STOCK ASSESSMENT OF RED SNAPPER IN THE GULF OF MEXICO 1872 – 2013 - WITH PROVISIONAL 2014 LANDINGS

-- SEDAR Update Assessment --

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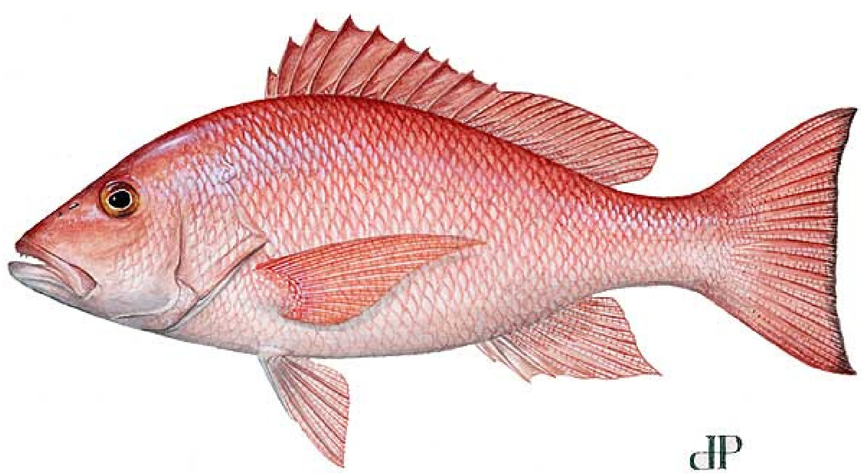

Report of the Update Assessment
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PREPARED FOR THE SCIENCE AND STATISTICAL COMMITTEE
GULF FISHERY MANAGEMENT COUNCIL

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1. INTRODUCTION

This document summarizes the update of the SEDAR 31 benchmark assessment of red snapper in the U.S. Gulf of Mexico using updated data inputs through 2013, and provisional 2014 landings. Except as otherwise noted, the specifications of the model and data streams are identical to those of the base models identified in the SEDAR 31 final report. An important change that has been incorporated in this assessment is an adjustment to the recreational catch and discard estimates produced by the Marine Recreational Information Program (MRIP). The stock assessment was accepted (with 2014 provisional landings) by the GMFMC SSC at a special meeting on Feb 19, 2015.

Requests for additional analyses were received by the Science Center after the base model was accepted. These addressed the following: 1) sensitivity runs to explore the implications of the MRIP recalibration and new information about recent recreational selectivity, 2) an analysis of alternative recreational allocation and 3) an analysis of alternative F_{MSY} proxies. The results of these analyses are attached as **Appendices 1-3**, respectively.

1.1 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 base model with data through 2013.
2. Document any changes or corrections made to model and input datasets and provide updated input data tables. Provide commercial and recreational landings and discards in pounds and numbers.
    - When updating recreational catch and effort indices of abundance, ensure use of the most current calibration methods from the September 2014 MRIP Calibration workshop, if possible.
3. Update model parameter estimates and their variances, model uncertainties, estimates of stock status and management benchmarks, and provide the probability of overfishing occurring at specified future harvest and exploitation levels.
4. Develop a stock assessment update report to address these TORS and fully document the input data and results of the stock assessment update.

NOTE: The intent of update assessments is to expedite appraisals of stock status by using only the methods and data sets used in the base model and approved during the preceding SEDAR assessment of that stock.

2. DATA REVIEW AND UPDATE

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 a viable option. 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 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. Correspondingly, an age class 1 red snapper would experience half a year of age-0 M and half a year of age-1 M, and so forth. The final base vector and the “high” and “low” vectors used in SEDAR 31 are given in **Table 2.1 and Figure 2.2**.

2.2.2 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 2.3a**), 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 2.3b**). 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.

2.2.3 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 SEDAR 31, is shown in **Table 2.2** and **Figure 2.4**.

2.2.4 Conversion factors

The update model used conversion factors approved for SEDAR 31 and summarized below:

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
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

2.2.5 Release Mortality

A meta-analysis was developed for SEDAR 31 (and used for the update assessment) to estimate discard mortality rates for Gulf of Mexico red snapper. Data used in this meta-analysis were compiled from 11 studies that produced 70 distinct estimates. There are multiple estimates from some studies because they produced estimates for multiple fishing depths and/or seasons in which data were collected. Separate discard mortality relationships were developed for each sector (i.e., commercial and recreational). No venting was assumed to occur prior to 2008 (i.e., when venting became mandatory), and venting was assumed to occur from 2008 onward. An average seasonal effect was assumed in the relationships. For the commercial sector, average depths at which discards occurred for each gear (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 at the AW.

The resulting release mortality rates, by fleet, region, open/closed season and venting requirement are summarized in **Table 2.3**.

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 2013.

Landings:
Estimates of commercial landings (pounds, whole weight) are available since the inception of the major fisheries (1980 for the longline fishery and 1872 for the vertical line). With the exception of the additional two years of data, the commercial estimates have not changed significantly since SEDAR 31 (**Table 2.4**).

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 (FIN) 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 2.5**).

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 (2007-2013) 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.

During the years prior to 2007, the commercial red snapper fishery was managed, in part, through the use of closed seasons and a permitting system that limited the landings of red snapper per trip. Permitting began in 1993 with class 1 permits; followed in 1998 with the introduction of class 2 permits. Prior to 1993, red snapper permits were not required for commercial vessels. Those vessels with class 1 permits during the years 1993-1995 were defined as "class 1" vessels for the period 1990-1992. Similarly, vessels with class 2 permits during the years 1998-2000 were defined as "class 2" vessels during the period 1990-1997. All other vessels were defined as "no permit" for those periods in the analysis. To address the possible effects of these regulations on the number of red snapper discarded, the self-reported discard and coastal logbook data were stratified by gear (vertical line or bottom longline), permit category (class 1, 2000 pounds; class 2, 200 pounds; or no permit), red snapper season (open or closed), and region fished (eastern or western Gulf of Mexico, delineated by the Mississippi River). Discard rates were calculated using discard logbook data while total fishing effort was summed from coastal logbook data. For the years where discard rate data were available (2002-2006), discards were estimated for each stratum as the product of the year and stratum-specific discard rates and total effort. For the years where no discard rate data were available (1990-2001), discards were calculated as the product of the mean stratum-specific discard rate for 2002-2006 and the stratum-specific total effort. The strata-specific discards were summed within years to calculate yearly total discards.

It should be noted that there has been an increasing tendency of fishers to report "no discards" of any species. In contrast, trips with no discards of any species are uncommon in the observer data (McCarthy, 2012), suggesting that some fishers under-report their discards. Accordingly, the self-reported discard logbook data set was filtered to remove records with "no discards" to reduce the likelihood of using discard rates that were erroneously low.

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 2007-2013; complete years of observer data. 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. Year and stratum specific discards were calculated as described for pre-IFQ years.

Commercial discards in numbers of fish are summarized in **Table 2.6** (vertical line) and **Table 2.7** (longline).

Size and age composition of discards:
Commercial discard age compositions for both the open and closed seasons were constructed by applying age length keys to the length frequencies from the commercial observer program. Separate age length keys for the eastern and western Gulf were used (which included length and age data from commercial fisheries, recreational fisheries, and the NMFS bottom long line survey) (**Table 2.8**). Very few discarded red snapper were sampled from the long line fishery in

the western Gulf of Mexico in 2008 and 2010, therefore they were excluded from the western long line discard age compositions.

The computed annual age composition of the commercial discards, by fleet, region and red snapper season (Open/Closed) 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.

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 three surveys: (1) the Marine Recreational Information Program (MRIP), formerly the Marine Recreational Fishery Statistics Survey (MRFSS), conducted by the NOAA Fisheries (NMFS), (2) the Texas Marine Sport-Harvest Monitoring Program by the Texas Parks and Wildlife Department (TPWD) and (3) the Southeast Region Headboat Survey (SRHS) conducted by NMFS, Southeast Fisheries Science Center, Beaufort, NC. The MRIP and the TPWD surveys are both sampling-based, while the SRHS strives to be a census of headboats using logbooks. The three 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.

Important changes were made to the design of the MRIP Access Point Angler Intercept Survey (APAIS) in 2013 as part of the ongoing efforts by the program to address issues raised by the 2006 National Research Council. The new survey covers the fishing day more effectively than the original MRFSS Access Point Survey (see example **Figure 2.5**) and, as a result, tended to produce higher estimates of red snapper landings and discards than the original design. For this reason, there is a need to adjust the original time series of MRFSS estimates to the new time series of MRIP APAIS estimates.

The Second MRIP Calibration Workshop convened September 8 – 10, 2014, in North Charleston, SC to address these changes and determine how best to adjust survey estimates to maintain a consistent time series of catch estimates. The summary report from the workshop (Carmichael and Van Voorhees, 2015) suggested several calibration approaches to explore. The recommended interim adjustment, found in Appendix 2 of that report, is based on the ratio of the total catch to the catch during the peak period as follows:

- Define the peak period for each of the domains (excluding species) using two criteria: 1) the contiguous range of hours during which weighted hourly proportions of total trips in the MRFSS years (prior to 2013) were greater than or equal to the corresponding weighted hourly proportions of total trips in 2013, and 2) the peak period that accounted for at least 75% of the intercept trips in the MRFSS years.

- Estimate the peak catch $c_{p,2013}$ and total catch $c_{total,2013}$ using the 2013 data based on the new MRIP survey method and calculate the ratio

$$R_{2013} = c_{total,2013}/c_{p,2013}$$

- Estimate the adjusted total catch for year *y* (i.e., a prediction of what would have been obtained if MRIP had been run) as

$$c_{tot,y} = R_{2013} * c_{p,y}$$

where $c_{p,y}$ is the estimate based on the MRFSS method during the peak period in year *y*.

Separate ratios were computed for the discards and landings of each species, sub-region, state, and mode combination (all waves and areas are combined within those strata).

In accordance with the recommendations set forth by the MRIP Calibration Workshop II, MRIP personnel continue to investigate the remaining two methods described in the report. It is possible that one of them will be determined to be a better method at some future date. In the interim, the simple ratio method is recommended by the MRIP Calibration Workshop II.

Landings:

Recreational landings by fishing mode (Private + Charter, Headboat) and region are summarized in **Table 2.12**. The rescaled landings for the private/charter are 10-20% greater than the landings used in the SEDAR 31 assessment throughout the time series (**Figure 2.6**), reflecting the fact that trips targeting red snapper are better sampled under the new APAIS design.

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 as described in the SEDAR 31 assessment report. All recommendations from SEDAR 31 were followed in this update, however, results have changed due to the addition of additional years of data from 2012 and 2013 and the updated MRIP APAIS catch estimates.

To estimate discards for the headboat fleet, discard rates from SRHS headboats with consistent patterns of reporting for 2004-2013 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 2004-2013 headboat discard rates. These decisions were done by Gulf region, in accordance with SEDAR 31 recommendations. Previously (SEDAR 31), the MRIP proxies having the best linear correlations with the SRHS during 2004-2011were the “all modes combined” in the East Gulf of Mexico and the charter boat mode in the West Gulf of Mexico. 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 recreational discards (in numbers of fish) are summarized by region and red snapper season (open/closed) in **Table 2.14** (MRIP Private + Charter) and **Table 2.15** (Headboat). Closed season discards were combined across fishing mode (Private+Charter+Headboat).

The discard estimates from all three recreational surveys were affected by the MRIP APAIS adjustment, either directly (MRIP) or indirectly (SRHS, TPWD) due to the use of MRIP proxies. (**Figures 2.7-2.8**). It should be noted however that the proportionately large change in recreational discards had little effect on the overall assessment.

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. The regional age length key for the eastern Gulf was used (which included length and age data from commercial fisheries, recreational fisheries, and the NMFS bottom long line survey) (**Table 2.8**). The resulting annual age composition is summarized in **Table 2.16.** No information was available on the size or age of red snapper discards from the private or charter fleets.

Catch per unit effort:
All fishery CPUE indices used in the update assessment are summarized in **Table 2.11**.

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. The resulting indices are compared with the SEDAR 31 indices in **Figure 2.9** (MRIP) and **Figure 2.10** (HB).

2.3.3 Shrimp fishery bycatch

Shrimp bycatch estimates for Gulf of Mexico red snapper were generated using the same approach developed by Scott Nichols in the SEDAR 7 Gulf of Mexico red snapper assessment (Nichols 2004a, 2004b). The primary data on CPUE in the shrimp fishery came from a series of shrimp observer programs, which began in 1972 and extend to the current shrimp observer program. Additional CPUE data were obtained from the SEAMAP groundfish survey. Point estimates and associated standard errors of shrimp effort were generated by the NMFS Galveston Lab using their SN-pooled model (Nance 2004). Most CPUE data were reported in fish per net hour, while the shrimp effort data were reported in vessel-days. Therefore, data from the Vessel Operating Units File were needed to estimate the average number of nets per vessel for the shrimp fishery to convert total shrimp effort to net-hours. A detailed description of the data and methods used to produce the shrimp bycatch estimates can be found in Linton (2012). The resulting regional bycatch estimates (in numbers of fish) are summarized in **Table 2.17**.

Regional shrimp effort was used as an index of shrimp fishing mortality in the assessment, in addition to its use in the estimation of shrimp bycatch. 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**)

Age compositions for the shrimp bycatch were derived through visual inspection of modes in length frequencies from the 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 surveys on artificial reefs. The methodologies used to standardize and incorporate these data into the assessment are identical to those employed during SEDAR 31 and therefore only briefly reviewed below.

All fishery-independent indices used in the update assessment are summarized in **Table 2.20**.

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 2004-2013 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 (**Figure 2.11**). In general, the indices were similar to those developed for SEDAR31, although some disparities were noted, particularly in the Eastern Gulf.

Age compositions were constructed by applying regional age length keys (**Table 2.8**) to length frequencies from the survey. Separate age length keys for the eastern and western Gulf were used, which included length and age data from commercial fisheries, recreational fisheries, and the NMFS bottom long line survey. The resulting age compositions are summarized in **Table 2.21**.

2.4.2 SEAMAP Larval Survey

Ichthyoplankton samples have been collected 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 (*Lutjanus campechanus*) spawning season. The occurrence and abundance of red snapper larvae captured during SEAMAP surveys in the Gulf of Mexico have been used to reflect trends in relative spawning stock size of red snapper since 2004. A full review of the survey design and methodologies are described in SEDAR31-DW27.

Indices developed using the SEAMAP Fall Plankton Survey were recommended for use in the SEDAR 31 assessment model, and were also used for the update assessment (**Figure 2.12**). The abundance indices recommended for use were the age adjusted index for the western GOM that included all larvae between 3.75 and 9.25 mm, and the frequency of occurrence model for the eastern GOM. The frequency of occurrence model was chosen over the delta-lognormal index due to extremely low catches and occurrence of red snapper in the eastern GOM.

The 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

Trawl surveys have been conducted through SEAMAP in the Gulf of Mexico (GOM) since 1987. 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 Gulf of Mexico (GOM). A full review of the survey design and methodologies are described in SEDAR31-DW20.

As in SEDAR 31, indices developed from the SEAMAP Groundfish Survey were included in the update assessment model. Separate indices were developed for the eastern and western GOM and for the summer and fall surveys (**Figure 2.13**). 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 surveys were derived through visual inspection of modes in length frequencies from the surveys. (**Table 2.22 – Table 2.23**).

2.4.4 NMFS Bottom Longline

The Southeast Fisheries Science Center (SEFSC) Mississippi Laboratories has conducted standardized bottom longline surveys in the Gulf of Mexico, Caribbean, and Western North Atlantic since 1995. The objective of these surveys is to provide fisheries independent data for stock assessment purposes for as many species as possible. These surveys are conducted annually in U.S. waters of the Gulf of Mexico (GOM) and/or the Atlantic Ocean, and they provide an important source of fisheries independent information on large coastal sharks, snappers and groupers from the GOM and Atlantic. In 2011, an Expanded Stock Assessment Survey was conducted where high levels of survey effort were maintained from April through October. For this analysis, only data collected during the same time period as the annual survey were used to increase sample size. As in SEDAR 31, two standardized indices (Eastern GOM and Western GOM) were developed using NMFS bottom longline survey data (**Figure 2.14**).

Direct age compositions were used for the NMFS bottom long line survey, which included age data from the 2011 supplemental sampling. 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 (**Table 2.24**).

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 Artificial Reef Survey

This survey combines ROV observations of red snapper length from separate surveys conducted by the University of West Florida using ROVs, Dauphin Island Sea Lab using ROVs, and NMFS Panama City laboratory using ROVs and stationary camera. A multinomial regression model (SEDAR31-AW08) was used to predict the probability of a fish being in one of the length bins as a function of the covariates (i.e. year, season, longitude bin, and reef type (natural or artificial). The final model was:

TL_{cat} ~ year + reef type.

Sample sizes for the length comps were calculated as the number of red snapper measured multiplied by the area covered by the ROV surveys. The combined ROV length compositions include lengths of fish observed on artificial reefs. Age compositions for the combined ROV survey were constructed by applying separate age length keys for the eastern and western Gulf of Mexico to length frequencies from the surveys (**Table 2.25**).

3. STOCK ASSESSMENT METHODS

3.1 Overview

Like SEDAR 31, the assessment model selected for the update assessment was Stock Synthesis (SS) version 3.24P. Descriptions of SS algorithms and options are available in the SS user's manual (Methot 2010) and at the NOAA Fisheries Toolbox website (http://nft.nefsc.noaa.gov/). The r4ss software (www.cran.r-project.org/web/packages/r4ss/index.html) was utilized extensively to develop various graphics for the SS outputs and also was used to summarize various SS output files and to conduct the parametric bootstrap analyses.

Detailed descriptions of the data inputs, control files, parameter settings etc. can be found on the SEDAR website (http://sedarweb.org/sedar-31) and can also be obtained by contacting the corresponding author at Shannon.Calay@noaa.gov.

3.2 Model Configuration

Base model configuration was identical to SEDAR 31 except that an additional selectivity time block (2011-2013) was added to all recreational fleets to accommodate a perceived change in recent fishing behavior (i.e. larger average size).

General Structure

- Age structured model: ages 0 to 20+, 1872-2013 (provisional landings in 2014).
- 2 stock/region model : East and West of the Mississippi River

- Time-varying recruitment in each region allowing a change in average productivity in recent years (1984-2013)
- 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

<u>Fishing fleets definitions (14)</u>
Directed fleet landings and discards (8)

- Com Vertical line E/W 1872-
- Com Longline E/W 1980-
- MRFSS/MRIP E/W 1950-
- Headboat E/W 1950-

Bycatch fleets (discards only) (6)

- Com Closed Season (or zero IFQ allocation) E/W 1991-
- Rec Closed Season E/W 1997-
- Shrimp Bycatch E 1950, W1946-

<u>Indices of abundance (18)</u>
Fishery catch per unit effort (8)

- Commercial Vertical line E/W (1990-2006)
- MRFSS/MRIP E/W (1981-2013)
- Headboat E/W (1986-2013)
- Shrimp Fishing Effort E/W (1950-2013)

Fishery-independent surveys (11)

- SEAMAP Video E/W (1993-2013)
- SEAMAP Plankton E/W (1987-2012)
- SEAMAP Summer Groundfish E/W (1982-2013)
- SEAMAP Fall Groundfish Trawl E/W (1972-2013)
- NFMS bottom longline E/W (1986-2013)
- Artificial reef size composition E

The base model for this assessment represented red snapper age classes from age zero through age 20, where age 20 is a plus group. 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 2013, except for landings for which ***provisional*** 2014 estimates were available.

Fourteen fishing fleets and fifteen fishery-independent surveys were used (Section 2.3). The fishing fleets in the model were separated into east and west and included the commercial vertical line and longline, recreational headboat and private/charter fleets, the shrimp bycatch fleet, a commercial closed season fleet, and a recreational closed season fleet. The commercial and recreational closed season fleets represent fishery discards for those years when strict closed seasons were in place for each sector, in addition to the component of the commercial fishing fleet since 2007 that has had no red snapper IFQ allocation.

Eighteen indices of abundance were used in the update assessment. Eight fishery catch per unit effort indices were developed for the model including: commercial vertical line, MRFSS/MRIP, and Southeast Regional Headboat Survey **(Section 2.3, Table 2.11**). In addition, eleven fishery-independent surveys were incorporated including: the SEAMAP video survey, SEAMAP larval survey, SEAMAP summer and fall groundfish trawl, NMFS bottom longline, and the combined ROV survey. All indices were developed separately for the eastern and western GOM (**Section 2.4**; **Table 2.20**). Abundance indices were assumed to have a lognormal error structure with units of standard error of $\log_e$(index). If the variance of the observations was available only as a CV, then the value of se was approximated as $\text{sqrt}(\log_e(1+CV^2))$, where CV is the standard error of the observation divided by the mean value of the observation.

An index of shrimp effort was also incorporated into the model (**Section 2.3.3**). This information was used by the model in conjunction with the median value from the time series of annual shrimp bycatch estimates to estimate annual levels of shrimp bycatch. Essentially, a catchability parameter (Q) is estimated to scale the effort series into the fishing mortality rates that produce the best agreement between the median of the annual bycatch values predicted by the assessment model and the median of the observed annual bycatch values. Note that the model still predicts annual bycatch values, but does not attempt to fit those annual predictions to the annual observations owing to the very high uncertainty associated with them. Instead, the observed shrimp bycatch was input as a single value representing the median across the entire time series (i.e., as a super year), and the model fit the predicted median to the observed median.

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 not estimated.

For all of the fleets and surveys except for the NMFS bottom longline survey, age-specific selectivity parameters were specified for each age using a random walk approach. In the random walk selectivity approach, the age-specific selectivity parameters represent the rate of change from the selectivity value for the previous age. The NMFS bottom longline survey was estimated using a two parameter logistic function, because all older ages of red snapper are assumed to be vulnerable to this survey. 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 selection pattern.

For the recreational closed season fisheries, we assumed that selectivity was the same as during the open season for the private/charter fishery, with the difference being that no red snapper are retained during the closed season. Note that for the commercial closed season fisheries, the assumption is that selectivity during the true closed season period (i.e., prior to IFQs in 2007) is the same as selectivity for fishers with no IFQ allocation during the IFQ period (i.e., commercial fishers without allocation fish much as they did during the closed season). This assumption is necessary because we only have discard age or size data from the observer program for the period when IFQs were also in place. Finally, the recreational CPUE indices (specified as surveys in SS) were assumed to have the same selectivity patterns as their respective fisheries.

Time-varying processes were included in the base model in order to account for the way changes to fishing regulations altered the way people fished. The time varying processes included changes in selectivity and the discard mortality rate. The changes in selectivity were used to account for the switch to circle hooks in the recreational fishery, and to account for the switch to an IFQ system in the commercial fishery. The change in discard mortality rate was included to account for changes in venting practices, which were shown to have a significant effect on discard mortality rates.

Retention curves were used to account for discards that resulted from the implementation of minimum size regulations. The retention function was specified as a four parameter logistic function. Generally, these parameters were not estimated in the base model and the logistic function parameters were fixed to represent knife-edged retention at the minimum size limit. Retention functions changed over time as the size limits changed. For fleets and size limit time periods where discard age composition data were available (i.e., commercial vertical line east and west and long line east for 2007-2013, and headboat east for 2000-2013), the inflection point and asymptote of the retention functions were estimated. Attempts to estimate the slopes of the retention functions resulted in poor model convergence owing to the low number of samples.

Despite the fact that the red snapper Stock Synthesis model contains two areas (east and west of the Mississippi River), the model only estimates one stock recruitment relationship for the entire Gulf of Mexico. Annually estimated recruits are then allocated to each area using the following equation, where in the red snapper model, there are two parameters, *p*, one for each area *(i, j*), one which is fixed at zero and the other which is estimated:

$$rate_i = e^{p_i} / \sum_{j=1}^{N} e^{p_{ij}}$$

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 1972-2013 (i.e., the data rich period of the assessment). As in SEDAR 31, steepness was estimated near the upper limit and was therefore fixed at 0.99. 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 stocks, although they are managed currently as though they were a single stock.

Estimated recruitments in the early data poor period of the assessment were consistently lower than recruitments from the later data rich period, which might suggest a change in productivity over time. Therefore, the parameter controlling recruitment at virgin levels (R_0) was estimated as a time-varying process for two blocks of the time series: one prior to 1984 and another from 1984 to the present. The time-varying component was accomplished by estimating a multiplicative adjustment to the R_0 parameter. Incorporating a time-varying R_0 allows us to use the more recent estimate of stock productivity in the projections and the calculation of reference points. The sigma-R (σ_R) parameter, which represents the standard deviation of the log of recruitment, was fixed at 0.3. This parameter has two related roles: it penalizes deviations from the spawner-recruitment curve, and it defines the offset between the arithmetic mean spawner-recruitment curve (as calculated from log(R_0) and steepness) and the expected geometric mean (which is the basis from which the deviations are calculated).

Stock Synthesis is hard-coded to model recruits as age 0 fish. Annual deviations from the stock-recruit function were estimated in SS as a vector of deviations forced to sum to zero. Stock Synthesis assumes a lognormal error structure for recruitment. Consequently, expected recruitments were bias adjusted. Methot (2010) recommends that the full bias adjustment only be applied to data-rich years in the assessment therefore the estimates are very precise (σ^2=0). Therefore, no bias adjustment was applied prior to 1985, when only catch data are available. Prior to 1984, recruitment is estimated as a function of spawning stock biomass based on the stock-recruit parameters. This is done so SS will apply the full bias-correction only to those recruitment deviations that have enough data to inform the model about the full range of recruitment variability (Method 2011). Full bias adjustment was used from 1990 to 2007 when age composition data are available. Bias adjustment was phased in from no bias adjustment prior to 1972 to full bias adjustment in 1984 linearly. Bias adjustment was phased out over the last years (2007-2013), decreasing from full bias adjustment to no bias adjustment, because the age composition data contains little information on younger year classes for those years.

As in SEDAR 31, age composition data were weighted by the number of fish measured, with sample sizes capped at 200 fish to prevent the model from over-fitting the age compositions to the exclusion of the indices of abundance. Indices of abundance were weighted by the log-scale standard deviations estimated as part of the index standardization process.

3.3 Model Convergence

The ability of the model to find a global minimum was evaluated using an internal SS parameter "jitter" option which randomly changes the input parameter by a specified value. A jitter value of 10% was input for this assessment and 100 runs were made. SS carries out the jitter exercise by randomly changing the initial starting values of the parameters by 10% thus altering the starting estimates across many runs. The purpose in changing the parameter starting estimates across numerous models is to explore the model's ability to reach a global solution (i.e., minima) from starting at different places along the likelihood space.

3.4 Uncertainty and Measures of Precision

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

4. MODEL RESULTS

4.1 Landings

In this implementation and for SEDAR 31, the landings data were assumed to have been observed with relatively little error as an input log-scale standard error of 0.05 was used for all landings time series. Therefore, the landings were fit closely for all fleets with directed landings. However, due to the 2013 MRIP recalibration, the estimated annual landings for the update assessment are somewhat higher than the SEDAR 31 estimates from 1981 to the present (**Figure 4.1**).

4.2 Discards

The observed and predicted discards, and the input log-scale standard errors are shown in **Figure 4.2a-l**. The quality of the model fits to the discard data varied by fishing fleet. With few exceptions, the SEDAR 31 model and the update assessment fit the discards quite similarly. As mentioned in **Section 2.3.2**, the MRIP recalibration (APAIS) caused a significant change in the estimation of discards from all recreational surveys. This change was particularly evident in the Western Gulf (**Figure 4.2f, h**). It should be noted however that the proportionately large change in recreational discards had little effect on the overall implications of the assessment.

In general, the model fits to the commercial discard data were better than the fits to the recreational discard data. For each of the discard time series a fixed log-scale standard error of 0.5 was used to characterize uncertainty in those observations, compared to a value of 0.05 for the landings. Therefore, the model fit the landings data more precisely than the discard data when the two sources of information diverged from model expectations.

4.3 Indices

A comparison of the fits to the indices for SEDAR 31 and the update assessment are shown in **Figure 4.3**. The quality of the model fits to the indices of abundance varied by data source.

4.3.1 Fishery CPUE, Adult Stock

With few exceptions, the model fits to the fisheries dependent indices developed for SEDAR 31 and the update assessment were quite similar (**Figure 4.3 a-c**).. The commercial vertical line indices (**Figure 4.3a**) 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 while abundance in the western Gulf appears to have decline through 1995. The MRIP (charter + private boat) indices both suggested increasing abundance until about 2010, then a decline in abundance, particularly in the eastern Gulf since 2010 (**Figure 4.3b left**). This decline was not yet apparent during SEDAR 31. The decline was also noted in the observations of headboat CPUE in the eastern Gulf, although the model fit to that index did not decline as significantly as the observed values (**Figure 4.3c left**).

4.3.2 Fishery-Independent Surveys, Adult Stock

The model fits to the fisheries independent indices adult red snapper were quite similar for SEDAR 31 and the update assessment (**Figure 4.3 d-f**). The SEAMAP Video indices both suggested increasing abundance of adult red snapper during 2006-2011, however abundance appears to have declined in the eastern Gulf since that time (**Figure 4.3d**). The NMFS Bottom Longline (**Figure 4.3e**) and SEAMAP Ichthyoplankton (Larval) indices (**Figure 4.3f**) exhibited similarly increasing trends, but did not give evidence of a consistent decline in the east after 2011.

4.3.4 Fishery-Independent Surveys, Ages 0 and 1

The model fits to the fishery-independent indices referencing Ages 0 and 1 were also quite similar for SEDAR 31 and the update assessment (**Figure 4.3 g-h**). The SEAMAP Fall Groundfish Survey was used to index Age-0 recruits and generally varied with little trend throughout the time series (**Figure 4.3g**). During SEDAR 31, the SEAMAP Fall Groundfish index had suggested low recruitment in the eastern Gulf during 2010 and 2011. Estimates of Age-0 recruits in 2012 and 2013 were higher. Subsequently, the update assessment estimated moderate abundance of eastern recruits during the most recent years. The SEAMAP Summer Groundfish survey was used to index Age-1 red snapper and also varied with little trend during the time series (**Figure 4.3h**).

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 were capped at N=200 to prevent overfitting the age composition at the expense of other model components (e.g. indices of abundance). The SS model also estimates an effective N (eff N; **Figures 4.4-4.6**) which can be used to reweight age composition if desired. That feature was not used for the base model during SEDAR 31, or for the update assessment.

4.4.1 Age comp of retained landings

The model fits to the age composition of the retained catch, by fishery, were very similar for SEDAR 31 and the update model (**Figure 4.4**). For strata (fishery, year) with sufficient sample size (e.g. >50), the model fit the age composition of the retained catch well. Model fits were not as good for strata having low sample sizes, as expected given their lesser relative weight in the model. It should be noted for strata with less than 10 aged samples, annual age composition was not used in the update model (although it was used during SEDAR 31). Therefore, the number of panels (indicating the year) differs in some cases (**Figures 4.4 a, c, f, h**)

4.4.2 Age comp of discards

The model fits to the age composition of the discards, by fishery, were generally very similar for SEDAR 31 and the update model (**Figure 4.5**), except for the fit to the commercial closed season discard age composition which was superior in the update assessment (**Figure 4.5 f**). For strata (fishery, year) with sufficient sample size (e.g. >50), the model fit the age composition of discards quite well. Model fits to strata with low sample sizes were not as good, as expected given their low relative weight in the model. It should be noted for strata with less than 10 aged samples, annual age composition was not used in the update model (although it was used during

SEDAR 31). Therefore, the number of panels (indicating the year) differs in some cases (**Figures 4.5 c, f, g**).

4.4.3 Age comp of surveys

The model fits to the age composition of the fishery independent surveys, were generally also very similar for SEDAR 31 and the update model (**Figure 4.6**). For strata (fishery, year) with sufficient sample size (e.g. >50), the model fit the age composition of discards quite well. Model fits to strata with low sample size were not as good, as expected given their low relative weight in the model. It should be noted for strata with less than 10 aged samples, annual age composition was not used in the update model (although it was used during SEDAR 31). Therefore, the number of panels (indicating the year) differs in some cases (**Figures 4.6 c, j**). Furthermore, for reasons that are not entirely clear, there was a discrepancy in the number of samples available for the NMFS Bottom Longline East during the update assessment (**Figure 4.6 c**). This discrepancy had little impact on the model results.

4.5 Fishery Selectivity and Retention

Predicted age-based selectivities for fleets and indices in the terminal year (2013) are illustrated in **Figure 4.7** (fleet-specific) and in **Figure 4.8** (survey-specific).

In general, estimated fleet-specific selectivities for the update assessment were very similar to SEDAR 31, except for some recreational fleets. An additional selectivity block was estimated for the recreational fleets during 2011-2013 to accommodate an observed shift in the age composition toward larger, older fish. The primary effect of this change was to shift the selectivity of the eastern recreational fisheries toward full selection at older ages (**Figure 4.7 f, g**). The effect on the western recreational fleets was less noticeable. Estimated survey-specific selectivities differed somewhat between SEDAR 31 and the update assessment, in particular the eastern SEAMAP video selectivity (**Figure 4.8 a**) and the eastern ROV (**Figure 4.8 d**). The reasons for these changes were not entirely clear, but they were likely caused by differences in the input length composition data and the subsequent translation to age composition using age-length keys.
In the terminal year (2013) 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 survey in the east and west (Fall_E, Fall_W)
- age 1 for the summer groundfish survey in the east and west (Sum_E, Sum_W)
- ages 2-7 for the western MRIP fleet (MRIP_W)
- ages 3-5 for the western commercial closed season discard fleet (C_Clsd_W)
- ages 3-6 for the commercial vertical line (HL_E and HL_W)
- ages 3-6 for the western SEAMAP Video (Video_W)
- ages 3-7 for the eastern headboat (HB_E)
- ages 3-7 for the eastern commercial closed season discard fleet (C_Clsd_E)
- ages 3-20 for the eastern SEAMAP Video (Video_E)
- ages 4-20 for the eastern ROV survey (ROV_E)
- ages 5-6 for the western headboat (HB_W)

- ages 5-8 for the eastern MRIP fleet (MRIP_E)
- ages 5-8 for the eastern commercial longline fleet (LL_E)
- ages 6-20 for the western commercial longline (LL_W)
- ages 6-20 for the NMFS Bottom Longline (BLL_E, BLL_W)

As expected, the longline fisheries and the NMFS Bottom Longline survey landed the oldest fish (ages 6-20+) while younger fish (predominately ages 0 and 1) were discarded by the shrimp fleet. The commercial vertical line and recreational fleets in the eastern and western Gulf generally landed red snapper of intermediate ages (ages 2-8) (**Figure 4.7).**

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 4.9**). 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**). For the update assessment, estimated changes in selectivity were generally smaller than had been estimated during SEDAR 31.

Time-varying selectivity functions were also estimated for recreational fisheries to allow two changes, one due to a regulatory mandate requiring the use of circle-hooks beginning in 2007, and a second apparent change in fishing behavior resulting in a shift in age composition toward larger, older fish during 2011-2013 (**Figure 4.10**). For every fleet, an increasing shift in selectivity toward older red snapper was estimated for 2008-2010 and 2011-2013. 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.

Multiple length-based time-varying retention functions (logistic in form) were modeled for the commercial and recreational fisheries to account for the changes in the size of fished retained due to various minimum size limits (**Figure 4.11**). 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. The retention functions estimated for SEDAR 31 and the update assessment were nearly identical.

4.6 Recruitment

Profiles of the steepness parameter during SEDAR 31 suggested a steepness value towards the upper bound of 1.0 (**Figure 4.12**). Therefore, the SEDAR 31 AW Panel recommended fixing the Beverton – Holt steepness parameter at 0.99. This assumption was retained for the update assessment. SS was allowed to estimate the R_0 (virgin recruitment level). The estimated value of $\ln(R_0)$ during the recent time period (1984-2013) was 12.0441 (0.0567 = SD). The standard error of log recruitment (σ_R) was fixed at 0.3.

The spawner-recruit relationship estimated by SS (assuming steepness = 0.99 and $\sigma_R = 0.3$) is shown in **Figure 4.13**. Estimated gulf-wide recruitment (numbers of Age-0) with 95% confidence intervals, and estimated recruitment deviations are shown in **Figure 4.14** and **Figure 4.15**. Recruitment deviations varied without trend over the time series except during the mid

1980's, when a steep decline is noted. The recent years (since 2010) contain less information from which to estimate the level of recruitment, since not all cohorts have fully contributed to the fishery. The high estimated recruitment deviation value for 1972 corresponds to observed high recruitment index values from the Fall SEAMAP groundfish trawl survey indices.

Regional estimates 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. However, the update assessment suggests a less significant decline (to moderate levels) than the SEDAR 31 assessment, which estimated very low recruitments in 2010 and 2011 (**Figure 4.16**)

The spawning biomass and recruitment estimates 1872-2013 are summarized in **Table 4.1**.

4.7 Stock Biomass

Estimated total and regional biomass and spawning biomass are presented in **Table 4.1** and in **Figures 4.17** (total) **4.18** (regional). Total biomass and spawning biomass show a steady declining trend from the late 1880's through the early 1900s, followed by a flat trend up to the 1940s. Predicted SS total biomass showed strong declines starting in the 1940s and lasting through the late 1970s. Increases in total and spawning stock biomass are predicted by SS beginning in the about 1990. This trend is also consistent across both areas.

Estimates of annual number at age are summarized by area in **Table 4.2** (East) and **Table 4.3**. (West). Gulfwide number at age can be calculated by summing the two matrices.

In the eastern Gulf, the estimated mean age of red snapper was approximately 4.0 in the unfished state in 1872 (**Figure 4.19 top panels**). 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 of red snapper was approximately 4.0 in the unfished state in 1872 (**Figure 4.19 bottom panels**). The mean age remained stable at age 4 until the 1950s, 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.

4.8 Fishing Mortality

The fraction of the stock killed by fishing (numbers killed by fishing /total numbers) was used as the proxy for annual fishing mortality rate. Predicted annual fishing mortality estimates (all fleets combined) suggest low levels of F through the mid-1940s. From the late 1940s through the mid-1990s, a steadily increasing F was predicted. Since about 2000, estimated annual F has declined (**Table 4.4**; **Figure 4.20**).

Instantaneous annual fishing mortality by fleet is summarized in **Figure 4.21**. This represents the fishing mortality level on the most vulnerable age class for each fleet. In general, fishing mortality rates were lower prior to 1950 and increased thereafter. 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. Fishing mortality remained variable without trend until the late 1950s, when after which a significant increase in fishing mortality was observed for the vertical line fleet in both the east and the west. Fishing mortality declined in the early 1970s until the mid-1980s, after which an increase in fishing mortality was observed for the recreational fleet.

4.9 Measures of Uncertainty

Uncertainty in parameter estimates was quantified by computing asymptotic standard errors for each parameter (**Table 4.5**). Asymptotic standard errors are calculated by inverting the Hessian matrix (i.e., the matrix of second derivatives) after the model fitting process. Asymptotic standard errors provide a minimum estimate of uncertainty in parameter values.

4.10 Sensitivity Analyses

Initial models were prepared using the SEDAR 31 base, high and low natural mortality functions, and a run at base M which upweighted the indices by applying a log-scale standard error = 0.1 to all years (**Figure 4.22**). These models (which lacked 2014 provisional landings estimates) were prepared to the Gulf of Mexico Fishery Management Council (GMFMC) SSC for evaluation at their January 2015 meeting. The SSC chose to develop management advice using the base M run with no index reweighting, and did not further evaluate these sensitivity runs.

Additional sensitivity analyses were developed to address questions posed by the Council regarding the effects of the MRIP recalibration, the use of the 2011-2013 selectivity time-block for recreational fisheries, increasing recreational allocation and use of various MSY proxies on estimates of the overfishing limit (OFL) and acceptable biological catch (ABC). The results of these analyses are described in **Section 4.12** and **Appendices 1-3.**

4.11 Benchmarks and Reference Points

$F_{SPR26\%}$ was chosen as the proxy for F_{MSY}, although a number of other proxies were also considered (See Section 4.12 and Appendix 3). Therefore, the maximum fishing mortality threshold (MFMT) was assumed to be equal to the fishing mortality rate that produces SPR26% in equilibrium. The minimum stock size threshold (MSST) was calculated as (1-M) * $SSB_{FSPR26\%,}$ where M = 0.09. The update assessment indicated that the Gulf of Mexico red snapper stock was recovering, but remained overfished (SSB_{2013}/$SSB_{FSPR26\%}$ = 0.54; SSB_{2013}/MSST = 0.573). Overfishing was not occurring ($F_{Current}$/MFMT =0.995, where "$F_{current}$" is the mean F during 2011-2013). Annual estimates of stock status, in terms of exploitation rate (F/MFMT) and biomass (SSB/$SSB_{FSPR26\%;}$ SSB/MSST) are tabulated in **Table 4.6.** The relevant MSRA (Magnuson-Stevens Reauthorization Act) management references and benchmarks are summarized in **Tables 4.7** (SEDAR 31) and **Table 4.8** (update). The estimated harvest levels (OFL, ABC) for the update assessment are also shown in **Table 4.8.**

4.12 Projections

Deterministic projections were run using the Stock Synthesis model (described in section 3) to evaluate stock status and associated retained yields. Projections were run from 2015 to 2032 using the base model configuration with provisional 2014 catches as reviewed by the GMFMC SSC on February 19, 2015. Projections were run assuming that selectivity, discarding, and retention practices would continue as they had in three most recent years (2011-2013). The expected fishing effort levels for the 6 bycatch fleets (shrimp, recreational closed season, and commercial without IFQ allocation) in 2015-2032 were assumed be the same as in 2013. Since steepness was fixed near 1.0, it was assumed the forecast recruitments would to continue at recent levels (i.e., 1984-2013).

Two base projections ($F_{SPR26\%}$ and $F_{REBUILD}$) were evaluated by the GMFMC SSC and used to develop management advice. The overfishing limit (OFL) and acceptable biological catch (ABC) were calculated as stipulated by the GMFMC SSC during their January 2015 meeting in Tampa, Florida. OFL was calculated as the median (50th percentile) of the probability density function (PDF) of retained yield (millions of lbs) using the projection of $F_{SPR26\%}$. The acceptable biological catch (ABC) was calculated at a P* of 0.427 (the 42.7th percentile) of the PDF of retained yield using the projection of $F_{REBUILD}$, which achieves a gulfwide spawning potential ratio (SPR) of 26% in 2032. A P* of 0.427 implies a 42.7% probability of overfishing in any given year. Both sensitivity runs used a 51% commercial: 49% recreational allocation (2015-2032) when projecting OFLs and ABCs.

Projected recruitment (R in numbers of fish), fishing mortality (F), F/MFMT, spawning biomass (SSB in eggs), SSB/SSB $_{FSPR26\%}$, SSB/MSST, SSB/SSB_0, overfishing limit (OFL, millions of lbs retained) and acceptable biological catch (ABC, millions of lbs retained) for the $F_{SPR26\%}$ and $F_{Rebuild}$ projections are summarized in **Table 4.9** and **Table 4.10**, respectively, and in **Figure 4.23**.

4.12.1 Sensitivity to MRIP and new selectivity block

During the January 2015 GMFMC (Council) meeting, SEFSC staff noted that estimates of the overfishing limit (OFL), acceptable biological catch (ABC) and maximum sustainable yield (MSY) were estimated to be higher for the update assessment than for the SEDAR 31and proposed that this disparity likely resulted from a recent recalibration of recreational landing and discard estimates (MRIP) and a new selectivity time-block (2011-2013) added to the update assessment to accommodate a recent increase in the size of red snapper landed in the recreational sector. Subsequently, the Southeast Regional Office (SERO) requested two sensitivity analyses to further elucidate the reason for this disparity:

- Project the annual OFLs at $F_{26\%SPR}$ and the ABCs at $F_{REBUILD}$ from 2015-2032 using pre-MRIP recalibrated estimates.

- Project the annual OFLs at $F_{26\%SPR}$ and the ABCs at $F_{REBUILD}$ from 2015-2032 using pre-MRIP recalibrated estimates and no new recreational selectivity block for 201 1-2013.

The results of this analysis are summarized in Appendix 1. Estimates of OFL and ABC were sensitive to the treatment of MRIP removals and recent recreational selectivity. The lowest estimated OFL and ABC values occurred when using the pre-recalibrated MRIP estimates without allowing new estimates of 2011-2014 selectivity for the recreational fisheries. Intermediate OFL estimates resulted from using pre-recalibrated MRIP estimates while allowing the new selectivity estimates, and the highest OFL estimates were associated with the accepted base model (Recalibrated MRIP, New Selectivity Block).

4.12.2 Effect of Recreational Allocation

The Council also requested information pertaining to several proposed alternatives to Amendment 28 of the Reef Fish Fishery Management Plan, which concern the modification of red snapper allocation between the commercial and recreational sectors. Specifically, the Council requested projections of annual OFLs at $F_{26\%SPR}$ and annual ABCs at $F_{REBUILD}$ for the period 2015-2032 using the base assessment model run from the most recent update stock assessment. Beginning in 2016, projections should assume the following allocations between the commercial and recreational sectors:

- 51 % commercial, 49% recreational
- 45% commercial: 55% recreational
- 40% commercial, 60% recreational
- 35% commercial, 65% recreational
- 30% commercial, 70% recreational

For all projections, the allocation in 2015 was fixed at the current levels, 51% commercial and 49% recreational.

The results of these analyses are summarized in **Appendix 2**. The magnitude of recreational allocation did not affect the speed of recovery to the gulfwide management target ($SSB_{FSPR26\%)}$ because $F_{SPR26\%}$ was recalculated given the proposed allocation. However, when the trajectory of spawning stock biomass (SSB/SSB_0) was examined by region, increasing the recreational allocation was expected to result in decreasing spawning stock biomass in the eastern Gulf of Mexico during 2015-2032, while a modest but opposite effect was observed in the western Gulf. Following a substantial recovery in the eastern Gulf during 2003–2013 (from 2% to 12% of unfished SSB) the projected spawning stock biomass in the eastern Gulf is expected to decline to 7% of unfished SSB by 2032 if the allocation is held at 49%, and to 4.6% of unfished SSB if the recreational allocation is increased to 70%.

4.12.3 Alternative MSY proxies

The Council also recommended developing a new amendment to the reef fish management plan that would consider various red snapper maximum sustainable yield (MSY) proxies based on alternative spawning potential ratios (SPR). To aid the development of this amendment, the council requested projections of annual overfishing limits (OFL) and acceptable biological catches (ABC) for a range of MSY proxies:

- 40% SPR
- 30% SPR
- 26% SPR (status quo)
- 24% SPR
- 22% SPR
- 20% SPR
- The SPR proxy (if below 20% SPR) that results in the highest annual OFL and ABC.

All projections were to be completed assuming a rebuilding year of 2032. Projections assuming a rebuilding year of 2026 were also requested for MSY proxies less than 26% SPR, because a new rebuilding plan would be required in the event that a less conservative SPR proxy was adopted as the basis of management advice. In addition, the Council requested a projection of the time to rebuild to each SSB_{Proxy} in the absence of fishing mortality.

The results of these analyses are summarized in **Appendix 3**. There are many important caveats to this analysis, and the reader is encouraged to consider the full discussion in **Appendix 3**. To briefly summarize, the projections indicate that as the target SPR for red snapper becomes more conservative, the associated F_{Proxy} declines, SSB_{Proxy} increases, the time to rebuild becomes longer, and associated OFL, ABC, and equilibrium yields decrease. The MSY-link scenario resulted in an SPR of 23%, but produced lower equilibrium landings than when shrimp bycatch and closed-season discarding are assumed to remain at recent levels. This is because, under the linked scenario, any change in directed fishing mortality is assumed to be accompanied by a proportionate change in non-directed fishing mortality (in this case the change is an increase over recent levels). Accordingly, the MSY-link scenario does not appear to be a robust proxy for the global MSY when there is substantial bycatch mortality.

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Table 2.1. Age-specific natural mortality rates for Gulf of Mexico red snapper for input into three alternative model scenarios: the base model, a model that assumes low natural mortality, and a model that assumes high natural mortality. The column labeled *M* represents the average natural mortality experienced from July 1-June 30. The label *Adj. M* indicated the adjustment to account for SS advancing age on January 1.

Base			Low			High		
age	M	Adj. M	age	M	Adj. M	age	M	Adj. M
0	2	1	0	1	0.5	0	3.4	1.7
1	1.2	1.6	1	0.6	0.8	1	2	2.7
2	0.19	0.695	2	0.19	0.395	2	0.19	1.095
3	0.15	0.17	3	0.15	0.17	3	0.15	0.17
4	0.129	0.14	4	0.129	0.14	4	0.129	0.14
5	0.115	0.122	5	0.115	0.122	5	0.115	0.122
6	0.106	0.11	6	0.106	0.11	6	0.106	0.11
7	0.099	0.103	7	0.099	0.103	7	0.099	0.103
8	0.095	0.097	8	0.095	0.097	8	0.095	0.097
9	0.091	0.093	9	0.091	0.093	9	0.091	0.093
10	0.088	0.09	10	0.088	0.09	10	0.088	0.09
11	0.086	0.087	11	0.086	0.087	11	0.086	0.087
12	0.085	0.085	12	0.085	0.085	12	0.085	0.085
13	0.083	0.084	13	0.083	0.084	13	0.083	0.084
14	0.082	0.083	14	0.082	0.083	14	0.082	0.083
15	0.081	0.082	15	0.081	0.082	15	0.081	0.082
16	0.081	0.081	16	0.081	0.081	16	0.081	0.081
17	0.08	0.08	17	0.08	0.08	17	0.08	0.08
18	0.08	0.08	18	0.08	0.08	18	0.08	0.08
19	0.079	0.079	19	0.079	0.079	19	0.079	0.079
20	0.078	0.079	20	0.078	0.079	20	0.078	0.079

Table 2.2. 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 2.3. The fraction of released 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).

	East		West	
Sector	Closed	Open	Closed	Open
Recreational - no venting	0.21	0.21	0.22	0.22
Recreational - venting	0.10	0.10	0.10	0.10
Commercial vertical line- no venting	0.74	0.75	0.87	0.78
Commercial vertical line- venting	0.55	0.56	0.74	0.60
Commercial longline- no venting	0.74	0.81	0.87	0.91
Commercial longline- venting	0.55	0.64	0.74	0.81

Table 2.4. Commercial landings of Gulf of Mexico red snapper in kg whole weight. East and West refer to the division at the Mississippi River.

Year	East Vertical Line	East Longline	West Vertical Line	West Longline	Total
1872	236,469	0	0	0	236,469
1873	354,704	0	0	0	354,704
1874	532,057	0	0	0	532,057
1875	650,291	0	0	0	650,291
1876	768,526	0	0	0	768,526
1877	650,291	0	0	0	650,291
1878	591,174	0	0	0	591,174
1879	650,291	0	0	0	650,291
1880	827,643	0	404,166	0	1,231,809
1881	930,944	0	363,755	0	1,294,699
1882	1,035,147	0	322,894	0	1,358,041
1883	1,138,454	0	287,720	0	1,426,174
1884	1,241,764	0	252,544	0	1,494,308
1885	1,345,078	0	216,919	0	1,561,997
1886	1,449,293	0	181,742	0	1,631,035
1887	1,552,613	0	92,519	0	1,645,132
1888	1,486,615	0	96,563	0	1,583,178
1889	1,580,058	0	122,165	0	1,702,223
1890	1,901,608	0	110,010	0	2,011,618
1891	1,733,754	0	122,262	0	1,856,016
1892	1,819,080	0	132,982	0	1,952,062
1893	1,874,349	0	141,507	0	2,015,856
1894	1,917,621	0	147,355	0	2,064,976
1895	1,871,201	0	151,426	0	2,022,627
1896	1,890,397	0	154,624	0	2,045,021
1897	1,877,080	0	154,513	0	2,031,593
1898	2,092,140	0	247,059	0	2,339,199
1899	2,334,448	0	327,777	0	2,662,225
1900	2,573,747	0	403,686	0	2,977,433
1901	2,733,814	0	462,833	0	3,196,647
1902	2,850,182	0	510,760	0	3,360,942
1903	2,595,511	0	480,718	0	3,076,229
1904	2,398,021	0	458,911	0	2,856,932
1905	2,157,303	0	426,798	0	2,584,101
1906	1,923,660	0	393,570	0	2,317,230
1907	1,697,843	0	359,066	0	2,056,909
1908	1,525,545	0	333,741	0	1,859,286
1909	1,311,271	0	287,097	0	1,598,368

1910	1,105,269	0	244,082	0	1,349,351
1911	1,113,783	0	239,279	0	1,353,062
1912	1,121,933	0	234,904	0	1,356,837
1913	1,129,934	0	230,640	0	1,360,574
1914	1,137,315	0	226,265	0	1,363,580
1915	1,144,311	0	221,890	0	1,366,201
1916	1,150,897	0	217,087	0	1,367,984
1917	1,124,573	0	212,712	0	1,337,285
1918	1,130,603	0	208,337	0	1,338,940
1919	1,233,286	0	213,815	0	1,447,101
1920	1,340,104	0	219,293	0	1,559,397
1921	1,451,011	0	225,310	0	1,676,321
1922	1,565,878	0	230,788	0	1,796,666
1923	1,681,610	0	236,265	0	1,917,875
1924	1,642,634	0	228,237	0	1,870,871
1925	1,645,323	0	220,207	0	1,865,530
1926	1,602,240	0	212,066	0	1,814,306
1927	1,749,768	0	265,763	0	2,015,531
1928	1,562,257	0	193,625	0	1,755,882
1929	1,659,604	0	189,190	0	1,848,794
1930	1,013,096	0	251,090	0	1,264,186
1931	1,020,483	0	155,489	0	1,175,972
1932	1,095,896	0	186,565	0	1,282,461
1933	990,809	0	203,038	0	1,193,847
1934	891,247	0	210,803	0	1,102,050
1935	1,093,623	0	306,234	0	1,399,857
1936	1,258,258	0	395,255	0	1,653,513
1937	1,115,129	0	429,359	0	1,544,488
1938	1,442,592	0	424,259	0	1,866,851
1939	1,693,125	0	387,581	0	2,080,706
1940	1,132,599	0	370,073	0	1,502,672
1941	1,030,467	0	334,702	0	1,365,169
1942	824,791	0	247,044	0	1,071,835
1943	656,019	0	168,459	0	824,478
1944	757,513	0	126,865	0	884,378
1945	660,070	0	69,736	0	729,806
1946	1,052,244	0	146,692	0	1,198,936
1947	1,103,225	0	216,899	0	1,320,124
1948	1,178,742	0	270,078	0	1,448,820
1949	1,409,947	0	394,532	0	1,804,479
1950	767,985	0	669,524	0	1,437,509
1951	914,858	0	670,201	0	1,585,059
1952	1,018,333	0	750,322	0	1,768,655

1953	919,191	0	616,247	0	1,535,438
1954	854,201	0	619,599	0	1,473,800
1955	955,561	0	676,778	0	1,632,339
1956	1,143,445	0	915,086	0	2,058,531
1957	1,025,976	0	913,316	0	1,939,292
1958	1,689,444	0	1,522,886	0	3,212,330
1959	1,545,775	0	1,556,548	0	3,102,323
1960	1,731,283	0	1,633,469	0	3,364,752
1961	1,589,504	0	1,927,299	0	3,516,803
1962	1,638,699	0	1,874,063	0	3,512,762
1963	1,365,294	0	1,667,933	0	3,033,227
1964	1,635,958	0	1,628,533	0	3,264,491
1965	1,683,991	0	1,653,835	0	3,337,826
1966	1,405,576	0	1,379,478	0	2,785,054
1967	1,318,568	0	1,919,127	0	3,237,695
1968	1,187,299	0	2,340,939	0	3,528,238
1969	1,107,646	0	1,899,400	0	3,007,046
1970	1,047,551	0	2,110,442	0	3,157,993
1971	1,008,594	0	2,433,990	0	3,442,584
1972	1,076,974	0	2,196,193	0	3,273,167
1973	1,230,611	0	2,207,723	0	3,438,334
1974	1,708,939	0	2,011,138	0	3,720,077
1975	1,622,329	0	1,783,962	0	3,406,291
1976	1,491,469	0	1,508,466	487	3,000,422
1977	1,026,819	0	1,303,215	0	2,330,034
1978	905,530	0	1,221,978	0	2,127,508
1979	924,374	0	1,121,499	0	2,045,873
1980	859,897	42,640	1,141,469	19,983	2,063,989
1981	965,088	81,582	1,425,778	22,344	2,494,792
1982	1,039,592	102,772	1,660,844	32,485	2,835,693
1983	1,082,970	201,859	1,732,789	44,786	3,062,404
1984	740,225	167,126	1,318,327	345,942	2,571,620
1985	736,531	51,863	837,351	274,373	1,900,118
1986	390,013	34,426	876,968	377,106	1,678,513
1987	361,431	28,791	668,724	332,954	1,391,900
1988	389,164	34,775	1,068,260	303,966	1,796,165
1989	305,307	35,640	858,179	206,268	1,405,394
1990	316,432	33,923	797,320	54,622	1,202,297
1991	179,249	9,391	782,317	32,927	1,003,884
1992	184,382	2,580	1,213,132	8,990	1,409,084
1993	198,211	6,910	1,316,047	9,204	1,530,372
1994	239,100	3,610	1,211,754	7,171	1,461,635
1995	78,354	3,837	1,240,758	7,940	1,330,889

1996	106,132	3,442	1,834,388	12,411	1,956,373
1997	83,647	2,099	2,081,763	14,251	2,181,760
1998	172,093	2,501	1,935,716	12,349	2,122,659
1999	249,606	2,955	1,917,712	41,422	2,211,695
2000	301,467	3,882	1,805,077	83,654	2,194,080
2001	355,881	4,572	1,680,850	56,686	2,097,989
2002	477,424	8,246	1,617,286	66,538	2,169,494
2003	463,466	6,337	1,453,659	77,185	2,000,647
2004	432,131	8,778	1,462,433	207,209	2,110,551
2005	362,587	9,593	1,360,899	128,327	1,861,406
2006	347,154	7,539	1,640,024	116,492	2,111,209
2007	384,224	6,902	925,388	83,363	1,399,877
2008	359,276	14,714	699,075	24,888	1,097,953
2009	423,104	6,735	689,904	23,836	1,143,579
2010	633,974	34,250	853,132	17,324	1,538,680
2011	721,988	37,148	838,820	8,193	1,606,149
2012	860,717	24,167	987,387	6,284	1,878,555
2013	1,122,205	49,773	1,354,552	22,188	2,548,718
2014	1,344,580	63,070	1,096,090	21,790	2,525,530

** 2014 landings are provisional estimates (pers. comm. STRELCHECK 2/6/15).

Table 2.5. Age frequency of landings by commercial fleets (reweighted by the length frequency to account for non-representative sampling). Effective N (EFF N) was capped at 200. 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	0.000	0.010	0.527	0.380	0.027	0.042	0.008	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1992	137	0.000	0.000	0.022	0.739	0.153	0.068	0.005	0.008	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1993	153	0.000	0.000	0.324	0.417	0.212	0.024	0.020	0.001	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1994	151	0.000	0.000	0.357	0.373	0.187	0.068	0.010	0.001	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.002
1995	92	0.000	0.000	0.146	0.490	0.272	0.078	0.010	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1997	32	0.000	0.000	0.000	0.533	0.392	0.040	0.026	0.006	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1998	197	0.000	0.000	0.080	0.568	0.265	0.052	0.006	0.012	0.001	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.010
1999	200	0.000	0.001	0.116	0.268	0.345	0.110	0.068	0.036	0.020	0.018	0.011	0.004	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.002
2000	200	0.000	0.000	0.035	0.407	0.297	0.171	0.061	0.016	0.007	0.003	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2001	200	0.000	0.000	0.097	0.244	0.338	0.168	0.093	0.034	0.013	0.006	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2002	200	0.000	0.001	0.084	0.535	0.166	0.138	0.043	0.029	0.002	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
2003	200	0.000	0.008	0.137	0.403	0.291	0.089	0.044	0.013	0.006	0.003	0.001	0.001	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.002
2004	200	0.000	0.007	0.212	0.318	0.301	0.120	0.017	0.012	0.003	0.003	0.000	0.001	0.002	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.000
2005	200	0.000	0.001	0.111	0.448	0.192	0.161	0.059	0.016	0.004	0.003	0.003	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000
2006	200	0.000	0.008	0.190	0.380	0.240	0.082	0.052	0.029	0.009	0.002	0.002	0.001	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.001	0.002
2007	200	0.000	0.010	0.217	0.520	0.209	0.028	0.011	0.003	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2008	200	0.000	0.001	0.181	0.361	0.376	0.069	0.011	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009	200	0.000	0.007	0.140	0.379	0.314	0.117	0.034	0.006	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010	200	0.000	0.001	0.094	0.299	0.332	0.190	0.061	0.017	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2011	200	0.000	0.002	0.081	0.128	0.420	0.260	0.073	0.027	0.007	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2012	200	0.000	0.008	0.074	0.233	0.134	0.303	0.173	0.051	0.017	0.005	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2013	200	0.000	0.002	0.122	0.123	0.218	0.132	0.218	0.135	0.032	0.012	0.003	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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	0.000	0.000	0.666	0.170	0.135	0.013	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.006
1992	200	0.000	0.000	0.011	0.680	0.177	0.086	0.025	0.011	0.008	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
1993	200	0.000	0.000	0.036	0.382	0.442	0.115	0.016	0.007	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
1994	200	0.000	0.000	0.050	0.447	0.299	0.154	0.033	0.008	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001
1995	97	0.000	0.000	0.000	0.303	0.341	0.176	0.141	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
1998	200	0.000	0.009	0.064	0.459	0.264	0.127	0.031	0.021	0.016	0.005	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
1999	200	0.000	0.000	0.033	0.190	0.390	0.221	0.095	0.044	0.017	0.004	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2000	200	0.000	0.000	0.061	0.372	0.281	0.155	0.080	0.036	0.008	0.002	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2001	200	0.000	0.000	0.099	0.226	0.306	0.177	0.111	0.046	0.021	0.009	0.003	0.002	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
2002	200	0.000	0.014	0.104	0.412	0.207	0.142	0.058	0.037	0.015	0.005	0.002	0.002	0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.002
2003	200	0.000	0.002	0.049	0.290	0.359	0.133	0.074	0.041	0.030	0.007	0.005	0.003	0.002	0.002	0.002	0.000	0.000	0.000	0.001	0.000	0.002
2004	200	0.000	0.000	0.040	0.285	0.355	0.183	0.052	0.036	0.023	0.010	0.006	0.003	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.000	0.002
2005	200	0.000	0.001	0.099	0.267	0.261	0.177	0.091	0.037	0.022	0.012	0.008	0.005	0.003	0.005	0.004	0.004	0.001	0.002	0.002	0.000	0.002
2006	200	0.000	0.000	0.066	0.433	0.253	0.099	0.081	0.040	0.012	0.006	0.006	0.002	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000
2007	200	0.000	0.000	0.077	0.379	0.319	0.095	0.051	0.043	0.017	0.008	0.004	0.003	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.002
2008	200	0.000	0.000	0.027	0.356	0.404	0.140	0.038	0.013	0.008	0.008	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
2009	200	0.000	0.000	0.022	0.296	0.377	0.209	0.067	0.014	0.006	0.003	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
2010	200	0.000	0.000	0.015	0.236	0.338	0.260	0.121	0.020	0.004	0.002	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
2011	200	0.000	0.001	0.056	0.103	0.278	0.305	0.164	0.062	0.020	0.007	0.002	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
2012	200	0.000	0.001	0.032	0.314	0.139	0.219	0.158	0.073	0.043	0.011	0.002	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.001
2013	200	0.000	0.003	0.035	0.166	0.449	0.119	0.103	0.073	0.033	0.010	0.001	0.002	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.003

Table 2.5 (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	0.000	0.000	0.018	0.625	0.143	0.143	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.071	0.000	0.000	0.000	0.000	0.000
1992	15	0.000	0.000	0.000	0.143	0.225	0.286	0.143	0.122	0.000	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.061
1993	30	0.000	0.000	0.043	0.204	0.306	0.259	0.068	0.060	0.000	0.000	0.017	0.000	0.000	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.026
1995	19	0.000	0.000	0.000	0.358	0.465	0.138	0.000	0.000	0.000	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1997	10	0.000	0.000	0.077	0.231	0.462	0.154	0.077	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1998	25	0.000	0.000	0.000	0.049	0.123	0.258	0.316	0.254	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1999	102	0.000	0.000	0.000	0.036	0.489	0.180	0.211	0.034	0.000	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.016
2000	84	0.000	0.000	0.000	0.034	0.147	0.408	0.182	0.091	0.040	0.049	0.021	0.000	0.008	0.000	0.006	0.000	0.000	0.000	0.000	0.008	0.008
2001	91	0.000	0.000	0.016	0.056	0.289	0.285	0.274	0.052	0.019	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
2002	179	0.000	0.025	0.051	0.144	0.191	0.140	0.188	0.116	0.029	0.018	0.012	0.010	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.073
2003	197	0.000	0.000	0.006	0.166	0.309	0.237	0.101	0.060	0.050	0.028	0.004	0.004	0.004	0.008	0.004	0.003	0.000	0.004	0.000	0.000	0.013
2004	200	0.000	0.000	0.014	0.221	0.377	0.235	0.074	0.036	0.024	0.000	0.005	0.003	0.000	0.000	0.000	0.003	0.000	0.003	0.000	0.000	0.008
2005	200	0.000	0.000	0.039	0.151	0.315	0.341	0.118	0.031	0.000	0.000	0.003	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2006	200	0.000	0.000	0.022	0.092	0.358	0.207	0.228	0.053	0.019	0.004	0.000	0.000	0.004	0.008	0.000	0.000	0.004	0.000	0.000	0.000	0.000
2007	200	0.000	0.035	0.073	0.132	0.312	0.255	0.111	0.051	0.023	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2008	200	0.000	0.000	0.002	0.107	0.311	0.354	0.095	0.043	0.024	0.019	0.008	0.006	0.006	0.002	0.006	0.004	0.004	0.002	0.000	0.000	0.008
2009	200	0.000	0.000	0.005	0.082	0.420	0.229	0.203	0.023	0.008	0.014	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.012
2010	200	0.000	0.000	0.005	0.081	0.330	0.399	0.118	0.051	0.013	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2011	200	0.000	0.000	0.000	0.028	0.212	0.377	0.246	0.099	0.025	0.011	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2012	200	0.000	0.004	0.030	0.069	0.103	0.296	0.300	0.132	0.040	0.019	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2013	200	0.000	0.000	0.003	0.054	0.076	0.226	0.249	0.205	0.148	0.024	0.005	0.003	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.001

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	0.000	0.000	0.594	0.402	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	0.000	0.000
1998	200	0.000	0.000	0.003	0.052	0.110	0.279	0.103	0.079	0.077	0.045	0.054	0.044	0.032	0.032	0.017	0.018	0.020	0.008	0.008	0.003	0.017
1999	76	0.000	0.000	0.000	0.204	0.437	0.135	0.049	0.000	0.175	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2000	200	0.000	0.000	0.000	0.015	0.026	0.126	0.157	0.188	0.124	0.082	0.039	0.044	0.033	0.027	0.006	0.013	0.013	0.003	0.000	0.003	0.101
2001	179	0.000	0.000	0.000	0.000	0.021	0.049	0.191	0.134	0.110	0.117	0.062	0.063	0.035	0.058	0.022	0.014	0.037	0.007	0.008	0.018	0.055
2002	200	0.000	0.002	0.023	0.169	0.088	0.188	0.075	0.093	0.074	0.041	0.042	0.031	0.029	0.018	0.022	0.021	0.018	0.019	0.009	0.002	0.038
2003	200	0.000	0.000	0.000	0.000	0.004	0.031	0.031	0.073	0.143	0.084	0.088	0.066	0.088	0.042	0.046	0.050	0.067	0.031	0.019	0.011	0.126
2004	200	0.000	0.000	0.000	0.023	0.149	0.072	0.084	0.084	0.075	0.076	0.074	0.048	0.064	0.045	0.044	0.035	0.024	0.014	0.013	0.009	0.067
2005	200	0.000	0.000	0.000	0.041	0.050	0.151	0.117	0.129	0.092	0.099	0.053	0.048	0.050	0.059	0.038	0.019	0.020	0.000	0.007	0.004	0.023
2006	200	0.000	0.000	0.000	0.010	0.029	0.069	0.127	0.162	0.110	0.081	0.100	0.062	0.057	0.043	0.039	0.024	0.018	0.014	0.004	0.006	0.044
2007	200	0.000	0.000	0.000	0.006	0.042	0.089	0.213	0.180	0.099	0.089	0.059	0.067	0.017	0.031	0.012	0.028	0.025	0.009	0.011	0.003	0.022
2008	200	0.000	0.000	0.004	0.032	0.101	0.088	0.167	0.160	0.130	0.082	0.077	0.027	0.038	0.005	0.012	0.016	0.010	0.009	0.007	0.000	0.035
2009	200	0.000	0.000	0.000	0.007	0.049	0.111	0.106	0.083	0.072	0.175	0.110	0.071	0.033	0.024	0.045	0.025	0.016	0.011	0.003	0.008	0.052
2010	84	0.000	0.000	0.000	0.089	0.244	0.290	0.182	0.063	0.012	0.048	0.000	0.024	0.014	0.000	0.012	0.000	0.000	0.012	0.000	0.000	0.012
2011	14	0.000	0.000	0.000	0.000	0.214	0.286	0.214	0.143	0.071	0.071	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2012	149	0.000	0.000	0.000	0.076	0.038	0.083	0.185	0.183	0.090	0.064	0.089	0.049	0.013	0.015	0.027	0.015	0.006	0.026	0.006	0.008	0.025
2013	116	0.000	0.000	0.007	0.070	0.099	0.022	0.029	0.094	0.143	0.183	0.050	0.053	0.015	0.027	0.051	0.052	0.024	0.016	0.000	0.038	0.026

Table 2.6. Commercial vertical line discards (number of fish) by region (East/West) and red snapper season (Open = “vessels with allocation”, Closed = “vessels without allocation”).
).

Year	East Open	East Closed	West Open	West Closed
1990	160,529	-	514,832	-
1991	283,019	110,132	789,015	94,552
1992	70,130	306,349	268,014	163,905
1993	51,412	222,746	316,531	77,583
1994	51,153	341,137	314,558	51,525
1995	38,470	338,125	313,774	50,618
1996	75,826	468,420	780,752	53,995
1997	70,864	357,005	665,234	80,294
1998	95,073	369,511	780,944	80,691
1999	104,236	451,302	735,395	65,489
2000	142,410	245,565	650,846	81,421
2001	131,998	234,182	749,238	64,550
2002	178,383	144,089	729,981	163,848
2003	168,982	461,119	678,232	42,437
2004	77,097	195,082	615,041	44,474
2005	135,848	126,734	848,414	31,865
2006	106,061	94,408	434,172	17,504
2007	666,020	215,509	332,439	50,944
2008	166,522	207,776	557,104	-
2009	1,923,724	669,079	103,320	-
2010	1,261,527	46,956	267,798	3,228
2011	811,041	183,616	196,522	-
2012	740,149	149,447	227,984	257,625
2013	316,306	3,551	168,846	9,588

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

Year	East Open	East Closed	West Open	West Closed
1990	9,785	-	830	-
1991	11,759	8,996	2,521	133
1992	2,891	16,170	400	235
1993	1,955	44,553	851	452
1994	2,330	54,211	1,248	611
1995	1,522	35,527	1,635	1,139
1996	2,206	34,621	1,398	832
1997	2,177	48,846	818	515
1998	1,701	49,086	834	625
1999	2,283	48,548	2,979	1,170
2000	2,019	29,246	2,137	869
2001	1,833	27,449	1,261	596
2002	2,214	9,026	1,889	795
2003	2,054	5,638	4,289	966
2004	2,658	28,535	6,574	839
2005	2,239	17,841	5,853	701
2006	2,911	6,427	5,174	492
2007	16,216	20,788	-	-
2008	2,426	2,689	491	-
2009	5,852	29,600	166	229
2010	8,337	6,586	43	172
2011	15,332	5,631	6	1,461
2012	22,935	7,817	16	-
2013	14,094	2,118	1,347	29

Table 2.8. 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

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	0.889	0.111	0.000	0.000	0.000	0.000	0.000	0.000	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	0.444	0.460	0.095	0.000	0.000	0.000	0.000	0.000	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	0.058	0.574	0.311	0.057	0.000	0.000	0.000	0.000	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	0.008	0.396	0.483	0.098	0.015	0.000	0.000	0.000	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	0.001	0.225	0.566	0.162	0.037	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
44	0.001	0.058	0.526	0.297	0.084	0.029	0.006	0.000	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	0.000	0.018	0.319	0.420	0.164	0.057	0.017	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
52	0.000	0.007	0.150	0.453	0.258	0.088	0.027	0.011	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
56	0.000	0.003	0.063	0.371	0.340	0.157	0.048	0.013	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
60	0.000	0.000	0.031	0.239	0.400	0.226	0.072	0.022	0.006	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
64	0.000	0.000	0.008	0.141	0.368	0.315	0.124	0.029	0.011	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
68	0.000	0.000	0.000	0.056	0.260	0.404	0.202	0.055	0.016	0.004	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
72	0.000	0.000	0.000	0.000	0.154	0.380	0.309	0.108	0.035	0.004	0.003	0.003	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000
76	0.000	0.000	0.000	0.000	0.000	0.252	0.411	0.207	0.066	0.017	0.022	0.011	0.006	0.004	0.002	0.000	0.000	0.000	0.001	0.000
80	0.000	0.000	0.000	0.000	0.000	0.000	0.288	0.291	0.153	0.091	0.047	0.031	0.028	0.016	0.003	0.013	0.009	0.006	0.000	0.025
84	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.114	0.164	0.171	0.064	0.071	0.107	0.057	0.036	0.021	0.007	0.007	0.014	0.164
88	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.095	0.095	0.083	0.071	0.036	0.083	0.024	0.012	0.071	0.012	0.024	0.393
92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.024	0.024	0.024	0.024	0.095	0.048	0.071	0.048	0.048	0.595
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	0.091	0.000	0.091	0.000	0.000	0.000	0.000	0.818
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	0.333	0.000	0.667
104	0.000	0.000	0.000	0.000	0.000	0.000	0.000	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

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	0.083	0.917	0.000	0.000	0.000	0.000	0.000	0.000	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	0.015	0.691	0.294	0.000	0.000	0.000	0.000	0.000	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	0.013	0.522	0.388	0.077	0.000	0.000	0.000	0.000	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	0.230	0.502	0.215	0.048	0.000	0.000	0.000	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	0.127	0.492	0.282	0.079	0.015	0.000	0.000	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	0.062	0.415	0.346	0.125	0.039	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
48	0.001	0.023	0.288	0.383	0.198	0.071	0.029	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
52	0.001	0.009	0.148	0.403	0.267	0.114	0.036	0.015	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
56	0.000	0.005	0.063	0.330	0.343	0.166	0.061	0.021	0.006	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
60	0.000	0.000	0.032	0.240	0.333	0.234	0.096	0.036	0.015	0.007	0.003	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
64	0.000	0.000	0.011	0.128	0.283	0.296	0.156	0.060	0.027	0.016	0.010	0.005	0.003	0.002	0.002	0.001	0.000	0.000	0.000	0.000
68	0.000	0.000	0.000	0.053	0.186	0.307	0.203	0.100	0.056	0.033	0.025	0.010	0.008	0.007	0.006	0.003	0.001	0.001	0.000	0.001
72	0.000	0.000	0.000	0.000	0.105	0.221	0.240	0.148	0.092	0.052	0.030	0.027	0.022	0.017	0.012	0.013	0.004	0.006	0.004	0.008
76	0.000	0.000	0.000	0.000	0.000	0.128	0.193	0.153	0.101	0.083	0.067	0.067	0.051	0.034	0.030	0.025	0.018	0.011	0.005	0.033
80	0.000	0.000	0.000	0.000	0.000	0.000	0.070	0.136	0.110	0.100	0.088	0.087	0.056	0.058	0.057	0.050	0.025	0.019	0.019	0.125
84	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.071	0.071	0.048	0.057	0.059	0.074	0.105	0.048	0.050	0.059	0.021	0.297
88	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.025	0.035	0.015	0.055	0.035	0.050	0.045	0.045	0.020	0.055	0.040	0.578
92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.016	0.000	0.000	0.048	0.048	0.048	0.048	0.063	0.016	0.048	0.667
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	0.083	0.083	0.000	0.000	0.000	0.000	0.000	0.833
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 2.9. Age composition of OPEN SEASON commercial fleet discards, by fleet and region. 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	0.000	0.136	0.434	0.309	0.081	0.024	0.010	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2008	161	0.000	0.177	0.390	0.242	0.098	0.053	0.027	0.009	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009	200	0.000	0.013	0.126	0.303	0.247	0.159	0.092	0.039	0.013	0.004	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2010	200	0.000	0.020	0.084	0.274	0.279	0.181	0.103	0.041	0.012	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2011	200	0.000	0.049	0.142	0.221	0.229	0.169	0.107	0.052	0.019	0.006	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2012	200	0.000	0.049	0.116	0.214	0.228	0.177	0.118	0.058	0.021	0.008	0.003	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.002
2013	200	0.000	0.155	0.255	0.247	0.161	0.095	0.055	0.022	0.006	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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	0.000	0.011	0.330	0.397	0.174	0.056	0.017	0.007	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2008	200	0.000	0.017	0.436	0.398	0.117	0.023	0.004	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009	70	0.000	0.031	0.621	0.316	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010	200	0.000	0.028	0.526	0.341	0.069	0.006	0.004	0.005	0.004	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.002
2011	200	0.000	0.011	0.273	0.289	0.172	0.096	0.063	0.037	0.019	0.011	0.007	0.005	0.004	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.003
2012	200	0.000	0.017	0.398	0.267	0.099	0.064	0.056	0.037	0.020	0.011	0.007	0.005	0.004	0.003	0.003	0.002	0.002	0.001	0.001	0.000	0.005
2013	200	0.000	0.008	0.339	0.307	0.135	0.083	0.057	0.031	0.014	0.007	0.004	0.003	0.002	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.003

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
2007	91	0.000	0.000	0.028	0.176	0.311	0.247	0.141	0.061	0.021	0.007	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009	200	0.000	0.003	0.027	0.189	0.295	0.233	0.151	0.068	0.022	0.007	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010	200	0.000	0.000	0.019	0.148	0.271	0.261	0.179	0.080	0.026	0.009	0.003	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2011	200	0.000	0.000	0.014	0.115	0.257	0.265	0.195	0.097	0.034	0.012	0.004	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001
2012	200	0.000	0.000	0.007	0.057	0.185	0.269	0.250	0.141	0.051	0.019	0.007	0.004	0.003	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.003
2013	200	0.000	0.000	0.012	0.074	0.177	0.239	0.237	0.153	0.061	0.023	0.008	0.005	0.003	0.003	0.001	0.001	0.001	0.000	0.000	0.000	0.002

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	0.000	0.004	0.108	0.442	0.305	0.105	0.028	0.007	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-2010	6	0.000	0.003	0.140	0.183	0.154	0.140	0.134	0.089	0.047	0.026	0.019	0.014	0.013	0.010	0.006	0.006	0.005	0.003	0.002	0.001	0.005
-2012	1	0.000	0.000	0.000	0.000	0.053	0.186	0.307	0.203	0.100	0.056	0.033	0.025	0.010	0.008	0.007	0.006	0.003	0.001	0.001	0.000	0.001
-2013	37	0.000	0.000	0.002	0.037	0.112	0.141	0.162	0.132	0.094	0.062	0.047	0.037	0.033	0.024	0.021	0.020	0.016	0.009	0.008	0.005	0.037

Table 2.10. Age composition of CLOSED SEASON commercial fleet discards, by region. 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	0.000	0.004	0.098	0.354	0.304	0.151	0.063	0.019	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2008	200	0.000	0.001	0.075	0.267	0.291	0.204	0.105	0.038	0.011	0.004	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009	200	0.000	0.004	0.092	0.265	0.268	0.194	0.108	0.043	0.015	0.005	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010	200	0.000	0.024	0.316	0.357	0.137	0.070	0.048	0.030	0.012	0.004	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2011	200	0.000	0.004	0.036	0.163	0.276	0.253	0.164	0.070	0.022	0.007	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2012	200	0.000	0.036	0.137	0.273	0.231	0.157	0.100	0.045	0.014	0.005	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2013	33	0.000	0.053	0.266	0.325	0.160	0.112	0.059	0.019	0.005	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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	11	0.000	0.003	0.096	0.401	0.313	0.129	0.042	0.012	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010	53	0.000	0.002	0.052	0.266	0.306	0.185	0.097	0.042	0.016	0.008	0.005	0.003	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.000	0.006
2012	200	0.000	0.004	0.135	0.339	0.275	0.141	0.061	0.024	0.009	0.004	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2013	12	0.000	0.002	0.052	0.254	0.301	0.207	0.110	0.045	0.016	0.006	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 2.11. Fishery-dependent indices with associated log-scale standard errors. All indices were scaled to the series mean.

a) Eastern Gulf

	COM_VL_E		MRIP_E		HBT_E	
YEAR	Index	SE	Index	SE	Index	SE
1972						
1973						
1974						
1975						
1976						
1977						
1978						
1979						
1980						
1981			0.560	0.478		
1982			0.318	0.513		
1983			1.142	0.519		
1984			0.695	0.557		
1985			0.815	0.520		
1986			0.335	0.484	0.116	0.896
1987			0.534	0.252	0.128	0.905
1988			0.186	0.299	0.170	0.855
1989			0.115	0.317	0.196	0.854
1990	0.266	0.753	0.112	0.352	0.212	0.872
1991	0.420	0.624	0.288	0.289	0.253	0.882
1992	1.269	0.579	0.614	0.225	0.374	0.857
1993	0.699	0.557	0.499	0.257	0.490	0.810
1994	0.627	0.557	0.305	0.277	0.388	0.853
1995	0.746	0.570	0.321	0.306	0.326	0.860
1996	0.449	0.621	0.383	0.296	0.491	0.782
1997	0.368	0.642	1.043	0.247	0.826	0.735
1998	1.288	0.617	1.598	0.182	1.272	0.707
1999	0.780	0.626	1.259	0.157	1.212	0.730
2000	1.472	0.621	1.168	0.171	1.209	0.740
2001	1.342	0.624	0.989	0.178	1.161	0.729
2002	1.650	0.611	1.539	0.172	1.695	0.714
2003	1.464	0.605	1.298	0.169	1.527	0.719
2004	1.657	0.631	1.096	0.152	1.215	0.720
2005	1.367	0.613	0.834	0.168	1.233	0.711
2006	1.139	0.621	0.996	0.183	0.719	0.715
2007			2.920	0.196	1.528	0.716
2008			2.775	0.171	1.929	0.716
2009			1.636	0.204	3.549	0.717
2010			2.791	0.203	2.054	0.802
2011			1.662	0.203	1.900	0.814
2012			1.502	0.197	0.894	0.826
2013			0.673	0.210	0.935	0.817

b) Western Gulf

	COM_VL_W		MRIP_W		HBT_W	
YEAR	Index	SE	Index	SE	Index	SE
1972						
1973						
1974						
1975						
1976						
1977						
1978						
1979						
1980						
1981			0.223	0.760		
1982			0.550	0.465		
1983			1.125	0.290		
1984			0.484	0.324		
1985			0.229	0.334		
1986			0.458	0.318	0.602	0.225
1987			0.533	0.345	0.724	0.200
1988			0.573	0.332	0.875	0.198
1989			0.532	0.355	0.766	0.193
1990	0.661	0.239	0.328	0.319	0.550	0.192
1991	1.080	0.215	0.822	0.325	0.892	0.211
1992	1.767	0.222	0.863	0.271	1.570	0.215
1993	1.157	0.161	0.952	0.282	1.592	0.206
1994	1.155	0.161	1.038	0.274	1.252	0.192
1995	1.340	0.161	1.213	0.250	1.313	0.211
1996	1.339	0.161	0.940	0.253	1.366	0.237
1997	1.176	0.161	0.812	0.254	1.483	0.212
1998	0.934	0.161	0.869	0.254	1.260	0.217
1999	0.866	0.161	0.530	0.256	0.394	0.210
2000	0.988	0.161	0.655	0.258	0.528	0.223
2001	0.851	0.161	0.636	0.268	0.771	0.288
2002	0.816	0.161	0.789	0.257	0.671	0.266
2003	0.790	0.161	0.645	0.255	0.573	0.245
2004	0.657	0.161	0.597	0.251	0.434	0.242
2005	0.589	0.161	0.880	0.254	0.478	0.239
2006	0.834	0.162	0.699	0.230	0.565	0.270
2007			1.885	0.247	1.037	0.307
2008			1.851	0.244	1.125	0.516
2009			2.394	0.251	1.169	0.289
2010			3.296	0.305	1.285	0.461
2011			2.609	0.262	1.301	0.524
2012			1.328	0.269	1.426	0.581
2013			1.664	0.248	1.996	0.544

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

	East GOM		West GOM	
YEAR	Private + Charter	Headboat	Private + Charter	Headboat
1950	146,342	148,165	195,484	416,230
1951	187,338	148,165	268,523	416,230
1952	228,334	148,165	341,561	416,230
1953	269,330	148,165	414,600	416,230
1954	310,326	148,165	487,639	416,230
1955	351,322	148,165	560,678	416,230
1956	392,317	148,165	633,717	416,230
1957	421,348	148,165	688,317	416,230
1958	450,379	148,165	742,916	416,230
1959	479,409	148,165	797,516	416,230
1960	508,440	148,165	852,115	416,230
1961	513,614	148,165	868,619	416,230
1962	518,788	148,165	885,124	416,230
1963	523,962	148,165	901,628	416,230
1964	529,136	148,165	918,132	416,230
1965	534,310	148,165	934,637	416,230
1966	546,838	148,165	974,103	416,230
1967	559,365	148,165	1,013,570	416,230
1968	571,893	148,165	1,053,037	416,230
1969	584,420	148,165	1,092,504	416,230
1970	596,948	148,165	1,131,970	416,230
1971	627,495	148,165	1,245,372	416,230
1972	658,043	148,165	1,358,773	416,230
1973	688,590	148,165	1,472,174	416,230
1974	719,138	148,165	1,585,576	416,230
1975	749,686	148,165	1,698,977	416,230
1976	768,637	148,165	1,680,521	416,230
1977	787,589	148,165	1,662,064	416,230
1978	806,540	148,165	1,643,607	416,230
1979	825,492	148,165	1,625,151	416,230
1980	844,444	148,165	1,606,694	416,230
1981	972,097	47,780	1,740,325	344,252
1982	869,406	153,823	1,289,479	388,247
1983	952,299	301,790	2,258,348	370,500
1984	177,342	40,842	784,056	373,218
1985	486,696	90,234	696,148	368,605
1986	681,505	16,364	455,628	316,090
1987	655,604	9,685	190,440	319,348
1988	621,313	13,832	354,726	423,024

1989	563,097	10,797	261,098	372,473
1990	371,307	15,539	151,553	187,006
1991	648,857	15,580	301,956	264,686
1992	1,010,227	33,873	380,290	413,056
1993	1,504,395	37,275	496,208	458,772
1994	940,898	28,998	360,443	497,738
1995	752,396	23,078	448,643	354,550
1996	695,459	28,388	275,679	349,266
1997	1,172,204	48,439	285,304	347,424
1998	920,307	76,759	205,460	244,738
1999	878,792	67,432	165,732	98,699
2000	850,440	57,640	180,088	111,410
2001	1,014,182	51,289	120,192	116,358
2002	1,349,549	75,121	112,878	138,475
2003	1,177,990	71,021	128,754	157,905
2004	1,427,234	63,482	139,725	110,329
2005	909,126	46,791	153,529	99,988
2006	853,426	47,882	202,928	121,177
2007	1,299,093	63,603	285,309	110,314
2008	689,451	61,986	132,235	57,569
2009	788,910	81,590	194,777	75,998
2010	353,317	35,943	46,017	51,514
2011	798,266	69,187	95,937	50,656
2012	704,945	54,178	244,903	54,283
2013	1,158,943	43,985	130,447	43,743
2014 ***	386,300	42,750	124,110	34,890

** 2014 landings are provisional estimates (pers. comm. STRELCHECK 2/6/15).

Table 2.13. Age frequency of landings by recreational fishing modes (reweighted by the length frequency to account for non-representative sampling). Effective N (EFF N) was capped at 200. Data bars indicate the relative magnitude of the annual age frequency.

a) MRIP (Private + Charter), 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
1991	200	0.000	0.073	0.510	0.392	0.016	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
1992	200	0.000	0.094	0.475	0.291	0.119	0.013	0.008	0.000	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
1993	200	0.000	0.000	0.493	0.349	0.120	0.031	0.002	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1994	200	0.000	0.006	0.258	0.466	0.167	0.068	0.031	0.003	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1995	200	0.000	0.018	0.395	0.255	0.198	0.076	0.032	0.013	0.002	0.006	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
1996	101	0.000	0.012	0.181	0.597	0.133	0.018	0.014	0.021	0.000	0.011	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1997	56	0.000	0.000	0.666	0.226	0.038	0.051	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1998	200	0.000	0.003	0.215	0.573	0.168	0.032	0.009	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1999	200	0.000	0.000	0.050	0.470	0.429	0.040	0.011	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2000	200	0.000	0.000	0.070	0.574	0.287	0.063	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2001	200	0.000	0.000	0.268	0.407	0.221	0.090	0.004	0.010	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2002	200	0.000	0.000	0.088	0.555	0.238	0.072	0.027	0.015	0.003	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2003	200	0.000	0.001	0.163	0.464	0.283	0.049	0.022	0.013	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2004	200	0.000	0.002	0.145	0.415	0.277	0.114	0.022	0.014	0.007	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2005	200	0.000	0.000	0.186	0.532	0.160	0.078	0.032	0.005	0.003	0.001	0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
2006	200	0.000	0.002	0.157	0.522	0.210	0.055	0.033	0.015	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2007	200	0.000	0.000	0.147	0.630	0.182	0.024	0.007	0.006	0.003	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2008	200	0.000	0.000	0.161	0.507	0.257	0.056	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009	200	0.000	0.002	0.005	0.324	0.394	0.205	0.048	0.014	0.006	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010	200	0.000	0.000	0.008	0.169	0.465	0.216	0.095	0.029	0.012	0.004	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2011	200	0.000	0.000	0.001	0.038	0.219	0.404	0.230	0.078	0.024	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2012	200	0.000	0.000	0.001	0.071	0.109	0.285	0.321	0.147	0.048	0.009	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001
2013	200	0.000	0.000	0.036	0.078	0.152	0.091	0.292	0.208	0.098	0.032	0.007	0.001	0.002	0.002	0.000	0.000	0.001	0.000	0.001	0.000	0.001

b) MRIP (Private + Charter), 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
1991	200	0.000	0.007	0.667	0.289	0.035	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	0.000	0.000
1992	200	0.000	0.000	0.342	0.535	0.081	0.021	0.012	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1993	200	0.000	0.010	0.748	0.218	0.017	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1998	200	0.000	0.049	0.157	0.520	0.191	0.050	0.018	0.009	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1999	172	0.000	0.000	0.037	0.589	0.261	0.059	0.046	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
2002	200	0.000	0.030	0.236	0.434	0.192	0.071	0.016	0.012	0.006	0.002	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000
2003	200	0.000	0.000	0.081	0.333	0.280	0.136	0.081	0.044	0.019	0.013	0.002	0.000	0.003	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000
2004	200	0.000	0.011	0.286	0.516	0.128	0.037	0.013	0.003	0.003	0.001	0.001	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.002
2005	200	0.000	0.010	0.166	0.424	0.179	0.105	0.053	0.029	0.019	0.003	0.003	0.001	0.004	0.001	0.001	0.000	0.000	0.000	0.001	0.001	0.000
2006	200	0.000	0.001	0.142	0.538	0.204	0.052	0.033	0.013	0.009	0.002	0.003	0.001	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001
2007	200	0.000	0.000	0.104	0.601	0.225	0.034	0.015	0.011	0.004	0.003	0.001	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2008	200	0.000	0.000	0.052	0.369	0.448	0.106	0.017	0.001	0.004	0.001	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009	200	0.000	0.000	0.023	0.247	0.385	0.251	0.075	0.006	0.005	0.002	0.000	0.002	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.004
2010	200	0.000	0.000	0.000	0.187	0.367	0.254	0.158	0.029	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.001
2011	200	0.000	0.000	0.052	0.079	0.287	0.284	0.211	0.072	0.008	0.004	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
2012	200	0.000	0.000	0.000	0.186	0.127	0.229	0.260	0.123	0.055	0.010	0.003	0.000	0.002	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.002
2013	200	0.000	0.004	0.054	0.114	0.465	0.090	0.104	0.111	0.036	0.011	0.008	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.002

Table 2.13. (Continued)

c) Headboat, 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
1991	20	0.000	0.000	0.692	0.281	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1992	78	0.000	0.000	0.334	0.527	0.077	0.026	0.030	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1993	200	0.000	0.000	0.518	0.362	0.102	0.010	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1994	200	0.000	0.060	0.309	0.471	0.113	0.030	0.014	0.002	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
1995	12	0.000	0.118	0.392	0.164	0.319	0.000	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1996	117	0.000	0.006	0.381	0.528	0.056	0.026	0.000	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
1997	97	0.000	0.000	0.845	0.119	0.030	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1998	200	0.000	0.000	0.129	0.713	0.137	0.014	0.003	0.002	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1999	200	0.000	0.000	0.035	0.545	0.360	0.048	0.006	0.004	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2000	141	0.000	0.000	0.164	0.528	0.255	0.049	0.000	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
2001	200	0.000	0.005	0.420	0.262	0.240	0.052	0.010	0.006	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2002	200	0.000	0.000	0.104	0.758	0.067	0.047	0.017	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
2003	73	0.000	0.000	0.308	0.451	0.236	0.000	0.003	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2004	67	0.000	0.000	0.069	0.466	0.244	0.167	0.015	0.022	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2005	100	0.000	0.000	0.137	0.580	0.203	0.049	0.026	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2006	188	0.000	0.002	0.265	0.371	0.273	0.066	0.007	0.011	0.002	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2007	200	0.000	0.000	0.205	0.536	0.214	0.012	0.023	0.000	0.006	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2008	135	0.000	0.000	0.019	0.726	0.211	0.045	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009	200	0.000	0.000	0.010	0.546	0.292	0.111	0.033	0.005	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010	200	0.000	0.000	0.008	0.291	0.444	0.168	0.059	0.023	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2011	200	0.000	0.000	0.000	0.166	0.405	0.298	0.096	0.025	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
2012	200	0.000	0.000	0.006	0.190	0.232	0.283	0.172	0.068	0.020	0.016	0.010	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2013	200	0.000	0.000	0.013	0.147	0.236	0.125	0.241	0.156	0.051	0.022	0.005	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

d) Headboat, 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
1991	102	0.000	0.000	0.438	0.424	0.076	0.046	0.009	0.005	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
1992	26	0.000	0.000	0.193	0.795	0.002	0.004	0.002	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
1993	200	0.000	0.004	0.263	0.404	0.271	0.045	0.008	0.003	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
1994	200	0.000	0.006	0.428	0.388	0.122	0.045	0.009	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1995	10	0.000	0.000	0.764	0.236	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1998	200	0.000	0.000	0.068	0.429	0.299	0.127	0.045	0.016	0.008	0.003	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
1999	200	0.000	0.000	0.027	0.350	0.371	0.122	0.082	0.019	0.011	0.003	0.011	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
2000	200	0.000	0.000	0.234	0.557	0.130	0.041	0.026	0.008	0.003	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001
2001	74	0.000	0.000	0.367	0.281	0.119	0.102	0.039	0.069	0.014	0.005	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2002	200	0.000	0.045	0.129	0.508	0.166	0.079	0.030	0.035	0.000	0.004	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.001
2003	140	0.000	0.000	0.233	0.334	0.228	0.150	0.043	0.000	0.009	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2004	165	0.000	0.000	0.333	0.260	0.179	0.132	0.050	0.020	0.007	0.011	0.000	0.003	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000
2005	200	0.000	0.000	0.328	0.368	0.118	0.091	0.067	0.008	0.003	0.002	0.000	0.003	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2006	200	0.000	0.000	0.157	0.537	0.240	0.019	0.013	0.011	0.021	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2007	69	0.000	0.000	0.020	0.605	0.336	0.035	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2008	133	0.000	0.000	0.000	0.237	0.581	0.135	0.037	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009	200	0.000	0.000	0.000	0.135	0.412	0.327	0.085	0.009	0.005	0.005	0.007	0.005	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.010
2010	200	0.000	0.000	0.000	0.115	0.267	0.357	0.177	0.048	0.026	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2011	200	0.000	0.000	0.003	0.070	0.219	0.311	0.252	0.119	0.018	0.006	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2012	200	0.000	0.000	0.000	0.070	0.085	0.355	0.342	0.091	0.044	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.003
2013	200	0.000	0.000	0.005	0.083	0.450	0.198	0.160	0.067	0.024	0.011	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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
1981	79,632	16,246		
1982	19,394	16,990		
1983	743	3,731		
1984	38,093	0		
1985	22,541	131,690		
1986	51,525	5,788		
1987	85,119	21,599		
1988	90,579	272,482		
1989	241,915	194,562		
1990	634,919	246,220		
1991	1,117,630	401,143		
1992	1,235,157	312,692		
1993	1,271,217	386,178		
1994	973,773	493,327		
1995	484,711	764,032		
1996	1,131,039	177,691		
1997	2,291,862	203,762	124,476	2,816
1998	1,004,971	219,913	195,753	14,506
1999	1,464,936	481,679	249,518	39,278
2000	1,355,730	177,436	630,124	99,079
2001	1,557,369	98,418	1,192,965	35,683
2002	2,165,044	104,377	1,123,128	28,994
2003	2,078,983	364,856	756,380	70,801
2004	2,470,008	1,897,550	448,651	485,855
2005	1,538,156	1,285,349	600,694	372,726
2006	2,040,997	1,462,346	511,553	248,626
2007	3,261,903	984,331	560,563	252,798
2008	874,968	756,939	1,540,605	509,785
2009	1,070,846	562,622	1,154,990	779,393
2010	466,409	7,471	1,277,544	15,366
2011	529,558	213,524	1,650,626	508,654
2012	311,861	397,996	1,252,622	804,353
2013	756,211	97,982	1,843,203	259,708

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
1990	12,190	51,729		
1991	20,482	48,388		
1992	45,390	55,227		
1993	28,565	58,485		
1994	40,379	113,127		
1995	32,429	95,497		
1996	74,233	39,144		
1997	118,762	39,712	3,358	407
1998	124,212	45,472	11,060	393
1999	188,564	50,279	17,521	1,107
2000	117,115	24,673	20,163	3,381
2001	122,537	19,801	13,686	2,249
2002	122,034	19,425	15,527	2,402
2003	128,521	60,674	13,584	16,136
2004	59,534	100,260	6,964	11,128
2005	34,076	92,481	7,296	12,566
2006	208,109	132,979	19,790	25,060
2007	241,745	127,330	26,812	32,173
2008	206,864	69,880	102,564	51,625
2009	258,752	35,146	20,000	15,940
2010	80,890	30,936	40,734	13,412
2011	189,362	24,469	70,477	22,444
2012	197,861	20,431	95,518	12,681
2013	289,195	15,735	63,437	6,710

Table 2.16. Derived age frequency of discards by the recreational headboat fishing mode during the open season. Age composition was estimated from length composition using regional ALKs (**Table 2.8**). Effective N (EFF N) was capped at 200. 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	0.000	0.125	0.371	0.367	0.104	0.024	0.007	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2006	200	0.000	0.100	0.396	0.385	0.095	0.019	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2007	200	0.000	0.095	0.380	0.386	0.106	0.023	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009	200	0.000	0.032	0.320	0.437	0.150	0.042	0.013	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010	200	0.000	0.030	0.272	0.442	0.165	0.056	0.023	0.008	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2011	200	0.000	0.010	0.151	0.382	0.251	0.119	0.053	0.020	0.007	0.003	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2012	200	0.000	0.022	0.207	0.398	0.211	0.091	0.043	0.017	0.006	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2013	200	0.000	0.021	0.234	0.404	0.200	0.085	0.038	0.013	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 2.17. Estimated shrimp bycatch (numbers of fish) by region. Bycatch was modeled using a super-year approach (i.e. the model predicts annual bycatch values, but does not attempt to fit those annual predictions to the annual observations owing to the very high uncertainty associated with them. Instead, the observed shrimp bycatch was input as a single value representing the median across the entire time series and the model fit the predicted median to the observed median).

YEAR	East Gulf	West Gulf
MEDIAN (1972-2013)	974,700	18,230,000
1972	13,260,000	113,900,000
1973	1,245,000	14,830,000
1974	704,100	17,810,000
1975	1,202,000	8,335,000
1976	1,112,000	30,200,000
1977	1,521,000	11,430,000
1978	258,800	6,739,000
1979	1,115,000	23,750,000
1980	444,800	25,720,000
1981	1,327,000	55,780,000
1982	1,598,000	24,980,000
1983	1,151,000	18,490,000
1984	889,000	13,750,000
1985	668,600	10,230,000
1986	228,400	5,933,000
1987	324,500	12,330,000
1988	380,500	9,861,000
1989	646,600	10,620,000
1990	2,136,000	40,950,000
1991	1,841,000	41,260,000
1992	1,295,000	31,760,000
1993	741,200	34,970,000
1994	1,090,000	34,470,000
1995	1,491,000	47,870,000
1996	1,121,000	36,990,000
1997	1,726,000	26,690,000
1998	1,624,000	56,750,000
1999	1,845,000	23,940,000
2000	2,177,000	12,120,000
2001	2,316,000	24,100,000
2002	2,172,000	22,090,000
2003	1,266,000	30,660,000
2004	1,405,000	27,880,000
2005	623,700	12,500,000
2006	1,852,000	11,590,000
2007	1,226,000	6,825,000
2008	161,400	2,710,000
2009	351,100	3,735,000
2010	191,600	2,795,000
2011	333,700	5,833,000
2012	248,800	8,242,000
2013	509,000	15,980,000

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

YEAR	East Gulf	West Gulf
1946	-	0.0099
1947	-	0.0507
1948	-	0.1333
1949	-	0.2154
1950	0.226	0.2601
1951	0.3893	0.2735
1952	0.4601	0.3228
1953	0.5082	0.3148
1954	0.6516	0.4153
1955	0.7696	0.3427
1956	0.9747	0.4471
1957	1.0673	0.5605
1958	1.129	0.8644
1959	1.2252	0.9236
1960	1.2026	0.9456
1961	0.8724	0.7548
1962	0.8327	0.7342
1963	0.9345	0.8516
1964	1.1094	0.777
1965	1.2034	0.8904
1966	1.1271	0.9334
1967	1.0697	1.1748
1968	1.2603	1.0203
1969	1.2291	1.3625
1970	1.2112	1.2306
1971	1.0436	1.2848
1972	1.1254	1.4029
1973	1.2406	1.1187
1974	1.2	1.1037
1975	1.1967	1.0444
1976	1.1101	1.2151
1977	1.3243	1.0408
1978	1.0166	1.2179
1979	1.0463	1.2698
1980	0.6405	0.7696
1981	1.0056	1.1889
1982	1.002	1.2143
1983	1.0976	0.9806

1984	1.289	1.2489
1985	1.2428	1.2137
1986	1.2883	1.6698
1987	1.0439	1.7104
1988	0.9842	1.657
1989	1.1965	1.4927
1990	1.0466	1.4349
1991	1.0756	1.7435
1992	1.3041	1.7981
1993	1.0771	1.7762
1994	1.1141	1.4267
1995	1.3179	1.2382
1996	1.4922	1.3018
1997	1.5703	1.5836
1998	1.973	1.4369
1999	1.2158	1.3525
2000	1.0447	1.4756
2001	1.1735	1.5821
2002	1.4046	1.8631
2003	1.1636	1.5032
2004	1.1541	1.3808
2005	0.9719	0.9982
2006	0.6301	0.7451
2007	0.4732	0.6011
2008	0.3094	0.4312
2009	0.4765	0.5133
2010	0.2989	0.502
2011	0.3722	0.6171
2012	0.3669	0.4954
2013	0.4264	0.5461

Table 2.19. Age composition of red snapper sampled by the shrimp observer program, inferred from a modal analysis of annual length frequency. Data bars indicate the relative magnitude of the annual age frequency

a) Eastern Gulf

YEAR	EFF N	Age 0	Age 1	Age 2
1992	50	0.876	0.124	0.000
1993	50	0.834	0.166	0.000
1994	50	0.533	0.456	0.012
1995	50	0.792	0.208	0.000
1996	50	0.822	0.178	0.000
1999	88	0.895	0.094	0.011
2000	200	0.575	0.411	0.013
2001	200	0.653	0.341	0.006
2002	200	0.956	0.026	0.017
2003	200	0.784	0.181	0.035
2004	200	0.893	0.095	0.012
2005	200	0.606	0.369	0.025
2006	200	0.951	0.045	0.004
2007	200	0.872	0.086	0.042
2008	200	0.840	0.117	0.043
2009	200	0.968	0.026	0.006
2010	200	0.531	0.458	0.011
2011	200	0.973	0.022	0.005
2012	200	0.844	0.132	0.023
2013	200	0.554	0.441	0.005

b) Western Gulf

YEAR	EFF N	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	0.812	0.187	0.001
1998	200	0.919	0.077	0.004
1999	200	0.894	0.102	0.004
2000	200	0.790	0.202	0.008
2001	200	0.644	0.336	0.021
2002	200	0.779	0.196	0.025
2003	200	0.772	0.206	0.022
2004	200	0.440	0.550	0.010
2005	200	0.483	0.496	0.021
2006	200	0.807	0.184	0.010
2007	200	0.722	0.251	0.027
2008	200	0.613	0.342	0.045
2009	200	0.880	0.101	0.019
2010	200	0.728	0.258	0.014
2011	200	0.733	0.245	0.021
2012	200	0.912	0.076	0.012
2013	200	0.668	0.309	0.024

Table 2.20. Fishery-independent indices and associated log-scale standard error for the eastern (a) and western (b) Gulf of Mexico.

a) Eastern Gulf

	VIDEO_E		LARVAL_E		NMFS BLL_E		SUM_GROUNDFISH_E		FALL_GROUNDFISH_E	
YEAR	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE
1972									3.288	0.273
1973									0.536	0.228
1974									0.621	0.290
1975									0.517	0.279
1976									0.625	0.255
1977									0.861	0.292
1978									0.389	0.229
1979									0.310	0.253
1980									0.576	0.233
1981									2.000	0.238
1982							1.229	0.620	2.254	0.184
1983							0.994	0.702	0.320	0.242
1984							0.052	0.752	0.260	0.338
1985							0.374	0.431	0.119	0.347
1986							0.044	0.808	0.110	0.657
1987			0.598	0.853			0.557	0.305	0.186	0.474
1988			0.264	1.050			0.646	0.516	0.246	0.416
1989							2.299	0.505	3.759	0.334
1990							1.023	0.302	2.142	0.296
1991			0.339	0.841			1.064	0.380	2.400	0.254
1992							2.904	0.475	0.194	0.408
1993	1.266	0.644					0.330	0.508	1.398	0.340
1994	0.418	0.975	0.033	1.056			0.898	0.351	0.345	0.287
1995	0.021	1.654	0.128	0.852			0.341	0.544	0.723	0.279
1996	0.282	0.729			0.124	1.045	0.517	0.388	0.556	0.344
1997	0.286	0.771	0.149	0.847	0.078	1.047	0.703	0.386	0.932	0.360
1998							0.296	0.891	0.222	0.365
1999			0.550	0.740	0.180	1.047	0.132	0.568	0.609	0.357
2000			1.392	0.662	0.048	1.048	0.579	0.373	1.683	0.288
2001			0.277	0.731	0.206	0.731	0.222	0.560	0.523	0.445
2002	2.155	0.507	0.555	0.848	0.253	0.841	0.195	0.532	0.416	0.354
2003			0.613	0.658	0.345	0.597	0.726	0.551	1.230	0.259
2004	0.997	0.526	0.252	1.056	0.358	0.654	0.661	0.499	0.331	0.383
2005	0.994	0.502			0.245	1.045	1.536	0.535	0.736	0.312
2006	0.388	0.582	1.288	0.734	0.232	0.842	0.312	0.399	2.871	0.212
2007	0.846	0.522	1.096	0.554	0.477	0.843	2.768	0.316	1.841	0.277
2008	1.491	0.510					3.590	0.304	0.375	0.350
2009	1.246	0.496	0.943	0.651	0.740	0.512	0.521	0.288	3.041	0.292
2010	1.670	0.481	4.592	0.444	1.986	0.345	1.695	0.475	0.346	0.468
2011	1.896	0.464	3.636	0.459	1.858	0.221	0.530	0.508	0.202	0.474
2012	0.858	0.521	1.295	0.546	5.217	0.341	1.589	0.333	1.151	0.545
2013	1.185	0.514			3.655	0.382	2.672	0.478	0.757	0.432

Table 2.20. (Fishery-independent indices continued).

b) Western Gulf

	VIDEO_W		LARVAL_W		NMFS BLL_W		SUM_GROUNDFISH_W		FALL_GROUNDFISH_W	
YEAR	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE
1972									3.448	0.175
1973									1.827	0.184
1974									0.580	0.232
1975									0.832	0.217
1976									0.793	0.202
1977									0.845	0.205
1978									0.641	0.274
1979									0.968	0.205
1980									3.681	0.160
1981									1.328	0.181
1982							2.614	0.212	0.884	0.190
1983							0.710	0.272	0.749	0.263
1984							0.704	0.270	0.293	0.249
1985							0.957	0.293	0.442	0.219
1986			0.374	0.607			0.262	0.405	0.414	0.196
1987			0.628	0.608			0.616	0.213	0.152	0.232
1988							0.292	0.238	0.347	0.185
1989			0.692	0.597			0.252	0.289	0.729	0.171
1990			0.627	0.500			2.167	0.159	0.815	0.153
1991			0.190	0.677			0.850	0.185	0.914	0.140
1992			0.331	0.476			0.528	0.193	0.265	0.179
1993	0.942	0.431	0.351	0.475			0.602	0.189	0.489	0.167
1994	0.461	0.497	0.254	0.608			1.216	0.175	1.417	0.146
1995	0.248	0.482	0.980	0.346			1.013	0.168	1.694	0.131
1996	0.295	0.290	0.677	0.418	0.034	1.126	1.085	0.169	0.714	0.158
1997	0.466	0.312	1.101	0.332	0.463	0.525	0.845	0.171	1.190	0.150
1998							0.739	0.188	0.560	0.173
1999			0.524	0.443	0.112	0.912	0.572	0.190	1.213	0.144
2000			1.516	0.326	0.828	0.313	1.212	0.155	0.761	0.144
2001			1.074	0.471	0.683	0.332	0.670	0.253	0.588	0.162
2002	0.760	0.278	0.837	0.358	0.624	0.280	0.933	0.168	0.556	0.156
2003			1.561	0.308	0.696	0.363	0.478	0.208	0.998	0.151
2004	0.391	0.385	0.918	0.364	0.799	0.361	1.169	0.161	1.604	0.128
2005	1.077	0.213					1.307	0.167	1.202	0.120
2006	0.542	0.299	1.485	0.362	0.649	0.441	1.221	0.148	0.943	0.148
2007	1.611	0.237	1.406	0.306	0.646	0.441	0.947	0.180	0.685	0.174
2008	0.753	0.257			0.652	0.602	0.934	0.155	0.433	0.135
2009	1.132	0.211	1.705	0.298	1.285	0.331	0.525	0.156	1.858	0.112
2010	1.009	0.294	0.680	0.443	0.499	0.556	1.326	0.155	0.669	0.166
2011	1.597	0.175	2.435	0.343	1.796	0.199	1.767	0.154	0.824	0.158
2012	1.991	0.151	2.654	0.299	3.294	0.345	1.448	0.145	1.833	0.153
2013	2.724	0.117			2.941	0.311	2.038	0.172	0.823	0.234

Table 2.21. Derived age composition applied to the Reef Fish Video survey. Age composition was estimated from length composition using regional ALKs (Table 2.8). Data bars indicate the relative magnitude of the annual age frequency.

a) Reef Fish Video 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	24	0.000	0.213	0.309	0.222	0.124	0.062	0.032	0.015	0.006	0.004	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.004
2009	21	0.000	0.026	0.161	0.317	0.231	0.147	0.080	0.027	0.007	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010	17	0.000	0.014	0.189	0.262	0.193	0.126	0.091	0.056	0.025	0.013	0.008	0.004	0.003	0.005	0.002	0.002	0.001	0.000	0.000	0.001	0.006
2011	144	0.000	0.013	0.098	0.237	0.253	0.186	0.120	0.053	0.018	0.007	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.005
2012	52	0.000	0.000	0.037	0.153	0.206	0.210	0.179	0.114	0.050	0.020	0.009	0.005	0.004	0.003	0.002	0.001	0.001	0.001	0.000	0.000	0.003
2013	27	0.000	0.003	0.065	0.191	0.226	0.208	0.171	0.093	0.029	0.010	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

b) Reef Fish Video 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	0.000	0.004	0.163	0.321	0.221	0.126	0.079	0.040	0.018	0.009	0.006	0.004	0.003	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.001
2009	22	0.000	0.007	0.280	0.282	0.138	0.086	0.069	0.041	0.025	0.015	0.011	0.009	0.007	0.005	0.005	0.005	0.004	0.002	0.001	0.001	0.009
2010	71	0.000	0.005	0.203	0.343	0.225	0.108	0.054	0.024	0.012	0.007	0.004	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.003
2011	57	0.000	0.021	0.131	0.310	0.258	0.130	0.069	0.035	0.016	0.009	0.006	0.004	0.003	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.001
2012	62	0.000	0.005	0.109	0.162	0.228	0.203	0.142	0.071	0.032	0.016	0.010	0.007	0.005	0.003	0.002	0.002	0.002	0.001	0.001	0.000	0.002
2013	96	0.000	0.004	0.099	0.266	0.269	0.172	0.096	0.045	0.019	0.009	0.005	0.003	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.000	0.002

Table 2.22. Age composition of red snapper sampled by the SEAMAP Summer Groundfish Survey, inferred from a modal analysis of annual length frequency. Data bars indicate the relative magnitude of the annual age frequency

	Summer - East					Summer - West			
Year	EFF N	Age 0	Age 1	Age 2	Year	EFF N	Age 0	Age 1	Age 2
1987	23	0.000	1.000	0.000	1987	199	0.000	0.844	0.156
1988	44	0.000	0.546	0.455	1988	137	0.007	0.920	0.073
1989	96	0.281	0.563	0.156	1989	88	0.046	0.886	0.068
1990	85	0.035	0.965	0.000	1990	200	0.002	0.968	0.031
1991	98	0.010	0.806	0.184	1991	200	0.041	0.797	0.162
1992	84	0.000	0.964	0.036	1992	200	0.012	0.908	0.080
1993	20	0.050	0.850	0.100	1993	200	0.011	0.940	0.048
1994	48	0.000	0.792	0.208	1994	200	0.008	0.927	0.065
1995	40	0.025	0.600	0.375	1995	200	0.103	0.785	0.112
1996	59	0.000	0.915	0.085	1996	200	0.022	0.872	0.107
1997	32	0.031	0.938	0.031	1997	200	0.011	0.864	0.126
1998	10	0.000	0.800	0.200	1998	200	0.008	0.883	0.109
1999	14	0.071	0.357	0.571	1999	200	0.160	0.707	0.133
2000	83	0.012	0.952	0.036	2000	200	0.320	0.628	0.051
2001	11	0.000	0.546	0.455	2001	161	0.248	0.671	0.081
2002	29	0.035	0.517	0.448	2002	200	0.105	0.750	0.145
2003	42	0.024	0.881	0.095	2003	200	0.012	0.939	0.049
2004	37	0.054	0.865	0.081	2004	200	0.000	0.972	0.028
2005	58	0.017	0.879	0.103	2005	200	0.052	0.883	0.065
2006	20	0.050	0.700	0.250	2006	200	0.142	0.763	0.095
2007	167	0.030	0.910	0.060	2007	200	0.030	0.895	0.075
2008	200	0.008	0.695	0.297	2008	200	0.099	0.751	0.151
2009	98	0.020	0.602	0.378	2009	200	0.110	0.829	0.061
2010	112	0.179	0.527	0.295	2010	200	0.000	0.896	0.104
2011	70	0.000	0.686	0.314	2011	200	0.008	0.906	0.087
2012	115	0.017	0.713	0.270	2012	200	0.020	0.747	0.233
2013	117	0.197	0.650	0.154	2013	200	0.028	0.899	0.073

Table 2.23. Age composition of red snapper sampled by the SEAMAP Fall Groundfish Survey, inferred from a modal analysis of annual length frequency. Data bars indicate the relative magnitude of the annual age frequency.

	Fall - East				Fall - West			
Year	EFF N	Age 0	Age 1	Age 2	EFF N	Age 0	Age 1	Age 2
1987	14	0.071	0.929	0.000	150	0.713	0.267	0.020
1988	47	0.979	0.000	0.021	200	0.722	0.257	0.022
1989	200	0.926	0.067	0.008	200	0.909	0.079	0.012
1990	200	0.819	0.153	0.028	200	0.745	0.235	0.020
1991	200	0.898	0.095	0.007	200	0.918	0.070	0.012
1992	25	0.840	0.160	0.000	200	0.699	0.280	0.021
1993	200	0.910	0.020	0.071	200	0.739	0.223	0.038
1994	167	0.599	0.222	0.180	200	0.784	0.188	0.028
1995	173	0.994	0.006	0.000	200	0.883	0.087	0.030
1996	200	0.735	0.155	0.110	200	0.770	0.213	0.017
1997	183	0.874	0.077	0.049	200	0.893	0.090	0.017
1998	58	0.810	0.138	0.052	200	0.896	0.093	0.011
1999	144	0.882	0.090	0.028	200	0.944	0.048	0.009
2000	200	0.849	0.063	0.089	200	0.898	0.086	0.017
2001	66	0.788	0.091	0.121	200	0.839	0.125	0.036
2002	165	0.897	0.042	0.061	200	0.916	0.074	0.010
2003	200	0.925	0.067	0.008	200	0.938	0.055	0.007
2004	200	0.896	0.094	0.010	200	0.892	0.098	0.011
2005	200	0.726	0.231	0.043	200	0.808	0.177	0.015
2006	200	0.909	0.062	0.030	200	0.914	0.066	0.020
2007	200	0.974	0.026	0.000	200	0.925	0.070	0.005
2008	176	0.358	0.330	0.313	200	0.680	0.267	0.053
2009	200	0.918	0.035	0.047	200	0.978	0.017	0.005
2010	172	0.669	0.244	0.087	200	0.826	0.167	0.007
2011	76	0.566	0.171	0.263	200	0.841	0.128	0.031
2012	191	0.738	0.152	0.110	200	0.925	0.063	0.012
2013	114	0.965	0.026	0.009	200	0.847	0.124	0.029

Table 2.24. Derived age composition applied to the NMFS Bottom Longline survey. Age composition was estimated from length composition using regional ALKs (Table 2.8). Data bars indicate the relative magnitude of the annual age frequency.

a) NMFS BLL 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
2002	90	0.000	0.011	0.000	0.067	0.078	0.178	0.100	0.056	0.044	0.033	0.056	0.022	0.100	0.067	0.011	0.000	0.011	0.000	0.000	0.011	0.156
2003	17	0.000	0.000	0.000	0.059	0.471	0.000	0.000	0.059	0.118	0.118	0.000	0.059	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.118
2004	21	0.000	0.000	0.048	0.000	0.095	0.190	0.143	0.048	0.095	0.143	0.000	0.000	0.048	0.000	0.000	0.048	0.000	0.000	0.000	0.000	0.143
2010	18	0.000	0.000	0.000	0.000	0.389	0.278	0.222	0.000	0.000	0.056	0.000	0.000	0.000	0.056	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2011	182	0.000	0.000	0.000	0.011	0.137	0.247	0.275	0.198	0.055	0.027	0.000	0.005	0.005	0.000	0.016	0.000	0.000	0.005	0.005	0.000	0.011
2012	14	0.000	0.000	0.000	0.000	0.000	0.071	0.214	0.357	0.071	0.071	0.000	0.000	0.000	0.071	0.000	0.071	0.000	0.071	0.000	0.000	0.000
2013	17	0.000	0.000	0.000	0.000	0.000	0.059	0.176	0.647	0.118	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

b) NMFS BLL 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	0.000	0.000	0.000	0.000	0.012	0.035	0.047	0.153	0.165	0.118	0.082	0.024	0.071	0.012	0.071	0.094	0.012	0.024	0.012	0.012	0.059
2001	84	0.000	0.000	0.000	0.012	0.000	0.000	0.071	0.107	0.083	0.107	0.060	0.060	0.083	0.083	0.048	0.083	0.024	0.000	0.012	0.024	0.143
2002	75	0.000	0.000	0.000	0.000	0.027	0.027	0.027	0.067	0.040	0.093	0.053	0.093	0.067	0.027	0.053	0.027	0.027	0.067	0.040	0.000	0.267
2003	60	0.000	0.000	0.000	0.000	0.083	0.050	0.067	0.100	0.050	0.017	0.067	0.100	0.083	0.067	0.067	0.067	0.033	0.000	0.017	0.000	0.133
2004	50	0.000	0.000	0.000	0.000	0.020	0.160	0.100	0.160	0.180	0.080	0.020	0.000	0.040	0.060	0.020	0.020	0.040	0.000	0.020	0.020	0.060
2006	31	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.065	0.065	0.097	0.065	0.000	0.032	0.032	0.000	0.226	0.000	0.065	0.065	0.032	0.258
2007	41	0.000	0.000	0.000	0.024	0.000	0.000	0.171	0.122	0.146	0.024	0.000	0.073	0.024	0.073	0.073	0.098	0.000	0.000	0.024	0.049	0.098
2008	10	0.000	0.000	0.000	0.000	0.200	0.000	0.300	0.100	0.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.000	0.000	0.000	0.100
2009	68	0.000	0.000	0.000	0.015	0.015	0.191	0.088	0.044	0.059	0.074	0.074	0.015	0.059	0.044	0.029	0.029	0.044	0.000	0.015	0.029	0.176
2010	33	0.000	0.000	0.000	0.000	0.121	0.242	0.273	0.091	0.030	0.030	0.030	0.000	0.061	0.000	0.000	0.000	0.061	0.000	0.000	0.000	0.061
2011	200	0.000	0.000	0.002	0.005	0.034	0.113	0.183	0.214	0.083	0.067	0.036	0.043	0.018	0.025	0.011	0.018	0.009	0.018	0.014	0.013	0.094
2012	126	0.000	0.000	0.000	0.000	0.000	0.087	0.143	0.270	0.135	0.048	0.056	0.016	0.032	0.016	0.008	0.016	0.032	0.000	0.032	0.016	0.095
2013	86	0.000	0.000	0.000	0.000	0.000	0.012	0.035	0.128	0.198	0.256	0.070	0.047	0.035	0.035	0.012	0.023	0.023	0.000	0.012	0.023	0.093

Table 2.25. Derived age composition applied to the ROV survey. Age composition was estimated from length composition using regional ALKs (Table 2.8). 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
2007	32	0.000	0.208	0.368	0.260	0.067	0.019	0.011	0.006	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009	94	0.000	0.072	0.235	0.353	0.182	0.086	0.040	0.014	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2010	156	0.000	0.114	0.218	0.276	0.165	0.091	0.049	0.021	0.008	0.003	0.001	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.007
2011	200	0.000	0.065	0.181	0.289	0.200	0.121	0.071	0.033	0.012	0.005	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.006
2012	29	0.000	0.089	0.201	0.251	0.157	0.092	0.062	0.036	0.017	0.009	0.006	0.003	0.003	0.004	0.002	0.002	0.001	0.001	0.001	0.001	0.024
2013	75	0.000	0.076	0.190	0.324	0.181	0.084	0.047	0.025	0.011	0.006	0.004	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.000	0.001	0.017

Table 4.1. Predicted total biomass (whole weight metric tons), spawning biomass (eggs), age-0 recruits (thousand fish), and fishing mortality for the Gulf of Mexico red snapper ***update assessment***.

	East			West			Gulfwide		
YEAR	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)
1872	71,619	1.02E+12	35,396	129,709	1.85E+12	64,106	201,328	2.87E+12	99,502
1873	71,372	1.02E+12	35,396	129,709	1.85E+12	64,106	201,081	2.87E+12	99,502
1874	70,985	1.01E+12	35,396	129,709	1.85E+12	64,105	200,694	2.87E+12	99,501
1875	70,393	1.01E+12	35,395	129,709	1.85E+12	64,105	200,102	2.86E+12	99,500
1876	69,652	9.95E+11	35,395	129,709	1.85E+12	64,104	199,361	2.85E+12	99,499
1877	68,767	9.82E+11	35,395	129,709	1.85E+12	64,104	198,476	2.83E+12	99,498
1878	67,989	9.70E+11	35,394	129,709	1.85E+12	64,103	197,698	2.82E+12	99,497
1879	67,280	9.59E+11	35,394	129,709	1.85E+12	64,102	196,989	2.81E+12	99,496
1880	66,531	9.47E+11	35,394	129,708	1.85E+12	64,102	196,239	2.80E+12	99,495
1881	65,620	9.33E+11	35,393	129,276	1.85E+12	64,100	194,896	2.78E+12	99,493
1882	64,615	9.18E+11	35,392	128,832	1.84E+12	64,099	193,447	2.76E+12	99,491
1883	63,514	9.02E+11	35,391	128,397	1.83E+12	64,098	191,911	2.74E+12	99,489
1884	62,320	8.84E+11	35,391	127,983	1.83E+12	64,096	190,303	2.71E+12	99,487
1885	61,035	8.65E+11	35,390	127,604	1.82E+12	64,095	188,639	2.69E+12	99,484
1886	59,660	8.45E+11	35,389	127,274	1.82E+12	64,093	186,934	2.66E+12	99,482
1887	58,198	8.23E+11	35,388	127,000	1.81E+12	64,091	185,198	2.63E+12	99,479
1888	56,652	8.00E+11	35,387	126,847	1.81E+12	64,089	183,499	2.61E+12	99,476
1889	55,202	7.78E+11	35,386	126,726	1.81E+12	64,088	181,928	2.58E+12	99,474
1890	53,699	7.55E+11	35,385	126,607	1.80E+12	64,086	180,306	2.56E+12	99,471
1891	51,904	7.29E+11	35,384	126,524	1.80E+12	64,084	178,428	2.53E+12	99,468
1892	50,308	7.05E+11	35,383	126,446	1.80E+12	64,082	176,754	2.51E+12	99,465
1893	48,674	6.80E+11	35,382	126,371	1.80E+12	64,080	175,045	2.48E+12	99,462
1894	47,032	6.56E+11	35,381	126,296	1.80E+12	64,078	173,328	2.46E+12	99,459
1895	45,394	6.31E+11	35,380	126,222	1.80E+12	64,076	171,616	2.43E+12	99,456
1896	43,857	6.08E+11	35,379	126,147	1.80E+12	64,074	170,004	2.41E+12	99,453
1897	42,361	5.85E+11	35,378	126,073	1.80E+12	64,073	168,434	2.38E+12	99,450
1898	40,940	5.64E+11	35,377	126,004	1.80E+12	64,071	166,944	2.36E+12	99,447
1899	39,356	5.40E+11	35,249	125,837	1.79E+12	63,840	165,193	2.33E+12	99,090

Table 4.1. (Predicted biomass and recruitment continued).

	East			West			Gulfwide		
YEAR	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)
1900	37,561	5.14E+11	35,239	125,573	1.79E+12	63,822	163,134	2.31E+12	99,061
1901	35,537	4.85E+11	35,228	125,210	1.79E+12	63,801	160,747	2.27E+12	99,029
1902	33,354	4.54E+11	35,215	124,760	1.78E+12	63,779	158,114	2.23E+12	98,994
1903	31,054	4.21E+11	35,202	124,234	1.77E+12	63,754	155,288	2.19E+12	98,955
1904	29,024	3.90E+11	35,187	123,717	1.76E+12	63,727	152,741	2.16E+12	98,914
1905	27,243	3.63E+11	35,171	123,216	1.76E+12	63,698	150,459	2.12E+12	98,869
1906	25,780	3.41E+11	35,154	122,753	1.75E+12	63,668	148,533	2.09E+12	98,821
1907	24,652	3.22E+11	35,136	122,339	1.74E+12	63,635	146,991	2.07E+12	98,771
1908	23,869	3.09E+11	35,118	121,984	1.74E+12	63,602	145,853	2.05E+12	98,720
1909	23,393	3.00E+11	35,099	121,683	1.73E+12	63,568	145,076	2.03E+12	98,666
1910	23,273	2.96E+11	35,079	121,462	1.73E+12	63,531	144,735	2.03E+12	98,610
1911	23,510	2.98E+11	35,057	121,319	1.73E+12	63,493	144,829	2.02E+12	98,550
1912	23,880	3.03E+11	35,035	121,215	1.72E+12	63,451	145,095	2.03E+12	98,486
1913	24,352	3.09E+11	35,010	121,143	1.72E+12	63,407	145,495	2.03E+12	98,417
1914	24,898	3.18E+11	34,984	121,097	1.72E+12	63,359	145,995	2.04E+12	98,343
1915	25,496	3.27E+11	34,956	121,073	1.72E+12	63,309	146,569	2.05E+12	98,264
1916	26,124	3.37E+11	34,926	121,067	1.72E+12	63,255	147,191	2.06E+12	98,181
1917	26,767	3.47E+11	34,894	121,075	1.72E+12	63,197	147,842	2.07E+12	98,092
1918	27,443	3.58E+11	34,860	121,094	1.72E+12	63,136	148,537	2.08E+12	97,996
1919	28,112	3.68E+11	34,824	121,122	1.72E+12	63,070	149,234	2.09E+12	97,893
1920	28,661	3.77E+11	34,784	121,145	1.72E+12	62,998	149,806	2.10E+12	97,782
1921	29,068	3.84E+11	34,741	121,160	1.73E+12	62,920	150,228	2.11E+12	97,662
1922	29,312	3.89E+11	34,695	121,164	1.73E+12	62,837	150,476	2.11E+12	97,532
1923	29,381	3.90E+11	34,646	121,154	1.73E+12	62,748	150,535	2.12E+12	97,394
1924	29,267	3.90E+11	34,593	121,130	1.73E+12	62,651	150,397	2.12E+12	97,244

Table 4.1. (Predicted biomass and recruitment continued).

	East			West			Gulfwide		
YEAR	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)
1925	29,129	3.88E+11	34,533	121,105	1.73E+12	62,544	150,234	2.11E+12	97,077
1926	28,939	3.85E+11	34,469	121,078	1.72E+12	62,427	150,017	2.11E+12	96,896
1927	28,756	3.82E+11	34,399	121,052	1.72E+12	62,300	149,808	2.11E+12	96,699
1928	28,392	3.77E+11	34,321	120,961	1.72E+12	62,159	149,353	2.10E+12	96,481
1929	28,190	3.74E+11	34,240	120,931	1.72E+12	62,013	149,121	2.10E+12	96,253
1930	27,880	3.69E+11	34,155	120,900	1.72E+12	61,858	148,780	2.09E+12	96,012
1931	28,240	3.73E+11	34,067	120,797	1.72E+12	61,698	149,037	2.09E+12	95,765
1932	28,662	3.78E+11	33,977	120,780	1.72E+12	61,536	149,442	2.10E+12	95,513
1933	29,055	3.83E+11	33,883	120,728	1.72E+12	61,366	149,783	2.10E+12	95,250
1934	29,588	3.91E+11	33,782	120,648	1.72E+12	61,183	150,236	2.11E+12	94,965
1935	30,254	4.01E+11	33,672	120,546	1.72E+12	60,983	150,800	2.12E+12	94,655
1936	30,732	4.08E+11	33,551	120,327	1.72E+12	60,765	151,059	2.12E+12	94,317
1937	31,025	4.14E+11	33,418	119,983	1.71E+12	60,524	151,008	2.13E+12	93,942
1938	31,431	4.21E+11	33,271	119,565	1.71E+12	60,257	150,996	2.13E+12	93,528
1939	31,470	4.22E+11	33,109	119,116	1.70E+12	59,963	150,586	2.12E+12	93,072
1940	31,184	4.20E+11	32,934	118,677	1.69E+12	59,647	149,861	2.11E+12	92,581
1941	31,408	4.23E+11	32,752	118,238	1.69E+12	59,317	149,646	2.11E+12	92,069
1942	31,735	4.27E+11	32,566	117,824	1.68E+12	58,981	149,559	2.11E+12	91,547
1943	32,283	4.35E+11	32,385	117,498	1.68E+12	58,653	149,781	2.11E+12	91,038
1944	33,030	4.45E+11	32,210	117,261	1.67E+12	58,336	150,291	2.12E+12	90,545
1945	33,696	4.55E+11	32,045	117,081	1.67E+12	58,037	150,777	2.12E+12	90,082
1946	34,463	4.66E+11	31,910	116,974	1.67E+12	57,792	151,437	2.13E+12	89,702
1947	34,814	4.73E+11	31,804	116,794	1.67E+12	57,601	151,608	2.14E+12	89,405
1948	35,053	4.78E+11	31,600	116,520	1.66E+12	57,232	151,573	2.14E+12	88,832
1949	35,152	4.80E+11	31,448	116,143	1.66E+12	56,955	151,295	2.14E+12	88,403

Table 4.1. (Predicted biomass and recruitment continued).

	East			West			Gulfwide		
YEAR	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)
1950	34,944	4.79E+11	31,270	115,569	1.65E+12	56,633	150,513	2.13E+12	87,903
1951	34,900	4.79E+11	31,091	113,775	1.63E+12	56,309	148,675	2.11E+12	87,399
1952	34,559	4.76E+11	30,985	111,590	1.61E+12	56,116	146,149	2.08E+12	87,101
1953	33,958	4.69E+11	30,887	108,964	1.57E+12	55,940	142,922	2.04E+12	86,828
1954	33,314	4.60E+11	30,930	106,175	1.54E+12	56,018	139,489	2.00E+12	86,948
1955	32,613	4.51E+11	30,904	103,121	1.49E+12	55,971	135,734	1.94E+12	86,875
1956	31,701	4.38E+11	31,040	99,822	1.44E+12	56,218	131,523	1.88E+12	87,258
1957	30,492	4.21E+11	31,188	96,088	1.39E+12	56,484	126,580	1.81E+12	87,672
1958	29,320	4.04E+11	31,464	92,211	1.33E+12	56,984	121,531	1.74E+12	88,448
1959	27,408	3.77E+11	31,542	87,542	1.27E+12	57,125	114,950	1.64E+12	88,667
1960	25,564	3.50E+11	31,577	82,684	1.20E+12	57,190	108,248	1.55E+12	88,767
1961	23,495	3.20E+11	31,487	77,625	1.12E+12	57,026	101,120	1.44E+12	88,512
1962	21,578	2.92E+11	31,542	72,285	1.04E+12	57,126	93,863	1.34E+12	88,668
1963	19,646	2.63E+11	31,690	67,066	9.67E+11	57,394	86,712	1.23E+12	89,084
1964	18,035	2.39E+11	31,749	62,181	8.93E+11	57,500	80,215	1.13E+12	89,249
1965	16,216	2.12E+11	31,919	57,525	8.22E+11	57,808	73,741	1.03E+12	89,727
1966	14,400	1.86E+11	31,969	53,005	7.54E+11	57,900	67,405	9.40E+11	89,869
1967	12,917	1.64E+11	32,040	48,931	6.93E+11	58,027	61,848	8.56E+11	90,067
1968	11,588	1.44E+11	31,875	44,443	6.28E+11	57,730	56,031	7.72E+11	89,605
1969	10,453	1.27E+11	31,821	39,701	5.60E+11	57,631	50,154	6.87E+11	89,452
1970	9,452	1.12E+11	31,315	35,489	4.98E+11	56,714	44,941	6.10E+11	88,029
1971	8,560	9.88E+10	31,060	31,297	4.38E+11	56,253	39,857	5.37E+11	87,312
1972	8,939	8.70E+10	133,648	29,153	3.75E+11	245,985	38,092	4.62E+11	379,633
1973	8,431	7.51E+10	39,280	25,810	3.17E+11	130,437	34,240	3.92E+11	169,717
1974	8,279	6.66E+10	36,470	23,164	2.74E+11	59,913	31,443	3.41E+11	96,382

Table 4.1. (Predicted biomass and recruitment continued).

	East			West			Gulfwide		
YEAR	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)
1975	7,646	6.27E+10	34,359	21,228	2.49E+11	74,854	28,874	3.11E+11	109,213
1976	7,137	6.07E+10	40,090	19,396	2.29E+11	76,528	26,533	2.90E+11	116,618
1977	6,463	5.54E+10	45,605	17,511	2.08E+11	79,669	23,973	2.63E+11	125,274
1978	5,942	5.10E+10	26,297	15,708	1.87E+11	61,335	21,650	2.38E+11	87,633
1979	5,546	4.77E+10	24,331	14,354	1.67E+11	85,629	19,900	2.14E+11	109,960
1980	5,301	4.43E+10	46,628	14,288	1.48E+11	188,910	19,590	1.93E+11	235,538
1981	5,333	3.93E+10	78,129	13,875	1.30E+11	139,472	19,208	1.69E+11	217,601
1982	5,177	3.19E+10	58,573	13,239	1.16E+11	90,542	18,415	1.48E+11	149,115
1983	4,864	2.70E+10	24,936	12,419	1.10E+11	58,876	17,283	1.37E+11	83,812
1984	4,207	2.45E+10	14,018	10,943	1.03E+11	45,996	15,150	1.28E+11	60,015
1985	4,394	2.92E+10	12,864	10,389	9.75E+10	71,776	14,783	1.27E+11	84,640
1986	4,360	3.31E+10	29,148	9,909	9.28E+10	71,078	14,270	1.26E+11	100,226
1987	3,930	3.38E+10	12,185	9,229	8.63E+10	55,135	13,160	1.20E+11	67,320
1988	3,415	2.90E+10	26,326	9,264	8.49E+10	60,789	12,678	1.14E+11	87,115
1989	3,296	2.39E+10	50,926	9,508	8.01E+10	127,583	12,804	1.04E+11	178,509
1990	3,353	1.97E+10	46,580	9,615	7.86E+10	87,246	12,967	9.84E+10	133,826
1991	3,963	1.88E+10	58,947	10,998	8.38E+10	124,399	14,961	1.03E+11	183,346
1992	4,511	2.13E+10	38,903	12,086	9.28E+10	105,916	16,597	1.14E+11	144,819
1993	4,862	2.35E+10	52,674	13,186	1.02E+11	124,285	18,048	1.25E+11	176,959
1994	4,534	2.30E+10	39,819	13,891	1.11E+11	111,127	18,425	1.34E+11	150,946
1995	4,944	2.22E+10	88,064	15,023	1.23E+11	121,516	19,967	1.45E+11	209,580
1996	5,252	2.22E+10	59,145	15,570	1.35E+11	78,665	20,822	1.57E+11	137,811
1997	5,842	2.42E+10	60,513	16,107	1.46E+11	88,624	21,949	1.70E+11	149,136
1998	6,018	2.71E+10	47,444	15,999	1.54E+11	79,998	22,017	1.81E+11	127,441
1999	7,225	3.43E+10	102,743	16,447	1.63E+11	103,953	23,672	1.97E+11	206,696

Table 4.1. (Predicted biomass and recruitment continued).

	East			West			Gulfwide		
YEAR	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)	Total Biomass (mt)	Spawning Biomass (eggs)	Recruits (1000s)
2000	7,428	3.48E+10	84,594	16,745	1.70E+11	103,886	24,174	2.04E+11	188,480
2001	7,672	3.53E+10	65,201	16,558	1.73E+11	75,143	24,230	2.08E+11	140,344
2002	7,758	3.52E+10	79,523	16,995	1.78E+11	94,821	24,753	2.14E+11	174,345
2003	7,658	3.54E+10	80,914	17,536	1.83E+11	115,470	25,194	2.19E+11	196,384
2004	8,175	3.69E+10	108,675	18,484	1.89E+11	133,212	26,658	2.26E+11	241,887
2005	8,427	3.57E+10	104,178	19,093	1.93E+11	108,460	27,520	2.29E+11	212,638
2006	9,916	4.25E+10	119,704	20,167	2.00E+11	107,194	30,083	2.43E+11	226,898
2007	11,780	5.64E+10	99,131	21,008	2.09E+11	89,455	32,788	2.65E+11	188,586
2008	12,543	6.92E+10	58,898	22,673	2.30E+11	61,304	35,216	2.99E+11	120,203
2009	14,918	9.73E+10	69,463	26,329	2.67E+11	129,286	41,247	3.64E+11	198,749
2010	16,741	1.29E+11	51,183	29,969	3.12E+11	108,115	46,710	4.41E+11	159,298
2011	19,729	1.75E+11	66,405	34,158	3.69E+11	94,538	53,887	5.44E+11	160,942
2012	20,554	1.95E+11	80,372	39,126	4.28E+11	170,952	59,680	6.23E+11	251,324
2013	20,952	2.09E+11	63,844	43,180	4.82E+11	132,456	64,132	6.90E+11	196,300

Table 4.2. Estimated numbers at age (in 1000s of fish, beginning of year) in the Eastern Gulf

YEAR	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
1872	35395.90	13021.40	2628.98	1312.06	1106.94	962.33	851.80	763.07	688.39	624.75	569.27	520.27	476.92	438.06	402.77	370.69	341.50	314.93	290.72	268.37	3264.62
1873	35395.80	13021.40	2628.12	1305.23	1096.17	950.54	840.28	753.25	679.78	620.51	566.57	519.66	476.36	437.55	402.29	370.25	341.10	314.56	290.38	268.05	3260.80
1874	35395.70	13021.40	2627.68	1301.30	1084.98	935.33	824.18	738.10	666.68	610.61	561.35	516.89	475.52	436.77	401.58	369.59	340.50	314.00	289.86	267.58	3255.01
1875	35395.40	13021.30	2626.99	1295.71	1073.34	916.77	802.27	716.55	646.79	595.62	550.30	511.64	472.54	435.59	400.49	368.59	339.58	313.15	289.08	266.85	3246.20
1876	35395.10	13021.20	2626.49	1291.53	1062.80	900.61	780.28	692.38	623.42	575.61	535.34	501.24	467.43	432.57	399.14	367.35	338.43	312.10	288.10	265.95	3235.26
1877	35394.60	13021.10	2625.96	1287.26	1053.20	885.22	760.30	668.20	597.88	552.56	515.89	487.28	457.61	427.60	396.10	365.86	337.05	310.83	286.93	264.87	3222.10
1878	35394.30	13021.00	2626.34	1290.23	1054.66	882.42	752.22	655.16	580.50	531.65	496.37	469.84	445.11	418.85	391.77	363.27	335.87	309.74	285.92	263.94	3210.80
1879	35393.90	13020.80	2626.52	1292.05	1059.60	886.29	752.32	650.23	570.91	517.05	478.13	452.18	429.30	407.52	383.86	359.40	333.59	308.74	285.00	263.09	3200.45
1880	35393.50	13020.70	2626.24	1290.14	1058.01	887.18	752.56	647.82	564.50	507.48	464.35	435.42	413.02	392.91	373.35	352.02	329.92	306.54	283.98	262.15	3189.01
1881	35392.90	13020.50	2625.46	1284.16	1047.49	876.41	744.45	640.76	556.28	498.82	453.87	422.43	397.31	377.63	359.59	342.03	322.82	302.86	281.67	260.95	3174.38
1882	35392.20	13020.30	2624.96	1280.08	1037.01	861.80	729.89	629.32	546.40	489.71	444.95	412.64	385.21	363.02	345.39	329.22	313.46	296.15	278.11	258.65	3157.77
1883	35391.40	13020.10	2624.41	1275.90	1027.77	847.00	711.97	612.31	532.68	479.08	435.60	404.24	376.01	351.72	331.80	315.99	301.51	287.36	271.76	255.21	3138.22
1884	35390.60	13019.80	2623.82	1271.49	1018.18	833.02	693.82	592.47	514.22	465.07	424.89	395.46	368.10	343.08	321.24	303.34	289.18	276.20	263.50	249.20	3114.81
1885	35389.70	13019.50	2623.19	1266.81	1008.09	818.53	676.23	572.42	493.42	446.93	411.16	385.44	359.82	335.59	313.09	293.46	277.39	264.70	253.07	241.44	3085.40
1886	35388.80	13019.10	2622.52	1261.85	997.48	803.40	658.11	552.82	472.51	426.80	393.80	372.67	350.41	327.77	306.01	285.78	268.12	253.69	242.34	231.69	3048.79
1887	35387.80	13018.80	2621.81	1256.57	986.26	787.57	639.33	532.76	452.01	406.61	374.71	356.62	338.50	318.92	298.62	279.07	260.88	245.01	232.05	221.66	3003.64
1888	35386.80	13018.40	2621.06	1250.99	974.46	771.06	619.93	512.21	431.24	386.86	355.63	339.02	323.62	307.79	290.28	272.07	254.51	238.16	223.90	212.06	2950.35
1889	35385.90	13018.10	2621.11	1251.57	971.50	763.19	608.13	497.60	415.36	369.44	338.58	321.81	307.70	294.31	280.20	264.51	248.17	232.39	217.68	204.64	2893.30
1890	35385.00	13017.70	2620.39	1246.71	964.85	753.88	595.80	483.41	399.72	354.02	322.19	306.11	291.82	279.58	267.69	255.11	241.07	226.40	212.22	198.78	2831.83
1891	35383.90	13017.40	2618.41	1231.97	940.39	728.44	570.94	460.13	377.58	335.56	305.49	290.53	276.87	264.47	253.63	243.08	231.89	219.35	206.21	193.29	2763.06
1892	35382.80	13017.00	2618.90	1235.25	935.24	715.72	556.62	444.68	362.37	318.40	290.47	275.69	262.97	251.11	240.10	230.49	221.13	211.16	199.94	187.96	2697.42
1893	35381.80	13016.60	2618.09	1229.95	929.87	704.30	540.52	428.72	346.44	303.79	274.48	261.86	249.28	238.27	227.74	217.98	209.46	201.15	192.28	182.06	2630.01
1894	35380.70	13016.20	2617.40	1224.99	919.43	694.11	526.74	412.48	331.01	289.01	260.99	247.24	236.59	225.67	215.91	206.58	197.92	190.38	183.01	174.94	2561.03
1895	35379.60	13015.80	2616.75	1220.38	909.72	680.65	514.39	398.47	315.79	274.88	247.51	234.91	223.20	214.01	204.34	195.70	187.43	179.75	173.08	166.38	2489.77
1896	35378.50	13015.40	2616.63	1219.81	905.92	673.11	504.13	388.92	304.90	262.17	235.36	222.76	212.06	201.89	193.77	185.20	177.55	170.21	163.41	157.34	2417.01
1897	35377.50	13015.00	2616.15	1216.81	901.39	666.48	495.40	378.87	295.86	252.33	223.98	211.71	200.98	191.71	182.70	175.52	167.93	161.15	154.65	148.46	2341.30
1898	35376.50	13014.70	2615.89	1215.21	897.27	661.38	489.07	371.27	287.43	244.49	215.35	201.42	190.96	181.65	173.44	165.45	159.12	152.39	146.38	140.47	2263.80
1899	35249.30	13014.30	2614.09	1202.39	878.62	642.22	472.20	357.08	274.61	234.29	206.67	193.21	181.26	172.19	163.95	156.70	149.63	144.05	138.09	132.65	2180.91
1900	35239.10	12967.50	2611.78	1185.32	847.44	608.97	442.50	333.29	255.59	219.90	195.60	184.85	173.33	162.93	154.94	147.67	141.28	135.05	130.13	124.75	2092.21
1901	35227.70	12963.70	2599.68	1164.79	809.81	564.78	401.80	299.72	229.20	200.28	180.84	174.30	165.22	155.23	146.06	139.03	132.65	127.03	121.55	117.13	1997.39
1902	35215.20	12959.60	2596.19	1140.04	771.06	518.66	356.62	260.99	197.90	175.70	162.19	160.53	155.20	147.40	138.63	130.58	124.42	118.82	113.91	108.99	1897.89
1903	35201.50	12955.00	2592.33	1117.56	728.84	472.64	311.99	221.20	164.78	148.07	139.89	143.38	142.34	137.89	131.09	123.42	116.36	110.98	106.10	101.71	1793.77
1904	35186.70	12949.90	2591.55	1116.86	715.63	447.68	284.95	193.93	139.95	123.43	117.99	123.70	127.16	126.49	122.66	116.73	110.00	103.82	99.12	94.76	1694.53
1905	35170.80	12944.50	2590.89	1118.95	718.11	441.83	271.44	178.08	123.34	105.13	98.55	104.38	109.75	113.06	112.57	109.27	104.09	98.19	92.76	88.56	1600.38
1906	35153.90	12938.60	2591.36	1129.44	732.50	453.51	274.68	173.73	115.91	93.82	84.67	87.37	92.82	97.79	100.83	100.50	97.65	93.12	87.93	83.07	1513.89
1907	35136.10	12932.40	2592.43	1145.29	758.69	477.88	292.25	181.92	116.89	89.76	76.52	75.30	77.93	82.96	87.49	90.30	90.09	87.62	83.64	78.98	1435.87
1908	35117.80	12925.90	2593.87	1164.86	793.56	514.68	321.55	201.68	127.39	92.50	74.33	68.30	67.41	69.91	74.49	78.64	81.25	81.15	79.00	75.41	1367.12
1909	35098.70	12919.10	2594.96	1182.81	829.74	557.41	359.90	230.17	146.33	102.76	77.63	66.56	61.35	60.68	62.99	67.18	70.99	73.42	73.40	71.46	1306.17
1910	35078.60	12912.10	2596.43	1204.04	870.41	607.23	407.86	268.98	174.15	120.75	87.61	69.79	60.03	55.44	54.88	57.03	60.89	64.41	66.67	66.66	1252.30

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Table 4.2. (Numbers at age (in 1000s of fish) in the Eastern Gulf… Continued)

YEAR	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
1911	35057.30	12904.70	2597.63	1224.21	913.10	661.61	463.34	317.24	211.56	146.75	104.47	79.06	63.16	54.43	50.32	49.87	51.87	55.44	58.70	60.77	1203.29
1912	35034.50	12896.90	2596.77	1229.51	935.14	700.42	509.95	363.86	251.85	179.17	127.41	94.35	71.61	57.33	49.46	45.77	45.40	47.27	50.57	53.54	1154.20
1913	35010.00	12888.50	2595.67	1232.70	944.35	722.29	543.99	403.38	290.90	214.11	155.97	115.14	85.52	65.04	52.12	45.01	41.69	41.40	43.15	46.16	1103.51
1914	34983.70	12879.50	2594.32	1234.73	950.48	732.98	564.02	432.53	324.11	247.98	186.74	141.02	104.42	77.71	59.16	47.45	41.02	38.04	37.80	39.40	1050.94
1915	34955.70	12869.80	2592.73	1235.81	954.54	740.17	574.45	450.01	348.70	276.79	216.55	168.89	127.92	94.91	70.70	53.88	43.26	37.43	34.75	34.53	997.01
1916	34925.90	12859.50	2590.93	1236.14	956.95	744.88	581.43	459.34	363.57	298.13	241.91	195.89	153.23	116.30	86.37	64.40	49.13	39.49	34.20	31.75	943.44
1917	34894.30	12848.50	2588.94	1235.96	958.19	747.73	585.96	465.55	371.59	311.06	260.69	218.86	177.75	139.32	105.85	78.69	58.73	44.85	36.08	31.25	892.01
1918	34860.30	12836.90	2587.00	1237.05	961.01	751.61	590.73	471.10	378.11	318.61	272.41	235.94	198.67	161.68	126.85	96.47	71.79	53.64	41.00	32.99	844.82
1919	34823.70	12824.40	2584.71	1236.49	962.40	754.36	594.27	475.29	382.90	324.33	279.10	246.56	214.19	180.71	147.22	115.62	88.01	65.56	49.03	37.48	803.28
1920	34784.10	12810.90	2581.61	1230.94	955.48	749.04	590.85	473.87	382.96	326.90	283.18	252.41	223.65	194.67	164.41	134.07	105.40	80.31	59.89	44.79	768.76
1921	34741.40	12796.40	2578.22	1224.34	943.77	736.34	580.31	466.27	377.98	325.17	284.33	255.85	228.74	203.08	176.95	149.59	122.11	96.09	73.29	54.65	743.18
1922	34695.20	12780.60	2574.51	1216.81	930.19	719.02	563.29	452.46	367.59	318.91	281.58	256.61	231.61	207.47	184.39	160.82	136.09	111.20	87.59	66.81	728.02
1923	34646.00	12763.70	2570.43	1208.24	914.77	699.32	542.01	433.09	351.89	307.88	274.75	253.81	232.00	209.81	188.14	167.37	146.12	123.78	101.24	79.75	724.37
1924	34592.60	12745.60	2565.99	1198.66	897.53	677.45	518.46	410.18	331.68	292.28	263.70	247.30	229.14	209.87	189.99	170.53	151.86	132.71	112.53	92.04	731.79
1925	34533.40	12725.90	2562.30	1196.21	889.89	664.18	501.82	392.05	313.90	275.39	250.27	237.34	223.24	207.26	190.02	172.19	154.71	137.91	120.65	102.30	749.67
1926	34469.10	12704.10	2558.08	1192.47	885.25	655.89	489.82	377.87	298.80	260.04	235.44	225.17	214.17	201.85	187.59	172.16	156.16	140.45	125.32	109.63	774.98
1927	34398.80	12680.50	2553.81	1191.28	883.57	653.49	484.54	369.44	288.45	247.74	222.46	211.85	203.22	193.68	182.72	169.98	156.16	141.79	127.65	113.90	804.79
1928	34321.20	12654.60	2547.83	1180.17	870.03	640.48	473.15	358.52	276.82	236.77	210.45	199.82	190.87	183.46	175.02	165.29	153.92	141.54	128.64	115.82	834.35
1929	34240.10	12626.10	2543.79	1186.02	873.77	641.63	472.64	356.49	273.41	229.40	202.47	189.35	180.33	172.59	166.05	158.58	149.91	139.73	128.63	116.91	864.35
1930	34154.60	12596.20	2537.27	1178.33	870.05	636.95	467.45	351.79	268.66	225.12	195.29	181.97	170.69	162.88	156.05	150.29	143.66	135.95	126.85	116.76	891.64
1931	34066.50	12564.80	2536.00	1210.81	914.02	680.43	501.55	374.63	284.85	229.97	196.92	176.69	165.13	155.21	148.25	142.18	137.07	131.16	124.24	115.92	922.47
1932	33976.90	12532.40	2529.93	1212.21	942.13	717.61	538.10	403.61	304.55	244.36	201.46	178.23	160.41	150.21	141.32	135.13	129.72	125.18	119.90	113.58	950.25
1933	33883.40	12499.40	2523.19	1207.65	940.79	737.28	565.47	431.55	327.03	260.79	213.80	182.29	161.75	145.87	136.74	128.77	123.25	118.44	114.41	109.58	973.22
1934	33782.10	12465.00	2517.44	1211.24	947.21	746.10	589.58	459.90	354.45	282.11	229.36	193.70	165.65	147.28	132.95	124.75	117.60	112.67	108.38	104.69	991.85
1935	33671.70	12427.70	2511.31	1214.66	959.15	760.29	604.64	485.63	382.41	307.81	249.26	208.03	176.21	151.00	134.39	121.43	114.06	107.63	103.22	99.29	1005.57
1936	33551.40	12387.10	2502.75	1203.60	949.83	757.77	605.44	489.79	397.32	329.19	270.30	225.74	188.97	160.39	137.57	122.56	110.86	104.23	98.45	94.42	1011.68
1937	33418.30	12342.90	2493.64	1192.36	930.72	739.91	594.11	483.23	395.00	339.37	287.52	244.47	204.78	171.77	145.93	125.30	111.74	101.17	95.22	89.94	1011.46
1938	33270.70	12293.90	2485.53	1194.15	930.97	733.89	587.95	480.29	394.58	339.67	297.80	260.34	222.03	186.35	156.47	133.07	114.37	102.09	92.53	87.08	1008.33
1939	33108.50	12239.60	2473.69	1175.19	910.35	712.32	564.07	460.49	380.30	333.70	294.62	268.88	235.76	201.47	169.27	142.26	121.11	104.20	93.11	84.38	999.98
1940	32933.90	12179.90	2461.00	1156.22	876.78	677.87	531.29	429.34	354.64	316.83	286.42	265.32	242.87	213.38	182.53	153.51	129.15	110.05	94.78	84.69	987.33
1941	32751.90	12115.70	2452.19	1174.39	896.84	685.66	533.74	425.78	347.62	303.57	277.14	259.15	240.77	220.85	194.22	166.31	140.00	117.90	100.57	86.61	980.66
1942	32566.30	12048.80	2439.92	1175.29	918.39	708.58	546.04	432.39	348.37	299.25	266.59	250.99	235.40	219.15	201.21	177.14	151.83	127.94	107.85	92.00	977.27
1943	32385.00	11980.50	2427.78	1179.75	934.39	740.86	577.42	452.14	361.38	303.37	264.92	241.92	228.45	214.69	200.06	183.87	162.03	139.02	117.27	98.85	981.03
1944	32209.80	11913.80	2415.14	1182.58	951.02	767.04	615.48	486.98	384.68	317.74	270.37	240.80	220.55	208.69	196.31	183.13	168.47	148.61	127.63	107.66	992.43
1945	32045.10	11849.30	2401.27	1173.18	948.37	775.61	632.65	515.53	411.57	337.01	282.47	245.61	219.40	201.35	190.71	179.58	167.69	154.42	136.35	117.11	1010.36
1946	31909.70	11788.70	2388.91	1171.28	948.17	781.06	646.67	535.39	440.08	362.52	300.74	256.83	223.98	200.48	184.18	174.62	164.60	153.85	141.82	125.22	1036.47
1947	31804.20	11738.90	2374.72	1149.97	923.49	756.91	629.15	529.60	442.70	381.01	319.63	272.63	233.53	204.07	182.84	168.14	159.57	150.56	140.87	129.86	1064.78
1948	31600.30	11700.10	2364.37	1140.68	903.02	733.46	606.27	512.48	435.63	382.20	335.27	289.62	247.77	212.66	186.02	166.84	153.57	145.89	137.80	128.93	1094.43
1949	31447.60	11625.10	2356.05	1131.82	889.98	711.41	582.24	489.66	418.08	374.42	335.27	303.55	263.01	225.46	193.70	169.61	152.27	140.30	133.42	126.01	1119.88

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Table 4.2. (Numbers at age (in 1000s of fish) in the Eastern Gulf… Continued)

YEAR	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
1950	31,269.90	11,568.90	2,339.52	1,116.96	867.17	685.28	550.64	459.07	390.23	354.82	325.56	302.89	275.07	238.80	204.91	176.23	154.46	138.81	128.03	121.75	1,138.03
1951	31,090.70	11,437.40	2,320.58	1,068.63	827.91	663.74	542.06	447.34	378.26	337.34	312.53	295.27	275.55	250.73	217.90	187.16	161.12	141.36	127.16	117.29	1,155.24
1952	30,984.60	11,324.60	2,290.41	1,041.59	772.91	617.86	512.51	431.10	361.36	323.68	295.00	282.98	268.16	250.74	228.39	198.68	170.82	147.20	129.28	116.29	1,164.95
1953	30,887.40	11,265.60	2,264.15	1,009.84	735.16	562.78	466.24	399.50	341.84	306.31	281.17	266.69	256.59	243.64	228.05	207.92	181.06	155.83	134.42	118.05	1,171.10
1954	30,930.10	11,216.50	2,249.73	987.77	705.42	531.75	423.42	363.10	316.81	289.96	266.17	254.23	241.87	233.17	221.62	207.65	189.51	165.19	142.31	122.76	1,178.54
1955	30,904.20	11,191.00	2,236.90	969.96	681.45	505.50	397.68	328.51	287.16	268.51	251.79	240.65	230.55	219.77	212.09	201.78	189.25	172.89	150.85	129.96	1,189.55
1956	31,040.40	11,148.00	2,227.57	944.85	650.57	474.51	367.96	301.32	254.16	240.68	231.32	227.23	217.83	209.10	199.53	192.74	183.56	172.33	157.60	137.51	1,203.96
1957	31,187.70	11,138.70	2,213.42	914.77	608.17	433.49	330.76	268.16	224.74	209.00	204.58	208.09	205.02	196.93	189.23	180.75	174.78	166.62	156.58	143.19	1,220.08
1958	31,463.90	11,165.10	2,208.91	899.35	582.71	402.56	301.31	240.86	200.05	184.95	177.72	184.07	187.79	185.39	178.26	171.45	163.93	158.67	151.42	142.30	1,240.16
1959	31,541.60	11,246.20	2,204.08	842.82	515.50	340.64	245.38	194.14	159.76	154.60	150.50	158.20	164.34	168.00	166.02	159.79	153.84	147.24	142.66	136.14	1,244.19
1960	31,577.10	11,246.40	2,215.33	821.92	469.19	293.30	202.89	155.10	126.57	122.42	125.04	133.78	141.05	146.82	150.24	148.62	143.18	138.00	132.21	128.09	1,240.61
1961	31,486.60	11,265.60	2,207.04	785.85	422.71	244.07	159.35	117.85	93.30	92.94	96.09	110.36	118.42	125.11	130.35	133.52	132.21	127.51	123.01	117.85	1,221.29
1962	31,542.10	11,328.30	2,208.10	767.87	392.93	213.58	128.99	90.32	69.29	67.70	72.34	84.64	97.49	104.83	110.86	115.62	118.55	117.51	113.44	109.44	1,192.57
1963	31,690.10	11,359.80	2,214.72	740.74	361.37	185.03	104.86	68.28	49.73	48.54	51.41	63.34	74.33	85.79	92.34	97.75	102.05	104.74	103.92	100.32	1,152.60
1964	31,748.60	11,383.50	2,220.89	746.69	353.62	173.88	93.27	56.98	38.58	35.34	37.24	45.13	55.77	65.57	75.76	81.62	86.49	90.38	92.86	92.13	1,111.93
1965	31,918.80	11,353.70	2,215.55	702.45	318.60	148.52	75.72	44.16	28.19	25.53	25.79	32.29	39.25	48.60	57.20	66.15	71.34	75.67	79.16	81.33	1,055.57
1966	31,969.10	11,387.20	2,200.74	662.29	272.72	119.84	57.62	32.20	19.71	17.65	17.92	22.15	27.82	33.88	41.99	49.48	57.28	61.83	65.65	68.68	987.37
1967	32,039.60	11,427.40	2,206.07	656.12	258.47	104.02	47.46	25.04	14.69	12.49	12.50	15.43	19.13	24.07	29.35	36.41	42.94	49.76	53.77	57.09	919.23
1968	31,875.40	11,469.40	2,210.49	644.80	248.51	95.42	39.88	20.03	11.11	9.18	8.76	10.73	13.29	16.51	20.79	25.38	31.52	37.21	43.16	46.64	847.74
1969	31,820.90	11,355.20	2,217.17	644.25	244.33	92.14	36.85	16.96	8.96	6.98	6.45	7.53	9.25	11.48	14.28	18.00	21.99	27.34	32.31	37.47	777.29
1970	31,314.60	11,344.80	2,193.72	642.12	242.51	90.15	35.47	15.65	7.58	5.63	4.90	5.55	6.49	7.99	9.93	12.36	15.60	19.07	23.73	28.05	708.08
1971	31,059.80	11,169.40	2,189.71	629.11	238.85	88.54	34.41	14.96	6.95	4.74	3.95	4.21	4.78	5.60	6.91	8.59	10.70	13.52	16.55	20.60	639.45
1972	133,648.00	11,126.00	2,151.30	612.29	226.37	84.42	32.81	14.15	6.49	4.30	3.30	3.38	3.62	4.12	4.83	5.97	7.42	9.26	11.71	14.34	572.28
1973	39,280.40	47,776.60	2,130.39	557.52	195.35	69.83	27.20	11.86	5.43	3.77	2.86	2.80	2.88	3.09	3.52	4.13	5.10	6.35	7.93	10.03	503.05
1974	36,469.70	13,999.90	9,226.14	588.18	181.13	57.49	20.35	8.76	4.03	2.93	2.38	2.39	2.35	2.42	2.60	2.96	3.48	4.31	5.37	6.71	434.16
1975	34,359.00	13,012.00	2,730.54	2,888.91	227.79	63.25	19.49	7.46	3.35	2.31	1.94	2.01	2.03	2.00	2.06	2.21	2.52	2.97	3.68	4.59	376.78
1976	40,090.30	12,259.80	2,534.20	866.95	1,206.29	90.46	25.30	8.45	3.38	2.11	1.63	1.66	1.74	1.75	1.73	1.78	1.92	2.19	2.58	3.19	331.35
1977	45,605.40	14,336.60	2,374.76	763.29	345.20	468.35	36.24	11.10	3.89	2.16	1.50	1.41	1.44	1.50	1.52	1.50	1.55	1.67	1.91	2.24	291.43
1978	26,297.30	16,220.00	2,776.11	727.05	322.33	147.40	211.62	17.94	5.76	2.65	1.61	1.31	1.23	1.26	1.32	1.33	1.32	1.36	1.47	1.68	258.83
1979	24,330.80	9,426.39	3,148.65	873.31	319.35	143.42	69.29	108.52	9.63	4.00	2.00	1.40	1.15	1.08	1.11	1.16	1.17	1.16	1.20	1.30	230.27
1980	46,628.20	8,714.75	1,827.74	980.05	378.56	140.16	66.50	35.11	57.59	6.64	3.00	1.75	1.23	1.01	0.95	0.97	1.02	1.04	1.02	1.06	204.49
1981	78,128.70	16,875.40	1,669.88	505.17	367.70	145.09	57.39	29.99	16.89	37.74	4.79	2.59	1.51	1.07	0.87	0.82	0.85	0.89	0.90	0.89	179.26
1982	58,573.20	28,013.70	3,188.25	403.91	154.39	108.93	44.04	19.22	10.95	9.55	24.45	4.01	2.17	1.27	0.90	0.74	0.69	0.71	0.75	0.76	152.27
1983	24,935.80	21,001.70	5,342.09	810.74	119.09	40.34	27.13	11.66	5.58	5.37	5.59	19.81	3.26	1.77	1.03	0.73	0.60	0.57	0.58	0.61	125.35
1984	14,018.30	8,919.88	4,002.07	1,456.12	261.73	32.46	9.61	6.24	3.08	2.53	2.93	4.35	15.46	2.55	1.38	0.81	0.57	0.47	0.45	0.46	99.08
1985	12,863.90	4,989.59	1,755.01	1,610.77	842.07	134.28	14.62	4.04	2.87	1.89	1.71	2.41	3.60	12.81	2.11	1.15	0.67	0.48	0.39	0.37	83.02
1986	29,148.00	4,583.99	992.84	688.70	830.93	426.32	69.80	8.01	2.33	2.06	1.45	1.50	2.11	3.16	11.25	1.86	1.01	0.59	0.42	0.35	73.60
1987	12,185.20	10,376.10	910.45	365.84	323.30	409.40	231.49	41.78	5.09	1.80	1.66	1.29	1.33	1.88	2.82	10.06	1.66	0.91	0.53	0.38	66.36
1988	26,325.60	4,364.59	2,047.16	288.25	128.98	123.36	182.81	120.24	23.62	3.75	1.40	1.47	1.14	1.18	1.67	2.50	8.94	1.48	0.81	0.47	59.52

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Table 4.2. (Numbers at age (in 1000s of fish) in the Eastern Gulf… Continued)

YEAR	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
1989	50,925.90	9,444.18	859.82	633.76	96.43	45.61	50.26	86.43	62.08	16.52	2.82	1.22	1.28	1.00	1.04	1.47	2.20	7.88	1.30	0.71	52.97
1990	46,579.80	18,166.20	1,851.70	244.56	180.35	29.16	16.20	21.15	40.44	41.45	11.98	2.44	1.06	1.12	0.87	0.90	1.28	1.92	6.88	1.14	46.94
1991	58,946.80	16,683.00	3,583.51	609.32	90.26	65.85	11.39	7.02	9.94	26.41	29.70	10.29	2.10	0.92	0.96	0.75	0.78	1.11	1.67	5.97	41.75
1992	38,902.80	21,094.20	3,311.17	1,289.26	265.69	40.18	31.98	6.10	4.06	7.25	20.67	26.15	9.09	1.86	0.81	0.85	0.67	0.69	0.99	1.48	42.48
1993	52,673.80	13,840.00	4,177.44	1,117.50	484.02	102.18	17.37	15.59	3.30	2.87	5.60	18.17	23.05	8.03	1.64	0.72	0.76	0.59	0.62	0.88	39.07
1994	39,819.00	18,848.30	2,726.32	1,255.55	341.10	157.10	39.30	7.85	7.95	2.29	2.18	4.91	15.97	20.30	7.08	1.45	0.63	0.67	0.52	0.55	35.38
1995	88,063.80	14,239.90	3,715.61	916.40	405.76	107.63	56.74	16.47	3.74	5.28	1.70	1.89	4.28	13.97	17.78	6.20	1.27	0.56	0.59	0.46	31.63
1996	59,145.40	31,324.00	2,807.26	1,352.76	322.59	133.14	40.58	24.88	8.28	2.56	4.01	1.49	1.66	3.77	12.31	15.68	5.48	1.12	0.49	0.52	28.41
1997	60,512.90	20,946.50	6,196.63	1,066.67	531.78	117.69	54.03	18.62	12.94	5.71	1.96	3.52	1.31	1.47	3.33	10.87	13.86	4.85	1.00	0.44	25.65
1998	47,443.70	21,383.40	4,126.31	2,277.55	398.19	193.84	50.90	27.61	10.60	9.59	4.52	1.74	3.13	1.17	1.31	2.97	9.71	12.40	4.34	0.89	23.38
1999	102,743.00	16,598.00	4,244.26	1,676.21	1,115.08	191.09	103.33	30.15	17.63	8.17	7.82	4.03	1.56	2.80	1.05	1.17	2.67	8.74	11.16	3.91	21.88
2000	84,593.50	36,641.80	3,291.17	1,646.27	697.89	424.66	78.55	46.84	15.48	11.93	6.23	6.84	3.53	1.37	2.46	0.92	1.03	2.36	7.72	9.86	22.80
2001	65,201.20	30,306.50	7,225.87	1,253.05	685.17	261.29	176.71	37.32	24.87	10.88	9.18	5.47	6.03	3.12	1.21	2.18	0.82	0.92	2.09	6.85	29.03
2002	79,523.40	23,282.30	5,939.85	2,600.66	463.65	226.37	99.06	79.33	18.82	17.26	8.23	8.05	4.81	5.31	2.75	1.07	1.93	0.72	0.81	1.85	31.81
2003	80,914.10	28,219.20	4,556.62	2,114.98	943.15	150.29	84.97	44.50	39.77	13.10	12.99	7.21	7.07	4.24	4.68	2.43	0.94	1.71	0.64	0.72	29.83
2004	108,675.00	28,892.60	5,553.09	1,702.71	849.18	340.04	60.88	39.94	23.20	27.90	9.98	11.40	6.35	6.24	3.74	4.14	2.15	0.84	1.51	0.57	27.11
2005	104,178.00	38,818.50	5,659.24	1,988.99	610.37	270.88	126.67	27.34	20.09	16.23	21.05	8.75	10.03	5.60	5.51	3.31	3.66	1.90	0.74	1.34	24.55
2006	119,704.00	37,399.90	7,673.72	2,244.02	939.39	268.26	131.82	69.83	16.31	15.09	12.91	18.67	7.79	8.94	4.99	4.92	2.96	3.28	1.70	0.66	23.21
2007	99,131.30	43,331.10	7,438.28	3,248.86	1,251.81	502.87	155.49	83.88	47.06	12.97	12.50	11.56	16.76	7.00	8.05	4.50	4.44	2.67	2.96	1.54	21.60
2008	58,898.40	36,027.60	8,602.54	3,088.88	1,677.34	607.79	269.26	92.59	54.53	36.56	10.64	11.08	10.27	14.93	6.24	7.19	4.02	3.97	2.39	2.65	20.74
2009	69,463.20	21,497.10	7,204.22	4,021.45	2,131.21	1,068.29	400.66	186.83	69.28	43.26	30.66	9.50	9.92	9.22	13.41	5.61	6.47	3.62	3.58	2.16	21.11
2010	51,183.10	25,242.40	4,302.34	3,371.63	2,765.66	1,357.91	701.62	275.62	138.58	54.87	36.33	27.38	8.51	8.90	8.28	12.06	5.05	5.83	3.27	3.23	21.01
2011	66,404.60	18,686.40	5,066.15	2,056.81	2,528.34	2,026.07	1,019.15	542.56	222.47	116.68	47.74	32.67	24.70	7.69	8.06	7.50	10.93	4.59	5.29	2.97	22.04
2012	80,371.50	24,197.80	3,749.40	2,409.78	1,526.31	1,772.56	1,325.42	641.64	355.54	160.14	94.33	41.63	28.57	21.64	6.75	7.07	6.59	9.62	4.04	4.66	22.05
2013	63,844.10	29,291.70	4,857.56	1,780.41	1,770.34	1,062.49	1,166.71	847.80	428.33	260.40	130.49	82.47	36.50	25.11	19.04	5.94	6.23	5.82	8.49	3.57	23.61

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Table 4.3. Estimated numbers at age (in 1000s of fish) in the Western Gulf

YEAR	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
1872	64105.90	23583.20	4761.37	2376.28	2004.78	1742.87	1542.70	1382.01	1246.74	1131.49	1031.01	942.27	863.76	793.37	729.45	671.35	618.50	570.37	526.52	486.04	5912.59
1873	64105.70	23583.20	4761.37	2376.28	2004.78	1742.87	1542.70	1382.01	1246.74	1131.49	1031.01	942.27	863.76	793.37	729.45	671.35	618.50	570.37	526.52	486.04	5912.59
1874	64105.40	23583.20	4761.37	2376.28	2004.78	1742.87	1542.70	1382.01	1246.74	1131.49	1031.01	942.27	863.76	793.37	729.45	671.35	618.50	570.37	526.52	486.04	5912.59
1875	64104.90	23583.10	4761.36	2376.28	2004.78	1742.87	1542.70	1382.01	1246.74	1131.49	1031.01	942.27	863.76	793.37	729.45	671.35	618.50	570.37	526.52	486.04	5912.59
1876	64104.30	23582.90	4761.34	2376.27	2004.78	1742.87	1542.70	1382.01	1246.74	1131.49	1031.01	942.27	863.76	793.37	729.45	671.35	618.50	570.37	526.52	486.04	5912.59
1877	64103.50	23582.70	4761.30	2376.26	2004.78	1742.87	1542.70	1382.01	1246.74	1131.49	1031.01	942.27	863.76	793.37	729.45	671.35	618.50	570.37	526.52	486.04	5912.59
1878	64102.80	23582.40	4761.26	2376.24	2004.77	1742.87	1542.70	1382.01	1246.74	1131.49	1031.01	942.27	863.76	793.37	729.45	671.35	618.50	570.37	526.52	486.04	5912.59
1879	64102.20	23582.10	4761.20	2376.22	2004.75	1742.86	1542.70	1382.01	1246.74	1131.49	1031.01	942.27	863.76	793.37	729.45	671.35	618.50	570.37	526.52	486.04	5912.59
1880	64101.50	23581.90	4761.15	2376.19	2004.73	1742.85	1542.69	1382.00	1246.74	1131.49	1031.01	942.27	863.76	793.37	729.45	671.35	618.50	570.37	526.52	486.04	5912.59
1881	64100.40	23581.60	4753.99	2361.19	1965.87	1704.16	1515.75	1365.49	1236.23	1125.70	1028.86	941.64	863.18	792.84	728.96	670.90	618.08	569.99	526.17	485.71	5908.62
1882	64099.10	23581.20	4754.57	2358.96	1956.86	1674.46	1484.42	1343.08	1222.38	1116.71	1023.79	939.74	862.65	792.35	728.52	670.49	617.70	569.64	525.85	485.42	5905.00
1883	64097.70	23580.70	4755.16	2360.67	1958.65	1670.34	1461.00	1316.82	1203.28	1104.74	1015.81	935.16	860.96	791.92	728.12	670.12	617.37	569.33	525.56	485.15	5901.77
1884	64096.20	23580.20	4755.67	2362.23	1963.32	1675.05	1459.58	1297.36	1180.60	1087.95	1005.10	927.93	856.82	790.42	727.76	669.79	617.06	569.05	525.30	484.91	5898.87
1885	64094.60	23579.70	4756.19	2363.79	1968.00	1682.36	1465.96	1297.47	1164.02	1067.93	990.01	918.19	850.24	786.66	726.42	669.50	616.80	568.81	525.07	484.70	5896.32
1886	64092.90	23579.10	4756.72	2365.42	1972.82	1689.82	1474.72	1304.57	1165.02	1053.42	971.97	904.46	841.38	780.67	723.01	668.31	616.57	568.59	524.88	484.52	5894.14
1887	64091.10	23578.50	4757.25	2367.04	1977.67	1697.41	1483.63	1313.80	1172.30	1054.82	958.95	888.04	828.84	772.57	717.55	665.22	615.51	568.42	524.72	484.37	5892.31
1888	64089.40	23577.80	4758.74	2370.71	1987.86	1710.30	1496.28	1325.35	1182.87	1062.65	960.67	876.28	813.92	761.18	710.22	660.29	612.75	567.53	524.63	484.30	5891.39
1889	64087.70	23577.20	4758.55	2371.32	1990.59	1718.76	1507.40	1336.50	1193.18	1072.18	967.79	877.85	803.13	747.47	699.74	653.54	608.21	564.98	523.81	484.22	5890.42
1890	64086.00	23576.50	4757.96	2370.27	1988.63	1718.67	1513.16	1345.41	1202.57	1081.17	976.34	884.31	804.54	737.54	687.11	643.88	601.97	560.77	521.44	483.44	5889.21
1891	64084.00	23575.90	4758.06	2370.44	1988.95	1718.17	1513.91	1351.06	1210.90	1089.85	984.59	892.14	810.48	738.84	677.99	632.26	593.08	555.03	517.56	481.26	5887.49
1892	64082.10	23575.20	4757.72	2370.03	1987.91	1717.27	1512.65	1351.23	1215.67	1097.24	992.44	899.66	817.64	744.28	679.17	623.86	582.37	546.82	512.25	477.67	5883.77
1893	64080.20	23574.50	4757.38	2369.46	1986.52	1715.34	1511.15	1349.67	1215.54	1101.40	999.10	906.82	824.52	750.84	684.16	624.94	574.62	536.94	504.66	472.76	5876.91
1894	64078.30	23573.80	4757.09	2368.96	1985.20	1713.30	1508.87	1347.98	1213.92	1101.17	1002.85	912.89	831.06	757.15	690.18	629.52	575.60	529.78	495.54	465.75	5865.95
1895	64076.30	23573.10	4756.84	2368.59	1984.20	1711.59	1506.68	1345.70	1212.24	1099.61	1002.60	916.31	836.62	763.15	695.97	635.05	579.81	530.68	488.93	457.32	5849.29
1896	64074.40	23572.40	4756.62	2368.31	1983.48	1710.32	1504.89	1343.58	1210.09	1098.03	1001.17	916.08	839.75	768.25	701.48	640.38	584.91	534.56	489.76	451.22	5826.08
1897	64072.50	23571.60	4756.41	2368.08	1982.92	1709.38	1503.56	1341.85	1208.10	1096.03	999.71	914.76	839.53	771.12	706.17	645.44	589.81	539.26	493.34	451.99	5798.96
1898	64070.60	23570.90	4756.27	2367.98	1982.73	1708.90	1502.73	1340.66	1206.54	1094.23	997.89	913.43	838.32	770.92	708.80	649.75	594.47	543.77	497.67	455.29	5774.62
1899	63840.20	23570.30	4754.46	2364.40	1973.59	1699.78	1496.13	1336.16	1203.09	1091.51	995.77	911.62	836.97	769.69	708.51	652.07	598.35	547.99	501.76	459.21	5754.27
1900	63821.80	23485.50	4752.85	2360.41	1962.64	1684.09	1482.73	1326.98	1196.95	1087.23	992.86	909.56	835.20	768.34	707.28	651.71	600.40	551.49	505.58	462.92	5738.31
1901	63801.20	23478.70	4734.35	2356.64	1951.71	1667.29	1463.90	1311.95	1186.72	1080.57	988.56	906.78	833.19	766.61	705.95	650.50	599.99	553.31	508.73	466.38	5726.23
1902	63778.60	23471.20	4731.86	2345.09	1942.49	1652.05	1445.21	1292.81	1171.69	1070.46	982.18	902.75	830.56	764.69	704.28	649.20	598.80	552.87	510.36	469.25	5717.65
1903	63753.60	23462.80	4729.38	2341.86	1927.89	1639.30	1428.62	1274.24	1153.28	1056.17	972.72	896.85	826.80	762.20	702.45	647.61	597.56	551.72	509.91	470.70	5711.86
1904	63726.90	23453.70	4728.18	2341.65	1927.83	1629.48	1419.30	1260.65	1137.37	1039.94	959.87	888.25	821.43	758.78	700.20	645.96	596.13	550.60	508.88	470.31	5708.12
1905	63698.10	23443.80	4726.70	2341.82	1929.59	1631.31	1412.08	1253.20	1125.73	1025.87	945.22	876.55	813.58	753.88	697.09	643.91	594.62	549.30	507.86	469.37	5704.50
1906	63667.50	23433.20	4725.29	2342.30	1932.82	1635.80	1415.70	1248.05	1119.86	1015.79	932.59	863.21	802.90	746.72	692.62	641.08	592.77	547.94	506.68	468.46	5700.61
1907	63635.30	23422.00	4723.77	2342.89	1936.52	1641.75	1421.78	1252.56	1116.08	1010.95	923.60	851.73	790.74	736.97	686.08	637.01	590.20	546.27	505.47	467.40	5696.51
1908	63602.10	23410.10	4722.15	2343.51	1940.50	1648.30	1429.27	1259.34	1120.99	1008.02	919.37	843.57	780.27	725.84	677.16	631.03	586.49	543.93	503.95	466.31	5692.10
1909	63567.60	23397.90	4720.25	2343.72	1943.61	1654.23	1436.70	1267.01	1127.70	1012.80	916.83	839.74	772.83	716.26	666.97	622.86	581.01	540.54	501.82	464.93	5687.27
1910	63531.20	23385.20	4718.66	2344.61	1948.52	1661.50	1445.03	1275.50	1135.77	1019.52	921.42	837.50	769.39	709.49	658.22	613.54	573.53	535.54	498.73	463.00	5682.02

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Table 4.3. (Numbers at age (in 1000s of fish) in the Western Gulf… Continued)

YEAR	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
1911	63492.60	23371.80	4716.91	2345.53	1953.64	1669.99	1454.32	1284.66	1144.49	1027.42	927.76	841.76	767.39	706.39	652.05	605.54	565.00	528.68	494.15	460.19	5675.83
1912	63451.30	23357.60	4714.31	2344.87	1954.96	1674.92	1462.12	1293.15	1152.85	1035.39	934.97	847.55	771.30	704.56	649.21	599.87	557.63	520.82	487.83	455.97	5667.56
1913	63406.90	23342.40	4711.54	2343.77	1954.90	1676.54	1466.77	1300.28	1160.59	1043.02	942.24	854.15	776.62	708.16	647.53	597.25	552.42	514.04	480.58	450.14	5656.08
1914	63359.30	23326.10	4708.56	2342.57	1954.44	1676.94	1468.49	1304.61	1167.12	1050.09	949.22	860.80	782.67	713.05	650.84	595.72	550.01	509.23	474.32	443.45	5640.14
1915	63308.50	23308.60	4705.35	2341.26	1953.89	1676.99	1469.15	1306.33	1171.12	1056.05	955.67	867.18	788.77	718.61	655.34	598.77	548.60	507.02	469.89	437.69	5619.28
1916	63254.60	23289.90	4701.89	2339.83	1953.24	1676.95	1469.49	1307.09	1172.77	1059.74	961.12	873.08	794.62	724.22	660.46	602.91	551.42	505.72	467.86	433.60	5594.73
1917	63197.30	23270.10	4698.21	2338.30	1952.53	1676.86	1469.78	1307.59	1173.58	1061.30	964.50	878.07	800.03	729.59	665.62	607.62	555.24	508.32	466.67	431.73	5568.32
1918	63135.70	23249.00	4694.29	2336.64	1951.68	1676.67	1470.00	1308.03	1174.14	1062.10	965.95	881.16	804.61	734.57	670.56	612.37	559.58	511.85	469.07	430.63	5542.24
1919	63069.50	23226.30	4690.12	2334.85	1950.72	1676.37	1470.13	1308.40	1174.65	1062.67	966.70	882.49	807.45	738.78	675.14	616.93	563.96	515.86	472.32	432.85	5517.18
1920	62997.80	23202.00	4685.45	2332.57	1948.69	1675.01	1469.49	1308.29	1174.84	1063.05	967.18	883.17	808.66	741.38	679.00	621.14	568.15	519.89	476.02	435.85	5496.02
1921	62920.40	23175.60	4680.44	2330.03	1946.23	1672.73	1467.93	1307.50	1174.60	1063.14	967.50	883.60	809.27	742.48	681.39	624.69	572.02	523.75	479.73	439.25	5479.20
1922	62836.80	23147.10	4675.00	2327.30	1943.51	1670.02	1465.51	1305.85	1173.73	1062.83	967.55	883.88	809.66	743.03	682.39	626.87	575.28	527.31	483.29	442.68	5466.75
1923	62747.70	23116.40	4669.15	2324.38	1940.67	1667.12	1462.75	1303.47	1172.11	1061.96	967.24	883.92	809.91	743.39	682.90	627.79	577.29	530.31	486.57	445.95	5458.36
1924	62650.90	23083.60	4662.84	2321.25	1937.66	1664.12	1459.83	1300.78	1169.82	1060.41	966.42	883.63	809.94	743.61	683.21	628.25	578.13	532.15	489.33	448.98	5453.58
1925	62543.70	23048.00	4656.37	2318.41	1935.81	1662.29	1457.72	1298.50	1167.60	1058.45	965.05	882.89	809.68	743.64	683.42	628.55	578.55	532.93	491.04	451.53	5452.03
1926	62427.30	23008.50	4649.33	2315.49	1934.21	1661.46	1456.64	1296.94	1165.75	1056.56	963.31	881.65	809.02	743.42	683.47	628.75	578.84	533.33	491.77	453.12	5453.04
1927	62299.90	22965.70	4641.52	2312.29	1932.56	1660.86	1456.44	1296.30	1164.56	1055.00	961.63	880.07	807.89	742.82	683.27	628.80	579.03	533.61	492.15	453.80	5455.50
1928	62159.40	22918.80	4631.91	2306.36	1924.59	1654.22	1452.31	1293.94	1162.60	1053.15	959.93	878.45	806.37	741.72	682.65	628.56	579.02	533.73	492.35	454.10	5457.89
1929	62012.60	22867.20	4623.75	2304.31	1926.68	1654.32	1451.28	1293.17	1162.32	1052.39	958.62	877.01	804.99	740.41	681.73	628.07	578.87	533.79	492.53	454.34	5461.06
1930	61857.60	22813.20	4613.40	2300.41	1925.40	1656.55	1451.66	1292.42	1161.74	1052.20	957.95	875.82	803.67	739.15	680.53	627.22	578.43	533.66	492.59	454.51	5464.26
1931	61698.20	22756.20	4601.39	2292.91	1916.06	1649.44	1449.47	1290.25	1159.48	1050.81	957.45	875.12	802.49	737.85	679.29	626.05	577.59	533.19	492.41	454.52	5466.78
1932	61535.90	22697.50	4591.60	2290.55	1919.14	1650.63	1449.59	1292.17	1159.98	1050.10	956.68	874.81	801.98	736.90	678.22	625.02	576.61	532.50	492.06	454.43	5470.02
1933	61366.40	22637.80	4579.21	2284.50	1914.11	1650.27	1448.57	1291.01	1160.90	1050.11	955.88	874.05	801.66	736.39	677.31	624.00	575.62	531.57	491.40	454.08	5472.64
1934	61183.00	22575.40	4566.86	2277.70	1907.43	1644.34	1447.14	1289.42	1159.43	1050.71	955.80	873.29	800.94	736.07	676.82	623.14	574.67	530.65	490.52	453.46	5474.57
1935	60983.10	22508.00	4554.14	2271.25	1900.95	1637.80	1441.38	1287.81	1157.79	1049.27	956.30	873.21	800.23	735.40	676.51	622.68	573.87	529.76	489.67	452.64	5475.71
1936	60765.20	22434.40	4538.81	2261.30	1886.19	1622.98	1429.26	1278.79	1153.87	1046.42	954.48	873.52	800.02	734.62	675.78	622.29	573.35	528.93	488.76	451.78	5475.07
1937	60524.10	22354.30	4522.34	2250.24	1869.05	1601.65	1410.30	1264.35	1143.44	1041.58	951.41	871.72	800.17	734.31	674.96	621.52	572.90	528.36	487.92	450.87	5472.78
1938	60256.80	22265.60	4505.50	2240.64	1856.23	1583.50	1389.29	1246.06	1129.56	1031.63	946.81	868.86	798.47	734.40	674.63	620.72	572.15	527.91	487.36	450.06	5469.47
1939	59963.10	22167.30	4487.65	2232.35	1848.45	1572.77	1373.63	1227.56	1113.25	1019.12	937.77	864.66	795.85	732.84	674.71	620.42	571.41	527.23	486.95	449.55	5465.67
1940	59646.90	22059.20	4468.45	2224.80	1844.93	1569.41	1366.54	1215.06	1097.57	1004.89	926.59	856.46	792.05	730.48	673.32	620.53	571.17	526.58	486.35	449.20	5462.04
1941	59317.30	21942.90	4446.95	2215.88	1840.24	1567.94	1364.66	1209.42	1086.80	990.95	913.73	846.26	784.56	727.01	671.17	619.27	571.29	526.37	485.77	448.65	5458.51
1942	58981.10	21821.60	4424.12	2206.53	1836.23	1567.25	1365.63	1209.11	1082.61	981.70	901.23	834.57	775.27	720.19	668.03	617.33	570.16	526.52	485.60	448.14	5455.09
1943	58652.70	21698.00	4401.25	2198.53	1837.08	1572.27	1370.81	1213.47	1084.54	979.12	893.26	823.29	764.68	711.77	661.86	614.54	568.47	525.56	485.82	448.06	5452.35
1944	58335.50	21577.10	4377.72	2190.16	1838.18	1580.65	1380.45	1221.23	1090.44	981.95	891.31	816.13	754.46	702.15	654.22	608.96	565.98	524.08	485.01	448.33	5450.53
1945	58037.20	21460.40	4354.09	2180.03	1835.29	1585.67	1390.60	1231.52	1098.48	987.88	894.11	814.41	747.95	692.82	645.43	601.98	560.88	521.83	483.67	447.61	5449.51
1946	57791.90	21350.70	4331.56	2170.41	1832.40	1588.74	1398.87	1242.91	1109.20	995.96	899.79	817.05	746.46	686.92	636.92	593.95	554.51	517.18	481.64	446.43	5448.48
1947	57600.90	21206.80	4307.34	2156.23	1816.86	1578.81	1396.43	1247.16	1117.48	1004.60	906.76	822.13	748.77	685.45	631.40	586.03	547.04	511.23	477.29	444.50	5445.67
1948	57231.60	20917.80	4274.15	2141.19	1798.17	1558.64	1382.97	1242.09	1119.46	1011.10	914.26	828.39	753.32	687.48	629.97	580.88	539.68	504.28	471.74	440.42	5440.59
1949	56954.90	20349.80	4209.09	2121.93	1780.35	1537.38	1361.67	1227.89	1113.49	1012.10	919.88	835.15	758.99	691.59	631.77	579.50	534.88	497.44	465.27	435.25	5431.57

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Table 4.3. (Numbers at age (in 1000s of fish) in the Western Gulf… Continued)

YEAR	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
1950	56633.20	19830.80	4086.97	2084.22	1752.10	1510.05	1334.72	1203.82	1097.45	1004.86	920.12	840.09	765.00	696.62	635.40	581.03	533.49	492.90	458.86	429.19	5417.17
1951	56308.60	19494.50	3968.84	1824.80	1555.19	1390.61	1257.27	1146.45	1057.18	979.84	909.36	838.92	768.26	700.99	638.97	583.40	534.01	490.81	453.92	422.57	5389.41
1952	56116.40	19316.30	3897.80	1732.26	1334.76	1219.81	1149.45	1074.39	1003.52	942.01	885.97	828.87	766.96	703.77	642.79	586.51	536.03	491.14	451.86	417.90	5356.14
1953	55940.30	19008.80	3854.29	1659.04	1234.54	1027.57	995.64	973.64	934.95	891.01	850.51	807.15	757.39	702.23	645.01	589.71	538.62	492.76	451.94	415.80	5318.51
1954	56017.70	18988.00	3792.86	1607.65	1168.59	948.23	838.90	843.29	847.51	830.25	804.49	774.83	737.54	693.46	643.59	591.74	541.56	495.13	453.42	415.87	5281.84
1955	55970.90	18530.70	3778.97	1543.56	1108.33	885.99	767.86	706.44	731.30	750.89	748.92	732.67	707.77	675.05	635.35	590.25	543.24	497.66	455.45	417.09	5246.39
1956	56217.60	18863.00	3687.88	1498.58	1036.41	824.99	708.68	641.06	609.11	645.66	676.35	681.72	668.93	647.49	618.18	582.40	541.60	498.96	457.56	418.75	5212.30
1957	56484.30	18445.90	3737.39	1409.76	959.73	741.14	641.07	579.92	545.21	533.32	579.59	614.96	621.71	611.27	592.27	566.02	533.79	496.90	458.24	420.21	5176.62
1958	56984.40	18002.10	3644.01	1395.42	882.66	675.88	570.12	520.89	490.90	476.01	478.18	526.77	560.60	567.89	558.91	542.08	518.57	489.54	456.16	420.67	5143.07
1959	57125.30	16797.20	3515.74	1287.32	793.05	564.90	483.67	440.83	425.99	419.72	423.17	433.39	478.87	510.65	517.80	510.12	495.26	474.26	448.15	417.59	5098.46
1960	57189.60	16584.40	3268.07	1184.49	692.71	486.35	392.37	366.31	355.51	361.14	371.83	383.09	393.52	435.69	465.06	472.05	465.51	452.40	433.65	409.78	5048.83
1961	57025.60	16509.60	3212.49	1030.43	589.14	399.05	323.27	288.23	289.40	297.64	318.29	336.03	347.25	357.42	396.11	423.24	430.03	424.50	412.96	395.84	4987.64
1962	57126.20	17290.50	3185.00	945.40	455.78	303.19	243.76	224.10	218.77	236.47	259.74	286.71	303.60	314.37	323.90	359.32	384.31	390.87	386.23	375.73	4903.01
1963	57394.20	17413.30	3322.99	891.88	388.92	219.76	176.57	163.52	166.31	176.34	205.21	233.54	258.56	274.35	284.36	293.27	325.67	348.67	354.97	350.76	4798.73
1964	57500.10	16975.40	3337.31	919.33	361.53	185.24	126.87	117.73	120.86	133.72	152.87	184.44	210.54	233.57	248.07	257.38	265.71	295.36	316.54	322.26	4679.63
1965	57808.40	17336.60	3249.03	902.61	357.97	165.55	103.81	82.88	85.79	96.34	115.52	137.24	166.09	189.97	210.95	224.28	232.93	240.71	267.84	287.04	4540.31
1966	57899.50	16929.80	3298.27	841.47	328.57	153.93	88.54	65.68	59.08	67.47	82.77	103.52	123.36	149.59	171.27	190.38	202.61	210.63	217.88	242.44	4373.98
1967	58027.10	16770.80	3226.83	847.81	314.14	146.95	85.06	57.27	47.56	46.91	58.20	74.27	93.17	111.24	135.03	154.75	172.19	183.44	190.89	197.47	4187.99
1968	57729.70	15796.60	3127.46	728.98	244.03	107.43	66.14	47.81	37.60	35.58	39.49	51.81	66.31	83.35	99.63	121.05	138.87	154.68	164.94	171.65	3947.26
1969	57631.10	16352.60	2879.80	574.23	142.75	56.79	36.12	30.44	27.31	25.86	28.95	34.77	45.74	58.67	73.82	88.32	107.42	123.35	137.53	146.66	3666.00
1970	56714.20	14947.80	2952.64	459.23	100.04	31.13	18.38	16.18	17.10	18.59	20.94	25.44	30.65	40.41	51.88	65.34	78.25	95.27	109.51	122.10	3388.13
1971	56252.60	15215.20	2629.53	376.83	52.29	14.20	7.27	6.58	7.78	10.59	14.49	18.18	22.15	26.74	35.28	45.34	57.17	68.53	83.52	96.01	3080.49
1972	245985.00	14880.20	2528.71	181.54	16.91	3.16	1.76	1.69	2.35	4.02	7.67	12.27	15.44	18.85	22.78	30.09	38.71	48.86	58.63	71.45	2720.24
1973	130437.00	63434.60	2391.59	103.07	4.38	0.62	0.28	0.32	0.51	1.10	2.79	6.41	10.29	12.97	15.85	19.17	25.35	32.64	41.24	49.49	2358.57
1974	59912.60	36176.00	10520.20	187.11	4.60	0.24	0.07	0.06	0.11	0.26	0.79	2.36	5.42	8.73	11.02	13.48	16.32	21.60	27.84	35.17	2055.82
1975	74853.50	16598.90	6504.33	2585.06	38.00	0.92	0.07	0.03	0.03	0.07	0.21	0.69	2.07	4.77	7.69	9.71	11.89	14.41	19.10	24.62	1850.71
1976	76528.00	21091.10	3103.41	1723.02	829.26	13.50	0.42	0.04	0.02	0.02	0.06	0.18	0.62	1.85	4.28	6.90	8.72	10.69	12.97	17.18	1688.92
1977	79668.70	20637.70	3930.14	601.62	469.71	291.22	6.29	0.24	0.03	0.01	0.02	0.05	0.16	0.55	1.66	3.84	6.20	7.84	9.62	11.67	1537.32
1978	61335.20	22463.00	3829.44	703.19	145.03	147.36	124.96	3.41	0.15	0.02	0.01	0.02	0.05	0.15	0.49	1.49	3.44	5.55	7.04	8.63	1391.32
1979	85628.70	16530.30	4114.70	632.73	145.74	39.05	56.30	62.60	2.07	0.11	0.02	0.01	0.02	0.04	0.13	0.44	1.33	3.07	4.96	6.29	1251.86
1980	188910.00	22893.50	3010.88	669.90	123.10	36.35	14.04	27.06	36.91	1.45	0.09	0.01	0.01	0.01	0.04	0.12	0.39	1.18	2.73	4.42	1122.46
1981	139472.00	57097.50	4107.99	338.40	83.24	21.43	10.13	5.65	14.14	24.00	1.15	0.08	0.01	0.01	0.01	0.03	0.10	0.34	1.04	2.41	993.28
1982	90541.80	38098.90	10035.20	610.02	42.03	11.96	4.96	3.60	2.69	8.68	18.62	1.00	0.07	0.01	0.01	0.01	0.03	0.09	0.30	0.91	871.21
1983	58876.30	24300.40	6949.55	2789.75	157.76	10.76	4.15	2.33	2.07	1.85	7.05	16.35	0.88	0.06	0.01	0.01	0.01	0.03	0.08	0.27	774.07
1984	45996.20	16833.10	4545.65	1739.26	874.75	56.34	4.94	2.36	1.53	1.54	1.55	6.24	14.51	0.78	0.05	0.01	0.01	0.01	0.02	0.07	692.96
1985	71776.40	12255.80	3202.66	1485.76	772.65	417.52	31.21	3.14	1.62	1.13	1.25	1.32	5.32	12.39	0.67	0.05	0.01	0.00	0.01	0.02	595.23
1986	71077.90	19533.70	2378.45	1075.77	627.18	386.50	247.25	20.76	2.26	1.24	0.94	1.08	1.13	4.59	10.70	0.58	0.04	0.01	0.00	0.01	516.86
1987	55134.50	17345.30	3756.38	809.72	450.97	303.34	220.01	158.94	14.40	1.66	1.00	0.79	0.91	0.96	3.88	9.06	0.49	0.03	0.01	0.00	439.08
1988	60789.10	13850.60	3358.73	1478.77	424.02	254.03	191.23	152.44	116.33	11.01	1.36	0.85	0.67	0.77	0.82	3.32	7.75	0.42	0.03	0.00	376.97

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Table 4.3. (Numbers at age (in 1000s of fish) in the Western Gulf… Continued)

1989	127583.00	15532.00	2662.86	1188.06	621.33	196.30	139.26	120.53	104.94	86.00	8.94	1.16	0.72	0.57	0.66	0.70	2.84	6.64	0.36	0.02	323.44
1990	87245.90	33564.70	3004.80	976.76	543.80	314.19	115.90	92.97	87.21	80.91	71.68	7.73	1.00	0.63	0.50	0.58	0.61	2.48	5.80	0.31	282.86
1991	124399.00	22375.00	6499.65	1235.25	536.45	312.89	204.04	83.61	71.91	71.55	70.34	64.08	6.93	0.90	0.56	0.45	0.52	0.55	2.24	5.24	255.91
1992	105916.00	29937.40	4327.59	2692.26	699.55	315.86	208.83	150.80	66.02	59.97	62.68	63.15	57.70	6.26	0.81	0.51	0.41	0.47	0.50	2.03	237.05
1993	124285.00	27152.80	5800.52	1715.95	1391.57	378.24	199.40	149.07	116.78	54.60	52.45	56.38	56.97	52.16	5.66	0.74	0.46	0.37	0.43	0.45	217.42
1994	111127.00	32091.60	5263.04	2249.71	868.49	755.88	239.75	142.37	115.47	96.56	47.79	47.21	50.90	51.54	47.23	5.13	0.67	0.42	0.33	0.39	198.28
1995	121516.00	29079.00	6238.38	2129.73	1183.08	490.03	492.69	174.19	111.76	96.26	84.84	43.09	42.70	46.13	46.75	42.89	4.67	0.61	0.38	0.30	181.14
1996	78665.20	31541.00	5647.92	2559.73	1127.94	666.82	318.94	356.83	136.39	93.01	84.53	76.50	38.97	38.69	41.84	42.45	38.98	4.24	0.55	0.35	165.41
1997	88623.50	20402.50	6101.79	2362.36	1355.42	609.15	415.25	224.37	273.21	111.95	81.22	76.07	69.05	35.25	35.03	37.92	38.51	35.40	3.86	0.50	150.81
1998	79997.60	20343.60	3908.63	2521.95	1212.15	705.03	368.70	286.60	169.53	222.46	97.42	72.99	68.57	62.37	31.87	31.70	34.35	34.92	32.14	3.50	137.50
1999	103953.00	19271.00	3914.83	1658.27	1369.84	659.60	440.03	260.12	219.62	139.26	194.30	87.68	65.89	62.03	56.47	28.88	28.76	31.20	31.75	29.21	128.31
2000	103886.00	24862.40	3701.71	1677.84	914.84	745.20	409.14	308.94	197.95	179.32	121.17	174.36	78.91	59.43	55.99	51.03	26.13	26.05	28.28	28.78	142.92
2001	75142.60	22728.40	4746.46	1558.88	900.51	484.96	454.16	283.09	232.57	160.15	155.10	108.26	156.26	70.86	53.42	50.38	45.96	23.56	23.50	25.52	155.11
2002	94821.40	17563.50	4362.81	2042.04	869.71	494.26	302.65	319.69	215.89	189.98	139.30	139.10	97.38	140.83	63.93	48.24	45.55	41.59	21.34	21.29	163.78
2003	115470.00	21197.00	3364.56	1882.57	1146.26	476.24	308.81	213.64	244.39	176.57	165.15	124.78	124.98	87.67	126.92	57.67	43.56	41.17	37.63	19.31	167.62
2004	133212.00	29547.80	4103.57	1453.99	1079.59	655.54	307.26	222.14	165.40	201.23	153.96	148.09	112.22	112.62	79.08	114.60	52.13	39.41	37.29	34.08	169.46
2005	108460.00	36325.90	5737.96	1722.31	817.83	613.33	419.71	218.82	169.66	134.05	173.34	136.59	131.77	100.06	100.52	70.65	102.49	46.67	35.32	33.41	182.58
2006	107194.00	31484.90	7090.42	2441.93	993.12	477.21	401.42	304.13	169.74	139.47	116.59	154.95	122.46	118.38	89.98	90.48	63.66	92.44	42.13	31.89	195.20
2007	89454.70	32121.50	6151.75	3054.96	1394.13	568.40	306.94	287.43	234.02	138.96	121.21	104.29	139.02	110.10	106.53	81.06	81.59	57.46	83.52	38.07	205.38
2008	61304.10	28090.00	6406.37	2783.24	2050.42	951.63	416.06	238.27	236.10	199.44	121.22	108.61	93.73	125.19	99.24	96.13	73.21	73.77	52.01	75.59	220.56
2009	129286.00	20231.10	5615.48	3124.28	2153.03	1556.54	744.05	340.38	204.76	207.68	178.24	109.74	98.63	85.28	114.02	90.48	87.73	66.88	67.46	47.56	271.08
2010	108115.00	41531.40	4033.97	2740.47	2436.16	1651.55	1228.96	613.45	294.59	181.06	186.29	161.62	99.81	89.88	77.80	104.12	82.71	80.27	61.26	61.78	292.13
2011	94537.50	35043.90	8311.07	1983.43	2185.61	1943.14	1350.57	1038.81	534.78	261.34	162.68	169.15	147.19	91.08	82.10	71.13	95.30	75.77	73.61	56.18	324.89
2012	170952.00	29602.80	6994.45	4069.64	1587.06	1738.33	1581.33	1127.35	897.41	473.19	234.85	147.78	154.11	134.37	83.23	75.10	65.14	87.35	69.52	67.54	349.99
2013	132456.00	55367.80	5917.07	3386.46	3147.05	1176.03	1341.94	1266.03	949.01	783.95	422.38	212.65	134.21	140.25	122.41	75.90	68.55	59.51	79.89	63.58	382.25

Table 4.4. Estimates of annual exploitation rate (numbers killed /total numbers all fleets combined), which was used as the proxy for annual fishing mortality rate.

YEAR	SEDAR 31	UPDATE
1872	0.000	0.000
1873	0.001	0.001
1874	0.001	0.001
1875	0.001	0.001
1876	0.002	0.002
1877	0.001	0.001
1878	0.001	0.001
1879	0.001	0.001
1880	0.003	0.003
1881	0.003	0.003
1882	0.003	0.003
1883	0.003	0.003
1884	0.003	0.003
1885	0.003	0.003
1886	0.004	0.004
1887	0.004	0.004
1888	0.003	0.003
1889	0.004	0.004
1890	0.004	0.004
1891	0.004	0.004
1892	0.004	0.004
1893	0.005	0.005
1894	0.005	0.005
1895	0.005	0.005
1896	0.005	0.005
1897	0.005	0.005
1898	0.006	0.006

YEAR	SEDAR 31	UPDATE
1899	0.007	0.007
1900	0.008	0.007
1901	0.009	0.008
1902	0.009	0.009
1903	0.009	0.008
1904	0.008	0.008
1905	0.008	0.007
1906	0.007	0.007
1907	0.007	0.006
1908	0.006	0.005
1909	0.005	0.005
1910	0.004	0.004
1911	0.004	0.004
1912	0.004	0.004
1913	0.004	0.004
1914	0.004	0.004
1915	0.004	0.004
1916	0.004	0.004
1917	0.004	0.004
1918	0.004	0.004
1919	0.004	0.004
1920	0.004	0.004
1921	0.005	0.004
1922	0.005	0.005
1923	0.005	0.005
1924	0.005	0.005
1925	0.005	0.005
1926	0.005	0.005
1927	0.006	0.005
1928	0.005	0.005

YEAR	SEDAR 31	UPDATE
1929	0.005	0.005
1930	0.004	0.003
1931	0.003	0.003
1932	0.004	0.003
1933	0.003	0.003
1934	0.003	0.003
1935	0.004	0.004
1936	0.005	0.004
1937	0.004	0.004
1938	0.005	0.005
1939	0.006	0.006
1940	0.004	0.004
1941	0.004	0.004
1942	0.003	0.003
1943	0.002	0.002
1944	0.002	0.002
1945	0.002	0.002
1946	0.004	0.004
1947	0.007	0.007
1948	0.013	0.012
1949	0.020	0.018
1950	0.029	0.026
1951	0.031	0.029
1952	0.036	0.033
1953	0.036	0.033
1954	0.044	0.040
1955	0.041	0.038
1956	0.051	0.048
1957	0.059	0.055
1958	0.085	0.078

YEAR	SEDAR 31	UPDATE
1959	0.091	0.084
1960	0.095	0.087
1961	0.084	0.078
1962	0.083	0.077
1963	0.091	0.084
1964	0.090	0.083
1965	0.099	0.092
1966	0.101	0.094
1967	0.121	0.111
1968	0.116	0.107
1969	0.137	0.126
1970	0.134	0.123
1971	0.143	0.130
1972	0.146	0.134
1973	0.119	0.109
1974	0.127	0.116
1975	0.132	0.121
1976	0.134	0.123
1977	0.116	0.107
1978	0.130	0.121
1979	0.155	0.142
1980	0.111	0.100
1981	0.121	0.109
1982	0.119	0.108
1983	0.126	0.117
1984	0.135	0.127
1985	0.153	0.140
1986	0.160	0.145
1987	0.147	0.137
1988	0.148	0.137

YEAR	SEDAR 31	UPDATE
1989	0.141	0.130
1990	0.119	0.107
1991	0.152	0.137
1992	0.134	0.125
1993	0.138	0.129
1994	0.133	0.121
1995	0.123	0.110
1996	0.107	0.098
1997	0.158	0.137
1998	0.145	0.128
1999	0.135	0.117
2000	0.153	0.128
2001	0.133	0.115
2002	0.154	0.136
2003	0.124	0.111
2004	0.105	0.093
2005	0.079	0.069
2006	0.071	0.059
2007	0.054	0.048
2008	0.034	0.032
2009	0.054	0.052
2010	0.047	0.041
2011	0.062	0.049
2012	-	0.049
2013	-	0.049

Table 4.5. Listing of estimated parameters values and their associated standard errors, initial parameter values, the upper and lower bounds on that parameter, and any prior densities assigned to parameters.

Label	Value	Min	Max	Init	Status	Parm_StDev	PR_type
RecrDist_Area_1	-0.59394	-4	4	-0.8	OK	0.0463851	No_prior
RecrDist_Area_1_DEVadd_1972	-0.00412	_	_	_	act	0.0562334	dev
RecrDist_Area_1_DEVadd_1973	-0.15997	_	_	_	act	0.060306	dev
RecrDist_Area_1_DEVadd_1974	0.024847	_	_	_	act	0.0688525	dev
RecrDist_Area_1_DEVadd_1975	-0.04759	_	_	_	act	0.0662885	dev
RecrDist_Area_1_DEVadd_1976	-0.01347	_	_	_	act	0.0624733	dev
RecrDist_Area_1_DEVadd_1977	0.009213	_	_	_	act	0.0634513	dev
RecrDist_Area_1_DEVadd_1978	-0.06538	_	_	_	act	0.0657232	dev
RecrDist_Area_1_DEVadd_1979	-0.17602	_	_	_	act	0.0615328	dev
RecrDist_Area_1_DEVadd_1980	-0.21559	_	_	_	act	0.0510534	dev
RecrDist_Area_1_DEVadd_1981	0.003687	_	_	_	act	0.0431198	dev
RecrDist_Area_1_DEVadd_1982	0.040274	_	_	_	act	0.0426087	dev
RecrDist_Area_1_DEVadd_1983	-0.06859	_	_	_	act	0.0521673	dev
RecrDist_Area_1_DEVadd_1984	-0.15669	_	_	_	act	0.0608131	dev
RecrDist_Area_1_DEVadd_1985	-0.31004	_	_	_	act	0.0544869	dev
RecrDist_Area_1_DEVadd_1986	-0.07706	_	_	_	act	0.0328338	dev
RecrDist_Area_1_DEVadd_1987	-0.24742	_	_	_	act	0.0365655	dev
RecrDist_Area_1_DEVadd_1988	-0.06276	_	_	_	act	0.0244191	dev
RecrDist_Area_1_DEVadd_1989	-0.08418	_	_	_	act	0.020499	dev
RecrDist_Area_1_DEVadd_1990	-0.00861	_	_	_	act	0.0213797	dev
RecrDist_Area_1_DEVadd_1991	-0.03934	_	_	_	act	0.0216782	dev
RecrDist_Area_1_DEVadd_1992	-0.10624	_	_	_	act	0.0236064	dev
RecrDist_Area_1_DEVadd_1993	-0.06841	_	_	_	act	0.0226157	dev
RecrDist_Area_1_DEVadd_1994	-0.11286	_	_	_	act	0.0226992	dev
RecrDist_Area_1_DEVadd_1995	0.068919	_	_	_	act	0.0218413	dev
RecrDist_Area_1_DEVadd_1996	0.078169	_	_	_	act	0.023834	dev
RecrDist_Area_1_DEVadd_1997	0.053914	_	_	_	act	0.0238234	dev

RecrDist_Area_1_DEVadd_1998	0.018227	_	_	_	act	0.0230191	dev
RecrDist_Area_1_DEVadd_1999	0.146662	_	_	_	act	0.0213989	dev
RecrDist_Area_1_DEVadd_2000	0.098185	_	_	_	act	0.024195	dev
RecrDist_Area_1_DEVadd_2001	0.114098	_	_	_	act	0.021816	dev
RecrDist_Area_1_DEVadd_2002	0.105576	_	_	_	act	0.0217047	dev
RecrDist_Area_1_DEVadd_2003	0.060449	_	_	_	act	0.0190732	dev
RecrDist_Area_1_DEVadd_2004	0.09865	_	_	_	act	0.0179456	dev
RecrDist_Area_1_DEVadd_2005	0.139521	_	_	_	act	0.0184726	dev
RecrDist_Area_1_DEVadd_2006	0.177193	_	_	_	act	0.0191121	dev
RecrDist_Area_1_DEVadd_2007	0.175275	_	_	_	act	0.0193821	dev
RecrDist_Area_1_DEVadd_2008	0.139582	_	_	_	act	0.0211446	dev
RecrDist_Area_1_DEVadd_2009	-0.00698	_	_	_	act	0.0231041	dev
RecrDist_Area_1_DEVadd_2010	-0.03958	_	_	_	act	0.0277572	dev
RecrDist_Area_1_DEVadd_2011	0.061053	_	_	_	act	0.0315021	dev
RecrDist_Area_1_DEVadd_2012	-0.04138	_	_	_	act	0.036254	dev
RecrDist_Area_1_DEVadd_2013	-0.03493	_	_	_	act	0.0463053	dev
SR_LN(R0)	12.0441	1	20	11.8	OK	0.056995	No_prior
SR_envlink	-0.53615	-5	5	0	OK	0.0758103	No_prior
Main_RecrDev_1899	-0.00357	_	_	_	act	0.298282	dev
Main_RecrDev_1900	-0.00382	_	_	_	act	0.298244	dev
Main_RecrDev_1901	-0.00409	_	_	_	act	0.298203	dev
Main_RecrDev_1902	-0.00439	_	_	_	act	0.298158	dev
Main_RecrDev_1903	-0.00472	_	_	_	act	0.298108	dev
Main_RecrDev_1904	-0.00509	_	_	_	act	0.298054	dev
Main_RecrDev_1905	-0.00548	_	_	_	act	0.297995	dev
Main_RecrDev_1906	-0.00592	_	_	_	act	0.297931	dev
Main_RecrDev_1907	-0.00638	_	_	_	act	0.297861	dev
Main_RecrDev_1908	-0.00687	_	_	_	act	0.297788	dev
Main_RecrDev_1909	-0.00739	_	_	_	act	0.29771	dev
Main_RecrDev_1910	-0.00795	_	_	_	act	0.297626	dev
Main_RecrDev_1911	-0.00855	_	_	_	act	0.297536	dev

Main_RecrDev_1912	-0.00921	_	_	_	act	0.297437	dev
Main_RecrDev_1913	-0.00992	_	_	_	act	0.297332	dev
Main_RecrDev_1914	-0.01068	_	_	_	act	0.297217	dev
Main_RecrDev_1915	-0.0115	_	_	_	act	0.297095	dev
Main_RecrDev_1916	-0.01237	_	_	_	act	0.296965	dev
Main_RecrDev_1917	-0.01329	_	_	_	act	0.296827	dev
Main_RecrDev_1918	-0.01429	_	_	_	act	0.296679	dev
Main_RecrDev_1919	-0.01535	_	_	_	act	0.29652	dev
Main_RecrDev_1920	-0.01651	_	_	_	act	0.296348	dev
Main_RecrDev_1921	-0.01775	_	_	_	act	0.296164	dev
Main_RecrDev_1922	-0.01909	_	_	_	act	0.295965	dev
Main_RecrDev_1923	-0.02051	_	_	_	act	0.295754	dev
Main_RecrDev_1924	-0.02205	_	_	_	act	0.295526	dev
Main_RecrDev_1925	-0.02376	_	_	_	act	0.295275	dev
Main_RecrDev_1926	-0.02562	_	_	_	act	0.295001	dev
Main_RecrDev_1927	-0.02766	_	_	_	act	0.294702	dev
Main_RecrDev_1928	-0.0299	_	_	_	act	0.294375	dev
Main_RecrDev_1929	-0.03226	_	_	_	act	0.294032	dev
Main_RecrDev_1930	-0.03476	_	_	_	act	0.293669	dev
Main_RecrDev_1931	-0.03734	_	_	_	act	0.293291	dev
Main_RecrDev_1932	-0.03998	_	_	_	act	0.292903	dev
Main_RecrDev_1933	-0.04275	_	_	_	act	0.292499	dev
Main_RecrDev_1934	-0.04575	_	_	_	act	0.292063	dev
Main_RecrDev_1935	-0.04904	_	_	_	act	0.29159	dev
Main_RecrDev_1936	-0.05263	_	_	_	act	0.291077	dev
Main_RecrDev_1937	-0.05661	_	_	_	act	0.290507	dev
Main_RecrDev_1938	-0.06103	_	_	_	act	0.289877	dev
Main_RecrDev_1939	-0.06591	_	_	_	act	0.289194	dev
Main_RecrDev_1940	-0.07119	_	_	_	act	0.288461	dev
Main_RecrDev_1941	-0.07672	_	_	_	act	0.287702	dev
Main_RecrDev_1942	-0.0824	_	_	_	act	0.286928	dev

Main_RecrDev_1943	-0.08799	_	_	_	act	0.286169	dev
Main_RecrDev_1944	-0.09342	_	_	_	act	0.285433	dev
Main_RecrDev_1945	-0.09856	_	_	_	act	0.284722	dev
Main_RecrDev_1946	-0.10281	_	_	_	act	0.28409	dev
Main_RecrDev_1947	-0.10613	_	_	_	act	0.283548	dev
Main_RecrDev_1948	-0.11257	_	_	_	act	0.28302	dev
Main_RecrDev_1949	-0.11741	_	_	_	act	0.282442	dev
Main_RecrDev_1950	-0.12306	_	_	_	act	0.281776	dev
Main_RecrDev_1951	-0.12878	_	_	_	act	0.281091	dev
Main_RecrDev_1952	-0.13215	_	_	_	act	0.280686	dev
Main_RecrDev_1953	-0.13522	_	_	_	act	0.280298	dev
Main_RecrDev_1954	-0.13376	_	_	_	act	0.28047	dev
Main_RecrDev_1955	-0.13449	_	_	_	act	0.280303	dev
Main_RecrDev_1956	-0.12997	_	_	_	act	0.280858	dev
Main_RecrDev_1957	-0.12509	_	_	_	act	0.28153	dev
Main_RecrDev_1958	-0.1161	_	_	_	act	0.282888	dev
Main_RecrDev_1959	-0.1134	_	_	_	act	0.283292	dev
Main_RecrDev_1960	-0.112	_	_	_	act	0.283412	dev
Main_RecrDev_1961	-0.11453	_	_	_	act	0.282841	dev
Main_RecrDev_1962	-0.11237	_	_	_	act	0.283102	dev
Main_RecrDev_1963	-0.10722	_	_	_	act	0.283972	dev
Main_RecrDev_1964	-0.10487	_	_	_	act	0.284502	dev
Main_RecrDev_1965	-0.09892	_	_	_	act	0.285666	dev
Main_RecrDev_1966	-0.09664	_	_	_	act	0.286313	dev
Main_RecrDev_1967	-0.09369	_	_	_	act	0.287087	dev
Main_RecrDev_1968	-0.0979	_	_	_	act	0.28699	dev
Main_RecrDev_1969	-0.09846	_	_	_	act	0.287883	dev
Main_RecrDev_1970	-0.11319	_	_	_	act	0.286251	dev
Main_RecrDev_1971	-0.11974	_	_	_	act	0.279335	dev
Main_RecrDev_1972	1.35214	_	_	_	act	0.129114	dev
Main_RecrDev_1973	0.549824	_	_	_	act	0.133428	dev

Main_RecrDev_1974	-0.01325	_	_	_	act	0.156609	dev
Main_RecrDev_1975	0.113703	_	_	_	act	0.149198	dev
Main_RecrDev_1976	0.181013	_	_	_	act	0.140591	dev
Main_RecrDev_1977	0.255082	_	_	_	act	0.142929	dev
Main_RecrDev_1978	-0.09939	_	_	_	act	0.158081	dev
Main_RecrDev_1979	0.130797	_	_	_	act	0.13403	dev
Main_RecrDev_1980	0.896238	_	_	_	act	0.101797	dev
Main_RecrDev_1981	0.822075	_	_	_	act	0.0975885	dev
Main_RecrDev_1982	0.449999	_	_	_	act	0.0965937	dev
Main_RecrDev_1983	-0.12224	_	_	_	act	0.113982	dev
Main_RecrDev_1984	-0.95148	_	_	_	act	0.122632	dev
Main_RecrDev_1985	-0.59925	_	_	_	act	0.0899827	dev
Main_RecrDev_1986	-0.42221	_	_	_	act	0.0782073	dev
Main_RecrDev_1987	-0.80832	_	_	_	act	0.0771284	dev
Main_RecrDev_1988	-0.53793	_	_	_	act	0.066437	dev
Main_RecrDev_1989	0.19628	_	_	_	act	0.0603962	dev
Main_RecrDev_1990	-0.07824	_	_	_	act	0.0615955	dev
Main_RecrDev_1991	0.231944	_	_	_	act	0.0629497	dev
Main_RecrDev_1992	-0.01487	_	_	_	act	0.0635678	dev
Main_RecrDev_1993	0.176576	_	_	_	act	0.0624855	dev
Main_RecrDev_1994	0.011753	_	_	_	act	0.0629034	dev
Main_RecrDev_1995	0.333587	_	_	_	act	0.0610475	dev
Main_RecrDev_1996	-0.09184	_	_	_	act	0.0633318	dev
Main_RecrDev_1997	-0.01843	_	_	_	act	0.0655365	dev
Main_RecrDev_1998	-0.17979	_	_	_	act	0.065209	dev
Main_RecrDev_1999	0.298502	_	_	_	act	0.061023	dev
Main_RecrDev_2000	0.204231	_	_	_	act	0.0662443	dev
Main_RecrDev_2001	-0.0918	_	_	_	act	0.0623335	dev
Main_RecrDev_2002	0.123802	_	_	_	act	0.0625654	dev
Main_RecrDev_2003	0.241495	_	_	_	act	0.0597546	dev
Main_RecrDev_2004	0.448141	_	_	_	act	0.0576716	dev

Main_RecrDev_2005	0.318713	_	_	_	act	0.0576322	dev
Main_RecrDev_2006	0.380651	_	_	_	act	0.0578071	dev
Main_RecrDev_2007	0.19152	_	_	_	act	0.0582377	dev
Main_RecrDev_2008	-0.27037	_	_	_	act	0.0605922	dev
Main_RecrDev_2009	0.218923	_	_	_	act	0.0619929	dev
Main_RecrDev_2010	-0.01455	_	_	_	act	0.0674304	dev
Main_RecrDev_2011	-0.0159	_	_	_	act	0.0741727	dev
Main_RecrDev_2012	0.420501	_	_	_	act	0.0793558	dev
Main_RecrDev_2013	0.165072	_	_	_	act	0.0988455	dev
Main_RecrDev_2014	-0.00021	_	_	_	act	0.298787	dev
ForeRecr_2015	0	_	_	_	act	0.3	dev
ForeRecr_2016	0	_	_	_	act	0.3	dev
ForeRecr_2017	0	_	_	_	act	0.3	dev
ForeRecr_2018	0	_	_	_	act	0.3	dev
ForeRecr_2019	0	_	_	_	act	0.3	dev
ForeRecr_2020	0	_	_	_	act	0.3	dev
ForeRecr_2021	0	_	_	_	act	0.3	dev
ForeRecr_2022	0	_	_	_	act	0.3	dev
ForeRecr_2023	0	_	_	_	act	0.3	dev
ForeRecr_2024	0	_	_	_	act	0.3	dev
ForeRecr_2025	0	_	_	_	act	0.3	dev
ForeRecr_2026	0	_	_	_	act	0.3	dev
ForeRecr_2027	0	_	_	_	act	0.3	dev
ForeRecr_2028	0	_	_	_	act	0.3	dev
ForeRecr_2029	0	_	_	_	act	0.3	dev
ForeRecr_2030	0	_	_	_	act	0.3	dev
ForeRecr_2031	0	_	_	_	act	0.3	dev
ForeRecr_2032	0	_	_	_	act	0.3	dev
ForeRecr_2033	0	_	_	_	act	0.3	dev
ForeRecr_2034	0	_	_	_	act	0.3	dev
ForeRecr_2035	0	_	_	_	act	0.3	dev

ForeRecr_2036	0	_	_	_	act	0.3	dev
ForeRecr_2037	0	_	_	_	act	0.3	dev
ForeRecr_2038	0	_	_	_	act	0.3	dev
ForeRecr_2039	0	_	_	_	act	0.3	dev
ForeRecr_2040	0	_	_	_	act	0.3	dev
ForeRecr_2041	0	_	_	_	act	0.3	dev
ForeRecr_2042	0	_	_	_	act	0.3	dev
ForeRecr_2043	0	_	_	_	act	0.3	dev
ForeRecr_2044	0	_	_	_	act	0.3	dev
ForeRecr_2045	0	_	_	_	act	0.3	dev
ForeRecr_2046	0	_	_	_	act	0.3	dev
ForeRecr_2047	0	_	_	_	act	0.3	dev
ForeRecr_2048	0	_	_	_	act	0.3	dev
ForeRecr_2049	0	_	_	_	act	0.3	dev
ForeRecr_2050	0	_	_	_	act	0.3	dev
ForeRecr_2051	0	_	_	_	act	0.3	dev
ForeRecr_2052	0	_	_	_	act	0.3	dev
ForeRecr_2053	0	_	_	_	act	0.3	dev
ForeRecr_2054	0	_	_	_	act	0.3	dev
ForeRecr_2055	0	_	_	_	act	0.3	dev
ForeRecr_2056	0	_	_	_	act	0.3	dev
ForeRecr_2057	0	_	_	_	act	0.3	dev
ForeRecr_2058	0	_	_	_	act	0.3	dev
ForeRecr_2059	0	_	_	_	act	0.3	dev
ForeRecr_2060	0	_	_	_	act	0.3	dev
ForeRecr_2061	0	_	_	_	act	0.3	dev
ForeRecr_2062	0	_	_	_	act	0.3	dev
ForeRecr_2063	0	_	_	_	act	0.3	dev
ForeRecr_2064	0	_	_	_	act	0.3	dev
ForeRecr_2065	0	_	_	_	act	0.3	dev
ForeRecr_2066	0	_	_	_	act	0.3	dev

ForeRecr_2067	0	_	_	_	act	0.3	dev
ForeRecr_2068	0	_	_	_	act	0.3	dev
ForeRecr_2069	0	_	_	_	act	0.3	dev
ForeRecr_2070	0	_	_	_	act	0.3	dev
ForeRecr_2071	0	_	_	_	act	0.3	dev
ForeRecr_2072	0	_	_	_	act	0.3	dev
ForeRecr_2073	0	_	_	_	act	0.3	dev
ForeRecr_2074	0	_	_	_	act	0.3	dev
F_fleet_1_YR_1872_s_1	0.013619	0	8	_	act	0.0015771	F
F_fleet_1_YR_1873_s_1	0.020647	0	8	_	act	0.00240728	F
F_fleet_1_YR_1874_s_1	0.031457	0	8	_	act	0.0037037	F
F_fleet_1_YR_1875_s_1	0.039208	0	8	_	act	0.00466978	F
F_fleet_1_YR_1876_s_1	0.047349	0	8	_	act	0.00570731	F
F_fleet_1_YR_1877_s_1	0.040808	0	8	_	act	0.00495879	F
F_fleet_1_YR_1878_s_1	0.037507	0	8	_	act	0.00456923	F
F_fleet_1_YR_1879_s_1	0.041561	0	8	_	act	0.00506279	F
F_fleet_1_YR_1880_s_1	0.05341	0	8	_	act	0.00651969	F
F_fleet_1_YR_1881_s_1	0.060944	0	8	_	act	0.00747984	F
F_fleet_1_YR_1882_s_1	0.068985	0	8	_	act	0.00853567	F
F_fleet_1_YR_1883_s_1	0.077482	0	8	_	act	0.00968245	F
F_fleet_1_YR_1884_s_1	0.086526	0	8	_	act	0.0109322	F
F_fleet_1_YR_1885_s_1	0.096141	0	8	_	act	0.0122912	F
F_fleet_1_YR_1886_s_1	0.106433	0	8	_	act	0.0137806	F
F_fleet_1_YR_1887_s_1	0.117347	0	8	_	act	0.0154033	F
F_fleet_1_YR_1888_s_1	0.115387	0	8	_	act	0.0153181	F
F_fleet_1_YR_1889_s_1	0.125598	0	8	_	act	0.0168321	F
F_fleet_1_YR_1890_s_1	0.155947	0	8	_	act	0.0212297	F
F_fleet_1_YR_1891_s_1	0.147031	0	8	_	act	0.0203391	F
F_fleet_1_YR_1892_s_1	0.158752	0	8	_	act	0.0222541	F
F_fleet_1_YR_1893_s_1	0.168495	0	8	_	act	0.0239437	F
F_fleet_1_YR_1894_s_1	0.177651	0	8	_	act	0.0256014	F

F_fleet_1_YR_1895_s_1	0.178227	0	8	_	act	0.0259998	F
F_fleet_1_YR_1896_s_1	0.184545	0	8	_	act	0.0272017	F
F_fleet_1_YR_1897_s_1	0.187503	0	8	_	act	0.0278912	F
F_fleet_1_YR_1898_s_1	0.214929	0	8	_	act	0.0324401	F
F_fleet_1_YR_1899_s_1	0.250488	0	8	_	act	0.0388864	F
F_fleet_1_YR_1900_s_1	0.293814	0	8	_	act	0.0477098	F
F_fleet_1_YR_1901_s_1	0.337782	0	8	_	act	0.0586006	F
F_fleet_1_YR_1902_s_1	0.386284	0	8	_	act	0.0737988	F
F_fleet_1_YR_1903_s_1	0.384028	0	8	_	act	0.0822892	F
F_fleet_1_YR_1904_s_1	0.37835	0	8	_	act	0.0901246	F
F_fleet_1_YR_1905_s_1	0.353323	0	8	_	act	0.0912242	F
F_fleet_1_YR_1906_s_1	0.317391	0	8	_	act	0.0864816	F
F_fleet_1_YR_1907_s_1	0.274216	0	8	_	act	0.0762327	F
F_fleet_1_YR_1908_s_1	0.235723	0	8	_	act	0.065275	F
F_fleet_1_YR_1909_s_1	0.190367	0	8	_	act	0.0512433	F
F_fleet_1_YR_1910_s_1	0.148453	0	8	_	act	0.0380284	F
F_fleet_1_YR_1911_s_1	0.138377	0	8	_	act	0.0334558	F
F_fleet_1_YR_1912_s_1	0.130742	0	8	_	act	0.0300069	F
F_fleet_1_YR_1913_s_1	0.125342	0	8	_	act	0.027554	F
F_fleet_1_YR_1914_s_1	0.121704	0	8	_	act	0.0258651	F
F_fleet_1_YR_1915_s_1	0.119396	0	8	_	act	0.0247295	F
F_fleet_1_YR_1916_s_1	0.117977	0	8	_	act	0.0239636	F
F_fleet_1_YR_1917_s_1	0.113672	0	8	_	act	0.0227244	F
F_fleet_1_YR_1918_s_1	0.112886	0	8	_	act	0.0222628	F
F_fleet_1_YR_1919_s_1	0.122312	0	8	_	act	0.0239277	F
F_fleet_1_YR_1920_s_1	0.13323	0	8	_	act	0.0260582	F
F_fleet_1_YR_1921_s_1	0.14591	0	8	_	act	0.028741	F
F_fleet_1_YR_1922_s_1	0.160606	0	8	_	act	0.0320649	F
F_fleet_1_YR_1923_s_1	0.177256	0	8	_	act	0.0360762	F
F_fleet_1_YR_1924_s_1	0.178085	0	8	_	act	0.0369587	F
F_fleet_1_YR_1925_s_1	0.182516	0	8	_	act	0.0384819	F

F_fleet_1_YR_1926_s_1	0.180799	0	8	_	act	0.0385664	F
F_fleet_1_YR_1927_s_1	0.200915	0	8	_	act	0.0434303	F
F_fleet_1_YR_1928_s_1	0.181881	0	8	_	act	0.0397198	F
F_fleet_1_YR_1929_s_1	0.194713	0	8	_	act	0.0427684	F
F_fleet_1_YR_1930_s_1	0.116996	0	8	_	act	0.025289	F
F_fleet_1_YR_1931_s_1	0.112685	0	8	_	act	0.0234006	F
F_fleet_1_YR_1932_s_1	0.116273	0	8	_	act	0.0232887	F
F_fleet_1_YR_1933_s_1	0.101546	0	8	_	act	0.0197135	F
F_fleet_1_YR_1934_s_1	0.088235	0	8	_	act	0.0166055	F
F_fleet_1_YR_1935_s_1	0.105754	0	8	_	act	0.0194602	F
F_fleet_1_YR_1936_s_1	0.121327	0	8	_	act	0.0221553	F
F_fleet_1_YR_1937_s_1	0.107888	0	8	_	act	0.0196212	F
F_fleet_1_YR_1938_s_1	0.14118	0	8	_	act	0.0257342	F
F_fleet_1_YR_1939_s_1	0.171211	0	8	_	act	0.031762	F
F_fleet_1_YR_1940_s_1	0.117044	0	8	_	act	0.0218631	F
F_fleet_1_YR_1941_s_1	0.105697	0	8	_	act	0.0194453	F
F_fleet_1_YR_1942_s_1	0.082694	0	8	_	act	0.0148067	F
F_fleet_1_YR_1943_s_1	0.063407	0	8	_	act	0.0109547	F
F_fleet_1_YR_1944_s_1	0.070622	0	8	_	act	0.0118148	F
F_fleet_1_YR_1945_s_1	0.059808	0	8	_	act	0.00975618	F
F_fleet_1_YR_1946_s_1	0.094281	0	8	_	act	0.0151926	F
F_fleet_1_YR_1947_s_1	0.099928	0	8	_	act	0.0161167	F
F_fleet_1_YR_1948_s_1	0.108879	0	8	_	act	0.0176427	F
F_fleet_1_YR_1949_s_1	0.13418	0	8	_	act	0.0219563	F
F_fleet_1_YR_1950_s_1	0.075208	0	8	_	act	0.0123372	F
F_fleet_1_YR_1951_s_1	0.092367	0	8	_	act	0.0151767	F
F_fleet_1_YR_1952_s_1	0.107696	0	8	_	act	0.0179266	F
F_fleet_1_YR_1953_s_1	0.102666	0	8	_	act	0.0173874	F
F_fleet_1_YR_1954_s_1	0.100612	0	8	_	act	0.0172613	F
F_fleet_1_YR_1955_s_1	0.119078	0	8	_	act	0.0207071	F
F_fleet_1_YR_1956_s_1	0.152647	0	8	_	act	0.0271523	F

F_fleet_1_YR_1957_s_1	0.147418	0	8	_	act	0.0269211	F
F_fleet_1_YR_1958_s_1	0.268091	0	8	_	act	0.0513202	F
F_fleet_1_YR_1959_s_1	0.279334	0	8	_	act	0.0571702	F
F_fleet_1_YR_1960_s_1	0.358799	0	8	_	act	0.0788372	F
F_fleet_1_YR_1961_s_1	0.378892	0	8	_	act	0.08945	F
F_fleet_1_YR_1962_s_1	0.445589	0	8	_	act	0.112483	F
F_fleet_1_YR_1963_s_1	0.414976	0	8	_	act	0.110538	F
F_fleet_1_YR_1964_s_1	0.554806	0	8	_	act	0.156373	F
F_fleet_1_YR_1965_s_1	0.660088	0	8	_	act	0.201439	F
F_fleet_1_YR_1966_s_1	0.630586	0	8	_	act	0.205551	F
F_fleet_1_YR_1967_s_1	0.656929	0	8	_	act	0.22364	F
F_fleet_1_YR_1968_s_1	0.644724	0	8	_	act	0.226782	F
F_fleet_1_YR_1969_s_1	0.643465	0	8	_	act	0.232074	F
F_fleet_1_YR_1970_s_1	0.646656	0	8	_	act	0.239369	F
F_fleet_1_YR_1971_s_1	0.66411	0	8	_	act	0.253232	F
F_fleet_1_YR_1972_s_1	0.784876	0	8	_	act	0.315505	F
F_fleet_1_YR_1973_s_1	0.971519	0	8	_	act	0.384071	F
F_fleet_1_YR_1974_s_1	0.876627	0	8	_	act	0.177802	F
F_fleet_1_YR_1975_s_1	0.669352	0	8	_	act	0.130325	F
F_fleet_1_YR_1976_s_1	0.62294	0	8	_	act	0.147573	F
F_fleet_1_YR_1977_s_1	0.477789	0	8	_	act	0.128479	F
F_fleet_1_YR_1978_s_1	0.448145	0	8	_	act	0.120066	F
F_fleet_1_YR_1979_s_1	0.457189	0	8	_	act	0.108611	F
F_fleet_1_YR_1980_s_1	0.485033	0	8	_	act	0.10822	F
F_fleet_1_YR_1981_s_1	0.720539	0	8	_	act	0.181045	F
F_fleet_1_YR_1982_s_1	0.96828	0	8	_	act	0.223525	F
F_fleet_1_YR_1983_s_1	0.854039	0	8	_	act	0.13314	F
F_fleet_1_YR_1984_s_1	0.412944	0	8	_	act	0.0533712	F
F_fleet_1_YR_1985_s_1	0.3271	0	8	_	act	0.040701	F
F_fleet_1_YR_1986_s_1	0.164233	0	8	_	act	0.0196451	F
F_fleet_1_YR_1987_s_1	0.18684	0	8	_	act	0.0242682	F

F_fleet_1_YR_1988_s_1	0.281116	0	8	_	act	0.0400635	F
F_fleet_1_YR_1989_s_1	0.313191	0	8	_	act	0.0410176	F
F_fleet_1_YR_1990_s_1	0.432652	0	8	_	act	0.0528771	F
F_fleet_1_YR_1991_s_1	0.198083	0	8	_	act	0.0225302	F
F_fleet_1_YR_1992_s_1	0.141355	0	8	_	act	0.0157643	F
F_fleet_1_YR_1993_s_1	0.132806	0	8	_	act	0.0148217	F
F_fleet_1_YR_1994_s_1	0.174852	0	8	_	act	0.020279	F
F_fleet_1_YR_1995_s_1	0.06452	0	8	_	act	0.00791668	F
F_fleet_1_YR_1996_s_1	0.07831	0	8	_	act	0.00889781	F
F_fleet_1_YR_1997_s_1	0.054389	0	8	_	act	0.00626594	F
F_fleet_1_YR_1998_s_1	0.078897	0	8	_	act	0.0102005	F
F_fleet_1_YR_1999_s_1	0.096782	0	8	_	act	0.0112047	F
F_fleet_1_YR_2000_s_1	0.120392	0	8	_	act	0.0126607	F
F_fleet_1_YR_2001_s_1	0.154425	0	8	_	act	0.015395	F
F_fleet_1_YR_2002_s_1	0.193855	0	8	_	act	0.0194806	F
F_fleet_1_YR_2003_s_1	0.178539	0	8	_	act	0.0182077	F
F_fleet_1_YR_2004_s_1	0.17077	0	8	_	act	0.0170702	F
F_fleet_1_YR_2005_s_1	0.138253	0	8	_	act	0.0143483	F
F_fleet_1_YR_2006_s_1	0.099719	0	8	_	act	0.0106944	F
F_fleet_1_YR_2007_s_1	0.157092	0	8	_	act	0.0194561	F
F_fleet_1_YR_2008_s_1	0.109572	0	8	_	act	0.0140217	F
F_fleet_1_YR_2009_s_1	0.098888	0	8	_	act	0.0127323	F
F_fleet_1_YR_2010_s_1	0.116516	0	8	_	act	0.01499	F
F_fleet_1_YR_2011_s_1	0.120902	0	8	_	act	0.0160154	F
F_fleet_1_YR_2012_s_1	0.151542	0	8	_	act	0.0217557	F
F_fleet_1_YR_2013_s_1	0.225919	0	8	_	act	0.0371509	F
F_fleet_1_YR_2014_s_1	0.316414	0	8	_	act	0.0619855	F
F_fleet_2_YR_1880_s_1	0.022439	0	8	_	act	0.00201124	F
F_fleet_2_YR_1881_s_1	0.020444	0	8	_	act	0.00184603	F
F_fleet_2_YR_1882_s_1	0.018316	0	8	_	act	0.00166168	F
F_fleet_2_YR_1883_s_1	0.016412	0	8	_	act	0.0014919	F

F_fleet_2_YR_1884_s_1	0.014438	0	8	_	act	0.00131219	F
F_fleet_2_YR_1885_s_1	0.012395	0	8	_	act	0.00112465	F
F_fleet_2_YR_1886_s_1	0.01036	0	8	_	act	0.000937767	F
F_fleet_2_YR_1887_s_1	0.005253	0	8	_	act	0.000473741	F
F_fleet_2_YR_1888_s_1	0.005457	0	8	_	act	0.000490527	F
F_fleet_2_YR_1889_s_1	0.006882	0	8	_	act	0.000617618	F
F_fleet_2_YR_1890_s_1	0.006188	0	8	_	act	0.000554765	F
F_fleet_2_YR_1891_s_1	0.006872	0	8	_	act	0.000615898	F
F_fleet_2_YR_1892_s_1	0.007476	0	8	_	act	0.000670168	F
F_fleet_2_YR_1893_s_1	0.007962	0	8	_	act	0.000714	F
F_fleet_2_YR_1894_s_1	0.008299	0	8	_	act	0.000744601	F
F_fleet_2_YR_1895_s_1	0.008536	0	8	_	act	0.000766235	F
F_fleet_2_YR_1896_s_1	0.008724	0	8	_	act	0.000783354	F
F_fleet_2_YR_1897_s_1	0.008723	0	8	_	act	0.000783498	F
F_fleet_2_YR_1898_s_1	0.013974	0	8	_	act	0.00125715	F
F_fleet_2_YR_1899_s_1	0.018625	0	8	_	act	0.00168093	F
F_fleet_2_YR_1900_s_1	0.023091	0	8	_	act	0.00209454	F
F_fleet_2_YR_1901_s_1	0.026687	0	8	_	act	0.00244753	F
F_fleet_2_YR_1902_s_1	0.029704	0	8	_	act	0.00294143	F
F_fleet_2_YR_1903_s_1	0.028165	0	8	_	act	0.00322503	F
F_fleet_2_YR_1904_s_1	0.027012	0	8	_	act	0.00344277	F
F_fleet_2_YR_1905_s_1	0.025175	0	8	_	act	0.00339764	F
F_fleet_2_YR_1906_s_1	0.023216	0	8	_	act	0.00323179	F
F_fleet_2_YR_1907_s_1	0.021151	0	8	_	act	0.00297838	F
F_fleet_2_YR_1908_s_1	0.019614	0	8	_	act	0.00276407	F
F_fleet_2_YR_1909_s_1	0.016825	0	8	_	act	0.00236632	F
F_fleet_2_YR_1910_s_1	0.014254	0	8	_	act	0.00199969	F
F_fleet_2_YR_1911_s_1	0.013926	0	8	_	act	0.00194916	F
F_fleet_2_YR_1912_s_1	0.013639	0	8	_	act	0.00190547	F
F_fleet_2_YR_1913_s_1	0.01337	0	8	_	act	0.00186542	F
F_fleet_2_YR_1914_s_1	0.013105	0	8	_	act	0.00182642	F

F_fleet_2_YR_1915_s_1	0.012847	0	8	_	act	0.00178866	F
F_fleet_2_YR_1916_s_1	0.012566	0	8	_	act	0.00174806	F
F_fleet_2_YR_1917_s_1	0.012312	0	8	_	act	0.00171113	F
F_fleet_2_YR_1918_s_1	0.012059	0	8	_	act	0.00167425	F
F_fleet_2_YR_1919_s_1	0.012379	0	8	_	act	0.00171698	F
F_fleet_2_YR_1920_s_1	0.012703	0	8	_	act	0.00176053	F
F_fleet_2_YR_1921_s_1	0.013063	0	8	_	act	0.00180914	F
F_fleet_2_YR_1922_s_1	0.013396	0	8	_	act	0.00185401	F
F_fleet_2_YR_1923_s_1	0.013733	0	8	_	act	0.00189926	F
F_fleet_2_YR_1924_s_1	0.013283	0	8	_	act	0.00183539	F
F_fleet_2_YR_1925_s_1	0.012828	0	8	_	act	0.00177024	F
F_fleet_2_YR_1926_s_1	0.012363	0	8	_	act	0.00170324	F
F_fleet_2_YR_1927_s_1	0.015516	0	8	_	act	0.00213555	F
F_fleet_2_YR_1928_s_1	0.011321	0	8	_	act	0.00155562	F
F_fleet_2_YR_1929_s_1	0.011062	0	8	_	act	0.00151627	F
F_fleet_2_YR_1930_s_1	0.0147	0	8	_	act	0.00201141	F
F_fleet_2_YR_1931_s_1	0.009114	0	8	_	act	0.0012439	F
F_fleet_2_YR_1932_s_1	0.010937	0	8	_	act	0.00148803	F
F_fleet_2_YR_1933_s_1	0.011919	0	8	_	act	0.00161755	F
F_fleet_2_YR_1934_s_1	0.012402	0	8	_	act	0.00167931	F
F_fleet_2_YR_1935_s_1	0.018092	0	8	_	act	0.00244716	F
F_fleet_2_YR_1936_s_1	0.023525	0	8	_	act	0.00318424	F
F_fleet_2_YR_1937_s_1	0.025792	0	8	_	act	0.00349494	F
F_fleet_2_YR_1938_s_1	0.02571	0	8	_	act	0.00348428	F
F_fleet_2_YR_1939_s_1	0.023645	0	8	_	act	0.00319913	F
F_fleet_2_YR_1940_s_1	0.022679	0	8	_	act	0.00305843	F
F_fleet_2_YR_1941_s_1	0.020571	0	8	_	act	0.00276134	F
F_fleet_2_YR_1942_s_1	0.015193	0	8	_	act	0.00202607	F
F_fleet_2_YR_1943_s_1	0.010342	0	8	_	act	0.00136741	F
F_fleet_2_YR_1944_s_1	0.007768	0	8	_	act	0.0010175	F
F_fleet_2_YR_1945_s_1	0.004259	0	8	_	act	0.000552509	F

F_fleet_2_YR_1946_s_1	0.008955	0	8	_	act	0.00115255	F
F_fleet_2_YR_1947_s_1	0.013297	0	8	_	act	0.00170224	F
F_fleet_2_YR_1948_s_1	0.016689	0	8	_	act	0.00212856	F
F_fleet_2_YR_1949_s_1	0.024672	0	8	_	act	0.00314188	F
F_fleet_2_YR_1950_s_1	0.043337	0	8	_	act	0.00556826	F
F_fleet_2_YR_1951_s_1	0.046535	0	8	_	act	0.00615993	F
F_fleet_2_YR_1952_s_1	0.056604	0	8	_	act	0.00775872	F
F_fleet_2_YR_1953_s_1	0.050534	0	8	_	act	0.00713426	F
F_fleet_2_YR_1954_s_1	0.05486	0	8	_	act	0.00793562	F
F_fleet_2_YR_1955_s_1	0.064468	0	8	_	act	0.0095478	F
F_fleet_2_YR_1956_s_1	0.09396	0	8	_	act	0.0143111	F
F_fleet_2_YR_1957_s_1	0.10132	0	8	_	act	0.0159114	F
F_fleet_2_YR_1958_s_1	0.18517	0	8	_	act	0.0303298	F
F_fleet_2_YR_1959_s_1	0.212371	0	8	_	act	0.0367975	F
F_fleet_2_YR_1960_s_1	0.253315	0	8	_	act	0.0466623	F
F_fleet_2_YR_1961_s_1	0.348453	0	8	_	act	0.0688685	F
F_fleet_2_YR_1962_s_1	0.39894	0	8	_	act	0.0843507	F
F_fleet_2_YR_1963_s_1	0.407532	0	8	_	act	0.0905396	F
F_fleet_2_YR_1964_s_1	0.441744	0	8	_	act	0.102115	F
F_fleet_2_YR_1965_s_1	0.493263	0	8	_	act	0.119384	F
F_fleet_2_YR_1966_s_1	0.446429	0	8	_	act	0.112559	F
F_fleet_2_YR_1967_s_1	0.691555	0	8	_	act	0.184738	F
F_fleet_2_YR_1968_s_1	1.03151	0	8	_	act	0.299097	F
F_fleet_2_YR_1969_s_1	1.04113	0	8	_	act	0.316624	F
F_fleet_2_YR_1970_s_1	1.42487	0	8	_	act	0.434935	F
F_fleet_2_YR_1971_s_1	2.11359	0	8	_	act	0.626055	F
F_fleet_2_YR_1972_s_1	2.43288	0	8	_	act	0.666755	F
F_fleet_2_YR_1973_s_1	2.26253	0	8	_	act	0.46181	F
F_fleet_2_YR_1974_s_1	1.3406	0	8	_	act	0.20659	F
F_fleet_2_YR_1975_s_1	0.731995	0	8	_	act	0.140258	F
F_fleet_2_YR_1976_s_1	0.609957	0	8	_	act	0.148376	F

F_fleet_2_YR_1977_s_1	0.699368	0	8	_	act	0.206274	F
F_fleet_2_YR_1978_s_1	0.835107	0	8	_	act	0.253237	F
F_fleet_2_YR_1979_s_1	0.914822	0	8	_	act	0.277077	F
F_fleet_2_YR_1980_s_1	1.15206	0	8	_	act	0.360804	F
F_fleet_2_YR_1981_s_1	1.4951	0	8	_	act	0.331878	F
F_fleet_2_YR_1982_s_1	1.11631	0	8	_	act	0.154586	F
F_fleet_2_YR_1983_s_1	0.705872	0	8	_	act	0.0910204	F
F_fleet_2_YR_1984_s_1	0.469004	0	8	_	act	0.0578951	F
F_fleet_2_YR_1985_s_1	0.301541	0	8	_	act	0.0357979	F
F_fleet_2_YR_1986_s_1	0.34292	0	8	_	act	0.0376418	F
F_fleet_2_YR_1987_s_1	0.279322	0	8	_	act	0.0284106	F
F_fleet_2_YR_1988_s_1	0.421854	0	8	_	act	0.0373432	F
F_fleet_2_YR_1989_s_1	0.34797	0	8	_	act	0.0297832	F
F_fleet_2_YR_1990_s_1	0.318737	0	8	_	act	0.027274	F
F_fleet_2_YR_1991_s_1	0.2606	0	8	_	act	0.0216129	F
F_fleet_2_YR_1992_s_1	0.301085	0	8	_	act	0.0241049	F
F_fleet_2_YR_1993_s_1	0.298159	0	8	_	act	0.0237143	F
F_fleet_2_YR_1994_s_1	0.261329	0	8	_	act	0.0213725	F
F_fleet_2_YR_1995_s_1	0.256279	0	8	_	act	0.0203626	F
F_fleet_2_YR_1996_s_1	0.34503	0	8	_	act	0.0262007	F
F_fleet_2_YR_1997_s_1	0.376297	0	8	_	act	0.0277746	F
F_fleet_2_YR_1998_s_1	0.357202	0	8	_	act	0.0269277	F
F_fleet_2_YR_1999_s_1	0.383396	0	8	_	act	0.0294394	F
F_fleet_2_YR_2000_s_1	0.37743	0	8	_	act	0.0292938	F
F_fleet_2_YR_2001_s_1	0.36655	0	8	_	act	0.0282561	F
F_fleet_2_YR_2002_s_1	0.35081	0	8	_	act	0.0270558	F
F_fleet_2_YR_2003_s_1	0.316089	0	8	_	act	0.0249217	F
F_fleet_2_YR_2004_s_1	0.314775	0	8	_	act	0.0249889	F
F_fleet_2_YR_2005_s_1	0.301073	0	8	_	act	0.0252495	F
F_fleet_2_YR_2006_s_1	0.332345	0	8	_	act	0.0297775	F
F_fleet_2_YR_2007_s_1	0.154872	0	8	_	act	0.0159091	F

F_fleet_2_YR_2008_s_1	0.090106	0	8	_	act	0.00904266	F
F_fleet_2_YR_2009_s_1	0.069093	0	8	_	act	0.00677485	F
F_fleet_2_YR_2010_s_1	0.073473	0	8	_	act	0.00700627	F
F_fleet_2_YR_2011_s_1	0.067091	0	8	_	act	0.00637592	F
F_fleet_2_YR_2012_s_1	0.07437	0	8	_	act	0.00715684	F
F_fleet_2_YR_2013_s_1	0.093666	0	8	_	act	0.00889252	F
F_fleet_2_YR_2014_s_1	0.071418	0	8	_	act	0.00699643	F
F_fleet_3_YR_1980_s_1	0.041209	0	8	_	act	0.0109772	F
F_fleet_3_YR_1981_s_1	0.093458	0	8	_	act	0.0243722	F
F_fleet_3_YR_1982_s_1	0.16134	0	8	_	act	0.0423756	F
F_fleet_3_YR_1983_s_1	0.426184	0	8	_	act	0.10453	F
F_fleet_3_YR_1984_s_1	0.341919	0	8	_	act	0.0687247	F
F_fleet_3_YR_1985_s_1	0.065056	0	8	_	act	0.0109928	F
F_fleet_3_YR_1986_s_1	0.02769	0	8	_	act	0.00424729	F
F_fleet_3_YR_1987_s_1	0.020612	0	8	_	act	0.00298283	F
F_fleet_3_YR_1988_s_1	0.032591	0	8	_	act	0.00496957	F
F_fleet_3_YR_1989_s_1	0.053254	0	8	_	act	0.00847031	F
F_fleet_3_YR_1990_s_1	0.073367	0	8	_	act	0.0114135	F
F_fleet_3_YR_1991_s_1	0.023815	0	8	_	act	0.00356103	F
F_fleet_3_YR_1992_s_1	0.005705	0	8	_	act	0.000778761	F
F_fleet_3_YR_1993_s_1	0.012622	0	8	_	act	0.0017342	F
F_fleet_3_YR_1994_s_1	0.006316	0	8	_	act	0.000881988	F
F_fleet_3_YR_1995_s_1	0.00667	0	8	_	act	0.000940709	F
F_fleet_3_YR_1996_s_1	0.005864	0	8	_	act	0.000812752	F
F_fleet_3_YR_1997_s_1	0.003171	0	8	_	act	0.000430858	F
F_fleet_3_YR_1998_s_1	0.003041	0	8	_	act	0.000451301	F
F_fleet_3_YR_1999_s_1	0.002699	0	8	_	act	0.000358611	F
F_fleet_3_YR_2000_s_1	0.003207	0	8	_	act	0.000421261	F
F_fleet_3_YR_2001_s_1	0.003813	0	8	_	act	0.000458196	F
F_fleet_3_YR_2002_s_1	0.007747	0	8	_	act	0.000988689	F
F_fleet_3_YR_2003_s_1	0.005912	0	8	_	act	0.000775353	F

F_fleet_3_YR_2004_s_1	0.007755	0	8	_	act	0.00105306	F
F_fleet_3_YR_2005_s_1	0.007932	0	8	_	act	0.00106956	F
F_fleet_3_YR_2006_s_1	0.004896	0	8	_	act	0.000660963	F
F_fleet_3_YR_2007_s_1	0.006041	0	8	_	act	0.000991075	F
F_fleet_3_YR_2008_s_1	0.00887	0	8	_	act	0.00148151	F
F_fleet_3_YR_2009_s_1	0.002771	0	8	_	act	0.00046052	F
F_fleet_3_YR_2010_s_1	0.009501	0	8	_	act	0.00153862	F
F_fleet_3_YR_2011_s_1	0.008025	0	8	_	act	0.0012743	F
F_fleet_3_YR_2012_s_1	0.004952	0	8	_	act	0.000793726	F
F_fleet_3_YR_2013_s_1	0.01126	0	8	_	act	0.00195614	F
F_fleet_3_YR_2014_s_1	0.017108	0	8	_	act	0.00344259	F
F_fleet_4_YR_1976_s_1	4.89E-05	0	8	_	act	7.54799E-06	F
F_fleet_4_YR_1980_s_1	0.003071	0	8	_	act	0.000475737	F
F_fleet_4_YR_1981_s_1	0.003917	0	8	_	act	0.000615028	F
F_fleet_4_YR_1982_s_1	0.006309	0	8	_	act	0.000984445	F
F_fleet_4_YR_1983_s_1	0.009504	0	8	_	act	0.00146746	F
F_fleet_4_YR_1984_s_1	0.080326	0	8	_	act	0.0122348	F
F_fleet_4_YR_1985_s_1	0.067722	0	8	_	act	0.0100078	F
F_fleet_4_YR_1986_s_1	0.097569	0	8	_	act	0.0141576	F
F_fleet_4_YR_1987_s_1	0.088167	0	8	_	act	0.0127608	F
F_fleet_4_YR_1988_s_1	0.081139	0	8	_	act	0.0116352	F
F_fleet_4_YR_1989_s_1	0.057605	0	8	_	act	0.00858505	F
F_fleet_4_YR_1990_s_1	0.014975	0	8	_	act	0.00227835	F
F_fleet_4_YR_1991_s_1	0.008706	0	8	_	act	0.00132857	F
F_fleet_4_YR_1992_s_1	0.002186	0	8	_	act	0.000333368	F
F_fleet_4_YR_1993_s_1	0.00206	0	8	_	act	0.000310828	F
F_fleet_4_YR_1994_s_1	0.00146	0	8	_	act	0.000221142	F
F_fleet_4_YR_1995_s_1	0.001483	0	8	_	act	0.00022496	F
F_fleet_4_YR_1996_s_1	0.002062	0	8	_	act	0.000312816	F
F_fleet_4_YR_1997_s_1	0.002164	0	8	_	act	0.000324043	F
F_fleet_4_YR_1998_s_1	0.001782	0	8	_	act	0.000273188	F

F_fleet_4_YR_1999_s_1	0.00565	0	8	_	act	0.000864309	F
F_fleet_4_YR_2000_s_1	0.010773	0	8	_	act	0.00167121	F
F_fleet_4_YR_2001_s_1	0.007088	0	8	_	act	0.00110781	F
F_fleet_4_YR_2002_s_1	0.008132	0	8	_	act	0.00128452	F
F_fleet_4_YR_2003_s_1	0.009304	0	8	_	act	0.00147542	F
F_fleet_4_YR_2004_s_1	0.024318	0	8	_	act	0.0039238	F
F_fleet_4_YR_2005_s_1	0.014743	0	8	_	act	0.00240407	F
F_fleet_4_YR_2006_s_1	0.012947	0	8	_	act	0.00213367	F
F_fleet_4_YR_2007_s_1	0.011806	0	8	_	act	0.0020585	F
F_fleet_4_YR_2008_s_1	0.003204	0	8	_	act	0.000550062	F
F_fleet_4_YR_2009_s_1	0.002601	0	8	_	act	0.00043974	F
F_fleet_4_YR_2010_s_1	0.00153	0	8	_	act	0.000254235	F
F_fleet_4_YR_2011_s_1	0.00058	0	8	_	act	9.24871E-05	F
F_fleet_4_YR_2012_s_1	0.000377	0	8	_	act	5.70352E-05	F
F_fleet_4_YR_2013_s_1	0.001193	0	8	_	act	0.000170027	F
F_fleet_4_YR_2014_s_1	0.001039	0	8	_	act	0.000143527	F
F_fleet_5_YR_1950_s_1	0.032673	0	8	_	act	0.00473176	F
F_fleet_5_YR_1951_s_1	0.043233	0	8	_	act	0.006378	F
F_fleet_5_YR_1952_s_1	0.054773	0	8	_	act	0.008212	F
F_fleet_5_YR_1953_s_1	0.066935	0	8	_	act	0.0101795	F
F_fleet_5_YR_1954_s_1	0.079379	0	8	_	act	0.0122333	F
F_fleet_5_YR_1955_s_1	0.092623	0	8	_	act	0.0144879	F
F_fleet_5_YR_1956_s_1	0.107461	0	8	_	act	0.0171595	F
F_fleet_5_YR_1957_s_1	0.1195	0	8	_	act	0.0194713	F
F_fleet_5_YR_1958_s_1	0.134889	0	8	_	act	0.0226571	F
F_fleet_5_YR_1959_s_1	0.151968	0	8	_	act	0.0264822	F
F_fleet_5_YR_1960_s_1	0.17011	0	8	_	act	0.030862	F
F_fleet_5_YR_1961_s_1	0.180086	0	8	_	act	0.0338007	F
F_fleet_5_YR_1962_s_1	0.189338	0	8	_	act	0.0365639	F
F_fleet_5_YR_1963_s_1	0.195165	0	8	_	act	0.0383786	F
F_fleet_5_YR_1964_s_1	0.203963	0	8	_	act	0.0411474	F

F_fleet_5_YR_1965_s_1	0.217399	0	8	_	act	0.0455468	F
F_fleet_5_YR_1966_s_1	0.229883	0	8	_	act	0.0492869	F
F_fleet_5_YR_1967_s_1	0.239083	0	8	_	act	0.0520389	F
F_fleet_5_YR_1968_s_1	0.246451	0	8	_	act	0.0540575	F
F_fleet_5_YR_1969_s_1	0.253438	0	8	_	act	0.055938	F
F_fleet_5_YR_1970_s_1	0.261893	0	8	_	act	0.0579737	F
F_fleet_5_YR_1971_s_1	0.280614	0	8	_	act	0.0629458	F
F_fleet_5_YR_1972_s_1	0.308677	0	8	_	act	0.0713924	F
F_fleet_5_YR_1973_s_1	0.181474	0	8	_	act	0.0273021	F
F_fleet_5_YR_1974_s_1	0.115949	0	8	_	act	0.0180811	F
F_fleet_5_YR_1975_s_1	0.178852	0	8	_	act	0.0245144	F
F_fleet_5_YR_1976_s_1	0.241771	0	8	_	act	0.0349091	F
F_fleet_5_YR_1977_s_1	0.275104	0	8	_	act	0.038923	F
F_fleet_5_YR_1978_s_1	0.26135	0	8	_	act	0.0345329	F
F_fleet_5_YR_1979_s_1	0.271973	0	8	_	act	0.0388457	F
F_fleet_5_YR_1980_s_1	0.372761	0	8	_	act	0.0518305	F
F_fleet_5_YR_1981_s_1	0.456722	0	8	_	act	0.0621363	F
F_fleet_5_YR_1982_s_1	0.26526	0	8	_	act	0.0316158	F
F_fleet_5_YR_1983_s_1	0.213662	0	8	_	act	0.0220207	F
F_fleet_5_YR_1984_s_1	0.044382	0	8	_	act	0.00377789	F
F_fleet_5_YR_1985_s_1	0.238068	0	8	_	act	0.0199539	F
F_fleet_5_YR_1986_s_1	0.505436	0	8	_	act	0.0448796	F
F_fleet_5_YR_1987_s_1	0.804305	0	8	_	act	0.0786285	F
F_fleet_5_YR_1988_s_1	0.781357	0	8	_	act	0.0588388	F
F_fleet_5_YR_1989_s_1	0.9355	0	8	_	act	0.0700912	F
F_fleet_5_YR_1990_s_1	0.546851	0	8	_	act	0.0418827	F
F_fleet_5_YR_1991_s_1	0.504059	0	8	_	act	0.0379979	F
F_fleet_5_YR_1992_s_1	0.632599	0	8	_	act	0.0451914	F
F_fleet_5_YR_1993_s_1	0.888251	0	8	_	act	0.0645583	F
F_fleet_5_YR_1994_s_1	0.810747	0	8	_	act	0.0676513	F
F_fleet_5_YR_1995_s_1	0.883608	0	8	_	act	0.0803754	F

F_fleet_5_YR_1996_s_1	0.705159	0	8	_	act	0.0552007	F
F_fleet_5_YR_1997_s_1	0.926388	0	8	_	act	0.0715666	F
F_fleet_5_YR_1998_s_1	0.534041	0	8	_	act	0.0554188	F
F_fleet_5_YR_1999_s_1	0.530543	0	8	_	act	0.0448397	F
F_fleet_5_YR_2000_s_1	0.72291	0	8	_	act	0.0533843	F
F_fleet_5_YR_2001_s_1	0.9273	0	8	_	act	0.058228	F
F_fleet_5_YR_2002_s_1	0.981717	0	8	_	act	0.057665	F
F_fleet_5_YR_2003_s_1	0.804925	0	8	_	act	0.0472708	F
F_fleet_5_YR_2004_s_1	1.0543	0	8	_	act	0.0608567	F
F_fleet_5_YR_2005_s_1	0.669664	0	8	_	act	0.0443045	F
F_fleet_5_YR_2006_s_1	0.478618	0	8	_	act	0.0336507	F
F_fleet_5_YR_2007_s_1	0.530074	0	8	_	act	0.0381564	F
F_fleet_5_YR_2008_s_1	0.210373	0	8	_	act	0.0201602	F
F_fleet_5_YR_2009_s_1	0.184392	0	8	_	act	0.0171283	F
F_fleet_5_YR_2010_s_1	0.07036	0	8	_	act	0.00647066	F
F_fleet_5_YR_2011_s_1	0.210948	0	8	_	act	0.0247355	F
F_fleet_5_YR_2012_s_1	0.186228	0	8	_	act	0.0214787	F
F_fleet_5_YR_2013_s_1	0.361958	0	8	_	act	0.0474633	F
F_fleet_5_YR_2014_s_1	0.145071	0	8	_	act	0.0231151	F
F_fleet_6_YR_1950_s_1	0.034695	0	8	_	act	0.00608665	F
F_fleet_6_YR_1951_s_1	0.05122	0	8	_	act	0.00923609	F
F_fleet_6_YR_1952_s_1	0.068785	0	8	_	act	0.0126755	F
F_fleet_6_YR_1953_s_1	0.087059	0	8	_	act	0.0163556	F
F_fleet_6_YR_1954_s_1	0.106507	0	8	_	act	0.0203255	F
F_fleet_6_YR_1955_s_1	0.126785	0	8	_	act	0.0246738	F
F_fleet_6_YR_1956_s_1	0.150198	0	8	_	act	0.0297446	F
F_fleet_6_YR_1957_s_1	0.167922	0	8	_	act	0.0341694	F
F_fleet_6_YR_1958_s_1	0.192231	0	8	_	act	0.0401502	F
F_fleet_6_YR_1959_s_1	0.223135	0	8	_	act	0.0483493	F
F_fleet_6_YR_1960_s_1	0.264966	0	8	_	act	0.0595977	F
F_fleet_6_YR_1961_s_1	0.294853	0	8	_	act	0.0697311	F

F_fleet_6_YR_1962_s_1	0.31927	0	8	_	act	0.0787078	F
F_fleet_6_YR_1963_s_1	0.326092	0	8	_	act	0.0830181	F
F_fleet_6_YR_1964_s_1	0.33679	0	8	_	act	0.0876374	F
F_fleet_6_YR_1965_s_1	0.357744	0	8	_	act	0.0951761	F
F_fleet_6_YR_1966_s_1	0.376236	0	8	_	act	0.102978	F
F_fleet_6_YR_1967_s_1	0.421842	0	8	_	act	0.120849	F
F_fleet_6_YR_1968_s_1	0.504763	0	8	_	act	0.157667	F
F_fleet_6_YR_1969_s_1	0.604556	0	8	_	act	0.203032	F
F_fleet_6_YR_1970_s_1	0.691624	0	8	_	act	0.251662	F
F_fleet_6_YR_1971_s_1	1.01112	0	8	_	act	0.408886	F
F_fleet_6_YR_1972_s_1	1.34952	0	8	_	act	0.594502	F
F_fleet_6_YR_1973_s_1	0.850336	0	8	_	act	0.218122	F
F_fleet_6_YR_1974_s_1	0.255842	0	8	_	act	0.0410362	F
F_fleet_6_YR_1975_s_1	0.342177	0	8	_	act	0.0526837	F
F_fleet_6_YR_1976_s_1	0.621749	0	8	_	act	0.11479	F
F_fleet_6_YR_1977_s_1	0.658141	0	8	_	act	0.131584	F
F_fleet_6_YR_1978_s_1	0.685056	0	8	_	act	0.139203	F
F_fleet_6_YR_1979_s_1	0.679428	0	8	_	act	0.145508	F
F_fleet_6_YR_1980_s_1	0.908233	0	8	_	act	0.222201	F
F_fleet_6_YR_1981_s_1	0.631012	0	8	_	act	0.10789	F
F_fleet_6_YR_1982_s_1	0.201918	0	8	_	act	0.0226379	F
F_fleet_6_YR_1983_s_1	0.419151	0	8	_	act	0.0405982	F
F_fleet_6_YR_1984_s_1	0.193491	0	8	_	act	0.0181488	F
F_fleet_6_YR_1985_s_1	0.410054	0	8	_	act	0.0380449	F
F_fleet_6_YR_1986_s_1	0.338934	0	8	_	act	0.0307086	F
F_fleet_6_YR_1987_s_1	0.119214	0	8	_	act	0.00920559	F
F_fleet_6_YR_1988_s_1	0.215778	0	8	_	act	0.0159323	F
F_fleet_6_YR_1989_s_1	0.184453	0	8	_	act	0.0136571	F
F_fleet_6_YR_1990_s_1	0.102066	0	8	_	act	0.00728043	F
F_fleet_6_YR_1991_s_1	0.117823	0	8	_	act	0.00777066	F
F_fleet_6_YR_1992_s_1	0.142612	0	8	_	act	0.0100025	F

F_fleet_6_YR_1993_s_1	0.180551	0	8	_	act	0.0122573	F
F_fleet_6_YR_1994_s_1	0.166265	0	8	_	act	0.0118942	F
F_fleet_6_YR_1995_s_1	0.259139	0	8	_	act	0.0186712	F
F_fleet_6_YR_1996_s_1	0.148009	0	8	_	act	0.0108932	F
F_fleet_6_YR_1997_s_1	0.154746	0	8	_	act	0.0112526	F
F_fleet_6_YR_1998_s_1	0.11992	0	8	_	act	0.00908128	F
F_fleet_6_YR_1999_s_1	0.116375	0	8	_	act	0.00879799	F
F_fleet_6_YR_2000_s_1	0.176792	0	8	_	act	0.0139578	F
F_fleet_6_YR_2001_s_1	0.120214	0	8	_	act	0.00940194	F
F_fleet_6_YR_2002_s_1	0.102665	0	8	_	act	0.0081271	F
F_fleet_6_YR_2003_s_1	0.121128	0	8	_	act	0.00979726	F
F_fleet_6_YR_2004_s_1	0.146853	0	8	_	act	0.0119073	F
F_fleet_6_YR_2005_s_1	0.147604	0	8	_	act	0.0121527	F
F_fleet_6_YR_2006_s_1	0.154399	0	8	_	act	0.0132805	F
F_fleet_6_YR_2007_s_1	0.16763	0	8	_	act	0.0150293	F
F_fleet_6_YR_2008_s_1	0.036007	0	8	_	act	0.00362942	F
F_fleet_6_YR_2009_s_1	0.04338	0	8	_	act	0.00428738	F
F_fleet_6_YR_2010_s_1	0.009028	0	8	_	act	0.000859627	F
F_fleet_6_YR_2011_s_1	0.017524	0	8	_	act	0.0017045	F
F_fleet_6_YR_2012_s_1	0.044392	0	8	_	act	0.0045401	F
F_fleet_6_YR_2013_s_1	0.021044	0	8	_	act	0.00199769	F
F_fleet_6_YR_2014_s_1	0.019265	0	8	_	act	0.00191887	F
F_fleet_7_YR_1950_s_1	0.042799	0	8	_	act	0.00652877	F
F_fleet_7_YR_1951_s_1	0.044421	0	8	_	act	0.00692321	F
F_fleet_7_YR_1952_s_1	0.046321	0	8	_	act	0.00734656	F
F_fleet_7_YR_1953_s_1	0.048106	0	8	_	act	0.00773823	F
F_fleet_7_YR_1954_s_1	0.049619	0	8	_	act	0.00808601	F
F_fleet_7_YR_1955_s_1	0.05129	0	8	_	act	0.00848656	F
F_fleet_7_YR_1956_s_1	0.05352	0	8	_	act	0.00904761	F
F_fleet_7_YR_1957_s_1	0.055646	0	8	_	act	0.00960846	F
F_fleet_7_YR_1958_s_1	0.059167	0	8	_	act	0.0105614	F

F_fleet_7_YR_1959_s_1	0.063222	0	8	_	act	0.0117421	F
F_fleet_7_YR_1960_s_1	0.067251	0	8	_	act	0.013066	F
F_fleet_7_YR_1961_s_1	0.071012	0	8	_	act	0.0143604	F
F_fleet_7_YR_1962_s_1	0.074447	0	8	_	act	0.0155897	F
F_fleet_7_YR_1963_s_1	0.076325	0	8	_	act	0.0163344	F
F_fleet_7_YR_1964_s_1	0.079426	0	8	_	act	0.0175543	F
F_fleet_7_YR_1965_s_1	0.084786	0	8	_	act	0.0196669	F
F_fleet_7_YR_1966_s_1	0.088318	0	8	_	act	0.0211297	F
F_fleet_7_YR_1967_s_1	0.090122	0	8	_	act	0.0220076	F
F_fleet_7_YR_1968_s_1	0.091091	0	8	_	act	0.0225063	F
F_fleet_7_YR_1969_s_1	0.091604	0	8	_	act	0.0228241	F
F_fleet_7_YR_1970_s_1	0.092781	0	8	_	act	0.0232679	F
F_fleet_7_YR_1971_s_1	0.094708	0	8	_	act	0.0241148	F
F_fleet_7_YR_1972_s_1	0.100217	0	8	_	act	0.0265609	F
F_fleet_7_YR_1973_s_1	0.075253	0	8	_	act	0.0133835	F
F_fleet_7_YR_1974_s_1	0.033265	0	8	_	act	0.00545209	F
F_fleet_7_YR_1975_s_1	0.043887	0	8	_	act	0.0069388	F
F_fleet_7_YR_1976_s_1	0.061814	0	8	_	act	0.0100334	F
F_fleet_7_YR_1977_s_1	0.07391	0	8	_	act	0.0117579	F
F_fleet_7_YR_1978_s_1	0.069607	0	8	_	act	0.0102589	F
F_fleet_7_YR_1979_s_1	0.065711	0	8	_	act	0.00994868	F
F_fleet_7_YR_1980_s_1	0.086447	0	8	_	act	0.0133977	F
F_fleet_7_YR_1981_s_1	0.034792	0	8	_	act	0.0052093	F
F_fleet_7_YR_1982_s_1	0.079479	0	8	_	act	0.0106207	F
F_fleet_7_YR_1983_s_1	0.103736	0	8	_	act	0.011697	F
F_fleet_7_YR_1984_s_1	0.012682	0	8	_	act	0.00112496	F
F_fleet_7_YR_1985_s_1	0.048736	0	8	_	act	0.00431563	F
F_fleet_7_YR_1986_s_1	0.013686	0	8	_	act	0.00130511	F
F_fleet_7_YR_1987_s_1	0.014291	0	8	_	act	0.00151794	F
F_fleet_7_YR_1988_s_1	0.021683	0	8	_	act	0.001849	F
F_fleet_7_YR_1989_s_1	0.02003	0	8	_	act	0.00173237	F

F_fleet_7_YR_1990_s_1	0.027999	0	8	_	act	0.00234054	F
F_fleet_7_YR_1991_s_1	0.014843	0	8	_	act	0.00122696	F
F_fleet_7_YR_1992_s_1	0.023924	0	8	_	act	0.00186665	F
F_fleet_7_YR_1993_s_1	0.024954	0	8	_	act	0.00202336	F
F_fleet_7_YR_1994_s_1	0.027379	0	8	_	act	0.00238705	F
F_fleet_7_YR_1995_s_1	0.029297	0	8	_	act	0.00268775	F
F_fleet_7_YR_1996_s_1	0.030854	0	8	_	act	0.00250947	F
F_fleet_7_YR_1997_s_1	0.045749	0	8	_	act	0.00390376	F
F_fleet_7_YR_1998_s_1	0.048562	0	8	_	act	0.00502936	F
F_fleet_7_YR_1999_s_1	0.043892	0	8	_	act	0.00373543	F
F_fleet_7_YR_2000_s_1	0.088632	0	8	_	act	0.00940341	F
F_fleet_7_YR_2001_s_1	0.082141	0	8	_	act	0.00849464	F
F_fleet_7_YR_2002_s_1	0.093066	0	8	_	act	0.00932835	F
F_fleet_7_YR_2003_s_1	0.089427	0	8	_	act	0.00894125	F
F_fleet_7_YR_2004_s_1	0.089367	0	8	_	act	0.00911264	F
F_fleet_7_YR_2005_s_1	0.058847	0	8	_	act	0.00613281	F
F_fleet_7_YR_2006_s_1	0.0464	0	8	_	act	0.0049176	F
F_fleet_7_YR_2007_s_1	0.047325	0	8	_	act	0.00506328	F
F_fleet_7_YR_2008_s_1	0.040128	0	8	_	act	0.00444903	F
F_fleet_7_YR_2009_s_1	0.040695	0	8	_	act	0.00453315	F
F_fleet_7_YR_2010_s_1	0.016377	0	8	_	act	0.0018949	F
F_fleet_7_YR_2011_s_1	0.028048	0	8	_	act	0.00347385	F
F_fleet_7_YR_2012_s_1	0.024141	0	8	_	act	0.00311899	F
F_fleet_7_YR_2013_s_1	0.02361	0	8	_	act	0.0034436	F
F_fleet_7_YR_2014_s_1	0.024826	0	8	_	act	0.00412295	F
F_fleet_8_YR_1950_s_1	0.063463	0	8	_	act	0.0105745	F
F_fleet_8_YR_1951_s_1	0.068718	0	8	_	act	0.0118206	F
F_fleet_8_YR_1952_s_1	0.073264	0	8	_	act	0.0129423	F
F_fleet_8_YR_1953_s_1	0.077003	0	8	_	act	0.0139188	F
F_fleet_8_YR_1954_s_1	0.080558	0	8	_	act	0.0148445	F
F_fleet_8_YR_1955_s_1	0.083815	0	8	_	act	0.0157764	F

F_fleet_8_YR_1956_s_1	0.088387	0	8	_	act	0.017013	F
F_fleet_8_YR_1957_s_1	0.091694	0	8	_	act	0.0181669	F
F_fleet_8_YR_1958_s_1	0.097848	0	8	_	act	0.0200112	F
F_fleet_8_YR_1959_s_1	0.106499	0	8	_	act	0.0226923	F
F_fleet_8_YR_1960_s_1	0.119394	0	8	_	act	0.0266362	F
F_fleet_8_YR_1961_s_1	0.132524	0	8	_	act	0.0313562	F
F_fleet_8_YR_1962_s_1	0.143698	0	8	_	act	0.0358918	F
F_fleet_8_YR_1963_s_1	0.146065	0	8	_	act	0.0379131	F
F_fleet_8_YR_1964_s_1	0.148718	0	8	_	act	0.0396259	F
F_fleet_8_YR_1965_s_1	0.156133	0	8	_	act	0.0428495	F
F_fleet_8_YR_1966_s_1	0.158218	0	8	_	act	0.0447242	F
F_fleet_8_YR_1967_s_1	0.171705	0	8	_	act	0.0512215	F
F_fleet_8_YR_1968_s_1	0.201118	0	8	_	act	0.0661602	F
F_fleet_8_YR_1969_s_1	0.238325	0	8	_	act	0.0857945	F
F_fleet_8_YR_1970_s_1	0.266559	0	8	_	act	0.104135	F
F_fleet_8_YR_1971_s_1	0.367708	0	8	_	act	0.163426	F
F_fleet_8_YR_1972_s_1	0.46643	0	8	_	act	0.229721	F
F_fleet_8_YR_1973_s_1	0.362013	0	8	_	act	0.122061	F
F_fleet_8_YR_1974_s_1	0.070701	0	8	_	act	0.0119535	F
F_fleet_8_YR_1975_s_1	0.081109	0	8	_	act	0.0128875	F
F_fleet_8_YR_1976_s_1	0.147885	0	8	_	act	0.0293489	F
F_fleet_8_YR_1977_s_1	0.167268	0	8	_	act	0.0355454	F
F_fleet_8_YR_1978_s_1	0.181047	0	8	_	act	0.0397008	F
F_fleet_8_YR_1979_s_1	0.178835	0	8	_	act	0.0405951	F
F_fleet_8_YR_1980_s_1	0.255932	0	8	_	act	0.0699445	F
F_fleet_8_YR_1981_s_1	0.155741	0	8	_	act	0.0294947	F
F_fleet_8_YR_1982_s_1	0.063411	0	8	_	act	0.00746147	F
F_fleet_8_YR_1983_s_1	0.068015	0	8	_	act	0.00682155	F
F_fleet_8_YR_1984_s_1	0.087356	0	8	_	act	0.00825808	F
F_fleet_8_YR_1985_s_1	0.183087	0	8	_	act	0.0169967	F
F_fleet_8_YR_1986_s_1	0.202702	0	8	_	act	0.0185377	F

F_fleet_8_YR_1987_s_1	0.178656	0	8	_	act	0.0138821	F
F_fleet_8_YR_1988_s_1	0.220166	0	8	_	act	0.0168161	F
F_fleet_8_YR_1989_s_1	0.220575	0	8	_	act	0.0168497	F
F_fleet_8_YR_1990_s_1	0.104829	0	8	_	act	0.00775165	F
F_fleet_8_YR_1991_s_1	0.090107	0	8	_	act	0.00613723	F
F_fleet_8_YR_1992_s_1	0.127557	0	8	_	act	0.00925044	F
F_fleet_8_YR_1993_s_1	0.138529	0	8	_	act	0.00963046	F
F_fleet_8_YR_1994_s_1	0.182522	0	8	_	act	0.0134919	F
F_fleet_8_YR_1995_s_1	0.156864	0	8	_	act	0.0120618	F
F_fleet_8_YR_1996_s_1	0.142026	0	8	_	act	0.0109423	F
F_fleet_8_YR_1997_s_1	0.141825	0	8	_	act	0.010773	F
F_fleet_8_YR_1998_s_1	0.105836	0	8	_	act	0.00830892	F
F_fleet_8_YR_1999_s_1	0.050691	0	8	_	act	0.00399289	F
F_fleet_8_YR_2000_s_1	0.078202	0	8	_	act	0.00642886	F
F_fleet_8_YR_2001_s_1	0.084112	0	8	_	act	0.00687016	F
F_fleet_8_YR_2002_s_1	0.091305	0	8	_	act	0.0075151	F
F_fleet_8_YR_2003_s_1	0.105371	0	8	_	act	0.00882162	F
F_fleet_8_YR_2004_s_1	0.080731	0	8	_	act	0.00679475	F
F_fleet_8_YR_2005_s_1	0.069192	0	8	_	act	0.00589555	F
F_fleet_8_YR_2006_s_1	0.067873	0	8	_	act	0.00603595	F
F_fleet_8_YR_2007_s_1	0.048009	0	8	_	act	0.00447082	F
F_fleet_8_YR_2008_s_1	0.017501	0	8	_	act	0.00215468	F
F_fleet_8_YR_2009_s_1	0.018039	0	8	_	act	0.00205481	F
F_fleet_8_YR_2010_s_1	0.010628	0	8	_	act	0.00116372	F
F_fleet_8_YR_2011_s_1	0.010462	0	8	_	act	0.00108871	F
F_fleet_8_YR_2012_s_1	0.011344	0	8	_	act	0.00119498	F
F_fleet_8_YR_2013_s_1	0.008707	0	8	_	act	0.000962462	F
F_fleet_8_YR_2014_s_1	0.006387	0	8	_	act	0.000640061	F
F_fleet_9_YR_1991_s_1	0.11281	0	8	_	act	0.0512484	F
F_fleet_9_YR_1992_s_1	0.259524	0	8	_	act	0.115958	F
F_fleet_9_YR_1993_s_1	0.215179	0	8	_	act	0.102012	F

F_fleet_9_YR_1994_s_1	0.316617	0	8	_	act	0.139703	F
F_fleet_9_YR_1995_s_1	0.355677	0	8	_	act	0.168308	F
F_fleet_9_YR_1996_s_1	0.379474	0	8	_	act	0.163018	F
F_fleet_9_YR_1997_s_1	0.133169	0	8	_	act	0.0524492	F
F_fleet_9_YR_1998_s_1	0.124307	0	8	_	act	0.051525	F
F_fleet_9_YR_1999_s_1	0.46514	0	8	_	act	0.274375	F
F_fleet_9_YR_2000_s_1	0.251664	0	8	_	act	0.182566	F
F_fleet_9_YR_2001_s_1	0.162143	0	8	_	act	0.0918392	F
F_fleet_9_YR_2002_s_1	0.07508	0	8	_	act	0.0395009	F
F_fleet_9_YR_2003_s_1	0.144279	0	8	_	act	0.0617583	F
F_fleet_9_YR_2004_s_1	0.073969	0	8	_	act	0.0323552	F
F_fleet_9_YR_2005_s_1	0.062563	0	8	_	act	0.0316329	F
F_fleet_9_YR_2006_s_1	0.036853	0	8	_	act	0.0198047	F
F_fleet_9_YR_2007_s_1	0.060972	0	8	_	act	0.0308668	F
F_fleet_9_YR_2008_s_1	0.036865	0	8	_	act	0.0175304	F
F_fleet_9_YR_2009_s_1	0.107956	0	8	_	act	0.0531108	F
F_fleet_9_YR_2010_s_1	0.008173	0	8	_	act	0.00421227	F
F_fleet_9_YR_2011_s_1	0.027698	0	8	_	act	0.0138863	F
F_fleet_9_YR_2012_s_1	0.029029	0	8	_	act	0.0156799	F
F_fleet_9_YR_2013_s_1	0.001107	0	8	_	act	0.000575581	F
F_fleet_9_YR_2014_s_1	0.001219	0	8	_	act	0.00064052	F
F_fleet_10_YR_1991_s_1	0.044683	0	8	_	act	0.0214868	F
F_fleet_10_YR_1992_s_1	0.064193	0	8	_	act	0.0303421	F
F_fleet_10_YR_1993_s_1	0.040553	0	8	_	act	0.0247779	F
F_fleet_10_YR_1994_s_1	0.021343	0	8	_	act	0.011242	F
F_fleet_10_YR_1995_s_1	0.018008	0	8	_	act	0.00912937	F
F_fleet_10_YR_1996_s_1	0.016766	0	8	_	act	0.00815619	F
F_fleet_10_YR_1997_s_1	0.022206	0	8	_	act	0.0103687	F
F_fleet_10_YR_1998_s_1	0.026439	0	8	_	act	0.0129487	F
F_fleet_10_YR_1999_s_1	0.030652	0	8	_	act	0.0173246	F
F_fleet_10_YR_2000_s_1	0.031767	0	8	_	act	0.0152738	F

F_fleet_10_YR_2001_s_1	0.02251	0	8	_	act	0.0103005	F
F_fleet_10_YR_2002_s_1	0.044804	0	8	_	act	0.0188048	F
F_fleet_10_YR_2003_s_1	0.017926	0	8	_	act	0.00920873	F
F_fleet_10_YR_2004_s_1	0.017481	0	8	_	act	0.00855254	F
F_fleet_10_YR_2005_s_1	0.012918	0	8	_	act	0.00657462	F
F_fleet_10_YR_2006_s_1	0.006254	0	8	_	act	0.00327658	F
F_fleet_10_YR_2007_s_1	0.01634	0	8	_	act	0.0093504	F
F_fleet_10_YR_2008_s_1	1.98E-08	0	8	_	act	3.49319E-05	F
F_fleet_10_YR_2009_s_1	4.41E-05	0	8	_	act	2.25955E-05	F
F_fleet_10_YR_2010_s_1	0.000626	0	8	_	act	0.000319509	F
F_fleet_10_YR_2011_s_1	0.000265	0	8	_	act	0.000135561	F
F_fleet_10_YR_2012_s_1	0.050213	0	8	_	act	0.027853	F
F_fleet_10_YR_2013_s_1	0.001468	0	8	_	act	0.000746631	F
F_fleet_10_YR_2014_s_1	0.001379	0	8	_	act	0.00070593	F
F_fleet_11_YR_1997_s_1	0.02188	0	8	_	act	0.0109548	F
F_fleet_11_YR_1998_s_1	0.036859	0	8	_	act	0.0186549	F
F_fleet_11_YR_1999_s_1	0.052228	0	8	_	act	0.0265096	F
F_fleet_11_YR_2000_s_1	0.115191	0	8	_	act	0.0570025	F
F_fleet_11_YR_2001_s_1	0.169329	0	8	_	act	0.0830035	F
F_fleet_11_YR_2002_s_1	0.141501	0	8	_	act	0.06433	F
F_fleet_11_YR_2003_s_1	0.088556	0	8	_	act	0.0380399	F
F_fleet_11_YR_2004_s_1	0.064827	0	8	_	act	0.0309139	F
F_fleet_11_YR_2005_s_1	0.082855	0	8	_	act	0.0414487	F
F_fleet_11_YR_2006_s_1	0.059337	0	8	_	act	0.030095	F
F_fleet_11_YR_2007_s_1	0.046088	0	8	_	act	0.0210007	F
F_fleet_11_YR_2008_s_1	0.106786	0	8	_	act	0.0524268	F
F_fleet_11_YR_2009_s_1	0.087835	0	8	_	act	0.0440219	F
F_fleet_11_YR_2010_s_1	0.094227	0	8	_	act	0.0451432	F
F_fleet_11_YR_2011_s_1	0.305229	0	8	_	act	0.161848	F
F_fleet_11_YR_2012_s_1	0.213678	0	8	_	act	0.105847	F
F_fleet_11_YR_2013_s_1	0.341479	0	8	_	act	0.179477	F

F_fleet_11_YR_2014_s_1	0.366975	0	8	_	act	0.191997	F
F_fleet_12_YR_1997_s_1	0.000524	0	8	_	act	0.000262695	F
F_fleet_12_YR_1998_s_1	0.003088	0	8	_	act	0.00154994	F
F_fleet_12_YR_1999_s_1	0.009098	0	8	_	act	0.00454231	F
F_fleet_12_YR_2000_s_1	0.023062	0	8	_	act	0.0112636	F
F_fleet_12_YR_2001_s_1	0.007782	0	8	_	act	0.003884	F
F_fleet_12_YR_2002_s_1	0.006761	0	8	_	act	0.0034285	F
F_fleet_12_YR_2003_s_1	0.022173	0	8	_	act	0.0114033	F
F_fleet_12_YR_2004_s_1	0.155834	0	8	_	act	0.0924196	F
F_fleet_12_YR_2005_s_1	0.129426	0	8	_	act	0.106781	F
F_fleet_12_YR_2006_s_1	0.041158	0	8	_	act	0.0213285	F
F_fleet_12_YR_2007_s_1	0.033513	0	8	_	act	0.0155809	F
F_fleet_12_YR_2008_s_1	0.047346	0	8	_	act	0.0245226	F
F_fleet_12_YR_2009_s_1	0.068274	0	8	_	act	0.0345769	F
F_fleet_12_YR_2010_s_1	0.002079	0	8	_	act	0.00110835	F
F_fleet_12_YR_2011_s_1	0.041683	0	8	_	act	0.0213925	F
F_fleet_12_YR_2012_s_1	0.070437	0	8	_	act	0.036842	F
F_fleet_12_YR_2013_s_1	0.019451	0	8	_	act	0.0100904	F
F_fleet_12_YR_2014_s_1	0.016868	0	8	_	act	0.00866117	F
F_fleet_13_YR_1950_s_1	0.005765	0	8	_	act	0.000940841	F
F_fleet_13_YR_1951_s_1	0.009932	0	8	_	act	0.00162067	F
F_fleet_13_YR_1952_s_1	0.011738	0	8	_	act	0.00191541	F
F_fleet_13_YR_1953_s_1	0.012965	0	8	_	act	0.00211566	F
F_fleet_13_YR_1954_s_1	0.016624	0	8	_	act	0.00271265	F
F_fleet_13_YR_1955_s_1	0.019635	0	8	_	act	0.0032039	F
F_fleet_13_YR_1956_s_1	0.024868	0	8	_	act	0.00405776	F
F_fleet_13_YR_1957_s_1	0.027231	0	8	_	act	0.00444327	F
F_fleet_13_YR_1958_s_1	0.028805	0	8	_	act	0.00470015	F
F_fleet_13_YR_1959_s_1	0.03126	0	8	_	act	0.00510066	F
F_fleet_13_YR_1960_s_1	0.030683	0	8	_	act	0.00500657	F
F_fleet_13_YR_1961_s_1	0.022258	0	8	_	act	0.00363188	F

F_fleet_13_YR_1962_s_1	0.021245	0	8	_	act	0.00346661	F
F_fleet_13_YR_1963_s_1	0.023842	0	8	_	act	0.00389043	F
F_fleet_13_YR_1964_s_1	0.028305	0	8	_	act	0.00461859	F
F_fleet_13_YR_1965_s_1	0.030704	0	8	_	act	0.00500996	F
F_fleet_13_YR_1966_s_1	0.028757	0	8	_	act	0.00469232	F
F_fleet_13_YR_1967_s_1	0.027293	0	8	_	act	0.00445336	F
F_fleet_13_YR_1968_s_1	0.032157	0	8	_	act	0.00524694	F
F_fleet_13_YR_1969_s_1	0.031361	0	8	_	act	0.00511706	F
F_fleet_13_YR_1970_s_1	0.030904	0	8	_	act	0.00504253	F
F_fleet_13_YR_1971_s_1	0.026628	0	8	_	act	0.00434475	F
F_fleet_13_YR_1972_s_1	0.028677	0	8	_	act	0.00435521	F
F_fleet_13_YR_1973_s_1	0.031676	0	8	_	act	0.00511325	F
F_fleet_13_YR_1974_s_1	0.030613	0	8	_	act	0.00494556	F
F_fleet_13_YR_1975_s_1	0.03054	0	8	_	act	0.00493786	F
F_fleet_13_YR_1976_s_1	0.028317	0	8	_	act	0.00457354	F
F_fleet_13_YR_1977_s_1	0.033783	0	8	_	act	0.00543659	F
F_fleet_13_YR_1978_s_1	0.025952	0	8	_	act	0.0042105	F
F_fleet_13_YR_1979_s_1	0.026727	0	8	_	act	0.00433971	F
F_fleet_13_YR_1980_s_1	0.016349	0	8	_	act	0.0026507	F
F_fleet_13_YR_1981_s_1	0.025665	0	8	_	act	0.00411418	F
F_fleet_13_YR_1982_s_1	0.025672	0	8	_	act	0.00414465	F
F_fleet_13_YR_1983_s_1	0.02802	0	8	_	act	0.00454486	F
F_fleet_13_YR_1984_s_1	0.033008	0	8	_	act	0.00537736	F
F_fleet_13_YR_1985_s_1	0.031856	0	8	_	act	0.00519585	F
F_fleet_13_YR_1986_s_1	0.032884	0	8	_	act	0.00532171	F
F_fleet_13_YR_1987_s_1	0.026695	0	8	_	act	0.00435007	F
F_fleet_13_YR_1988_s_1	0.025145	0	8	_	act	0.00408297	F
F_fleet_13_YR_1989_s_1	0.03081	0	8	_	act	0.0049894	F
F_fleet_13_YR_1990_s_1	0.026776	0	8	_	act	0.00432873	F
F_fleet_13_YR_1991_s_1	0.027585	0	8	_	act	0.00445199	F
F_fleet_13_YR_1992_s_1	0.033383	0	8	_	act	0.00539597	F

F_fleet_13_YR_1993_s_1	0.027594	0	8	_	act	0.00445736	F
F_fleet_13_YR_1994_s_1	0.028152	0	8	_	act	0.00451698	F
F_fleet_13_YR_1995_s_1	0.033512	0	8	_	act	0.00531197	F
F_fleet_13_YR_1996_s_1	0.037852	0	8	_	act	0.00602746	F
F_fleet_13_YR_1997_s_1	0.040178	0	8	_	act	0.00642392	F
F_fleet_13_YR_1998_s_1	0.050204	0	8	_	act	0.00799884	F
F_fleet_13_YR_1999_s_1	0.030822	0	8	_	act	0.0048651	F
F_fleet_13_YR_2000_s_1	0.026377	0	8	_	act	0.0041871	F
F_fleet_13_YR_2001_s_1	0.029709	0	8	_	act	0.00473729	F
F_fleet_13_YR_2002_s_1	0.036013	0	8	_	act	0.00574427	F
F_fleet_13_YR_2003_s_1	0.029735	0	8	_	act	0.00475214	F
F_fleet_13_YR_2004_s_1	0.029427	0	8	_	act	0.00466202	F
F_fleet_13_YR_2005_s_1	0.02441	0	8	_	act	0.00385064	F
F_fleet_13_YR_2006_s_1	0.016135	0	8	_	act	0.00259442	F
F_fleet_13_YR_2007_s_1	0.012131	0	8	_	act	0.00196523	F
F_fleet_13_YR_2008_s_1	0.007878	0	8	_	act	0.00127856	F
F_fleet_13_YR_2009_s_1	0.012226	0	8	_	act	0.00198799	F
F_fleet_13_YR_2010_s_1	0.007605	0	8	_	act	0.00123439	F
F_fleet_13_YR_2011_s_1	0.009492	0	8	_	act	0.00154009	F
F_fleet_13_YR_2012_s_1	0.009345	0	8	_	act	0.00151315	F
F_fleet_13_YR_2013_s_1	0.010872	0	8	_	act	0.00176249	F
F_fleet_13_YR_2014_s_1	0.010878	0	8	_	act	0.0017751	F
F_fleet_14_YR_1946_s_1	0.002525	0	8	_	act	0.000385254	F
F_fleet_14_YR_1947_s_1	0.012939	0	8	_	act	0.00197368	F
F_fleet_14_YR_1948_s_1	0.034036	0	8	_	act	0.00519324	F
F_fleet_14_YR_1949_s_1	0.055024	0	8	_	act	0.00839872	F
F_fleet_14_YR_1950_s_1	0.066463	0	8	_	act	0.0101471	F
F_fleet_14_YR_1951_s_1	0.069898	0	8	_	act	0.0106726	F
F_fleet_14_YR_1952_s_1	0.082526	0	8	_	act	0.0126039	F
F_fleet_14_YR_1953_s_1	0.08048	0	8	_	act	0.0122915	F
F_fleet_14_YR_1954_s_1	0.106237	0	8	_	act	0.0162324	F

F_fleet_14_YR_1955_s_1	0.087627	0	8	_	act	0.0133849	F
F_fleet_14_YR_1956_s_1	0.114385	0	8	_	act	0.0174792	F
F_fleet_14_YR_1957_s_1	0.143475	0	8	_	act	0.021933	F
F_fleet_14_YR_1958_s_1	0.221569	0	8	_	act	0.0339016	F
F_fleet_14_YR_1959_s_1	0.236783	0	8	_	act	0.0362336	F
F_fleet_14_YR_1960_s_1	0.242429	0	8	_	act	0.0370992	F
F_fleet_14_YR_1961_s_1	0.19334	0	8	_	act	0.029571	F
F_fleet_14_YR_1962_s_1	0.188029	0	8	_	act	0.0287554	F
F_fleet_14_YR_1963_s_1	0.218175	0	8	_	act	0.0333735	F
F_fleet_14_YR_1964_s_1	0.198967	0	8	_	act	0.0304255	F
F_fleet_14_YR_1965_s_1	0.228056	0	8	_	act	0.0348789	F
F_fleet_14_YR_1966_s_1	0.239071	0	8	_	act	0.036564	F
F_fleet_14_YR_1967_s_1	0.301117	0	8	_	act	0.0460738	F
F_fleet_14_YR_1968_s_1	0.261387	0	8	_	act	0.0399821	F
F_fleet_14_YR_1969_s_1	0.349495	0	8	_	act	0.0535011	F
F_fleet_14_YR_1970_s_1	0.315727	0	8	_	act	0.0483319	F
F_fleet_14_YR_1971_s_1	0.329823	0	8	_	act	0.0504635	F
F_fleet_14_YR_1972_s_1	0.35526	0	8	_	act	0.0496471	F
F_fleet_14_YR_1973_s_1	0.282494	0	8	_	act	0.0419625	F
F_fleet_14_YR_1974_s_1	0.283553	0	8	_	act	0.0430428	F
F_fleet_14_YR_1975_s_1	0.266683	0	8	_	act	0.040268	F
F_fleet_14_YR_1976_s_1	0.310537	0	8	_	act	0.0468111	F
F_fleet_14_YR_1977_s_1	0.266007	0	8	_	act	0.0401537	F
F_fleet_14_YR_1978_s_1	0.311162	0	8	_	act	0.0469782	F
F_fleet_14_YR_1979_s_1	0.319165	0	8	_	act	0.0473628	F
F_fleet_14_YR_1980_s_1	0.196513	0	8	_	act	0.0293525	F
F_fleet_14_YR_1981_s_1	0.297679	0	8	_	act	0.0436352	F
F_fleet_14_YR_1982_s_1	0.31532	0	8	_	act	0.0475672	F
F_fleet_14_YR_1983_s_1	0.252092	0	8	_	act	0.0381631	F
F_fleet_14_YR_1984_s_1	0.322559	0	8	_	act	0.0488522	F
F_fleet_14_YR_1985_s_1	0.301414	0	8	_	act	0.0441797	F

F_fleet_14_YR_1986_s_1	0.410454	0	8	_	act	0.0591194	F
F_fleet_14_YR_1987_s_1	0.381447	0	8	_	act	0.0520412	F
F_fleet_14_YR_1988_s_1	0.364508	0	8	_	act	0.0494831	F
F_fleet_14_YR_1989_s_1	0.335291	0	8	_	act	0.0455878	F
F_fleet_14_YR_1990_s_1	0.360786	0	8	_	act	0.0524559	F
F_fleet_14_YR_1991_s_1	0.424363	0	8	_	act	0.0590632	F
F_fleet_14_YR_1992_s_1	0.361136	0	8	_	act	0.0462462	F
F_fleet_14_YR_1993_s_1	0.353959	0	8	_	act	0.0450514	F
F_fleet_14_YR_1994_s_1	0.340653	0	8	_	act	0.0477979	F
F_fleet_14_YR_1995_s_1	0.348753	0	8	_	act	0.0541303	F
F_fleet_14_YR_1996_s_1	0.349537	0	8	_	act	0.0531712	F
F_fleet_14_YR_1997_s_1	0.471623	0	8	_	act	0.0736116	F
F_fleet_14_YR_1998_s_1	0.423384	0	8	_	act	0.0671187	F
F_fleet_14_YR_1999_s_1	0.430568	0	8	_	act	0.0711214	F
F_fleet_14_YR_2000_s_1	0.519669	0	8	_	act	0.0891858	F
F_fleet_14_YR_2001_s_1	0.453553	0	8	_	act	0.069515	F
F_fleet_14_YR_2002_s_1	0.498113	0	8	_	act	0.0720663	F
F_fleet_14_YR_2003_s_1	0.362994	0	8	_	act	0.0511046	F
F_fleet_14_YR_2004_s_1	0.299406	0	8	_	act	0.0400972	F
F_fleet_14_YR_2005_s_1	0.23687	0	8	_	act	0.0338957	F
F_fleet_14_YR_2006_s_1	0.205114	0	8	_	act	0.0325282	F
F_fleet_14_YR_2007_s_1	0.158312	0	8	_	act	0.0245143	F
F_fleet_14_YR_2008_s_1	0.108627	0	8	_	act	0.0164135	F
F_fleet_14_YR_2009_s_1	0.135574	0	8	_	act	0.0210093	F
F_fleet_14_YR_2010_s_1	0.126595	0	8	_	act	0.0190615	F
F_fleet_14_YR_2011_s_1	0.161129	0	8	_	act	0.0247782	F
F_fleet_14_YR_2012_s_1	0.127368	0	8	_	act	0.0193487	F
F_fleet_14_YR_2013_s_1	0.139112	0	8	_	act	0.0210201	F
F_fleet_14_YR_2014_s_1	0.139345	0	8	_	act	0.0212494	F
LnQ_base_13_Shr_E	3.66854	-10	20	1	OK	0.104874	No_prior
LnQ_base_14_Shr_W	1.36584	-10	20	1	OK	0.0873474	No_prior

AgeSel_1P_3_HL_E	2.74284	-5	5	1	OK	0.339367	Normal
AgeSel_1P_4_HL_E	0.628379	-5	5	1	OK	0.0593312	Normal
AgeSel_1P_5_HL_E	0.230961	-5	5	0	OK	0.0539899	Normal
AgeSel_1P_6_HL_E	0.100293	-5	5	0	OK	0.0796189	Normal
AgeSel_1P_7_HL_E	-0.04954	-5	5	0	OK	0.125291	Normal
AgeSel_1P_8_HL_E	-0.02966	-5	5	0	OK	0.188386	Normal
AgeSel_1P_9_HL_E	-0.6143	-5	5	0	OK	0.310574	Normal
AgeSel_1P_10_HL_E	-0.35883	-5	5	0	OK	0.429024	Normal
AgeSel_1P_11_HL_E	-1.39991	-5	5	0	OK	0.422919	Normal
AgeSel_2P_3_HL_W	1.41882	-5	5	1	OK	0.268952	Normal
AgeSel_2P_4_HL_W	1.12905	-5	5	1	OK	0.0842607	Normal
AgeSel_2P_5_HL_W	0.137175	-5	5	0	OK	0.0508034	Normal
AgeSel_2P_6_HL_W	-0.2423	-5	5	0	OK	0.0657303	Normal
AgeSel_2P_7_HL_W	-0.38227	-5	5	0	OK	0.09569	Normal
AgeSel_2P_8_HL_W	-0.34994	-5	5	0	OK	0.139122	Normal
AgeSel_2P_9_HL_W	-0.50049	-5	5	0	OK	0.201455	Normal
AgeSel_2P_10_HL_W	-0.90351	-5	5	0	OK	0.327941	Normal
AgeSel_2P_11_HL_W	-1.13072	-5	5	0	OK	0.344366	Normal
AgeSel_3P_3_LL_E	-0.39266	-5	5	1	OK	0.255281	Normal
AgeSel_3P_4_LL_E	1.26702	-5	5	1	OK	0.197522	Normal
AgeSel_3P_5_LL_E	1.50214	-5	5	0	OK	0.0900088	Normal
AgeSel_3P_6_LL_E	0.756302	-5	5	0	OK	0.0802104	Normal
AgeSel_3P_7_LL_E	0.393355	-5	5	0	OK	0.0984932	Normal
AgeSel_3P_8_LL_E	-0.22203	-5	5	0	OK	0.140654	Normal
AgeSel_3P_9_LL_E	-0.42596	-5	5	0	OK	0.221462	Normal
AgeSel_3P_10_LL_E	-0.18976	-5	5	0	OK	0.297253	Normal
AgeSel_3P_11_LL_E	-0.80778	-5	5	0	OK	0.286632	Normal
AgeSel_4P_3_LL_W	2.15022	-5	5	1	OK	0.646731	Normal
AgeSel_4P_4_LL_W	0.380096	-5	5	1	OK	0.224368	Normal
AgeSel_4P_5_LL_W	0.657071	-5	5	0	OK	0.13864	Normal
AgeSel_4P_6_LL_W	0.892763	-5	5	0	OK	0.115267	Normal

AgeSel_4P_7_LL_W	0.247947	-5	5	0	OK	0.105731	Normal
AgeSel_4P_8_LL_W	0.33796	-5	5	0	OK	0.107591	Normal
AgeSel_4P_9_LL_W	0.200575	-5	5	0	OK	0.107633	Normal
AgeSel_4P_10_LL_W	-0.23509	-5	5	0	OK	0.119221	Normal
AgeSel_4P_11_LL_W	-0.11814	-5	5	0	OK	0.103827	Normal
AgeSel_5P_3_MRIP_E	2.16898	-5	5	1	OK	0.149277	Normal
AgeSel_5P_4_MRIP_E	0.077148	-5	5	1	OK	0.0446857	Normal
AgeSel_5P_5_MRIP_E	-0.21506	-5	5	0	OK	0.0479172	Normal
AgeSel_5P_6_MRIP_E	-0.30242	-5	5	0	OK	0.0873945	Normal
AgeSel_5P_7_MRIP_E	-0.33515	-5	5	0	OK	0.155954	Normal
AgeSel_5P_8_MRIP_E	-0.22022	-5	5	0	OK	0.247577	Normal
AgeSel_5P_9_MRIP_E	-0.98584	-5	5	0	OK	0.449398	Normal
AgeSel_5P_10_MRIP_E	-0.24562	-5	5	0	OK	0.626895	Normal
AgeSel_5P_11_MRIP_E	-1.66145	-5	5	0	OK	0.6211	Normal
AgeSel_6P_3_MRIP_W	3.46047	-5	5	1	OK	0.26569	Normal
AgeSel_6P_4_MRIP_W	-0.30212	-5	5	1	OK	0.0560145	Normal
AgeSel_6P_5_MRIP_W	-0.7695	-5	5	0	OK	0.0651728	Normal
AgeSel_6P_6_MRIP_W	-0.62781	-5	5	0	OK	0.110329	Normal
AgeSel_6P_7_MRIP_W	-0.28893	-5	5	0	OK	0.164465	Normal
AgeSel_6P_8_MRIP_W	-0.46022	-5	5	0	OK	0.23212	Normal
AgeSel_6P_9_MRIP_W	-0.48681	-5	5	0	OK	0.330669	Normal
AgeSel_6P_10_MRIP_W	-0.86697	-5	5	0	OK	0.508583	Normal
AgeSel_6P_11_MRIP_W	-1.01905	-5	5	0	OK	0.542304	Normal
AgeSel_7P_3_HBT_E	3.04002	-5	5	1	OK	0.120717	Normal
AgeSel_7P_4_HBT_E	0.371247	-5	5	1	OK	0.053171	Normal
AgeSel_7P_5_HBT_E	-0.26089	-5	5	0	OK	0.0578504	Normal
AgeSel_7P_6_HBT_E	-0.61856	-5	5	0	OK	0.114944	Normal
AgeSel_7P_7_HBT_E	-0.37112	-5	5	0	OK	0.217731	Normal
AgeSel_7P_8_HBT_E	-0.20894	-5	5	0	OK	0.3608	Normal
AgeSel_7P_9_HBT_E	-0.36816	-5	5	0	OK	0.569259	Normal
AgeSel_7P_10_HBT_E	-0.44893	-5	5	0	OK	0.832084	Normal

AgeSel_7P_11_HBT_E	-2.10918	-5	5	0	OK	0.967224	Normal
AgeSel_8P_3_HBT_W	4.75867	-5	5	1	OK	0.545671	Normal
AgeSel_8P_4_HBT_W	-0.06666	-5	5	1	OK	0.0601175	Normal
AgeSel_8P_5_HBT_W	-0.50423	-5	5	0	OK	0.0606672	Normal
AgeSel_8P_6_HBT_W	-0.54233	-5	5	0	OK	0.0928317	Normal
AgeSel_8P_7_HBT_W	-0.39172	-5	5	0	OK	0.140457	Normal
AgeSel_8P_8_HBT_W	-0.62486	-5	5	0	OK	0.217532	Normal
AgeSel_8P_9_HBT_W	-0.49517	-5	5	0	OK	0.324398	Normal
AgeSel_8P_10_HBT_W	-0.79475	-5	5	0	OK	0.485558	Normal
AgeSel_8P_11_HBT_W	-0.94547	-5	5	0	OK	0.501349	Normal
AgeSel_9P_2_C_Clsd_E	2.04788	-5	5	1	OK	1.40005	Normal
AgeSel_9P_3_C_Clsd_E	3.48799	-5	5	1	OK	0.254857	Normal
AgeSel_9P_4_C_Clsd_E	1.33989	-5	5	1	OK	0.0977261	Normal
AgeSel_9P_5_C_Clsd_E	0.357501	-5	5	0	OK	0.087443	Normal
AgeSel_9P_6_C_Clsd_E	0.109934	-5	5	0	OK	0.118582	Normal
AgeSel_9P_7_C_Clsd_E	0.031813	-5	5	0	OK	0.127603	Normal
AgeSel_9P_8_C_Clsd_E	-0.21862	-5	5	0	OK	0.180482	Normal
AgeSel_9P_9_C_Clsd_E	-0.50319	-5	5	0	OK	0.287948	Normal
AgeSel_9P_10_C_Clsd_E	-0.67185	-5	5	0	OK	0.4933	Normal
AgeSel_9P_11_C_Clsd_E	-1.25476	-5	5	0	OK	0.627532	Normal
AgeSel_10P_2_C_Clsd_W	1.352	-5	5	1	OK	1.72843	Normal
AgeSel_10P_3_C_Clsd_W	4.20862	-5	5	1	OK	0.73103	Normal
AgeSel_10P_4_C_Clsd_W	1.36045	-5	5	1	OK	0.211432	Normal
AgeSel_10P_5_C_Clsd_W	0.606427	-5	5	0	OK	0.162634	Normal
AgeSel_10P_6_C_Clsd_W	-0.52195	-5	5	0	OK	0.196418	Normal
AgeSel_10P_7_C_Clsd_W	-0.67993	-5	5	0	OK	0.27495	Normal
AgeSel_10P_8_C_Clsd_W	-0.54397	-5	5	0	OK	0.414265	Normal
AgeSel_10P_9_C_Clsd_W	-0.65487	-5	5	0	OK	0.625208	Normal
AgeSel_10P_10_C_Clsd_W	-0.22957	-5	5	0	OK	0.88467	Normal
AgeSel_10P_11_C_Clsd_W	-0.42664	-5	5	0	OK	0.899189	Normal
AgeSel_13P_2_Shr_E	-3.19851	-20	20	-0.1	OK	0.0465066	Normal

AgeSel_13P_3_Shr_E	-1.14707	-20	20	-0.1	OK	0.143446	Normal
AgeSel_14P_2_Shr_W	-2.72058	-20	20	-0.1	OK	0.0433906	Normal
AgeSel_14P_3_Shr_W	-1.39153	-20	20	-0.1	OK	0.133335	Normal
AgeSel_15P_2_Video_E	1.56585	-5	5	1	OK	1.51702	Normal
AgeSel_15P_3_Video_E	2.41346	-5	5	1	OK	0.385978	Normal
AgeSel_15P_4_Video_E	1.25889	-5	5	1	OK	0.216741	Normal
AgeSel_15P_5_Video_E	0.134392	-5	5	0	OK	0.177734	Normal
AgeSel_15P_6_Video_E	0.059179	-5	5	0	OK	0.189715	Normal
AgeSel_15P_7_Video_E	0.19862	-5	5	0	OK	0.221133	Normal
AgeSel_15P_8_Video_E	-0.05617	-5	5	0	OK	0.289426	Normal
AgeSel_15P_9_Video_E	-0.27732	-5	5	0	OK	0.439225	Normal
AgeSel_15P_10_Video_E	-0.28354	-5	5	0	OK	0.654866	Normal
AgeSel_15P_11_Video_E	0.071125	-5	5	0	OK	0.694975	Normal
AgeSel_16P_2_Video_W	1.60709	-5	5	1	OK	1.58812	Normal
AgeSel_16P_3_Video_W	4.05221	-5	5	1	OK	0.552002	Normal
AgeSel_16P_4_Video_W	1.15401	-5	5	1	OK	0.178284	Normal
AgeSel_16P_5_Video_W	0.132721	-5	5	0	OK	0.153661	Normal
AgeSel_16P_6_Video_W	-0.07556	-5	5	0	OK	0.181858	Normal
AgeSel_16P_7_Video_W	-0.26812	-5	5	0	OK	0.232191	Normal
AgeSel_16P_8_Video_W	-0.36894	-5	5	0	OK	0.317132	Normal
AgeSel_16P_9_Video_W	-0.36583	-5	5	0	OK	0.45316	Normal
AgeSel_16P_10_Video_W	-0.27104	-5	5	0	OK	0.619709	Normal
AgeSel_16P_11_Video_W	-0.42764	-5	5	0	OK	0.601915	Normal
AgeSel_19P_2_Sum_E	1.00922	-20	20	-0.1	OK	0.107332	Normal
AgeSel_19P_3_Sum_E	-0.05001	-20	20	-0.1	OK	0.061383	Normal
AgeSel_19P_4_Sum_E	-10.0163	-50	0	-10	OK	0.991591	Normal
AgeSel_20P_2_Sum_W	1.21662	-20	20	-0.1	OK	0.0626495	Normal
AgeSel_20P_3_Sum_W	-0.9362	-20	20	-0.1	OK	0.0477804	Normal
AgeSel_20P_4_Sum_W	-10.028	-50	0	-10	OK	0.984663	Normal
AgeSel_21P_2_Fall_E	-3.68479	-20	20	-0.1	OK	0.0501128	Normal
AgeSel_21P_3_Fall_E	0.770008	-20	20	-0.1	OK	0.0772472	Normal

AgeSel_22P_2_Fall_W	-3.40155	-20	20	-0.1	OK	0.0433853	Normal
AgeSel_22P_3_Fall_W	-0.69039	-20	20	-0.1	OK	0.105398	Normal
AgeSel_23P_1_BLL_W	5.6726	4	18	12	OK	0.132643	No_prior
AgeSel_23P_2_BLL_W	1.75045	-5	5	2	OK	0.0863234	Normal
AgeSel_25P_2_ROV_E	2.96102	-5	5	1	OK	1.1654	Normal
AgeSel_25P_3_ROV_E	1.95476	-5	5	1	OK	0.163904	Normal
AgeSel_25P_4_ROV_E	0.781845	-5	5	1	OK	0.117871	Normal
AgeSel_25P_5_ROV_E	-0.33262	-5	5	0	OK	0.124771	Normal
AgeSel_25P_6_ROV_E	-0.15473	-5	5	0	OK	0.165581	Normal
AgeSel_25P_7_ROV_E	0.003163	-5	5	0	OK	0.221503	Normal
AgeSel_25P_8_ROV_E	-0.16041	-5	5	0	OK	0.312345	Normal
AgeSel_25P_9_ROV_E	-0.24763	-5	5	0	OK	0.477697	Normal
AgeSel_25P_10_ROV_E	-0.17825	-5	5	0	OK	0.684091	Normal
AgeSel_25P_11_ROV_E	0.681107	-5	5	0	OK	0.651088	Normal
Retain_1P_1_HL_E_BLK1repl_2007	28.635	10	100	33.02	OK	0.787217	No_prior
Retain_1P_3_HL_E_BLK1repl_2007	0.43485	0	1	0.5	OK	0.0457056	No_prior
Retain_2P_1_HL_W_BLK1repl_2007	36.5898	10	100	33.02	OK	0.671018	No_prior
Retain_2P_3_HL_W_BLK1repl_2007	0.876462	0	1	0.5	OK	0.0216365	No_prior
Retain_3P_1_LL_E_BLK1repl_2007	7.51261	6	100	33.02	OK	30.3494	No_prior
Retain_3P_3_LL_E_BLK1repl_2007	0.437563	0	1	0.5	OK	0.0468947	No_prior
Retain_7P_1_HBT_E_BLK2repl_2000	38.1543	10	100	40.64	OK	0.327145	No_prior
Retain_7P_3_HBT_E_BLK2repl_2000	0.476555	0	1	0.5	OK	0.0350436	No_prior
AgeSel_1P_3_HL_E_BLK3repl_2007	2.42599	-5	5	1	OK	0.118833	Normal
AgeSel_1P_4_HL_E_BLK3repl_2007	0.986265	-5	5	1	OK	0.0638092	Normal
AgeSel_1P_5_HL_E_BLK3repl_2007	0.271934	-5	5	0	OK	0.0562636	Normal
AgeSel_1P_6_HL_E_BLK3repl_2007	-0.02346	-5	5	0	OK	0.0692596	Normal
AgeSel_1P_7_HL_E_BLK3repl_2007	-0.07686	-5	5	0	OK	0.0910672	Normal
AgeSel_1P_8_HL_E_BLK3repl_2007	-0.24019	-5	5	0	OK	0.132762	Normal
AgeSel_1P_9_HL_E_BLK3repl_2007	-0.53373	-5	5	0	OK	0.222332	Normal
AgeSel_1P_10_HL_E_BLK3repl_2007	-0.50749	-5	5	0	OK	0.376223	Normal
AgeSel_1P_11_HL_E_BLK3repl_2007	-0.77546	-5	5	0	OK	0.475875	Normal

AgeSel_2P_3_HL_W_BLK3repl_2007	4.68561	-5	5	1	OK	0.219014	Normal
AgeSel_2P_4_HL_W_BLK3repl_2007	1.15791	-5	5	1	OK	0.102055	Normal
AgeSel_2P_5_HL_W_BLK3repl_2007	0.267531	-5	5	0	OK	0.0647507	Normal
AgeSel_2P_6_HL_W_BLK3repl_2007	-0.12505	-5	5	0	OK	0.07091	Normal
AgeSel_2P_7_HL_W_BLK3repl_2007	-0.30005	-5	5	0	OK	0.0938724	Normal
AgeSel_2P_8_HL_W_BLK3repl_2007	-0.45809	-5	5	0	OK	0.133389	Normal
AgeSel_2P_9_HL_W_BLK3repl_2007	-0.41206	-5	5	0	OK	0.194702	Normal
AgeSel_2P_10_HL_W_BLK3repl_2007	-0.48815	-5	5	0	OK	0.290047	Normal
AgeSel_2P_11_HL_W_BLK3repl_2007	-0.83094	-5	5	0	OK	0.306667	Normal
AgeSel_3P_3_LL_E_BLK3repl_2007	2.75146	-5	5	1	OK	0.358413	Normal
AgeSel_3P_4_LL_E_BLK3repl_2007	2.32772	-5	5	1	OK	0.167203	Normal
AgeSel_3P_5_LL_E_BLK3repl_2007	1.4058	-5	5	0	OK	0.078011	Normal
AgeSel_3P_6_LL_E_BLK3repl_2007	0.671677	-5	5	0	OK	0.0605633	Normal
AgeSel_3P_7_LL_E_BLK3repl_2007	0.185174	-5	5	0	OK	0.0672429	Normal
AgeSel_3P_8_LL_E_BLK3repl_2007	-0.09512	-5	5	0	OK	0.0898856	Normal
AgeSel_3P_9_LL_E_BLK3repl_2007	-0.22593	-5	5	0	OK	0.128772	Normal
AgeSel_3P_10_LL_E_BLK3repl_2007	-0.43392	-5	5	0	OK	0.201921	Normal
AgeSel_3P_11_LL_E_BLK3repl_2007	-0.7654	-5	5	0	OK	0.256549	Normal
AgeSel_4P_3_LL_W_BLK3repl_2007	-0.13806	-5	5	1	OK	0.723389	Normal
AgeSel_4P_4_LL_W_BLK3repl_2007	2.60359	-5	5	1	OK	0.618038	Normal
AgeSel_4P_5_LL_W_BLK3repl_2007	1.15226	-5	5	0	OK	0.200827	Normal
AgeSel_4P_6_LL_W_BLK3repl_2007	0.766834	-5	5	0	OK	0.151072	Normal
AgeSel_4P_7_LL_W_BLK3repl_2007	0.840679	-5	5	0	OK	0.130829	Normal
AgeSel_4P_8_LL_W_BLK3repl_2007	0.267721	-5	5	0	OK	0.122149	Normal
AgeSel_4P_9_LL_W_BLK3repl_2007	-0.07527	-5	5	0	OK	0.137266	Normal
AgeSel_4P_10_LL_W_BLK3repl_2007	0.439435	-5	5	0	OK	0.143617	Normal
AgeSel_4P_11_LL_W_BLK3repl_2007	-0.6709	-5	5	0	OK	0.126999	Normal
AgeSel_5P_3_MRIP_E_BLK5repl_2008	1.36248	-5	5	1	OK	0.563623	Normal
AgeSel_5P_3_MRIP_E_BLK5repl_2011	1.46696	-5	5	1	OK	0.899618	Normal
AgeSel_5P_4_MRIP_E_BLK5repl_2008	-0.09777	-5	5	1	OK	0.177331	Normal
AgeSel_5P_4_MRIP_E_BLK5repl_2011	-0.26231	-5	5	1	OK	0.377144	Normal

AgeSel_5P_5_MRIP_E_BLK5repl_2008	0.165099	-5	5	0	OK	0.0953289	Normal
AgeSel_5P_5_MRIP_E_BLK5repl_2011	0.544031	-5	5	0	OK	0.192472	Normal
AgeSel_5P_6_MRIP_E_BLK5repl_2008	-0.18069	-5	5	0	OK	0.121491	Normal
AgeSel_5P_6_MRIP_E_BLK5repl_2011	0.559597	-5	5	0	OK	0.132674	Normal
AgeSel_5P_7_MRIP_E_BLK5repl_2008	-0.22216	-5	5	0	OK	0.203622	Normal
AgeSel_5P_7_MRIP_E_BLK5repl_2011	0.246288	-5	5	0	OK	0.111497	Normal
AgeSel_5P_8_MRIP_E_BLK5repl_2008	-0.38529	-5	5	0	OK	0.372061	Normal
AgeSel_5P_8_MRIP_E_BLK5repl_2011	-0.04864	-5	5	0	OK	0.146909	Normal
AgeSel_5P_9_MRIP_E_BLK5repl_2008	-0.20963	-5	5	0	OK	0.593949	Normal
AgeSel_5P_9_MRIP_E_BLK5repl_2011	-0.261	-5	5	0	OK	0.216702	Normal
AgeSel_5P_10_MRIP_E_BLK5repl_2008	-0.42479	-5	5	0	OK	0.911635	Normal
AgeSel_5P_10_MRIP_E_BLK5repl_2011	-0.70697	-5	5	0	OK	0.377541	Normal
AgeSel_5P_11_MRIP_E_BLK5repl_2008	-1.64075	-5	5	0	OK	1.15744	Normal
AgeSel_5P_11_MRIP_E_BLK5repl_2011	-1.02479	-5	5	0	OK	0.551111	Normal
AgeSel_6P_3_MRIP_W_BLK5repl_2008	0.872286	-5	5	1	OK	0.644971	Normal
AgeSel_6P_3_MRIP_W_BLK5repl_2011	1.91487	-5	5	1	OK	0.739302	Normal
AgeSel_6P_4_MRIP_W_BLK5repl_2008	0.29527	-5	5	1	OK	0.264161	Normal
AgeSel_6P_4_MRIP_W_BLK5repl_2011	-0.46255	-5	5	1	OK	0.23317	Normal
AgeSel_6P_5_MRIP_W_BLK5repl_2008	0.125859	-5	5	0	OK	0.10304	Normal
AgeSel_6P_5_MRIP_W_BLK5repl_2011	0.708917	-5	5	0	OK	0.136572	Normal
AgeSel_6P_6_MRIP_W_BLK5repl_2008	-0.24305	-5	5	0	OK	0.114082	Normal
AgeSel_6P_6_MRIP_W_BLK5repl_2011	-0.19172	-5	5	0	OK	0.118708	Normal
AgeSel_6P_7_MRIP_W_BLK5repl_2008	-0.35698	-5	5	0	OK	0.169316	Normal
AgeSel_6P_7_MRIP_W_BLK5repl_2011	0.032734	-5	5	0	OK	0.132255	Normal
AgeSel_6P_8_MRIP_W_BLK5repl_2008	-1.28839	-5	5	0	OK	0.383794	Normal
AgeSel_6P_8_MRIP_W_BLK5repl_2011	-0.44549	-5	5	0	OK	0.159679	Normal
AgeSel_6P_9_MRIP_W_BLK5repl_2008	-0.98766	-5	5	0	OK	0.736433	Normal
AgeSel_6P_9_MRIP_W_BLK5repl_2011	-0.77499	-5	5	0	OK	0.257325	Normal
AgeSel_6P_10_MRIP_W_BLK5repl_2008	-0.86934	-5	5	0	OK	1.08242	Normal
AgeSel_6P_10_MRIP_W_BLK5repl_2011	-0.90356	-5	5	0	OK	0.474913	Normal
AgeSel_6P_11_MRIP_W_BLK5repl_2008	-0.29697	-5	5	0	OK	1.05524	Normal

AgeSel_6P_11_MRIP_W_BLK5repl_2011	-1.0691	-5	5	0	OK	0.586255	Normal
AgeSel_7P_2_HBT_E_BLK5repl_2008	1.93685	-5	5	1	OK	1.43829	Normal
AgeSel_7P_2_HBT_E_BLK5repl_2011	1.83566	-5	5	1	OK	1.47849	Normal
AgeSel_7P_3_HBT_E_BLK5repl_2008	3.19034	-5	5	1	OK	0.292198	Normal
AgeSel_7P_3_HBT_E_BLK5repl_2011	3.69409	-5	5	1	OK	0.314014	Normal
AgeSel_7P_4_HBT_E_BLK5repl_2008	1.12377	-5	5	1	OK	0.110448	Normal
AgeSel_7P_4_HBT_E_BLK5repl_2011	1.42523	-5	5	1	OK	0.115837	Normal
AgeSel_7P_5_HBT_E_BLK5repl_2008	-0.28284	-5	5	0	OK	0.0842398	Normal
AgeSel_7P_5_HBT_E_BLK5repl_2011	-0.06275	-5	5	0	OK	0.0836277	Normal
AgeSel_7P_6_HBT_E_BLK5repl_2008	-0.37057	-5	5	0	OK	0.131155	Normal
AgeSel_7P_6_HBT_E_BLK5repl_2011	-0.22138	-5	5	0	OK	0.0950914	Normal
AgeSel_7P_7_HBT_E_BLK5repl_2008	-0.38854	-5	5	0	OK	0.227653	Normal
AgeSel_7P_7_HBT_E_BLK5repl_2011	-0.12712	-5	5	0	OK	0.118038	Normal
AgeSel_7P_8_HBT_E_BLK5repl_2008	-0.29893	-5	5	0	OK	0.396118	Normal
AgeSel_7P_8_HBT_E_BLK5repl_2011	-0.2463	-5	5	0	OK	0.163288	Normal
AgeSel_7P_9_HBT_E_BLK5repl_2008	-0.4122	-5	5	0	OK	0.663565	Normal
AgeSel_7P_9_HBT_E_BLK5repl_2011	-0.4673	-5	5	0	OK	0.26251	Normal
AgeSel_7P_10_HBT_E_BLK5repl_2008	-1.621	-5	5	0	OK	1.02932	Normal
AgeSel_7P_10_HBT_E_BLK5repl_2011	-0.60225	-5	5	0	OK	0.341872	Normal
AgeSel_8P_3_HBT_W_BLK5repl_2008	-1.02097	-5	5	1	OK	0.99042	Normal
AgeSel_8P_3_HBT_W_BLK5repl_2011	0.248189	-5	5	1	OK	0.953236	Normal
AgeSel_8P_4_HBT_W_BLK5repl_2008	2.48472	-5	5	1	OK	0.84532	Normal
AgeSel_8P_4_HBT_W_BLK5repl_2011	1.30899	-5	5	1	OK	0.636542	Normal
AgeSel_8P_5_HBT_W_BLK5repl_2008	0.735313	-5	5	0	OK	0.131484	Normal
AgeSel_8P_5_HBT_W_BLK5repl_2011	1.04078	-5	5	0	OK	0.171855	Normal
AgeSel_8P_6_HBT_W_BLK5repl_2008	0.019289	-5	5	0	OK	0.104784	Normal
AgeSel_8P_6_HBT_W_BLK5repl_2011	0.338487	-5	5	0	OK	0.114212	Normal
AgeSel_8P_7_HBT_W_BLK5repl_2008	-0.47735	-5	5	0	OK	0.155021	Normal
AgeSel_8P_7_HBT_W_BLK5repl_2011	-0.03774	-5	5	0	OK	0.112779	Normal
AgeSel_8P_8_HBT_W_BLK5repl_2008	-0.8343	-5	5	0	OK	0.304187	Normal
AgeSel_8P_8_HBT_W_BLK5repl_2011	-0.80896	-5	5	0	OK	0.158143	Normal

AgeSel_8P_9_HBT_W_BLK5repl_2008	-0.31893	-5	5	0	OK	0.475864	Normal
AgeSel_8P_9_HBT_W_BLK5repl_2011	-0.84233	-5	5	0	OK	0.275452	Normal
AgeSel_8P_10_HBT_W_BLK5repl_2008	-1.45437	-5	5	0	OK	0.520984	Normal
AgeSel_8P_10_HBT_W_BLK5repl_2011	-1.78701	-5	5	0	OK	0.434718	Normal

Table 4.6. Summary of annual stock status estimates (gulfwide) for Gulf of Mexico red snapper (F_{MSY} proxy = $F_{SPR26\%}$).

YEAR	F	F/MFMT	SSB	SSB/SSB $_{FSPR26\%}$	SSB/MSST
1872	0.000	0.009	2.87E+12	2.247	2.469
1873	0.001	0.014	2.87E+12	2.244	2.466
1874	0.001	0.021	2.87E+12	2.240	2.462
1875	0.001	0.026	2.86E+12	2.234	2.454
1876	0.002	0.031	2.85E+12	2.225	2.445
1877	0.001	0.026	2.83E+12	2.215	2.434
1878	0.001	0.024	2.82E+12	2.206	2.424
1879	0.001	0.026	2.81E+12	2.197	2.414
1880	0.003	0.056	2.80E+12	2.188	2.404
1881	0.003	0.058	2.78E+12	2.173	2.388
1882	0.003	0.060	2.76E+12	2.157	2.370
1883	0.003	0.063	2.74E+12	2.139	2.351
1884	0.003	0.066	2.71E+12	2.120	2.330
1885	0.003	0.068	2.69E+12	2.100	2.308
1886	0.004	0.071	2.66E+12	2.080	2.286
1887	0.004	0.071	2.63E+12	2.059	2.263
1888	0.003	0.069	2.61E+12	2.039	2.241
1889	0.004	0.076	2.58E+12	2.020	2.220
1890	0.004	0.090	2.56E+12	2.001	2.199
1891	0.004	0.084	2.53E+12	1.979	2.175
1892	0.004	0.089	2.51E+12	1.960	2.153
1893	0.005	0.093	2.48E+12	1.940	2.132
1894	0.005	0.097	2.46E+12	1.920	2.110
1895	0.005	0.096	2.43E+12	1.900	2.088
1896	0.005	0.098	2.41E+12	1.881	2.067
1897	0.005	0.099	2.38E+12	1.862	2.047
1898	0.006	0.115	2.36E+12	1.845	2.027

Table 4.6. (Summary of annual stock status continued).

YEAR	F	F/MFMT	SSB	SSB/SSB $_{FSPR26\%}$	SSB/MSST
1899	0.007	0.133	2.33E+12	1.825	2.005
1900	0.007	0.152	2.31E+12	1.802	1.980
1901	0.008	0.166	2.27E+12	1.775	1.951
1902	0.009	0.179	2.23E+12	1.746	1.919
1903	0.008	0.169	2.19E+12	1.714	1.884
1904	0.008	0.162	2.16E+12	1.684	1.851
1905	0.007	0.150	2.12E+12	1.657	1.821
1906	0.007	0.137	2.09E+12	1.634	1.795
1907	0.006	0.123	2.07E+12	1.614	1.774
1908	0.005	0.111	2.05E+12	1.599	1.758
1909	0.005	0.095	2.03E+12	1.589	1.746
1910	0.004	0.079	2.03E+12	1.583	1.739
1911	0.004	0.078	2.02E+12	1.582	1.739
1912	0.004	0.076	2.03E+12	1.584	1.741
1913	0.004	0.075	2.03E+12	1.589	1.746
1914	0.004	0.075	2.04E+12	1.595	1.753
1915	0.004	0.074	2.05E+12	1.602	1.760
1916	0.004	0.074	2.06E+12	1.610	1.769
1917	0.004	0.072	2.07E+12	1.618	1.778
1918	0.004	0.071	2.08E+12	1.627	1.788
1919	0.004	0.077	2.09E+12	1.636	1.797
1920	0.004	0.082	2.10E+12	1.643	1.805
1921	0.004	0.088	2.11E+12	1.649	1.812
1922	0.005	0.095	2.11E+12	1.652	1.816
1923	0.005	0.102	2.12E+12	1.654	1.817
1924	0.005	0.100	2.12E+12	1.653	1.817
1925	0.005	0.100	2.11E+12	1.652	1.815

Table 4.6. (Summary of annual stock status continued).

YEAR	F	F/MFMT	SSB	SSB/SSB $_{FSPR26\%}$	SSB/MSST
1926	0.005	0.098	2.11E+12	1.649	1.812
1927	0.005	0.110	2.11E+12	1.647	1.810
1928	0.005	0.096	2.10E+12	1.642	1.804
1929	0.005	0.102	2.10E+12	1.639	1.801
1930	0.003	0.070	2.09E+12	1.635	1.797
1931	0.003	0.065	2.09E+12	1.637	1.799
1932	0.003	0.070	2.10E+12	1.641	1.803
1933	0.003	0.065	2.10E+12	1.644	1.807
1934	0.003	0.060	2.11E+12	1.650	1.813
1935	0.004	0.076	2.12E+12	1.657	1.820
1936	0.004	0.089	2.12E+12	1.661	1.825
1937	0.004	0.084	2.13E+12	1.662	1.826
1938	0.005	0.101	2.13E+12	1.662	1.827
1939	0.006	0.113	2.12E+12	1.659	1.823
1940	0.004	0.083	2.11E+12	1.652	1.815
1941	0.004	0.076	2.11E+12	1.649	1.813
1942	0.003	0.060	2.11E+12	1.648	1.811
1943	0.002	0.046	2.11E+12	1.650	1.813
1944	0.002	0.048	2.12E+12	1.655	1.819
1945	0.002	0.039	2.12E+12	1.661	1.825
1946	0.004	0.076	2.13E+12	1.669	1.834
1947	0.007	0.132	2.14E+12	1.672	1.837
1948	0.012	0.237	2.14E+12	1.673	1.839
1949	0.018	0.355	2.14E+12	1.672	1.838
1950	0.026	0.525	2.13E+12	1.666	1.831
1951	0.029	0.579	2.11E+12	1.651	1.815
1952	0.033	0.672	2.08E+12	1.628	1.789

Table 4.6. (Summary of annual stock status continued).

YEAR	F	F/MFMT	SSB	SSB/SSB $_{FSPR26\%}$	SSB/MSST
1953	0.033	0.674	2.04E+12	1.596	1.754
1954	0.040	0.820	2.00E+12	1.560	1.714
1955	0.038	0.777	1.94E+12	1.518	1.668
1956	0.048	0.963	1.88E+12	1.471	1.616
1957	0.055	1.119	1.81E+12	1.415	1.555
1958	0.078	1.579	1.74E+12	1.357	1.491
1959	0.084	1.691	1.64E+12	1.284	1.411
1960	0.087	1.772	1.55E+12	1.208	1.328
1961	0.078	1.572	1.44E+12	1.128	1.239
1962	0.077	1.568	1.34E+12	1.045	1.148
1963	0.084	1.708	1.23E+12	0.961	1.056
1964	0.083	1.683	1.13E+12	0.885	0.972
1965	0.092	1.861	1.03E+12	0.809	0.889
1966	0.094	1.895	9.40E+11	0.735	0.808
1967	0.111	2.255	8.56E+11	0.669	0.735
1968	0.107	2.175	7.72E+11	0.603	0.663
1969	0.126	2.555	6.87E+11	0.537	0.590
1970	0.123	2.488	6.10E+11	0.477	0.524
1971	0.130	2.639	5.37E+11	0.419	0.461
1972	0.134	2.724	4.62E+11	0.361	0.397
1973	0.109	2.206	3.92E+11	0.306	0.337
1974	0.116	2.355	3.41E+11	0.266	0.293
1975	0.121	2.456	3.11E+11	0.243	0.267
1976	0.123	2.487	2.90E+11	0.226	0.249
1977	0.107	2.170	2.63E+11	0.206	0.226
1978	0.121	2.445	2.38E+11	0.186	0.204
1979	0.142	2.884	2.14E+11	0.168	0.184

Table 4.6. (Summary of annual stock status continued).

YEAR	F	F/MFMT	SSB	SSB/SSB $_{FSPR26\%}$	SSB/MSST
1980	0.100	2.030	1.93E+11	0.151	0.166
1981	0.109	2.213	1.69E+11	0.132	0.145
1982	0.108	2.184	1.48E+11	0.116	0.127
1983	0.117	2.378	1.37E+11	0.107	0.117
1984	0.127	2.564	1.28E+11	0.100	0.110
1985	0.140	2.839	1.27E+11	0.099	0.109
1986	0.145	2.945	1.26E+11	0.098	0.108
1987	0.137	2.777	1.20E+11	0.094	0.103
1988	0.137	2.777	1.14E+11	0.089	0.098
1989	0.130	2.624	1.04E+11	0.081	0.089
1990	0.107	2.158	9.84E+10	0.077	0.084
1991	0.137	2.772	1.03E+11	0.080	0.088
1992	0.125	2.527	1.14E+11	0.089	0.098
1993	0.129	2.615	1.25E+11	0.098	0.108
1994	0.121	2.443	1.34E+11	0.105	0.115
1995	0.110	2.223	1.45E+11	0.113	0.125
1996	0.098	1.979	1.57E+11	0.123	0.135
1997	0.137	2.769	1.70E+11	0.133	0.146
1998	0.128	2.603	1.81E+11	0.142	0.156
1999	0.117	2.375	1.97E+11	0.154	0.170
2000	0.128	2.595	2.04E+11	0.160	0.176
2001	0.115	2.338	2.08E+11	0.163	0.179
2002	0.136	2.752	2.14E+11	0.167	0.183
2003	0.111	2.254	2.19E+11	0.171	0.188
2004	0.093	1.892	2.26E+11	0.177	0.194
2005	0.069	1.392	2.29E+11	0.179	0.196
2006	0.059	1.192	2.43E+11	0.190	0.208

Table 4.6. (Summary of annual stock status continued).

YEAR	F	F/MFMT	SSB	SSB/SSB $_{FSPR26\%}$	SSB/MSST
2007	0.048	0.980	2.65E+11	0.207	0.228
2008	0.032	0.658	2.99E+11	0.234	0.257
2009	0.052	1.044	3.64E+11	0.285	0.313
2010	0.041	0.840	4.41E+11	0.345	0.379
2011	0.049	0.999	5.44E+11	0.425	0.467
2012	0.049	1.001	6.23E+11	0.487	0.535
2013	0.049	0.984	6.90E+11	0.540	0.593

Table 4.7. Summary of MSRA benchmarks and references for the Gulf of Mexico red snapper ***SEDAR 31*** assessment.

Criteria	Definition	SEDAR 31
Base M	Fully selected ages of Lorenzen M	0.09
Steepness		0.99
Virgin Recruitment		1.63E+05
SSB Unfished (eggs)		4.72E+12
SPR Target		0.26
Mortality Rate Criteria		
F_{MSY} or Proxy	$F_{SPR26\%}$	0.078
MFMT	$F_{SPR26\%}$	0.078
$F_{Current}$	$F_{2009-2011}$	0.054
$F_{current}$/MFMT		
Biomass Criteria		
SSB_{MSY} or Proxy	Equilibrium SSB @ $F_{SPR26\%}$	1.22E+12
MSST	(1-M)*SSB@$F_{SPR26\%}$	1.11E+12
$SSB_{Current}$	SSB_{2011}	4.46E+11
$SSB_{Current}/SSB_{FSPR26\%}$		0.366
$SSB_{Current/MSST}$		0.400

Table 4.8. Summary of MSRA benchmarks and references for the Gulf of Mexico red snapper ***UPDATE*** assessment.

Criteria	Definition	Update
Base M	Fully selected ages of Lorenzen M	0.09
Steepness		0.99
Virgin Recruitment		1.70E+05
SSB Unfished (eggs)		4.91E+12
SPR Target		0.26
Mortality Rate Criteria		
F_{MSY} or Proxy	$F_{SPR26\%}$	0.0494
MFMT	$F_{SPR26\%}$	0.0494
$F_{Current}$	$F_{2011-2013}$	0.0491
$F_{current}$/MFMT		0.994
Biomass Criteria		
SSB_{MSY} or Proxy	Equilibrium SSB @ $F_{SPR26\%}$	1.28E+12
MSST	(1-M)*SSB@$F_{SPR26\%}$	1.16E+12
$SSB_{Current}$	SSB_{2013}	6.90E+11
$SSB_{Current}/SSB_{FSPR26\%}$		0.540
$SSB_{Current}$/MSST		0.593
OFL	Annual Retained Yield @ $F_{SPR26\%}$	Million LBS (WW)
	2015	16.10
	2016	15.31
	2017	14.79
	2018	14.25
	2019	13.60
	2020	13.17
	2021	12.93
	2022	12.79
	2023	12.77
	2024	12.77
	2025	12.78
	2026	12.78
	2027	12.78
	2028	12.79
	2029	12.79
	2030	12.80
	2031	12.80
	2032	12.80

	Equilibrium	12.91
ABC	Annual Retained Yield (lbs) @ $F_{Rebuild}$	Million LBS (WW)
	2015	14.29
	2016	13.96
	2017	13.75
	2018	13.39
	2019	12.85
	2020	12.49
	2021	12.29
	2022	12.18
	2023	12.17
	2024	12.19
	2025	12.21
	2026	12.22
	2027	12.23
	2028	12.24
	2029	12.25
	2030	12.26
	2031	12.27
	2032	12.27
	2031	12.28
	2032	12.29
	Equilibrium	12.40

Table 4.9. Results of projections at $F_{SPR26\%}$ including recruitment (R in numbers of fish), fishing mortality (F), F/MFMT, spawning biomass (SSB in eggs), SSB/SSB $F_{SPR26\%}$, SSB/MSST, SSB/SSB_0, overfishing limit (OFL, millions of lbs retained) and acceptable biological catch (ABC, millions of lbs retained).

Project $F_{SPR26\%}$

YEAR	R	F	F/MFMT	SSB	$SSB/SSB_{FSPR26\%}$	SSB/MSST	SSB/SSB_0	OFL
2015	167,931	0.053	1.068	8.067E+11	0.630	0.693	0.164	16.10
2016	168,057	0.052	1.057	8.484E+11	0.663	0.729	0.173	15.31
2017	168,180	0.051	1.042	8.938E+11	0.699	0.768	0.182	14.79
2018	168,280	0.051	1.029	9.342E+11	0.730	0.802	0.190	14.25
2019	168,357	0.050	1.019	9.679E+11	0.756	0.831	0.197	13.60
2020	168,420	0.050	1.013	9.972E+11	0.779	0.857	0.203	13.17
2021	168,473	0.050	1.010	1.023E+12	0.800	0.879	0.208	12.93
2022	168,518	0.050	1.008	1.047E+12	0.818	0.899	0.213	12.79
2023	168,557	0.050	1.007	1.068E+12	0.835	0.917	0.217	12.77
2024	168,590	0.050	1.006	1.086E+12	0.849	0.933	0.221	12.77
2025	168,619	0.050	1.006	1.103E+12	0.862	0.947	0.224	12.78
2026	168,643	0.050	1.005	1.117E+12	0.873	0.960	0.227	12.78
2027	168,665	0.050	1.005	1.130E+12	0.884	0.971	0.230	12.78
2028	168,683	0.050	1.004	1.142E+12	0.893	0.981	0.232	12.79
2029	168,701	0.050	1.004	1.153E+12	0.901	0.990	0.235	12.79
2030	168,716	0.050	1.004	1.163E+12	0.909	0.999	0.237	12.80
2031	168,730	0.050	1.003	1.172E+12	0.916	1.007	0.239	12.80
2032	168,743	0.050	1.003	1.181E+12	0.923	1.014	0.240	12.80

Table 4.10. Results of projections at $F_{Rebuild}$ including recruitment (R in numbers of fish), fishing mortality (F), F/MFMT, spawning biomass (SSB in eggs), SSB/SSB $F_{SPR26\%}$, SSB/MSST, SSB/SSB_0, overfishing limit (OFL, millions of lbs retained) and acceptable biological catch (ABC, millions of lbs retained).

Project $F_{Rebuild}$

YEAR	R	F	F/MFMT	SSB	$SSB/SSB_{FSPR26\%}$	SSB/MSST	SSB/SSB_0	ABC
2015	167,931	0.051	1.034	8.067E+11	0.630	0.693	0.164	14.29
2016	168,086	0.051	1.029	8.588E+11	0.671	0.738	0.175	13.96
2017	168,231	0.050	1.018	9.139E+11	0.714	0.785	0.186	13.75
2018	168,347	0.050	1.008	9.635E+11	0.753	0.828	0.196	13.39
2019	168,437	0.049	0.998	1.006E+12	0.786	0.864	0.205	12.85
2020	168,510	0.049	0.992	1.042E+12	0.815	0.895	0.212	12.49
2021	168,571	0.049	0.989	1.075E+12	0.840	0.924	0.219	12.29
2022	168,622	0.049	0.987	1.105E+12	0.864	0.949	0.225	12.18
2023	168,667	0.049	0.986	1.132E+12	0.884	0.972	0.230	12.17
2024	168,705	0.049	0.986	1.155E+12	0.903	0.992	0.235	12.19
2025	168,737	0.049	0.985	1.177E+12	0.920	1.011	0.239	12.21
2026	168,765	0.049	0.984	1.195E+12	0.934	1.027	0.243	12.22
2027	168,789	0.049	0.984	1.212E+12	0.948	1.041	0.247	12.23
2028	168,810	0.049	0.983	1.227E+12	0.959	1.054	0.250	12.24
2029	168,829	0.049	0.983	1.242E+12	0.971	1.067	0.253	12.25
2030	168,847	0.049	0.982	1.255E+12	0.981	1.078	0.255	12.26
2031	168,862	0.049	0.982	1.266E+12	0.990	1.088	0.258	12.27
2032	168,876	0.049	0.982	1.278E+12	0.999	1.097	0.260	12.27

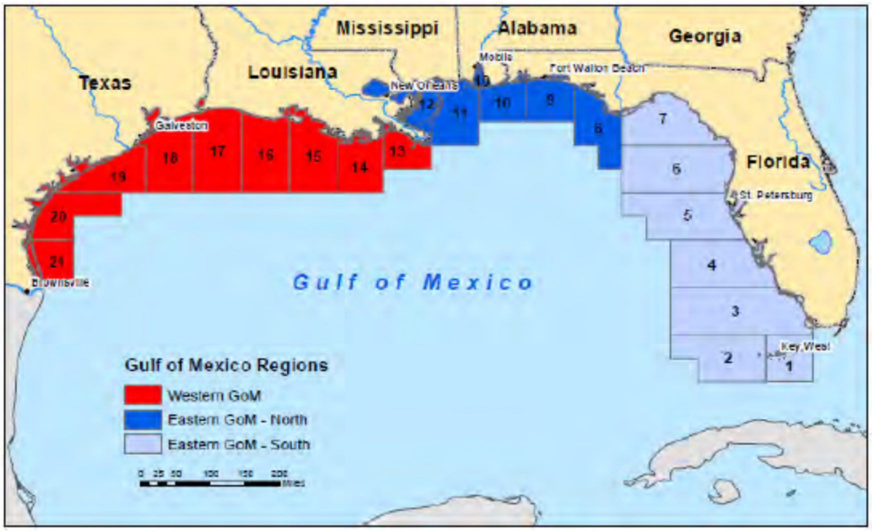


Figure 2.1. Regional designations assumed for red snapper: eastern gulf (grids 1 to 12) and western gulf (grids 13 to 21). Northeastern and southeastern subregions are used only for commercial vertical line landings.

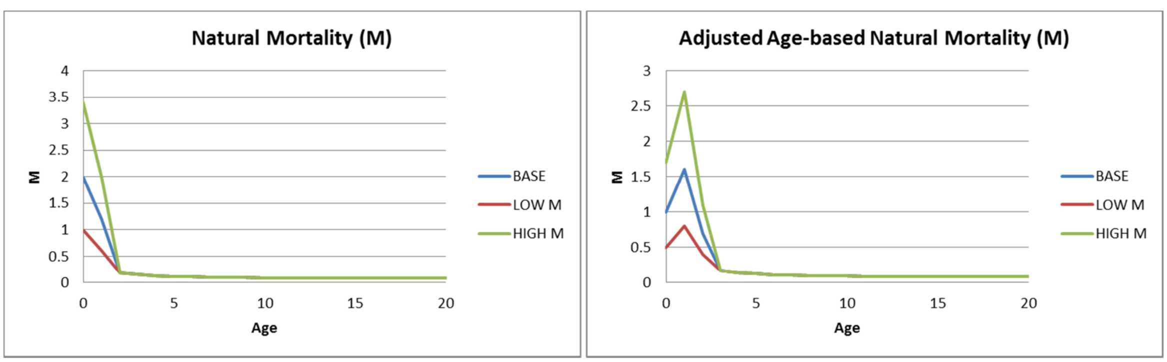


Figure 2.2. Age-specific natural mortality rates (left) and adjusted natural mortality rates (right) for Gulf of Mexico red snapper for three alternative model scenarios: the base, low and high natural mortality. The adjustment accounts for SS advancing age on January 1.

A)

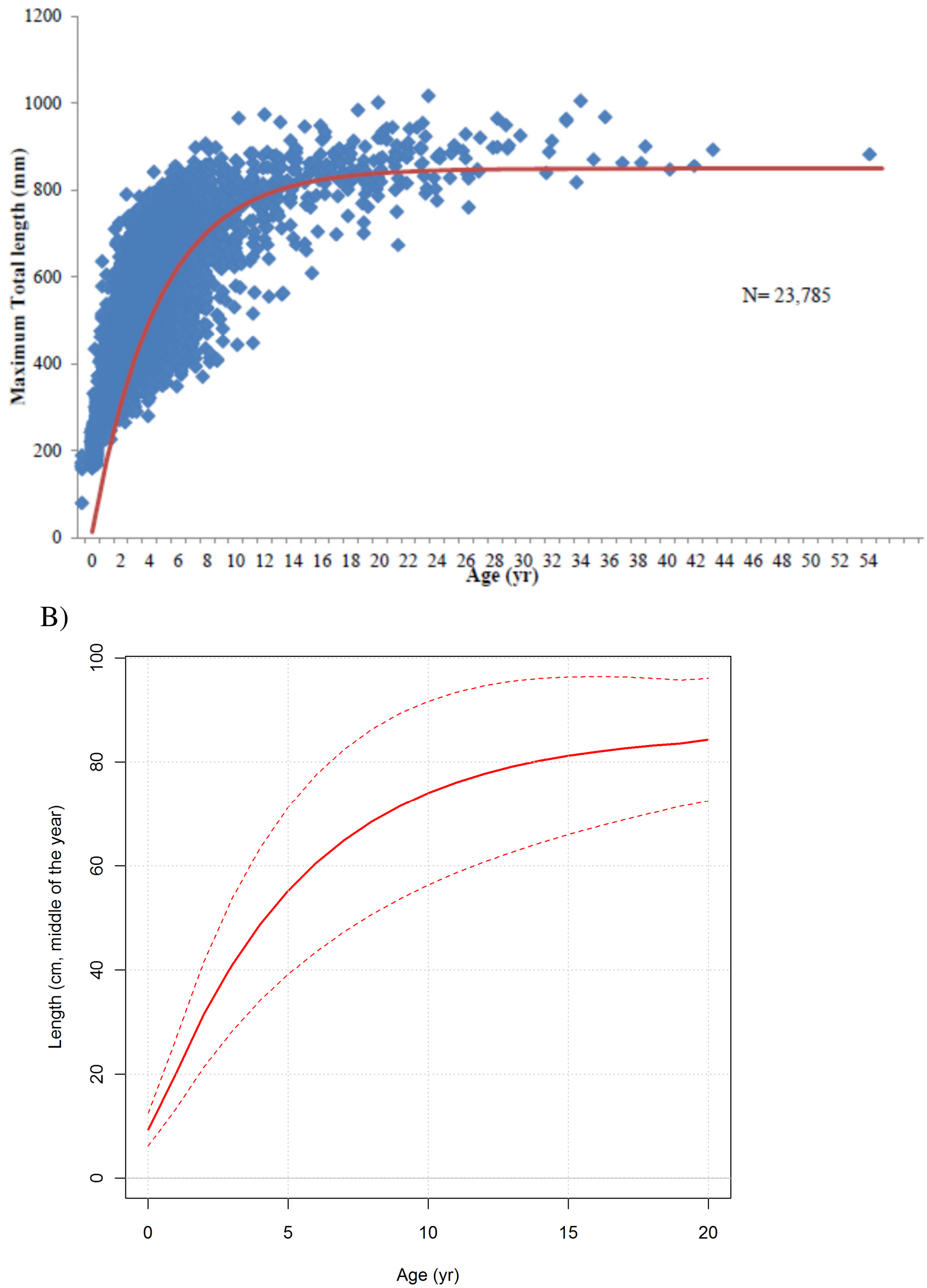


Figure 2.3. (**A**) The initial growth curve fit to readings of the biological age at size and (**B**) the adjusted SS growth curve. The coefficient of variations were modeled as a function of age (dotted lines).

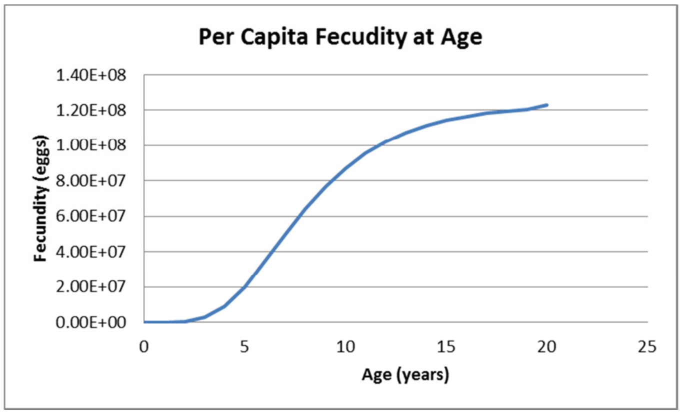


Figure 2.4. Per capita fecundity (eggs) at age.

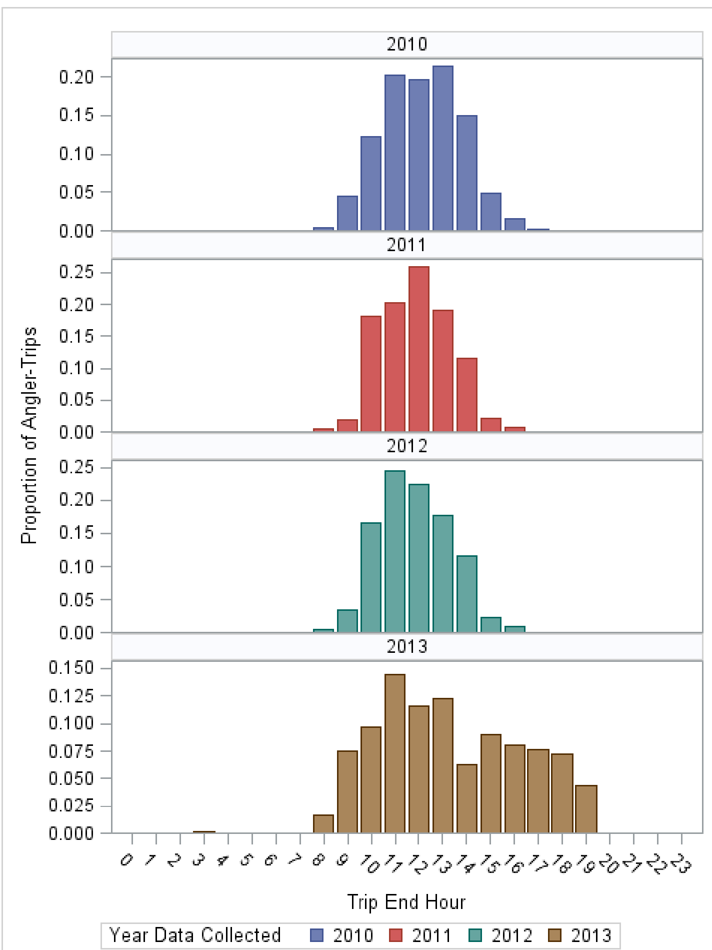


Figure 2.5. Proportion of Alabama private boat trips by time of day. Prior to changes in sampling design (implemented in 2013) afternoon and evening trips were undersampled.

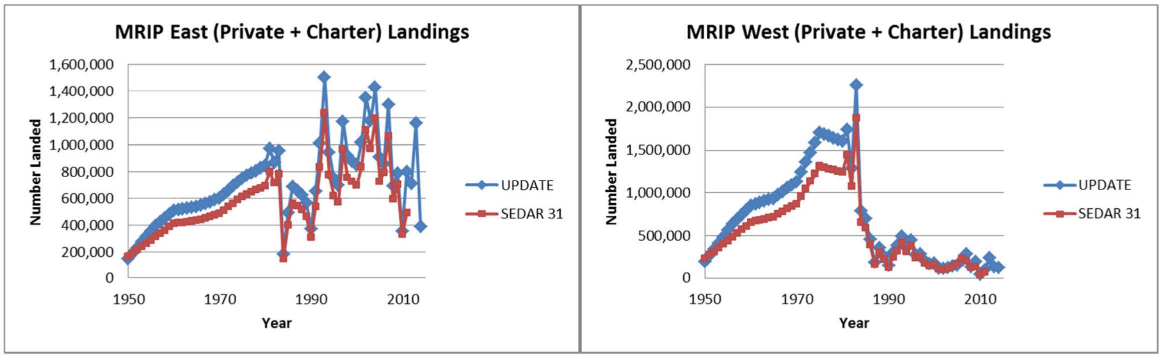


Figure 2.6. Recreational private + charter boat (MRIP) landings 1950-2014. Due to the recent APAIS recalibration, the MRIP estimates for the update assessment (blue) are typically 10-20% higher than the SEDAR 31 estimates (red).

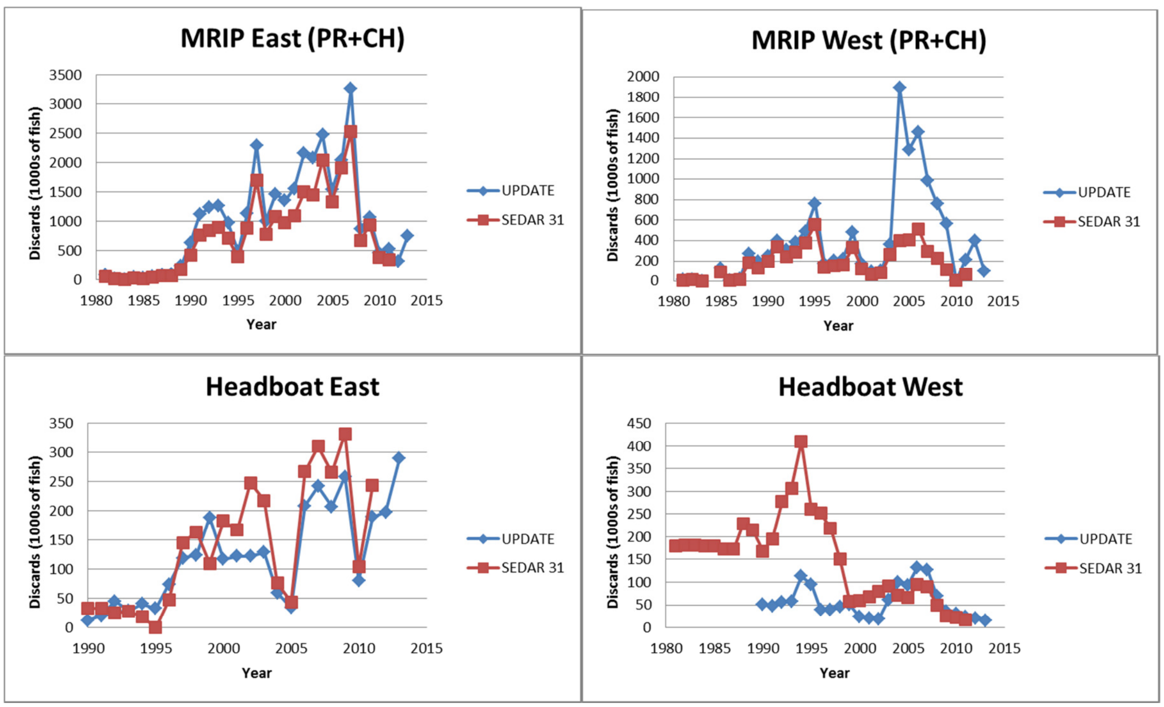


Figure 2.7. Open season recreational discards (in 1000s of fish) by fishing mode and region. The update assessment estimates (blue) are compared to the SEDAR 31 estimates (red).

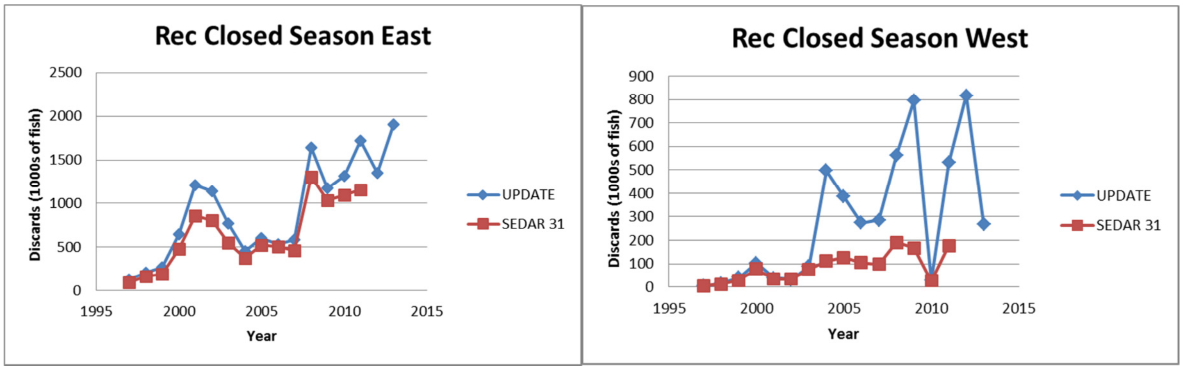


Figure 2.8. Closed season recreational (all modes combined) discards (in 1000s of fish) by region. The update assessment estimates (blue) are compared to the SEDAR 31 estimates (red).

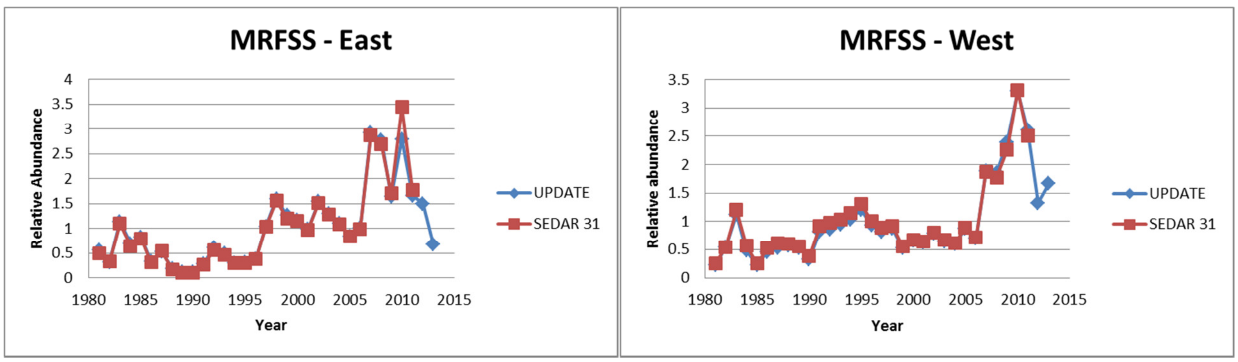


Figure 2.9. MRIP indices of abundance, by region. The update assessment estimates (blue) are compared to the SEDAR 31 estimates (red).

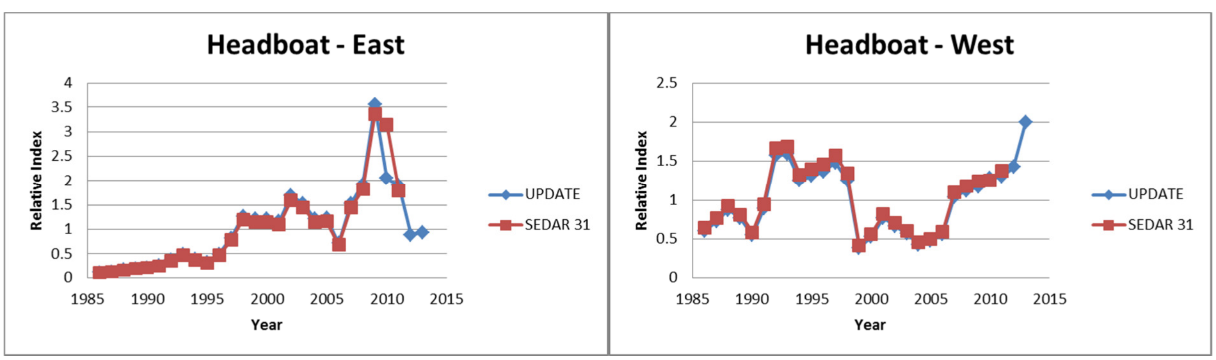


Figure 2.10. Headboat indices of abundance, by region. The update assessment estimates (blue) are compared to the SEDAR 31 estimates (red).

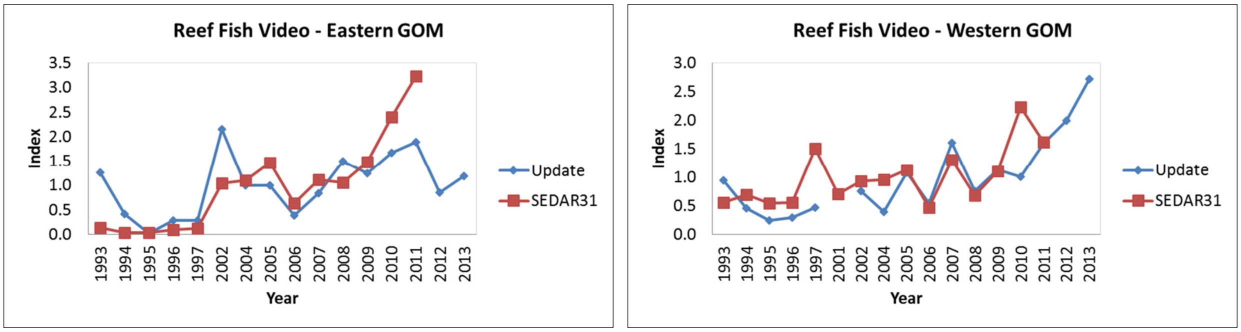


Figure 2.11. Reef Fish Video indices of abundance, by region. The update assessment estimates (blue) are compared to the SEDAR 31 estimates (red).

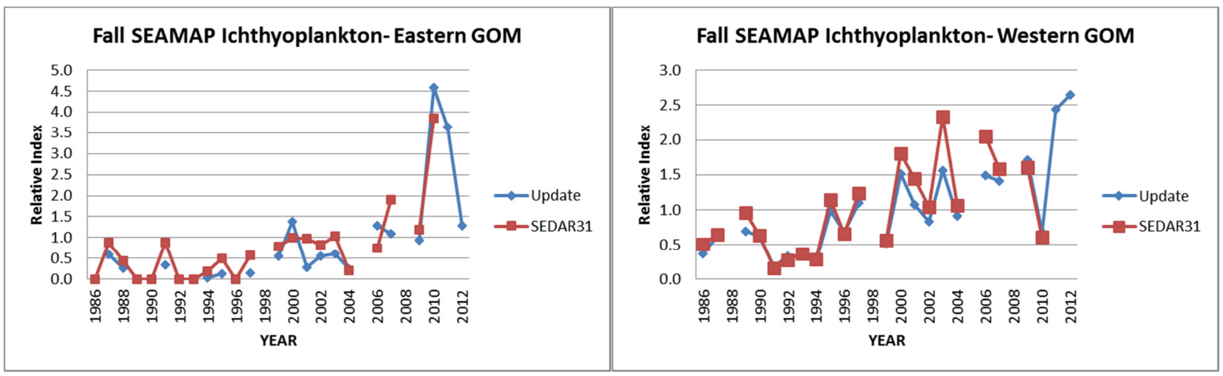


Figure 2.12. SEAMAP Ichthyoplankton (larval survey) indices of abundance, by region. The update assessment estimates (blue) are compared to the SEDAR 31 estimates (red).

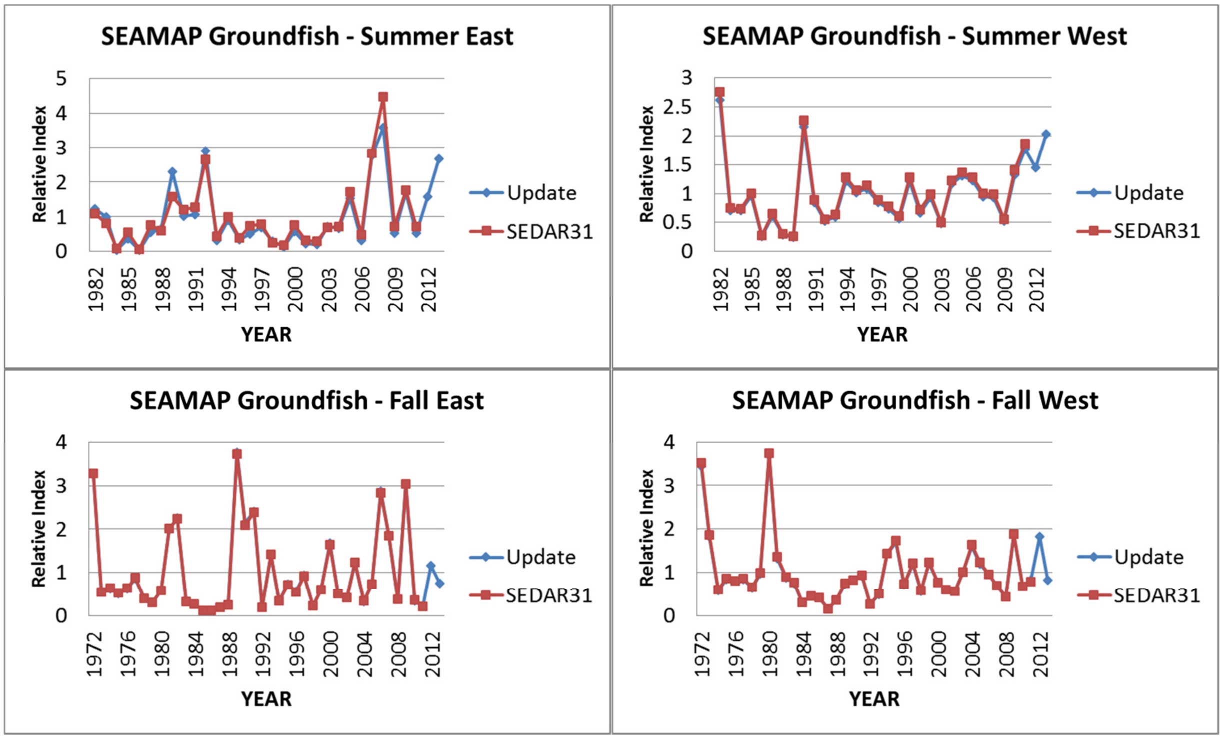


Figure 2.13. SEAMAP Groundfish indices of abundance, by region. The update assessment estimates (blue) are compared to the SEDAR 31 estimates (red).

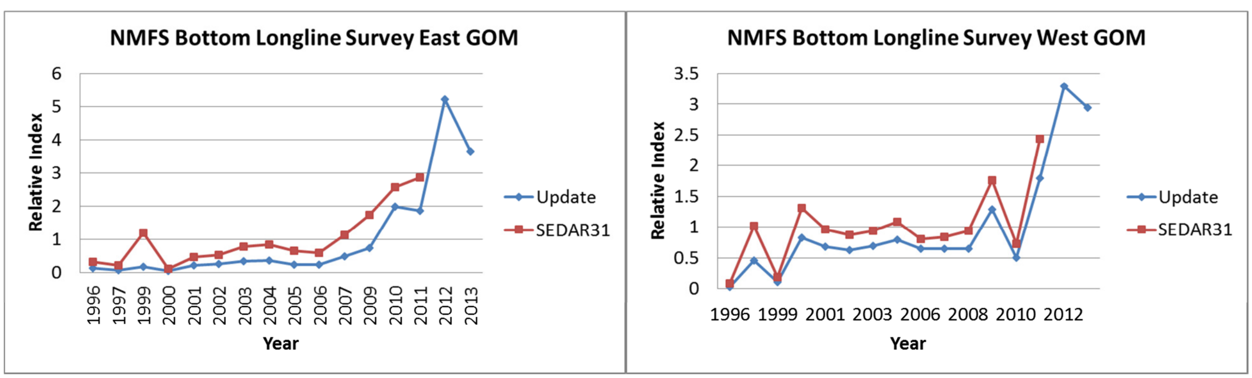


Figure 2.14. NMFS Bottom Longline indices of abundance, by region. The update assessment estimates (blue) are compared to the SEDAR 31 estimates (red).

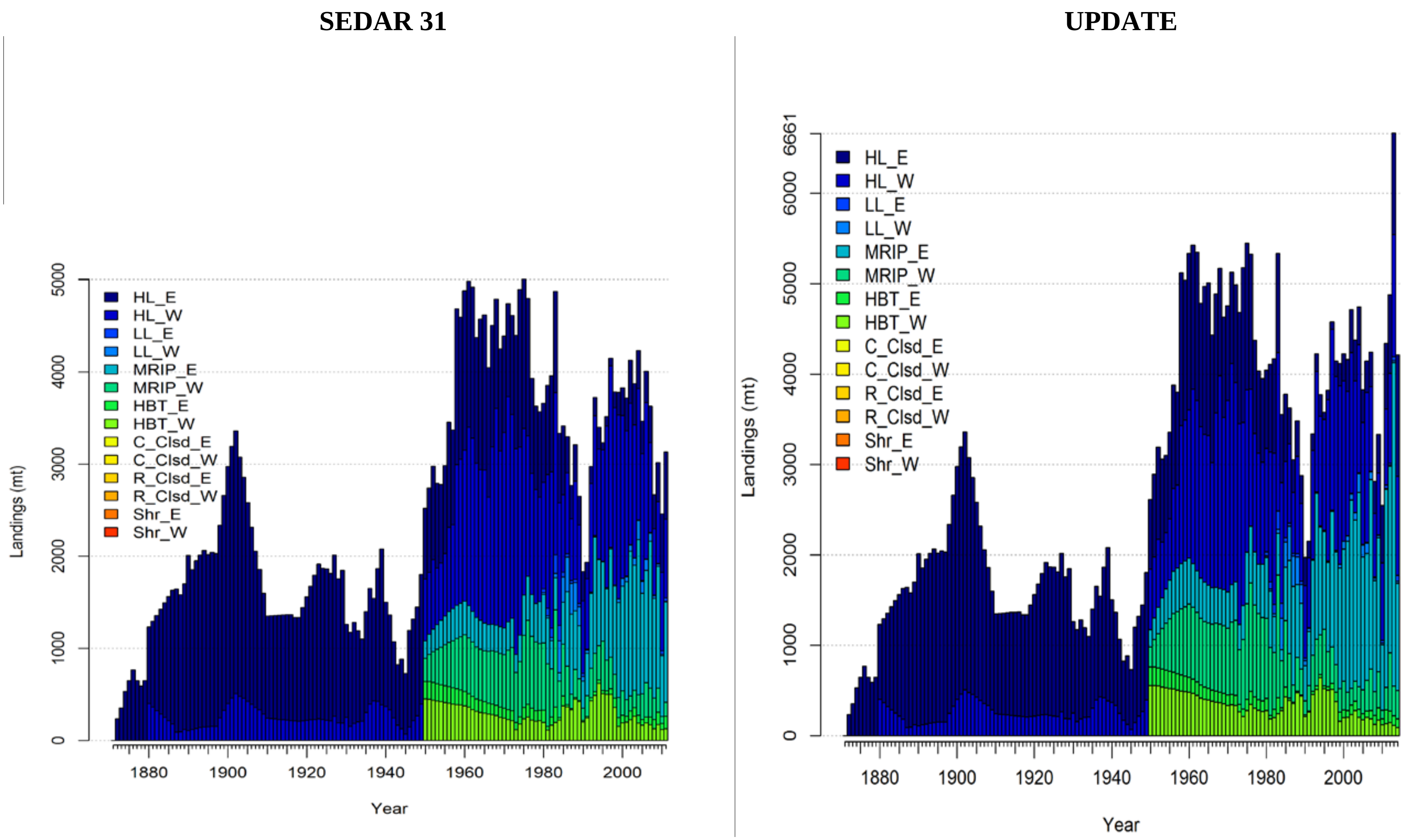
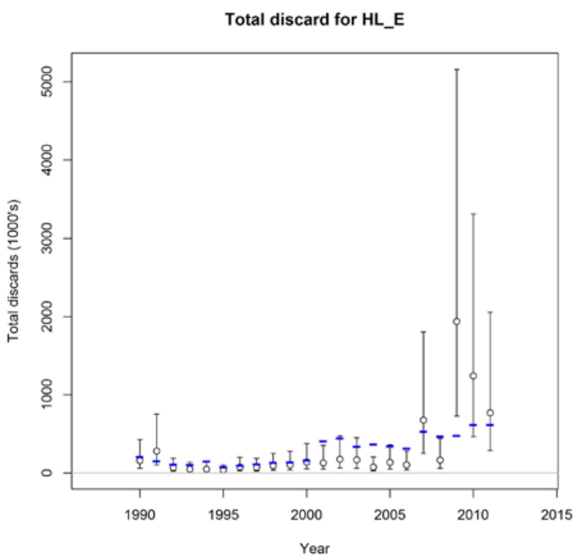


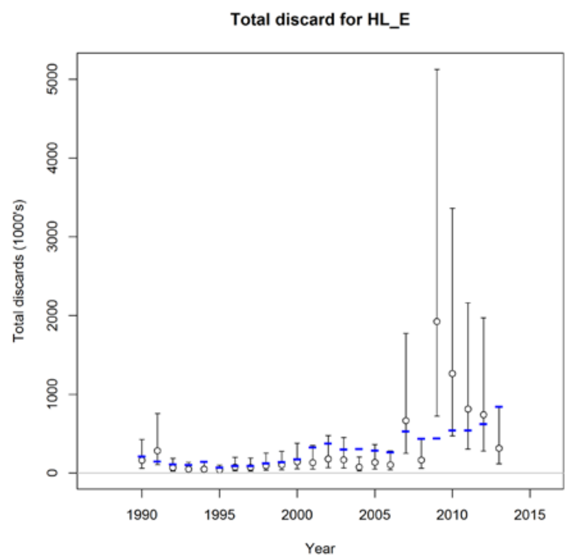
Figure 4.1. A comparison of the model estimated landings computed in metric tons (MT) for SEDAR 31 (left) and the update assessment (right).

Figure 4.2. A comparison of the fits to the discards (in 1000s of fish) for SEDAR 31 (left) and the update assessment (right). Observed values (open circles) with log-scale standard errors (error bars) and predicted values (blue line) are shown.

a) Commercial Vertical Line (aka HL): East

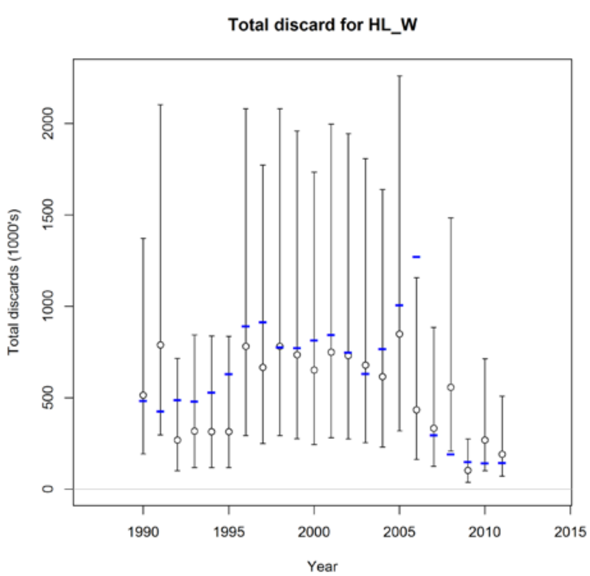
SEDAR 31	**UPDATE**





b) Commercial Vertical Line (aka HL): West

SEDAR 31	**UPDATE**



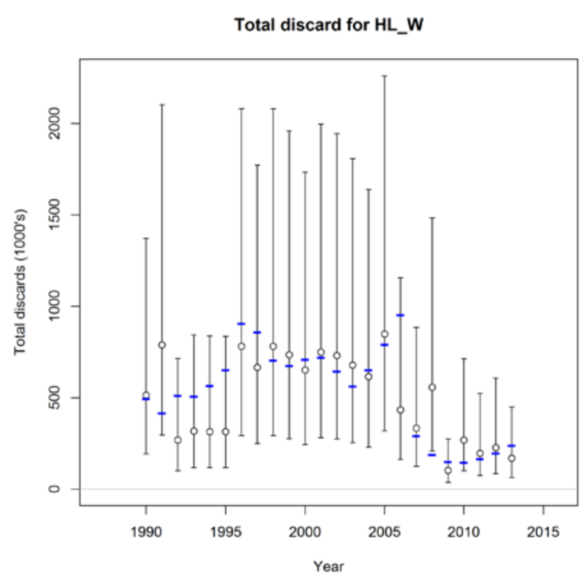
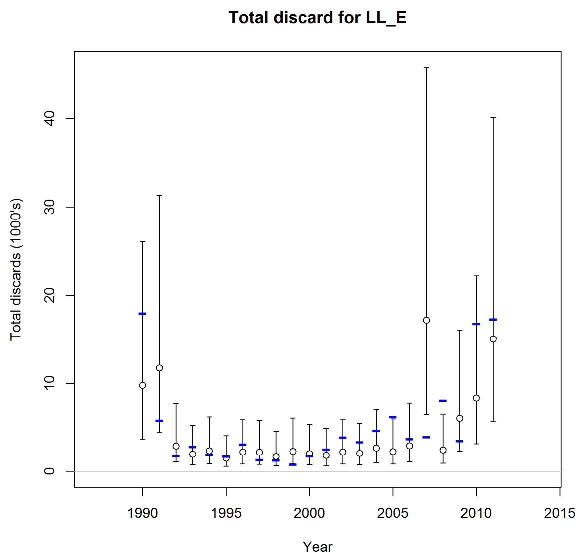
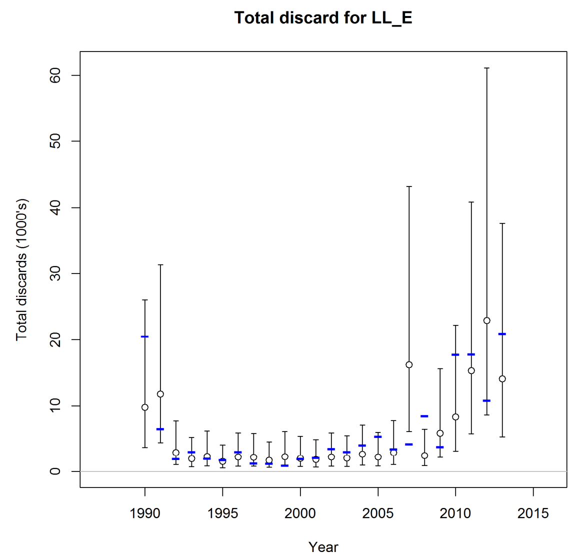


Figure 4.2 (fits to discards continued).

c) Commercial Long Line (aka HL): East

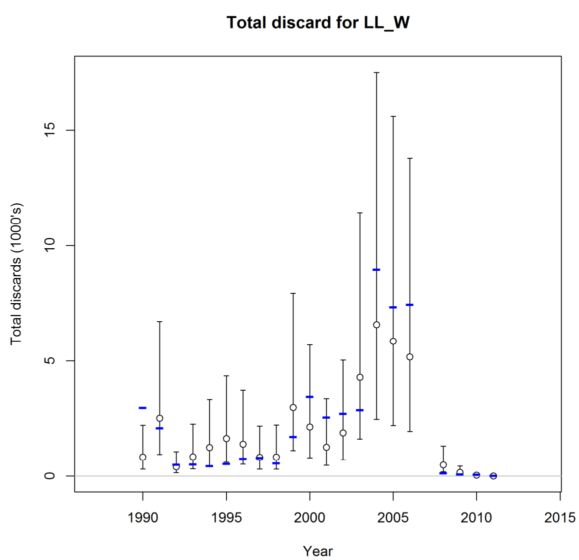
SEDAR 31 | **UPDATE**





d) Commercial Long Line (aka HL): West

SEDAR 31 | **UPDATE**



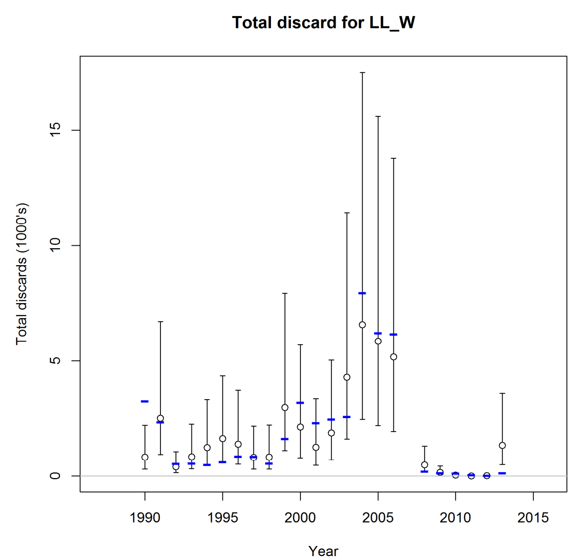
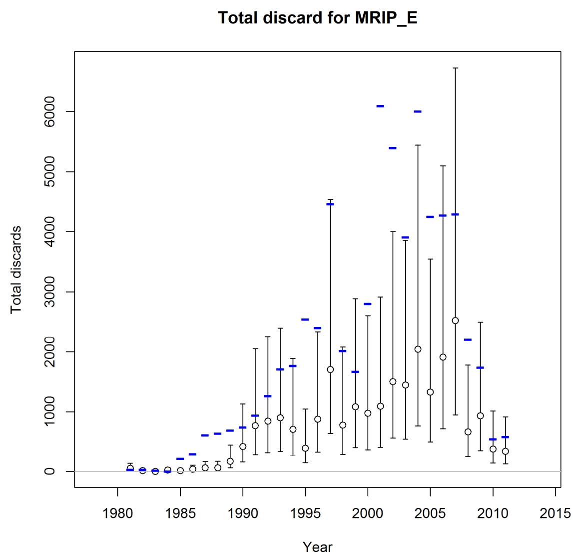


Figure 4.2 (fits to discards continued).

e) Recreational MRIP (charter + private boat): East

SEDAR 31



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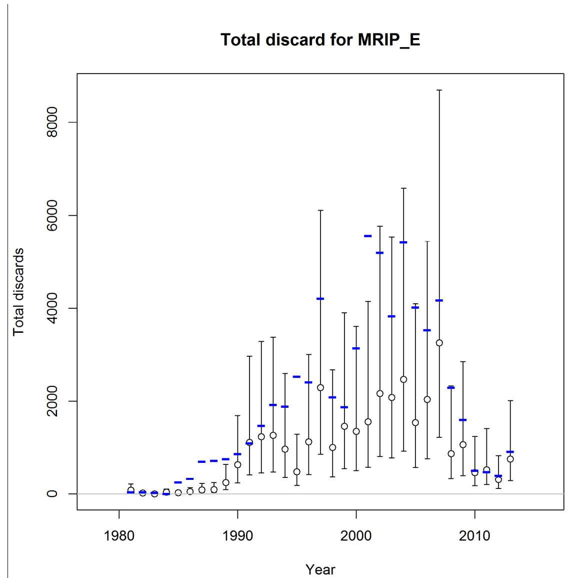
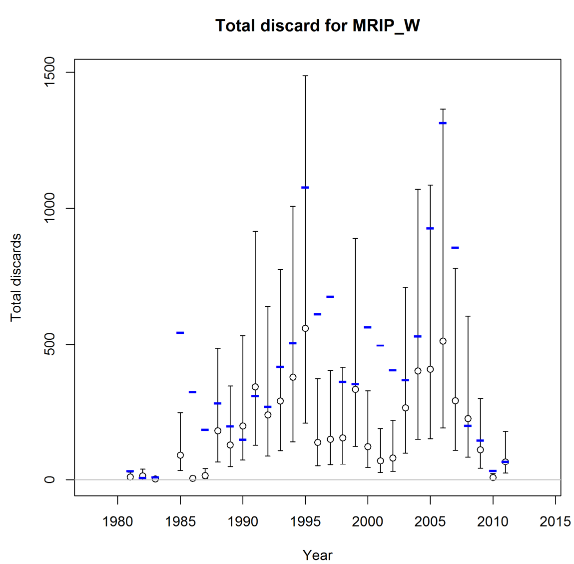


f) Recreational MRIP (charter + private boat): West

SEDAR 31



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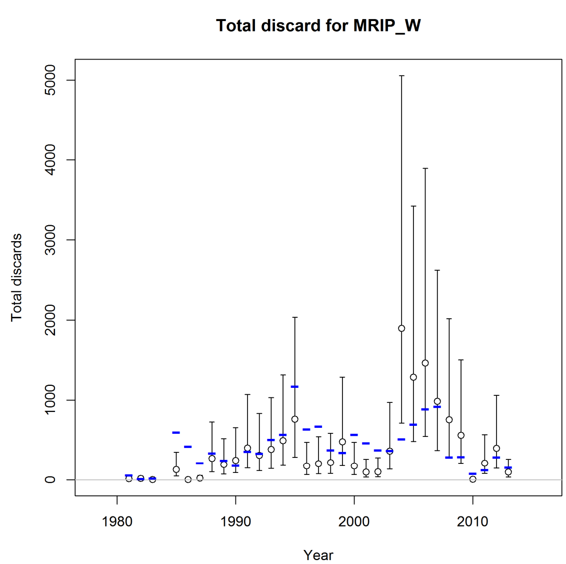
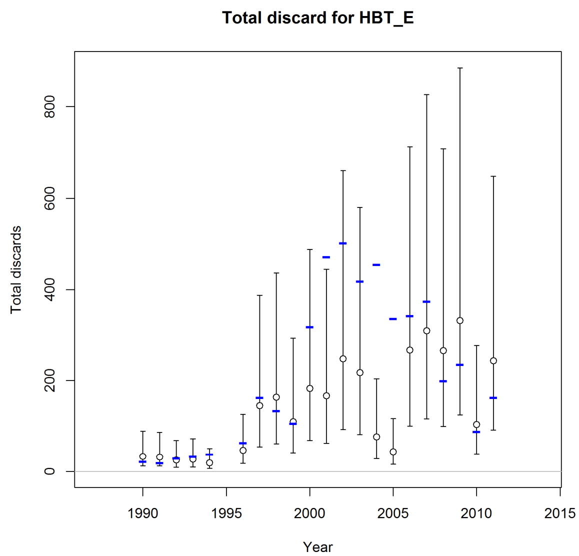
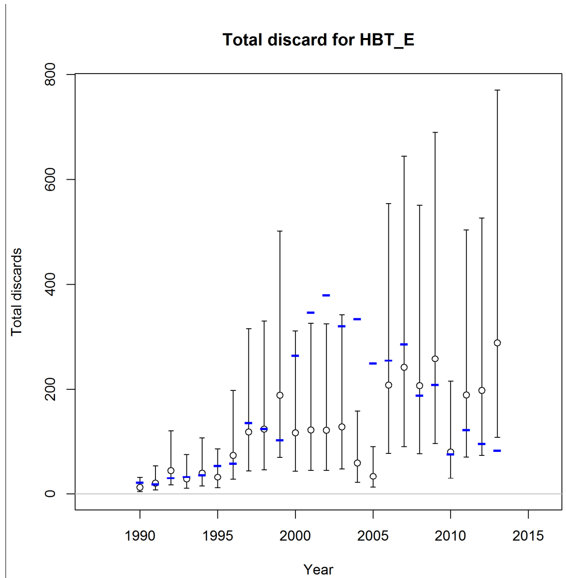


Figure 4.2 (fits to discards continued).

g) Recreational headboat: East

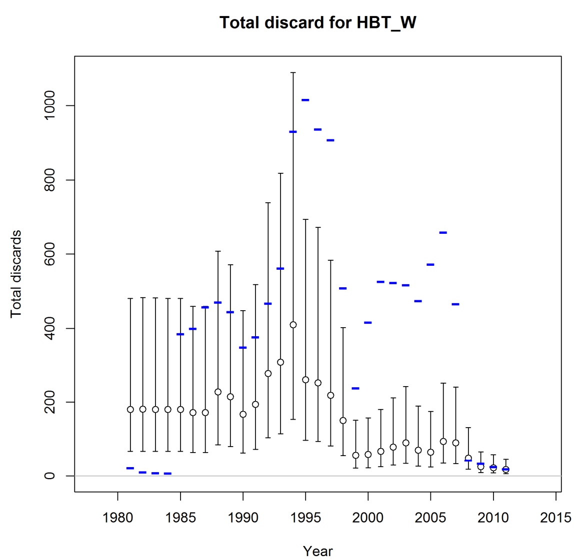
SEDAR 31 | **UPDATE**





h) Recreational headboat: West

SEDAR 31 | **UPDATE**



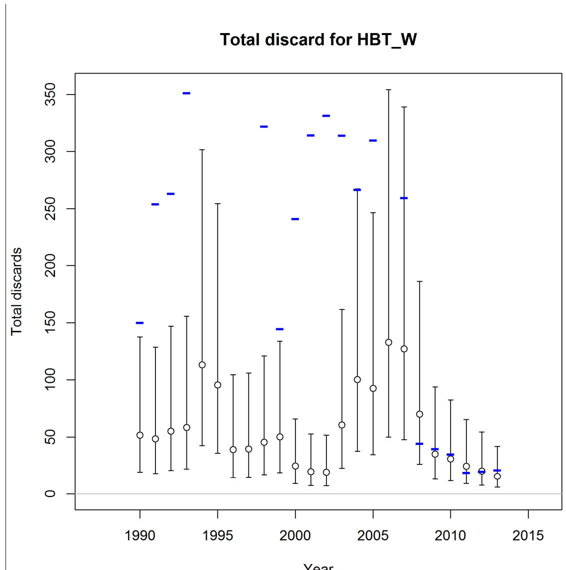
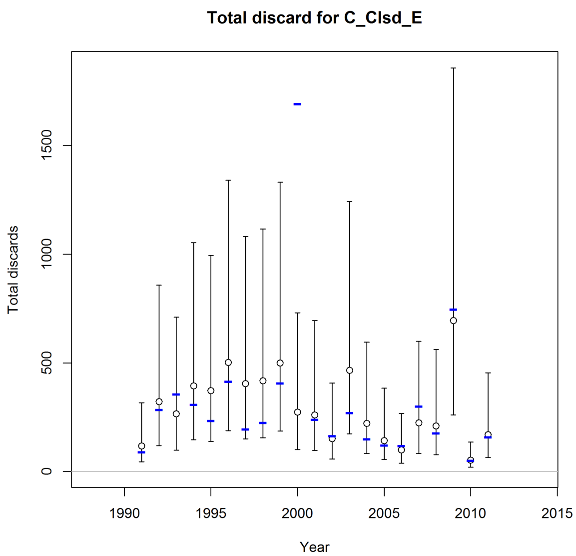


Figure 4.2 (fits to discards continued).

i) Commercial closed season (no allocation): East

SEDAR 31



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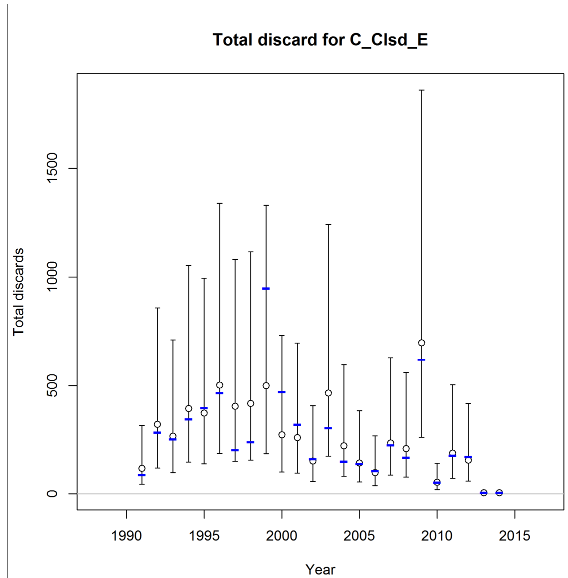
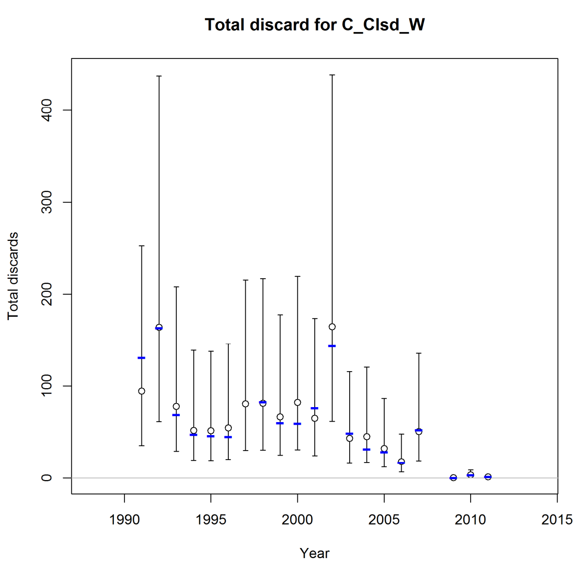


j) Commercial closed season (no allocation): West

SEDAR 31



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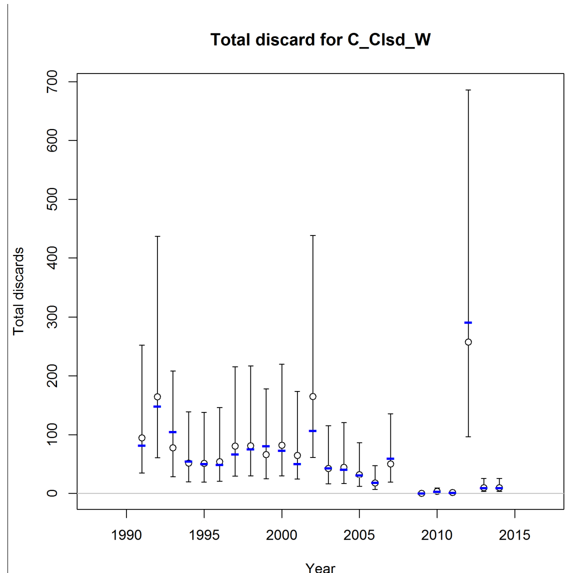
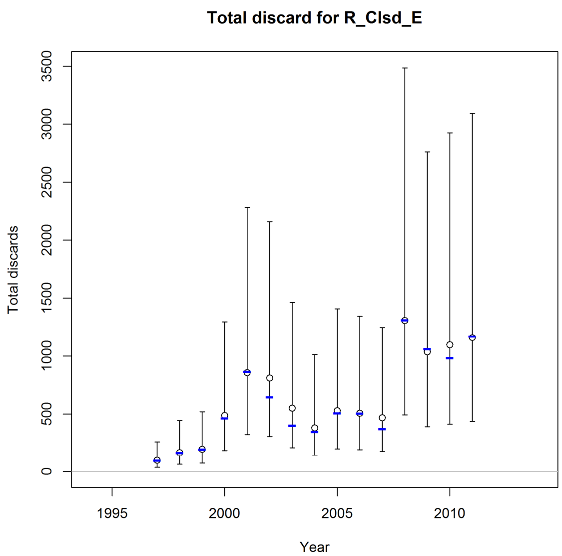


Figure 4.2 (fits to discards continued).

k) Recreational closed season: East

SEDAR 31



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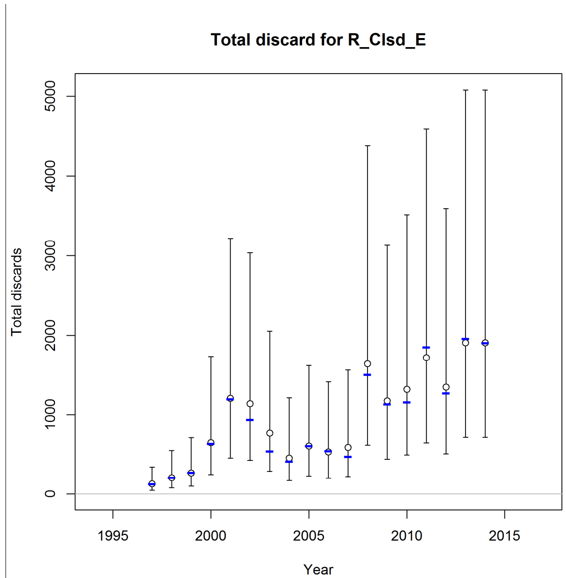
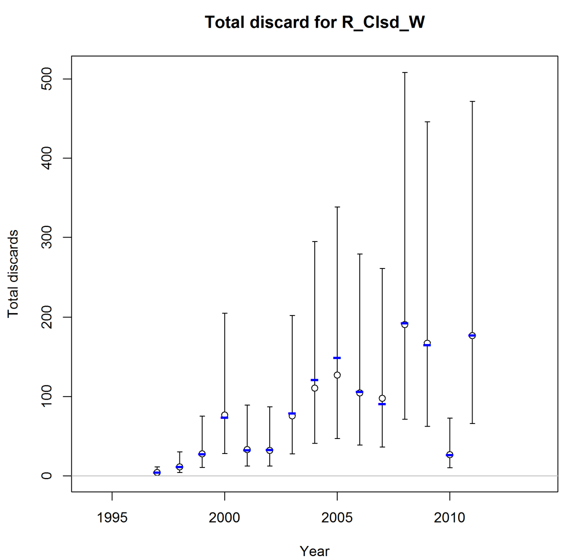


l) Recreational closed season: West

SEDAR 31



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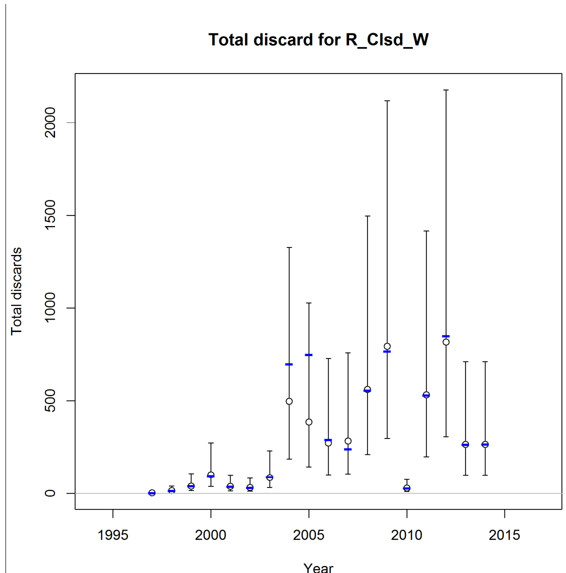
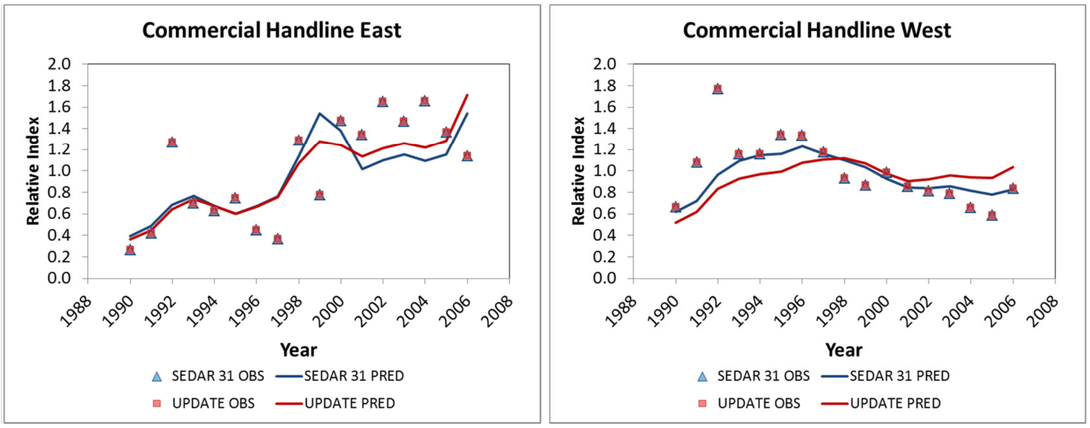
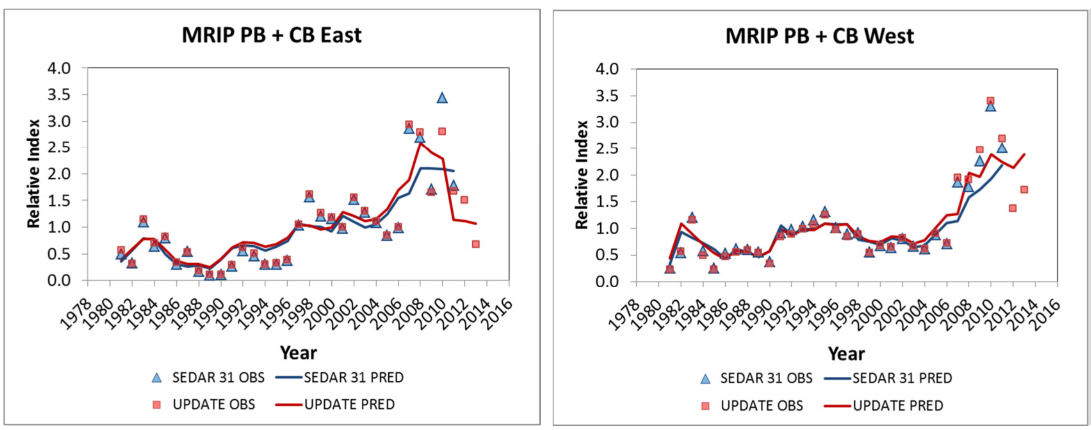


Figure 4.3. A comparison of the fits to the relative indices of abundance (scaled to a mean of 1.0) for SEDAR 31 (blue) and the update assessment (red).

a) Commercial Vertical Line (aka HL):
(*Note*: this index was truncated at the IFQ period, and was not updated after SEDAR 31.



b) Recreational MRIP (charter + private boat):



c) Recreational headboat

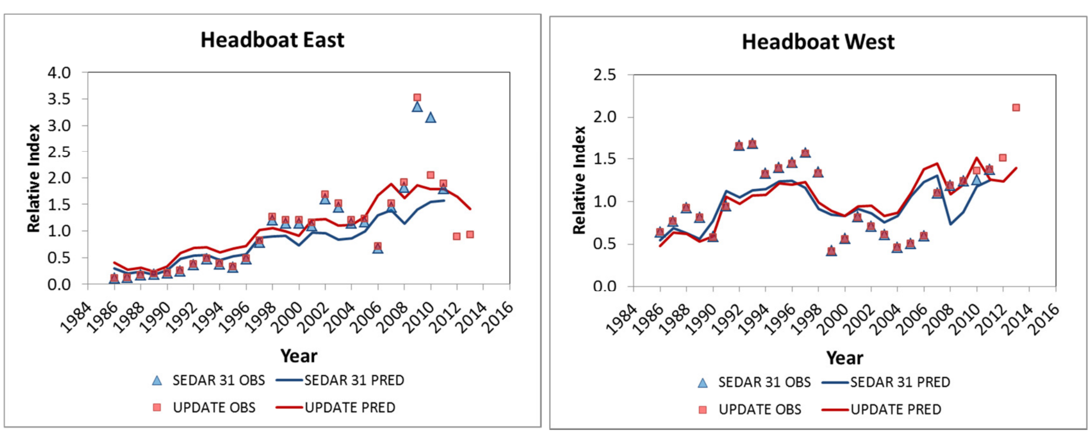
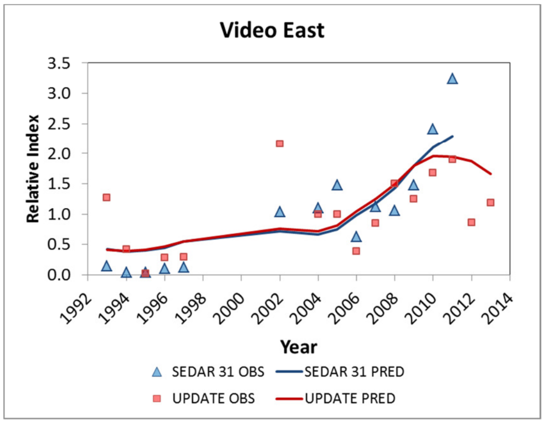
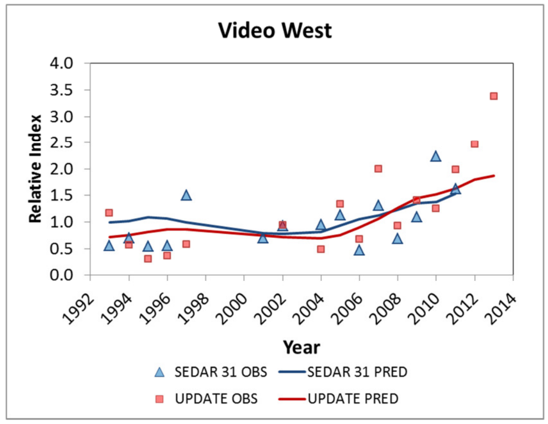


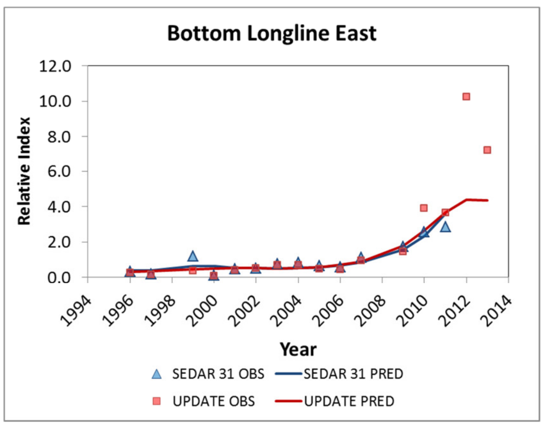
Figure 4.3 (Fits to indices continued)

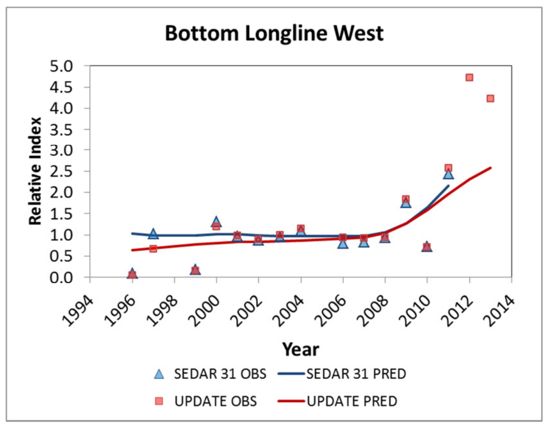
d) SEAMAP Video



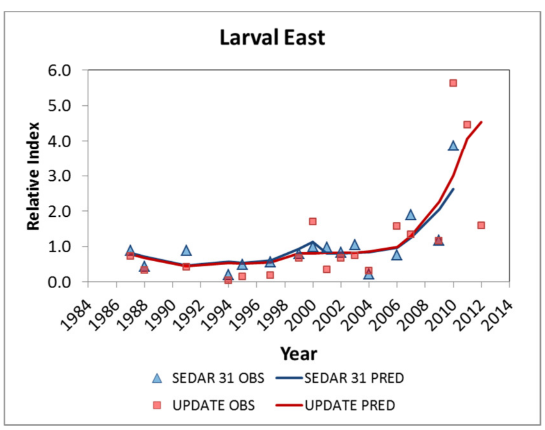


e) NMFS Bottom Longline West





f) SEAMAP Ichthyoplankton (Larval) survey



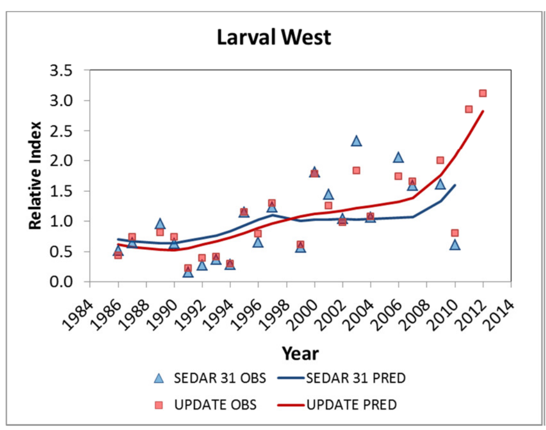
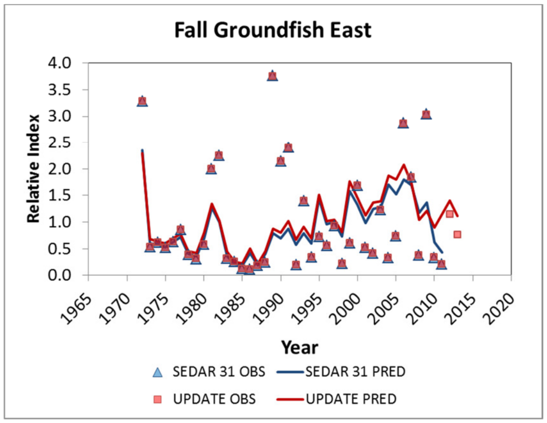
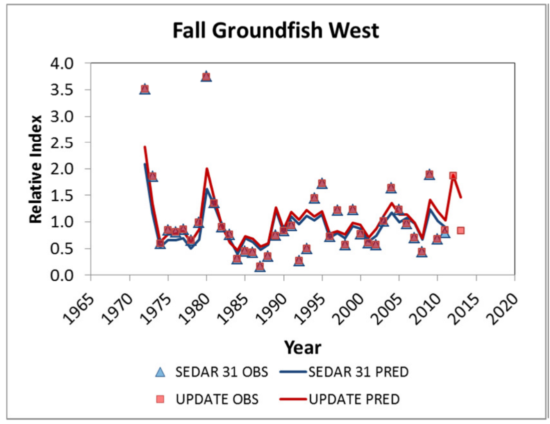


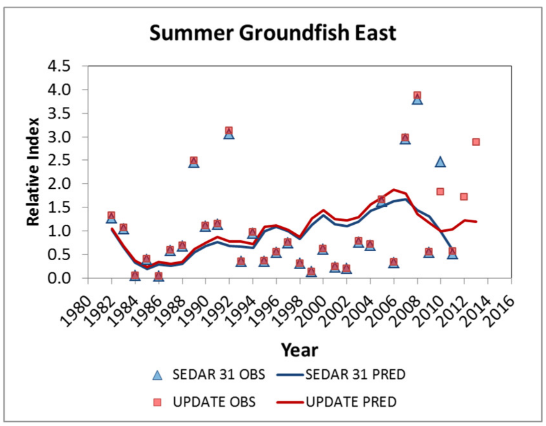
Figure 4.3 (Fits to indices continued)

g) SEAMAP Fall Groundfish Survey





h) SEAMAP Summer Groundfish Survey



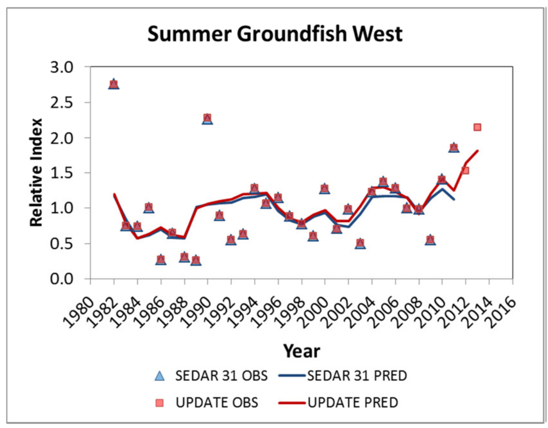
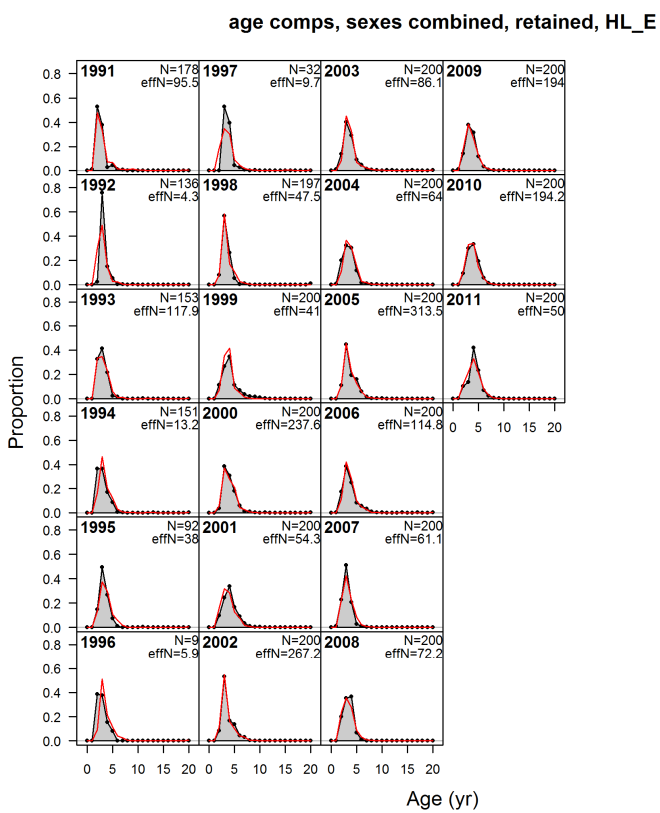


Figure 4.4. Model fits to age composition of retained catch, by fleet.

a) Commercial Vertical Line: East

SEDAR 31



UPDATE

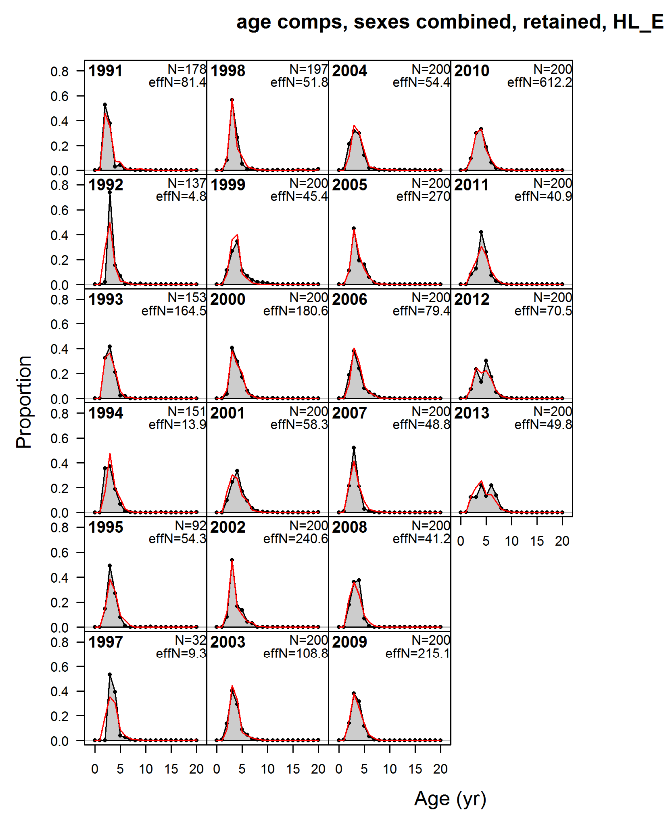
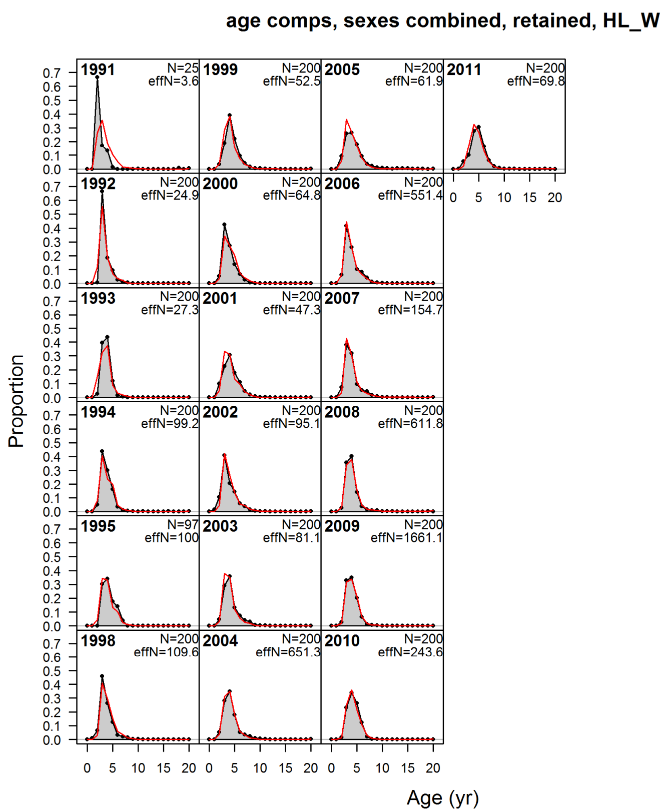


Figure 4.4. (fits to age comp of retained catch continued).

b) Commercial Vertical Line: West

SEDAR 31



UPDATE

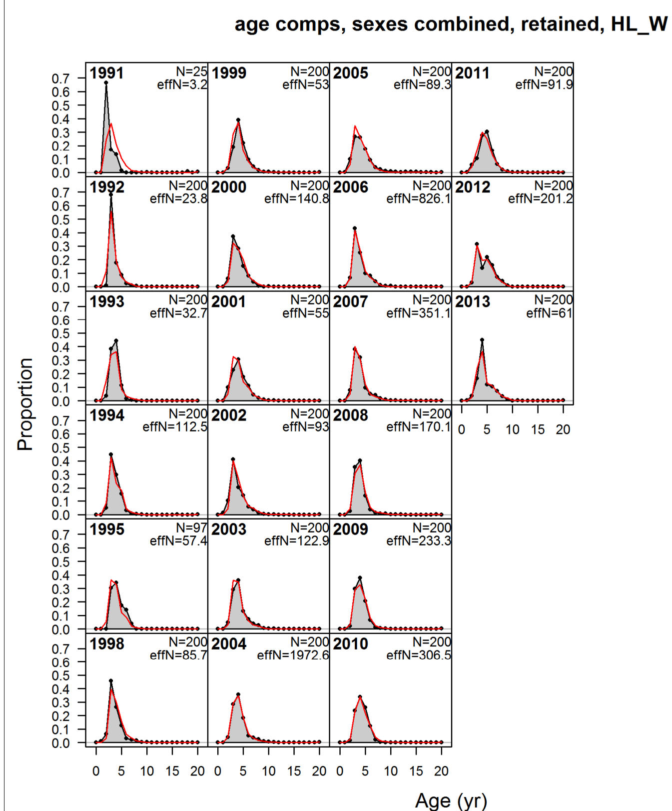
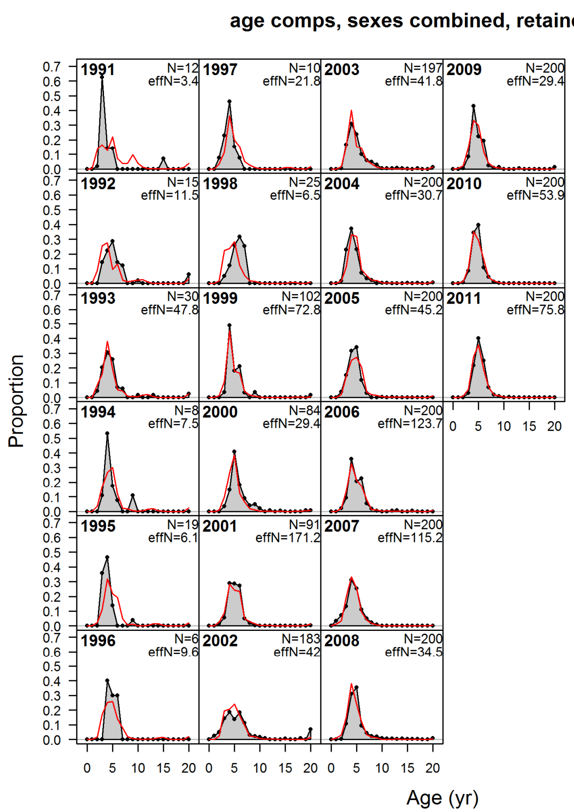


Figure 4.4. (fits to age comp of retained catch continued).

c) Commercial Long Line: East

SEDAR 31



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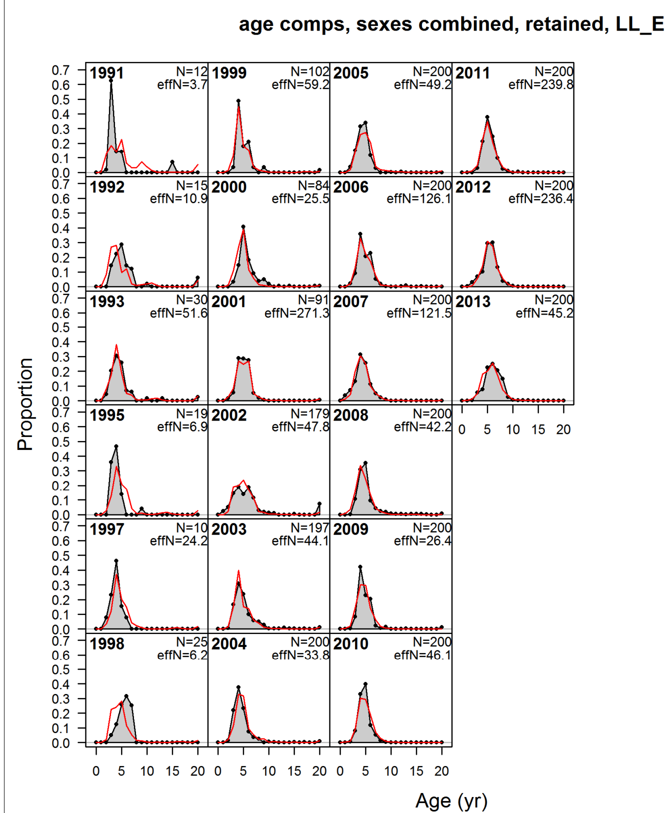
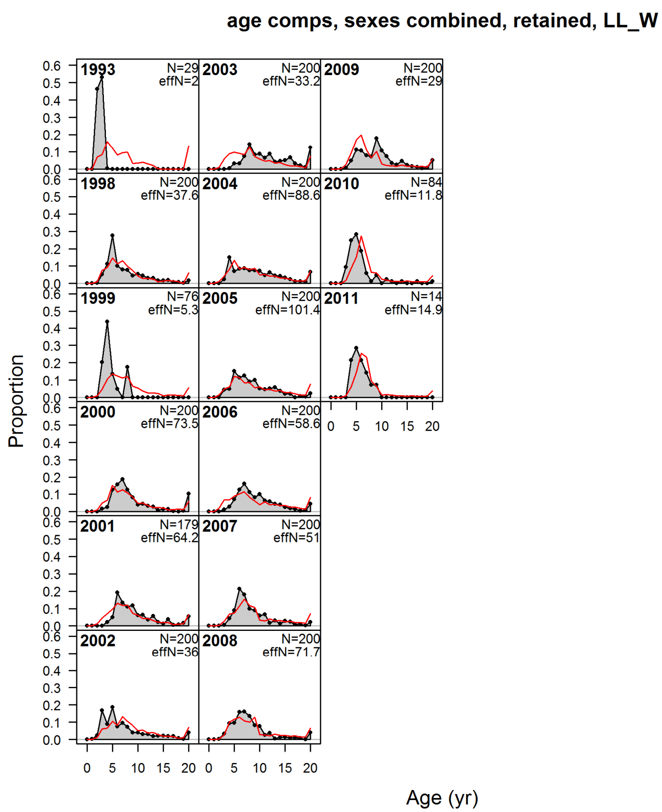


Figure 4.4. (fits to age comp of retained catch continued).

d) Commercial Long Line: West

SEDAR 31



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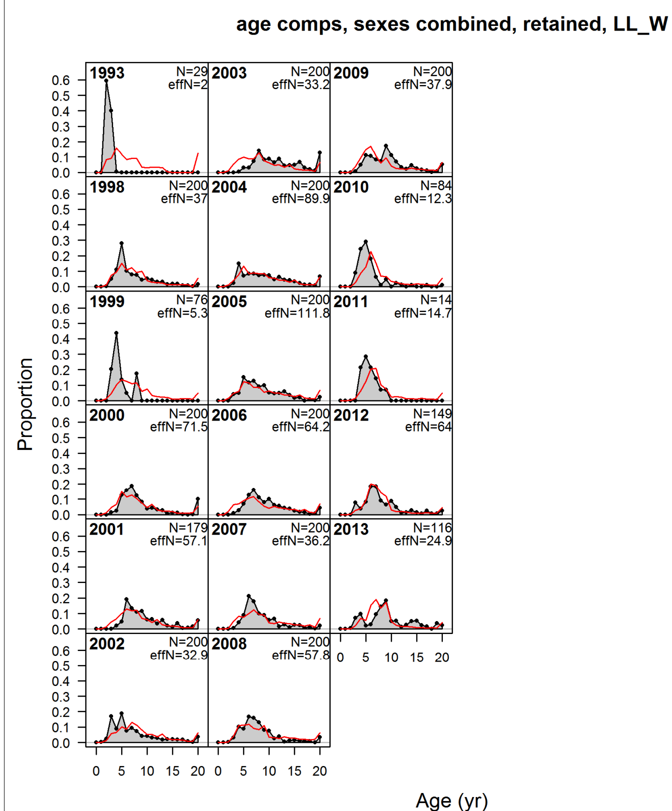
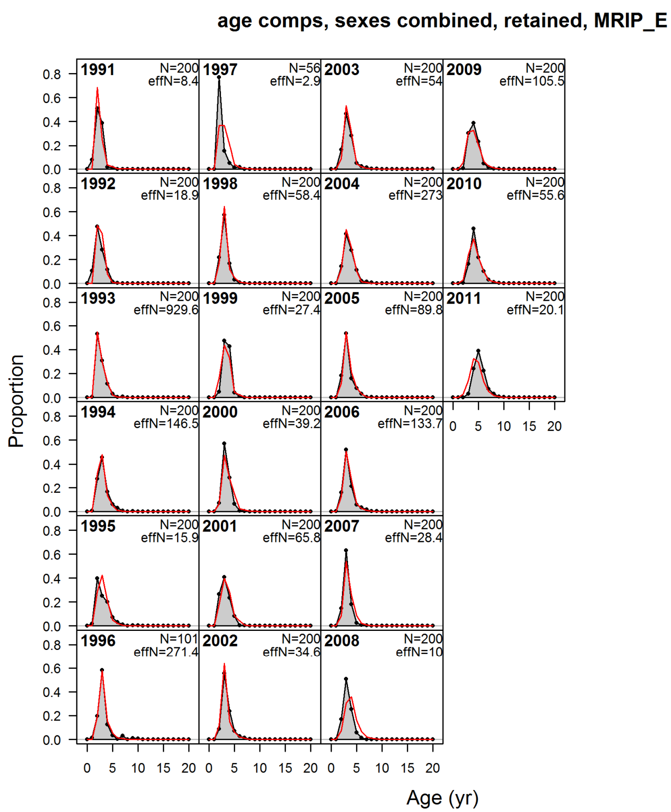


Figure 4.4. (fits to age comp of retained catch continued).

e) Recreational MRIP (Charter + Private): East

SEDAR 31



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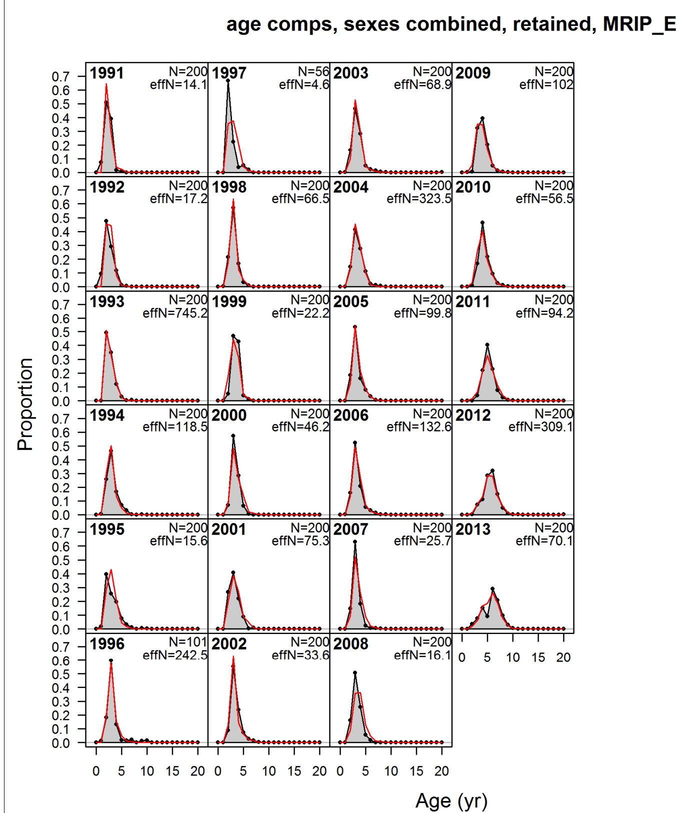
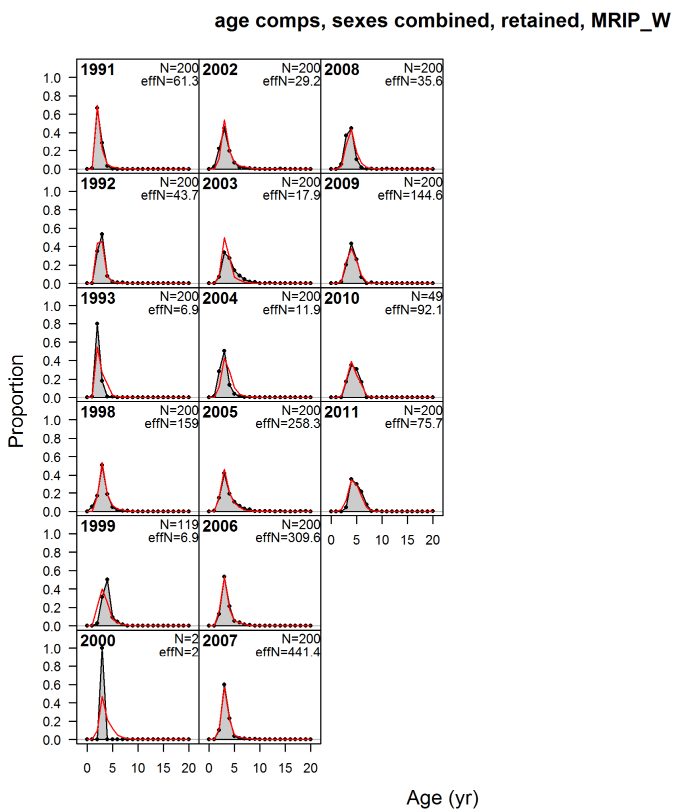


Figure 4.4. (fits to age comp of retained catch continued).

f) Recreational MRIP (Charter + Private): West

SEDAR 31	UPDATE



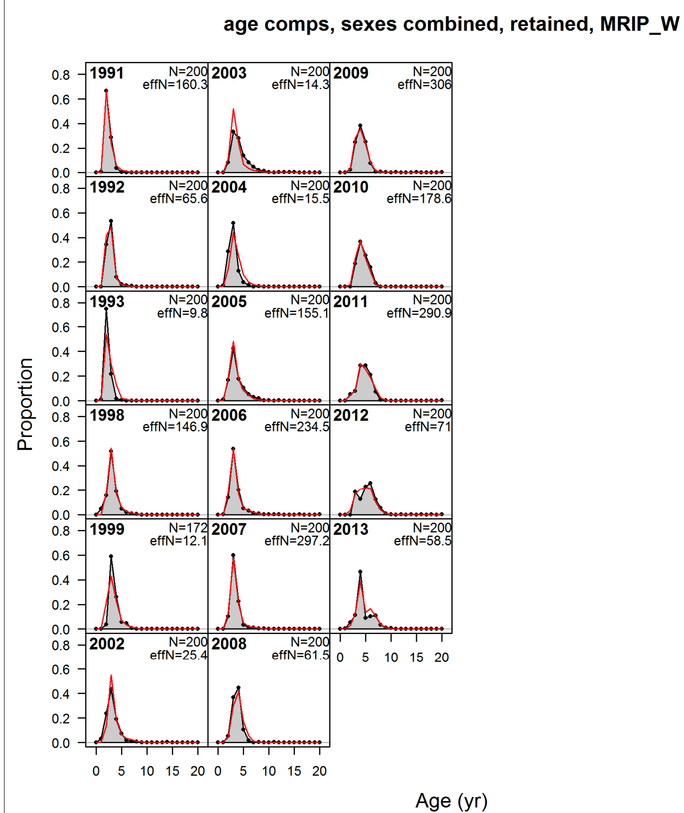
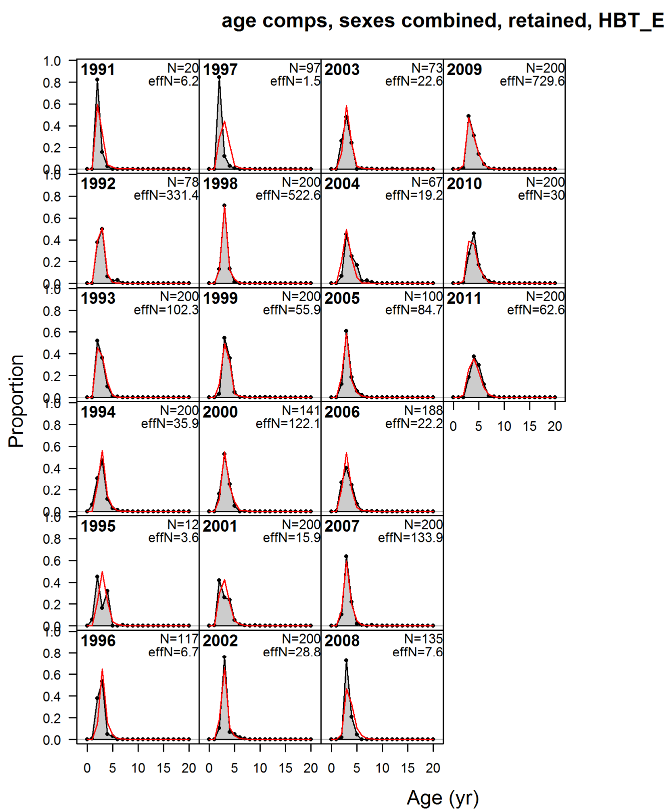


Figure 4.4. (fits to age comp of retained catch continued).

g) Recreational Headboat: East

SEDAR 31



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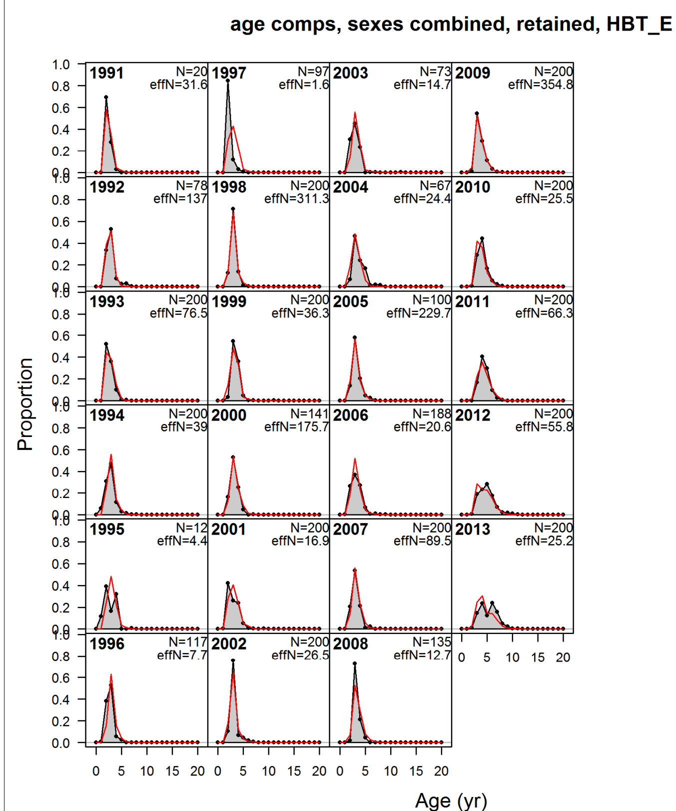
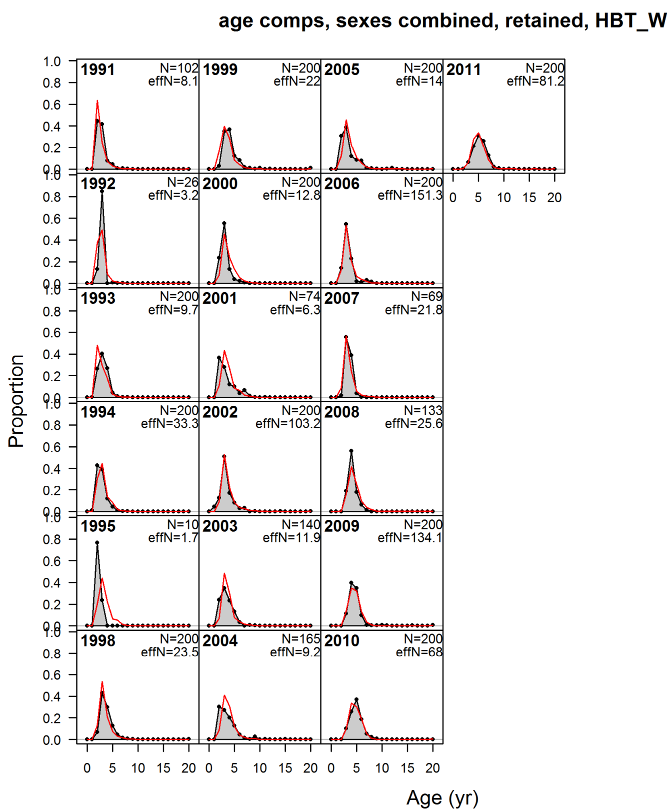


Figure 4.4. (fits to age comp of retained catch continued).

h) Recreational Headboat: West

SEDAR 31



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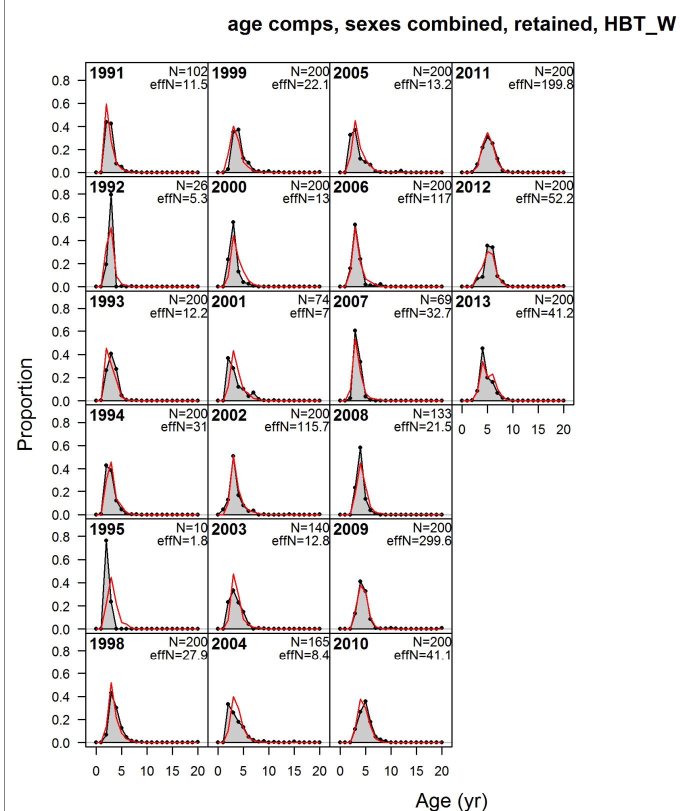
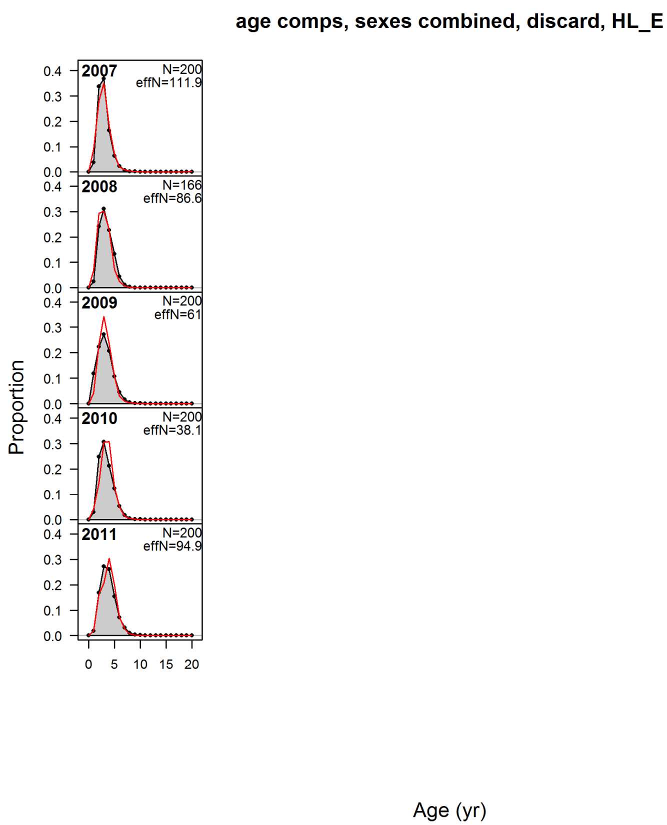


Figure 4.5. Model fits to age composition of discards, by fleet.

a) Commercial Vertical Line: East

SEDAR 31



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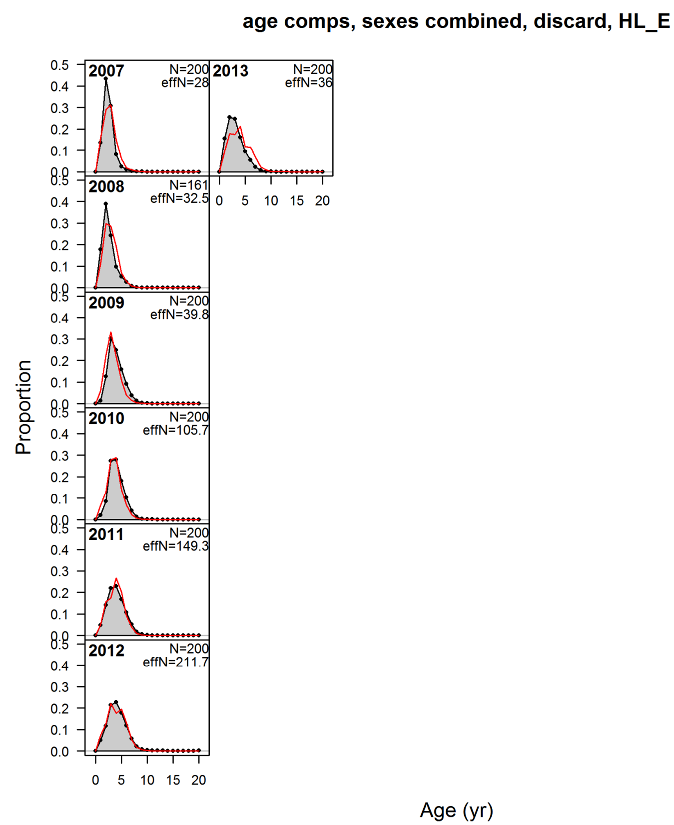
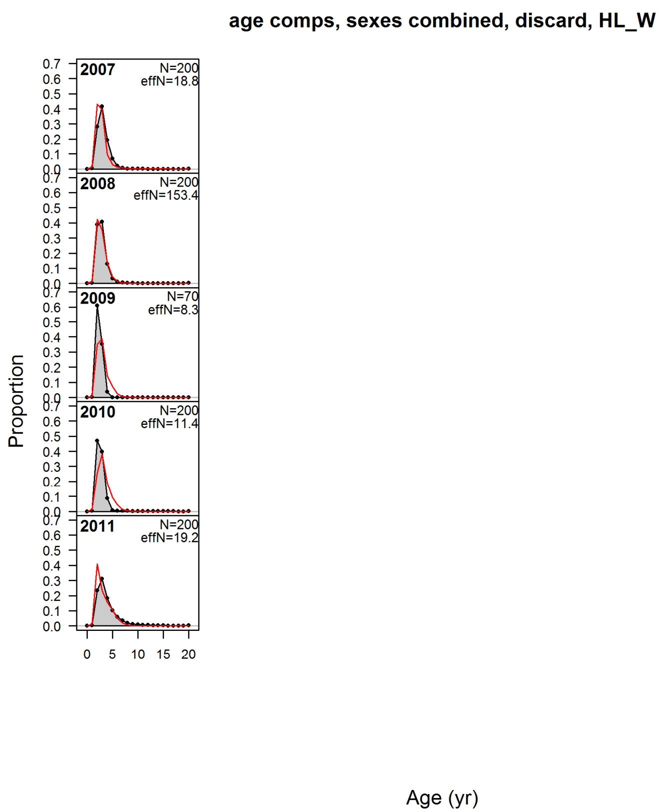


Figure 4.5. (fits to age composition of discards continued).

b) Commercial Vertical Line: West

SEDAR 31



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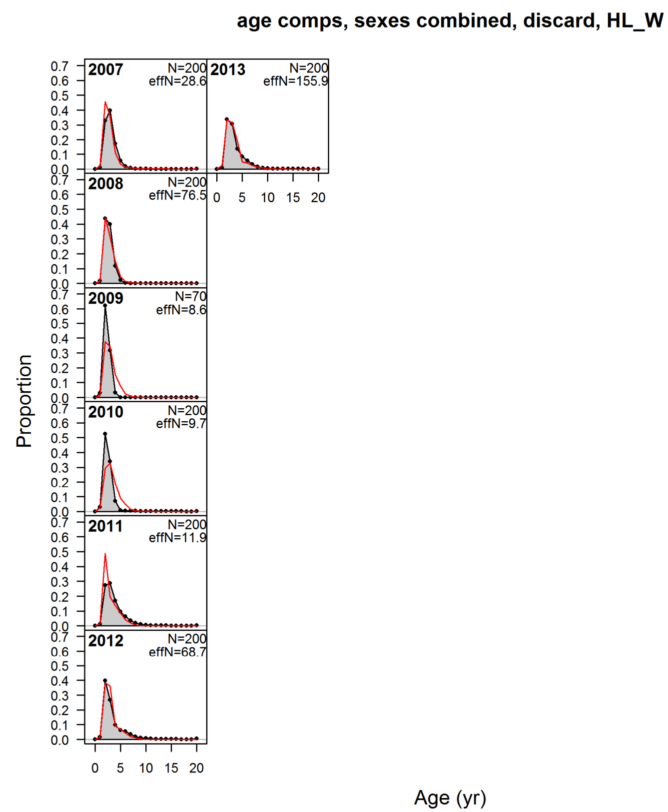
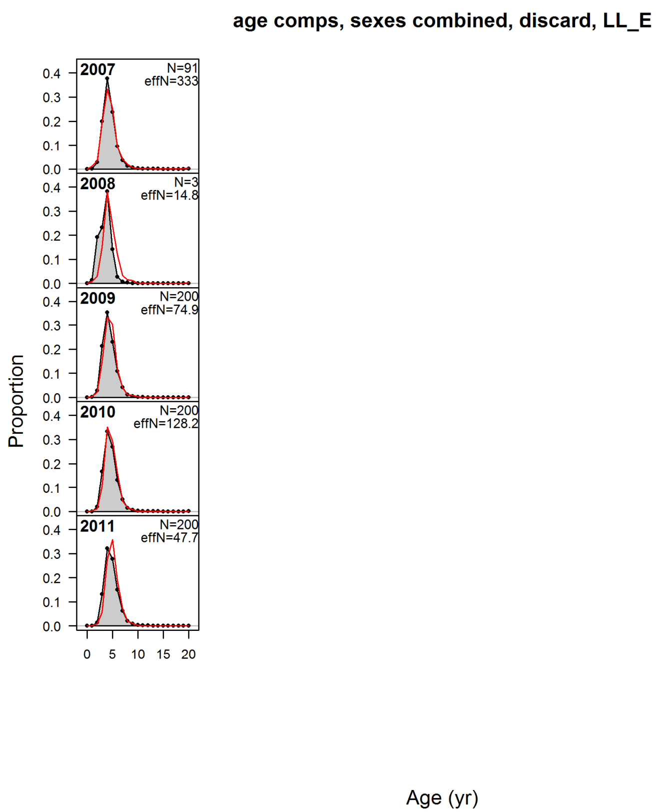


Figure 4.5. (fits to age composition of discards continued).

c) Commercial Long Line: East

SEDAR 31



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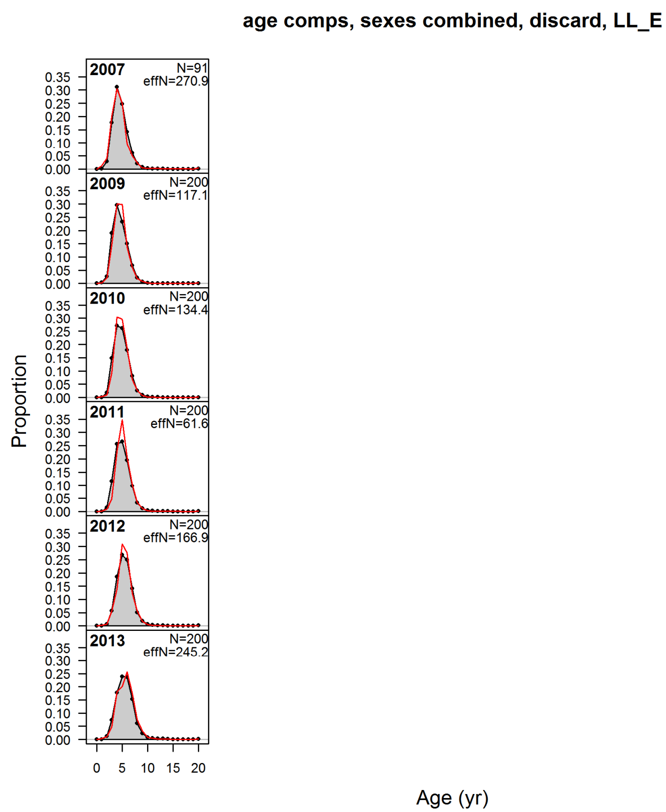
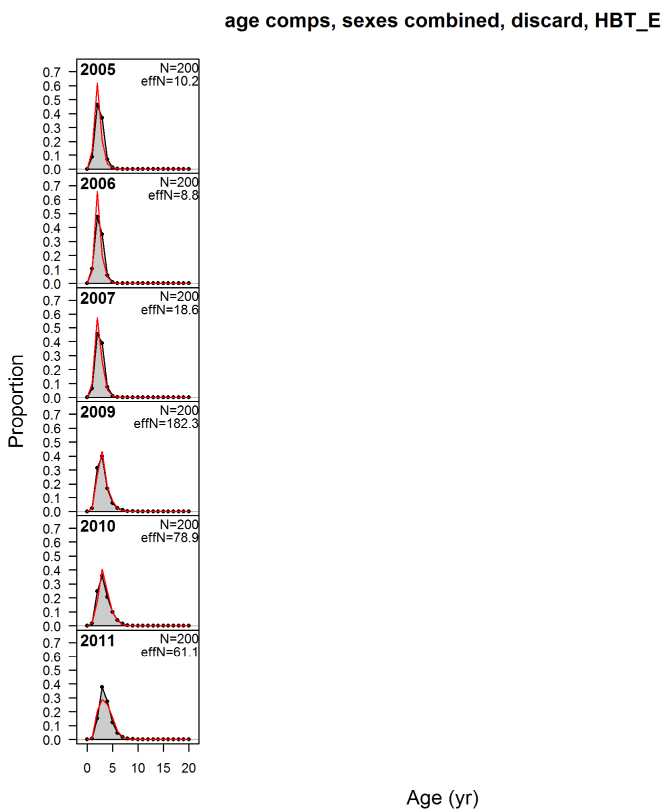


Figure 4.5. (fits to age composition of discards continued).

d) Recreational headboat: East

SEDAR 31 | **UPDATE**



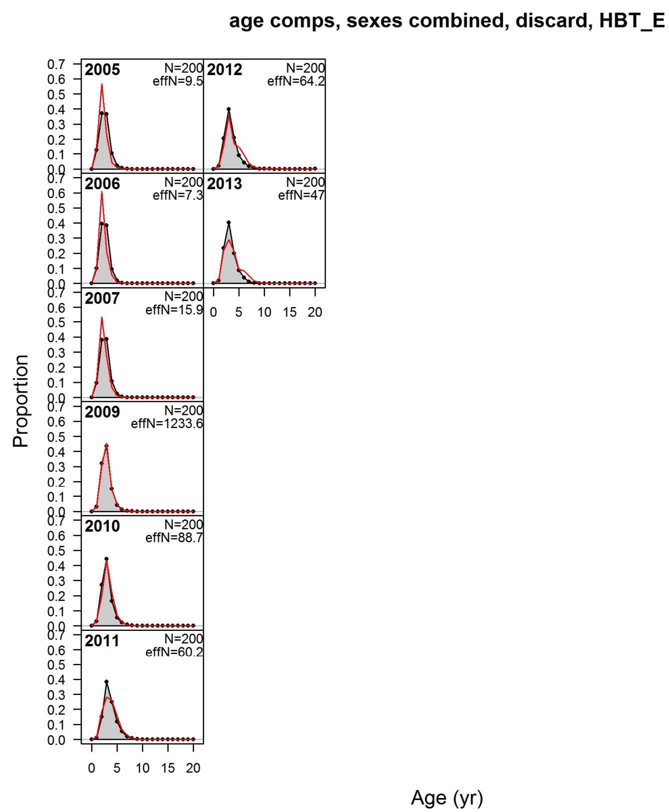
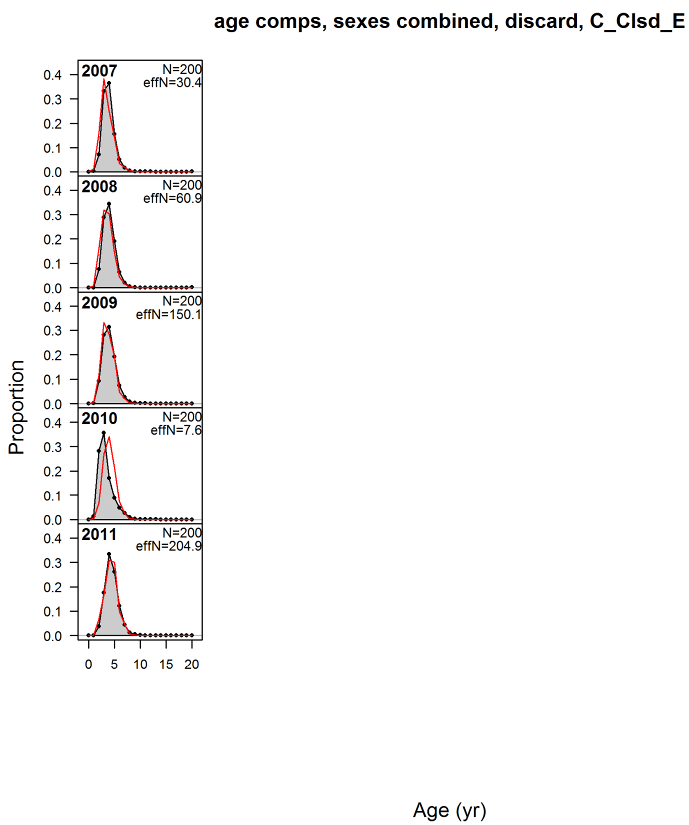


Figure 4.5. (fits to age composition of discards continued).

e) Commercial Closed Season Discards (no allocation): East

SEDAR 31



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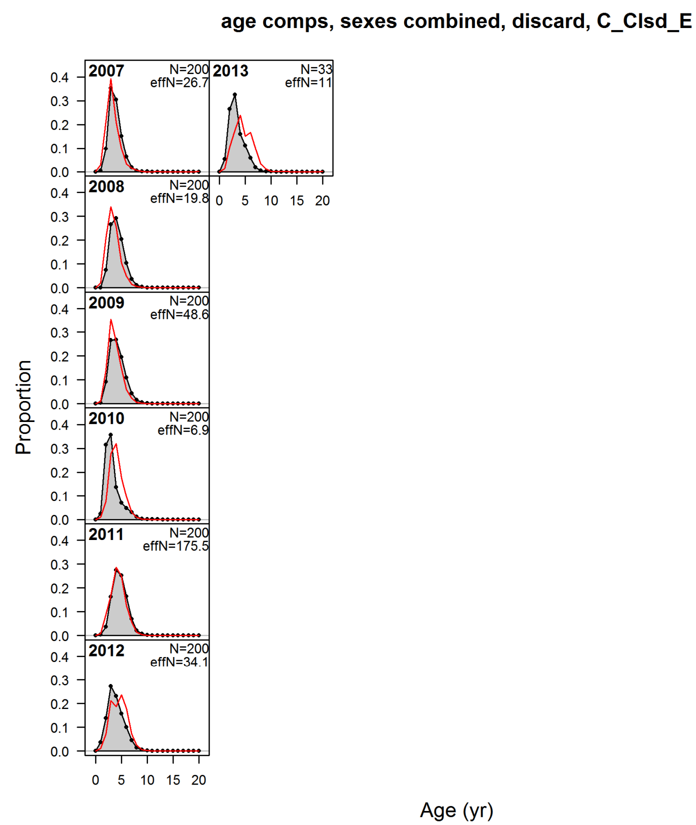
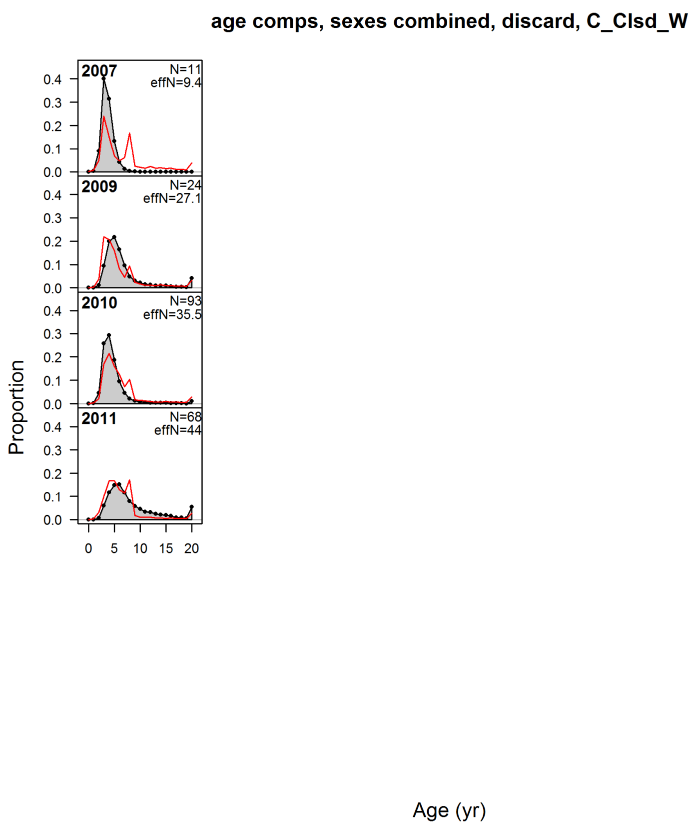


Figure 4.5. (fits to age composition of discards continued).

f) Commercial Closed Season Discards (no allocation): West

SEDAR 31	**UPDATE**



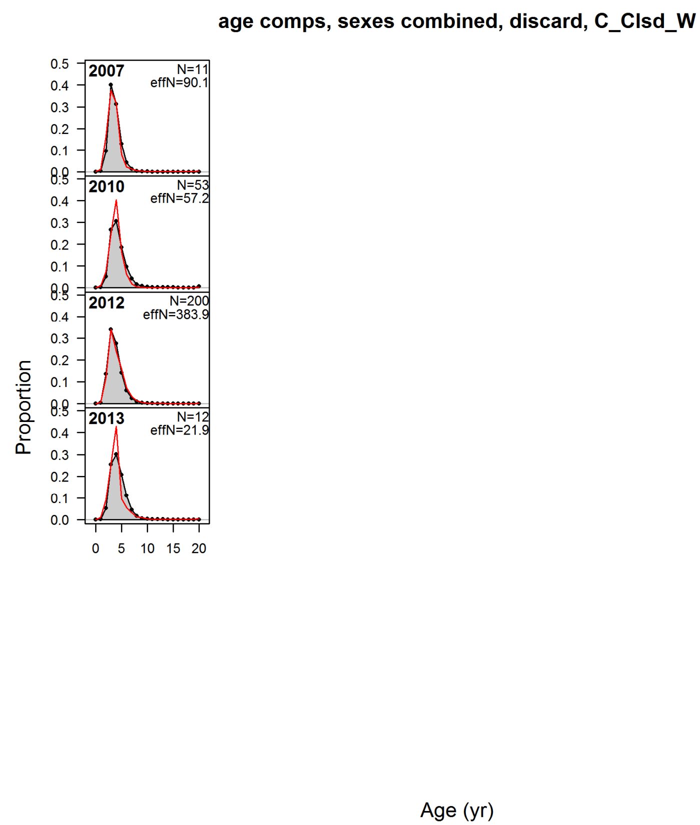
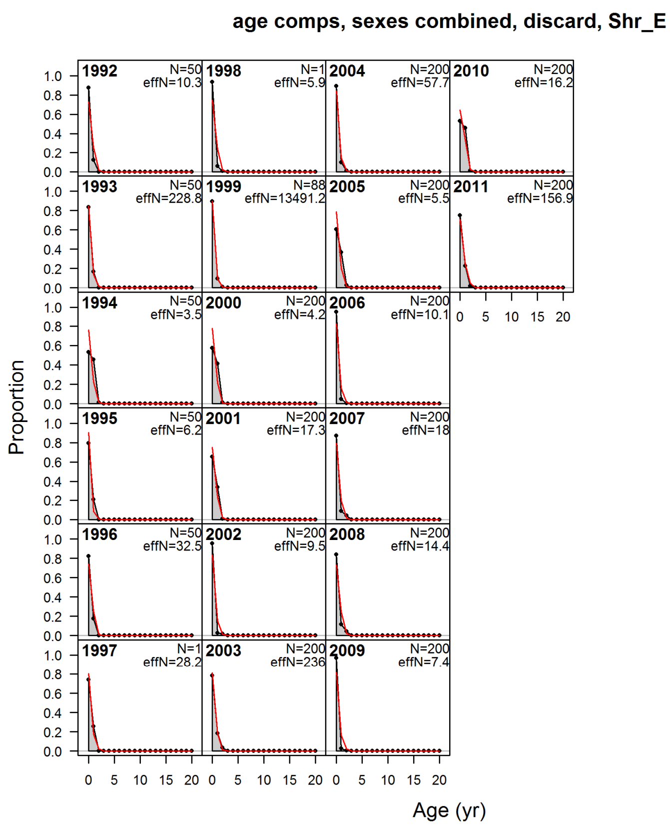


Figure 4.5. (fits to age composition of discards continued).

g) Shrimp Bycatch:East

SEDAR 31



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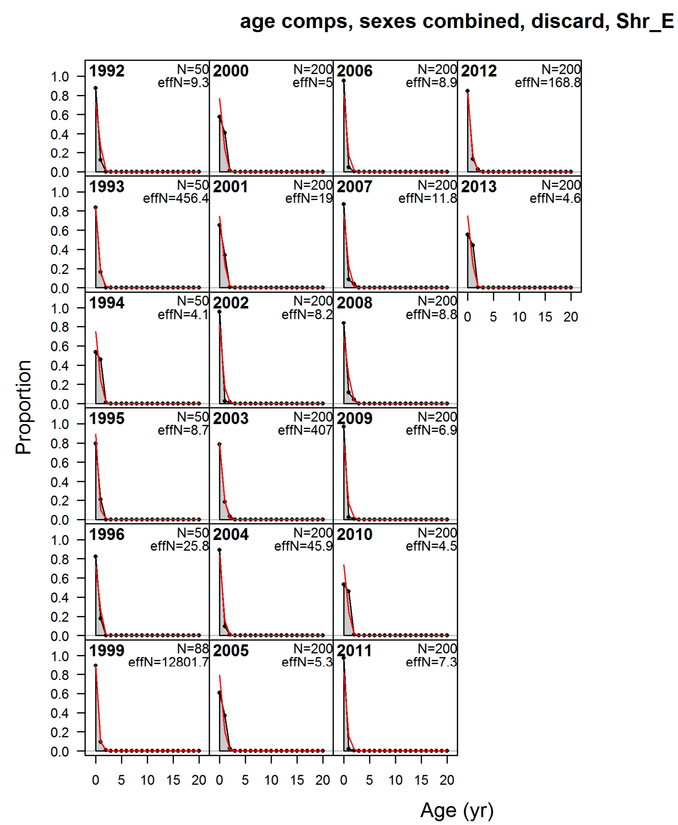
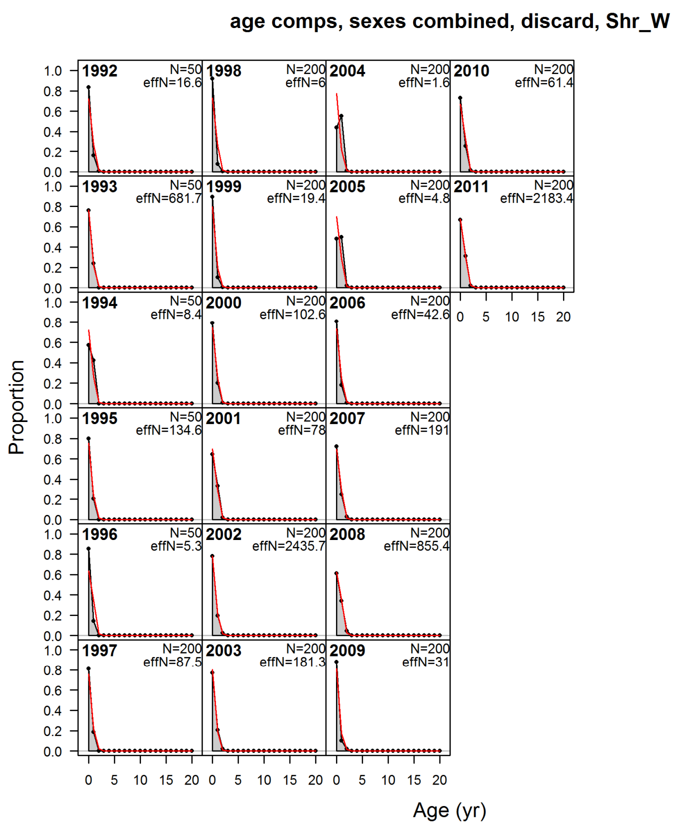


Figure 4.5. (fits to age composition of discards continued).

h) Shrimp Bycatch:West

SEDAR 31



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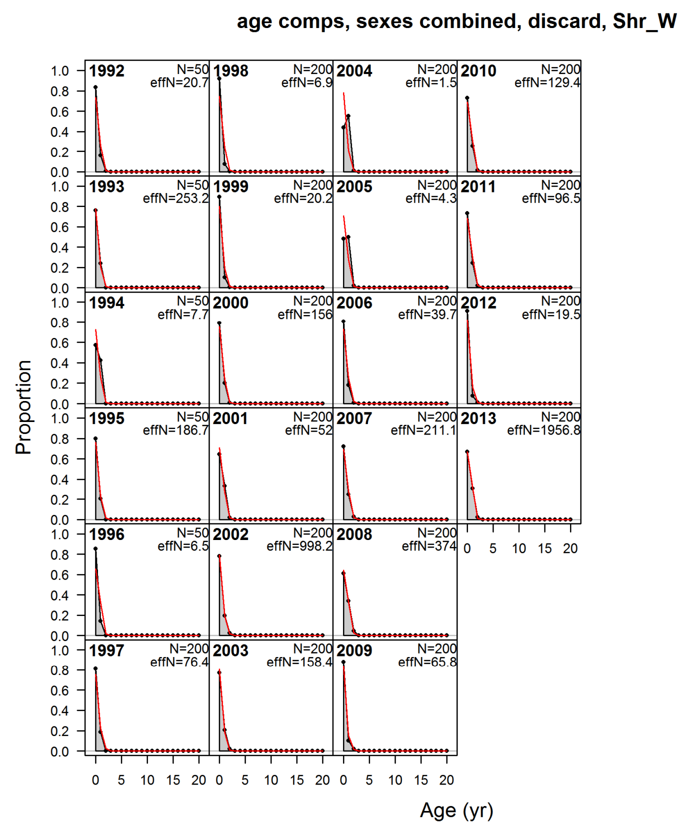
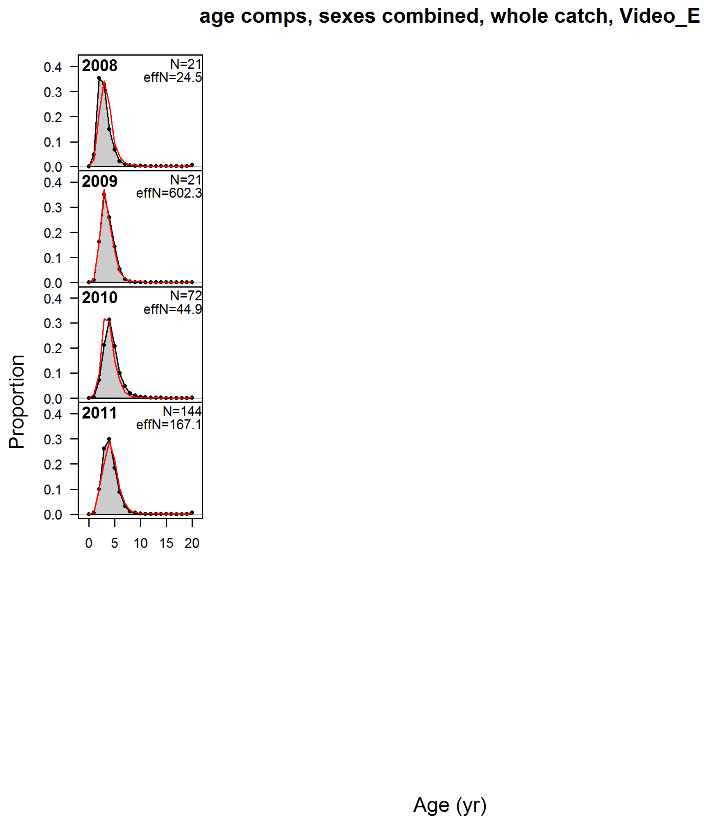


Figure 4.6. Model fits to derived age composition of fishery independent surveys.

a) SEAMAP Video East

SEDAR 31



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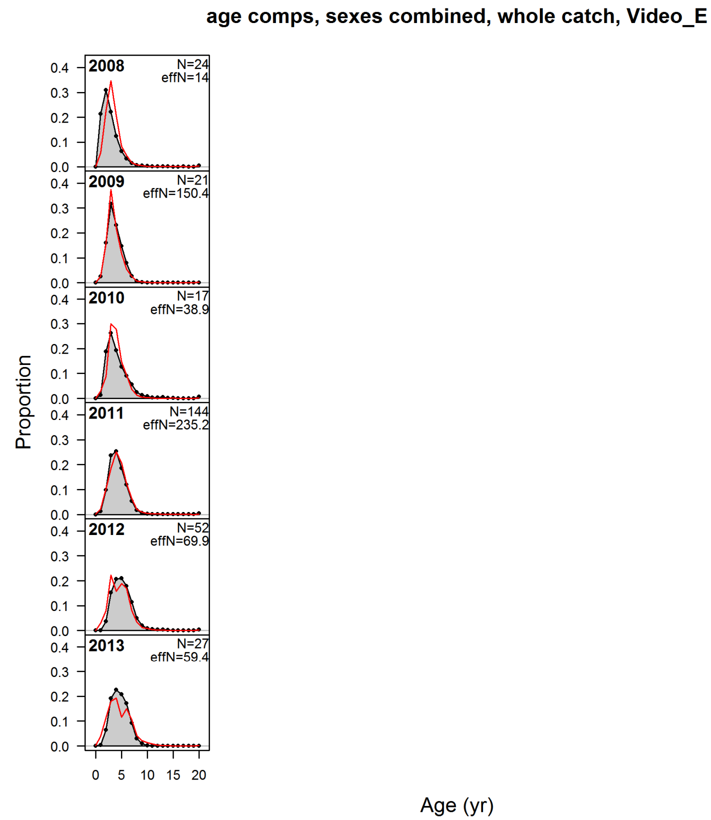
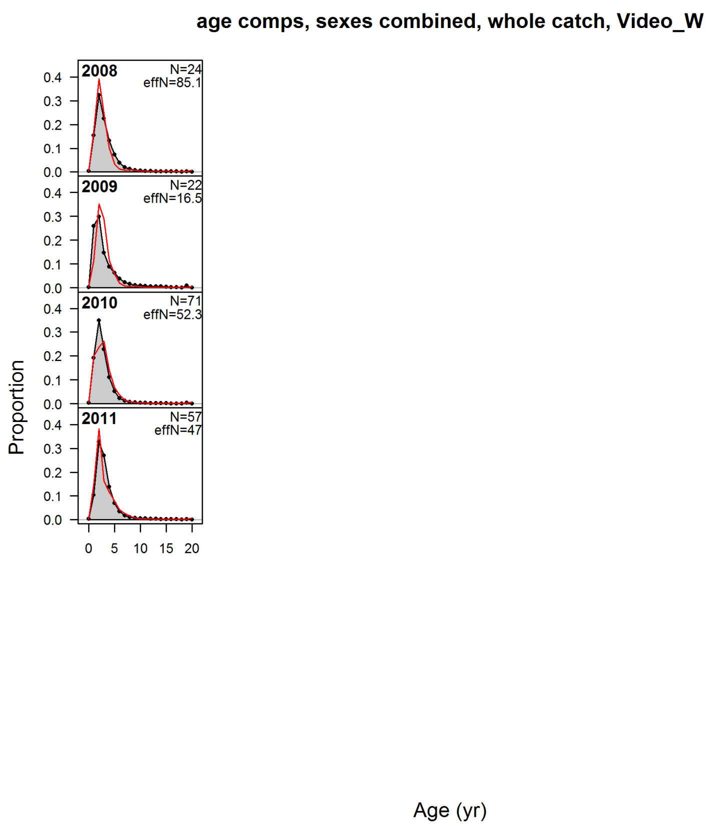


Figure 4.6. (fits to age composition of surveys continued)

b) SEAMAP Video West

SEDAR 31



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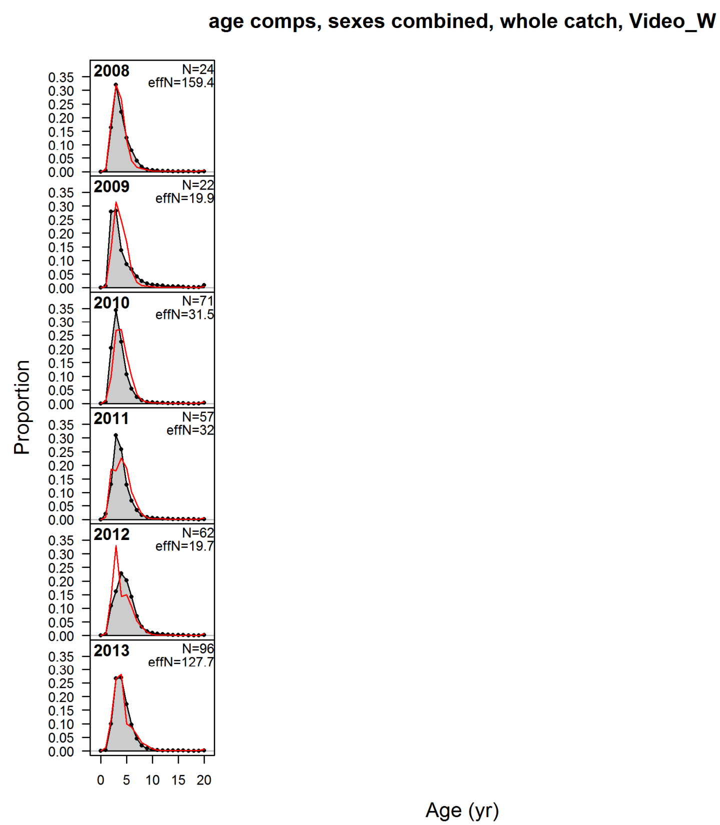
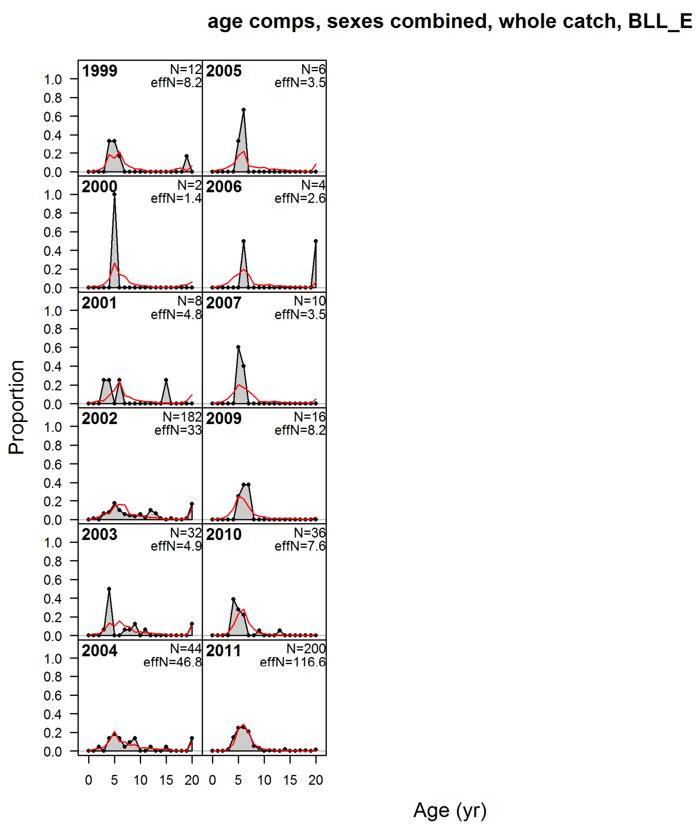


Figure 4.6. (fits to age composition of surveys continued)

c) NMFS Bottom Longline East

SEDAR 31



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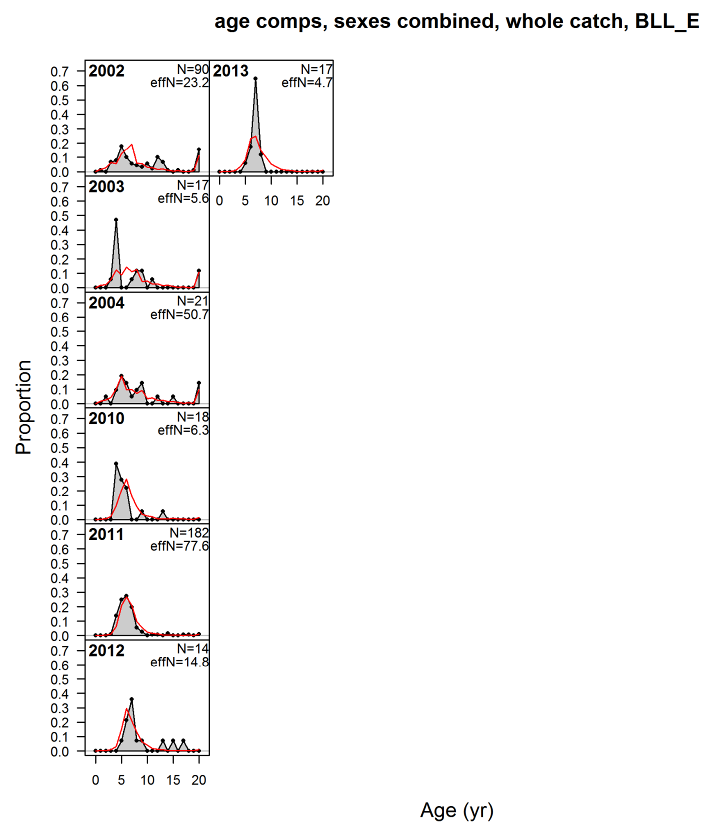
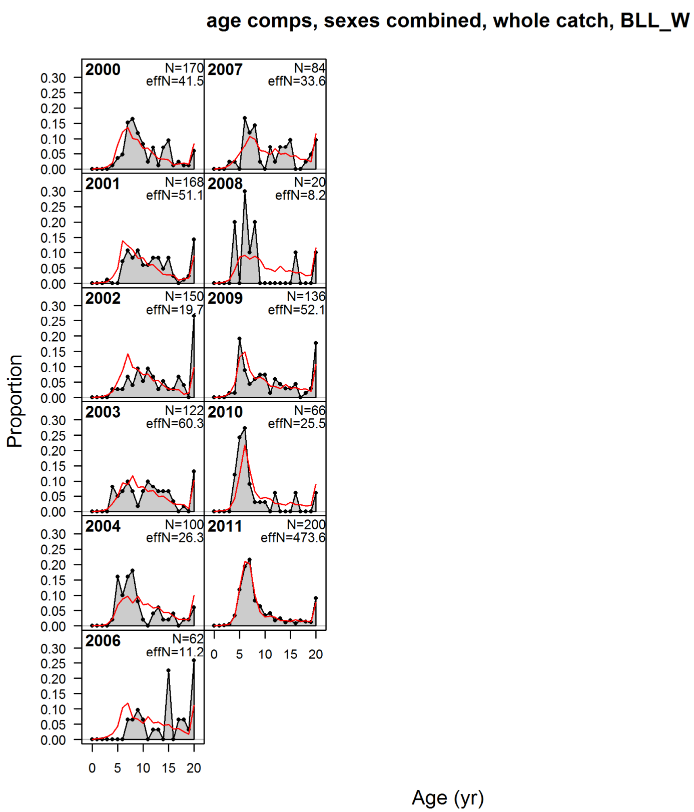


Figure 4.6. (fits to age composition of surveys continued)

e) NMFS Bottom Longline West

SEDAR 31



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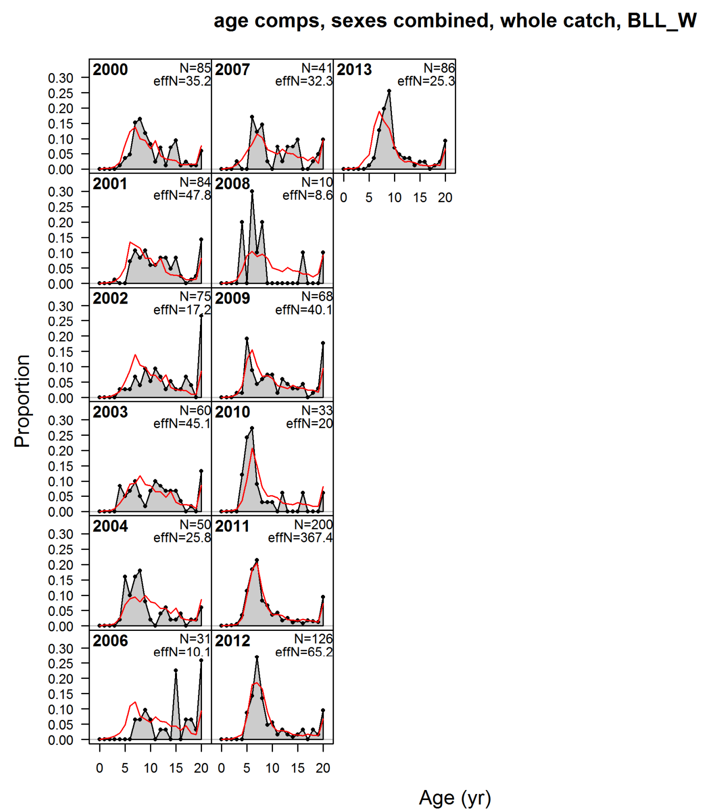
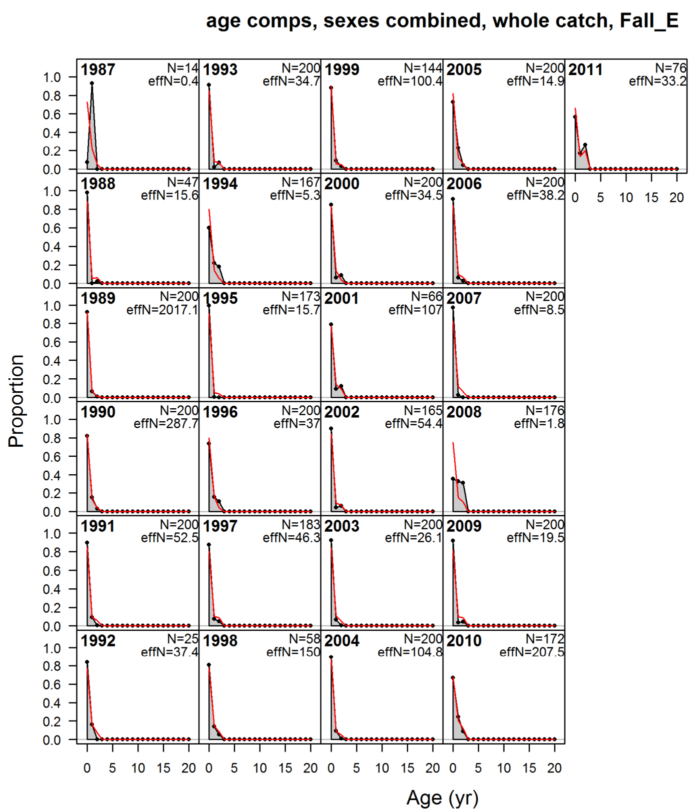


Figure 4.6. (fits to age composition of surveys continued)

f) SEAMAP Fall Groundfish East

SEDAR 31



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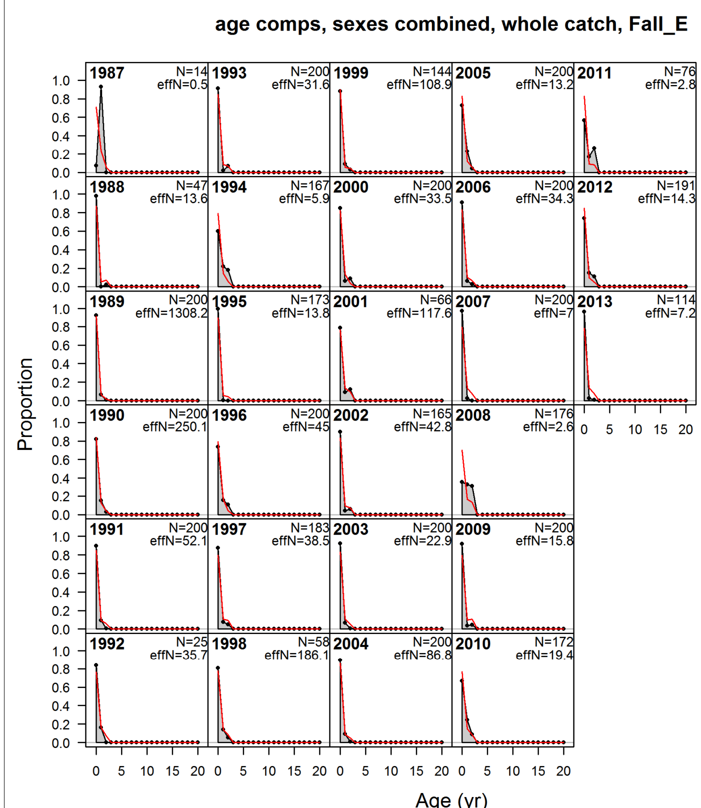
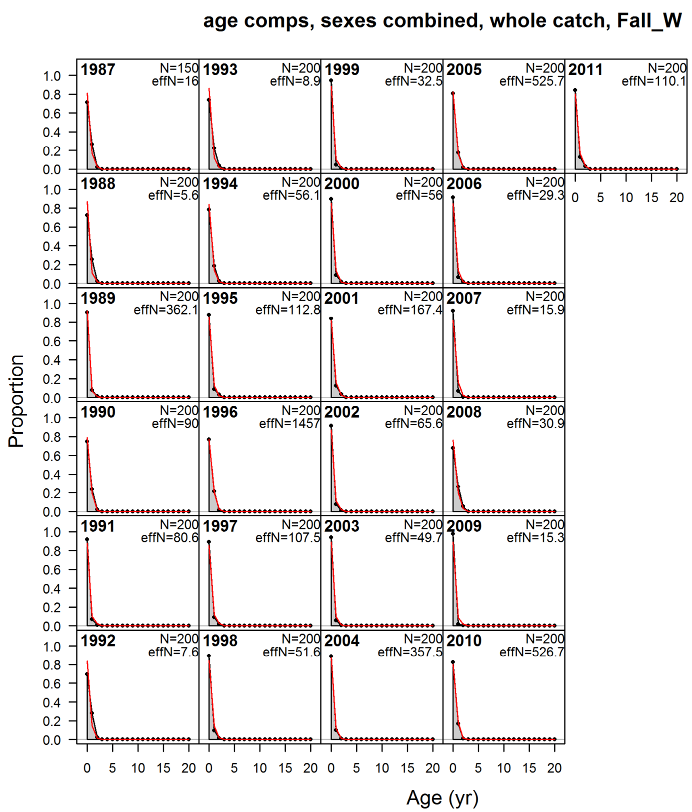


Figure 4.6. (fits to age composition of surveys continued)

g) SEAMAP Fall Groundfish West

SEDAR 31



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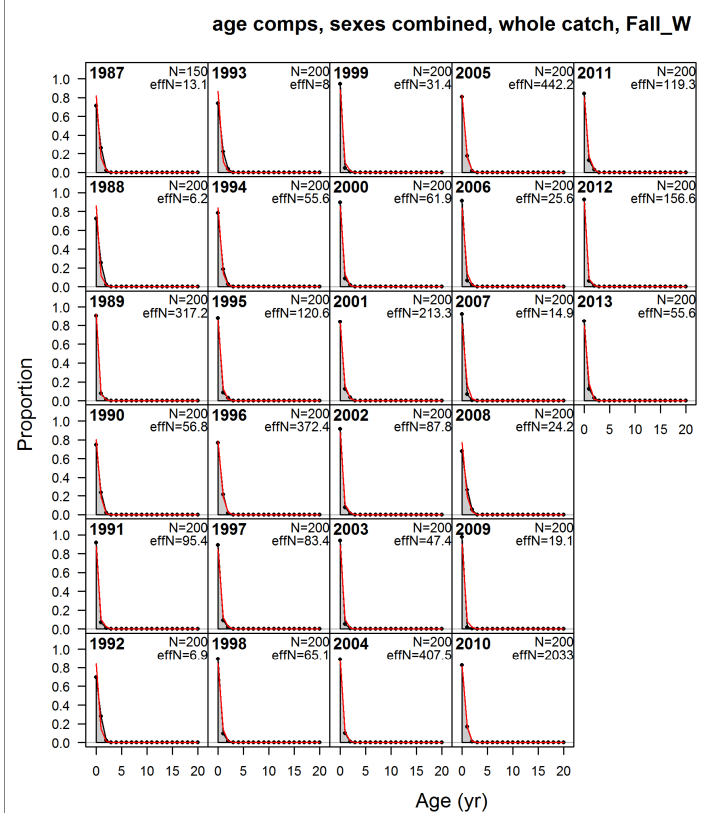
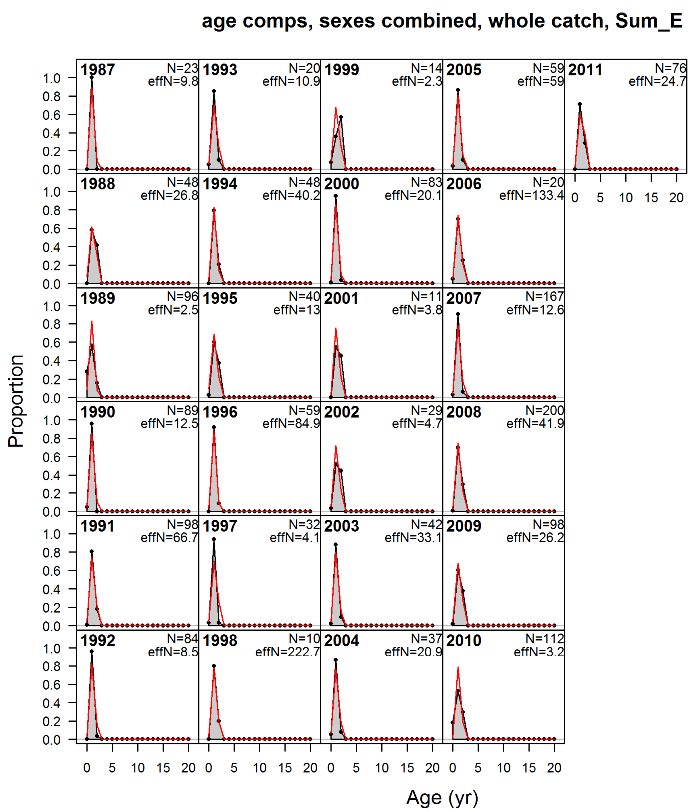


Figure 4.6. (fits to age composition of surveys continued)

h) SEAMAP Summer Groundfish East

SEDAR 31	UPDATE



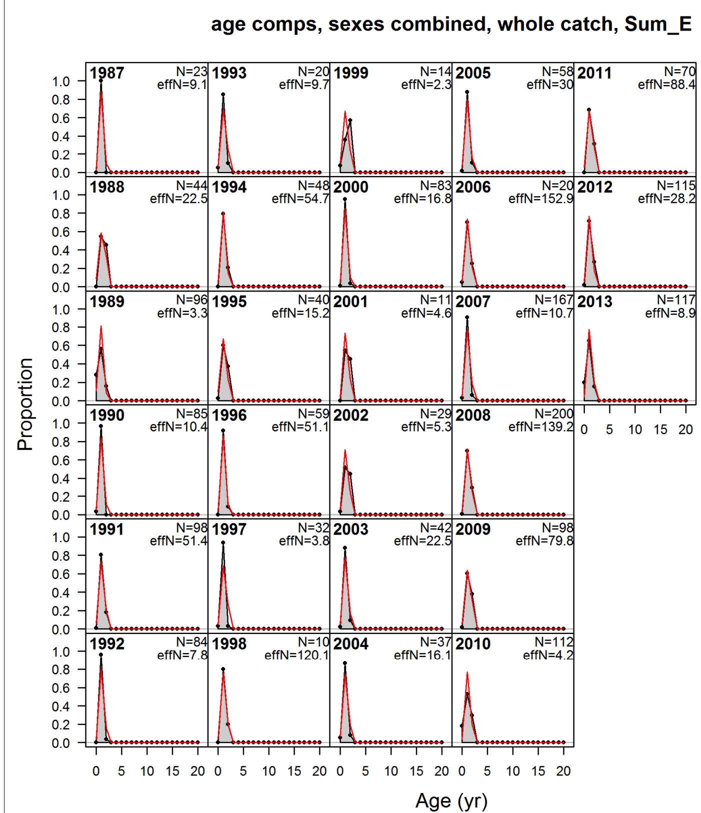
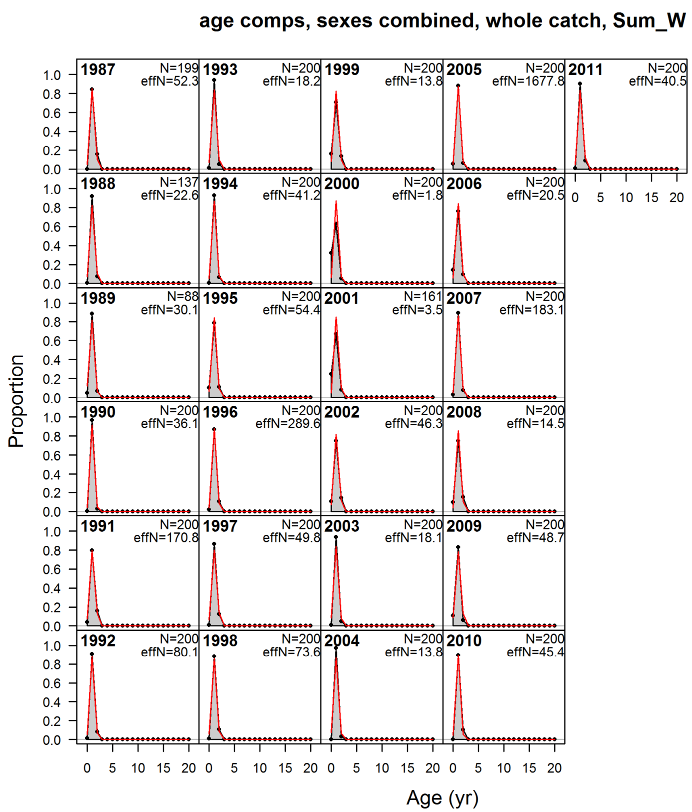


Figure 4.6. (fits to age composition of surveys continued)

i) SEAMAP Summer Groundfish West

SEDAR 31



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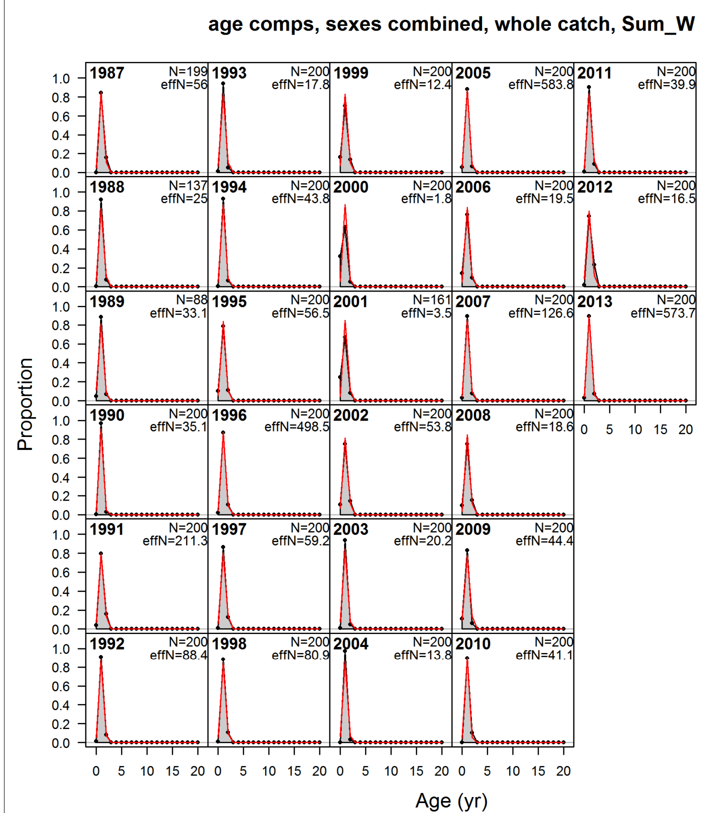
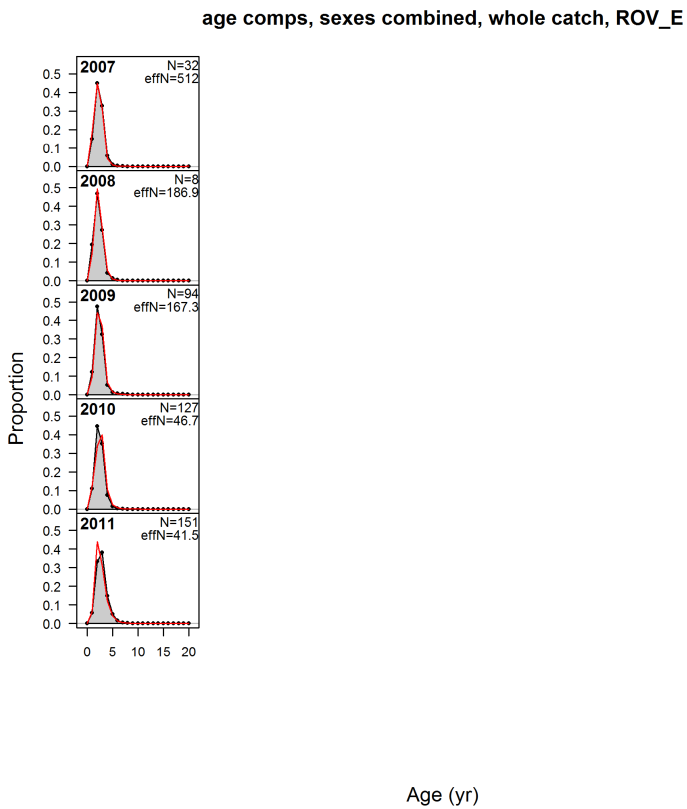


Figure 4.6. (fits to age composition of surveys continued)

j) ROV East

SEDAR 31



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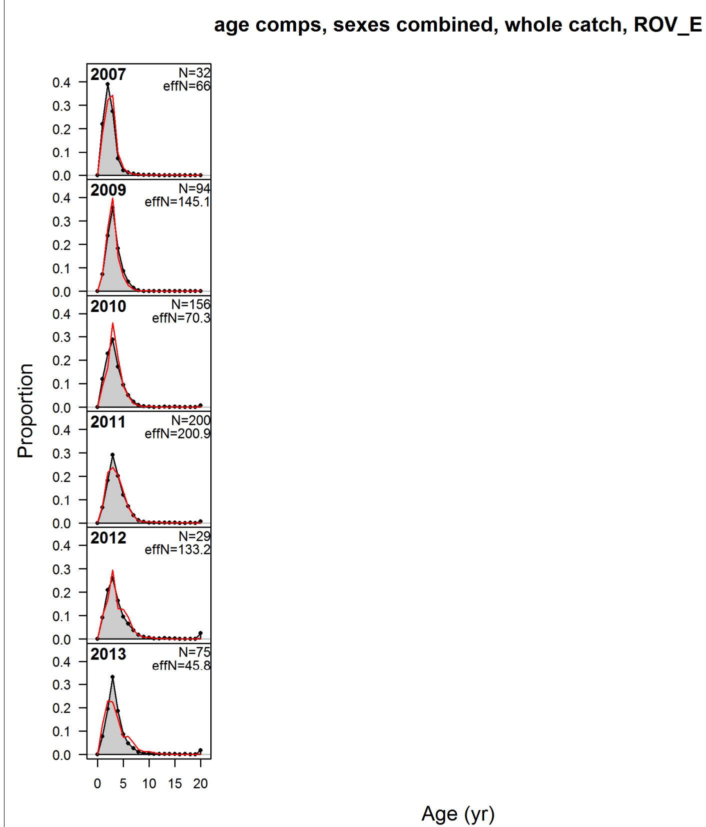
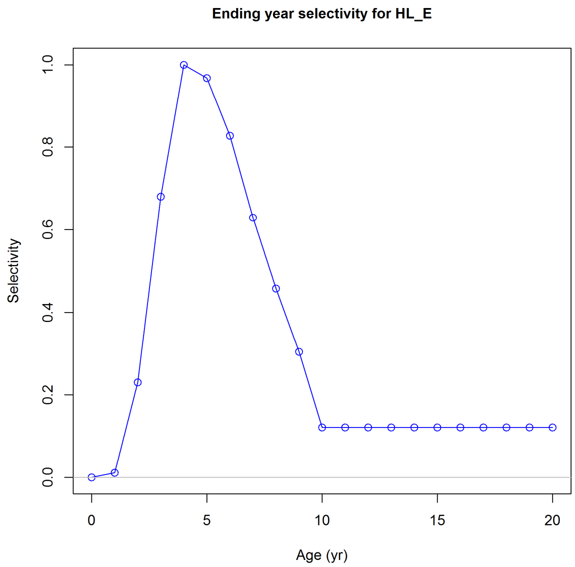
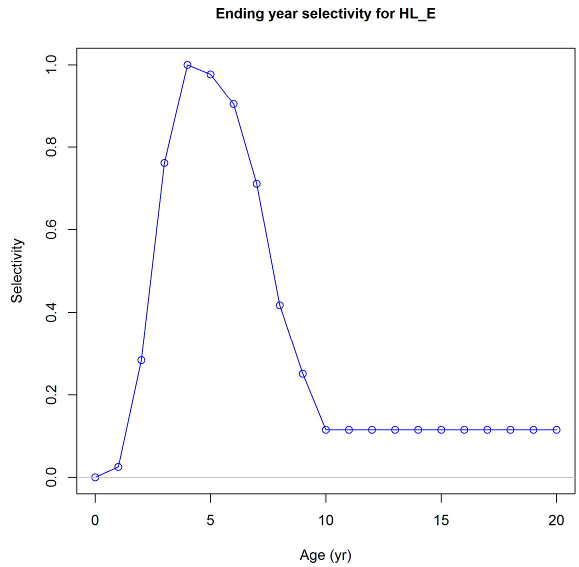


Figure 4.7. Age based selectivity, by fishery.

a) Commerical Vertical Line East

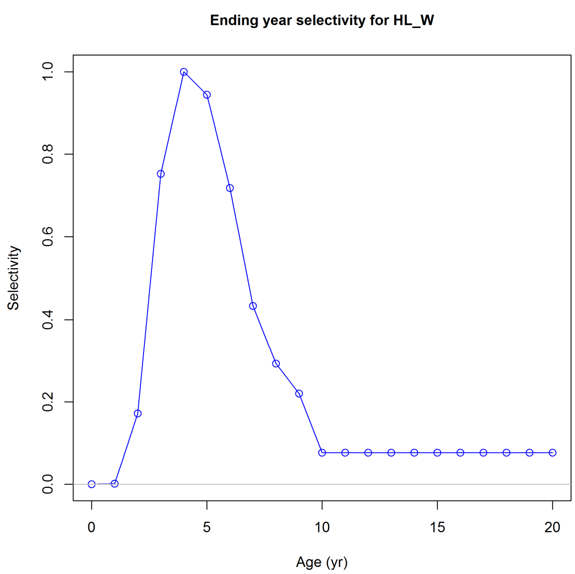
SEDAR 31 **UPDATE**





b) Commerical Vertical Line West

SEDAR 31 **UPDATE**



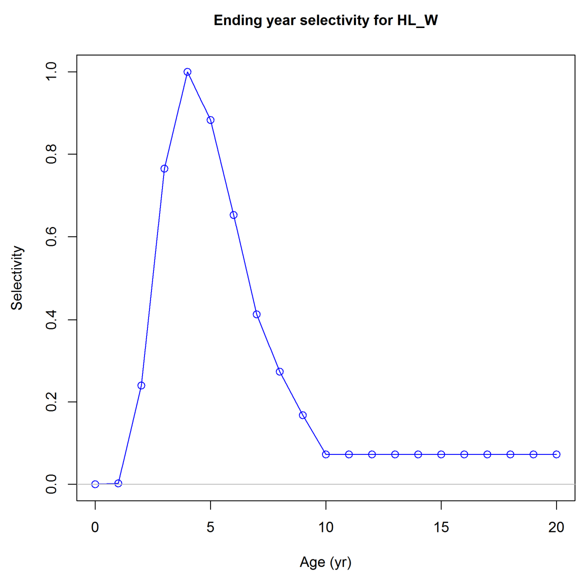
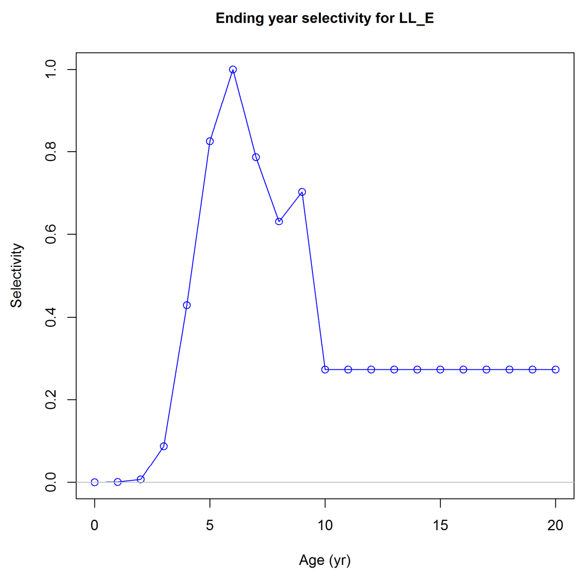


Figure 4.7. (Age based fleet selectivity continued)

c) Commerical Long Line East

SEDAR 31



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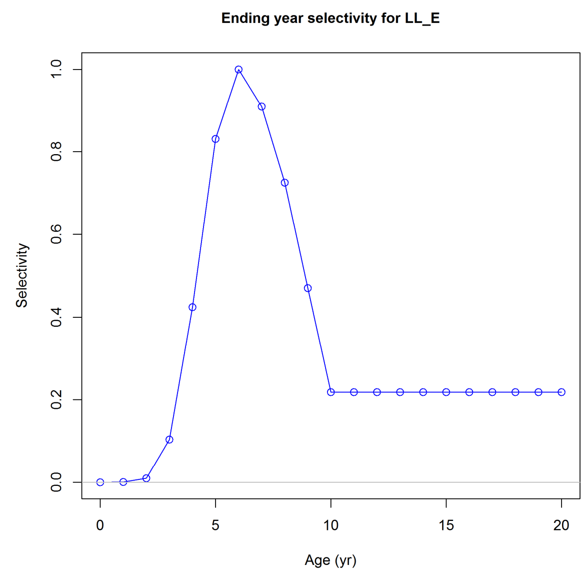
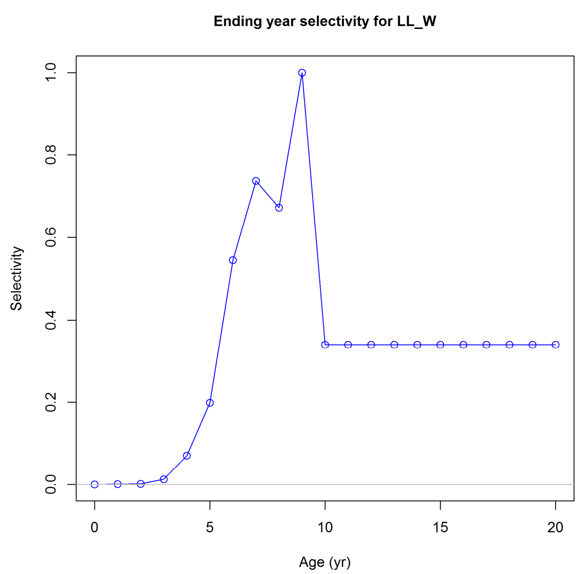


d) Commerical Long Line West

SEDAR 31



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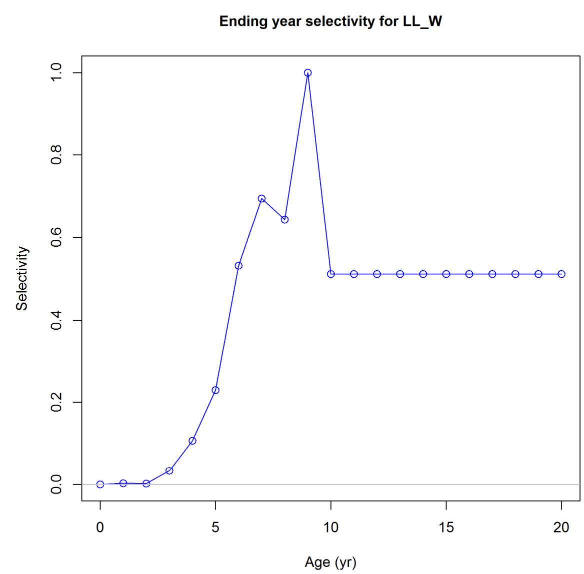
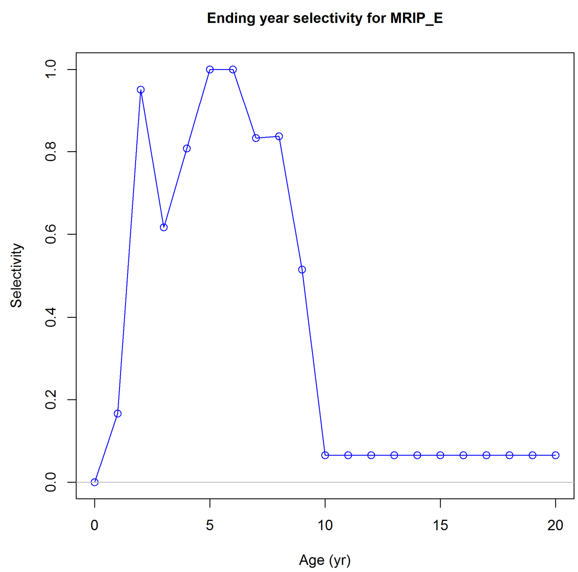


Figure 4.7. (Age based fleet selectivity continued)

e) Recreational MRIP (Charter + Private) East

SEDAR 31



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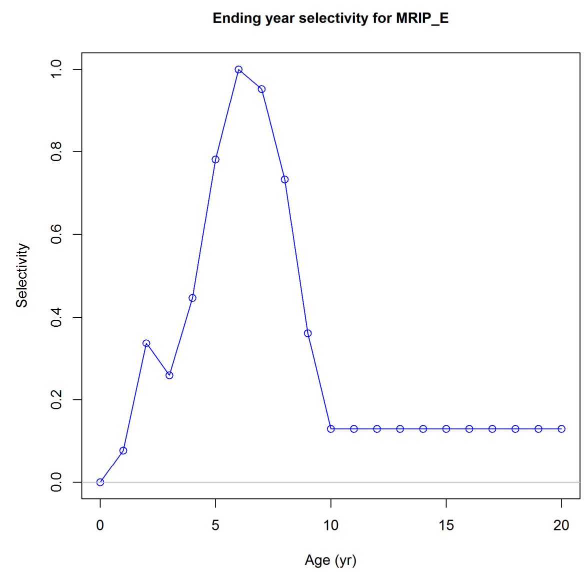
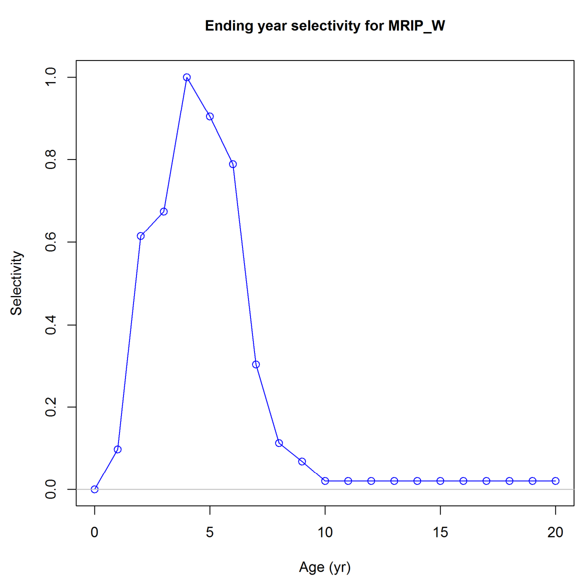


f) Recreational MRIP (Charter + Private) West

SEDAR 31



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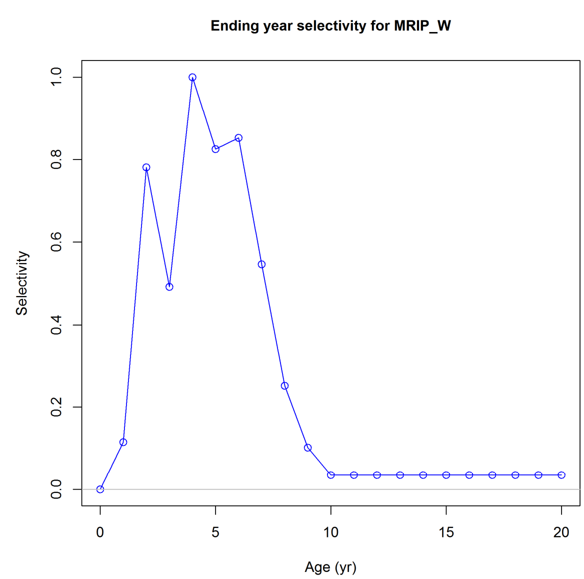
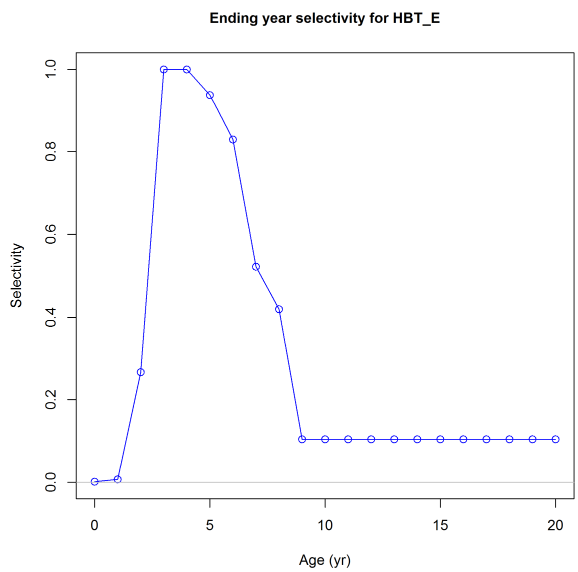


Figure 4.7. (Age based fleet selectivity continued)

g) Recreational Headboat East

SEDAR 31



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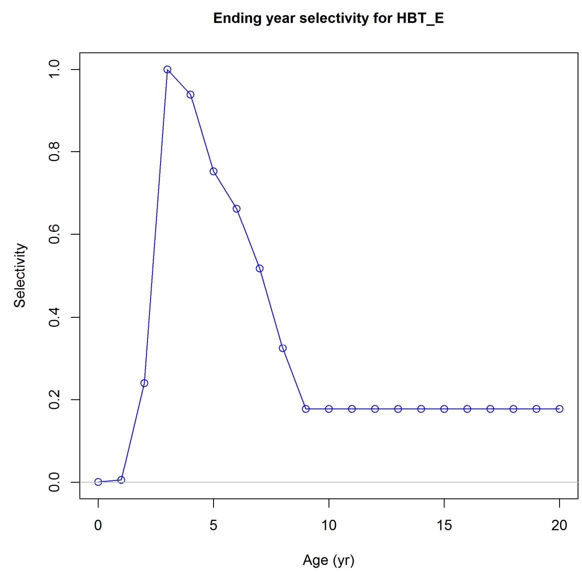
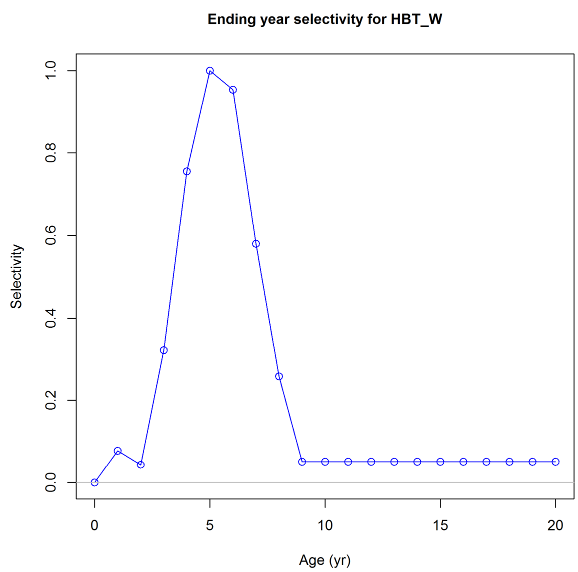


h) Recreational Headboat West

SEDAR 31



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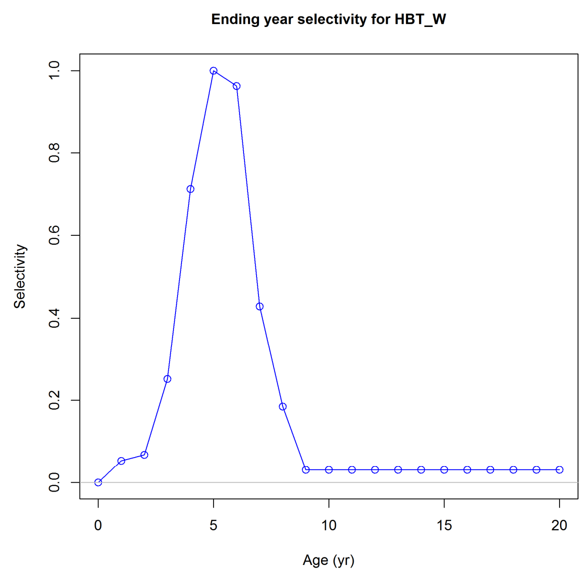
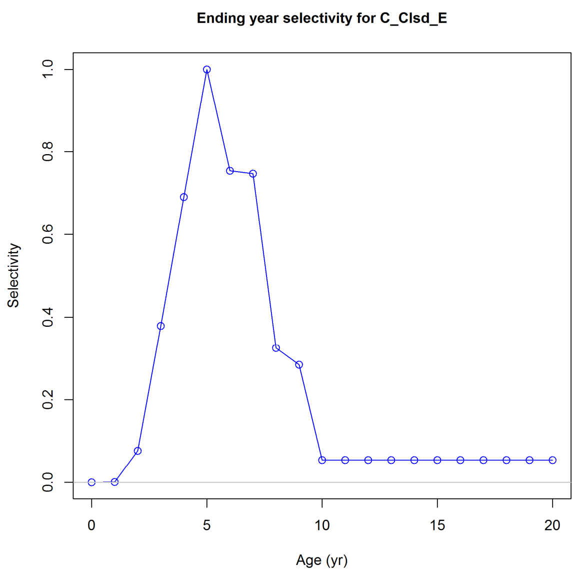
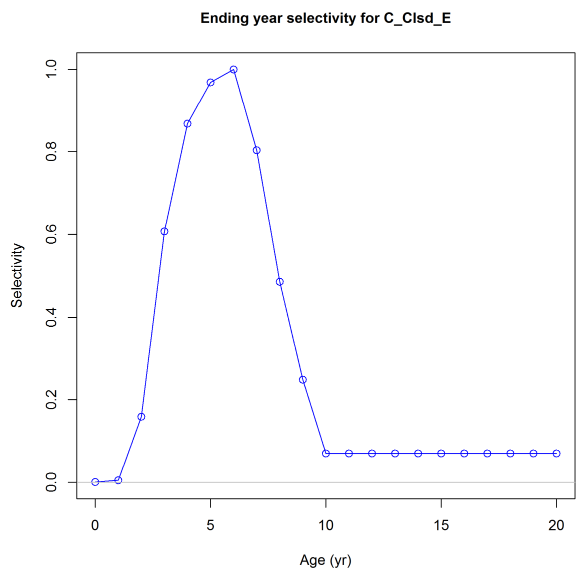


Figure 4.7. (Age based fleet selectivity continued)

i) Commerical Closed Season (no allocation) East

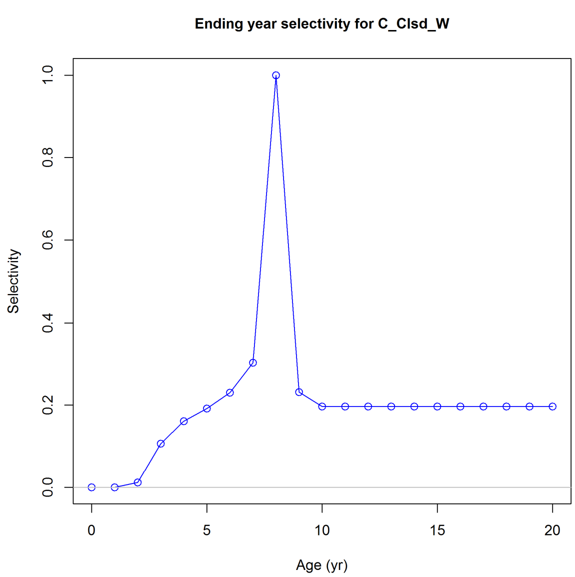
SEDAR 31 **UPDATE**





j) Commerical Closed Season (no allocation) West

SEDAR 31 **UPDATE**



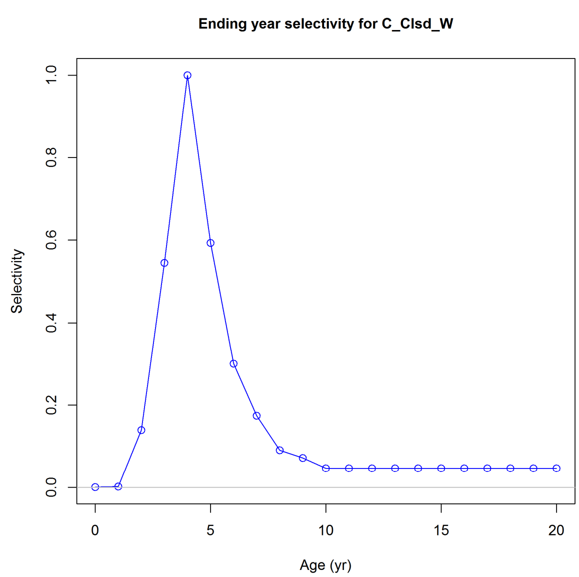
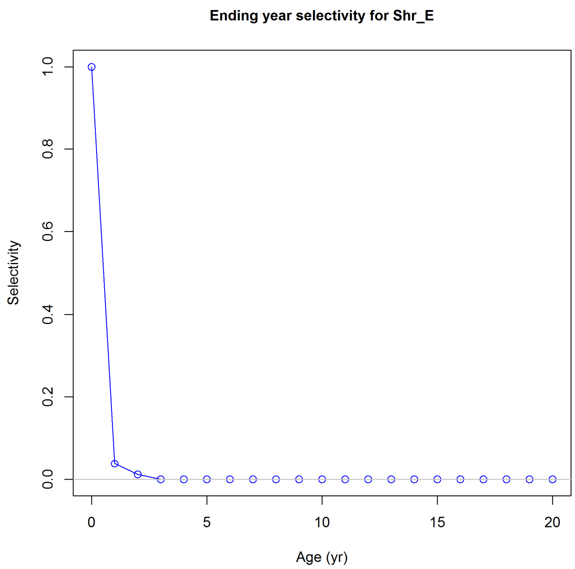
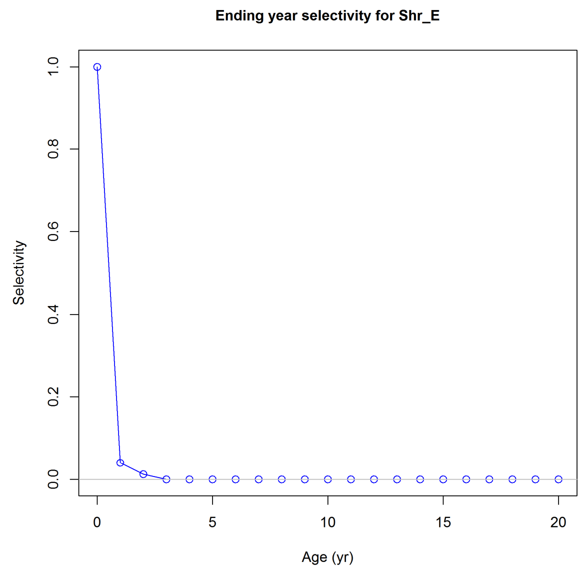


Figure 4.7. (Age based fleet selectivity continued)

k) Shrimp Bycatch East

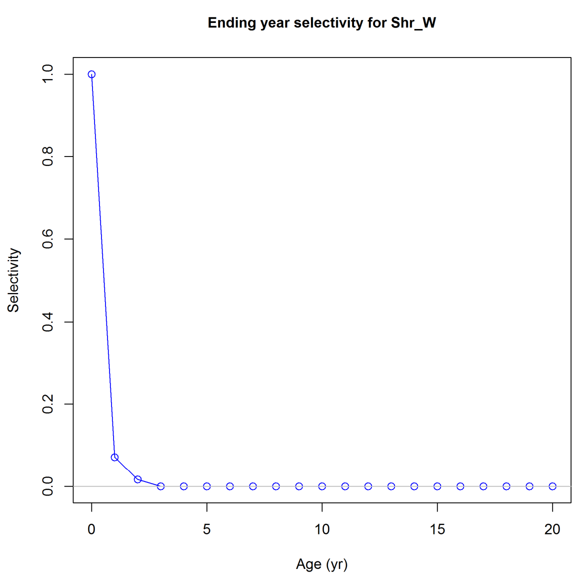
SEDAR 31	UPDATE





l) Shrimp Bycatch West

SEDAR 31	UPDATE



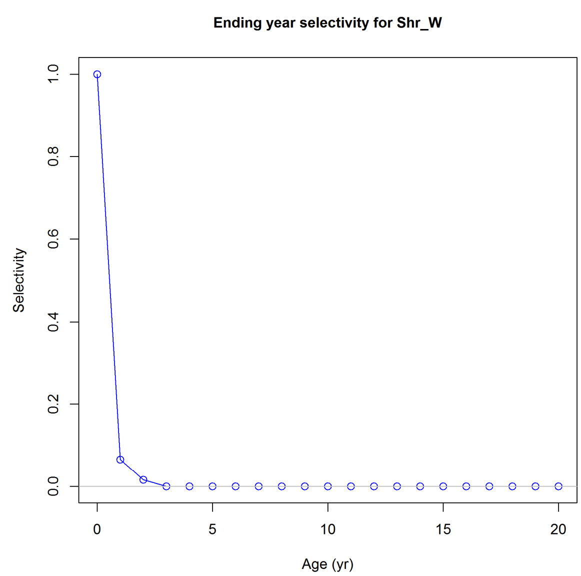
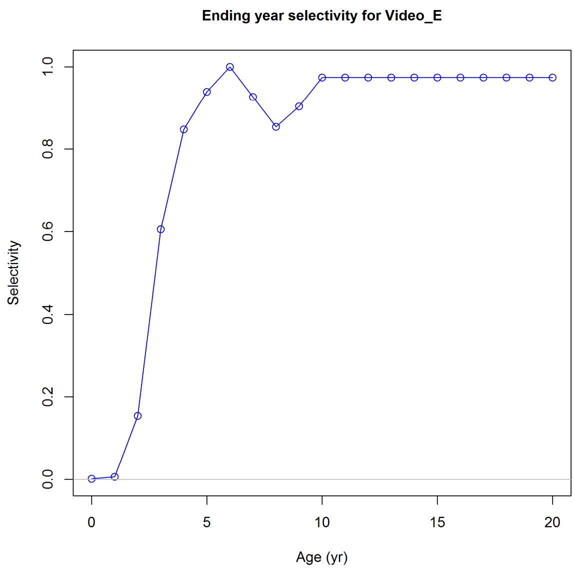
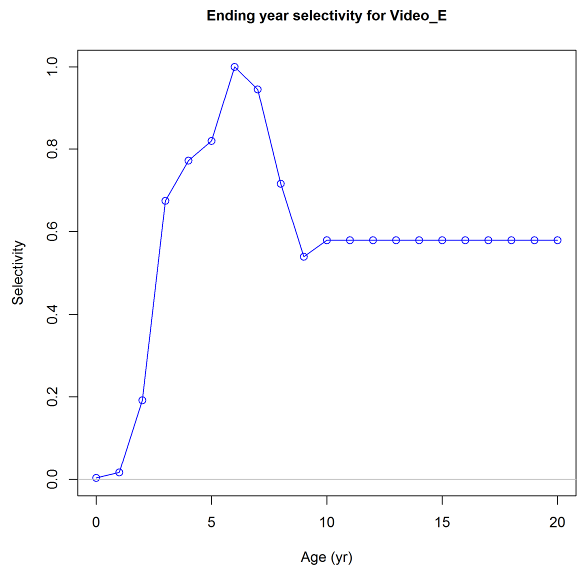


Figure 4.8. Age based selectivity, by survey.

a) SEAMAP Video East

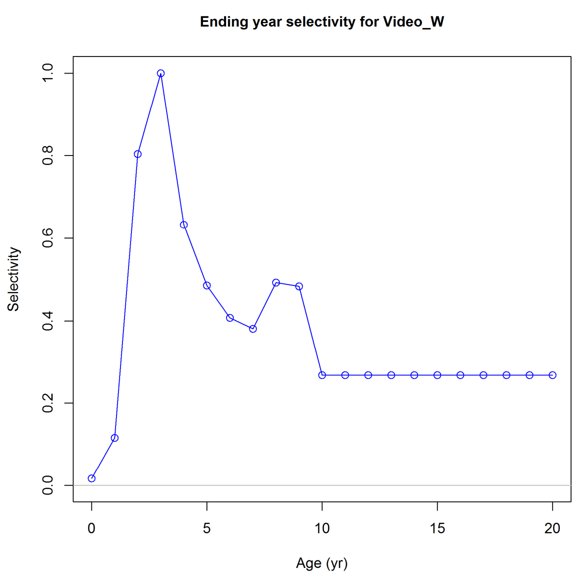
SEDAR 31	UPDATE





b) SEAMAP Video West

SEDAR 31	UPDATE



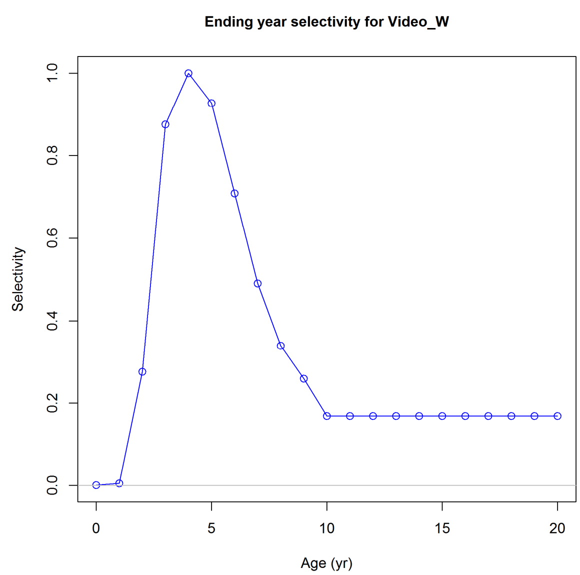
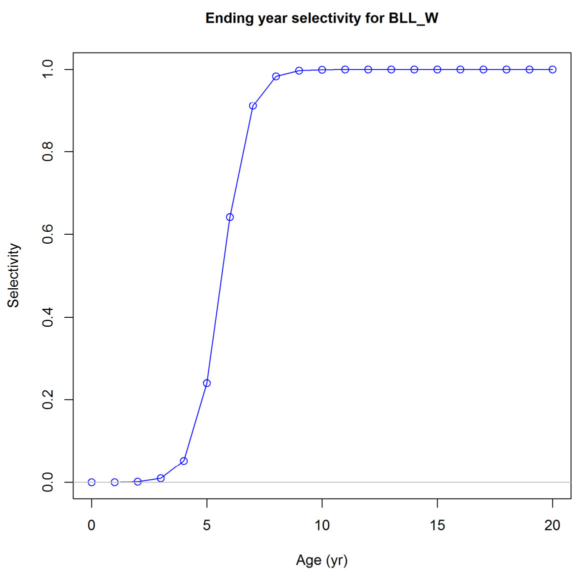


Figure 4.8. (Age based selectivity by survey continued)

c) NMFS Bottom Longline West

SEDAR 31



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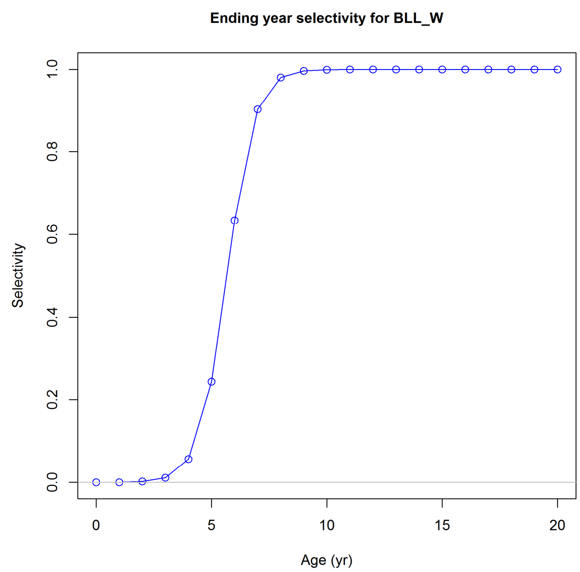
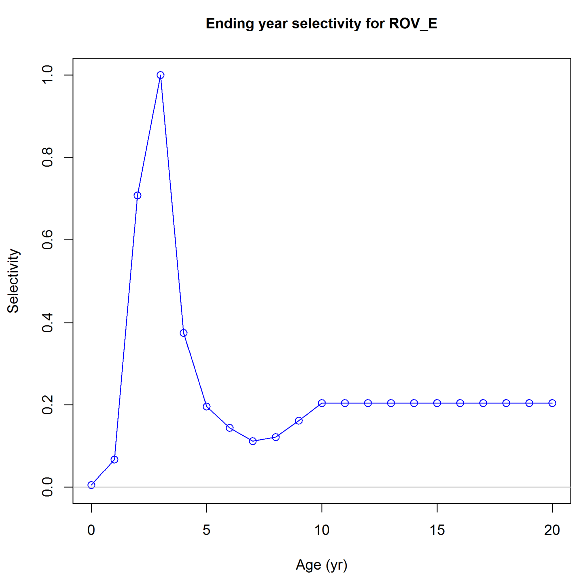


d) ROV East

SEDAR 31



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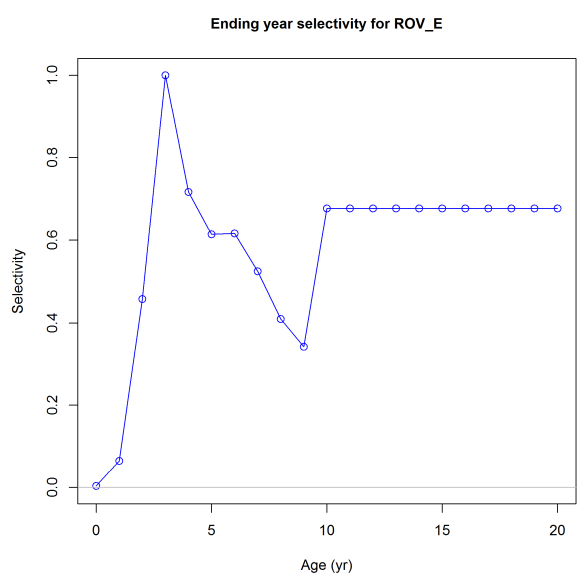
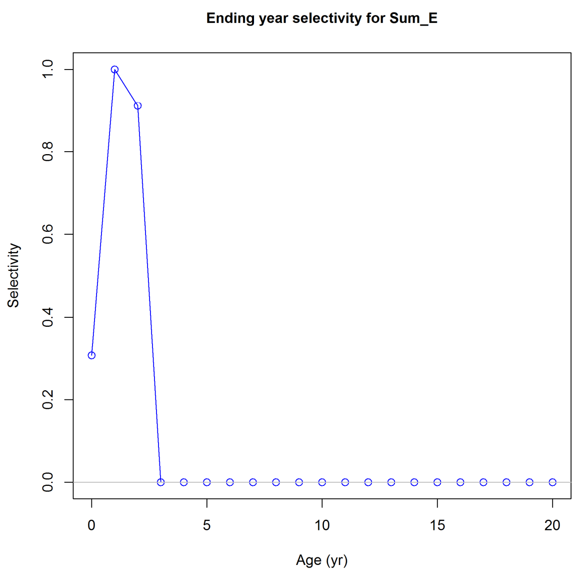


Figure 4.8. (Age based selectivity by survey continued)

e) SEAMAP Summer Groundfish East

SEDAR 31



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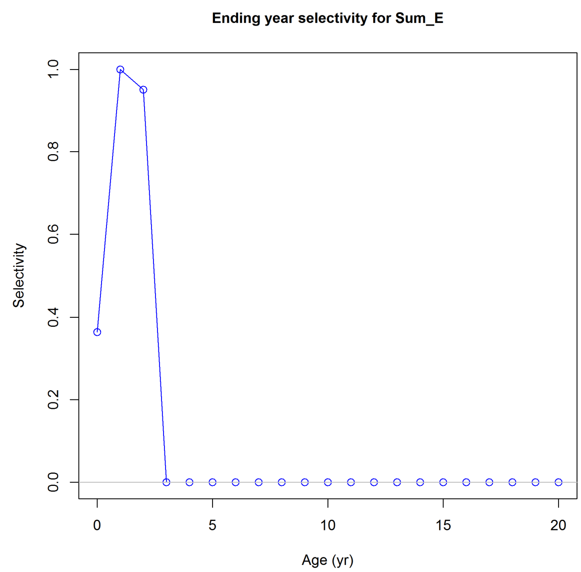
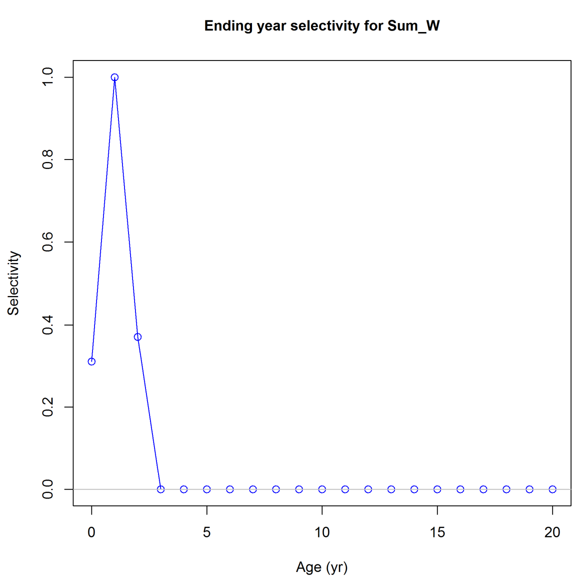


f) SEAMAP Summer Groundfish West

SEDAR 31



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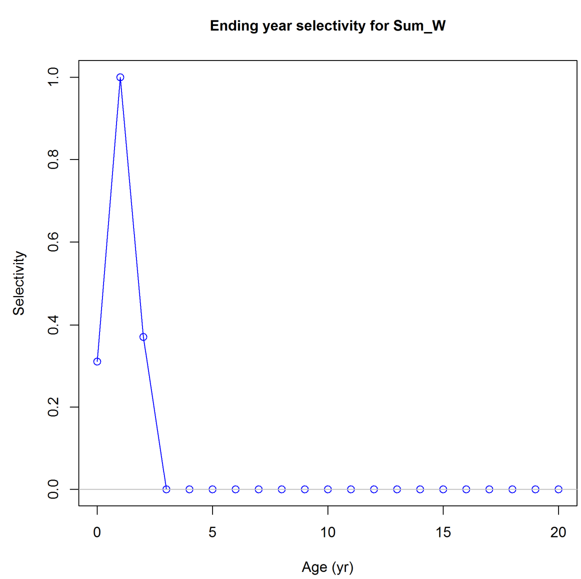
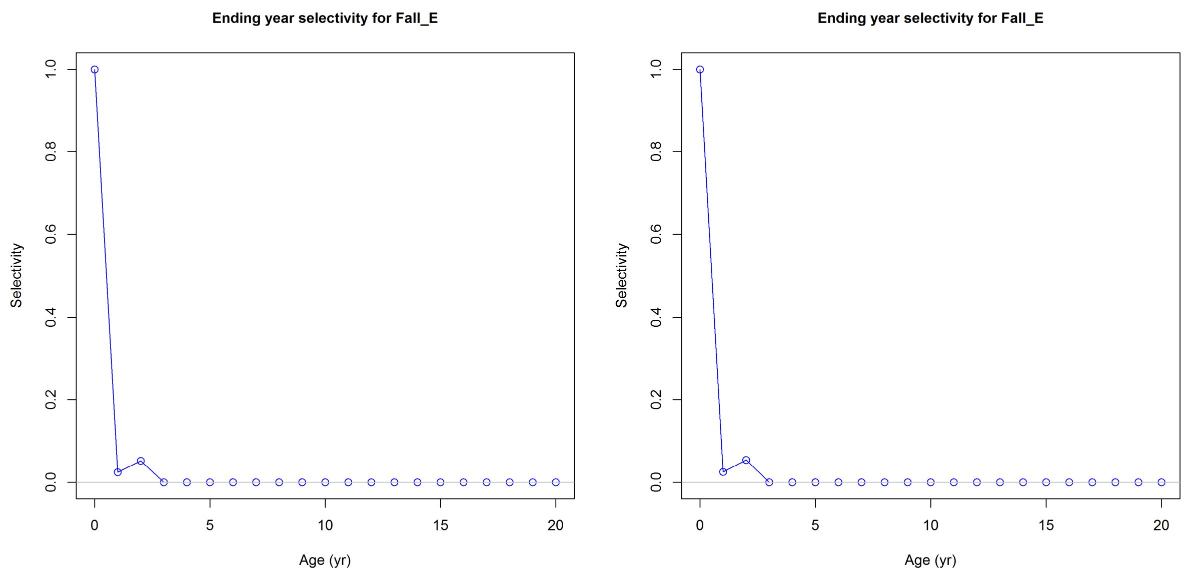


Figure 4.8. (Age based selectivity by survey continued)

g) SEAMAP Fall Groundfish East

SEDAR 31 | **UPDATE**



h) SEAMAP Fall Groundfish West

SEDAR 31 | **UPDATE**

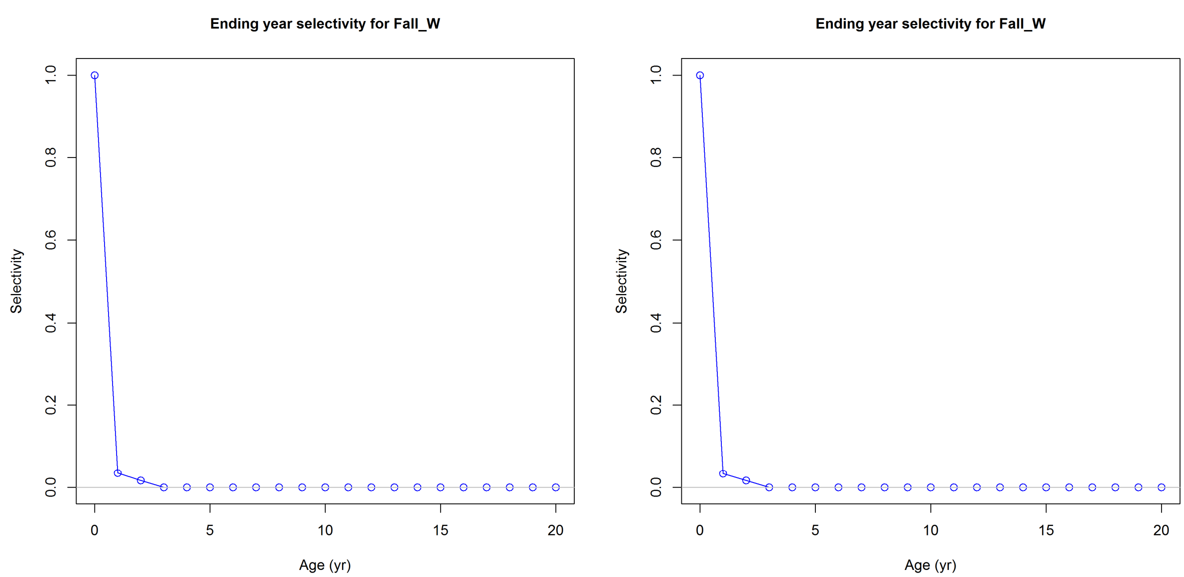
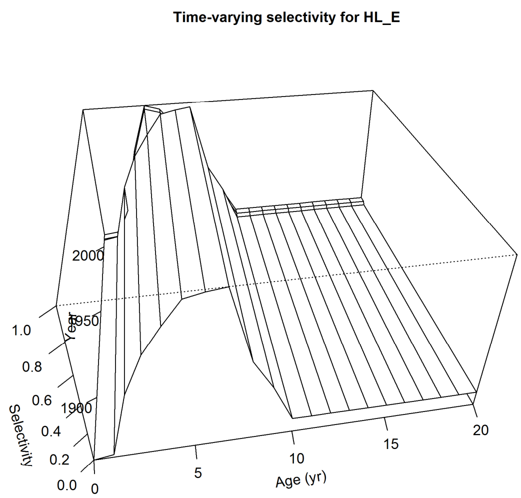
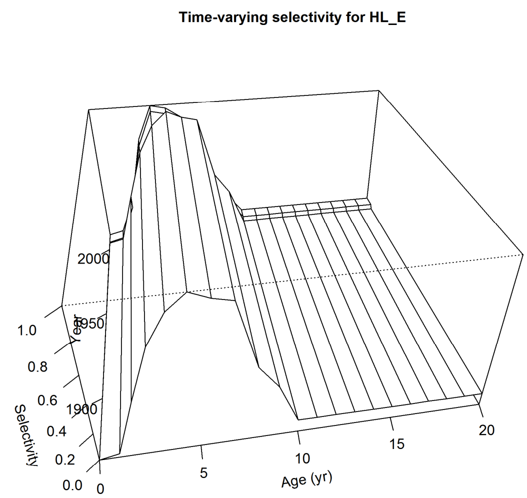


Figure 4.9. Time-varying changes in estimated selectivity at age for the commerical fleets. The change in 2007 accounted for a shift in selectivity due to the impostion of IFQ.

a) Commercial Vertical Line East

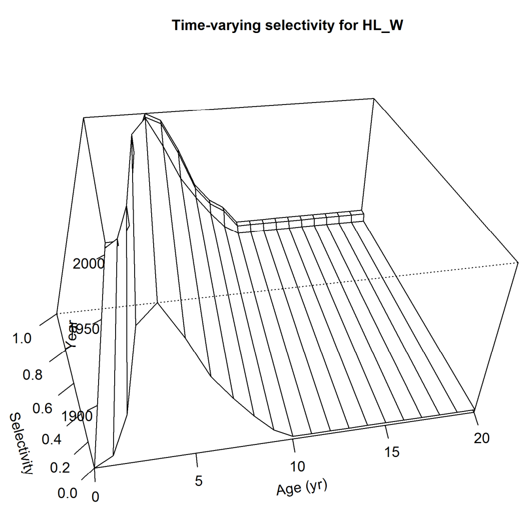
SEDAR 31	**UPDATE**





b) Commercial Vertical Line West

SEDAR 31	**UPDATE**



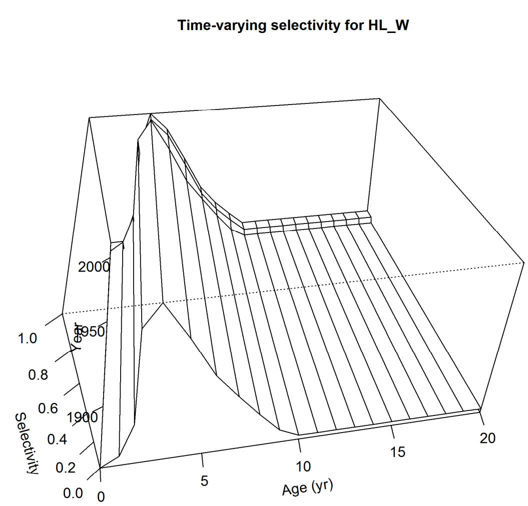
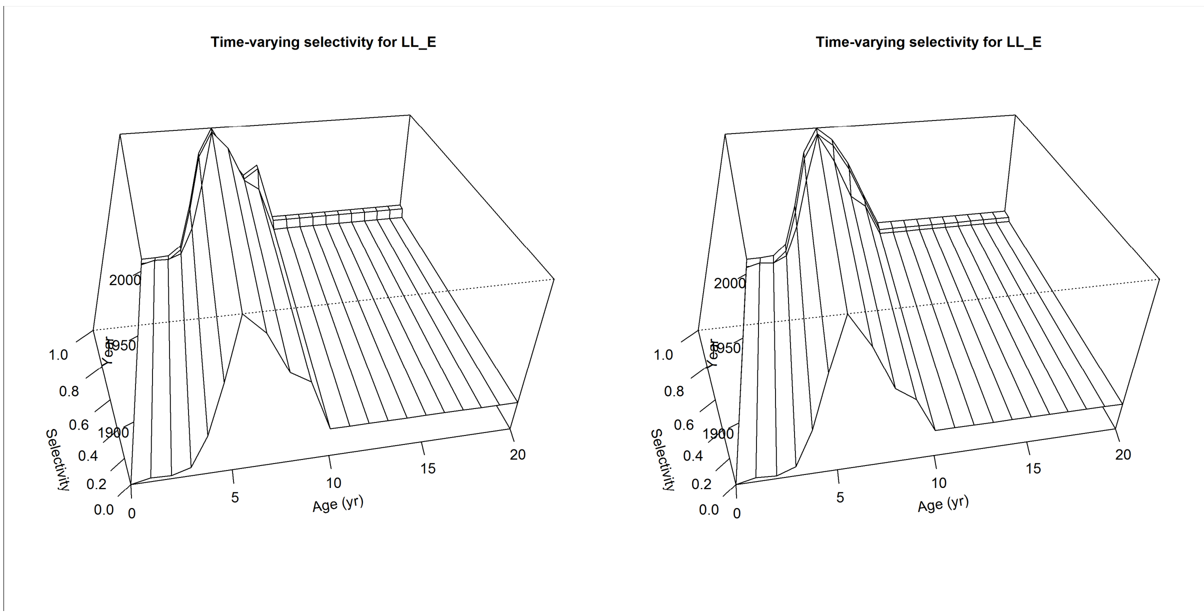


Figure 4.9. (Time-varying changes commercial selectivity continued).

c) Commercial Longline East

SEDAR 31 **UPDATE**



d) Commercial Longline West

SEDAR 31 **UPDATE**

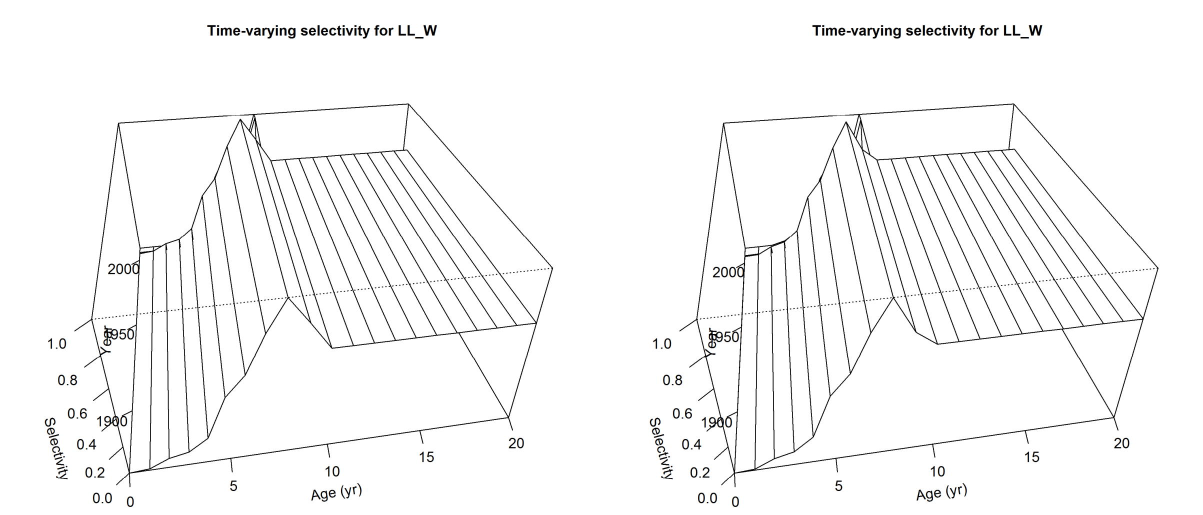
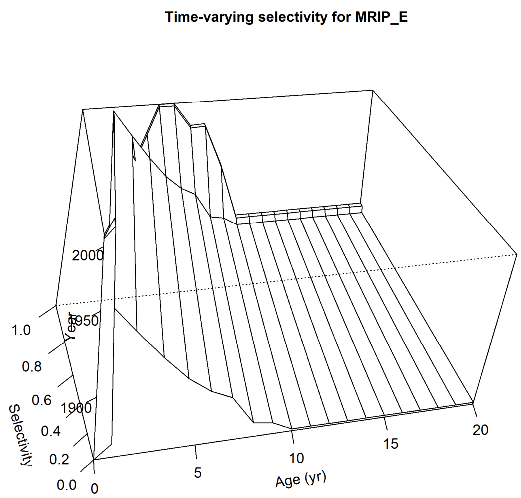
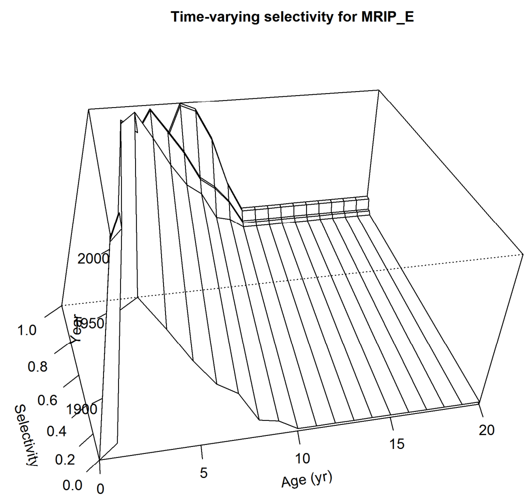


Figure 4.10. Time-varying changes in estimated selectivity at age for the recreational fleets. The change in 2007 accounted for a shift in selectivity due to the impostion of circle hooks. The change in 2011 was implemented to account for a possible shift in targeting toward larger fish.

a) Recreational MRIP (Charter + Private) East

SEDAR 31	UPDATE
	

a) Recreational MRIP (Charter + Private) West

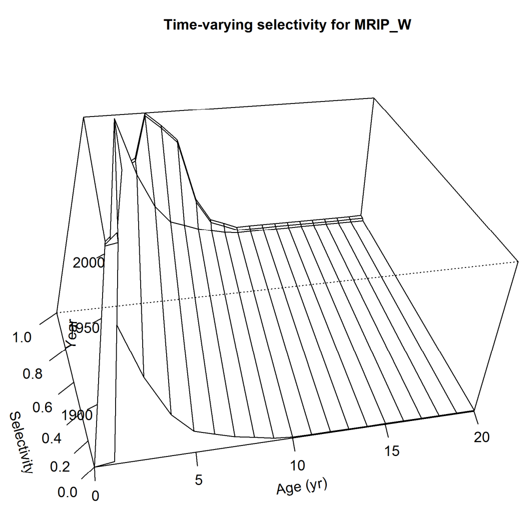
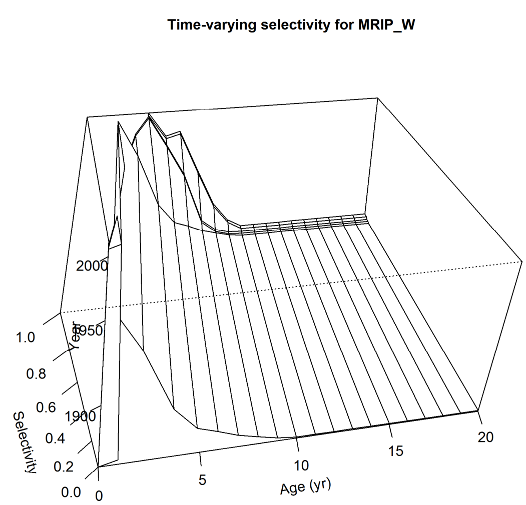
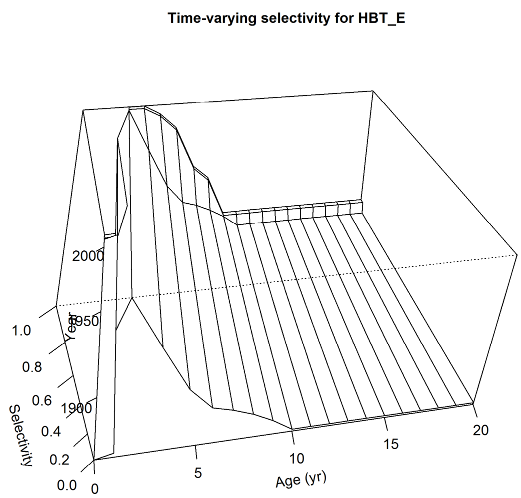
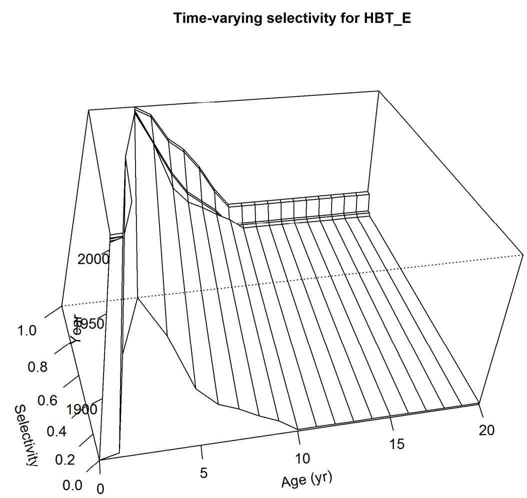
SEDAR 31	UPDATE
	

Figure 4.10. (Time-varying changes in recreational selectivity continued).

c) Recreational Headboat East

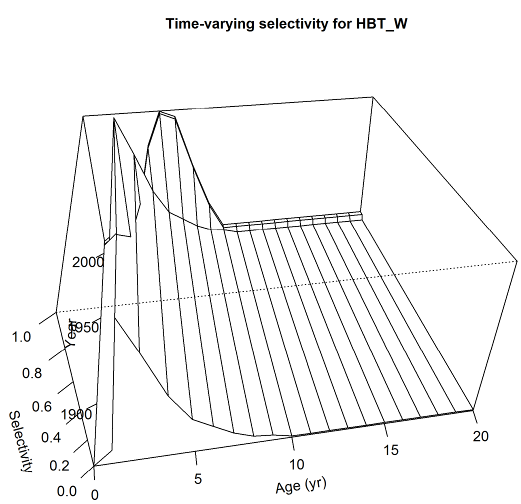
SEDAR 31	UPDATE





d) Recreational Headboat West

SEDAR 31	UPDATE



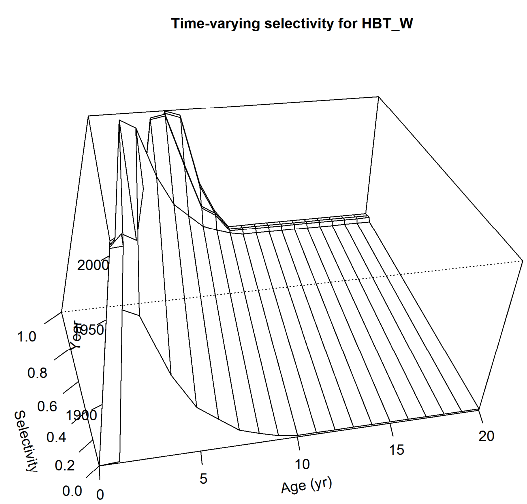
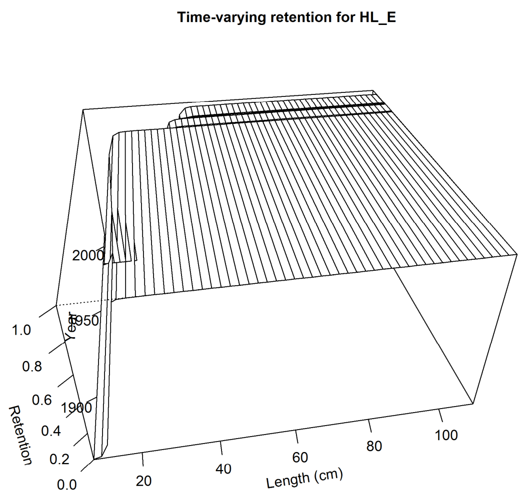


Figure 4.11. Time-varying changes in estimated retention at length. The changes were implemented to account for various minimum size limits.

a) Commercial Vertical Line East

SEDAR 31



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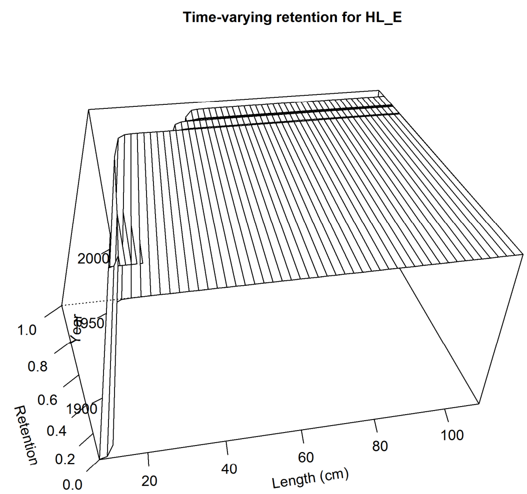
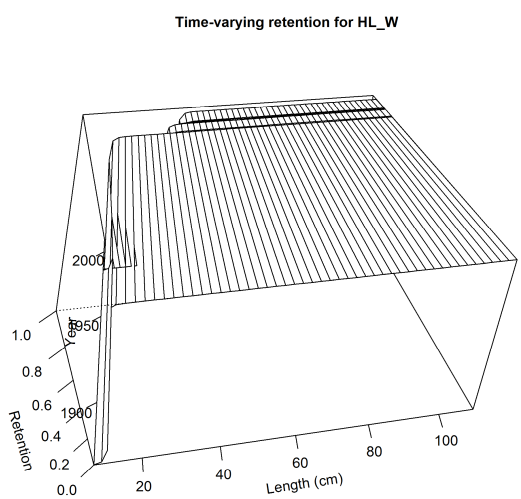


b) Commercial Vertical Line West

SEDAR 31



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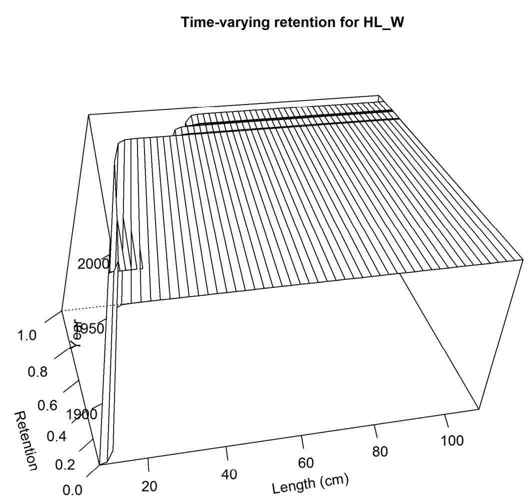
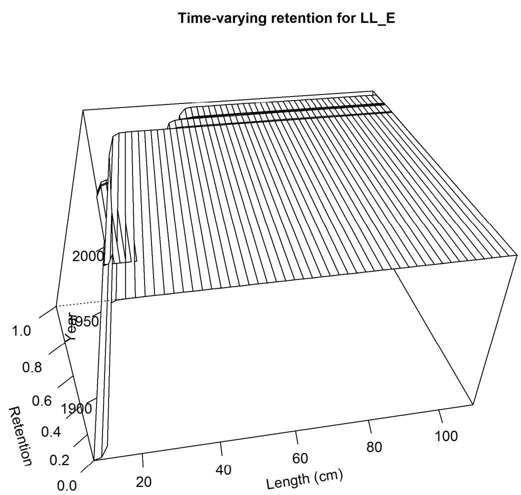


Figure 4.11. Time-varying changes in estimated retention at length (continued).

c) Commercial Longline East

SEDAR 31



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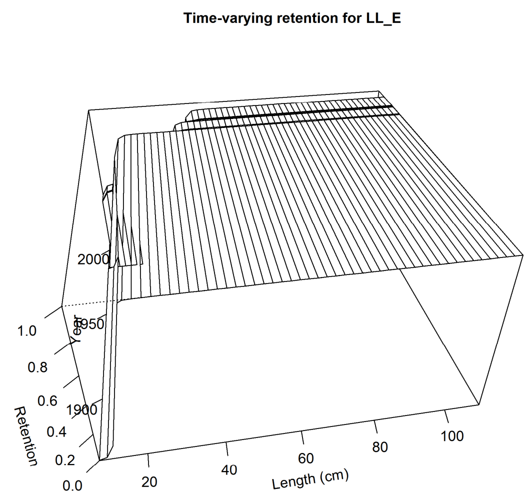
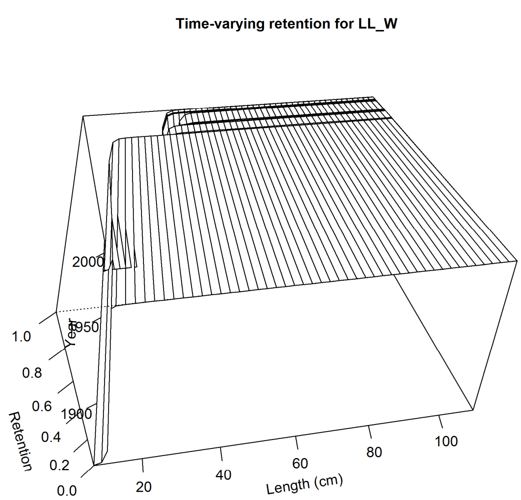


d) Commercial Longline West

SEDAR 31



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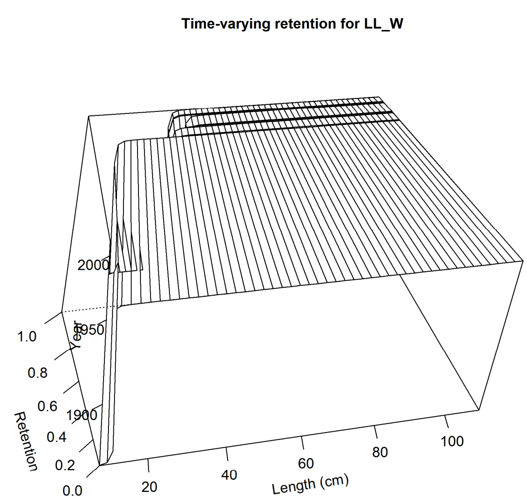
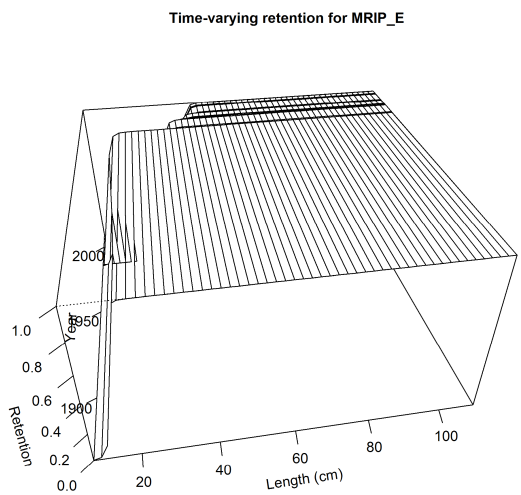


Figure 4.11. Time-varying changes in estimated retention at length (continued).

e) Recreational MRIP (Charter + Private) East

SEDAR 31



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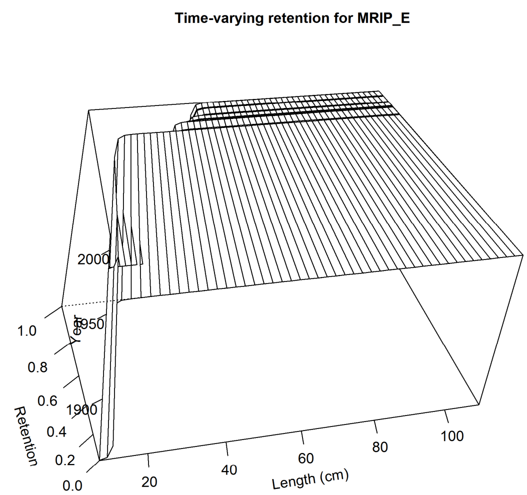
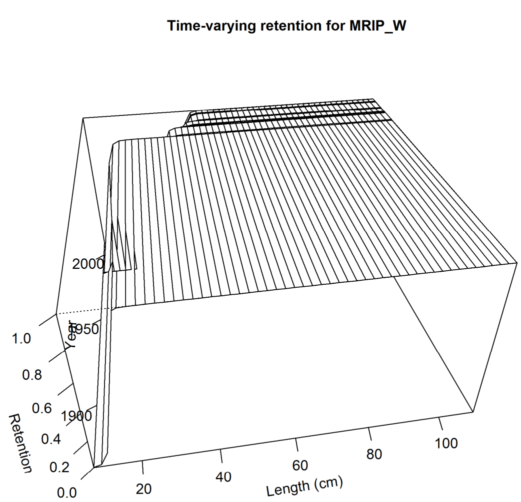


f) Recreational MRIP (Charter + Private) West

SEDAR 31



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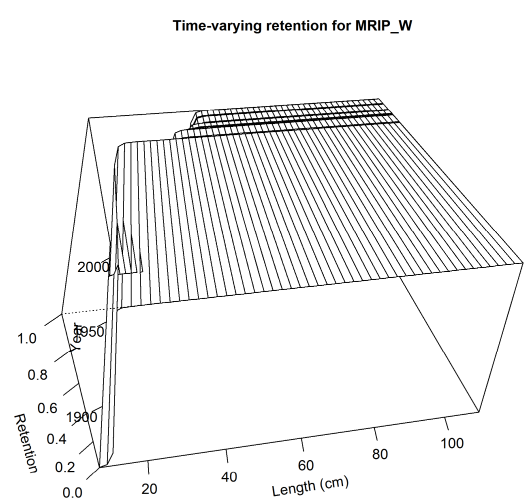
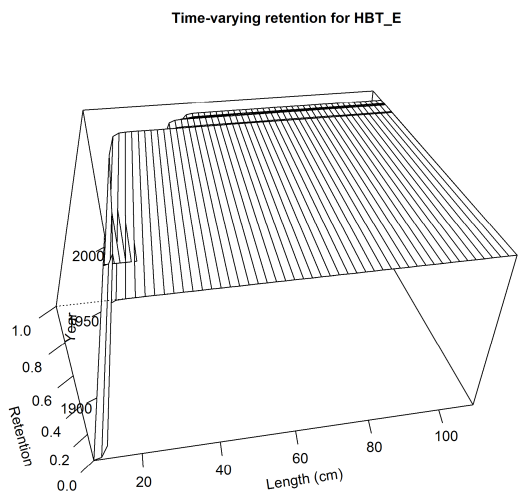
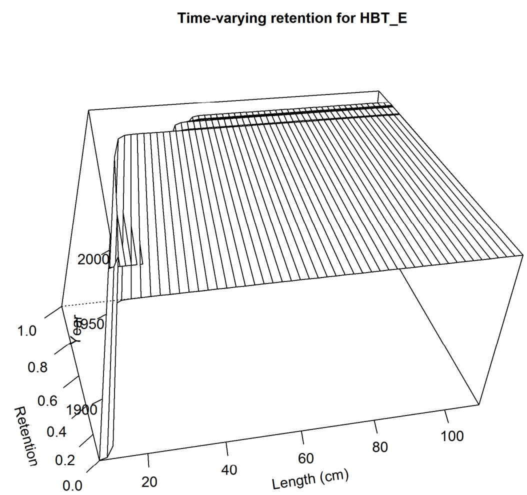


Figure 4.11. Time-varying changes in estimated retention at length (continued).

g) Recreational Headboat East

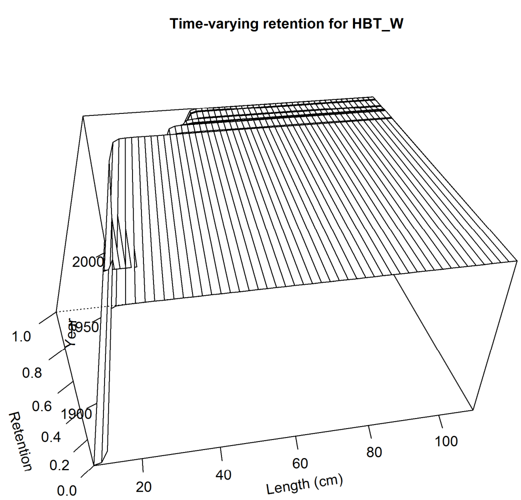
SEDAR 31 | **UPDATE**

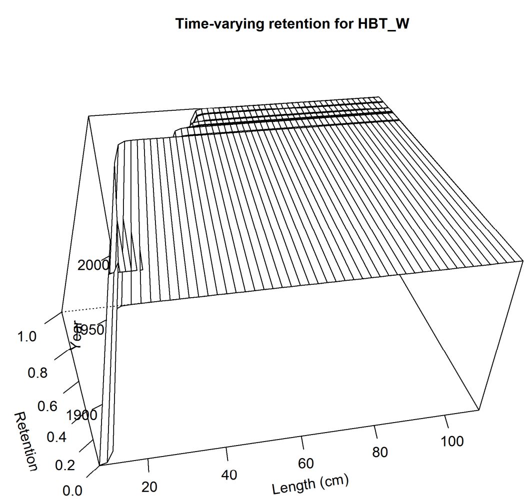




h) Recreational Headboat West

SEDAR 31 | **UPDATE**





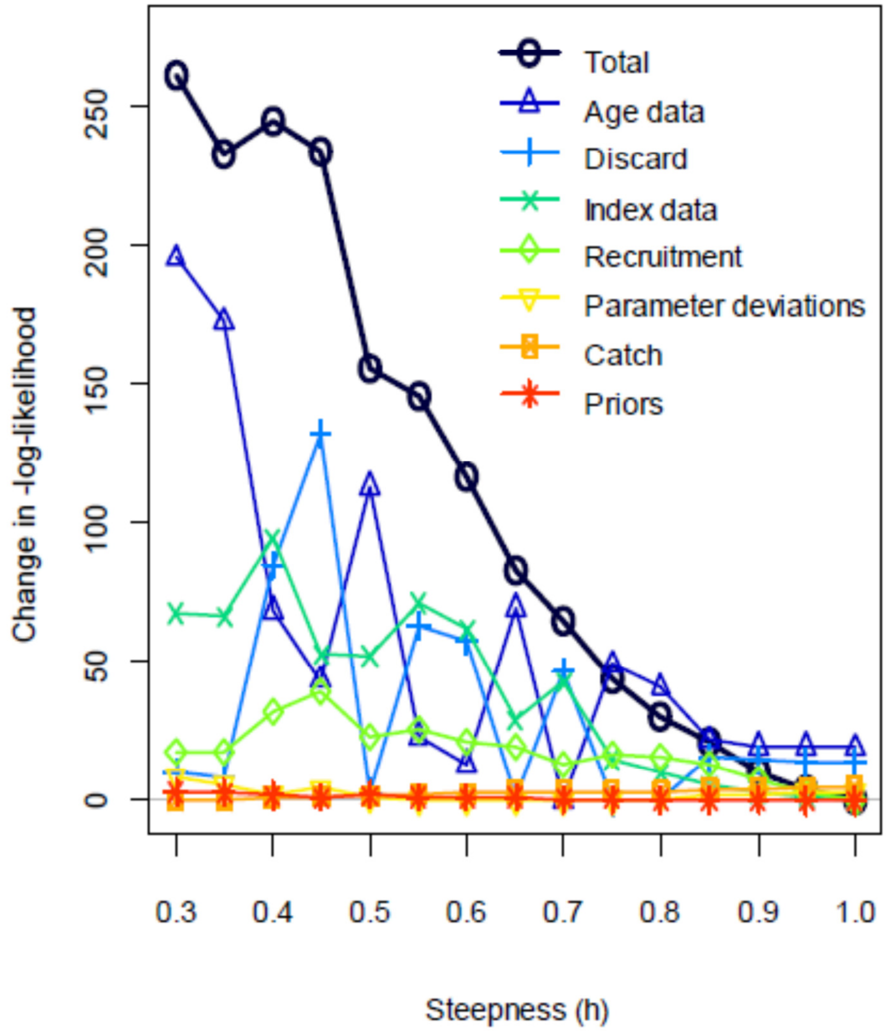


Figure 4.12. SS profile of Beverton – Holt steepness parameter for Gulf of Mexico red snapper for the SEDAR 31 base model configuration. The black line represents the change in total model data likelihood, the blue line is the change in discard data likelihood, the green line is the change in age likelihood, the aqua colored line is the change in index data likelihood, the red line is the change in catch data likelihood, and the yellow line is the change in recruitment data likelihood.

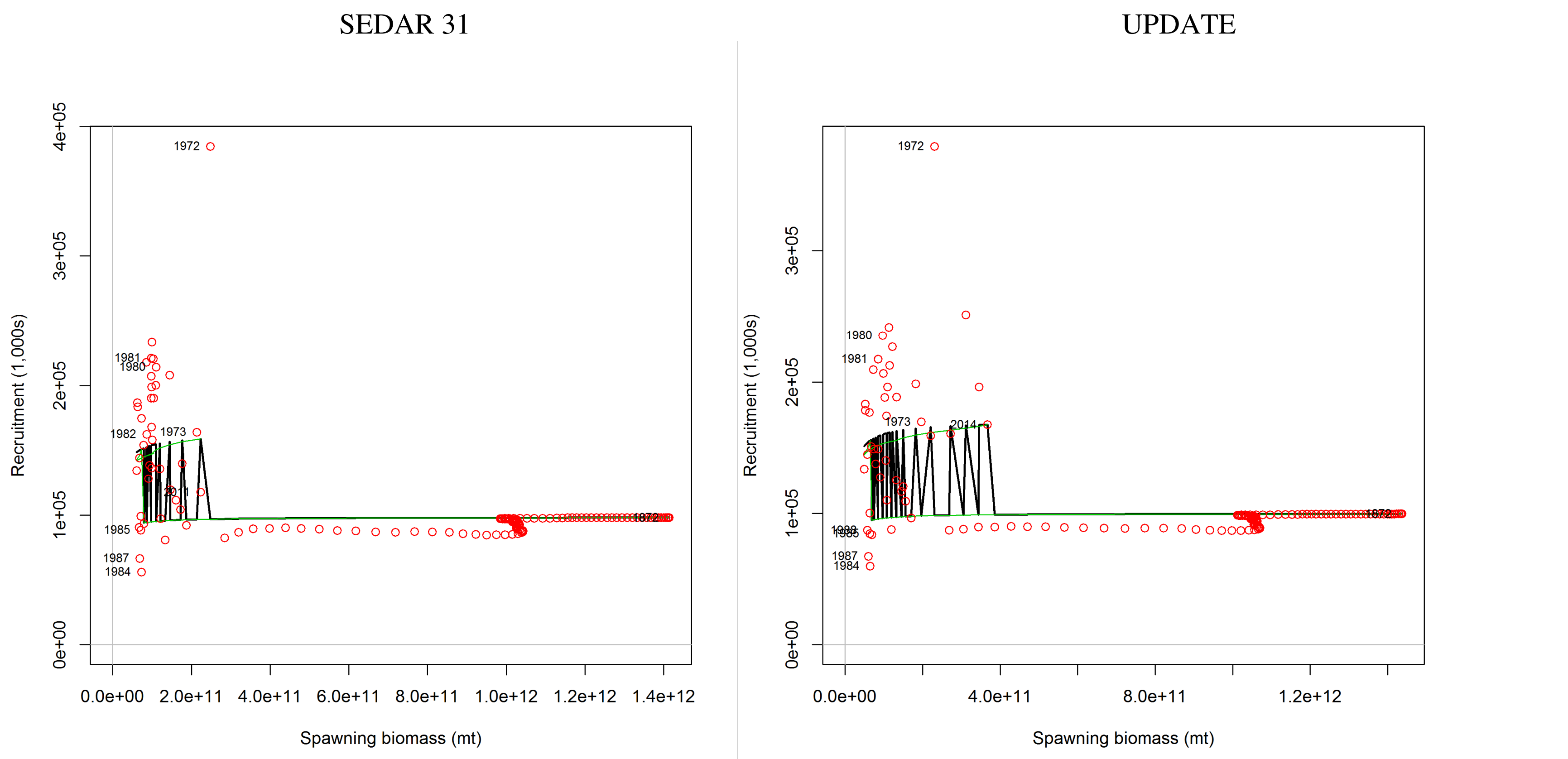


Figure 4.13. Predicted stock-recruitment relationship for Gulf of Mexico red snapper (steepness = 0.99, σ_R=0.3). Plotted are predicted annual recruitments from SS (circles) and expected recruitment from the stock recruit relationship (black line). Labels are included on the first year, last year, and years with natural log deviations > 0.5.

SEDAR 31 UPDATE

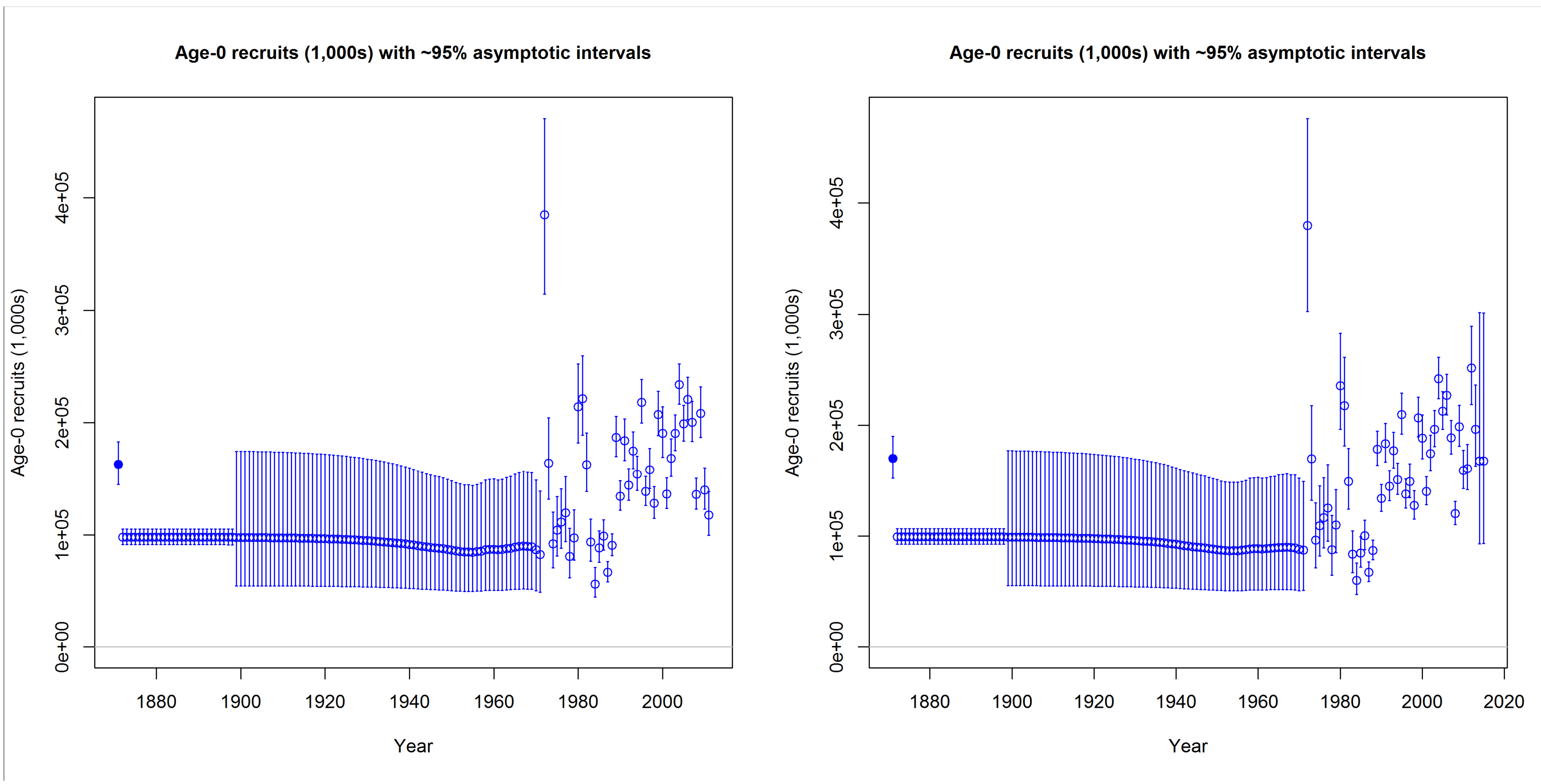


Figure 4.14. Estimated Age-0 recruitment with 95% confidence intervals for Gulf of Mexico red snapper (steepness = 0.99, $\sigma_R = 0.3$).

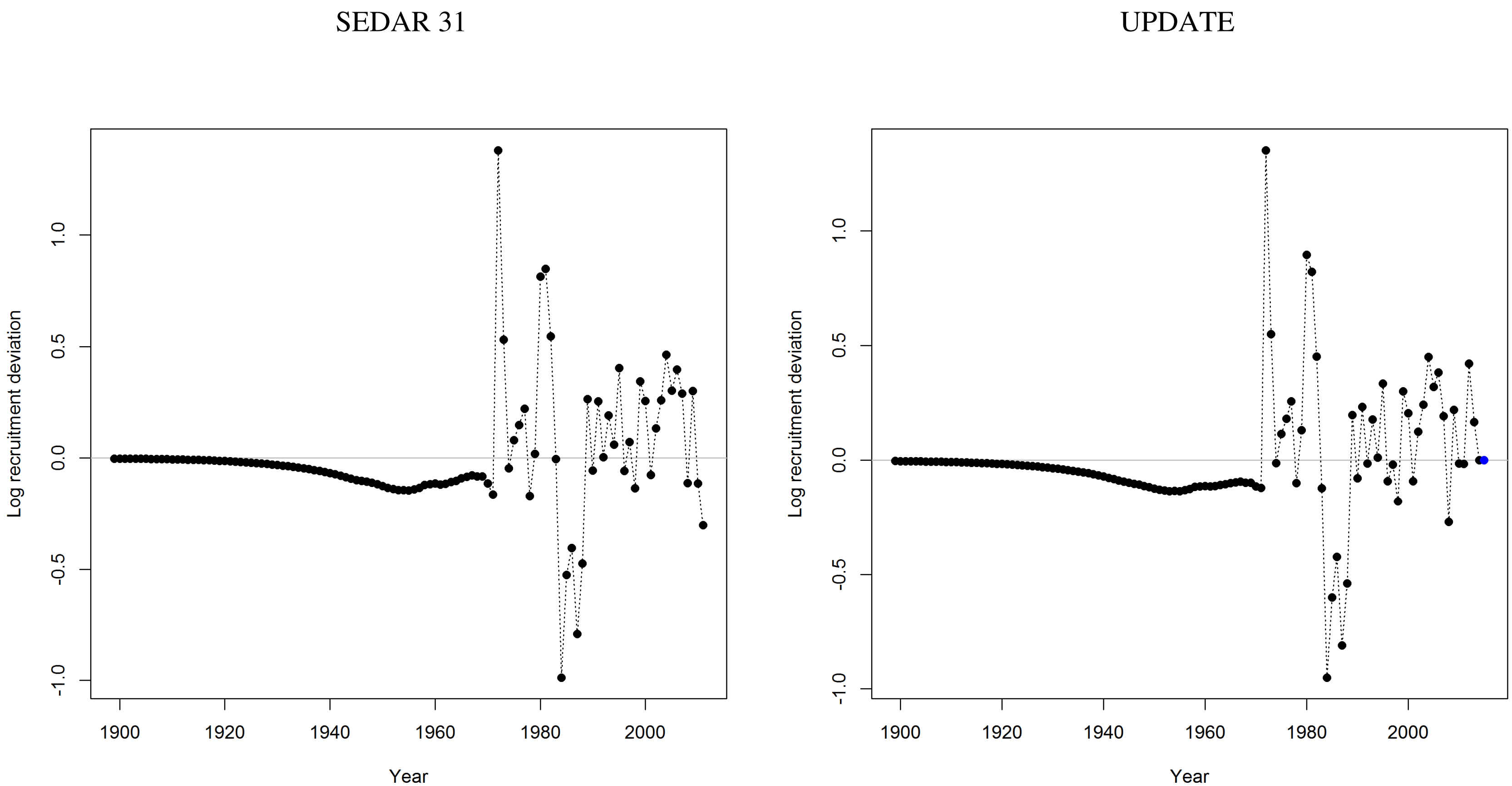


Figure 4.15. Log recruitment deviations (1985-2010) for Gulf of Mexico red snapper (steepness = 0.99, σ_R = 0.3).

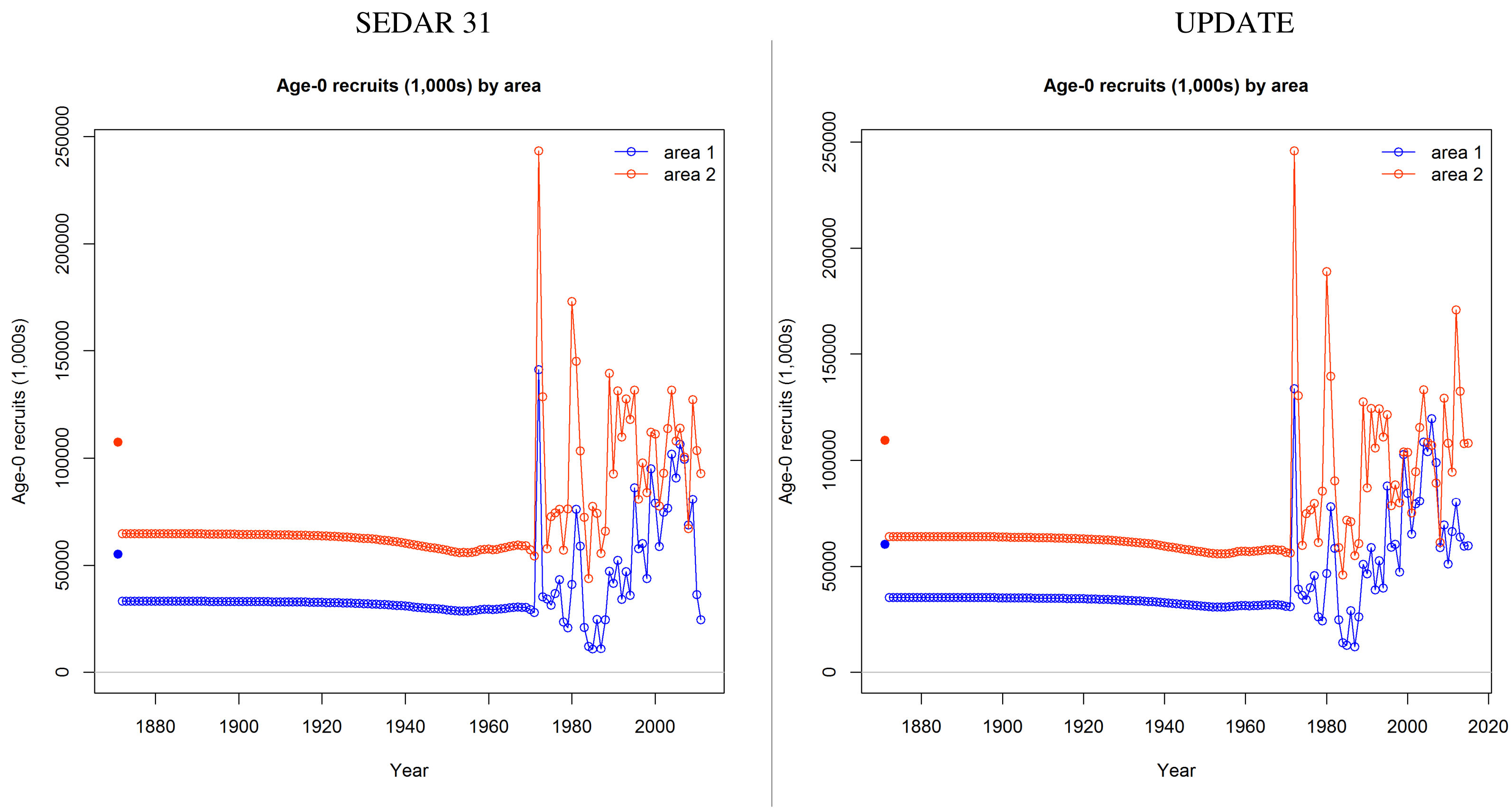


Figure 4.16. Age-0 recruits (in 1000s of fish) by area. Area 1 = Eastern Gulf; Area 1 = Western Gulf

SEDAR 31 UPDATE

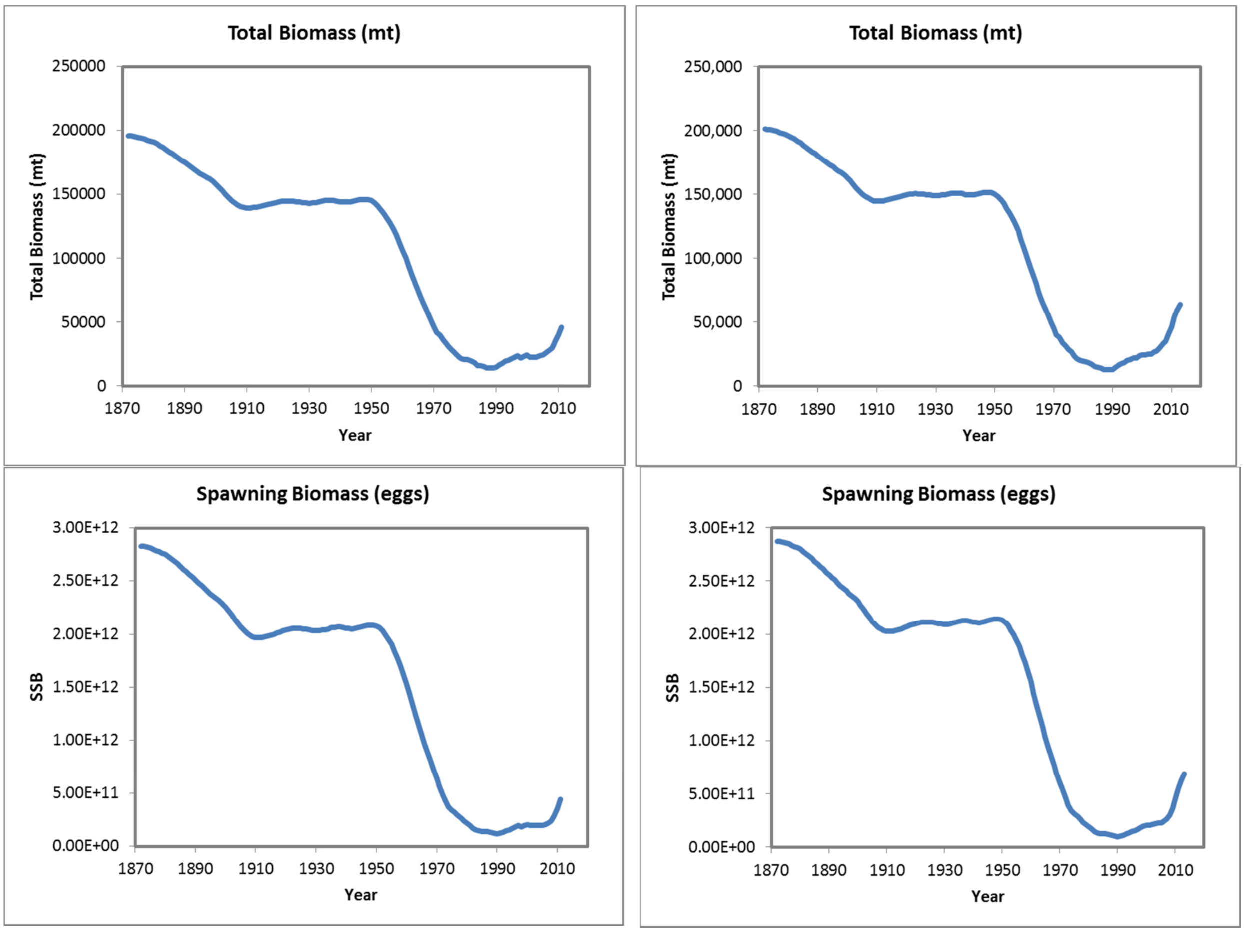


Figure 4.17. Gulfwide estimates of total biomass (mt) and spawning biomass (eggs).

SEDAR 31 **UPDATE**

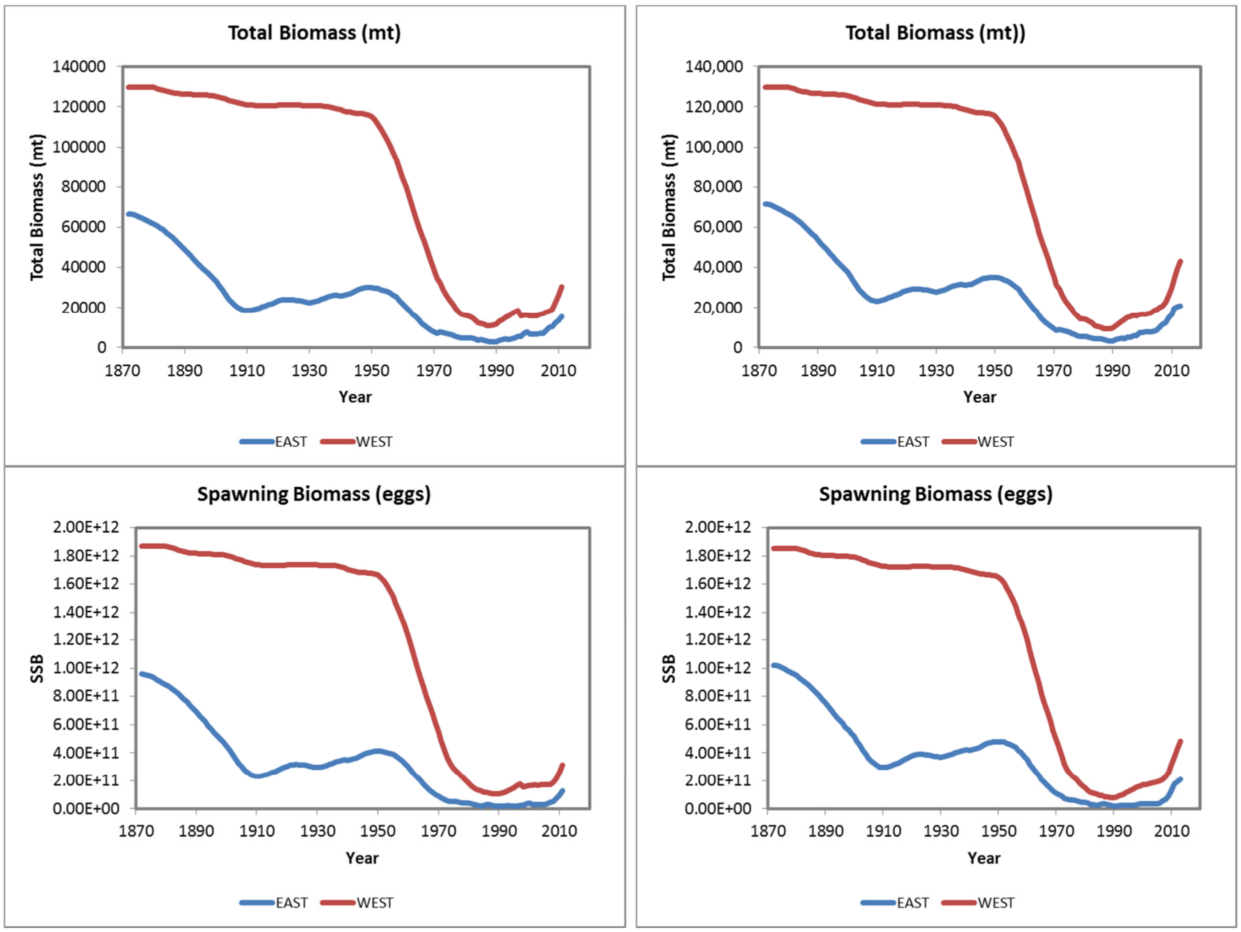


Figure 4.18. Area-specific estimates of total biomass (mt) and spawning biomass (eggs).

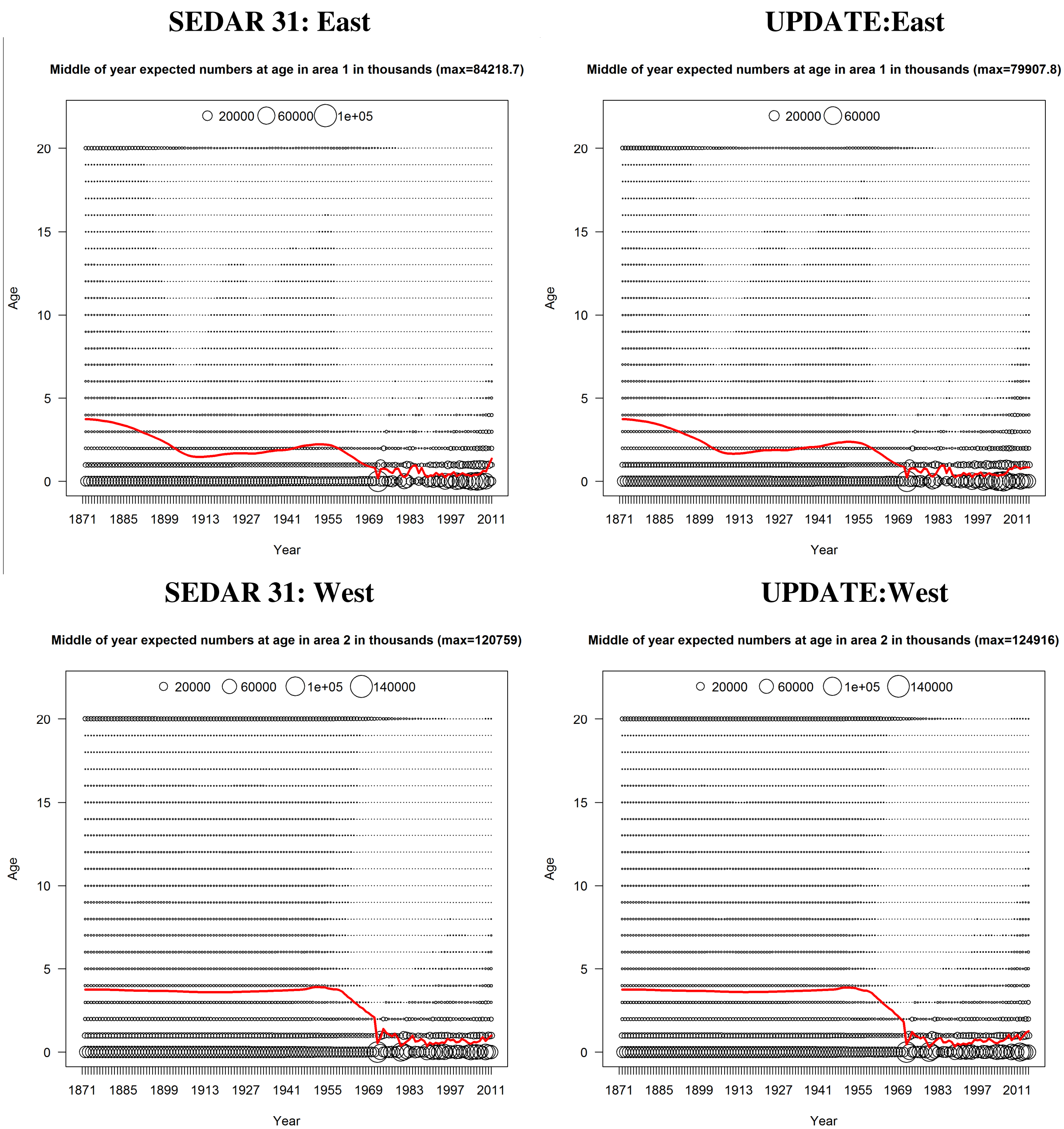


Figure 4.19. Age compostion (open bubbles) and mean age (red line) of red snapper, by area.

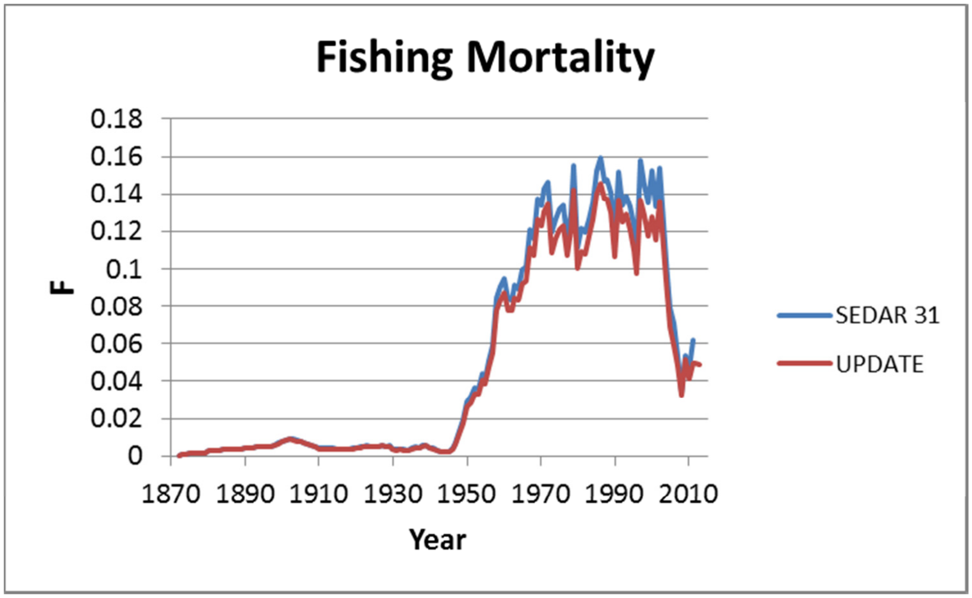


Figure 4.20. Annual exploitation rate (total kill/total numbers).

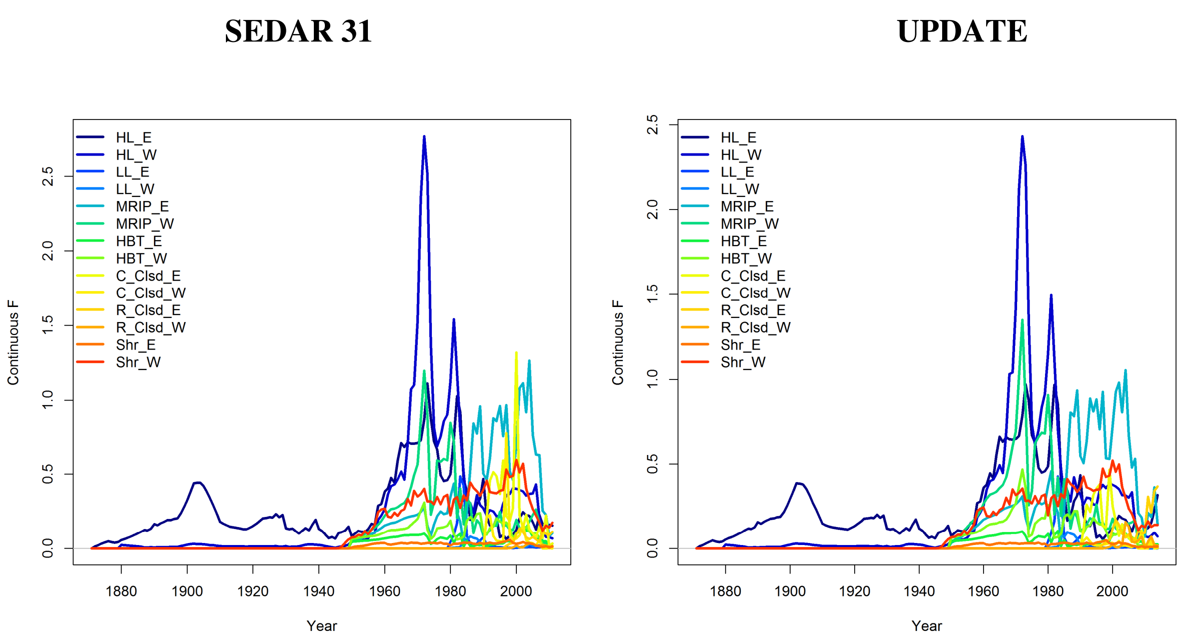


Figure 4.21. Fleet specific fishing mortality rate for Gulf of Mexico red snapper. This represents the fishing mortality level on the most vulnerable age class for each fleet.

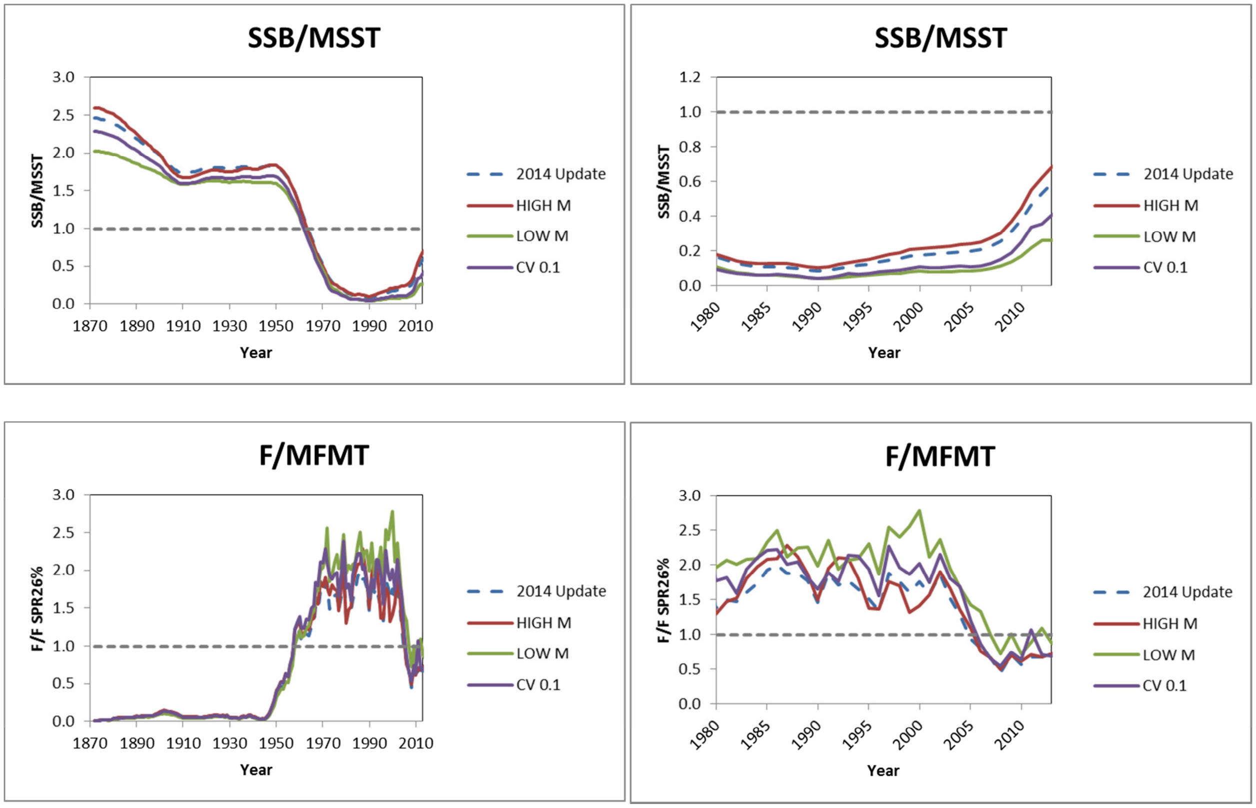


Figure 4.22. Initial sensitivity runs using the SEDAR 31 base, low and high natural mortality assumptions, and a run that upweighted the the indices by applying a log-scale standard error of 0.1. There runs did not include 2014 provisional landings estimates.

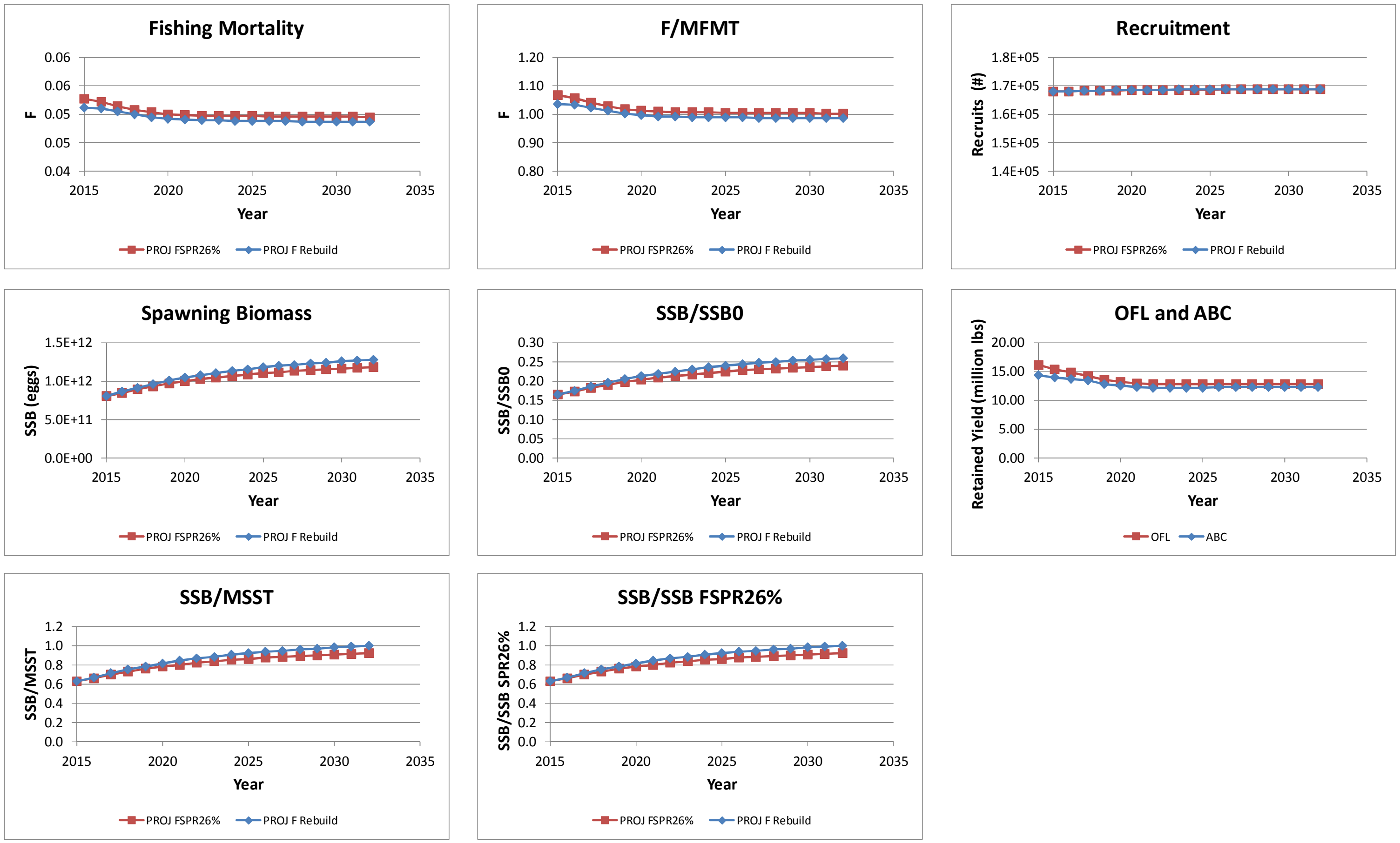


Figure 4.23. Results of projections at $F_{SPR26\%}$ (red) and $F_{Rebuild}$ (blue) including recruitment (R in numbers of fish), fishing mortality (F), F/MFMT, spawning biomass (SSB in eggs), SSB/SSB $_{FSPR26}$%, SSB/MSST, SSB/SSB_0, overfishing limit (OFL, millions of lbs retained) and acceptable biological catch (ABC, millions of lbs retained).

APPENDIX 1

SENSITIVITY RUNS TO EVALUATE THE EFFECT OF RECALIBRATED RECREATIONAL REMOVALS AND RECREATIONAL SELECTIVITY ON ESTIMATES OF OFL, ABC AND MSY FOR GULF RED SNAPPER

Shannon L. Cass-Calay

March 9, 2015

1. INTRODUCTION

During the January 2015 Gulf of Mexico Fishery Management Council (Council) Standing and Special Reef Fish SSC meeting, the Southeast Fisheries Science Center presented the results of the Red Snapper assessment update. Center staff noted that estimates of the overfishing limit (OFL), acceptable biological catch (ABC) and maximum sustainable yield (MSY) were higher for the update than for the most recent benchmark stock assessment (SEDAR 31) and noted that this disparity likely resulted from a recent recalibration of recreational landing and discard estimates (MRIP) and a new selectivity time-block (2011-2014) added to the update assessment to accommodate a recent increase in the size of red snapper landed in the recreational sector. The Council requested two sensitivity analyses to further elucidate the reason for this disparity:

1 Project the annual OFLs at F26%SPR and the ABCs at $F_{REBUILD}$ from 2015-2032 using pre-MRIP recalibrated estimates.

2 Project the annual OFLs at F26%SPR and the ABCs at $F_{REBUILD}$ from 2015-2032 using pre-MRIP recalibrated estimates and no new recreational selectivity block for 201 1-2013.

2. METHODS

The requested sensitivity runs are based on the 2014 update of the SEDAR 31 Gulf of Mexico red snapper assessment (SEDAR 31). Like SEDAR 31, the update assessment and associated projections were conducted using Stock Synthesis (SS: V3.24U[1]). SS is an integrated statistical catch-at-age model which is widely used for stock assessments in the United States and throughout the world. The model, and accompanying documentation and examples are available on the NOAA Toolbox website (NOAA 2011: http://nft.nefsc.noaa.gov/SS3.html). Descriptions of SS algorithms and options were also summarized by Methot (2000) and Methot and Wetzel (2013).

Deterministic projections were run to evaluate stock status and associated retained yields for the specified sensitivity runs. Projections were run from 2015 to 2032 using the base model configuration with provisional 2014 catches as reviewed by the GMFMC SSC on February 19, 2015. Projections were run assuming that selectivity, discarding, and retention would continue as they had in three most recent years (2011-2013). The expected fishing effort levels for the 6 bycatch fleets (shrimp, recreational closed season, and commercial without IFQ allocation) in 2015-2032 were assumed be the same as in 2013. Forecast recruitments were derived from the model estimated Beverton-Holt stock-recruitment relationship, based on the recent time period (i.e., 1984-2013).

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1 [1] Stock Synthesis Version 3.24U was made available by Richard Methot (Richard.Methot@noaa.gov) on March 4, 2015. This version allows allocation fractions to vary annually during the projection.

The overfishing limit (OFL) and acceptable biological catch (ABC) were calculated as stipulated by the GMFMC SSC during their January 2015 meeting in Tampa, Florida. OFL was calculated as the median (50th percentile) of the probability density function (PDF) of retained yield (millions of lbs) using the projection of $F_{SPR26\%}$. The acceptable biological catch (ABC) was calculated at a P* of 0.427 (the 42.7th percentile) of the PDF of retained yield using the projection of $F_{REBUILD,}$ which achieves a gulfwide spawning potential ratio (SPR) of 26% in 2032. A P* of 0.427 implies a 42.7% probability of overfishing in any given year. Both sensitivity runs used a 51% commercial: 49% recreational allocation (2015-2032) when projecting OFLs and ABCs.

3. RESULTS AND DISCUSSION

Two important changes were made to the 2014 red snapper update assessment: (1) recent recreational removals were increased owing to a recent recalibration of MRIP recreational landing and discard estimates (**Figure 1**), and (2) a new selectivity time-block (2011-2014) which was added to accommodate a recent increase in the size of red snapper landed in the recreational sector (**Figure 2**). These modifications did not notably affect annual estimates of spawning stock biomass relative to the unfished condition (SSB/SSB_0**; Figure 3**)or fishing mortality (**Figure 4**) but had a modest effect on estimated recruitment (**Figure 5**).

Estimates of OFL and ABC were sensitive to the treatment of MRIP removals and recent recreational selectivity (**Table 1-2**, **Figure 6-7**). The lowest estimated OFL and ABC values occurred when using the pre-recalibrated MRIP estimates without allowing new estimates of 2011-2014 selectivity for the recreational fisheries. Intermediate OFL estimates resulted from using pre-recalibrated MRIP estimates while allowing the new selectivity estimates, and the highest OFL estimates were associated with the approved base model (Recalibrated MRIP, New Selectivity Block).

The results described in this report are dependent on a number of strong assumptions: (1) that selectivity, discarding, and retention will continue as they have in the three most recent years (2011-2013); (2) that the expected fishing effort levels for the 6 bycatch fleets will continue at 2014 levels; and (3) that forecast recruitments will continue at the average of the recent time period (i.e., 1984-2013). If any of these assumptions are violated (e.g. by a change in selectivity, retention/high-grading, environmentally driven recruitment fluctuations) the projected yields will be lower/higher than those required to permit recovery of the red snapper stock by 2032.

4. ACKNOWLEDGMENTS

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assessment and fishery management. Fish. Res. 42:86-99. NOAA Fisheries Toolbox, 2011. Stock Synthesis, Version 3.23b. http://nft.nefsc.noaa.gov SEDAR 31 – Gulf of Mexico Red Snapper Stock Assessment Report. SEDAR, North Charleston SC. 1103 pp.
Available online at: http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=31

Table 1. OFL (retained yield in millions of lbs whole weight) for the base model and two sensitivity runs. OFL was calculated as the median (50th percentile) of the probability density function (PDF) of retained yield (millions of lbs) using the projection of $F_{SPR26\%}$.

YEAR	BASE	Pre-MRIP Recalibration	Pre-MRIP Recalibration No Sel Block
2015	16.10	15.12	13.42
2016	15.31	14.38	12.68
2017	14.79	13.90	12.31
2018	14.25	13.35	12.04
2019	13.60	12.71	11.69
2020	13.17	12.31	11.49
2021	12.93	12.08	11.36
2022	12.79	11.94	11.27
2023	12.77	11.90	11.25
2024	12.77	11.90	11.26
2025	12.78	11.90	11.26
2026	12.78	11.89	11.26
2027	12.78	11.89	11.27
2028	12.79	11.89	11.27
2029	12.79	11.89	11.27
2030	12.80	11.89	11.28
2031	12.80	11.89	11.28
2032	12.80	11.89	11.28
EQUIL	12.91	11.96	11.37

Table 2. ABC (retained yield in millions of lbs whole weight) for the base model and two sensitivity runs. ABC was calculated at a P* of 0.427 (the 42.7th percentile) of the PDF of retained yield using the projection of FREBUILD, which achieves a gulfwide spawning potential ratio (SPR) of 26% in 2032. A P* of 0.427 implies a 42.7% probability of overfishing in any given year.

YEAR	BASE	Pre-MRIP Recalibration	Pre-MRIP Recalibration No Sel Block
2015	14.29	13.63	11.97
2016	13.96	13.27	11.59
2017	13.75	13.03	11.43
2018	13.39	12.63	11.28
2019	12.85	12.08	11.03
2020	12.49	11.74	10.90
2021	12.29	11.56	10.82
2022	12.18	11.44	10.75
2023	12.17	11.42	10.75
2024	12.19	11.42	10.76
2025	12.21	11.43	10.78
2026	12.22	11.43	10.77
2027	12.23	11.43	10.78
2028	12.24	11.44	10.79
2029	12.25	11.44	10.80
2030	12.26	11.44	10.80
2031	12.27	11.45	10.78
2032	12.27	11.45	10.84
EQUIL	12.40	11.53	10.93

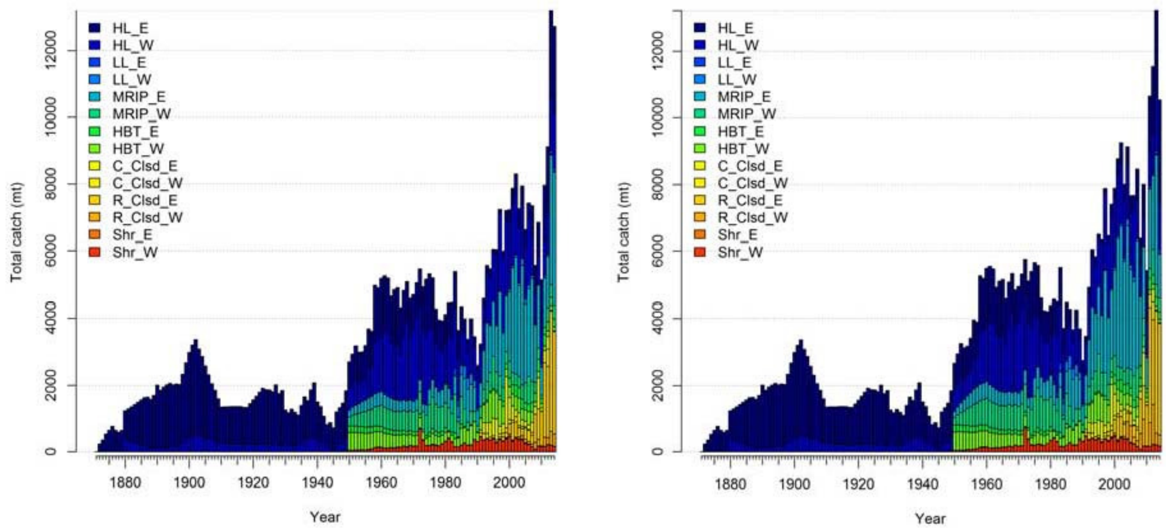

Figure 1. Gulfwide estimated red snapper removals before (left) and after (right) the MRIP recalibration.

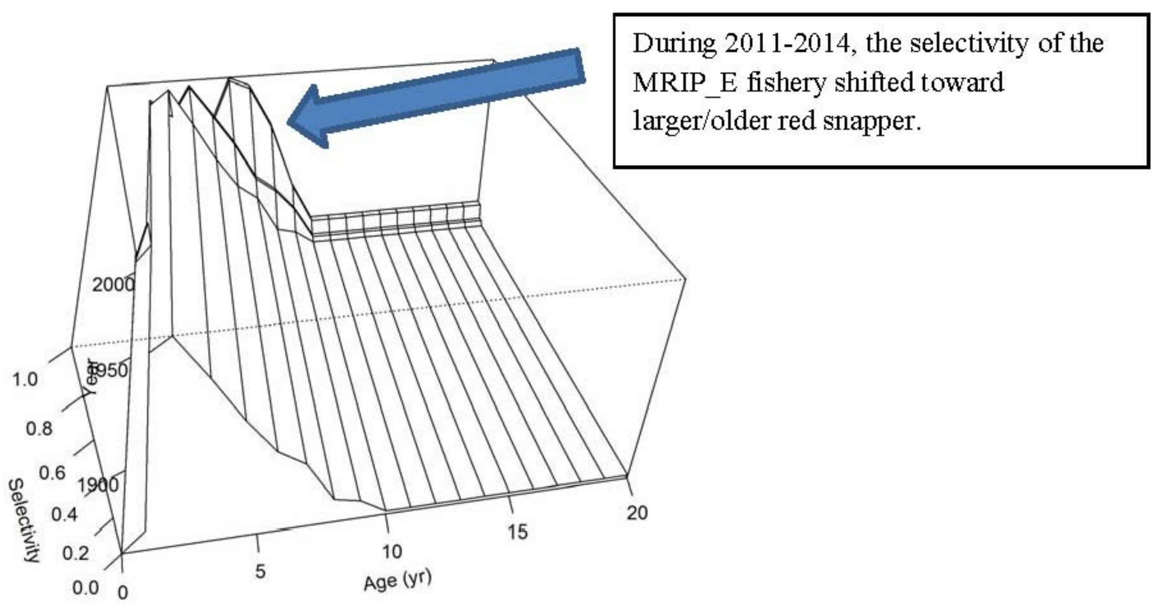

Figure 2. A representative example of the change in the selectivity of the recreational fisheries during 2011-2014. Data indicates that recreational fishers have shifted to larger/older red snapper in the most recent years.

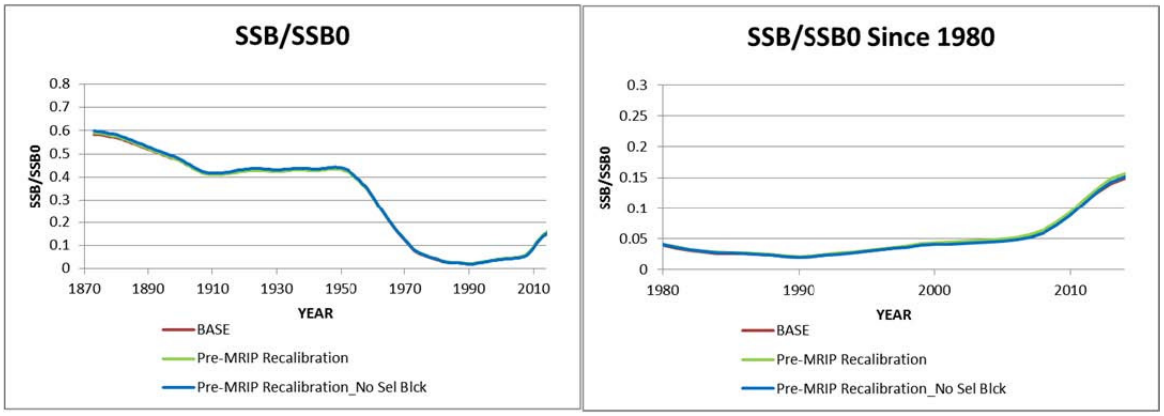

Figure 3. Annual estimates of spawning stock biomass relative to unfished levels during 1872-2013 (left) and in the recent period (right).

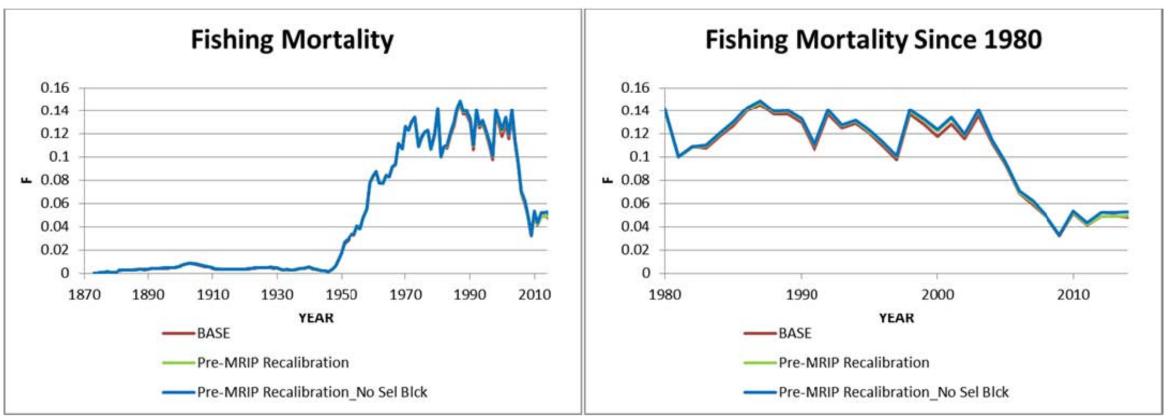

Figure 4. Annual estimates of fishing mortality (computed across all ages) during 1872-2013 (left) and in the recent period (right).

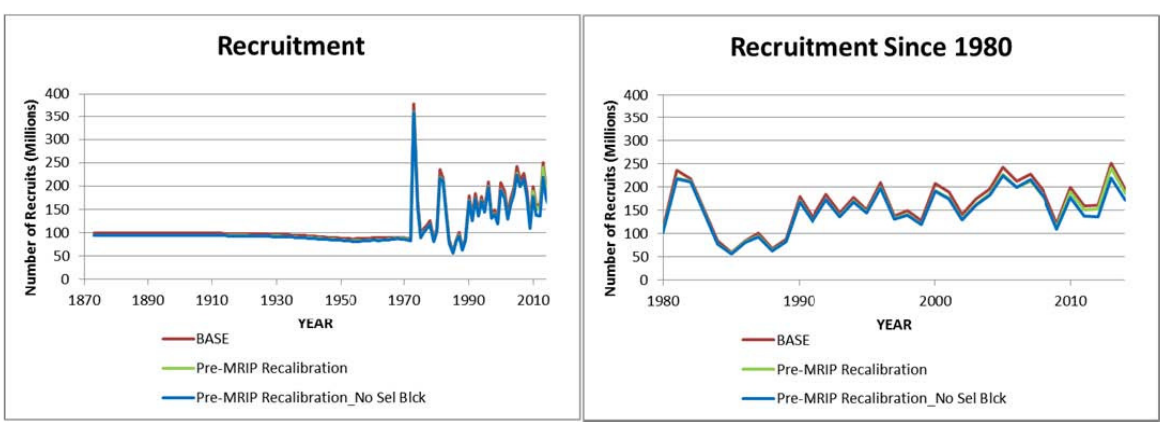

Figure 5. Annual estimates of recruitment (Age 0) during 1872-2013 (left) and in the recent period (right).

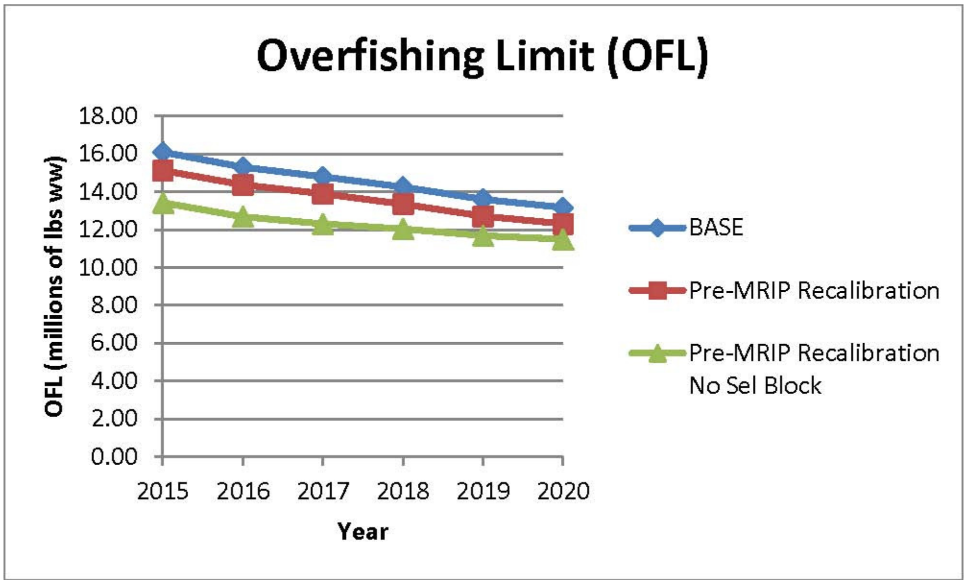

Figure 6. OFL (retained yield in millions of lbs whole weight) for the base model and two sensitivity runs. OFL was calculated as the median (50th percentile) of the probability density function (PDF) of retained yield (millions of lbs) using the projection of $F_{SPR26\%}$.

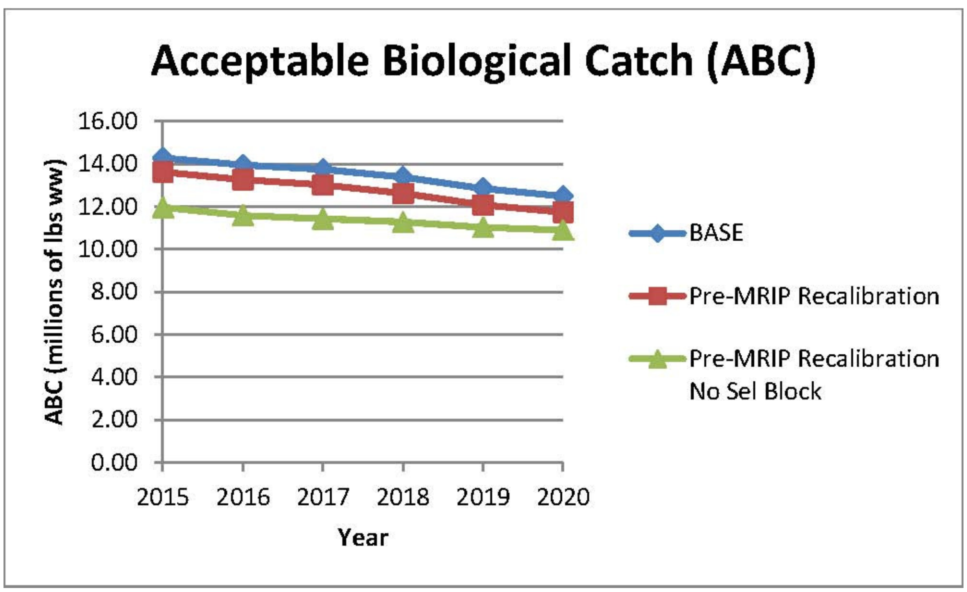

Figure 7. ABC (retained yield in millions of lbs whole weight) for the base model and two sensitivity runs. ABC was calculated at a P* of 0.427 (the 42.7th percentile) of the PDF of retained yield using the projection of $F_{REBUILD}$, which achieves a gulfwide spawning potential ratio (SPR) of 26% in 2032. A P* of 0.427 implies a 42.7% probability of overfishing in any given year.

APPENDIX 2

THE EFFECT OF ALTERNATIVE ALLOCATIONS FOR THE RECREATIONAL AND COMMERCIAL RED SNAPPER FISHERIES IN THE U.S. GULF OF MEXICO

Shannon L. Cass-Calay

March 9, 2015

1. INTRODUCTION

During the January 2015 Gulf of Mexico Fishery Management Council (Council) meeting, the Council requested information pertaining to several proposed alternatives to Amendment 28 of the Reef Fish Fishery Management Plan. These concern the modification of red snapper allocation between the commercial and recreational sectors. Specifically, the Council requested projections of annual OFLs at F26%SPR and annual ABCs at FREBUILD for the period 2015-2032 using the base assessment model run from the most recent update stock assessment. Beginning in 2016, projections should assume the following allocations between the commercial and recreational sectors:

a) 51 % commercial, 49% recreational
b) 45% commercial: 55% recreational
c) 40% commercial, 60% recreational
d) 35% commercial, 65% recreational
e) 30% commercial, 70% recreational

For all projections, the allocation in 2015 was fixed at the current levels, 51% commercial and 49% recreational.

2. METHODS

The results presented in this paper were based on the 2014 update of the SEDAR 31 Gulf of Mexico red snapper assessment (SEDAR 31). Like SEDAR 31, the update assessment and associated projections were conducted using Stock Synthesis (SS: V3.24U[2]). SS is an integrated statistical catch-at-age model which is widely used for stock assessments in the United States and throughout the world. The model, and accompanying documentation and examples are available on the NOAA Toolbox website (NOAA 2011: http://nft.nefsc.noaa.gov/SS3.html). Descriptions of SS algorithms and options were also summarized by Methot (2000) and Methot and Wetzel (2013).

Deterministic projections were run to evaluate stock status and associated retained yields for the specified allocation scenarios. Projections were run from 2015 to 2032 using the base model configuration with updated 2014 catches as reviewed and approved by the GMFMC SSC on February 19. 2015. Projections were run assuming that selectivity, discarding, and retention would continue as they had in the three most recent years (2011-2013). The expected fishing effort levels for the 6 bycatch fleets (shrimp, recreational closed season, and commercial without IFQ allocation) in 2015-2032 were assumed be the same as in 2013. Forecast recruitments were assumed to continue at the average of the recent time period (i.e., 1984-2013).

The overfishing limit (OFL) and acceptable biological catch (ABC) were calculated as stipulated by the GMFMC SSC during their January 2015 meeting in Tampa, Florida. OFL was calculated as the median (50th percentile) of the probability density function (PDF) of retained yield (millions of lbs) using the projection of $F_{SPR26\%}$. The acceptable biological catch (ABC) was calculated at a P* of 0.427 (the 42.7th percentile) of the PDF of retained yield using the

[2] [1] Stock Synthesis Version 3.24U was made available by Richard Methot (Richard.Methot@noaa.gov) on March 4, 2015. This version allows allocation fractions to vary annually during the projection.

projection of $F_{REBUILD}$, which achieved a gulfwide spawning potential ratio (SPR) of 26% in 2032. A P* of 0.427 implies a 42.7% probability of overfishing in any given year.

3. RESULTS AND DISCUSSION

The computed OFL (retained yield in millions of lbs whole weight) was positively correlated to the magnitude of recreational allocation over the range of allocations examined (**Figure 1, Table 1**). When 49% of the catch was allocated to the recreational fisheries, the corresponding OFL was 16.1 mp in 2015, 15.31 mp in 2016 and 14.79 mp in 2017. In comparison, when 70% of the catch was allocated to the recreational fisheries, the corresponding OFL increased to 18.17 mp in 2015, 16.71 mp in 2016 and 15.89 mp in 2017.

Similarly, the computed ABC (retained yield in millions of lbs whole weight) was also positively correlated to the magnitude of recreational allocation over the range of allocations examined (**Figure 2, Table 2**). When 49% of the catch was allocated to the recreational fisheries, the corresponding ABC was 14.29 mp in 2015, 13.96 mp in 2016 and 13.75 mp in 2017. In comparison, when 70% of the catch was allocated to the recreational fisheries, the corresponding ABC increased to 16.05 mp in 2015, 15.24 mp in 2016 and 14.78 mp in 2017.

The magnitude of recreational allocation did not affect the speed of recovery to the gulfwide management target ($SSB_{SPR26\%}$; **Figure 3**). However, when the trajectory of spawning stock biomass (SSB/SSB_0) was examined by region, increasing the recreational allocation was expected to result in decreasing spawning stock biomass in the eastern Gulf of Mexico during 2015-2032, while a modest but opposite effect was observed in the western Gulf (**Figure 4**). Following a substantial recovery in the eastern Gulf during 2003–2013 (from 2% to 12% of unfished SSB) the projected spawning stock biomass in the eastern Gulf is expected to decline to 7% of unfished SSB by 2032 if the allocation is held at 49%, and to 4.6% of unfished SSB if the recreational allocation is increased to 70%.

Most recreational fishing takes place in the eastern Gulf of Mexico, therefore increasing the percent allocation of recreational fishing had the effect of increasing removals (landed and discarded dead) of the eastern stock (**Figures 5-7**) and decreasing removals from the western stock. Although the fraction of total red snapper biomass removed by all fisheries combined was insensitive to sector allocation (**Figure 5**), the fraction extracted by the MRIP_E fishery was projected to increase significantly with higher recreational allocation (**Figure 5-6**), which caused a substantial increase in the total removals of the eastern stock (**Figure 7**). When 49% of the retained yield was allocated to the recreational fishery, less than 25% of the eastern standing biomass was predicted to be removed each year. When the recreational allocation was increased to 70%, the removed fraction increased to 30% by 2030.

The predicted regional recruitments also have some influence on corresponding trends in projected spawning stock biomass. For most of the period since 1984 the estimated eastern recruitment (number of Age-0 red snapper) has generally been lower than the estimated western recruitment (**Figure 8**). The eastern stock experienced several years of fortuitously high recruitment during the 2000s that boosted spawning biomass in the short-term, but recruitment subsequently returned to intermediate levels (**Figure 8**). The projections assumed that future recruitments would continue at intermediate levels (average from 1984-2013) for each region, therefore the very stong year-classes from the 2000s eventually die off and are not fully replaced (**Figure 8**).

The results described in this report were dependent on a number of strong assumptions: 1) that selectivity, discarding, and retention will continue as they have in the three most recent years (2011-2013); 2) that the expected fishing effort levels for the 6 bycatch fleets will continue at 2013 levels; and 3) that forecast recruitments continue at the average of the recent time period (i.e., 1984-2013). If any of these assumptions are violated (e.g. by a change in selectivity, retention/high-grading, environmentally driven recruitment fluctuations) the projected yields will be lower/higher than those required to permit recovery of the red snapper stock by 2032.

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5. LITERATURE CITED

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NOAA Fisheries Toolbox, 2011. Stock Synthesis, Version 3.23b. http://nft.nefsc.noaa.gov

SEDAR 31 – Gulf of Mexico Red Snapper Stock Assessment Report. SEDAR, North Charleston SC. 1103 pp. Available online at: http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=31

Table 1. OFL (retained yield in millions of lbs whole weight) as a function of recreational allocation. OFL was calculated as the median (50th percentile) of the probability density function (PDF) of retained yield (millions of lbs) using the projection of $F_{SPR26\%}$.

OFL (Retained Yield Million Pounds Whole Weight)					
YEAR	**Rec 49%**	**Rec 55%**	**Rec 60%**	**Rec 65%**	**Rec 70%**
2015	16.10	16.70	17.19	17.69	18.17
2016	15.31	15.72	16.06	16.39	16.71
2017	14.79	15.12	15.38	15.64	15.89
2018	14.25	14.54	14.77	15.00	15.23
2019	13.60	13.87	14.09	14.31	14.52
2020	13.17	13.43	13.65	13.86	14.07
2021	12.93	13.19	13.40	13.61	13.81
2022	12.79	13.04	13.24	13.44	13.63
2023	12.77	13.01	13.20	13.39	13.57
2024	12.77	13.01	13.20	13.38	13.55
2025	12.78	13.01	13.19	13.36	13.53
2026	12.78	13.01	13.18	13.35	13.51
2027	12.78	13.01	13.18	13.34	13.50
2028	12.79	13.00	13.18	13.34	13.49
2029	12.79	13.01	13.17	13.34	13.49
2030	12.80	13.01	13.17	13.33	13.48
2031	12.80	13.01	13.18	13.33	13.48
2032	12.80	13.01	13.18	13.33	13.48
Equil	12.91	13.11	13.27	13.42	13.57

Table 2. ABC (retained yield in millions of lbs whole weight) as a function of recreational allocation. ABC was calculated at a P* of 0.427 (the 42.7th percentile) of the PDF of retained yield using the projection of FREBUILD, which achieves a gulfwide spawning potential ratio (SPR) of 26% in 2032. A P* of 0.427 implies a 42.7% probability of overfishing in any given year.

ABC (Retained Yield Million Pounds Whole Weight)					
YEAR	**Rec 49%**	**Rec 55%**	**Rec 60%**	**Rec 65%**	**Rec 70%**
2015	14.29	14.76	15.18	15.61	16.05
2016	13.96	14.31	14.62	14.93	15.24
2017	13.75	14.04	14.29	14.53	14.78
2018	13.39	13.65	13.87	14.09	14.32
2019	12.85	13.10	13.31	13.52	13.73
2020	12.49	12.73	12.94	13.15	13.35
2021	12.29	12.54	12.74	12.94	13.14
2022	12.18	12.42	12.61	12.81	12.99
2023	12.17	12.40	12.59	12.77	12.95
2024	12.19	12.42	12.60	12.77	12.95
2025	12.21	12.43	12.60	12.77	12.94
2026	12.22	12.43	12.60	12.77	12.93
2027	12.23	12.42	12.61	12.77	12.93
2028	12.24	12.43	12.61	12.77	12.92
2029	12.25	12.44	12.61	12.77	12.92
2030	12.26	12.45	12.62	12.77	12.92
2031	12.27	12.45	12.62	12.77	12.92
2032	12.27	12.46	12.63	12.78	12.92
Equil	12.40	12.59	12.73	12.87	12.98

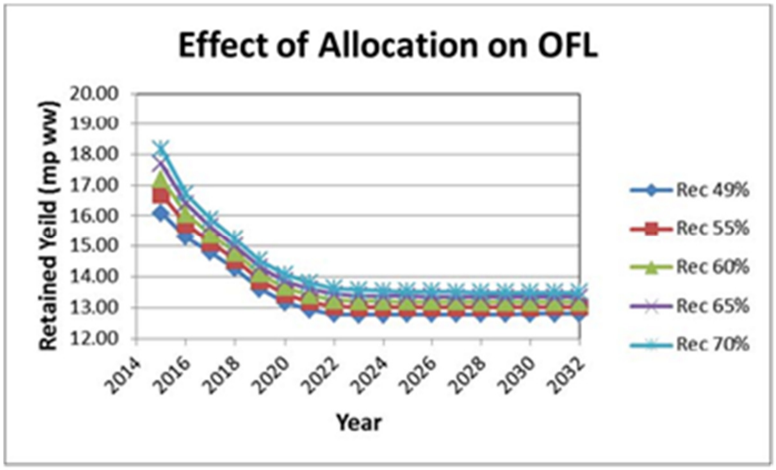

Figure 1. OFL (retained yield in millions of lbs whole weight) as a function of recreational allocation. OFL was calculated as the median (50th percentile) of the probability density function (PDF) of retained yield (millions of lbs) using the projection of $F_{SPR26\%}$.

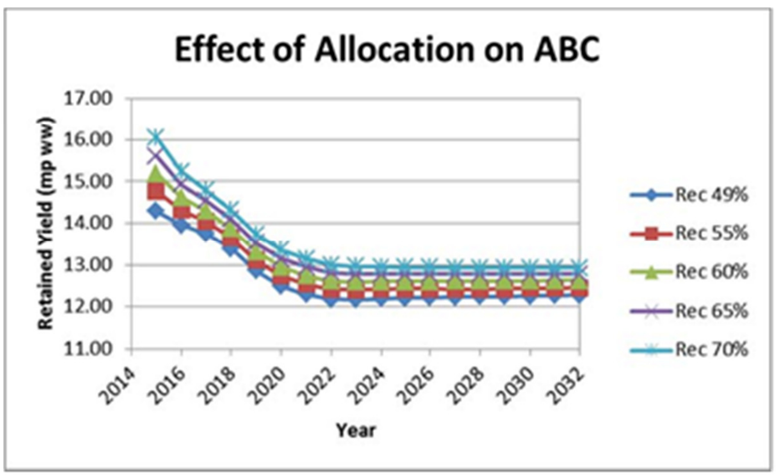

Figure 2. ABC (retained yield in millions of lbs whole weight) as a function of recreational allocation. ABC was calculated at a P* of 0.427 (the 42.7th percentile) of the PDF of retained yield using the projection of $F_{REBUILD}$, which achieves a gulfwide spawning potential ratio (SPR) of 26% in 2032. A P* of 0.427 implies a 42.7% probability of overfishing in any given year.

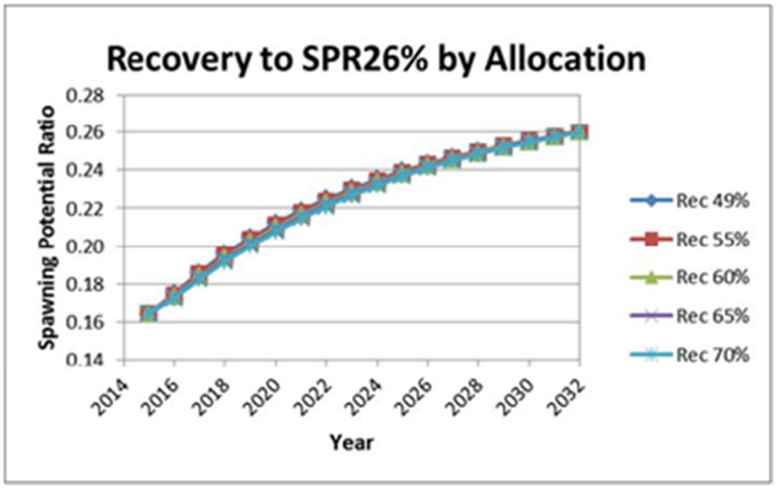

Figure 3. Recovery trajectory by allocation scenario. As expected, all scenarios achieve recovery to $SSB_{SPR26\%}$ by 2032.

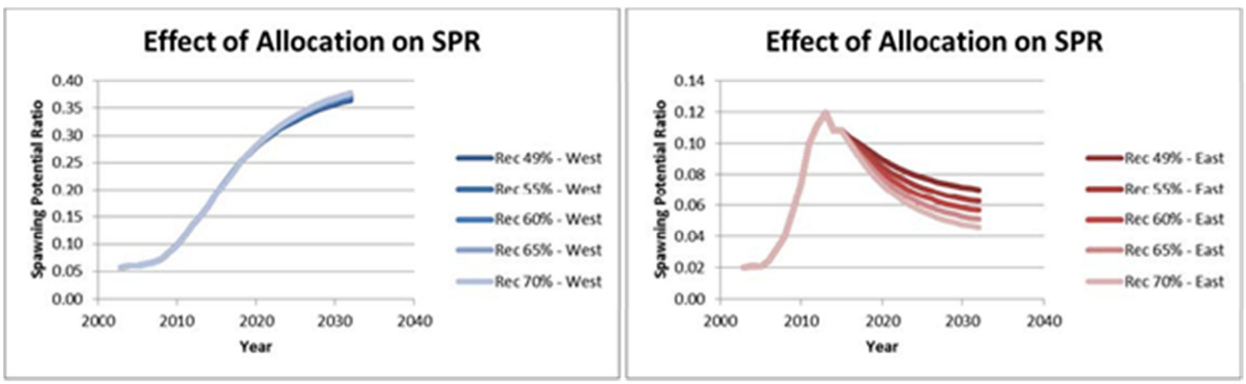

Figure 4. Effect of allocation scenario on SPR in the western Gulf (left panel) and the eastern Gulf (right panel).

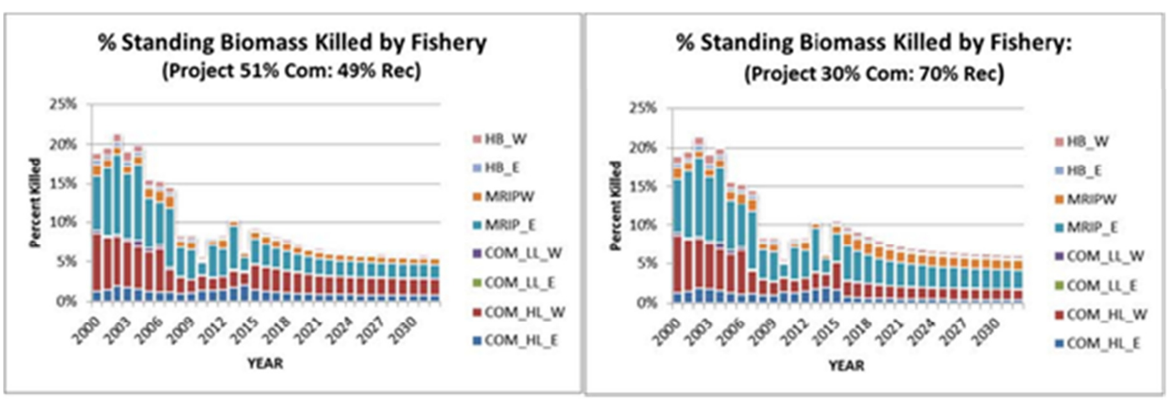

Figure 5. The fraction of total standing biomass killed by fishery at the current allocation (left panel) and at a recreational allocation of 70% (right panel).

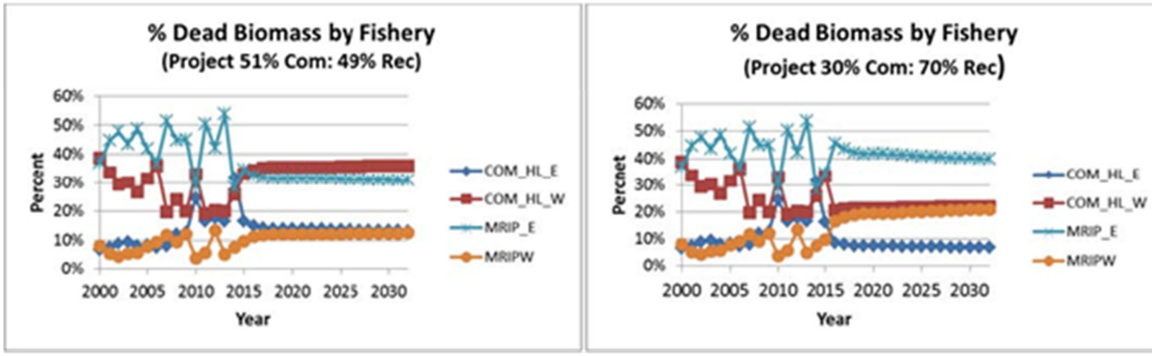

Figure 6. The fraction of total dead biomass (retained + dead discards) killed by fishery at the current allocation (left panel) and at a recreational allocation of 70% (right panel).

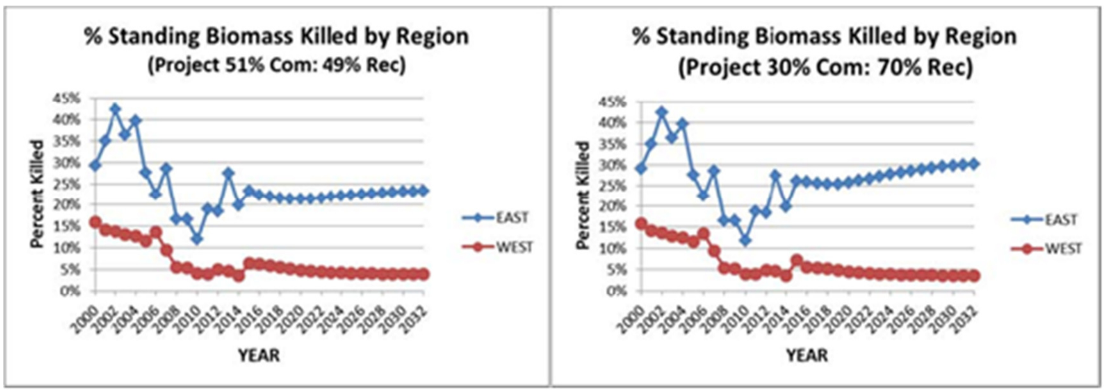

Figure 7. The fraction of total standing biomass killed by region at the current allocation (left panel) and at a recreational allocation of 70% (right panel).

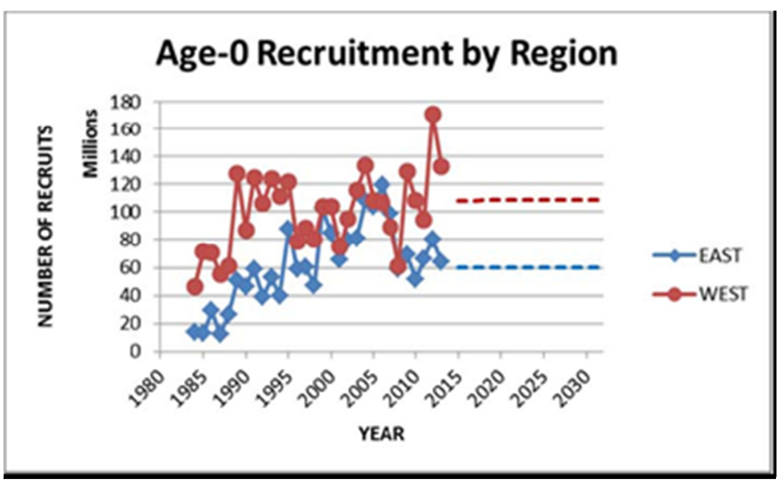

Figure 8. Observed (solid) and projected recruitment (dashed) by region.

APPENDIX 3.

EFFECT OF ALTERNATIVE MSY PROXIES ON THE PROJECTED OVERFISHING LIMITS AND ALLOWABLE BIOLOGICAL CATCHES FOR THE RED SNAPPER FISHERY IN THE U.S. GULF OF MEXICO

Southeast Fisheries Science Center
May 5, 2015

Daniel R. Goethel and Matthew W. Smith

1. INTRODUCTION

During the January 2015 Gulf of Mexico Fishery Management Council (hereafter referred to as 'the Council') meeting, the Council recommended developing a new amendment to the reef fish management plan that would consider various red snapper maximum sustainable yield (MSY) proxies based on alternative spawning potential ratios (SPR). To aid the development of this amendment, the council requested projections of annual overfishing limits (OFL) and acceptable biological catches (ABC) for a range of MSY proxies:

- 40% SPR
- 30% SPR
- 26% SPR (status quo)
- 24% SPR
- 22% SPR
- 20% SPR
- The SPR proxy (if below 20% SPR) that results in the highest annual OFL and ABC.

All projections were to be completed assuming a rebuilding year of 2032. Projections assuming a rebuilding year of 2026 were also requested for MSY proxies less than 26% SPR, because a new rebuilding plan would be required in the event that a less conservative SPR proxy was adopted as the basis of management advice. In addition, the Council requested a projection of the time to rebuild to each SSB_{Proxy} in the absence of fishing mortality.

2. METHODS

The results presented in this paper were based on determinist projections conditioned on the base model from the 2014 update of the SEDAR 31 Gulf of Mexico red snapper assessment with catches updated through 2014 (as reviewed and approved by the GMFMC SSC on February 19, 2015). The projections were implemented using Stock Synthesis (SS3, V3.24U; Methot and Wetzel, 2013).

The projections assumed that fishery selectivity, discarding, and retention practices would continue as they had in the three most recent years of the assessment (2011 – 2013). Forecasted recruitments were assumed to continue at the average of the recent time period (1984 - 2013).

The fishing mortality levels for the 6 bycatch fleets (shrimp, recreational closed season, and commercial without IFQ allocation, each with an eastern and western component) were held constant at the 2013 estimated level for all years of the projections. The fishing mortality rates for the directed fleets were constrained so as to maintain the current catch allocations of 51% to the commercial sector and 49% to the recreational sector. In addition, the relative distribution of fishing mortality for fleets within each sector was assumed to remain in a constant proportion based on the average distribution from 2011-2013. The total fishing mortality rate for the directed fleets was then scaled up or down until the projections equilibrated at the target SPR. The fishing mortality rate proxies (F_{Proxy}) corresponding to the requested SPR targets, expressed as the fraction of the stock removed by fishing (total removals in numbers divided by total abundance), were set to the values that maintained the SPR target on average over the last ten years of the projections (approximate equilibrium removal rate). The corresponding proxies for MSY (equilibrium OFL) and spawning stock (egg production) were averaged over the same years. MSST was calculated as $(1\text{-}M)*SSB_{Proxy}$, where M is the assumed natural mortality rate of 0.086 representing the average value across all fully selected age classes (SEDAR 31, 2013). The annual OFL and ABC values were calculated as stipulated by the GMFMC SSC during their 2015 meeting in Tampa, Florida for each of the requested SPR proxies. The time series of annual OFLs was taken as the forecasted landings (millions of pounds) given the F_{Proxy}, which represented the median (50^{th} percentile) of the probability density function (PDF) of retained yield in each year of the long-term projection (2015-2074).

The ABC values were calculated assuming a P* value of 0.427 (the 42.7^{th} percentile) of the PDF of the landings (retained yield) based on projections of $F_{Rebuild}$. Because the stock is currently below the management target (SPR 26%), a rebuilding plan is in place with the goal of attaining a gulfwide SPR of 26% by 2032. Therefore, ABCs are based on short-term projections with a $F_{Rebuild}$ that will attain the SPR target by that date (i.e., ABCs are based on the 42.7^{th} percentile of the MLE of retained yield that results from an $F_{Rebuild}$, which rebuilds the stock to the given SPR target in 2032). However, a shorter rebuilding timeline (i.e., an end year of 2026) was required for SPR management targets that were less conservative than the current SPR 26% target, which required a second set of ABC calculations. For ABC projections, a given target SPR was achieved when the gulfwide spawning potential ratio of X% was reached in the terminal year (i.e., 2026 or 2032 depending on the scenario), where X was equal to 40, 30, 26, 24, 22, or 20.

The “SPR proxy that results in the highest annual OFL and ABC” is essentially equivalent to the SPR corresponding to the global MSY, which is achieved when fishing is restricted to an optimal age class, and is difficult to achieve in practice. For this reason, the SEDAR 7 and 31 assessments used an approximation to the global MSY referred to as ‘MSY-link’, which was calculated as the maximum sustainable landings when all sources of fishing mortality (directed, closed-season, and bycatch) were scaled up or down by the same proportion. The SPR corresponding to the MSY-link scenario was then used as the SPR proxy that results in the highest yield. Note that while the ABCs under the MSY-link case are listed for comparison with the 2032 and 2026 rebuilding scenarios, they are calculated from the 42.7^{th} percentile of the yearly OFL and not based on a $F_{Rebuild}$.

The value of optimal yield (OY) was calculated assuming the fishing mortality rates on the directed fleets were reduced by 25% [i.e., $F_{OY}(directed)=0.75*F_{Proxy}(directed)$]. Although multiple possibilities exist for determining OY depending on the assumptions regarding bycatch, considering the difficulties in controlling bycatch mortality it was deemed that only directed effort should be scaled for OY calculations. For the MSY-link run, because fishing mortality rates on all fleets were scalable, the optimal yield fishing mortality is actually scaled to 0.75 for all fleets. An additional run was completed with no fishing mortality (F=0 for all directed and bycatch fleets) to determine rebuilding times in the absence of fishing pressure.

Uncertainty in derived quantities (including retained yield) is carried through the projections from the parameter estimation phase in the stock assessment model and represents the approximate variance obtained from the inversion of the Hessian matrix. The PDF and 95% confidence bands are calculated assuming a normal distribution of the derived quantity.

3. RESULTS

The MSY-link (equilibrium OFL from the link scenario) is 11.41 million pounds (mp; Table 1, second to last row) and results in an SPR proxy of 23% (Figure 1). The corresponding OFLs for the MSY-link run are 15.2 mp in 2015, 14.5 mp in 2016, and 13.9 mp in 2017 (Table 1). The resulting ABCs (42.7th percentile of OFL) are 15.0 mp in 2015, 14.3 mp in 2016, and 13.7 mp in 2017 (Tables 2-3). The associated harvest and SSB proxies (equilibrium levels) were 1.12E+12 eggs for SSB and a harvest rate of 0.07 (Table 4). In the absence of fishing mortality the SSB proxy was attained in 2018 (Table 5). Equilibrium optimum yield was projected to be 98% of the MSY (Table 1, last row).

Both OFL and ABC (retained yield in millions of pounds whole weight) increased as the magnitude of the SPR_{Proxy} target value was reduced (Table 1-3, Figures 2-9). For long-term equilibrium runs, the most conservative SPR of 40% resulted in an OFL of 8.94 million pounds (mp) in 2015, 9.54 mp in 2016, and 10.1 mp in 2017 (Table 1, Figures 2-3). Maintaining the status quo and applying an SPR of 26% resulted in annual OFLs of 16.1 mp in 2015, 15.3 mp in 2016, and 14.8 mp in 2017. The least conservative SPR (SPR 20%) resulted in OFLs of 20.7 mp in 2015, 18.3 mp in 2016, and 16.8 mp in 2017. Equilibrium OFL (average retained yield from 2065-2074) for the various SPR targets ranged from a low of 10.6 mp for an SPR of 40% to a high of 13.6 mp for an SPR of 20% (Table 1).

ABCs (retained yield in millions of pounds whole weight) were also inversely related to the magnitude of the SPR target for both a rebuilding year of 2032 (Table 2, Figures 4-6) and 2026 (Table 3, Figures 7-9). Status quo rebuilding (SPR 26%) projections produced estimated ABC values of 14.3 mp in 2015, 14.0 mp in 2016, and 13.7 mp in 2017. The lowest annual ABCs were achieved with an SPR of 40% and resulted in annual yields of 6.55 mp in 2015, 7.26 mp in 2016, and 7.91 mp in 2017. The highest annual ABCs were obtained at SPR 20% and were equal to 18.9 mp in 2015, 17.1 mp in 2016, and 16.0 mp in 2017. Because this was a less conservative SPR proxy, it required a shorter projection terminal year of 2026. Equilibrium yield for ABC projections also increased as SPR proxy declined.

Both SSB and F proxies were calculated for each SPR target along with associated MSST values (Table 4). SSB proxies increased as the SPR target became more conservative, while F proxies were inversely related to the SPR target level. Estimated values of the SSB proxy ranged from 9.83E+11 eggs at SPR 20% to 1.97E+12 eggs at SPR 40%, and F proxies (as a total harvest rate defined by the fraction of total removals to total abundance) ranged from 0.052 to 0.045 for the same SPR targets. Proxies for the status quo SPR 26% target were 1.28E+12 eggs for SSB and a harvest rate of 0.049.

The time to rebuild increased as the SPR proxy became more conservative (Table 5). By definition the SSB proxy must be achieved in the same year as the SPR target, which meant either the terminal year for ABC projections (2026 or 2032) or 2070 for equilibrium OFL projections (i.e., the mid-point over which the average SPR values were taken). The starting (2015) gulfwide SPR for the projections was 0.16, which resulted in the stock being below each SPR target and requiring rebuilding regardless of projection scenario. In the absence of fishing mortality, rebuilding times for SSB proxies ranged from 2017 for the least conservative SPRs (i.e., 20% and 22%) to 2022 for the most conservative SPR 40% proxy (Table 5 and Figure 10). Rebuilding to the status quo SPR 26% target occurred in 2018 when there was no harvesting. The time to rebuild to MSST was also determined (Table 5). The estimated generation time (fecundity weighted mean age) was 15 years.

Equilibrium yields achieved at the optimum yield fishing mortality rate (0.75* $F_{\text{Direct at SPRtarget}}$) were between 88% and 95% of the equilibrium yields obtained at the target SPR (Table 1, last row). The difference was greatest for the more conservative SPR target values. At the status quo of SPR 26%, equilibrium optimum yield was projected to be 93% of the equilibrium yield.

4. DISCUSSION

The projections indicate that as the target SPR for red snapper becomes more conservative, the associated F_{Proxy} declines, SSB_{Proxy} increases, the time to rebuild becomes longer, and associated OFL, ABC, and equilibrium yields decrease. The MSY-link scenario resulted in an SPR of 23%, but produced lower equilibrium landings than when shrimp bycatch and closed-season discarding are assumed to remain at recent levels. This is because, under the linked scenario, any increase in directed fishing mortality is assumed to be accompanied by a proportionate increase in non-directed fishing mortality. Accordingly, the MSY-link scenario does not appear to be a robust proxy for the global MSY when there is substantial bycatch mortality. Alternative approaches to calculating MSY proxies should be considered.

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., $F_{\text{OY, Directed}} = 0.75 * F_{\text{SPRtarget, Directed}}$), 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 95% of F_{Proxy} instead of 75% (Table 6). The disparity between realized and intended harvest rate is due to the substantial contribution of the bycatch fleets to the total annual removals (i.e., resulting in high relative F in comparison to some directed fleets; Figure 11 top left panel). However, the total instantaneous fishing mortality was closer to 85% of the total fishing mortality at SPR 26% (Figure 11, bottom panel), which better reflects the decrease in directed fishing mortality. The degree of difference in mortality is also a function of the metric used (e.g., because shrimp bycatch is mostly juvenile red snapper, an F metric that looked at age 3+ mortality would better reflect the 0.75 mortality scalar).

There was interaction within the model between fishing mortality and fleet allocation. To achieve F_{OY} (75% of F SPR_{REF}) and retain the desired allocation for the recreational and commercial sectors, the realized fishing mortalities at F_{OY} were around 80% of F SPR 26% for each of the commercial fisheries and 70% for each of the recreational fisheries, which averaged to 75% of the F SPR 26% for the directed fisheries (Table 6, Figure 11 top right panel). Given the many approaches to calculating optimal yield when multiple directed and bycatch fleets exist (e.g., average directed F is 75% of F at the SPR target, average F across all directed and bycatch fleets is 75% of F at the SPR target or total harvest rate is 75% of that at the SPR target), consideration of a standard OY approach should be undertaken in the future to avoid further confusion.

An important caveat for these projections is that SPR is calculated for the entire gulfwide stock (estimated to be 0.16 in 2015), which ignores the regional impact that a given SPR target might have on the eastern or western component of the stock complex individually. When SPR values are viewed regionally (Figure 12; ABC projections with a 2032 rebuild date are shown for illustrative purposes), quite disparate effects are seen. In 2015, the western Gulf of Mexico red snapper SPR was 0.19, but the eastern Gulf of Mexico SPR was only 0.11. Additionally, the SPR (and spawning stock biomass) is projected to increase in the western Gulf of Mexico for all SPR target values. However, the eastern Gulf of Mexico is forecasted to decline even further for all but the most conservative SPR target (e.g., SPR 40%). Even the forecast with the status quo (SPR 26% target) demonstrates continual declines in the eastern Gulf of Mexico stock unit to an SPR ratio of 0.07 in 2032.

The differential response in SPR ratio by region is a function of four major assumptions of the projection: the allocation by sector (commercial v. recreational), assumed regional recruitment, fixed bycatch rates, and relative distribution of F by fleet. SEFSC (2015) demonstrated that increasing allocation to the commercial fishery could increase SPR ratios, but this result is also a function of the latter three assumptions in the Stock Synthesis projections. For instance, the eastern stock receives only half of the recruitment of the western stock in each year of the projection (Figure 13; fixed at recent timeseries averages for the length of the projections), but encounters nearly three times the fishing pressure (Figure 11, top left panel). Relative F by fleet (for the directed fisheries) is fixed at the 2011-2013 average values, which results in much higher fishing mortality from the eastern Gulf of Mexico recreational (MRIP) fishery and the commercial handline fishery, in comparison to the associated western Gulf of Mexico counterparts. Additionally, the bycatch fishing mortality is held constant at the average rates from 2011-2013. The consequence is a high closed season F from the recreational fishery in the eastern Gulf of Mexico that nearly matches the associated open season fishing mortality, and is much larger than any F experienced by the western Gulf of Mexico stock.

The large discrepancy between recruitment and removals (fishing mortality) within the eastern stock is the major factor causing a decline in SPR throughout the projections. However, because recruitment and mortality is more balanced in the western stock, the SPR ratio is able to increase. The outcome is a gulfwide average SPR 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.

The projection results should therefore be treated cautiously, especially considering that gulfwide SPR ratios and other proxy values do not accurately reflect the fine-scale (e.g., regional) dynamics in the Gulf of Mexico. Additionally, if allocation to the recreational sector is increased (e.g., SEFSC, 2015) in combination with a reduction in management target SPR, the impacts on the regional spawning potential will be more severe than indicated by either action individually.

5. ACKNOWLEDGEMENTS

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7. TABLES

Table 1. OFL (retained yield in millions of pounds whole weight) as a function of spawning potential ratio proxy for long-term equilibrium runs. OFL was calculated as the median (50th percentile) of the probability density function of retained yield (millions of pounds). All runs achieve target SPR values over the last ten years of the model (2065-2074) where the average SPR over that time frame equaled the target value. Equilibrium yield was the average OFL over the last ten years. Equilibrium optimal yield (OY) was the average retained yield over the last ten years with F_{Direct}=0.75*$F_{Direct\ at\ SPRtarget}$ for the directed fisheries. The MSY-link run maximizes equilibrium yield assuming all fisheries are scalable, while maintaining proportional Fs, and does not aim for any prespecified target SPR.

OFL (Retained Yield Million Pounds Whole Weight)							
YEAR	**MSY-LINK**	**SPR 40%**	**SPR 30%**	**SPR 26%**	**SPR 24%**	**SPR 22%**	**SPR 20%**
2015	15.24	8.94	13.63	16.10	17.49	19.00	20.65
2016	14.45	9.54	13.49	15.31	16.26	17.24	18.25
2017	13.91	10.08	13.42	14.80	15.47	16.14	16.79
2018	13.31	10.34	13.18	14.26	14.76	15.24	15.70
2019	12.56	10.24	12.71	13.60	14.02	14.41	14.78
2020	12.03	10.07	12.36	13.17	13.55	13.90	14.24
2021	11.71	9.94	12.14	12.93	13.29	13.64	13.96
2022	11.52	9.87	12.03	12.79	13.14	13.47	13.78
2023	11.46	9.91	12.03	12.77	13.11	13.42	13.72
2024	11.45	9.98	12.05	12.77	13.10	13.41	13.69
2025	11.44	10.03	12.08	12.78	13.10	13.39	13.67
2026	11.43	10.08	12.10	12.78	13.09	13.38	13.64
2027	11.42	10.13	12.11	12.79	13.09	13.37	13.62
2028	11.42	10.17	12.13	12.79	13.08	13.36	13.61
2029	11.41	10.21	12.14	12.79	13.08	13.35	13.60
2030	11.40	10.24	12.16	12.80	13.08	13.35	13.59
2031	11.40	10.27	12.17	12.80	13.08	13.34	13.58
2032	11.40	10.30	12.18	12.81	13.08	13.34	13.57
Equil	11.41	10.57	12.34	12.91	13.17	13.40	13.60
Equil OY	11.20	9.29	11.29	12.00	12.33	12.64	12.93

Table 2. ABC (retained yield in millions of pounds whole weight) as a function of spawning potential ratio (SPR) target for a 2032 rebuilding date. ABC was calculated using a P* of 0.427 (the 42.7th percentile) of the probability density function of retained yield obtained from the projection of $F_{Rebuild}$ (the harvest rate that achieves the specified gulfwide spawning potential ratio (SPR) in 2032). A P* of 0.427 implies a 42.7% probability of overfishing in any given year. Less conservative SPR proxies than currently used for management (e.g., values below SPR 26%) may require a new rebuilding plan (i.e., rebuilding date of 2026). The values provided here may not be appropriate for use in setting allowable harvest levels for those target proxies. The MSY-link run maximizes equilibrium yield assuming all fisheries are scalable, while maintaining proportional Fs, and does not aim for any prespecified target SPR. ABCs for the MSY-link are calculated directly from the OFL and not a $F_{Rebuild}$.

ABC (Retained Yield Million Pounds Whole Weight)							
YEAR	**MSY-LINK**	**SPR 40%**	**SPR 30%**	**SPR 26%**	**SPR 24%**	**SPR 22%**	**SPR 20%**
2015	15.00	6.55	11.54	14.28	15.87	17.63	19.59
2016	14.25	7.26	11.79	13.96	15.11	16.31	17.55
2017	13.72	7.91	12.02	13.74	14.61	15.45	16.28
2018	13.10	8.32	11.99	13.38	14.05	14.67	15.26
2019	12.36	8.37	11.67	12.85	13.40	13.91	14.39
2020	11.86	8.31	11.40	12.49	12.99	13.46	13.90
2021	11.56	8.24	11.24	12.29	12.78	13.23	13.64
2022	11.38	8.21	11.15	12.18	12.65	13.08	13.48
2023	11.33	8.27	11.17	12.17	12.62	13.04	13.42
2024	11.31	8.35	11.22	12.19	12.63	13.03	13.40
2025	11.30	8.41	11.25	12.21	12.63	13.02	13.37
2026	11.29	8.47	11.29	12.22	12.63	13.01	13.35
2027	11.28	8.53	11.31	12.23	12.64	13.00	13.34
2028	11.28	8.58	11.34	12.24	12.64	13.00	13.32
2029	11.27	8.62	11.36	12.25	12.64	12.99	13.31
2030	11.26	8.66	11.38	12.26	12.64	12.99	13.30
2031	11.26	8.70	11.40	12.26	12.65	12.99	13.29
2032	11.25	8.73	11.41	12.27	12.65	12.99	13.29
Equil	11.26	9.05	11.61	12.40	12.74	13.04	13.30

Table 3. ABC (retained yield in millions of pounds whole weight) as a function of spawning potential ratio (SPR) target for a 2026 rebuilding date. ABC was calculated using a P* of 0.427 (the 42.7th percentile) of the probability density function of retained yield obtained from the projection of $F_{Rebuild}$ (the harvest rate that achieves the specified gulfwide spawning potential ratio (SPR) in 2026). A P* of 0.427 implies a 42.7% probability of overfishing in any given year. Current rebuilding plans stipulate a terminal date of 2032, therefore SPR proxies at or above the levels currently used for management (e.g., SPR 26% or greater) do not require a 2026 rebuilding date. The values provided here may not be appropriate for use in setting allowable harvest levels for those target proxies. The MSY-link run maximizes equilibrium yield assuming all fisheries are scalable, while maintaining proportional Fs, and does not aim for any prespecified target SPR. ABCs are calculated directly from the OFL and not a $F_{Rebuild}$.

ABC (Retained Yield Million Pounds Whole Weight)							
YEAR	**MSY-LINK**	**SPR 40%**	**SPR 30%**	**SPR 26%**	**SPR 24%**	**SPR 22%**	**SPR 20%**
2015	15.00	4.27	9.71	12.78	14.59	16.63	18.91
2016	14.25	4.92	10.23	12.80	14.19	15.64	17.14
2017	13.72	5.54	10.67	12.84	13.92	14.98	16.01
2018	13.10	5.98	10.84	12.67	13.52	14.33	15.07
2019	12.36	6.14	10.66	12.25	12.97	13.63	14.24
2020	11.86	6.16	10.47	11.93	12.59	13.20	13.76
2021	11.56	6.13	10.34	11.75	12.39	12.98	13.51
2022	11.38	6.13	10.27	11.66	12.28	12.84	13.35
2023	11.33	6.19	10.31	11.67	12.27	12.81	13.30
2024	11.31	6.27	10.37	11.70	12.28	12.81	13.28
2025	11.30	6.34	10.42	11.72	12.30	12.81	13.26
2026	11.29	6.40	10.46	11.75	12.31	12.81	13.24
Equil	11.26	7.03	10.88	12.00	12.47	12.88	13.22

Table 4. Rebuilding proxies for each SPR target. All proxies are equilibrium values averaged over the last ten years of the projection (2065-2074) for the given parameter and are obtained from runs that achieve the target SPR on average over the last ten years. Fishing mortality proxies are yearly harvest rates (total removals/total abundance), which account for all removals from the commercial, recreational, and bycatch fleets (bycatch fishing mortality rates are held constant at 2014 terminal year assessment model estimates). Spawning stock biomass (SSB) is in number of eggs and minimum stock size threshold (MSST) is equivalent to SSB_{Proxy}*(1-M) where M is natural mortality rate (equal to 0.086).

F and SSB Proxies			
SPR	**F (Removals/Abundance)**	**SSB (Eggs)**	**MSST (Eggs)**
MSY-LINK	0.07	1.12E+12	1.03E+12
0.20	0.05	9.83E+11	8.98E+11
0.22	0.05	1.08E+12	9.88E+11
0.24	0.05	1.18E+12	1.08E+12
0.26	0.05	1.28E+12	1.17E+12
0.30	0.05	1.47E+12	1.35E+12
0.40	0.04	1.97E+12	1.80E+12

Table 5. The time required to rebuild based on the projection year that SSB_{Proxy} is achieved for each SPR target. F=0 runs indicate the time to rebuild in the absence of any fishing mortality. For the MSY-link run only one projection was undertaken (i.e., there were no rebuilding scenarios), so the 2032 and 2026 terminal year runs were not applicable (NA).

Year that Rebuilding Target is Reached								
SPR	**F=0**		**OFL (Reach SPR by 2074)**		**2032 (Reach SPR by 2032)**		**2026 (Reach SPR by 2026)**	
	SSB	**MSST**	**SSB**	**MSST**	**SSB**	**MSST**	**SSB**	**MSST**
MSY-LINK	2018	2017	2070	2023	NA	NA	NA	NA
0.2	2017	2016	2070	2022	2032	2020	2026	2019
0.22	2017	2017	2070	2026	2032	2023	2026	2021
0.24	2018	2017	2070	2029	2032	2024	2026	2022
0.26	2018	2018	2070	2031	2032	2025	2026	2023
0.3	2019	2019	2070	2034	2032	2026	2026	2023
0.4	2022	2021	2070	2037	2032	2028	2026	2024

Table 6. Retained yield and relative fishing mortality for optimal yield (OY) runs where the directed fishing mortality was equivalent to 0.75 multiplied by the F at SPR 26%. Proportions are given as the OY run value divided by the SPR 26% run value. Harvest rate is total removals (in numbers) divided by total abundance. The total F proportions and harvest rate proportions differ because total F is average instantaneous fishing mortality across all directed and bycatch fleets, whereas harvest rate is total removals divided by total abundance. Retained yield is in millions of pounds. Equilibrium values are averages over the last ten years (2065-2074) of the projection.

Optimal Yield (OY) Run Results						
YEAR	**Retained Yield (mp)**	**Yield Proportion**	**Harvest Rate**	**Harvest Rate Proportion**	**Total F Proportion**	**Directed F Proportion**
2015	12.49	0.78	0.0493	0.93	0.84	0.75
2016	12.59	0.82	0.0493	0.95	0.84	0.75
2017	12.70	0.86	0.0491	0.95	0.84	0.75
2018	12.60	0.88	0.0487	0.96	0.84	0.75
2019	12.22	0.90	0.0483	0.96	0.84	0.75
2020	11.90	0.90	0.0480	0.96	0.84	0.75
2021	11.71	0.91	0.0479	0.96	0.84	0.75
2022	11.60	0.91	0.0478	0.96	0.84	0.75
2023	11.61	0.91	0.0477	0.96	0.84	0.75
2024	11.65	0.91	0.0477	0.96	0.84	0.75
2025	11.68	0.91	0.0476	0.96	0.84	0.75
2026	11.71	0.92	0.0476	0.96	0.84	0.75
2027	11.73	0.92	0.0476	0.96	0.84	0.75
2028	11.75	0.92	0.0475	0.96	0.84	0.75
2029	11.77	0.92	0.0475	0.96	0.84	0.75
2030	11.79	0.92	0.0475	0.96	0.84	0.75
2031	11.81	0.92	0.0475	0.96	0.84	0.75
2032	11.82	0.92	0.0475	0.96	0.84	0.74
Equil	12.00	0.93	0.05	0.96	0.83	0.74

8. FIGURES

Figure 1. Equilibrium yield verse equilibrium SPR assuming scalability of all fisheries and constant recruitment (i.e., MSY-link scenario). MSY-proxy is 11.41 million pounds and results in an SPR of 23%.

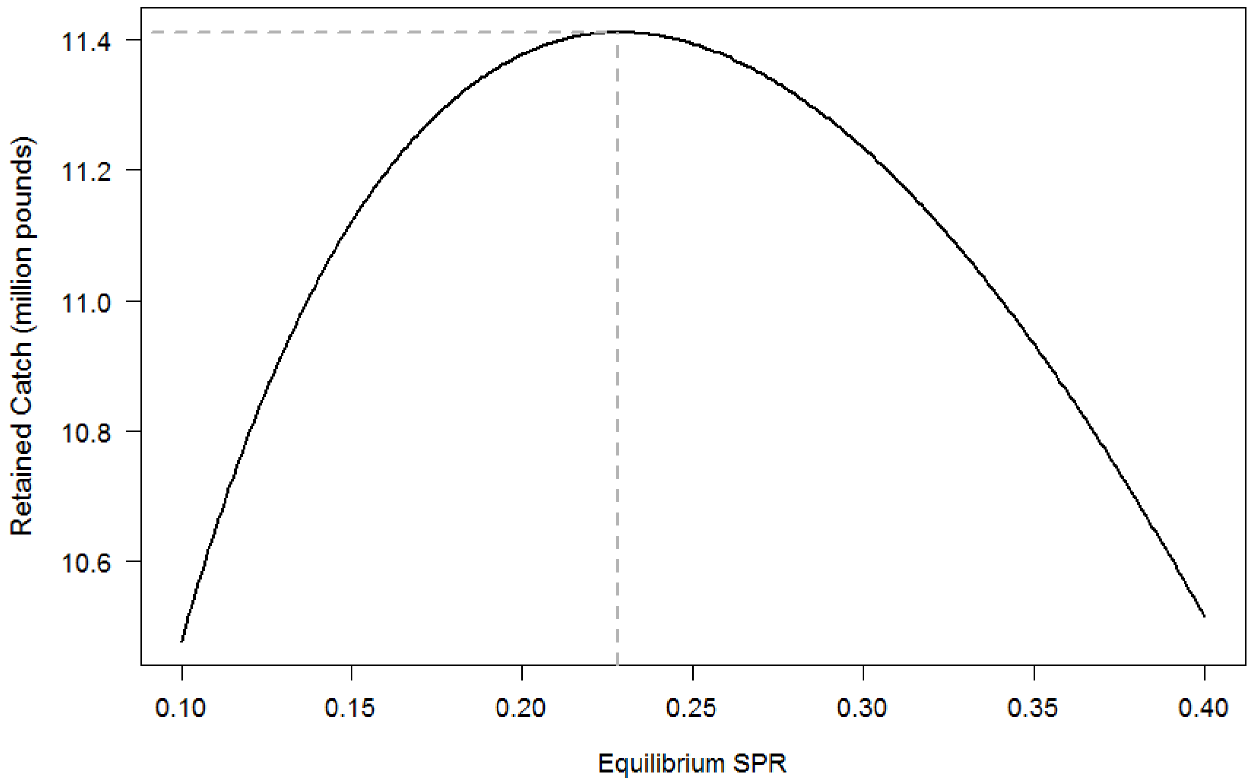


Figure 2. Timeseries plots of overfishing limits (OFLs) with associated symmetrical 95% confidence intervals (grey shaded region) and corresponding SPR levels for each SPR target.

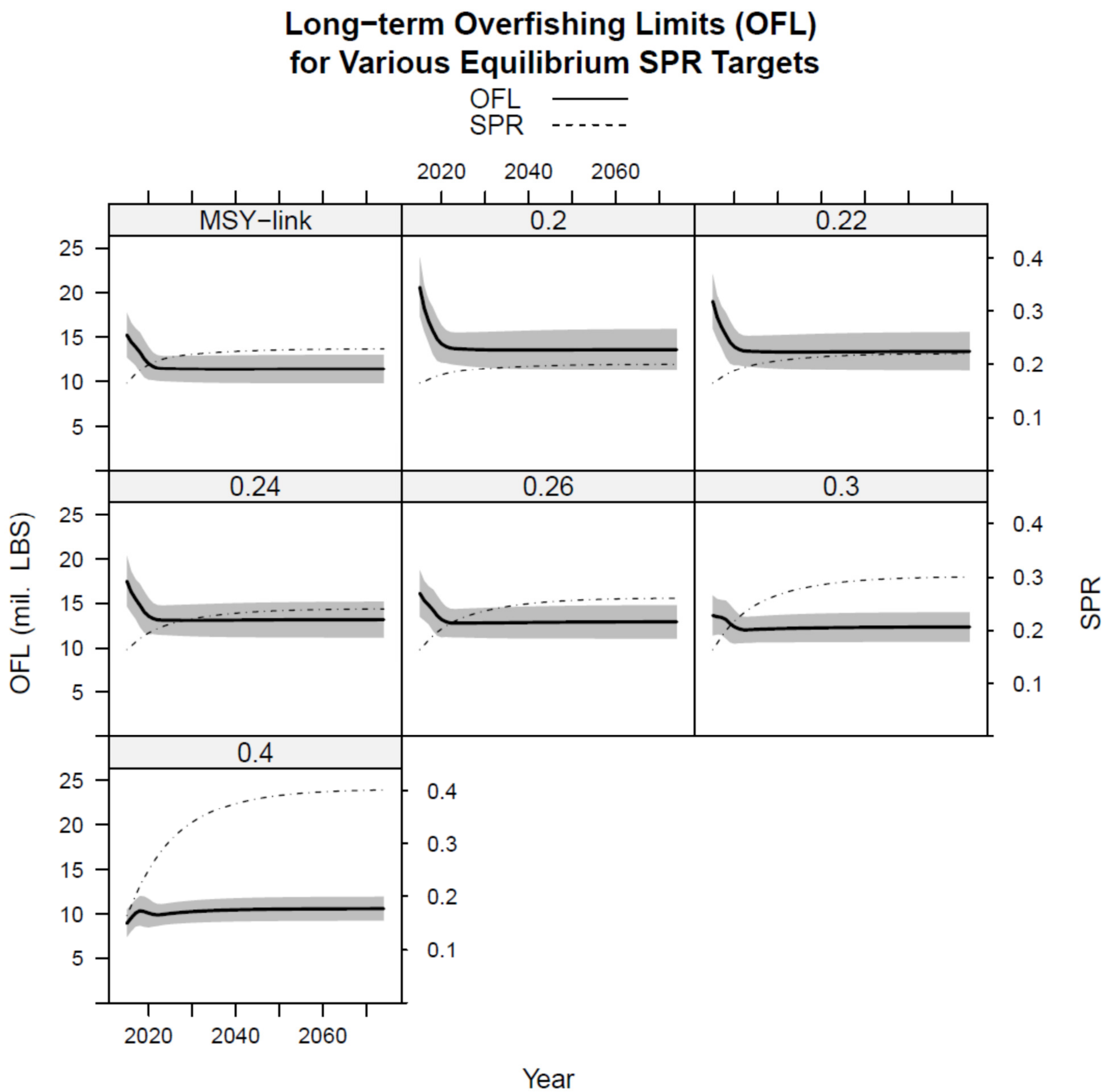
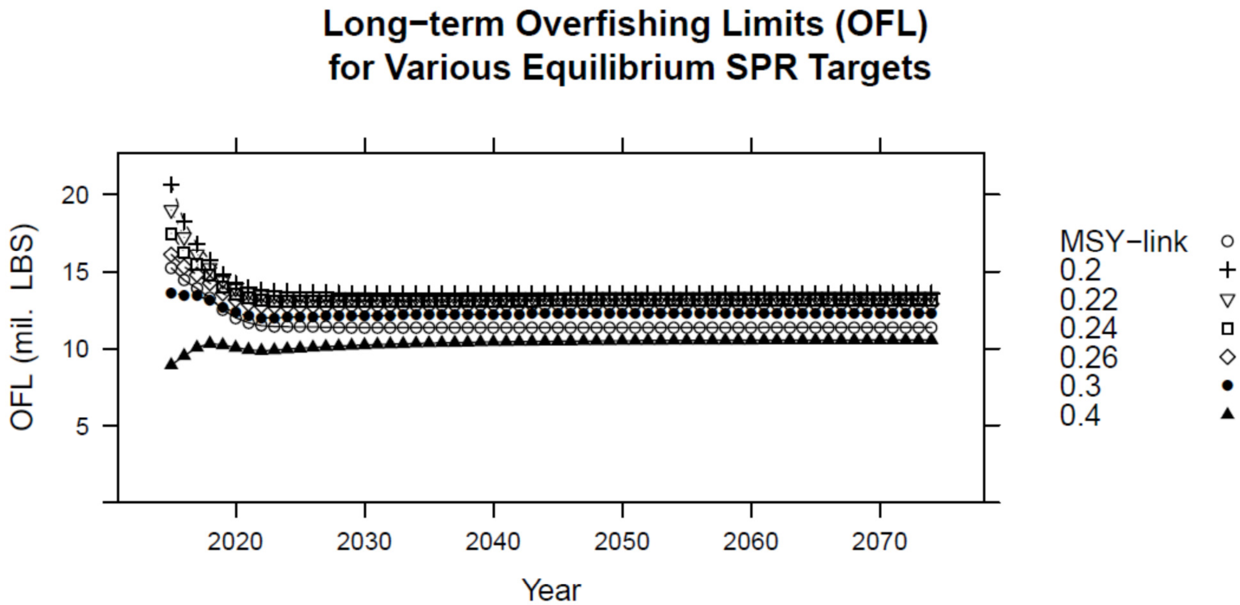


Figure 3. Timeseries plots of OFLs and associated SPR levels for each SPR target.



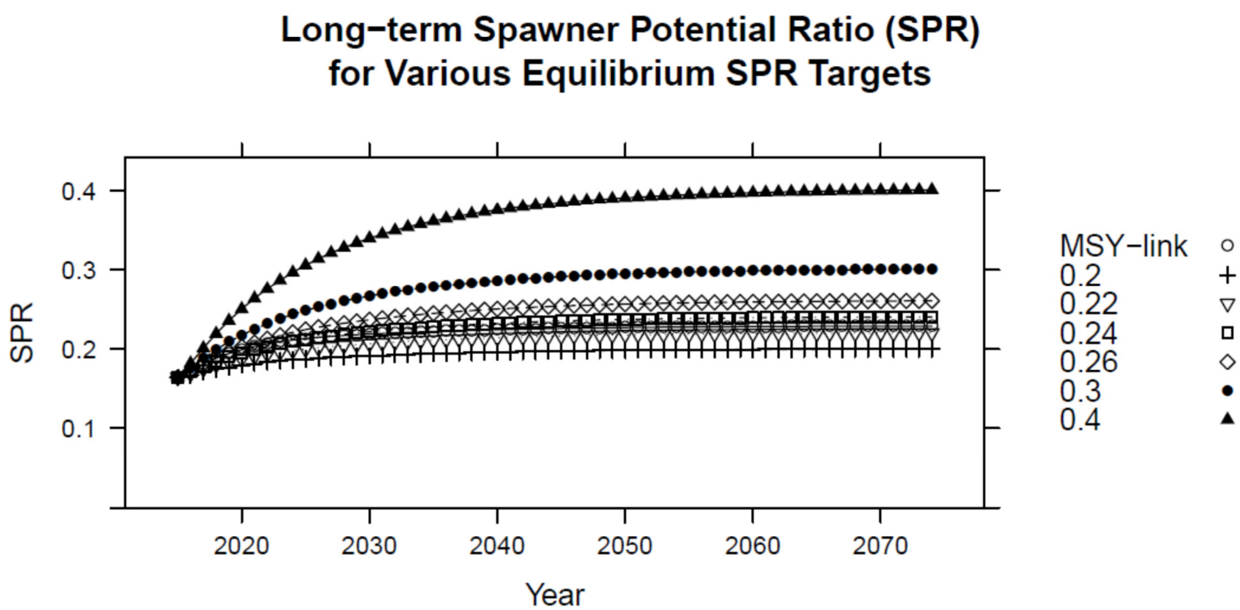


Figure 4. Timeseries plots of acceptable biological catches (ABCs) with associated symmetrical 95% confidence intervals (grey shaded region) and corresponding SPR levels for each SPR target assuming a rebuilding date of 2032. MSY-link runs are shown for comparison, but are not directly applicable because no rebuilding scenarios were undertaken.

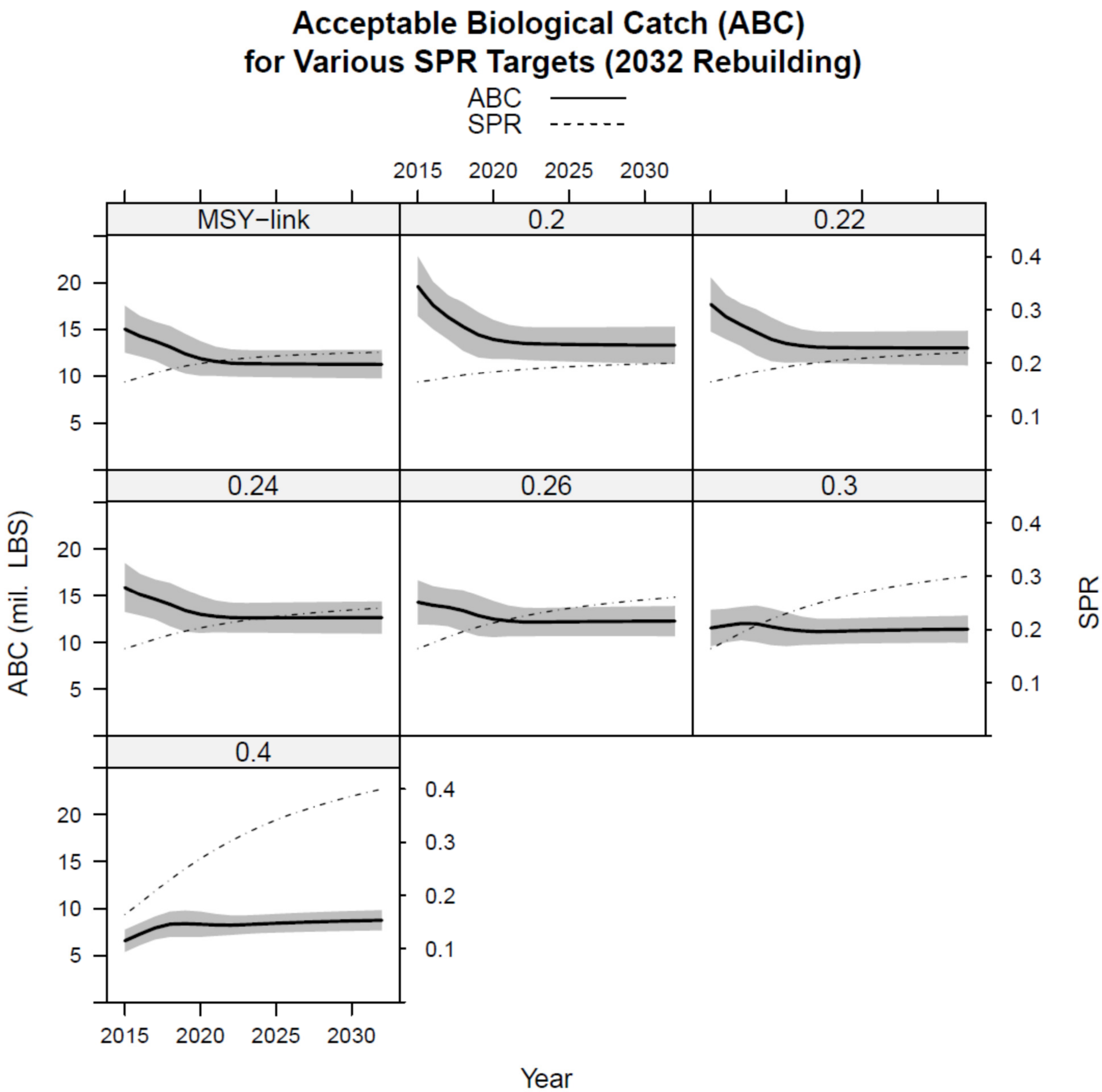


Figure 5. Timeseries plots of ABCs and associated SPR levels for each SPR target assuming a rebuilding date of 2032. MSY-link runs are shown for comparison, but are not directly applicable because no rebuilding scenarios were undertaken.

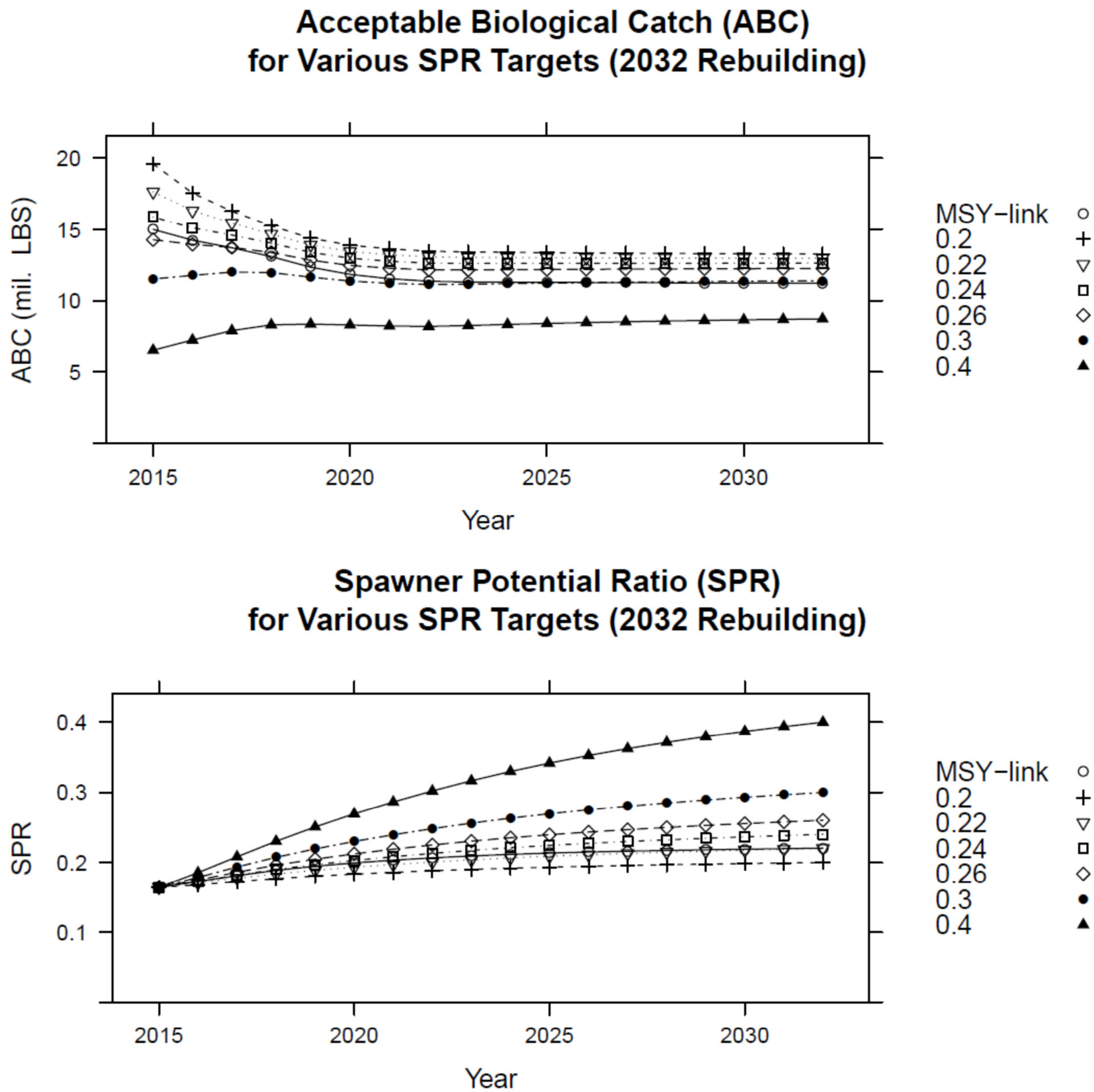


Figure 6. Timeseries plots of retained yield for each SPR target assuming a rebuilding date of 2032. The ABC is calculated from the median (MLE) of retained yield based on a P* of 0.427. MSY-link runs are shown for comparison, but are not directly applicable because no rebuilding scenarios were undertaken.

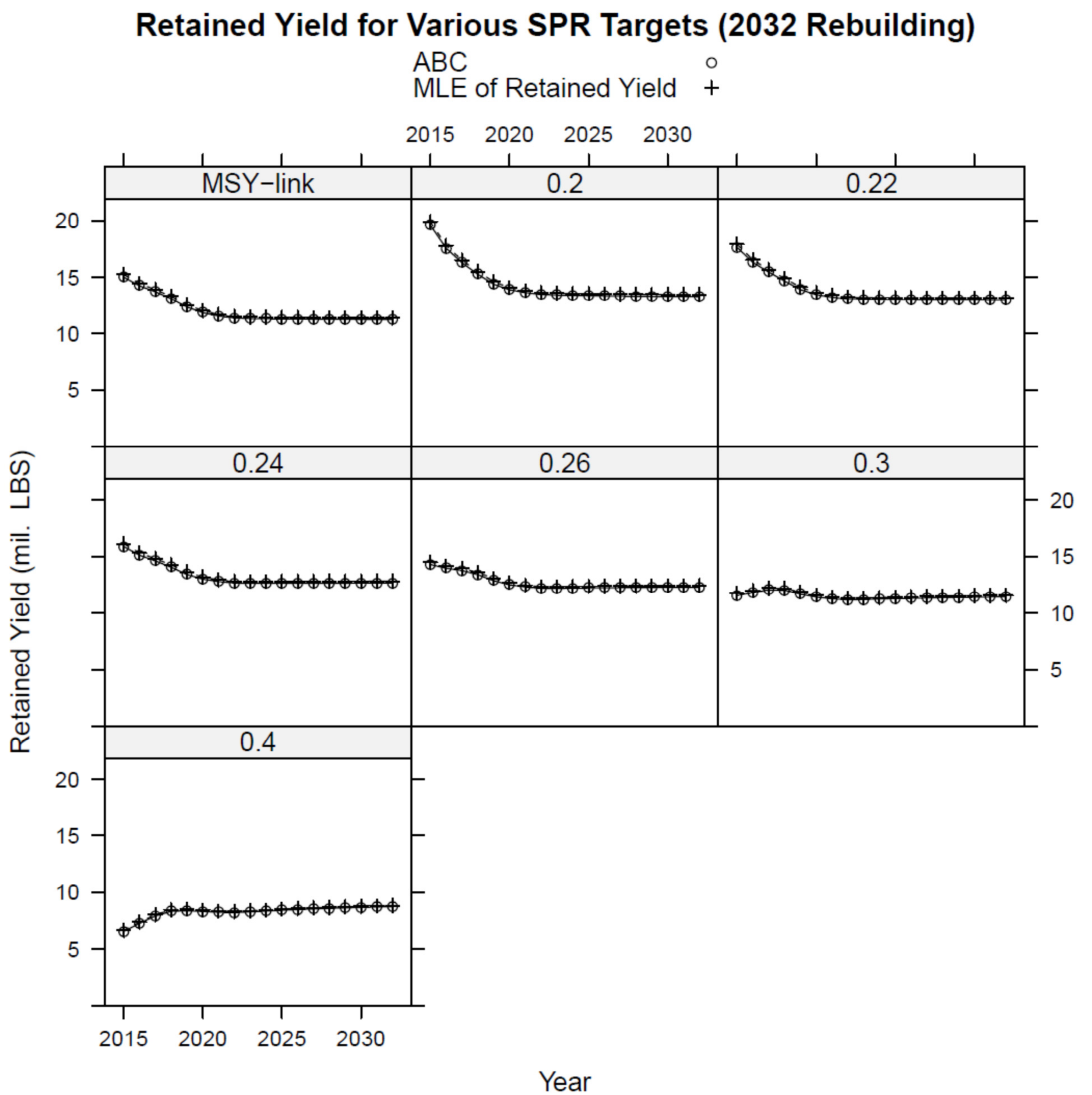


Figure 7. Timeseries plots of ABCs with associated symmetrical 95% confidence intervals (grey shaded region) and corresponding SPR levels for each SPR target assuming a rebuilding date of 2026. MSY-link runs are shown for comparison, but are not directly applicable because no rebuilding scenarios were undertaken.

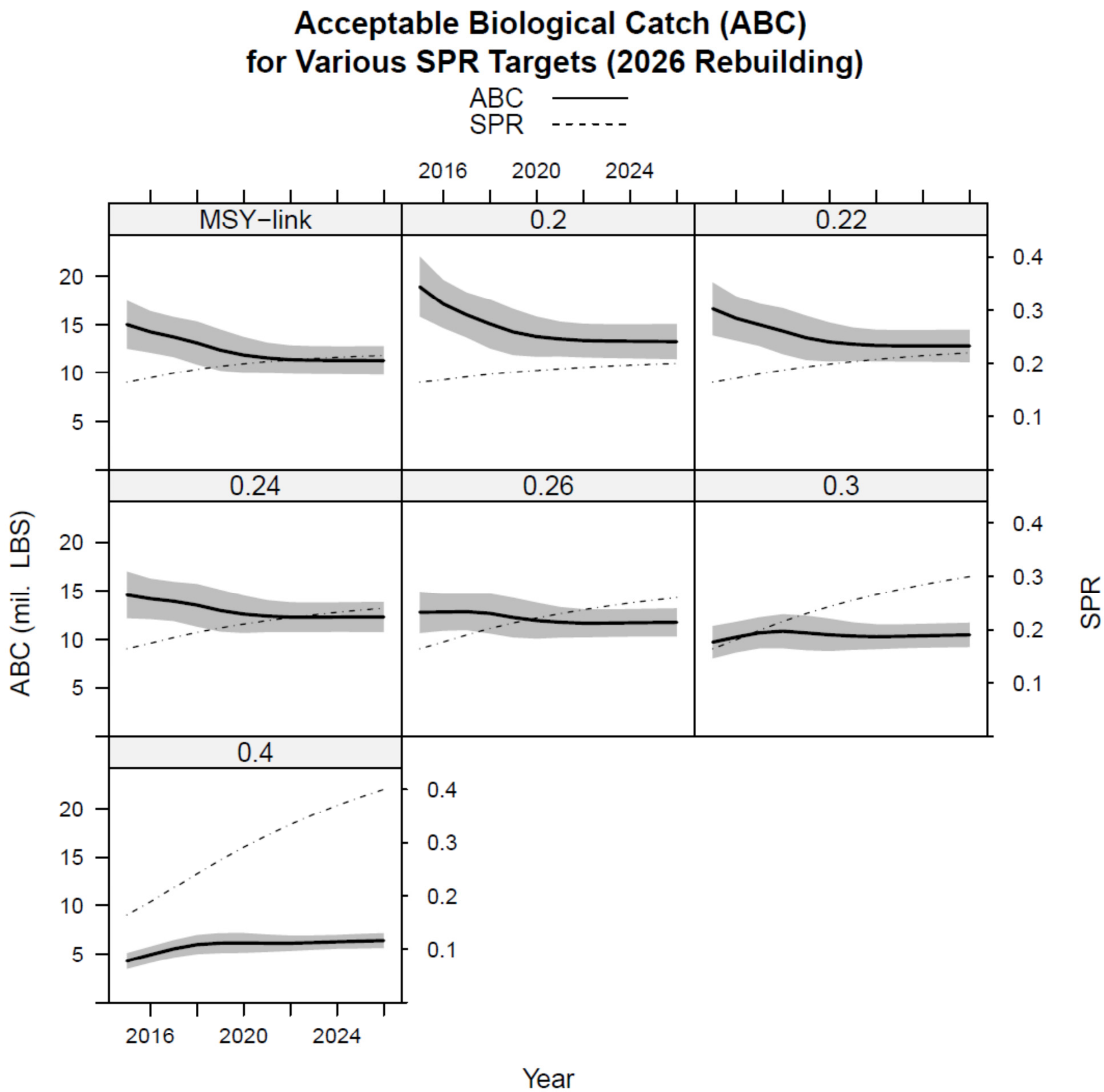
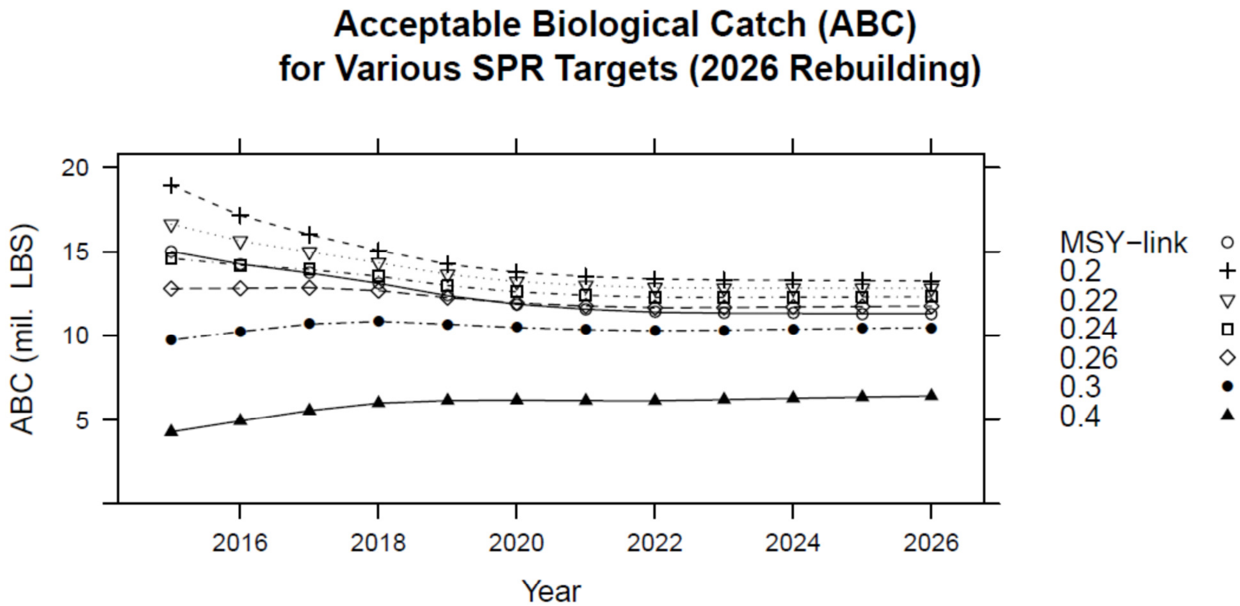


Figure 8. Timeseries plots of ABCs and associated SPR levels for each SPR target assuming a rebuilding date of 2026. MSY-link runs are shown for comparison, but are not directly applicable because no rebuilding scenarios were undertaken.



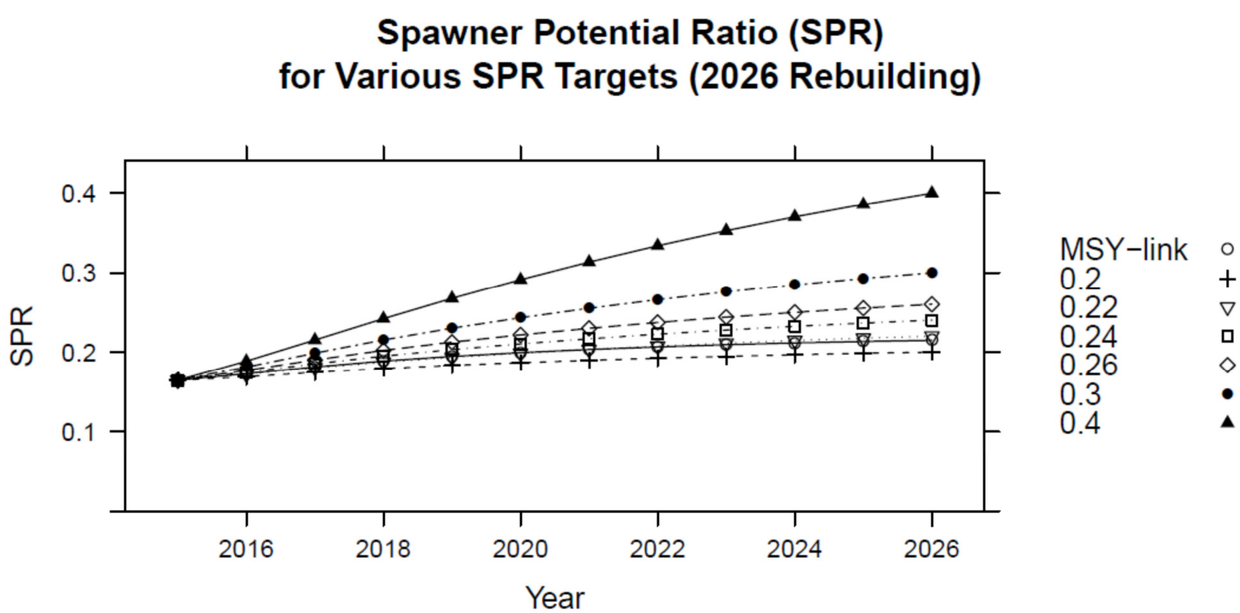


Figure 9. Timeseries plots of retained yield for each SPR target assuming a rebuilding date of 2026. The ABC is calculated from the median (MLE) of retained yield based on a P* of 0.427. MSY-link runs are shown for comparison, but are not directly applicable because no rebuilding scenarios were undertaken.

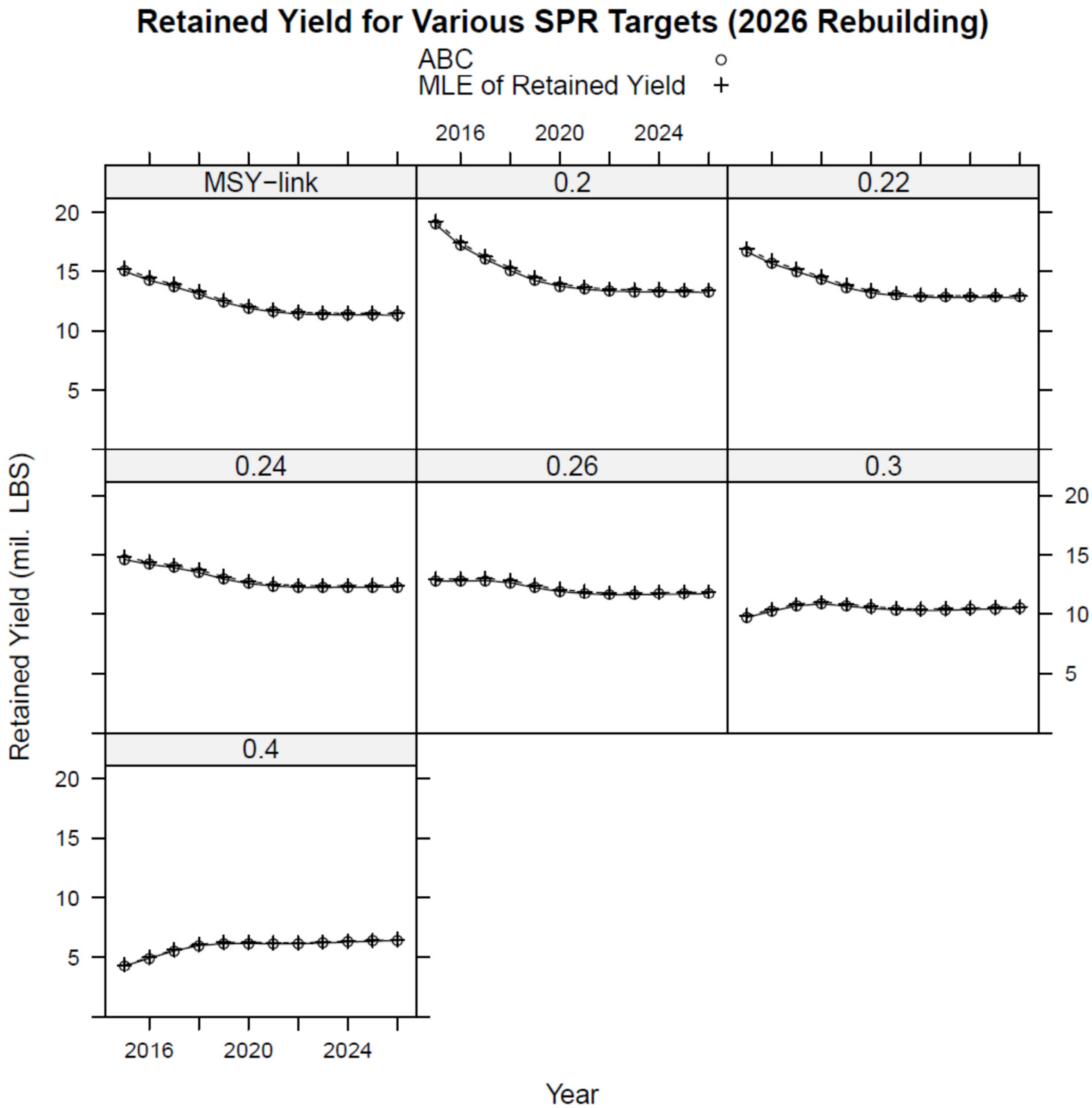


Figure 10. Timeseries of spawning stock biomass in the absence of fishing mortality. The inset provides the time to rebuild to a given target SSB_{Proxy} for each target SPR. Because SSB_{Proxy} is often between $SSB_{F=0}$ values, the intersection of SSB_{Proxy} and rebuilding year line segments occurs just below the actual $SSB_{F=0}$ curve.

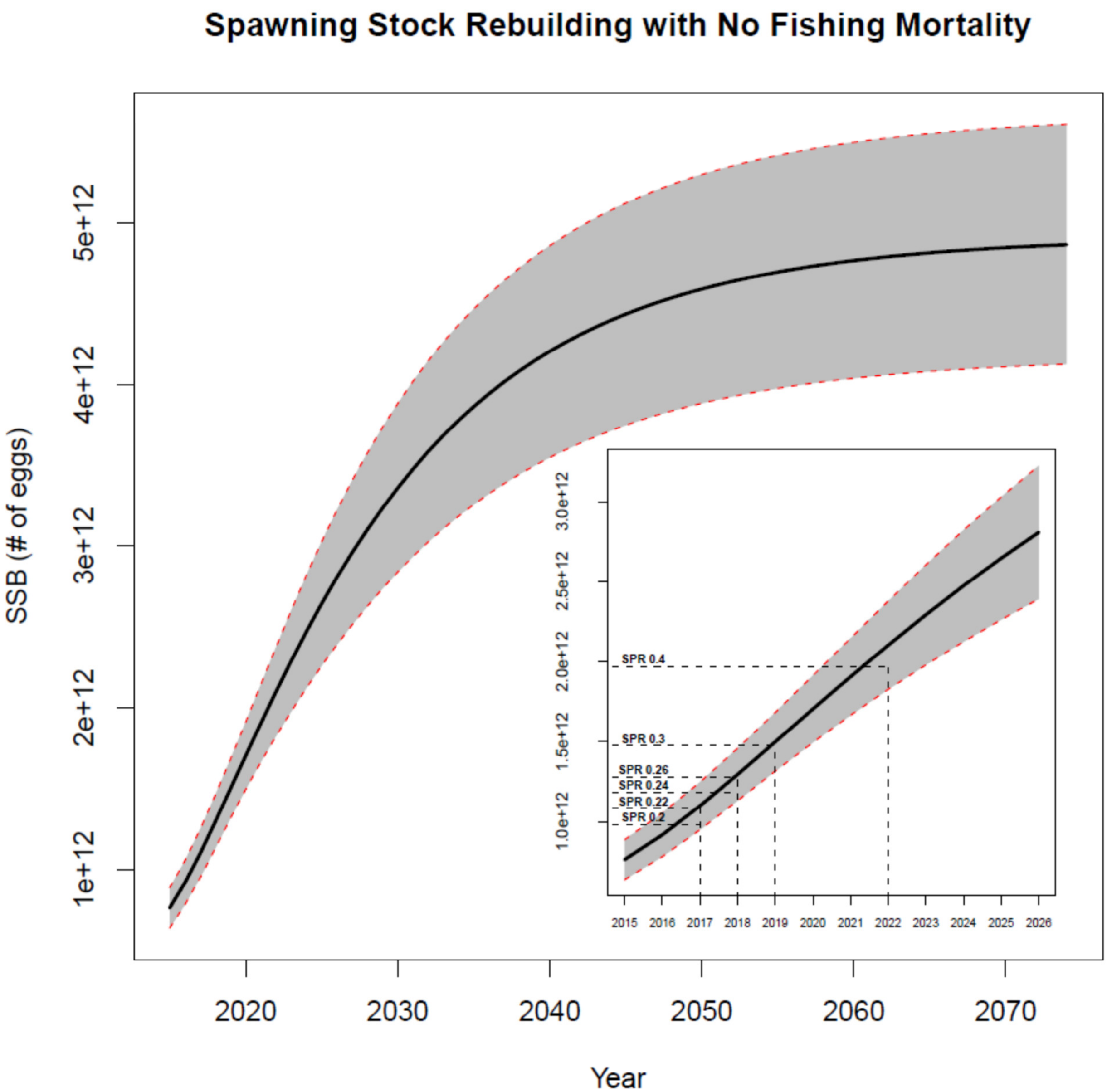


Figure 11. Comparison of relative fishing mortalities for SPR 26% and optimum yield (OY) runs. The top left panel compares equilibrium relative fishing mortality by fleet within a given projection (i.e., relative F is the fleet-specific F divided by the total F in that projection). SPR 26% values represent the relative Fs for all runs (except the optimal yield runs), which are input based on the stock assessment relative Fs from 2011-2013. Because the OY runs only reduce directed F while bycatch fleet Fs are fixed (input directly), the relative Fs for these runs differ from those in the other projections. The top right panel compares the ratio of equilibrium optimal yield fishing mortality by fleet to the associated fishing mortality at SPR 26%. The bottom panel illustrates the timeseries of relative fishing morality (F/F at SPR 26%) for each sector. The OY run aims to reduce directed fishing mortality to $0.75^{*}F_{\text{Direct at SPR 26\%}}$, which results in a realized total fishing mortality that is not reduced by the same 0.75 scalar, because it does not reduce bycatch fishing mortality.

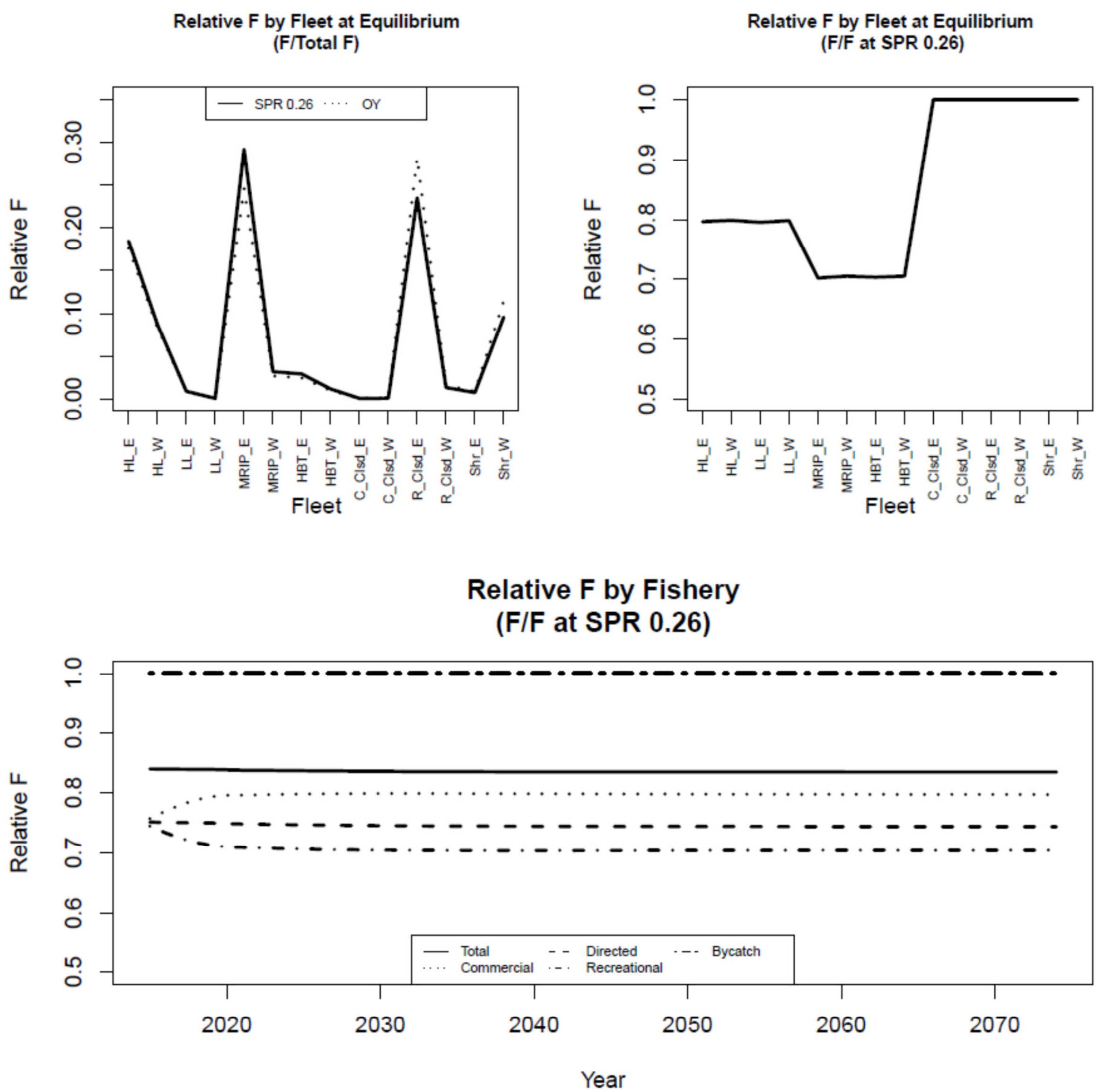
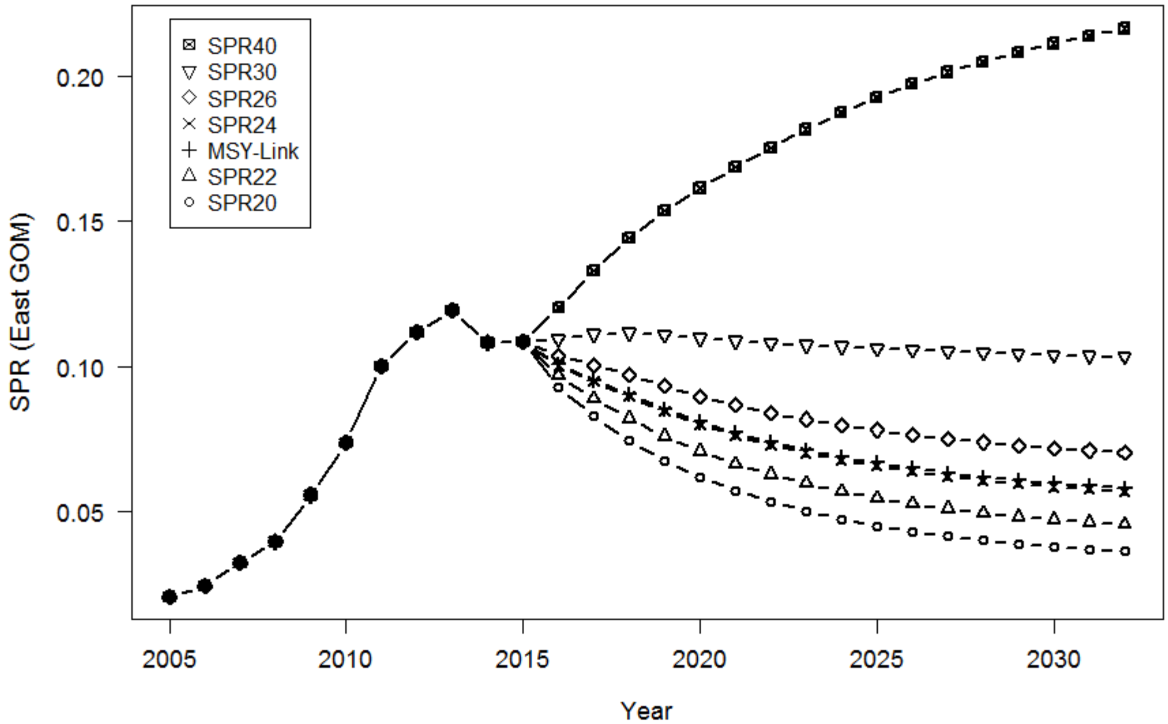


Figure 12. Effect of various gulfwide SPR target values on the regional SPRs for the eastern (top) and western (bottom) Gulf of Mexico. Projected SPR values were obtained from ABC projections with a 2032 rebuild date (except the MSY-link run).



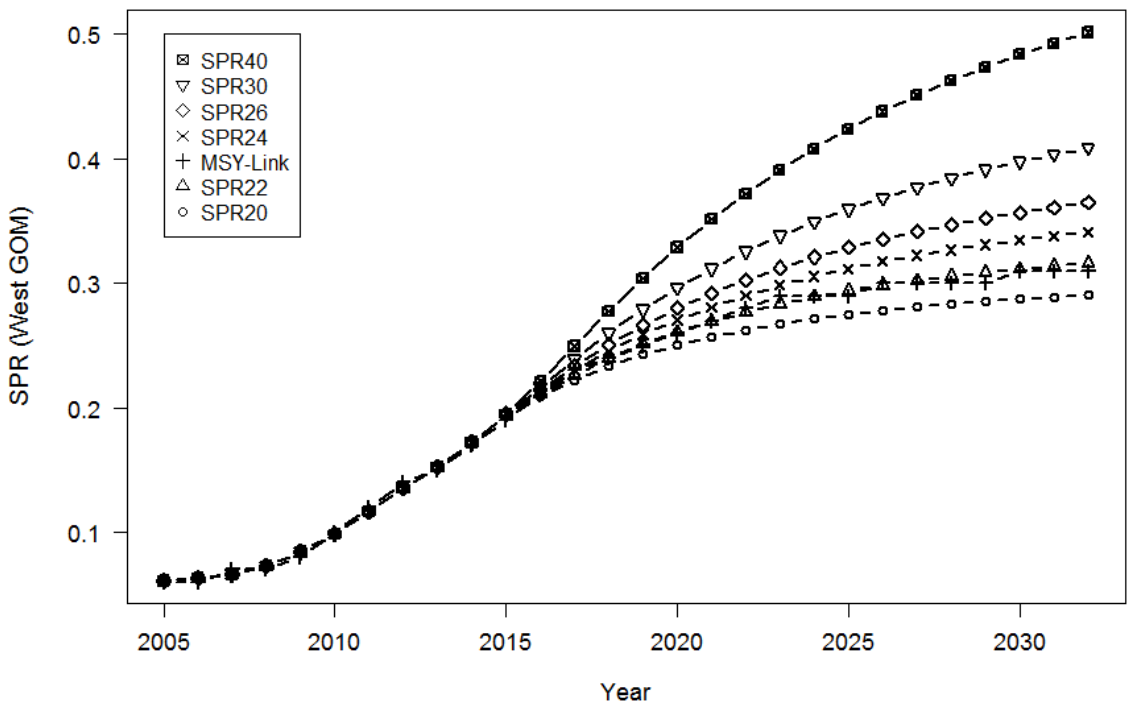
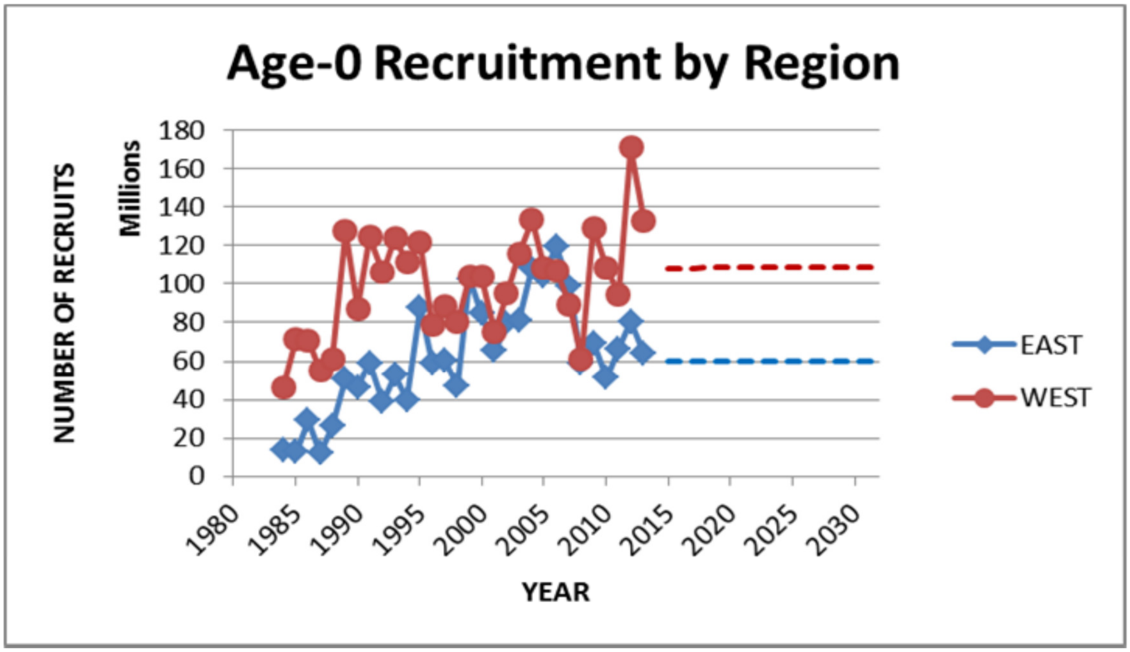


Figure 13. Recruitment by region for red snapper (from SEFSC, 2015). Values used in the projections (2015-2074) are assumed equal to the recent timeseries average (1984-2013), which represent intermediate recruitment levels over the full assessment timeseries.



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