predicted total discards (i.e., before applying the discard mortality rate for each fleet and timeblock) by fleet and region in 1000s of fish for the 2014 SEDAR 31 Update Assessment (left panel) and the SEDAR 52 Base Model (right panel). For shrimp bycatch all discards are dead and only the median (first data point in the plotted observed timeseries) is fit (see text for more details). Red points are observed values and the blue line is the predicted value.

a) Commercial Vertical Line (HL) East:

2014 SEDAR 31 Update

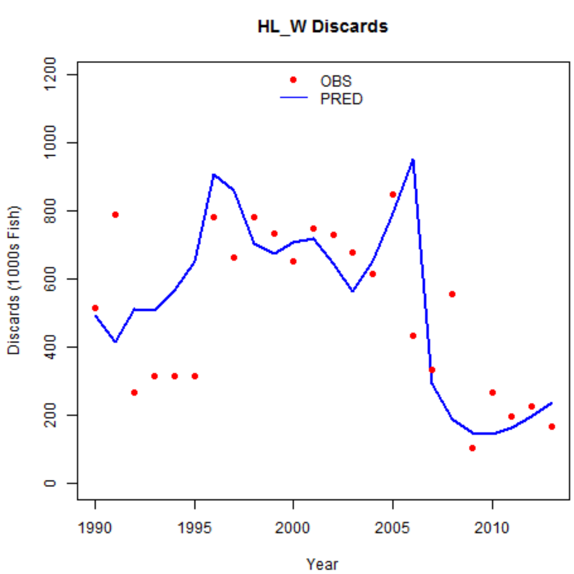


SEDAR 52



b) Commercial Vertical Line (HL) West:

2014 SEDAR 31 Update



SEDAR 52

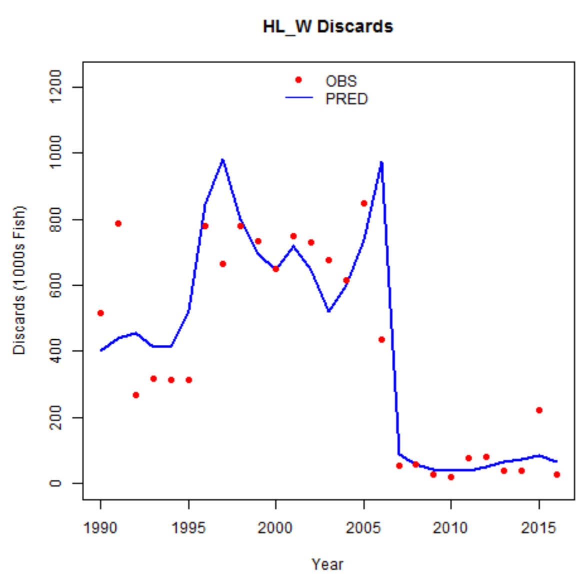
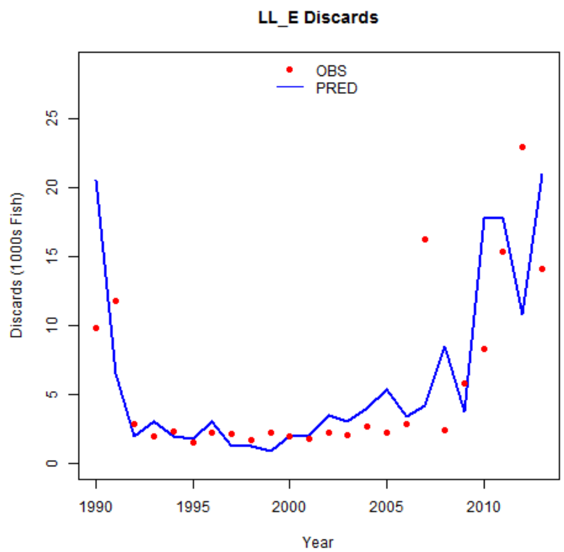


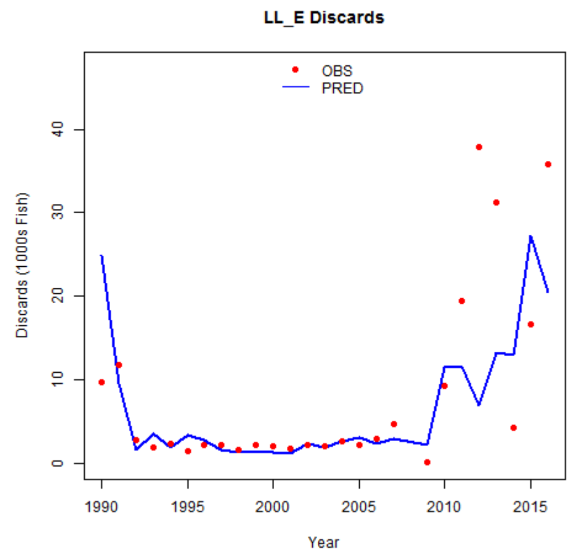
Figure 4.2 (fit to discards continued).

c) Commercial Long Line (LL) East:

2014 SEDAR 31 Update

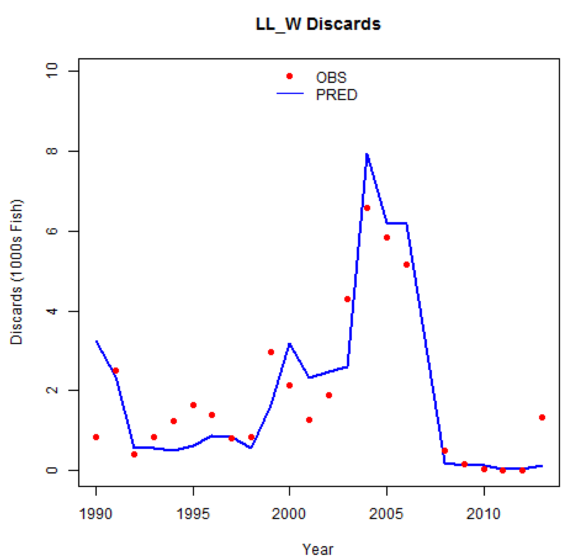


SEDAR 52



d) Commercial Long Line (LL) West:

2014 SEDAR 31 Update



SEDAR 52

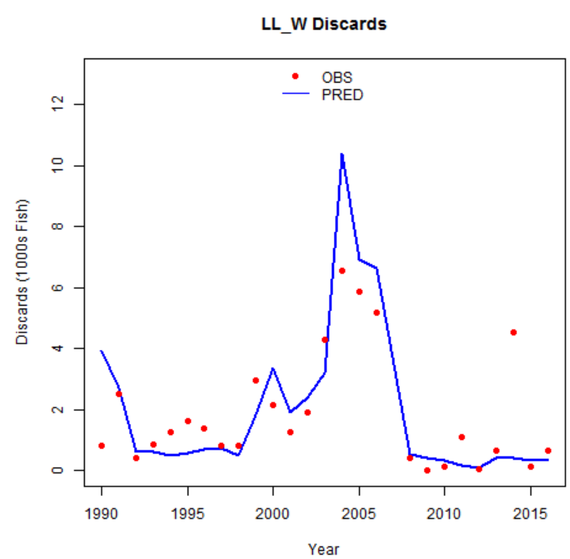
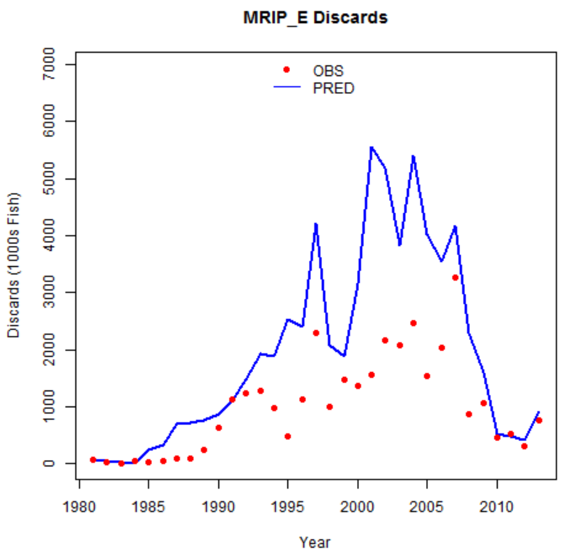


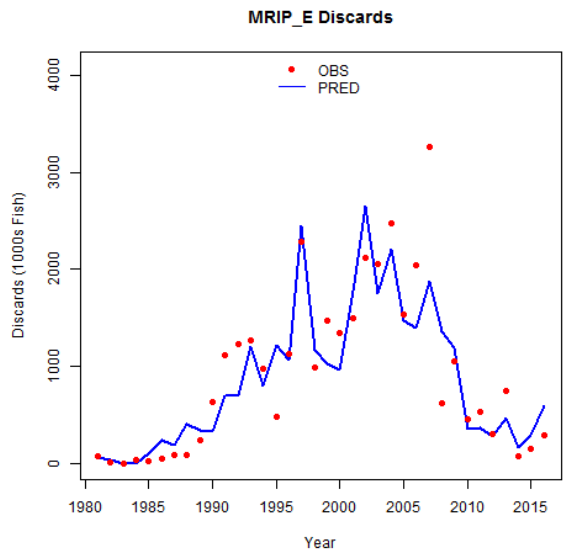
Figure 4.2 (fit to discards continued).

e) Recreational charter\private boat (MRIP\MRFSS) East:

2014 SEDAR 31 Update

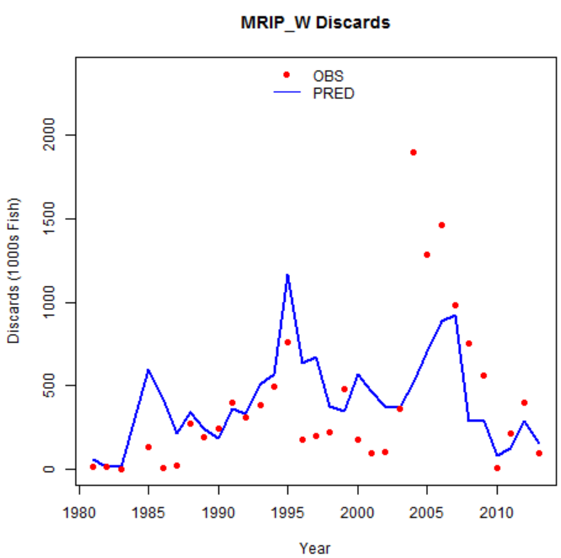


SEDAR 52



f) Recreational charter\private boat (MRIP\MRFSS) West:

2014 SEDAR 31 Update



SEDAR 52

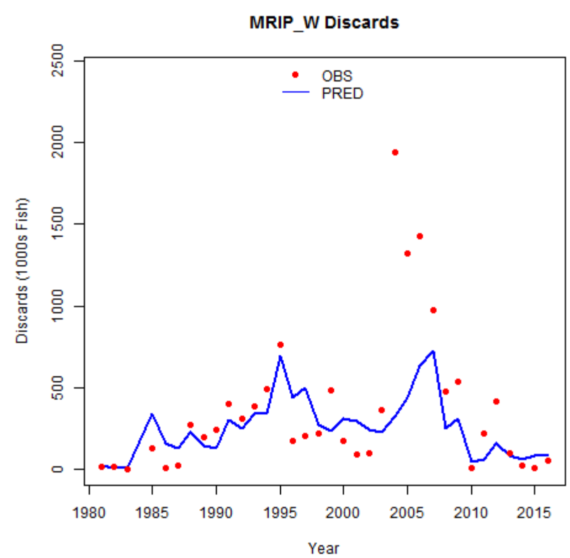
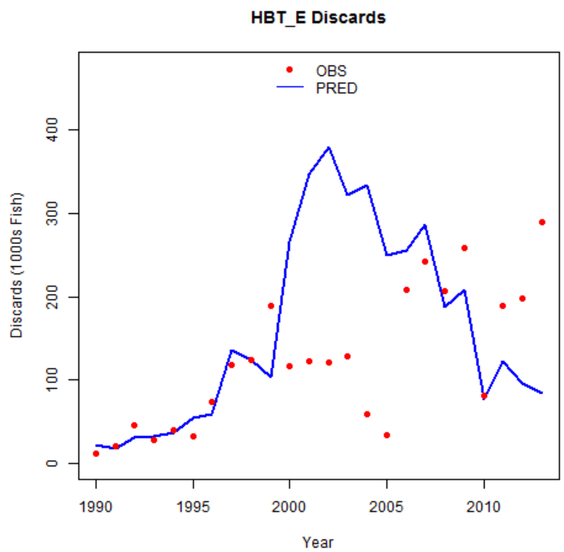


Figure 4.2 (fit to discards continued).

g) Recreational headboat (HBT) East:

2014 SEDAR 31 Update



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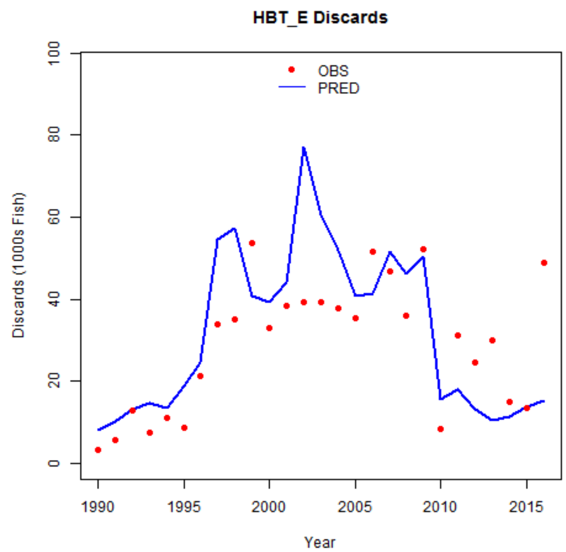
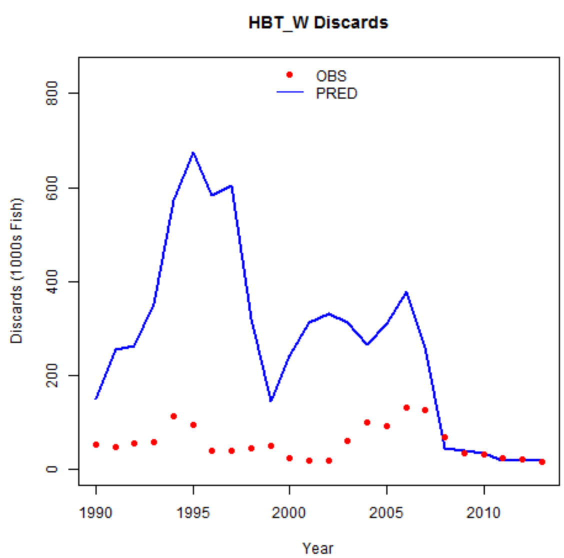


h) Recreational headboat (HBT) West:

2014 SEDAR 31 Update



SEDAR 52

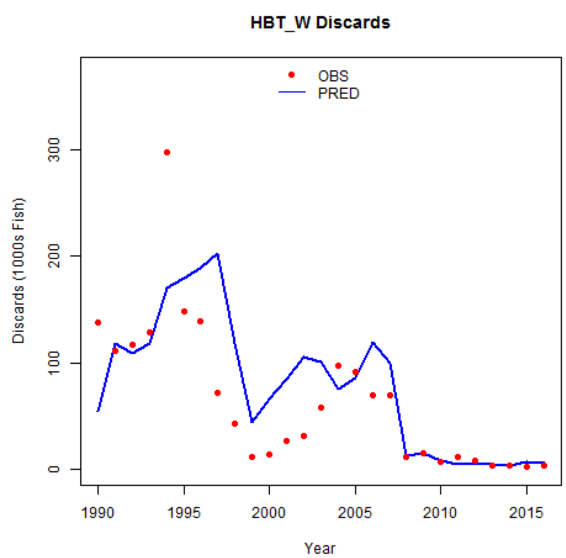
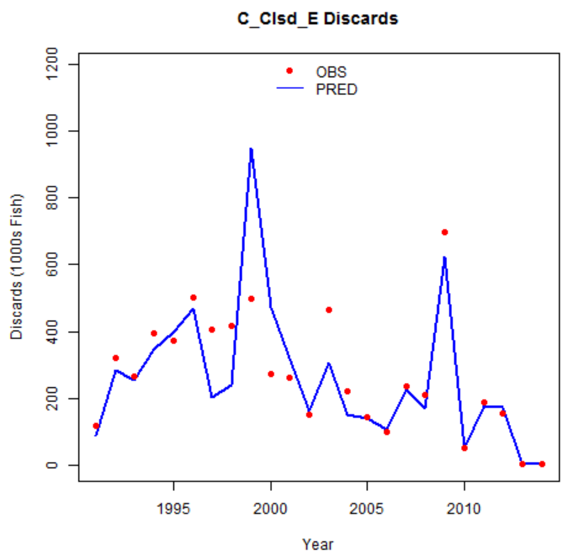


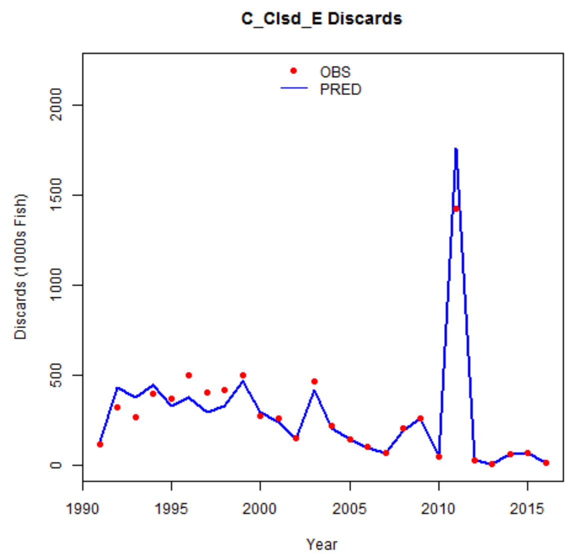
Figure 4.2 (fit to discards continued).

i) Commercial closed season (or no allocation; C_Closed) East:

2014 SEDAR 31 Update

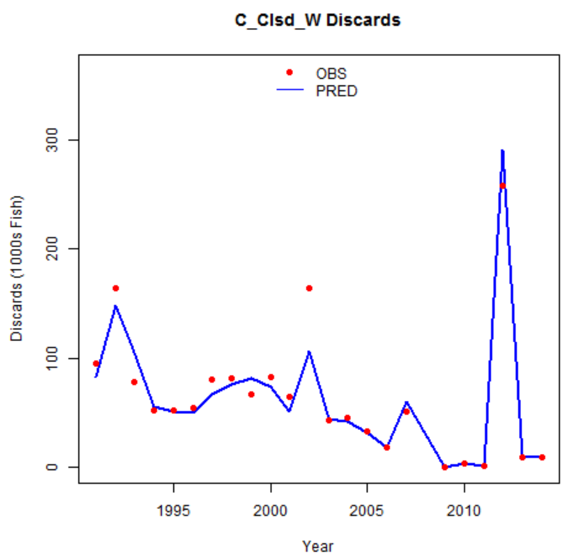


SEDAR 52



j) Commercial closed season (or no allocation; C_Closed) West:

2014 SEDAR 31 Update



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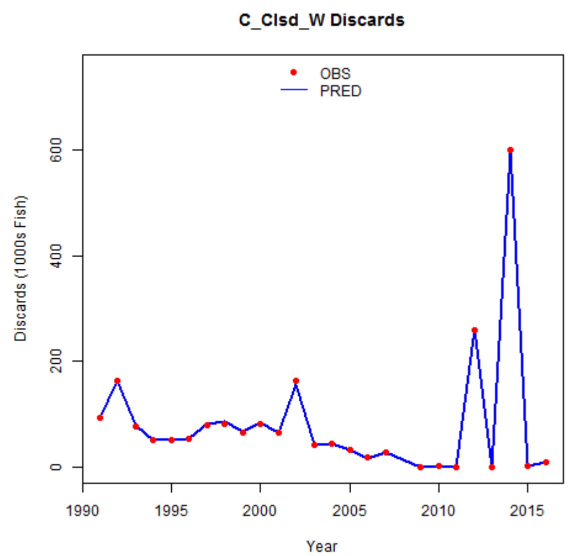
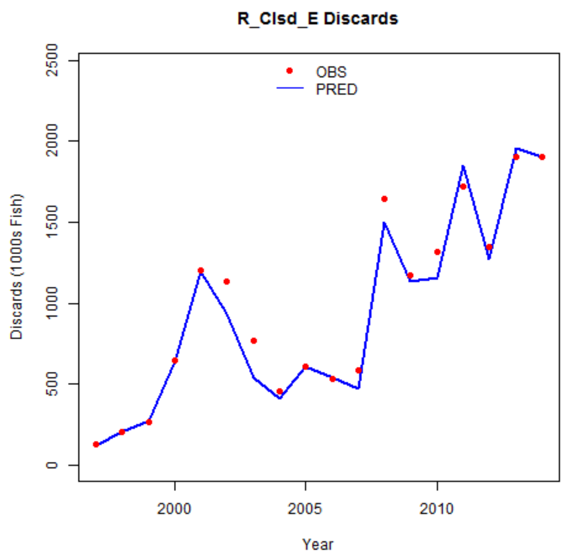


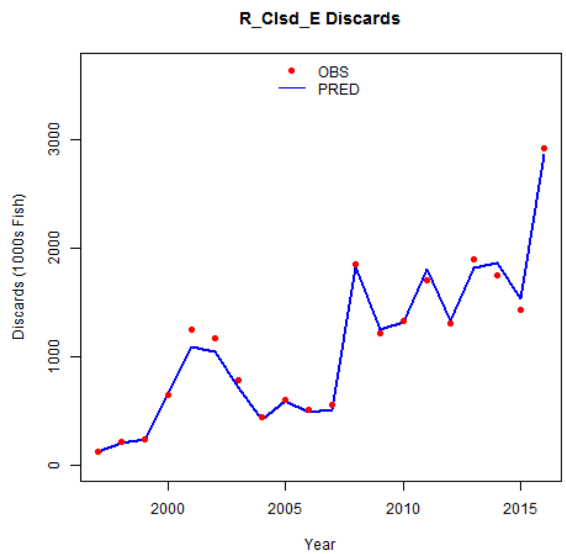
Figure 4.2 (fit to discards continued).

k) Recreational closed season (R_Closed) East:

2014 SEDAR 31 Update

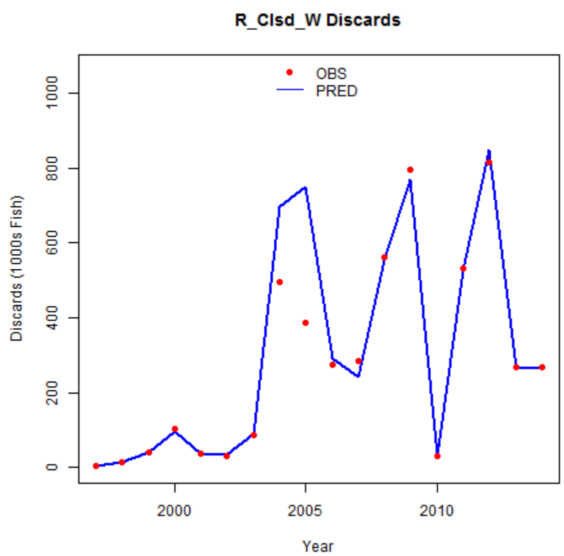


SEDAR 52



l) Recreational closed season (R_Closed) West:

2014 SEDAR 31 Update



SEDAR 52

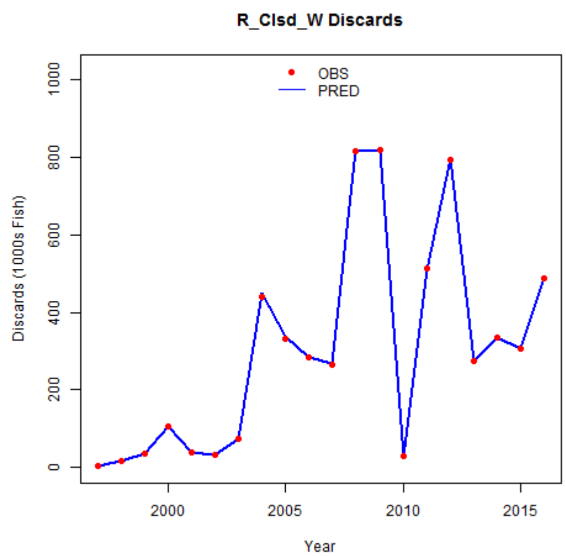
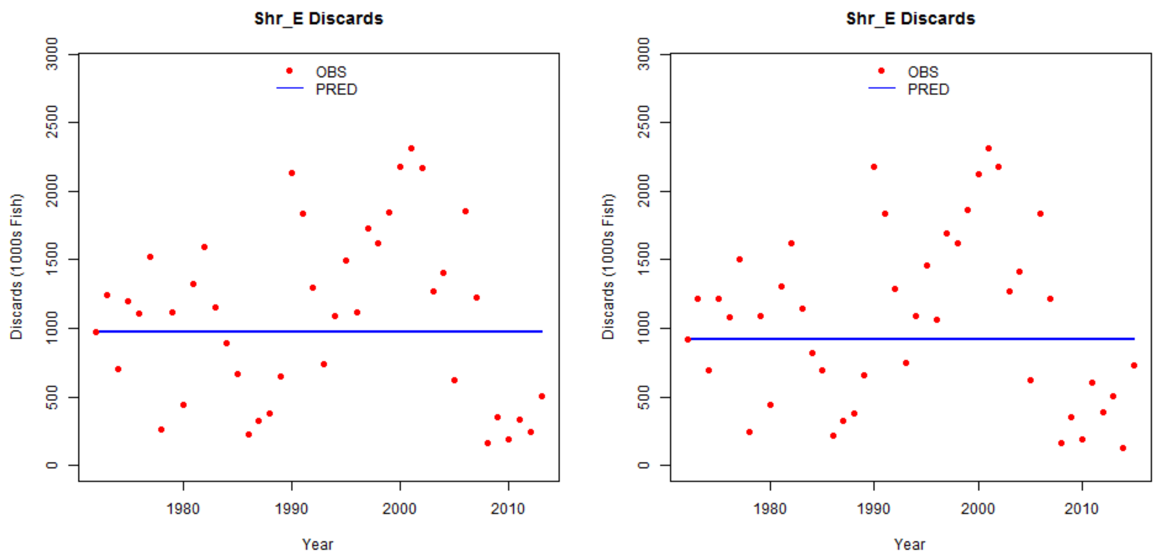


Figure 4.2 (fit to discards continued).

m) Shrimp bycatch (SHR) East (note that the first observed data point is the observed median):

2014 SEDAR 31 Update **SEDAR 52**



n) Shrimp bycatch (SHR) West (note that the first observed data point is the observed median):

2014 SEDAR 31 Update **SEDAR 52**

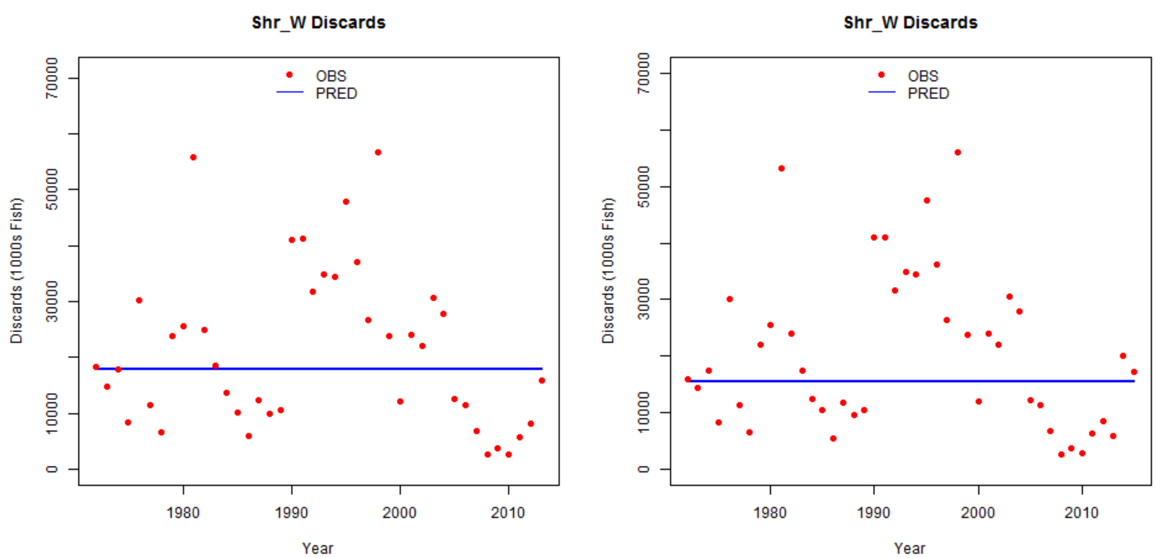
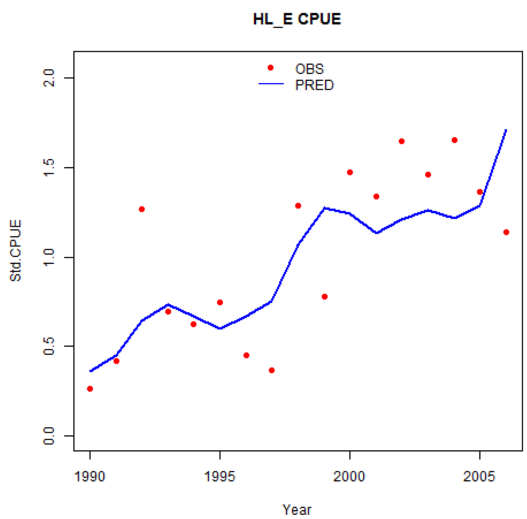


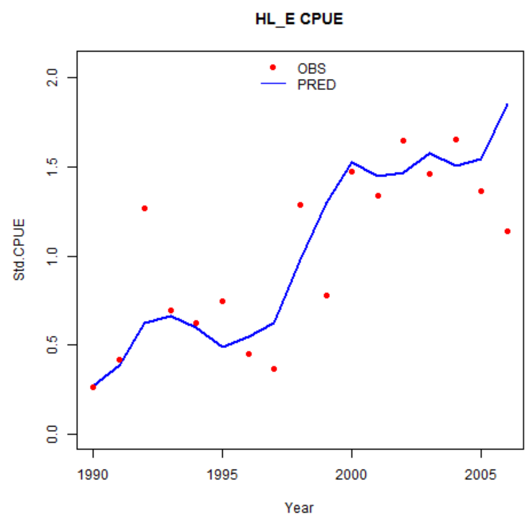
Figure 4.3. Observed and predicted indices by fleet or survey and region for the 2014 SEDAR 31 Update Assessment (left panel) and the SEDAR 52 Base Model (right panel). Panels K-L illustrates the SEAMAP larval indices and is an index of spawning stock biomass. Similarly, Panels Q-R are the index of shrimp effort. All other panels illustrate indices of abundance (i.e., fishery-dependent CPUE, Panels A-F, or fishery-independent surveys, Panels G-J and M-P). Red points are observed values and the blue line is the predicted value.

a) Commercial Vertical Line (HL) CPUE East (***Note***: this index was truncated in 2006 when IFQs were implemented and has not been updated since SEDAR 31):

2014 SEDAR 31 Update

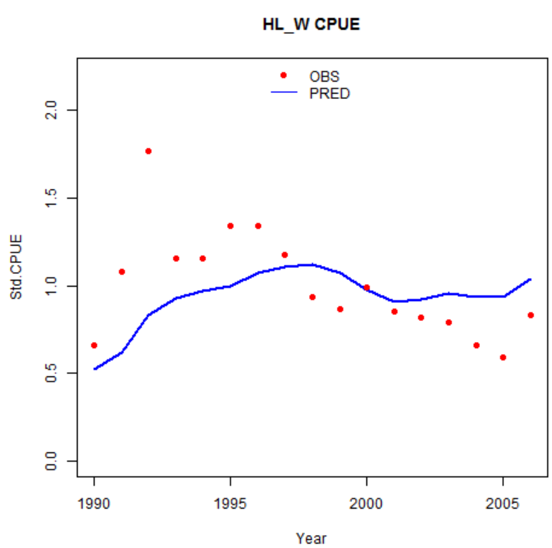


SEDAR 52



b) Commercial Vertical Line (HL) CPUE West (***Note***: this index was truncated in 2006 when IFQs were implemented and has not been updated since SEDAR 31):

2014 SEDAR 31 Update



SEDAR 52

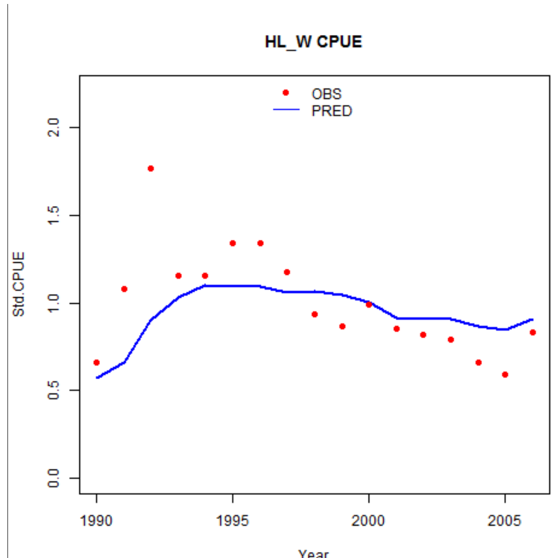
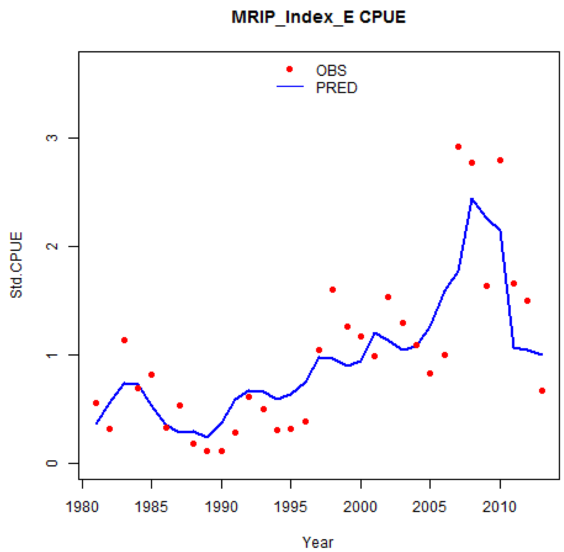


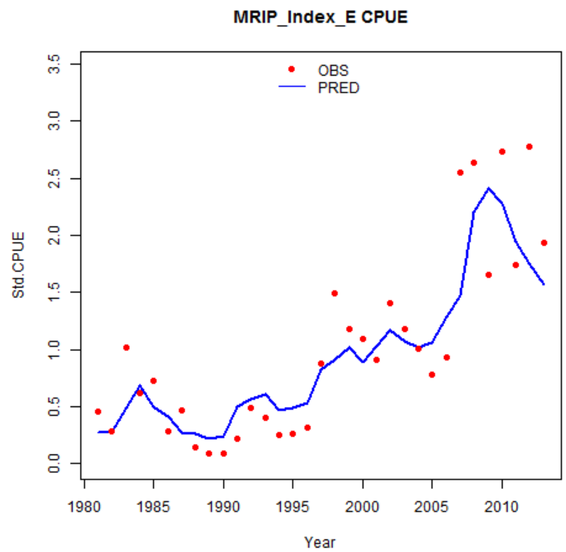
Figure 4.3 (fit to indices continued).

c) Recreational charter\private boat (MRIP\MRFSS) CPUE East (***Note***: this index was truncated in 2013):

2014 SEDAR 31 Update

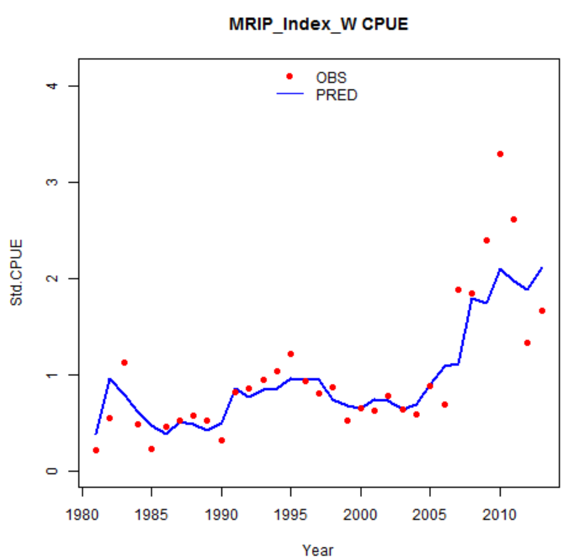


SEDAR 52



d) Recreational charter\private boat (MRIP\MRFSS) CPUE West (***Note***: this index was truncated in 2013):

2014 SEDAR 31 Update



SEDAR 52

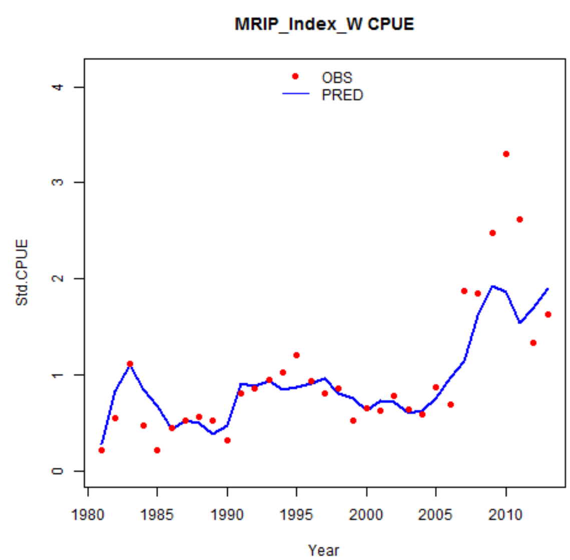
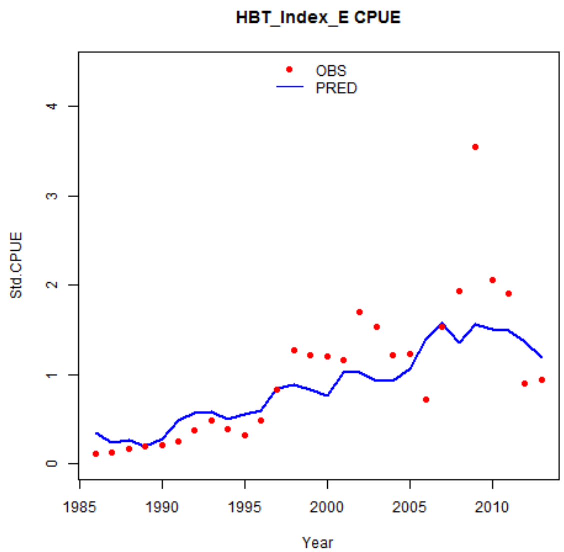


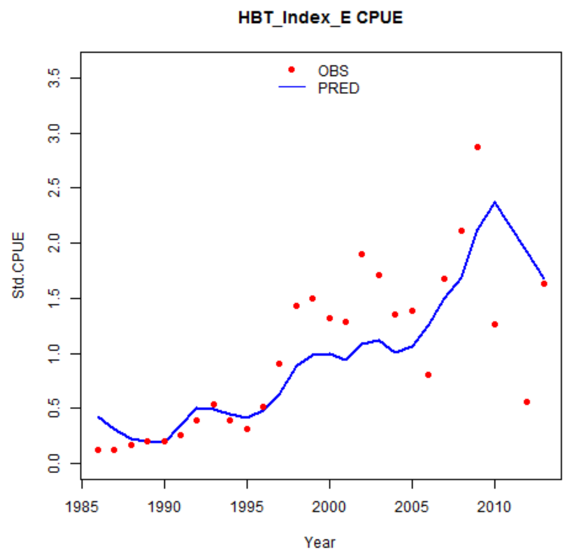
Figure 4.3 (fit to indices continued).

e) Recreational headboat (HBT) CPUE East (***Note***: this index was truncated in 2013):

2014 SEDAR 31 Update

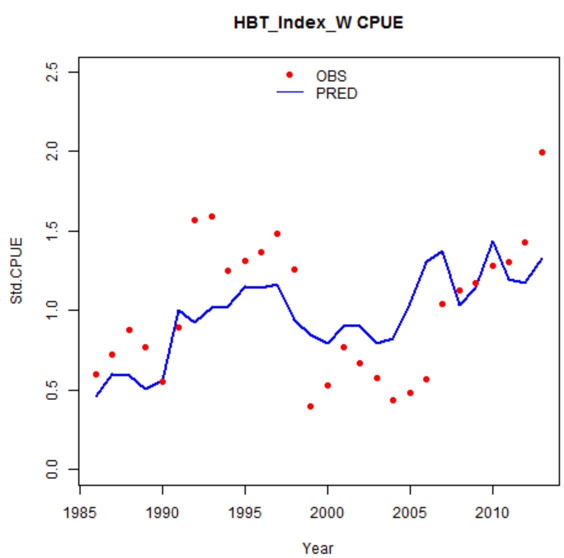


SEDAR 52



f) Recreational headboat (HBT) West:

2014 SEDAR 31 Update



SEDAR 52

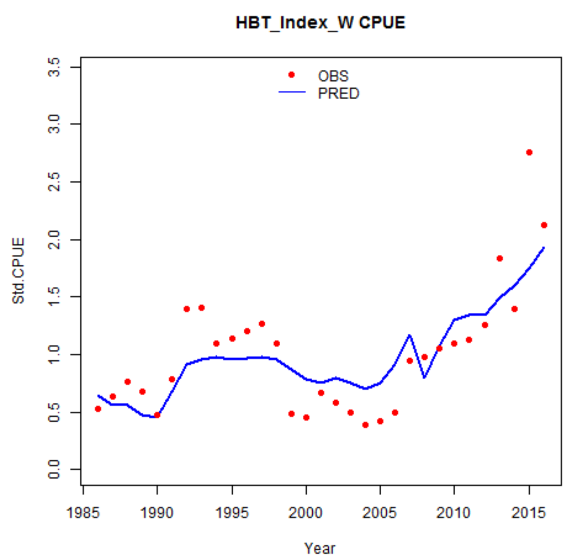
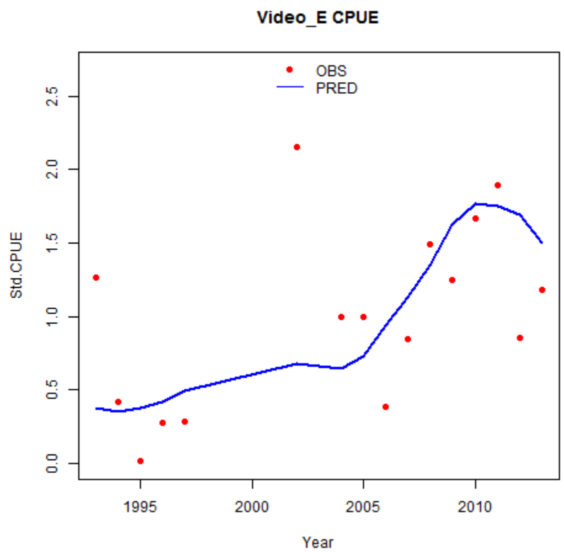


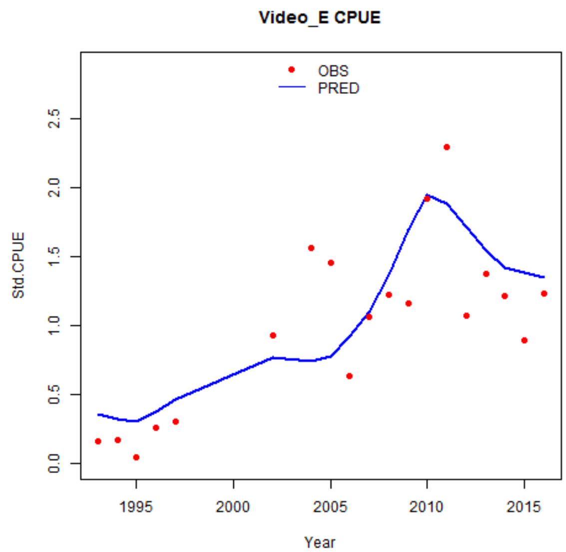
Figure 4.3 (fit to indices continued).

g) SEAMAP Video (VID) East:

2014 SEDAR 31 Update

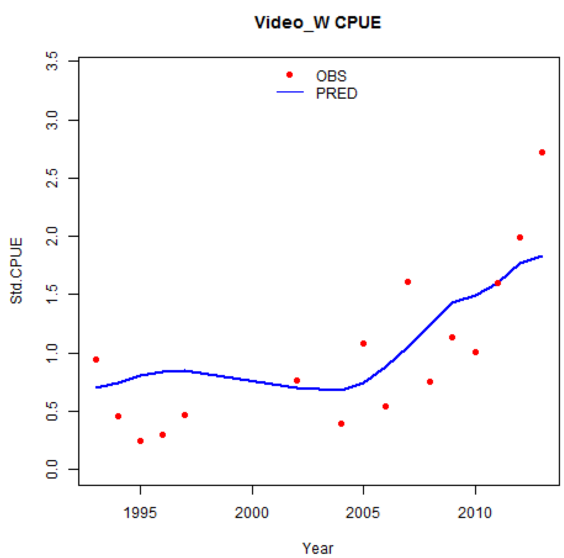


SEDAR 52



h) SEAMAP Video (VID) West:

2014 SEDAR 31 Update



SEDAR 52

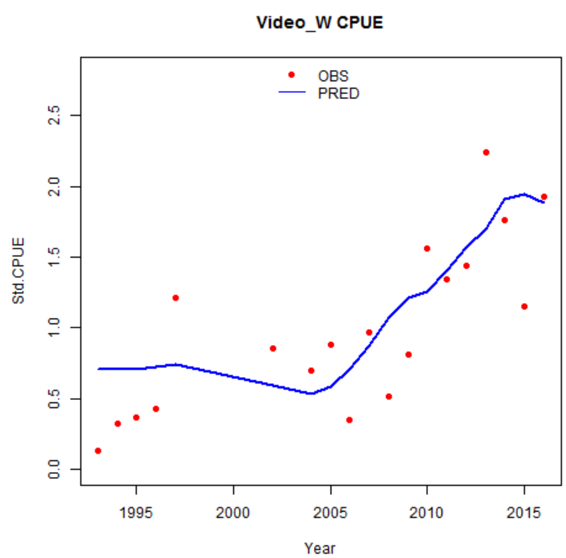
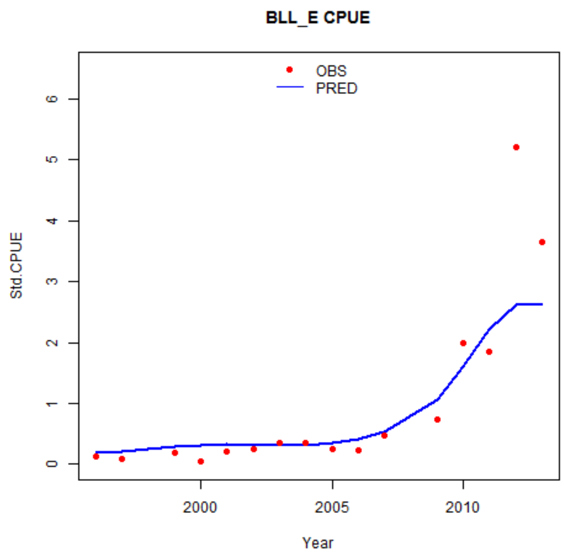


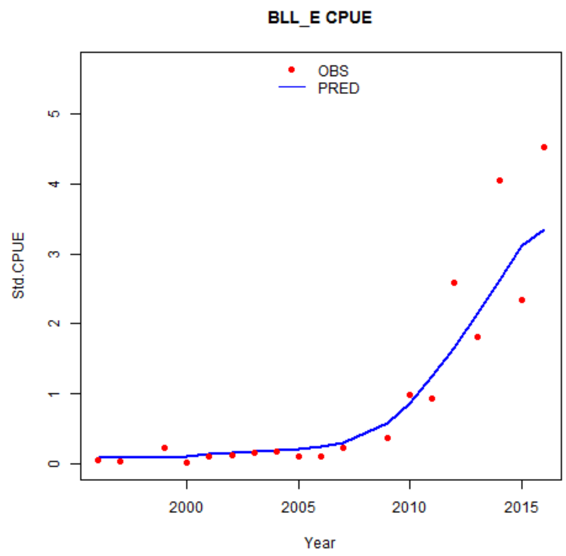
Figure 4.3 (fit to indices continued).

i) NMFS Bottom Long Line (BLL) East:

2014 SEDAR 31 Update

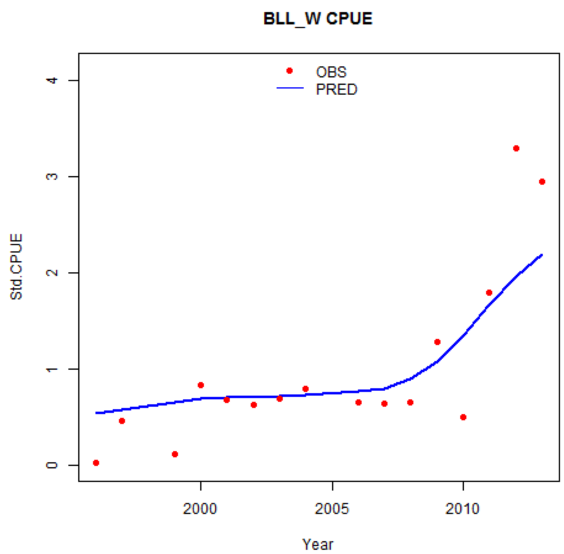


SEDAR 52



j) NMFS Bottom Long Line (BLL) West:

2014 SEDAR 31 Update



SEDAR 52

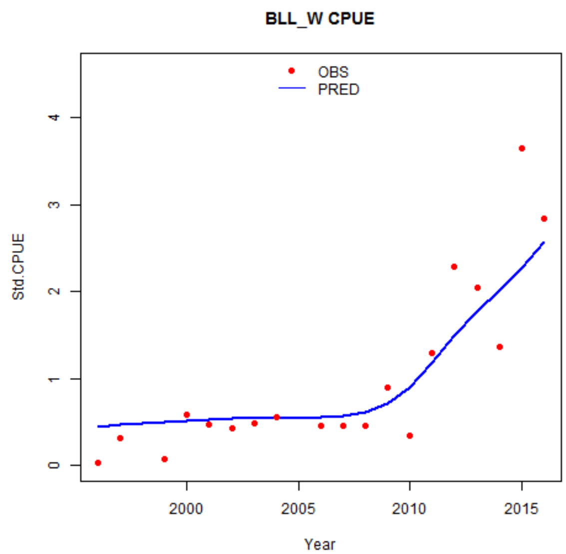
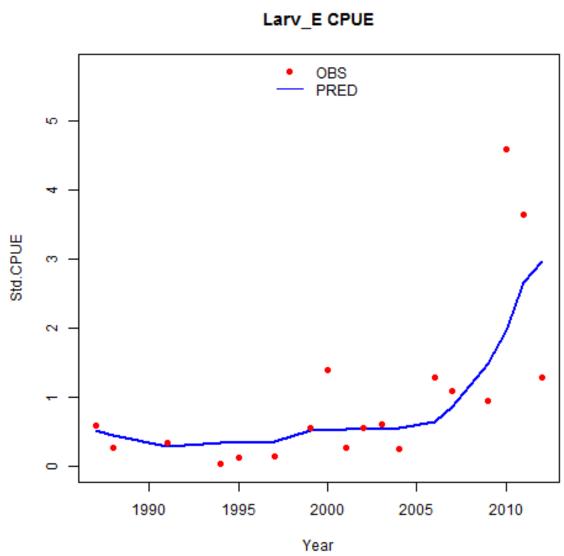
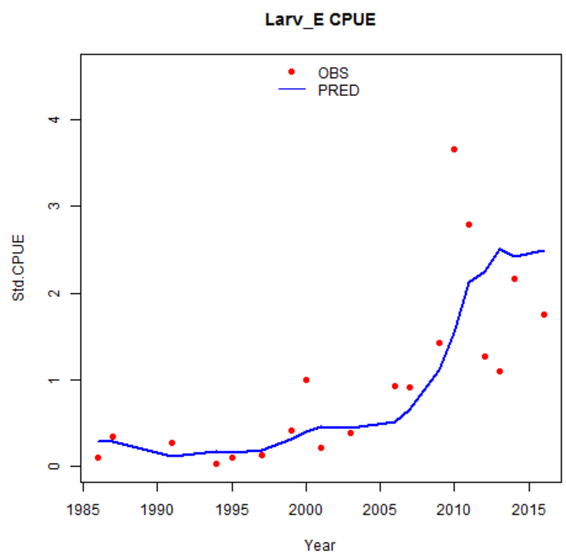


Figure 4.3 (fit to indices continued).

k) SEAMAP Ichthyoplankton (Larval) East (index of SSB):

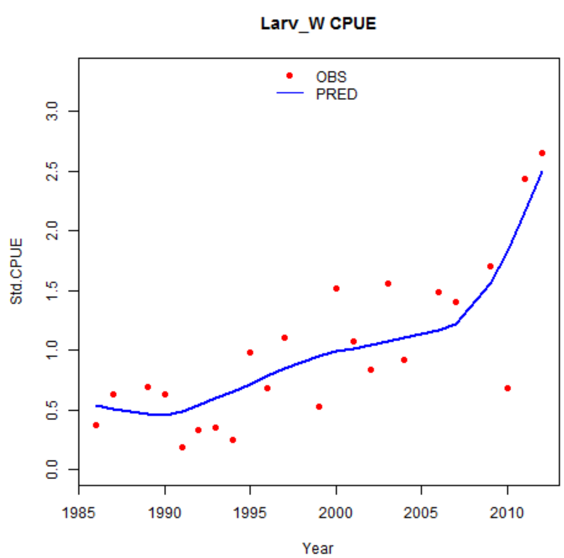
2014 SEDAR 31 Update	**SEDAR 52**





l) SEAMAP Ichthyoplankton (Larval) East (index of SSB):

2014 SEDAR 31 Update	**SEDAR 52**



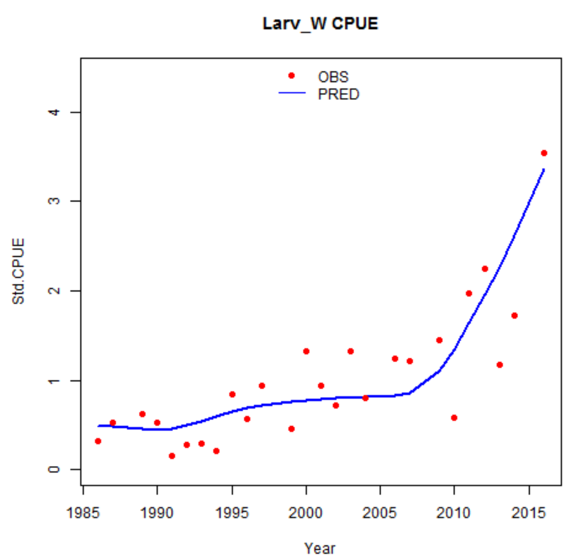
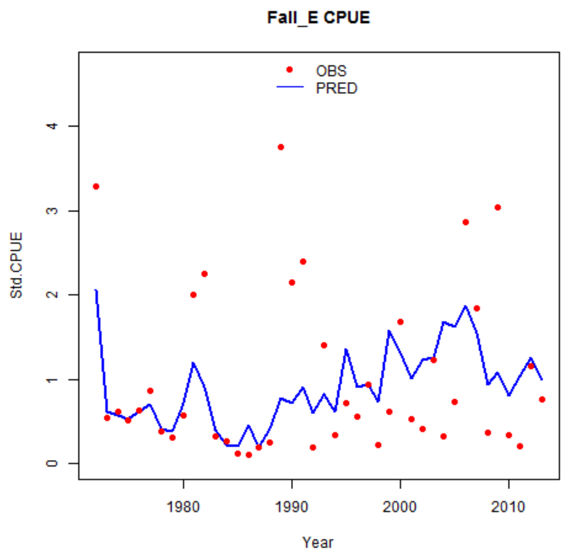


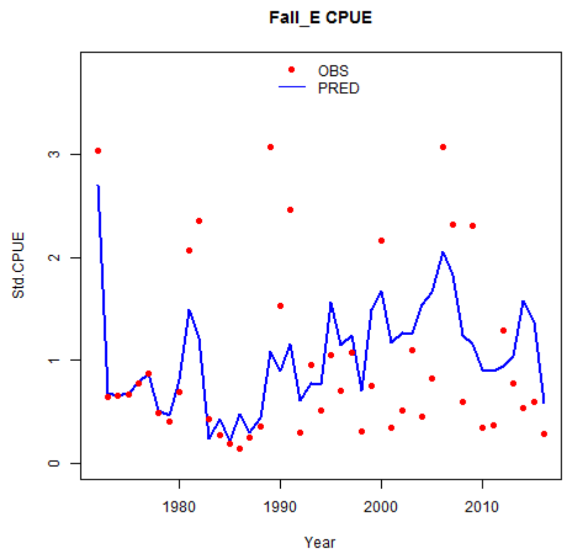
Figure 4.3 (fit to indices continued).

m) SEAMAP Fall Trawl Survey (Fall) East (index of Ages 0 and 1):

2014 SEDAR 31 Update

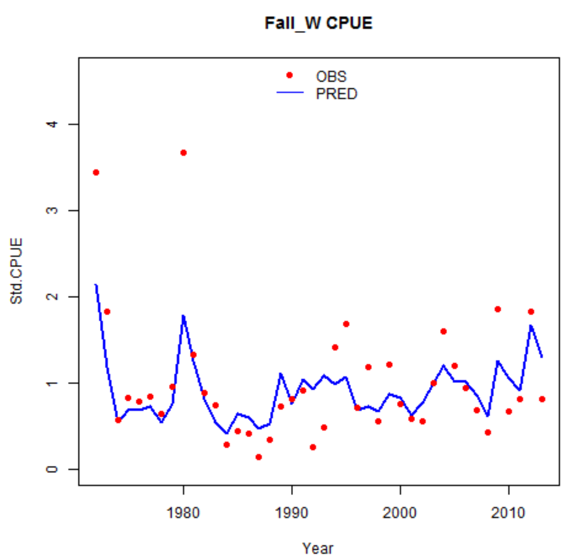


SEDAR 52



n) SEAMAP Fall Trawl Survey (Fall) West (index of Ages 0 and 1):

2014 SEDAR 31 Update



SEDAR 52

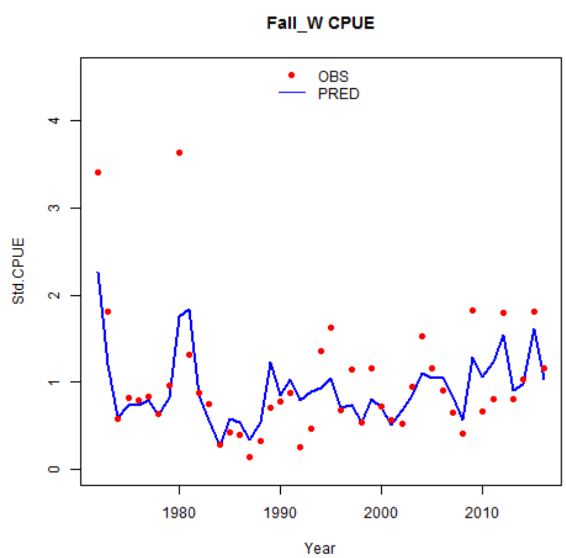
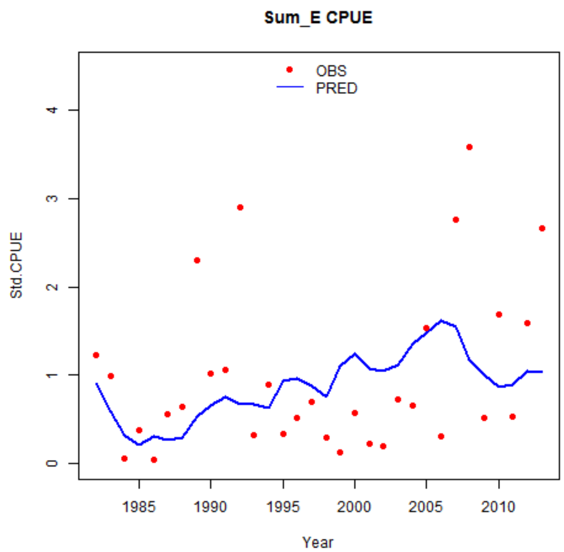


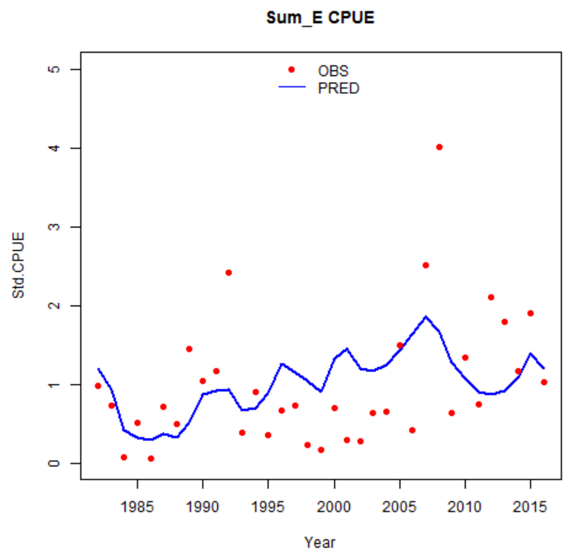
Figure 4.3 (fit to indices continued).

o) SEAMAP Summer Trawl Survey (SUM) East (index of Ages 0 and 1):

2014 SEDAR 31 Update

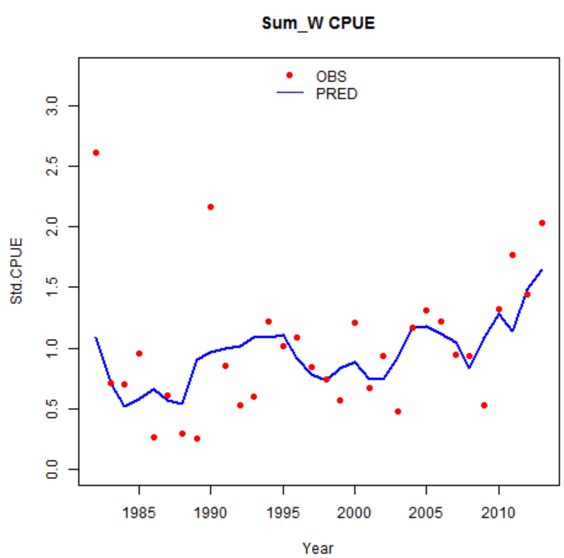


SEDAR 52



p) SEAMAP Summer Trawl Survey (SUM) West (index of Ages 0 and 1):

2014 SEDAR 31 Update



SEDAR 52

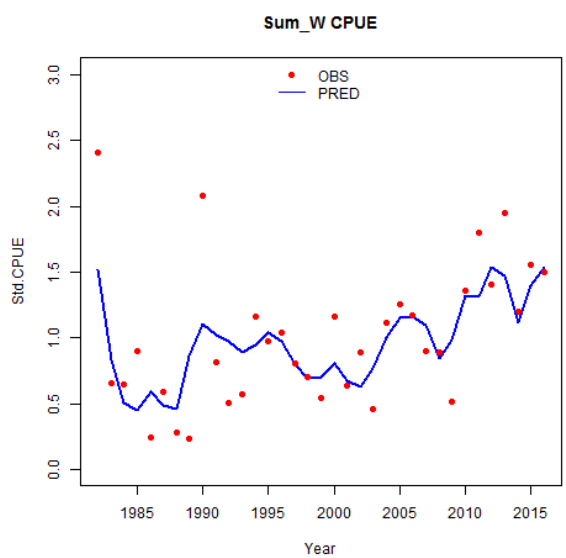
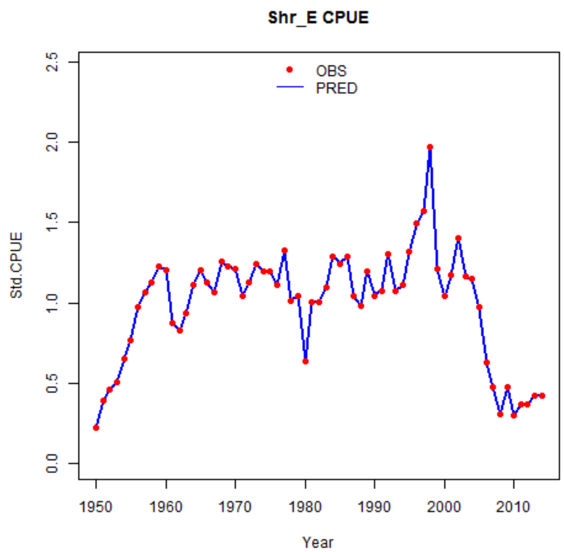


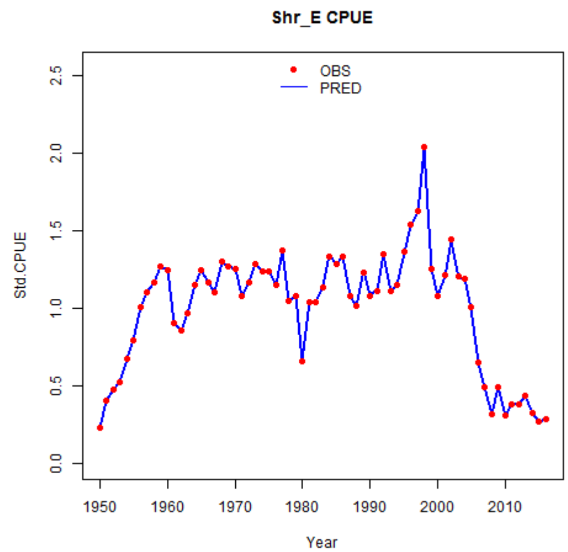
Figure 4.3 (fit to indices continued).

q) Shrimp Effort (SHR) East (index fishing effort):

2014 SEDAR 31 Update

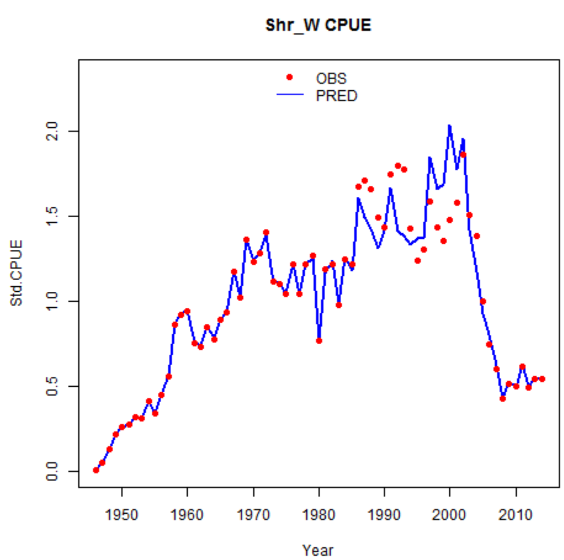


SEDAR 52



r) Shrimp Effort (SHR) West (index fishing effort):

2014 SEDAR 31 Update



SEDAR 52

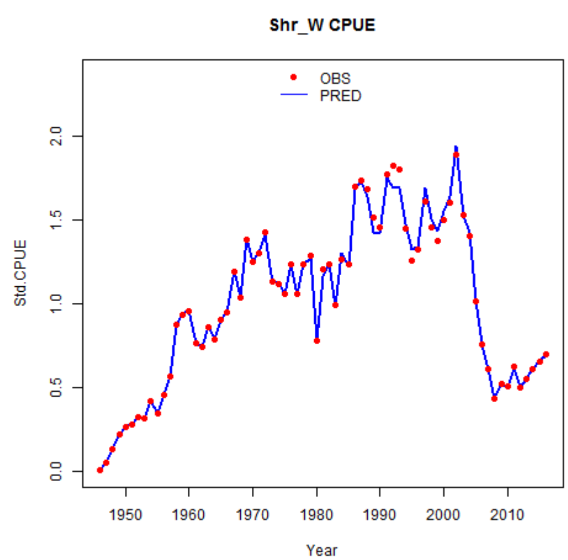
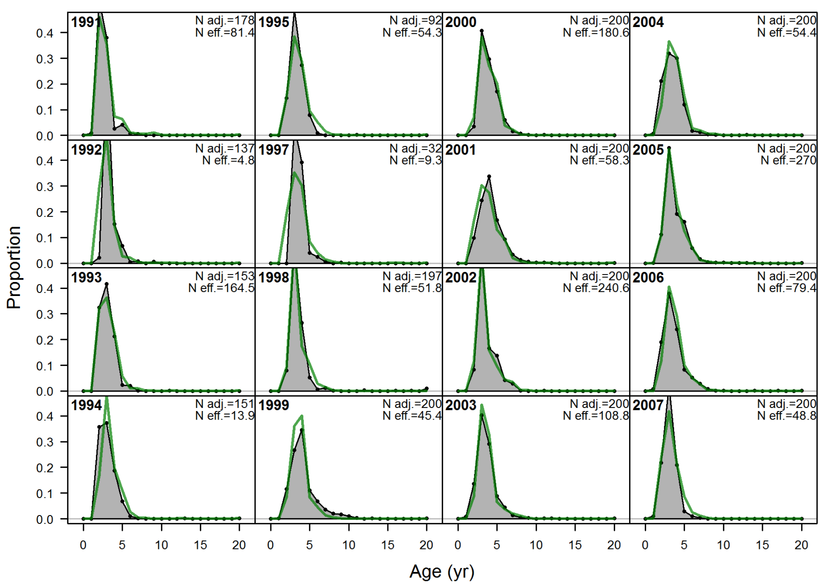


Figure 4.4. Model fits to the age composition of retained catch by fleet and region. The green lines represent predicted age compostions, while the grey shaded region represents observed age compositions. The effective sample size used to weight the yearly age composition data is provided by the *Nadj* for the 2014 SEDAR 31 Update (Left Panel) and the *Neff* for SEDAR 52 (Right Panel) and is shown in the upper right corner of each graph.

a) Commercial Vertical Line (HL) East:

2014 SEDAR 31 Update



SEDAR 52

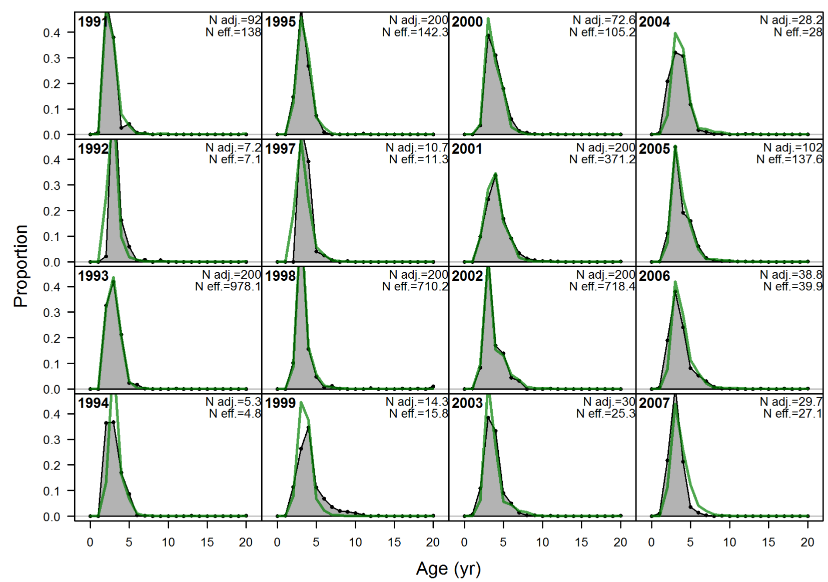
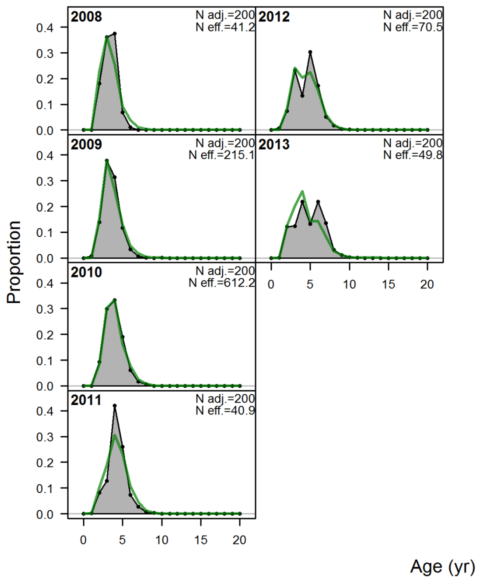


Figure 4.4. (fits to the age composition of retained catch continued).

a) Commercial Vertical Line (HL) East (continued):

2014 SEDAR 31 Update



SEDAR 52

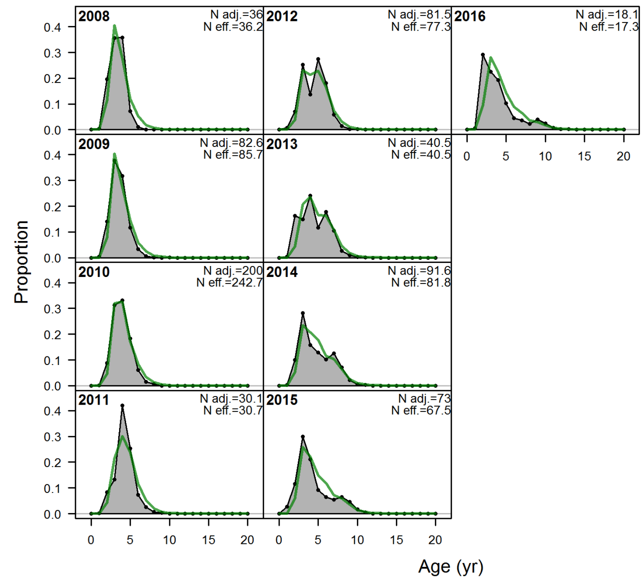
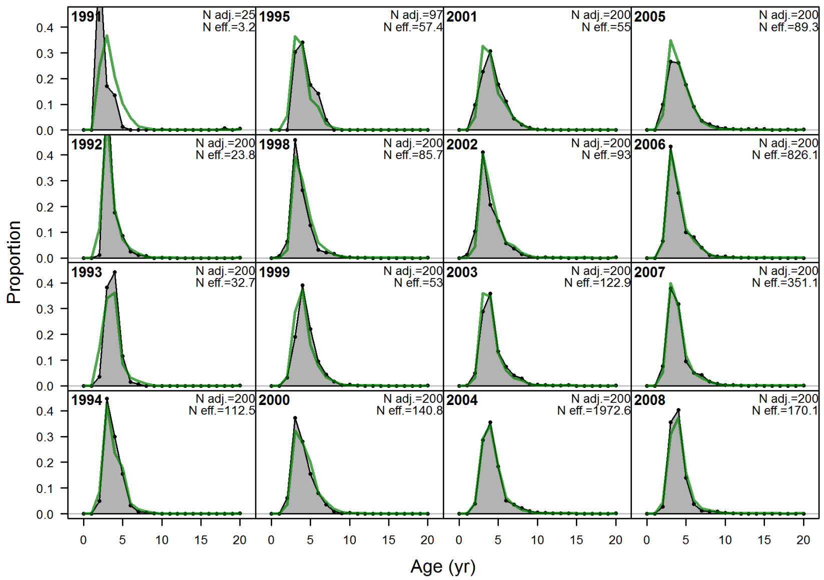


Figure 4.4. (fits to age comp of retained catch continued).

b) Commercial Vertical Line (HL) West:

2014 SEDAR 31 Update



SEDAR 52

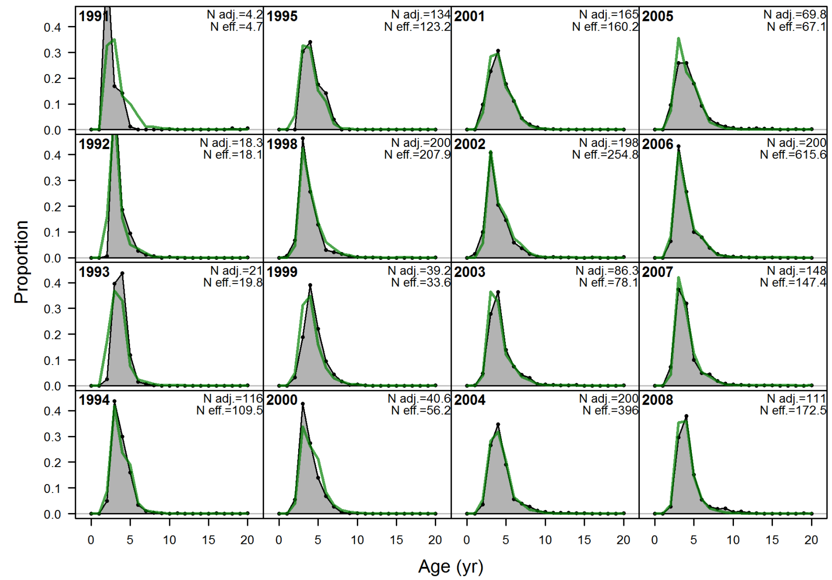
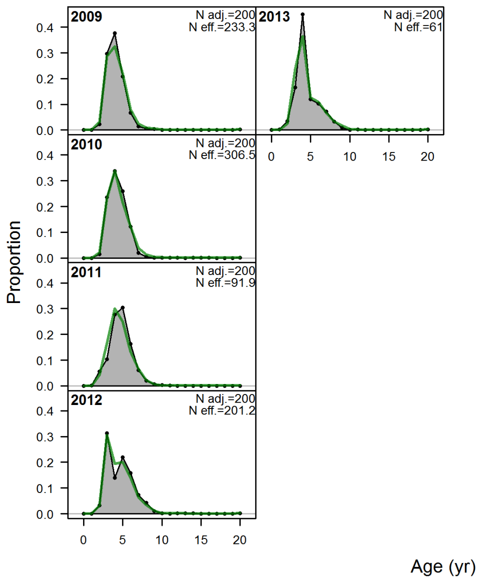


Figure 4.4. (fits to age comp of retained catch continued).

b) Commercial Vertical Line (HL) West (continued):

2014 SEDAR 31 Update



SEDAR 52

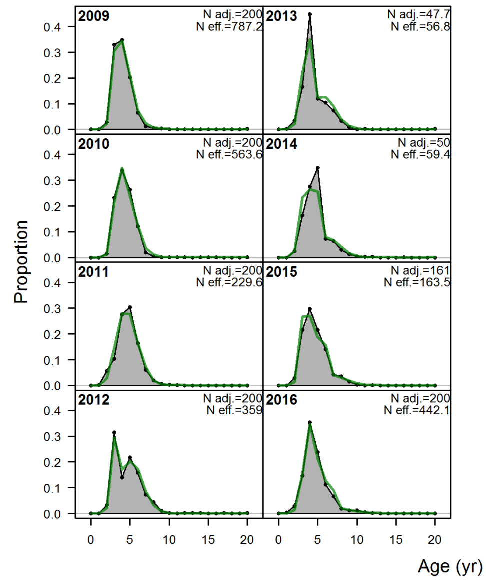
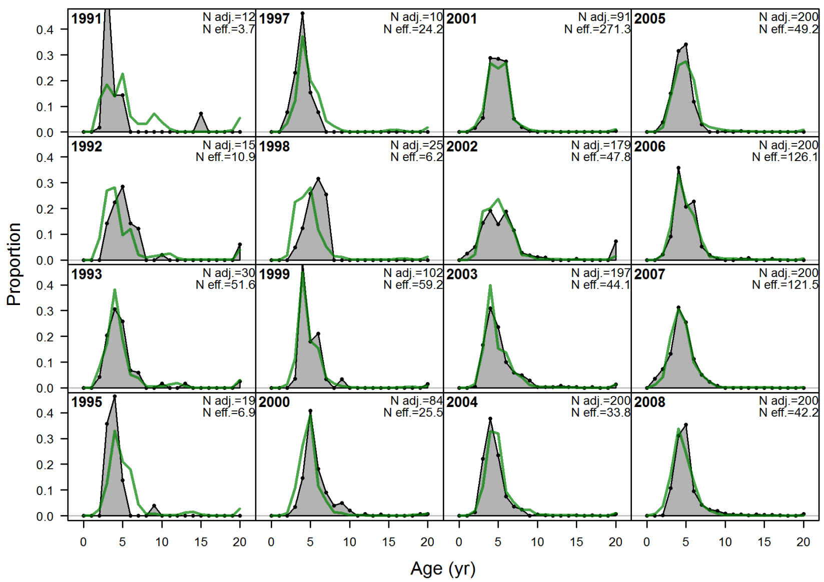


Figure 4.4. (fits to age comp of retained catch continued).

c) Commercial Long Line (LL) East:

2014 SEDAR 31 Update



SEDAR 52

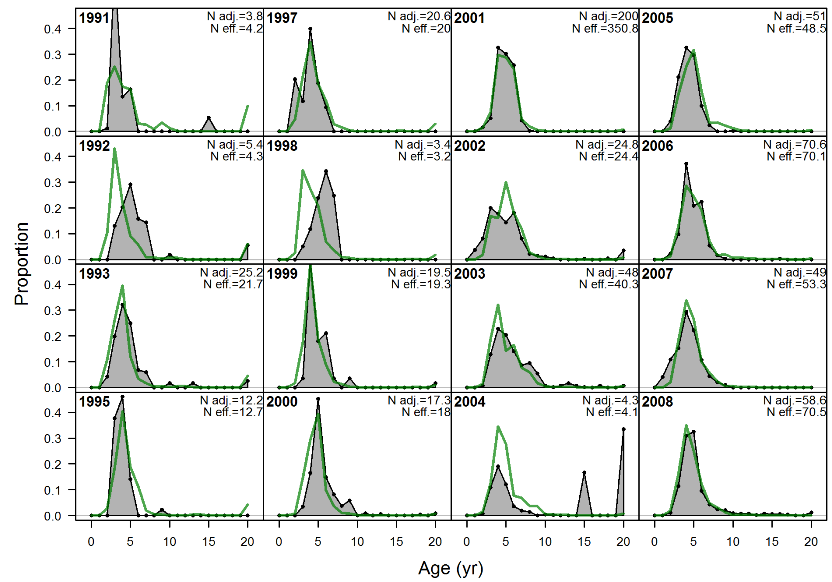
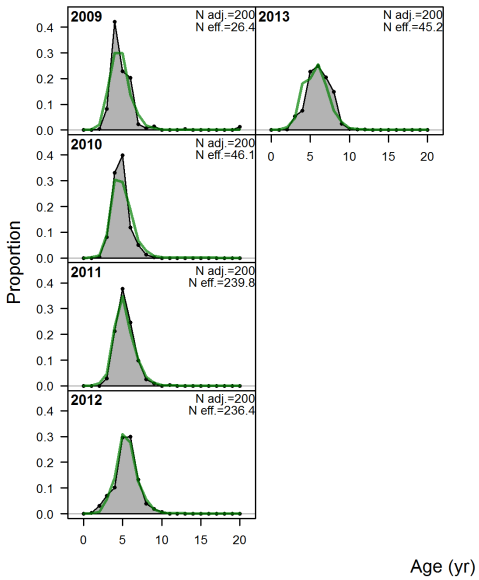


Figure 4.4. (fits to the age composition of retained catch continued).

c) Commercial Long Line (LL) East (continued):

2014 SEDAR 31 Update



SEDAR 52

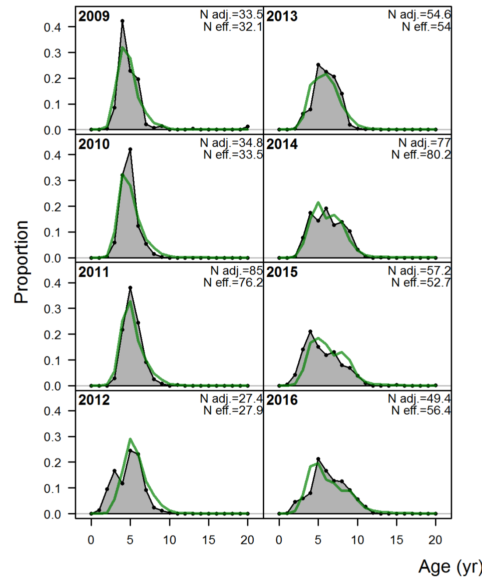
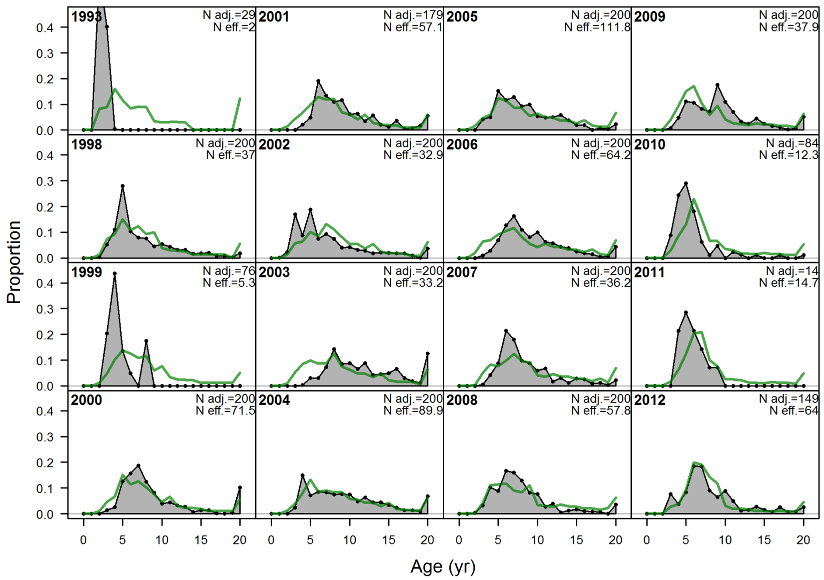


Figure 4.4. (fits to age comp of retained catch continued).

b) Commercial Long Line (LL) West:

2014 SEDAR 31 Update



SEDAR 52

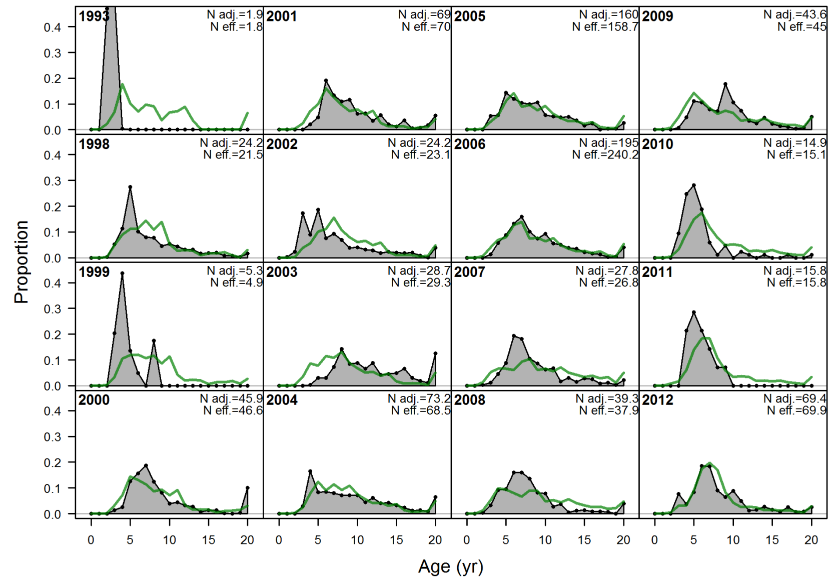
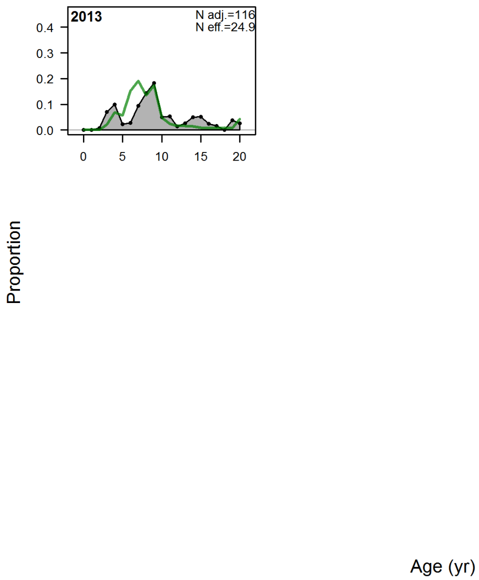


Figure 4.4. (fits to age comp of retained catch continued).

b) Commercial Long Line (LL) West (continued):

2014 SEDAR 31 Update



SEDAR 52

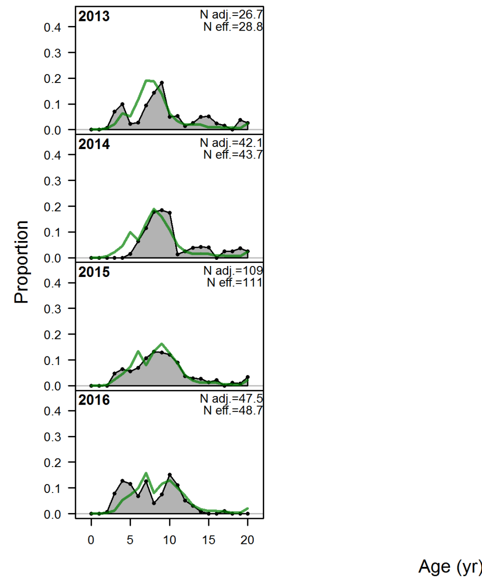
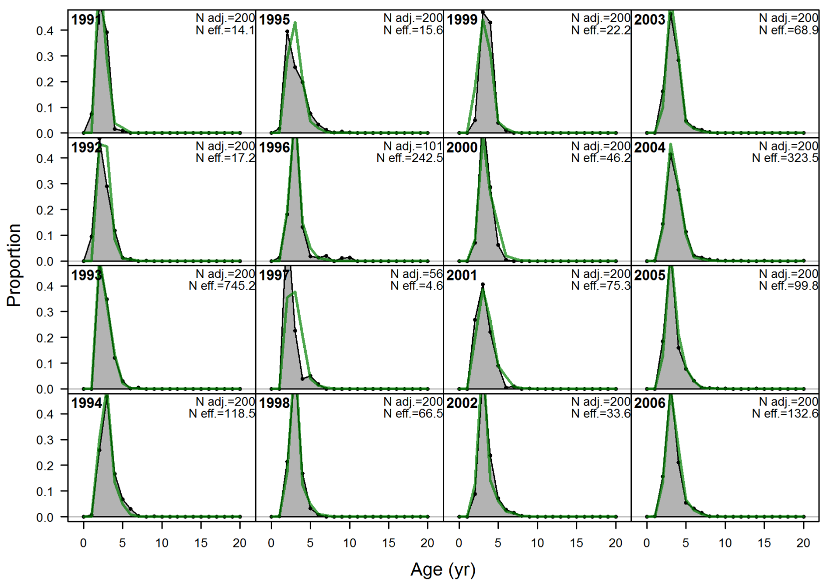


Figure 4.4. (fits to age comp of retained catch continued).

e) Recreational Private/Charter (MRIP/MRFSS) East:

2014 SEDAR 31 Update



SEDAR 52

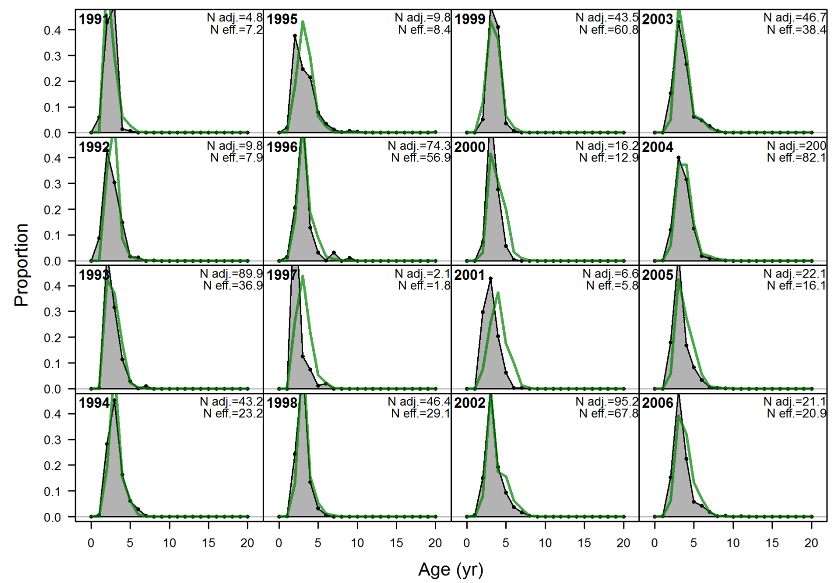
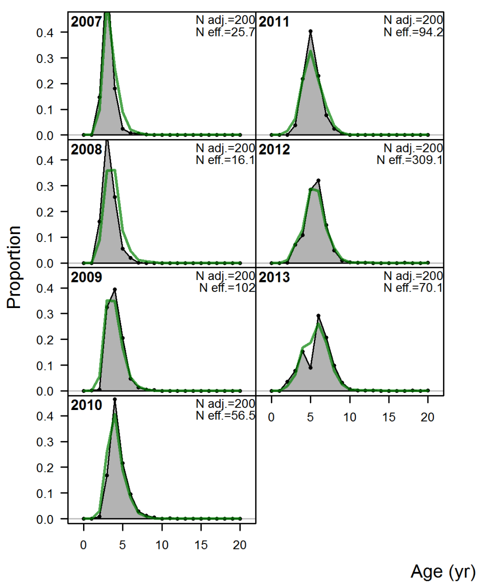


Figure 4.4. (fits to age comp of retained catch continued).

e) Recreational Private/Charter (MRIP/MRFSS) East (continued):

2014 SEDAR 31 Update



SEDAR 52

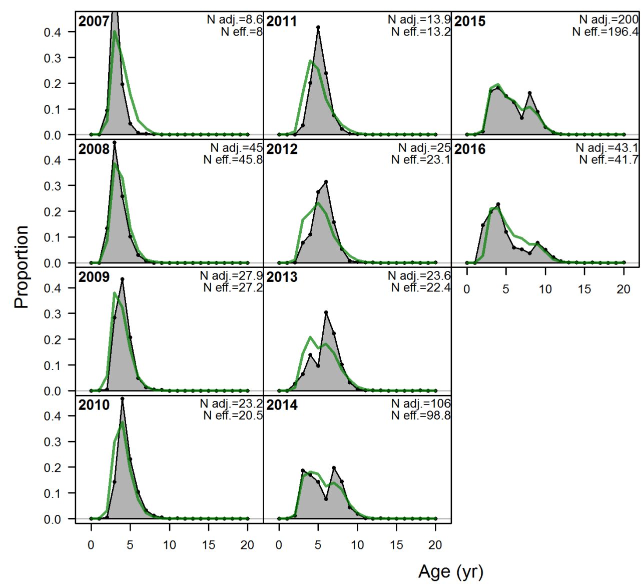
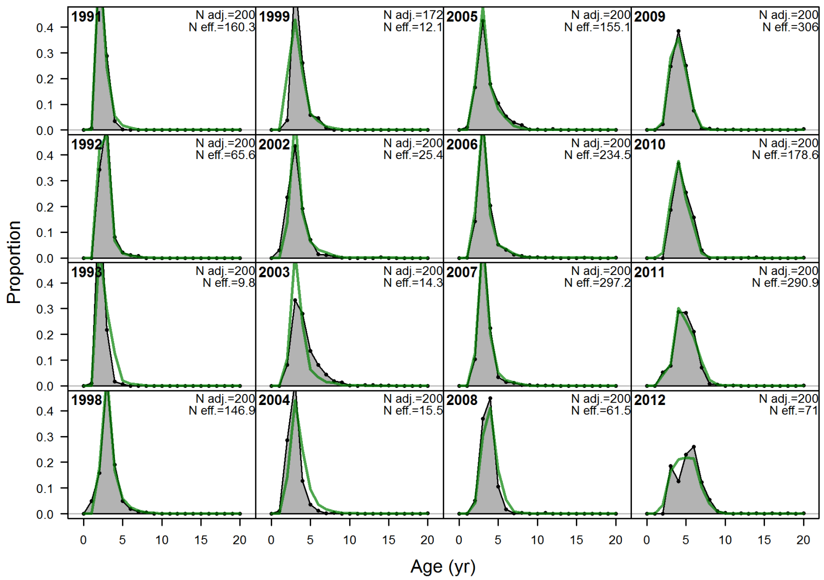


Figure 4.4. (fits to age comp of retained catch continued).

f) Recreational Private/Charter (MRIP/MRFSS) West:

2014 SEDAR 31 Update



SEDAR 52

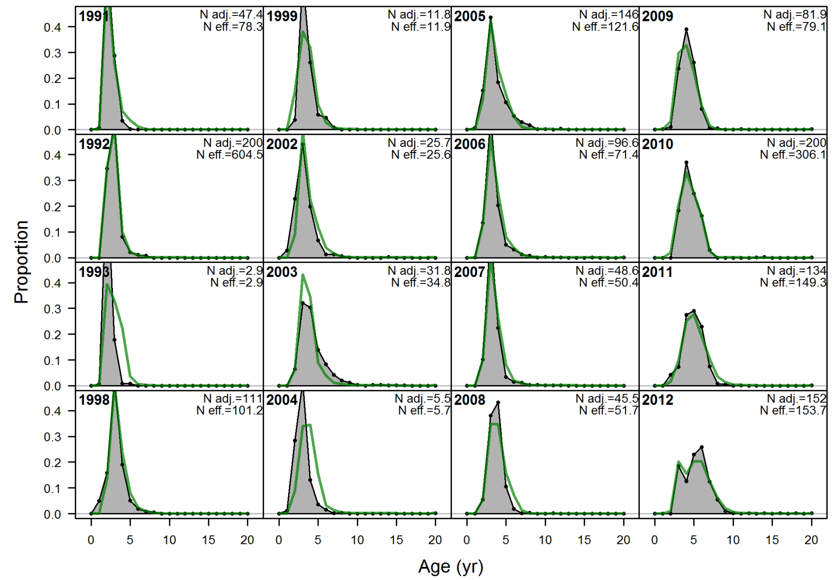
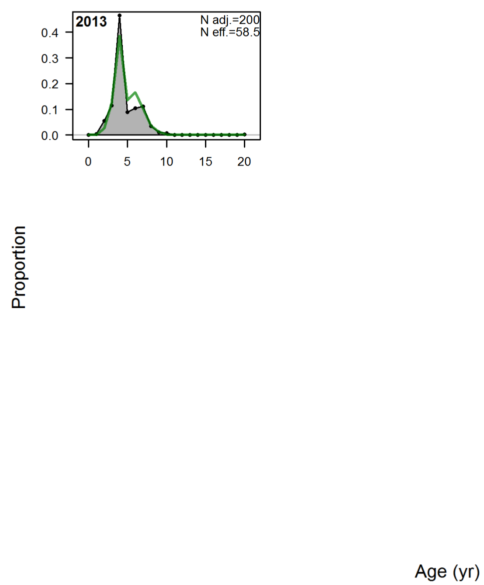


Figure 4.4. (fits to age comp of retained catch continued).

f) Recreational Private/Charter (MRIP/MRFSS) West (continued):

2014 SEDAR 31 Update



SEDAR 52

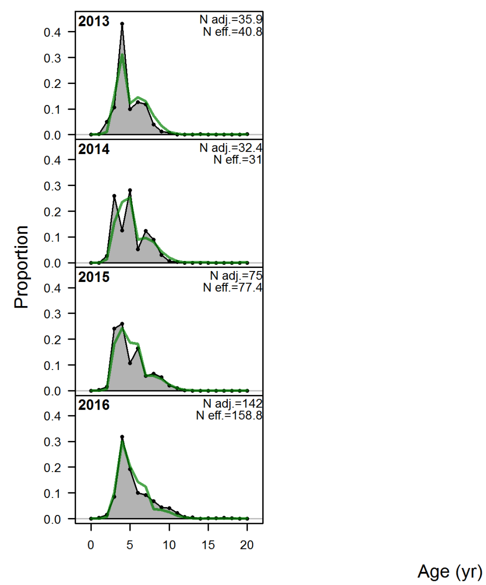
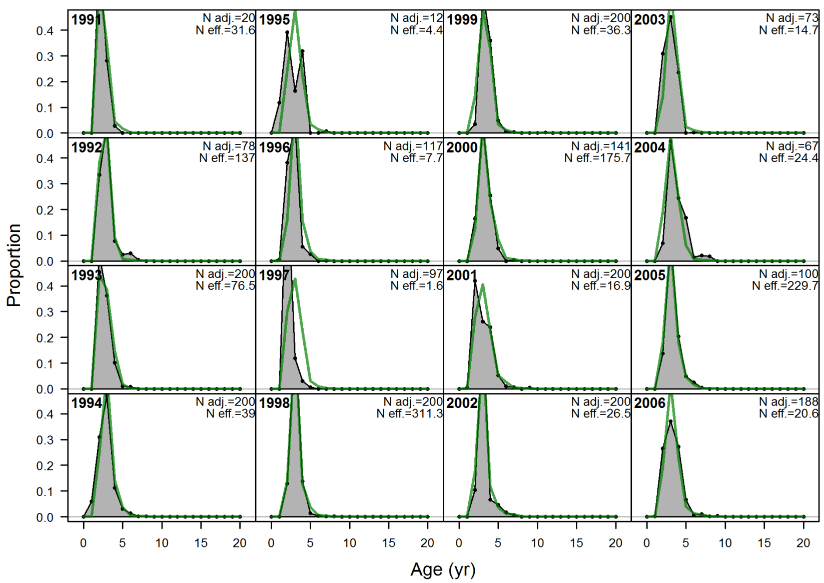


Figure 4.4. (fits to age comp of retained catch continued).

g) Recreational Headboat (HBT) East:

2014 SEDAR 31 Update



SEDAR 52

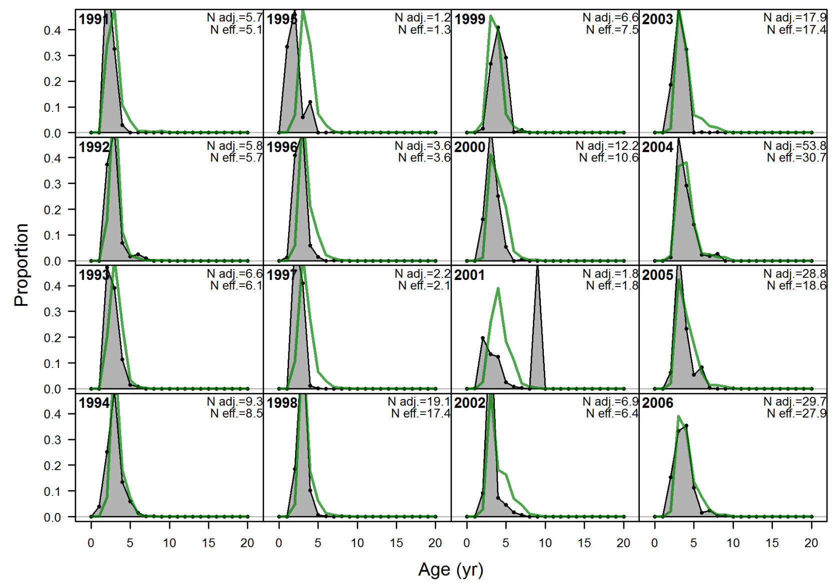
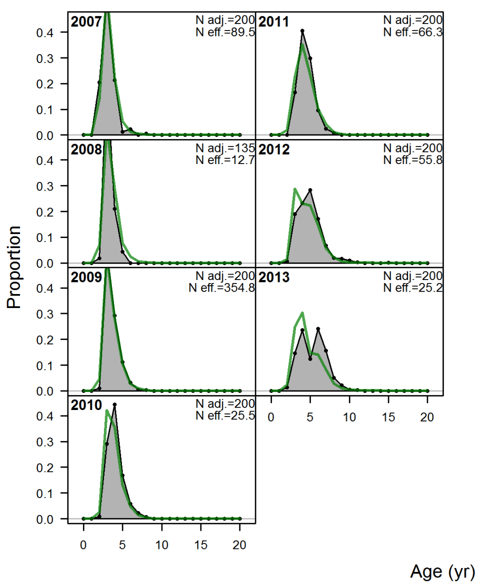


Figure 4.4. (fits to age comp of retained catch continued).

e) Recreational Headboat (HBT) East (continued):

2014 SEDAR 31 Update



SEDAR 52

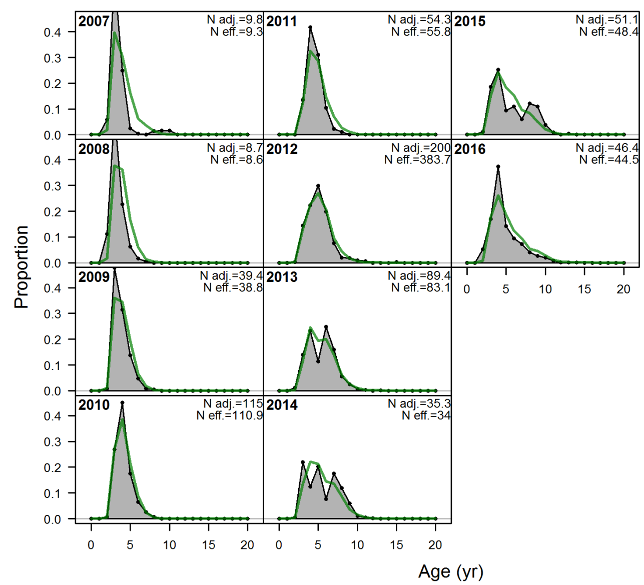
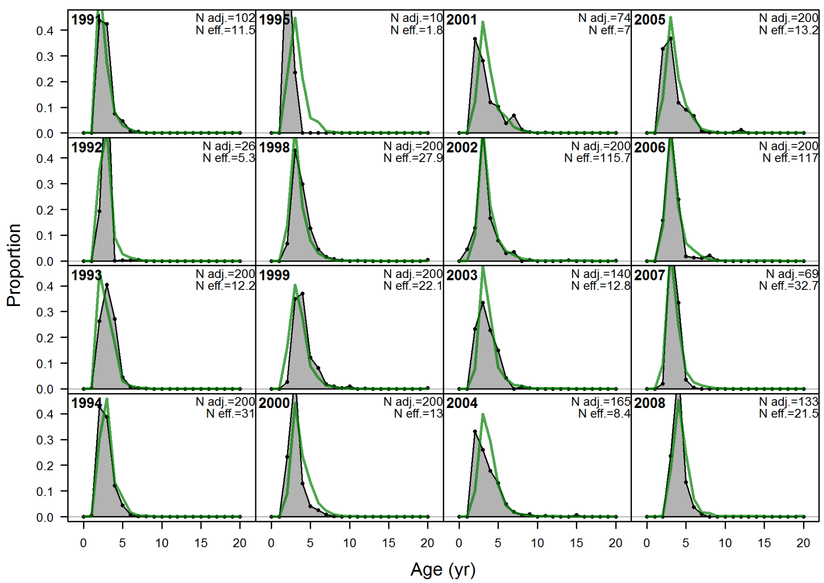


Figure 4.4. (fits to age comp of retained catch continued).

f) Recreational Headboat (HBT) West:

2014 SEDAR 31 Update



SEDAR 52

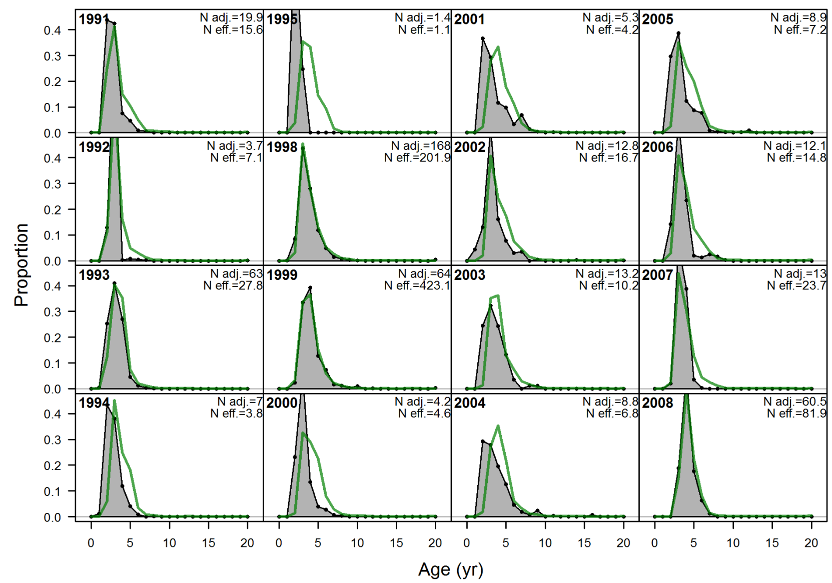
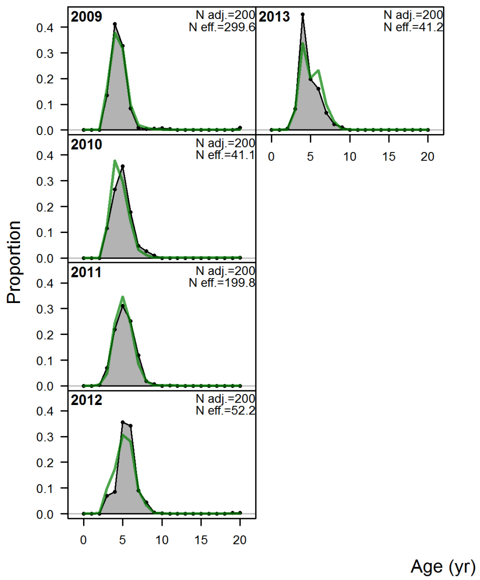


Figure 4.4. (fits to age comp of retained catch continued).

f) Recreational Headboat (HBT) West (continued):

2014 SEDAR 31 Update



SEDAR 52

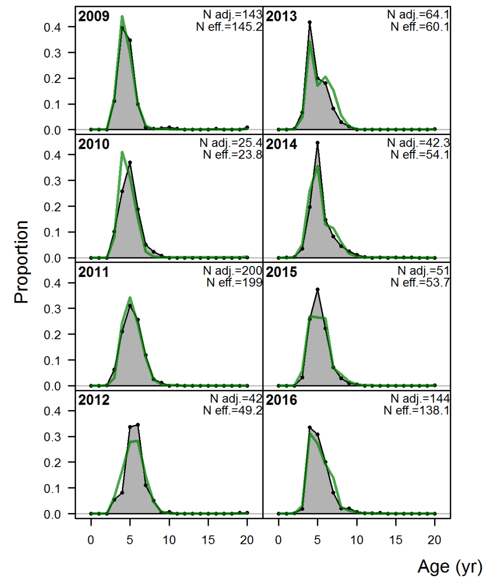
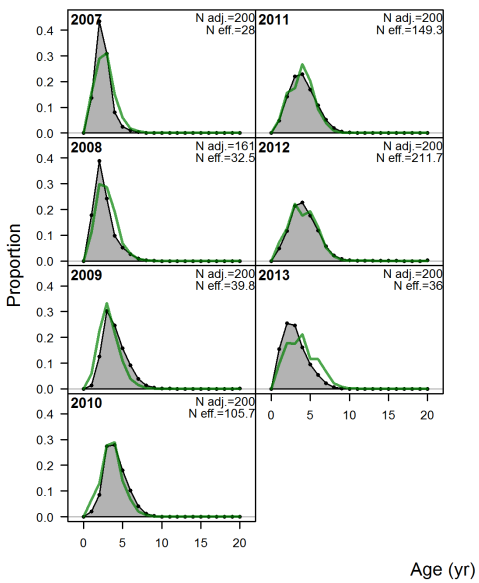


Figure 4.5. Model fits to the age composition of discards by fleet and region. The green lines represent predicted age compostions, while the grey shaded region represents observed age compositions. The effective sample size used to weight the yearly age composition data is provided by the *Nadj* for the 2014 SEDAR 31 Update (Left Panel) and the *Neff* for SEDAR 52 (Right Panel) and is shown in the upper right corner of each graph.

a) Commercial Vertical Line (HL) East:

2014 SEDAR 31 Update



SEDAR 52

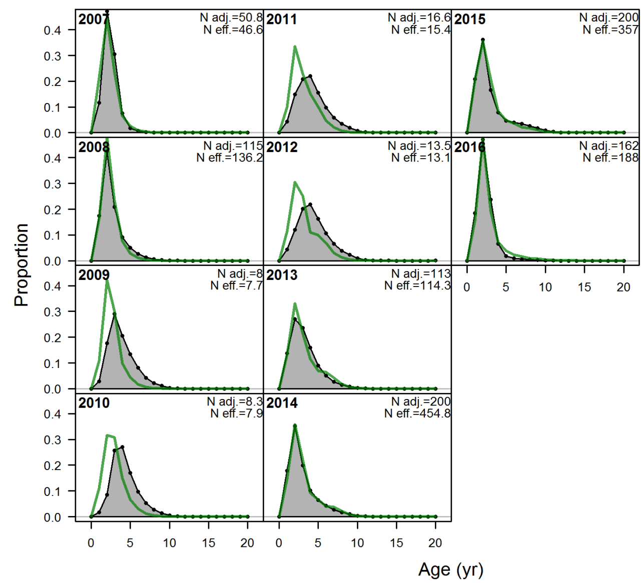
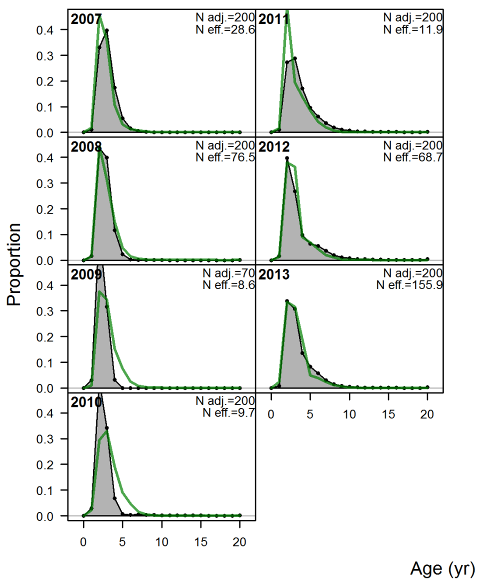


Figure 4.5. (fits to age comp of discards continued).

b) Commercial Vertical Line (HL) West:

2014 SEDAR 31 Update



SEDAR 52

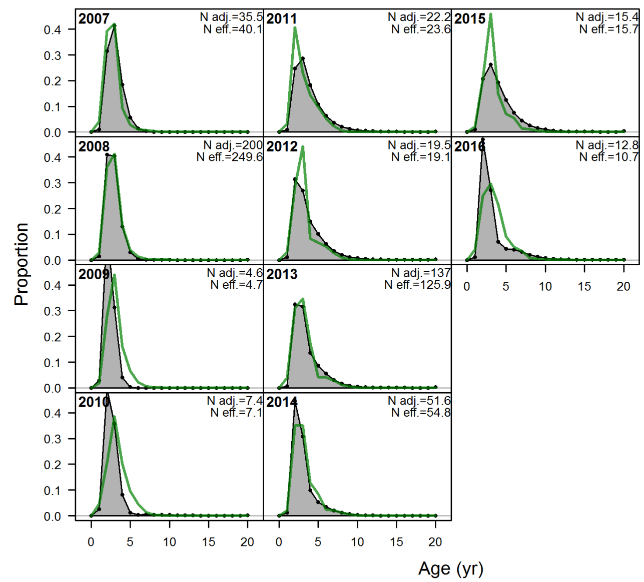
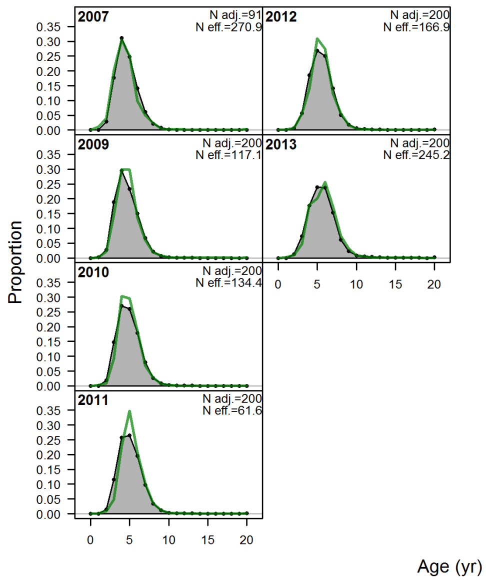


Figure 4.5. (fits to age comp of discards continued).

c) Commercial Long Line (LL) East:

2014 SEDAR 31 Update



SEDAR 52

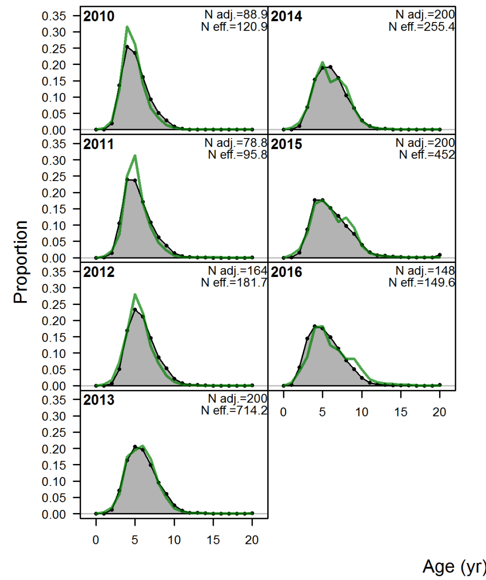
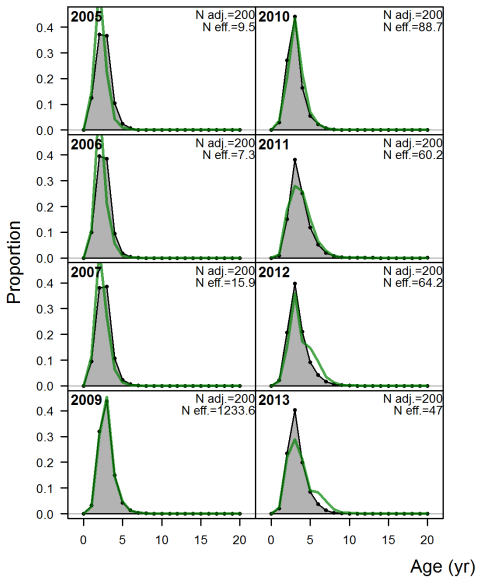


Figure 4.5. (fits to age comp of discards continued).

d) Recreational Headboat (HBT) East:

2014 SEDAR 31 Update



SEDAR 52

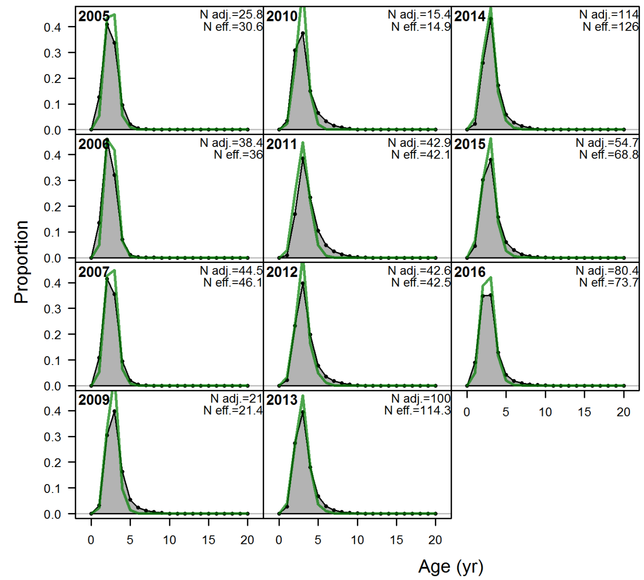
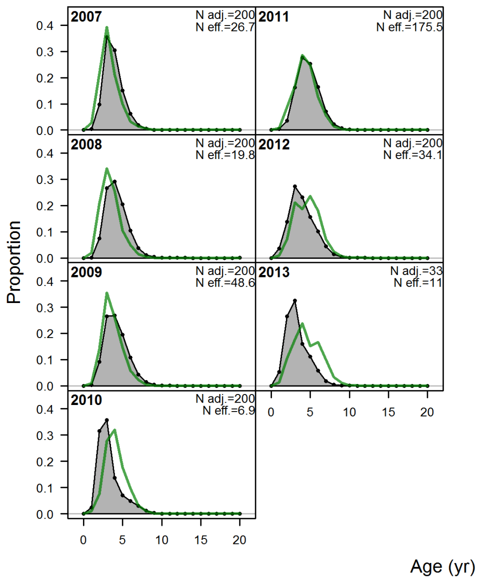


Figure 4.5. (fits to age comp of discards continued).

e) Commercial Closed Season/no-IFQ (C_Closed) East:

2014 SEDAR 31 Update



SEDAR 52

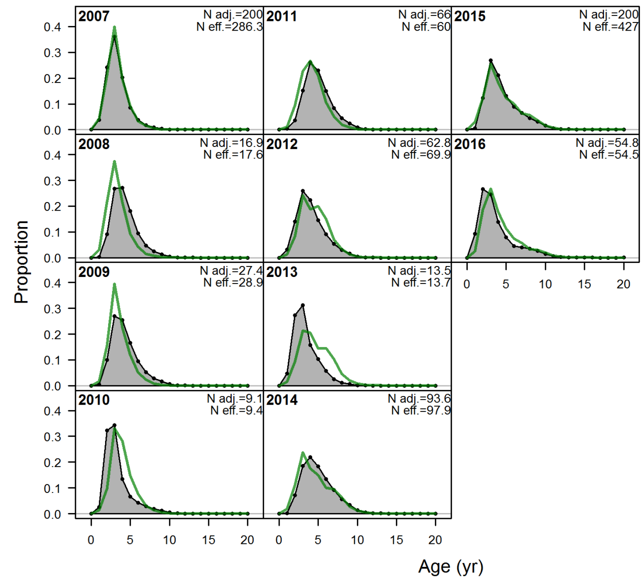
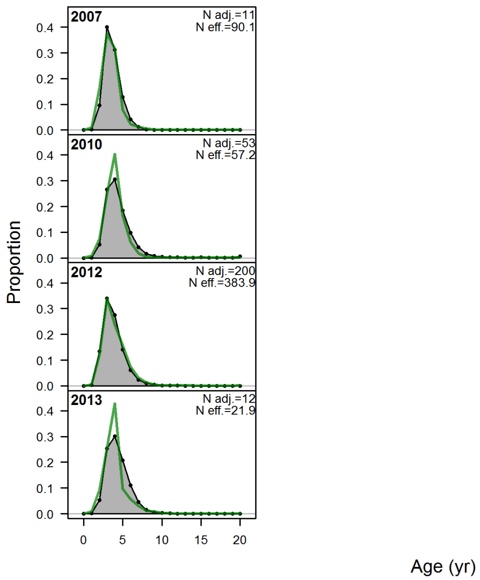


Figure 4.5. (fits to age comp of retained catch continued).

f) Commercial Closed Season/no-IFQ (C_Closed) West:

2014 SEDAR 31 Update



SEDAR 52

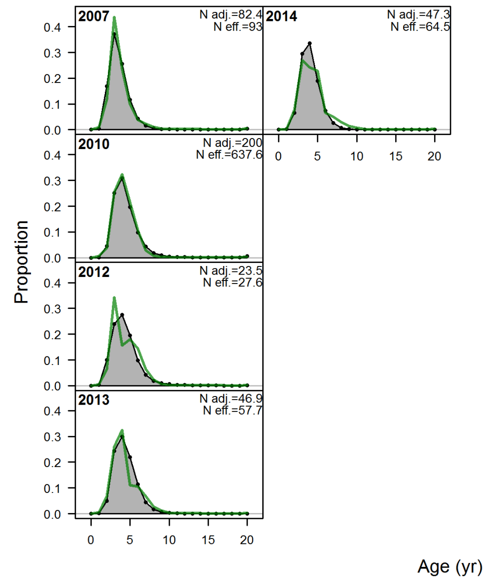
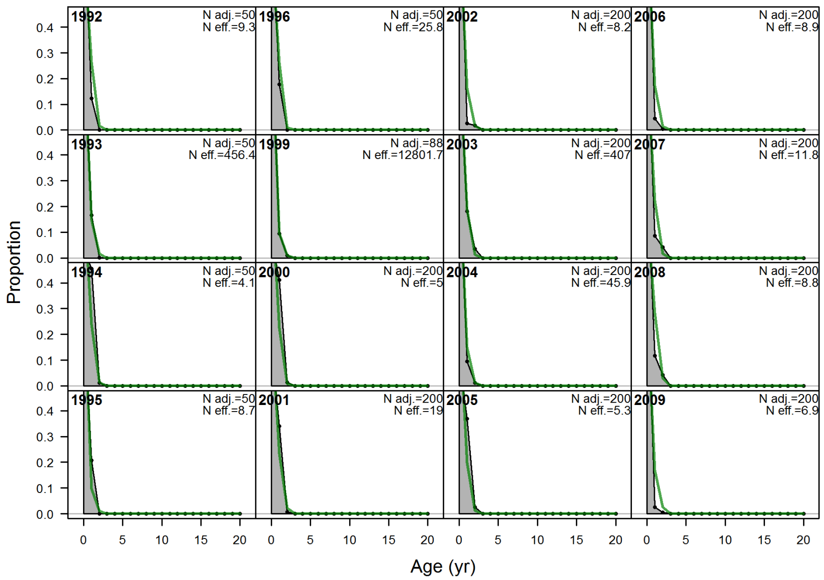


Figure 4.5. (fits to age comp of retained catch continued).

g) Shrimp bycatch (SHR) East:

2014 SEDAR 31 Update



SEDAR 52

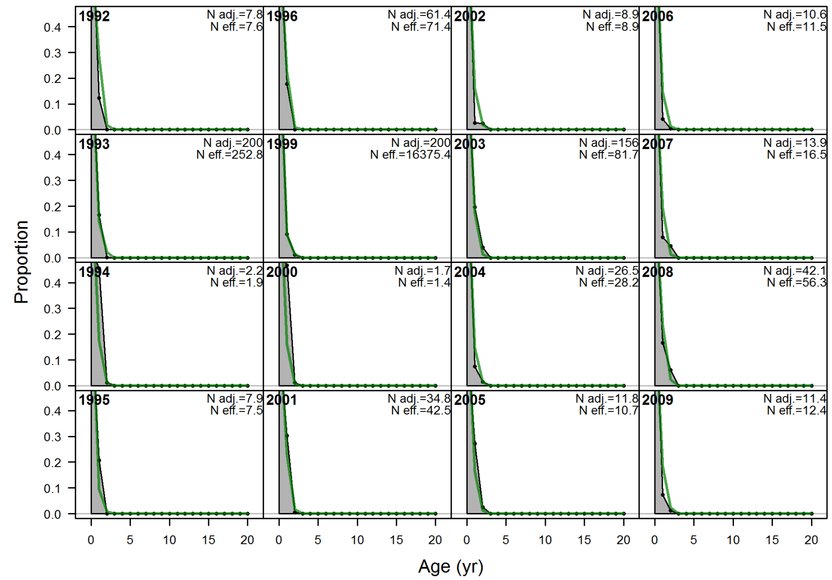
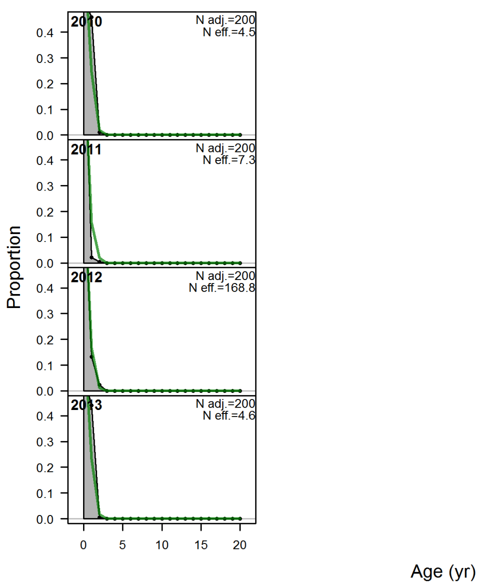


Figure 4.5. (fits to age comp of retained catch continued).

g) Shrimp bycatch (SHR) East (continued):

2014 SEDAR 31 Update



SEDAR 52

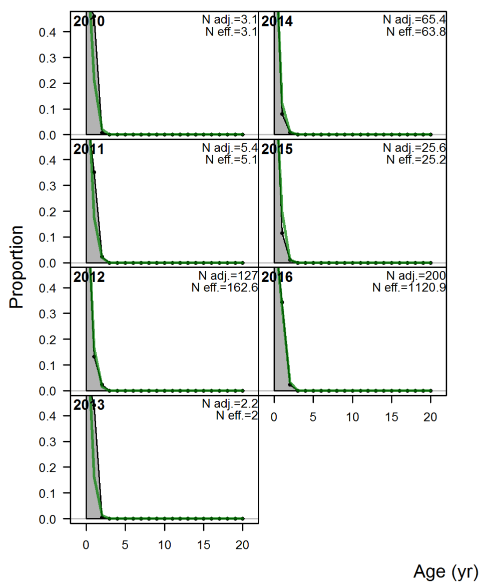
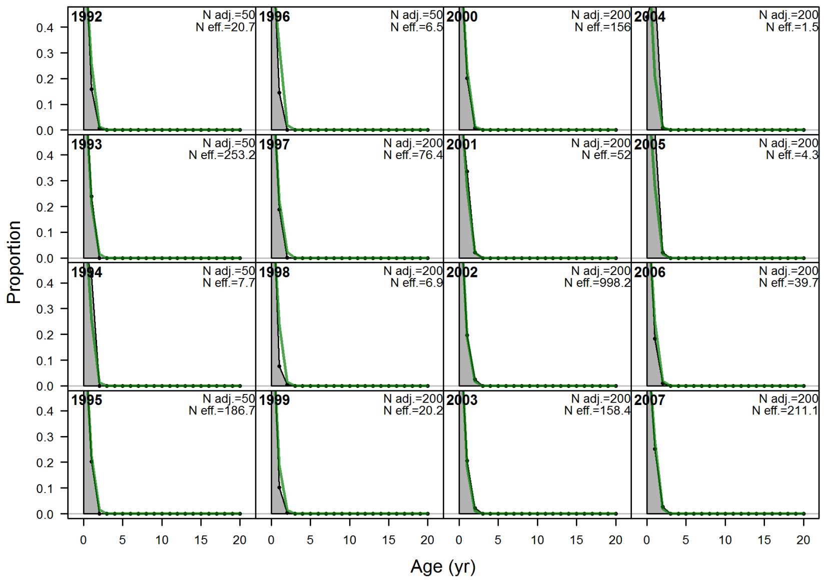


Figure 4.5. (fits to age comp of retained catch continued).

h) Shrimp bycatch (SHR) West:

2014 SEDAR 31 Update



SEDAR 52

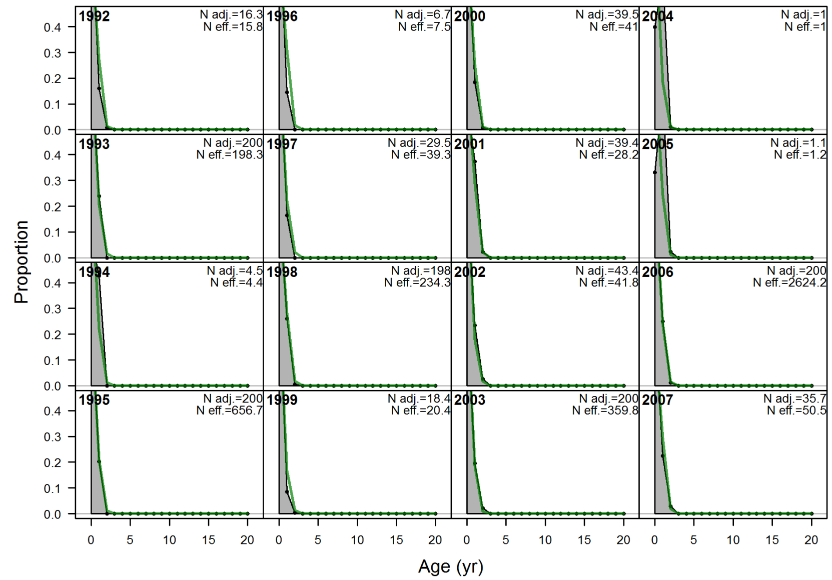
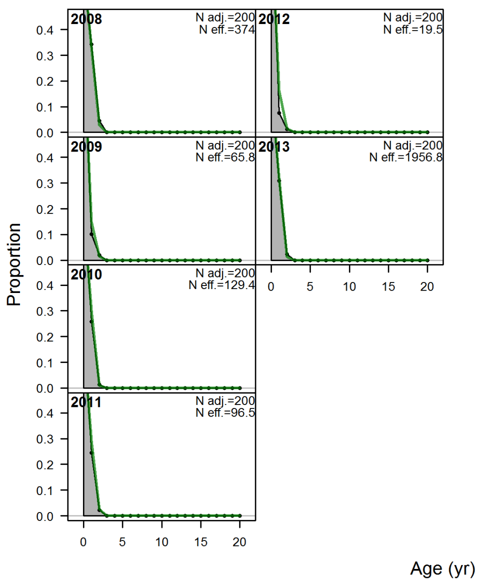


Figure 4.5. (fits to age comp of retained catch continued).

g) Shrimp bycatch (SHR) East (continued):

2014 SEDAR 31 Update



SEDAR 52

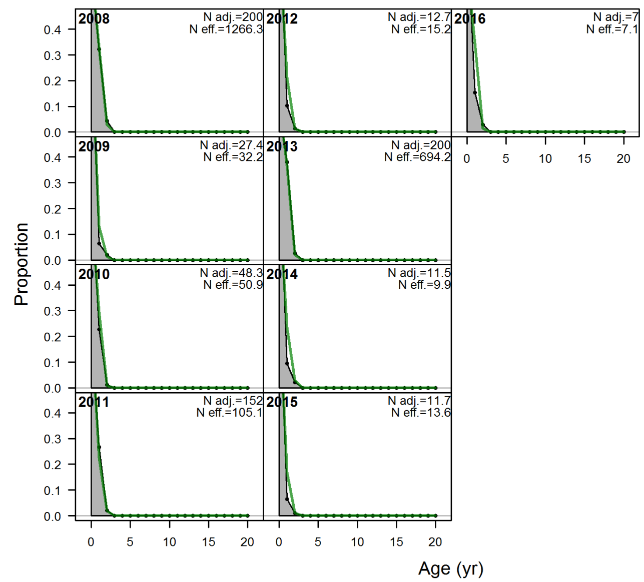
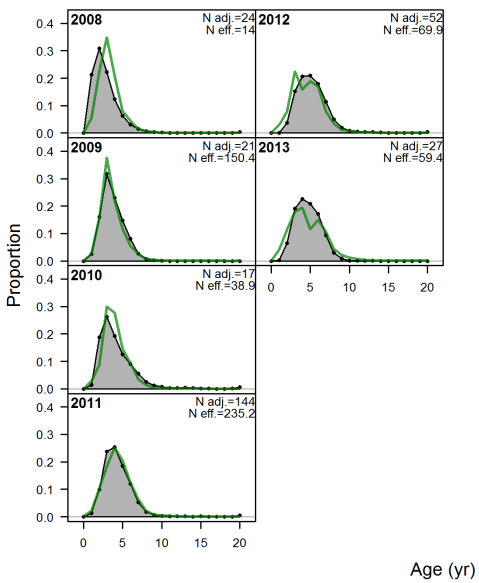


Figure 4.6. Model fits to the age composition of the surveys by region. The green lines represent predicted age compostions, while the grey shaded region represents observed age compositions. The effective sample size used to weight the yearly age composition data is provided by the *Nadj* for the 2014 SEDAR 31 Update (Left Panel) and the *Neff* for SEDAR 52 (Right Panel) and is shown in the upper right corner of each graph.

a) Video Survey (VID) East:

2014 SEDAR 31 Update



SEDAR 52

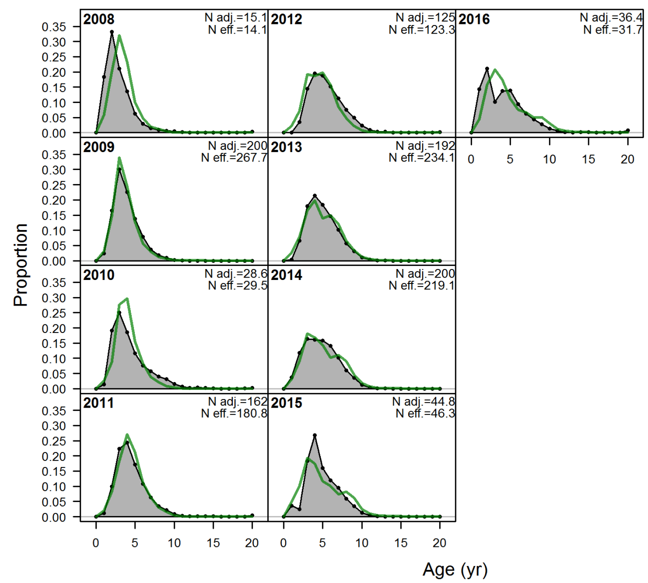
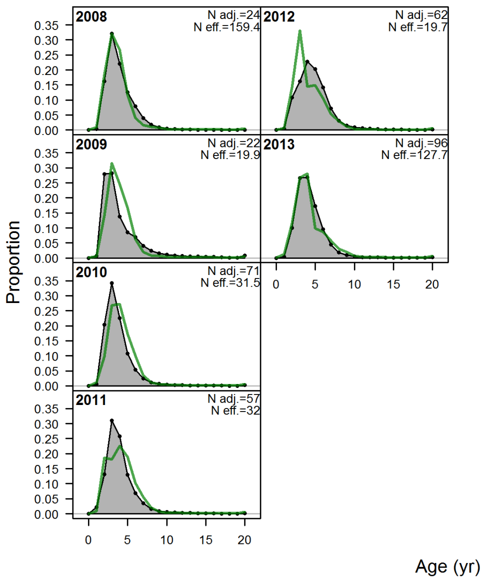


Figure 4.6. (fits to age comp of surveys continued).

b) Video Survey (VID) West:

2014 SEDAR 31 Update



SEDAR 52

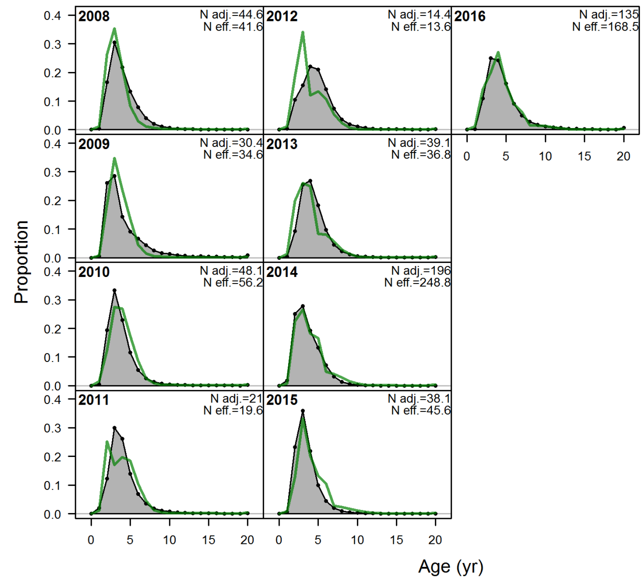
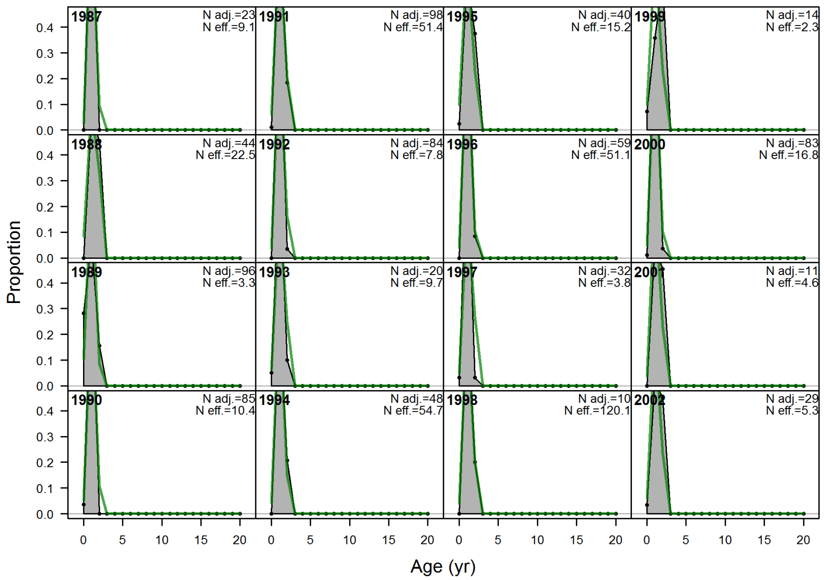


Figure 4.6. (fits to age comp of surveys continued).

c) SEAMAP Summer Groundfish Trawl Survey (SUM) East:

2014 SEDAR 31 Update



SEDAR 52

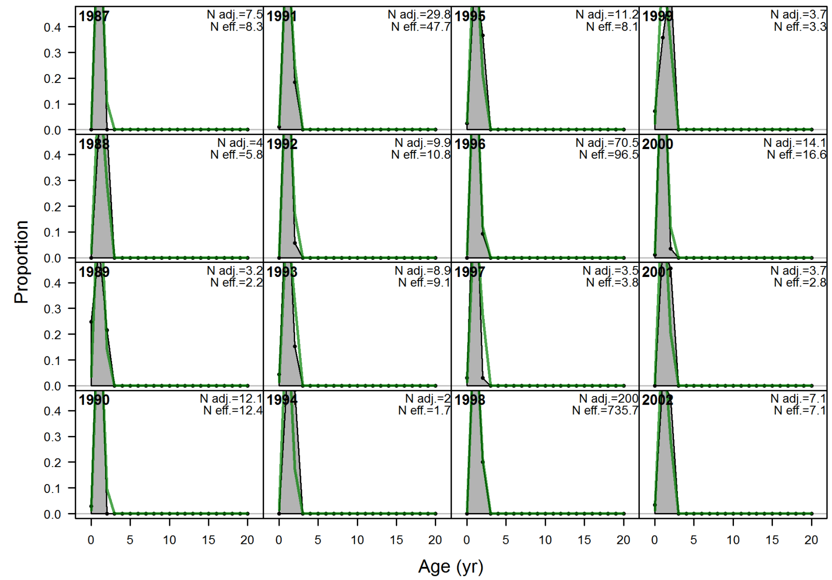
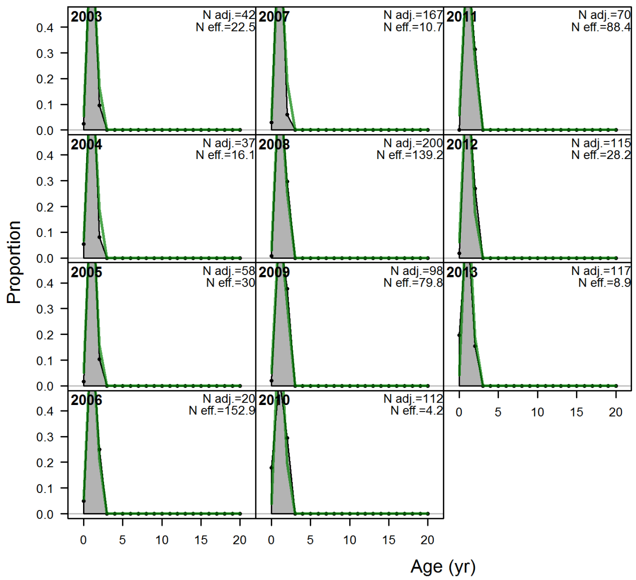


Figure 4.6. (fits to age comp of surveys continued).

c) SEAMAP Summer Groundfish Trawl Survey (SUM) East (continued):

2014 SEDAR 31 Update



SEDAR 52

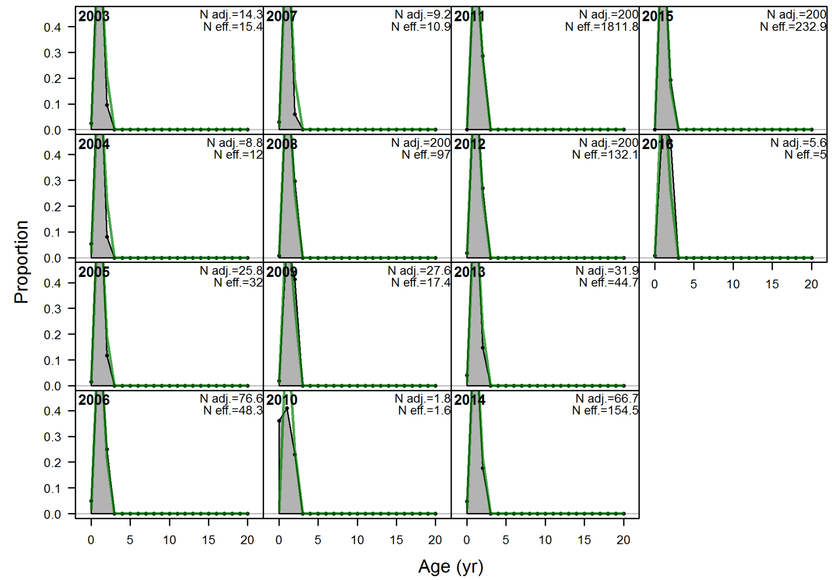
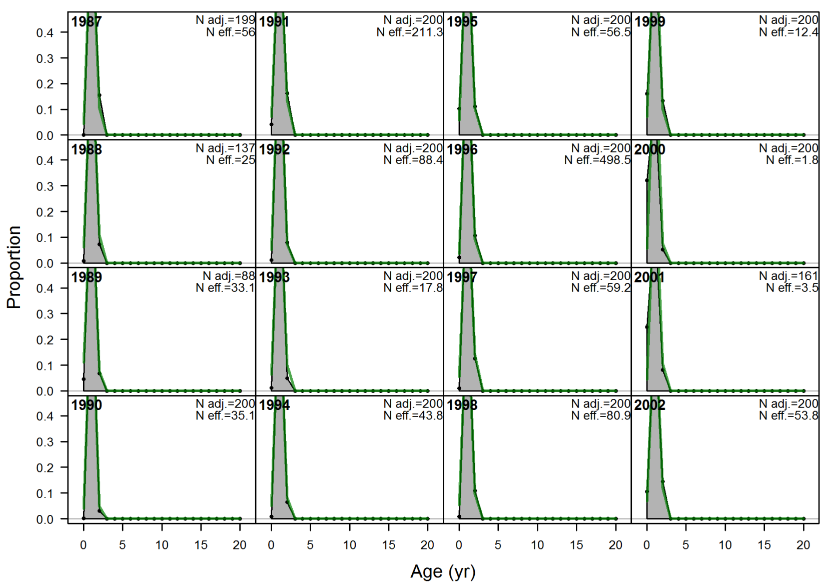


Figure 4.6. (fits to age comp of surveys continued).

d) SEAMAP Summer Groundfish Trawl Survey (SUM) West:

2014 SEDAR 31 Update



SEDAR 52

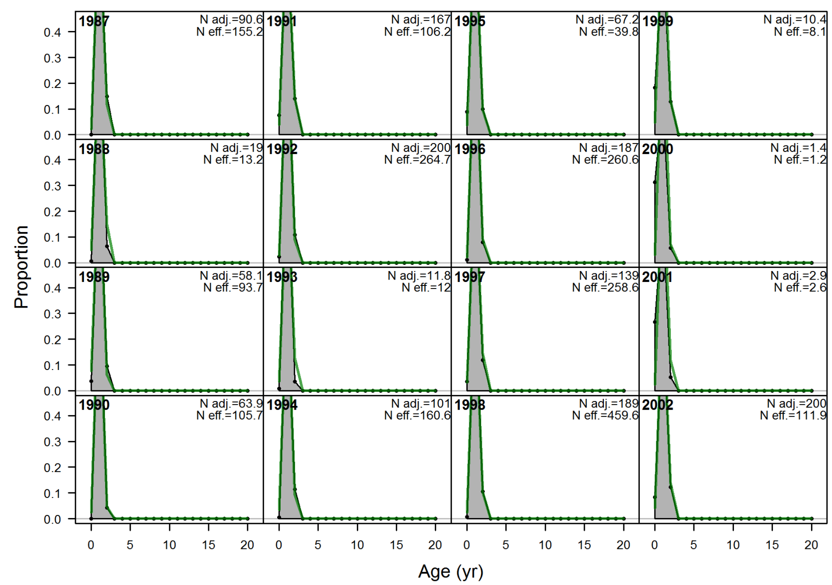
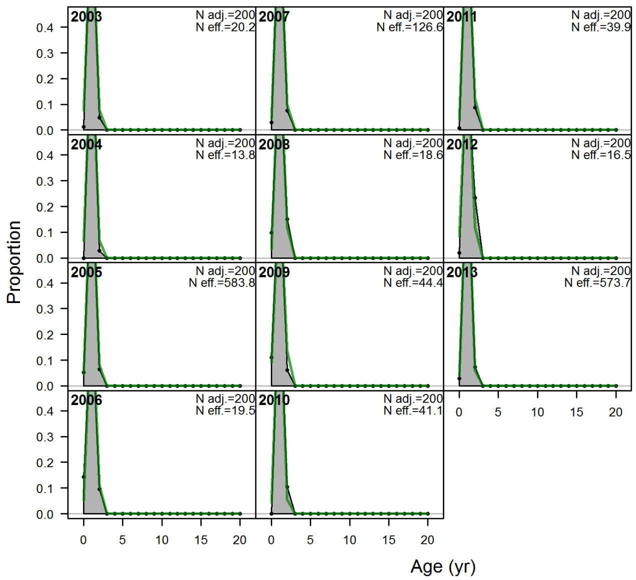


Figure 4.6. (fits to age comp of surveys continued).

d) SEAMAP Summer Groundfish Trawl Survey (SUM) West (continued):

2014 SEDAR 31 Update



SEDAR 52

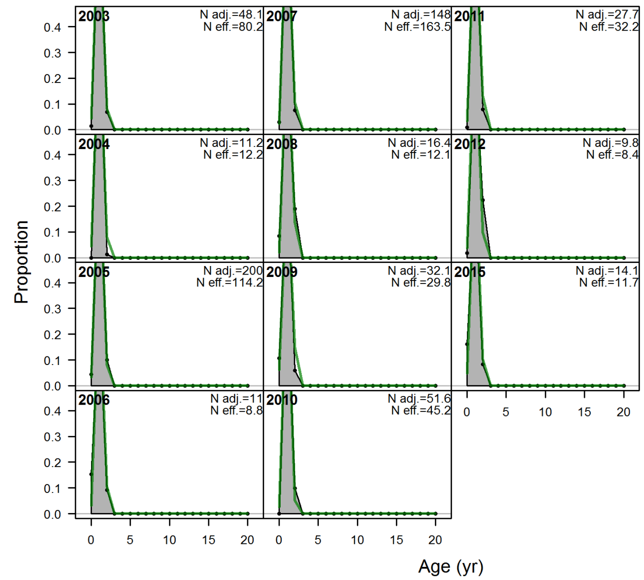
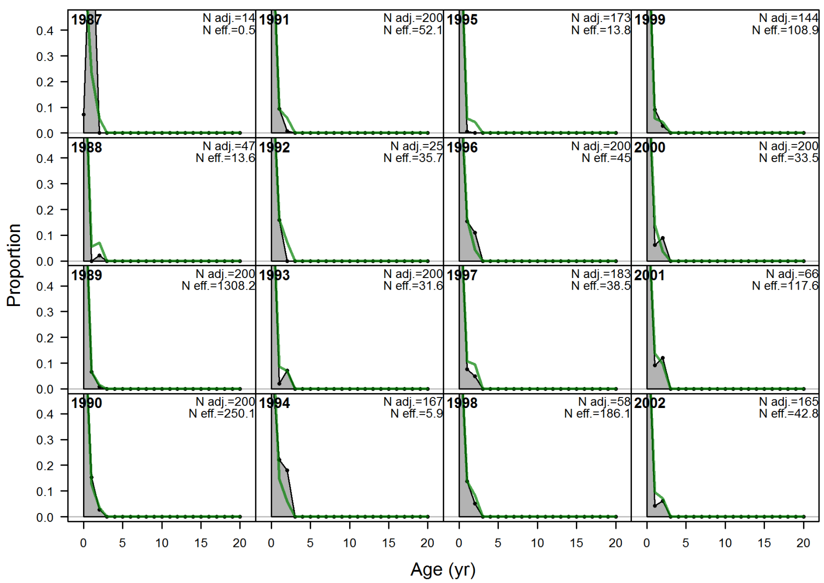


Figure 4.6. (fits to age comp of surveys continued).

e) SEAMAP Fall Groundfish Trawl Survey (Fall) East:

2014 SEDAR 31 Update



SEDAR 52

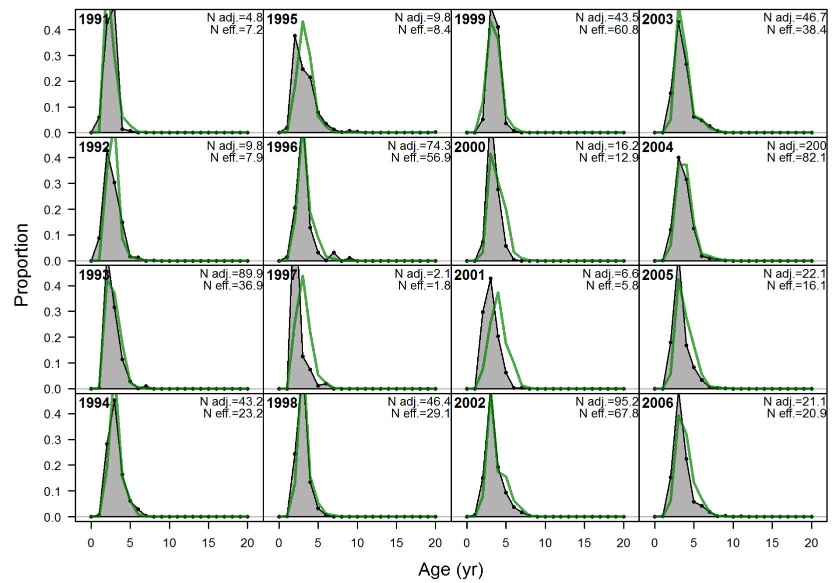
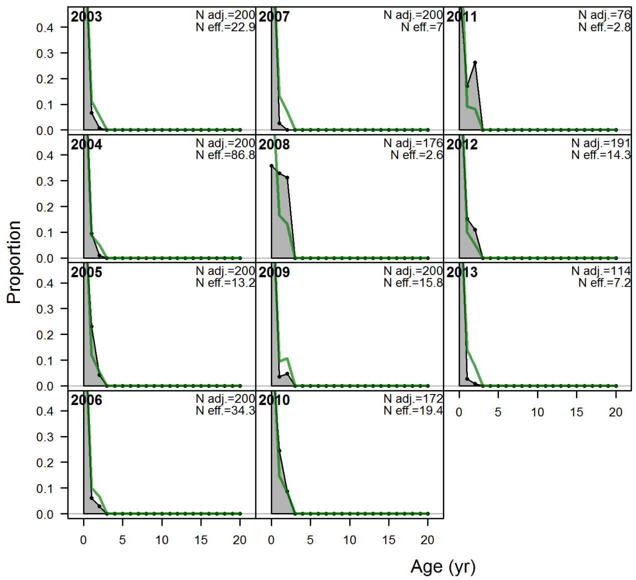


Figure 4.6. (fits to age comp of surveys continued).

e) SEAMAP Fall Groundfish Trawl Survey (Fall) East (continued):

2014 SEDAR 31 Update



SEDAR 52

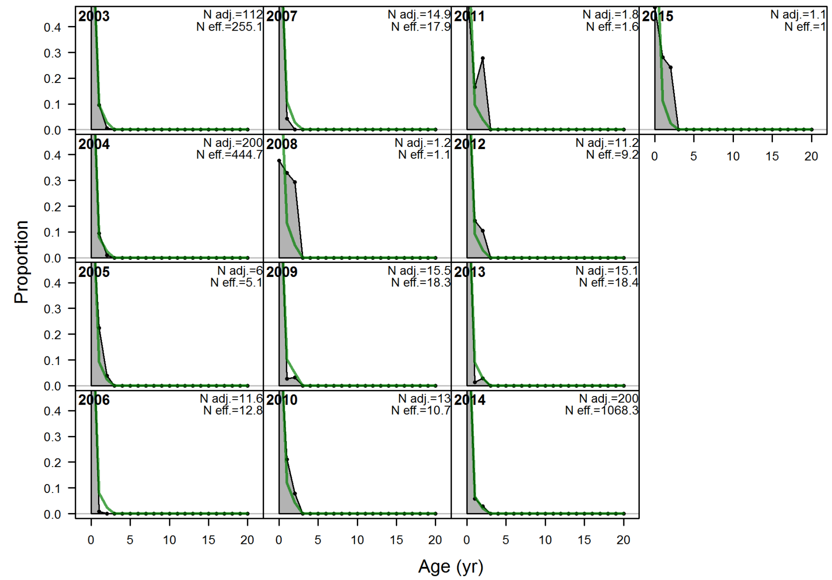
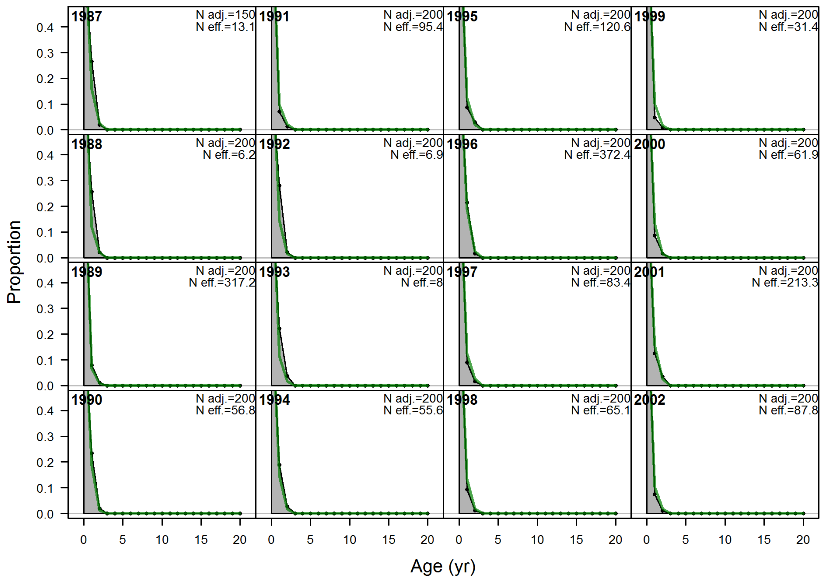


Figure 4.6. (fits to age comp of surveys continued).

f) SEAMAP Fall Groundfish Trawl Survey (Fall) West:

2014 SEDAR 31 Update



SEDAR 52

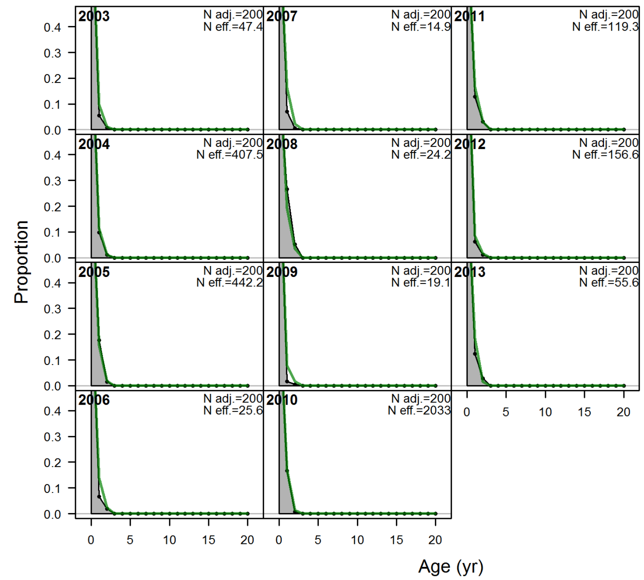
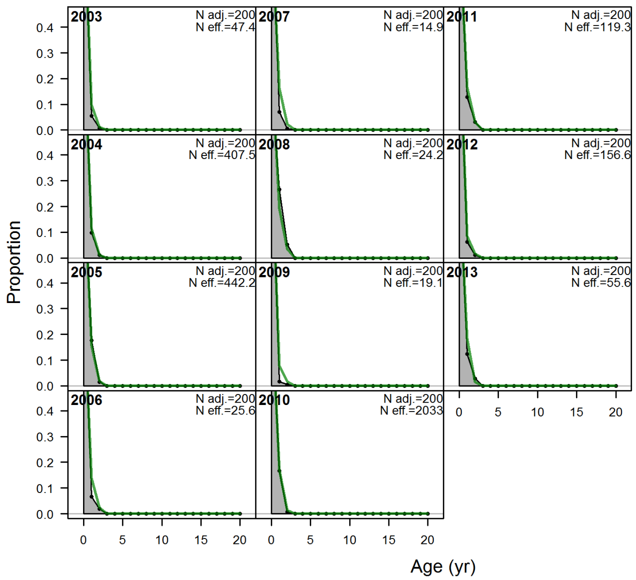


Figure 4.6. (fits to age comp of surveys continued).

f) SEAMAP Fall Groundfish Trawl Survey (Fall) West (continued):

2014 SEDAR 31 Update



SEDAR 52

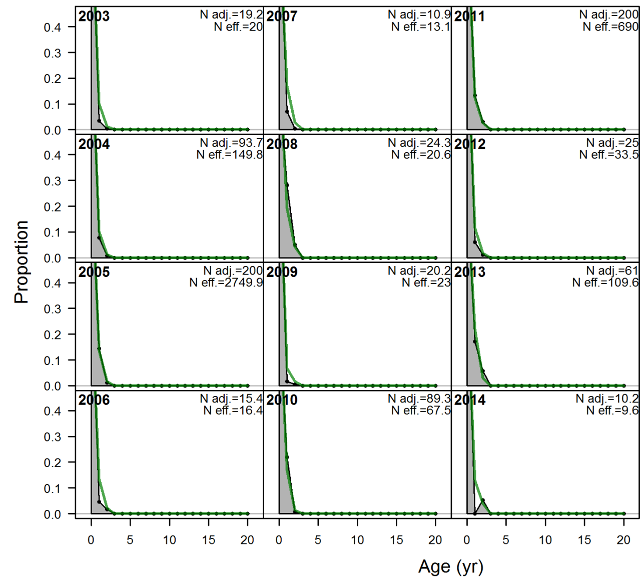
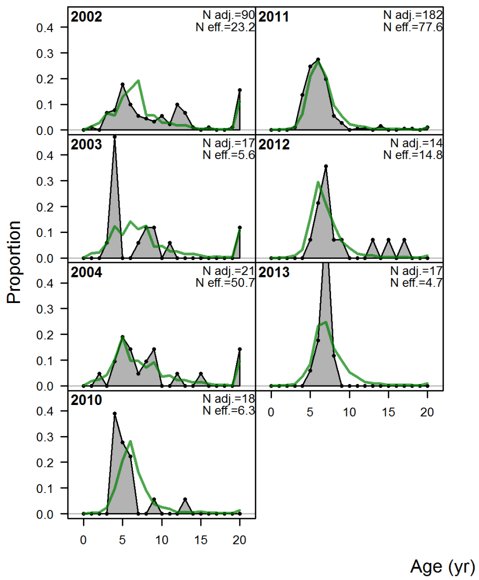


Figure 4.6. (fits to age comp of surveys continued).

g) NMFS Bottom Long Line (BLL) East:

2014 SEDAR 31 Update



SEDAR 52

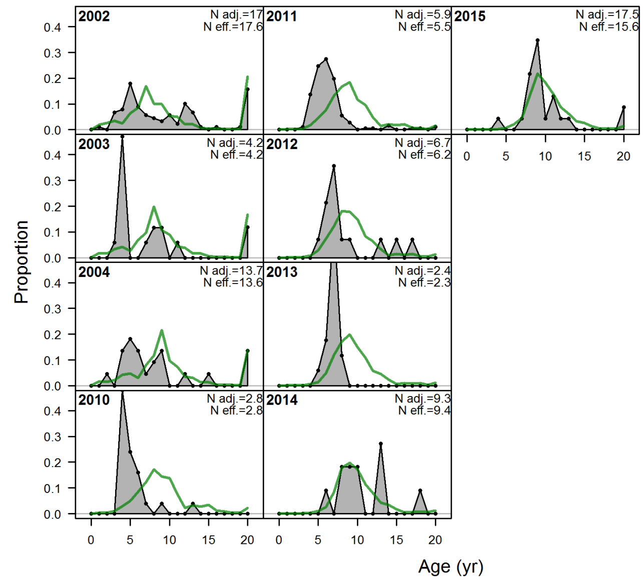
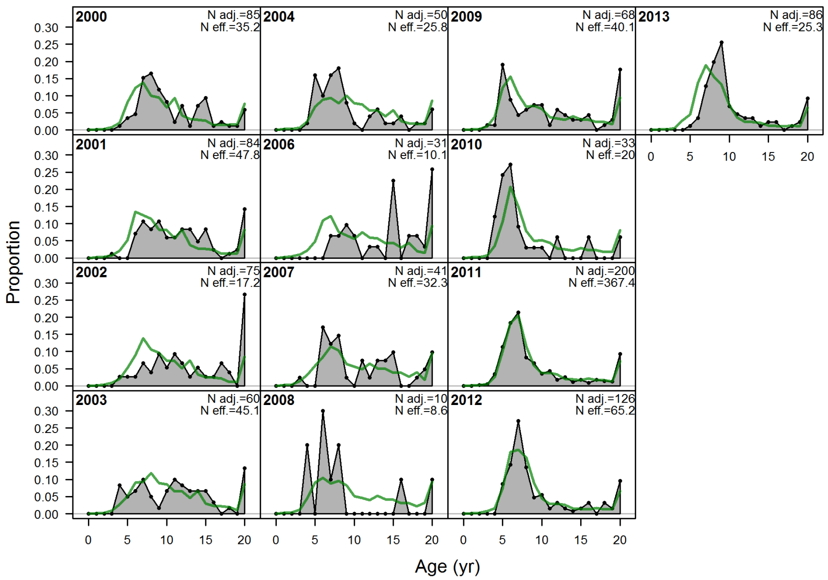


Figure 4.6. (fits to age comp of surveys continued).

h) NMFS Bottom Long Line (BLL) West:

2014 SEDAR 31 Update



SEDAR 52

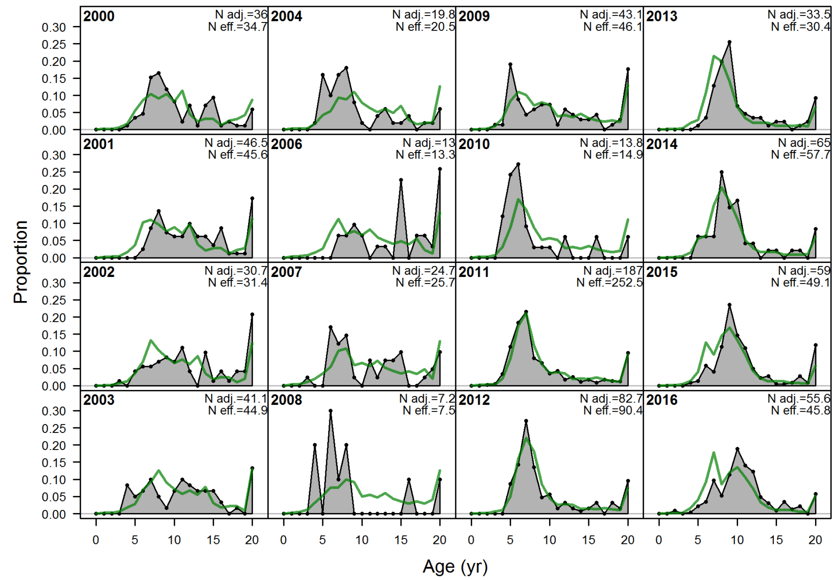
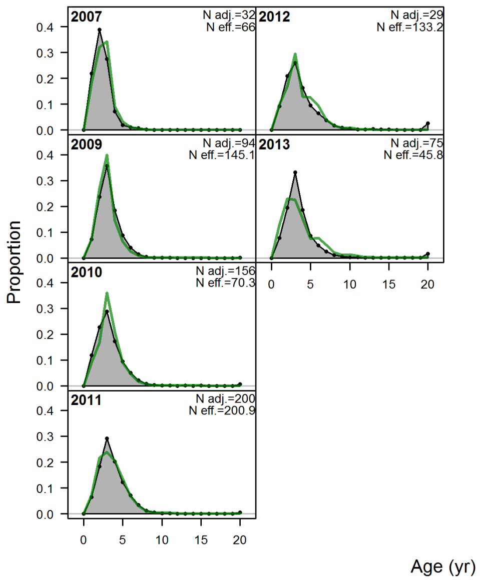


Figure 4.6. (fits to age comp of surveys continued).

i) Artificial Reef Survey (ROV) East:

2014 SEDAR 31 Update



SEDAR 52

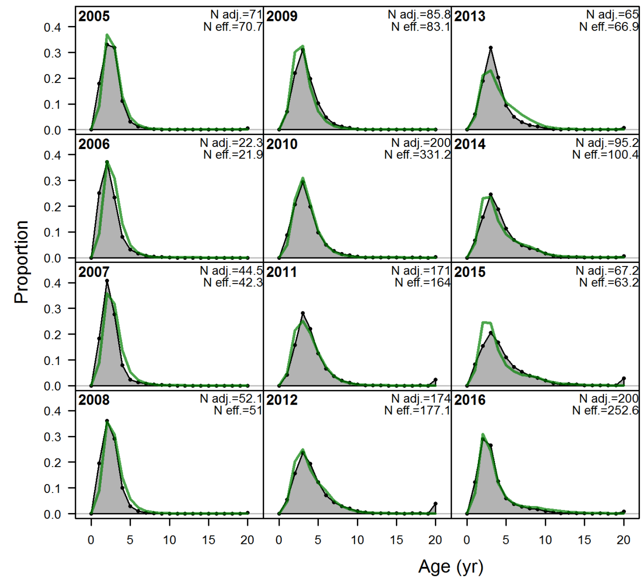


Figure 4.7. Model fits to the age composition aggregated across years within a given fleet or survey. The green lines represent predicted age compostions, while the grey shaded region represents observed age compositions. Results for the 2014 SEDAR 31 Update are in the Left Panel and SEDAR 52 results are in the Right Panel.

2014 SEDAR 31 Update **SEDAR 52**

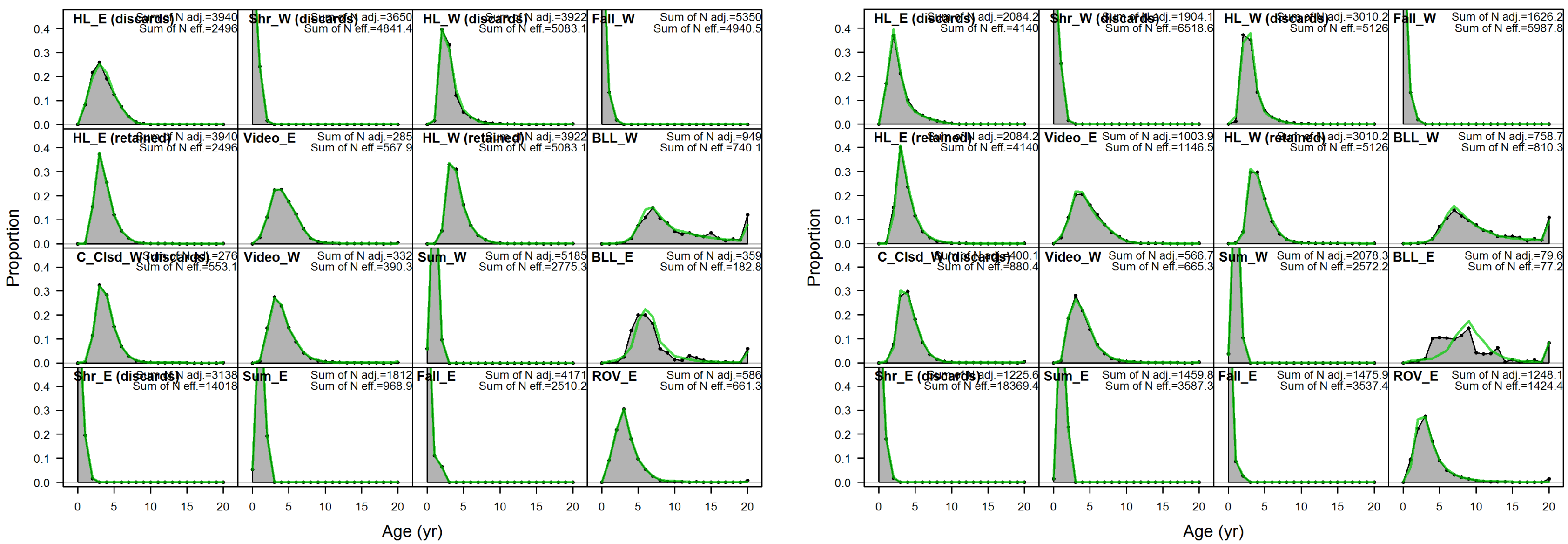
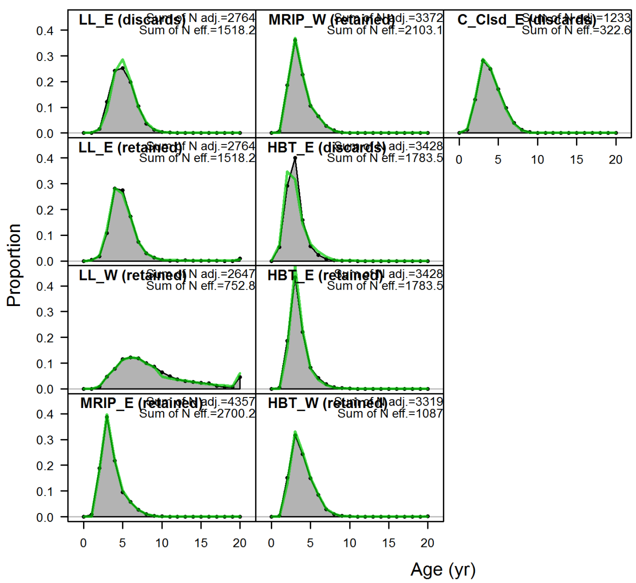


Figure 4.7. (fits to aggregated age compositions continued).

2014 SEDAR 31 Update



SEDAR 52

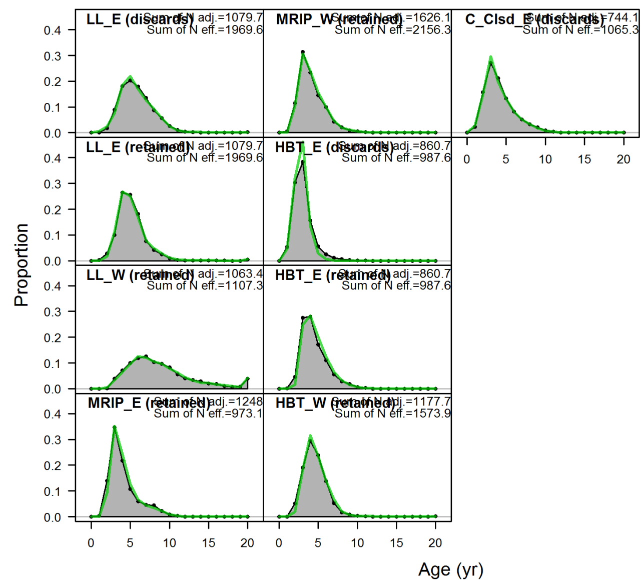
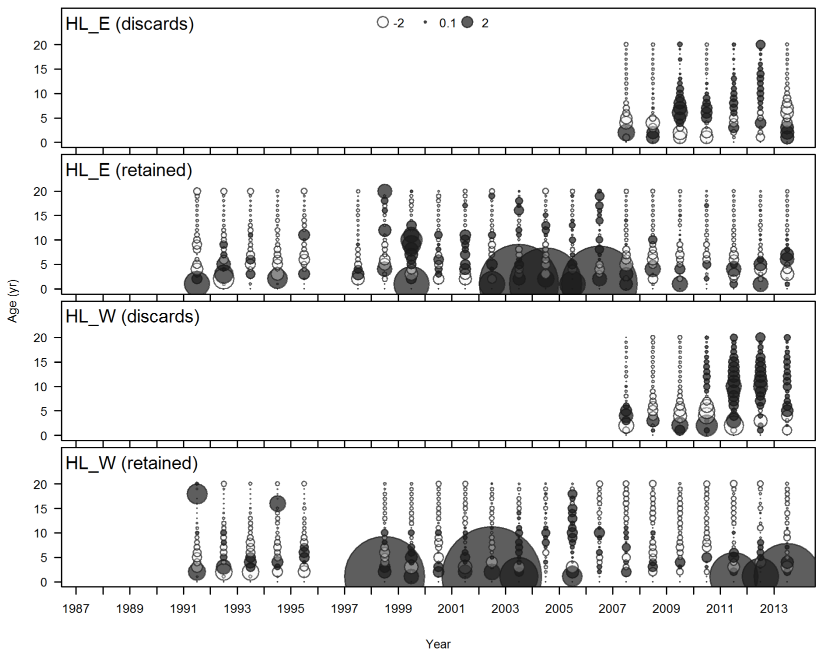


Figure 4.8. Pearson residuals for age composition data by year compared across fleets. Closed bubbles are positive residuals (observed > expected) and open bubbles are negative residuals (observed < expected). Results for the 2014 SEDAR 31 Update are in the Left Panel and SEDAR 52 results are in the Right Panel.

2014 SEDAR 31 Update



SEDAR 52

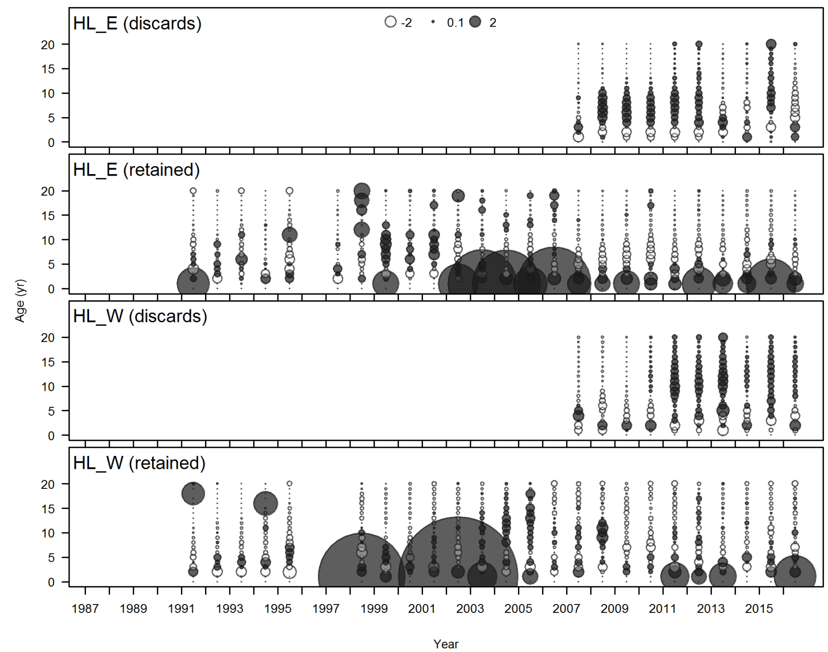
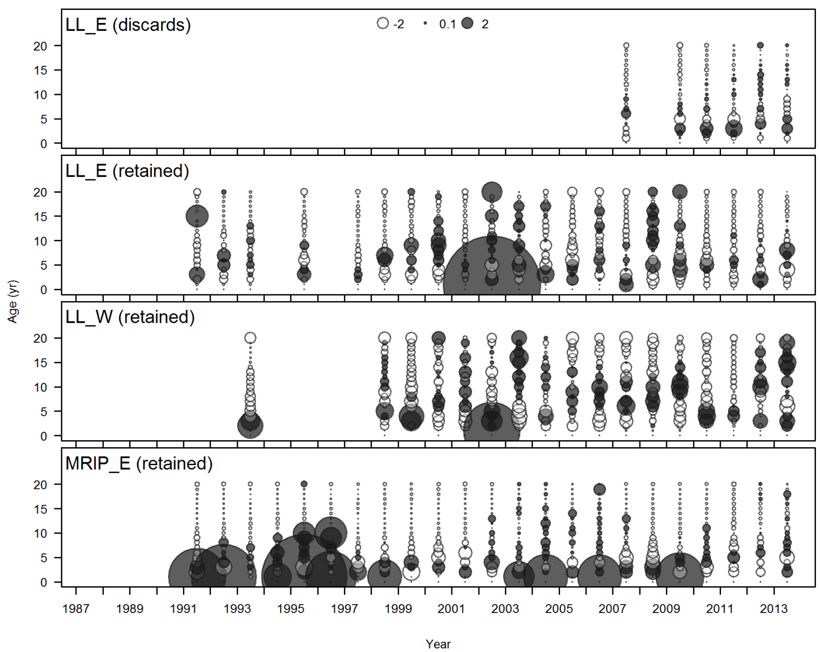


Figure 4.8. (Pearson residuals of age composition data).

2014 SEDAR 31 Update



SEDAR 52

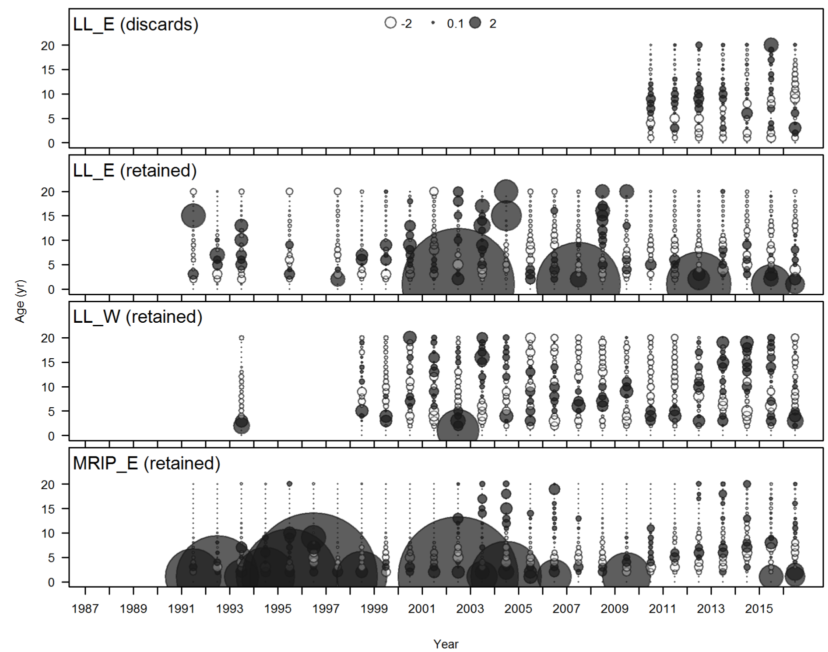


Figure 4.8. (Pearson residuals of age composition data).

2014 SEDAR 31 Update **SEDAR 52**

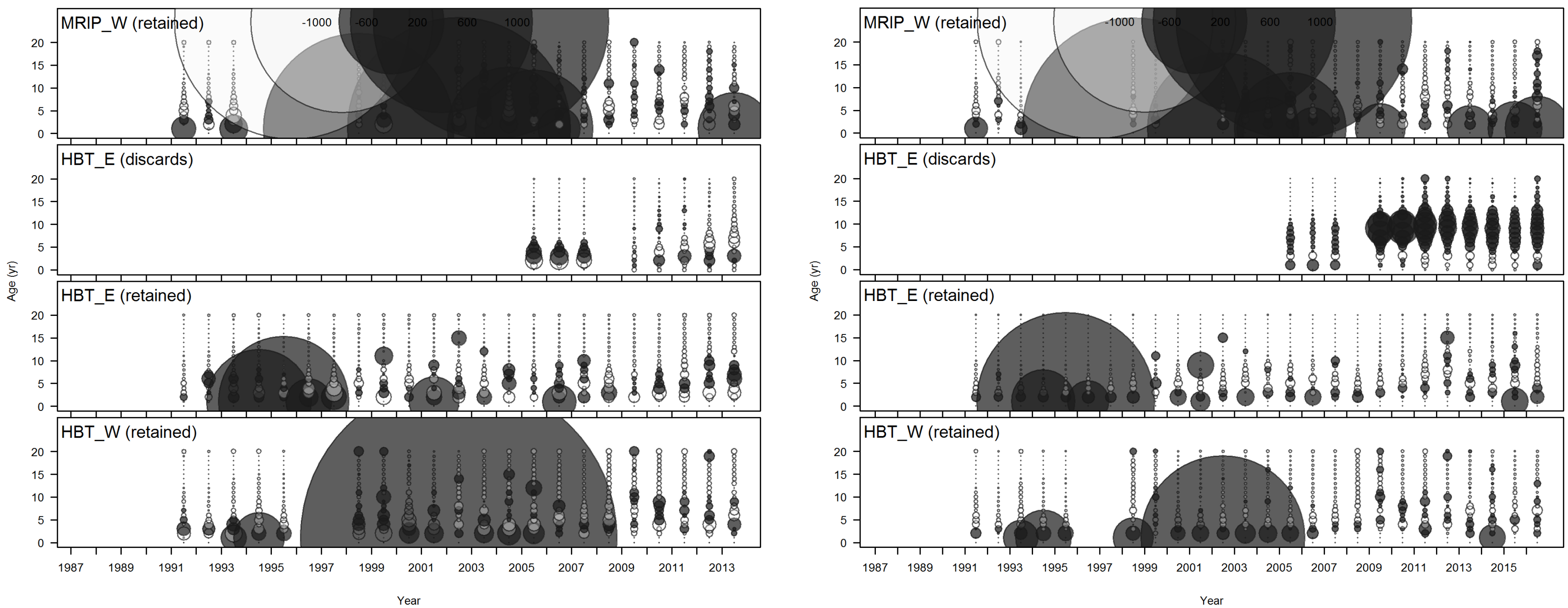
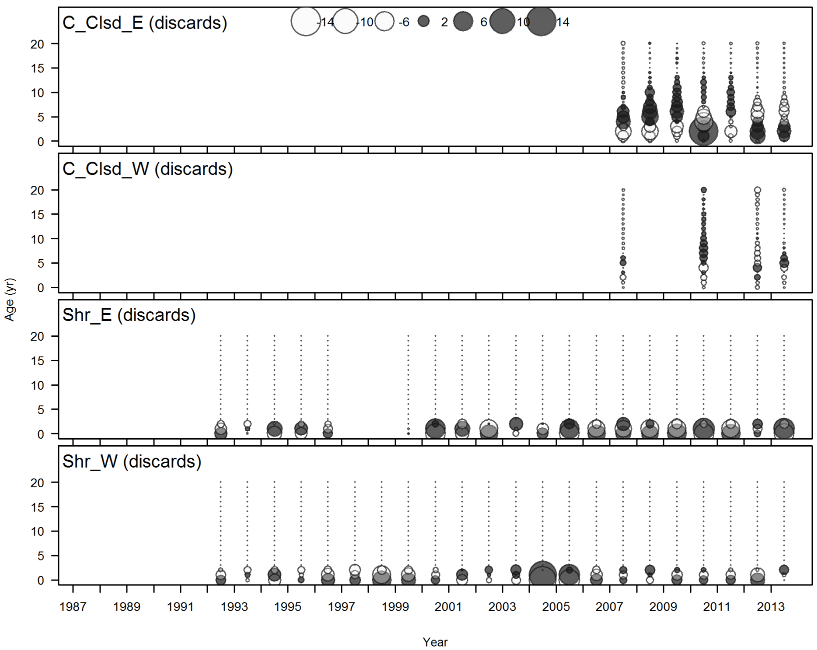


Figure 4.8. (Pearson residuals of age composition data).

2014 SEDAR 31 Update



SEDAR 52

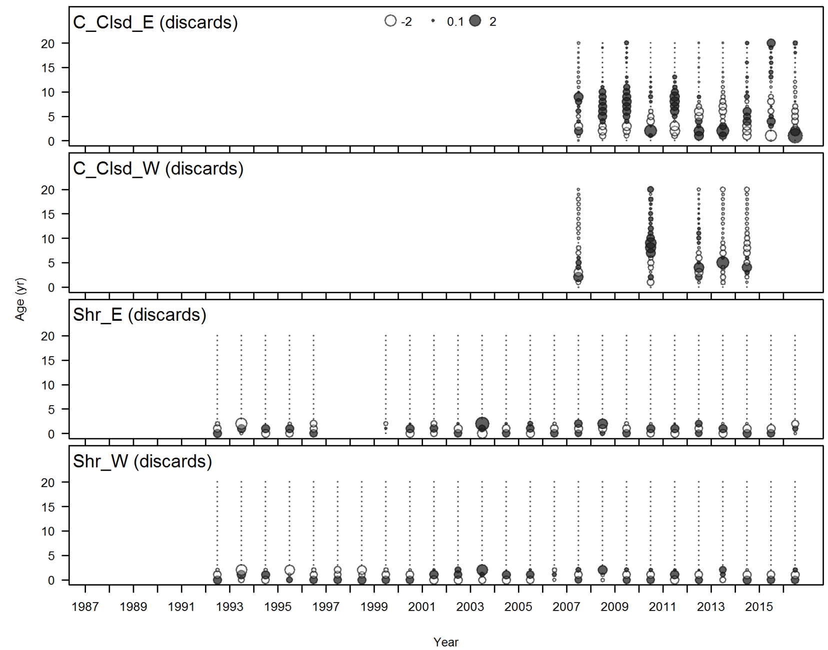
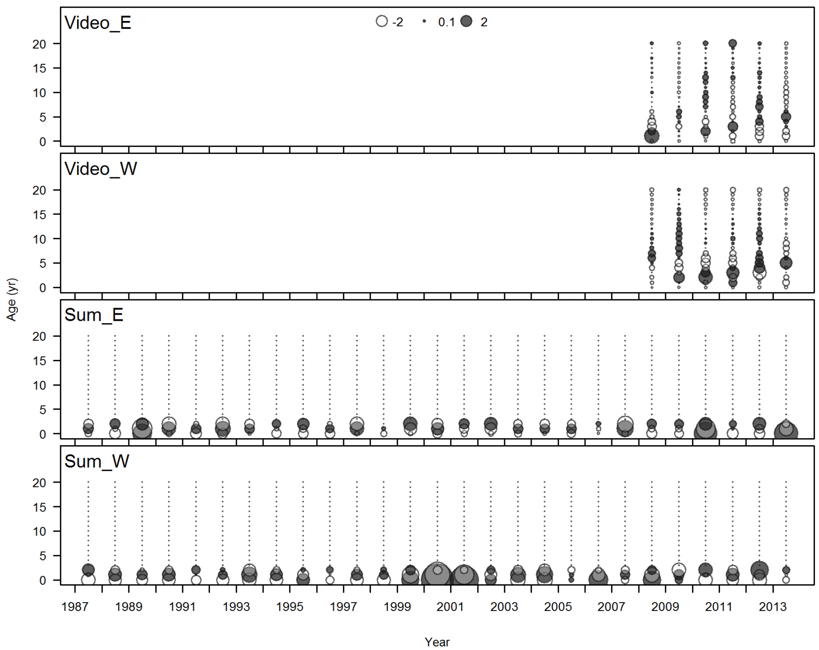


Figure 4.8. (Pearson residuals of age composition data).

2014 SEDAR 31 Update



SEDAR 52

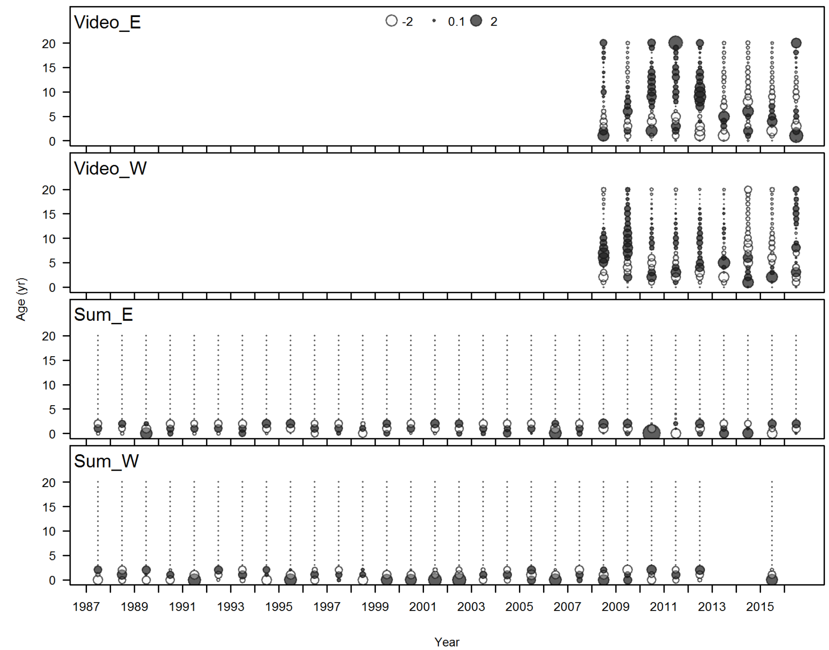


Figure 4.8. (Pearson residuals of age composition data).

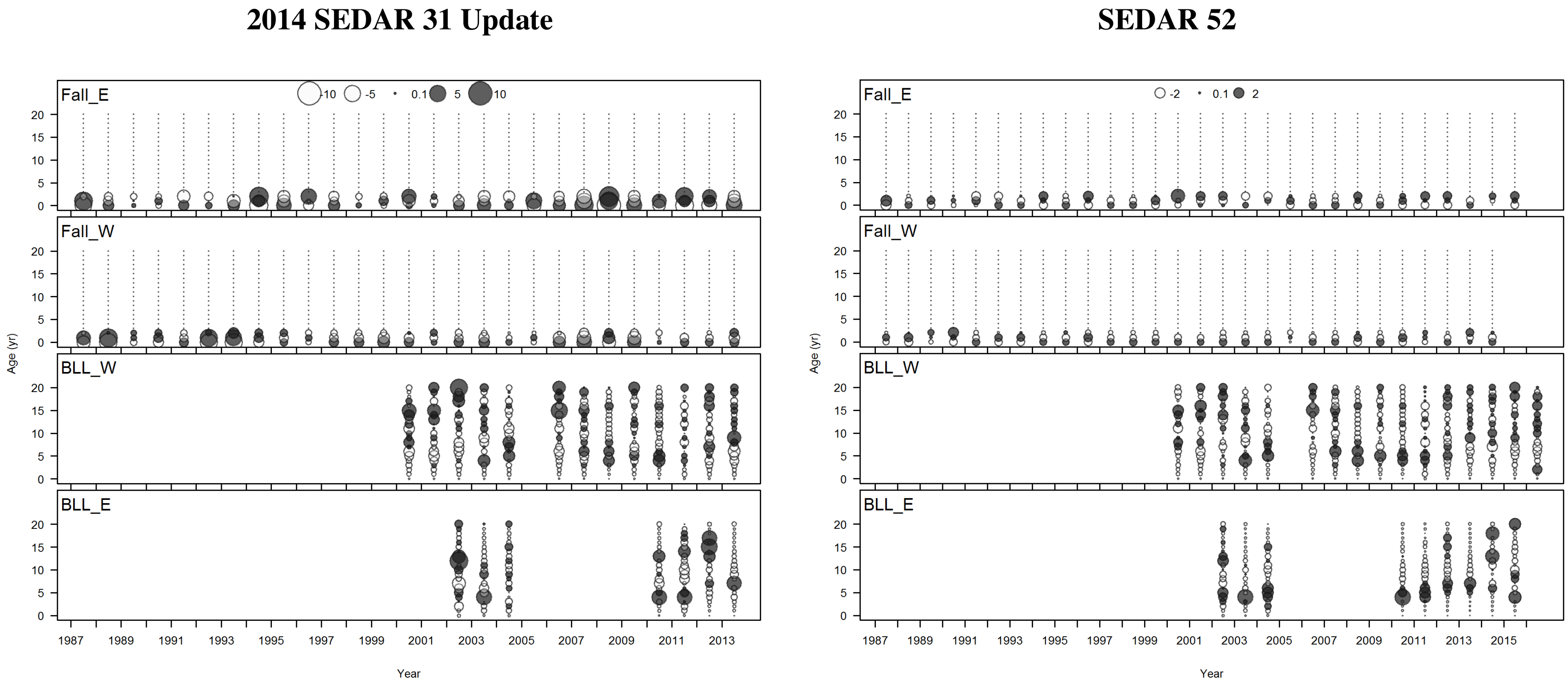
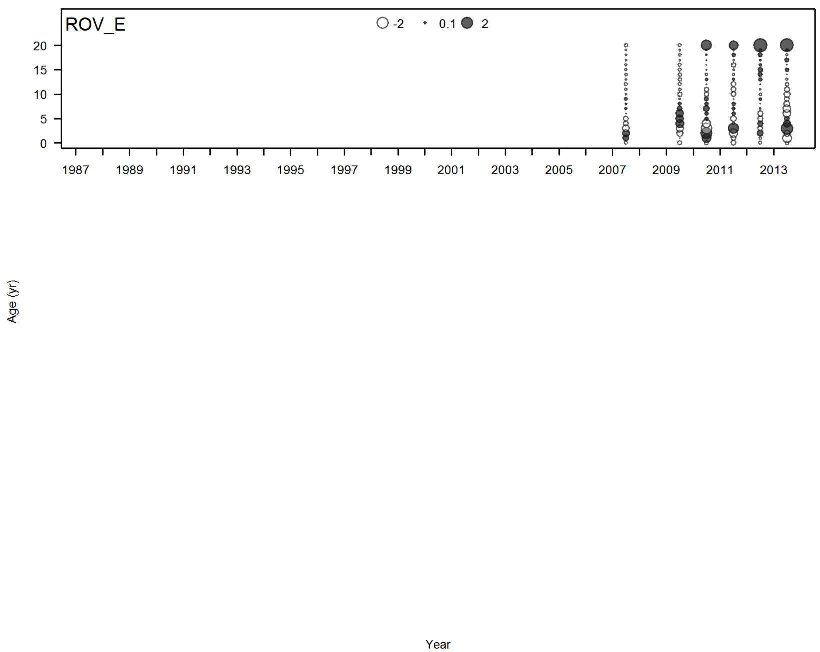


Figure 4.8. (Pearson residuals of age composition data).

2014 SEDAR 31 Update



SEDAR 52

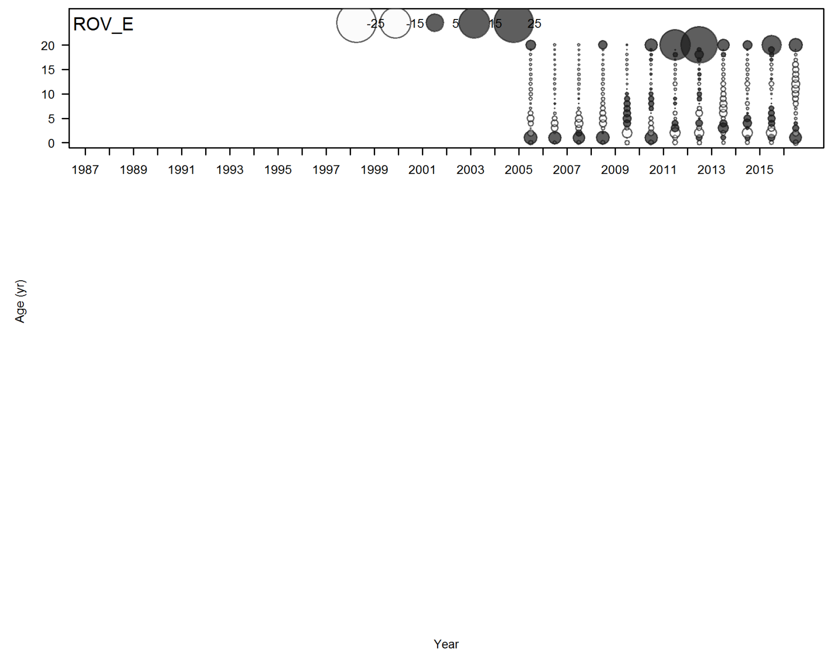
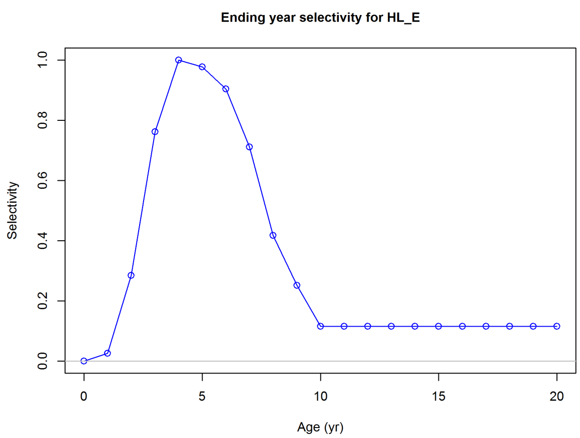


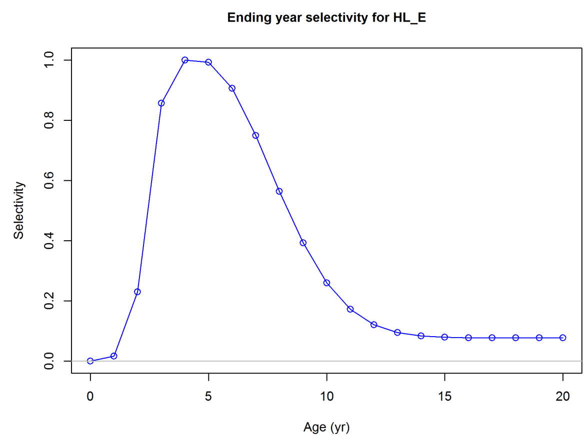
Figure 4.9. Terminal timeblock age-based selectivity for each fishing fleet. The 2014 SEDAR 31 Update Assessment estimated selectivities are provided in the left hand panel, while the SEDAR 52 estimated selectivities are provided in the right hand panel.

a) Commerical Vertical Line (HL) East

2014 SEDAR 31 Update

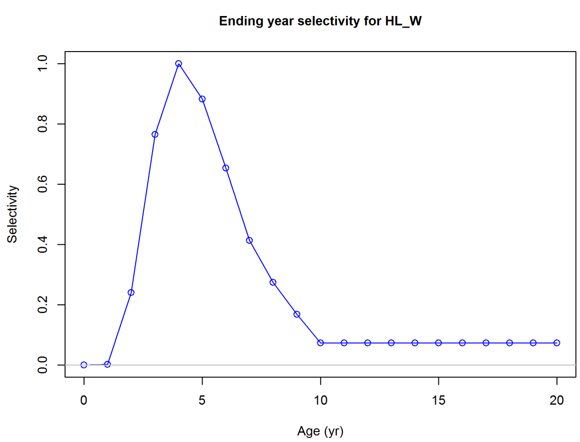


SEDAR 52



b) Commerical Vertical Line (HL) West:

2014 SEDAR 31 Update



SEDAR 52

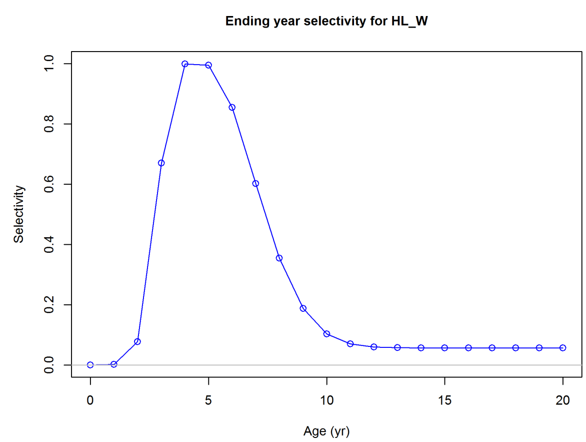
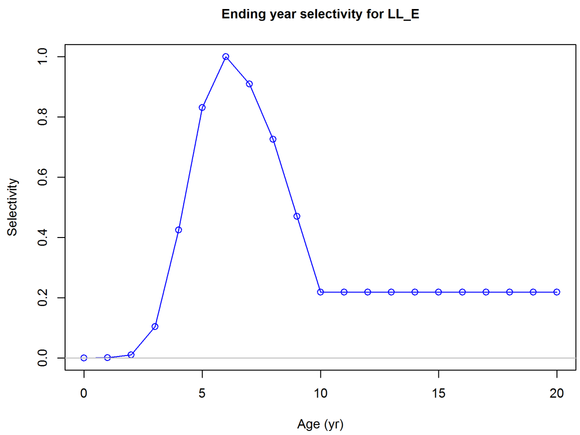


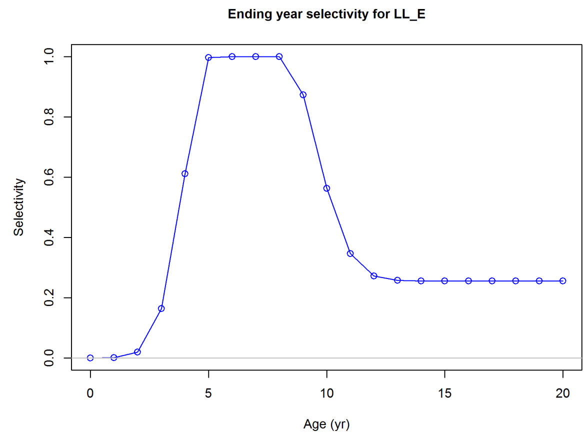
Figure 4.9. (Terminal timeblock age-based selectivity for each fishing fleet continued)

c) Commerical Long Line (LL) East:

2014 SEDAR 31 Update

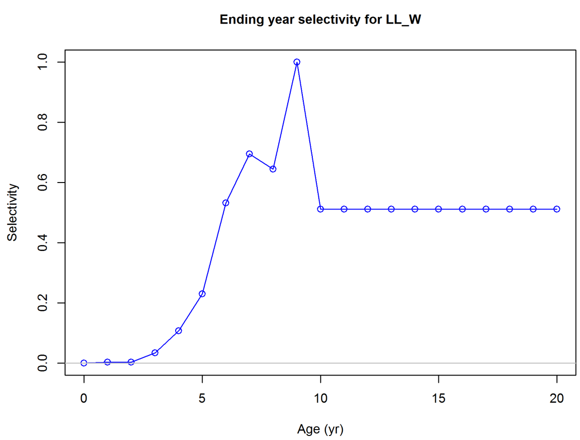


SEDAR 52



d) Commerical Long Line (LL) West:

2014 SEDAR 31 Update



SEDAR 52

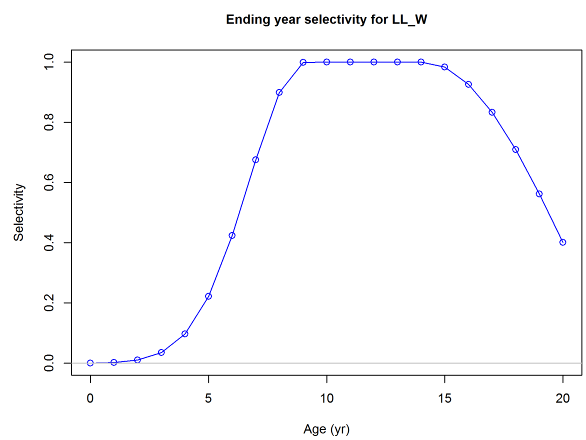
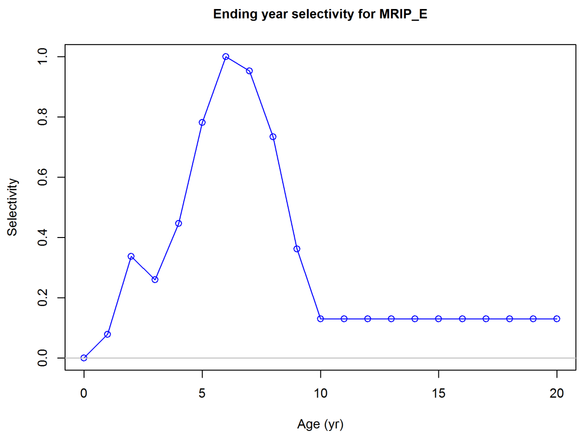


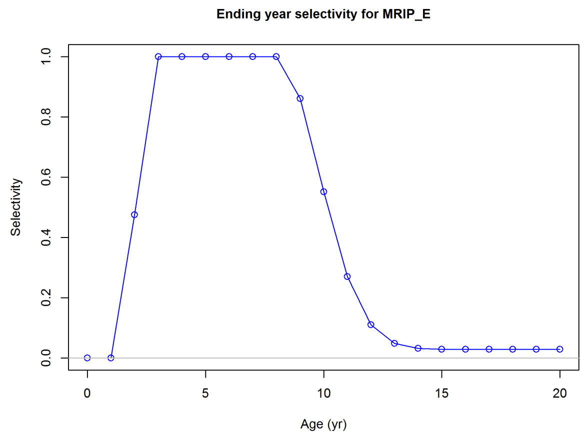
Figure 4.9. (Terminal timeblock age-based selectivity for each fishing fleet continued)

e) Recreational Charter/Private (MRIP/MRFSS) East:

2014 SEDAR 31 Update

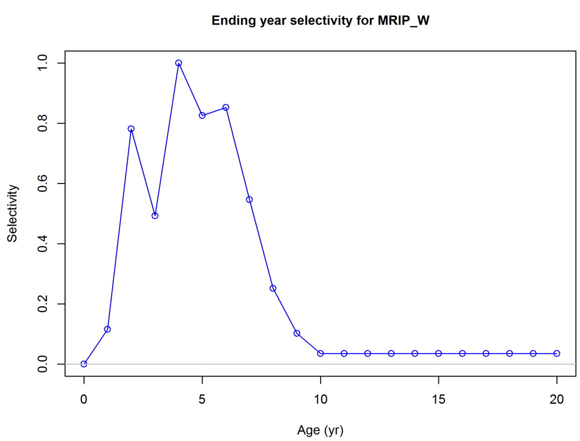


SEDAR 52



f) Recreational Charter/Private (MRIP/MRFSS) West

2014 SEDAR 31 Update



SEDAR 52

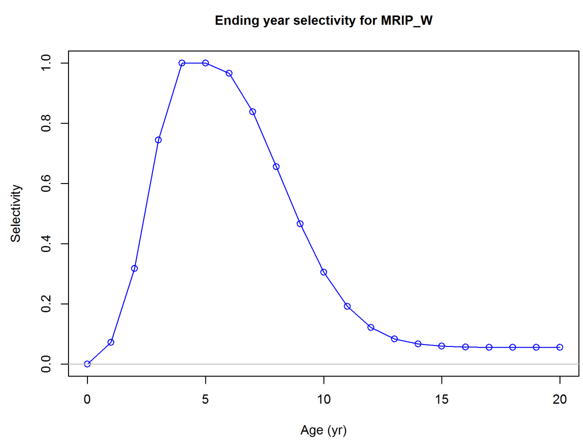
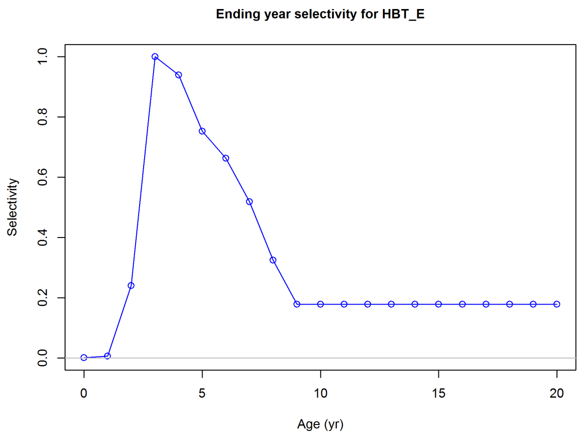


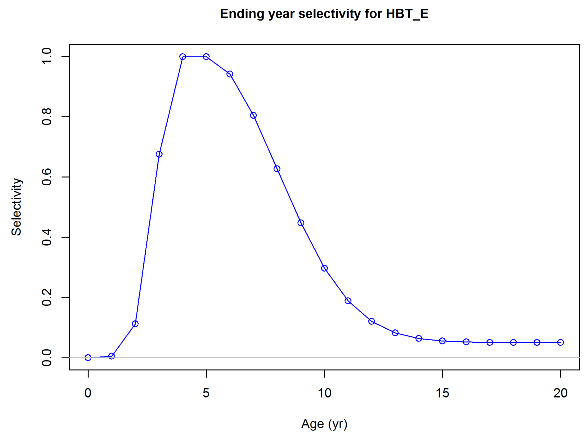
Figure 4.9. (Terminal timeblock age-based selectivity for each fishing fleet continued)

g) Recreational Headboat (HBT) East:

2014 SEDAR 31 Update

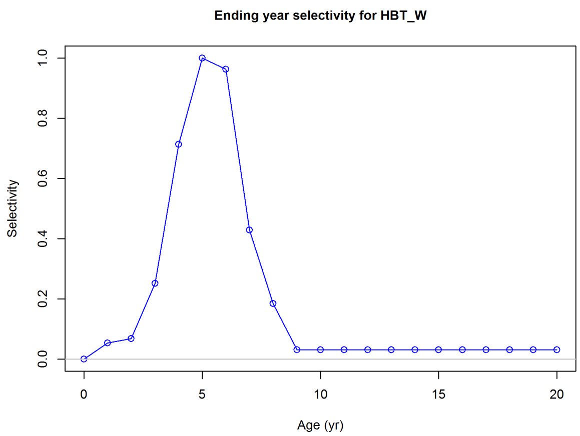


SEDAR 52



h) Recreational Headboat (HBT) West:

2014 SEDAR 31 Update



SEDAR 52

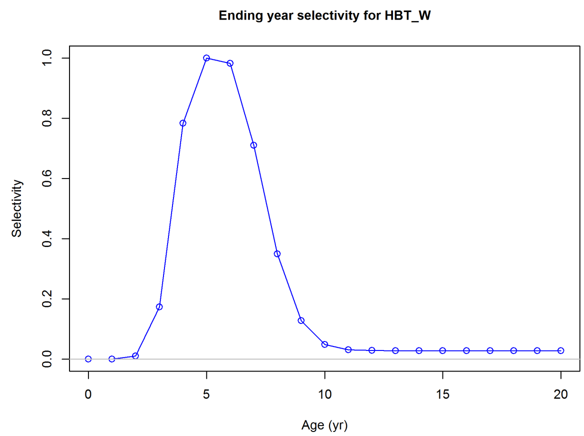
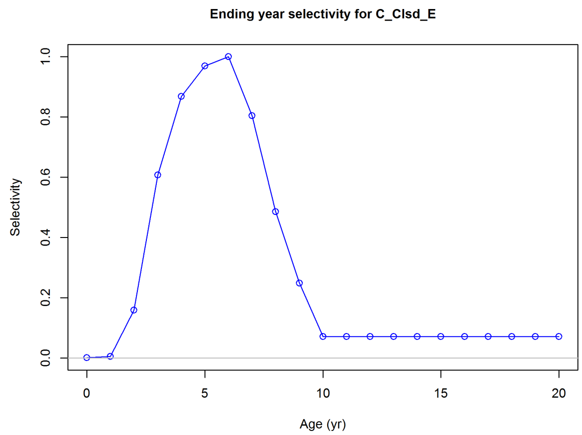


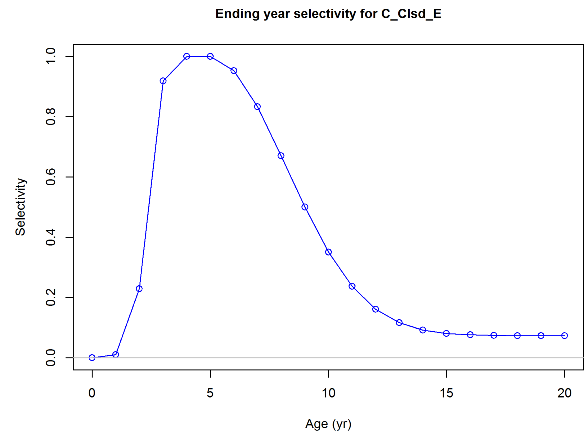
Figure 4.9. (Terminal timeblock age-based selectivity for each fishing fleet continued)

i) Commerical Closed Season/No-IFQ (C_Closed) East:

2014 SEDAR 31 Update

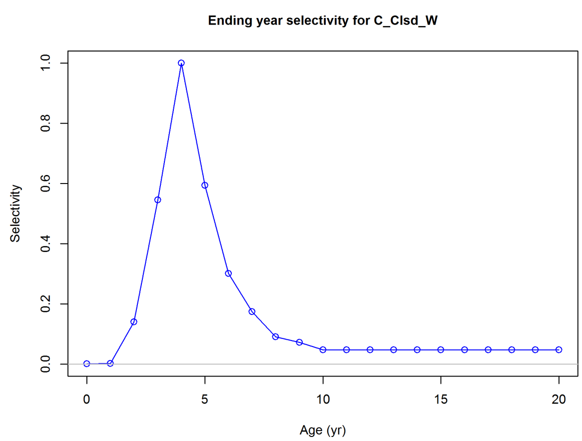


SEDAR 52



j) Commerical Closed Season/No-IFQ (C_Closed) West:

2014 SEDAR 31 Update



SEDAR 52

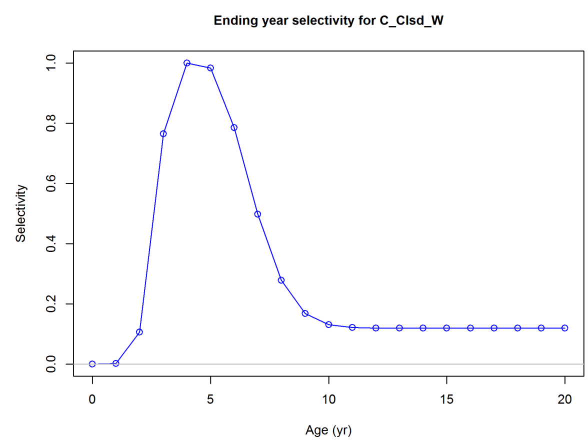
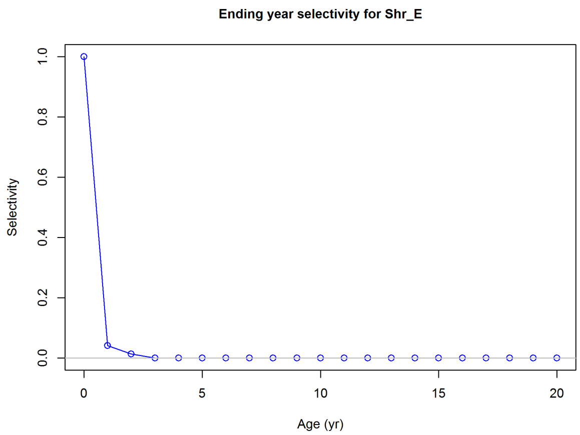


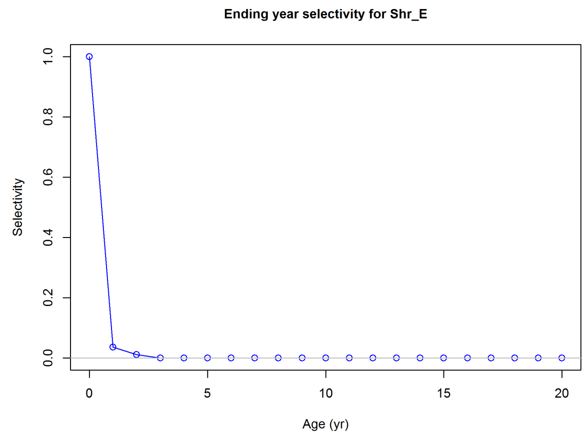
Figure 4.9. (Terminal timeblock age-based selectivity for each fishing fleet continued)

k) Shrimp Bycatch (SHR) East:

2014 SEDAR 31 Update

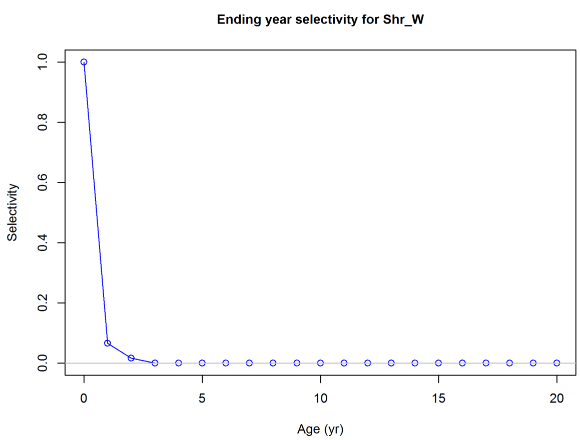


SEDAR 52



l) Shrimp Bycatch (SHR) West:

2014 SEDAR 31 Update



SEDAR 52

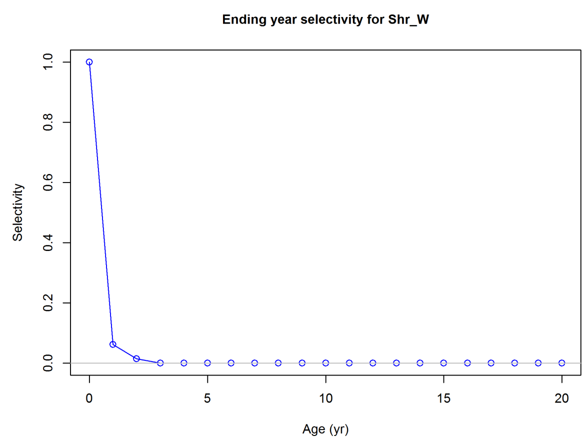
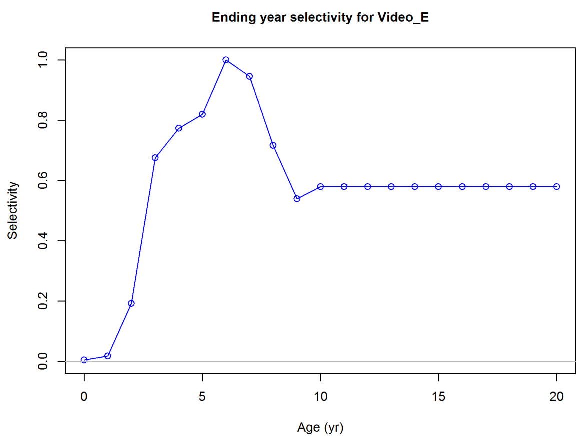


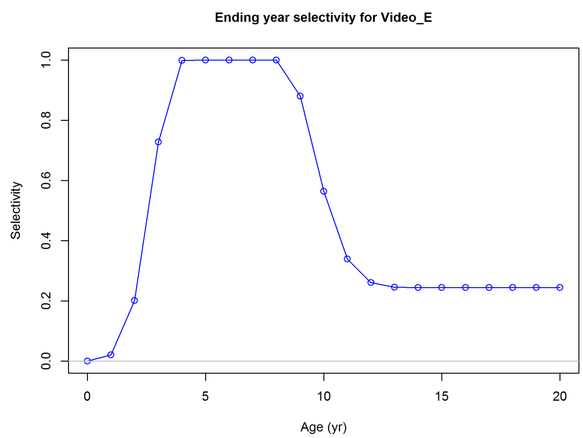
Figure 4.10. Terminal timeblock age-based selectivity for each survey. The 2014 SEDAR 31 Update Assessment estimated selectivities are provided in the left hand panel, while the SEDAR 52 estimated selectivities are provided in the right hand panel.

a) SEAMAP Video (VID) East:

2014 SEDAR 31 Update

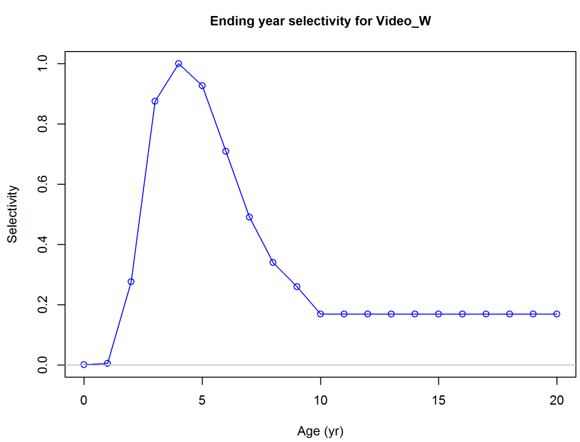


SEDAR 52



b) SEAMAP Video (VID) West:

2014 SEDAR 31 Update



SEDAR 52

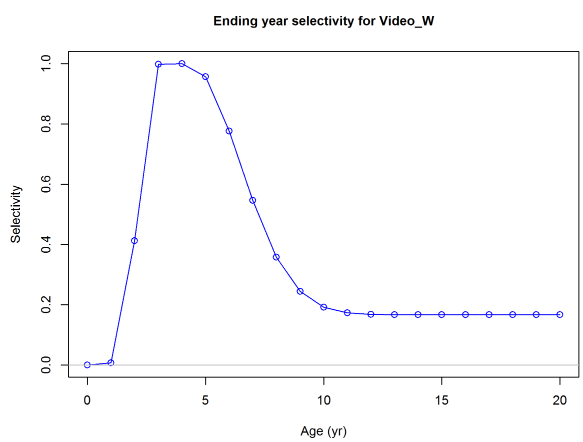
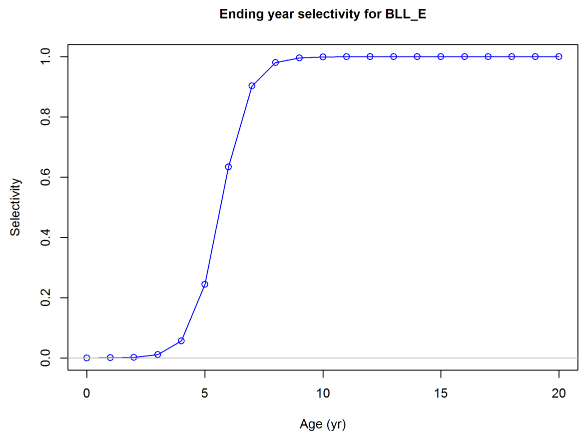
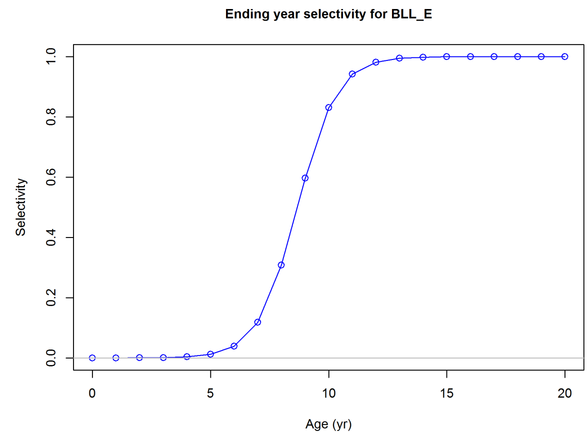


Figure 4.10. (Terminal timeblock age-based selectivity for each survey continued)

c) NMFS Bottom Longline (BLL) East:

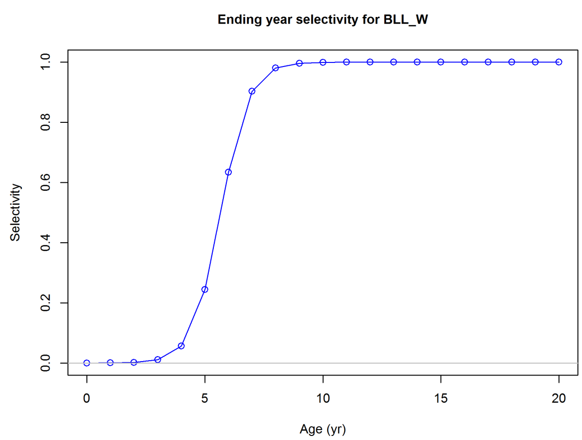
2014 SEDAR 31 Update **SEDAR 52**





d) NMFS Bottom Longline (BLL) West:

2014 SEDAR 31 Update **SEDAR 52**



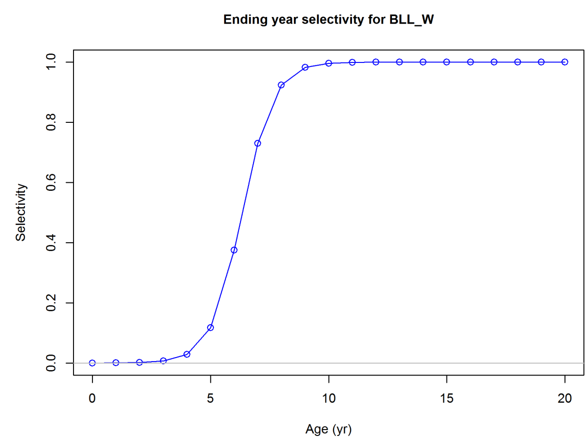
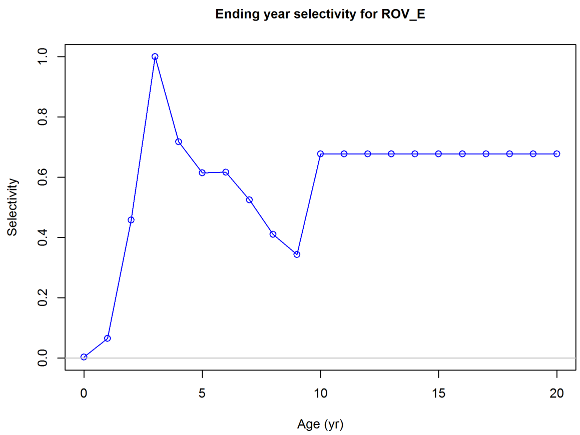


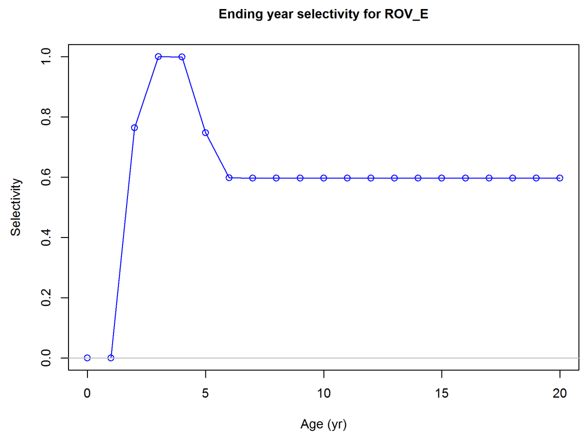
Figure 4.10. (Terminal timeblock age-based selectivity for each survey continued)

e) Artificial Reef Survey (ROV) East:

2014 SEDAR 31 Update

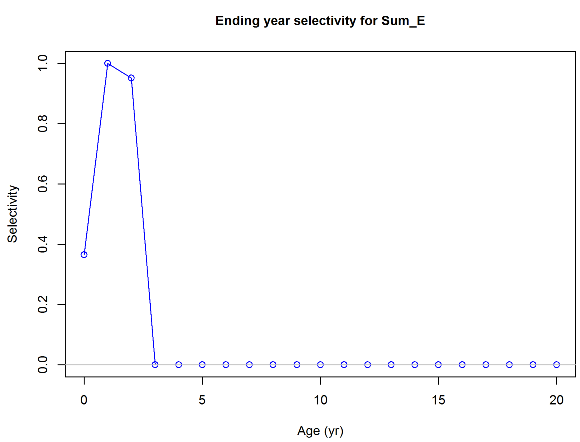


SEDAR 52



f) SEAMAP Summer Groundfish Trawl Survey (SUM) East:

2014 SEDAR 31 Update



SEDAR 52

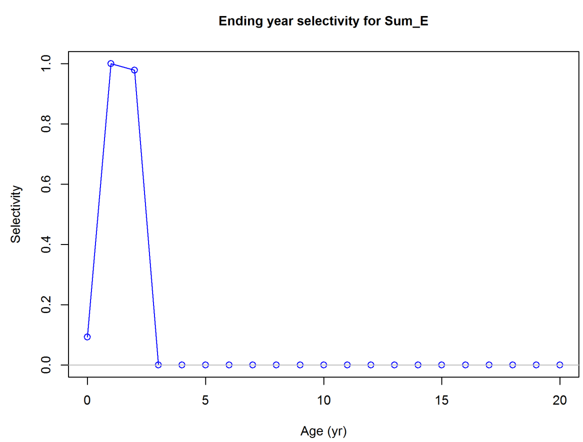
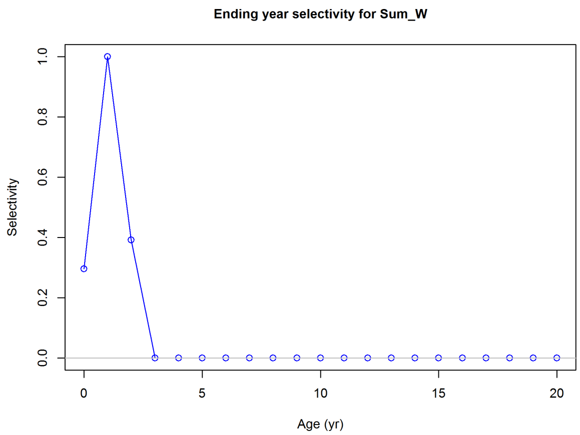


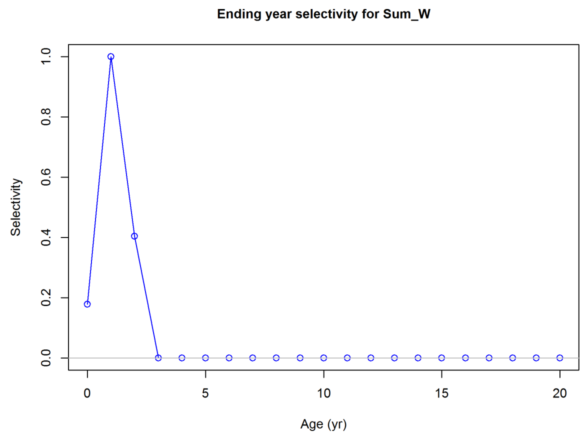
Figure 4.10. (Terminal timeblock age-based selectivity for each survey continued)

g) SEAMAP Summer Groundfish Trawl Survey (SUM) West:

2014 SEDAR 31 Update

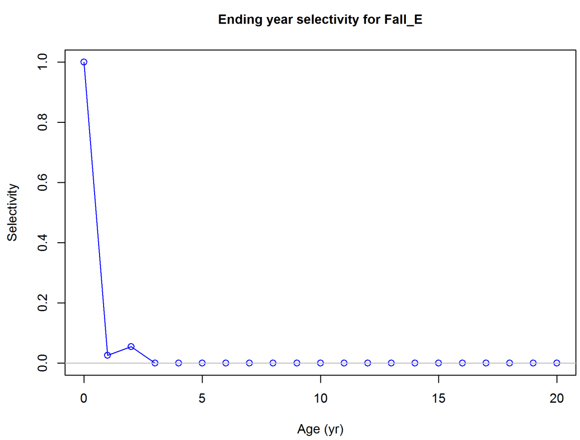


SEDAR 52



h) SEAMAP Fall Groundfish Trawl Survey (Fall) East:

2014 SEDAR 31 Update



SEDAR 52

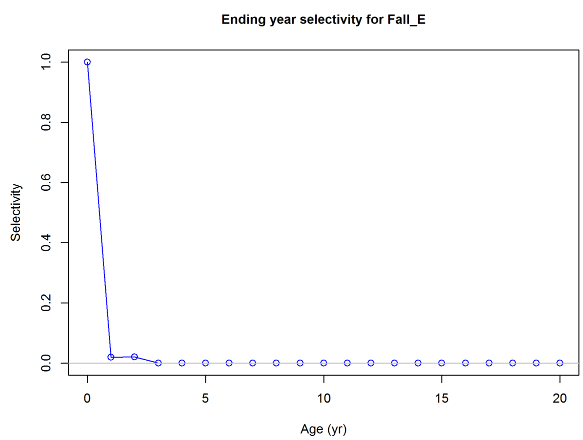
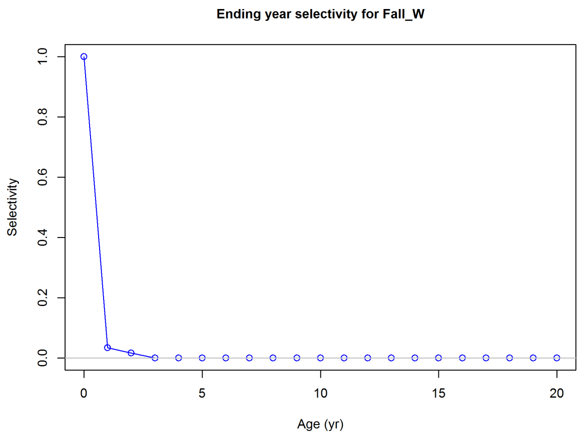


Figure 4.10. (Terminal timeblock age-based selectivity for each survey continued)

i) SEAMAP Fall Groundfish Trawl Survey (Fall) West:

2014 SEDAR 31 Update



SEDAR 52

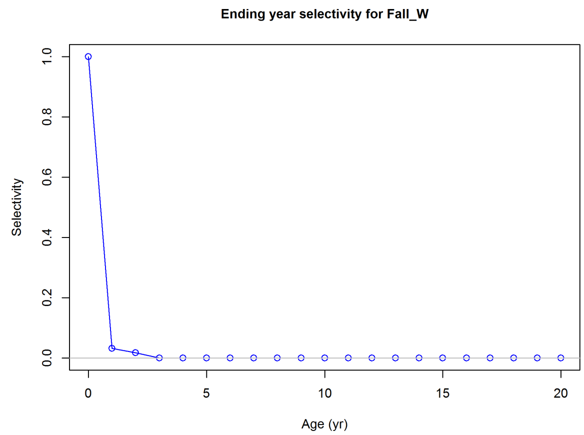
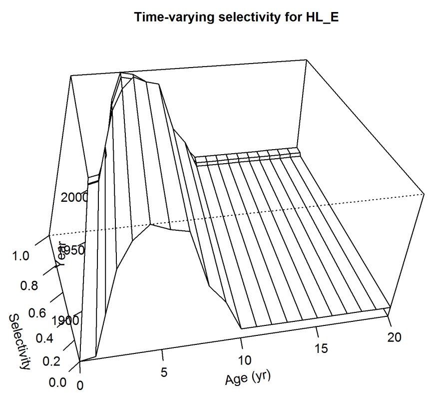


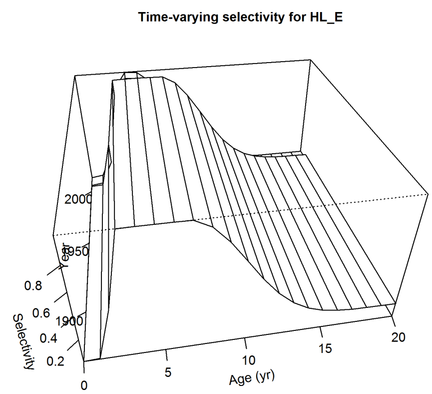
Figure 4.11. Time-varying selectivity estimates by age for the commerical fleets. Two timeblocks existed (pre- and post-2007) to account for the implementation of IFQs. The 2014 SEDAR 31 Update Assessment estimates are provided in the Left Panel and the SEDAR 52 estimates are provided in the Right Panel.

a) Commercial Vertical Line (HL) East:

2014 SEDAR 31 Update

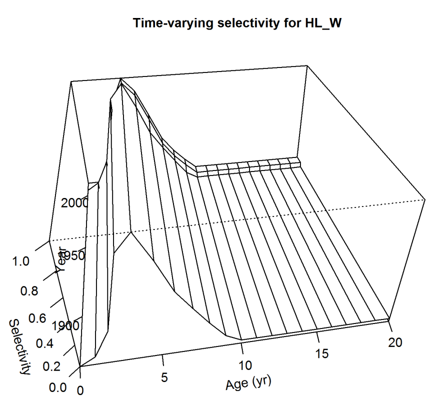


SEDAR 52



b) Commercial Vertical Line (HL) West

2014 SEDAR 31 Update



SEDAR 52

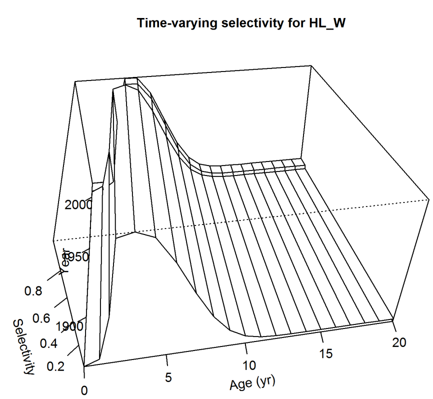
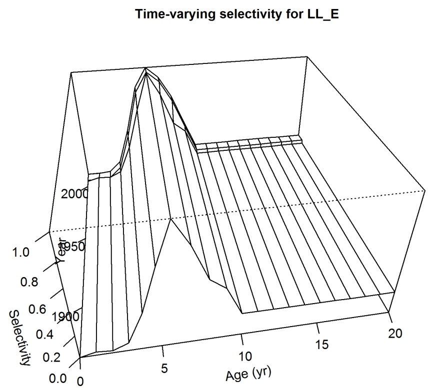


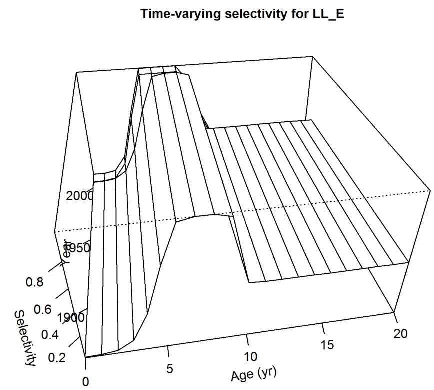
Figure 4.11. (Time-varying commercial fleet selectivity continued).

c) Commercial Longline (LL) East:

2014 SEDAR 31 Update

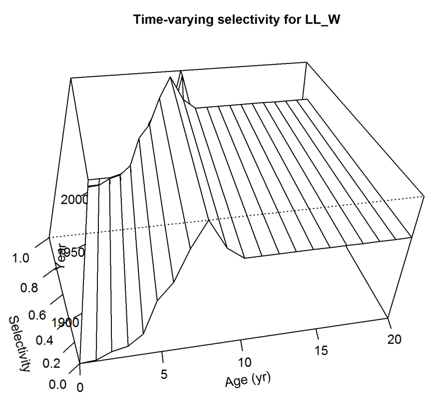


SEDAR 52



d) Commercial Longline (LL) West:

2014 SEDAR 31 Update



SEDAR 52

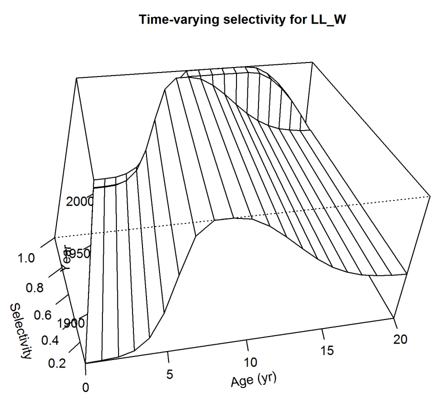
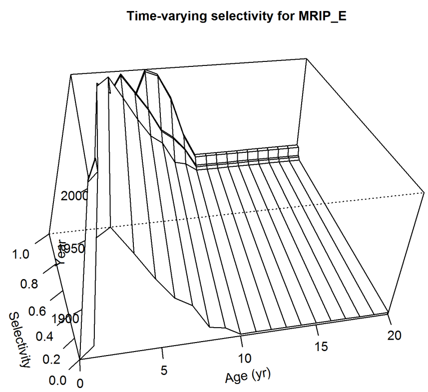


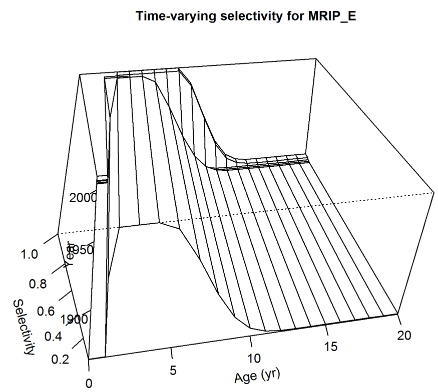
Figure 4.12. Time-varying selectivity estimates by age for the recreational fleets. Three timeblocks existed (pre-2008, 2008-2010, and 2011-2016). The change in 2008 accounted for a shift in selectivity due to the forced use of circle hooks. The change in 2011 was implemented to account for a possible shift in targeting toward larger fish. The 2014 SEDAR 31 Update Assessment estimates are provided in the Left Panel and the SEDAR 52 estimates are provided in the Right Panel.

a) Recreational Private/Charter (MRIP) East:

2014 SEDAR 31 Update

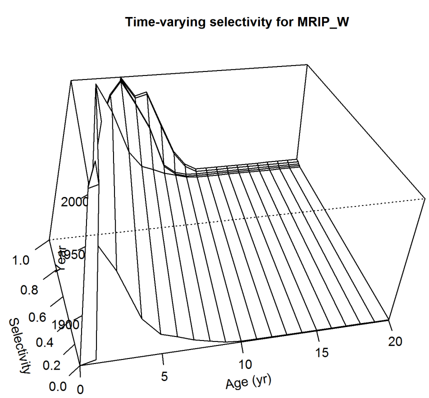


SEDAR 52



b) Recreational Private/Charter (MRIP) West

2014 SEDAR 31 Update



SEDAR 52

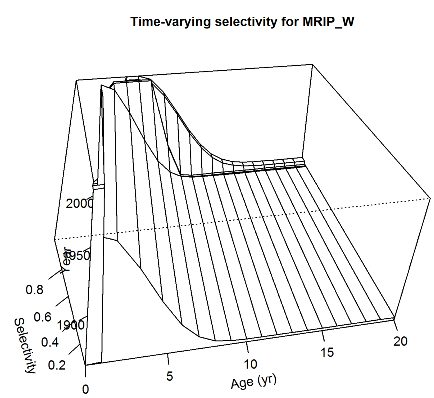
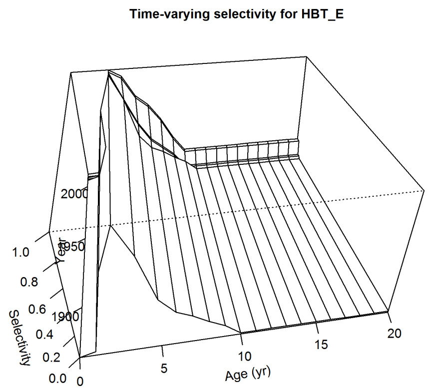


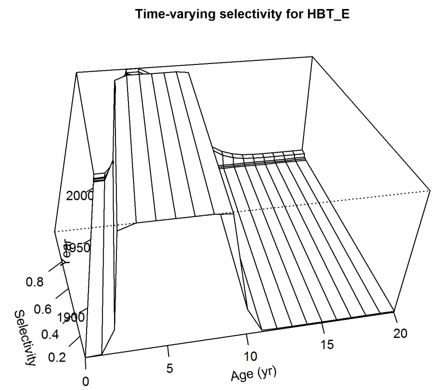
Figure 4.12. (Time-varying recreational fleet selectivity continued).

c) Recreational Headboat (HBT) East:

2014 SEDAR 31 Update

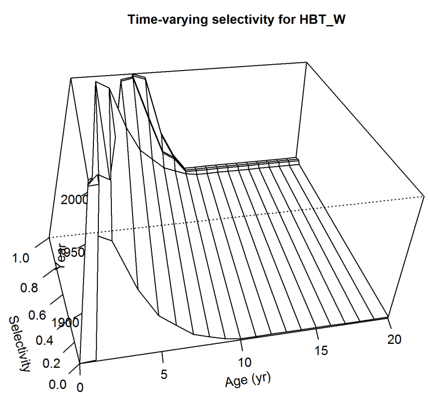


SEDAR 52



d) Recreational Headboat West

2014 SEDAR 31 Update



SEDAR 52

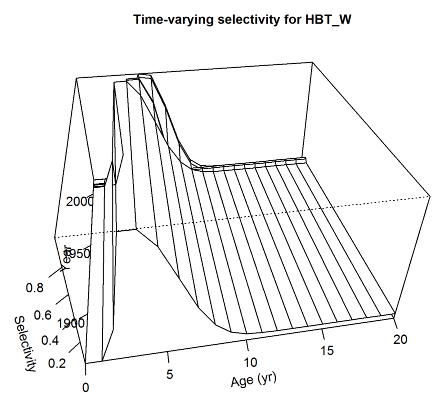
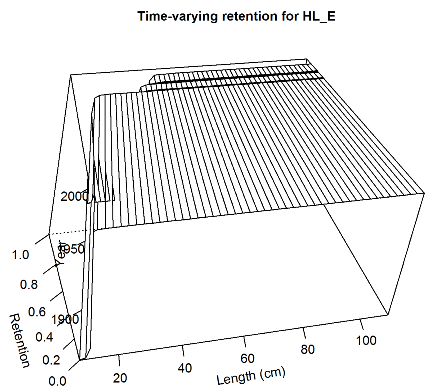
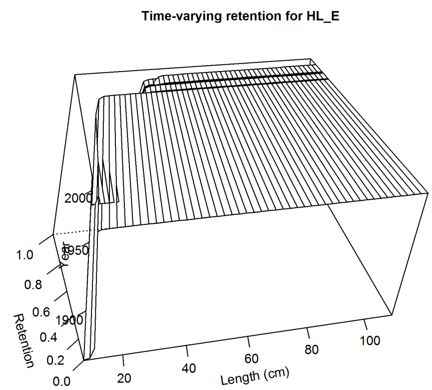


Figure 4.13. Time-varying retention at length. The changes were implemented to account for various minimum size limits. The asymptote of the retention function is the only estimated parameter and is only estimated for the most recent timeblock in the commercial fisheries (to account for potential highgrading under IFQ programs). The 2014 SEDAR 31 Update Assessment estimates are provided in the Left Panel and the SEDAR 52 estimates are provided in the Right Panel.

a) Commercial Vertical Line (HL) East:

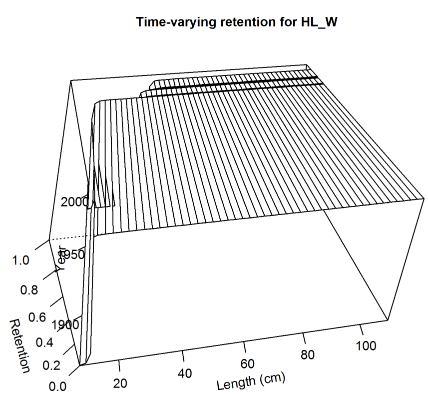
2014 SEDAR 31 Update **SEDAR 52**





b) Commercial Vertical Line (HL) West:

2014 SEDAR 31 Update **SEDAR 52**



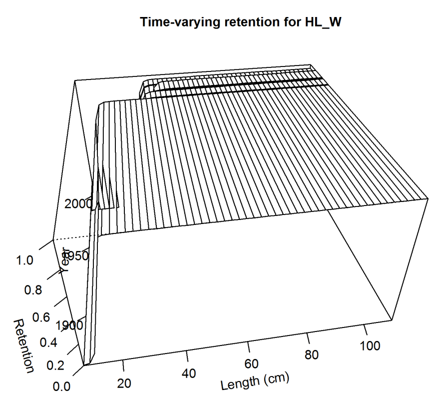
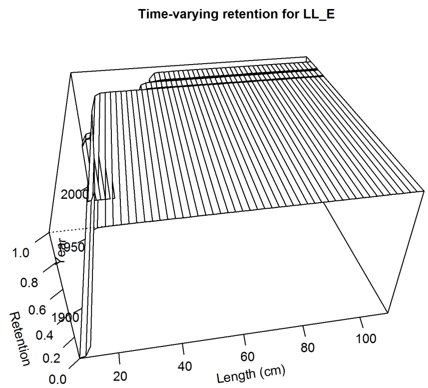


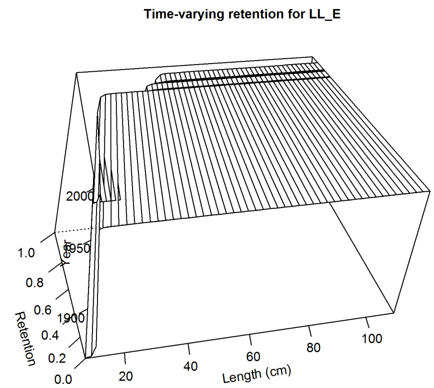
Figure 4.13. Time-varying retention at length (continued).

c) Commercial Longline (LL) East:

2014 SEDAR 31 Update

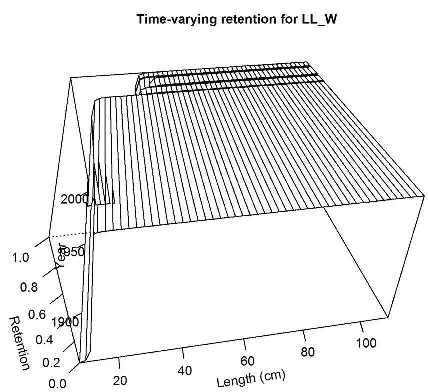


SEDAR 52



d) Commercial Longline (LL) West:

2014 SEDAR 31 Update



SEDAR 52

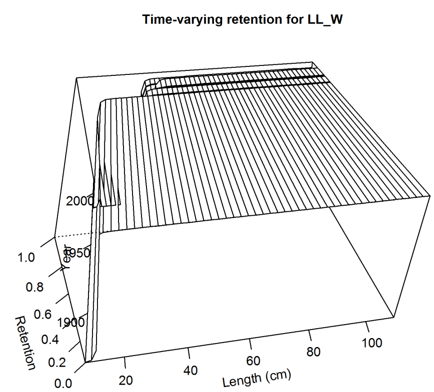
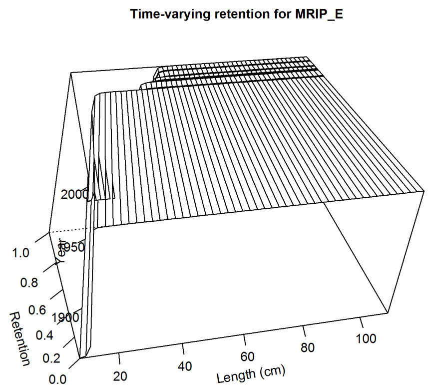


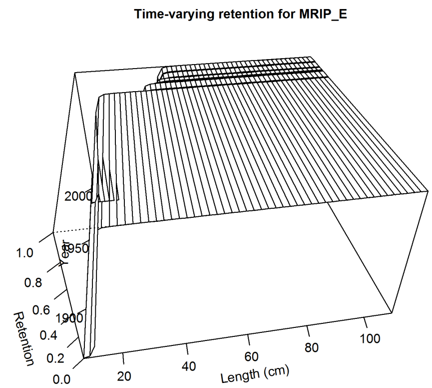
Figure 4.13. Time-varying retention at length (continued).

e) Recreational Private/Charter (MRIP) East:

2014 SEDAR 31 Update

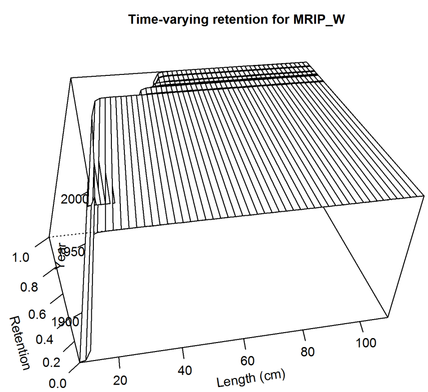


SEDAR 52



f) Recreational Private/Charter (MRIP) West:

2014 SEDAR 31 Update



SEDAR 52

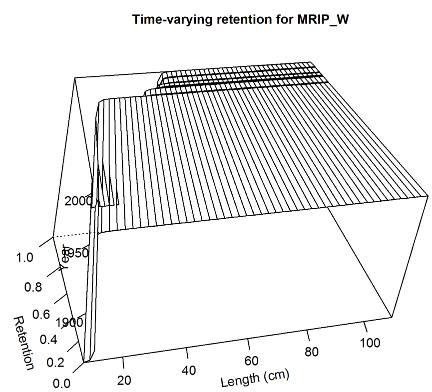
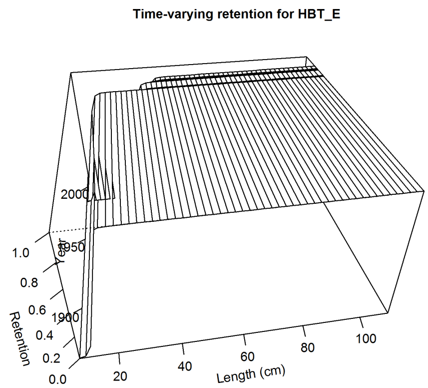


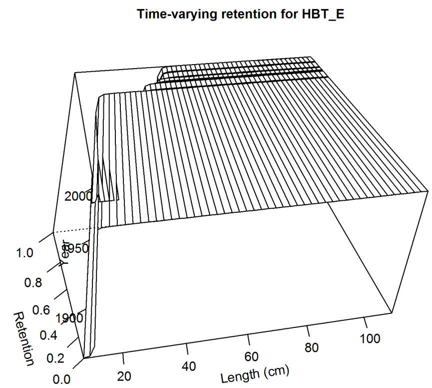
Figure 4.13. Time-varying retention at length (continued).

g) Recreational Headboat (HBT) East:

2014 SEDAR 31 Update

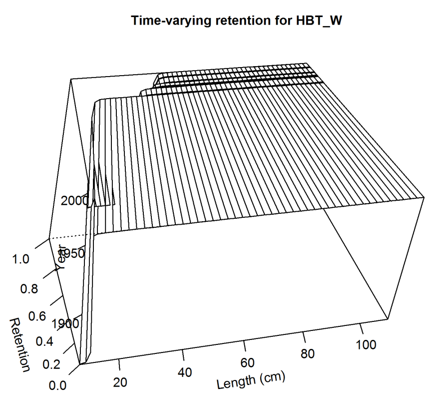


SEDAR 52

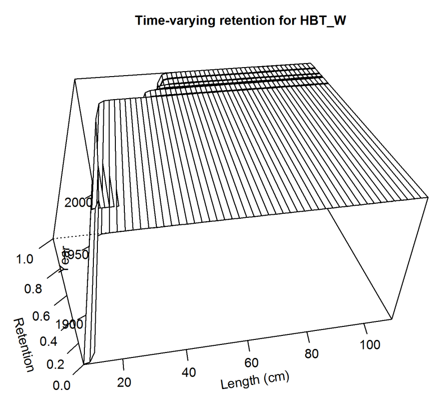


h) Recreational Headboat (HBT) West:

2014 SEDAR 31 Update



SEDAR 52



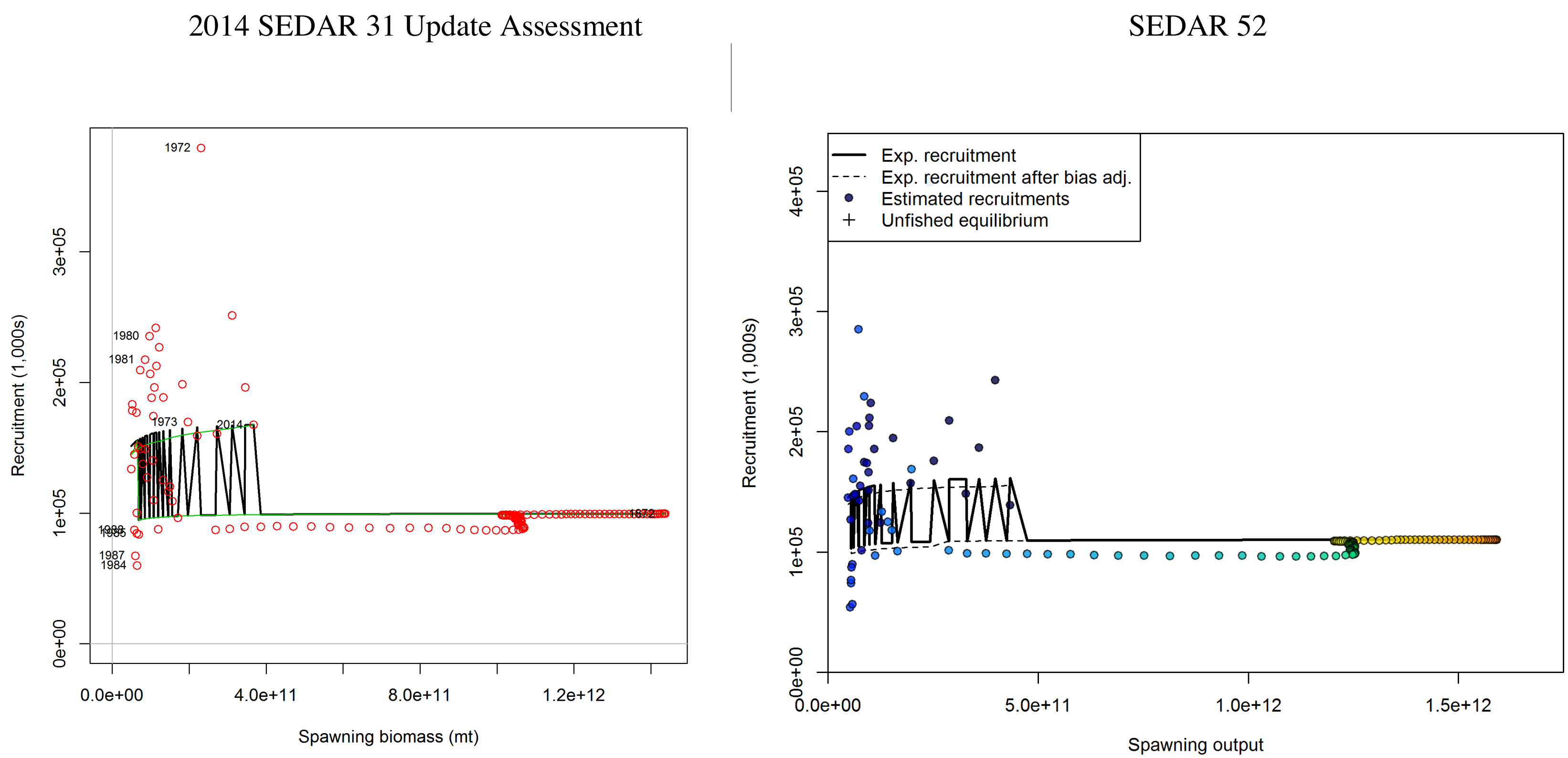


Figure 4.14. Predicted stock-recruitment relationship for Gulf of Mexico red snapper (steepness = 0.99, σ_R=0.3). Plotted are predicted annual recruitments from SS (circles) and expected recruitment from the stock recruit relationship (black line). Labels are included on the first year, last year, and years with natural log deviations > 0.5. Results from the 2014 SEDAR 31 Update Assessment are presented in the Left Panel and those from the SEDAR 52 Base Model are presented in the Right Panel.

2014 SEDAR 31 Update Assessment SEDAR 52

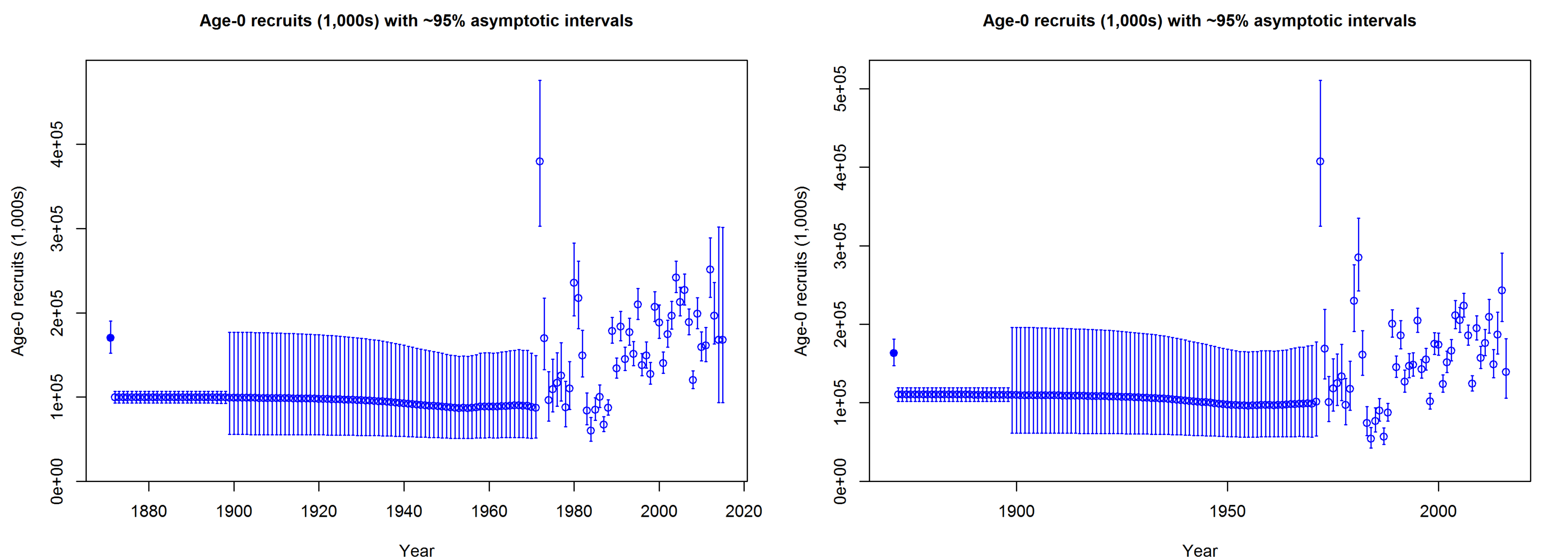


Figure 4.15. Estimated Age-0 recruitment with 95% confidence intervals for Gulf of Mexico red snapper (steepness = 0.99, $\sigma_R = 0.3$). Results from the 2014 SEDAR 31 Update Assessment are presented in the Left Panel and those from the SEDAR 52 Base Model are presented in the Right Panel.

2014 SEDAR 31 Update Assessment SEDAR 52

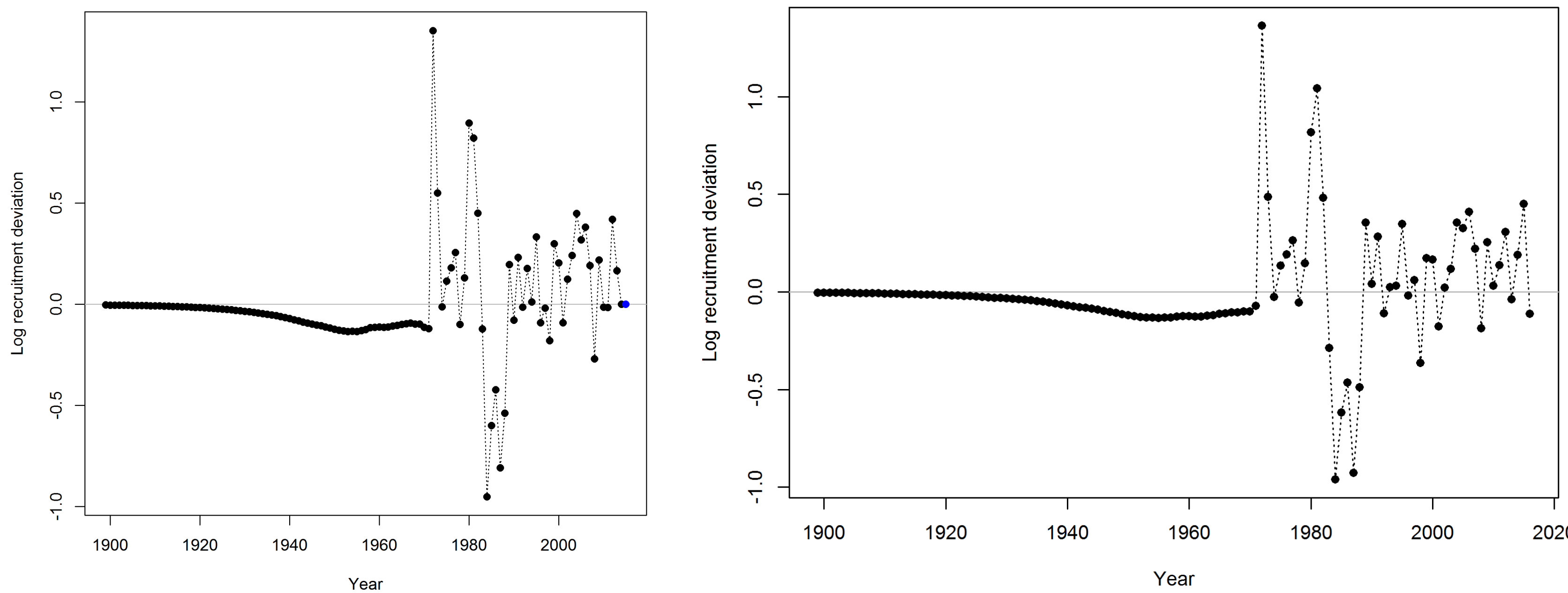


Figure 4.16. Log recruitment deviations (1899-2016) for Gulf of Mexico red snapper (steepness = 0.99, $\sigma_R = 0.3$). Results from the 2014 SEDAR 31 Update Assessment are presented in the Left Panel and those from the SEDAR 52 Base Model are presented in the Right Panel.

2014 SEDAR 31 Update Assessment SEDAR 52

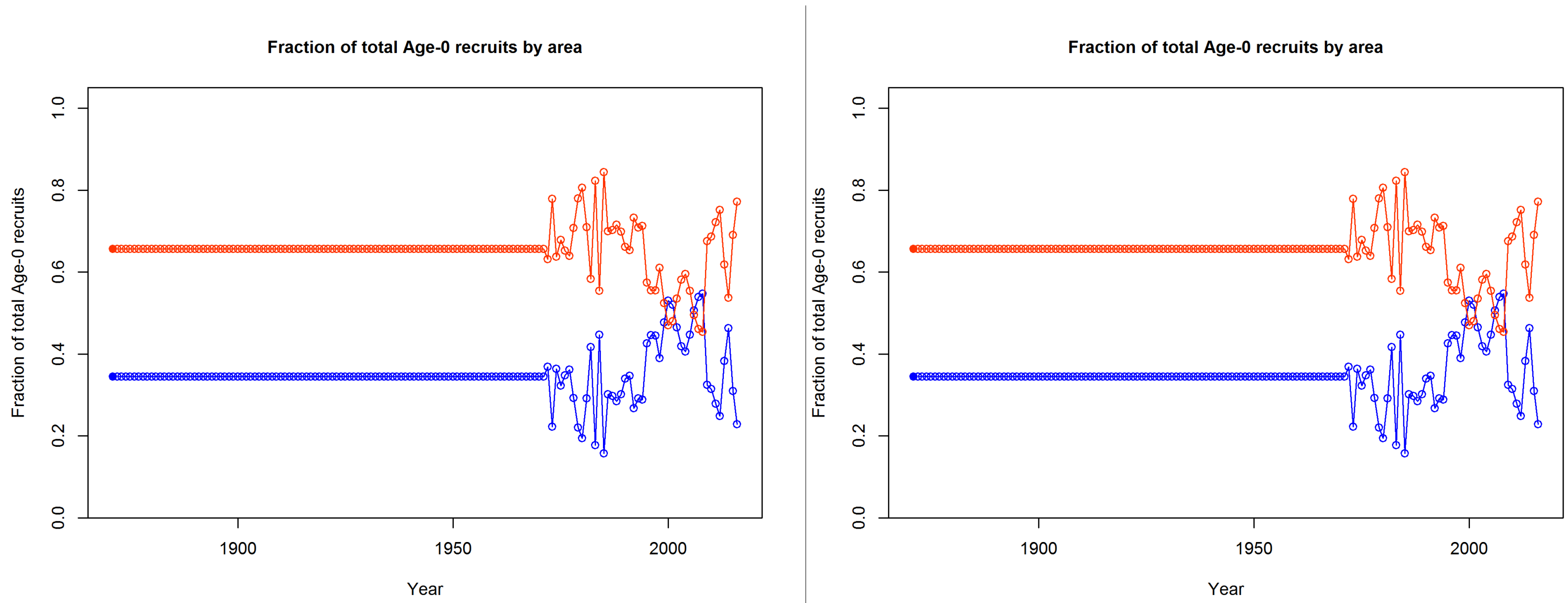


Figure 4.17. Annual recruitment apportionment to area (Area 1 = Eastern Gulf, Area 2 = Western Gulf). Results from the 2014 SEDAR 31 Update Assessment are presented in the Left Panel and those from the SEDAR 52 Base Model are presented in the Right Panel.

2014 SEDAR 31 Update Assessment SEDAR 52

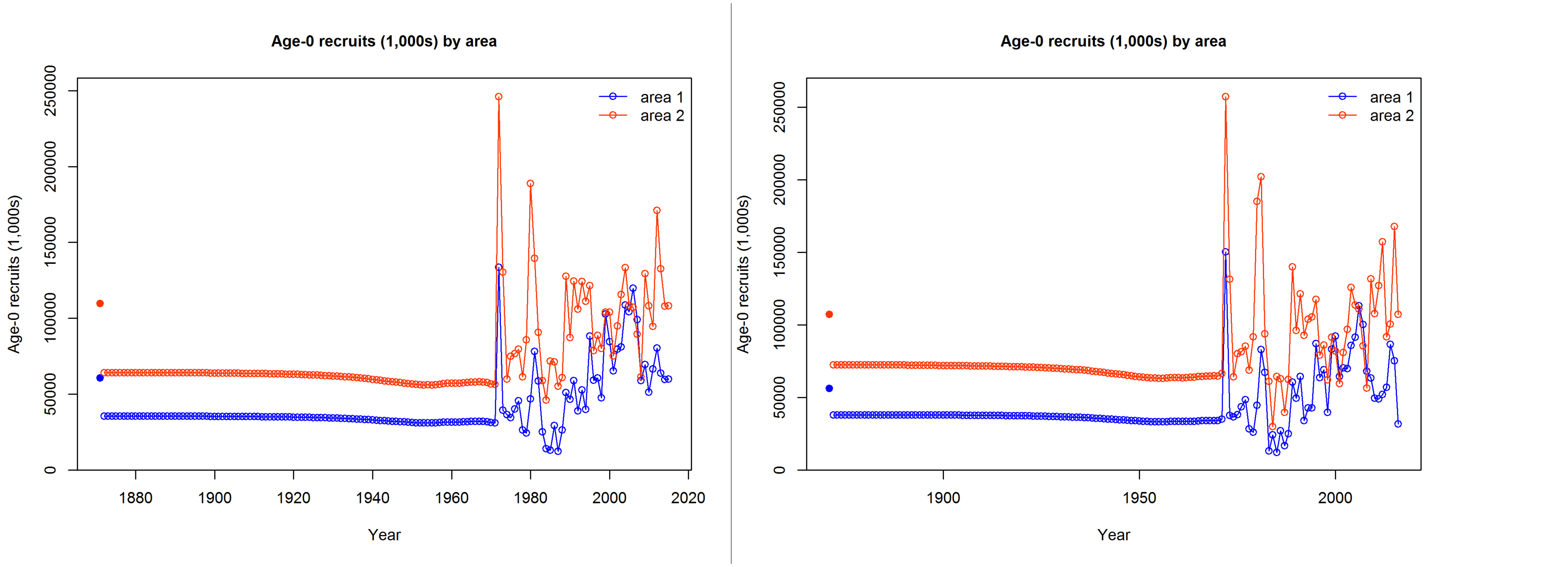


Figure 4.18. Age-0 recruits (in 1000s of fish) by area (Area 1 = Eastern Gulf, Area 2 = Western Gulf). Results from the 2014 SEDAR 31 Update Assessment are presented in the Left Panel and those from the SEDAR 52 Base Model are presented in the Right Panel.

2014 SEDAR 31 Update Assessment SEDAR 52

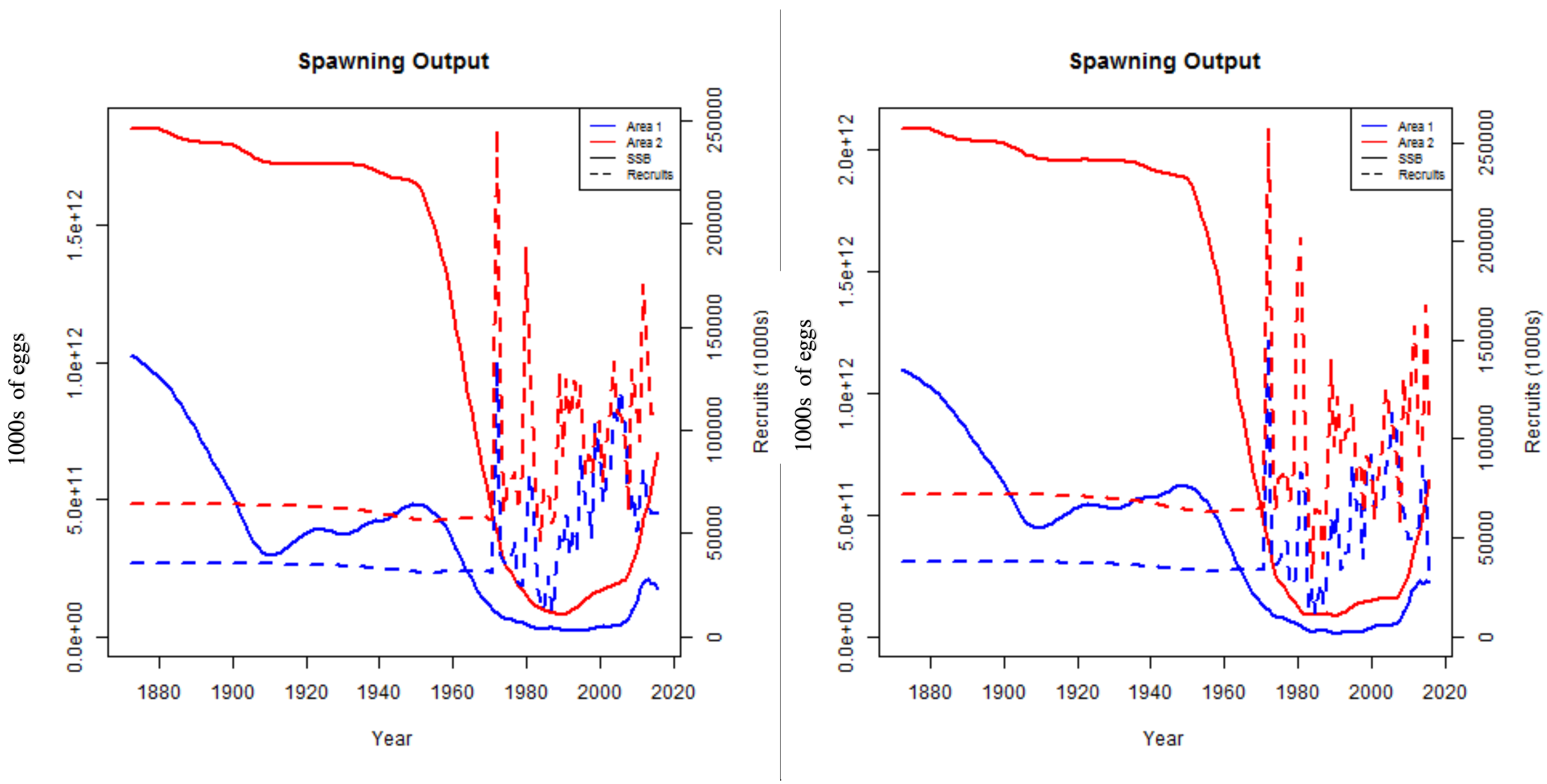


Figure 4.19. Region-specific spawning stock biomass (1000s of eggs) and associated Age-0 recruits (in 1000s of fish; Area 1 = Eastern Gulf, Area 2 = Western Gulf). Results from the 2014 SEDAR 31 Update Assessment are presented in the Left Panel and those from the SEDAR 52 Base Model are presented in the Right Panel.

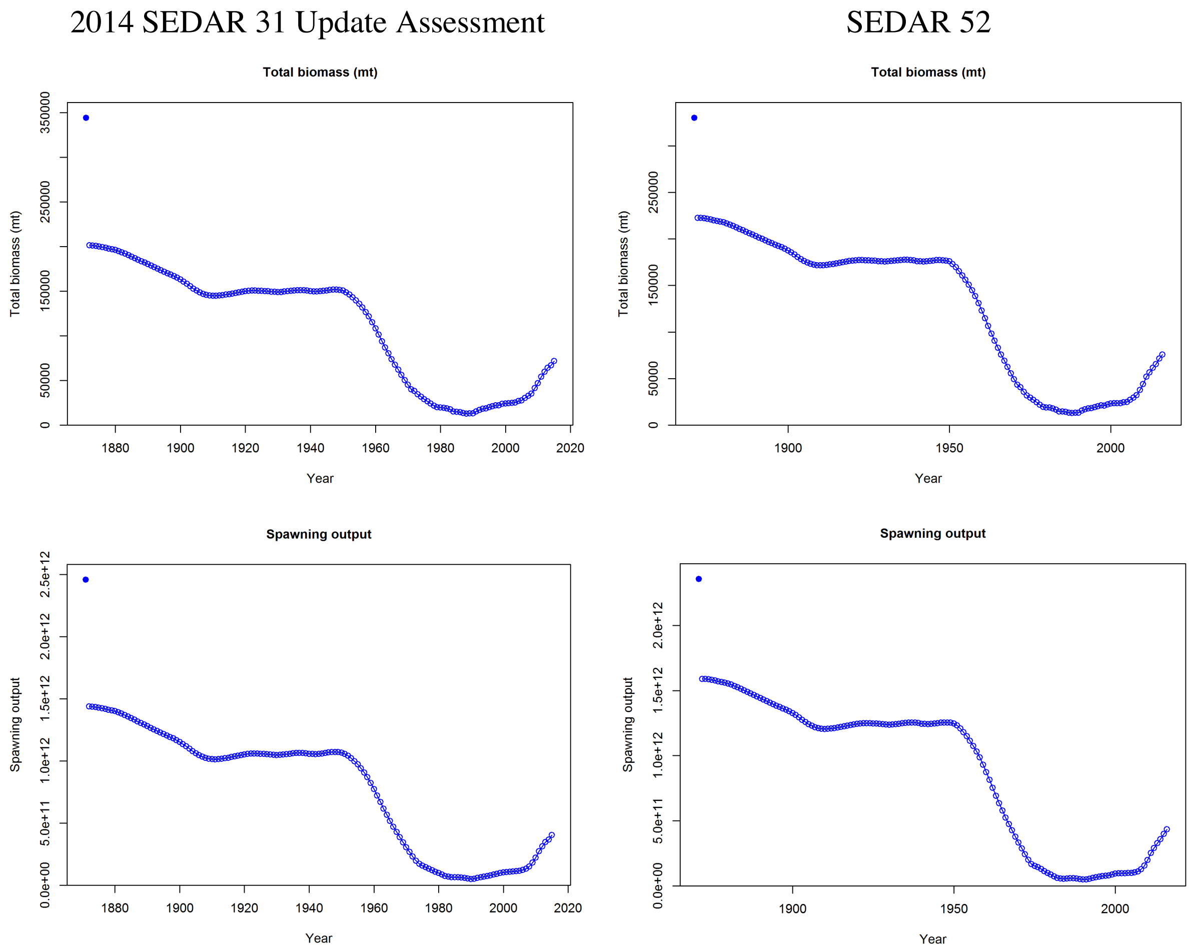


Figure 4.20. Gulfwide estimates of total biomass (mt; Top Panel) and spawning biomass (1000s of eggs; Bottom Panel). Results from the 2014 SEDAR 31 Update Assessment are presented in the Left Panel and those from the SEDAR 52 Base Model are presented in the Right Panel.

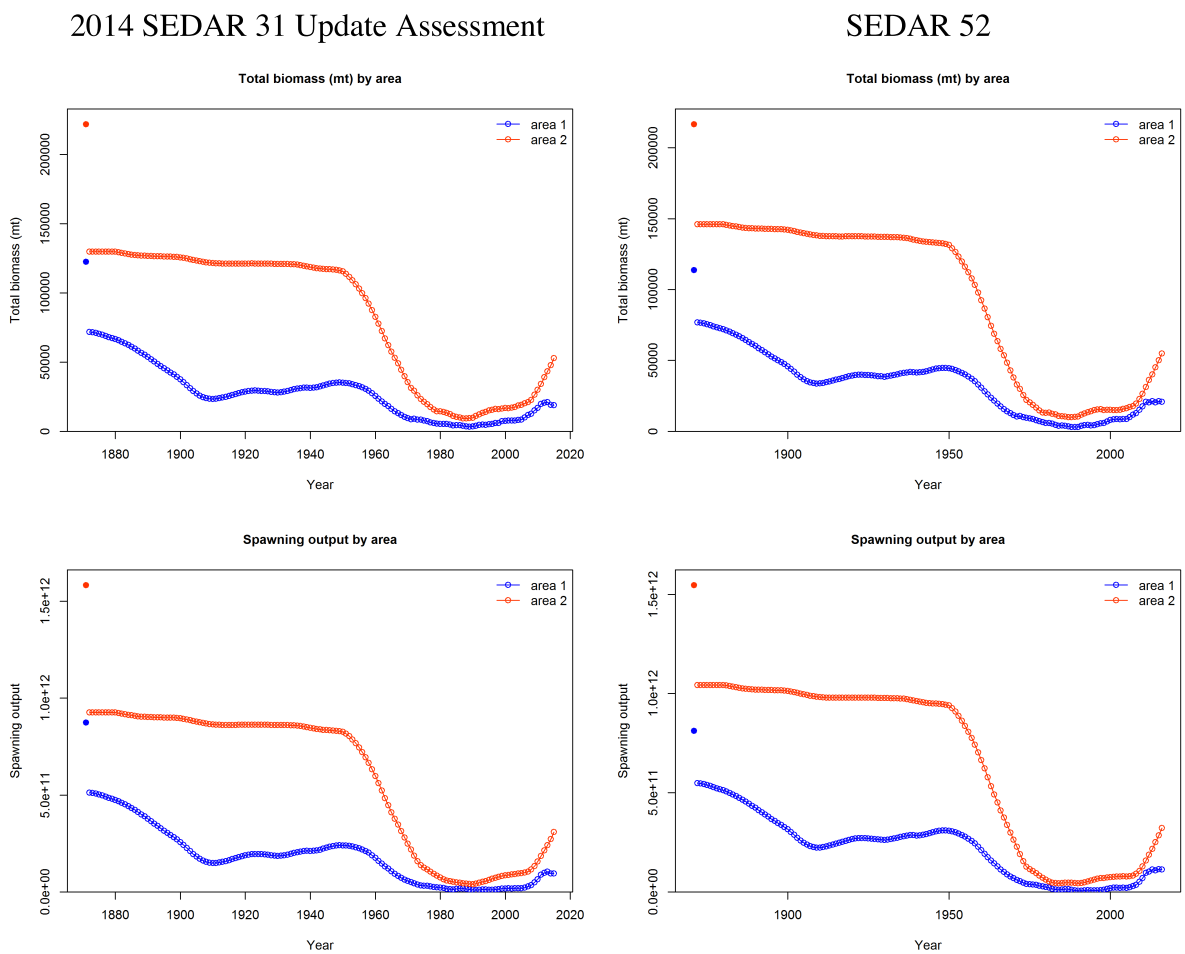


Figure 4.21. Area-specific (Area 1 = Eastern Gulf, Area 2 = Western Gulf) estimates of biomass (mt; Top Panel) and spawning biomass (1000s of eggs; Bottom Panel). Results from the 2014 SEDAR 31 Update Assessment are presented in the Left Panel and those from the SEDAR 52 Base Model are presented in the Right Panel.

2014 SEDAR 31 Update Assessment SEDAR 52

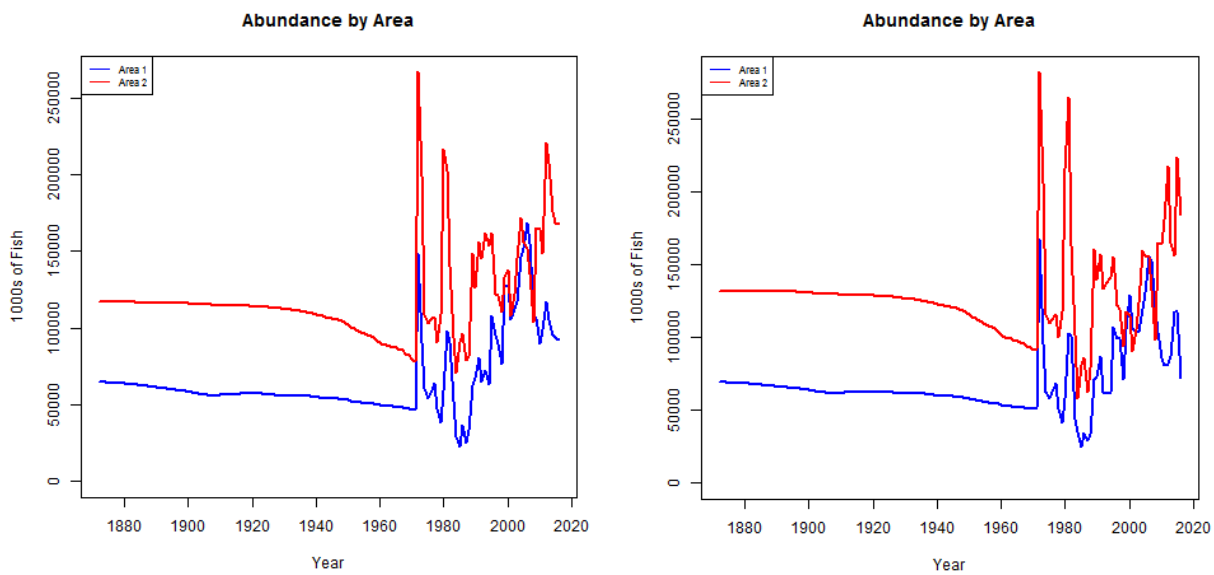


Figure 4.22. Area-specific (Area 1 = Eastern Gulf, Area 2 = Western Gulf) estimates of total abundance (1000s of fish; Top Panel). Results from the 2014 SEDAR 31 Update Assessment are presented in the Left Panel and those from the SEDAR 52 Base Model are presented in the Right Panel.

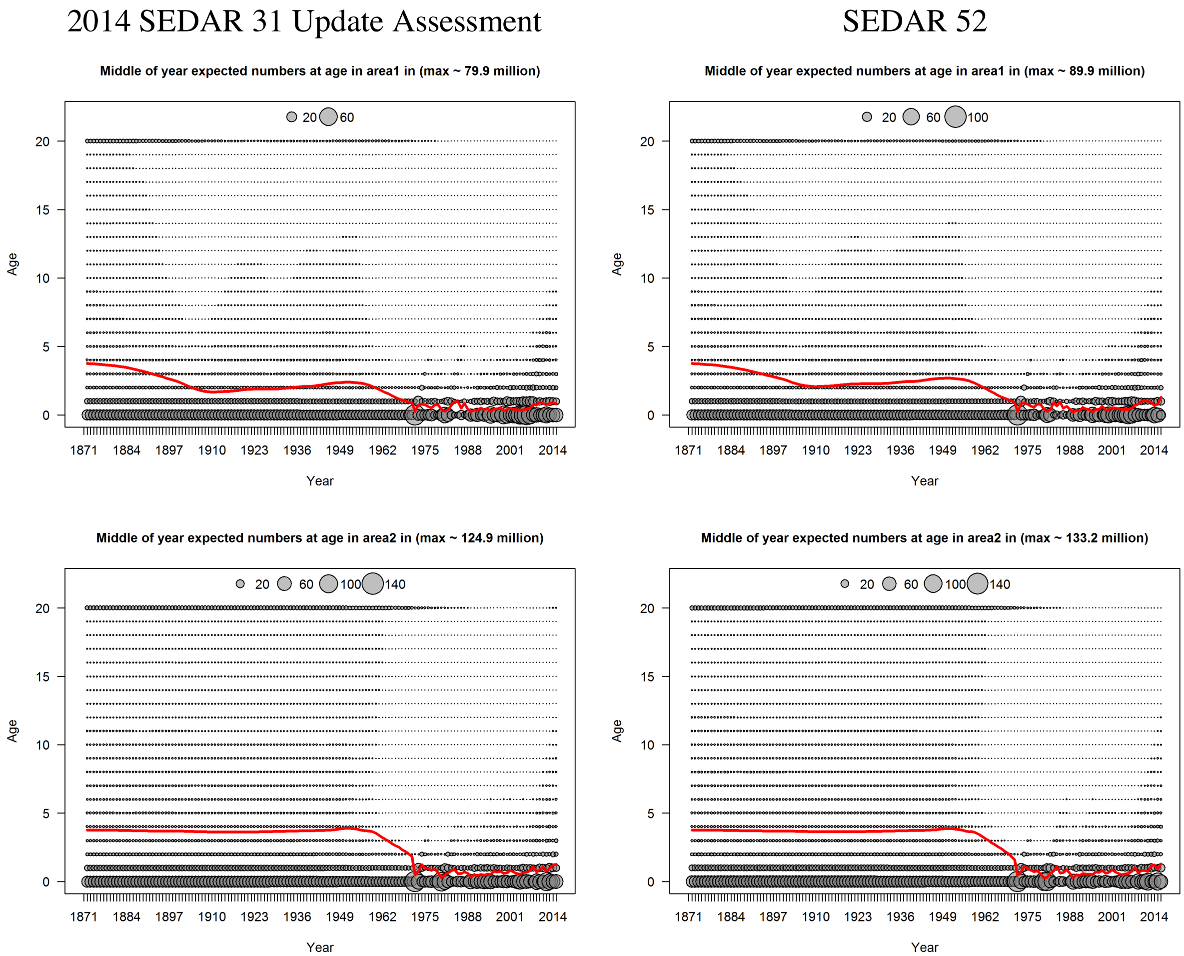


Figure 4.23. Mid-year age compostion (open bubbles) and mean age (based on average estimated abundance; red line) of red snapper by area (Area 1 = Eastern Gulf, Top Panel, and Area 2 = Western Gulf, Bottom Panel). Results from the 2014 SEDAR 31 Update Assessment are presented in the Left Panel and those from the SEDAR 52 Base Model are presented in the Right Panel.

2014 SEDAR 31 Update Assessment SEDAR 52

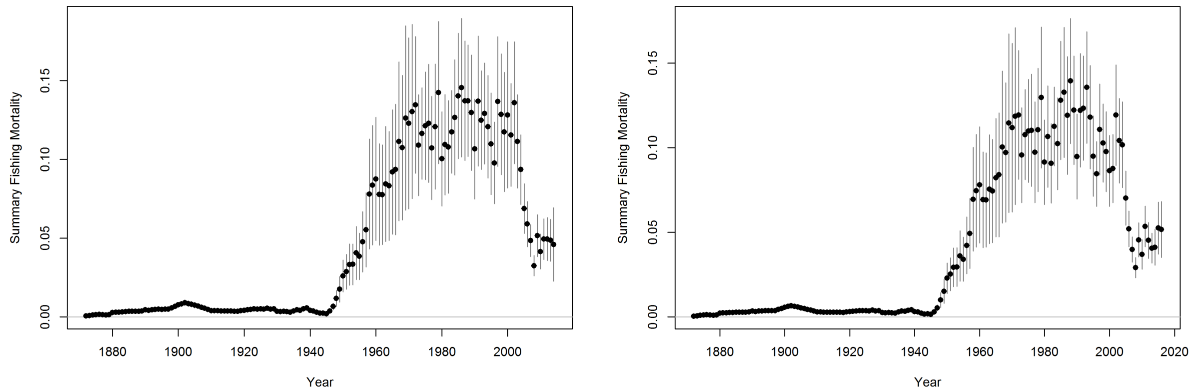


Figure 4.24. Annual exploitation rate (total killed / total numbers) with 95% confidence intervals. Results from the 2014 SEDAR 31 Update Assessment are presented in the Left Panel and those from the SEDAR 52 Base Model are presented in the Right Panel.

2014 SEDAR 31 Update Assessment SEDAR 52

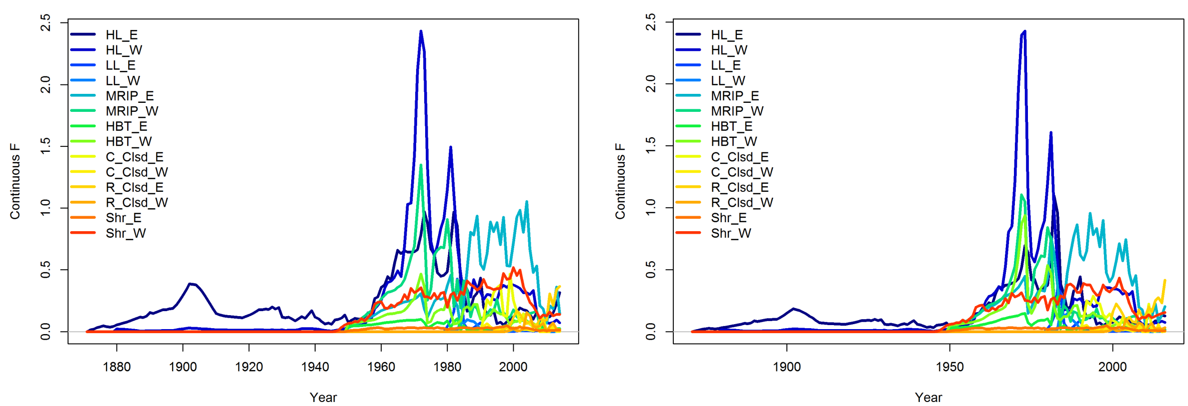


Figure 4.25. Fleet-specific apical fishing mortality rate for Gulf of Mexico red snapper. This represents the instantaneous fishing mortality level on the most vulnerable age class for each fleet. Results from the 2014 SEDAR 31 Update Assessment are presented in the Left Panel and those from the SEDAR 52 Base Model are presented in the Right Panel.

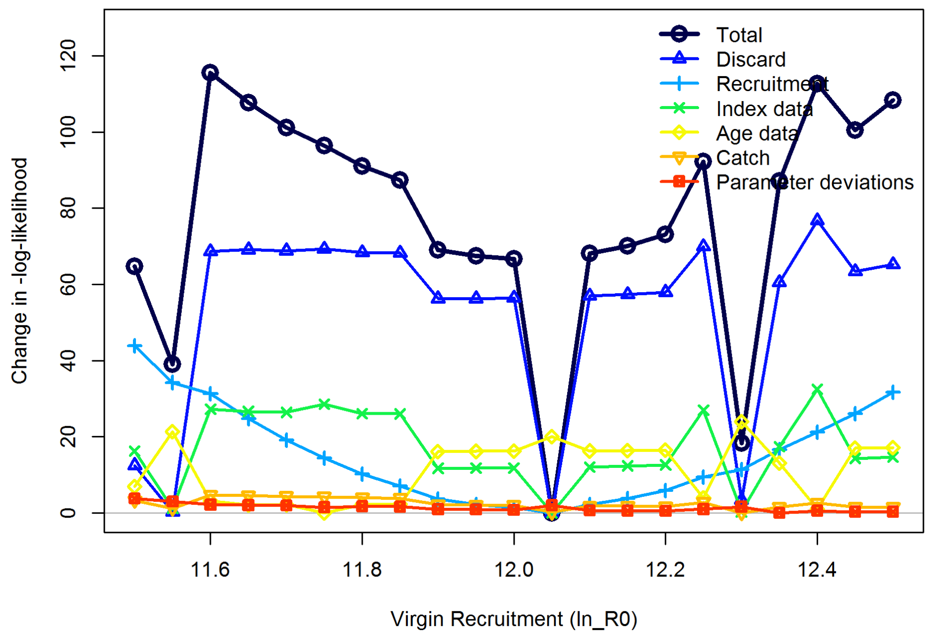


Figure 4.26. The profile likelihood for the virgin recruitment parameter of the Beverton – Holt stock-recruit function. Each line represents the change in –log-likelihood value for each of the data sources fit in the model across the range of fixed virgin recruitment values tested in the profile diagnostic run. The black line represents the change in total likelihood, the dark blue line is the change in discard likelihood, the aqua line is the change in recruitment penalty likelihood, the green line is the change in index likelihood, the yellow line is the change in age composition likelihood, and the orange line is the change in catch likelihood.

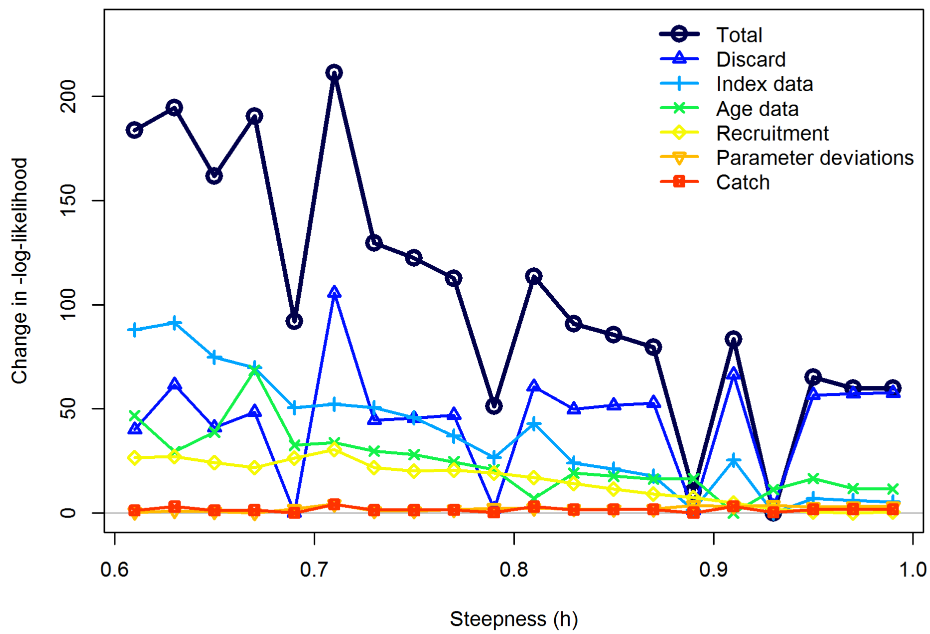


Figure 4.27. The profile likelihood for the steepness parameter of the Beverton – Holt stock-recruit function. Each line represents the change in –log-likelihood value for each of the data sources fit in the model across the range of fixed steepness values tested in the profile diagnostic run. The black line represents the change in total likelihood, the dark blue line is the change in discard likelihood, the aqua line is the change in index likelihood, the green line is the change in age composition likelihood, the yellow line is the change in recruitment penalty likelihood, and the red line is the change in catch likelihood.

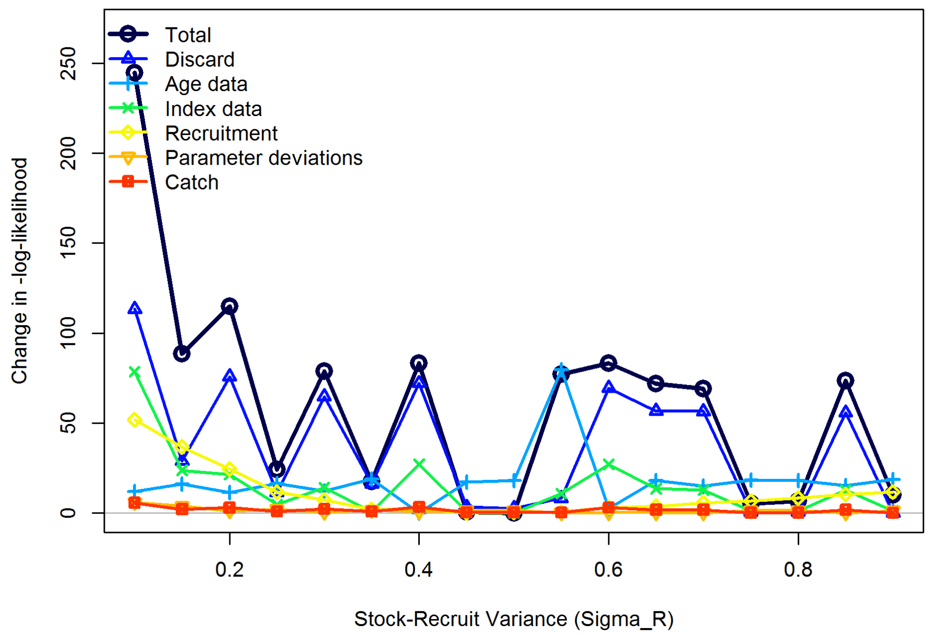


Figure 4.28. The profile likelihood for the variance parameter of the Beverton – Holt stock-recruit function. Each line represents the change in –log-likelihood value for each of the data sources fit in the model across the range of fixed variance values tested in the profile diagnostic run. The black line represents the change in total likelihood, the dark blue line is the change in discard likelihood, the aqua line is the change in age composition likelihood, the green line is the change in index likelihood, the yellow line is the change in recruitment penalty likelihood, and the red line is the change in catch likelihood.

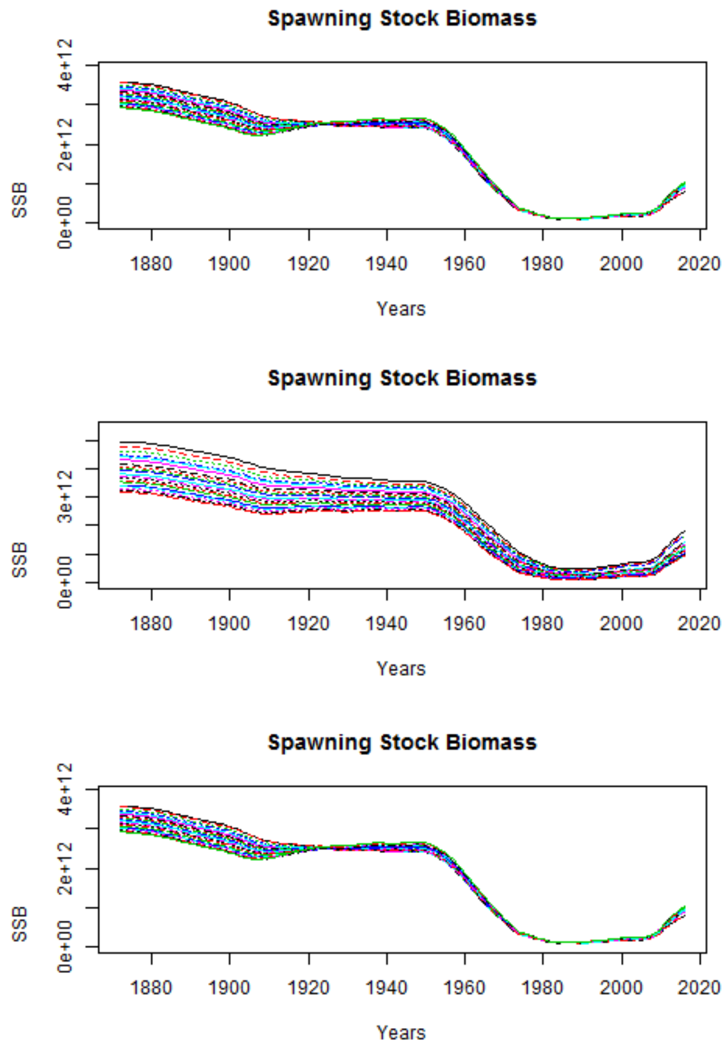


Figure 4.29. Trends in spawning stock biomass for each of the profile likelihood runs. The top panel represents the range of values for virgin recruitment, the middle panel represents the range of values for steepness, and the bottom panel represents the rand of values for the stock-recruit variance term. Note that not all of the values of the paramters used in the profile likelihood analyses are realistic for red snapper. SSB is in 1000s of eggs.

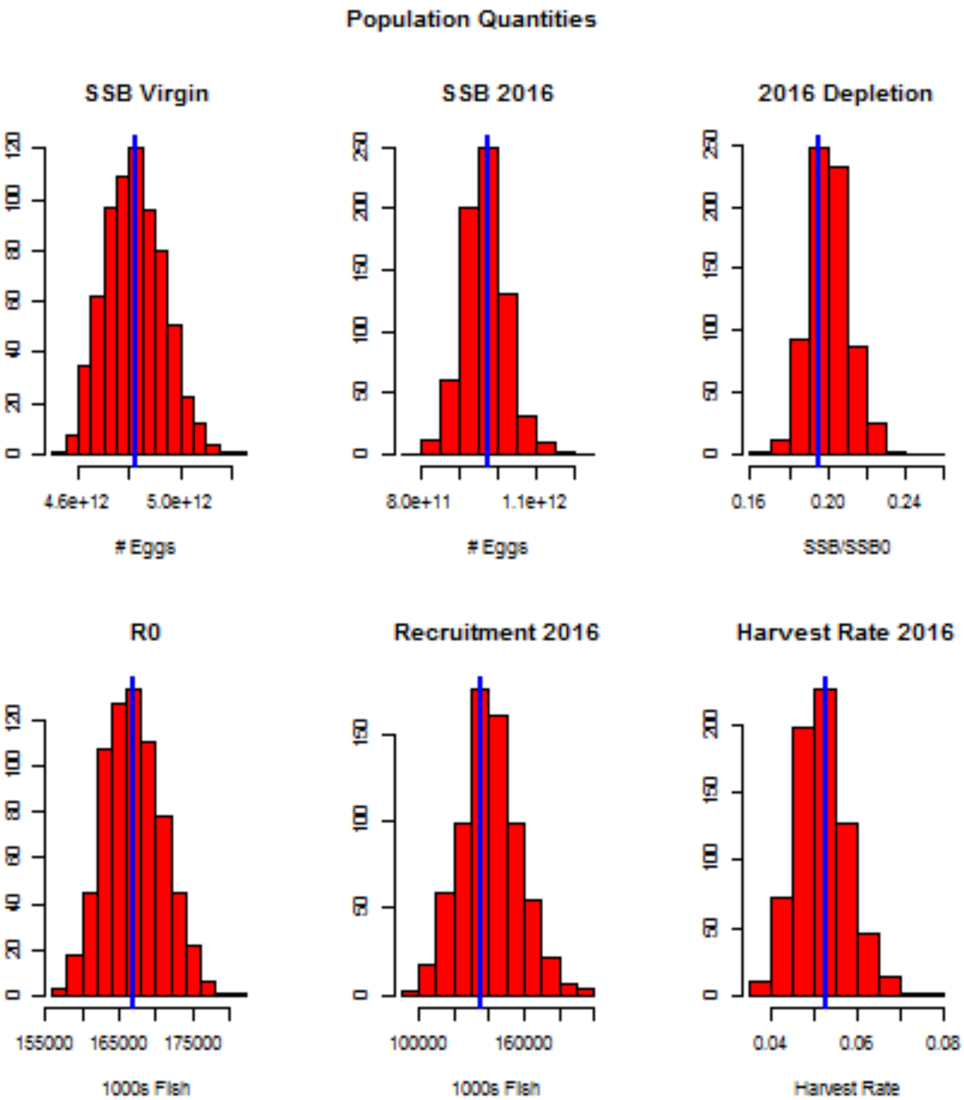


Figure 4.30. Histograms of derived quantities and estimated parameters for the 700 bootstrap runs. The base model value is indicated by the blue vertical line. SSB is in 1000s of eggs.

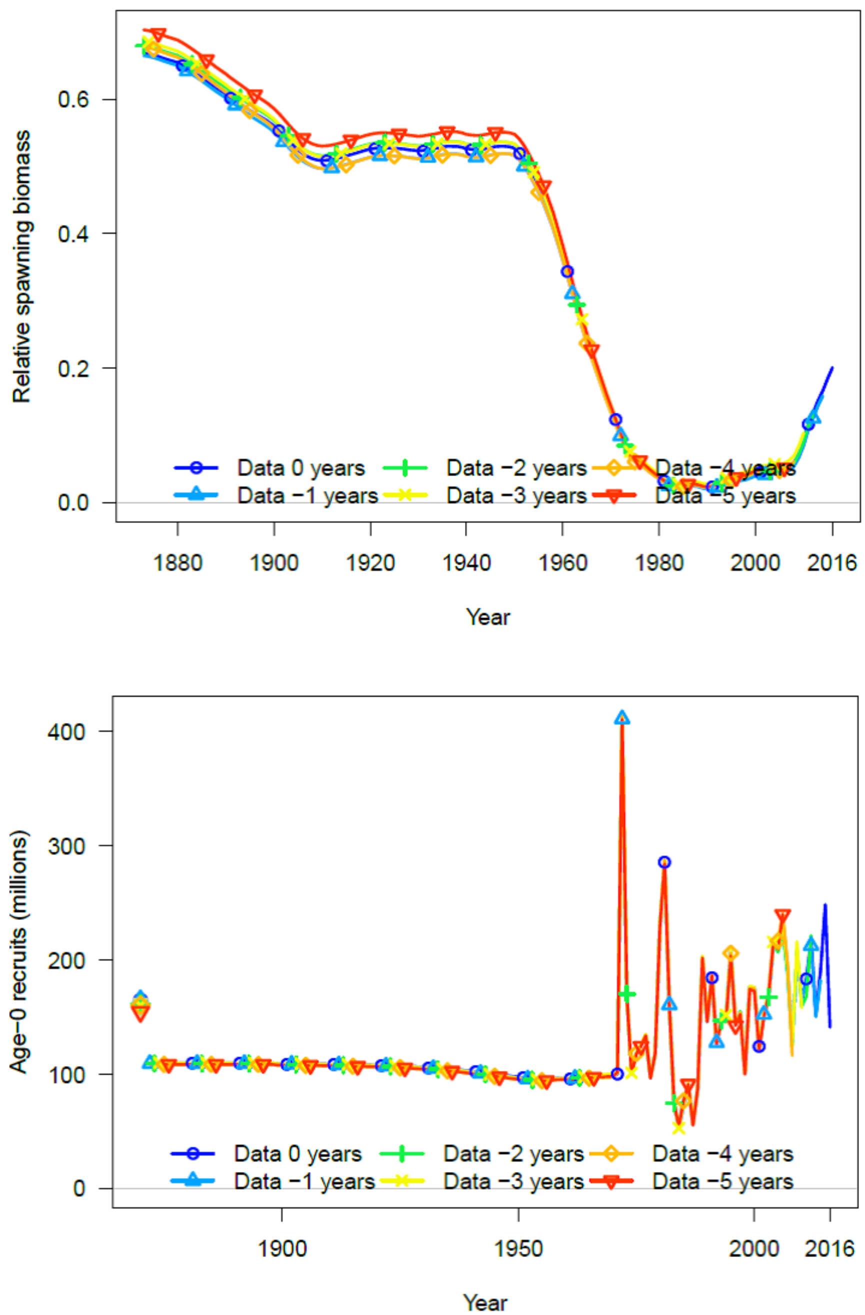


Figure 4.31. Results of a five year retrospective analysis for SPR ratio (top panel) and recruitment (millions of fish; bottom panel). There is no discernible systematic bias, because each data peel is not consistently over or underestimating any of the population quantities.

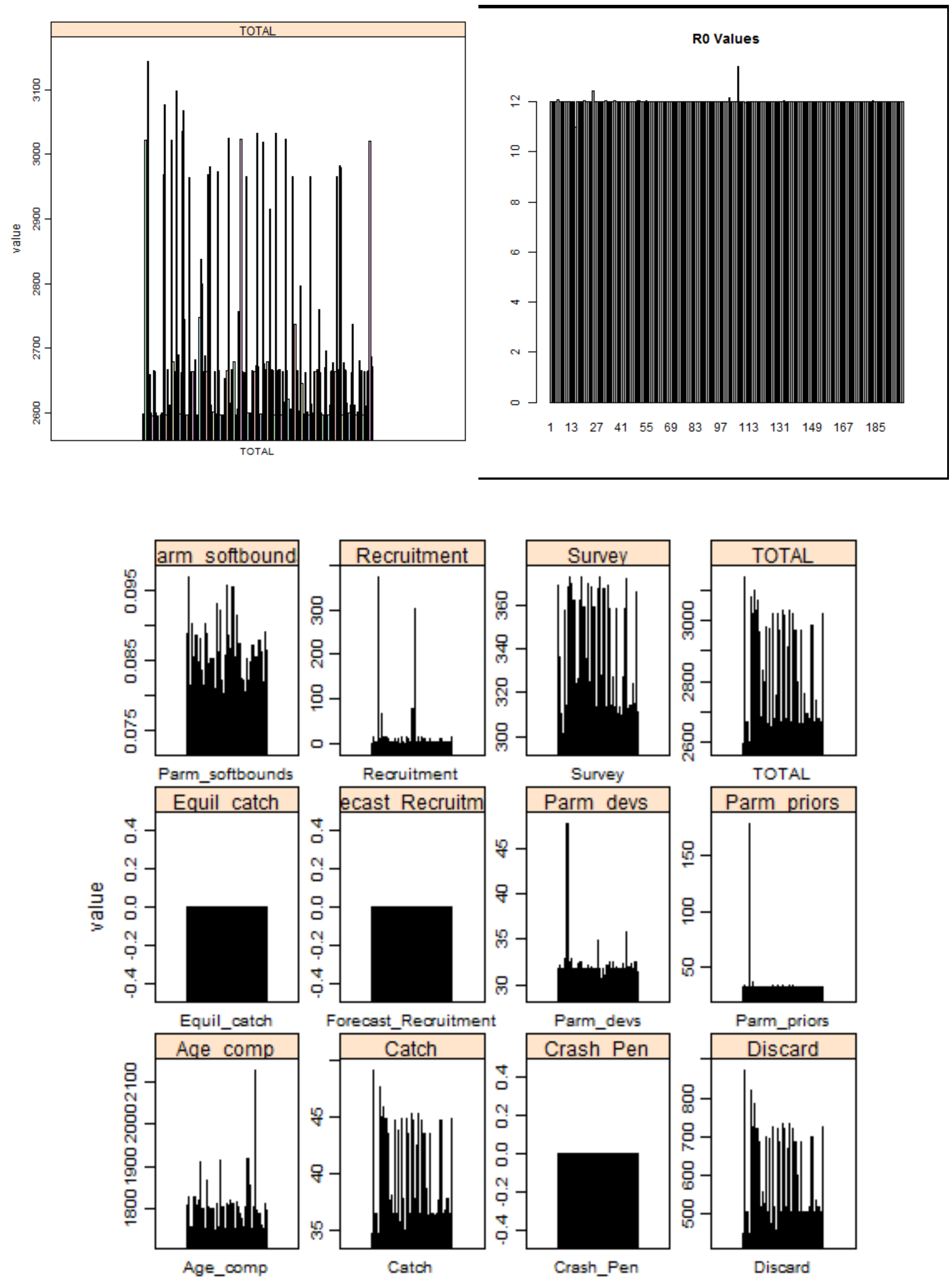


Figure 4.32. Results of the jitter analysis for various likelihood components (top left and bottom panels) and virgin recruitment estimates (top right panel). Each graph gives the results of 200 model runs where the starting parameter values for each run were randomly changed ('jittered') by 0.15 from the base model best fit values.

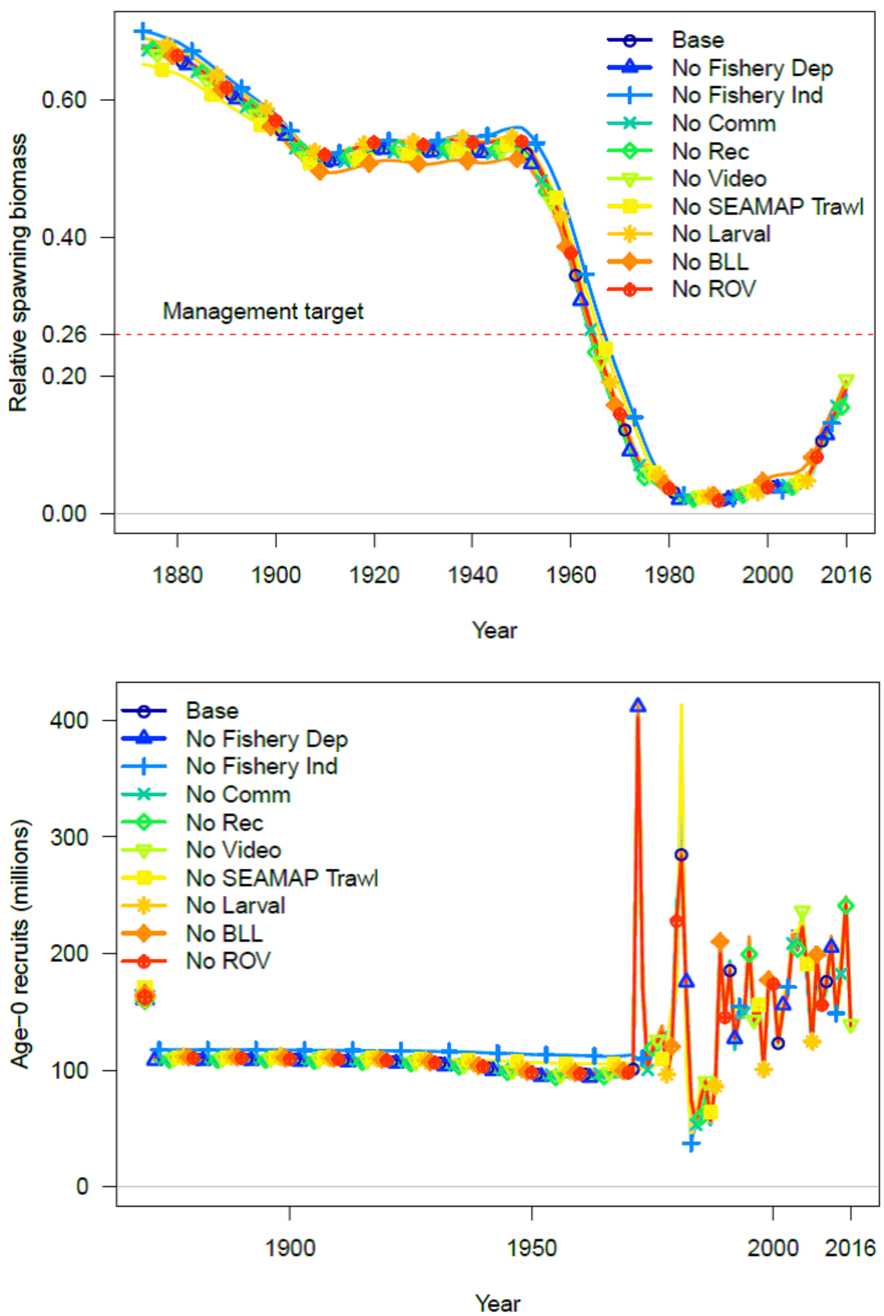


Figure 4.33. Results of a 'jack-knife' analysis with the fishery-dependent and independent indices. SPR ratio (top panel) and recruitment (millions of fish; bottom panel) are shown. The analysis was performed by running the base model with one (or a group) of the indices removed in order to determine if any given index had undue influence on model results or indicated widely differing trends in population trajectories. The results indicate that all of the indices are generally in agreement and no one index seems to be driving the assessment.

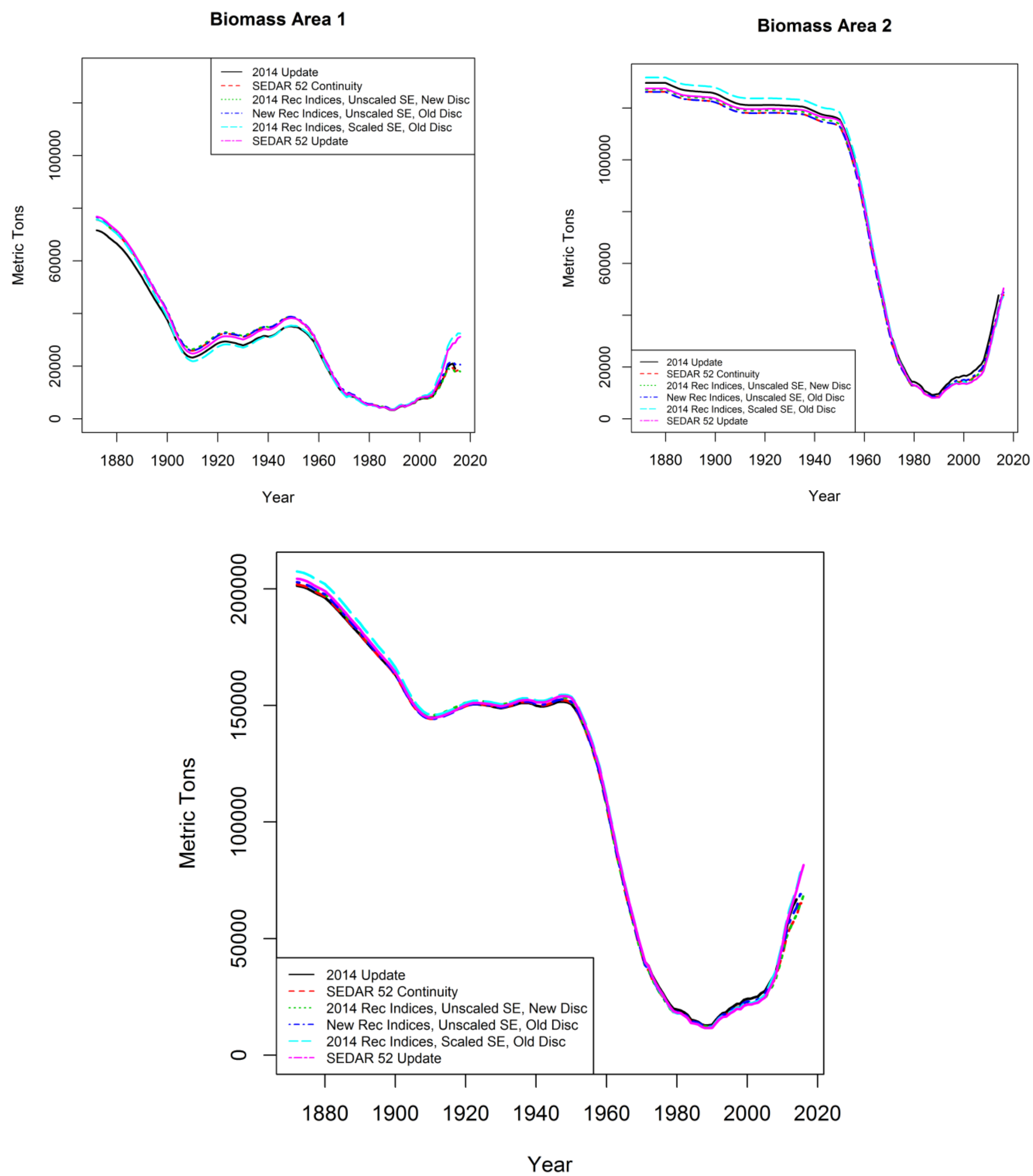


Figure 4.34. Results of the continuity model building exercise for regional biomass (top panel; area 1 is eastern Gulf and area 2 is western Gulf) and gulfwide biomass (bottom panel). The black line represents the 2014 SEDAR 31 Update Assessment, the red line is the SEDAR 52 continuity model, and the pink line is the SEDAR 52 Update Model (with all data updated using SEDAR 52 best practices). See text for a description of the intermediate model building runs (green, blue, and aqua lines).

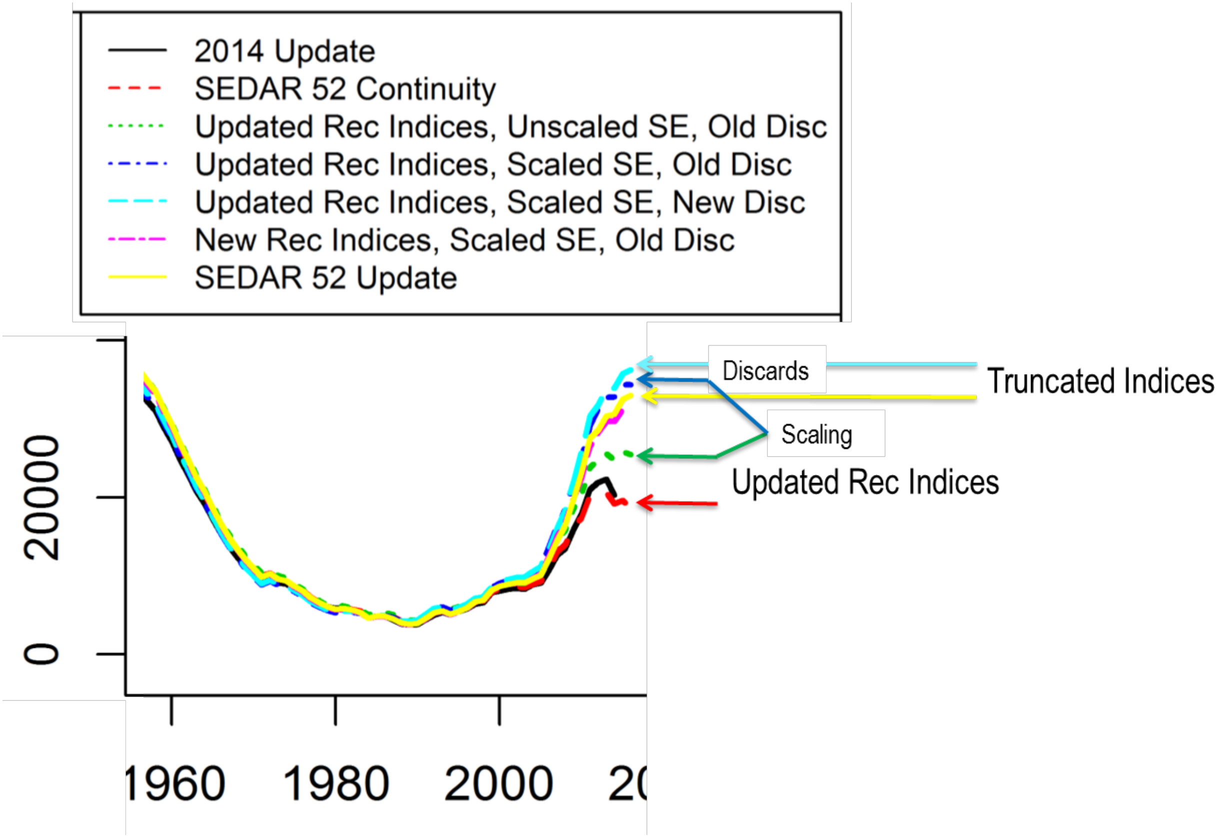


Figure 4.35. Results of the continuity model building exercise for eastern Gulf of Mexico biomass in the recent timeperiod demonstrating the impact of each data update. The black line represents the 2014 SEDAR 31 Update Assessment, the red line is the SEDAR 52 continuity model, and the yellow line is the SEDAR 52 Base Model. See text for a description of the intermediate model building runs (green, blue, aqua lines, and pink lines).

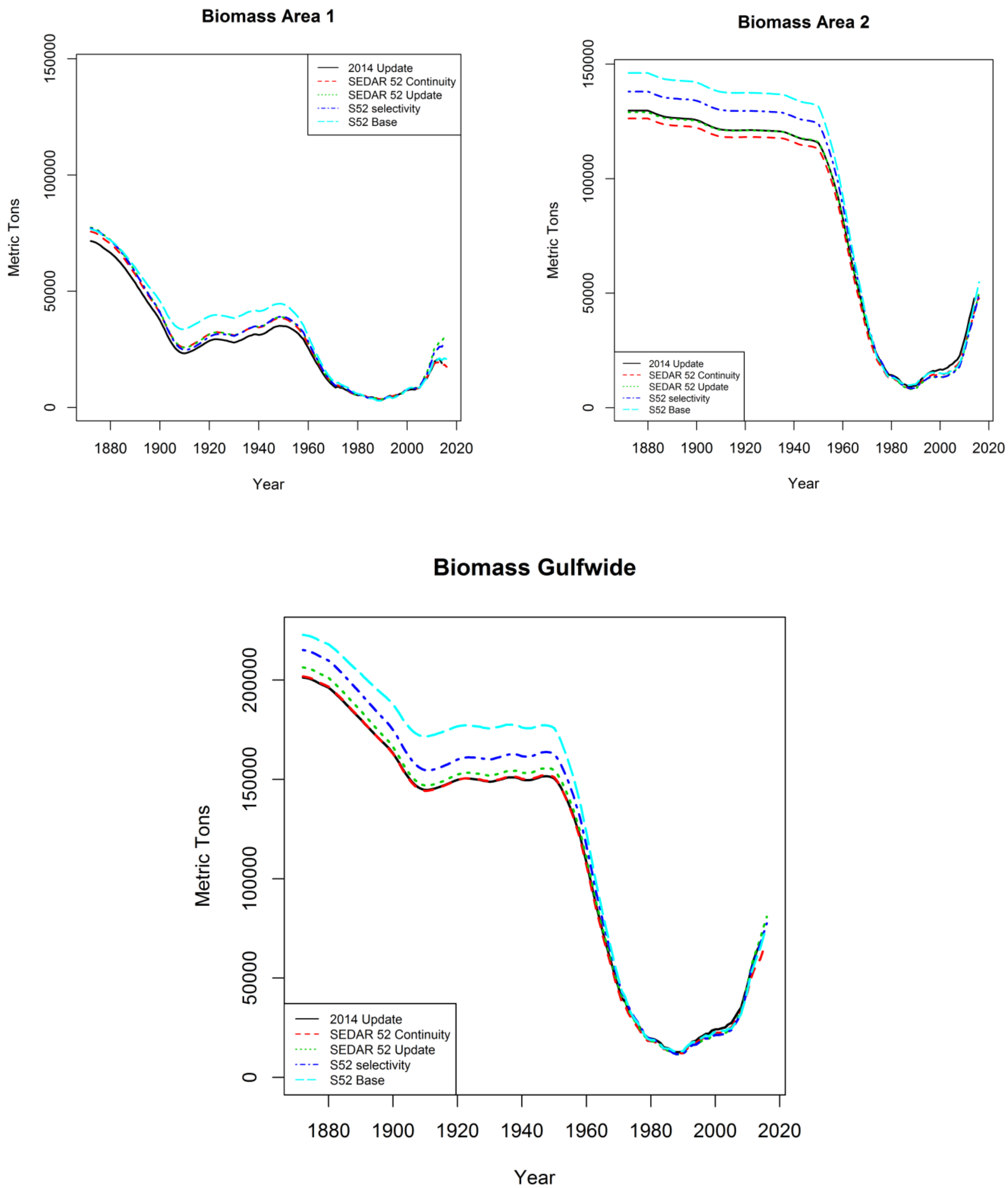


Figure 4.36. Results of the base model building exercise for regional biomass (top panel; area 1 is eastern Gulf and area 2 is western Gult) and gulfwide biomass (bottom panel). The black line represents the 2014 SEDAR 31 Update Assessment, the red line is the SEDAR 52 continuity model, the green line is the SEDAR 52 Update Model, the blue line is the SEDAR 52 Update Model but with double normal selectivity functions, and the aqua line is the SEDAR 52 Base Model.

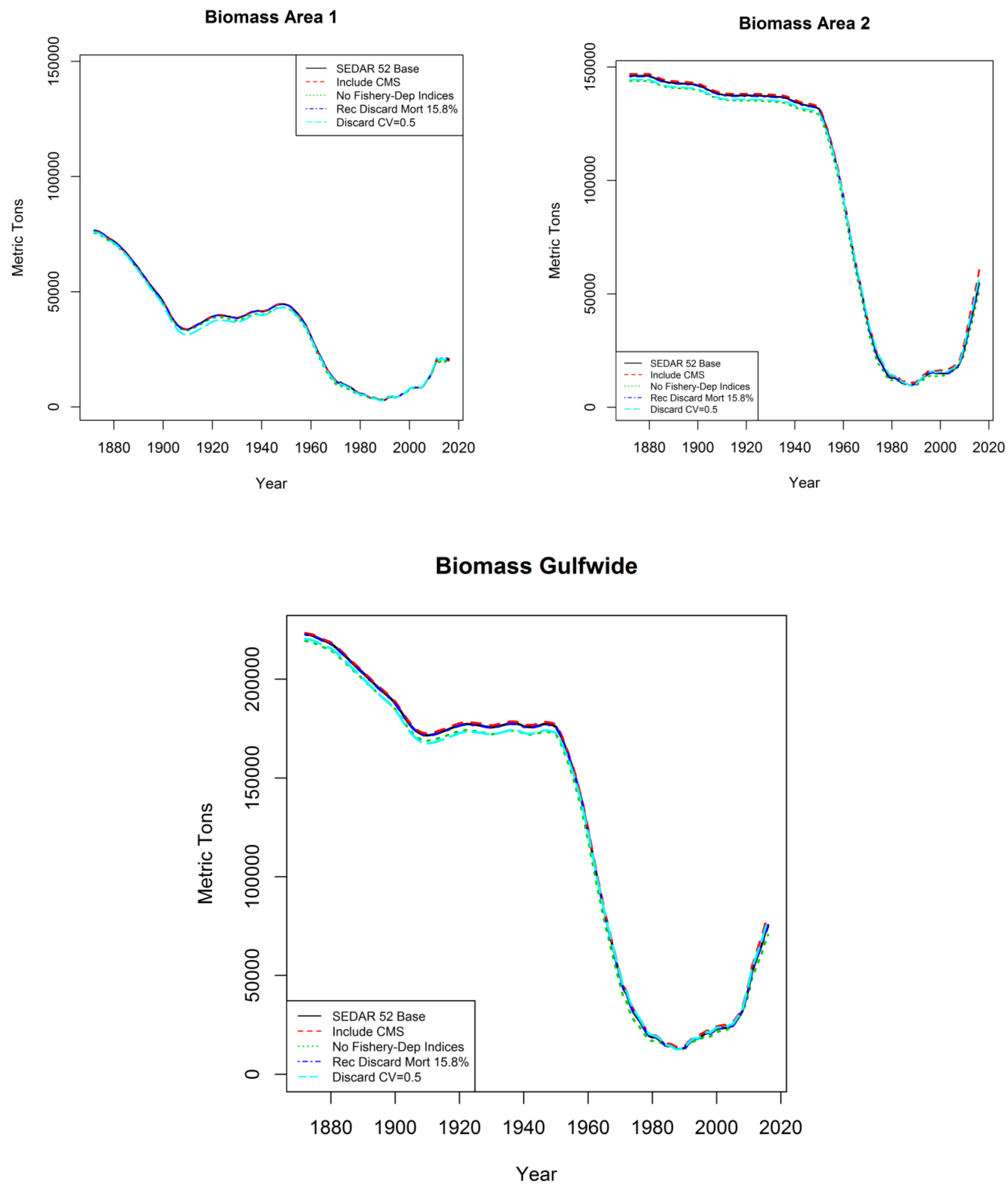


Figure 4.37. Results of sensitivity runs for regional biomass (top panel; area 1 is eastern Gulf and area 2 is western Gult) and gulfwide biomass (bottom panel). The black line represents the SEDAR 52 Base Model, the red line incorporates the Connectivity Modeling System (CMS) recruitment index, the green line removes all fishery-dependent CPUE indices, the blue line uses a recreational discard mortality of 15.8% in the most recent timeperiod, and the aqua line increases the discard CVs to 0.5.

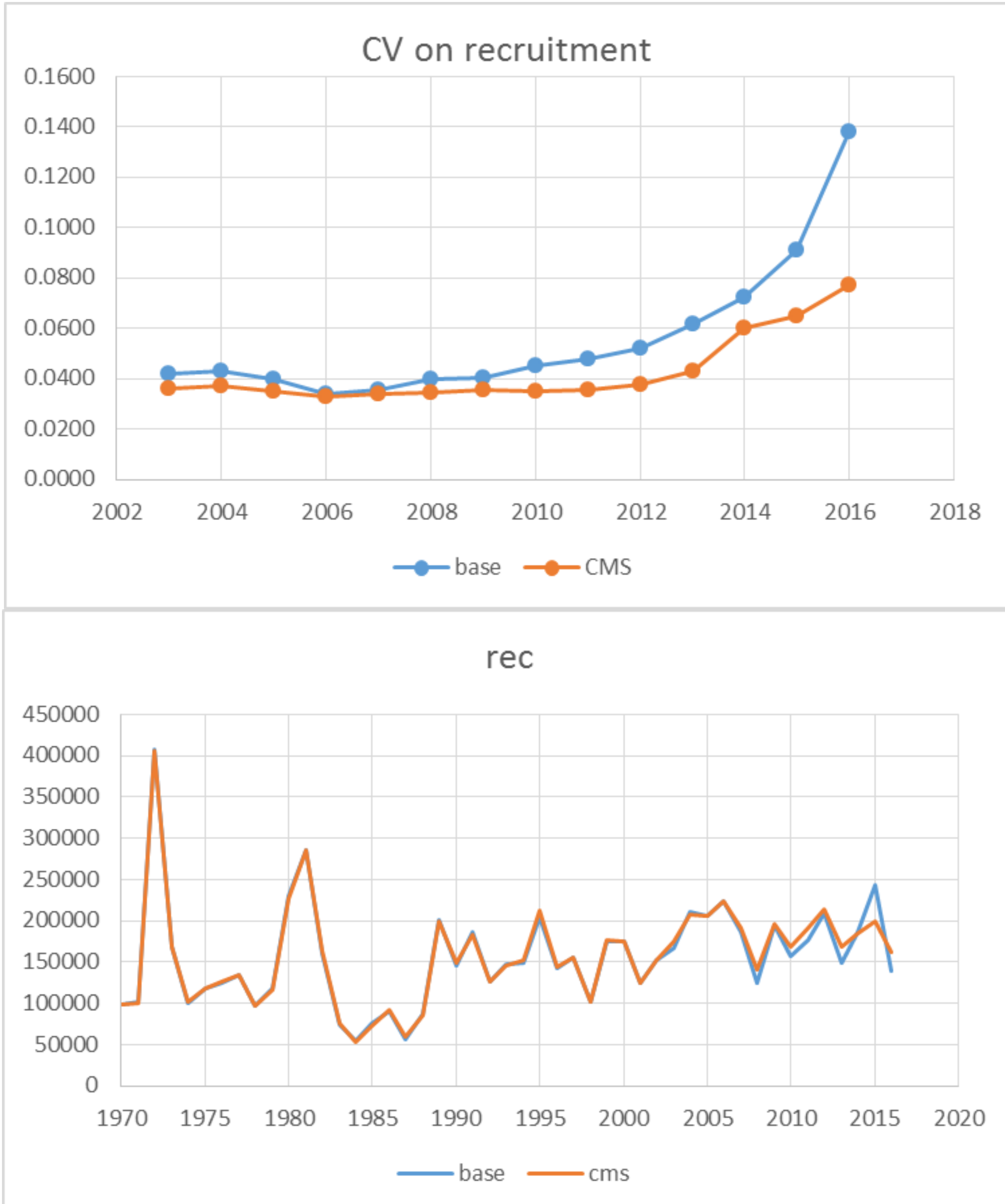


Figure 4.38. Results of the sensitivity run incorporating the Connectivity Modeling System (CMS) results as an index of recruitment. The top panel provides the recruitment Coefficient of Variation (CV) for the years with the CMS data included (2003-2016) and the bottom panel gives the gulfwide recruitment estimates for the SEDAR 52 Base Model (blue line) and the model including the CMS index (orange line).

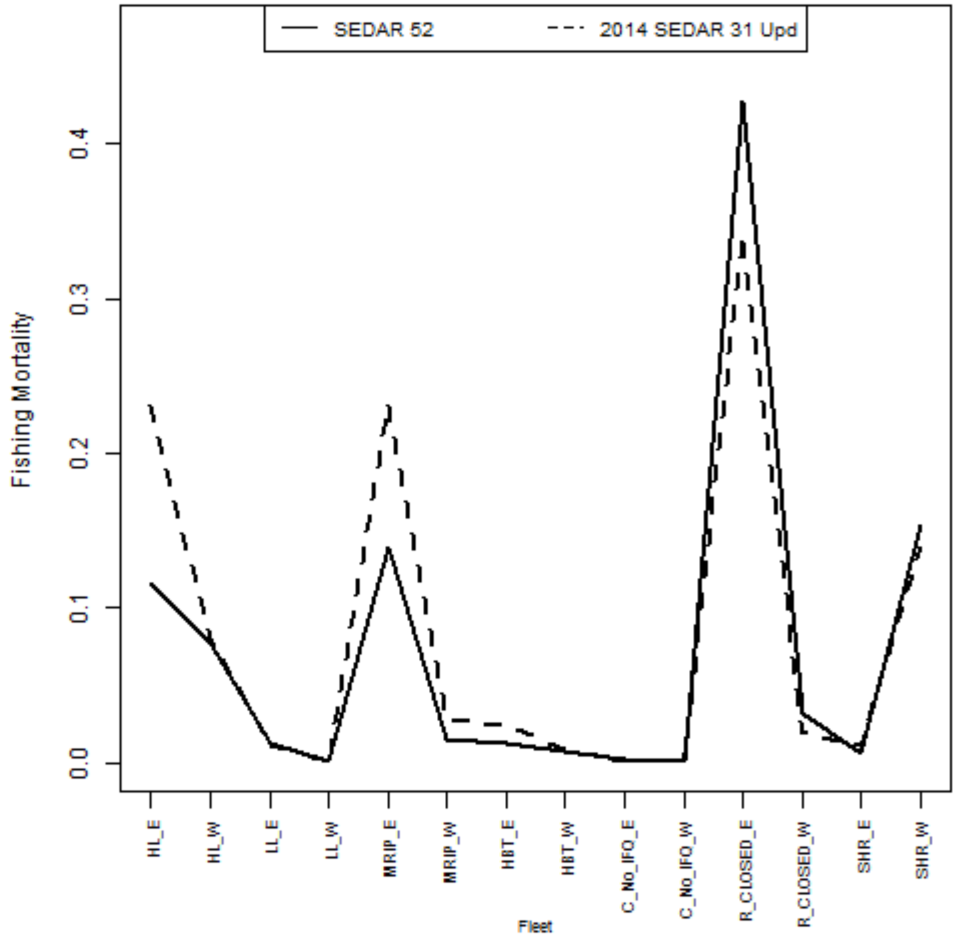


Figure 5.1. The terminal year fishing mortalities used in the projections for the SEDAR 52 Base Model (solid line) and the 2014 SEDAR 31 Update Assessment (dashed line). The directed fleet fishing mortalities represent three year averages from the terminal three years of the associated assessment model. The projections assume the directed fleet fishing mortalities are held in a constant proportion based on these values, whereas the bycatch and discard fleet fishing mortalties are fixed at the levels shown here for every year of the projection.

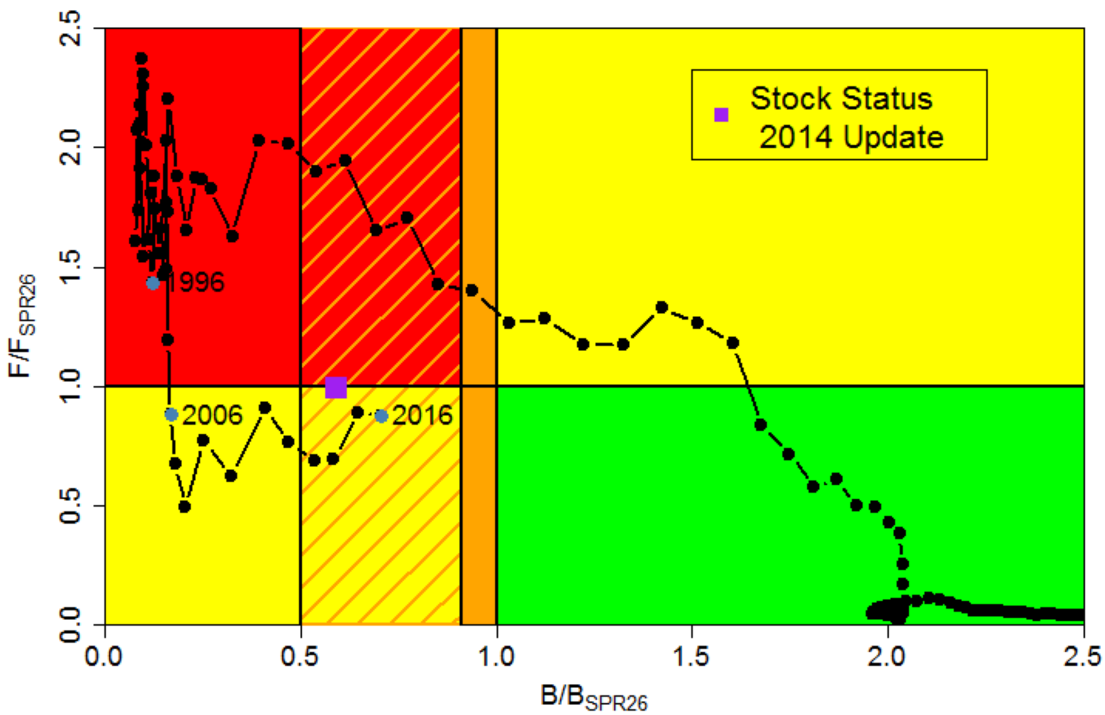


Figure 5.2. Kobe plot illustrating the timeseries of stock status for the the SEDAR 52 Base Model. The orange coloring indicates the region where the stock is below the biomass target ($SSB_{SPR26\%}$), but above the old biomass threshold ($MSST_{OLD}$). The orange striped region represents the region where the stock is below the biomass target ($SSB_{SPR26\%}$), but above the current biomass threshold ($MSST_{NEW}$). The purple square represents the terminal year stock status estimated by the 2014 SEDAR 31 Update Assessment.

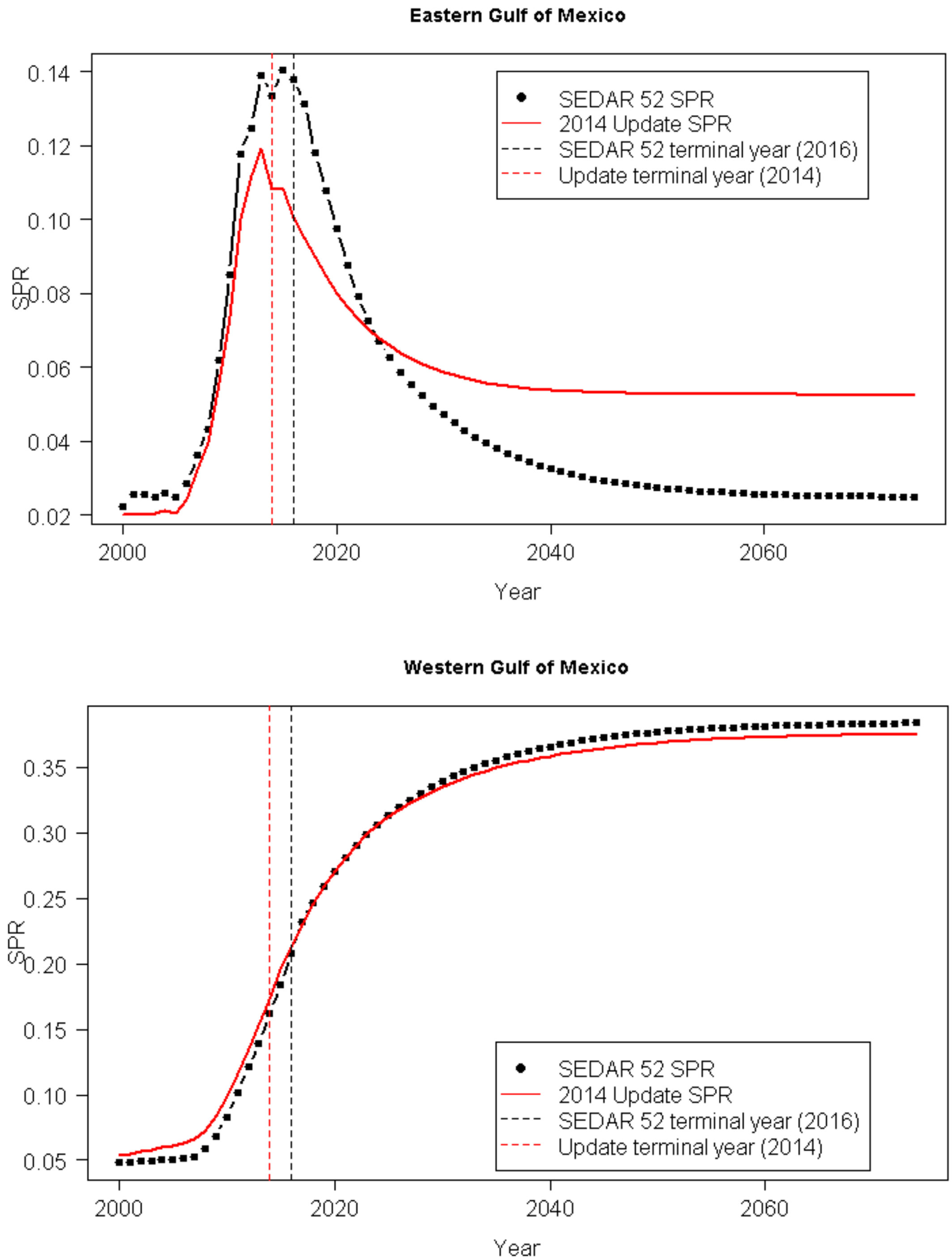


Figure 5.3. Estimated and projected regional SPR for the eastern (Top Panel) and western (Bottom Panel) Gulf of Mexico. Results and corresponding terminal assessment year for the 2014 SEDAR 31 Update Assessment (red lines) and SEDAR 52 Base Model (black lines) are illustrated. Results are provided for OFL projections (i.e., rebuilding to a SPR of 26% in equilibrium).

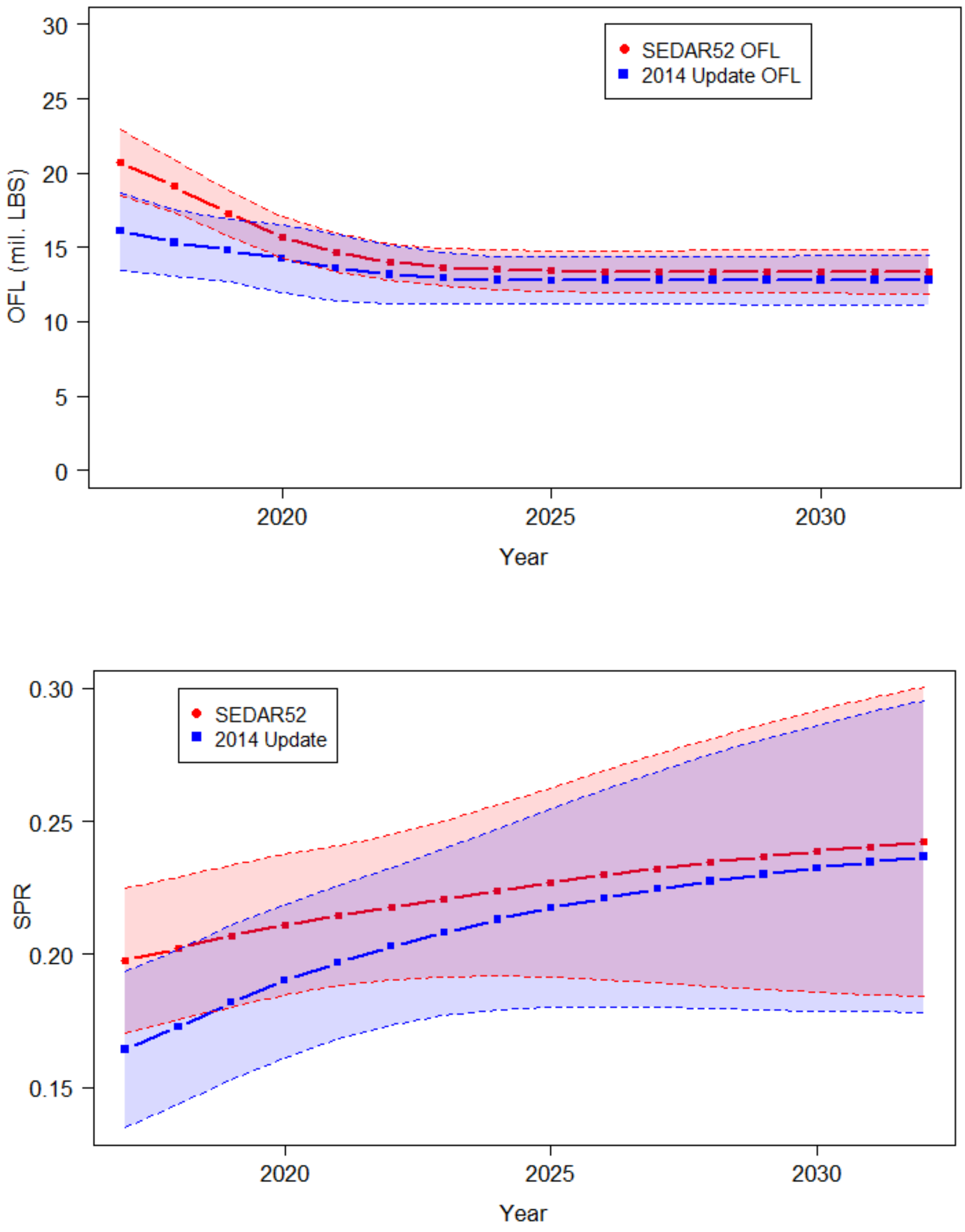


Figure 5.4. Overfishing limit (retained yield; Top Panel) and resulting SPR (Bottom Panel) for projections that achieve SPR 26% in equilibrium assuming recent average recruitment. The results from the 2014 SEDAR 31 Update Assessment (blue lines) are compared with those from SEDAR 52 (red lines) with associated 95% confidence intervals (shaded regions).

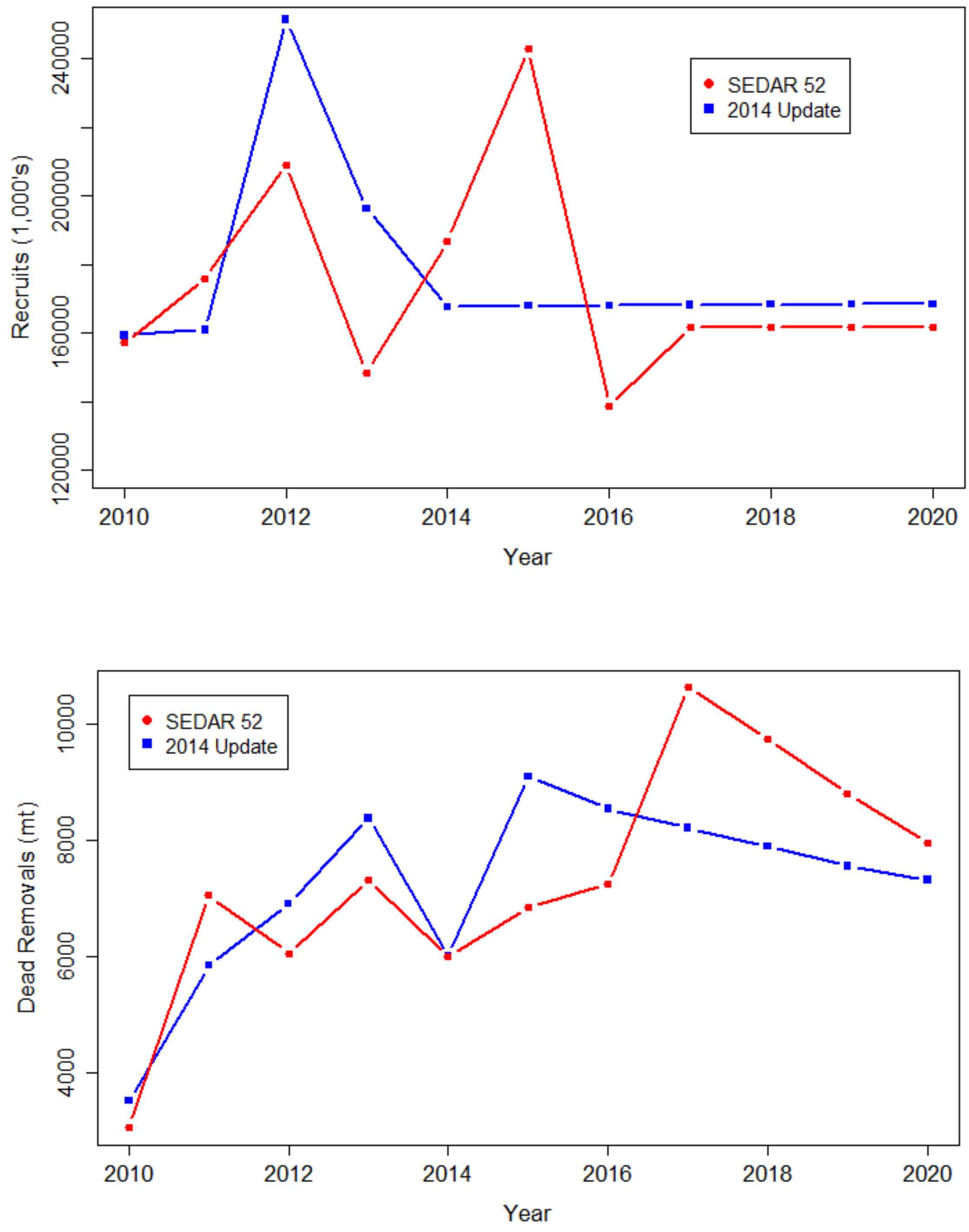


Figure 5.5. Recruitment (1000s of fish; Top Panel) and dead removals (metric tons; Bottom Panel) estimated by the assessment model then projected for OFL forecasts. The results from the 2014 SEDAR 31 Update Assessment (assessment terminal year 2014; blue lines) are compared with those from SEDAR 52 (assessment terminal year 2016; red lines).

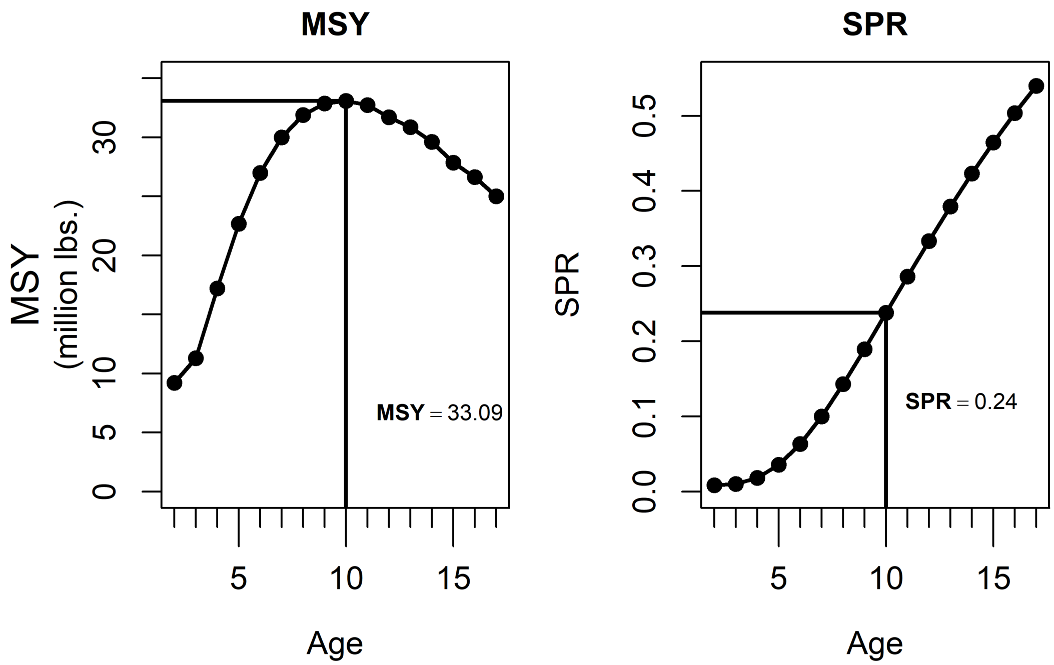


Figure 5.6: Results of the global YPR (i.e., global MSY with steepness = 1.0) projections assuming a single fleet with optimal knife-edge selectivity at a given age, no bycatch or discards, and near infinite fishing mortality. Projections were based on the assumption that average recent recruitment would continue in the future (i.e., steepness = 1.0). The left panel shows the yield curve, while the right panel shows the resulting SPR. The maximum yield occurs with selection by the fishery at age 10 and results in a SPR of 24%).

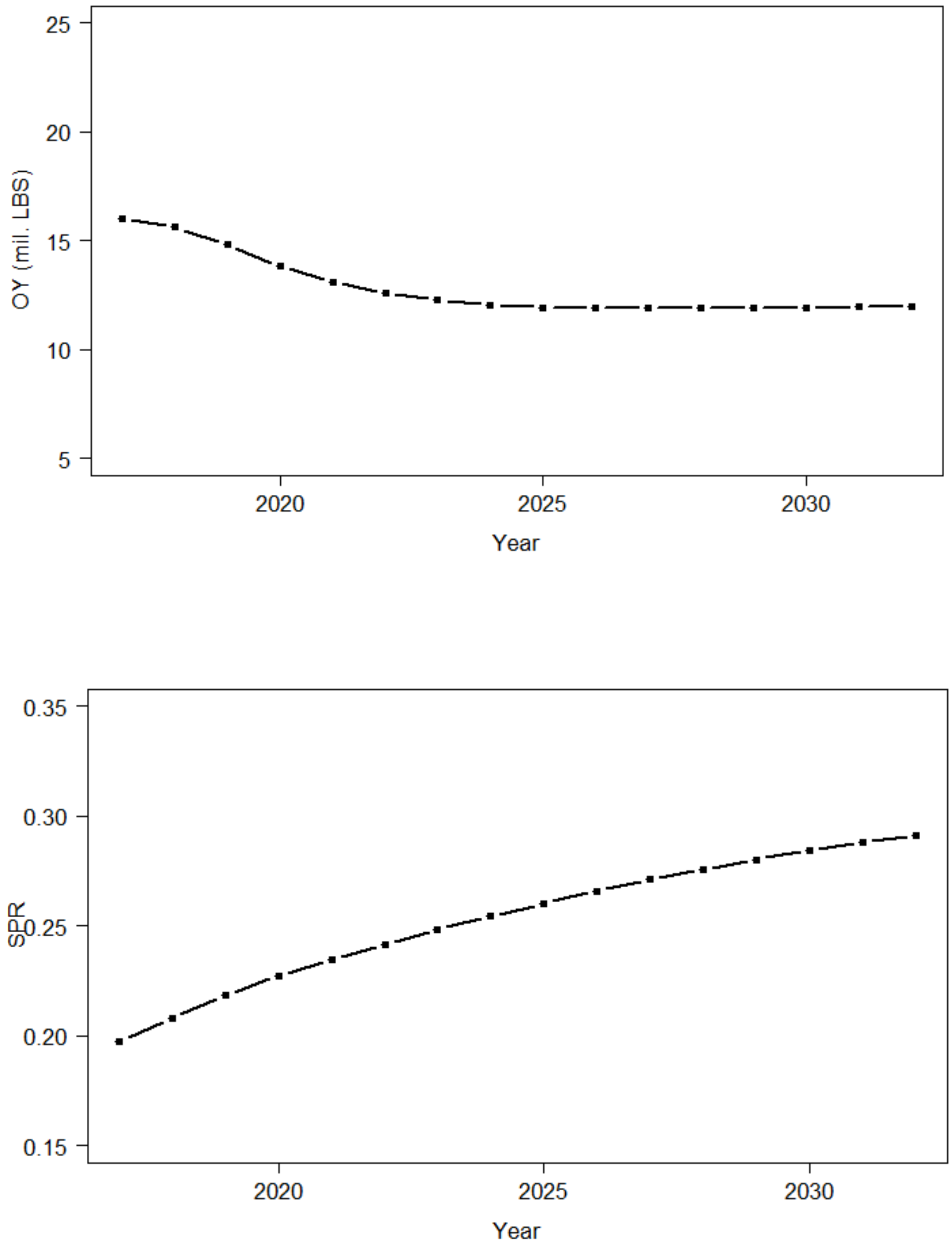


Figure 5.7. Yield (million pounds; Top Panel) and SPR (Bottom Panel) based on OY projections (i.e., directed fishing mortality = 0.75 * directed fishing mortality associated with $F_{SPR26\%}$) assuming recent average recruitment.

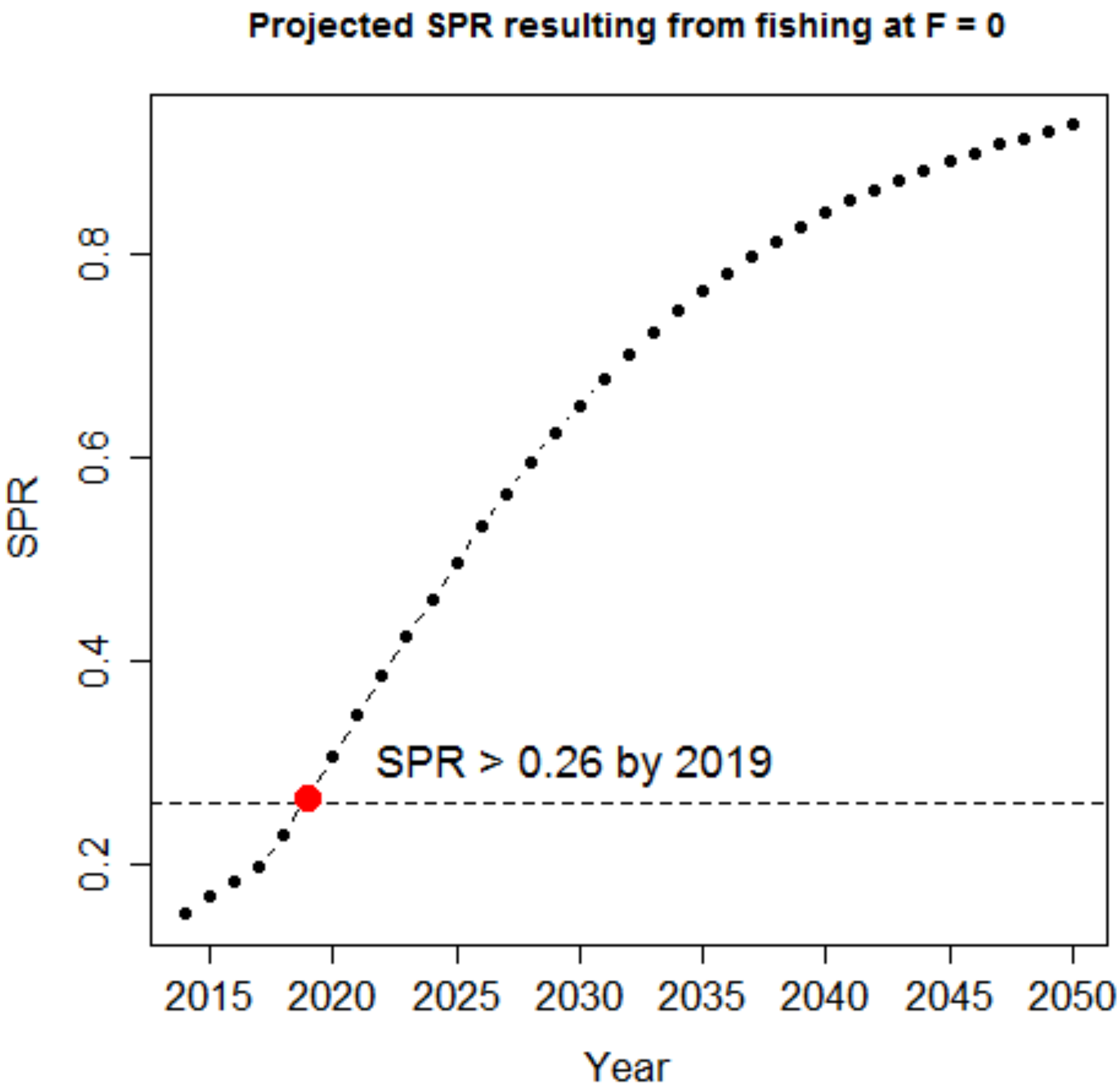


Figure 5.8. Timeseries of projected SPR in the absence of fishing mortality. The Gulf of Mexico red snapper resource is projected to be at the target SPR of 26% by 2019 if no fishing were to occur.

APPENDIX A: STOCK SYNTHESIS 3 INPUT FILES

A.1 Starter File

#Control file for red snapper
#Stock Synthesis Version 3.24j
rsnapper.dat
rsnapper.ctl
1 # 0=use init values in control file; 1=use ss3.par
1 # run display detail (0,1,2)
1 # detailed age-structured reports in REPORT.SSO (0,1)
0 # write detailed checkup.sso file (0,1)
0 # write parm values to ParmTrace.sso
0 # report level in CUMREPORT.SSO (0,1,2)
1 # Include prior_like for non-estimated parameters (0,1)
1 # Use Soft Boundaries to aid convergence
1 # Number of bootstrap datafiles to produce
10 # Turn off estimation for parameters entering after this phase
1000 # MCMC burn interval
100 # MCMC thin interval
0 # jitter initial parm value by this fraction
-1 # min yr for sdreport outputs (-1 for styr)
-2 # max yr for sdreport outputs (-1 for endyr; -2 for endyr+Nforecastyrs
0 # N individual STD years
0.0001 # final convergence criteria
0 # retrospective year relative to end year
0 # min age for calc of summary biomass
1 # Depletion basis: denom is: 0=skip; 1=rel X*B0; 2=rel X*Bmsy; 3=rel X*B_styr
1 # Fraction (X) for Depletion denominator
4 # (1-SPR)_reporting: 0=skip; 1=rel(1-SPR); 2=rel(1-SPR_MSY); 3=rel(1-SPR_Btarget); 4=notrel
2 # F_std reporting: 0=skip; 1=exploit(Bio); 2=exploit(Num); 3=sum(frates)
0 # F_report_basis: 0=raw; 1=rel Fspr; 2=rel Fmsy ; 3=rel Fbtgt
999

A.2 Data File

#C data file created using the SS_writedat function in the R package r4ss
#C should work with SS version: 3.24
#C file write time: 2018-03-01 12:24:05
#
1872 #_styr
2016 #_endyr
1 #_nseas
12 #_months_per_seas
1 #_spawn_seas
14 #_Nfleet
15 #_Nsurveys
2 #_N_areas
HL_E%HL_W%LL_E%LL_W%MRIP_E%MRIP_W%HBT_E%HBT_W%C_Clsd_E%C_Clsd_W%R_Clsd_E%R_Clsd_W%Shr_E%Shr_W%
Video_E%Video_W%Larv_E%Larv_W%Sum_E%Sum_W%Fall_E%Fall_W%BLL_W%BLL_E%ROV_E%MRIP_Index_E%MRIP_Index_W
%HBT_Index_E%HBT_Index_W #_fleetnames
-1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 #_surveytiming_in_season
1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 2 1 1 1 2 1 2 #_area_assignments_for_each_fishery_and_survey
1 1 1 1 2 2 2 2 2 2 2 2 2 2 #_units of catch: 1=bio; 2=num
0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 -1 -1 -1 -1 -1 -1 #_se of log(catch) only used for init_eq_catch and for Fmethod 2 and 3
1 #_Ngenders
20 #_Nages
0 0 0 0 0 0 0 0 0 0 0 0 0 0 #_init_equil_catch_for_each_fishery
145 #_N_lines_of_catch_to_read
#_HL_E HL_W LL_E LL_W MRIP_E MRIP_W HBT_E HBT_W C_Clsd_E C_Clsd_WR_Clsd_E R_Clsd_WShr_E
Shr_W year seas
236.4695 0.0000 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1872 1 #_1
354.7042 0.0000 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1873 1 #_2

532.0566 0.0000 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1874 1 #_3
650.2913 0.0000 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1875 1 #_4
768.5261 0.0000 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1876 1 #_5
650.2913 0.0000 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1877 1 #_6
591.1737 0.0000 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1878 1 #_7
650.2913 0.0000 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1879 1 #_8
827.6432 404.1662 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1880 1 #_9
930.9444 363.7552 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1881 1 #_10
1035.1468 322.8938 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1882 1 #_11
1138.4538 287.7195 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1883 1 #_12
1241.7645 252.5444 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1884 1 #_13
1345.0783 216.9192 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1885 1 #_14
1449.2934 181.7418 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1886 1 #_15
1552.6131 92.5192 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1887 1 #_16
1486.6150 96.5626 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1888 1 #_17
1580.0577 122.1647 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1889 1 #_18
1901.6075 110.0102 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1890 1 #_19
1733.7539 122.2617 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1891 1 #_20
1819.0796 132.9819 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1892 1 #_21
1874.3489 141.5068 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1893 1 #_22
1917.6212 147.3554 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1894 1 #_23
1871.2005 151.4264 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1895 1 #_24
1890.3975 154.6242 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1896 1 #_25
1877.0795 154.5126 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1897 1 #_26
2092.1399 247.0586 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1898 1 #_27
2334.4476 327.7772 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1899 1 #_28
2573.7471 403.6863 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1900 1 #_29
2733.8144 462.8330 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1901 1 #_30
2850.1817 510.7604 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1902 1 #_31
2595.5113 480.7181 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1903 1 #_32
2398.0208 458.9112 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1904 1 #_33
2157.3035 426.7978 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1905 1 #_34
1923.6598 393.5699 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1906 1 #_35
1697.8434 359.0660 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1907 1 #_36
1525.5450 333.7410 0.0000 0.0000 0.000 0.0000 0.0000 0.000 0.000 0.000 0.000 0.000 0.000
0.000 1908 1 #_37

1311.2707	287.0968	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1909	1	#_38
1105.2690	244.0821	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1910	1	#_39
1113.7834	239.2790	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1911	1	#_40
1121.9331	234.9037	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1912	1	#_41
1129.9340	230.6404	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1913	1	#_42
1137.3153	226.2650	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1914	1	#_43
1144.3106	221.8897	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1915	1	#_44
1150.8972	217.0875	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1916	1	#_45
1124.5734	212.7121	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1917	1	#_46
1130.6030	208.3372	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1918	1	#_47
1233.2864	213.8153	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1919	1	#_48
1340.1042	219.2929	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1920	1	#_49
1451.0111	225.3102	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1921	1	#_50
1565.8784	230.7878	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1922	1	#_51
1681.6103	236.2654	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1923	1	#_52
1642.6344	228.2368	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1924	1	#_53
1645.3229	220.2073	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1925	1	#_54
1602.2398	212.0658	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1926	1	#_55
1749.7684	265.7629	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1927	1	#_56
1562.2569	193.6254	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1928	1	#_57
1659.6038	189.1902	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1929	1	#_58
1013.0963	251.0901	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1930	1	#_59
1020.4835	155.4887	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1931	1	#_60
1095.8959	186.5648	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1932	1	#_61
990.8095	203.0384	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1933	1	#_62
891.2469	210.8025	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1934	1	#_63
1093.6225	306.2338	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1935	1	#_64
1258.2575	395.2549	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1936	1	#_65
1115.1292	429.3592	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1937	1	#_66
1442.5920	424.2586	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1938	1	#_67
1693.1247	387.5806	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1939	1	#_68
1132.5988	370.0729	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1940	1	#_69
1030.4671	334.7022	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1941	1	#_70
824.7910	247.0441	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1942	1	#_71
656.0189	168.4588	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1943	1	#_72

757.5129	126.8652	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1944	1	#_73
660.0699	69.7357	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1945	1	#_74
1052.2445	146.6922	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	1946	1	#_75
1103.2246	216.8993	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	1947	1	#_76
1178.7423	270.0784	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	1948	1	#_77
1409.9470	394.5319	0.0000	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	1949	1	#_78
767.9854	669.5241	0.0000	0.0000	146.342	195.4837	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1950	1	#_79
914.8582	670.2009	0.0000	0.0000	187.338	268.5226	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1951	1	#_80
1018.3330	750.3216	0.0000	0.0000	228.334	341.5615	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1952	1	#_81
919.1913	616.2470	0.0000	0.0000	269.330	414.6004	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1953	1	#_82
854.2011	619.5990	0.0000	0.0000	310.326	487.6393	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1954	1	#_83
955.5613	676.7775	0.0000	0.0000	351.322	560.6782	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1955	1	#_84
1143.4451	915.0863	0.0000	0.0000	392.317	633.7171	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1956	1	#_85
1025.9765	913.3159	0.0000	0.0000	421.348	688.3166	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1957	1	#_86
1689.4442	1522.8865	0.0000	0.0000	450.378	742.9161	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1958	1	#_87
1545.7752	1556.5485	0.0000	0.0000	479.409	797.5156	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1959	1	#_88
1731.2827	1633.4687	0.0000	0.0000	508.440	852.1151	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1960	1	#_89
1589.5038	1927.2990	0.0000	0.0000	513.614	868.6194	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1961	1	#_90
1638.6986	1874.0627	0.0000	0.0000	518.788	885.1238	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1962	1	#_91
1365.2935	1667.9326	0.0000	0.0000	523.962	901.6281	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1963	1	#_92
1635.9748	1628.5499	0.0000	0.0000	529.136	918.1324	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1964	1	#_93
1684.0080	1653.8515	0.0000	0.0000	534.310	934.6367	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1965	1	#_94
1405.5906	1379.4924	0.0000	0.0000	546.838	974.1035	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1966	1	#_95
1318.5811	1919.1468	0.0000	0.0000	559.365	1013.5702	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1967	1	#_96
1187.3111	2340.9625	0.0000	0.0000	571.893	1053.0370	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1968	1	#_97
1107.6576	1899.4194	0.0000	0.0000	584.420	1092.5037	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1969	1	#_98
1047.5615	2110.4636	0.0000	0.0000	596.948	1131.9705	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1970	1	#_99
1008.6043	2434.0148	0.0000	0.0000	627.495	1245.3718	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1971	1	#_100
1076.9854	2196.2152	0.0000	0.0000	658.043	1358.7732	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1972	1	#_101
1230.6232	2207.7461	0.0000	0.0000	688.590	1472.1745	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1973	1	#_102
1708.9563	2011.1585	0.0000	0.0000	719.138	1585.5758	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1974	1	#_103
1622.3460	1783.9808	0.0000	0.0000	749.686	1698.9772	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1975	1	#_104
1491.4842	1508.4818	0.0000	0.4872	768.637	1680.5206	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1976	1	#_105
1026.8299	1303.2284	0.0000	0.0000	787.589	1662.0640	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1977	1	#_106
905.5392	1221.9905	0.0000	0.0000	806.540	1643.6074	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1978	1	#_107

924.3832	1121.5107	0.0000	0.0000	825.492	1625.1508	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1979	1	#_108
859.9057	1141.4806	42.6406	19.9829	844.444	1606.6942	148.1653	416.230	0.000	0.000	0.000	0.000	0.001	0.001	1980	1	#_109
965.0982	1425.7931	81.5833	22.3446	972.097	1740.3252	47.7803	344.252	0.000	0.000	0.000	0.000	0.001	0.001	1981	1	#_110
1039.6022	1660.8613	102.7733	32.4853	869.406	1289.4795	153.8230	388.247	0.000	0.000	0.000	0.000	0.001	0.001	1982	1	#_111
1082.9810	1732.8068	201.8610	44.7863	952.299	2258.3479	301.7902	370.500	0.000	0.000	0.000	0.000	0.001	0.001	1983	1	#_112
740.2322	1318.3403	167.1275	345.9458	177.342	784.0557	40.8421	373.218	0.000	0.000	0.000	0.000	0.001	0.001	1984	1	#_113
736.5381	837.3596	51.8636	274.3762	486.696	696.1475	90.2343	368.605	0.000	0.000	0.000	0.000	0.001	0.001	1985	1	#_114
390.0166	876.9771	34.4265	377.1094	681.505	455.6282	16.3640	316.090	0.000	0.000	0.000	0.000	0.001	0.001	1986	1	#_115
361.4345	668.7309	28.7914	332.9574	655.604	190.4395	9.6850	319.348	0.000	0.000	0.000	0.000	0.001	0.001	1987	1	#_116
389.1676	1068.2706	34.7755	303.9694	621.312	354.7260	13.8320	423.024	0.000	0.000	0.000	0.000	0.001	0.001	1988	1	#_117
305.3097	858.1878	35.6402	206.2702	563.097	261.0983	10.7970	372.473	0.000	0.000	0.000	0.000	0.001	0.001	1989	1	#_118
316.4357	797.3280	33.9232	54.6225	371.307	151.5526	15.5390	187.006	0.000	0.000	0.000	0.000	0.001	0.001	1990	1	#_119
179.2506	782.3249	9.3913	32.9274	648.857	301.9562	15.5800	264.686	0.001	0.001	0.000	0.000	0.001	0.001	1991	1	#_120
184.3838	1213.1440	2.5805	8.9902	1010.227	380.2898	33.8730	413.056	0.001	0.001	0.000	0.000	0.001	0.001	1992	1	#_121
198.2131	1316.0610	6.9105	9.2038	1504.395	496.2079	37.2750	458.772	0.001	0.001	0.000	0.000	0.001	0.001	1993	1	#_122
239.1021	1211.7663	3.6096	7.1709	940.898	360.4428	28.9980	497.738	0.001	0.001	0.000	0.000	0.001	0.001	1994	1	#_123
78.3543	1240.7707	3.8370	7.9405	752.396	448.6429	23.0780	354.550	0.001	0.001	0.000	0.000	0.001	0.001	1995	1	#_124
106.1328	1834.4067	3.4416	12.4114	695.459	275.6791	28.3880	349.266	0.001	0.001	0.000	0.000	0.001	0.001	1996	1	#_125
83.6482	2081.7842	2.0987	14.2513	1172.204	285.3044	48.4390	347.424	0.001	0.001	0.001	0.001	0.001	0.001	1997	1	#_126
172.0944	1935.7356	2.5013	12.3488	920.307	205.4600	76.7590	244.738	0.001	0.001	0.001	0.001	0.001	0.001	1998	1	#_127
249.6087	1917.7321	2.9555	41.4226	878.792	165.7319	67.4320	98.699	0.001	0.001	0.001	0.001	0.001	0.001	1999	1	#_128
301.4706	1805.0958	3.8818	83.6550	850.440	180.0877	57.6400	111.410	0.001	0.001	0.001	0.001	0.001	0.001	2000	1	#_129
355.8846	1680.8675	4.5721	56.6870	1014.182	120.1923	51.2890	116.358	0.001	0.001	0.001	0.001	0.001	0.001	2001	1	#_130
477.3863	1617.3024	8.2459	66.5385	1349.549	112.8778	75.1210	138.475	0.001	0.001	0.001	0.001	0.001	0.001	2002	1	#_131
463.4709	1453.6741	6.3370	77.1861	1177.991	128.7536	71.0210	157.905	0.001	0.001	0.001	0.001	0.001	0.001	2003	1	#_132
430.2126	1462.4479	8.7785	207.2108	1427.234	139.7252	63.4820	110.329	0.001	0.001	0.001	0.001	0.001	0.001	2004	1	#_133
362.5905	1360.9134	9.5934	128.3278	909.126	153.5291	46.7910	99.988	0.001	0.001	0.001	0.001	0.001	0.001	2005	1	#_134
347.1698	1639.9693	7.5388	116.5519	853.426	202.9280	47.8820	121.177	0.001	0.001	0.001	0.001	0.001	0.001	2006	1	#_135
396.2462	954.3418	7.1177	85.9715	1299.093	285.3092	63.6030	110.314	0.001	0.001	0.001	0.001	0.001	0.001	2007	1	#_136
367.8547	718.1286	15.0649	25.5067	689.451	132.2351	61.9860	57.569	0.001	0.001	0.001	0.001	0.001	0.001	2008	1	#_137
416.7987	679.6233	6.6349	23.4808	788.910	194.7768	81.5900	75.998	0.001	0.001	0.001	0.001	0.001	0.001	2009	1	#_138
633.8751	853.1746	34.3190	17.3272	353.317	46.0166	35.9430	51.514	0.001	0.001	0.001	0.001	0.001	0.001	2010	1	#_139
732.0998	852.3675	37.6682	8.3425	798.266	95.9368	69.1870	50.656	0.001	0.001	0.001	0.001	0.001	0.001	2011	1	#_140
839.3369	961.8738	23.5623	6.1253	704.945	244.9029	54.1780	54.283	0.001	0.001	0.001	0.001	0.001	0.001	2012	1	#_141
1038.9528	1359.3848	50.0243	23.0814	1158.944	133.2143	43.9850	43.743	0.001	0.001	0.001	0.001	0.001	0.001	2013	1	#_142

972.7233 1473.4154 54.3431 25.0657 391.079 107.2720 42.7570 35.511 0.001 0.001 0.001 0.001 0.001
0.001 2014 1 #_143
1318.6399 1803.9585 113.4477 22.6900 584.008 201.6594 45.4620 63.033 0.001 0.001 0.001 0.001 0.001
0.001 2015 1 #_144
1139.2045 1806.8133 79.8386 24.0497 824.804 174.3410 38.4490 61.137 0.001 0.001 0.001 0.001 0.001
0.001 2016 1 #_145
593 #_N_cpue
#_Units: 0=numbers; 1=biomass; 2=F

#_Errtype: -1=normal; 0=lognormal; >0=T

#_Fleet Units Errtype

#_Fleet	Units	Errtype	
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2	1	0	#_2
3	1	0	#_3
4	1	0	#_4
5	0	0	#_5
6	0	0	#_6
7	0	0	#_7
8	0	0	#_8
9	0	0	#_9
10	0	0	#_10
11	0	0	#_11
12	0	0	#_12
13	2	0	#_13
14	2	0	#_14
15	0	0	#_15
16	0	0	#_16
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18	0	0	#_18
19	0	0	#_19
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1997	1	1	0.3675000	0.2084581	#_8
1998	1	1	1.2883000	0.2002765	#_9
1999	1	1	0.7796000	0.2031301	#_10
2000	1	1	1.4717000	0.2016452	#_11
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2002	1	1	1.6504000	0.1982383	#_13
2003	1	1	1.4638000	0.1964113	#_14
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 2016     1        29        2.1235122 0.3217854 #_593
14 #_N_discard_fleets
#_discard_units (1=same_as_catchunits(bio/num); 2=fraction; 3=numbers)
#_discard_errtype:  >0 for DF of T-dist(read CV below); 0 for normal with CV; -1 for normal with se; -2 for lognormal
#_Fleet   units    errtype
 1        3        -2        #_1
 2        3        -2        #_2
 3        3        -2        #_3
 4        3        -2        #_4
 5        1        -2        #_5
 6        1        -2        #_6
 7        1        -2        #_7
 8        1        -2        #_8
 9        1        -2        #_9
10        1        -2        #_10
11        1        -2        #_11
12        1        -2        #_12
13        1        -2        #_13
14        1        -2        #_14
434 #_N_discard
#_Yr      Seas     Flt       Discard  Std_in
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 1991     1         1         283.019  0.3      #_2
 1992     1         1          70.130  0.3      #_3
 1993     1         1          51.412  0.3      #_4
 1994     1         1          51.153  0.3      #_5
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 1993     1        2          316.531  0.3      #_31
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2013	1	2	38.489	0.3	#_51
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1991	1	3	11.759	0.3	#_56
1992	1	3	2.891	0.3	#_57
1993	1	3	1.955	0.3	#_58
1994	1	3	2.330	0.3	#_59
1995	1	3	1.522	0.3	#_60
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2013	1	3	31.233	0.3	#_78
2014	1	3	4.357	0.3	#_79
2015	1	3	16.644	0.3	#_80
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1992	1	4	0.400	0.3	#_84
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1995	1	9	373.652	0.3	#_257
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1998	1	11	216.493	0.3	#_306
1999	1	11	239.848	0.3	#_307
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2004	1	11	448.714	0.3	#_312
2005	1	11	601.216	0.3	#_313
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2007	1	11	558.185	0.3	#_315
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0 #_N_meanbodywt
30 #_DF_for_meanbodywt_T-distribution_like
2 # length bin method: 1=use databins; 2=generate from binwidth,min,max below; 3=read vector
2 # binwidth for population size comp
8 # minimum size in the population (lower edge of first bin and size at age 0.00)
110 # maximum size in the population (lower edge of last bin)
-0.001 #_comp_tail_compression
1e-07 #_add_to_comp
0 #_combine males into females at or below this bin number
50 #_N_lbins
#_lbin_vector
12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 100 102
104 106 108 110 #_lbin_vector
0 #_N_Length_comp_observations
21 #_N_agebins
#_agebin_vector
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 #_agebin_vector
2 #_N_ageerror_definitions
#_age0  age1    age2    age3    age4    age5    age6    age7    age8    age9    age10   age11   age12
        age13   age14   age15   age16   age17   age18   age19   age20
-1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000
        -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  #_1
 0.001   0.845   0.552   0.517   0.661   0.860   0.800   1.035   1.008   1.141   1.579   2.019   2.019
2.019    2.019   2.019   2.310   2.310   2.310   2.310   4.489   #_2
-1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000
        -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  -1.000  #_3
 0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001   0.001
0.001    0.001   0.001   0.001   0.001   0.001   0.001   0.001   #_4
484 #_N_agecomp
```

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2 #_Lbin_method: 1=poplenbins; 2=datalenbins; 3=lengths
0 #_combine males into females at or below this bin number
#_Yr	Seas	FltSvy	Gender	Part	Ageerr	Lbin_lo	Lbin_hi	Nsamp	a0	a1	a2	a3
	a4	a5	a6	a7	a8	a9	a10	a11	a12	a13	a14	a15
	a16	a17	a18	a19	a20
2007	1	1	0	1	2	-1	-1	5.08E+01	0	1.17E-01	0.471490446
	0.30517443		0.0753479	0.01821455		0.00713267		0.003273354		0.001654344
	0.000844669		2.33E-04	7.26E-05	2.15E-05	1.05E-05	2.40E-07	4.81E-07	1.02E-06	0.00E+00	0.00E+00	2.40E-07
	0.00E+00	#_1
2008	1	1	0	1	2	-1	-1	1.15E+02	0	1.74E-01	0.424127552
	0.20894124		0.0909194	0.04972568		0.02731088		0.013180383		0.006708153		0.0035219
	1.09E-03	3.10E-04	8.05E-05	4.30E-05	0.00E+00	0.00E+00	1.88E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_2
2009	1	1	0	1	2	-1	-1	8.02E+00	0	2.93E-02	0.177226542
	0.29052112		0.2061413	0.13446142		0.0807298	0.042903757		0.021997698		0.011284747
	3.63E-03	1.13E-03	4.15E-04	1.81E-04	2.40E-06	4.80E-06	2.65E-05	0.00E+00	0.00E+00	2.40E-06	0.00E+00	#_3
2010	1	1	0	1	2	-1	-1	8.34E+00	0	1.79E-02	0.085320792
	0.25751549		0.2703521	0.1697923	0.09745638		0.052765196		0.027847049		0.014533201
	4.49E-03	1.35E-03	4.10E-04	1.95E-04	1.98E-05	2.43E-05	2.79E-05	0.00E+00	0.00E+00	1.06E-05	3.05E-06	#_4
2011	1	1	0	1	2	-1	-1	1.66E+01	0	4.32E-02	0.148379711
	0.20798355		0.220553	0.15606141		0.09733832		0.059331443		0.034829549
	0.019786329		7.52E-03	2.61E-03	7.91E-04	4.82E-04	1.78E-04	1.70E-04	1.17E-04	6.85E-05	6.85E-05	3.70E-05
	4.49E-04	#_5
2012	1	1	0	1	2	-1	-1	1.35E+01	0	4.41E-02	0.12034408
	0.20217442		0.2189401	0.16188574		0.1062263	0.065468999		0.038746906		0.023623305
	9.64E-03	3.67E-03	1.34E-03	1.19E-03	5.86E-04	2.91E-04	2.09E-04	1.15E-04	7.67E-05	1.66E-04	1.22E-03	#_6
2013	1	1	0	1	2	-1	-1	1.13E+02	0	1.38E-01	0.270801916
	0.23571033		0.1603788	0.08966861		0.0515549	0.027633702		0.014565505		0.007788646
	2.49E-03	8.15E-04	2.80E-04	1.83E-04	6.22E-05	3.10E-05	2.40E-05	3.21E-06	0.00E+00	1.77E-05	6.62E-05	#_7
2014	1	1	0	1	2	-1	-1	2.00E+02	0	1.79E-01	0.352284339
	0.198975	0.1020484	0.06418044		0.04308885		0.027528636		0.016449355		0.009779357
	3.96E-03	1.44E-03	4.64E-04	3.34E-04	1.26E-04	7.41E-05	6.23E-05	1.85E-05	1.41E-05	3.12E-05	1.27E-04	#_8
2015	1	1	0	1	2	-1	-1	2.00E+02	0	2.09E-01	0.360994223
	0.16621925		0.0790201	0.04757786		0.04004906		0.034658415		0.025751203
	0.018179828		9.44E-03	3.96E-03	1.47E-03	1.30E-03	6.42E-04	2.94E-04	2.63E-04	1.81E-04	1.31E-04	1.38E-04
	1.14E-03	#_9
2016	1	1	0	1	2	-1	-1	1.62E+02	0	1.85E-01	0.470948598
	0.23667258		0.0653289	0.0175087	0.00932477		0.005838524		0.003715358		0.002539139
	1.31E-03	5.65E-04	2.29E-04	2.16E-04	1.28E-04	4.99E-05	4.23E-05	3.86E-05	2.44E-05	3.13E-05	2.81E-04	#_10
1991	1	1	0	2	2	-1	-1	9.20E+01	0	9.70E-03	0.5275	0.3795
	0.0266	0.0412	0.0084	0.0067	0.0003	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_11
1992	1	1	0	2	2	-1	-1	7.18E+00	0	0.00E+00	0.0219	0.7381
	0.1626	0.0584	0.0048	0.0079	0	0.0062	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_12
1993	1	1	0	2	2	-1	-1	2.00E+02	0	0.00E+00	0.3266	0.4176
	0.2127	0.0228	0.0173	0.0008	0	0	0.00E+00	2.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_13
1994	1	1	0	2	2	-1	-1	5.30E+00	0	0.00E+00	0.3643	0.3673
	0.1708	0.0874	0.0043	0.0018	0	0	0.00E+00	0.00E+00	0.00E+00	1.80E-03	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.26E-03	#_14
1995	1	1	0	2	2	-1	-1	2.00E+02	0	0.00E+00	0.1478	0.4969
	0.2675	0.0731	0.0098	0	0	0	0.00E+00	4.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_15
-1996	1	1	0	2	2	-1	-1	9.00E+00	0	0.00E+00	0.3878	0.3778
	0.152	0.0824	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_462
1997	1	1	0	2	2	-1	-1	1.07E+01	0	0.00E+00	0	0.5326
	0.3919	0.0405	0.0257	0.0057	0	0.0036	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_16
1998	1	1	0	2	2	-1	-1	2.00E+02	0	0.00E+00	0.102	0.6597
	0.1568	0.0473	0.0059	0.0119	0.0013	0	0.00E+00	0.00E+00	2.70E-03	0.00E+00	0.00E+00	0.00E+00
	1.30E-03	0.00E+00	1.10E-03	0.00E+00	9.97E-03	#_17
1999	1	1	0	2	2	-1	-1	1.43E+01	0	1.30E-03	0.1148	0.2642
	0.3466	0.113	0.0689	0.0353	0.0202	0.0169	1.12E-02	4.50E-03	0.00E+00	1.60E-03	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E-03	#_18
2000	1	1	0	2	2	-1	-1	7.26E+01	0	0.00E+00	0.0365	0.386
	0.3107	0.1785	0.0597	0.0136	0.0081	0.0031	0.00E+00	2.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E-03	#_19
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2001	1	1	0	2	2	-1	-1	2.00E+02	0	0.00E+00	0.0975	0.2448
	0.3386	0.1675	0.0913	0.0337	0.0128	0.0061	3.20E-03	2.80E-03	4.00E-04	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	3.00E-04	0.00E+00	0.00E+00	1.01E-03	#_20						
2002	1	1	0	2	2	-1	-1	2.00E+02	0	9.00E-04	0.0838	0.5289
	0.1693	0.1392	0.0433	0.0317	0.0005	0	0.00E+00	1.80E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	5.00E-04	1.75E-04	#_21						
2003	1	1	0	2	2	-1	-1	3.00E+01	0	6.90E-03	0.1082	0.3848
	0.334	0.0909	0.0499	0.0139	0.0039	0.0027	5.00E-04	1.90E-03	8.00E-04	0.00E+00	0.00E+00	0.00E+00
	5.00E-04	0.00E+00	2.00E-04	0.00E+00	1.03E-03	#_22						
2004	1	1	0	2	2	-1	-1	2.82E+01	0	7.20E-03	0.2082	0.3208
	0.3065	0.1178	0.017	0.0112	0.0028	0.0026	4.00E-04	1.10E-03	1.80E-03	2.10E-03	0.00E+00	7.00E-04
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_23						
2005	1	1	0	2	2	-1	-1	1.02E+02	0	1.00E-03	0.1117	0.4489
	0.1909	0.1597	0.0601	0.0145	0.0043	0.0027	2.80E-03	4.00E-04	7.00E-04	1.20E-03	7.00E-04	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	2.00E-04	3.82E-04	#_24						
2006	1	1	0	2	2	-1	-1	3.88E+01	0	7.40E-03	0.1906	0.3807
	0.2408	0.0819	0.0517	0.0296	0.0077	0.0023	1.70E-03	5.00E-04	4.00E-04	3.00E-04	8.00E-04	5.00E-04
	3.00E-04	9.00E-04	0.00E+00	6.00E-04	1.40E-03	#_25						
2007	1	1	0	2	2	-1	-1	2.97E+01	0	1.04E-02	0.2177	0.506
	0.2119	0.0356	0.0138	0.0033	0	0.001	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.00E-04	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_26						
2008	1	1	0	2	2	-1	-1	3.60E+01	0	3.90E-03	0.197	0.3569
	0.3573	0.0726	0.0115	0	0	0	8.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_27						
2009	1	1	0	2	2	-1	-1	8.26E+01	0	5.20E-03	0.1411	0.3763
	0.3176	0.1173	0.0339	0.0066	0.0009	0	4.00E-04	0.00E+00	2.00E-04	0.00E+00	0.00E+00	2.00E-04
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_28						
2010	1	1	0	2	2	-1	-1	2.00E+02	0	7.00E-04	0.0883	0.312
	0.3318	0.1841	0.0607	0.0155	0.0059	0	4.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	3.00E-04	0.00E+00	0.00E+00	2.75E-04	#_29						
2011	1	1	0	2	2	-1	-1	3.01E+01	0	1.60E-03	0.0834	0.1321
	0.4203	0.2535	0.0727	0.0263	0.0071	0.0027	0.00E+00	2.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-04	#_30						
2012	1	1	0	2	2	-1	-1	8.15E+01	0	7.20E-03	0.0701	0.2531
	0.1361	0.2745	0.1812	0.0581	0.0139	0.0026	1.70E-03	8.00E-04	2.00E-04	0.00E+00	0.00E+00	0.00E+00
	2.00E-04	0.00E+00	0.00E+00	0.00E+00	2.66E-04	#_31						
2013	1	1	0	2	2	-1	-1	4.05E+01	0	4.00E-03	0.1626	0.1499
	0.2407	0.1169	0.1785	0.1049	0.0273	0.0095	3.30E-03	1.60E-03	2.00E-04	2.00E-04	2.00E-04	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.09E-04	#_32						
2014	1	1	0	2	2	-1	-1	9.16E+01	0	2.50E-03	0.1006	0.2816
	0.1571	0.1292	0.101	0.1251	0.071	0.0227	5.30E-03	2.40E-03	3.00E-04	6.00E-04	5.00E-04	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_33						
2015	1	1	0	2	2	-1	-1	7.30E+01	0	2.65E-02	0.1159	0.2996
	0.2117	0.0915	0.0648	0.0547	0.0653	0.0462	1.76E-02	4.80E-03	8.00E-04	8.00E-04	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_34						
2016	1	1	0	2	2	-1	-1	1.81E+01	0	5.90E-03	0.2914	0.2251
	0.1922	0.1032	0.0445	0.0365	0.0232	0.0391	2.45E-02	7.80E-03	3.10E-03	1.70E-03	9.00E-04	4.00E-04
	2.00E-04	0.00E+00	0.00E+00	0.00E+00	2.57E-04	#_35						
2007	1	2	0	1	2	-1	-1	3.55E+01	0	1.04E-02	0.315894065	
	0.41317272		0.1836312	0.05679069		0.01371761		0.004109521		0.001333098		
	0.000510468		2.09E-04	1.08E-04	4.38E-05	2.94E-05	2.05E-05	1.43E-05	9.29E-06	4.46E-06	2.14E-06	1.07E-06
	2.14E-06	#_36										
2008	1	2	0	1	2	-1	-1	2.00E+02	0	1.51E-02	0.409917992	
	0.40494197		0.1305763	0.02935599		0.0048485	0.001921391		0.00105902		0.000629986	
	3.79E-04	2.46E-04	1.29E-04	1.18E-04	1.19E-04	1.24E-04	6.83E-05	6.06E-05	7.10E-05	3.11E-05	3.49E-04	#_37
2009	1	2	0	1	2	-1	-1	4.60E+00	0	2.89E-02	0.614649869	
	0.31273147		0.0399501	0.00377481		0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_38			
2010	1	2	0	1	2	-1	-1	7.40E+00	0	2.60E-02	0.492916392	
	0.35737389		0.0813803	0.01259542		0.00397396		0.004515722		0.004103024		
	0.003551202		2.78E-03	1.95E-03	1.78E-03	1.19E-03	9.49E-04	8.88E-04	7.17E-04	5.36E-04	5.01E-04	2.32E-04
	2.09E-03	#_39										
2011	1	2	0	1	2	-1	-1	2.22E+01	0	9.20E-03	0.2476133	
	0.28649616		0.1834618	0.10841203		0.06372322		0.037002268		0.020887732		
	0.012508553		8.17E-03	5.18E-03	3.82E-03	2.64E-03	2.19E-03	1.85E-03	1.61E-03	8.66E-04	8.47E-04	5.18E-04
	3.01E-03	#_40										
2012	1	2	0	1	2	-1	-1	1.95E+01	0	1.18E-02	0.31314921	
	0.26982476		0.1494669	0.10077465		0.06253845		0.035717177		0.019609257		
	0.011462838		7.12E-03	4.36E-03	3.03E-03	2.14E-03	1.76E-03	1.22E-03	1.11E-03	5.67E-04	5.45E-04	3.24E-04
	3.47E-03	#_41										

2013 1 2 0 1 2 -1 -1 1.37E+02 0 7.29E-03 0.324612823
0.31610888 0.1353265 0.08587892 0.0555218 0.030760861 0.016274725 0.008958074
5.29E-03 3.01E-03 2.00E-03 1.47E-03 1.19E-03 8.56E-04 8.05E-04 4.62E-04 4.54E-04 3.68E-04 3.36E-03 #_42
2014 1 2 0 1 2 -1 -1 5.16E+01 0 1.12E-02 0.446336447
0.30740706 0.0992869 0.05350285 0.0342864 0.020559238 0.011299201 0.006230806
3.60E-03 2.08E-03 1.20E-03 9.18E-04 6.46E-04 4.28E-04 3.83E-04 1.61E-04 1.71E-04 1.19E-04 2.09E-04 #_43
2015 1 2 0 1 2 -1 -1 1.54E+01 0 1.11E-02 0.207201173
0.26328536 0.1934944 0.12410546 0.07598085 0.045331855 0.026285729 0.0160072
1.03E-02 6.46E-03 4.76E-03 3.33E-03 2.53E-03 1.98E-03 1.83E-03 9.44E-04 9.29E-04 5.59E-04 3.55E-03 #_44
2016 1 2 0 1 2 -1 -1 1.28E+01 0 1.18E-02 0.468605873
0.27218501 0.0701845 0.04361731 0.04030416 0.031653874 0.020673398
0.012961383 8.35E-03 5.17E-03 3.64E-03 2.63E-03 1.98E-03 1.49E-03 1.39E-03 6.54E-04 6.50E-04 4.39E-04
1.60E-03 #_45
1991 1 2 0 2 2 -1 -1 4.25E+00 0 0.00E+00 0.6625 0.1689
0.1422 0.0122 0 0 0 0 2.30E-03 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 6.70E-03 0.00E+00 5.28E-03 #_46
1992 1 2 0 2 2 -1 -1 1.83E+01 0 0.00E+00 0.006 0.664
0.1859 0.0955 0.0269 0.0115 0.006 0 2.30E-03 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 1.88E-03 #_47
1993 1 2 0 2 2 -1 -1 2.10E+01 0 0.00E+00 0.0249 0.3963
0.4372 0.1187 0.0147 0.0065 0.0007 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 1.05E-03 #_48
1994 1 2 0 2 2 -1 -1 1.16E+02 0 0.00E+00 0.0488 0.4377
0.299 0.16 0.0341 0.01 0.0042 0.0019 1.00E-04 1.90E-03 0.00E+00 0.00E+00 0.00E+00 0.00E+00
1.10E-03 0.00E+00 0.00E+00 0.00E+00 1.20E-03 #_49
1995 1 2 0 2 2 -1 -1 1.34E+02 0 0.00E+00 0 0.303
0.3405 0.1757 0.1411 0.0391 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 5.00E-04 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_50
1998 1 2 0 2 2 -1 -1 2.00E+02 0 8.70E-03 0.0668 0.4637
0.2555 0.1292 0.0296 0.021 0.0153 0.0046 3.50E-03 6.00E-04 5.00E-04 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 9.96E-04 #_51
1999 1 2 0 2 2 -1 -1 3.92E+01 0 3.00E-04 0.0329 0.189
0.3913 0.2212 0.0949 0.0442 0.0162 0.004 4.10E-03 1.00E-03 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 1.02E-03 #_52
2000 1 2 0 2 2 -1 -1 4.06E+01 0 0.00E+00 0.0538 0.4261
0.2736 0.1395 0.068 0.0278 0.006 0.0021 1.80E-03 5.00E-04 6.00E-04 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 2.78E-04 #_53
2001 1 2 0 2 2 -1 -1 1.65E+02 0 0.00E+00 0.0985 0.2262
0.3061 0.1771 0.1106 0.0458 0.0208 0.0085 3.20E-03 1.80E-03 6.00E-04 0.00E+00 5.00E-04 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 4.51E-04 #_54
2002 1 2 0 2 2 -1 -1 1.98E+02 0 1.55E-02 0.1 0.4077
0.206 0.1458 0.0595 0.0374 0.0154 0.0043 1.90E-03 2.60E-03 6.00E-04 6.00E-04 2.00E-04 0.00E+00
5.00E-04 0.00E+00 0.00E+00 0.00E+00 2.05E-03 #_55
2003 1 2 0 2 2 -1 -1 8.63E+01 0 1.60E-03 0.0469 0.2792
0.3633 0.1387 0.0747 0.0427 0.03 0.007 4.60E-03 3.80E-03 1.80E-03 1.80E-03 2.60E-03 0.00E+00
0.00E+00 0.00E+00 5.00E-04 0.00E+00 8.33E-04 #_56
2004 1 2 0 2 2 -1 -1 2.00E+02 0 0.00E+00 0.0353 0.2659
0.3476 0.1906 0.0566 0.039 0.0273 0.0126 6.30E-03 4.30E-03 3.10E-03 3.30E-03 1.60E-03 2.30E-03
7.00E-04 6.00E-04 6.00E-04 0.00E+00 2.40E-03 #_57
2005 1 2 0 2 2 -1 -1 6.98E+01 0 7.00E-04 0.0952 0.2592
0.2592 0.1797 0.0925 0.0408 0.0227 0.0127 7.90E-03 4.70E-03 4.00E-03 5.40E-03 3.90E-03 4.30E-03
6.00E-04 1.30E-03 2.50E-03 0.00E+00 2.62E-03 #_58
2006 1 2 0 2 2 -1 -1 2.00E+02 0 0.00E+00 0.0646 0.4331
0.2554 0.099 0.0797 0.0386 0.0142 0.0059 4.30E-03 2.20E-03 1.20E-03 8.00E-04 0.00E+00 8.00E-04
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_59
2007 1 2 0 2 2 -1 -1 1.48E+02 0 0.00E+00 0.073 0.3739
0.3198 0.1005 0.0485 0.0438 0.0186 0.0081 4.50E-03 3.60E-03 1.10E-03 5.00E-04 1.10E-03 1.50E-03
0.00E+00 0.00E+00 0.00E+00 0.00E+00 1.56E-03 #_60
2008 1 2 0 2 2 -1 -1 1.11E+02 0 0.00E+00 0.0281 0.296
0.3793 0.1521 0.055 0.0275 0.0186 0.0206 6.20E-03 8.00E-03 3.90E-03 1.50E-03 6.00E-04 0.00E+00
8.00E-04 0.00E+00 0.00E+00 1.30E-03 2.50E-04 #_61
2009 1 2 0 2 2 -1 -1 2.00E+02 0 0.00E+00 0.0284 0.3291
0.3478 0.2027 0.065 0.0131 0.0059 0.0036 1.50E-03 4.00E-04 0.00E+00 3.00E-04 0.00E+00 0.00E+00
0.00E+00 0.00E+00 4.00E-04 0.00E+00 1.83E-03 #_62
2010 1 2 0 2 2 -1 -1 2.00E+02 0 0.00E+00 0.0148 0.2326
0.3382 0.2626 0.1222 0.0205 0.004 0.0017 4.00E-04 7.00E-04 4.00E-04 0.00E+00 5.00E-04 4.00E-04
4.00E-04 0.00E+00 0.00E+00 0.00E+00 6.58E-04 #_63
2011 1 2 0 2 2 -1 -1 2.00E+02 0 1.30E-03 0.0561 0.1027
0.2777 0.3045 0.1639 0.0614 0.0198 0.0067 2.50E-03 1.90E-03 6.00E-04 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 6.00E-04 0.00E+00 3.15E-04 #_64

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2012 1 2 0 2 2 -1 -1 2.00E+02 0 4.00E-04 0.0317 0.3144
0.1403 0.2175 0.1587 0.0728 0.0435 0.0109 2.40E-03 0.00E+00 1.20E-03 1.40E-03 1.00E-03 0.00E+00
5.00E-04 1.20E-03 5.00E-04 2.00E-04 1.25E-03 #_65
2013 1 2 0 2 2 -1 -1 4.77E+01 0 2.70E-03 0.0349 0.1652
0.4484 0.1197 0.1038 0.0731 0.0337 0.0101 1.30E-03 2.30E-03 6.00E-04 8.00E-04 0.00E+00 6.00E-04
0.00E+00 0.00E+00 0.00E+00 0.00E+00 2.89E-03 #_66
2014 1 2 0 2 2 -1 -1 5.00E+01 0 0.00E+00 0.0256 0.1641
0.2745 0.3479 0.0722 0.0634 0.0295 0.0131 3.90E-03 2.70E-03 2.20E-03 0.00E+00 0.00E+00 0.00E+00
7.00E-04 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_67
2015 1 2 0 2 2 -1 -1 1.61E+02 0 0.00E+00 0.0294 0.2158
0.298 0.2154 0.1409 0.0431 0.0354 0.0155 3.70E-03 6.00E-04 1.20E-03 0.00E+00 5.00E-04 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 4.06E-04 #_68
2016 1 2 0 2 2 -1 -1 2.00E+02 0 2.90E-03 0.0288 0.1458
0.3535 0.2376 0.113 0.0662 0.0187 0.0126 1.22E-02 4.70E-03 1.80E-03 9.00E-04 0.00E+00 6.00E-04
0.00E+00 6.00E-04 0.00E+00 0.00E+00 0.00E+00 #_69
-2009 1 3 0 1 2 -1 -1 9.00E+00 0 9.01E-02 0.018711425
0.06622836 0.2815148 0.26710439 0.14366683 0.068846009 0.036223968
0.019191259 6.34E-03 1.58E-03 3.55E-04 1.82E-04 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 #_473
2010 1 3 0 1 2 -1 -1 8.89E+01 0 3.86E-04 0.018894286
0.13641966 0.2540632 0.23595829 0.16237617 0.093924023 0.051785964
0.029324059 1.05E-02 3.67E-03 1.20E-03 7.57E-04 2.09E-04 1.27E-04 1.28E-04 3.37E-05 2.66E-05 5.28E-05
2.13E-04 #_70
2011 1 3 0 1 2 -1 -1 7.88E+01 0 2.91E-04 0.013791069
0.10599667 0.2405002 0.23671426 0.17181057 0.108013162 0.062747675
0.03657933 1.41E-02 5.08E-03 1.65E-03 1.08E-03 3.58E-04 2.06E-04 2.01E-04 1.05E-04 7.62E-05 9.41E-05
6.28E-04 #_71
2012 1 3 0 1 2 -1 -1 1.64E+02 0 2.61E-04 0.007037527
0.05144059 0.1688337 0.23369185 0.21255375 0.146256995 0.087285605
0.053605966 2.18E-02 8.44E-03 2.94E-03 2.13E-03 8.73E-04 4.49E-04 4.05E-04 2.10E-04 1.42E-04 2.26E-04
1.46E-03 #_72
2013 1 3 0 1 2 -1 -1 2.00E+02 0 2.44E-04 0.01237316
0.07095914 0.1641034 0.20602896 0.19577203 0.149103731 0.095599626
0.060286038 2.61E-02 1.01E-02 3.45E-03 2.50E-03 9.00E-04 5.43E-04 5.12E-04 1.76E-04 1.50E-04 1.97E-04
9.09E-04 #_73
2014 1 3 0 1 2 -1 -1 2.00E+02 0 8.83E-04 0.011494412
0.06931075 0.1537787 0.18987011 0.19307364 0.158531795 0.10513984
0.066926512 2.92E-02 1.14E-02 3.80E-03 2.81E-03 1.06E-03 6.44E-04 5.45E-04 1.73E-04 1.42E-04 2.45E-04
1.01E-03 #_74
2015 1 3 0 1 2 -1 -1 2.00E+02 0 3.57E-04 0.015240663
0.08717897 0.1768517 0.1769072 0.15296976 0.12904083 0.097430545 0.073985258
3.97E-02 1.75E-02 7.01E-03 6.93E-03 4.25E-03 1.88E-03 1.34E-03 1.10E-03 7.32E-04 9.98E-04 8.62E-03 #_75
2016 1 3 0 1 2 -1 -1 1.48E+02 0 2.94E-03 0.056186907
0.14445627 0.1828583 0.17611251 0.14871529 0.114540205 0.077380148
0.051213662 2.39E-02 9.65E-03 3.45E-03 2.87E-03 1.38E-03 7.53E-04 5.92E-04 3.07E-04 2.43E-04 2.98E-04
2.13E-03 #_76
1991 1 3 0 2 2 -1 -1 3.83E+00 0 0.00E+00 0.0132 0.6358
0.1346 0.1635 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 5.29E-02
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_77
1992 1 3 0 2 2 -1 -1 5.41E+00 0 0.00E+00 0 0.1298
0.2039 0.2917 0.1571 0.1434 0 0 1.85E-02 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 5.56E-02 #_78
1993 1 3 0 2 2 -1 -1 2.52E+01 0 0.00E+00 0.0427 0.1994
0.3205 0.2493 0.0684 0.0598 0 0 1.71E-02 0.00E+00 0.00E+00 1.71E-02 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 2.56E-02 #_79
-1994 1 3 0 2 2 -1 -1 8.00E+00 0 0.00E+00 0 0.1196
0.6627 0.1148 0.0742 0 0 0.0287 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_483
1995 1 3 0 2 2 -1 -1 1.22E+01 0 0.00E+00 0 0.3778
0.4601 0.1404 0 0 0 0.0217 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_80
-1996 1 3 0 2 2 -1 -1 6.00E+00 0 0.00E+00 0 0
0.4 0.3 0.3 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_463
1997 1 3 0 2 2 -1 -1 2.06E+01 0 0.00E+00 0.2028 0.1174
0.3986 0.1874 0.0937 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_81
1998 1 3 0 2 2 -1 -1 3.42E+00 0 0.00E+00 0 0.0511
0.1192 0.2384 0.3431 0.2482 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_82
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1999	1	3	0	2	2	-1	-1	1.95E+01	0	0.00E+00	0	0.0354
	0.4869	0.1797	0.2112	0.0351	0	0.0351	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.65E-02	#_83						
2000	1	3	0	2	2	-1	-1	1.73E+01	0	0.00E+00	0	0.0335
	0.1644	0.4516	0.1481	0.0814	0.0376	0.0575	0.00E+00	8.00E-03	0.00E+00	6.00E-03	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	4.00E-03	0.00E+00	7.97E-03	#_84						
2001	1	3	0	2	2	-1	-1	2.00E+02	0	0.00E+00	0.0165	0.0517
	0.3257	0.3014	0.2574	0.0439	0.0033	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_85						
2002	1	3	0	2	2	-1	-1	2.48E+01	0	3.65E-02	0.0808	0.2008
	0.1788	0.1445	0.182	0.0816	0.0223	0.0149	1.18E-02	3.90E-03	0.00E+00	0.00E+00	0.00E+00	2.40E-03
	0.00E+00	0.00E+00	3.90E-03	0.00E+00	3.59E-02	#_86						
2003	1	3	0	2	2	-1	-1	4.80E+01	0	0.00E+00	0.0073	0.1291
	0.2279	0.2046	0.1403	0.0871	0.0952	0.0547	6.40E-03	2.00E-03	6.40E-03	1.75E-02	6.40E-03	1.80E-03
	0.00E+00	6.40E-03	0.00E+00	0.00E+00	7.05E-03	#_87						
2004	1	3	0	2	2	-1	-1	4.35E+00	0	0.00E+00	0.0066	0.1097
	0.1901	0.1208	0.0351	0.019	0.0131	0	2.80E-03	1.20E-03	0.00E+00	0.00E+00	0.00E+00	1.67E-01
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E-01	#_88						
2005	1	3	0	2	2	-1	-1	5.10E+01	0	0.00E+00	0.0394	0.2113
	0.325	0.2967	0.0986	0.0246	0	0	3.20E-03	0.00E+00	1.20E-03	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_89						
2006	1	3	0	2	2	-1	-1	7.06E+01	0	0.00E+00	0.0236	0.0981
	0.3724	0.2088	0.2231	0.0537	0.0158	0.0023	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	2.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_90						
2007	1	3	0	2	2	-1	-1	4.90E+01	0	4.12E-02	0.109	0.152
	0.2942	0.2217	0.1073	0.0446	0.0208	0.0093	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_91						
2008	1	3	0	2	2	-1	-1	5.86E+01	0	0.00E+00	0.0106	0.1132
	0.3091	0.3255	0.095	0.0427	0.0247	0.0212	8.90E-03	6.60E-03	7.70E-03	2.20E-03	6.60E-03	5.40E-03
	5.80E-03	2.70E-03	0.00E+00	0.00E+00	1.21E-02	#_92						
2009	1	3	0	2	2	-1	-1	3.35E+01	0	0.00E+00	0.0041	0.0863
	0.4227	0.2281	0.1966	0.0218	0.0076	0.0144	0.00E+00	0.00E+00	0.00E+00	4.90E-03	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E-02	#_93						
2010	1	3	0	2	2	-1	-1	3.48E+01	0	0.00E+00	0.0044	0.0597
	0.3206	0.4206	0.1236	0.0547	0.014	0.0024	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_94						
2011	1	3	0	2	2	-1	-1	8.50E+01	0	0.00E+00	0	0.0284
	0.2182	0.3799	0.2447	0.0921	0.0245	0.0087	0.00E+00	3.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_95						
2012	1	3	0	2	2	-1	-1	2.74E+01	0	1.35E-02	0.0946	0.1666
	0.1172	0.2449	0.2312	0.0917	0.0246	0.0117	4.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_96						
2013	1	3	0	2	2	-1	-1	5.46E+01	0	0.00E+00	0.0039	0.0614
	0.0796	0.2518	0.2247	0.2061	0.1394	0.0202	3.80E-03	2.80E-03	2.20E-03	1.40E-03	1.20E-03	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E-03	#_97						
2014	1	3	0	2	2	-1	-1	7.70E+01	0	0.00E+00	0.0051	0.0772
	0.1747	0.1433	0.1913	0.1271	0.1395	0.1034	3.14E-02	5.20E-03	0.00E+00	1.80E-03	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_98						
2015	1	3	0	2	2	-1	-1	5.72E+01	0	5.30E-03	0.0431	0.1404
	0.2105	0.1515	0.1183	0.1299	0.0796	0.0691	3.81E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	2.50E-03
	0.00E+00	0.00E+00	0.00E+00	6.00E-04	1.15E-03	#_99						
2016	1	3	0	2	2	-1	-1	4.94E+01	0	1.30E-03	0.0457	0.0604
	0.0794	0.2124	0.1673	0.1273	0.1256	0.0918	5.57E-02	2.67E-02	4.20E-03	5.00E-04	0.00E+00	7.00E-04
	6.00E-04	0.00E+00	0.00E+00	5.00E-04	0.00E+00	#_100						
-2008	1	4	0	1	2	-1	-1	7.00E+00	0	3.59E-03	0.097776481	
	0.42506942		0.3165758	0.11507959		0.03207693		0.007899075		0.001617079		
	0.000319759		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	#_471										
-2010	1	4	0	1	2	-1	-1	6.00E+00	0	3.12E-03	0.144060755	
	0.1684474	0.151776	0.14233952		0.12939861		0.089212232		0.051033549		0.034324415	
	2.37E-02	1.57E-02	1.30E-02	8.05E-03	5.83E-03	4.60E-03	4.38E-03	2.80E-03	1.86E-03	8.74E-04	5.57E-03	#_481
-2012	1	4	0	1	2	-1	-1	1.00E+00	0	0.00E+00	0	0
	0.0403226	0.17193548		0.27387097		0.212903226		0.12483871		0.072258065		4.06E-02
	2.52E-02	8.06E-03	9.68E-03	7.10E-03	5.48E-03	2.90E-03	1.61E-03	1.29E-03	6.45E-04	1.29E-03	#_460	
-2013	1	4	0	1	2	-1	-1	3.70E+01	0	8.59E-05	0.002110881	
	0.03305841		0.1049165	0.14131403		0.14915947		0.128801688		0.098887769		
	0.071615634		5.70E-02	4.01E-02	3.27E-02	2.25E-02	2.07E-02	1.96E-02	1.67E-02	9.09E-03	8.88E-03	5.53E-03
	3.73E-02	#_479										
-2014	1	4	0	1	2	-1	-1	1.00E+01	0	4.65E-05	0.001324428	
	0.02212598		0.1019207	0.14593689		0.14183439		0.12045645		0.090670039		

0.066735692 5.32E-02 3.64E-02 3.31E-02 2.22E-02 2.05E-02 1.77E-02 1.66E-02 8.11E-03 1.05E-02 5.78E-03
8.48E-02 #_475
-2015 1 4 0 1 2 -1 -1 1.00E+00 0 1.35E-02 0.72972973
0.25675676 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_476
-2016 1 4 0 1 2 -1 -1 5.70E+01 0 0.00E+00 0.000125001
0.00200228 0.0154014 0.05357646 0.11181311 0.141445069 0.128862574
0.102664534 8.47E-02 5.98E-02 5.37E-02 3.60E-02 3.29E-02 3.13E-02 2.64E-02 1.58E-02 1.64E-02 9.27E-03
7.79E-02 #_478
1993 1 4 0 2 2 -1 -1 1.86E+00 0 0.00E+00 0.4696 0.5258
0.0046 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_101
1998 1 4 0 2 2 -1 -1 2.42E+01 0 0.00E+00 0.0034 0.0514
0.1134 0.2757 0.1016 0.0802 0.0775 0.0451 5.33E-02 4.43E-02 3.18E-02 3.19E-02 1.70E-02 1.82E-02
1.98E-02 7.70E-03 7.80E-03 2.50E-03 1.73E-02 #_102
1999 1 4 0 2 2 -1 -1 5.27E+00 0 0.00E+00 0 0.2036
0.4373 0.1354 0.0489 0 0.1748 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_103
2000 1 4 0 2 2 -1 -1 4.59E+01 0 0.00E+00 0 0.0145
0.0261 0.1264 0.1573 0.1878 0.1244 0.0817 3.90E-02 4.37E-02 3.26E-02 2.72E-02 6.30E-03 1.30E-02
1.31E-02 2.60E-03 0.00E+00 2.90E-03 1.01E-01 #_104
2001 1 4 0 2 2 -1 -1 6.90E+01 0 0.00E+00 0 0
0.0208 0.0489 0.1911 0.1338 0.1098 0.1171 6.17E-02 6.33E-02 3.53E-02 5.77E-02 2.20E-02 1.35E-02
3.71E-02 6.60E-03 8.40E-03 1.79E-02 5.49E-02 #_105
2002 1 4 0 2 2 -1 -1 2.42E+01 0 2.80E-03 0.0233 0.1734
0.0897 0.1871 0.0753 0.0933 0.0693 0.0389 4.06E-02 3.11E-02 2.90E-02 1.81E-02 2.25E-02 2.07E-02
1.87E-02 1.91E-02 7.50E-03 1.90E-03 3.79E-02 #_106
2003 1 4 0 2 2 -1 -1 2.87E+01 0 0.00E+00 0 0
0.0039 0.0309 0.0309 0.0734 0.1429 0.084 8.84E-02 6.55E-02 8.84E-02 4.23E-02 4.60E-02 4.95E-02
6.67E-02 3.09E-02 1.91E-02 1.14E-02 1.26E-01 #_107
2004 1 4 0 2 2 -1 -1 7.32E+01 0 0.00E+00 0 0.0289
0.1655 0.0836 0.0847 0.0801 0.0713 0.071 7.17E-02 4.35E-02 6.05E-02 4.17E-02 4.23E-02 3.16E-02
2.36E-02 1.24E-02 1.38E-02 9.10E-03 6.50E-02 #_108
2005 1 4 0 2 2 -1 -1 1.60E+02 0 0.00E+00 0 0.054
0.0568 0.1433 0.1196 0.1037 0.0991 0.1055 5.69E-02 5.19E-02 4.89E-02 5.03E-02 3.68E-02 1.55E-02
2.42E-02 0.00E+00 3.80E-03 4.30E-03 2.55E-02 #_109
2006 1 4 0 2 2 -1 -1 1.95E+02 0 0.00E+00 0 0.0136
0.0579 0.0883 0.1315 0.1591 0.1008 0.0744 9.28E-02 5.59E-02 5.12E-02 3.84E-02 3.51E-02 2.17E-02
1.67E-02 1.33E-02 3.60E-03 5.40E-03 4.02E-02 #_110
2007 1 4 0 2 2 -1 -1 2.78E+01 0 0.00E+00 0.0027 0.011
0.045 0.0883 0.1928 0.1817 0.1046 0.0858 6.21E-02 6.75E-02 1.67E-02 3.04E-02 1.43E-02 2.80E-02
2.51E-02 8.40E-03 1.10E-02 2.70E-03 2.20E-02 #_111
2008 1 4 0 2 2 -1 -1 3.93E+01 0 0.00E+00 0.0031 0.032
0.0927 0.0952 0.1595 0.1607 0.1364 0.0825 7.82E-02 2.69E-02 3.67E-02 5.60E-03 1.21E-02 1.45E-02
8.70E-03 8.70E-03 6.60E-03 0.00E+00 3.99E-02 #_112
2009 1 4 0 2 2 -1 -1 4.36E+01 0 0.00E+00 0 0.007
0.049 0.1108 0.1056 0.0793 0.0722 0.1783 1.07E-01 7.34E-02 3.48E-02 2.51E-02 4.70E-02 2.23E-02
1.45E-02 1.13E-02 4.20E-03 7.20E-03 5.08E-02 #_113
2010 1 4 0 2 2 -1 -1 1.49E+01 0 0.00E+00 0 0.0941
0.2471 0.2824 0.1882 0.0588 0.0118 0.0471 0.00E+00 2.35E-02 1.18E-02 0.00E+00 1.18E-02 0.00E+00
0.00E+00 1.18E-02 0.00E+00 0.00E+00 1.18E-02 #_114
2011 1 4 0 2 2 -1 -1 1.58E+01 0 0.00E+00 0 0
0.2143 0.2857 0.2143 0.1429 0.0714 0.0714 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_115
2012 1 4 0 2 2 -1 -1 6.94E+01 0 0.00E+00 0 0.0764
0.0382 0.0833 0.1854 0.1834 0.0898 0.0642 8.87E-02 4.86E-02 1.27E-02 1.54E-02 2.68E-02 1.46E-02
6.40E-03 2.63E-02 6.40E-03 8.00E-03 2.55E-02 #_116
2013 1 4 0 2 2 -1 -1 2.67E+01 0 0.00E+00 0.0069 0.0702
0.0988 0.0224 0.0285 0.0943 0.1433 0.1834 5.02E-02 5.28E-02 1.50E-02 2.66E-02 5.07E-02 5.21E-02
2.43E-02 1.64E-02 0.00E+00 3.82E-02 2.57E-02 #_117
2014 1 4 0 2 2 -1 -1 4.21E+01 0 0.00E+00 0 0
0 0.0152 0.0632 0.1142 0.1787 0.1851 1.75E-01 1.29E-02 2.57E-02 3.79E-02 4.13E-02 4.07E-02
0.00E+00 2.44E-02 2.44E-02 3.66E-02 2.44E-02 #_118
2015 1 4 0 2 2 -1 -1 1.09E+02 0 0.00E+00 0 0.0473
0.0649 0.0553 0.07 0.1074 0.132 0.1294 1.21E-01 9.04E-02 3.72E-02 2.89E-02 2.76E-02 1.34E-02
2.26E-02 0.00E+00 1.17E-02 7.60E-03 3.37E-02 #_119
2016 1 4 0 2 2 -1 -1 4.75E+01 0 0.00E+00 0.0062 0.0782
0.1268 0.1159 0.0678 0.1258 0.0405 0.0743 1.51E-01 1.11E-01 5.18E-02 3.11E-02 9.30E-03 0.00E+00
0.00E+00 1.04E-02 0.00E+00 0.00E+00 0.00E+00 #_120

1991	1	5	0	2	2	-1	-1	4.79E+00	0	6.11E-02	0.4293	0.4884
	0.0137	0.0074	0.0001	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_121						
1992	1	5	0	2	2	-1	-1	9.78E+00	0	8.83E-02	0.4283	0.3033
	0.1492	0.0169	0.0124	0	0.0017	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_122						
1993	1	5	0	2	2	-1	-1	8.99E+01	0	3.70E-03	0.5264	0.3153
	0.1136	0.0292	0.0018	0.01	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_123						
1994	1	5	0	2	2	-1	-1	4.32E+01	0	7.10E-03	0.2826	0.4517
	0.1631	0.0621	0.0294	0.0031	0	0.0008	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_124						
1995	1	5	0	2	2	-1	-1	9.77E+00	0	1.97E-02	0.3769	0.2467
	0.2146	0.0788	0.0353	0.0132	0.0019	0.007	4.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E-03	#_125						
1996	1	5	0	2	2	-1	-1	7.43E+01	0	1.48E-02	0.2055	0.5747
	0.1295	0.0312	0.0009	0.0312	0	0.0122	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_126						
1997	1	5	0	2	2	-1	-1	2.12E+00	0	0.00E+00	0.767	0.1261
	0.0749	0.0125	0.0196	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_127						
1998	1	5	0	2	2	-1	-1	4.64E+01	0	2.40E-03	0.2436	0.58
	0.1343	0.0324	0.0063	0.0002	0.0007	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_128						
1999	1	5	0	2	2	-1	-1	4.35E+01	0	0.00E+00	0.0521	0.4911
	0.4102	0.037	0.0083	0.0011	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.19E-05	#_129						
2000	1	5	0	2	2	-1	-1	1.62E+01	0	0.00E+00	0.0734	0.5883
	0.2762	0.0577	0.0044	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_130						
2001	1	5	0	2	2	-1	-1	6.58E+00	0	0.00E+00	0.2978	0.4275
	0.2046	0.0632	0.0035	0.003	0	0.0004	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_131						
2002	1	5	0	2	2	-1	-1	9.52E+01	0	7.50E-03	0.1498	0.4959
	0.1921	0.0939	0.0382	0.0177	0.0034	0.0004	3.00E-04	1.00E-04	1.00E-04	4.00E-04	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.38E-04	#_132						
2003	1	5	0	2	2	-1	-1	4.67E+01	0	7.00E-04	0.1536	0.431
	0.2664	0.0628	0.0477	0.0268	0.0079	0.0016	3.00E-04	0.00E+00	1.00E-04	0.00E+00	3.00E-04	1.00E-04
	0.00E+00	2.00E-04	0.00E+00	0.00E+00	4.69E-04	#_133						
2004	1	5	0	2	2	-1	-1	2.00E+02	0	1.80E-03	0.1207	0.3999
	0.3152	0.1254	0.0187	0.0103	0.0047	0.0017	1.00E-04	3.00E-04	3.00E-04	2.00E-04	0.00E+00	3.00E-04
	0.00E+00	0.00E+00	1.00E-04	0.00E+00	3.02E-04	#_134						
2005	1	5	0	2	2	-1	-1	2.21E+01	0	2.00E-04	0.1801	0.5248
	0.1679	0.0823	0.0333	0.006	0.0031	0.0008	6.00E-04	3.00E-04	0.00E+00	1.00E-04	4.00E-04	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.55E-05	#_135						
2006	1	5	0	2	2	-1	-1	2.11E+01	0	1.30E-03	0.1538	0.4925
	0.2244	0.0585	0.0423	0.0195	0.0019	0.003	3.00E-04	1.30E-03	2.00E-04	3.00E-04	1.00E-04	1.00E-04
	1.00E-04	0.00E+00	0.00E+00	3.00E-04	1.15E-04	#_136						
2007	1	5	0	2	2	-1	-1	8.61E+00	0	0.00E+00	0.0942	0.6506
	0.1958	0.0433	0.0069	0.0045	0.0028	0	6.00E-04	6.00E-04	0.00E+00	7.00E-04	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_137						
2008	1	5	0	2	2	-1	-1	4.50E+01	0	0.00E+00	0.1341	0.4673
	0.2583	0.102	0.0295	0.0088	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_138						
2009	1	5	0	2	2	-1	-1	2.79E+01	0	2.20E-03	0.0044	0.2836
	0.4334	0.2072	0.0483	0.0137	0.0047	0.0025	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_139						
2010	1	5	0	2	2	-1	-1	2.32E+01	0	0.00E+00	0.0055	0.1425
	0.466	0.2311	0.103	0.0319	0.0125	0.0048	8.00E-04	1.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_140						
2011	1	5	0	2	2	-1	-1	1.39E+01	0	0.00E+00	0.001	0.0361
	0.2016	0.4167	0.2389	0.0762	0.023	0.0044	1.80E-03	3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_141						
2012	1	5	0	2	2	-1	-1	2.50E+01	0	0.00E+00	0.0009	0.0774
	0.1097	0.2744	0.3134	0.1576	0.0536	0.0077	2.50E-03	1.00E-03	4.00E-04	2.00E-04	0.00E+00	0.00E+00
	0.00E+00	4.00E-04	2.00E-04	0.00E+00	5.80E-04	#_142						
2013	1	5	0	2	2	-1	-1	2.36E+01	0	0.00E+00	0.0277	0.064
	0.1386	0.0962	0.3037	0.2226	0.1026	0.032	6.10E-03	1.00E-03	1.60E-03	1.40E-03	0.00E+00	0.00E+00
	4.00E-04	2.00E-04	1.30E-03	0.00E+00	6.07E-04	#_143						

2014	1	5	0	2	2	-1	-1	1.06E+02	0	0.00E+00	0.0125	0.1865
	0.1695	0.1426	0.0773	0.1976	0.1453	0.0441	1.95E-02	2.30E-03	0.00E+00	2.10E-03	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.26E-04	#_144						
2015	1	5	0	2	2	-1	-1	2.00E+02	0	2.00E-04	0.0133	0.1683
	0.1826	0.1503	0.1262	0.0648	0.1617	0.0895	2.97E-02	9.70E-03	2.10E-03	1.00E-03	4.00E-04	0.00E+00
	0.00E+00	1.00E-04	0.00E+00	0.00E+00	0.00E+00	#_145						
2016	1	5	0	2	2	-1	-1	4.31E+01	0	3.00E-04	0.1449	0.1974
	0.2271	0.1209	0.0595	0.0525	0.0363	0.0777	5.00E-02	2.23E-02	7.10E-03	1.90E-03	4.00E-04	0.00E+00
	1.10E-03	0.00E+00	0.00E+00	0.00E+00	5.89E-04	#_146						
1991	1	6	0	2	2	-1	-1	4.74E+01	0	6.80E-03	0.6671	0.2885
	0.0354	0.0023	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_147						
1992	1	6	0	2	2	-1	-1	2.00E+02	0	0.00E+00	0.3462	0.5312
	0.0809	0.0213	0.012	0.0084	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_148						
1993	1	6	0	2	2	-1	-1	2.93E+00	0	6.90E-03	0.7983	0.1783
	0.009	0.0075	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_149						
1998	1	6	0	2	2	-1	-1	1.11E+02	0	4.94E-02	0.1574	0.5193
	0.1898	0.051	0.018	0.0086	0.006	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.46E-04	#_150						
1999	1	6	0	2	2	-1	-1	1.18E+01	0	0.00E+00	0.0374	0.5885
	0.2606	0.0585	0.0461	0.009	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_151						
-2000	1	6	0	2	2	-1	-1	3.00E+00	0	0.00E+00	0	0.2
	0	0	0	0.7	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	1.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_461						
2002	1	6	0	2	2	-1	-1	2.57E+01	0	2.83E-02	0.2288	0.4405
	0.1987	0.0677	0.0132	0.0124	0.0063	0.0017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E-03	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_152						
2003	1	6	0	2	2	-1	-1	3.18E+01	0	0.00E+00	0.064	0.3211
	0.3046	0.1395	0.0832	0.0427	0.0199	0.0113	3.80E-03	0.00E+00	3.30E-03	2.90E-03	1.60E-03	7.00E-04
	7.00E-04	0.00E+00	0.00E+00	0.00E+00	4.22E-04	#_153						
2004	1	6	0	2	2	-1	-1	5.54E+00	0	1.12E-02	0.2837	0.513
	0.1311	0.0362	0.0149	0.0024	0.0034	0.0005	5.00E-04	0.00E+00	0.00E+00	0.00E+00	6.00E-04	0.00E+00
	8.00E-04	0.00E+00	0.00E+00	0.00E+00	1.61E-03	#_154						
2005	1	6	0	2	2	-1	-1	1.46E+02	0	7.30E-03	0.1523	0.4356
	0.1837	0.1063	0.0537	0.0291	0.0177	0.0025	3.00E-03	1.30E-03	3.50E-03	7.00E-04	1.10E-03	0.00E+00
	0.00E+00	0.00E+00	1.00E-03	1.10E-03	0.00E+00	#_155						
2006	1	6	0	2	2	-1	-1	9.66E+01	0	1.20E-03	0.1363	0.546
	0.203	0.0504	0.0319	0.0137	0.0083	0.0019	3.20E-03	9.00E-04	8.00E-04	0.00E+00	0.00E+00	0.00E+00
	9.00E-04	0.00E+00	0.00E+00	3.00E-04	1.14E-03	#_156						
2007	1	6	0	2	2	-1	-1	4.86E+01	0	0.00E+00	0.1024	0.6029
	0.2244	0.0335	0.0143	0.0111	0.004	0.0035	1.40E-03	7.00E-04	1.50E-03	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.33E-04	#_157						
2008	1	6	0	2	2	-1	-1	4.55E+01	0	0.00E+00	0.0545	0.3815
	0.4316	0.106	0.0191	0.0011	0.0036	0.0008	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_158						
2009	1	6	0	2	2	-1	-1	8.19E+01	0	1.80E-03	0.0118	0.2369
	0.3895	0.2616	0.08	0.0058	0.0052	0.0016	0.00E+00	1.90E-03	0.00E+00	0.00E+00	0.00E+00	7.00E-04
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.12E-03	#_159						
2010	1	6	0	2	2	-1	-1	2.00E+02	0	0.00E+00	0	0.1837
	0.3696	0.25	0.1626	0.0299	0	0	0.00E+00	0.00E+00	0.00E+00	8.00E-04	2.50E-03	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.24E-04	#_160						
2011	1	6	0	2	2	-1	-1	1.34E+02	0	0.00E+00	0.042	0.0735
	0.2752	0.2905	0.2289	0.0746	0.0076	0.0046	0.00E+00	1.20E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.85E-03	#_161						
2012	1	6	0	2	2	-1	-1	1.52E+02	0	0.00E+00	0	0.1852
	0.126	0.2302	0.2594	0.124	0.0545	0.0103	2.30E-03	0.00E+00	2.50E-03	0.00E+00	1.40E-03	0.00E+00
	1.20E-03	0.00E+00	1.40E-03	0.00E+00	1.74E-03	#_162						
2013	1	6	0	2	2	-1	-1	3.59E+01	0	2.90E-03	0.0494	0.1056
	0.4311	0.099	0.1266	0.1184	0.0403	0.0135	6.90E-03	0.00E+00	8.00E-04	7.00E-04	1.80E-03	4.00E-04
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.49E-03	#_163						
2014	1	6	0	2	2	-1	-1	3.24E+01	0	0.00E+00	0.0264	0.2597
	0.1246	0.2822	0.0525	0.1242	0.0902	0.0306	6.20E-03	3.30E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_164						
2015	1	6	0	2	2	-1	-1	7.50E+01	0	2.40E-03	0.0149	0.2415
	0.26	0.1069	0.1648	0.0579	0.0668	0.0526	1.99E-02	1.02E-02	1.70E-03	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.66E-04	#_165						

2016	1	6	0	2	2	-1	-1	1.42E+02	0	2.70E-03	0.0154	0.0844
	0.3188	0.1925	0.0997	0.092	0.0687	0.0441	4.06E-02	2.30E-02	6.50E-03	4.50E-03	9.00E-04	1.10E-03
	1.00E-03	3.00E-03	1.20E-03	0.00E+00	0.00E+00	#_166						
2005	1	7	0	1	2	-1	-1	2.58E+01	0	1.26E-01	0.408464948	
	0.33802689		0.0963299	0.0215121	0.00625318		0.001976088		0.000836546		0.000324067	
	5.34E-05	6.85E-06	1.93E-06	7.53E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_167
2006	1	7	0	1	2	-1	-1	3.84E+01	0	1.35E-01	0.457882728	
	0.32071713		0.0705214	0.01158889		0.0027545	0.000763209		0.000316807		0.000155545	
	3.86E-05	1.25E-05	4.98E-06	2.47E-06	0.00E+00	0.00E+00	2.61E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_168
2007	1	7	0	1	2	-1	-1	4.45E+01	0	1.08E-01	0.414568406	
	0.35464923		0.0950195	0.01995642		0.00564387		0.001601461		0.000605753		
	0.000233331		4.11E-05	9.05E-06	2.70E-06	1.42E-06	0.00E+00	0.00E+00	2.61E-08	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	#_169										
2009	1	7	0	1	2	-1	-1	2.10E+01	0	3.31E-02	0.305267296	
	0.3980255	0.1627737	0.05411089		0.02389686		0.012321948		0.006198005		0.002956806	
	8.93E-04	2.83E-04	8.24E-05	3.95E-05	7.55E-06	9.26E-06	8.57E-06	0.00E+00	0.00E+00	4.05E-06	1.17E-06	#_170
2010	1	7	0	1	2	-1	-1	1.54E+01	0	3.52E-02	0.309214513	
	0.37419245		0.1508237	0.06457966		0.03343543		0.016885439		0.008701075		
	0.00456684		1.56E-03	5.27E-04	1.58E-04	8.77E-05	1.33E-05	1.21E-05	1.68E-05	4.73E-06	4.73E-06	3.31E-06
	1.17E-05	#_171										
2011	1	7	0	1	2	-1	-1	4.29E+01	0	9.39E-03	0.169597852	
	0.38557389		0.2345149	0.10540983		0.0490488	0.024132195		0.012589632		0.006316997	
	2.15E-03	6.95E-04	2.35E-04	1.53E-04	4.79E-05	2.61E-05	2.95E-05	1.22E-05	1.06E-05	9.14E-06	5.79E-05	#_172
2012	1	7	0	1	2	-1	-1	4.26E+01	0	2.13E-02	0.232424693	
	0.39848326		0.1993144	0.07795852		0.03516108		0.017868179		0.009725614		
	0.005077281		1.74E-03	5.68E-04	1.81E-04	1.19E-04	2.84E-05	2.02E-05	2.25E-05	9.30E-06	9.30E-06	3.98E-06
	2.47E-05	#_173										
2013	1	7	0	1	2	-1	-1	1.00E+02	0	2.68E-02	0.274498471	
	0.39499633		0.1797776	0.06797189		0.02950313		0.014078929		0.007263311		
	0.003535432		1.06E-03	3.15E-04	8.97E-05	5.12E-05	9.78E-06	7.78E-06	4.31E-06	0.00E+00	0.00E+00	2.71E-06
	2.36E-06	#_174										
2014	1	7	0	1	2	-1	-1	1.14E+02	0	2.37E-02	0.259017526	
	0.43088929		0.1726616	0.05921339		0.02869617		0.014266511		0.006908	0.003330951	
	8.18E-04	2.91E-04	1.10E-04	5.06E-05	2.15E-06	4.30E-06	1.03E-05	0.00E+00	0.00E+00	2.15E-06	0.00E+00	#_175
2015	1	7	0	1	2	-1	-1	5.47E+01	0	4.52E-02	0.302422462	
	0.38031945		0.1568511	0.0609904	0.02939442		0.013761902		0.006568874		0.003148113	
	8.77E-04	2.75E-04	9.76E-05	4.75E-05	0.00E+00	0.00E+00	5.51E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_176
2016	1	7	0	1	2	-1	-1	8.04E+01	0	8.93E-02	0.348883637	
	0.35129321		0.1284568	0.04302088		0.01914397		0.009732531		0.00541032		
	0.002945597		1.13E-03	4.01E-04	1.41E-04	9.20E-05	2.12E-05	1.42E-05	2.01E-05	9.20E-06	9.20E-06	1.80E-06
	2.28E-05	#_177										
1991	1	7	0	2	2	-1	-1	5.69E+00	0	0.00E+00	0.6456	0.3251
	0.0293	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_178						
1992	1	7	0	2	2	-1	-1	5.82E+00	0	0.00E+00	0.3734	0.5074
	0.0688	0.0165	0.0242	0.0096	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_179						
1993	1	7	0	2	2	-1	-1	6.62E+00	0	0.00E+00	0.4712	0.3908
	0.1145	0.0154	0.0081	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_180						
1994	1	7	0	2	2	-1	-1	9.35E+00	0	3.90E-02	0.2526	0.494
	0.1341	0.0594	0.0162	0.0024	0.0024	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_181						
1995	1	7	0	2	2	-1	-1	1.23E+00	0	3.35E-01	0.4808	0.0611
	0.1207	0	0	0.0028	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_182						
1996	1	7	0	2	2	-1	-1	3.62E+00	0	1.34E-02	0.409	0.5032
	0.0582	0.0151	0	0.0011	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_183						
1997	1	7	0	2	2	-1	-1	2.18E+00	0	0.00E+00	0.5781	0.409
	0.011	0.0019	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_184						
1998	1	7	0	2	2	-1	-1	1.91E+01	0	0.00E+00	0.1856	0.7017
	0.1013	0.0074	0.0022	0.0002	0.0014	0.0002	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_185						
1999	1	7	0	2	2	-1	-1	6.64E+00	0	0.00E+00	0.0167	0.2677
	0.4094	0.2908	0.003	0.0112	0	0	0.00E+00	1.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_186						

2000	1	7	0	2	2	-1	-1	1.22E+01	0	0.00E+00	0.1602	0.5305
	0.2506	0.0547	0	0.0041	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_187						
2001	1	7	0	2	2	-1	-1	1.82E+00	0	1.80E-03	0.1976	0.134
	0.1246	0.0254	0.0077	0.0039	0	0.505	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_188						
2002	1	7	0	2	2	-1	-1	6.86E+00	0	0.00E+00	0.0918	0.7649
	0.0728	0.0456	0.0178	0.0062	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-04
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_189						
2003	1	7	0	2	2	-1	-1	1.79E+01	0	0.00E+00	0.1867	0.4828
	0.3243	0	0.0033	0.0005	0.0019	0	0.00E+00	0.00E+00	5.00E-04	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_190						
2004	1	7	0	2	2	-1	-1	5.38E+01	0	0.00E+00	0.0139	0.4857
	0.2926	0.14	0.0231	0.0177	0.0271	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_191						
2005	1	7	0	2	2	-1	-1	2.88E+01	0	0.00E+00	0.0634	0.5598
	0.2333	0.055	0.0838	0.0031	0	0	1.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_192						
2006	1	7	0	2	2	-1	-1	2.97E+01	0	0.00E+00	0.1528	0.3338
	0.3529	0.1129	0.0151	0.0247	0.0038	0.0039	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_193						
2007	1	7	0	2	2	-1	-1	9.77E+00	0	0.00E+00	0.0594	0.6182
	0.2485	0.0242	0.0038	0.0007	0.0141	0.0156	1.56E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_194						
2008	1	7	0	2	2	-1	-1	8.72E+00	0	0.00E+00	0.1113	0.579
	0.2268	0.0616	0.0169	0.0044	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_195						
2009	1	7	0	2	2	-1	-1	3.94E+01	0	0.00E+00	0.0087	0.4781
	0.3138	0.1377	0.0472	0.0091	0.0054	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_196						
2010	1	7	0	2	2	-1	-1	1.15E+02	0	0.00E+00	0.0073	0.2691
	0.4514	0.1754	0.0655	0.0249	0.0063	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_197						
2011	1	7	0	2	2	-1	-1	5.43E+01	0	0.00E+00	0	0.1345
	0.417	0.3107	0.1038	0.0235	0.0105	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_198						
2012	1	7	0	2	2	-1	-1	2.00E+02	0	0.00E+00	0.0028	0.1434
	0.224	0.2986	0.1982	0.0765	0.0195	0.0185	1.05E-02	5.60E-03	0.00E+00	0.00E+00	0.00E+00	2.40E-03
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_199						
2013	1	7	0	2	2	-1	-1	8.94E+01	0	0.00E+00	0.0125	0.14
	0.2333	0.1137	0.2486	0.1594	0.0564	0.0255	6.50E-03	3.10E-03	0.00E+00	7.00E-04	3.00E-04	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_200						
2014	1	7	0	2	2	-1	-1	3.53E+01	0	0.00E+00	0.0053	0.2202
	0.1244	0.2022	0.0763	0.1755	0.1189	0.0594	1.09E-02	4.50E-03	1.50E-03	0.00E+00	9.00E-04	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_201						
2015	1	7	0	2	2	-1	-1	5.11E+01	0	6.00E-04	0.011	0.1858
	0.2532	0.0946	0.1099	0.06	0.1216	0.1089	3.80E-02	9.20E-03	1.60E-03	4.70E-03	0.00E+00	0.00E+00
	9.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_202						
2016	1	7	0	2	2	-1	-1	4.64E+01	0	0.00E+00	0.0526	0.1687
	0.3731	0.1416	0.0949	0.0724	0.0395	0.0265	2.06E-02	7.40E-03	9.00E-04	5.00E-04	1.30E-03	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_203						
1991	1	8	0	2	2	-1	-1	1.99E+01	0	0.00E+00	0.4383	0.4238
	0.0758	0.0461	0.0091	0.0054	0.0015	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_204						
1992	1	8	0	2	2	-1	-1	3.74E+00	0	0.00E+00	0.1293	0.852
	0.0025	0.0078	0.0038	0.0037	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.31E-04	#_205						
1993	1	8	0	2	2	-1	-1	6.30E+01	0	4.10E-03	0.2535	0.41
	0.2706	0.0455	0.0109	0.0032	0.002	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_206						
1994	1	8	0	2	2	-1	-1	6.98E+00	0	1.28E-02	0.4332	0.3811
	0.1198	0.0416	0.0088	0.0009	0.0019	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_207						
1995	1	8	0	2	2	-1	-1	1.42E+00	0	0.00E+00	0.7518	0.2482
	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_208						
1998	1	8	0	2	2	-1	-1	1.68E+02	0	8.00E-04	0.0837	0.437
	0.28	0.1183	0.0486	0.0154	0.0076	0.0036	6.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-04
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.23E-03	#_209						

1999	1	8	0	2	2	-1	-1	6.40E+01	0	0.00E+00	0.0238	0.3351
	0.3924	0.1276	0.0735	0.017	0.0119	0.0031	1.02E-02	0.00E+00	1.50E-03	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.82E-03	#_210						
2000	1	8	0	2	2	-1	-1	4.22E+00	0	0.00E+00	0.2314	0.5537
	0.1347	0.0399	0.0277	0.007	0.0029	0	8.00E-04	0.00E+00	7.00E-04	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	3.00E-04	3.00E-04	0.00E+00	4.70E-04	#_211						
2001	1	8	0	2	2	-1	-1	5.33E+00	0	0.00E+00	0.367	0.2939
	0.116	0.0975	0.0339	0.0688	0.014	0.0045	6.00E-04	2.80E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-03	#_212						
2002	1	8	0	2	2	-1	-1	1.28E+01	0	4.31E-02	0.1302	0.5157
	0.1603	0.0777	0.0305	0.0349	0	0.0038	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E-03	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.19E-03	#_213						
2003	1	8	0	2	2	-1	-1	1.32E+01	0	0.00E+00	0.2441	0.3231
	0.2423	0.1324	0.0359	0	0.0112	0.011	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_214						
2004	1	8	0	2	2	-1	-1	8.76E+00	0	0.00E+00	0.2926	0.2797
	0.1963	0.1262	0.0466	0.0181	0.0069	0.0243	0.00E+00	3.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	6.20E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_215						
2005	1	8	0	2	2	-1	-1	8.94E+00	0	0.00E+00	0.2962	0.3862
	0.1227	0.0882	0.0773	0.01	0.0048	0.003	0.00E+00	3.00E-03	8.60E-03	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_216						
2006	1	8	0	2	2	-1	-1	1.21E+01	0	0.00E+00	0.1422	0.5446
	0.234	0.0204	0.0139	0.0254	0.0167	0.0028	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_217						
2007	1	8	0	2	2	-1	-1	1.30E+01	0	0.00E+00	0.0199	0.5547
	0.3867	0.0359	0.0027	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_218						
2008	1	8	0	2	2	-1	-1	6.05E+01	0	0.00E+00	0	0.1883
	0.5595	0.1775	0.0623	0.0123	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_219						
2009	1	8	0	2	2	-1	-1	1.43E+02	0	0.00E+00	0	0.1118
	0.395	0.3475	0.0986	0.01	0.0044	0.0051	1.01E-02	4.40E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	3.60E-03	0.00E+00	0.00E+00	0.00E+00	9.49E-03	#_220						
2010	1	8	0	2	2	-1	-1	2.54E+01	0	0.00E+00	0	0.1008
	0.2575	0.3696	0.1875	0.0511	0.0241	0.0075	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.89E-03	#_221						
2011	1	8	0	2	2	-1	-1	2.00E+02	0	0.00E+00	0.0023	0.0621
	0.2104	0.3113	0.2566	0.1187	0.0247	0.0123	0.00E+00	1.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_222						
2012	1	8	0	2	2	-1	-1	4.20E+01	0	0.00E+00	0	0.055
	0.0816	0.3376	0.3449	0.1103	0.0508	0.0056	7.70E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	3.30E-03	3.30E-03	#_223						
2013	1	8	0	2	2	-1	-1	6.41E+01	0	0.00E+00	0.004	0.0674
	0.4169	0.2	0.1807	0.083	0.0303	0.0127	1.20E-03	5.00E-04	7.00E-04	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.59E-03	#_224						
2014	1	8	0	2	2	-1	-1	4.23E+01	0	6.00E-04	0.0026	0.0347
	0.1963	0.4464	0.1476	0.0835	0.0447	0.0257	1.19E-02	2.30E-03	0.00E+00	8.00E-04	0.00E+00	7.00E-04
	1.40E-03	7.00E-04	0.00E+00	0.00E+00	0.00E+00	#_225						
2015	1	8	0	2	2	-1	-1	5.10E+01	0	0.00E+00	0	0.0313
	0.2575	0.3731	0.2231	0.0719	0.0284	0.0093	4.40E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.98E-04	#_226						
2016	1	8	0	2	2	-1	-1	1.44E+02	0	0.00E+00	0.0016	0.0194
	0.3342	0.3082	0.2009	0.0812	0.021	0.0198	6.30E-03	2.20E-03	1.60E-03	2.70E-03	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.95E-04	#_227						
2007	1	9	0	1	2	-1	-1	2.00E+02	0	3.90E-02	0.242160289	
	0.36023713		0.2023368	0.08631757		0.03752036		0.01763328		0.00896936		
	0.004204561		1.16E-03	2.79E-04	8.92E-05	3.75E-05	2.16E-06	1.98E-06	3.02E-06	0.00E+00	0.00E+00	7.57E-07
	4.66E-07	#_228										
2008	1	9	0	1	2	-1	-1	1.69E+01	0	2.13E-03	0.091646995	
	0.26848022		0.2704778	0.18038206		0.09422474		0.047147151		0.02506379		
	0.013278379		4.57E-03	1.39E-03	4.42E-04	3.28E-04	1.40E-04	6.00E-05	3.58E-05	7.96E-06	0.00E+00	3.67E-05
	1.62E-04	#_229										
2009	1	9	0	1	2	-1	-1	2.74E+01	0	5.36E-03	0.099330581	
	0.26955156		0.2544461	0.16674449		0.09568563		0.052714233		0.029371897		
	0.016294242		6.20E-03	2.14E-03	7.01E-04	4.51E-04	1.50E-04	6.92E-05	9.23E-05	9.38E-05	6.93E-05	3.46E-05
	4.96E-04	#_230										
2010	1	9	0	1	2	-1	-1	9.10E+00	0	2.50E-02	0.323366212	
	0.34234305		0.1335316	0.06687399		0.04235001		0.029334469		0.018930859		
	0.011213602		4.43E-03	1.61E-03	4.56E-04	3.02E-04	8.50E-05	6.60E-05	3.01E-05	0.00E+00	0.00E+00	2.26E-05
	2.08E-05	#_231										

2011 1 9 0 1 2 -1 -1 6.60E+01 0 3.82E-03 0.036609051
0.15119588 0.2605482 0.23060664 0.14985709 0.083728404 0.045525214
0.025084372 8.59E-03 2.83E-03 8.62E-04 4.67E-04 6.69E-05 5.96E-05 6.99E-05 1.40E-05 1.40E-05 1.86E-05
4.10E-05 #_232
2012 1 9 0 1 2 -1 -1 6.28E+01 0 3.23E-02 0.14036632
0.25998203 0.2236224 0.14515511 0.09144124 0.054003391 0.029356612
0.015715441 5.34E-03 1.75E-03 5.47E-04 2.58E-04 3.74E-05 4.56E-05 5.95E-05 7.67E-06 7.67E-06 1.78E-05
2.02E-05 #_233
2013 1 9 0 1 2 -1 -1 1.35E+01 0 4.76E-02 0.273617467
0.31218321 0.1580391 0.10419462 0.05753605 0.02588981 0.01211185
0.006010397 1.97E-03 6.82E-04 9.68E-05 8.33E-05 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 #_234
2014 1 9 0 1 2 -1 -1 9.36E+01 0 2.19E-03 0.071851099
0.18471195 0.2195576 0.18282872 0.13422566 0.091476458 0.055995671
0.033895021 1.37E-02 5.02E-03 1.66E-03 1.20E-03 4.58E-04 2.70E-04 2.27E-04 6.57E-05 5.01E-05 1.13E-04
4.54E-04 #_235
2015 1 9 0 1 2 -1 -1 2.00E+02 0 5.96E-03 0.123169401
0.26868883 0.210975 0.13114715 0.08830626 0.065165201 0.045154957
0.031224053 1.53E-02 6.23E-03 2.41E-03 2.26E-03 1.16E-03 5.40E-04 4.22E-04 1.69E-04 1.15E-04 2.55E-04
1.37E-03 #_236
2016 1 9 0 1 2 -1 -1 5.48E+01 0 9.34E-02 0.26687445
0.2453382 0.1387678 0.07920964 0.04579306 0.04088233 0.035356296 0.026058712
1.48E-02 6.13E-03 2.22E-03 1.99E-03 8.34E-04 4.26E-04 4.21E-04 2.15E-04 1.90E-04 1.30E-04 9.78E-04 #_237
2007 1 10 0 1 2 -1 -1 8.24E+01 0 4.56E-03 0.169553279
0.37155791 0.2564855 0.11576377 0.04302332 0.015899367 0.006608784
0.003351102 2.15E-03 1.38E-03 1.12E-03 7.78E-04 8.58E-04 8.49E-04 6.50E-04 3.94E-04 5.43E-04 2.72E-04
4.20E-03 #_238
2010 1 10 0 1 2 -1 -1 2.00E+02 0 1.69E-03 0.046022115
0.2509591 0.3080805 0.19657449 0.09821648 0.043706842 0.018935901 0.009604797
5.29E-03 3.24E-03 2.05E-03 1.57E-03 1.78E-03 1.96E-03 1.11E-03 1.03E-03 1.23E-03 5.31E-04 6.42E-03 #_239
2012 1 10 0 1 2 -1 -1 2.35E+01 0 2.94E-03 0.100039648
0.2396648 0.2745746 0.19500297 0.0975651 0.042009012 0.019132376 0.009804897 5.88E-03
3.52E-03 2.46E-03 1.63E-03 1.25E-03 1.04E-03 9.34E-04 4.80E-04 4.21E-04 2.69E-04 1.38E-03 #_240
2013 1 10 0 1 2 -1 -1 4.69E+01 0 1.73E-03 0.049934731
0.24290776 0.2987056 0.21880712 0.11410478 0.044650375 0.016511504
0.007003275 2.93E-03 1.31E-03 7.50E-04 2.99E-04 1.59E-04 1.10E-04 6.11E-05 2.44E-05 0.00E+00 0.00E+00
0.00E+00 #_241
2014 1 10 0 1 2 -1 -1 4.73E+01 0 2.20E-03 0.065340346
0.2953211 0.3361745 0.18963117 0.07358151 0.025597573 0.00787751 0.002656399
9.14E-04 3.93E-04 1.62E-04 7.65E-05 3.38E-05 2.10E-05 1.59E-05 6.36E-06 0.00E+00 0.00E+00 0.00E+00 #_242
-2016 1 10 0 1 2 -1 -1 8.00E+00 0 9.94E-04 0.036301618
0.20764933 0.352113 0.25098534 0.10056079 0.034634663 0.011065111
0.003622018 1.32E-03 5.29E-04 1.34E-04 8.91E-05 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 #_472
1992 1 13 0 1 2 -1 -1 7.75E+00 0.8762 1.24E-01 0.0001 0
0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_243
1993 1 13 0 1 2 -1 -1 2.00E+02 0.8337 1.66E-01 0.0004 0
0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_244
1994 1 13 0 1 2 -1 -1 2.17E+00 0.5327 4.56E-01 0.0116 0
0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_245
1995 1 13 0 1 2 -1 -1 7.91E+00 0.7922 2.08E-01 0.0001 0
0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_246
1996 1 13 0 1 2 -1 -1 6.14E+01 0.8217 1.78E-01 0.0002 0
0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_247
-1997 1 13 0 1 2 -1 -1 1.00E+00 0 1.00E+00 0 0
0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_465
1999 1 13 0 1 2 -1 -1 2.00E+02 0.897727273 9.09E-02
0.011363636 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_248
2000 1 13 0 1 2 -1 -1 1.68E+00 0.520598389 4.68E-01
0.011047181 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_249

2001	1	13	0	1	2	-1	-1	3.48E+01	0.693259973		3.02E-01	
	0.004401651		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_250			
2002	1	13	0	1	2	-1	-1	8.88E+00	0.947910758		2.70E-02	
	0.025051995		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_251			
2003	1	13	0	1	2	-1	-1	1.56E+02	0.762961546		1.97E-01	
	0.040176009		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_252			
2004	1	13	0	1	2	-1	-1	2.65E+01	0.91007584		7.52E-02	
	0.014703606		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_253			
2005	1	13	0	1	2	-1	-1	1.18E+01	0.701739851		2.73E-01	
	0.025683513		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_254			
2006	1	13	0	1	2	-1	-1	1.06E+01	0.955010973		4.13E-02	
	0.003657644		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_255			
2007	1	13	0	1	2	-1	-1	1.39E+01	0.875481386		7.96E-02	
	0.044929397		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_256			
2008	1	13	0	1	2	-1	-1	4.21E+01	0.772535805		1.66E-01	
	0.061499579		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_257			
2009	1	13	0	1	2	-1	-1	1.14E+01	0.914670659		7.34E-02	
	0.011976048		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_258			
2010	1	13	0	1	2	-1	-1	3.13E+00	0.532178218		4.60E-01	
	0.007425743		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_259			
2011	1	13	0	1	2	-1	-1	5.36E+00	0.625206612		3.51E-01	
	0.023553719		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_260			
2012	1	13	0	1	2	-1	-1	1.27E+02	0.844115835		1.32E-01	
	0.023413432		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_261			
2013	1	13	0	1	2	-1	-1	2.25E+00	0.553875236		4.41E-01	
	0.005198488		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_262			
2014	1	13	0	1	2	-1	-1	6.54E+01	0.910881925		8.01E-02	
	0.008991141		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_263			
2015	1	13	0	1	2	-1	-1	2.56E+01	0.873703202		1.15E-01	
	0.010975793		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_264			
2016	1	13	0	1	2	-1	-1	2.00E+02	0.634546948		3.43E-01	
	0.022857925		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_265			
-2017	1	13	0	1	2	-1	-1	2.00E+02	0.890700678		9.77E-02	
	0.011624152		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_480			
1992	1	14	0	1	2	-1	-1	1.63E+01	0.8329	1.60E-01	0.0076	0
	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_266						
1993	1	14	0	1	2	-1	-1	2.00E+02	0.761	2.39E-01	0.0001	0
	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_267						
1994	1	14	0	1	2	-1	-1	4.47E+00	0.5736	4.26E-01	0.0004	0
	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_268						
1995	1	14	0	1	2	-1	-1	2.00E+02	0.7969	2.03E-01	0.0002	0
	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_269						
1996	1	14	0	1	2	-1	-1	6.66E+00	0.8553	1.45E-01	0	0
	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_270						
1997	1	14	0	1	2	-1	-1	2.95E+01	0.835249042		1.65E-01	0
	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_271					

1998 1 14 0 1 2 -1 -1 1.98E+02 0.734966592 2.59E-01
0.005567929 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_272
1999 1 14 0 1 2 -1 -1 1.84E+01 0.910259203 8.57E-02
0.004017522 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_273
2000 1 14 0 1 2 -1 -1 3.95E+01 0.806771206 1.85E-01
0.008129143 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_274
2001 1 14 0 1 2 -1 -1 3.94E+01 0.60281308 3.74E-01
0.023204341 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_275
2002 1 14 0 1 2 -1 -1 4.34E+01 0.738418289 2.35E-01
0.026980067 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_276
2003 1 14 0 1 2 -1 -1 2.00E+02 0.781444359 1.96E-01
0.022102287 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_277
2004 1 14 0 1 2 -1 -1 1.03E+00 0.398215254 5.91E-01
0.010945126 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_278
2005 1 14 0 1 2 -1 -1 1.15E+00 0.33158447 6.46E-01
0.022685255 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_279
2006 1 14 0 1 2 -1 -1 2.00E+02 0.737527658 2.50E-01
0.012357534 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_280
2007 1 14 0 1 2 -1 -1 3.57E+01 0.747089379 2.24E-01
0.029128605 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_281
2008 1 14 0 1 2 -1 -1 2.00E+02 0.634011443 3.22E-01
0.04408773 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_282
2009 1 14 0 1 2 -1 -1 2.74E+01 0.915578916 6.46E-02
0.019828617 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_283
2010 1 14 0 1 2 -1 -1 4.83E+01 0.759674599 2.28E-01
0.012139182 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_284
2011 1 14 0 1 2 -1 -1 1.52E+02 0.713037949 2.67E-01
0.020413627 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_285
2012 1 14 0 1 2 -1 -1 1.27E+01 0.881308123 1.03E-01
0.015260699 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_286
2013 1 14 0 1 2 -1 -1 2.00E+02 0.591711792 3.81E-01
0.027398367 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_287
2014 1 14 0 1 2 -1 -1 1.15E+01 0.883309852 9.50E-02
0.02173913 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_288
2015 1 14 0 1 2 -1 -1 1.17E+01 0.925233413 6.42E-02
0.010574804 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_289
2016 1 14 0 1 2 -1 -1 7.02E+00 0.816247741 1.54E-01
0.029571217 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_290
-2017 1 14 0 1 2 -1 -1 2.00E+02 0.854269059 6.34E-02
0.082295119 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_470
2008 1 15 0 0 2 -1 -1 1.51E+01 0 1.83E-01 0.331474766
0.21088174 0.1354814 0.06266912 0.02966138 0.01577226 0.009853811
0.006901966 4.49E-03 2.14E-03 8.77E-04 8.02E-04 7.20E-04 1.50E-04 1.77E-04 5.84E-04 3.67E-04 2.17E-04
3.79E-03 #_291
2009 1 15 0 0 2 -1 -1 2.00E+02 0 2.35E-02 0.165620248
0.30099585 0.2253882 0.13748694 0.07911415 0.037135287 0.017686169
0.009532474 2.56E-03 7.01E-04 1.66E-04 1.10E-04 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 #_292

2010 1 15 0 0 2 -1 -1 2.86E+01 0 1.40E-02 0.1909679
0.25024789 0.1853529 0.11691232 0.07675 0.057399193 0.04037684 0.031614047
1.56E-02 6.71E-03 3.02E-03 3.51E-03 2.40E-03 9.78E-04 5.06E-04 1.42E-04 0.00E+00 6.20E-04 2.87E-03 #_293
2011 1 15 0 0 2 -1 -1 1.62E+02 0 1.18E-02 0.1001038
0.22339277 0.2432318 0.17155101 0.1086524 0.063325106 0.03533431 0.021237307
8.04E-03 3.38E-03 1.21E-03 1.13E-03 1.25E-03 9.80E-04 4.01E-04 3.88E-04 3.48E-04 2.95E-04 3.93E-03 #_294
2012 1 15 0 0 2 -1 -1 1.25E+02 0 3.56E-04 0.035409721
0.14504244 0.1947944 0.1877913 0.15260667 0.113638374 0.075911454 0.050052584
2.37E-02 9.54E-03 3.53E-03 2.94E-03 1.29E-03 6.48E-04 5.86E-04 2.35E-04 1.84E-04 2.66E-04 1.48E-03 #_295
2013 1 15 0 0 2 -1 -1 1.92E+02 0 3.42E-03 0.065608206
0.18011006 0.2149463 0.18395521 0.14588801 0.101493673 0.056724869
0.031361477 1.11E-02 3.65E-03 9.61E-04 3.45E-04 6.95E-05 1.39E-04 1.39E-04 0.00E+00 0.00E+00 6.95E-05
0.00E+00 #_296
2014 1 15 0 0 2 -1 -1 2.00E+02 0 3.80E-02 0.11760207
0.16457327 0.1616756 0.15791933 0.14152436 0.102581646 0.060726698
0.035222206 1.29E-02 4.55E-03 1.40E-03 7.42E-04 1.58E-04 1.63E-04 1.37E-04 0.00E+00 0.00E+00 6.60E-05
3.08E-05 #_297
2015 1 15 0 0 2 -1 -1 4.48E+01 0 3.55E-02 0.024826071
0.18261805 0.2677299 0.15966848 0.12027898 0.094731319 0.059876528
0.034952231 1.28E-02 4.34E-03 1.30E-03 7.57E-04 2.10E-04 1.97E-04 1.33E-04 0.00E+00 0.00E+00 7.62E-05
4.45E-05 #_298
2016 1 15 0 0 2 -1 -1 3.64E+01 0 1.43E-01 0.21089158
0.10132977 0.1380727 0.13900403 0.09400186 0.063261323 0.043393465
0.027764257 1.40E-02 6.39E-03 1.86E-03 1.34E-03 1.81E-03 1.97E-03 9.03E-04 1.04E-03 1.04E-03 3.12E-04
8.24E-03 #_299
2008 1 16 0 0 2 -1 -1 4.46E+01 0 4.01E-03 0.165233704
0.30517972 0.2185443 0.13333533 0.07928272 0.041131308 0.02097446
0.011870198 6.99E-03 4.30E-03 2.42E-03 1.87E-03 1.29E-03 1.03E-03 7.61E-04 4.73E-04 3.40E-04 1.63E-04
8.04E-04 #_300
2009 1 16 0 0 2 -1 -1 3.04E+01 0 5.95E-03 0.260188669
0.28492097 0.1432166 0.09112632 0.06731072 0.043119134 0.026240814
0.016327897 1.31E-02 9.28E-03 7.06E-03 4.70E-03 4.96E-03 4.82E-03 4.15E-03 1.95E-03 1.87E-03 1.34E-03
8.43E-03 #_301
2010 1 16 0 0 2 -1 -1 4.81E+01 0 4.88E-03 0.194268589
0.33240168 0.2296552 0.116354 0.05538274 0.025523225 0.013076976 0.007337066
5.11E-03 3.44E-03 2.30E-03 1.66E-03 1.62E-03 1.56E-03 1.28E-03 6.11E-04 5.90E-04 4.15E-04 2.53E-03 #_302
2011 1 16 0 0 2 -1 -1 2.10E+01 0 2.06E-02 0.122178981
0.29911621 0.2615021 0.13858089 0.06904332 0.034952528 0.018837317
0.011444025 7.22E-03 4.57E-03 3.16E-03 2.30E-03 1.57E-03 1.22E-03 1.06E-03 6.40E-04 4.99E-04 2.62E-04
1.22E-03 #_303
2012 1 16 0 0 2 -1 -1 1.44E+01 0 4.49E-03 0.105336342
0.15545328 0.220309 0.20954942 0.1409284 0.073448371 0.035477649 0.019194962
1.14E-02 6.96E-03 4.53E-03 3.01E-03 2.35E-03 1.90E-03 1.61E-03 8.71E-04 6.75E-04 3.97E-04 2.11E-03 #_304
2013 1 16 0 0 2 -1 -1 3.91E+01 0 3.35E-03 0.09237607
0.25510389 0.2688221 0.18258439 0.0974531 0.046023493 0.021855041 0.011189928
6.32E-03 3.58E-03 2.45E-03 1.67E-03 1.35E-03 1.11E-03 8.77E-04 5.31E-04 6.30E-04 3.48E-04 2.37E-03 #_305
2014 1 16 0 0 2 -1 -1 1.96E+02 0 1.74E-02 0.250256775
0.27831777 0.192748 0.13239935 0.0712267 0.031594752 0.013314829 0.005920099
3.06E-03 1.66E-03 6.93E-04 4.75E-04 3.50E-04 2.45E-04 1.57E-04 7.62E-05 3.80E-05 1.90E-05 3.80E-05 #_306
2015 1 16 0 0 2 -1 -1 3.81E+01 0 5.66E-03 0.232672008
0.35962974 0.2181051 0.09909169 0.04384178 0.02017126 0.009186058
0.004483433 2.55E-03 1.42E-03 1.03E-03 6.15E-04 4.63E-04 2.71E-04 3.18E-04 1.20E-04 1.23E-04 9.45E-05
1.61E-04 #_307
2016 1 16 0 0 2 -1 -1 1.35E+02 0 2.91E-03 0.109870054
0.25049739 0.2424776 0.16084287 0.09031603 0.04932546 0.027790003
0.017892008 1.20E-02 7.62E-03 6.14E-03 4.20E-03 3.05E-03 2.32E-03 2.31E-03 1.38E-03 1.14E-03 7.17E-04
7.20E-03 #_308
1987 1 19 0 0 2 -1 -1 7.52E+00 0 1.00E+00 0 0
0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_309
1988 1 19 0 0 2 -1 -1 4.05E+00 0 5.11E-01 0.489361702
0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_310
1989 1 19 0 0 2 -1 -1 3.25E+00 0.247933884 5.37E-01
0.215289256 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_311
1990 1 19 0 0 2 -1 -1 1.21E+01 0.028301887 9.72E-01 0
0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_312

1991	1	19	0	0	2	-1	-1	2.98E+01	0.010204082		8.06E-01	
	0.183673469		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_313			
1992	1	19	0	0	2	-1	-1	9.95E+00	0	9.44E-01	0.056451613	
	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_314					
1993	1	19	0	0	2	-1	-1	8.86E+00	0.043478261		8.04E-01	
	0.152173913		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_315			
1994	1	19	0	0	2	-1	-1	2.02E+00	0	5.21E-01	0.479452055	
	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_316					
1995	1	19	0	0	2	-1	-1	1.12E+01	0.024390244		6.10E-01	
	0.365853659		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_317			
1996	1	19	0	0	2	-1	-1	7.05E+01	0	9.07E-01	0.092810457	
	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_318					
1997	1	19	0	0	2	-1	-1	3.54E+00	0.03125	9.38E-01	0.03125	0
	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_319						
1998	1	19	0	0	2	-1	-1	2.00E+02	0	8.00E-01	0.2	0
	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_320						
1999	1	19	0	0	2	-1	-1	3.74E+00	0.071428571		3.57E-01	
	0.571428571		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_321			
2000	1	19	0	0	2	-1	-1	1.41E+01	0.011904762		9.52E-01	
	0.035714286		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_322			
2001	1	19	0	0	2	-1	-1	3.68E+00	0	5.45E-01	0.454545455	
	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_323					
2002	1	19	0	0	2	-1	-1	7.13E+00	0.034482759		5.17E-01	
	0.448275862		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_324			
2003	1	19	0	0	2	-1	-1	1.43E+01	0.023809524		8.81E-01	
	0.095238095		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_325			
2004	1	19	0	0	2	-1	-1	8.82E+00	0.054054054		8.65E-01	
	0.081081081		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_326			
2005	1	19	0	0	2	-1	-1	2.58E+01	0.015625	8.67E-01	0.1171875	0
	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_327						
2006	1	19	0	0	2	-1	-1	7.66E+01	0.05	7.00E-01	0.25	0
	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_328						
2007	1	19	0	0	2	-1	-1	9.21E+00	0.02994012		9.10E-01	
	0.05988024		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_329			
2008	1	19	0	0	2	-1	-1	2.00E+02	0.00802139		6.95E-01	
	0.296791444		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_330			
2009	1	19	0	0	2	-1	-1	2.76E+01	0.019230769		5.67E-01	
	0.413461539		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_331			
2010	1	19	0	0	2	-1	-1	1.80E+00	0.361111111		4.10E-01	
	0.229166667		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_332			
2011	1	19	0	0	2	-1	-1	2.00E+02	0	7.14E-01	0.285714286	
	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_333					
2012	1	19	0	0	2	-1	-1	2.00E+02	0.017391304		7.13E-01	
	0.269565217		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_334			
2013	1	19	0	0	2	-1	-1	3.19E+01	0.040983607		8.11E-01	
	0.147540984		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_335			

2014 1 19 0 0 2 -1 -1 6.67E+01 0.048387097 7.74E-01
0.177419355 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_336
2015 1 19 0 0 2 -1 -1 2.00E+02 0 8.06E-01 0.193608367
0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_337
2016 1 19 0 0 2 -1 -1 5.59E+00 0.008547008 5.38E-01
0.452991453 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_338
1987 1 20 0 0 2 -1 -1 9.06E+01 0 8.51E-01 0.149038461
0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_339
1988 1 20 0 0 2 -1 -1 1.90E+01 0.006329114 9.30E-01
0.063291139 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_340
1989 1 20 0 0 2 -1 -1 5.81E+01 0.037407569 8.67E-01
0.095258808 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_341
1990 1 20 0 0 2 -1 -1 6.39E+01 0.000845308 9.56E-01
0.042772612 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_342
1991 1 20 0 0 2 -1 -1 1.67E+02 0.075294118 7.84E-01
0.140823529 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_343
1992 1 20 0 0 2 -1 -1 2.00E+02 0.024096386 8.67E-01
0.109103079 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_344
1993 1 20 0 0 2 -1 -1 1.18E+01 0.007751938 9.57E-01
0.034920635 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_345
1994 1 20 0 0 2 -1 -1 1.01E+02 0.005326232 8.80E-01 0.1147581
0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_346
1995 1 20 0 0 2 -1 -1 6.72E+01 0.089595376 8.10E-01
0.100237407 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_347
1996 1 20 0 0 2 -1 -1 1.87E+02 0.010662605 9.10E-01
0.079757371 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_348
1997 1 20 0 0 2 -1 -1 1.39E+02 0.03559322 8.46E-01
0.118135593 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_349
1998 1 20 0 0 2 -1 -1 1.89E+02 0.007537688 8.87E-01
0.105653266 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_350
1999 1 20 0 0 2 -1 -1 1.04E+01 0.183381089 6.88E-01
0.129083095 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_351
2000 1 20 0 0 2 -1 -1 1.44E+00 0.312024353 6.30E-01
0.057914764 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_352
2001 1 20 0 0 2 -1 -1 2.86E+00 0.266666667 6.81E-01 0.052
0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_353
2002 1 20 0 0 2 -1 -1 2.00E+02 0.083333333 7.94E-01
0.122712418 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_354
2003 1 20 0 0 2 -1 -1 4.81E+01 0.013574661 9.17E-01
0.069004525 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_355
2004 1 20 0 0 2 -1 -1 1.12E+01 0 9.87E-01 0.012964492
0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_356
2005 1 20 0 0 2 -1 -1 2.00E+02 0.04432133 8.56E-01
0.099970321 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_357
2006 1 20 0 0 2 -1 -1 1.10E+01 0.152508651 7.55E-01
0.092128028 0 0 0 0 0 0 0 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_358

2007	1	20	0	0	2	-1	-1	1.48E+02	0.029411765		8.95E-01	
	0.075163399		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_359			
2008	1	20	0	0	2	-1	-1	1.64E+01	0.084629972		7.25E-01	
	0.190155921		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_360			
2009	1	20	0	0	2	-1	-1	3.21E+01	0.106965174		8.33E-01	
	0.059701493		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_361			
2010	1	20	0	0	2	-1	-1	5.16E+01	0	9.02E-01	0.097938144	
	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_362					
2011	1	20	0	0	2	-1	-1	2.77E+01	0.009797297		9.11E-01	
	0.078828829		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_363			
2012	1	20	0	0	2	-1	-1	9.77E+00	0.018248175		7.58E-01	
	0.223418492		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_364			
-2013	1	20	0	0	2	-1	-1	9.00E+00	1	0.00E+00	0	0
	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_464						
2015	1	20	0	0	2	-1	-1	1.41E+01	0.161290323		7.55E-01	
	0.083870968		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_365			
1987	1	21	0	0	2	-1	-1	2.07E-01	0.071428571		9.29E-01	0
	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_366					
1988	1	21	0	0	2	-1	-1	1.11E+01	0.985915493		0.00E+00	
	0.014084507		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_367			
1989	1	21	0	0	2	-1	-1	4.87E+01	0.915782715		7.72E-02	
	0.007063054		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_368			
1990	1	21	0	0	2	-1	-1	2.00E+02	0.858699187		1.27E-01	
	0.014471545		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_369			
1991	1	21	0	0	2	-1	-1	1.37E+02	0.890252454		1.06E-01	
	0.004207574		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_370			
1992	1	21	0	0	2	-1	-1	4.77E+01	0.862068966		1.38E-01	0
	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_371					
1993	1	21	0	0	2	-1	-1	3.65E+01	0.928	2.80E-02	0.044	0
	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_372						
1994	1	21	0	0	2	-1	-1	2.72E+00	0.62745098		2.09E-01	
	0.163834423		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_373			
1995	1	21	0	0	2	-1	-1	2.34E+01	0.989304813		1.07E-02	0
	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_374					
1996	1	21	0	0	2	-1	-1	1.44E+01	0.734117647		1.78E-01	
	0.088235294		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_375			
1997	1	21	0	0	2	-1	-1	1.07E+02	0.903396226		6.26E-02	
	0.033962264		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_376			
1998	1	21	0	0	2	-1	-1	3.83E+01	0.864197531		9.88E-02	
	0.037037037		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_377			
1999	1	21	0	0	2	-1	-1	5.63E+01	0.883333333		8.83E-02	
	0.028333333		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_378			
2000	1	21	0	0	2	-1	-1	3.03E+01	0.856157636		6.07E-02	
	0.083128079		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_379			
2001	1	21	0	0	2	-1	-1	4.12E+01	0.857142857		6.12E-02	
	0.081632653		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_380			

2002	1	21	0	0	2	-1	-1	7.68E+01	0.882580175		4.64E-02	
	0.070991254		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_381			
2003	1	21	0	0	2	-1	-1	1.12E+02	0.89673913		9.67E-02	
	0.006521739		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_382			
2004	1	21	0	0	2	-1	-1	2.00E+02	0.895	9.48E-02	0.010227273	
	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_383					
2005	1	21	0	0	2	-1	-1	6.03E+00	0.736784141		2.24E-01	
	0.039647577		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_384			
2006	1	21	0	0	2	-1	-1	1.16E+01	0.992118863		7.88E-03	0
	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_385					
2007	1	21	0	0	2	-1	-1	1.49E+01	0.956796116		4.32E-02	0
	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_386					
2008	1	21	0	0	2	-1	-1	1.24E+00	0.377245509		3.29E-01	
	0.293413174		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_387			
2009	1	21	0	0	2	-1	-1	1.55E+01	0.94198139		2.64E-02	
	0.031609195		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_388			
2010	1	21	0	0	2	-1	-1	1.30E+01	0.710648424		2.11E-01	
	0.07804878		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_389			
2011	1	21	0	0	2	-1	-1	1.79E+00	0.556962025		1.65E-01	
	0.278481013		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_390			
2012	1	21	0	0	2	-1	-1	1.12E+01	0.751243781		1.44E-01	
	0.104477612		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_391			
2013	1	21	0	0	2	-1	-1	1.51E+01	0.95825214		1.36E-02	
	0.02810747		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_392			
2014	1	21	0	0	2	-1	-1	2.00E+02	0.91322314		5.79E-02	
	0.02892562		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_393			
2015	1	21	0	0	2	-1	-1	1.08E+00	0.475728155		2.82E-01	
	0.242718447		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_394			
-2016	1	21	0	0	2	-1	-1	1.70E+01	1	0.00E+00	0	0
	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_468						
1987	1	22	0	0	2	-1	-1	5.13E+00	0.643880208		3.40E-01	0.015625
	0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_395					
1988	1	22	0	0	2	-1	-1	2.63E+00	0.649524489		3.22E-01	
	0.028245364		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_396			
1989	1	22	0	0	2	-1	-1	2.00E+02	0.92644616		6.36E-02	
	0.00998632		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_397			
1990	1	22	0	0	2	-1	-1	1.07E+02	0.765637721		2.01E-01	
	0.033759107		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_398			
1991	1	22	0	0	2	-1	-1	2.57E+01	0.936237058		5.53E-02	
	0.008480881		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_399			
1992	1	22	0	0	2	-1	-1	1.27E+01	0.71294702		2.70E-01	
	0.017384106		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_400			
1993	1	22	0	0	2	-1	-1	1.68E+01	0.761414322		2.10E-01	
	0.029063525		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_401			
1994	1	22	0	0	2	-1	-1	3.95E+01	0.916798022		7.32E-02	
	0.009977189		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_402			

1995	1	22	0	0	2	-1	-1	3.83E+01	0.916409795		5.90E-02	
	0.024595428		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_403			
1996	1	22	0	0	2	-1	-1	2.00E+02	0.761164179		2.20E-01	
	0.01919403		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_404			
1997	1	22	0	0	2	-1	-1	2.61E+01	0.915604172		7.02E-02	
	0.01414956		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_405			
1998	1	22	0	0	2	-1	-1	2.22E+01	0.897959184		9.16E-02	
	0.010437052		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_406			
1999	1	22	0	0	2	-1	-1	3.72E+01	0.942477876		4.97E-02	
	0.007774968		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_407			
2000	1	22	0	0	2	-1	-1	2.68E+01	0.907451418		7.62E-02	
	0.016331505		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_408			
2001	1	22	0	0	2	-1	-1	4.22E+01	0.85327992		1.15E-01	
	0.031597396		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_409			
2002	1	22	0	0	2	-1	-1	5.47E+01	0.926456546		6.53E-02	
	0.008232789		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_410			
2003	1	22	0	0	2	-1	-1	1.92E+01	0.961553392		3.43E-02	
	0.004117969		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_411			
2004	1	22	0	0	2	-1	-1	9.37E+01	0.914763102		7.78E-02	
	0.007470895		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_412			
2005	1	22	0	0	2	-1	-1	2.00E+02	0.844284902		1.44E-01	
	0.011643446		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_413			
2006	1	22	0	0	2	-1	-1	1.54E+01	0.937492544		4.58E-02	
	0.016716373		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_414			
2007	1	22	0	0	2	-1	-1	1.09E+01	0.924572317		7.04E-02	
	0.005054432		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_415			
2008	1	22	0	0	2	-1	-1	2.43E+01	0.666976744		2.82E-01	
	0.051162791		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_416			
2009	1	22	0	0	2	-1	-1	2.02E+01	0.978772594		1.64E-02	
	0.004833964		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_417			
2010	1	22	0	0	2	-1	-1	8.93E+01	0.774115756		2.19E-01	
	0.006430868		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_418			
2011	1	22	0	0	2	-1	-1	2.00E+02	0.834206437		1.34E-01	
	0.032236357		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_419			
2012	1	22	0	0	2	-1	-1	2.50E+01	0.928741093		6.02E-02	
	0.011084719		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_420			
2013	1	22	0	0	2	-1	-1	6.10E+01	0.772222222		1.71E-01	
	0.056944444		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_421			
2014	1	22	0	0	2	-1	-1	1.02E+01	0.947368421		0.00E+00	
	0.052631579		0	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_422			
-2016	1	22	0	0	2	-1	-1	4.00E+00	0.75	0.00E+00	0.25	0
	0	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_482						
2000	1	23	0	0	2	-1	-1	3.60E+01	0	0.00E+00	0	0
	0.0118	0.0353	0.0471	0.1529	0.1647	0.1176	8.24E-02	2.35E-02	7.06E-02	1.18E-02	7.06E-02	9.41E-02
	1.18E-02	2.35E-02	1.18E-02	1.18E-02	5.88E-02	#_423						
2001	1	23	0	0	2	-1	-1	4.65E+01	0	0.00E+00	0	0
	0	0	0.0247	0.0864	0.1358	0.0741	6.17E-02	6.17E-02	9.88E-02	6.17E-02	6.17E-02	3.70E-02
	8.64E-02	1.23E-02	1.23E-02	1.23E-02	1.73E-01	#_424						

2002	1	23	0	0	2	-1	-1	3.07E+01	0	0.00E+00	0	0.0139
	0	0.0417	0.0556	0.0556	0.0694	0.0833	6.94E-02	1.11E-01	4.17E-02	0.00E+00	9.72E-02	1.39E-02
	4.17E-02	1.39E-02	4.17E-02	4.17E-02	2.08E-01	#_425						
2003	1	23	0	0	2	-1	-1	4.11E+01	0	0.00E+00	0	0
	0.0833	0.05	0.0667	0.1	0.05	0.0167	6.67E-02	1.00E-01	8.33E-02	6.67E-02	6.67E-02	6.67E-02
	3.33E-02	0.00E+00	1.67E-02	0.00E+00	1.33E-01	#_426						
2004	1	23	0	0	2	-1	-1	1.98E+01	0	0.00E+00	0	0
	0.02	0.16	0.1	0.16	0.18	0.08	2.00E-02	0.00E+00	4.00E-02	6.00E-02	2.00E-02	2.00E-02
	4.00E-02	0.00E+00	2.00E-02	2.00E-02	6.00E-02	#_427						
2006	1	23	0	0	2	-1	-1	1.30E+01	0	0.00E+00	0	0
	0	0	0	0.0645	0.0645	0.0968	6.45E-02	0.00E+00	3.23E-02	3.23E-02	0.00E+00	2.26E-01
	0.00E+00	6.45E-02	6.45E-02	3.23E-02	2.58E-01	#_428						
2007	1	23	0	0	2	-1	-1	2.47E+01	0	0.00E+00	0	0.0244
	0	0	0.1707	0.122	0.1463	0.0244	0.00E+00	7.32E-02	2.44E-02	7.32E-02	7.32E-02	9.76E-02
	0.00E+00	0.00E+00	2.44E-02	4.88E-02	9.76E-02	#_429						
2008	1	23	0	0	2	-1	-1	7.21E+00	0	0.00E+00	0	0
	0.2	0	0.3	0.1	0.2	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	1.00E-01	0.00E+00	0.00E+00	0.00E+00	1.00E-01	#_430						
2009	1	23	0	0	2	-1	-1	4.31E+01	0	0.00E+00	0	0.0147
	0.0147	0.1912	0.0882	0.0441	0.0588	0.0735	7.35E-02	1.47E-02	5.88E-02	4.41E-02	2.94E-02	2.94E-02
	4.41E-02	0.00E+00	1.47E-02	2.94E-02	1.77E-01	#_431						
2010	1	23	0	0	2	-1	-1	1.38E+01	0	0.00E+00	0	0
	0.1212	0.2424	0.2727	0.0909	0.0303	0.0303	3.03E-02	0.00E+00	6.06E-02	0.00E+00	0.00E+00	0.00E+00
	6.06E-02	0.00E+00	0.00E+00	0.00E+00	6.06E-02	#_432						
2011	1	23	0	0	2	-1	-1	1.87E+02	0	0.00E+00	0.0018	0.0054
	0.0341	0.1131	0.1831	0.2154	0.0808	0.0664	3.59E-02	4.31E-02	1.80E-02	2.51E-02	1.08E-02	1.80E-02
	9.00E-03	1.80E-02	1.44E-02	1.26E-02	9.52E-02	#_433						
2012	1	23	0	0	2	-1	-1	8.27E+01	0	0.00E+00	0	0
	0	0.0873	0.1429	0.2698	0.1349	0.0476	5.56E-02	1.59E-02	3.17E-02	1.59E-02	7.90E-03	1.59E-02
	3.17E-02	0.00E+00	3.17E-02	1.59E-02	9.52E-02	#_434						
2013	1	23	0	0	2	-1	-1	3.35E+01	0	0.00E+00	0	0
	0	0.0116	0.0349	0.1279	0.1977	0.2558	6.98E-02	4.65E-02	3.49E-02	3.49E-02	1.16E-02	2.33E-02
	2.33E-02	0.00E+00	1.16E-02	2.33E-02	9.30E-02	#_435						
2014	1	23	0	0	2	-1	-1	6.50E+01	0	0.00E+00	0	0
	0	0.0625	0.0625	0.0625	0.25	0.1458	1.67E-01	4.17E-02	4.17E-02	0.00E+00	2.08E-02	2.08E-02
	0.00E+00	2.08E-02	2.08E-02	0.00E+00	8.33E-02	#_436						
2015	1	23	0	0	2	-1	-1	5.90E+01	0	0.00E+00	0	0
	0.0091	0.0136	0.0591	0.0409	0.1136	0.2364	1.46E-01	1.09E-01	5.00E-02	2.27E-02	2.73E-02	4.50E-03
	4.50E-03	9.10E-03	2.73E-02	9.10E-03	1.18E-01	#_437						
2016	1	23	0	0	2	-1	-1	5.56E+01	0	0.00E+00	0.0088	0
	0.0044	0.0219	0.0351	0.0965	0.0526	0.114	1.89E-01	1.40E-01	1.23E-01	4.82E-02	3.07E-02	8.80E-03
	3.51E-02	1.32E-02	2.19E-02	0.00E+00	5.70E-02	#_438						
-2000	1	24	0	0	2	-1	-1	1.00E+00	0	0.00E+00	0	0
	0	1	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_474						
-2001	1	24	0	0	2	-1	-1	3.00E+00	0	0.00E+00	0	0
	0.3333	0	0.3333	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.33E-01	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_484						
2002	1	24	0	0	2	-1	-1	1.70E+01	0	1.12E-02	0	0.0674
	0.0787	0.1798	0.0899	0.0562	0.0449	0.0337	5.62E-02	2.25E-02	1.01E-01	6.74E-02	1.12E-02	0.00E+00
	1.12E-02	0.00E+00	0.00E+00	1.12E-02	1.57E-01	#_439						
2003	1	24	0	0	2	-1	-1	4.18E+00	0	0.00E+00	0	0.0588
	0.4706	0	0	0.0588	0.1176	0.1176	0.00E+00	5.88E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-01	#_440						
2004	1	24	0	0	2	-1	-1	1.37E+01	0	0.00E+00	0.0455	0
	0.1364	0.1818	0.1364	0.0455	0.0909	0.1364	0.00E+00	0.00E+00	4.55E-02	0.00E+00	0.00E+00	4.55E-02
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.36E-01	#_441						
-2005	1	24	0	0	2	-1	-1	3.00E+00	0	0.00E+00	0	0
	0	0.3333	0.6667	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_466						
-2006	1	24	0	0	2	-1	-1	2.00E+00	0	0.00E+00	0	0
	0	0	0.5	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E-01	#_467						
-2007	1	24	0	0	2	-1	-1	6.00E+00	0	0.00E+00	0	0
	0.1667	0.5	0.3333	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_477						
-2009	1	24	0	0	2	-1	-1	8.00E+00	0	0.00E+00	0	0
	0	0.25	0.375	0.375	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	#_469						

2010 1 24 0 0 2 -1 -1 2.84E+00 0 0.00E+00 0 0
0.48 0.24 0.16 0.04 0 0.04 0.00E+00 0.00E+00 0.00E+00 4.00E-02 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_442
2011 1 24 0 0 2 -1 -1 5.92E+00 0 0.00E+00 0 0.011
0.1374 0.2473 0.2747 0.1978 0.0549 0.0275 0.00E+00 5.50E-03 5.50E-03 0.00E+00 1.65E-02 0.00E+00
0.00E+00 5.50E-03 5.50E-03 0.00E+00 1.10E-02 #_443
2012 1 24 0 0 2 -1 -1 6.72E+00 0 0.00E+00 0 0
0 0.0714 0.2143 0.3571 0.0714 0.0714 0.00E+00 0.00E+00 0.00E+00 7.14E-02 0.00E+00 7.14E-02
0.00E+00 7.14E-02 0.00E+00 0.00E+00 0.00E+00 #_444
2013 1 24 0 0 2 -1 -1 2.43E+00 0 0.00E+00 0 0
0 0.0588 0.1765 0.6471 0.1176 0 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 #_445
2014 1 24 0 0 2 -1 -1 9.30E+00 0 0.00E+00 0 0
0 0 0.0909 0 0.1818 0.1818 1.82E-01 0.00E+00 0.00E+00 2.73E-01 0.00E+00 0.00E+00
0.00E+00 0.00E+00 9.09E-02 0.00E+00 0.00E+00 #_446
2015 1 24 0 0 2 -1 -1 1.75E+01 0 0.00E+00 0 0
0.0435 0 0 0.0435 0.2174 0.3478 4.35E-02 1.30E-01 4.35E-02 4.35E-02 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 8.70E-02 #_447
2005 1 25 0 0 1 -1 -1 7.10E+01 0 1.80E-01 0.331004725
0.31953287 0.1110955 0.03095612 0.01239127 0.005810348 0.002705255
0.001182078 3.52E-04 1.15E-04 3.22E-05 1.18E-05 1.92E-06 3.85E-06 4.43E-06 0.00E+00 0.00E+00 1.92E-06
5.27E-03 #_448
2006 1 25 0 0 1 -1 -1 2.23E+01 0 2.51E-01 0.370991122
0.23447461 0.0810363 0.03098057 0.01589361 0.008077345 0.00409967
0.002071058 6.30E-04 2.05E-04 5.59E-05 2.52E-05 1.62E-06 3.25E-06 4.16E-06 0.00E+00 0.00E+00 1.62E-06
0.00E+00 #_449
2007 1 25 0 0 1 -1 -1 4.45E+01 0 1.83E-01 0.40709266
0.27713504 0.0802213 0.02372593 0.01285096 0.007510496 0.004348028
0.002523209 9.37E-04 3.56E-04 1.15E-04 7.60E-05 1.77E-05 1.32E-05 1.34E-05 4.20E-06 4.20E-06 3.25E-06
1.23E-05 #_450
2008 1 25 0 0 1 -1 -1 5.21E+01 0 1.96E-01 0.361049694
0.29170374 0.1006361 0.02953607 0.01067622 0.004308203 0.001950973
0.000780816 2.13E-04 4.86E-05 1.03E-05 4.42E-06 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
3.18E-03 #_451
2009 1 25 0 0 1 -1 -1 8.58E+01 0 7.07E-02 0.219969163
0.31103404 0.1988747 0.10228749 0.04867771 0.023360137 0.012411897
0.007156128 2.71E-03 9.88E-04 4.27E-04 4.71E-04 3.03E-04 1.16E-04 6.14E-05 1.89E-05 0.00E+00 7.67E-05
3.78E-04 #_452
2010 1 25 0 0 1 -1 -1 2.00E+02 0 8.84E-02 0.207464754
0.29297759 0.1979954 0.09871098 0.0500954 0.027112427 0.015203382 0.008853857
4.05E-03 1.90E-03 7.12E-04 6.53E-04 7.58E-04 3.88E-04 2.00E-04 4.69E-04 3.31E-04 2.10E-04 3.54E-03 #_453
2011 1 25 0 0 1 -1 -1 1.71E+02 0 4.22E-02 0.158191051
0.2822936 0.2216464 0.12488636 0.06667358 0.036611962 0.020889752 0.012208558
5.10E-03 2.07E-03 7.29E-04 8.44E-04 5.65E-04 3.74E-04 1.98E-04 2.64E-04 7.12E-04 2.06E-04 2.34E-02 #_454
2012 1 25 0 0 1 -1 -1 1.74E+02 0 5.48E-02 0.156903825
0.23584277 0.1941751 0.12320429 0.07229476 0.044912242 0.029209814
0.020470487 1.11E-02 5.34E-03 2.03E-03 2.43E-03 2.02E-03 1.18E-03 6.15E-04 1.01E-03 2.04E-03 6.49E-04
3.97E-02 #_455
2013 1 25 0 0 1 -1 -1 6.50E+01 0 6.06E-02 0.189411843
0.31913626 0.2023901 0.09472849 0.04977438 0.02975564 0.018657908
0.012325493 5.77E-03 2.56E-03 1.01E-03 1.67E-03 8.38E-04 4.85E-04 2.56E-04 2.87E-04 1.49E-03 4.18E-04
8.44E-03 #_456
2014 1 25 0 0 1 -1 -1 9.52E+01 0 6.72E-02 0.15712435
0.24536165 0.1890264 0.11395881 0.06951165 0.049513409 0.036985395
0.029381263 1.65E-02 7.56E-03 3.21E-03 3.40E-03 2.39E-03 1.07E-03 6.74E-04 6.60E-04 4.37E-04 5.73E-04
5.49E-03 #_457
2015 1 25 0 0 1 -1 -1 6.72E+01 0 8.24E-02 0.15485959
0.20491197 0.1678278 0.10949041 0.07346353 0.053664917 0.038799645 0.0311304
2.00E-02 1.03E-02 4.20E-03 7.37E-03 4.05E-03 1.83E-03 1.09E-03 2.18E-03 2.02E-03 2.13E-03 2.83E-02 #_458
2016 1 25 0 0 1 -1 -1 2.00E+02 0 1.22E-01 0.288837148
0.26494727 0.1253083 0.06035687 0.03691865 0.027504973 0.020757896
0.017017791 1.07E-02 5.37E-03 2.20E-03 2.72E-03 2.10E-03 1.04E-03 5.91E-04 9.96E-04 7.03E-04 6.91E-04
9.17E-03 #_459
0 #_N_MeanSize_at_Age_obs
1 #_N_environ_variables
146 #_N_environ_obs

#_Yr	Variable	Value	
1871	1	1	#_1
1872	1	1	#_2
1873	1	1	#_3

1874	1	1	#_4
1875	1	1	#_5
1876	1	1	#_6
1877	1	1	#_7
1878	1	1	#_8
1879	1	1	#_9
1880	1	1	#_10
1881	1	1	#_11
1882	1	1	#_12
1883	1	1	#_13
1884	1	1	#_14
1885	1	1	#_15
1886	1	1	#_16
1887	1	1	#_17
1888	1	1	#_18
1889	1	1	#_19
1890	1	1	#_20
1891	1	1	#_21
1892	1	1	#_22
1893	1	1	#_23
1894	1	1	#_24
1895	1	1	#_25
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1900	1	1	#_30
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1929	1	1	#_59
1930	1	1	#_60
1931	1	1	#_61
1932	1	1	#_62
1933	1	1	#_63
1934	1	1	#_64
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1938	1	1	#_68
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1941	1	1	#_71
1942	1	1	#_72
1943	1	1	#_73

1944	1	1	#_74
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1946	1	1	#_76
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1948	1	1	#_78
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1967	1	1	#_97
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1978	1	1	#_108
1979	1	1	#_109
1980	1	1	#_110
1981	1	1	#_111
1982	1	1	#_112
1983	1	1	#_113
1984	1	0	#_114
1985	1	0	#_115
1986	1	0	#_116
1987	1	0	#_117
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1990	1	0	#_120
1991	1	0	#_121
1992	1	0	#_122
1993	1	0	#_123
1994	1	0	#_124
1995	1	0	#_125
1996	1	0	#_126
1997	1	0	#_127
1998	1	0	#_128
1999	1	0	#_129
2000	1	0	#_130
2001	1	0	#_131
2002	1	0	#_132
2003	1	0	#_133
2004	1	0	#_134
2005	1	0	#_135
2006	1	0	#_136
2007	1	0	#_137
2008	1	0	#_138
2009	1	0	#_139
2010	1	0	#_140
2011	1	0	#_141
2012	1	0	#_142
2013	1	0	#_143

2014 1 0 #_144
2015 1 0 #_145
2016 1 0 #_146
0 #_N_sizefreq_methods
0 #_do_tags
0 #_morphcomp_data
#
999

A.3 Control File

#V3.24f
#_data_and_control_files: data.ss // control.ss
#_SS-V3.24f-safe;_08/03/2012;_Stock_Synthesis_by_Richard_Methot_(NOAA)_using_ADMB_10.1
1 #_N_Growth_Patterns
1 #_N_Morphs_Within_GrowthPattern
2 # N recruitment designs go here if N_GP*nseas*area>1 - Red Snapper is a 2 area model
0 # placeholder for recruitment interaction request
1 1 1 #_recruitment design element for GP=1, seas=1, area=1
1 1 2 #_recruitment design element for GP=1, seas=1, area=2
0 # N_movement_definitions goes here if N_areas > 1
#ADD A BLOCK TO RECREATIONAL SELECTIVITY 2010-2013
5 #_Nblock_Patterns
4 4 1 1 2 #_blocks_per_pattern
begin and end years of blocks
1985 1993 1994 1994 1995 2006 2007 2016 #BLOCK 1 used for commercial size limit, and <100% retention during IFQ period
1985 1993 1994 1994 1995 1999 2000 2016 #BLOCK 2 used for recreational size limit
2007 2016 #BLOCK 3 used for change in commercial selectivity with implementation of IFQ
2008 2016 #BLOCK 4 used for discard mortality
2008 2010 2011 2016 #BLOCK 5 used for recreational selectivity change (implementation of circle hooks, etc)
0.5 #_fracfemale
3 #_natM_type:_0=1Parm; 1=N_breakpoints;_2=Lorenzen;_3=agespecific;_4=agespec_withseasinterpolate
#_Age_natmort_by gender x growthpattern
1 1.6 0.695 0.17 0.14 0.122 0.11 0.103 0.097 0.093 0.09 0.087 0.085 0.084 0.083 0.082 0.081 0.08 0.08 0.079 0.079
1 # GrowthModel: 1=vonBert with L1&L2; 2=Richards with L1&L2; 3=age_speciific_K; 4=not implemented
0.75 #_Growth_Age_for_L1
999 #_Growth_Age_for_L2 (999 to use as Linf)
0 #_SD_add_to_LAA (set to 0.1 for SS2 V1.x compatibility)
#UPDATE CV GROWTH - SHOULD BE 1 NOT 0
1 #_CV_Growth_Pattern: 0 CV=f(LAA); 1 CV=F(A); 2 SD=F(LAA); 3 SD=F(A); 4 logSD=F(A)
4 #_maturity_option: 1=length logistic; 2=age logistic; 3=read age-maturity matrix by growth_pattern; 4=read age-fecundity; 5=read fec and wt from wtatage.ss
0 0 350000 2620000 9070000 20300000 34710000 49950000 64270000 76760000 87150000 95530000 102150000 107300000 111270000 114300000 116610000 118360000 119680000 120670000 123234591
2 #_First_Mature_Age
3 #_fecundity option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b; (4)eggs=a+b*L; (5)eggs=a+b*W
0 #_hermaphroditism option: 0=none; 1=age-specific fxn
1 #_parameter_offset_approach (1=none, 2= M, G, CV_G as offset from female-GP1, 3=like SS2 V1.x)
2 #_env/block/dev_adjust_method (1=standard; 2=logistic transform keeps in base parm bounds; 3=standard w/ no bound check)
Prior types (-1 = none, 0=normal, 1=symmetric beta, 2=full beta, 3=lognormal)
#_growth_parms
#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_stddev Block Block_Fxn
0.2 0.5 0.38 0.4 0 1 -3 0 0 0 0 0 0 0 # NatM_p_1_Fem_GP_1
7 21 9.96 9.96 -1 1 -3 0 0 0 0 0 0 # L_at_Amin_Fem_GP_1
70 100 85.64 85.64 -1 1 -3 0 0 0 0 0 0 # L_at_Amax_Fem_GP_1
0.05 0.8 0.1919 0.1919 -1 1 -3 0 0 0 0 0 0 # VonBert_K_Fem_GP_1

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0.01 0.5 0.1735 0.1735 -1 1 -5 0 0 0 0 0 0
0 # CV_young_Fem_GP_1
0.01 0.5 0.0715 0.0715 -1 1 -5 0 0 0 0 0 0
0 # CV_old_Fem_GP_1
0 1 0.00001673 0.00001673 -1 1 -3 0 0 0 0
0 0 0 # Wtlen_1_Fem
0 4 2.953 2.953 -1 1 -3 0 0 0 0 0 0
0 # Wtlen_2_Fem
50 1000 999 999 -1 1 -3 0 0 0 0 0 0
0 # Mat50%_Fem
-1 1000 999 999 -1 1 -3 0 0 0 0 0 0
0 # Mat_slope_Fem
0 1000 999 999 -1 1 -3 0 0 0 0 0 0
0 # Eggs/kg_inter_Fem
0 1000 999 999 -1 1 -3 0 0 0 0 0 0
0 # Eggs/kg_slope_wt_Fem
0 0 0 0 -1 0 -4 0 0 0 0 0 0
0 # RecrDist_GP_1
-4 4 -0.8 -0.8 -1 1 4 0 2 1972 2016 0.1 0
0 # RecrDist_Area1
-4 4 0 0 -1 1 -4 0 0 0 0 0 0
0 # RecrDist_Area2
0 0 0 0 -1 0 -4 0 0 0 0 0 0
0 # RecrDist_Seas_1
0 0 1 1 -1 0 -4 0 0 0 0 0 0
0 # CohortGrowDev
#_Cond No MG parm trends
#_seasonal_effects_on_biology_parms

0 0 0 0 0 0 0 0 0 0
#_femwtlen1,femwtlen2,mat1,mat2,fec1,fec2,Malewtlen1,malewtlen2,L1,K
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no seasonal
MG parameters
#
5 #_MGparm_Dev_Phase
#_Spawner-Recruitment
3 #_SR_function: 2=Ricker; 3=std_B-H; 4=SCAA; 5=Hockey;6=B-H_flattop; 7=survival_3Parm
#_LO HI INIT PRIOR PR_type SD PHASE
1 20 11.8 11.8 -1 1 1 # SR_LN(R0)
0.2 1 0.99 0.99 -1 1 -4 # SR_BH_steep
0 2 0.3 0.3 -1 1 -4 # SR_sigmaR
-5 5 0 0 -1 1 3 # SR_envlink
-5 5 0 0 -1 1 -4 # SR_R1_offset
0 0 0 0 -1 0 -99 # SR_autocorr
1 #_SR_env_link
2 #_SR_env_target_0=none;1=devs;_2=R0;_3=steepness
1 #do_recdev: 0=none; 1=devvector; 2=simple deviations
1899 # first year of main recr_devs; early devs can preceed this era
2016 # last year of main recr_devs; forecast devs start in following year
4 #_recdev phase
1 # (0/1) to read 13 advanced options
0 #_recdev_early_start (0=none; neg value makes relative to recdev_start)
-5 #_recdev_early_phase
0 #_forecast_recruitment phase (incl. late recr) (0 value resets to
maxphase+1)
1 #_lambda for Fcast_recr_like occurring before endyr+1
1971.4 #_last_early_yr_nobias_adj_in_MPD
1971.6 #_first_yr_fullbias_adj_in_MPD
2015.9 #_last_yr_fullbias_adj_in_MPD
2017.0 #_first_recent_yr_nobias_adj_in_MPD
0.9229 #_max_bias_adj_in_MPD (1.0 to mimic pre-2009 models)
0 #_period of cycles in recruitment (N parms read below)
-5 #min rec_dev
5 #max rec_dev
0 #_read_recdevs
#Fishing Mortality info
0.3 # F ballpark for tuning early phases
-2001 # F ballpark year (neg value to disable)
2 # F_Method: 1=Pope; 2=instan. F; 3=hybrid (hybrid is recommended)
2.9 # max F or harvest rate, depends on F_Method
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# no additional F input needed for Fmethod 1
# if Fmethod=2; read overall start F value; overall phase; N detailed inputs to read
# 5 # if Fmethod=3; read N iterations for tuning for Fmethod 3

0.05 1 0 # overall start F value; overall phase; N detailed inputs to read
#_initial_F_parms
#_LO HI INIT PRIOR PR_type SD PHASE
0 1 0 0.01 0 99 -1 #_HLE
0 1 0 0.01 0 99 -1 #_HL_W
0 1 0 0.01 0 99 -1 #_LL_E
0 1 0 0.01 0 99 -1 #_LL_W
0 1 0 0.01 0 99 -1 #_MRIP_E
0 1 0 0.01 0 99 -1 #_MRIP_W
0 1 0 0.01 0 99 -1 #_HBT_E
0 1 0 0.01 0 99 -1 #_HBT_W
0 1 0 0.01 0 99 -1 #_C_Clsd_E
0 1 0 0.01 0 99 -1 #_C_Clsd_W
0 1 0 0.01 0 99 -1 #_R_Clsd_E
0 1 0 0.01 0 99 -1 #_R_Clsd_W
0 1 0 0.01 0 99 -1 #_Shr_E
0 1 0 0.01 0 99 -1 #_Shr_W
#_Q_setup
# Q_type options: <0=mirror,0=float_nobiasadj, 1=float_biasadj, 2=parm_nobiasadj, 3=parm_w_random_dev, 4=parm_w_randwalk, 5=mean_unbiased_float_assign_to_parm
#_for_env-var:_enter_index_of_the_env-var_to_be_linked
#_Den-dep env-var extra_se Q_type
0 0 0 0 #_HLE
0 0 0 0 #_HL_W
0 0 0 0 #_LL_E
0 0 0 0 #_LL_W
0 0 0 0 #_MRIP_E
0 0 0 0 #_MRIP_W
0 0 0 0 #_HBT_E
0 0 0 0 #_HBT_W
0 0 0 0 #_C_Clsd_E
0 0 0 0 #_C_Clsd_W
0 0 0 0 #_R_Clsd_E
0 0 0 0 #_R_Clsd_W
0 0 0 2 #_Shr_E
0 0 0 2 #_Shr_W
0 0 0 0 #_Video_E
0 0 0 0 #_Video_W
0 0 0 0 #_Larv_E
0 0 0 0 #_Larv_W
0 0 0 0 #_Sum_E
0 0 0 0 #_Sum_W
0 0 0 0 #_Fall_E
0 0 0 0 #_Fall_W
0 0 0 0 #_BLL_W
0 0 0 0 #_BLL_E
0 0 0 0 #_ROV_E
0 0 0 0 #_MRIP_Index_E
0 0 0 0 #_MRIP_Index_W
0 0 0 0 #_HBT_Index_E
0 0 0 0 #_HBT_Index_W
#_Cond 0 #_If q has random component, then 0=read one parm for each fleet with random q; 1=read a parm for each year of index
#_Q_parms(if_any)
# LO HI INIT PRIOR PR_type SD PHASE
  -10 20 1 1 -1 1 1 #_Shr_E
  -10 20 1 1 -1 1 1 #_Shr_W
#_size_selex_types
#discard_options:_0=none;_1=define_retention;_2=retention&mortality;_3=all_discarded_dead
#_Pattern Discard Male Special
0 2 0 0 #_HLE
0 2 0 0 #_HL_W
```

0	2	0	0	#_LL_E
0	2	0	0	#_LL_W
0	2	0	0	#_MRIP_E
0	2	0	0	#_MRIP_W
0	2	0	0	#_HBT_E
0	2	0	0	#_HBT_W
0	2	0	0	#_C_Clsd_E
0	2	0	0	#_C_Clsd_W
0	2	0	0	#_R_Clsd_E
0	2	0	0	#_R_Clsd_W
0	3	0	0	#_Shr_E
0	3	0	0	#_Shr_W
0	0	0	0	#_Video_E
0	0	0	0	#_Video_W
30	0	0	0	#_Larv_E
30	0	0	0	#_Larv_W
0	0	0	0	#_Sum_E
0	0	0	0	#_Sum_W
0	0	0	0	#_Fall_E
0	0	0	0	#_Fall_W
0	0	0	0	#_BLL_W
0	0	0	0	#_BLL_E
0	0	0	0	#_ROV_E
0	0	0	0	#_MRIP_Index_E
0	0	0	0	#_MRIP_Index_W
0	0	0	0	#_HBT_Index_E
0	0	0	0	#_HBT_Index_W

#_age_selex_types

#_Pattern	___	Male	Special	
20	0	0	0	#_HLE
20	0	0	0	#_HL_W
20	0	0	0	#_LL_E
20	0	0	0	#_LL_W
20	0	0	0	#_MRIP_E
20	0	0	0	#_MRIP_W
20	0	0	0	#_HBT_E
20	0	0	0	#_HBT_W
20	0	0	0	#_C_Clsd_E
20	0	0	0	#_C_Clsd_W
15	0	0	5	#_R_Clsd_E
15	0	0	6	#_R_Clsd_W
17	0	0	0	#_Shr_E
17	0	0	0	#_Shr_W
20	0	0	0	#_Video_E
20	0	0	0	#_Video_W
10	0	0	0	#_Larv_E
10	0	0	0	#_Larv_W
17	0	0	0	#_Sum_E
17	0	0	0	#_Sum_W
17	0	0	0	#_Fall_E
17	0	0	0	#_Fall_W
12	0	0	0	#_BLL_W
12	0	0	0	#_BLL_E
20	0	0	0	#_ROV_E
15	0	0	5	#_MRIP_Index_E
15	0	0	6	#_MRIP_Index_W
15	0	0	7	#_HBT_Index_E
15	0	0	8	#_HBT_Index_W

#_LO HI INIT PRIOR PR_type SD PHASE env-var use_dev dev_minyr dev_maxyr dev_std block block_fxn

10 100 15.24 15.24 -1 1 -3 0 0 0 0 0 1 2 # Retain_1P_1_HL_E
-1 20 1 1 -1 1 -3 0 0 0 0 0 1 2 # Retain_1P_2_HL_E
0 1 1 1 -1 1 -2 0 0 0 0 0 1 2 # Retain_1P_3_HL_E
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # Retain_1P_4_HL_E
-10 10 -5 -5 -1 1 -2 0 0 0 0 0 0 0 # DiscMort_1P_1_HL_E
-1 2 1 1 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_1P_2_HL_E
-1 2 0.75 0.75 -1 1 -2 0 0 0 0 0 4 2 # DiscMort_1P_3_HL_E
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_1P_4_HL_E
10 100 15.24 15.24 -1 1 -3 0 0 0 0 0 1 2 # Retain_2P_1_HL_W
-1 20 1 1 -1 1 -3 0 0 0 0 0 1 2 # Retain_2P_2_HL_W

0 1 1 1 -1 1 -2 0 0 0 0 0 1 2 # Retain_2P_3_HL_W
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # Retain_2P_4_HL_W
-10 10 -5 -5 -1 1 -2 0 0 0 0 0 0 0 # DiscMort_2P_1_HL_W
-1 2 1 1 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_2P_2_HL_W
-1 2 0.78 0.78 -1 1 -2 0 0 0 0 0 4 2 # DiscMort_2P_3_HL_W
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_2P_4_HL_W
10 100 15.24 15.24 -1 1 -3 0 0 0 0 0 1 2 # Retain_3P_1_LL_E
-1 20 1 1 -1 1 -3 0 0 0 0 0 1 2 # Retain_3P_2_LL_E
0 1 1 1 -1 1 -2 0 0 0 0 0 1 2 # Retain_3P_3_LL_E
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # Retain_3P_4_LL_E
-10 10 -5 -5 -1 1 -2 0 0 0 0 0 0 0 # DiscMort_3P_1_LL_E
-1 2 1 1 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_3P_2_LL_E
-1 2 0.81 0.81 -1 1 -2 0 0 0 0 0 4 2 # DiscMort_3P_3_LL_E
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_3P_4_LL_E
10 100 15.24 15.24 -1 1 -3 0 0 0 0 0 1 2 # Retain_4P_1_LL_W
-1 20 1 1 -1 1 -3 0 0 0 0 0 1 2 # Retain_4P_2_LL_W
0 1 1 1 -1 1 -2 0 0 0 0 0 1 2 # Retain_4P_3_LL_W
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # Retain_4P_4_LL_W
-10 10 -5 -5 -1 1 -2 0 0 0 0 0 0 0 # DiscMort_4P_1_LL_W
-1 2 1 1 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_4P_2_LL_W
-1 2 0.91 0.91 -1 1 -2 0 0 0 0 0 4 2 # DiscMort_4P_3_LL_W
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_4P_4_LL_W
10 100 15.24 15.24 -1 1 -3 0 0 0 0 0 2 2 # Retain_5P_1_MRIP_E
-1 20 1 1 -1 1 -3 0 0 0 0 0 2 2 # Retain_5P_2_MRIP_E
0 1 1 1 -1 1 -2 0 0 0 0 0 0 0 # Retain_5P_3_MRIP_E
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # Retain_5P_4_MRIP_E
-10 10 -5 -5 -1 1 -2 0 0 0 0 0 0 0 # DiscMort_5P_1_MRIP_E
-1 2 1 1 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_5P_2_MRIP_E
-1 2 0.21 0.21 -1 1 -2 0 0 0 0 0 4 2 # DiscMort_5P_3_MRIP_E
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_5P_4_MRIP_E
10 100 15.24 15.24 -1 1 -3 0 0 0 0 0 2 2 # Retain_6P_1_MRIP_W
-1 20 1 1 -1 1 -3 0 0 0 0 0 2 2 # Retain_6P_2_MRIP_W
0 1 1 1 -1 1 -2 0 0 0 0 0 0 0 # Retain_6P_3_MRIP_W
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # Retain_6P_4_MRIP_W
-10 10 -5 -5 -1 1 -2 0 0 0 0 0 0 0 # DiscMort_6P_1_MRIP_W
-1 2 1 1 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_6P_2_MRIP_W
-1 2 0.22 0.22 -1 1 -2 0 0 0 0 0 4 2 # DiscMort_6P_3_MRIP_W
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_6P_4_MRIP_W
10 100 15.24 15.24 -1 1 -3 0 0 0 0 0 2 2 # Retain_7P_1_HBT_E
-1 20 1 1 -1 1 -3 0 0 0 0 0 2 2 # Retain_7P_2_HBT_E
0 1 1 1 -1 1 -2 0 0 0 0 0 2 2 # Retain_7P_3_HBT_E
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # Retain_7P_4_HBT_E
-10 10 -5 -5 -1 1 -2 0 0 0 0 0 0 0 # DiscMort_7P_1_HBT_E
-1 2 1 1 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_7P_2_HBT_E
-1 2 0.21 0.21 -1 1 -2 0 0 0 0 0 4 2 # DiscMort_7P_3_HBT_E
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_7P_4_HBT_E
10 100 15.24 15.24 -1 1 -3 0 0 0 0 0 2 2 # Retain_8P_1_HBT_W
-1 20 1 1 -1 1 -3 0 0 0 0 0 2 2 # Retain_8P_2_HBT_W
0 1 1 1 -1 1 -2 0 0 0 0 0 0 0 # Retain_8P_3_HBT_W
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # Retain_8P_4_HBT_W
-10 10 -5 -5 -1 1 -2 0 0 0 0 0 0 0 # DiscMort_8P_1_HBT_W
-1 2 1 1 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_8P_2_HBT_W
-1 2 0.22 0.22 -1 1 -2 0 0 0 0 0 4 2 # DiscMort_8P_3_HBT_W
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_8P_4_HBT_W
10 100 10 10 -1 1 -3 0 0 0 0 0 0 0 # Retain_9P_1_C_Clsd_E
-1 20 1 1 -1 1 -3 0 0 0 0 0 0 0 # Retain_9P_2_C_Clsd_E
0 1 0 0 -1 1 -2 0 0 0 0 0 0 0 # Retain_9P_3_C_Clsd_E
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # Retain_9P_4_C_Clsd_E
-10 10 -5 -5 -1 1 -2 0 0 0 0 0 0 0 # DiscMort_9P_1_C_Clsd_E
-1 2 1 1 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_9P_2_C_Clsd_E
-1 2 0.74 0.74 -1 1 -2 0 0 0 0 0 4 2 # DiscMort_9P_3_C_Clsd_E
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_9P_4_C_Clsd_E
10 100 10 10 -1 1 -3 0 0 0 0 0 0 0 # Retain_10P_1_C_Clsd_W
-1 20 1 1 -1 1 -3 0 0 0 0 0 0 0 # Retain_10P_2_C_Clsd_W
0 1 0 0 -1 1 -2 0 0 0 0 0 0 0 # Retain_10P_3_C_Clsd_W
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # Retain_10P_4_C_Clsd_W
-10 10 -5 -5 -1 1 -2 0 0 0 0 0 0 0 # DiscMort_10P_1_C_Clsd_W
-1 2 1 1 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_10P_2_C_Clsd_W
-1 2 0.87 0.87 -1 1 -2 0 0 0 0 0 4 2 # DiscMort_10P_3_C_Clsd_W
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_10P_4_C_Clsd_W

10 100 10 10 -1 1 -3 0 0 0 0 0 0 0 # Retain_11P_1_R_Clsd_E
-1 20 1 1 -1 1 -3 0 0 0 0 0 0 0 # Retain_11P_2_R_Clsd_E
0 1 0 0 -1 1 -2 0 0 0 0 0 0 0 # Retain_11P_3_R_Clsd_E
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # Retain_11P_4_R_Clsd_E
-10 10 -5 -5 -1 1 -2 0 0 0 0 0 0 0 # DiscMort_11P_1_R_Clsd_E
-1 2 1 1 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_11P_2_R_Clsd_E
-1 2 0.21 0.21 -1 1 -2 0 0 0 0 0 4 2 # DiscMort_11P_3_R_Clsd_E
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_11P_4_R_Clsd_E
10 100 10 10 -1 1 -3 0 0 0 0 0 0 0 # Retain_12P_1_R_Clsd_W
-1 20 1 1 -1 1 -3 0 0 0 0 0 0 0 # Retain_12P_2_R_Clsd_W
0 1 0 0 -1 1 -2 0 0 0 0 0 0 0 # Retain_12P_3_R_Clsd_W
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # Retain_12P_4_R_Clsd_W
-10 10 -5 -5 -1 1 -2 0 0 0 0 0 0 0 # DiscMort_12P_1_R_Clsd_W
-1 2 1 1 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_12P_2_R_Clsd_W
-1 2 0.22 0.22 -1 1 -2 0 0 0 0 0 4 2 # DiscMort_12P_3_R_Clsd_W
-1 2 0 0 -1 1 -4 0 0 0 0 0 0 0 # DiscMort_12P_4_R_Clsd_W
0 19.8 2.76027 5.4 1 0.05 2 0 0 0 0 0.5 3 2 # AgeSel_1P_1_HL_E
-5 3 -2.01383 -2.3 1 0.05 3 0 0 0 0 0.5 3 2 # AgeSel_1P_2_HL_E
-4 12 -0.336177 1.6 1 0.05 3 0 0 0 0 0.5 3 2 # AgeSel_1P_3_HL_E
-2 6 2.70056 1.7 1 0.05 3 0 0 0 0 0.5 3 2 # AgeSel_1P_4_HL_E
-15 5 -11.8786 -8.3 1 0.05 2 0 0 0 0 0.5 3 2 # AgeSel_1P_5_HL_E
-5 5 -3.1569 -1.8 1 0.05 2 0 0 0 0 0.5 3 2 # AgeSel_1P_6_HL_E
0 19.8 3.23407 5.4 1 0.05 2 0 0 0 0 0.5 3 2 # AgeSel_2P_1_HL_W
-8 3 -4.95775 -2.3 1 0.05 3 0 0 0 0 0.5 3 2 # AgeSel_2P_2_HL_W
-4 12 0.232107 1.6 1 0.05 3 0 0 0 0 0.5 3 2 # AgeSel_2P_3_HL_W
-2 6 2.32277 1.7 1 0.05 3 0 0 0 0 0.5 3 2 # AgeSel_2P_4_HL_W
-15 5 -4.94275 -8.3 1 0.05 2 0 0 0 0 0.5 3 2 # AgeSel_2P_5_HL_W
-5 5 -3.45417 -1.8 1 0.05 2 0 0 0 0 0.5 3 2 # AgeSel_2P_6_HL_W
0 19.8 5.83175 7.5 1 0.05 2 0 0 0 0 0.5 3 2 # AgeSel_3P_1_LL_E
-5 3 0.511092 3 1 0.05 3 0 0 0 0 0.5 3 2 # AgeSel_3P_2_LL_E
-4 12 1.25141 2.2 1 0.05 3 0 0 0 0 0.5 3 2 # AgeSel_3P_3_LL_E
-2 6 0.0202586 2.1 1 0.05 3 0 0 0 0 0.5 3 2 # AgeSel_3P_4_LL_E
-15 5 -4.42574 -14.1 1 0.05 2 0 0 0 0 0.5 3 2 # AgeSel_3P_5_LL_E
-5 8 4.47157 5 1 0.05 2 0 0 0 0 0.5 3 2 # AgeSel_3P_6_LL_E
0 19.8 8.18689 7.5 1 0.05 2 0 0 0 0 0.5 3 2 # AgeSel_4P_1_LL_W
-5 3 -3.81036 3 1 0.05 3 0 0 0 0 0.5 3 2 # AgeSel_4P_2_LL_W
-4 12 2.46406 2.2 1 0.05 3 0 0 0 0 0.5 3 2 # AgeSel_4P_3_LL_W
-2 6 4.22005 2.1 1 0.05 3 0 0 0 0 0.5 3 2 # AgeSel_4P_4_LL_W
-15 5 -7.20927 -14.1 1 0.05 2 0 0 0 0 0.5 3 2 # AgeSel_4P_5_LL_W
-5 5 0.835389 5 1 0.05 2 0 0 0 0 0.5 3 2 # AgeSel_4P_6_LL_W
0 19.8 1.51966 5.4 1 0.05 2 0 0 0 0 0.5 5 2 # AgeSel_5P_1_MRIP_E
-6 3 -4.71687 -2.3 1 0.05 3 0 0 0 0 0.5 5 2 # AgeSel_5P_2_MRIP_E
-4 12 -2.48095 1.6 1 0.05 3 0 0 0 0 0.5 5 2 # AgeSel_5P_3_MRIP_E
-2 6 2.6846 1.7 1 0.05 3 0 0 0 0 0.5 5 2 # AgeSel_5P_4_MRIP_E
-15 5 -7.17778 -8.3 1 0.05 2 0 0 0 0 0.5 5 2 # AgeSel_5P_5_MRIP_E
-8 5 -4.97544 -1.8 1 0.05 2 0 0 0 0 0.5 5 2 # AgeSel_5P_6_MRIP_E
0 19.8 1.30659 5.4 1 0.05 2 0 0 0 0 0.5 5 2 # AgeSel_6P_1_MRIP_W
-8 3 -4.98823 -2.3 1 0.05 3 0 0 0 0 0.5 5 2 # AgeSel_6P_2_MRIP_W
-8 12 -3.98592 1.6 1 0.05 3 0 0 0 0 0.5 5 2 # AgeSel_6P_3_MRIP_W
-2 6 1.48241 1.7 1 0.05 3 0 0 0 0 0.5 5 2 # AgeSel_6P_4_MRIP_W
-16 5 -13.4869 -8.3 1 0.05 2 0 0 0 0 0.5 5 2 # AgeSel_6P_5_MRIP_W
-5 5 -3.00108 -1.8 1 0.05 2 0 0 0 0 0.5 5 2 # AgeSel_6P_6_MRIP_W
0 19.8 2.70596 5.4 1 0.05 2 0 0 0 0 0.5 5 2 # AgeSel_7P_1_HBT_E
-5 3 -0.713446 -2.3 1 0.05 3 0 0 0 0 0.5 5 2 # AgeSel_7P_2_HBT_E
-4 12 -0.320467 1.6 1 0.05 3 0 0 0 0 0.5 5 2 # AgeSel_7P_3_HBT_E
-2 6 -0.21241 1.7 1 0.05 3 0 0 0 0 0.5 5 2 # AgeSel_7P_4_HBT_E
-15 5 -12.6354 -8.3 1 0.05 2 0 0 0 0 0.5 5 2 # AgeSel_7P_5_HBT_E
-8 5 -4.88947 -1.8 1 0.05 2 0 0 0 0 0.5 5 2 # AgeSel_7P_6_HBT_E
0 19.8 1.3869 5.4 1 0.05 2 0 0 0 0 0.5 5 2 # AgeSel_8P_1_HBT_W
-8 3 -4.94962 -2.3 1 0.05 3 0 0 0 0 0.5 5 2 # AgeSel_8P_2_HBT_W
-6 12 -3.9063 1.6 1 0.05 3 0 0 0 0 0.5 5 2 # AgeSel_8P_3_HBT_W
-2 6 2.29813 1.7 1 0.05 3 0 0 0 0 0.5 5 2 # AgeSel_8P_4_HBT_W
-15 5 -12.4808 -8.3 1 0.05 2 0 0 0 0 0.5 5 2 # AgeSel_8P_5_HBT_W
-5 5 -3.66149 -1.8 1 0.05 2 0 0 0 0 0.5 5 2 # AgeSel_8P_6_HBT_W
0 19.8 3.31523 5.4 1 0.05 2 0 0 0 0 0.5 0 0 # AgeSel_9P_1_C_Clsd_E
-5 3 -2.83709 -2.3 1 0.05 3 0 0 0 0 0.5 0 0 # AgeSel_9P_2_C_Clsd_E
-4 12 0.218445 1.6 1 0.05 3 0 0 0 0 0.5 0 0 # AgeSel_9P_3_C_Clsd_E
-2 6 3.02543 1.7 1 0.05 3 0 0 0 0 0.5 0 0 # AgeSel_9P_4_C_Clsd_E
-15 5 -11.2423 -8.3 1 0.05 2 0 0 0 0 0.5 0 0 # AgeSel_9P_5_C_Clsd_E
-5 5 -3.64179 -1.8 1 0.05 2 0 0 0 0 0.5 0 0 # AgeSel_9P_6_C_Clsd_E

0 19.8 3.67602 5.4 1 0.05 2 0 0 0 0 0 0.5 0 0 # AgeSel_10P_1_C_Clsd_W
-6 3 -4.85037 -2.3 1 0.05 3 0 0 0 0 0 0.5 0 0 # AgeSel_10P_2_C_Clsd_W
-4 12 0.242077 1.6 1 0.05 3 0 0 0 0 0 0.5 0 0 # AgeSel_10P_3_C_Clsd_W
-2 6 1.1784 1.7 1 0.05 3 0 0 0 0 0 0.5 0 0 # AgeSel_10P_4_C_Clsd_W
-15 5 -11.6075 -8.3 1 0.05 2 0 0 0 0 0 0.5 0 0 # AgeSel_10P_5_C_Clsd_W
-5 5 -2.39319 -1.8 1 0.05 2 0 0 0 0 0 0.5 0 0 # AgeSel_10P_6_C_Clsd_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_1_Shr_E
-20 20 -3.14268 -0.1 0 1 2 0 0 0 0 0 0 0 0 # AgeSel_13P_2_Shr_E
-20 20 -1.07972 -0.1 0 1 2 0 0 0 0 0 0 0 0 # AgeSel_13P_3_Shr_E
-50 0 -20 -20 0 1 2 0 0 0 0 0 0 0 0 # AgeSel_13P_4_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_5_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_6_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_7_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_8_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_9_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_10_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_11_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_12_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_13_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_14_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_15_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_16_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_17_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_18_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_19_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_20_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_13P_21_Shr_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_1_Shr_W
-20 20 -2.73058 -0.1 0 1 2 0 0 0 0 0 0 0 0 # AgeSel_14P_2_Shr_W
-20 20 -1.29559 -0.1 0 1 2 0 0 0 0 0 0 0 0 # AgeSel_14P_3_Shr_W
-50 0 -20 -20 0 1 2 0 0 0 0 0 0 0 0 # AgeSel_14P_4_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_5_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_6_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_7_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_8_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_9_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_10_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_11_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_12_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_13_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_14_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_15_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_16_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_17_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_18_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_19_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_20_Shr_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_14P_21_Shr_W
0 19.8 3.49016 5.4 1 0.05 2 0 0 0 0 0 0.5 0 0 # AgeSel_15P_1_Video_E
-5 3 -1.14063 -2.3 1 0.05 3 0 0 0 0 0 0.5 0 0 # AgeSel_15P_2_Video_E
-4 12 0.356396 1.6 1 0.05 3 0 0 0 0 0 0.5 0 0 # AgeSel_15P_3_Video_E
-2 6 0.964759 1.7 1 0.05 3 0 0 0 0 0 0.5 0 0 # AgeSel_15P_4_Video_E
-15 5 -3.6871 -8.3 1 0.05 2 0 0 0 0 0 0.5 0 0 # AgeSel_15P_5_Video_E
-5 5 -0.667166 -1.8 1 0.05 2 0 0 0 0 0 0.5 0 0 # AgeSel_15P_6_Video_E
0 19.8 2.84346 5.4 1 0.05 2 0 0 0 0 0 0.5 0 0 # AgeSel_16P_1_Video_W
-5 3 -3.82022 -2.3 1 0.05 3 0 0 0 0 0 0.5 0 0 # AgeSel_16P_2_Video_W
-4 12 -0.447196 1.6 1 0.05 3 0 0 0 0 0 0.5 0 0 # AgeSel_16P_3_Video_W
-2 6 2.19099 1.7 1 0.05 3 0 0 0 0 0 0.5 0 0 # AgeSel_16P_4_Video_W
-15 5 -10.3848 -8.3 1 0.05 2 0 0 0 0 0 0.5 0 0 # AgeSel_16P_5_Video_W
-5 5 -1.55472 -1.8 1 0.05 2 0 0 0 0 0 0.5 0 0 # AgeSel_16P_6_Video_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_19P_1_Sum_E
-20 20 1.16508 -0.1 0 1 2 0 0 0 0 0 0 0 0 # AgeSel_19P_2_Sum_E
-20 20 0.0735348 -0.1 0 1 2 0 0 0 0 0 0 0 0 # AgeSel_19P_3_Sum_E
-50 0 -10.0298 -10 0 1 2 0 0 0 0 0 0 0 0 # AgeSel_19P_4_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_19P_5_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_19P_6_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_19P_7_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_19P_8_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_19P_9_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 0 # AgeSel_19P_10_Sum_E

-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_19P_11_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_19P_12_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_19P_13_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_19P_14_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_19P_15_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_19P_16_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_19P_17_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_19P_18_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_19P_19_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_19P_20_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_19P_21_Sum_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_1_Sum_W
-20 20 1.15544 -0.1 0 1 2 0 0 0 0 0 0 0 # AgeSel_20P_2_Sum_W
-20 20 -0.935845 -0.1 0 1 2 0 0 0 0 0 0 0 # AgeSel_20P_3_Sum_W
-50 0 -10.0252 -10 0 1 2 0 0 0 0 0 0 0 # AgeSel_20P_4_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_5_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_6_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_7_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_8_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_9_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_10_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_11_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_12_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_13_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_14_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_15_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_16_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_17_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_18_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_19_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_20_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_20P_21_Sum_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_1_Fall_E
-20 20 -3.72655 -0.1 0 1 2 0 0 0 0 0 0 0 # AgeSel_21P_2_Fall_E
-20 20 0.684902 -0.1 0 1 2 0 0 0 0 0 0 0 # AgeSel_21P_3_Fall_E
-50 0 -20 -20 0 1 2 0 0 0 0 0 0 0 # AgeSel_21P_4_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_5_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_6_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_7_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_8_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_9_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_10_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_11_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_12_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_13_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_14_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_15_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_16_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_17_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_18_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_19_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_20_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_21P_21_Fall_E
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_1_Fall_W
-20 20 -3.47213 -0.1 0 1 2 0 0 0 0 0 0 0 # AgeSel_22P_2_Fall_W
-20 20 -0.769867 -0.1 0 1 2 0 0 0 0 0 0 0 # AgeSel_22P_3_Fall_W
-50 0 -20 -20 0 1 2 0 0 0 0 0 0 0 # AgeSel_22P_4_Fall_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_5_Fall_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_6_Fall_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_7_Fall_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_8_Fall_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_9_Fall_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_10_Fall_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_11_Fall_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_12_Fall_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_13_Fall_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_14_Fall_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_15_Fall_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_16_Fall_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_17_Fall_W

-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_18_Fall_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_19_Fall_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_20_Fall_W
-20 20 0 0 0 1 -1 0 0 0 0 0 0 0 # AgeSel_22P_21_Fall_W
4 18 6.58345 12 -1 1 2 0 0 0 0 0 0 0 # AgeSel_23P_1_BLL_W
-5 5 2.15511 2 0 1 2 0 0 0 0 0 0 0 # AgeSel_23P_2_BLL_W
4 18 6.58345 12 -1 1 2 0 0 0 0 0 0 0 # AgeSel_24P_1_BLL_E
-5 5 2.15511 2 0 1 2 0 0 0 0 0 0 0 # AgeSel_24P_2_BLL_E
0 19.8 2.29632 5.4 1 0.05 2 0 0 0 0 0.5 0 0 # AgeSel_25P_1_ROV_E
-5 3 -2.33268 -2.3 1 0.05 3 0 0 0 0 0.5 0 0 # AgeSel_25P_2_ROV_E
-4 12 -1.9357 1.6 1 0.05 3 0 0 0 0 0.5 0 0 # AgeSel_25P_3_ROV_E
-2 6 -1.20939 1.7 1 0.05 3 0 0 0 0 0.5 0 0 # AgeSel_25P_4_ROV_E
-15 5 -11.2341 -8.3 1 0.05 2 0 0 0 0 0.5 0 0 # AgeSel_25P_5_ROV_E
-5 5 0.216479 -1.8 1 0.05 2 0 0 0 0 0.5 0 0 # AgeSel_25P_6_ROV_E
#_Cond 0 #_custom_sel-env_setup (0/1)
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no enviro fxns
1 #_custom_sel-blk_setup (0/1)
10 100 33.02 33.02 -1 1 -4 # Retain_1P_1_HL_E_BLK1repl_1985
10 100 35.56 35.56 -1 1 -4 # Retain_1P_1_HL_E_BLK1repl_1994
10 100 38.1 38.1 -1 1 -4 # Retain_1P_1_HL_E_BLK1repl_1995
10 100 33.02 33.02 -1 1 -6 # Retain_1P_1_HL_E_BLK1repl_2007
-1 20 1 1 -1 1 -4 # Retain_1P_2_HL_E_BLK1repl_1985
-1 20 1 1 -1 1 -4 # Retain_1P_2_HL_E_BLK1repl_1994
-1 20 1 1 -1 1 -4 # Retain_1P_2_HL_E_BLK1repl_1995
-1 20 1 1 -1 1 -4 # Retain_1P_2_HL_E_BLK1repl_2007
0 1 1 1 -1 1 -4 # Retain_1P_3_HL_E_BLK1repl_1985
0 1 1 1 -1 1 -4 # Retain_1P_3_HL_E_BLK1repl_1994
0 1 1 1 -1 1 -4 # Retain_1P_3_HL_E_BLK1repl_1995
0 1 0.81148 0.5 -1 1 6 # Retain_1P_3_HL_E_BLK1repl_2007
-1 2 0.56 0.56 -1 1 -4 # DiscMort_1P_3_HL_E_BLK4repl_2008
10 100 33.02 33.02 -1 1 -4 # Retain_2P_1_HL_W_BLK1repl_1985
10 100 35.56 35.56 -1 1 -4 # Retain_2P_1_HL_W_BLK1repl_1994
10 100 38.1 38.1 -1 1 -4 # Retain_2P_1_HL_W_BLK1repl_1995
10 100 33.02 33.02 -1 1 -6 # Retain_2P_1_HL_W_BLK1repl_2007
-1 20 1 1 -1 1 -4 # Retain_2P_2_HL_W_BLK1repl_1985
-1 20 1 1 -1 1 -4 # Retain_2P_2_HL_W_BLK1repl_1994
-1 20 1 1 -1 1 -4 # Retain_2P_2_HL_W_BLK1repl_1995
-1 20 1 1 -1 1 -4 # Retain_2P_2_HL_W_BLK1repl_2007
0 1 1 1 -1 1 -4 # Retain_2P_3_HL_W_BLK1repl_1985
0 1 1 1 -1 1 -4 # Retain_2P_3_HL_W_BLK1repl_1994
0 1 1 1 -1 1 -4 # Retain_2P_3_HL_W_BLK1repl_1995
0 1 0.961804 0.5 -1 1 6 # Retain_2P_3_HL_W_BLK1repl_2007
-1 2 0.6 0.6 -1 1 -4 # DiscMort_2P_3_HL_W_BLK4repl_2008
6 100 33.02 33.02 -1 1 -4 # Retain_3P_1_LL_E_BLK1repl_1985
6 100 35.56 35.56 -1 1 -4 # Retain_3P_1_LL_E_BLK1repl_1994
6 100 38.1 38.1 -1 1 -4 # Retain_3P_1_LL_E_BLK1repl_1995
6 100 33.02 33.02 -1 1 -6 # Retain_3P_1_LL_E_BLK1repl_2007
-1 20 1 1 -1 1 -4 # Retain_3P_2_LL_E_BLK1repl_1985
-1 20 1 1 -1 1 -4 # Retain_3P_2_LL_E_BLK1repl_1994
-1 20 1 1 -1 1 -4 # Retain_3P_2_LL_E_BLK1repl_1995
-1 20 1 1 -1 1 -4 # Retain_3P_2_LL_E_BLK1repl_2007
0 1 1 1 -1 1 -4 # Retain_3P_3_LL_E_BLK1repl_1985
0 1 1 1 -1 1 -4 # Retain_3P_3_LL_E_BLK1repl_1994
0 1 1 1 -1 1 -4 # Retain_3P_3_LL_E_BLK1repl_1995
0 1 0.53786 0.5 -1 1 6 # Retain_3P_3_LL_E_BLK1repl_2007
-1 2 0.64 0.64 -1 1 -4 # DiscMort_3P_3_LL_E_BLK4repl_2008
10 100 33.02 33.02 -1 1 -4 # Retain_4P_1_LL_W_BLK1repl_1985
10 100 35.56 35.56 -1 1 -4 # Retain_4P_1_LL_W_BLK1repl_1994
10 100 38.1 38.1 -1 1 -4 # Retain_4P_1_LL_W_BLK1repl_1995
10 100 33.02 33.02 -1 1 -6 # Retain_4P_1_LL_W_BLK1repl_2007
-1 20 1 1 -1 1 -4 # Retain_4P_2_LL_W_BLK1repl_1985
-1 20 1 1 -1 1 -4 # Retain_4P_2_LL_W_BLK1repl_1994
-1 20 1 1 -1 1 -4 # Retain_4P_2_LL_W_BLK1repl_1995
-1 20 1 1 -1 1 -4 # Retain_4P_2_LL_W_BLK1repl_2007
0 1 1 1 -1 1 -4 # Retain_4P_3_LL_W_BLK1repl_1985
0 1 1 1 -1 1 -4 # Retain_4P_3_LL_W_BLK1repl_1994
0 1 1 1 -1 1 -4 # Retain_4P_3_LL_W_BLK1repl_1995
0 1 0.946892 0.5 -1 1 6 # Retain_4P_3_LL_W_BLK1repl_2007
-1 2 0.81 0.81 -1 1 -4 # DiscMort_4P_3_LL_W_BLK4repl_2008
10 100 33.02 33.02 -1 1 -4 # Retain_5P_1_MRIP_E_BLK2repl_1985

10 100 35.56 35.56 -1 1 -4 # Retain_5P_1_MRIP_E_BLK2repl_1994
10 100 38.1 38.1 -1 1 -4 # Retain_5P_1_MRIP_E_BLK2repl_1995
10 100 40.64 40.64 -1 1 -4 # Retain_5P_1_MRIP_E_BLK2repl_2000
-1 20 1 1 -1 1 -4 # Retain_5P_2_MRIP_E_BLK2repl_1985
-1 20 1 1 -1 1 -4 # Retain_5P_2_MRIP_E_BLK2repl_1994
-1 20 1 1 -1 1 -4 # Retain_5P_2_MRIP_E_BLK2repl_1995
-1 20 1 1 -1 1 -4 # Retain_5P_2_MRIP_E_BLK2repl_2000
-1 2 0.118 0.118 -1 1 -4 # DiscMort_5P_3_MRIP_E_BLK4repl_2008
10 100 33.02 33.02 -1 1 -4 # Retain_6P_1_MRIP_W_BLK2repl_1985
10 100 35.56 35.56 -1 1 -4 # Retain_6P_1_MRIP_W_BLK2repl_1994
10 100 38.1 38.1 -1 1 -4 # Retain_6P_1_MRIP_W_BLK2repl_1995
10 100 40.64 40.64 -1 1 -4 # Retain_6P_1_MRIP_W_BLK2repl_2000
-1 20 1 1 -1 1 -4 # Retain_6P_2_MRIP_W_BLK2repl_1985
-1 20 1 1 -1 1 -4 # Retain_6P_2_MRIP_W_BLK2repl_1994
-1 20 1 1 -1 1 -4 # Retain_6P_2_MRIP_W_BLK2repl_1995
-1 20 1 1 -1 1 -4 # Retain_6P_2_MRIP_W_BLK2repl_2000
-1 2 0.118 0.118 -1 1 -4 # DiscMort_6P_3_MRIP_W_BLK4repl_2008
10 100 33.02 33.02 -1 1 -4 # Retain_7P_1_HBT_E_BLK2repl_1985
10 100 35.56 35.56 -1 1 -4 # Retain_7P_1_HBT_E_BLK2repl_1994
10 100 38.1 38.1 -1 1 -4 # Retain_7P_1_HBT_E_BLK2repl_1995
10 100 40.64 40.64 -1 1 -6 # Retain_7P_1_HBT_E_BLK2repl_2000
-1 20 1 1 -1 1 -4 # Retain_7P_2_HBT_E_BLK2repl_1985
-1 20 1 1 -1 1 -4 # Retain_7P_2_HBT_E_BLK2repl_1994
-1 20 1 1 -1 1 -4 # Retain_7P_2_HBT_E_BLK2repl_1995
-1 20 1 1 -1 1 -4 # Retain_7P_2_HBT_E_BLK2repl_2000
0 1 1 1 -1 1 -4 # Retain_7P_3_HBT_E_BLK2repl_1985
0 1 1 1 -1 1 -4 # Retain_7P_3_HBT_E_BLK2repl_1994
0 1 1 1 -1 1 -4 # Retain_7P_3_HBT_E_BLK2repl_1995
0 1 1 1 -1 1 -6 # Retain_7P_3_HBT_E_BLK2repl_2000
-1 2 0.118 0.118 -1 1 -4 # DiscMort_7P_3_HBT_E_BLK4repl_2008
10 100 33.02 33.02 -1 1 -4 # Retain_8P_1_HBT_W_BLK2repl_1985
10 100 35.56 35.56 -1 1 -4 # Retain_8P_1_HBT_W_BLK2repl_1994
10 100 38.1 38.1 -1 1 -4 # Retain_8P_1_HBT_W_BLK2repl_1995
10 100 40.64 40.64 -1 1 -4 # Retain_8P_1_HBT_W_BLK2repl_2000
-1 20 1 1 -1 1 -4 # Retain_8P_2_HBT_W_BLK2repl_1985
-1 20 1 1 -1 1 -4 # Retain_8P_2_HBT_W_BLK2repl_1994
-1 20 1 1 -1 1 -4 # Retain_8P_2_HBT_W_BLK2repl_1995
-1 20 1 1 -1 1 -4 # Retain_8P_2_HBT_W_BLK2repl_2000
-1 2 0.118 0.118 -1 1 -4 # DiscMort_8P_3_HBT_W_BLK4repl_2008
-1 2 0.55 0.55 -1 1 -4 # DiscMort_9P_3_C_Clsd_E_BLK4repl_2008
-1 2 0.74 0.74 -1 1 -4 # DiscMort_10P_3_C_Clsd_W_BLK4repl_2008
-1 2 0.118 0.118 -1 1 -4 # DiscMort_11P_3_R_Clsd_E_BLK4repl_2008
-1 2 0.118 0.118 -1 1 -4 # DiscMort_12P_3_R_Clsd_W_BLK4repl_2008
0 19.8 3.27537 5.4 1 0.05 2 # AgeSel_1P_1_HL_E_BLK3repl_2007
-5 3 -4.91435 -2.3 1 0.05 3 # AgeSel_1P_2_HL_E_BLK3repl_2007
-4 12 0.284437 1.6 1 0.05 3 # AgeSel_1P_3_HL_E_BLK3repl_2007
-2 6 2.88143 1.7 1 0.05 3 # AgeSel_1P_4_HL_E_BLK3repl_2007
-15 5 -12.4119 -8.3 1 0.05 2 # AgeSel_1P_5_HL_E_BLK3repl_2007
-5 5 -2.83744 -1.8 1 0.05 2 # AgeSel_1P_6_HL_E_BLK3repl_2007
0 19.8 3.56392 5.4 1 0.05 2 # AgeSel_2P_1_HL_W_BLK3repl_2007
-5 3 -4.77442 -2.3 1 0.05 3 # AgeSel_2P_2_HL_W_BLK3repl_2007
-4 12 0.0108765 1.6 1 0.05 3 # AgeSel_2P_3_HL_W_BLK3repl_2007
-2 6 2.21512 1.7 1 0.05 3 # AgeSel_2P_4_HL_W_BLK3repl_2007
-15 5 -13.6732 -8.3 1 0.05 2 # AgeSel_2P_5_HL_W_BLK3repl_2007
-5 5 -2.21992 -1.8 1 0.05 2 # AgeSel_2P_6_HL_W_BLK3repl_2007
0 19.8 5.27164 7.5 1 0.05 2 # AgeSel_3P_1_LL_E_BLK3repl_2007
-5 3 -4.17678 3 1 0.05 3 # AgeSel_3P_2_LL_E_BLK3repl_2007
-4 12 1.10671 2.2 1 0.05 3 # AgeSel_3P_3_LL_E_BLK3repl_2007
-2 6 2.31498 2.1 1 0.05 3 # AgeSel_3P_4_LL_E_BLK3repl_2007
-15 5 -12.375 -14.1 1 0.05 2 # AgeSel_3P_5_LL_E_BLK3repl_2007
-5 5 -1.52989 5 1 0.05 2 # AgeSel_3P_6_LL_E_BLK3repl_2007
0 19.8 8.6368 7.5 1 0.05 2 # AgeSel_4P_1_LL_W_BLK3repl_2007
-5 3 -4.33596 3 1 0.05 3 # AgeSel_4P_2_LL_W_BLK3repl_2007
-4 12 2.244 2.2 1 0.05 3 # AgeSel_4P_3_LL_W_BLK3repl_2007
-2 6 3.76335 2.1 1 0.05 3 # AgeSel_4P_4_LL_W_BLK3repl_2007
-15 5 -13.1074 -14.1 1 0.05 2 # AgeSel_4P_5_LL_W_BLK3repl_2007
-5 5 -0.338798 5 1 0.05 2 # AgeSel_4P_6_LL_W_BLK3repl_2007
0 19.8 3.54153 5.4 1 0.05 2 # AgeSel_5P_1_MRIP_E_BLK5repl_2008
0 19.8 2.23249 5.4 1 0.05 2 # AgeSel_5P_1_MRIP_E_BLK5repl_2011
-5 3 -4.79047 -2.3 1 0.05 3 # AgeSel_5P_2_MRIP_E_BLK5repl_2008

-5 3 -1.18931 -2.3 1 0.05 3 # AgeSel_5P_2_MRIP_E_BLK5repl_2011
-4 12 1.78536 1.6 1 0.05 3 # AgeSel_5P_3_MRIP_E_BLK5repl_2008
-4 12 -1.90776 1.6 1 0.05 3 # AgeSel_5P_3_MRIP_E_BLK5repl_2011
-2 6 1.97388 1.7 1 0.05 3 # AgeSel_5P_4_MRIP_E_BLK5repl_2008
-2 6 2.14102 1.7 1 0.05 3 # AgeSel_5P_4_MRIP_E_BLK5repl_2011
-15 5 -8.92309 -8.3 1 0.05 2 # AgeSel_5P_5_MRIP_E_BLK5repl_2008
-15 5 -10.6909 -8.3 1 0.05 2 # AgeSel_5P_5_MRIP_E_BLK5repl_2011
-5 5 -3.88496 -1.8 1 0.05 2 # AgeSel_5P_6_MRIP_E_BLK5repl_2008
-5 5 -3.13483 -1.8 1 0.05 2 # AgeSel_5P_6_MRIP_E_BLK5repl_2011
0 19.8 2.27802 5.4 1 0.05 2 # AgeSel_6P_1_MRIP_W_BLK5repl_2008
0 19.8 3.59744 5.4 1 0.05 2 # AgeSel_6P_1_MRIP_W_BLK5repl_2011
-5 3 -2.01573 -2.3 1 0.05 3 # AgeSel_6P_2_MRIP_W_BLK5repl_2008
-5 3 -3.94328 -2.3 1 0.05 3 # AgeSel_6P_2_MRIP_W_BLK5repl_2011
-4 12 -1.59533 1.6 1 0.05 3 # AgeSel_6P_3_MRIP_W_BLK5repl_2008
-4 12 0.942638 1.6 1 0.05 3 # AgeSel_6P_3_MRIP_W_BLK5repl_2011
-2 6 0.737643 1.7 1 0.05 3 # AgeSel_6P_4_MRIP_W_BLK5repl_2008
-2 6 2.79947 1.7 1 0.05 3 # AgeSel_6P_4_MRIP_W_BLK5repl_2011
-15 5 -3.00789 -8.3 1 0.05 2 # AgeSel_6P_5_MRIP_W_BLK5repl_2008
-15 5 -10.8227 -8.3 1 0.05 2 # AgeSel_6P_5_MRIP_W_BLK5repl_2011
-5 5 -3.66989 -1.8 1 0.05 2 # AgeSel_6P_6_MRIP_W_BLK5repl_2008
-5 5 -3.14159 -1.8 1 0.05 2 # AgeSel_6P_6_MRIP_W_BLK5repl_2011
0 19.8 3.06417 5.4 1 0.05 2 # AgeSel_7P_1_HBT_E_BLK5repl_2008
0 19.8 3.78383 5.4 1 0.05 2 # AgeSel_7P_1_HBT_E_BLK5repl_2011
-5 3 -4.79854 -2.3 1 0.05 3 # AgeSel_7P_2_HBT_E_BLK5repl_2008
-5 3 -4.84726 -2.3 1 0.05 3 # AgeSel_7P_2_HBT_E_BLK5repl_2011
-4 12 -0.0955082 1.6 1 0.05 3 # AgeSel_7P_3_HBT_E_BLK5repl_2008
-4 12 0.315724 1.6 1 0.05 3 # AgeSel_7P_3_HBT_E_BLK5repl_2011
-2 6 2.54663 1.7 1 0.05 3 # AgeSel_7P_4_HBT_E_BLK5repl_2008
-2 6 2.90763 1.7 1 0.05 3 # AgeSel_7P_4_HBT_E_BLK5repl_2011
-15 5 -10.4343 -8.3 1 0.05 2 # AgeSel_7P_5_HBT_E_BLK5repl_2008
-15 5 -11.5411 -8.3 1 0.05 2 # AgeSel_7P_5_HBT_E_BLK5repl_2011
-5 5 -4.54451 -1.8 1 0.05 2 # AgeSel_7P_6_HBT_E_BLK5repl_2008
-5 5 -3.72947 -1.8 1 0.05 2 # AgeSel_7P_6_HBT_E_BLK5repl_2011
0 19.8 3.46153 5.4 1 0.05 2 # AgeSel_8P_1_HBT_W_BLK5repl_2008
0 19.8 4.61047 5.4 1 0.05 2 # AgeSel_8P_1_HBT_W_BLK5repl_2011
-5 3 -3.52564 -2.3 1 0.05 3 # AgeSel_8P_2_HBT_W_BLK5repl_2008
-5 3 -4.94778 -2.3 1 0.05 3 # AgeSel_8P_2_HBT_W_BLK5repl_2011
-4 12 -1.52657 1.6 1 0.05 3 # AgeSel_8P_3_HBT_W_BLK5repl_2008
-4 12 0.369315 1.6 1 0.05 3 # AgeSel_8P_3_HBT_W_BLK5repl_2011
-2 6 1.62573 1.7 1 0.05 3 # AgeSel_8P_4_HBT_W_BLK5repl_2008
-2 6 1.29668 1.7 1 0.05 3 # AgeSel_8P_4_HBT_W_BLK5repl_2011
-15 5 -10.4078 -8.3 1 0.05 2 # AgeSel_8P_5_HBT_W_BLK5repl_2008
-15 5 -11.5248 -8.3 1 0.05 2 # AgeSel_8P_5_HBT_W_BLK5repl_2011
-5 5 -2.82795 -1.8 1 0.05 2 # AgeSel_8P_6_HBT_W_BLK5repl_2008
-5 5 -3.23967 -1.8 1 0.05 2 # AgeSel_8P_6_HBT_W_BLK5repl_2011

3	#_env/block/dev_adjust_method			(1=standard;		2=logistic	trans	to	keep	in	base	parm
	bounds;	3=standardw/		no	bound	check)						
	#	TG_custom:		0=no	read;	1=read	if	tags	exist			
#_Cond	-6	6	1	1	2	0.01	-4	0	0	0	0	0
	0	0	#_placeholder		if	no	parameters					
1	#_Variance_adjustments_to_input_values											
#_fleet:	1	2	3	4	5	6	7	8	9	10	11	12
	13	14	survey:	1	2	3	4	5	6	7	8	9
	10	11	12	13	14	15						
0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	#_add_to_survey_CV							
0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	#_add_to_discard_stddev							
0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	#_add_to_bodywt_CV							
1	1	1	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	#_mult_by_lencomp_N							
1	1	1	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	#_mult_by_agecomp_N							

1	1	1	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	#_mult_by_size-at-age_N							
7	#_maxlambdaphase											
1	#_sd_offset											
0	#	number	of	changes	to	make	to	default	Lambdas	(default	value	is
	1.0)											
0	#	(0/1)	read	specs	for	more	stddev	reporting				
999												

A.4 Forecast File

```
#C forecast file written by R function SS_writeforecast
#C rerun model to get more complete formatting in forecast.ss_new
#C should work with SS version: 3.24
#C file write time: 2018-03-05 15:22:01
#
1 #_benchmarks
2 #_MSY
0.1652 #_SPRtarget
0.26 #_Btarget
#_Bmark_years: beg_bio end_bio beg_selex end_selex beg_alloc end_alloc
1984 2016 2011 2016 2011 2016
1 #_Bmark_relF_Basis
1 #_Forecast
60 #_Nforecastyrs
0.2 #_F_scalar
#_Fcast_years:  beg_selex, end_selex, beg_relF, end_relF
2016 2016 2011 2016
2 #_ControlRuleMethod
0.01 #_BforconstantF
0.001 #_BfornoF
1 #_Flimitfraction
2 #_N_forecast_loops
3 #_First_forecast_loop_with_stochastic_recruitment
0 #_Forecast_loop_control_3
0 #_Forecast_loop_control_4
0 #_Forecast_loop_control_5
2017 #_FirstYear_for_caps_and_allocations
0 #_stddev_of_log_catch_ratio
0 #_Do_West_Coast_gfish_rebuilder_output
2017 #_Ydecl
-1 #_Yinit
1 #_fleet_relative_F
3 #_basis_for_fcast_catch_tuning
# max totalcatch by fleet (-1 to have no max)
-1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1
# max totalcatch by area (-1 to have no max)
-1 -1
# fleet assignment to allocation group (enter group ID# for each fleet, 0 for not included in an alloc group)
1 1 1 1 2 2 2 2 0 0 0 0 0 0
# allocation fraction for each of: 2  allocation groups
 #_Grp1 Grp2
  0.51 0.49
360 #_Ncatch
99 #_InputBasis
 #_Year Seas Fleet Catch_or_F
  2017    1     9 0.00285046
  2017    1    10 0.00077750
  2017    1    11 0.42766800
  2017    1    12 0.03216120
  2017    1    13 0.00694144
  2017    1    14 0.15369900
  2018    1     9 0.00285046
  2018    1    10 0.00077750
  2018    1    11 0.42766800
  2018    1    12 0.03216120
  2018    1    13 0.00694144
```

2018	1	14	0.15369900
2019	1	9	0.00285046
2019	1	10	0.00077750
2019	1	11	0.42766800
2019	1	12	0.03216120
2019	1	13	0.00694144
2019	1	14	0.15369900
2020	1	9	0.00285046
2020	1	10	0.00077750
2020	1	11	0.42766800
2020	1	12	0.03216120
2020	1	13	0.00694144
2020	1	14	0.15369900
2021	1	9	0.00285046
2021	1	10	0.00077750
2021	1	11	0.42766800
2021	1	12	0.03216120
2021	1	13	0.00694144
2021	1	14	0.15369900
2022	1	9	0.00285046
2022	1	10	0.00077750
2022	1	11	0.42766800
2022	1	12	0.03216120
2022	1	13	0.00694144
2022	1	14	0.15369900
2023	1	9	0.00285046
2023	1	10	0.00077750
2023	1	11	0.42766800
2023	1	12	0.03216120
2023	1	13	0.00694144
2023	1	14	0.15369900
2024	1	9	0.00285046
2024	1	10	0.00077750
2024	1	11	0.42766800
2024	1	12	0.03216120
2024	1	13	0.00694144
2024	1	14	0.15369900
2025	1	9	0.00285046
2025	1	10	0.00077750
2025	1	11	0.42766800
2025	1	12	0.03216120
2025	1	13	0.00694144
2025	1	14	0.15369900
2026	1	9	0.00285046
2026	1	10	0.00077750
2026	1	11	0.42766800
2026	1	12	0.03216120
2026	1	13	0.00694144
2026	1	14	0.15369900
2027	1	9	0.00285046
2027	1	10	0.00077750
2027	1	11	0.42766800
2027	1	12	0.03216120
2027	1	13	0.00694144
2027	1	14	0.15369900
2028	1	9	0.00285046
2028	1	10	0.00077750
2028	1	11	0.42766800
2028	1	12	0.03216120
2028	1	13	0.00694144
2028	1	14	0.15369900
2029	1	9	0.00285046
2029	1	10	0.00077750
2029	1	11	0.42766800
2029	1	12	0.03216120
2029	1	13	0.00694144
2029	1	14	0.15369900
2030	1	9	0.00285046
2030	1	10	0.00077750
2030	1	11	0.42766800

2030	1	12	0.03216120
2030	1	13	0.00694144
2030	1	14	0.15369900
2031	1	9	0.00285046
2031	1	10	0.00077750
2031	1	11	0.42766800
2031	1	12	0.03216120
2031	1	13	0.00694144
2031	1	14	0.15369900
2032	1	9	0.00285046
2032	1	10	0.00077750
2032	1	11	0.42766800
2032	1	12	0.03216120
2032	1	13	0.00694144
2032	1	14	0.15369900
2033	1	9	0.00285046
2033	1	10	0.00077750
2033	1	11	0.42766800
2033	1	12	0.03216120
2033	1	13	0.00694144
2033	1	14	0.15369900
2034	1	9	0.00285046
2034	1	10	0.00077750
2034	1	11	0.42766800
2034	1	12	0.03216120
2034	1	13	0.00694144
2034	1	14	0.15369900
2035	1	9	0.00285046
2035	1	10	0.00077750
2035	1	11	0.42766800
2035	1	12	0.03216120
2035	1	13	0.00694144
2035	1	14	0.15369900
2036	1	9	0.00285046
2036	1	10	0.00077750
2036	1	11	0.42766800
2036	1	12	0.03216120
2036	1	13	0.00694144
2036	1	14	0.15369900
2037	1	9	0.00285046
2037	1	10	0.00077750
2037	1	11	0.42766800
2037	1	12	0.03216120
2037	1	13	0.00694144
2037	1	14	0.15369900
2038	1	9	0.00285046
2038	1	10	0.00077750
2038	1	11	0.42766800
2038	1	12	0.03216120
2038	1	13	0.00694144
2038	1	14	0.15369900
2039	1	9	0.00285046
2039	1	10	0.00077750
2039	1	11	0.42766800
2039	1	12	0.03216120
2039	1	13	0.00694144
2039	1	14	0.15369900
2040	1	9	0.00285046
2040	1	10	0.00077750
2040	1	11	0.42766800
2040	1	12	0.03216120
2040	1	13	0.00694144
2040	1	14	0.15369900
2041	1	9	0.00285046
2041	1	10	0.00077750
2041	1	11	0.42766800
2041	1	12	0.03216120
2041	1	13	0.00694144
2041	1	14	0.15369900
2042	1	9	0.00285046

2042	1	10	0.00077750
2042	1	11	0.42766800
2042	1	12	0.03216120
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2043	1	10	0.00077750
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2043	1	12	0.03216120
2043	1	13	0.00694144
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2044	1	10	0.00077750
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999 # verify end of input

A.5 Parameter File

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# MGparm[5]:
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# MGparm[7]:
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# MGparm[11]:
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# MGparm[12]:
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# MGparm[13]:
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# MGparm[14]:
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# MGparm[15]:
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# MGparm[16]:
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0.164495842227 -0.209191275962 -0.0637996815739 0.0785292866311 -0.241505453613 0.108635124842 -0.286336156897 -0.0514540642936
-0.0561151775814 -0.0724904353651 -0.0505956207139 -0.00570912968232 0.00299719892894 -0.0946531096864 -0.0631610725777 -
0.0678692394154 0.0875877145482 0.107705668113 0.107305978929 0.0497412150484 0.138805053865 0.192572759260 0.182287438244
0.127363401235 0.0803879128555 0.0662323001289 0.108598007567 0.167941645661 0.201861099284 0.209171415768 -0.0226712596596 -
0.0351934207860 -0.0802448046520 -0.121474821109 0.0419092648871 0.125268754886 -0.0412311102308 -0.151945453616
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# SR_parm[2]:
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# SR_parm[5]:
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# SR_parm[6]:
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