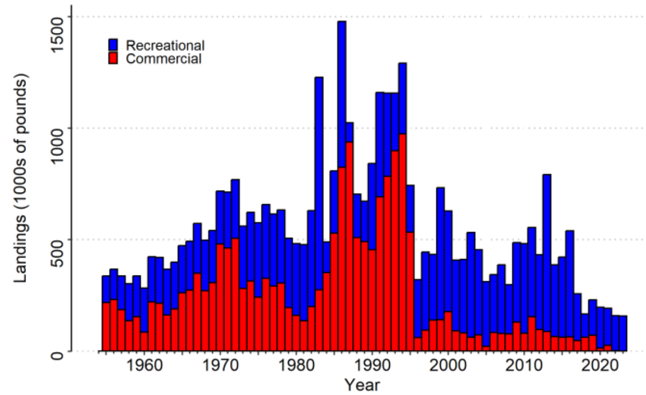
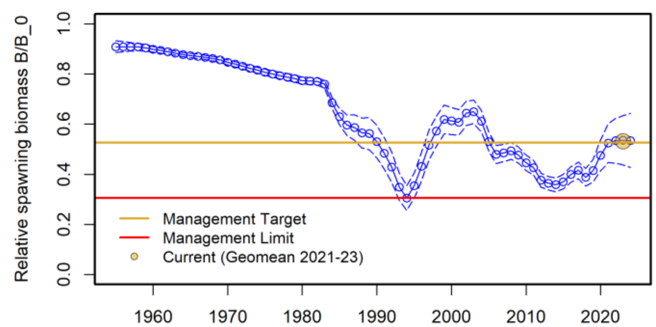
Assessment of Sheepshead *Archosargus probatocephalus* in Louisiana Waters
2025 Report

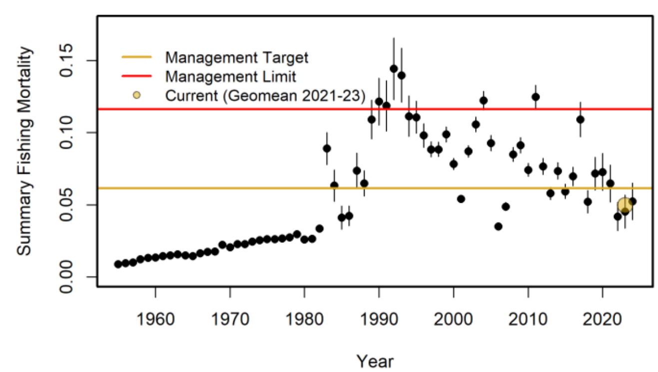
Executive Summary

Precautionary limits to fishing are proposed in this stock assessment by requiring spawning biomass not fall below the lowest level observed from 1982-2013. This is equivalent to maintaining the stock above a limit spawning potential ratio. The spawning potential ratio that corresponds with the minimum spawning biomass observation is 31%. Based on results of this assessment, the Louisiana Sheepshead stock is currently neither overfished or experiencing overfishing. The current spawning potential ratio estimate is 53%.



Landings of Sheepshead in Louisiana have averaged just under 2 million pounds per year in the most recent decade with recent lows near 1 million pounds per year. The recent low landings observed are primarily due to reductions in fishery effort caused by the lingering impacts of the COVID-19 pandemic combined with major hurricanes in 2020 and 2021. The highest harvests on record (over 4 million pounds) occurred during the mid-1990’s. After commercial gear restrictions were enacted in 1995, Sheepshead landings substantially declined. Recreational landings comprised approximately 50% of the Sheepshead harvest in the most recent decade.





An integrated statistical catch-at-length and -age model is used in this stock assessment to describe the dynamics of the Louisiana Sheepshead stock from 1955-2023. The assessment model projects forward from initial condition estimates using age and length structured population dynamic calculations. The primary model inputs are time-series’ of recreational and commercial landings, an index of relative abundance developed from the LDWF trammel net survey, length compositions of fishery and survey catches, and age-at-length compositions (age-length-keys) of the fishery and survey catches.

Summary of Changes from 2020 Assessment

The previous LDWF stock assessment of Sheepshead (West et al. 2020) utilized the Age Structured Assessment Program (ASAP) stock assessment model to estimate current and historical stock abundance and the rate of fishery removals. In the current assessment, Stock Synthesis 3 (SS3) is used as the primary assessment model with the ASAP assessment model presented as a continuity case.

Stock Synthesis 3 is an integrated fish population analysis model that combines all available data sources, with minimal preprocessing, into a single analysis through joint likelihood functions. The SS3 model is extremely flexible and can be configured from low to high complexity depending on data availability and life history of the stock. The SS3 population dynamics model can be parametrized using an age and/or size-based structure. A variety of fisheries and survey data can be used to configure SS3 allowing multiple fleets, surveys, sexes, areas, and stocks to be modeled simultaneously. The SS3 analysis also allows missing data to be included in the modeled time-series precluding the use of pooled data sets in years without observations that were necessary when developing ASAP model inputs. Another advantage of the integrated SS3 model is the ability to input data in the rawest form possible, eliminating the need to preprocess model inputs such as externally converting catch-at-length data into catch-at-age with age-length-keys, thus allowing more appropriate estimates of uncertainty around the estimated stock status metrics by carrying variances of the observations though the model fitting process into the parameter estimates and the calculated management metrics.

In this assessment, the SS3 base model is configured as a combined sex model with both age and length structuring where fishery and survey catch-at-age are estimated within SS3 from age-length-keys (ALKs) calculated from the species growth curve in concert with the available fleet- and survey-specific empirical ALKs, and the estimated fishery and survey catch-at-length. Model inputs for the SS3 base model are summarized below. Model inputs for the ASAP continuity run have been updated through 2023 with no changes made to the configuration of the ASAP model itself.

Life History:

- Growth was modeled for both sexes with a single von Bertalanffy growth equation with parameters estimated within the SS3 model.
- A combined sex weight-length relationship was fixed in SS3 with parameters estimated outside of the SS3 model.
- A combined sex natural mortality (M) point estimate (0.270 yr^{-1}) was used to scale declining M-at-age (Lorenzen 1996) outside of the SS3 model.
- Sex ratio was fixed at 1:1 at birth within the SS3 model.
- A length-based logistic maturity ogive was fixed in SS3 with parameters estimated outside of the SS3 model.
- Fecundity was assumed to be directly proportional to mature female body weight in the SS3 model.

Landings and Discards:

- Commercial landings (1955-2023).
- Recreational landings (1955-2023).
- Recreational discards (1982-2023) with 5% release mortality.

Indices:

- LDWF trammel net survey index of relative abundance (1985-2023).
- LDWF Trip Ticket Program commercial fishing effort index (2005-2023).

Length Composition:

- Commercial length composition (1988-2023).
- Recreational length composition (1982-2023).
- Trammel net survey length composition (1985-2023).

Age-at-length Composition (ALKs):

- Commercial landings ALKs (2002-2023).
- Recreational landings ALKs (2002-2023).
- Trammel net survey ALKs (2019-2023).

Assessment of Sheepshead *Archosargus probatocephalus* in Louisiana Waters
2025 Report

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1. Introduction

A statistical catch-at-length and -age model is used in this assessment to describe the dynamics of Sheepshead *Archosargus probatocephalus* occurring in Louisiana (LA) waters from 1955-2023. The assessment model projects forward from estimates of initial conditions using length and age structured population dynamic calculations. The primary model inputs are the removals from the commercial and recreational fisheries, an index of relative abundance developed from the LDWF marine trammel net survey, and the corresponding length and age-at-length compositions of the fisheries and survey.

1.1 Fishery Status

A comprehensive history of the Sheepshead (SH) resource and associated fishery within LA is described in Schexnayder et al. (1998) and for the Gulf of Mexico (GOM) in GSMFC (2006). A current summary of the Louisiana SH fishery is presented below.

Commercial

The commercial SH fishery operates primarily in larger bays and lakes within state estuarine waters from the coast inland to the freshwater-saltwater line, including the Mississippi River, and state nearshore territorial waters from the coastline seaward to the state territorial sea boundary. Some harvest also occurs from federal waters of the Exclusive Economic Zone (EEZ). While SH are harvested year round as bycatch, the winter fisheries target Sheepshead opportunistically as encountered (GSMFC 2006).

Recreational

The recreational SH fishery operates primarily within state inside waters from the coastline inland to the freshwater-saltwater line and state territorial waters from the coastline seaward to the state territorial sea boundary, with very little harvest from federal waters of the EEZ. Sheepshead are infrequently targeted recreationally with less than 1% of LA anglers reporting Sheepshead as their primary target in 2023 (LA Creel unpublished data).

1.2 Fishery Regulations

The LA SH fishery is governed by the Louisiana State Legislature, the Wildlife and Fisheries Commission, and the LDWF. A summary of LA commercial and recreational SH regulations are presented below.

Commercial

The LA commercial SH fishery is regulated with to a 10-inch minimum total length limit. Rules for the commercial harvest of SH in LA changed substantially from 1995 through 1997. Commercial harvest methods were restricted in 1995 when the Marine Resources Conservation Act of 1995 (Act 1316 of the

1995 Regular Legislative Session) became effective. This act prohibited the use of “set” gill nets and trammel nets in saltwater areas of LA, and restricted SH harvest by the use of "strike" nets to the period between the third Monday in October and March 1 of the following year. A "Restricted Species Permit" issued by LDWF was required in order to harvest SH, and several criteria were established in order to qualify for that permit. After March 1st 1997, all SH harvest by gill and trammel nets was banned, and commercial harvesters were required to utilize other legal commercial gear to harvest Sheepshead, such as trawls, set lines, or hook and line.

Recreational

There are currently no size or creel limit regulations for the recreational harvest of SH in LA.

1.3 Trends in Harvest

Time series of LA recreational (1982-2023) and commercial (1950-2023) SH landings are presented (Figure 1) along with recreational fishing effort estimates (angler trips; 1982-2023) and commercial fishing effort (trips with landed SH; 2005-2023).

Commercial

Commercial harvest of SH in LA was relatively low (<0.5 million pounds) until the 1980s when the commercial fishery expanded. Commercial harvest rapidly increased in the early 1980s and into the 1990s, peaking at 3.8 million pounds in 1993. Landings remained high throughout the 1990s, averaging near 3 million pounds. During the 2000s, commercial SH harvest declined from over 2 million pounds harvested in 2000 to under 1 million pounds harvested in 2006. Commercial landings in 2006 were greatly influenced by the passage of hurricanes Katrina and Rita the previous year, which caused extensive damage to infrastructure, vessels, and gear of the inshore and offshore trawl fleets. Commercial harvest of SH rebounded in the late 2000s with harvests over 1 million pounds. In the most recent decade, landings have averaged just under 1 million pounds with a noticeable down turn in the most recent years. The passages of hurricanes Laura and Ida in 2020 and 2021, along with the effects of COVID-19, caused substantial reductions in commercial fishing effort that correspond with the low landings observed in recent years (Figure 1). In 2023, 0.48 million pounds of Sheepshead were commercially harvested in LA.

Recreational

Recreational landing estimates of SH in LA have varied considerably over the available time series from a peak of 608 thousand fish harvested in 1983 to a low of 118 thousand fish harvested in 1987. After 1987, recreational SH landings generally increased to another peak of 621 thousand fish harvested in 2004. Recreational landings decreased after 2004 to a low of 152 thousand fish harvested in 2006 before increasing to another peak of 604 thousand fish harvested in 2011. After the 2011 peak, landings decreased again to a low of 144 thousand fish harvested in 2013 before increasing again to peaks of 552 and 493 thousand fish harvested in 2017 and 2020. Landings have declined since 2020 which corresponds to the observed reduction in fishing effort in recent years (Figure 1). In 2023, 232 thousand SH were recreationally harvested in LA.

2. Life History Information

2.1 Unit Stock Definition

Sheepshead occur in estuaries and nearshore habitat along the Atlantic and Gulf Coasts from Nova Scotia southward through the GOM to Brazil (GSMFC 2006). Most of the harvest is taken in the GOM with the largest commercial GOM harvest occurring in LA waters (Figure 2).

Genetic analyses of SH collected between North Carolina and Texas suggest no distinct geographic stock in the Southern Atlantic and the GOM (Murphy and MacDonald 2000). More recent work in the GOM (Anderson et al. 2008) suggests that the GOM Sheepshead populations constitute a single stock. However, for purposes of this assessment, the unit stock is defined as those SH occurring in LA waters

2.2 Morphometrics

Fish with only fork length (FL) measurements available were converted to total length (TL) from a linear regression of length data available from LDWF records (n=872; Table 1).

A combined sex length-weight regression was fit with a power function using SH length-at-weight data available from LDWF records (n=431; Table 2 and Figure 3).

2.3 Growth

Only minor differences have been found between male and female SH growth rates (Beckman et al. 1991; West et al. 2020). For purposes of this assessment, a combined sex von Bertalanffy growth model is fit to LDWF SH length-at-age data (n=17,747; Table 1 and Figure 4)) to calculate expected length-at-age for computation of an age-specific natural mortality rate (see section *2.5 Natural Mortality*). In the SS3 base model, the parameters of a combined sex von Bertalanffy growth function were estimated (see section *4.0 Assessment Model*).

2.4 Reproduction

Sheepshead are asynchronous batch spawners (Render and Wilson 1992). To realistically estimate annual fecundity, the number of eggs spawned per batch and the number of batches spawned per season must be known. Estimates of batch fecundity and spawning frequency for GOM Sheepshead are not available (see section *7.0 Research and Data Needs*). Thus, for purposes of this assessment, mature female biomass is used as a proxy of egg production.

A length-based logistic function is fit to female SH maturity data collected from the LDWF FI marine trammel net survey (n=593; Table 2 and Figure 5). Maturity is determined through macroscopic staging from samples collected during the species spawning season. This maturity function differs from the age-based female maturity estimates from Render and Wilson (1992) that were developed primarily from samples of commercially landed adult fish (n=392) with very few immature females represented (n=3).

Sex ratios observed in LDWF samples are also very close to 1:1. For purposes of this assessment, the sex ratio at birth is assumed to be 1:1.

2.5 Natural Mortality

Sheepshead can live to at least 24 years (Figure 4). For purposes of this assessment, a point estimate of natural mortality (M) was calculated (0.225; Table 1) based on the observed maximum age of 24 years (Hamel and Cope 2022). The M point estimate was used to scale estimates of M-at-age (Table 3 and Figure 6). Following SEDAR 12 (SEDAR 2006), the point estimate of M is rescaled where the average mortality rate is equivalent to the constant rate over ages. The allometric exponent estimated for natural ecosystems (-0.288; Lorenzen 1996) is used to calculate the Lorenzen curve as a function of age.

2.6 Discard Mortality

Discard mortality rates of Sheepshead are unknown. Sheepshead are typical caught in shallow estuarine waters and are not subject to the levels of barotrauma associated with fish species caught in deeper depths. Sheepshead are a hardy fish and thought to be resilient to handling and release from fishery interactions. For purposes of this assessment, a constant rate of discard mortality across time and fish size/age is assumed (5%).

3. Data Sources

3.1 Fishery Dependent

Landings and Discards

Commercial

Commercial Sheepshead landings (Figure 7) are taken from the LDWF Trip Ticket Program (1999-2023) and NMFS commercial statistical records (pre-1999; NMFS 2023). Landings represent direct harvest only. A time series of commercial live release estimates is currently not available. The primary gears of the LA commercial SH fishery are otter trawls and skimmer nets which account for over 75% of the recent commercial landings. A recent bycatch study of the LA inshore shrimp fishery (Cagle and West 2020) found no undersized SH in the observed otter trawl and skimmer net catches. However, discard estimates from SH caught in commercial fish otter trawls have not yet been documented (see section *7.0 Research and Data Needs*).

Recreational

Time series of recreational landings and live discards as used in this assessment are presented (Figures 8 and 9). Landings represent direct harvest only. Recreational SH landings and live release estimates are taken from the LDWF recreational creel survey (LA Creel; 2014-2023) and estimates hindcast to the historic MRIP time-series (1982-2013; details in *Appendix 1*). Consequently, the pre-2014 recreational estimates used in this assessment differ from the LA estimates currently published by MRIP (https://www.st.nmfs.noaa.gov/recreational-fisheries/data-and-documentation/queries/index).

Historical recreational landings (1955-1981) are estimated following the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation Survey (FHWAR) method (Brennan and Fitzpatrick 2012) outlined in the SEDAR 31 Data Workshop. The FHWAR survey has been conducted every five years since 1955. The FHWAR method uses estimates of U.S. saltwater anglers and the number of U.S saltwater days from the FHWAR survey as the main components. The ratio of U.S. saltwater anglers to total U.S. anglers was used to estimate the number of saltwater anglers in the West South Central (WSC) geographic region (LA, TX, AR, and OK) from the total number of WSC region anglers reported in each FHWAR survey. The ratio of WSC region saltwater anglers to U.S saltwater anglers was then used to calculate the WSC region saltwater days from estimates of the total U.S saltwater days reported in each FHWAR survey. Recreational effort from Texas was removed from the WSC region using the proportion of LA saltwater anglers reported in the WSC region in the 1991 FHWAR survey, which was the first year state-specific effort was reported in FHWAR surveys. To account for levels of bias associated with the 12-month recall period used in the 1955-1985 FHWAR surveys, a bias adjustment factor was calculated to adjust the pre-1991 FHWAR effort estimates using the ratio of the 1985 estimate of saltwater days in the WSC region and the sum of the mean LA Creel and TX saltwater effort from 1984-1986. The historic LA SH recreational landings estimates (1955-1981) were then computed from the mean hindcast LA Creel landings per unit of effort estimates from 1984-1986 and the adjusted saltwater days for LA estimated from the 1955-1985 FHWAR surveys. Linear interpolation was used to estimate landings between each 5 year survey period.

Effort Index

A time series of Sheepshead directed commercial fishing effort as used in this assessment is presented (Figure 10). The fishing effort index is derived as the annual number of trips that land SH from the LDWF Trip ticket Program (2005-2023; Figure 1) normalized to its long-term mean. The annual directed SH effort from LDWF Trip Tickets prior to 2005 (1999-2004) are considered unrepresentative of the current directed fishery and excluded.

<u>*Length Composition*</u>

Commercial

Annual length compositions of commercial harvest (Figure 11) are available from the Trip Interview Program (TIPS; pre-2002), the Fishery Information Network (FIN; 2002-2013), and the LDWF Biological Sampling Program (2014-2023). Annual sample size of the commercial SH length measurements are summarized (Table 4).

Commercial length compositions are weighted by the corresponding landings at the finest scale possible to correct for unrepresentative sampling. The pre-2014 commercial length compositions are unweighted. The 2014-2023 commercial length compositions were weighted by the landings of the major gear-types (trawls, hooks, and other) in each LA drainage basin.

Recreational

Annual length compositions of SH harvest estimates are available from the LDWF Biological Sampling Program (2014-2023) and MRIP (1982-2013; Figure 11). Annual sample size of the recreational SH length measurements are summarized (Table 4).

Recreational length compositions are weighted by the corresponding landings at the finest scale possible to correct for unrepresentative sampling. Length compositions from the LDWF Biological Sampling Program are weighted by landings estimates from each mode of fishing (Private and Charter) in each LA drainage basin. The MRIP length compositions are derived using the SAS template program available at https://www.fisheries.noaa.gov/recreational-fishing-data/recreational-fishing-data-downloads that estimates length frequencies for custom domains from the public-use MRIP datasets.

<u>*Age-at-length Composition*</u>

Age Assignments

Sheepshead spawn offshore during the spring with a peak in March and April (GSMFC 2006). An April 1st birthday is typically assumed as a biological birthday. However, in the SS3 assessment model, fish become age-1 the first January after birth. Thus, SH ages are assigned based a January 1st birthday in this assessment, where SH spawned the previous year become age-1 on January 1st and remain age-1 until the beginning of the following year.

Commercial

Age-at-length data used to develop annual age-length-keys (ALKs) of commercial Sheepshead landings (Figure 13) have been collected from LDWF sampling effort since 2002. Annual sample size of the commercial SH length-at-age measurements are summarized (Table 5).

Commercial age-at-length compositions are weighted by the corresponding landings at the finest scale possible to correct for any unrepresentative sampling. The pre-2014 commercial age-at-length compositions are unweighted. The 2014-2023 commercial age-at-length compositions are weighted by the landings of the major gear-types (trawls, hooks, and other) in each LA drainage basin.

Recreational

Age-at-length data used to develop annual age-length-keys (ALKs) of recreational Sheepshead landings (Figure 12) have been collected from LDWF sampling effort since 2002. Annual sample size of the recreational SH length-at-age measurements are summarized (Table 5).

Recreational age-at-length compositions are weighted by the corresponding landings at the finest scale possible to correct for any unrepresentative sampling. Recreational age-at-length compositions from 2014-2023 are weighted by landings estimates from each mode of fishing (Private and Charter) in each LA drainage basin. The pre-2014 age-at-length compositions are weighted by statewide landings of each mode of fishing.

3.2 Fishery Independent

Survey Description

The LDWF fishery-independent (FI) marine trammel net survey is used to develop an index of relative abundance as an input of the assessment model. Below is a brief description of the surveys methodology. Complete details can be found in LDWF (2018).

For sampling purposes, coastal Louisiana is currently divided into five LDWF coastal study areas (CSAs). Current CSA definitions are as follows: CSA 1 – Mississippi State line to South Pass of the Mississippi River (Pontchartrain Basin); CSA 3 – South Pass of the Mississippi River to Bayou Lafourche (Barataria Basin); CSA 5 – Bayou Lafourche to eastern shore of Atchafalaya Bay (Terrebonne Basin); CSA 6 – Eastern shore of Atchafalaya Bay to western shore of Freshwater Bayou Canal (Vermillion/Teche/Atchafalaya Basins); CSA 7 – western shore of Freshwater Bayou Canal to Texas State line (Mermentau/Calcasieu/Sabine Basins).

The LDWF Marine Fisheries Section conducts routine standardized sampling within each CSA as part of a long-term comprehensive monitoring program to collect life-history information and measure relative abundance/size distributions of recreationally and commercially important species.

This trammel net survey is conducted with standardized design from October-March. Survey gear is a 750-foot long and 6-foot depth net, consisting of 3 walls constructed of nylon. The inner wall has 1 5/8-inch bar mesh wall, and the two outer walls have 6-inch bar mesh wall.

This survey was conducted from January 1986 to October 2013 at fixed sampling stations within each CSA. In October 2010, additional fixed stations were added to allowing more spatial coverage within each CSA (Figure 14). Beginning in 2013, the survey design was modified where sampling locations are now selected randomly from the established stations within each CSA.

Samples are taken by 'striking' the net. All SH catches are enumerated and a maximum of 50 randomly selected SH are collected for length measurements, gender determination, and maturity information.

Indices are developed separately for each time period of consist sampling methodology (fixed station sampling 1986-2012 and random station selection 2013-2023). For index development, samples collected during the months of January, February, and March are grouped with the previous year's October, November, and December samples (e.g., 1986 January-March samples become the 1985 values). Catch per unit effort (CPUE) is defined as the number of SH caught per trammel net sample.

IOA Development

To reduce unexplained variability in catch rates unrelated to changes in abundance, the IOA was standardized using methods described below.

A delta lognormal approach (Lo *et al.* 1992; Ingram *et al.* 2010) is used to standardize Sheepshead catch-rates in each year as $I_y = c_y p_y$, where c_y are estimated annual mean CPUEs of non-zero Sheepshead catches assumed as lognormal distributions and p_y are estimated annual mean probabilities of Sheepshead capture assumed as binomial distributions. The lognormal and binomial means and their standard errors are estimated with generalized linear models as least squares means and back transformed. The lognormal model considers only samples in which Sheepshead are captured; the binomial model considers all samples.

Because of the designed nature of the LDWF marine trammel net survey, model development was rather straightforward. Variables considered in model inclusion were year, CSA, and sampling location. To determine the most appropriate models, we began the model selection process with a fully-reduced model that included only year as a fixed effect. More complex models were then developed including interactions and random effects and compared using AIC and log-likelihood values. All sub-models were estimated with the SAS generalized linear mixed modeling procedure (PROC GLIMMIX; SAS 2008). In the final sub-models, year was considered a fixed effect, CSA was considered a random block effect, and sampling locations within CSAs were considered random subsampling block effects.

The relative abundance index and 95% confidence intervals of the trammel net survey are presented (Figure 15).

Size Composition

Annual size compositions of SH catches from the LDWF trammel net survey are presented (Figure 11) along with the corresponding annual sample size of the length measurements (Table 4).

Age-at-size Composition

Age-at-size data used to develop annual age-length-keys (ALKs) of SH catches of the LDWF trammel net survey (Figure 16) have been collected since 2019. Annual sample size of the trammel net SH age-at-length measurements are summarized (Table 5).

4. Assessment Model

Stock Synthesis 3 (SS Version 3.30.20; Methot and Wetzel 2013) is used in this assessment to describe the dynamics of SH occurring in LA waters. Stock Synthesis 3 is an integrated fish population analysis model that combines available data sources, with minimal preprocessing, into a single analysis though joint likelihood functions. The SS3 model is extremely flexible and can be configured from low to high complexity depending on data availability and life history of the stock. The SS3 population dynamics model can be parametrized using an age and/or size-based structure. A variety of fisheries and survey data can be used to configure SS3 allowing multiple fleets, surveys, sexes, areas, and stocks to be modeled simultaneously. An overview of the model configuration, as applied in this assessment, is provided below. Specific details and full capabilities of SS3 can be found in the technical documentation (Methot et al. 2020).

4.1 Model Configuration

The base model was configured with annual time-steps from 1955-2023 with a simple one year forecast using the estimated fishing mortality rate from the terminal year of the assessment. Fish were modeled from age-0 through an age-10 plus group. Two fishing fleets (recreational and commercial), a relative abundance index developed from LDWF FI trammel net survey, and a commercial fishing effort index developed from the LDWF Trip Ticket Program were modeled. Fish spawn at the start of each annual time step and the age-0 fish recruit to the population at the time of settlement on April 1st. Lognormal error structure is assumed for fishery catches and abundance indices, normal error structure is assumed for the commercial fishing effort index, and Dirichlet-multinomial error structure is assumed for length and age-at-length composition data. Coefficients of variation of data sources with lognormal structure are converted to standard errors in natural log space using the $\sqrt{(log_e(1 + (CV)^2))}$ approximation (Methot et al. 2020). Length units are inches total length and biomass units are pounds. Inputs of the SS3 base model are summarized in Figure 17. The SS3 base model files (starter, forecast, data, and control files) are provided in *Appendix 2*.

Life History

Parameters for a power weight-length function and a logistic length-based maturity function (Table 2) are estimated outside of SS3 and fixed within the base model. In the SS3 base model, maturity of fish less than age-2 was set to zero, with the maturity of fish age-2 and greater determined from the length-based function.

The point estimate of M based on the observed longevity of the species (24 years) is assumed to decline as a function of age and is estimated outside of SS3 and fixed within the base model (Table 3).

Growth and variability in length-at-age are estimated within the SS3 base model using the von Bertalanffy growth function with an assumed normal error structure and variability modeled as a function of age. The SS3 formulation of the von Bertalanffy growth function requires 5 parameters: 3 parameters to describe mean length-at-age (lengths at minimum and maximum reference age, and the function's slope) and 2 parameters to describe variability in length-at-age (coefficients of variation at the minimum and maximum reference age). The minimum and maximum reference ages for the length-at-age parameters were specified as 0.5 years and the age at the maximum theoretical length (Linf). Fish less than the first reference age grow linearly from the settlement time of the age-0 recruits.

Stock-Recruitment

The Beverton-Holt stock recruitment function was used to describe the relationship between spawning biomass and age-0 recruitment. Three parameters are required for this function: the unfished recruitment level (R_0), the standard deviation of natural log recruitment (σ_R), and steepness (h; the proportion of R_0 produced by 20% of unfished spawning biomass). In the base model, steepness was fixed at 0.99 and the R_0 and σ_R parameters estimated (see section *4.3 Model Diagnostics*).

Annual lognormal recruitment deviations in the SS3 base model are estimated for the period considered data-rich (1982-2023), when size and age composition data were available to inform the model on the year to year recruitment levels, as a deviation vector with an explicit sum-to-zero constraint. Age-0 recruitment for the data-poor period prior to 1982, when no size or age composition data were available, are estimated directly from the stock recruitment relationship using the annual spawning output estimates.

Initial Conditions

The modeled time series in this assessment begins in 1955. The recreational and commercial fleets operated in LA prior to this time. In the SS3 base model, initial commercial landings are specified as the geometric mean of landings from 1950-1954 available from NOAA Fisheries commercial statistical records (93 thousand pounds). Initial recreational landings are specified as the geometric mean of the

1955-1957 historical recreational landings estimates (76 thousand fish). Initial apical fishing mortality parameters were estimated from the initial fleet-specific landings. Uncertainty around the initial landings were specified with a relatively small CV of 0.1 for the commercial fleet and a slightly larger CV of 0.15 for the recreational fleet. Larger uncertainty around the initial recreational landings was tested in the SS3 base model (CV=0.35), which led to model stability issues, and was ultimately not used.

Landings

Landings are assumed to have a lognormal error structure in the SS3 base model and are calculated from each fleets annual apical F's and selectivity-at-age derived from the length-based selectivity estimates and the species growth curve. Apical F's are calculated in the SS3 base model using the hybrid approach, where fractional annual harvest rates are first calculated using Pope's method before these values are converted into approximate apical F's and tuned over multiple iterations to achieve a better fit to each fleets landings. Uncertainty around commercial landings were specified with CV's of 0.05 for all years of the modeled time series. Coefficients of variation of the recreational landings were specified as the relative standard error of the annual landings estimates themselves (1982-2023, range 0.08 to 0.46) and 0.1 for the years prior to 1982. Larger uncertainty around the pre-1982 recreational landings time series was tested in the SS3 base model (CV=0.3), which led to model stability issues, and was ultimately not used.

Discards

Recreational discards are estimated in the SS3 base model from the selectivity and retention functions. Discard estimates are not available for the commercial fleet. The discard mortality rate used to calculate the number of dead recreational discards was assumed time invariant and fixed at 5% in the SS3 base model. Coefficients of variation of the input recreational discards were specified as the relative standard error of the annual discard estimates themselves (1982-2023, range 0.10 to 0.76)

Indices

Abundance indices are assumed proportional to stock abundance and to have a lognormal error structure in the SS3 base model. A relative abundance time series is modeled for the LDWF trammel net survey (1985-2023). Catchability of the trammel net survey were estimated in two time blocks that correspond to periods of consistent sampling methodology: fixed station sampling (1985-2012) and random station selection (2013-2023). Index uncertainty was specified with CV's estimated from the index standardization procedure.

Effort indices are assumed proportional to the level of F of the fisheries and to have a normal effort structure. The normal error structure is recommended (Methot et al. 2020) to allow the input effort data to be compared directly to the calculated F rates, rather than log (F). The resulting proportionality constant has units of 1/Q where Q is the catchability coefficient. A commercial fishing effort index is modeled for the commercial fleet (2005-2023). This index is developed from the LDWF Trip Ticket Program as the annual number of trips that land sheepshead (Figure 1) normalized to its long-term mean. Uncertainty of the effort index was specified with annual CV's of 0.10 in the SS3 base model.

Length and Age-at-length Compositions

Length and age-at-length composition data were modeled for both fleets and the trammel net survey.

Length compositions were available from 1982-2023 for the recreational fleet, from 1988-2023 for the commercial fleet, and from 1985-2023 for the trammel net survey. The annual number of length observations (Table 4) from each fleet and survey are used as the input sample sizes. Observations with less than 10 fish are excluded from model fitting.

Age-at-length composition data were available from 2002-2023 for the recreational and commercial fleets, and from 2019-2023 for the trammel net survey. In the SS3 base model, age data was considered conditional on the length information. This configuration avoids double use of both length and age composition information by making the age data conditional on the length information while also providing better information to estimate growth parameters and the variability in size-at-age (Methot et al. 2020). The annual number of age observations in each length bin from each fleet and survey are used as the input sample sizes.

Length and conditional age-at-length composition data were assumed to have a Dirichlet-multinomial error structure. The Dirichlet-multinomial (DM) differs from the standard multinomial by estimation of a self-weighting parameter that directly scales the input sample sizes. Six DM parameters were estimated in the SS3 base model for the length and conditional age-at-length compositions from each fleet and survey.

Selectivity and Retention

Length-based selectivity functions were used for both fleets and the trammel net survey. Selectivity represents the proportion of the stock vulnerable to capture. Selectivity of the fisheries and survey were assumed to be asymptotic and were estimated in SS3 using two parameter logistic selectivity functions (pattern 1). All selectivity parameters were estimated with symmetric beta priors (SE=0.05) to improve estimability. Selectivity of the recreational fleet and trammel net survey were modeled as time invariant. Selectivity of the commercial fleet was estimated in two time blocks that correspond with periods of consistent regulation: pre-entanglement net bans (pre-1997) and entanglement nets banned (1997-2023).

Size-based retention functions are used for the recreational fleet only in this assessment. Discard estimates are not available for the commercial fleet precluding the use of retention functions. Retention functions account for fish discarded based on the size of the fish. A time invariant recreational retention function is modeled that corresponds with the consistent size limit regulation (no size limit) over the modeled time period. An asymptotic retention function was used which requires three parameters: the ascending inflection point and slope, and a parameter controlling the height of the function's asymptote (maximum retention). Size composition information of the recreational discard estimates is currently unavailable (see *Research and Data Needs* section) requiring most retention function parameters to be fixed in this assessment. The ascending inflection point of the retention function was fixed at 10-inches TL with a fixed gradual slope to represent a wider range of retention at minimum size. The parameter controlling the height of the retention functions asymptote was estimated in SS3.

Estimated Parameters

In the SS3 base model, 79 total parameters were used with 65 parameters estimated. Estimated parameters were:

- Growth and variability in length-at-age (5)
- Unfished recruitment and recruitment variability (2)
- Annual recruitment deviations from 1982-2019 (38)
- Initial apical fishing mortality rates (2)
- Survey and effort catchability coefficients (3)
- Fishery selectivity (6)
- Fishery retention (1)
- Survey selectivity (2)
- Dirichlet-multinomial weighting factors (6)

Asymptotic standard error estimates derived from the inversion of the Hessian matrix are used to describe the uncertainty of the estimated parameters and calculated stock metrics.

Phases of estimation were specified in the SS3 base model as follows: initial fishing mortalities and the unfished recruitment parameters were estimated in the first phase, catchability coefficients in the second phase, selectivity/retention/ DM weighting parameters in the third phase, life history parameters in the fourth phase, recruitment deviations in the fifth phase, and recruitment variability in the last phase of estimation.

4.2 Model Results

Objective function components and log-likelihood values of the SS3 base model are summarized (Table 6). All components of the objective function were equally weighted (lambdas=1).

Parameter estimates and fixed parameter values of the base model are presented (Table 7) along with the asymptotic SEs and CVs (SE/estimate) of the estimates. Most parameters were reasonably estimated with CVs <1. Annual recruitment deviations estimated in 1986, 1988, 1990, 2009, and 2016 were the only parameters with CVs>1.

Model Fit

Landings and Discards

Model fits to the commercial and recreational landings match the observations very well (Table 8 and Figures 18 and 19) where the estimated landings virtually overlay the observations. Each time series used relatively low SEs to control model fits with the exception of the recreational landings beginning in the 1980's. Model estimated landings in units of numbers of fish and in units of biomass are also presented (Figure 20).

Model estimated discards provide reasonable fits to a portion of the time series (Table 9 and Figure 21) with a tendency to under fit most of the observations during the 1990's and 2000's and overfit the most recent observations. The SS3 base model used a single retention function to model recreational discards through time due to no length-based regulation changes occurring over that period. Changes in angler behavior though time could explain the lack of fit observed. If warranted, future assessments could be configured with time-varying retention functions to account for these changes.

Indices

Model estimated catch rates of the trammel net survey (Table 10 and Figure 22) provide reasonable fits to the observations given the relatively large SEs of the index. With the exception of the 2017 value, estimated catch rates lay within the 95% confidence intervals of the observations and adequately track the surveys trend across the time series with a noticeably better fit to the observations in the first catchability time block (1986-2012).

Model estimated fishing effort of the commercial fleet (Table 11 and Figure 23) generally tracks the trend of the observations with a much closer fit to the observations in the most recent years of the time series. The model reasonably fits the drop observed in the effort index from 2019 to 2020. Prior to 2019, the model tends to under fit the observations in most years.

Length Compositions

Model fits to the fishery and survey length composition data are presented in Figures 24-27. Length composition fits were controlled by the annual input sample sizes and the estimated DM parameters. The input and DM adjusted effective sample sizes are presented in the panel of the fleet and survey-specific length composition fits. The estimated DM multipliers used to adjust the input sample sizes were: 0.091 for the recreational fleet, 0.113 for the commercial fleet, and 0.179 for the trammel net survey.

The model provided adequate fits to the length composition data. Pearson residuals of the length composition fits show some patterning but only few instances with large residuals.

Conditional Age-at-length Compositions

Model fits to the fishery and survey conditional age-at-length compositions are presented in Figures 28-30. Fits were controlled by the annual input sample sizes in each TL inch bin and the estimated DM parameters. The estimated DM multipliers used to adjust the input sample sizes were: 0.640 for the recreational fleet, 0.361 for the commercial fleet, and 0.879 for the trammel net survey.

The model provided reasonable fits to the age-at-length composition data. Pearson residuals of the age-at-length composition fits show some patterning but only few instances with large residuals.

Growth

Estimated mean length-at-age and variability in length-at-age of the SS3 base model are presented (Figure 31) along with mean length-at-age estimated from the external growth function fit. Parameters of the von Bertalanffy growth function estimated in the SS3 base model are also presented (Table 7). The SS3 model estimated growth pattern differs from the external estimate. Estimates of the theoretical maximum length (Linf) were equivalent between SS3 and the external model fit (19.8 inches TL). However, the external fit, which doesn't account for selectivity the gear samples were collected from, had unrealistic estimates of the length at age-0 (7.5 inches TL) due to the lack of smaller younger fish in the data. The SS3 estimated von Bertalanffy growth curve, which accounts for selectivity of the fisheries and survey catches, is thought to be a better representation of the species growth pattern.

Selectivity and Retention

Fishery and survey length-based selectivity estimates are presented in Figures 32-34 along with the corresponding age-based selectivities derived from the length-based functions and the species growth curve. The length-based retention function of the recreational fleet is also presented.

Recreational

The logistic recreational length-based selectivity curve (Figure 32) indicates 50% vulnerability to the fishery at 11 inches TL and full vulnerability at sizes >20 inches TL which corresponds with 50% age-based vulnerability around age-2 and peak vulnerability at ages >9 years. The recreational retention function is presented in Figure 30. The asymptote of the retention function, which is used to match the level of observed discards, was the only parameter estimated.

Commercial

The logistic commercial length-based selectivity curves (Figure 33) were estimated for each period of consistent regulation: no gear regulations (pre-1997) and entanglement nets banned (1997-2023). The selectivity curve for the pre-1997 time block indicates 50% vulnerability to the fishery at 13 inches TL and full vulnerability at sizes >16 inches TL which corresponds with 50% age-based vulnerability around age-2 and peak vulnerability at ages >8 years.

The selectivity curve for the 1997-2023 time block indicates 50% vulnerability to the fishery at 16 inches TL and full vulnerability at sizes >20 inches TL which corresponds with 50% age-based vulnerability around age-4 and peak vulnerability at ages >9 years.

Trammel net

The logistic trammel net survey length-based selectivity curve (Figure 34) indicates 50% vulnerability to the survey gear at 13 inches TL and full vulnerability at sizes > 25 inches TL which corresponds with 50% age-based vulnerability around age-2 and peak vulnerability at ages >9 years.

<u>Fishing Mortality</u>

Estimated annual fishing mortality rates (fleet-specific apical and total exploitation) are presented in Table 12 and Figure 35. Exploitation rates are calculated as the total number of fishery removals >age-0 / total stock size > age-0 as numbers of fish.

Annual apical F rates of the recreational fleet have remained relatively low (<0.25) through time. The recreational annual apical F estimate in the terminal year of the assessment was 0.07. Annual apical F rates of the commercial fleet have varied over the time series from estimates close to zero in the early years to a peak of 0.48 estimated in 1993. After 1993, commercial annual apical F rates decreased considerably. The commercial annual apical F estimate in the terminal year of the assessment was 0.05.

Exploitation rates climbed gradually from less than 1% estimated in 1955 to around 3% in 1980. After 1980, exploitation rates climbed rapidly as the commercial fishery expanded to peaks near 14% in 1992 and 1993. After the entanglement net ban was enacted in 1996, exploitation rates generally decreased and have remained relatively stable varying between 4 to 10% with the exception of the 2011 and 2017 exploitation rate estimates of 12 and 11% respectively. The exploitation rate estimate in the terminal year of the assessment was 5%.

Recruitment

In the SS3 base model, the steepness parameter of the Beverton-Holt stock recruitment function was fixed at 0.99 (see *Model Diagnostics* Section) with the other two parameters (unfished recruitment and sigmaR) estimated. Unfished recruitment in log space was estimated as 8.06 which corresponds to 3.17 million age-0 recruits. The sigmaR parameter was estimated as 0.506. The resulting stock recruitment function and the relationship between SSB and age-0 recruits are presented in Figure 36.

Age-0 recruitment estimates are presented (Table 13 and Figure 37) along with the annual recruitment deviations estimated in log space (Figure 37). Age-0 recruitment has varied considerably over the modeled time series. Recruitment estimates during the data rich period (1982-2023) averaged 3.47 million age-0 fish with peaks greater than 8 and 10 million fish estimated in 1992 and 2017 respectively. Recruitment generally increased from less than 2 million age-0 recruits estimated in 1982 and 1983 to the first peak of 8.0 million age-0 fish in 1992. After 1992, recruitment generally declined to a low of 1.3 million fish estimated in 2001 and remained relativity low before increasing to the second peak of 10.7 million fish estimated in 2017. Recruitment estimates in the most recent decade averaged 2.93 million age-0 fish with less than 1 million age-0 recruits estimated in 2018 and 2023.

Stock Abundance and Biomass

Time series of exploitable biomass and abundance (>age-0), SSB, and relative SSB (SSB/SSB_0) estimates are presented in Table 13. Exploitable biomass, SSB, and relative SSB are also presented graphically (Figure 38). Time series of stock abundance-at-length and -age are also presented (Figures 39 and 40) along with the annual mean length/age of the stock.

Exploitable biomass estimates averaged 19.3 million pounds from 1955-2023 and ranged from a peak of 25.1 million pounds estimated in 1956 to a low of 11.4 million pounds in 2012. The 2023 estimate of exploitable biomass was 15.9 million pounds. Estimates of exploitable abundance averaged 9.81 million fish from 1955-2023 and ranged from a peak of 14.7 million fish estimated in 1997 to a low of 5.44 million fish in 2012. The 2023 estimate of exploitable abundance was 7.79 million fish.

Estimates of SSB averaged 5.49 million pounds from 1955-2023 and ranged from a low of 2.61 million pounds estimated in 1994 to a peak of 7.77 million pounds estimated in 1956. The 2023 estimate of SSB was 4.58 million pounds. Unfished SSB was estimated as 8.54 million pounds. Relative SSB estimates ranged from 90.9% estimated in 1955 to a low of 30.5% in 1994. The 2023 estimate of relative SSB was 53.6%.

4.3 Model Diagnostics

Correlation Analysis

A correlation analysis was conducted on the SS3 base model to identify parameter pairs with correlations greater than 0.7. (Table 14). High correlations were only identified between the parameters of the logistic length-based selectivity functions (inflection and width for 95% selection) of the trammel net survey and each time block of the commercial fishery.

Jitter Analysis

A jitter analysis was conducted on the SS3 base model to evaluate model stability and determine if a global solution was found. Initial parameter values of the base model were jittered using a value of 0.1 for 100 model runs. The log likelihood of the base model solution was achieved in 100% of the jitter runs indicating a stable global solution of the base model was found.

Sensitivity Analysis

A series of sensitivity runs were conducted to explore uncertainty in the configuration of the base model. Sensitivity runs include: increasing (and decreasing) the FHWAR historical recreational landings time series (1955-1981) by 25%, starting the model in 1982 rather than 1955, up-weighting the relative abundance index (lambda *5), up-weighting the commercial effort index (lambda *5), increasing the discard mortality rate from 5 to 8%, estimating age-based selectivity for each fleet and survey rather than length-based selectivity, and estimating M-at age from the SS3 estimated growth model rather than the externally estimated model. Time series of relative SSB, age-0 recruitment, and exploitation rates for the base and sensitivity model runs are presented (Figure 41). Results of each run are similar to the base model. The model runs with age-based selectivity estimated, and the abundance and effort indices upweighted, diverged the most from the base run.

Likelihood Profiles

Likelihood profiles were conducted on each of the stock-recruitment parameters of the base model to determine the stability of the parameter estimates and the optimal value of fixed parameters. Profiles of R0, sigmaR, and steepness are presented (Figure 42). The R0 profile shows a trough around the base model log-space estimate of 8.06 with optimal values from each data source near the base model estimate indicating the parameter was well estimated. The sigmaR profile also shows a trough around the base model estimate of 0.506 indicating a stable parameter estimate, although optimal values from each the individual likelihood components differed from the overall estimate. The steepness likelihood profile shows a steep decline towards 1 across likelihood components. In the SS3 base model, the steepness parameter was fixed at 0.99.

Retrospective Analysis

A retrospective analysis was conducted by sequentially truncating the base model by a year (terminal years 2018-2023). Retrospective estimates of relative SSB, age-0 recruits, and exploitation rates are presented (Figure 43). Retrospective estimates show both positive and negative bias where terminal year estimates either increase or decrease with each model peel. Retrospective patterns can be quantified through Mohns's ρ metric (Mohn 1999). Using the recommendations from Hurtado-Ferro et al. (2015), Mohns's ρ for long-lived species should fall between -0.15 and 0.20. Mohns's ρ metric for relative SSB, and exploitation rates fall within this range (0.09 and 0.17 respectively), but falls outside of this range for age-0 recruits (1.1). The larger retrospective pattern in age-0 recruits can be explained by the uncertainty around the 2017 age-0 recruitment estimates that varied substantially with each model peel. The model clearly has difficulty tracking the large 2017 year class through time with the available length and age composition data. Additional years of composition data will be needed to better estimate the 2017 year class strength.

Continuity Model

The ASAP assessment model used in the previous LDWF SH stock assessment (West et al. 2020) was updated with data through 2023 with no changes made to the configuration of the ASAP model itself. Time series of recruitment, relative SSB, and fleet-specific apical fishing mortalities estimates from ASAP are presented (Figure 44) along with the corresponding estimates from the SS3 base model. Trends of the ASAP estimated time series generally match the trends of the SS3 estimates.

The SS3 estimated age-0 recruitment time series tracks the age-1 ASAP recruitment estimates well with a one year lag. Recreational and commercial apical F estimates from the ASAP model track the trend of the SS3 estimates well but are much lower than the corresponding SS3 estimates. Trends in relative SSB estimates from each model are similar, although the ASAP model estimates a less depleted stock with less inter-annual variability when compared to the corresponding SS3 estimates.

5. Management Benchmarks

Overfishing and overfished limits should be defined for exploitable stocks. The implication is that when biomass falls below a specified limit, there is an unacceptable risk that recruitment will be reduced to undesirable levels. Management actions are needed to avoid approaching this limit and to recover the stock if biomass falls below the limit.

Precautionary limits to fishing are proposed in this stock assessment to ensure sustainability of the stock by requiring spawning biomass not fall below the lowest level observed from 1982-2013 (SSB_{limit}) where the stock demonstrated sustainability (i.e., no observed declines in recruitment over a wide-range of spawning biomass). This is equivalent to maintaining the stock above a limit spawning potential ratio (SPR_{limit}; Goodyear 1993) and brings the proposed fishing limits into the same framework as the management targets established by LAC 76: VII.385. For purposes of this assessment, SPR is calculated as the relative depletion of the stock (SSB/SSB0). As reference points to guide management, the spawning potential ratio and equilibrium exploitation rate that lead to the SSB_{limit} (SPR_{limit}, F_{limit}) were estimated in the SS3 base model.

Management targets for Sheepshead were established by LAC 76: VII.385. The spawning stock biomass target (SSB_{target}) is calculated as the average SSB (geometric mean) from 1982 (the beginning of the data rich period of the assessment) through 2013. The total exploitation rate target (F_{target}) and SPR target (SPR_{target}), that correspond to the SSB_{target} when the stock is in equilibrium, were estimated in the SS3 base model.

The proposed limits and established targets of fishing relative to each respective time-series are presented in Figure 45. Current estimates are taken as the geometric mean of the 2021-2023 estimates. Limit and target reference points are also presented in Table 15.

6. Stock Status

The history of the LA Sheepshead stock relative to F/F_{limit} and SSB/SSB_{limit} is presented in Table 16 and Figure 46. Fishing mortality rates exceeding F_{limit} ($F/F_{limit} > 1.0$) are defined as overfishing; spawning stock sizes below SSB_{limit} ($SSB/SSB_{limit} < 1.0$) are defined as the overfished condition.

Overfishing Status

The current estimate of F/F_{limit} is <1.0 (0.43), indicating the stock is currently not undergoing overfishing. The current assessment model does indicate that overfishing occurred in earlier years of the modeled time-series.

Overfished Status

The current estimate of SSB/SSB_{limit} is >1.0 (1.7), indicating the stock is currently not overfished. The current assessment model indicates the stock has not been overfished during the modeled time-series. The current SPR estimate is 53%.

Management Target Status

Management targets for Sheepshead established by LAC 76: VII.385 indicate the stock is currently just above its biomass target while the fishery is currently operating below its fishing mortality rate target.

7. Research and Data Needs

As with any analysis, the accuracy of this assessment is dependent on the accuracy of the information of which it is based. Below we list additional recommendations to improve future LA stock assessments of Sheepshead.

Commercial discard estimates are currently not available. If significant numbers of undersized commercially landed Sheepshead are discarded, total fishery removals would be underestimated and fishing mortality rate estimates would be biased low. Recent research has characterized the bycatch and discards from the commercial trotline fishery in LA (Midway et al 2022). Research is still needed to characterize the bycatch and discards from the commercial fish trawl fishery.

Length compositions of recreational discard estimates are currently not available. Most retention function parameters in the SS3 base model were required to be fixed due to this data gap. Length measurements of recreational live releases are needed.

Estimates of Sheepshead batch fecundity and spawning frequency as a function of age/size are needed.

A new FI survey that is more efficient capturing juvenile Sheepshead that provides better precision in relative abundance estimates would allow better representation of juvenile abundance in future stock assessments.

This assessment includes historic recreational harvest estimates (1955-1981) that are estimated using the most currently accepted method. If the historic estimates are not appropriately scaled to current harvest, it could influence estimates of unfished stock conditions. Continued examination of methods to improve such information could be useful for a number of stock assessments.

Factors that influence year-class strength of Sheepshead are poorly understood. Investigation of these factors, including inter-annual variation in seasonal factors (winter temperatures, seasonal salinities, food availability etc.) and the influence of environmental perturbations such as the Deepwater Horizon oil spill, could elucidate causes of inter-annual variation in abundance, as well as the species stock-recruitment relationship.

With the recent trend toward ecosystem-based assessment models (Mace 2000; NMFS 2001), more data is needed linking Sheepshead population dynamics to environmental conditions. The addition of meteorological and physical oceanographic data coupled with food web data may lead to a better understanding of the Sheepshead stock and its habitat.

Fishery-dependent data alone is not a reliable source of information to assess status of a fish stock. Consistent fishery-dependent and fishery-independent data sources, in a comprehensive monitoring plan, are essential to understanding the status of fishery. Present monitoring programs should be assessed for adequacy with respect to their ability to evaluate stock status, and modified if deemed necessary.

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9. Tables

Table 1: Life history parameters used to develop SS3 model inputs. Units are inches total length.

Type	Function	Equation	Parameters
FL to TL	Linear	$TL = m \times FL + b$	m=1.098, b=0.077
M point estimate	Hamel and Cope	$M = 5.40/\ Age_{max}$	Age_{max}=24 yrs, M=0.225
Growth	Von Bertalanffy	$TL = L_{\infty}(1 - e^{-K(t-t_0)})$	L_{∞}=19.8, K=0.355, t_0=-1.34

Table 2: Life history parameters used as fixed SS3 model inputs. Units are inches total length and pounds whole weight.

Type	Function	Equation	Parameters
Length-weight	Power	$W = aTL^b$	a=7.10-04, b=2.979
Maturity	Logistic	$Mat = 1/(1 + e^{\alpha(TL-TL_{50\%})})$	α=-0.3819, $TL_{50\%}$=15.93

Table 3: Natural mortality-at-age used as a fixed SS3 model input. The 10-plus value is the mean M-at-age for ages ≥10 weighted by expected survivorship.

Age	M
0	0.345
1	0.289
2	0.259
3	0.242
4	0.232
5	0.225
6	0.220
7	0.217
8	0.215
9	0.214
10+	0.212

Table 4: Annual sample size of length measurements from the fishery fleets and the LDWF trammel net survey.

	Length Samples		
Year	Commercial	Recreational	Trammel net
1982	--	216	--
1983	--	299	--
1984	--	173	--
1985	--	234	87
1986	--	396	212
1987	--	186	172
1988	35	292	236
1989	46	165	174
1990	7	143	173
1991	113	179	136
1992	8	604	212
1993	0	390	297
1994	329	403	270
1995	1548	503	287
1996	1071	571	362
1997	761	731	308
1998	198	738	300
1999	76	582	391
2000	303	398	374
2001	164	423	488
2002	199	824	390
2003	336	803	279
2004	307	945	314
2005	310	884	254
2006	229	469	253
2007	1067	425	201
2008	881	702	222
2009	790	703	275
2010	329	553	545
2011	805	636	268
2012	520	611	303
2013	246	357	368
2014	463	444	232
2015	463	391	159
2016	420	384	341
2017	348	390	309
2018	538	503	145
2019	597	418	82
2020	210	488	140
2021	649	875	64
2022	362	593	67
2023	541	566	86

Table 5: Annual sample size of age-at-length measurements from the fishery fleets and the LDWF trammel net survey.

	Age-at-length Samples		
Year	Commercial	Recreational	Trammel net
2002	30	68	--
2003	325	125	--
2004	303	182	--
2005	245	320	--
2006	228	226	--
2007	717	412	--
2008	721	551	--
2009	514	515	--
2010	239	379	--
2011	727	355	--
2012	481	319	--
2013	191	431	--
2014	454	341	--
2015	451	288	--
2016	411	348	--
2017	344	377	--
2018	492	464	--
2019	558	393	72
2020	192	453	135
2021	561	802	62
2022	319	544	63
2023	477	519	82

Table 6: Summary of objective function components and likelihood values of the SS3 base model.

LogL Componenet	logL*Lambda
TOTAL_LogL	12211.5
Catch	6.02787E-10
Equil_catch	1.04859E-05
Survey	18.6714
Discard	184.73
Length_comp	5788.19
Age_comp	6210.18
Recruitment	9.67018
InitEQ_regime	0
Sum_recdevs	-4.21885E-15
Forecast_Recruitment	0
Parm_priors	0.0805079
Parm_softbounds	0.00193636
Parm_devs	0
F_Ballpark	0
Crash_Pen	0

Table 7: Parameter estimates and fixed parameter values of the SS3 base model along with the asymptotic standard errors and coefficients of variation of the estimated parameters.

Parameter	Value	StdDev	Active/Fixed	CV
L_at_Amin_Fem_GP_1	6.43854	0.125702	Act	0.020
L_at_Amax_Fem_GP_1	19.828	0.0838683	Act	0.004
VonBert_K_Fem_GP_1	0.330025	0.0064468	Act	0.020
CV_young_Fem_GP_1	0.170987	0.0033213	Act	0.019
CV_old_Fem_GP_1	0.0871039	0.0026481	Act	0.030
Wtlen_1_Fem_GP_1	0.00071	0	Fix	
Wtlen_2_Fem_GP_1	2.9791	0	Fix	
Mat50%_Fem_GP_1	15.9319	0	Fix	
Mat_slope_Fem_GP_1	-0.3819	0	Fix	
FracFemale_GP_1	0.5	0	Fix	
SR_LN(R0)	8.06153	0.0327072	Act	0.004
SR_BH_steep	0.99	0	Fix	
SR_sigmaR	0.505762	0.0411805	Act	0.081
Main_RecrDev_1982	-0.805523	0.40773	Act	0.506
Main_RecrDev_1983	-0.700056	0.438763	Act	0.627
Main_RecrDev_1984	0.422662	0.278997	Act	0.660
Main_RecrDev_1985	0.340354	0.304709	Act	0.895
Main_RecrDev_1986	-0.0805633	0.386801	Act	4.801
Main_RecrDev_1987	0.612647	0.236203	Act	0.386
Main_RecrDev_1988	-0.345526	0.377684	Act	1.093
Main_RecrDev_1989	-0.363031	0.353583	Act	0.974
Main_RecrDev_1990	-0.13795	0.310977	Act	2.254
Main_RecrDev_1991	0.438421	0.225052	Act	0.513
Main_RecrDev_1992	1.02991	0.158177	Act	0.154
Main_RecrDev_1993	0.968439	0.171802	Act	0.177
Main_RecrDev_1994	0.906453	0.150468	Act	0.166
Main_RecrDev_1995	0.547951	0.158325	Act	0.289
Main_RecrDev_1996	0.946648	0.0967783	Act	0.102
Main_RecrDev_1997	-0.181265	0.136989	Act	0.756
Main_RecrDev_1998	0.339477	0.086291	Act	0.254
Main_RecrDev_1999	0.658844	0.0632226	Act	0.096
Main_RecrDev_2000	0.778318	0.054128	Act	0.070
Main_RecrDev_2001	-0.747237	0.0895558	Act	0.120
Main_RecrDev_2002	-0.364701	0.0714698	Act	0.196
Main_RecrDev_2003	-0.0626382	0.0609646	Act	0.973
Main_RecrDev_2004	-0.412907	0.0683843	Act	0.166
Main_RecrDev_2005	0.582092	0.0475331	Act	0.082
Main_RecrDev_2006	-0.141634	0.0606732	Act	0.428
Main_RecrDev_2007	-0.432434	0.0682419	Act	0.158
Main_RecrDev_2008	-0.0661407	0.0598542	Act	0.905
Main_RecrDev_2009	-0.0106163	0.0596803	Act	5.622
Main_RecrDev_2010	-0.339223	0.066527	Act	0.196
Main_RecrDev_2011	-0.817891	0.081572	Act	0.100
Main_RecrDev_2012	0.702542	0.0443155	Act	0.063
Main_RecrDev_2013	-0.341438	0.068006	Act	0.199
Main_RecrDev_2014	0.265536	0.0536474	Act	0.202
Main_RecrDev_2015	-0.985824	0.0907216	Act	0.092
Main_RecrDev_2016	0.0042244	0.0704606	Act	16.679
Main_RecrDev_2017	1.34846	0.067178	Act	0.050
Main_RecrDev_2018	-1.12966	0.122209	Act	0.108
Main_RecrDev_2019	-0.604106	0.11868	Act	0.196

Table 7 (continued):

Parameter	Value	StdDev	Active/Fixed	CV
Main_RecrDev_2020	-0.56997	0.137858	Act	0.242
Main_RecrDev_2021	0.33627	0.14327	Act	0.426
Main_RecrDev_2022	-0.387866	0.226891	Act	0.585
Main_RecrDev_2023	-1.20104	0.462906	Act	0.385
ForeRecr_2024	0	0	Fix	
InitF_seas_1_flt_1FISHERY1	0.0148171	0.00265518	Act	0.179
InitF_seas_1_flt_2FISHERY2	0.00433589	0.000528702	Act	0.122
Q_base_FISHERY2(2)	8.26945	0.570456	Act	0.069
LnQ_base_SURVEY1(3)_BLK1repl_1985	-8.35021	0.113272	Act	0.014
LnQ_base_SURVEY1(3)_BLK1repl_2013	-8.29591	0.172775	Act	0.021
Size_inflection_FISHERY1(1)	10.9145	0.340148	Act	0.031
Size_95%width_FISHERY1(1)	6.66413	0.608325	Act	0.091
Retain_L_infl_FISHERY1(1)	10	0	Fix	
Retain_L_width_FISHERY1(1)	2.6	0	Fix	
Retain_L_asymptote_logit_FISHERY1(1)	1.64613	0.0820497	Act	0.050
DiscMort_L_level_old_FISHERY1(1)	0.05	0	Fix	
Size_inflection_SURVEY1(3)	13.0297	0.452652	Act	0.035
Size_95%width_SURVEY1(3)	7.67157	0.485174	Act	0.063
ln(DM_theta)_Len_P1	-2.29947	0.0610657	Act	0.027
ln(DM_theta)_Len_P2	-2.06147	0.0853291	Act	0.041
ln(DM_theta)_Len_P3	-1.52111	0.0733293	Act	0.048
ln(DM_theta)_Age_P4	0.573766	0.112073	Act	0.195
ln(DM_theta)_Age_P5	-0.569196	0.0637122	Act	0.112
ln(DM_theta)_Age_P6	1.98736	0.457026	Act	0.230
Size_inflection_FISHERY2(2)_BLK2repl_1955	13.3489	0.309603	Act	0.023
Size_inflection_FISHERY2(2)_BLK2repl_1997	15.8563	0.154481	Act	0.010
Size_95%width_FISHERY2(2)_BLK2repl_1955	2.71892	0.340949	Act	0.125
Size_95%width_FISHERY2(2)_BLK2repl_1997	2.98426	0.160933	Act	0.054

Table 8: Observed and estimated commercial and recreational landings along with corresponding lognormal standard errors.

	Commercial (1000s of lbs)			Recreational (1000s of fish)		
Year	Observed	Predicted	StdErr	Observed	Predicted	StdErr
1955	103.600	103.600	0.050	67.633	67.633	0.100
1956	94.600	94.600	0.050	76.271	76.271	0.100
1957	81.900	81.900	0.050	84.910	84.910	0.100
1958	138.900	138.900	0.050	93.549	93.549	0.100
1959	146.100	146.100	0.050	102.187	102.187	0.100
1960	117.100	117.100	0.050	110.826	110.826	0.100
1961	144.600	144.600	0.050	113.292	113.292	0.100
1962	151.500	151.500	0.050	115.759	115.759	0.100
1963	177.100	177.100	0.050	118.226	118.226	0.100
1964	138.300	138.300	0.050	120.693	120.693	0.100
1965	103.600	103.600	0.050	123.160	123.160	0.100
1966	156.200	156.200	0.050	129.059	129.059	0.100
1967	170.100	170.100	0.050	134.958	134.958	0.100
1968	161.300	161.300	0.050	140.857	140.857	0.100
1969	312.600	312.600	0.050	146.755	146.755	0.100
1970	224.300	224.300	0.050	152.654	152.654	0.100
1971	239.400	239.400	0.050	169.604	169.604	0.100
1972	171.700	171.700	0.050	186.554	186.554	0.100
1973	169.500	169.500	0.050	203.503	203.503	0.100
1974	136.400	136.400	0.050	220.453	220.453	0.100
1975	100.800	100.800	0.050	237.402	237.402	0.100
1976	101.700	101.700	0.050	234.644	234.644	0.100
1977	133.000	133.000	0.050	231.885	231.885	0.100
1978	166.217	166.217	0.050	229.127	229.127	0.100
1979	249.495	249.495	0.050	226.368	226.368	0.100
1980	126.989	126.989	0.050	223.609	223.609	0.100
1981	129.610	129.610	0.050	226.714	226.714	0.100
1982	296.758	296.758	0.050	251.016	251.016	0.300
1983	543.416	543.416	0.050	608.954	608.954	0.295
1984	716.686	716.686	0.050	263.314	263.314	0.288
1985	719.936	719.936	0.050	168.635	168.635	0.262
1986	962.698	962.698	0.050	140.005	140.005	0.329
1987	1917.950	1917.950	0.050	117.728	117.728	0.266
1988	1848.680	1848.680	0.050	146.545	146.545	0.254
1989	2450.140	2450.140	0.050	265.657	265.657	0.440
1990	2767.050	2767.050	0.050	132.879	132.879	0.284
1991	2425.140	2425.140	0.050	154.096	154.096	0.316
1992	3063.940	3063.940	0.050	283.996	283.996	0.288
1993	3763.800	3763.790	0.050	338.842	338.842	0.294
1994	3289.430	3289.430	0.050	205.863	205.863	0.203
1995	3266.480	3266.480	0.050	305.771	305.771	0.212
1996	2639.260	2639.260	0.050	323.658	323.658	0.225
1997	3114.530	3114.530	0.050	408.143	408.143	0.191
1998	2371.610	2371.610	0.050	397.078	397.078	0.198
1999	3201.530	3201.530	0.050	269.940	269.940	0.201
2000	2594.880	2594.880	0.050	269.533	269.533	0.292
2001	1803.630	1803.630	0.050	243.731	243.731	0.188

Table 8 (continued):

	Commercial (1000s of lbs)			Recreational (1000s of fish)		
Year	Observed	Predicted	StdErr	Observed	Predicted	StdErr
2002	1583.360	1583.360	0.05	502.376	502.376	0.225
2003	1637.940	1637.940	0.05	523.140	523.140	0.207
2004	1519.010	1519.010	0.05	620.618	620.618	0.269
2005	1022.220	1022.210	0.05	391.488	391.488	0.215
2006	566.598	566.598	0.05	166.267	166.267	0.229
2007	1024.220	1024.220	0.05	152.329	152.329	0.189
2008	1170.400	1170.400	0.05	339.786	339.786	0.193
2009	1213.890	1213.890	0.05	360.808	360.808	0.233
2010	923.827	923.827	0.05	304.525	304.525	0.228
2011	884.606	884.606	0.05	604.239	604.239	0.345
2012	737.290	737.290	0.05	227.575	227.575	0.185
2013	1326.240	1326.240	0.05	144.338	144.338	0.175
2014	1085.300	1085.300	0.05	261.752	261.752	0.285
2015	823.235	823.235	0.05	257.835	257.835	0.08
2016	895.788	895.788	0.05	224.898	224.898	0.114
2017	748.059	748.059	0.05	552.381	552.381	0.404
2018	1429.170	1429.170	0.05	307.765	307.765	0.128
2019	1138.210	1138.210	0.05	399.492	399.492	0.097
2020	384.999	384.999	0.05	493.016	493.016	0.134
2021	541.236	541.236	0.05	324.641	324.641	0.084
2022	432.843	432.843	0.05	241.372	241.372	0.113
2023	481.255	481.255	0.05	231.926	231.926	0.101

Table 9: Observed and estimated recreational discards along with corresponding lognormal standard errors.

	Recreational (1000s of fish)		
Year	Observed	Predicted	StdErr
1982	214.902	107.743	0.440
1983	286.203	239.951	0.672
1984	98.460	106.913	0.410
1985	123.522	83.034	0.300
1986	160.881	71.541	0.249
1987	77.956	58.873	0.241
1988	140.262	76.790	0.277
1989	180.080	125.034	0.381
1990	159.690	59.567	0.269
1991	118.040	74.690	0.259
1992	182.843	174.614	0.185
1993	340.315	254.093	0.235
1994	255.914	149.100	0.203
1995	192.113	198.466	0.282
1996	304.864	190.065	0.261
1997	434.933	231.190	0.272
1998	372.394	195.181	0.226
1999	230.750	132.588	0.239
2000	223.897	144.213	0.239
2001	349.857	129.329	0.196
2002	293.345	223.762	0.188
2003	316.476	218.072	0.244
2004	271.307	267.189	0.232
2005	283.591	180.913	0.197
2006	236.627	88.706	0.251
2007	145.849	74.617	0.191
2008	243.123	154.548	0.234
2009	273.746	169.464	0.198
2010	301.756	147.248	0.220
2011	111.804	280.924	0.184
2012	153.727	110.797	0.167
2013	252.568	85.624	0.145
2014	203.061	141.743	0.307
2015	139.210	133.873	0.227
2016	82.864	103.485	0.247
2017	86.406	312.166	0.135
2018	246.853	215.124	0.264
2019	169.375	206.836	0.110
2020	110.063	212.954	0.102
2021	36.629	138.135	0.136
2022	65.971	114.891	0.201
2023	62.262	102.991	0.143

Table 10: Observed and estimated index of relative abundance of the LDWF FI trammel net survey along with corresponding lognormal standard errors and catchability coefficient estimates for each time block.

	Trammel net Survey			
Year	Observed	Predicted	StdErr	Q
1985	1.042	0.989	0.543	2.36E-04
1986	1.372	1.030	0.497	2.36E-04
1987	1.133	1.053	0.465	2.36E-04
1988	0.931	1.056	0.470	2.36E-04
1989	0.458	0.962	0.511	2.36E-04
1990	1.030	0.848	0.460	2.36E-04
1991	0.657	0.792	0.480	2.36E-04
1992	1.047	0.819	0.451	2.36E-04
1993	0.920	0.923	0.480	2.36E-04
1994	1.192	1.097	0.451	2.36E-04
1995	1.281	1.199	0.447	2.36E-04
1996	1.169	1.298	0.472	2.36E-04
1997	0.889	1.301	0.478	2.36E-04
1998	0.861	1.267	0.483	2.36E-04
1999	1.164	1.212	0.466	2.36E-04
2000	1.237	1.240	0.467	2.36E-04
2001	1.245	1.261	0.471	2.36E-04
2002	1.443	1.162	0.439	2.36E-04
2003	1.026	1.016	0.452	2.36E-04
2004	1.359	0.860	0.437	2.36E-04
2005	1.191	0.829	0.461	2.36E-04
2006	1.239	0.884	0.436	2.36E-04
2007	0.662	0.892	0.480	2.36E-04
2008	0.708	0.838	0.482	2.36E-04
2009	0.832	0.786	0.480	2.36E-04
2010	0.724	0.757	0.459	2.36E-04
2011	0.527	0.662	0.458	2.36E-04
2012	0.662	0.692	0.446	2.36E-04
2013	1.819	0.778	0.445	2.50E-04
2014	1.084	0.824	0.457	2.50E-04
2015	0.881	0.831	0.473	2.50E-04
2016	1.572	0.814	0.456	2.50E-04
2017	2.181	0.914	0.401	2.50E-04
2018	0.848	1.053	0.466	2.50E-04
2019	0.547	1.076	0.479	2.50E-04
2020	0.876	1.003	0.465	2.50E-04
2021	0.405	0.960	0.507	2.50E-04
2022	0.407	0.955	0.510	2.50E-04
2023	0.380	0.917	0.523	2.50E-04

Table 11: Observed and estimated effort index of the commercial fishery along with corresponding model input normal standard errors and the estimated catchability coefficient.

	Commercial Fishing Effort			
Year	Observed	Predicted	StdErr	Q
2005	1.275	0.878	0.100	8.269
2006	0.853	0.518	0.100	8.269
2007	1.347	0.948	0.100	8.269
2008	1.187	1.077	0.100	8.269
2009	1.291	1.157	0.100	8.269
2010	0.918	0.935	0.100	8.269
2011	1.181	0.979	0.100	8.269
2012	1.251	0.876	0.100	8.269
2013	1.280	1.649	0.100	8.269
2014	1.074	1.396	0.100	8.269
2015	1.194	0.984	0.100	8.269
2016	1.075	0.987	0.100	8.269
2017	1.135	0.817	0.100	8.269
2018	0.983	1.678	0.100	8.269
2019	1.184	1.265	0.100	8.269
2020	0.454	0.348	0.100	8.269
2021	0.434	0.440	0.100	8.269
2022	0.439	0.348	0.100	8.269
2023	0.443	0.394	0.100	8.269

Table 12: Annual fleet-specific apical fishing mortality and total exploitation rate estimates from the SS3 base model.

	Apical F		Exploitation rate (numbers
Year	Commercial	Recreational	killed/stock size>age-0)
1955	0.0048	0.0135	0.89%
1956	0.0044	0.0152	0.95%
1957	0.0038	0.0169	1.00%
1958	0.0065	0.0187	1.22%
1959	0.0069	0.0205	1.33%
1960	0.0055	0.0223	1.34%
1961	0.0069	0.0229	1.44%
1962	0.0072	0.0235	1.48%
1963	0.0085	0.0241	1.57%
1964	0.0067	0.0247	1.50%
1965	0.0050	0.0253	1.44%
1966	0.0076	0.0265	1.63%
1967	0.0083	0.0279	1.73%
1968	0.0079	0.0292	1.77%
1969	0.0155	0.0306	2.22%
1970	0.0112	0.0321	2.06%
1971	0.0121	0.0359	2.28%
1972	0.0088	0.0397	2.28%
1973	0.0087	0.0436	2.45%
1974	0.0071	0.0476	2.54%
1975	0.0053	0.0516	2.62%
1976	0.0054	0.0513	2.61%
1977	0.0071	0.0509	2.67%
1978	0.0089	0.0506	2.75%
1979	0.0135	0.0503	2.95%
1980	0.0069	0.0499	2.60%
1981	0.0071	0.0506	2.64%
1982	0.0163	0.0564	3.35%
1983	0.0314	0.1489	8.90%
1984	0.0456	0.0737	6.33%
1985	0.0502	0.0485	4.11%
1986	0.0694	0.0378	4.23%
1987	0.1376	0.0311	7.36%
1988	0.1346	0.0376	6.49%
1989	0.1808	0.0700	10.92%
1990	0.2178	0.0395	12.15%
1991	0.2153	0.0523	11.86%
1992	0.3263	0.1041	14.43%
1993	0.4803	0.1144	13.98%
1994	0.3911	0.0573	11.14%
1995	0.3104	0.0722	11.07%
1996	0.2057	0.0707	9.81%
1997	0.3281	0.0840	8.84%
1998	0.2232	0.0821	8.84%
1999	0.2809	0.0594	9.87%
2000	0.2298	0.0610	7.84%
2001	0.1593	0.0520	5.40%

Table 12 (continued):

Year	Apical F		Exploitation rate (numbers killed/stock size>age-0)
	Commercial	Recreational	
2002	0.1339	0.1088	8.70%
2003	0.1368	0.1285	10.57%
2004	0.1385	0.1789	12.23%
2005	0.1062	0.1293	9.27%
2006	0.0627	0.0534	3.51%
2007	0.1146	0.0458	4.87%
2008	0.1302	0.1055	8.50%
2009	0.1399	0.1211	9.14%
2010	0.1131	0.1069	7.42%
2011	0.1184	0.2279	12.49%
2012	0.1059	0.0951	7.65%
2013	0.1995	0.0561	5.79%
2014	0.1688	0.0938	7.35%
2015	0.1190	0.0875	5.93%
2016	0.1194	0.0773	6.97%
2017	0.0988	0.2022	10.91%
2018	0.2029	0.0916	5.22%
2019	0.1530	0.1024	7.16%
2020	0.0421	0.1309	7.28%
2021	0.0532	0.0952	6.48%
2022	0.0421	0.0726	4.18%
2023	0.0477	0.0694	4.53%
2024	--	--	5.23%

Table 13: Annual biomass and abundance of fish greater than age-0, SSB, age-0 recruits, and relative SSB estimates from the SS3 base model.

Year	Biomass>age-0 1000s of lbs	SSB 1000s of lbs	Abundance>age-0 1000s of fish	Age-0 Recruits 1000s of fish	Depletion SSB/SSB0
Virgin	27,133	8,541	11,323	3,170	1.000
Initial	25,085	7,761	10,859	3,169	0.909
1955	25,085	7,761	10,859	3,169	0.909
1956	25,097	7,765	10,862	3,169	0.909
1957	25,088	7,763	10,859	3,169	0.909
1958	25,064	7,754	10,852	3,169	0.908
1959	24,964	7,719	10,825	3,169	0.904
1960	24,841	7,675	10,794	3,169	0.899
1961	24,733	7,635	10,768	3,169	0.894
1962	24,608	7,589	10,738	3,169	0.889
1963	24,487	7,543	10,710	3,169	0.883
1964	24,354	7,493	10,679	3,169	0.877
1965	24,269	7,459	10,661	3,169	0.873
1966	24,221	7,440	10,653	3,169	0.871
1967	24,118	7,401	10,628	3,169	0.867
1968	23,999	7,357	10,599	3,169	0.861
1969	23,887	7,315	10,573	3,169	0.857
1970	23,638	7,225	10,510	3,169	0.846
1971	23,483	7,166	10,475	3,169	0.839
1972	23,286	7,093	10,427	3,169	0.831
1973	23,126	7,033	10,390	3,168	0.823
1974	22,941	6,964	10,346	3,168	0.815
1975	22,760	6,896	10,302	3,168	0.807
1976	22,586	6,831	10,260	3,168	0.800
1977	22,446	6,778	10,229	3,168	0.794
1978	22,310	6,726	10,199	3,168	0.788
1979	22,176	6,675	10,168	3,168	0.782
1980	21,998	6,609	10,126	3,168	0.774
1981	21,965	6,593	10,124	3,168	0.772
1982	21,931	6,578	10,119	1,366	0.770
1983	21,247	6,490	8,661	1,508	0.760
1984	18,695	5,846	7,292	4,604	0.685
1985	17,603	5,382	8,883	4,211	0.630
1986	17,672	5,093	9,826	2,746	0.596
1987	17,934	5,007	9,372	5,457	0.586
1988	17,970	4,825	10,902	2,079	0.565
1989	17,896	4,800	9,417	2,030	0.562
1990	16,424	4,527	8,004	2,525	0.530
1991	14,670	4,132	7,347	4,463	0.484
1992	13,562	3,661	8,404	8,006	0.429
1993	13,173	2,983	11,607	7,470	0.349
1994	13,884	2,605	13,232	6,969	0.305
1995	16,257	3,023	14,229	4,843	0.354
1996	18,079	3,687	13,298	7,188	0.432
1997	20,105	4,414	14,683	2,329	0.517
1998	20,628	4,884	11,986	3,922	0.572
1999	20,708	5,283	11,431	5,400	0.619

Table 13 (continued):

Year	Biomass>age-0 1000s of lbs	SSB 1000s of lbs	Abundance>age-0 1000s of fish	Age-0 Recruits 1000s of fish	Depletion SSB/SSB0
2000	20,151	5,233	12,071	6,085	0.613
2001	20,514	5,190	13,216	1,323	0.608
2002	20,997	5,496	10,613	1,941	0.644
2003	19,866	5,553	8,986	2,625	0.650
2004	17,884	5,220	8,234	1,849	0.611
2005	15,321	4,525	6,976	4,998	0.530
2006	14,555	4,094	8,743	2,422	0.479
2007	15,204	4,141	8,357	1,811	0.485
2008	15,278	4,210	7,537	2,613	0.493
2009	14,496	4,067	7,340	2,761	0.476
2010	13,619	3,804	7,260	1,987	0.445
2011	13,075	3,637	6,704	1,231	0.426
2012	11,440	3,217	5,437	5,626	0.377
2013	11,775	3,113	8,228	1,980	0.364
2014	12,190	3,060	7,437	3,633	0.358
2015	12,757	3,162	8,095	1,040	0.370
2016	13,066	3,413	6,647	2,800	0.400
2017	13,057	3,551	6,949	10,740	0.416
2018	14,140	3,318	13,029	901	0.388
2019	15,743	3,540	10,046	1,535	0.414
2020	16,381	4,063	8,363	1,619	0.476
2021	16,113	4,480	7,260	4,084	0.525
2022	15,922	4,564	8,432	2,017	0.534
2023	15,928	4,576	7,794	911	0.536
2024	15,451	4,570	6,475	3,163	0.535

Table 14: Correlated parameters of the SS3 base model with correlation coefficients greater than 0.7.

Parameter1	Parmeter2	Correlation
Size_95%width_SURVEY1(3)	Size_inflection_SURVEY1(3)	0.804
Size_95%width_FISHERY2(2)_BLK2repl_1955	Size_inflection_FISHERY2(2)_BLK2repl_1955	0.772
Size_95%width_FISHERY2(2)_BLK2repl_1997	Size_inflection_FISHERY2(2)_BLK2repl_1997	0.718

Table 15: Limit and target reference points for the Louisiana Sheepshead stock. Spawning stock biomass units are thousands of pounds. Fishing mortality rate units are per year.

Management Benchmarks		
Parameter	Definition	Value
SSB_{limit}	Proposed SSB Limit (Minimum SSB 1982-2013)	2605
SPR_{limit}	SPR that corresponds with SSB_{limit}	30.5%
F_{limit}	Equilibrium F that corresponds with SPR_{limit}	11.6%
SSB_{target}	LAC 76: VII.385 (Geometric mean SSB 1982-2013)	4411
SPR_{target}	SPR that corresponds with SSB_{target}	51.6%
F_{target}	Equilibrium F that corresponds with SPR_{target}	6.33%

Table 16: Stock status summary: annual SSB and exploitation rate (F) estimates, ratios of SSB and F to SSB_{limit} and F_{limit}, and spawning potential ratio (SSB/SSB_0) estimates. Current estimates are the geometric mean of the 2021-2023 estimates.

Year	SSB	SSB/SSB_{limit}	F	F/F_{limit}	SPR
1955	7,761	2.979	0.89%	0.077	90.9%
1956	7,765	2.981	0.95%	0.082	90.9%
1957	7,763	2.980	1.00%	0.086	90.9%
1958	7,754	2.977	1.22%	0.105	90.8%
1959	7,719	2.963	1.33%	0.114	90.4%
1960	7,675	2.946	1.34%	0.115	89.9%
1961	7,635	2.931	1.44%	0.124	89.4%
1962	7,589	2.913	1.48%	0.128	88.9%
1963	7,543	2.896	1.57%	0.135	88.3%
1964	7,493	2.876	1.50%	0.129	87.7%
1965	7,459	2.863	1.44%	0.124	87.3%
1966	7,440	2.856	1.63%	0.141	87.1%
1967	7,401	2.841	1.73%	0.149	86.7%
1968	7,357	2.824	1.77%	0.152	86.1%
1969	7,315	2.808	2.22%	0.191	85.7%
1970	7,225	2.773	2.06%	0.178	84.6%
1971	7,166	2.751	2.28%	0.196	83.9%
1972	7,093	2.723	2.28%	0.196	83.1%
1973	7,033	2.700	2.45%	0.211	82.3%
1974	6,964	2.673	2.54%	0.218	81.5%
1975	6,896	2.647	2.62%	0.226	80.7%
1976	6,831	2.622	2.61%	0.225	80.0%
1977	6,778	2.602	2.67%	0.230	79.4%
1978	6,726	2.582	2.75%	0.236	78.8%
1979	6,675	2.562	2.95%	0.254	78.2%
1980	6,609	2.537	2.60%	0.224	77.4%
1981	6,593	2.531	2.64%	0.227	77.2%
1982	6,578	2.525	3.35%	0.288	77.0%
1983	6,490	2.491	8.90%	0.766	76.0%
1984	5,846	2.244	6.33%	0.545	68.5%
1985	5,382	2.066	4.11%	0.354	63.0%
1986	5,093	1.955	4.23%	0.364	59.6%
1987	5,007	1.922	7.36%	0.634	58.6%
1988	4,825	1.852	6.49%	0.558	56.5%
1989	4,800	1.843	10.92%	0.940	56.2%
1990	4,527	1.738	12.15%	1.046	53.0%
1991	4,132	1.586	11.86%	1.021	48.4%
1992	3,661	1.405	14.43%	1.242	42.9%
1993	2,983	1.145	13.98%	1.203	34.9%
1994	2,605	1.000	11.14%	0.958	30.5%
1995	3,023	1.160	11.07%	0.953	35.4%
1996	3,687	1.415	9.81%	0.844	43.2%
1997	4,414	1.694	8.84%	0.761	51.7%
1998	4,884	1.875	8.84%	0.761	57.2%
1999	5,283	2.028	9.87%	0.850	61.9%
2000	5,233	2.009	7.84%	0.675	61.3%
2001	5,190	1.992	5.40%	0.465	60.8%

Table 16 (continued):

Year	SSB	SSB/SSB_{limit}	F	F/F_{limit}	SPR
2002	5,496	2.110	8.70%	0.749	64.4%
2003	5,553	2.131	10.57%	0.910	65.0%
2004	5,220	2.004	12.23%	1.052	61.1%
2005	4,525	1.737	9.27%	0.798	53.0%
2006	4,094	1.572	3.51%	0.302	47.9%
2007	4,141	1.589	4.87%	0.420	48.5%
2008	4,210	1.616	8.50%	0.731	49.3%
2009	4,067	1.561	9.14%	0.786	47.6%
2010	3,804	1.460	7.42%	0.639	44.5%
2011	3,637	1.396	12.49%	1.075	42.6%
2012	3,217	1.235	7.65%	0.659	37.7%
2013	3,113	1.195	5.79%	0.498	36.4%
2014	3,060	1.175	7.35%	0.633	35.8%
2015	3,162	1.214	5.93%	0.510	37.0%
2016	3,413	1.310	6.97%	0.600	40.0%
2017	3,551	1.363	10.91%	0.939	41.6%
2018	3,318	1.274	5.22%	0.449	38.8%
2019	3,540	1.359	7.16%	0.616	41.4%
2020	4,063	1.560	7.28%	0.626	47.6%
2021	4,480	1.720	6.48%	0.558	52.5%
2022	4,564	1.752	4.18%	0.360	53.4%
2023	4,576	1.757	4.53%	0.390	53.6%
2024	4,570	1.754	5.23%	0.450	53.5%
Current	4,540	1.743	4.97%	0.428	53.2%

10. Figures

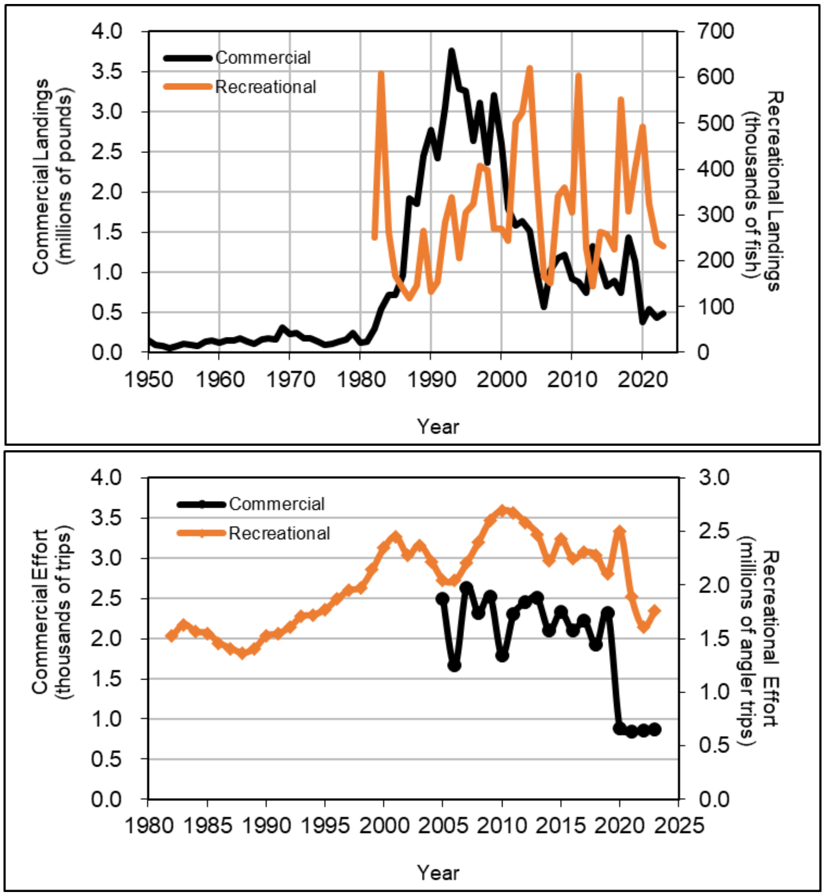


Figure 1: Reported Louisiana commercial and estimated recreational Sheepshead landings derived from NMFS statistical records, the LDWF Trip Ticket Program, and the LDWF LA Creel Survey along with the number of commercial fishing trips with Sheepshead landings and the estimated Louisiana recreational fishing effort (angler trips).

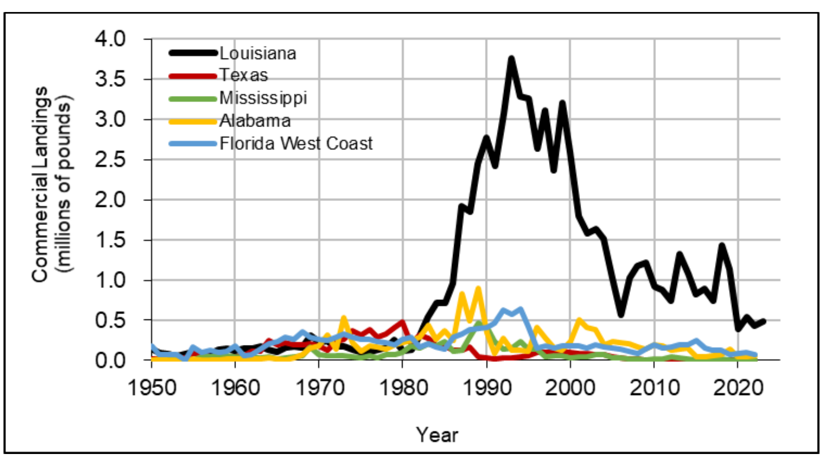


Figure 2: Reported commercial Sheepshead landings of the Gulf of Mexico derived from NMFS statistical records and the LDWF Trip Ticket Program.

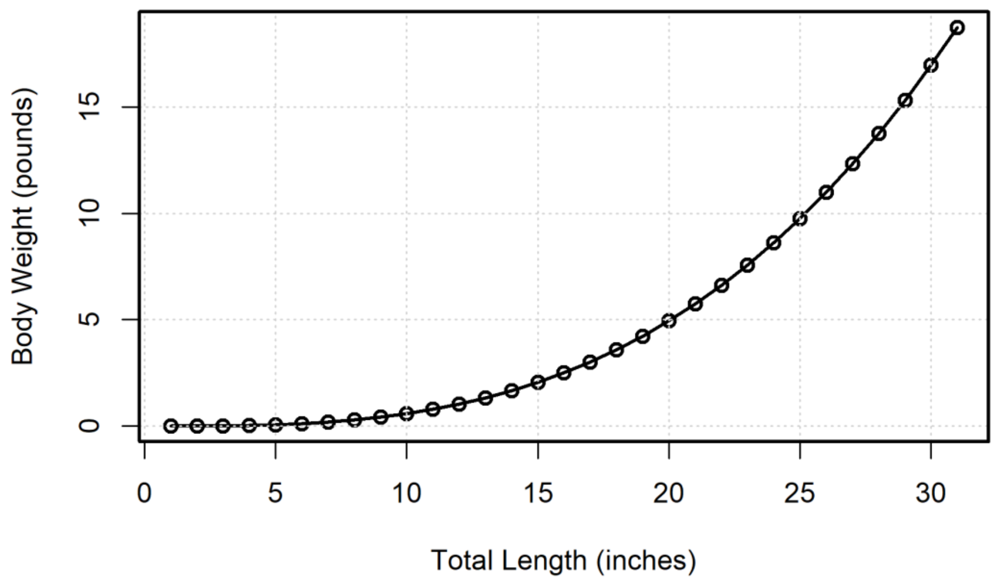


Figure 3: Mean weight-at-length relationship used as a fixed input of the SS3 base model.

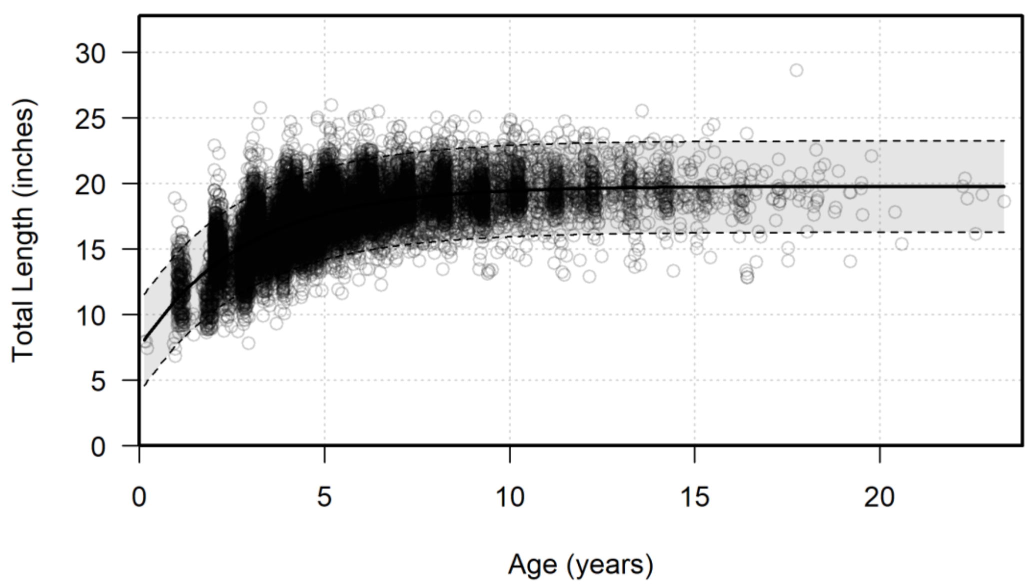


Figure 4: Length-at-age observations and estimated von Bertalanffy growth curve with 95% confidence intervals.

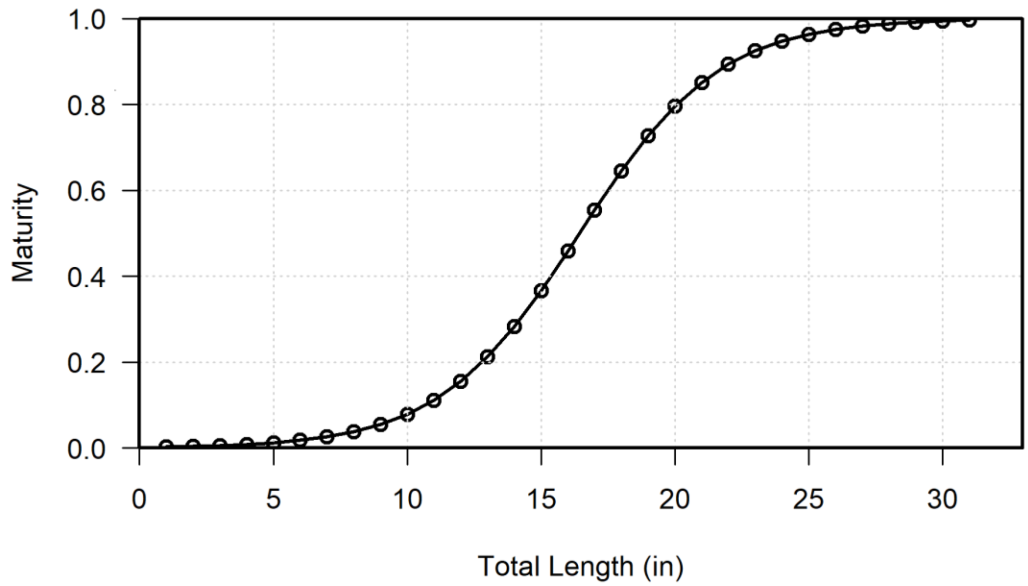


Figure 5: Mean maturity-at-length relationship used as a fixed input of the SS3 base model.

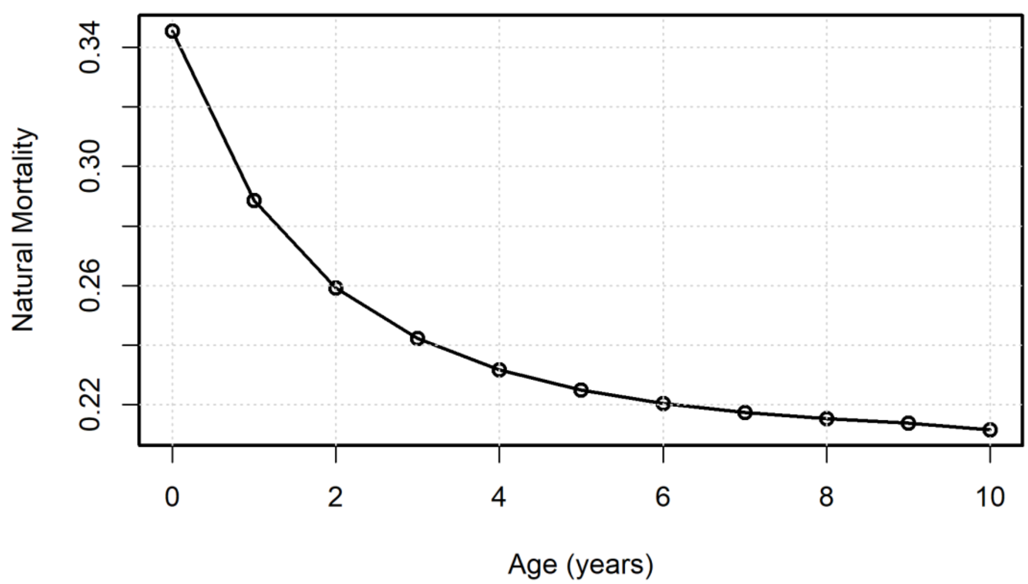


Figure 6: Age-specific natural mortality rate calculated from the Lorenzen curve and the M point estimate of 0.225. The 10-plus value is the mean M-at-age for ages ≥10 weighted by expected survivorship.

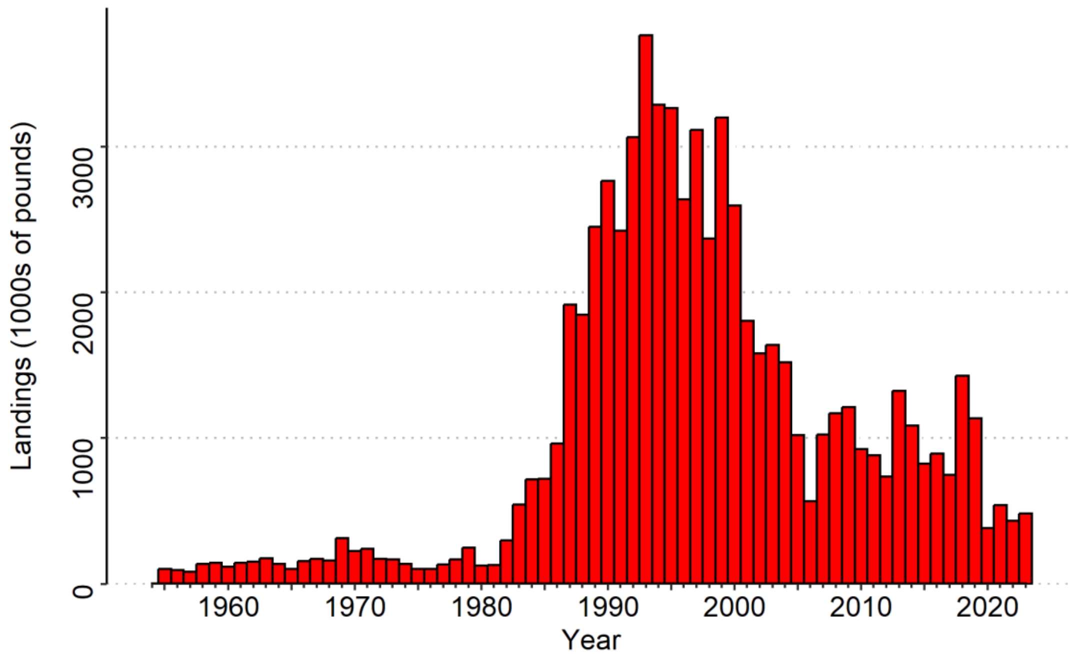


Figure 7: Observed commercial landings in pounds.

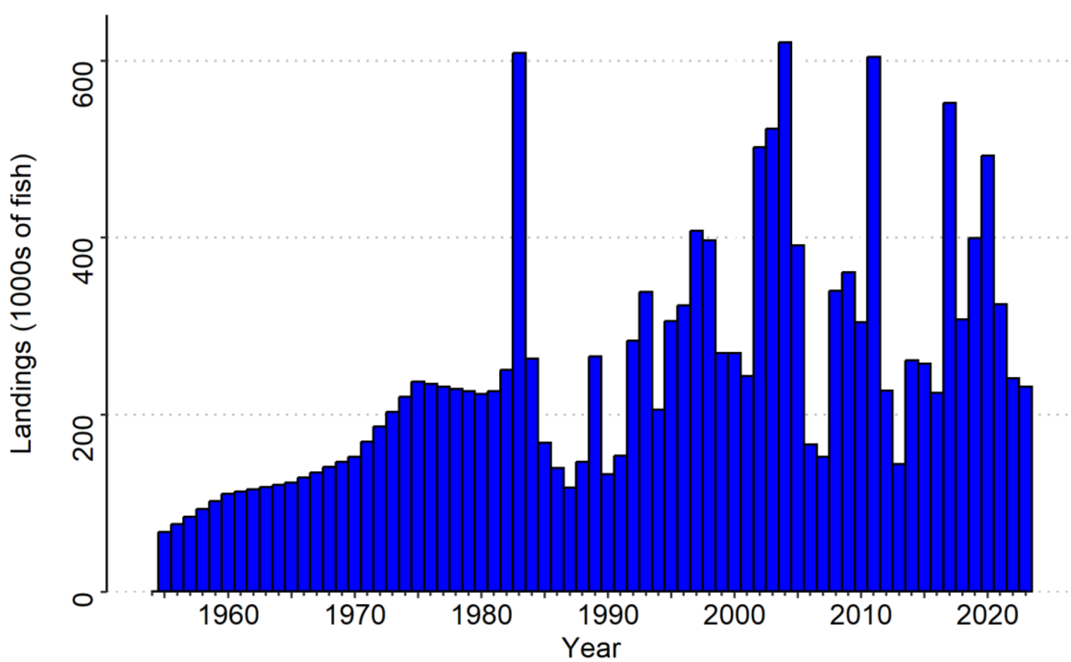


Figure 8: Observed recreational landings as numbers of fish.

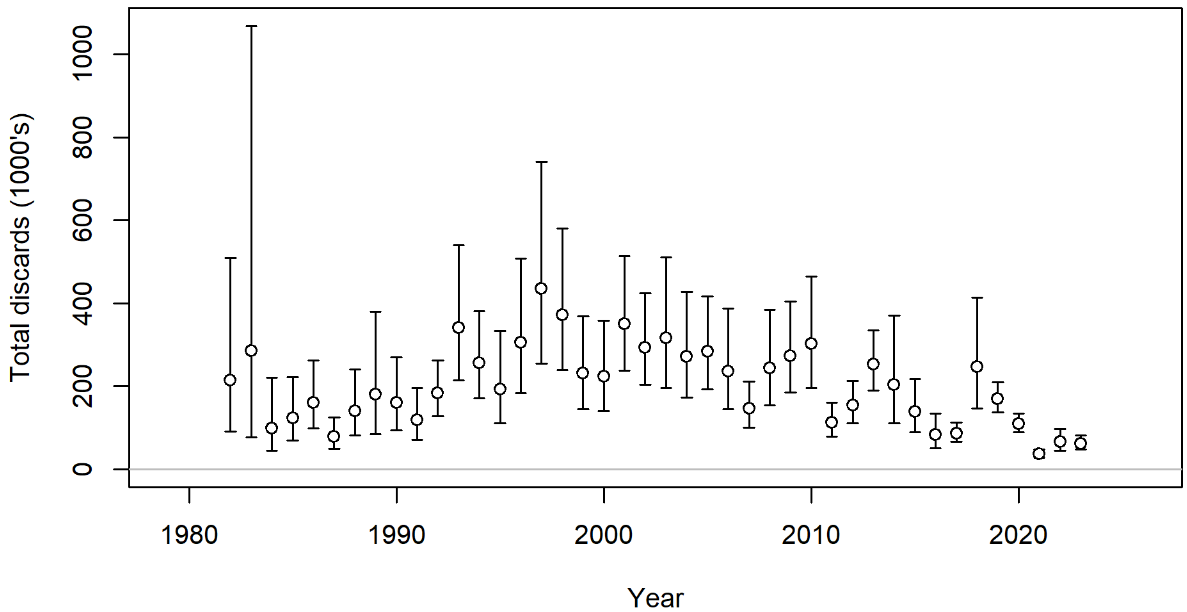


Figure 9: Observed recreational discards as numbers of fish and corresponding lognormal 95% confidence intervals.

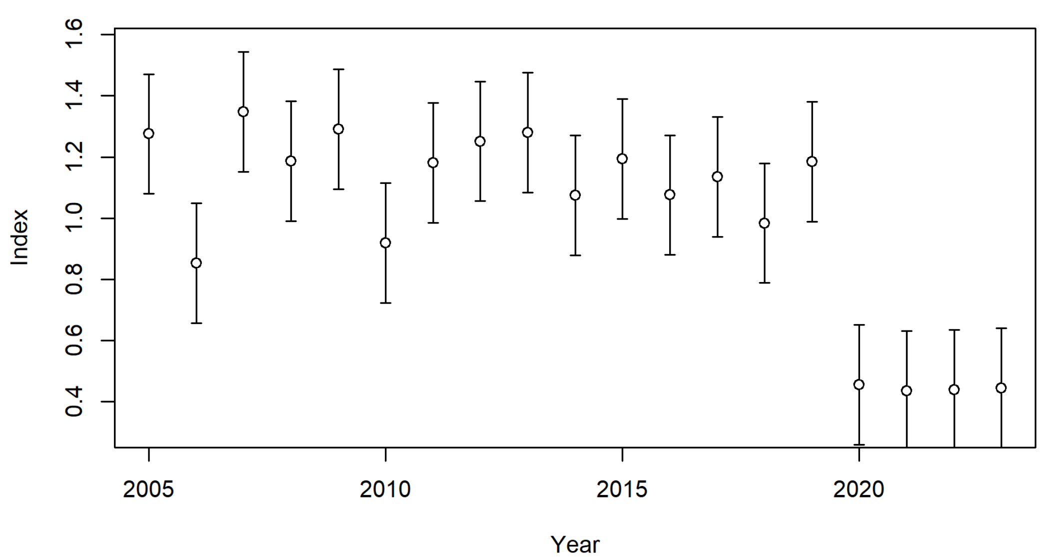


Figure 10: Observed fishing effort index of the commercial fishery with normally distributed 95% confidence intervals used as model inputs.

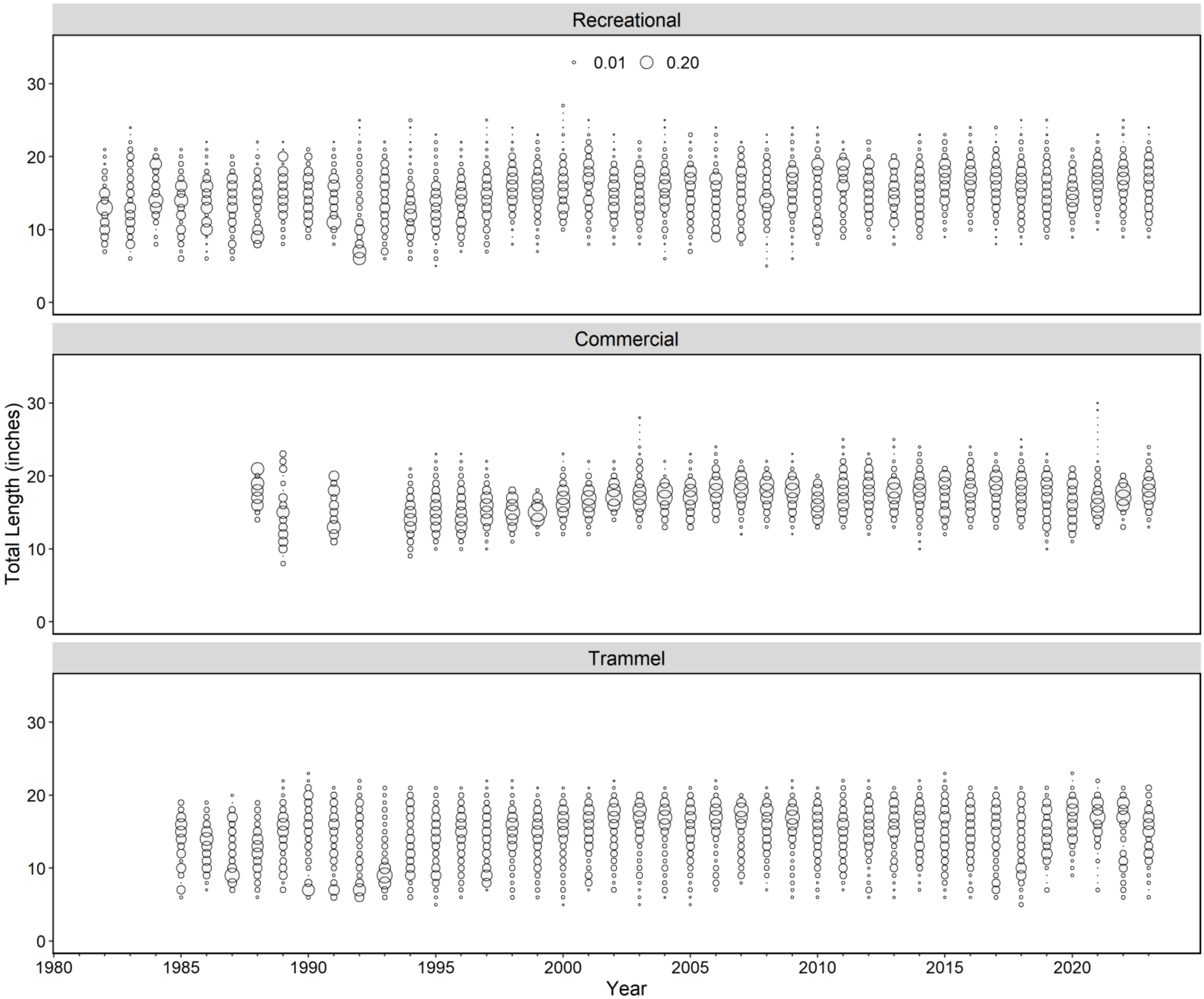


Figure 11: Observed size compositions of the fisheries and the LDWF trammel net survey.

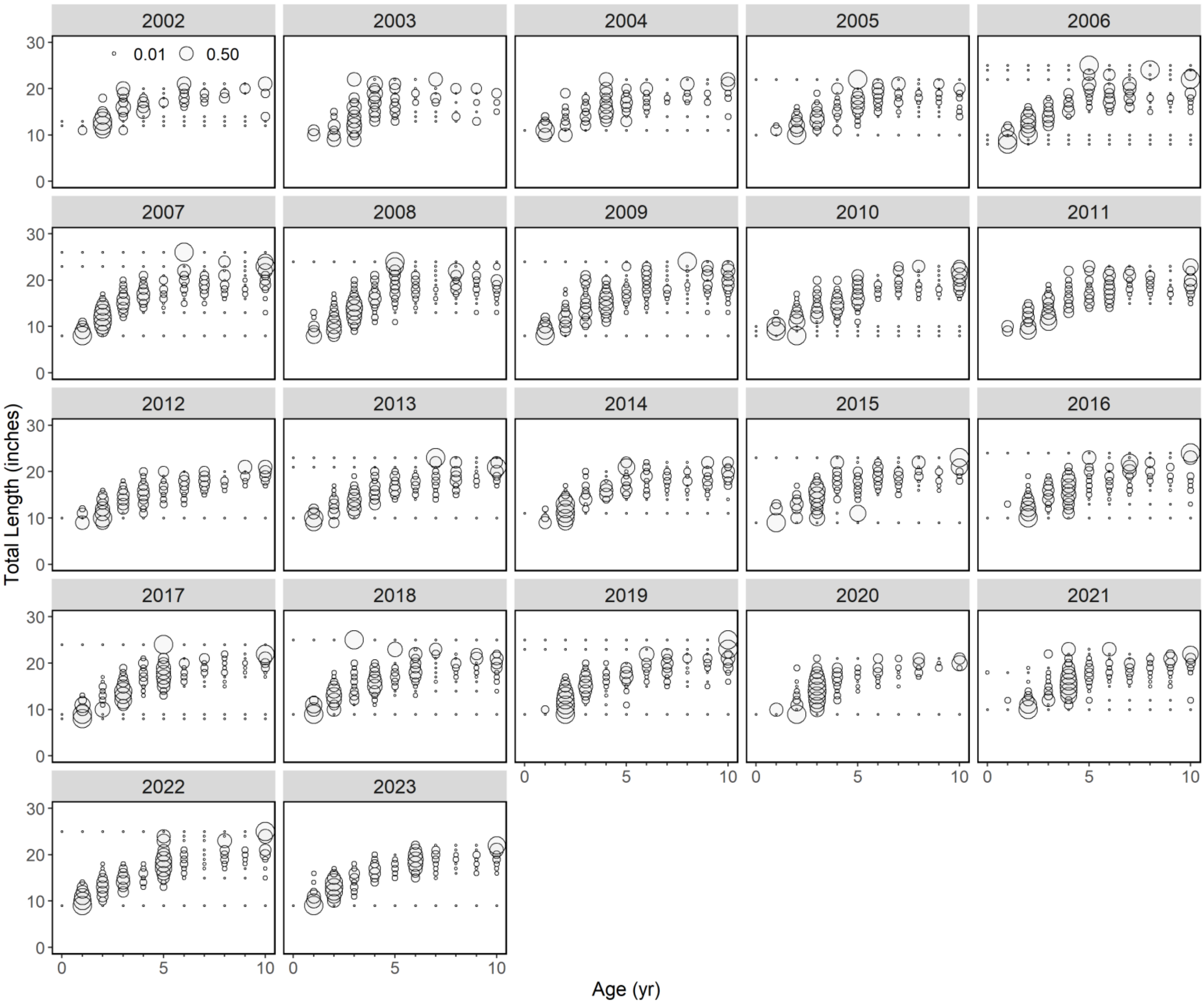


Figure 12: Observed age-at-length compositions of the recreational fishery.

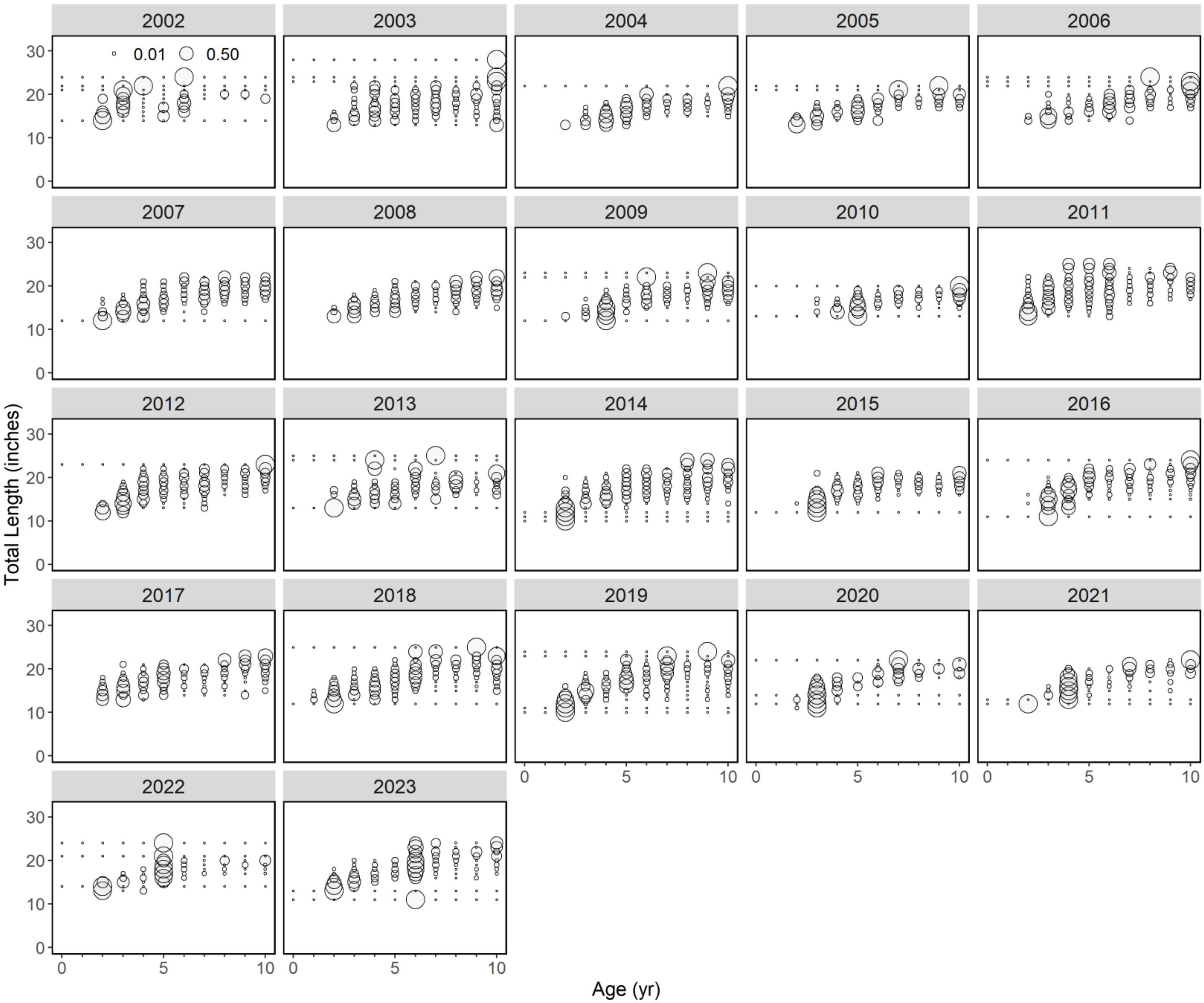


Figure 13: Observed age-at-length compositions of the commercial fishery.

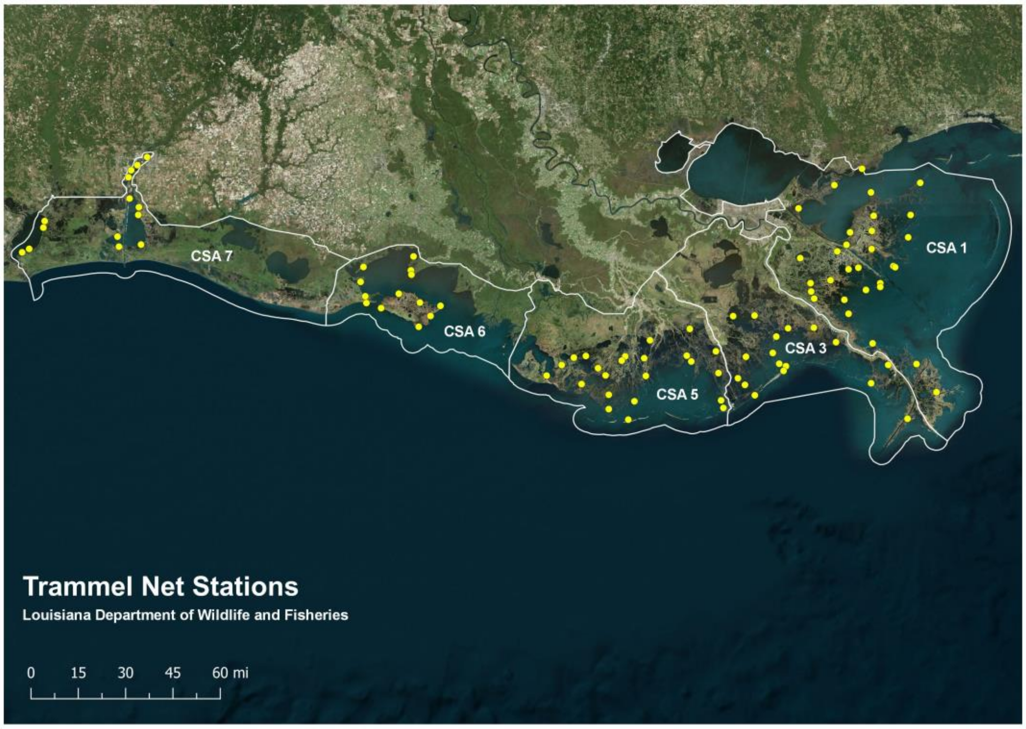


Figure 14: Station locations of the LDWF trammel net survey. Lines delineate LDWF Coastal Study Areas and state/federal waters.

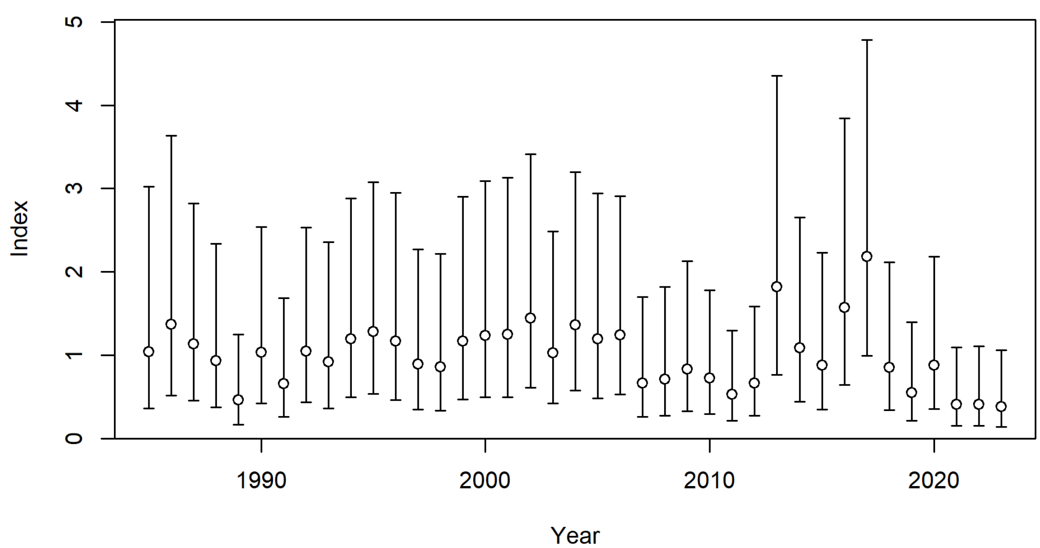


Figure 15: Observed index of relative abundance of the LDWF trammel net survey and corresponding lognormal 95% confidence intervals.

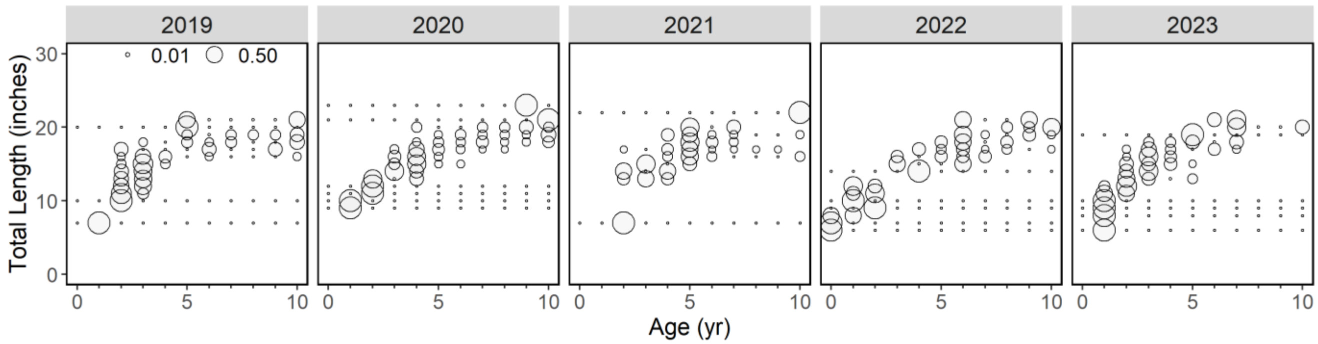


Figure 16: Observed age-at-length compositions of the LDWF trammel net survey.

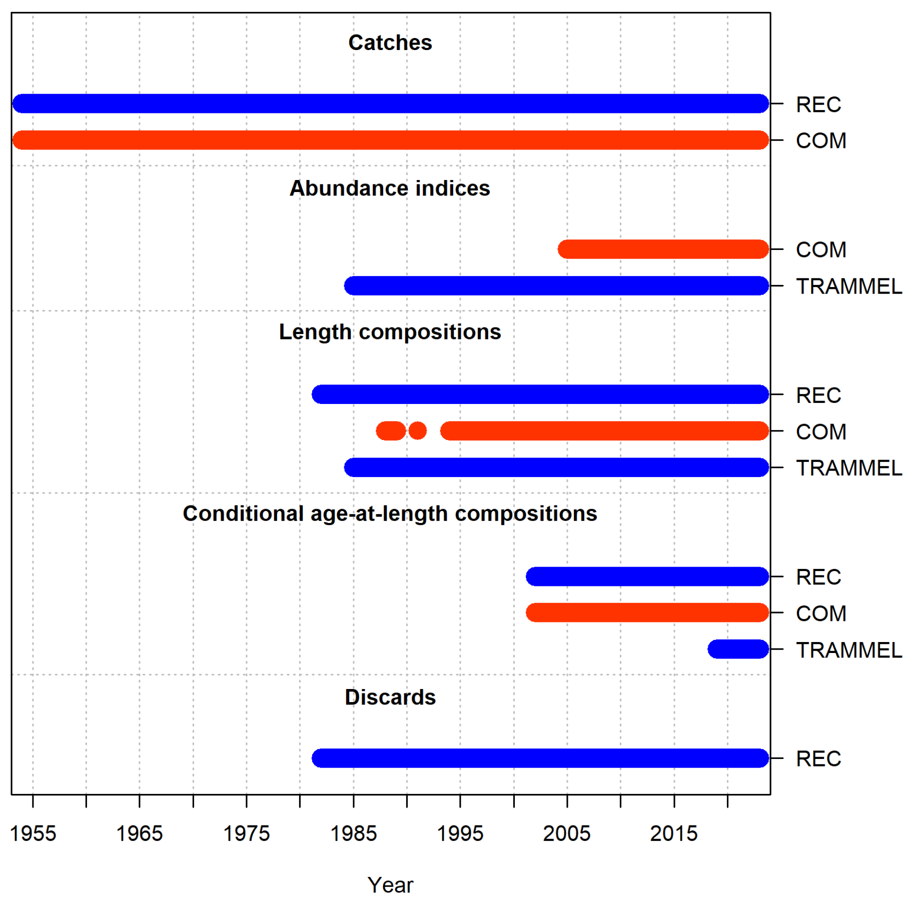


Figure 17: Data inputs of the SS3 base model.

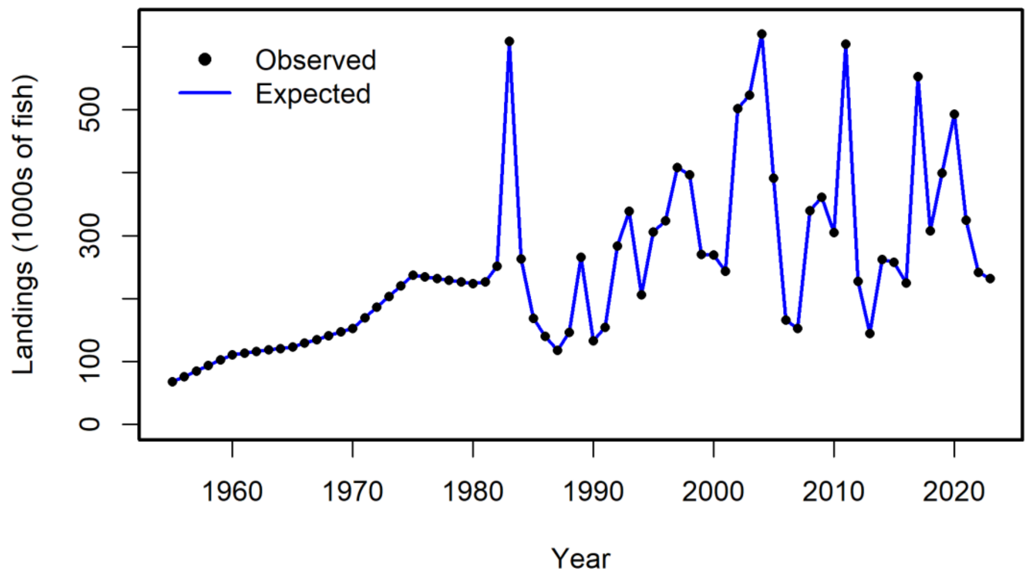


Figure 18: Observed and SS3 base model estimated recreational landings as numbers of fish.

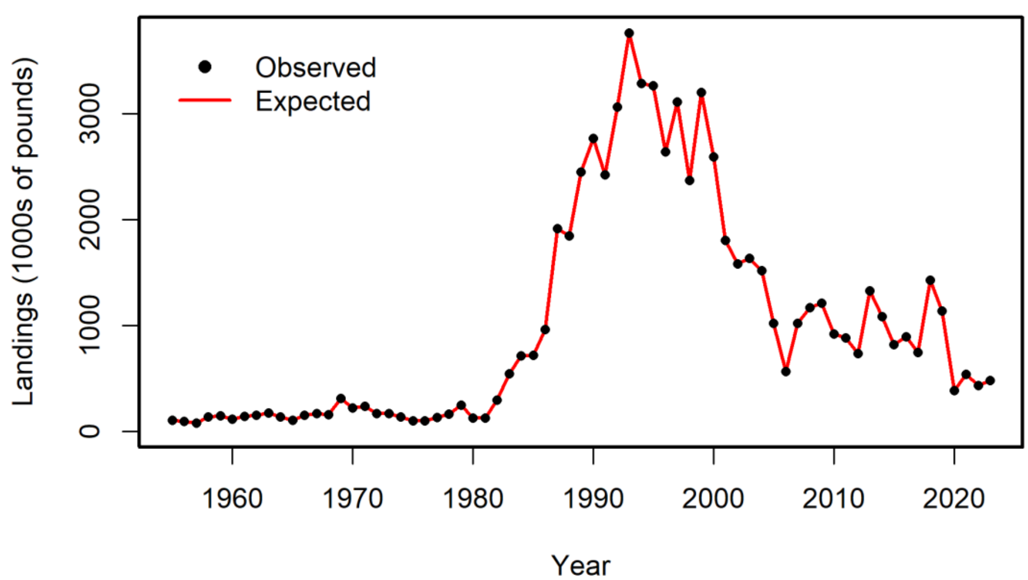


Figure 19: Observed and SS3 base model estimated commercial landings in pounds.

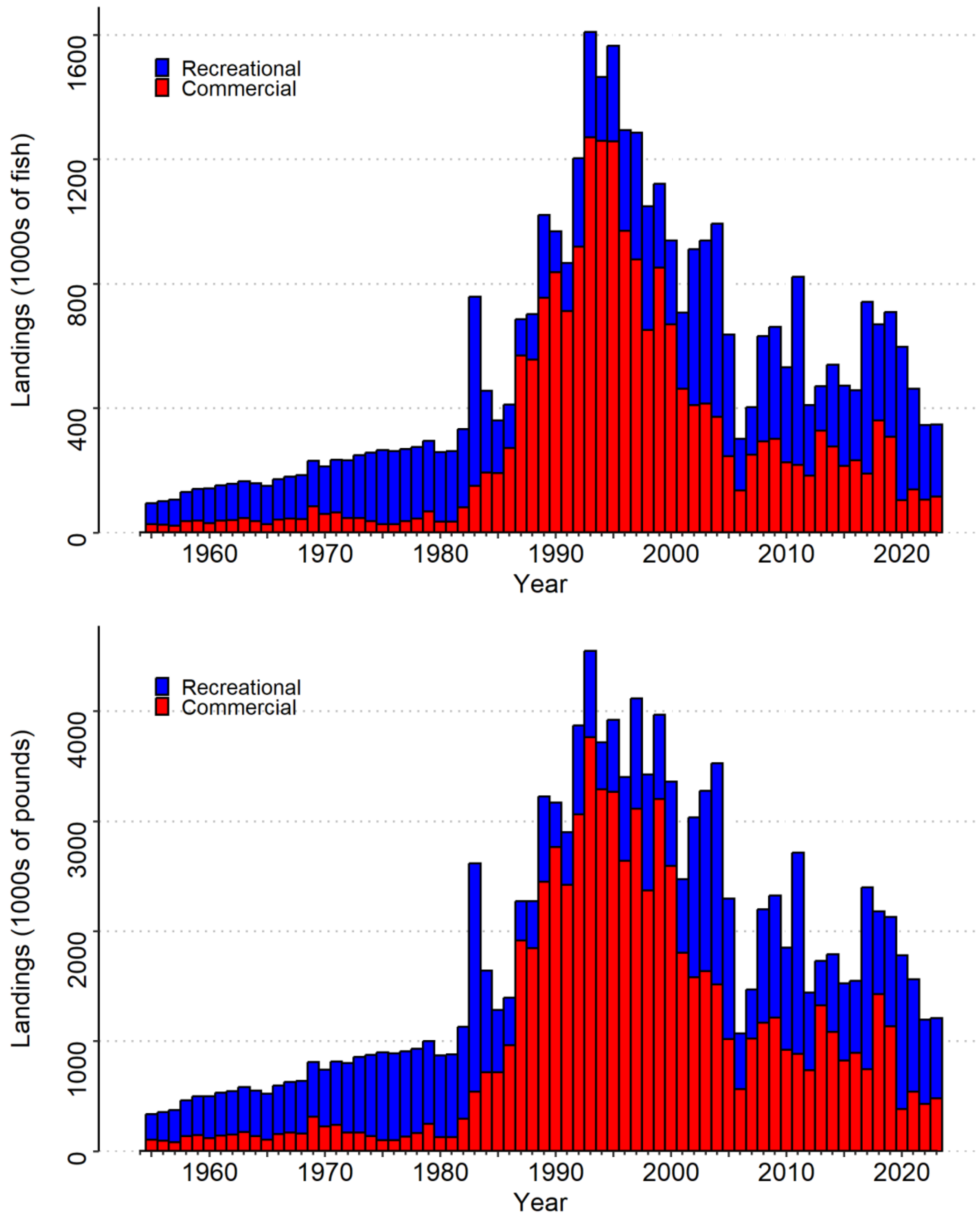


Figure 20: SS3 base model estimated landings in pounds (top) and as numbers of fish (bottom).

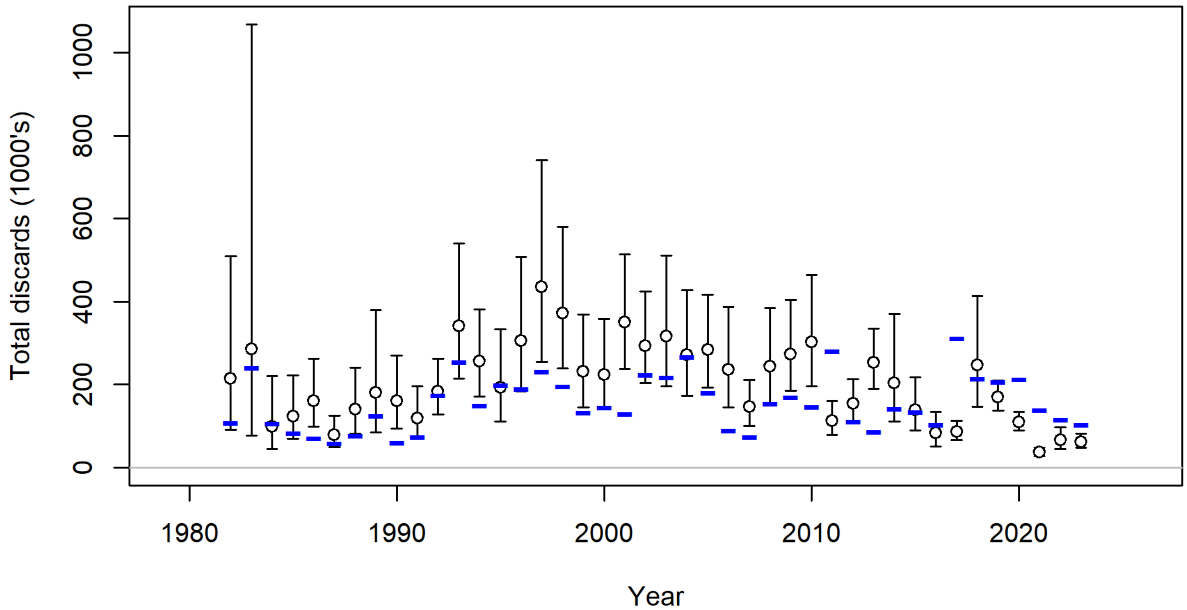


Figure 21: Observed and SS3 base model estimated discards of the recreational fishery with corresponding lognormal 95% confidence intervals.

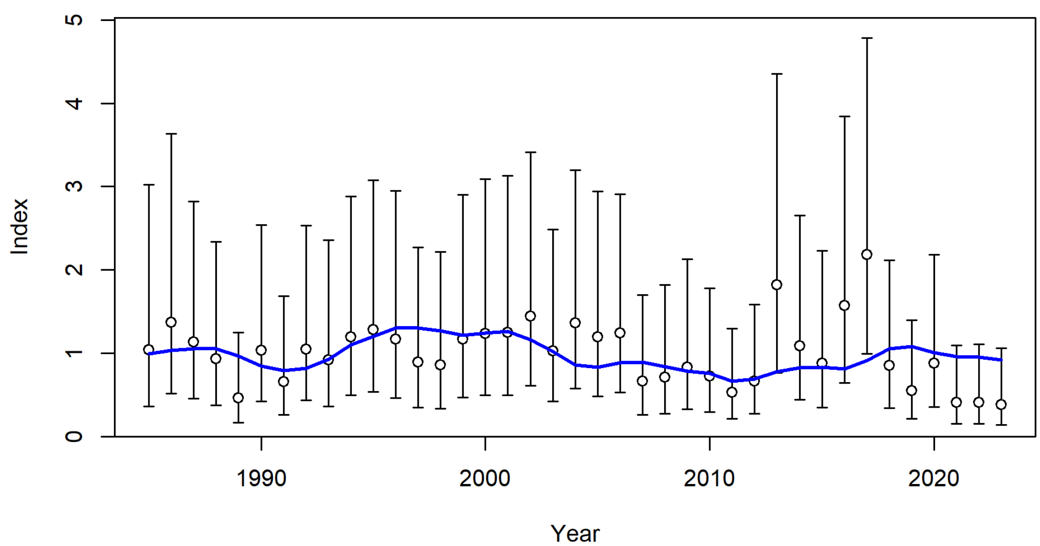


Figure 22: Observed and SS3 base model estimated index of relative abundance of the LDWF trammel net survey with corresponding lognormal 95% confidence intervals.

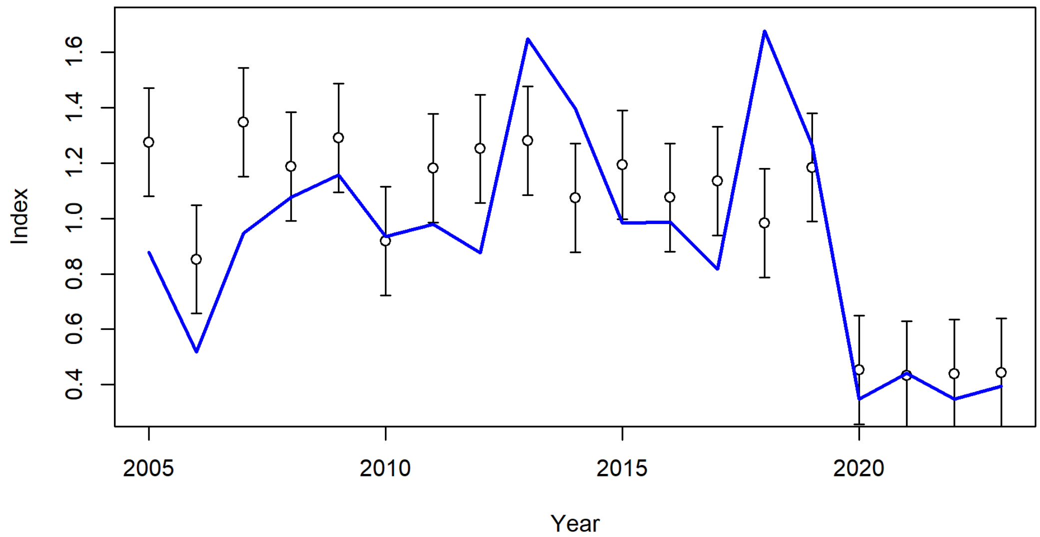


Figure 23: Observed and SS3 base model estimated fishing effort index of the commercial fishery with corresponding normally distributed 95% confidence intervals.

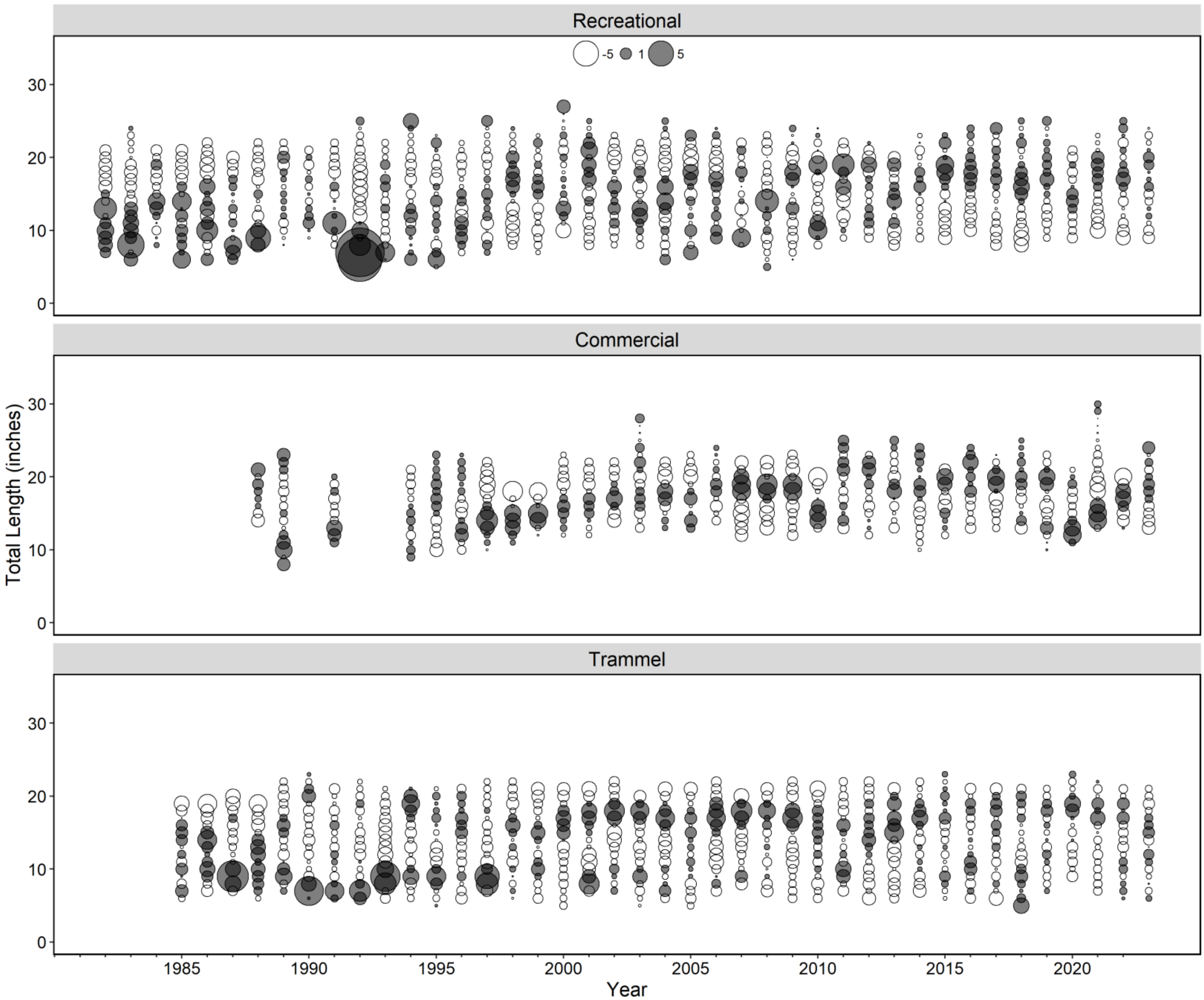


Figure 24: Pearson residuals of length composition fits of the fisheries and the LDWF trammel net survey. Dark bubbles represent instances where observed values are greater than the predicted values and clear bubbles represent instances where observed values are less than the predicted values.

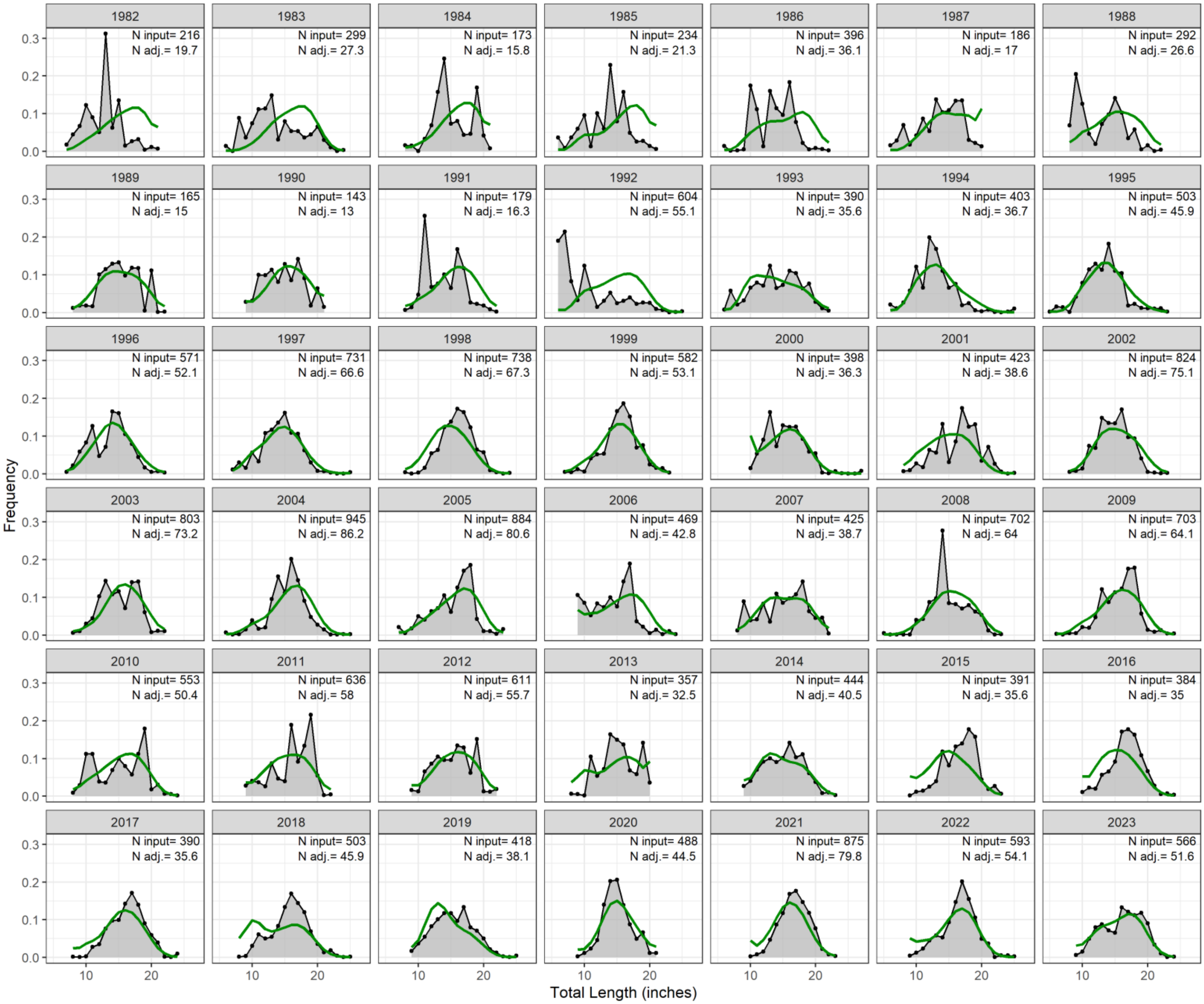


Figure 25: Observed and SS3 base model estimated size compositions of the recreational fishery. Input samples sizes (N input) and effective sample sizes adjusted by the estimated Dirichlet-multinomial multiplier (N adj.) are reported in each figure.

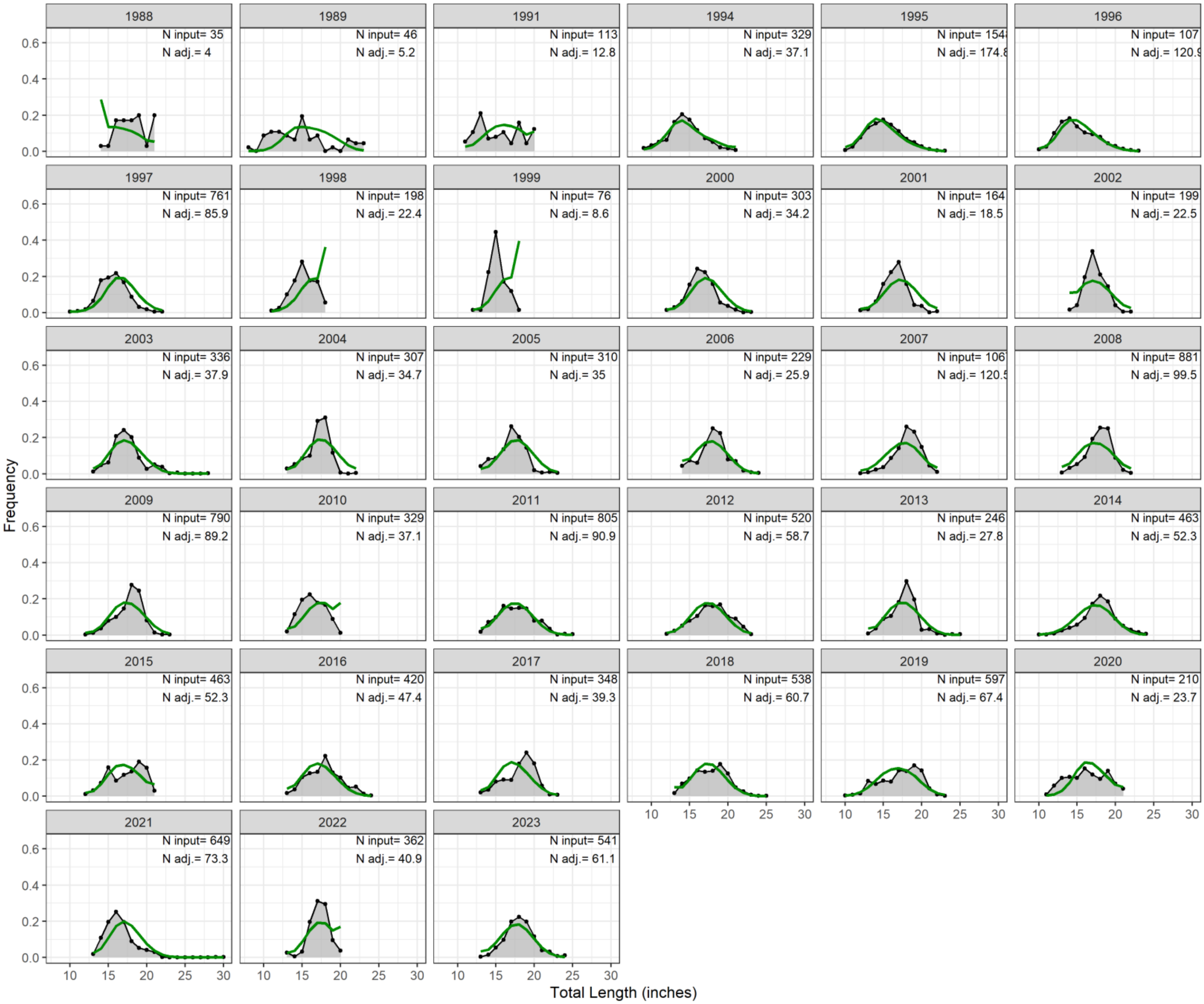


Figure 26: Observed and SS3 base model estimated size compositions of the commercial fishery. Input samples sizes (N input) and effective sample sizes adjusted by the estimated Dirichlet-multinomial multiplier (N adj.) are reported in each figure.

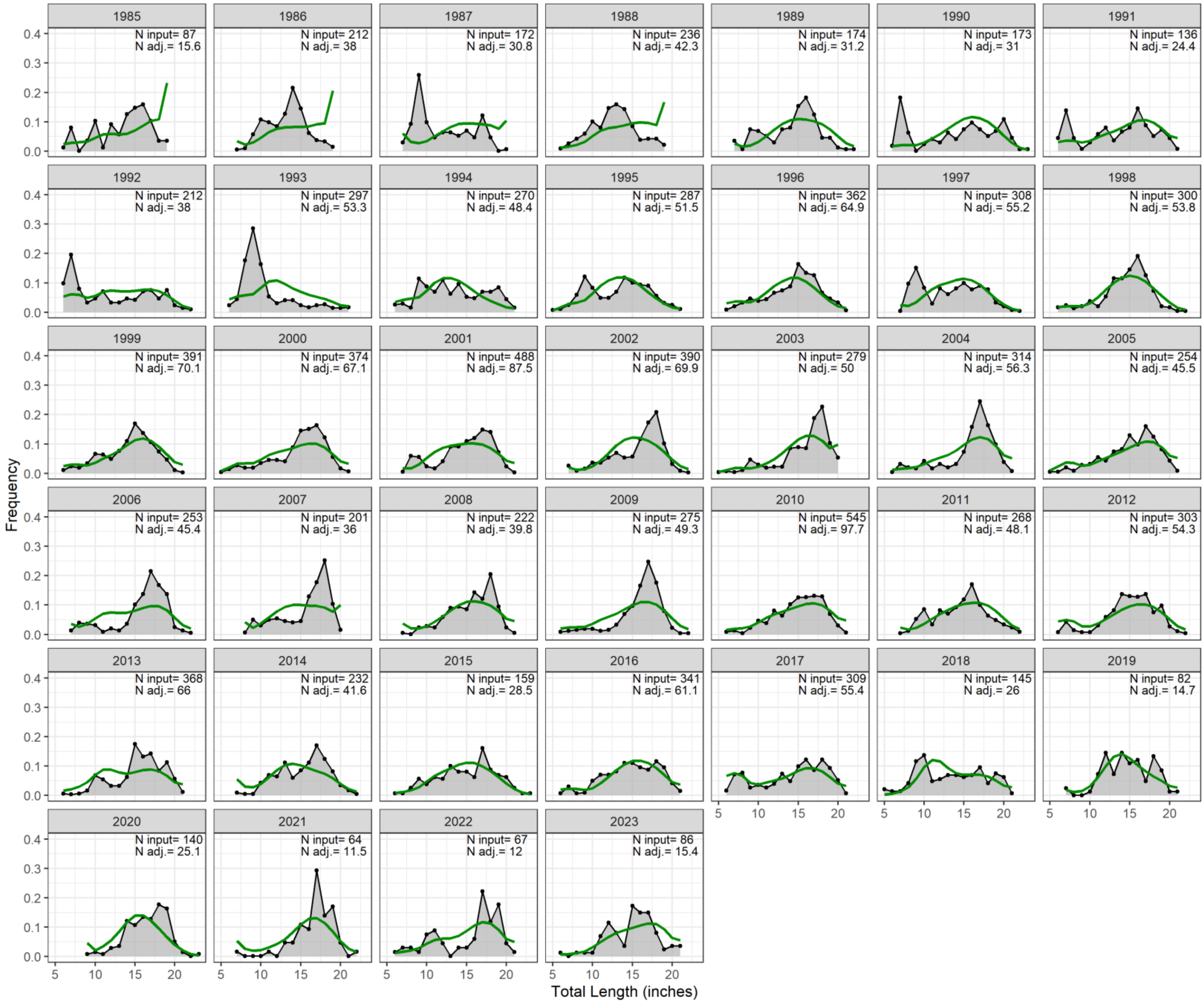


Figure 27: Observed and SS3 base model estimated size compositions of the LDWF trammel net survey. Input samples sizes (N input) and effective sample sizes adjusted by the estimated Dirichlet-multinomial multiplier (N adj.) are reported in each figure.

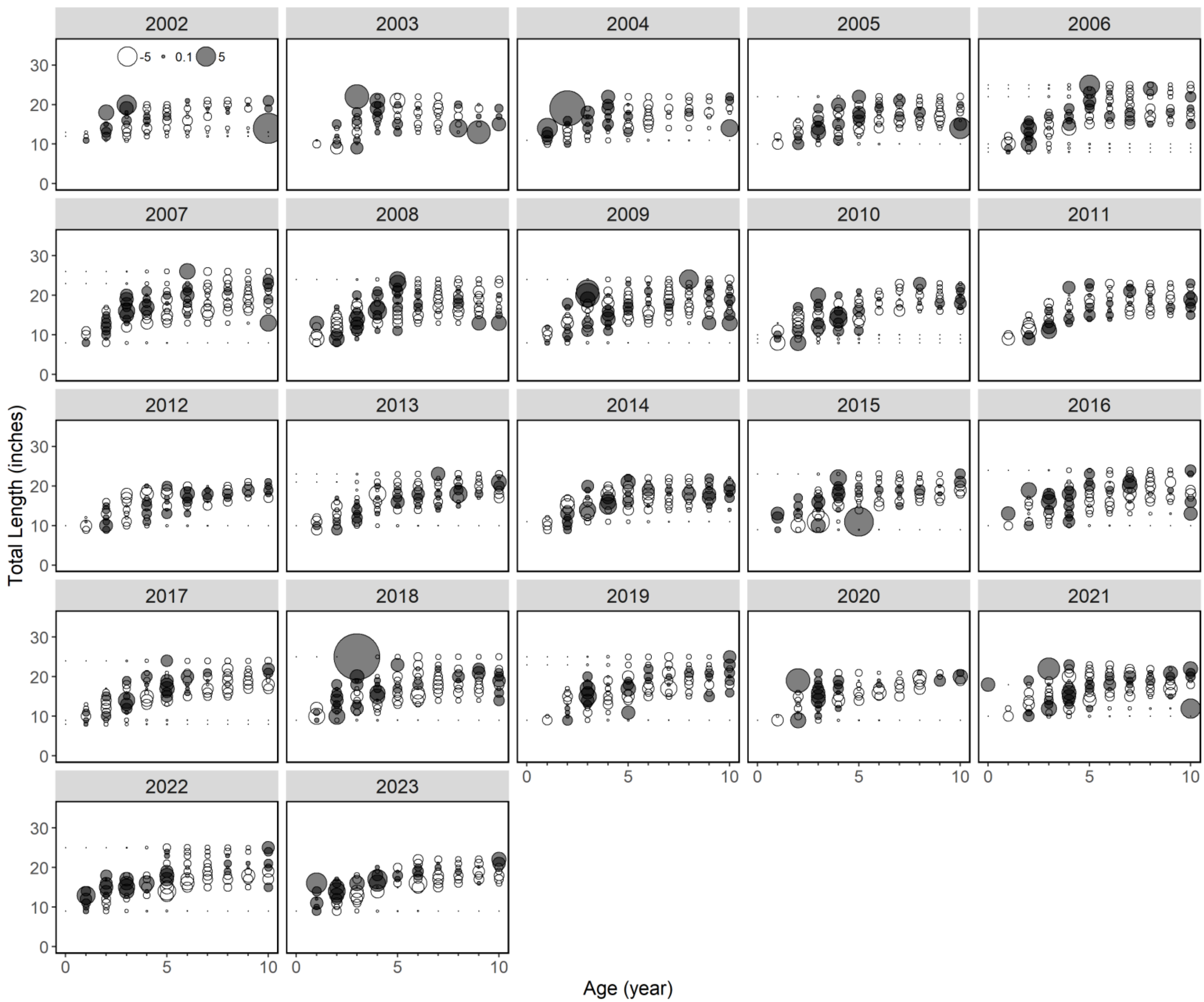


Figure 28: Pearson residuals of the conditional age-at-length composition fits of the recreational fishery. Dark bubbles represent instances where observed values are greater than the predicted values and clear bubbles represent instances where observed values are less than the predicted values.

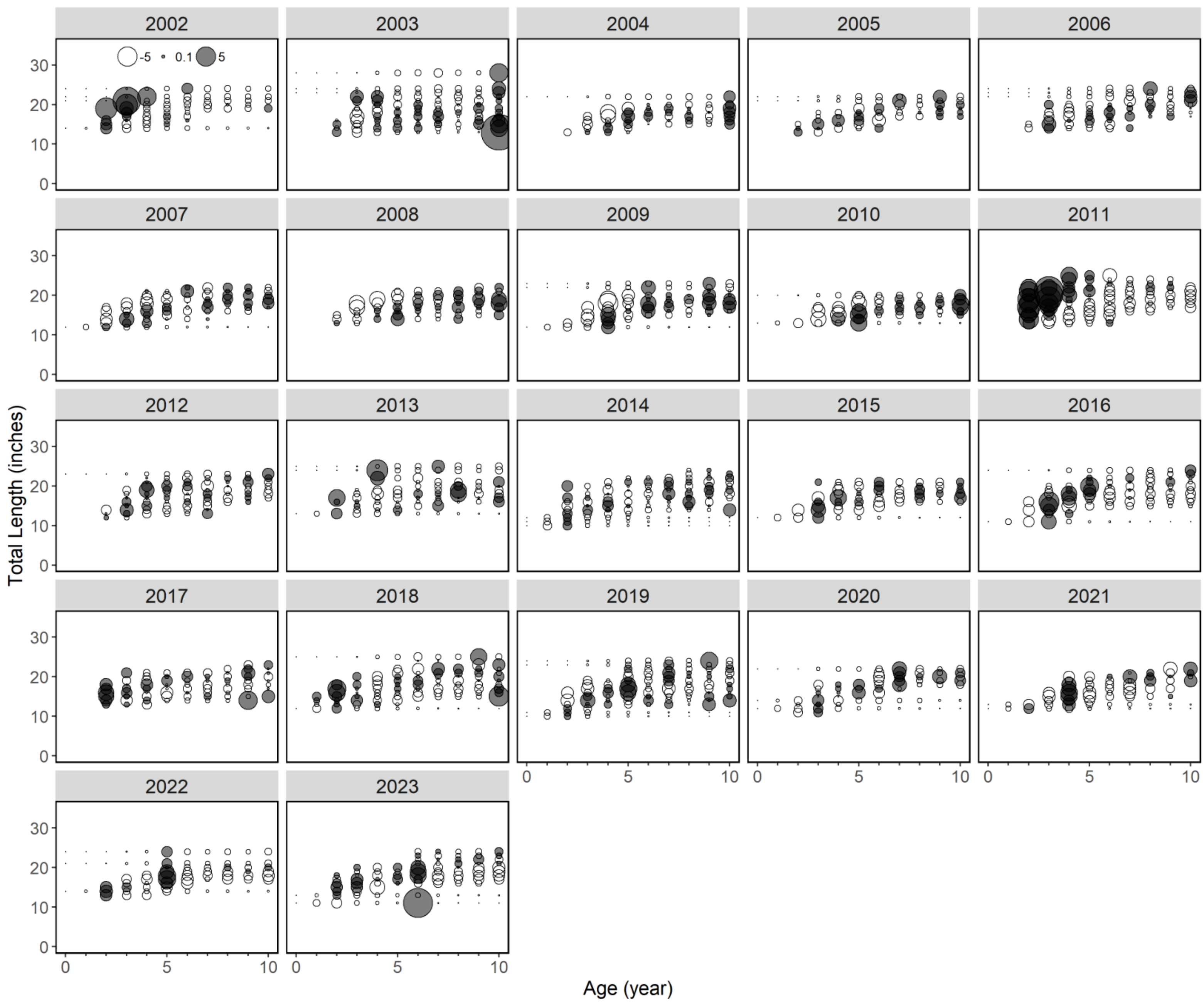


Figure 29: Pearson residuals of the conditional age-at-length composition fits of the commercial fishery. Dark bubbles represent instances where observed values are greater than the predicted values and clear bubbles represent instances where observed values are less than the predicted values.

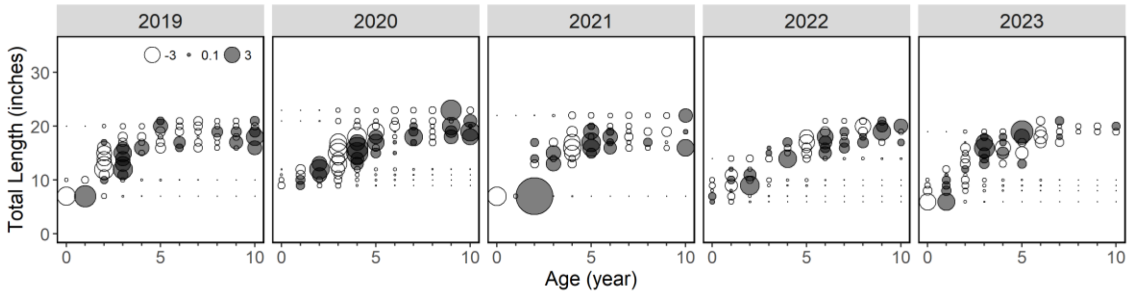


Figure 30: Pearson residuals of the conditional age-at-length composition fits of the LDWF trammel net survey. Dark bubbles represent instances where observed values are greater than the predicted values and clear bubbles represent instances where observed values are less than the predicted values.

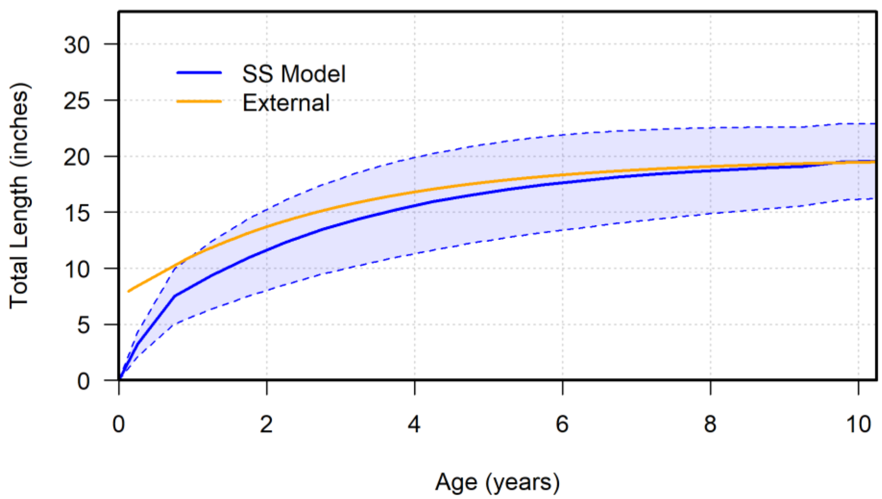


Figure 31: SS3 base model estimated mean length-at-age and 95% confidence distribution (shaded area) along with the external estimate of mean length-at-age. Parameter estimates of the SS3 base model estimated growth function are presented in Table 7.

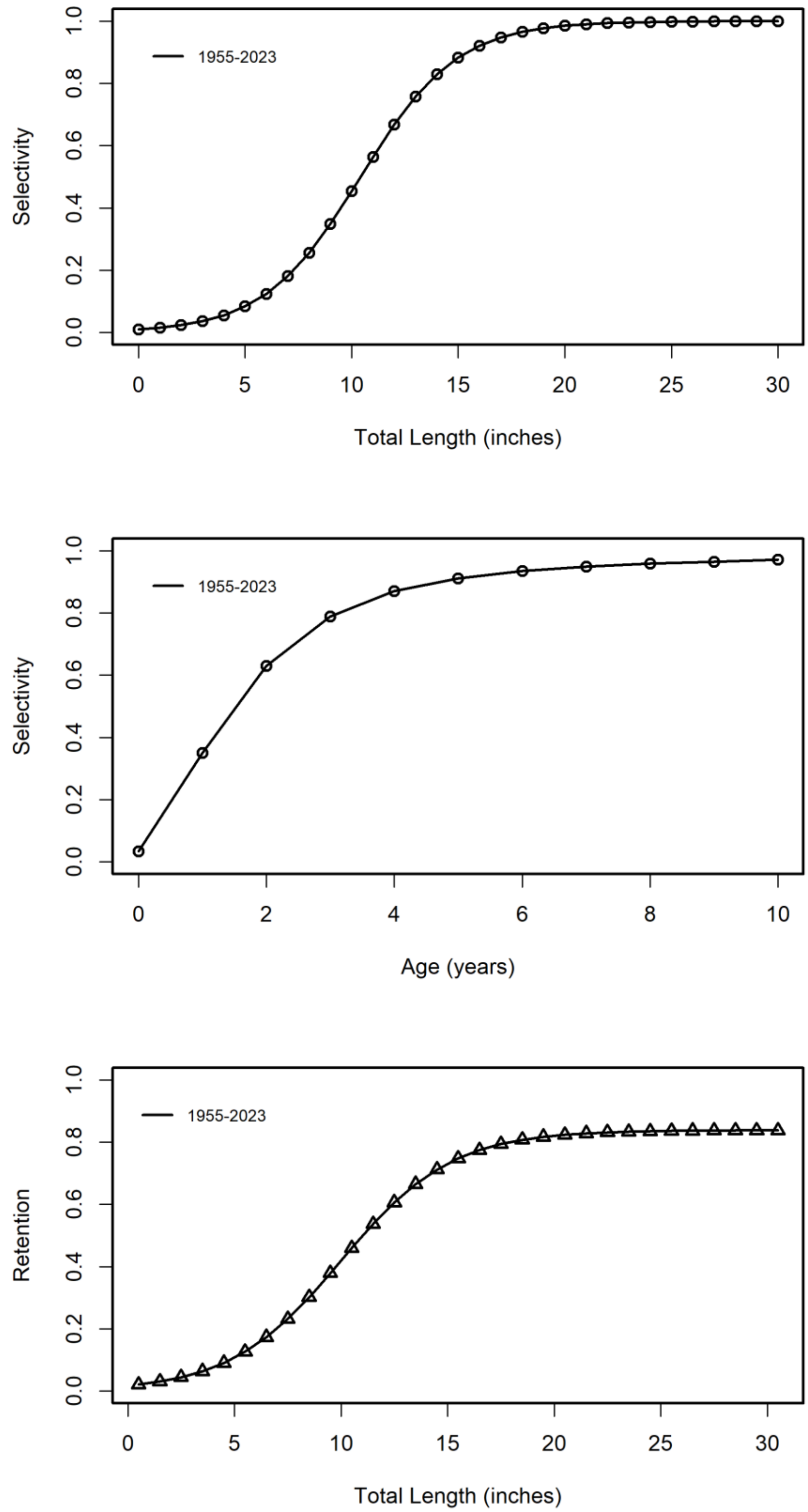


Figure 32: Estimated selectivity-at-size (top), selectivity-at-age (middle), and retention-at-size (bottom) functions of the recreational fishery.

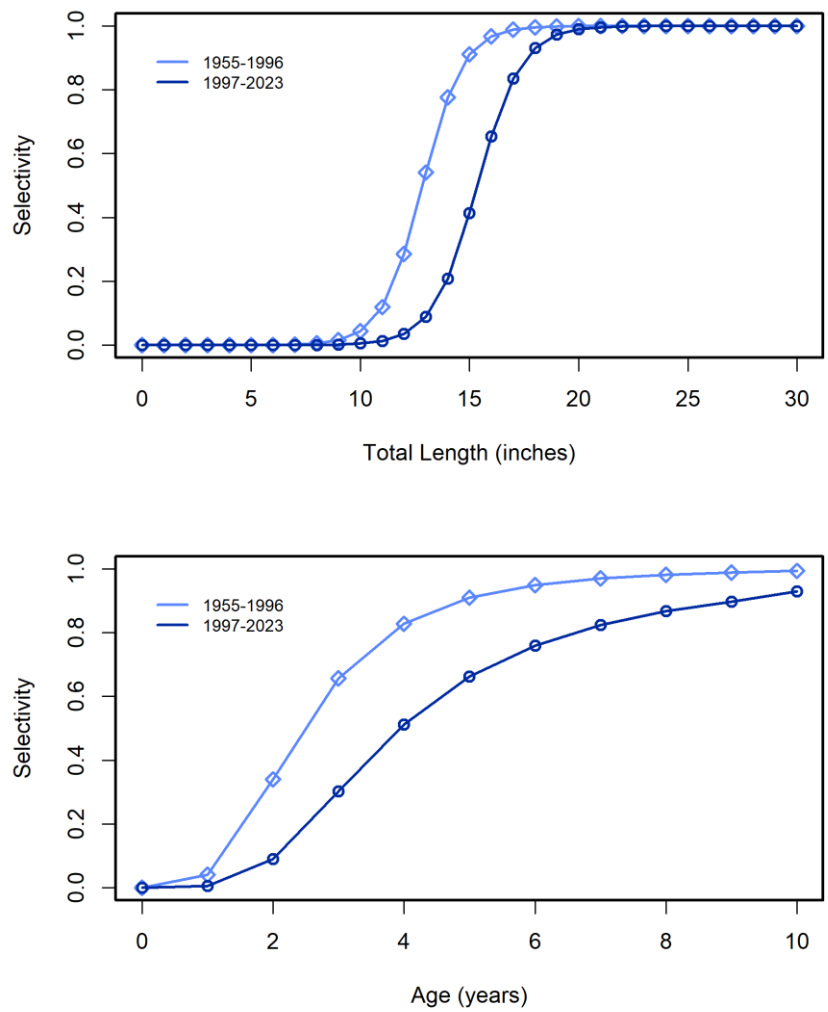


Figure 33: Estimated selectivity-at-size (top) and selectivity-at-age (bottom) functions of the commercial fishery for each time block of consistent regulation.

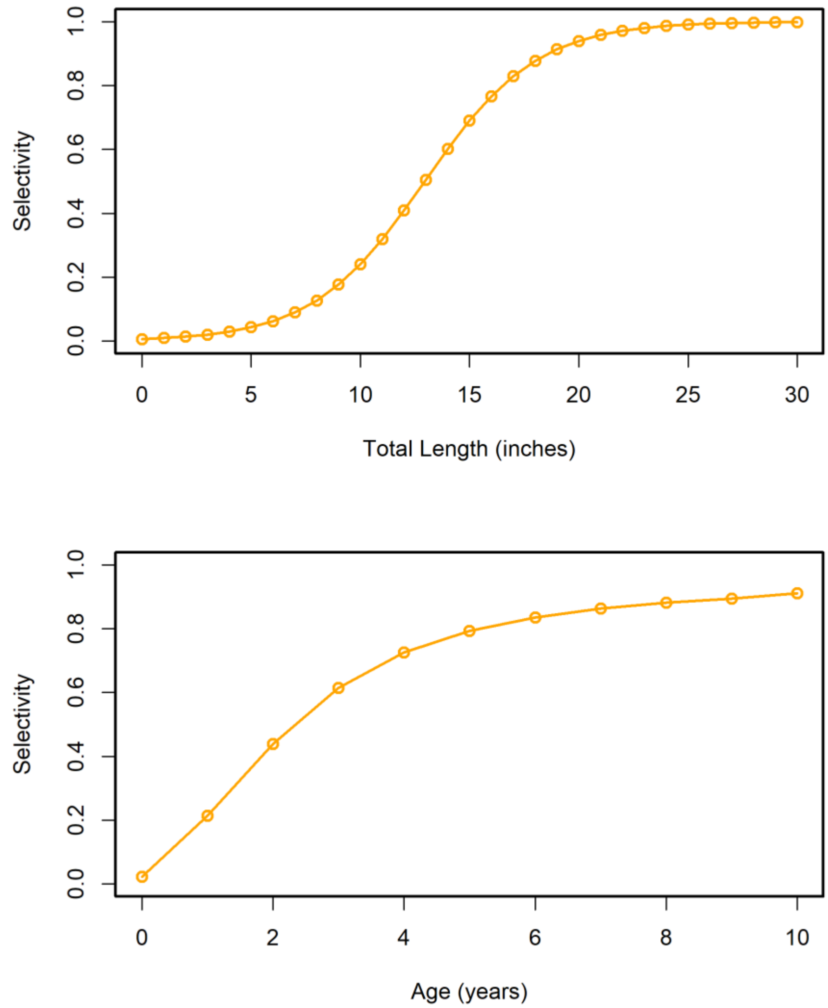


Figure 34: Estimated selectivity-at-size (top) and selectivity-at-age (bottom) functions of the LDWF trammel net survey.

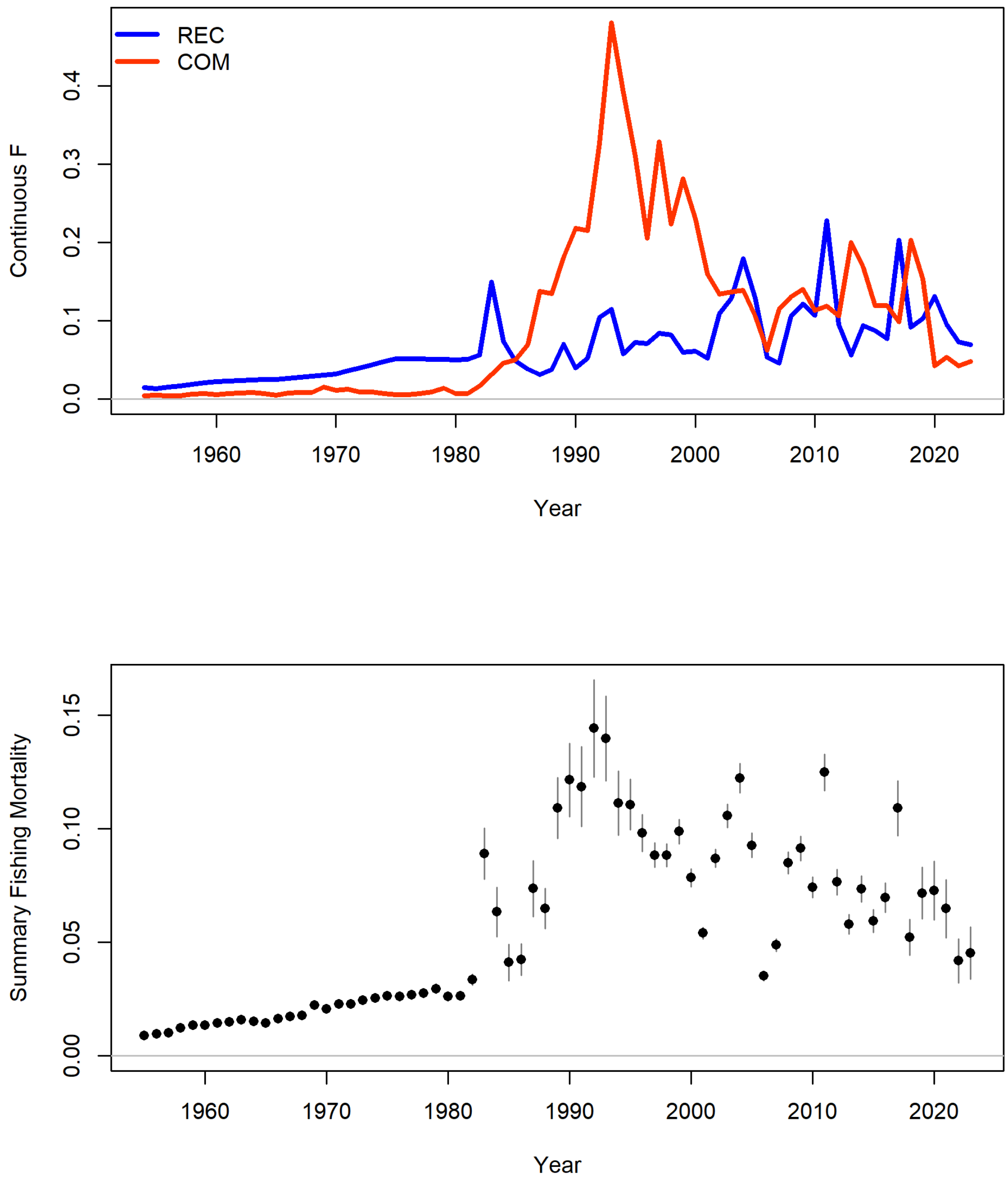


Figure 35: Fleet-specific apical fishing mortalities (top) and exploitation rate (summary F; bottom) estimates of the SS3 base model.

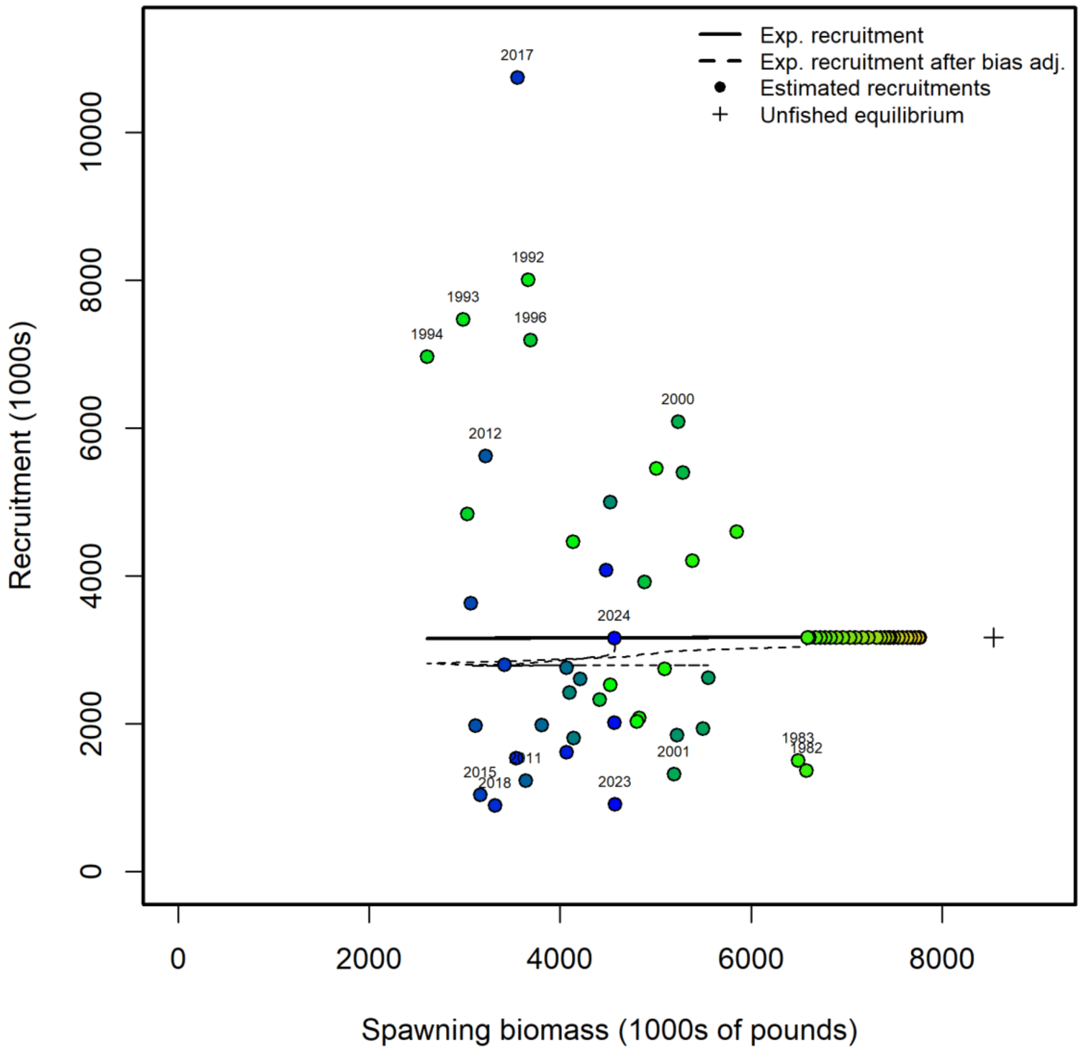


Figure 36: Estimated Beverton-Holt stock-recruitment relationship of the SS3 base model with steepness fixed at 0.99. Estimated age-0 recruitment/SSB pairs are plotted along with the expected Beverton-Holt recruitment (solid line) and the expected recruitment after lognormal bias adjustment (dashed line). Point colors indicate year (warmer colors indicate earlier years and cooler colors indicate later years).

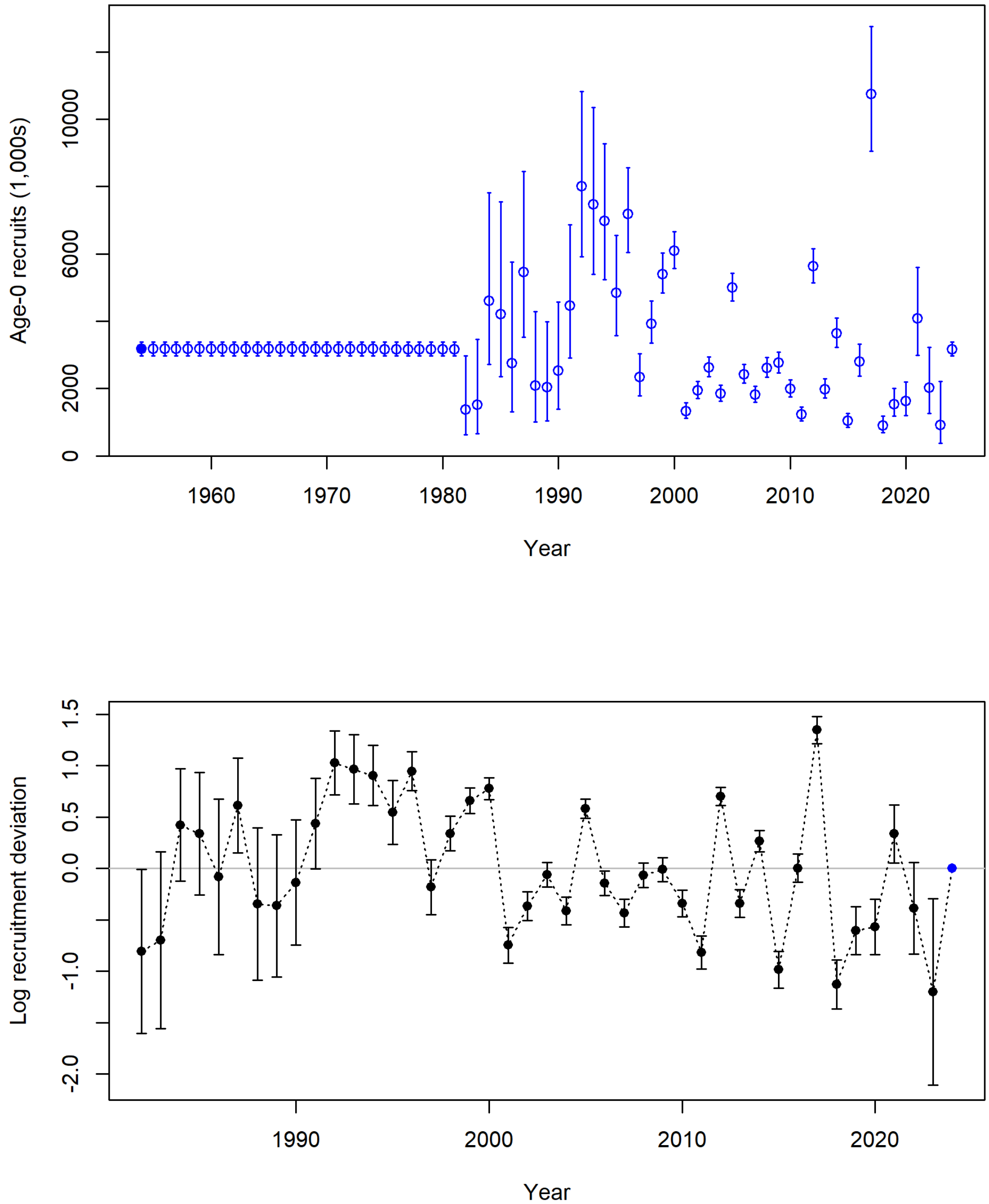


Figure 37: Annual age-0 recruitment (top) and lognormal recruitment deviations (bottom) estimates of the SS3 base model along with the 95% asymptotic confidence intervals of the estimates.

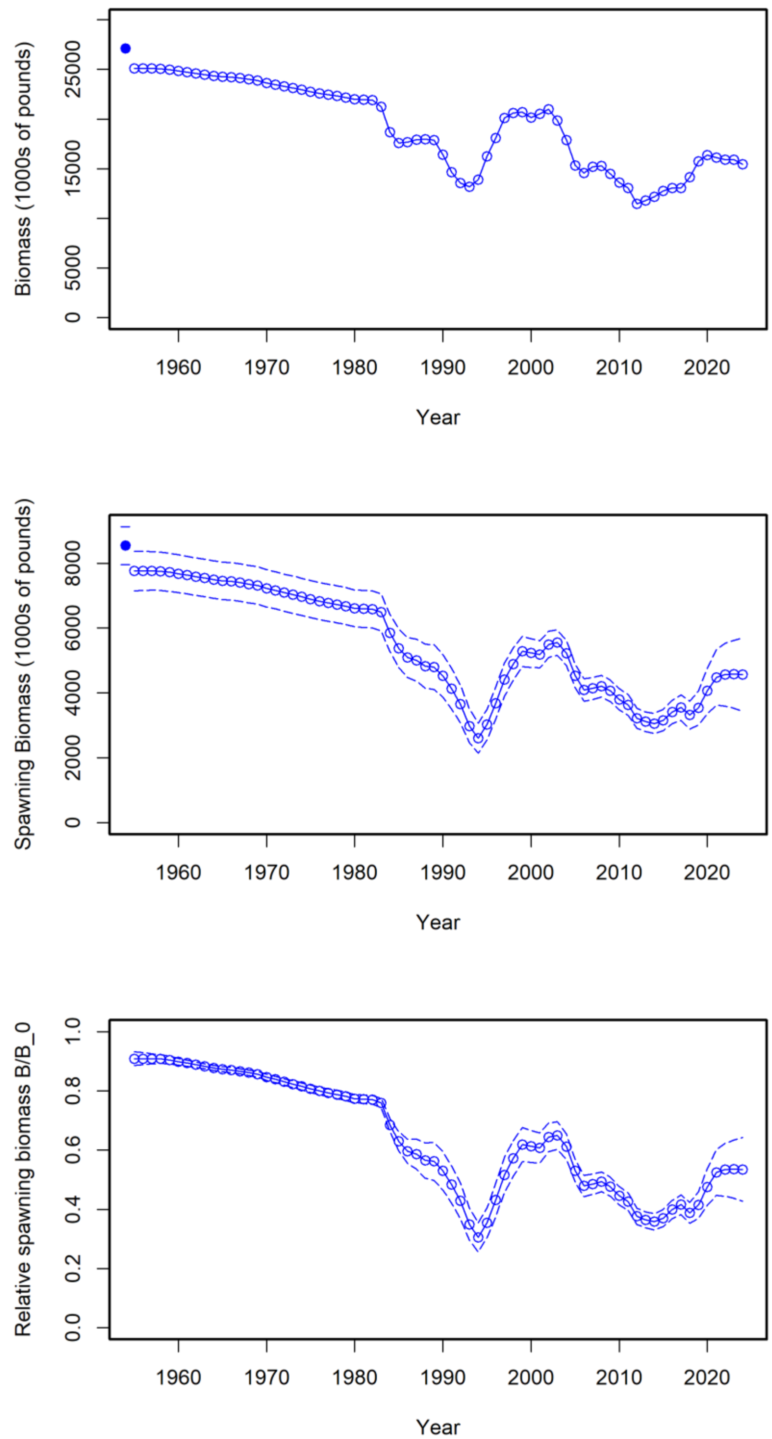


Figure 38: Annual biomass > age-0 (top), spawning biomass (middle), and relative spawning biomass (bottom) estimates of the SS3 base model along with the 95% asymptotic confidence intervals of spawning and relative spawning biomass time series.

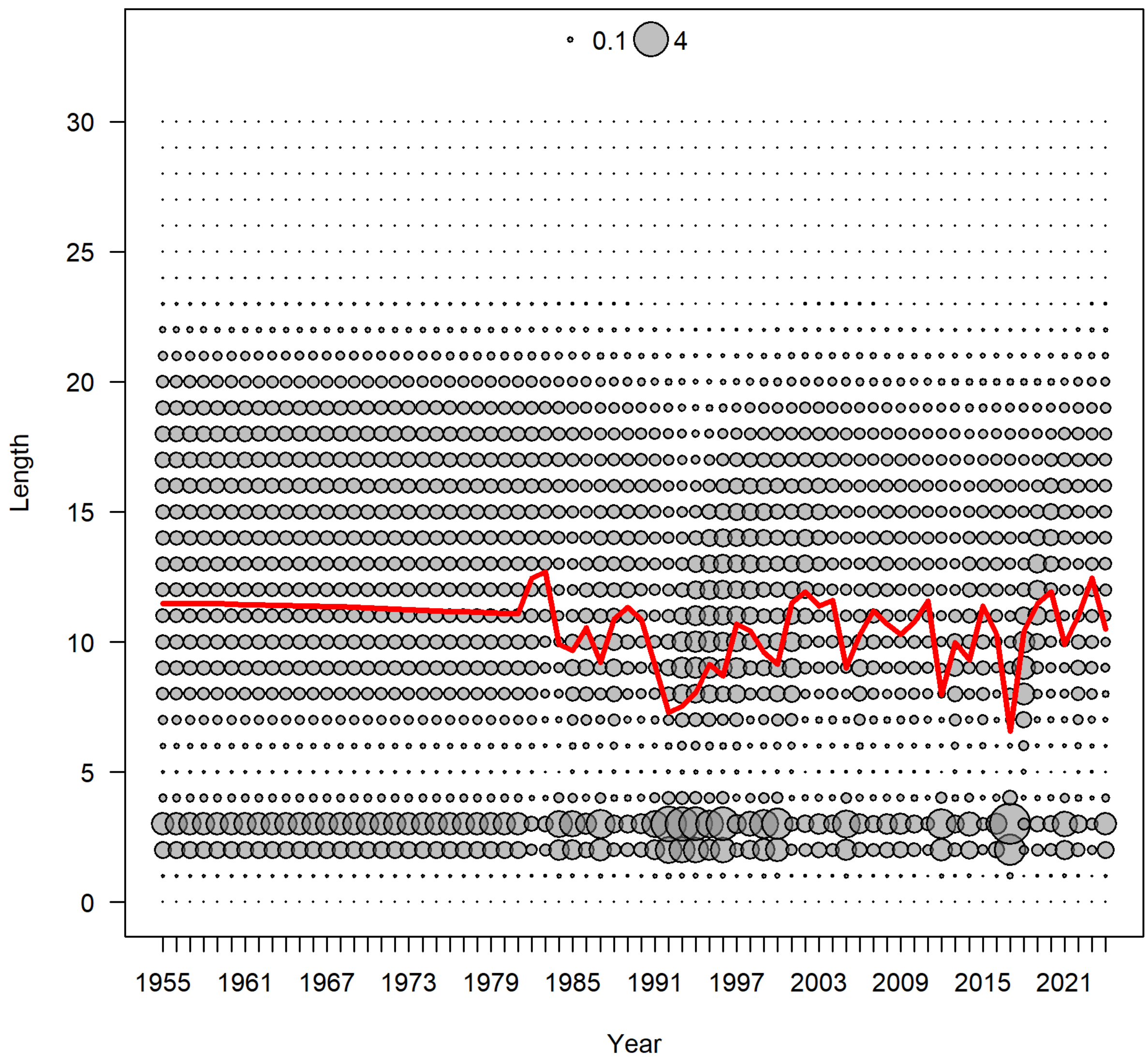


Figure 39: Annual beginning of the year abundance at length (max~11.7 million; inches total length) estimates (bubbles) from the SS3 base model along with the annual mean length of the stock (red line).

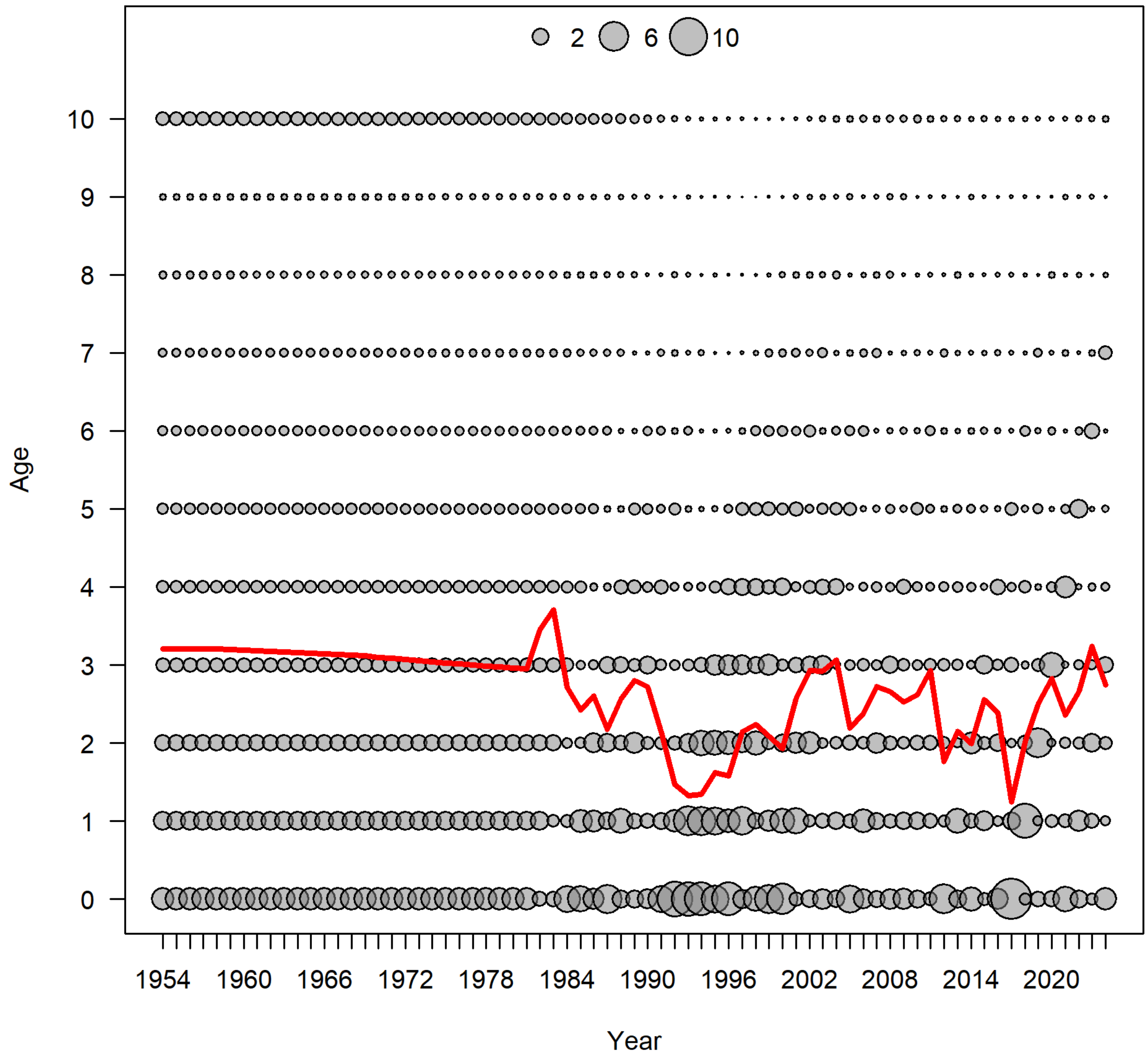


Figure 40: Annual beginning of the year abundance at age (max~11.7 million) estimates (bubbles) from the SS3 base model along with the annual mean age of the stock (red line).

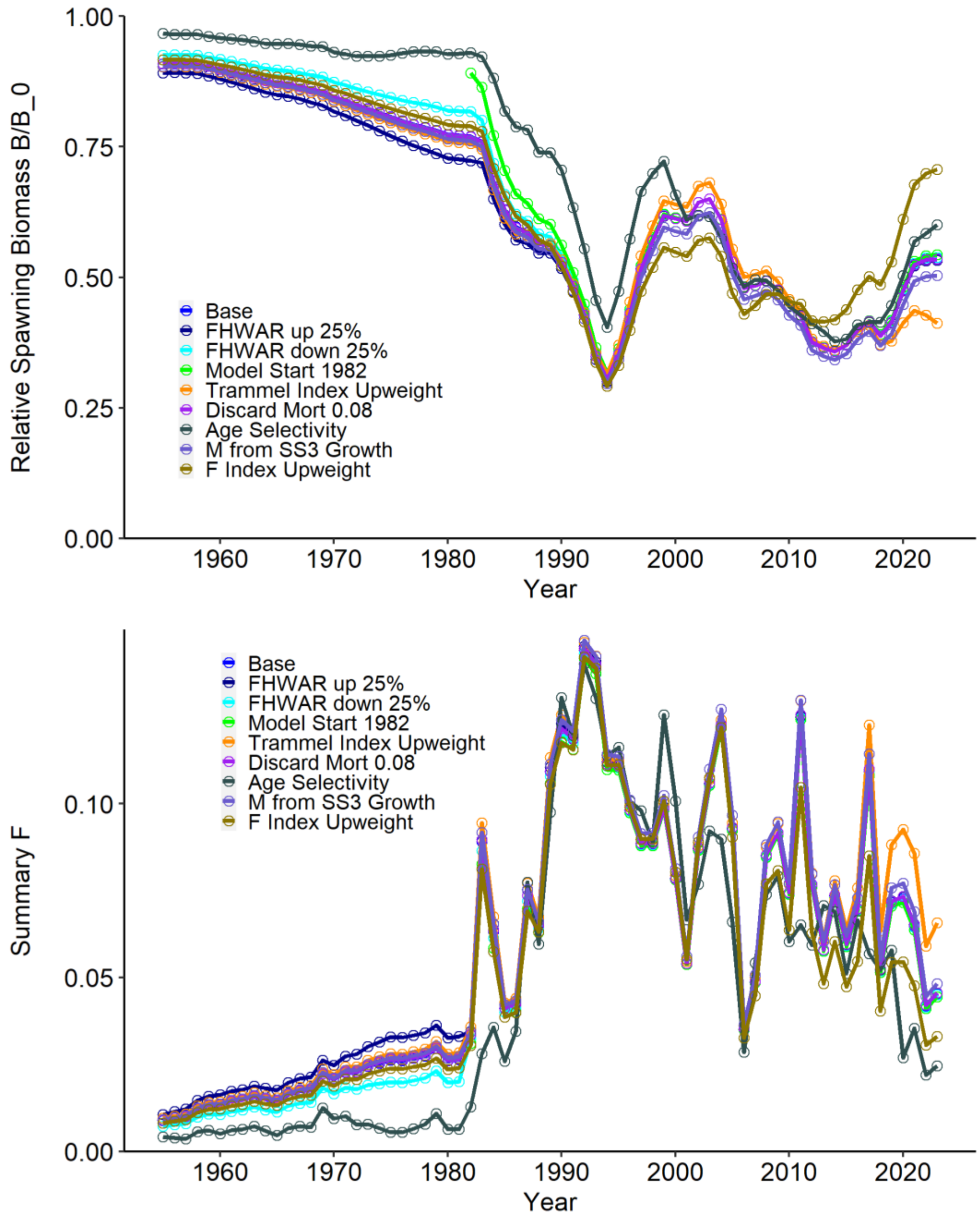


Figure 41: Model runs comparing time series of relative spawning stock biomass, exploitation rates (summary F), and age-0 recruitment estimates of the SS3 base model and sensitivity model runs (FHWAR estimates plus/minus 25%, relative abundance index upweighted, commercial effort index upweighted, discard morality rate increased from 5 to 8%, model start year in 1982, age-based selectivity instead of length-based, and M-at-age calculated from the SS3 estimated growth model.

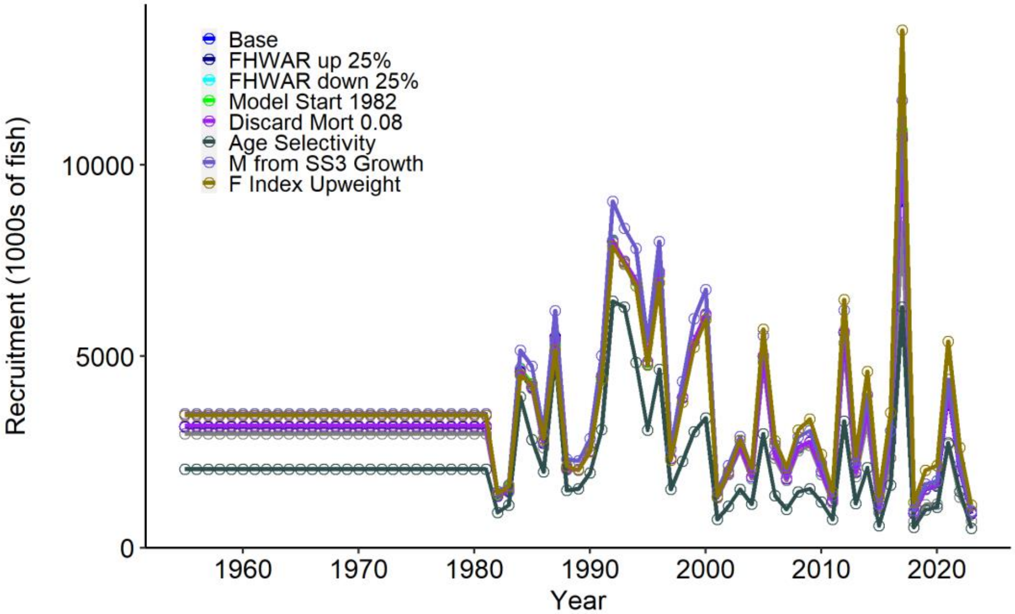


Figure 41 (continued):

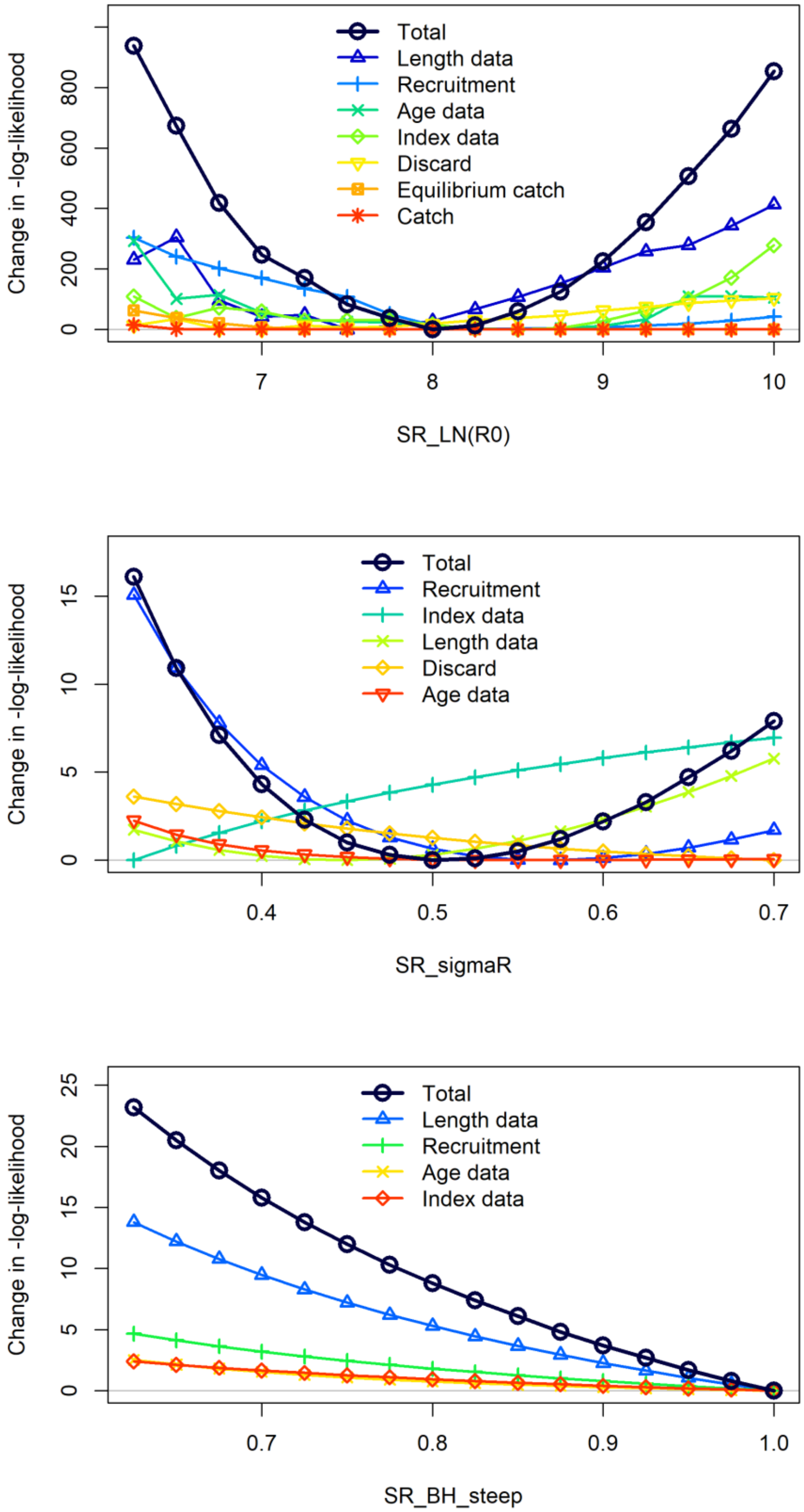


Figure 42: Likelihood profile plots of log-space unfished recruitment (LN_R0), recruitment variance (sigma R), and steepness parameters of the Beverton-Holt stock recruitment function.

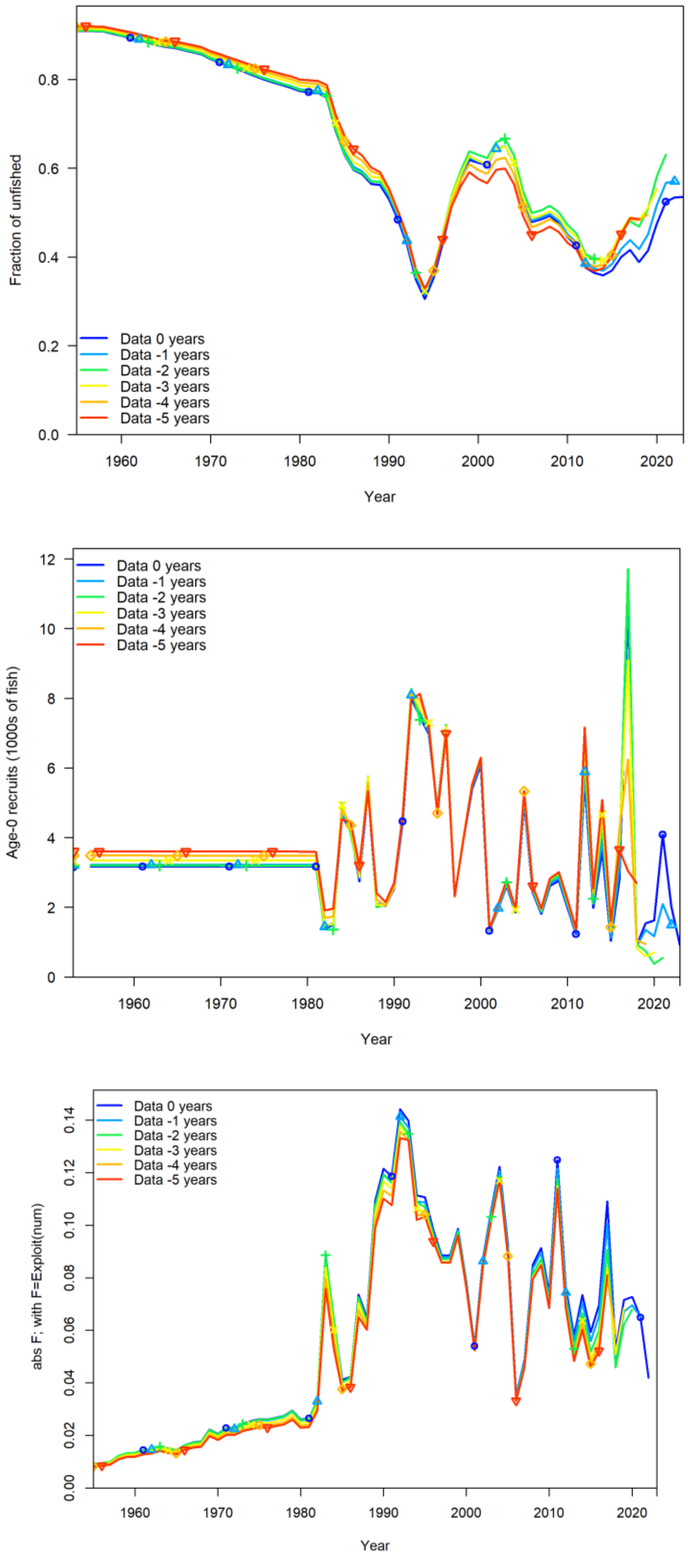


Figure 43: Retrospective analysis of relative spawning stock biomass, age-0 recruitment, and exploitation rate estimates of the SS3 base model.

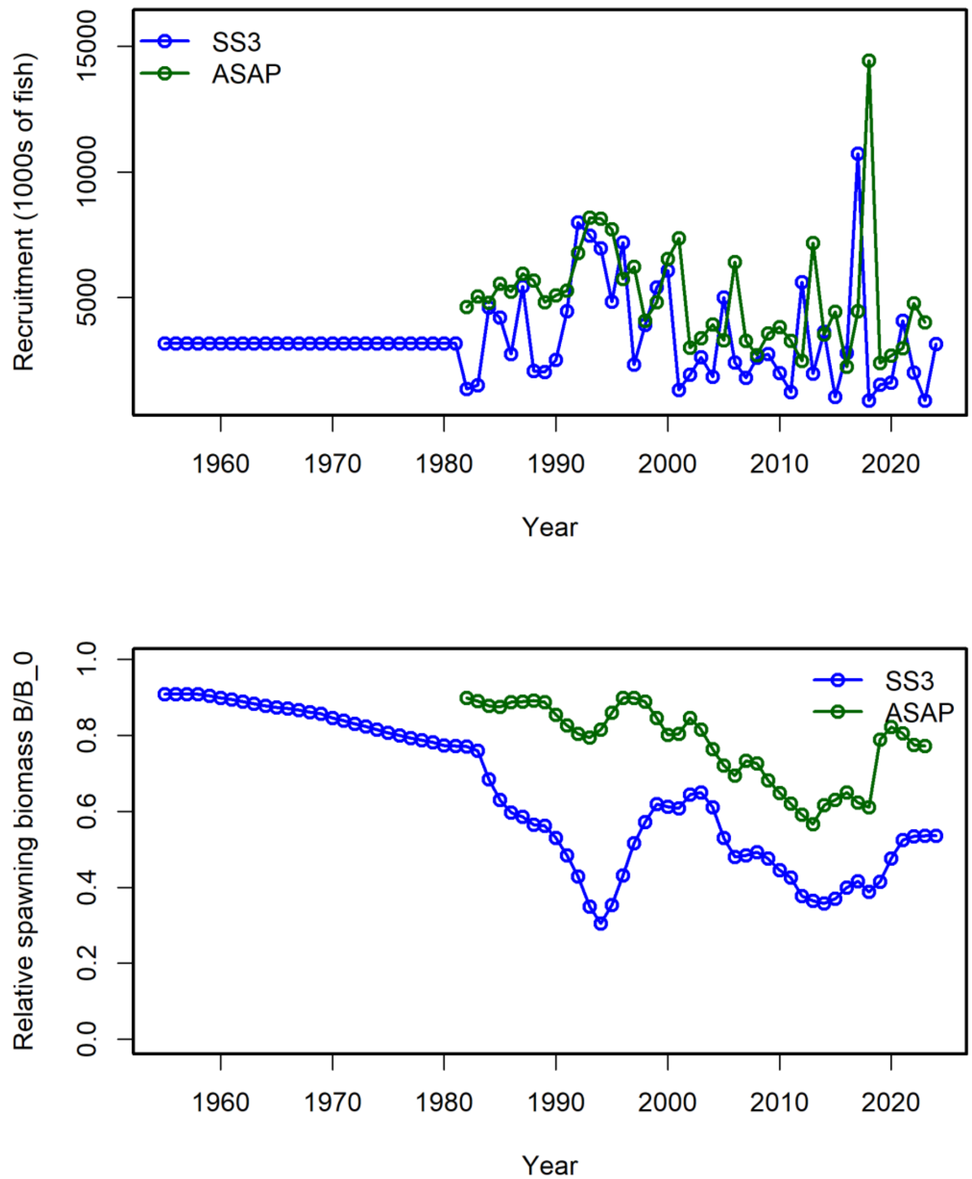
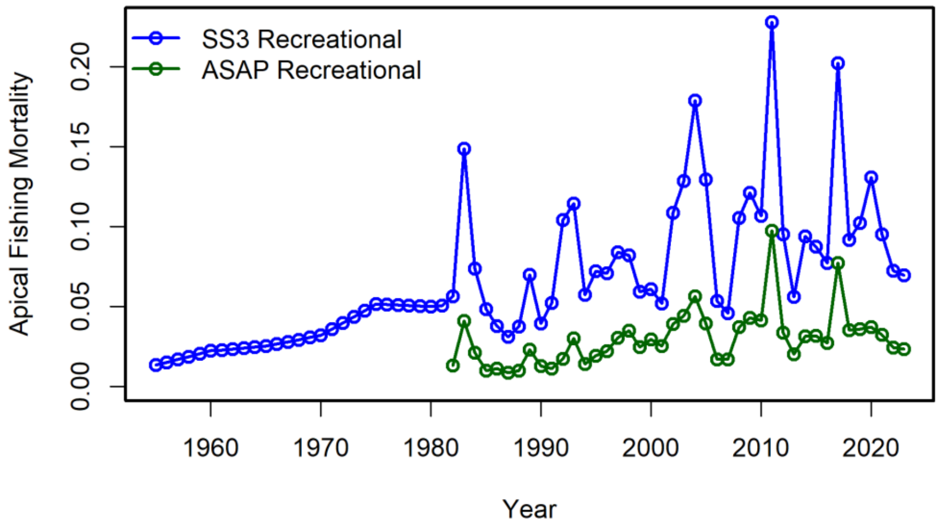


Figure 44: Comparison of the SS3 base model and the ASAP continuity model estimates of recruitment (age-0 in SS3 and age-1 in ASAP), relative spawning stock biomass, and fleet-specific apical fishing mortality rates.



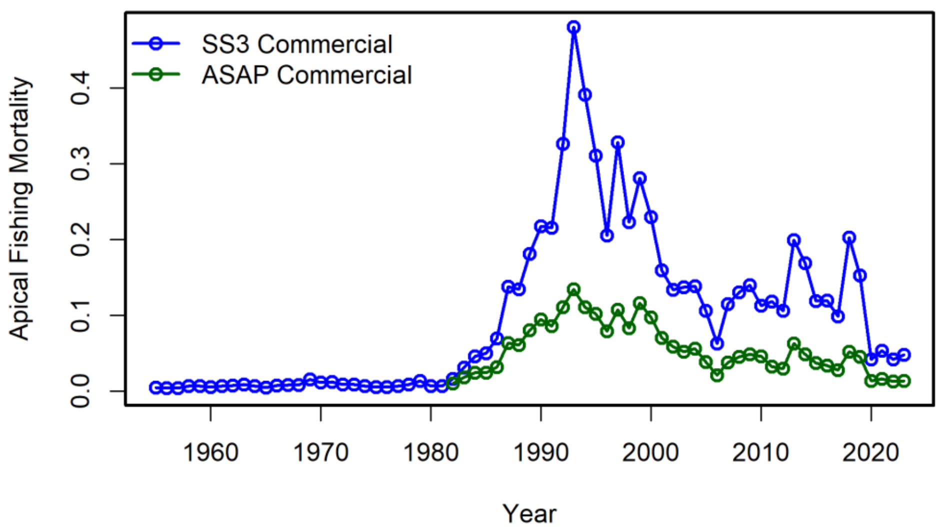


Figure 44 (continued):

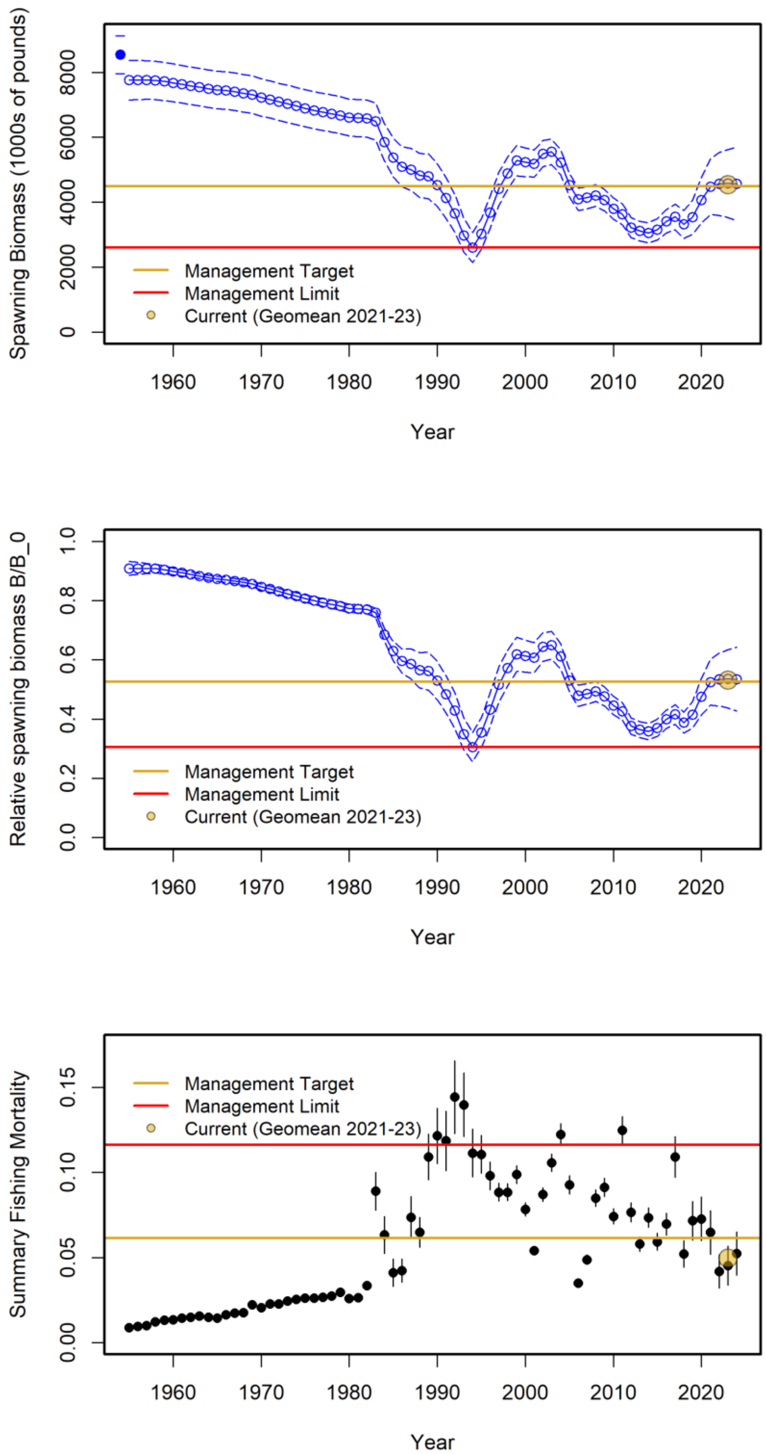


Figure 45: Time series of SS3 base model estimated spawning biomass, spawning potential ratio (relative SSB), and exploitation rates (summary F) relative to proposed limit and established target reference points. Current estimates represent the geometric mean of the 2021-2023 estimates.

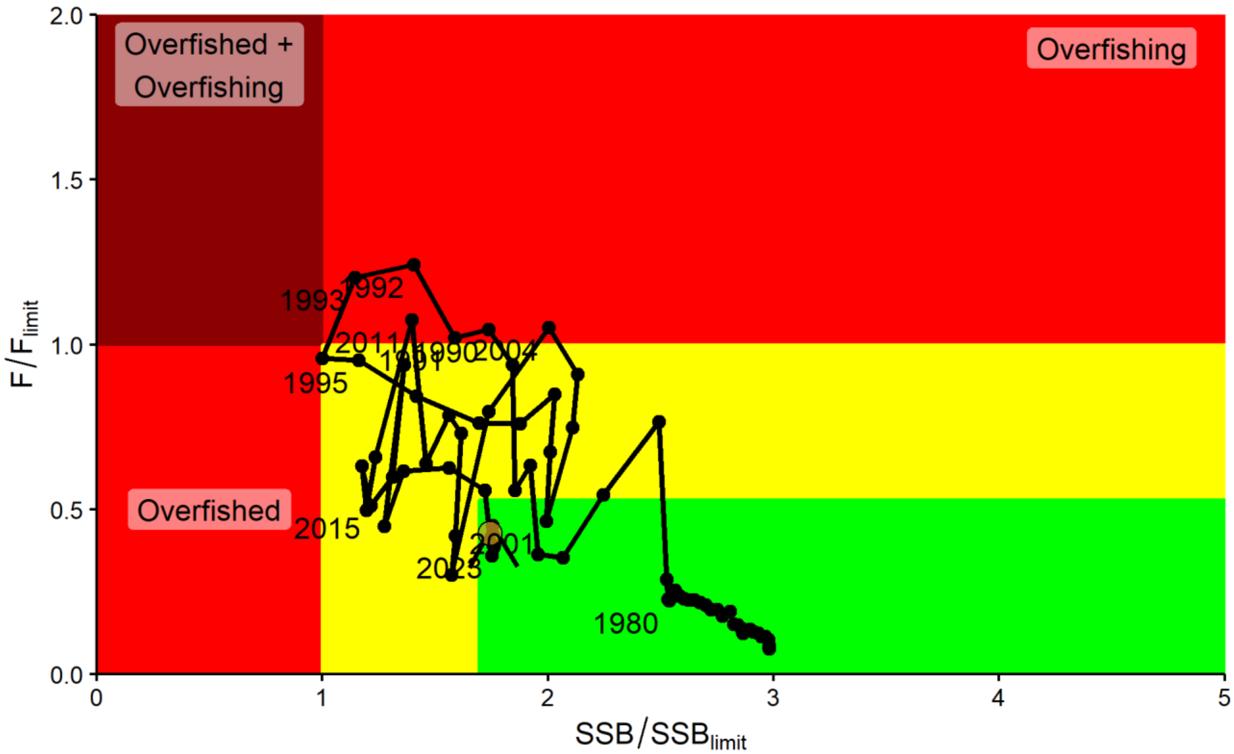


Figure 46: Kobe plot illustrating the trajectory of the stock relative to proposed limit and established reference points. The yellow circle represents current status (geometric mean 2021-2023).

Appendix 1:

LA Creel/MRIP Calibration Procedure

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Office of Fisheries
Louisiana Department of Wildlife and Fisheries
Updated 10/29/2020

Overview

The Louisiana Department of Wildlife and Fisheries (LDWF) conducts stock assessments on important recreationally and commercially landed species. Time-series of fishery removals are critical components of these stock assessments as they provide the level of depletion of the resource through time. Beginning in 2014, LDWF started its own creel survey (LA Creel) to provide recreational landings estimates for Louisiana-specific fishery management and stock assessment purposes. Prior to 2014 recreational landings estimates were taken from the National Marine Fisheries Service's Marine Recreational Intercept Program and the earlier Marine Recreational Fisheries Statistical Survey (MRIP/MRFSS). The MRIP and LA Creel surveys were conducted simultaneously in 2015 for benchmarking purposes. Methods are now needed to calibrate MRIP landings estimates to LA Creel landings estimates for species with upcoming LDWF stock assessments.

Abbreviations used in this document:

E - Fishing effort
FM - Fishing mode
- C - charter
- CI - charter inshore
- CO - charter offshore
- P - private
- PI - private inshore (LA Creel)
- PO - private offshore
- PR - private boat (MRIP)
- SH - shore (MRIP)

H - Harvest
HR - Harvest rate
D - Discards
DR – Discard rate
PSE - Percent standard error
R - Ratio
V - Variance
y – Year
w – Bimonthly period
wk – Week of year

Calibration Methodology

A ratio estimator approach is described below allowing hind-casting of LA Creel recreational harvest estimates to 1982. The calibration procedure to hind-cast LA Creel discard estimates is presented in the Appendix of this document. Concurrent harvest rate estimates of LA Creel and MRIP are only available for the single year (2015) both surveys were conducted simultaneously. Effort estimates, however, are available from both surveys for multiple years (2015-2017). The reliability of this calibration procedure could be greatly improved with more comparison years of the surveys.

Note: MRIP private fishing effort is distributed across the various fishing modes (shore, inshore, and offshore) by applying the observed distribution of those modes from the dockside survey. In 2016 and 2017, the MRIP effort estimation process required additional estimations, as the dockside portion of that survey was not conducted in Louisiana. NOAA Fisheries applied the proportions of trips by fishing mode observed in 2015 to the effort data collected in 2016 and 2017 to obtain estimates of angler trips by fishing mode. While this method is clearly not optimal, it does allow comparison of effort over additional years.

The LA Creel survey provides estimates for four fishing modes (FM): private inshore (PI), private offshore (PO), charter inshore (CI), and charter offshore (CO). The MRIP survey provides estimates for five fishing modes: private boat (PR), shore (SH), PO, CI, and CO. For calibration purposes, LA Creel estimates are transformed into a fifth fishing mode equivalent to the MRIP surveys SH mode by separating the PI mode into PR and SH modes. Additionally, the inshore/offshore fishing modes of each survey are collapsed into overall private (P) and charter (C) fishing modes for the species included in this report that support predominantly inshore fisheries.

Fishing effort (E) estimates of the two surveys are calibrated separately by collapsed fishing mode (P and SH only) and bimonthly period (w). Because the charter fishing effort frame used by the LA Creel and MRIP surveys are functionally equivalent, charter fishing effort and corresponding variance estimates of the two surveys are assumed equivalent and not adjusted. Harvest rates and corresponding variance estimates of the MRIP and LA Creel surveys for the species included in this report are also assumed equivalent and not adjusted. Calibrated effort estimates of the shore and private fishing modes are then combined with unadjusted MRIP harvest rate estimates to provide time-series of recreational harvest estimates for species with upcoming LDWF stock assessments as described below.

Fishing Effort

To allow hind-casting of LA Creel effort estimates to the historic MRIP effort time-series, fishing effort calibration factors are calculated as the ratio of mean fishing effort (2015-2017) from each survey by fishing mode (P and SH only) and bimonthly period as:

$$\hat{R}_{E,FM,w} = \frac{\bar{E}_{LAcreel,FM,w}}{\bar{E}_{MRIP,FM,w}} \qquad [1]$$

Note: MRIP effort estimates in Equation [1] are based on the FES and APAIS methodologies.

Survey-specific mean fishing effort (angler trips) and calibration factors for the P and SH fishing modes by bimonthly period are presented below.

FM	w	$\bar{E}_{LAcreel}$	$\bar{E}_{MRIP}$	$\hat{R}_E$
P	1	141,988	760,757	0.187
P	2	229,436	608,036	0.377
P	3	425,433	908,285	0.468
P	4	349,345	1,075,253	0.325
P	5	284,077	935,917	0.304
P	6	277,228	806,998	0.344
SH	1	50,377	753,943	0.067
SH	2	80,580	642,766	0.125
SH	3	151,142	897,938	0.168
SH	4	73,203	1,095,251	0.067
SH	5	105,286	1,228,032	0.086
SH	6	64,342	950,532	0.068

The hind-cast LA Creel fishing effort estimates (1982-2013) are then calculated by fishing mode and bimonthly period as:

$$\hat{E}_{y,w,FM,\hat{R}} = \hat{R}_{E,FM,w}\hat{E}_{y,w,FM,MRIP} \quad [2]$$

Note: MRIP effort estimates in Equation [2] have been calibrated to the FES and APAIS design changes (FCAL).

Variances of the hind-cast LA Creel fishing effort estimates from Equation [2] are approximated by fishing mode and bimonthly period as:

$$\hat{V}\left(\hat{E}_{y,w,FM,\hat{R}}\right) = \hat{E}^2_{y,w,FM,MRIP}\hat{V}\left(\hat{R}_{E,FM,w}\right) + \hat{R}^2_{E,FM,w}\hat{V}\left(\hat{E}_{y,w,FM,MRIP}\right) - \hat{V}\left(\hat{R}_{E,FM,w}\right)\hat{V}\left(\hat{E}_{y,w,FM,MRIP}\right) \quad [3]$$

where

$$\hat{V}\left(\hat{R}_{E,FM,w}\right) = \hat{R}_{E,FM,w}{}^2\left[\frac{\hat{V}(\bar{E}_{LAcreel,FM,w})}{\bar{E}_{LAcreel,FM,w}{}^2} + \frac{\hat{V}(\bar{E}_{MRIP,FM,w})}{\bar{E}_{MRIP,FM,w}{}^2}\right]$$

Harvest

The hind-cast LA Creel harvest estimates (1982-2013) by fishing mode (P and SH only) for the species included in this report are then calculated as:

$$\hat{H}_{y,FM,\hat{R}} = \sum_w \hat{E}_{y,w,FM,\hat{R}}\,\widehat{HR}_{y,w,FM,MRIP} \quad [4]$$

Note: MRIP harvest rate estimates in Equation [4] are FCAL estimates and represent A+ B1 landings only.

Variances of the calibrated harvest estimates are then calculated as:

$$\hat{V}\left(\hat{H}_{y,FM,\hat{R}}\right) = \sum_w \left[\hat{E}_{y,FM,w,\hat{R}}{}^2\hat{V}(\widehat{HR}_{y,FM,w,MRIP}) + \widehat{HR}_{y,FM,w,MRIP}{}^2\hat{V}\left(\hat{E}_{y,FM,w,\hat{R}}\right) - \hat{V}\left(\hat{E}_{y,FM,w,\hat{R}}\right)\hat{V}(\widehat{HR}_{y,FM,w,MRIP})\right] \quad [5]$$

Percent standard errors of the calibrated harvest estimates are then calculated as:

$$PSE\left(\hat{H}_{y,FM,\hat{R}}\right) = 100 \times \frac{\sqrt{\hat{V}\left(\hat{H}_{y,FM,\hat{R}}\right)}}{\hat{H}_{y,FM,\hat{R}}} \quad [6]$$

The MRIP (FCAL) and hind-cast LA Creel harvest estimate time-series and corresponding PSEs by fishing mode for species with upcoming LDWF stock assessments are presented belo

FM = Private

	Black Drum				Red Drum				Sheepshead				Southern Flounder				Spotted Seatrout			
	MRIP		LA Creel		MRIP		LA Creel		MRIP		LA Creel		MRIP		LA Creel		MRIP		LA Creel	
Year	Harvest	PSE	Harvest	PSE	Harvest	PSE	Harvest	PSE	Harvest	PSE	Harvest	PSE	Harvest	PSE	Harvest	PSE	Harvest	PSE	Harvest	PSE
1982	1,106,821	27.1	426,166	31.2	3,046,664	12.0	925,323	21.4	511,387	34.3	184,011	40.4	497,263	19.5	190,801	23.4	9,160,786	16.2	3,111,188	23.8
1983	1,659,509	34.3	595,673	38.8	4,758,470	32.7	1,542,955	41.7	1,064,824	38.1	334,974	43.8	1,929,817	51.4	610,002	58.6	7,402,179	20.0	2,660,990	25.0
1984	362,104	26.0	138,699	29.8	2,976,458	38.9	960,611	40.8	548,364	47.5	176,510	39.5	213,064	23.0	73,394	28.5	2,503,426	29.8	790,913	33.0
1985	356,406	30.0	115,179	34.5	2,563,074	14.5	865,588	21.9	340,142	32.1	114,127	35.8	431,284	24.5	150,115	27.3	5,947,072	15.2	2,109,649	22.2
1986	918,541	24.1	317,533	28.9	2,635,843	10.0	843,830	21.1	252,644	15.5	84,282	23.6	1,464,132	48.5	483,555	47.8	14,077,720	7.8	4,947,892	16.4
1987	683,049	25.6	237,415	30.7	2,602,974	23.0	876,900	30.6	270,702	33.7	87,926	33.0	147,601	25.2	52,016	27.6	11,023,715	10.1	4,035,139	15.6
1988	344,681	15.4	115,234	22.3	1,160,955	20.2	349,965	26.3	277,793	21.3	90,608	28.5	358,099	13.2	123,628	18.1	6,890,452	14.3	2,511,864	21.3
1989	227,336	20.4	76,002	25.3	2,015,801	12.6	676,453	24.5	789,892	49.3	254,087	50.2	341,489	25.9	111,900	29.0	8,082,318	11.9	2,753,203	18.0
1990	231,168	22.9	79,940	26.9	1,469,547	16.8	481,003	25.0	270,726	27.1	104,809	31.1	805,964	23.6	264,106	26.8	4,881,711	13.7	1,640,863	21.0
1991	183,005	19.4	62,265	26.3	1,824,768	20.0	582,125	33.1	402,935	32.6	138,862	35.4	694,466	16.1	248,442	20.6	13,468,560	9.9	4,744,596	18.2
1992	333,217	23.9	119,606	28.4	2,807,145	8.7	936,586	15.5	563,816	25.3	182,360	27.9	615,928	14.6	217,218	17.6	10,680,755	9.3	3,584,240	20.0
1993	246,588	17.6	88,970	24.2	2,581,130	9.9	880,530	16.3	885,380	26.7	320,661	35.5	500,023	14.8	175,907	18.0	7,757,436	12.1	2,655,102	18.2
1994	234,272	16.9	79,717	24.5	2,311,786	9.5	778,462	16.4	508,883	17.8	170,439	24.2	578,264	21.0	216,551	26.3	10,418,883	10.5	3,481,640	17.6
1995	335,507	18.4	109,385	22.1	3,842,177	8.7	1,269,660	19.6	920,809	20.4	274,232	26.3	398,528	14.0	146,807	19.4	12,135,672	13.2	3,937,329	27.0
1996	414,798	12.9	137,386	20.9	3,197,497	9.0	1,120,688	16.0	760,607	21.7	243,914	29.8	416,737	11.4	148,322	15.5	10,306,475	11.3	3,488,899	20.1
1997	477,705	16.1	161,196	20.3	2,861,918	9.6	987,223	16.3	1,005,406	18.2	318,972	22.9	445,579	11.7	155,574	18.2	10,415,118	11.9	3,599,696	17.9
1998	920,933	14.6	311,906	20.5	2,762,600	8.0	955,164	15.1	1,138,280	15.6	358,340	25.5	393,018	13.8	148,318	18.2	10,005,379	8.7	3,578,852	18.8
1999	681,905	11.9	236,111	18.6	3,459,681	6.9	1,208,361	14.4	793,093	16.2	246,697	26.4	758,946	10.4	272,110	16.0	14,037,235	8.5	4,731,081	18.3
2000	1,017,717	12.8	352,152	18.8	4,249,272	6.9	1,474,223	16.0	769,653	28.0	246,219	34.0	670,295	13.3	246,882	18.4	15,977,551	7.7	5,264,946	19.6
2001	765,815	13.7	259,288	20.5	4,322,843	7.7	1,456,752	14.4	567,945	15.8	193,751	22.4	427,914	12.2	155,260	16.0	12,618,114	8.0	4,269,752	15.9
2002	908,616	12.6	315,701	19.5	3,445,574	8.2	1,168,322	15.9	1,249,437	18.7	408,449	30.9	443,758	18.8	173,052	23.0	9,816,916	10.3	3,441,381	16.8
2003	659,209	14.7	229,521	22.3	2,977,090	7.4	1,014,320	17.2	1,257,175	23.2	396,409	28.7	647,034	15.7	250,097	18.7	10,528,223	9.6	3,662,095	20.0
2004	546,776	12.0	183,643	18.3	2,605,118	8.1	898,352	15.2	1,722,589	24.9	586,483	33.7	408,006	12.6	148,846	17.3	9,728,915	10.5	3,334,545	18.8
2005	461,775	13.0	156,509	21.3	2,236,920	9.4	772,472	15.8	962,130	23.6	302,340	30.7	286,521	12.9	108,654	15.8	10,699,116	8.5	3,616,229	17.8
2006	354,910	14.3	117,386	19.2	2,385,907	10.7	812,152	16.3	430,504	25.3	125,365	32.5	285,429	11.9	98,401	15.3	13,779,620	8.7	5,016,008	16.0
2007	415,104	15.7	142,698	18.7	3,049,990	8.3	1,045,909	15.6	320,952	21.9	95,855	25.9	355,606	19.0	123,052	23.8	11,790,003	8.3	3,967,935	18.2
2008	668,820	12.8	224,335	20.6	3,336,041	7.9	1,155,421	14.9	623,988	17.6	205,809	26.8	239,893	10.9	88,186	16.8	15,551,638	9.5	5,347,885	19.1
2009	908,297	13.6	308,638	19.6	3,414,547	8.2	1,187,696	16.4	1,055,358	22.6	315,386	32.0	398,573	14.6	140,011	19.7	15,667,348	8.8	5,452,613	16.8
2010	697,188	14.5	231,949	19.1	5,128,842	8.0	1,797,454	14.5	753,414	22.4	261,214	29.3	571,870	14.4	214,026	18.3	14,465,717	10.7	4,974,270	23.5
2011	679,614	15.1	232,721	20.6	4,548,266	8.3	1,584,573	14.9	1,425,042	35.5	525,042	44.9	544,173	14.7	198,755	17.6	17,697,003	9.6	5,977,076	18.1
2012	694,257	12.8	241,481	18.1	3,458,029	8.8	1,210,182	15.5	577,843	16.7	175,722	24.4	524,259	14.8	184,915	17.5	17,938,248	8.9	6,201,433	19.0
2013	528,084	14.3	172,534	20.4	4,523,043	8.7	1,512,033	15.4	311,155	16.9	95,381	24.0	930,394	13.1	317,618	25.0	12,928,606	9.4	4,374,563	17.4

FM = Shore

	Black Drum				Red Drum				Sheepshead				Southern Flounder				Spotted Seatrout			
	MRIP		LA Creel		MRIP		LA Creel		MRIP		LA Creel		MRIP		LA Creel		MRIP		LA Creel	
Year	Harvest	PSE	Harvest	PSE	Harvest	PSE	Harvest	PSE	Harvest	PSE	Harvest	PSE	Harvest	PSE	Harvest	PSE	Harvest	PSE	Harvest	PSE
1982	880,444	22.8	113,540	38.2	2,388,907	23.1	293,698	36.1	676,628	29.0	66,012	30.5	834,940	21.4	103,180	36.3	2,787,818	23.5	296,866	35.0
1983	500,922	29.9	62,566	38.0	1,351,640	25.0	123,385	34.4	2,326,172	25.9	276,981	40.7	327,205	34.7	31,100	37.4	2,927,094	47.2	258,452	45.3
1984	536,866	34.1	51,163	46.2	660,866	35.0	57,459	34.8	987,229	41.9	85,083	40.5	112,657	45.9	9,755	45.9	331,308	40.5	32,117	42.3
1985	181,986	27.0	16,397	32.7	618,693	30.8	46,417	33.4	656,976	30.2	51,856	35.9	284,046	29.1	23,081	33.1	500,629	27.9	43,400	33.5
1986	469,638	52.0	39,289	48.9	243,647	45.9	18,934	47.8	782,112	81.2	57,566	79.5	189,325	42.5	18,019	48.7	1,815,727	55.4	142,905	52.4
1987	260,971	52.0	26,358	51.9	665,407	54.3	49,467	55.0	65,880	46.2	4,878	52.4	185,090	37.3	14,954	38.7	965,130	44.3	112,992	58.7
1988	429,974	36.6	48,607	46.1	237,418	45.6	18,170	48.4	662,260	57.5	57,664	53.5	90,283	40.5	8,305	40.6	398,803	39.6	41,221	48.1
1989	484,955	58.2	47,183	67.1	472,062	35.4	45,444	43.7	179,471	40.2	16,156	43.5	127,388	33.6	12,077	38.8	402,794	68.4	30,056	67.0
1990	122,352	47.4	15,821	63.4	627,617	29.6	54,607	36.3	80,673	46.7	7,631	52.3	238,834	24.9	22,144	31.2	1,178,966	28.6	120,340	42.6
1991	80,287	38.8	7,830	45.0	497,827	35.7	39,572	39.7	109,726	43.1	8,166	45.0	617,776	26.6	69,562	37.3	1,611,329	29.8	190,451	48.5
1992	266,722	39.0	24,559	43.7	535,731	21.7	57,486	31.8	1,470,811	61.9	111,109	64.6	197,948	31.2	17,703	32.4	1,622,752	18.8	160,534	25.9
1993	332,409	38.4	32,083	46.0	1,058,829	26.2	102,231	30.1	438,233	37.3	34,539	38.3	152,286	34.8	14,994	35.2	1,262,891	19.3	139,848	32.3
1994	111,090	26.4	12,000	35.3	973,065	30.5	86,198	33.8	339,821	55.8	27,751	51.7	245,182	26.2	26,246	30.4	2,585,733	32.7	225,016	34.0
1995	122,762	40.4	10,791	37.0	747,219	23.9	61,587	28.3	338,135	43.2	33,177	41.4	56,558	30.7	5,970	40.2	1,432,447	21.4	141,769	30.2
1996	529,054	58.3	42,278	55.7	864,227	22.6	85,059	27.2	682,583	41.1	54,497	42.0	134,402	31.1	14,417	42.1	2,327,551	27.4	272,968	42.0
1997	123,564	39.8	14,500	55.8	347,632	21.5	33,897	27.2	283,171	25.4	28,012	31.1	307,330	23.1	31,614	33.0	1,905,584	21.5	196,046	32.0
1998	86,575	34.3	11,850	53.2	397,083	31.2	39,546	33.4	450,254	36.2	34,658	37.6	128,645	26.4	15,533	39.9	2,415,887	30.1	316,704	52.1
1999	385,329	39.6	34,484	42.0	492,350	25.7	58,215	38.6	202,445	35.8	17,647	34.4	641,276	32.9	57,671	36.5	3,530,688	27.9	302,816	33.9
2000	625,217	26.3	55,444	30.4	822,698	21.3	74,515	25.1	202,744	52.7	18,710	49.9	136,953	43.0	13,647	44.9	2,697,901	36.0	235,416	36.6
2001	675,474	30.1	74,021	37.8	621,324	23.2	56,647	29.7	399,908	49.4	46,027	53.6	305,296	67.4	40,328	72.5	2,657,545	28.5	284,780	35.3
2002	399,178	23.6	39,488	28.7	945,520	31.8	86,759	37.0	872,663	35.4	77,666	40.1	323,826	31.2	35,596	40.3	923,988	31.5	104,622	40.0
2003	288,546	23.4	29,030	28.5	280,366	33.2	26,439	34.2	983,844	36.8	108,655	37.5	199,400	38.3	17,629	37.0	945,730	42.3	70,559	43.3
2004	137,240	36.0	13,664	36.9	559,991	19.0	53,877	26.8	603,693	36.9	49,237	39.0	395,552	36.1	39,848	47.2	1,303,971	45.1	186,126	62.8
2005	138,758	28.0	13,443	36.2	704,981	30.9	57,698	36.6	563,322	29.6	52,206	36.7	450,207	38.7	35,117	45.5	632,798	30.7	54,561	34.2
2006	261,544	30.8	25,308	39.5	389,280	25.4	35,566	35.1	593,305	31.2	44,987	35.3	335,766	29.1	34,011	31.9	788,193	22.7	75,533	29.7
2007	286,213	35.5	28,210	37.6	187,726	25.1	17,832	35.4	257,091	36.2	27,901	42.7	348,752	28.0	38,995	36.9	771,812	27.5	84,196	35.4
2008	247,234	25.5	22,539	32.8	374,463	27.9	30,507	30.4	1,396,084	30.3	113,710	33.3	260,865	36.4	23,363	33.9	1,140,758	33.3	131,023	47.6
2009	100,842	26.9	10,221	33.5	123,122	28.0	12,120	33.8	523,105	46.9	62,220	56.4	470,681	44.6	39,588	45.3	611,298	25.2	62,519	33.2
2010	184,668	41.2	16,865	42.9	531,708	32.4	50,704	34.5	561,648	40.1	46,001	39.1	94,348	29.4	8,854	31.9	584,064	43.3	45,383	43.2
2011	380,669	21.7	36,537	27.0	983,461	22.1	96,717	27.3	1,318,064	44.8	124,632	55.1	430,717	40.0	39,973	40.9	651,281	27.8	67,792	37.1
2012	283,508	22.6	26,638	30.9	279,299	36.1	23,109	38.3	695,553	42.6	54,144	43.8	155,170	30.6	15,176	33.3	727,577	29.5	80,824	39.4
2013	471,823	13.0	36,871	21.6	849,762	9.3	80,731	27.2	659,450	12.4	48,095	25.1	573,922	18.3	51,029	30.3	2,682,372	11.4	241,359	21.8

Appendix (Discard Hindcast):

A ratio estimator approach is described below allowing hind-casting of LA Creel recreational discard estimates to 1982. Concurrent discard estimates of the LA Creel and MRIP surveys are not available.

Analogous to the procedure to hind-cast LA Creel harvest estimates, the hind-cast LA Creel effort estimates of the shore and private fishing modes are combined with unadjusted MRIP discard rate estimates to provide time-series of recreational discard estimates for species with upcoming LDWF stock assessments as described below. Discard estimates of the charter fishing mode for the LA Creel and MRIP surveys are assumed equivalent and not adjusted.

Discards (1982-2013)

The hind-cast LA Creel discard estimates (1982-2013) are calculated by collapsed fishing mode (P and SH only) and bimonthly period as:

$$\hat{D}_{y,FM,\hat{R}} = \sum_{w} \hat{E}_{y,w,FM,\hat{R}} \, \widehat{DR}_{y,w,FM,MRIP} \quad [1a]$$

Note: MRIP discard rate estimates in Equation [1a] are FCAL estimates and represent B2 landings only. The calibrated effort estimates are taken from Equation [2].

Variances of the calibrated discard estimates from Equation [1a] are then calculated as:

$$\hat{V}\left(\hat{D}_{y,FM,\hat{R}}\right) = \sum_{w} \left[\hat{E}_{y,FM,w,\hat{R}}^{\;2} \hat{V}(\widehat{DR}_{y,FM,w,MRIP}) + \widehat{DR}_{y,FM,w,MRIP}^{\;2} \hat{V}\left(\hat{E}_{y,FM,w,\hat{R}}\right) - \hat{V}\left(\hat{E}_{y,FM,w,\hat{R}}\right) \hat{V}(\widehat{DR}_{y,FM,w,MRIP}) \right] \quad [2a]$$

Percent standard errors of the calibrated discard estimates are then calculated as:

$$PSE\left(\hat{D}_{y,FM,\hat{R}}\right) = 100 \times \frac{\sqrt{\hat{V}\left(\hat{D}_{y,FM,\hat{R}}\right)}}{\hat{D}_{y,FM,\hat{R}}} \quad [3a]$$

Discards (2014-2016)

Discard estimates of the LA Creel survey are only available from week 19 of 2016 to present. Discard estimates prior to week 19 of 2016 are imputed by fishing mode (P, SH, and C) and week of year (wk) by calculating discard to harvest ratios from the LA Creel estimates from week 19 of 2016 to week 18 of 2017 as:

$$\hat{R}_{D/H,FM,wk} = \frac{\hat{D}_{LAcreel,FM,wk}}{\hat{H}_{LAcreel,FM,wk}} \quad [4a]$$

The imputed LA Creel discard estimates are then calculated by fishing mode from week 1 of 2014 to week 18 of 2016 as:

$$\hat{D}_{y,wk,FM,\hat{R}_{D/H}} = \hat{R}_{D/H,FM,wk} \hat{H}_{y,wk,FM,LAcreel} \quad [5a]$$

Variances of the imputed LA Creel discard estimates from Equation [5a] are approximated by fishing mode and week of year as:

$$\hat{V}\left(\hat{D}_{y,wk,FM,\hat{R}_{D/H}}\right) = \hat{H}^2_{y,wk,FM,LAcreel}\hat{V}\left(\hat{R}_{D/H,FM,wk}\right) + \hat{R}^2_{D/H,FM,wk}\hat{V}\left(\hat{H}_{y,wk,FM,LAcreel}\right) - \hat{V}\left(\hat{R}_{D/H,FM,wk}\right)\hat{V}\left(\hat{H}_{y,wk,FM,LAcreel}\right) \qquad [6a]$$

where

$$\hat{V}\left(\hat{R}_{D/H,FM,wk}\right) = \hat{R}_{D/H,FM,wk}{}^2\left[\frac{\hat{V}(\hat{D}_{LAcreel,FM,wk})}{\hat{D}_{LAcreel,FM,wk}{}^2} + \frac{\hat{V}(\hat{H}_{LAcreel,FM,wk})}{\hat{H}_{LAcreel,FM,wk}{}^2}\right]$$

The MRIP (FCAL) and hind-cast/imputed LA Creel discard estimate annual time-series and corresponding PSEs by fishing mode for species with upcoming LDWF stock assessments are presented below.

FM = Private

	Black Drum				Red Drum				Sheepshead				Southern Flounder				Spotted Seatrout			
	MRIP		LA Creel		MRIP		LA Creel		MRIP		LA Creel		MRIP		LA Creel		MRIP		LA Creel	
Year	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE
1982	818,734	54.5	345,860	60.5	274,870	40.0	94,664	41.5	515,459	44.8	200,681	47.1	1,083,668	45.5	415,439	50.2	1,654,868	35.7	609,681	39.2
1983	671,251	47.1	224,549	50.1	793,805	34.3	265,412	40.0	833,079	71.7	268,324	76.4	145,644	54.4	50,553	55.2	2,092,864	42.4	754,795	47.4
1984	284,254	68.2	93,240	65.6	346,317	56.3	111,489	56.2	309,986	35.6	93,467	45.2	65,411	64.9	21,520	65.9	197,040	21.8	64,439	30.9
1985	291,106	38.5	95,314	41.4	243,413	40.1	91,863	46.5	317,951	28.8	109,302	37.0	61,785	68.0	19,987	66.6	1,709,137	23.1	579,765	29.5
1986	448,236	20.4	152,135	27.7	451,777	15.3	162,385	19.5	393,569	19.8	127,427	29.5	367,830	40.1	162,331	43.1	4,745,760	10.2	1,630,190	19.8
1987	300,153	41.9	93,694	44.6	2,360,122	24.5	759,753	32.9	210,127	21.2	74,868	25.8	10,809	42.4	4,341	46.5	6,980,249	12.7	2,367,280	21.1
1988	350,541	21.1	118,251	29.1	3,062,822	16.2	1,010,542	22.4	398,058	25.6	135,054	32.6	375,399	58.9	119,109	60.9	5,610,284	10.4	2,077,053	16.1
1989	228,012	35.0	75,276	40.5	2,998,273	20.9	986,135	30.8	483,464	37.6	174,497	44.9	260,401	93.8	84,574	91.5	5,656,036	14.2	1,879,166	20.3
1990	653,511	28.7	214,860	36.2	1,880,922	19.7	575,989	24.4	408,363	25.1	146,133	30.3	334,821	40.3	107,726	42.4	4,750,794	18.0	1,566,570	24.0
1991	389,398	26.0	130,884	32.2	7,412,013	11.2	2,413,187	27.7	272,267	26.1	100,654	28.7	114,636	37.5	35,343	33.6	12,341,402	9.3	4,316,171	17.6
1992	559,417	33.2	179,758	38.0	5,753,237	9.1	1,845,345	17.5	440,289	16.8	142,247	23.5	42,988	21.4	14,876	24.2	8,795,484	8.4	2,994,762	16.4
1993	710,873	18.2	235,327	23.6	4,143,002	11.2	1,394,760	19.0	758,778	20.8	261,093	28.4	45,686	33.2	16,234	35.7	6,905,906	11.3	2,294,599	17.5
1994	440,825	29.8	144,491	33.2	4,086,816	12.5	1,292,596	19.6	608,190	19.3	200,928	25.0	34,050	29.6	11,832	31.0	7,780,829	9.7	2,545,253	17.4
1995	816,070	17.5	288,067	20.8	4,248,542	15.4	1,356,682	22.3	558,424	25.6	180,589	31.0	59,357	34.4	21,731	33.3	7,603,172	11.0	2,469,940	22.8
1996	525,560	20.4	180,919	27.4	3,312,106	11.9	1,066,067	18.3	878,282	23.1	280,982	30.9	80,897	23.0	28,339	27.1	8,055,743	10.2	2,790,011	17.6
1997	1,057,203	18.5	357,381	27.0	5,150,476	11.3	1,623,792	20.9	1,138,193	23.4	388,364	33.4	98,494	29.1	33,249	32.9	10,917,063	19.7	3,714,497	25.0
1998	1,439,547	24.7	488,061	28.2	5,753,271	10.8	1,852,465	18.5	1,056,926	17.9	341,063	28.4	99,007	29.1	32,096	32.3	9,977,400	9.3	3,525,435	17.2
1999	820,371	13.6	272,222	19.4	5,477,613	9.4	1,855,481	17.3	699,825	18.9	218,048	29.4	84,447	20.8	29,392	26.0	11,688,515	8.8	3,900,534	18.2
2000	1,833,450	16.2	636,903	21.0	6,018,948	8.2	2,015,680	18.4	586,993	21.9	204,594	28.9	121,790	28.3	37,513	29.7	11,091,619	7.9	3,696,143	17.1
2001	1,781,293	17.4	641,432	22.0	6,184,966	9.5	1,893,106	18.7	816,650	16.4	289,672	22.4	88,936	21.8	33,827	26.2	7,365,829	11.2	2,385,033	19.6
2002	1,670,431	17.1	549,754	23.8	6,266,166	10.8	2,051,328	21.1	854,311	17.0	278,770	22.5	90,982	26.1	32,596	28.9	6,778,238	11.5	2,325,982	18.2
2003	1,172,837	17.8	408,312	22.5	5,286,909	10.2	1,707,282	22.5	930,576	20.8	286,148	31.2	172,327	23.4	67,664	27.1	10,682,302	9.5	3,656,768	20.8
2004	1,155,649	17.0	384,622	24.5	3,841,642	10.1	1,251,295	17.5	701,938	19.9	253,961	27.9	149,844	27.6	53,175	29.8	9,847,326	11.5	3,329,014	17.7
2005	954,552	24.2	324,774	29.3	3,505,968	11.8	1,125,035	19.3	770,173	15.0	252,100	25.9	87,557	25.3	31,613	26.7	10,903,988	9.7	3,699,324	17.6
2006	699,933	16.3	227,542	20.8	4,124,647	11.7	1,352,670	19.7	616,668	30.1	179,470	34.3	41,784	27.7	14,147	30.4	11,930,250	9.1	4,253,200	16.1
2007	818,643	15.4	279,976	19.3	4,630,404	11.5	1,534,744	20.7	308,039	21.2	101,638	25.6	78,231	25.8	28,165	30.1	9,924,934	8.4	3,345,776	18.0
2008	1,320,182	14.8	447,658	22.4	5,074,358	8.1	1,704,655	15.5	609,401	23.6	193,005	30.6	50,063	26.0	17,325	28.4	13,158,192	9.4	4,628,268	17.0
2009	1,788,575	14.5	598,396	22.8	6,242,208	9.6	2,046,201	20.1	744,464	19.5	224,182	27.5	89,961	28.4	32,910	34.0	13,919,234	10.0	4,655,798	17.8
2010	1,813,254	14.9	636,963	18.6	7,335,948	10.2	2,585,291	15.8	711,836	21.9	248,894	26.2	111,912	23.5	40,129	23.3	9,190,616	12.6	3,180,901	22.2
2011	1,390,360	14.9	475,469	19.2	4,744,947	9.7	1,532,673	16.4	259,735	17.7	86,064	22.2	85,027	24.1	31,745	26.9	10,091,732	9.5	3,443,856	16.2
2012	1,136,427	13.3	373,501	18.6	5,374,152	8.9	1,776,461	17.9	422,968	13.4	136,234	19.8	152,363	24.3	53,417	25.2	13,175,745	8.7	4,524,702	18.2
2013	1,709,164	12.2	586,398	18.1	6,088,863	9.9	2,013,792	17.0	398,767	14.8	130,785	21.7	197,844	21.3	72,578	23.8	13,404,945	10.3	4,608,071	16.5
2014			330,955	24.0			1,609,006	11.8			148,454	38.3			44,345	56.6			2,316,191	11.3
2015			295,893	21.4			1,486,227	10.3			98,800	30.3			30,296	41.4			3,440,509	12.3
2016			161,733	21.0			1,096,370	6.4			47,135	25.6			29,612	24.3			3,643,636	8.6

FM = Shore

Year	Black Drum				Red Drum				Sheepshead				Southern Flounder				Spotted Seatrout			
	MRIP		LA Creel		MRIP		LA Creel		MRIP		LA Creel		MRIP		LA Creel		MRIP		LA Creel	
Year	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE
1982	149,995	64.4	19,897	80.7	364,343	26.2	52,316	41.6	89,674	57.7	11,246	70.6	128,975	30.5	15,915	45.2	386,524	48.1	49,802	62.2
1983	69,276	40.0	6,493	59.5	15,283	79.9	1,470	73.4	25,959	61.6	2,914	58.8					7,794	83.8	1,361	89.1
1984	285,887	32.0	20,494	39.5	83,103	84.6	5,758	89.8	12,248	103.2	2,139	105.1	3,384	99.3	319	100.5	59,529	52.1	4,864	50.1
1985	138,851	42.9	12,304	55.2	32,336	53.0	2,919	51.6	155,985	38.0	11,628	41.9	12,292	79.8	881	80.3	603,943	44.5	47,922	44.9
1986	107,212	49.6	7,822	51.3	19,379	65.3	1,723	60.3	473,615	72.5	34,777	72.6	11,853	75.8	1,010	78.1	267,044	41.3	22,713	38.7
1987	102,949	71.9	8,596	74.4	352,180	47.9	26,897	48.2	36,133	89.7	3,410	94.8	13,517	87.5	1,198	89.8	642,898	37.9	64,120	42.0
1988	185,774	51.5	16,072	60.9	329,574	30.8	28,447	35.6	116,937	36.7	10,973	40.9	7,726	52.0	616	56.8	205,385	41.4	24,387	50.9
1989	61,484	38.9	5,723	46.1	1,080,247	72.5	128,194	83.5	115,300	39.3	11,720	45.4	49,549	66.9	3,586	66.6	311,869	36.9	27,571	40.1
1990	96,587	44.0	13,477	59.9	327,612	37.7	28,235	45.2	18,485	89.3	1,318	92.6	783,955	82.6	72,564	86.6	736,838	34.5	65,803	38.9
1991	237,878	30.6	24,906	36.8	1,544,560	43.0	124,239	43.5	207,958	30.7	14,829	39.1	91,471	44.6	10,241	47.2	1,902,261	22.7	219,559	37.7
1992	860,902	31.0	76,139	32.3	1,833,394	25.8	167,249	28.7	514,453	32.0	41,930	37.4	49,674	57.6	4,587	56.0	1,468,815	20.7	142,809	28.3
1993	1,345,395	39.9	110,604	41.5	1,630,396	23.1	171,511	31.8	1,109,224	51.0	86,564	51.4	51,220	62.5	3,860	64.5	2,544,151	26.7	323,743	45.9
1994	947,564	31.5	99,539	33.8	2,220,435	25.8	190,194	29.9	690,548	35.8	54,745	36.3	27,765	64.3	2,143	65.9	2,280,973	19.3	214,069	27.3
1995	602,888	40.5	48,383	40.0	942,643	25.9	86,408	28.5	72,571	30.1	8,839	38.7	18,216	63.3	1,309	62.8	1,617,673	19.6	162,345	29.9
1996	493,436	28.1	52,883	32.7	1,516,179	39.1	120,897	39.3	295,818	49.5	24,464	47.5	123,621	57.8	16,558	74.1	2,271,614	31.3	308,086	52.8
1997	1,032,761	51.8	90,230	49.3	1,179,933	27.3	100,418	31.4	199,864	33.2	17,257	35.4	71,388	41.3	8,442	48.4	2,076,029	22.6	207,557	32.1
1998	1,033,214	43.8	84,752	44.3	2,262,074	26.0	204,593	31.1	207,500	34.3	20,284	40.9	39,280	40.3	3,276	42.0	1,721,873	25.1	220,941	47.8
1999	532,125	37.2	45,165	42.1	1,281,413	23.5	130,179	31.6	51,091	32.2	4,474	39.5	68,459	49.6	7,292	57.3	4,103,241	23.1	371,893	29.8
2000	955,854	28.8	73,538	36.4	1,948,980	22.8	182,824	29.6	265,642	61.1	21,463	56.0	24,518	50.4	2,069	53.3	2,552,559	34.6	207,540	35.3
2001	1,404,055	37.8	143,215	44.1	1,702,671	23.4	159,705	28.0	627,865	66.9	49,516	64.4	267,359	75.6	37,792	76.1	2,252,160	31.5	187,174	32.3
2002	559,039	30.6	45,914	33.0	1,187,635	24.6	99,572	27.3	192,094	28.9	16,154	33.4	132,712	47.7	11,419	48.6	1,035,758	30.9	94,081	34.7
2003	1,024,308	33.3	104,601	38.7	744,196	31.1	73,392	36.7	114,932	46.8	11,660	47.4	299,436	63.4	31,155	65.2	1,546,106	34.1	119,188	35.8
2004	477,328	44.0	37,608	44.0	944,587	31.1	83,721	31.6	83,683	37.1	9,645	45.2	24,033	55.8	1,683	59.3	1,547,223	44.2	179,206	58.2
2005	793,236	24.4	78,009	30.6	1,986,884	22.7	197,746	37.7	322,768	29.1	27,129	33.4	127,575	57.7	10,772	59.1	895,780	34.2	88,581	36.9
2006	1,085,517	44.4	94,206	40.6	2,355,407	21.3	246,212	35.5	670,528	47.6	51,507	48.7	109,904	38.3	14,722	53.3	1,144,271	28.0	114,481	33.4
2007	464,018	30.3	53,814	41.9	1,109,367	20.9	108,758	29.6	256,654	49.1	23,186	43.8	96,680	53.7	16,221	68.5	929,550	25.0	101,536	36.6
2008	901,587	24.4	79,859	28.4	1,912,635	19.8	158,866	23.6	248,799	29.8	18,285	34.4	12,748	60.9	1,302	65.4	1,377,270	27.7	120,320	31.0
2009	417,567	31.0	39,805	30.9	1,414,008	28.6	126,475	32.2	384,706	30.4	37,443	32.7	87,082	93.5	6,332	93.7	927,737	30.0	109,736	43.9
2010	572,004	29.7	56,545	30.2	1,506,818	23.6	154,439	35.8	583,189	30.2	46,495	32.6	74,678	40.5	7,726	48.6	828,375	54.9	63,464	53.8
2011	1,434,105	21.3	134,468	28.0	1,860,121	22.2	162,394	25.3	249,435	48.1	22,119	43.9	103,717	65.2	7,384	66.2	719,286	25.7	64,218	31.8
2012	1,263,476	24.4	132,282	31.2	977,186	35.2	90,057	34.4	175,964	43.2	13,443	45.1	52,159	45.4	6,074	56.4	674,174	31.1	75,140	37.8
2013	2,271,755	9.7	195,413	19.6	3,675,890	9.3	327,093	18.3	939,354	18.9	77,379	32.1	41,427	37.2	3,162	40.7	5,525,367	8.1	504,444	24.1
2014			79,920	38.8			375,249	12.4			51,901	55.7			9,346	53.3			594,294	15.1
2015			76,780	21.4			378,245	11.5			23,835	34.1			9,300	45.9			727,719	12.3
2016			50,106	21.9			275,986	8.7			24,951	66.9			9,495	37.5			892,875	11.4

FM = Charter

	Black Drum				Red Drum				Sheepshead				Southern Flounder				Spotted Seatrout			
	MRIP		LA Creel		MRIP		LA Creel		MRIP		LA Creel		MRIP		LA Creel		MRIP		LA Creel	
Year	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE	Discards	PSE
1982																	7,252	32.4		
1983													352	57.8			121,816	54.1		
1984	182	112.8							1,166	78.8							116	101.5		
1985									587	107.7							42,739	26.9		
1986					25	55.4			266	97.1							16,514	42.5		
1987	2,752	45.9			2,597	42.5			2,484	64.6							64,522	30.1		
1988	5	106.1			1,561	59.4											59,254	37.7		
1989	298	63.1			26,854	45.6			1,199	62.5			1,401	106.9			190,285	38.2		
1990	6,449	56.2			30,305	40.5			16,177	94.7			445	57.1			39,578	32.1		
1991	3,258	52.2			46,366	44.7			1,641	52.5			280	82.8			144,689	30.9		
1992	7,421	46.7			63,966	35.7			3,664	55.2			225	61.5			91,373	31.5		
1993	410	71.7			58,230	19.2											155,919	30.0		
1994	329	100.1			70,705	32.6			1,123	61.4							243,186	36.3		
1995	2,606	72.8			198,687	34.0			1,654	110.7							300,673	31.6		
1996	4,776	74.9			113,101	28.6			406	56.1			843	103.1			223,999	36.0		
1997	20,581	37.1			157,816	23.0			19,422	46.2			490	68.4			260,983	23.5		
1998	18,161	43.4			138,650	25.5			8,030	44.8			647	48.0			199,955	31.8		
1999	12,980	33.2			105,462	22.3			5,944	40.9			520	57.8			277,771	21.3		
2000	10,335	28.4			108,340	13.2			1,739	48.3			259	59.4			175,694	15.8		
2001	13,566	28.8			203,577	19.3			12,615	31.6			1,224	72.4			211,516	15.0		
2002	9,657	30.9			138,601	17.2			4,954	29.6			1,248	50.0			104,977	25.3		
2003	25,831	34.0			129,125	18.5			16,306	53.2			982	53.9			170,658	26.6		
2004	13,050	32.7			105,936	14.2			10,370	38.8			503	55.6			221,275	16.5		
2005	5,692	45.0			53,333	25.0			3,190	61.4							263,044	26.2		
2006	30,916	38.8			144,300	48.0			10,206	71.3							464,015	26.8		
2007	13,350	37.3			178,892	21.5			23,101	34.4			486	60.6			238,335	19.0		
2008	31,830	33.1			198,411	16.5			30,031	55.1			1,197	59.3			323,315	17.3		
2009	62,094	27.2			332,961	19.7			16,588	52.9			98	71.3			356,216	17.4		
2010	38,261	33.5			151,250	23.0			10,938	36.4			69	107.9			167,473	21.6		
2011	29,517	38.0			203,917	17.0			5,021	34.4			640	62.2			149,933	27.4		
2012	21,344	30.0			153,584	17.6			5,844	46.6			2,353	48.7			205,441	22.7		
2013	83,501	7.5			281,131	7.2			48,342	11.3			12,017	15.1			222,879	7.6		
2014			14,093	31.5			353,243	19.2			2,706	40.6			442	53.7			316,892	29.4
2015			14,464	32.7			403,525	14.1			16,575	50.0			553	46.7			413,119	18.4
2016			16,975	33.3			338,910	7.4			10,778	23.1			497	31.4			439,247	9.6

Appendix 2:

Starter:

```
#V3.30.20;_Stock_Synthesis_by_Richard_Methot_(NOAA)
#_File written by GUI version 3.30.20.0
#Stock Synthesis (SS) is a work of the U.S. Government and is not subject to copyright protection in the United States.
#Foreign copyrights may apply. See copyright.txt for more information.
#_user_support_available_at:NMFS.Stock.Synthesis@noaa.gov
#_user_info_available_at:https://vlab.noaa.gov/group/stock-synthesis
#C starter comment here
Sheepshead_dat.ss       # data file name
Sheepshead_ctl.ss       # control file name
0 # 0=use init values in control file; 1=use ss.par
0 # run display detail (0,1,2)
1 # detailed output (0=minimal for data-limited, 1=high (w/ wtatage.ss_new), 2=brief, 3=custom)
# custom report options: -100 to start with minimal; -101 to start with all; -number to remove, +number to add, -999 to end
0 # write 1st iteration details to echoinput.sso file (0,1)
0 # write parm values to ParmTrace.sso (0=no,1=good,active; 2=good,all; 3=every_iter,all_parms; 4=every,active)
0 # write to cumreport.sso (0=no,1=like&timeseries; 2=add survey fits)
0 # Include prior_like for non-estimated parameters (0,1)
1 # Use Soft Boundaries to aid convergence (0,1) (recommended)
#
2 # Number of datafiles to produce: 1st is input, 2nd is estimates, 3rd and higher are bootstrap
10 # Turn off estimation for parameters entering after this phase
#
0 # MCeval burn interval
1 # MCeval thin interval
0 # jitter initial parm value by this fraction
-1 # min yr for sdreport outputs (-1 for styr)
-1 # max yr for sdreport outputs (-1 for endyr+1; -2 for endyr+Nforecastyrs)
0 # N individual STD years
#vector of year values

0.0001 # final convergence criteria (e.g. 1.0e-04)
0 # retrospective year relative to end year (e.g. -4)
1 # min age for calc of summary biomass
1 # Depletion basis:  denom is: 0=skip; 1=rel X*SPB0; 2=rel SPBmsy; 3=rel X*SPB_styr; 4=rel X*SPB_endyr; values; >=11 invoke N multiyr (up to 9!) with 10's digit; >100 invokes log(ratio)
1 # Fraction (X) for Depletion denominator (e.g. 0.4)
4 # SPR_report_basis:  0=skip; 1=(1-SPR)/(1-SPR_tgt); 2=(1-SPR)/(1-SPR_MSY); 3=(1-SPR)/(1-SPR_Btarget); 4=rawSPR
2 # Annual_F_units: 0=skip; 1=exploitation(Bio); 2=exploitation(Num); 3=sum(Apical_F's); 4=true F for range of ages; 5=unweighted avg. F for range of ages
#COND 13 17 #_min and max age over which average F will be calculated with F_reporting=4 or 5 with F_reporting>3
0 # F_std_basis: 0=raw_annual_F; 1=F/Fspr; 2=F/Fmsy; 3=F/Fbtgt; where F means annual_F; values >=11 invoke N multiyr (up to 9!) with 10's digit; >100 invokes log(ratio)
1 # MCMC output detail: integer part (0=default; 1=adds obj func components); and decimal part (added to SR_LN(R0) on first call to mcmc)
0 # ALK tolerance (example 0.0001)
3.30 # check value for end of file and for version control
```

Forecast:

```
#V3.30.20;_Stock_Synthesis_by_Richard_Methot_(NOAA)
#_File written by GUI version 3.30.20.0
#Stock Synthesis (SS) is a work of the U.S. Government and is not subject to copyright protection in the United States.
#Foreign copyrights may apply. See copyright.txt for more information.
#_user_support_available_at:NMFS.Stock.Synthesis@noaa.gov
#_user_info_available_at:https://vlab.noaa.gov/group/stock-synthesis
#C generic forecast file
# for all year entries except rebuilder; enter either: actual year, -999 for styr, 0 for endyr, neg number for rel. endyr
1 # Benchmarks: 0=skip; 1=calc F_spr,F_btgt,F_msy; 2=calc F_spr,F_0.1,F_msy; 3=add F_BLimit
3 # Do_MSY: 1=set to F(SPR); 2=calc F(MSY); 3=set to F(Btgt) or F0.1; 4=set to F(endyr); 5=calc F(MEY)
0.2 # SPR target (e.g. 0.40)
0.2 # Biomass target (e.g. 0.40)
#_Bmark_years: beg_bio, end_bio, beg_selex, end_selex, beg_relF, end_relF, beg_recr_dist, end_recr_dist, beg_SRparm, end_SRparm (enter actual year, or values of 0 or -integer to be rel. endyr)
 2002 2023 2002 2023 2002 2023 1982 2023 1955 2023
#  2002 2022 2002 2022 2002 2022 1982 2022 1955 2022 #_after processing
# value <0 convert to endyr-value; except -999 converts to start_yr; must be >=start_yr and <=endyr
1 # Bmark_relF_Basis: 1 = use year range; 2 = set relF same as forecast below
#
0 # Forecast: -1=none; 0=simple_1yr; 1=F(SPR); 2=F(MSY) 3=F(Btgt) or F0.1; 4=Ave F (uses first-last relF yrs); 5=input annual F scalar
# where none and simple require no input after this line; simple sets forecast F same as end year F
1 # N forecast years
1 # Fmult (only used for Do_Forecast==5) such that apical_F(f)=Fmult*relF(f)
#_Fcast_years:  beg_selex, end_selex, beg_relF, end_relF, beg_mean recruits, end_recruits  (enter actual year, or values of 0 or -integer to be rel. endyr)
 2023 2023 2023 2023 1978 2023
#  2022 2022 2022 2022 1977 2022 #_after processing
0 # Forecast selectivity (0=fcast selex is mean from year range; 1=fcast selectivity from annual time-vary parms)
1 # Control rule method (0: none; 1: ramp does catch=f(SSB), buffer on F; 2: ramp does F=f(SSB), buffer on F; 3: ramp does catch=f(SSB), buffer on catch; 4: ramp does F=f(SSB), buffer on catch)
# values for top, bottom and buffer exist, but not used when Policy=0
0.4 # Control rule Biomass level for constant F (as frac of Bzero, e.g. 0.40); (Must be > the no F level below)
0.1 # Control rule Biomass level for no F (as frac of Bzero, e.g. 0.10)
0.75 # Buffer:  enter Control rule target as fraction of Flimit (e.g. 0.75), negative value invokes list of [year, scalar] with filling from year to YrMax
3 # N forecast loops (1=OFL only; 2=ABC; 3=get F from forecast ABC catch with allocations applied)
3 # First forecast loop with stochastic recruitment
```

```
0 # Forecast recruitment: 0=spawn_recr; 1=value*spawn_recr; 2=value*VirginRecr; 3=recent mean from yr range above (need to set phase to -1 in control to get constant recruitment in MCMC)
0 # value is multiplier of SRR
0 # Forecast loop control #5 (reserved for future bells&whistles)
2015 # FirstYear for caps and allocations (should be after years with fixed inputs)
0 # stddev of log(realized catch/target catch) in forecast (set value>0.0 to cause active impl_error)
0 # Do West Coast gfish rebuilder output (0/1)
2004 # Rebuilder: first year catch could have been set to zero (Ydecl)(-1 to set to 1999)
-1 # Rebuilder: year for current age structure (Yinit) (-1 to set to endyear+1)
1 # fleet relative F: 1=use first-last alloc year; 2=read seas, fleet, alloc list below
# Note that fleet allocation is used directly as average F if Do_Forecast=4
2 # basis for fcast catch tuning and for fcast catch caps and allocation  (2=deadbio; 3=retainbio; 5=deadnum; 6=retainnum)
# Conditional input if relative F choice = 2
# enter list of:  season,  fleet, relF; if used, terminate with season=-9999
#  -9999 1 0.0
# enter list of: fleet number, max annual catch for fleets with a max; terminate with fleet=-9999
-9999 -1
# enter list of area ID and max annual catch; terminate with area=-9999
-9999 -1
# enter list of fleet number and allocation group assignment, if any; terminate with fleet=-9999
-9999 -1
#_if N allocation groups >0, list year, allocation fraction for each group
# list sequentially because read values fill to end of N forecast
# terminate with -9999 in year field
# no allocation groups
2 # basis for input Fcast catch: -1=read basis with each obs; 2=dead catch; 3=retained catch; 99=input apical_F; NOTE: bio vs num based on fleet's catchunits
#enter list of Fcast catches or Fa; terminate with line having year=-9999
#_Yr Seas Fleet Catch(or_F)
-9999 1   1   0
#
999   # verify end of input
```

Data:

```
#V3.30.20;_Stock_Synthesis_by_Richard_Methot_(NOAA)
#_File written by GUI version 3.30.20.0
#Stock Synthesis (SS) is a work of the U.S. Government and is not subject to copyright protection in the United States.
#Foreign copyrights may apply. See copyright.txt for more information.
#_user_support_available_at:NMFS.Stock.Synthesis@noaa.gov
#_user_info_available_at:https://vlab.noaa.gov/group/stock-synthesis
#C data file for simple example
#_observed data:
#
1955 # StartYr
2023 # EndYr
1 # Nseas
 12 #_months/season
12 # Nsubseasons (even number, minimum is 2)
1 # spawn_month
-1 # Ngenders: 1, 2, -1  (use -1 for 1 sex setup with SSB multiplied by female_frac parameter)
10 # Nages=accumulator age, first age is always age 0
1 # Nareas
3 # Nfleets (including surveys)
#_fleet_type: 1=catch fleet; 2=bycatch only fleet; 3=survey; 4=ignore
#_sample_timing: -1 for fishing fleet to use season-long catch-at-age for observations, or 1 to use observation month;  (always 1 for surveys)
#_fleet_area:  area the fleet/survey operates in
#_units of catch:  1=bio; 2=num (ignored for surveys; their units read later)
#_catch_mult: 0=no; 1=yes
#_rows are fleets
#_fleet_type fishery_timing area catch_units need_catch_mult fleetname
 1 -1  1  2  0 FISHERY1 # 1
 1 -1  1  1  0 FISHERY2 # 2
 3  1  1  2  0 SURVEY1 # 3
#Bycatch_fleet_input_goes_next
#a:  fleet index
#b:  1=include dead bycatch in total dead catch for F0.1 and MSY optimizations and forecast ABC; 2=omit from total catch for these purposes (but still include the mortality)
#c:  1=Fmult scales with other fleets; 2=bycatch F constant at input value; 3=bycatch F from range of years
#d:  F or first year of range
#e:  last year of range
#f:  not used
# a   b   c   d   e   f
#_Catch data: yr, seas, fleet, catch, catch_se
#_catch_se:  standard error of log(catch)
#_NOTE:  catch data is ignored for survey fleets
-999      1         1         75.944    0.149
1955      1         1         67.633    0.1
1956      1         1         76.271    0.1
1957      1         1         84.910    0.1
1958      1         1         93.549    0.1
1959      1         1         102.187   0.1
1960      1         1         110.826   0.1
1961      1         1         113.292   0.1
1962      1         1         115.759   0.1
1963      1         1         118.226   0.1
1964      1         1         120.693   0.1
1965      1         1         123.160   0.1
1966      1         1         129.059   0.1
1967      1         1         134.958   0.1
1968      1         1         140.857   0.1
1969      1         1         146.755   0.1
1970      1         1         152.654   0.1
```

1971	1	1	169.604	0.1
1972	1	1	186.554	0.1
1973	1	1	203.503	0.1
1974	1	1	220.453	0.1
1975	1	1	237.402	0.1
1976	1	1	234.644	0.1
1977	1	1	231.885	0.1
1978	1	1	229.127	0.1
1979	1	1	226.368	0.1
1980	1	1	223.609	0.1
1981	1	1	226.714	0.1
1982	1	1	251.016	0.300
1983	1	1	608.954	0.295
1984	1	1	263.314	0.288
1985	1	1	168.635	0.262
1986	1	1	140.005	0.329
1987	1	1	117.728	0.266
1988	1	1	146.545	0.254
1989	1	1	265.657	0.440
1990	1	1	132.879	0.284
1991	1	1	154.096	0.316
1992	1	1	283.996	0.288
1993	1	1	338.842	0.294
1994	1	1	205.863	0.203
1995	1	1	305.771	0.212
1996	1	1	323.658	0.225
1997	1	1	408.143	0.191
1998	1	1	397.078	0.198
1999	1	1	269.940	0.201
2000	1	1	269.533	0.292
2001	1	1	243.731	0.188
2002	1	1	502.376	0.225
2003	1	1	523.140	0.207
2004	1	1	620.618	0.269
2005	1	1	391.488	0.215
2006	1	1	166.267	0.229
2007	1	1	152.329	0.189
2008	1	1	339.786	0.193
2009	1	1	360.808	0.233
2010	1	1	304.525	0.228
2011	1	1	604.239	0.345
2012	1	1	227.575	0.185
2013	1	1	144.338	0.175
2014	1	1	261.752	0.285
2015	1	1	257.835	0.080
2016	1	1	224.898	0.114
2017	1	1	552.381	0.404
2018	1	1	307.765	0.128
2019	1	1	399.492	0.097
2020	1	1	493.016	0.134
2021	1	1	324.641	0.084
2022	1	1	241.372	0.113
2023	1	1	231.926	0.101

-999	1	2	92.935		0.100
1955	1	2	103.600		0.050
1956	1	2	94.600		0.050
1957	1	2	81.900		0.050
1958	1	2	138.900		0.050
1959	1	2	146.100		0.050
1960	1	2	117.100		0.050
1961	1	2	144.600		0.050
1962	1	2	151.500		0.050
1963	1	2	177.100		0.050
1964	1	2	138.300		0.050
1965	1	2	103.600		0.050
1966	1	2	156.200		0.050
1967	1	2	170.100		0.050
1968	1	2	161.300		0.050
1969	1	2	312.600		0.050
1970	1	2	224.300		0.050
1971	1	2	239.400		0.050
1972	1	2	171.700		0.050
1973	1	2	169.500		0.050
1974	1	2	136.400		0.050
1975	1	2	100.800		0.050
1976	1	2	101.700		0.050
1977	1	2	133.000		0.050
1978	1	2	166.217		0.050
1979	1	2	249.495		0.050
1980	1	2	126.989		0.050
1981	1	2	129.610		0.050
1982	1	2	296.758		0.050
1983	1	2	543.416		0.050
1984	1	2	716.686		0.050
1985	1	2	719.936		0.050
1986	1	2	962.698		0.050
1987	1	2	1917.953	0.050	
1988	1	2	1848.679	0.050	
1989	1	2	2450.139	0.050	
1990	1	2	2767.046	0.050	
1991	1	2	2425.138	0.050	
1992	1	2	3063.942	0.050	
1993	1	2	3763.796	0.050	

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1994      1         2         3289.426  0.050
1995      1         2         3266.482  0.050
1996      1         2         2639.256  0.050
1997      1         2         3114.532  0.050
1998      1         2         2371.614  0.050
1999      1         2         3201.529  0.050
2000      1         2         2594.883  0.050
2001      1         2         1803.632  0.050
2002      1         2         1583.356  0.050
2003      1         2         1637.943  0.050
2004      1         2         1519.005  0.050
2005      1         2         1022.215  0.050
2006      1         2         566.598             0.050
2007      1         2         1024.219  0.050
2008      1         2         1170.397  0.050
2009      1         2         1213.886  0.050
2010      1         2         923.827             0.050
2011      1         2         884.606             0.050
2012      1         2         737.290             0.050
2013      1         2         1326.237  0.050
2014      1         2         1085.300  0.050
2015      1         2         823.235             0.050
2016      1         2         895.788             0.050
2017      1         2         748.059             0.050
2018      1         2         1429.166  0.050
2019      1         2         1138.209  0.050
2020      1         2         384.999             0.050
2021      1         2         541.236             0.050
2022      1         2         432.843             0.050
2023      1         2         481.255             0.050

-9999 0 0 0 0
#
 #_CPUE_and_surveyabundance_observations
#_Units:  0=numbers; 1=biomass; 2=F; 30=spawnbio; 31=recdev; 32=spawnbio*recdev; 33=recruitment; 34=depletion(&see Qsetup);
35=parm_dev(&see Qsetup)
#_Errtype:  -1=normal; 0=lognormal; >0=T
#_SD_Report: 0=no sdreport; 1=enable sdreport
#_Fleet Units Errtype SD_Report
1 2 -1 0 # FISHERY1
2 2 -1 0 # FISHERY2
3 0 0 0 # SURVEY1
#_yr month fleet obs stderr
1985      12.99     3         1.042     0.543
1986      12.99     3         1.372     0.497
1987      12.99     3         1.133     0.465
1988      12.99     3         0.931     0.470
1989      12.99     3         0.458     0.511
1990      12.99     3         1.030     0.460
1991      12.99     3         0.657     0.480
1992      12.99     3         1.047     0.451
1993      12.99     3         0.920     0.480
1994      12.99     3         1.192     0.451
1995      12.99     3         1.281     0.447
1996      12.99     3         1.169     0.472
1997      12.99     3         0.889     0.478
1998      12.99     3         0.861     0.483
1999      12.99     3         1.164     0.466
2000      12.99     3         1.237     0.467
2001      12.99     3         1.245     0.471
2002      12.99     3         1.443     0.439
2003      12.99     3         1.026     0.452
2004      12.99     3         1.359     0.437
2005      12.99     3         1.191     0.461
2006      12.99     3         1.239     0.436
2007      12.99     3         0.662     0.480
2008      12.99     3         0.708     0.482
2009      12.99     3         0.832     0.480
2010      12.99     3         0.724     0.459
2011      12.99     3         0.527     0.458
2012      12.99     3         0.662     0.446
2013      12.99     3         1.819     0.445
2014      12.99     3         1.084     0.457
2015      12.99     3         0.881     0.473
2016      12.99     3         1.572     0.456
2017      12.99     3         2.181     0.401
2018      12.99     3         0.848     0.466
2019      12.99     3         0.547     0.479
2020      12.99     3         0.876     0.465
2021      12.99     3         0.405     0.507
2022      12.99     3         0.407     0.510
2023      12.99     3         0.380     0.523

2005      7         2         1.27535647          0.1
2006      7         2         0.852623083         0.1
2007      7         2         1.347430724         0.1
2008      7         2         1.186924939         0.1
2009      7         2         1.291202583         0.1
2010      7         2         0.918052193         0.1
2011      7         2         1.18079096          0.1
2012      7         2         1.251331719         0.1
2013      7         2         1.280468119         0.1
2014      7         2         1.074468658         0.1
2015      7         2         1.193570083         0.1
2016      7         2         1.075490987         0.1
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2017      7         2         1.134786118        0.1
2018      7         2         0.983481302        0.1
2019      7         2         1.184369115        0.1
2020      7         2         0.453914447        0.1
2021      7         2         0.433979015        0.1
2022      7         2         0.4385795 0.1
2023      7         2         0.443179984        0.1


-9999 1 1 1 1 # terminator for survey observations
#
1 #_N_fleets_with_discard
#_discard_units (1=same_as_catchunits(bio/num); 2=fraction; 3=numbers)
#_discard_errtype:  >0 for DF of T-dist(read CV below); 0 for normal with CV; -1 for normal with se; -2 for lognormal; -3 for trunc normal with CV
# note: only enter units and errtype for fleets with discard
# note: discard data is the total for an entire season, so input of month here must be to a month in that season
#_Fleet units errtype
1 1 -2 # FISHERY1
#_yr month fleet obs stderr
1982      7         1         214.902   0.440
1983      7         1         286.203   0.672
1984      7         1         98.460    0.410
1985      7         1         123.522   0.300
1986      7         1         160.881   0.249
1987      7         1         77.956    0.241
1988      7         1         140.262   0.277
1989      7         1         180.080   0.381
1990      7         1         159.690   0.269
1991      7         1         118.040   0.259
1992      7         1         182.843   0.185
1993      7         1         340.315   0.235
1994      7         1         255.914   0.203
1995      7         1         192.113   0.282
1996      7         1         304.864   0.261
1997      7         1         434.933   0.272
1998      7         1         372.394   0.226
1999      7         1         230.750   0.239
2000      7         1         223.897   0.239
2001      7         1         349.857   0.196
2002      7         1         293.345   0.188
2003      7         1         316.476   0.244
2004      7         1         271.307   0.232
2005      7         1         283.591   0.197
2006      7         1         236.627   0.251
2007      7         1         145.849   0.191
2008      7         1         243.123   0.234
2009      7         1         273.746   0.198
2010      7         1         301.756   0.220
2011      7         1         111.804   0.184
2012      7         1         153.727   0.167
2013      7         1         252.568   0.145
2014      7         1         203.061   0.307
2015      7         1         139.210   0.227
2016      7         1         82.864    0.247
2017      7         1         86.406    0.135
2018      7         1         246.853   0.264
2019      7         1         169.375   0.110
2020      7         1         110.063   0.102
2021      7         1         36.629    0.136
2022      7         1         65.971    0.201
2023      7         1         62.262    0.143

-9999 0 0 0.0 0.0 # terminator for discard data
#
0 # use meanbodysize_data (0/1)
#_COND_0 #_DF_for_meanbodysize_T-distribution_like
# note:  type=1 for mean length; type=2 for mean body weight
#_yr month fleet part type obs stderr
# -9999 0 0 0 0 0 0 # terminator for mean body size data
#
# set up population length bin structure (note - irrelevant if not using size data and using empirical wtatage
2 # length bin method: 1=use databins; 2=generate from binwidth,min,max below; 3=read vector
1 # binwidth for population size comp
0 # minimum size in the population (lower edge of first bin and size at age 0.00)
30 # maximum size in the population (lower edge of last bin)
1 # use length composition data (0/1)
#_mintailcomp: upper and lower distribution for females and males separately are accumulated until exceeding this level.
#_addtocomp:  after accumulation of tails; this value added to all bins
#_combM+F: males and females treated as combined gender below this bin number
#_compressbins: accumulate upper tail by this number of bins; acts simultaneous with mintailcomp; set=0 for no forced accumulation
#_Comp_Error:  0=multinomial, 1=dirichlet
#_ParmSelect:  parm number for dirichlet
#_minsamplesize: minimum sample size; set to 1 to match 3.24, minimum value is 0.001
#
#_mintailcomp addtocomp combM+F CompressBins CompError ParmSelect minsamplesize
  0.001   1e-03     0         0                   1         1                   1 #_fleet:1_FISHERY1
  0.001   1e-03     0         0                   1         2                   1 #_fleet:2_FISHERY2
  0.001   1e-03     0         0                   1         3                   1 #_fleet:3_SURVEY1
# sex codes:  0=combined; 1=use female only; 2=use male only; 3=use both as joint sexxlength distribution
# partition codes:  (0=combined; 1=discard; 2=retained
31 # N_LengthBins; then enter lower edge of each length bin
 0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
#_yr month fleet sex part Nsamp datavector(female-male)
```

1982	7	1	0	2	216	0	0	0	0	0	0	0
	0.0173	0.0442	0.0674	0.1232	0.0908	0.0511	0.3156	0.0625	0.1357	0.0144	0.0263	0.0316
	0.0031	0.0105	0.0064	0	0	0	0	0	0	0	0	0
1983	7	1	0	2	299	0	0	0	0	0	0	0.0139
	0	0.0893	0.0365	0.0748	0.1131	0.1149	0.1505	0.0307	0.0805	0.0539	0.0534	0.0366
	0.0443	0.0655	0.0299	0.0098	0	0.0025	0	0	0	0	0	0
1984	7	1	0	2	173	0	0	0	0	0	0	0
	0	0.0156	0.0141	0	0.0324	0.0692	0.1585	0.2480	0.0733	0.0804	0.0434	0.0461
	0.1706	0.0415	0.0070	0	0	0	0	0	0	0	0	0
1985	7	1	0	2	234	0	0	0	0	0	0	0.0365
	0.0083	0.0358	0.0597	0.0960	0.0122	0.1018	0.0600	0.2318	0.0800	0.1589	0.0486	0.0251
	0.0269	0.0132	0.0052	0	0	0	0	0	0	0	0	0
1986	7	1	0	2	396	0	0	0	0	0	0	0.0133
	0.0008	0.0014	0.0043	0.1760	0.1131	0.0123	0.1621	0.1158	0.0969	0.1850	0.0782	0.0220
	0.0041	0.0078	0.0052	0.0017	0	0	0	0	0	0	0	0
1987	7	1	0	2	186	0	0	0	0	0	0	0.0157
	0.0276	0.0693	0.0172	0.0414	0.0872	0.0537	0.1383	0.1039	0.1096	0.1351	0.1359	0.0302
	0.0217	0.0130	0	0	0	0	0	0	0	0	0	0
1988	7	1	0	2	292	0	0	0	0	0	0	0
	0	0.0690	0.2073	0.1273	0.0460	0.0191	0.0721	0.0980	0.1424	0.1031	0.0340	0.0580
	0.0048	0.0151	0	0.0032	0	0	0	0	0.0006	0	0	0
1989	7	1	0	2	165	0	0	0	0	0	0	0
	0	0.0119	0.0175	0.0182	0.0159	0.1012	0.1159	0.1302	0.1339	0.0985	0.1192	0.1190
	0.0046	0.1120	0.0006	0.0014	0	0	0	0	0	0	0	0
1990	7	1	0	2	143	0	0	0	0	0	0	0
	0	0	0.0275	0.0306	0.1006	0.0997	0.1142	0.0817	0.1292	0.0861	0.1431	0.0912
	0.0176	0.0640	0.0144	0	0	0	0	0	0	0	0	0
1991	7	1	0	2	179	0	0	0	0	0	0	0
	0	0.0063	0.0134	0.0466	0.2598	0.0680	0.0765	0.1012	0.0647	0.1695	0.1191	0.0257
	0.0222	0.0180	0.0076	0.0014	0	0	0	0	0	0	0	0
1992	7	1	0	2	604	0	0	0	0	0	0	0.1931
	0.2181	0.0840	0.0326	0.1257	0.0628	0.0143	0.0307	0.0526	0.0240	0.0305	0.0403	0.0225
	0.0259	0.0253	0.0088	0.0058	0	0.0006	0.0024	0	0	0	0	0
1993	7	1	0	2	390	0	0	0	0	0	0	0.0066
	0.0583	0.0210	0.0315	0.0660	0.0795	0.0712	0.1252	0.0653	0.0736	0.1115	0.1053	0.0646
	0.0774	0.0275	0.0111	0.0039	0.0005	0	0	0	0	0	0	0
1994	7	1	0	2	403	0	0	0	0	0	0	0.0204
	0.0103	0.0260	0.0579	0.1225	0.0662	0.2021	0.1709	0.1115	0.0659	0.0767	0.0186	0.0241
	0.0048	0.0027	0.0068	0.0010	0	0.0016	0.0099	0	0	0	0	0
1995	7	1	0	2	503	0	0	0	0	0	0.0013	0.0152
	0.0137	0.0007	0.0415	0.0789	0.1155	0.1314	0.1149	0.1849	0.1122	0.1054	0.0182	0.0225
	0.0112	0.0111	0.0094	0.0110	0.0011	0	0	0	0	0	0	0
1996	7	1	0	2	571	0	0	0	0	0	0	0
	0.0038	0.0212	0.0583	0.0836	0.1277	0.0472	0.0710	0.1670	0.1623	0.1056	0.0796	0.0437
	0.0164	0.0042	0.0058	0.0023	0.0003	0	0	0	0	0	0	0
1997	7	1	0	2	731	0	0	0	0	0	0	0
	0.0102	0.0293	0.0155	0.0562	0.0326	0.1092	0.1177	0.1370	0.1636	0.1102	0.1072	0.0628
	0.0294	0.0066	0.0063	0.0025	0	0	0.0036	0	0	0	0	0
1998	7	1	0	2	738	0	0	0	0	0	0	0
	0	0.0030	0	0.0027	0.0153	0.0542	0.0635	0.1246	0.1400	0.1744	0.1656	0.1238
	0.0639	0.0568	0.0083	0.0029	0	0.0010	0	0	0	0	0	0
1999	7	1	0	2	582	0	0	0	0	0	0	0
	0.0044	0.0036	0.0118	0.0054	0.0404	0.0511	0.0529	0.1186	0.1675	0.1892	0.1535	0.0698
	0.0757	0.0246	0.0154	0.0141	0.0013	0.0000	0	0.0008	0	0	0	0
2000	7	1	0	2	398	0	0	0	0	0	0	0
	0	0	0	0.0138	0.0529	0.0906	0.1652	0.0736	0.1299	0.1256	0.1262	0.0935
	0.0587	0.0544	0.0020	0.0001	0.0061	0.0001	0	0	0.0073	0	0	0
2001	7	1	0	2	423	0	0	0	0	0	0	0
	0	0.0058	0.0088	0.0268	0.0167	0.0631	0.0560	0.1334	0.0308	0.0860	0.1765	0.1261
	0.1323	0.0339	0.0717	0.0258	0.0050	0	0.0012	0	0	0	0	0
2002	7	1	0	2	824	0	0	0	0	0	0	0
	0	0.0044	0.0066	0.0136	0.0738	0.0685	0.1498	0.1358	0.1348	0.1720	0.0980	0.0944
	0.0402	0.0041	0.0026	0.0001	0.0013	0	0	0	0	0	0	0
2003	7	1	0	2	803	0	0	0	0	0	0	0
	0	0.0046	0.0093	0.0290	0.0437	0.1031	0.1445	0.1081	0.1162	0.0714	0.1409	0.1432
	0.0599	0.0064	0.0102	0.0094	0	0	0	0	0	0	0	0
2004	7	1	0	2	945	0	0	0	0	0	0	0.0063
	0	0.0015	0.0140	0.0388	0.0161	0.0199	0.0964	0.1578	0.1137	0.2045	0.1477	0.0913
	0.0480	0.0271	0.0137	0.0004	0	0.0016	0.0014	0	0	0	0	0
2005	7	1	0	2	884	0	0	0	0	0	0	0.0003
	0.0205	0.0037	0.0171	0.0499	0.0406	0.0630	0.0714	0.1063	0.0610	0.1272	0.1723	0.1875
	0.0425	0.0099	0.0093	0.0025	0.0149	0	0	0	0	0	0	0
2006	7	1	0	2	469	0	0	0	0	0	0	0
	0	0	0.1068	0.0857	0.0518	0.0844	0.0738	0.1006	0.0755	0.1435	0.1917	0.0361
	0.0210	0.0044	0.0127	0.0010	0.0094	0.0016	0	0	0	0	0	0
2007	7	1	0	2	425	0	0	0	0	0	0	0
	0	0.0109	0.0893	0.0381	0.0413	0.0833	0.0350	0.1100	0.0858	0.0977	0.1082	0.1429
	0.0631	0.0450	0.0461	0.0028	0.0004	0	0	0	0	0	0	0
2008	7	1	0	2	702	0	0	0	0	0	0.0039	0
	0	0.0007	0.0000	0.0395	0.0420	0.0883	0.0983	0.2811	0.0853	0.0822	0.0703	0.0793
	0.0628	0.0531	0.0113	0.0008	0.0010	0	0	0	0	0	0	0
2009	7	1	0	2	703	0	0	0	0	0	0	0.0024
	0	0.0037	0.0036	0.0201	0.0189	0.0469	0.1225	0.0876	0.1139	0.1244	0.1778	0.1812
	0.0571	0.0133	0.0076	0.0124	0.0035	0.0029	0	0	0	0	0	0
2010	7	1	0	2	553	0	0	0	0	0	0	0
	0	0.0089	0.0285	0.1133	0.1127	0.0387	0.0359	0.0696	0.1006	0.0801	0.0578	0.1134
	0.1817	0.0172	0.0299	0.0053	0.0050	0.0012	0	0	0	0	0	0
2011	7	1	0	2	636	0	0	0	0	0	0	0
	0	0	0.0279	0.0405	0.0369	0.0256	0.0873	0.0462	0.0391	0.1904	0.0923	0.1349
	0.2179	0.0547	0.0023	0.0032	0	0.0008	0	0	0	0	0	0
2012	7	1	0	2	611	0	0	0	0	0	0	0
	0	0	0.0158	0.0117	0.0654	0.0862	0.1054	0.0967	0.0962	0.1355	0.1303	0.0624
	0.1530	0.0121	0.0110	0.0185	0	0	0	0	0	0	0	0

2013	7	1	0	2	357	0	0	0	0	0	0	0
	0	0.0054	0.0047	0.0016	0.1050	0.0536	0.0721	0.1652	0.1503	0.1382	0.0680	0.0586
	0.1423	0.0352	0	0	0	0	0	0	0	0	0	0
2014	7	1	0	2	444	0	0	0	0	0	0	0
	0	0	0.0264	0.0399	0.0705	0.0917	0.1014	0.0912	0.1020	0.1429	0.1042	0.1116
	0.0613	0.0377	0.0077	0.0092	0.0023	0	0	0	0	0	0	0
2015	7	1	0	2	391	0	0	0	0	0	0	0
	0	0	0.0016	0.0113	0.0137	0.0251	0.0397	0.1195	0.0821	0.1331	0.1411	0.1790
	0.1590	0.0440	0.0181	0.0267	0.0060	0	0	0	0	0	0	0
2016	7	1	0	2	384	0	0	0	0	0	0	0
	0	0	0.0006	0.0093	0.0223	0.0190	0.0564	0.0656	0.0916	0.1726	0.1787	0.1650
	0.1091	0.0670	0.0279	0.0046	0.0068	0.0034	0	0	0	0	0	0
2017	7	1	0	2	390	0	0	0	0	0	0	0
	0	0.0011	0.0006	0.0016	0.0273	0.0348	0.0770	0.0988	0.1001	0.1443	0.1734	0.1412
	0.0916	0.0595	0.0389	0.0012	0	0.0089	0	0	0	0	0	0
2018	7	1	0	2	503	0	0	0	0	0	0	0
	0	0.0015	0.0033	0.0303	0.0616	0.0498	0.0546	0.0836	0.1350	0.1709	0.1461	0.1211
	0.0697	0.0360	0.0129	0.0182	0.0038	0	0.0015	0	0	0	0	0
2019	7	1	0	2	418	0	0	0	0	0	0	0
	0	0	0.0169	0.0362	0.0551	0.0826	0.1018	0.1186	0.1183	0.0974	0.1349	0.0799
	0.0708	0.0499	0.0208	0.0116	0.0020	0	0.0034	0	0	0	0	0
2020	7	1	0	2	488	0	0	0	0	0	0	0
	0	0	0.0021	0.0112	0.0231	0.0455	0.1407	0.2044	0.2079	0.1397	0.0882	0.0487
	0.0660	0.0110	0.0113	0	0	0	0	0	0	0	0	0
2021	7	1	0	2	875	0	0	0	0	0	0	0
	0	0	0	0.0016	0.0078	0.0143	0.0465	0.0870	0.1184	0.1702	0.1779	0.1481
	0.1193	0.0772	0.0215	0.0077	0.0025	0	0	0	0	0	0	0
2022	7	1	0	2	593	0	0	0	0	0	0	0
	0	0	0.0038	0.0122	0.0230	0.0446	0.0583	0.0527	0.0940	0.1483	0.2038	0.1567
	0.1065	0.0492	0.0362	0	0.0043	0.0043	0.0020	0	0	0	0	0
2023	7	1	0	2	566	0	0	0	0	0	0	0
	0	0	0.0056	0.0151	0.0491	0.0800	0.0879	0.0717	0.0658	0.1341	0.1218	0.1126
	0.1196	0.0910	0.0339	0.0106	0	0.0012	0	0	0	0	0	0

1988	7	2	0	0	35	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0.0286	0.0286	0.1714	0.1714	0.1714
	0.2000	0.0286	0.2000	0	0	0	0	0	0	0	0	0
1989	7	2	0	0	46	0	0	0	0	0	0	0
	0	0.0217	0	0.0870	0.1087	0.1087	0.0870	0.0652	0.1957	0.0652	0.0870	0
	0.0217	0	0.0652	0.0435	0.0435	0	0	0	0	0	0	0
-1990	7	2	0	0	7	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0.5714	0.1429
	0	0	0.1429	0	0	0	0.1429	0	0	0	0	0
1991	7	2	0	0	113	0	0	0	0	0	0	0
	0	0	0	0	0.0531	0.1062	0.2124	0.0708	0.0796	0.1062	0.0442	0.1593
	0.0442	0.1239	0	0	0	0	0	0	0	0	0	0
-1992	7	2	0	0	8	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0.1250	0.1250	0.6250	0.1250	0
	0	0	0	0	0	0	0	0	0	0	0	0
1994	7	2	0	0	329	0	0	0	0	0	0	0
	0	0	0.0182	0.0334	0.0517	0.0638	0.1641	0.2067	0.1763	0.1185	0.0729	0.0517
	0.0213	0.0152	0.0061	0	0	0	0	0	0	0	0	0
1995	7	2	0	0	1548	0	0	0	0	0	0	0
	0	0	0	0.0071	0.0252	0.0756	0.1324	0.1563	0.1757	0.1486	0.1124	0.0685
	0.0504	0.0265	0.0129	0.0052	0.0026	0.0006	0	0	0	0	0	0
1996	7	2	0	0	1071	0	0	0	0	0	0	0
	0.0009	0	0	0.0084	0.0252	0.1018	0.1653	0.1849	0.1382	0.1046	0.0952	0.0794
	0.0448	0.0289	0.0140	0.0065	0.0019	0	0	0	0	0	0	0
1997	7	2	0	0	761	0	0	0	0	0	0	0
	0	0	0	0.0039	0.0079	0.0171	0.0644	0.1800	0.1958	0.2194	0.1682	0.0867
	0.0315	0.0171	0.0039	0.0039	0	0	0	0	0	0	0	0
1998	7	2	0	0	198	0	0	0	0	0	0	0
	0	0	0	0	0.0101	0.0253	0.1010	0.1768	0.2828	0.1768	0.1717	0.0556
	0	0	0	0	0	0	0	0	0	0	0	0
1999	7	2	0	0	76	0	0	0	0	0	0	0
	0	0	0	0	0	0.0132	0.0132	0.2237	0.4474	0.1711	0.1184	0.0132
	0	0	0	0	0	0	0	0	0	0	0	0
2000	7	2	0	0	303	0	0	0	0	0	0	0
	0	0	0	0	0	0.0132	0.0297	0.0627	0.1551	0.2442	0.2244	0.1584
	0.0561	0.0363	0.0165	0	0.0033	0	0	0	0	0	0	0
2001	7	2	0	0	164	0	0	0	0	0	0	0
	0	0	0	0	0	0.0122	0.0183	0.0610	0.1585	0.2256	0.2805	0.1585
	0.0427	0.0366	0	0.0061	0	0	0	0	0	0	0	0
2002	7	2	0	0	199	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0.0151	0.0402	0.1960	0.3417	0.2111
	0.1457	0.0402	0.0050	0.0050	0	0	0	0	0	0	0	0
2003	7	2	0	0	336	0	0	0	0	0	0	0
	0	0	0	0	0	0	0.0119	0.0476	0.0625	0.2113	0.2440	0.2054
	0.0893	0.0268	0.0506	0.0387	0.0030	0.0060	0	0	0	0.0030	0	0
2004	7	2	0	0	307	0	0	0	0	0	0	0
	0	0	0	0	0	0	0.0293	0.0521	0.0847	0.1010	0.2932	0.3127
	0.1173	0.0065	0	0.0033	0	0	0	0	0	0	0	0
2005	7	2	0	0	310	0	0	0	0	0	0	0
	0	0	0	0	0	0	0.0419	0.0806	0.0871	0.1355	0.2645	0.2065
	0.1452	0.0194	0.0065	0.0097	0.0032	0	0	0	0	0	0	0
2006	7	2	0	0	229	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0.0437	0.0742	0.0611	0.1616	0.2533
	0.2271	0.0786	0.0699	0.0175	0.0087	0.0044	0	0	0	0	0	0
2007	7	2	0	0	1067	0	0	0	0	0	0	0
	0	0	0	0	0.0009	0.0019	0.0075	0.0234	0.0356	0.0872	0.1425	0.2624
	0.2343	0.1500	0.0450	0.0094	0	0	0	0	0	0	0	0
2008	7	2	0	0	881	0	0	0	0	0	0	0
	0	0	0	0	0	0	0.0068	0.0329	0.0522	0.0931	0.1941	0.2554
	0.2520	0.0885	0.0204	0.0045	0	0	0	0	0	0	0	0

2009	7	2	0	0	790	0	0	0	0	0	0	0
	0	0	0	0	0	0.0013	0.0114	0.0367	0.0785	0.1000	0.1468	0.2797
	0.2468	0.0810	0.0139	0.0025	0.0013	0	0	0	0	0	0	0
2010	7	2	0	0	329	0	0	0	0	0	0	0
	0	0	0	0	0	0	0.0182	0.1155	0.1945	0.2249	0.1793	0.1672
	0.0881	0.0122	0	0	0	0	0	0	0	0	0	0
2011	7	2	0	0	805	0	0	0	0	0	0	0
	0	0	0	0	0	0	0.0174	0.0720	0.0981	0.1615	0.1466	0.1503
	0.1478	0.0795	0.0795	0.0348	0.0025	0.0062	0.0037	0	0	0	0	0
2012	7	2	0	0	520	0	0	0	0	0	0	0
	0	0	0	0	0	0.0058	0.0231	0.0519	0.0788	0.1058	0.1635	0.1596
	0.1692	0.1019	0.0904	0.0462	0.0038	0	0	0	0	0	0	0
2013	7	2	0	0	246	0	0	0	0	0	0	0
	0	0	0	0	0	0	0.0081	0.0366	0.0894	0.1057	0.1829	0.3008
	0.1992	0.0285	0.0325	0.0081	0	0.0041	0.0041	0	0	0	0	0
2014	7	2	0	0	463	0	0	0	0	0	0	0
	0	0	0	0.0023	0.0023	0.0076	0.0255	0.0389	0.0563	0.0949	0.1741	0.2195
	0.1866	0.0903	0.0515	0.0288	0.0152	0.0061	0	0	0	0	0	0
2015	7	2	0	0	463	0	0	0	0	0	0	0
	0	0	0	0	0	0.0109	0.0323	0.0738	0.1594	0.0870	0.1184	0.1371
	0.1920	0.1584	0.0308	0	0	0	0	0	0	0	0	0
2016	7	2	0	0	420	0	0	0	0	0	0	0
	0	0	0	0	0.0002	0	0.0166	0.0384	0.1059	0.1278	0.1349	0.2244
	0.1323	0.1034	0.0466	0.0527	0.0125	0.0042	0	0	0	0	0	0
2017	7	2	0	0	348	0	0	0	0	0	0	0
	0	0	0	0	0	0	0.0212	0.0352	0.0808	0.0923	0.0903	0.1812
	0.2422	0.1826	0.0576	0.0096	0.0069	0	0	0	0	0	0	0
2018	7	2	0	0	538	0	0	0	0	0	0	0
	0	0	0	0	0	0.0000	0.0176	0.0690	0.0978	0.1440	0.1360	0.1416
	0.1801	0.1264	0.0491	0.0270	0.0078	0.0024	0.0012	0	0	0	0	0
2019	7	2	0	0	597	0	0	0	0	0	0	0
	0	0	0	0.0031	0.0078	0.0150	0.0844	0.0683	0.0870	0.0809	0.1434	0.1404
	0.1715	0.1433	0.0441	0.0087	0.0015	0.0008	0	0	0	0	0	0
2020	7	2	0	0	210	0	0	0	0	0	0	0
	0	0	0	0	0.0086	0.0588	0.1011	0.1064	0.1011	0.1551	0.1202	0.0955
	0.1410	0.0703	0.0419	0.0001	0	0	0	0	0	0	0	0
2021	7	2	0	0	649	0	0	0	0	0	0	0
	0	0	0	0	0	0.0000	0.0184	0.1104	0.1986	0.2549	0.1983	0.0914
	0.0526	0.0416	0.0292	0.0021	0	0	0	0	0	0	0.0012	0.0012
2022	7	2	0	0	362	0	0	0	0	0	0	0
	0	0	0	0	0	0	0.0251	0.0047	0.0309	0.1976	0.3134	0.2964
	0.0956	0.0358	0.0004	0	0	0.0001	0	0	0	0	0	0
2023	7	2	0	0	541	0	0	0	0	0	0	0
	0	0	0	0	0.0002	0	0.0031	0.0147	0.0534	0.0976	0.2002	0.2268
	0.2003	0.1171	0.0382	0.0315	0.0063	0.0105	0	0	0	0	0	0

1985	12.99	3	0	0	87	0	0	0	0	0	0	0.0115
	0.0805	0	0.0345	0.1034	0.0115	0.0920	0.0575	0.1264	0.1494	0.1609	0.1034	0.0345
	0.0345	0	0	0	0	0	0	0	0	0	0	0
1986	12.99	3	0	0	212	0	0	0	0	0	0	0
	0.0047	0.0094	0.0566	0.1085	0.0991	0.0849	0.1274	0.2170	0.1462	0.0613	0.0377	0.0330
	0.0142	0	0	0	0	0	0	0	0	0	0	0
1987	12.99	3	0	0	172	0	0	0	0	0	0	0
	0.0291	0.0930	0.2616	0.0988	0.0465	0.0640	0.0640	0.0523	0.0698	0.0465	0.1221	0.0465
	0	0.0058	0	0	0	0	0	0	0	0	0	0
1988	12.99	3	0	0	236	0	0	0	0	0	0	0.0085
	0.0254	0.0424	0.0593	0.1017	0.0805	0.1483	0.1610	0.1441	0.0847	0.0381	0.0424	0.0424
	0.0212	0	0	0	0	0	0	0	0	0	0	0
1989	12.99	3	0	0	174	0	0	0	0	0	0	0
	0.0345	0.0057	0.0747	0.0690	0.0517	0.0287	0.0747	0.0805	0.1552	0.1839	0.1264	0.0460
	0.0460	0.0115	0.0057	0.0057	0	0	0	0	0	0	0	0
1990	12.99	3	0	0	173	0	0	0	0	0	0	0.0173
	0.1850	0.0636	0	0.0231	0.0405	0.0289	0.0636	0.0405	0.0751	0.0983	0.0751	0.0520
	0.0694	0.1098	0.0462	0.0058	0.0058	0	0	0	0	0	0	0
1991	12.99	3	0	0	136	0	0	0	0	0	0	0.0441
	0.1397	0.0441	0.0074	0.0294	0.0588	0.0809	0.0368	0.0662	0.0809	0.1471	0.0882	0.0515
	0.0735	0.0441	0.0074	0	0	0	0	0	0	0	0	0
1992	12.99	3	0	0	212	0	0	0	0	0	0	0.0991
	0.1981	0.0802	0.0330	0.0472	0.0708	0.0330	0.0330	0.0472	0.0425	0.0708	0.0755	0.0472
	0.0755	0.0236	0.0142	0.0094	0	0	0	0	0	0	0	0
1993	12.99	3	0	0	297	0	0	0	0	0	0	0.0236
	0.0438	0.1785	0.2896	0.1650	0.0539	0.0303	0.0404	0.0404	0.0236	0.0168	0.0236	0.0269
	0.0135	0.0135	0.0168	0	0	0	0	0	0	0	0	0
1994	12.99	3	0	0	270	0	0	0	0	0	0	0.0259
	0.0296	0.0148	0.1148	0.0889	0.0704	0.1111	0.0630	0.0963	0.0519	0.0481	0.0704	0.0704
	0.0852	0.0444	0.0148	0	0	0	0	0	0	0	0	0
1995	12.99	3	0	0	287	0	0	0	0	0	0.0070	0.0105
	0.0244	0.0592	0.1220	0.0836	0.0488	0.0488	0.0697	0.1185	0.1010	0.0941	0.0906	0.0557
	0.0314	0.0244	0.0105	0	0	0	0	0	0	0	0	0
1996	12.99	3	0	0	362	0	0	0	0	0	0	0.0083
	0.0193	0.0331	0.0470	0.0387	0.0442	0.0663	0.0746	0.0884	0.1657	0.1354	0.1271	0.0663
	0.0470	0.0331	0.0055	0	0	0	0	0	0	0	0	0
1997	12.99	3	0	0	308	0	0	0	0	0	0	0
	0.0032	0.0974	0.1526	0.0844	0.0292	0.0812	0.0617	0.0812	0.1006	0.0779	0.0909	0.0779
	0.0325	0.0195	0.0065	0.0032	0	0	0	0	0	0	0	0
1998	12.99	3	0	0	300	0	0	0	0	0	0	0.0167
	0.0233	0.0133	0.0200	0.0367	0.0200	0.0533	0.1167	0.1167	0.1467	0.1933	0.1267	0.0733
	0.0200	0.0167	0.0033	0.0033	0	0	0	0	0	0	0	0
1999	12.99	3	0	0	391	0	0	0	0	0	0	0.0102
	0.0230	0.0179	0.0332	0.0665	0.0639	0.0486	0.0767	0.1100	0.1714	0.1381	0.1074	0.0742
	0.0460	0.0102	0.0026	0	0	0	0	0	0	0	0	0
2000	12.99	3	0	0	374	0	0	0	0	0	0.0027	0.0134
	0.0267	0.0187	0.0187	0.0348	0.0455	0.0455	0.0401	0.0882	0.1471	0.1524	0.1658	0.1230
	0.0561	0.0160	0.0053	0	0	0	0	0	0	0	0	0

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2001    12.99   3       0       0       488     0       0       0       0       0       0       0
        0.0041  0.0594  0.0553  0.0225  0.0164  0.0410  0.0902  0.0922  0.1107  0.1209  0.1496  0.1414
        0.0717  0.0225  0.0020  0       0       0       0       0       0       0       0       0
2002    12.99   3       0       0       390     0       0       0       0       0       0       0
        0.0256  0.0077  0.0154  0.0359  0.0359  0.0538  0.0692  0.0538  0.0564  0.1179  0.1744  0.2103
        0.1026  0.0308  0.0077  0.0026  0       0       0       0       0       0       0       0
2003    12.99   3       0       0       279     0       0       0       0       0       0.0036  0.0072
        0.0036  0.0108  0.0466  0.0287  0.0179  0.0215  0.0215  0.0860  0.0896  0.0860  0.1900  0.2294
        0.1039  0.0538  0       0       0       0       0       0       0       0       0       0
2004    12.99   3       0       0       314     0       0       0       0       0       0       0.0032
        0.0318  0.0191  0.0159  0.0414  0.0159  0.0318  0.0191  0.0318  0.0732  0.1592  0.2484  0.1656
        0.0987  0.0382  0.0064  0       0       0       0       0       0       0       0       0
2005    12.99   3       0       0       254     0       0       0       0       0       0.0039  0.0039
        0.0197  0.0079  0.0276  0.0315  0.0551  0.0433  0.0748  0.0827  0.1299  0.0984  0.1614  0.1260
        0.0827  0.0433  0.0079  0       0       0       0       0       0       0       0       0
2006    12.99   3       0       0       253     0       0       0       0       0       0       0
        0.0119  0.0395  0.0356  0.0316  0.0079  0.0198  0.0119  0.0356  0.1028  0.1383  0.2174  0.1700
        0.1383  0.0237  0.0119  0.0040  0       0       0       0       0       0       0       0
2007    12.99   3       0       0       201     0       0       0       0       0       0       0
        0       0.0050  0.0498  0.0299  0.0498  0.0547  0.0448  0.0398  0.0448  0.1294  0.1791  0.2537
        0.1045  0.0149  0       0       0       0       0       0       0       0       0       0
2008    12.99   3       0       0       222     0       0       0       0       0       0       0
        0.0045  0       0.0225  0.0270  0.0225  0.0586  0.0901  0.0946  0.0856  0.1441  0.1216  0.2072
        0.0946  0.0225  0.0045  0       0       0       0       0       0       0       0       0
2009    12.99   3       0       0       275     0       0       0       0       0       0       0.0073
        0.0109  0.0145  0.0182  0.0182  0.0109  0.0145  0.0327  0.0691  0.0982  0.1673  0.2509  0.1782
        0.0800  0.0218  0.0036  0.0036  0       0       0       0       0       0       0       0
2010    12.99   3       0       0       545     0       0       0       0       0       0       0.0073
        0.0128  0.0037  0.0220  0.0459  0.0385  0.0807  0.0642  0.1028  0.1266  0.1284  0.1321  0.1303
        0.0697  0.0294  0.0055  0       0       0       0       0       0       0       0       0
2011    12.99   3       0       0       268     0       0       0       0       0       0       0
        0.0037  0.0112  0.0522  0.0858  0.0336  0.0821  0.0709  0.0933  0.1194  0.1716  0.1007  0.0634
        0.0485  0.0336  0.0224  0.0075  0       0       0       0       0       0       0       0
2012    12.99   3       0       0       303     0       0       0       0       0       0       0.0066
        0.0429  0.0132  0.0066  0.0066  0.0297  0.0594  0.0825  0.1386  0.1320  0.1287  0.1386  0.0759
        0.0990  0.0264  0.0099  0.0033  0       0       0       0       0       0       0       0
2013    12.99   3       0       0       368     0       0       0       0       0       0       0.0054
        0.0027  0.0054  0.0163  0.0679  0.0543  0.0326  0.0326  0.0625  0.1766  0.1332  0.1440  0.0842
        0.1141  0.0571  0.0109  0       0       0       0       0       0       0       0       0
2014    12.99   3       0       0       232     0       0       0       0       0       0       0
        0.0086  0.0043  0.0043  0.0431  0.0690  0.0647  0.1121  0.0603  0.0862  0.1121  0.1724  0.1250
        0.0819  0.0345  0.0172  0.0043  0       0       0       0       0       0       0       0
2015    12.99   3       0       0       159     0       0       0       0       0       0       0.0063
        0.0063  0.0252  0.0566  0.0377  0.0629  0.0566  0.1006  0.0818  0.0818  0.0629  0.1635  0.0881
        0.0692  0.0629  0.0252  0.0063  0.0063  0       0       0       0       0       0       0
2016    12.99   3       0       0       341     0       0       0       0       0       0       0.0059
        0.0293  0.0059  0.0088  0.0499  0.0704  0.0704  0.0821  0.1114  0.1114  0.0968  0.0880  0.1173
        0.0968  0.0411  0.0147  0       0       0       0       0       0       0       0       0
2017    12.99   3       0       0       309     0       0       0       0       0       0       0.0162
        0.0712  0.0777  0.0259  0.0356  0.0259  0.0388  0.0744  0.0485  0.1003  0.1230  0.0874  0.1230
        0.0939  0.0518  0.0065  0       0       0       0       0       0       0       0       0
2018    12.99   3       0       0       145     0       0       0       0       0       0.0207  0.0138
        0.0138  0.0414  0.1172  0.1379  0.0483  0.0552  0.0690  0.0690  0.0621  0.0690  0.0966  0.0414
        0.0759  0.0621  0.0069  0       0       0       0       0       0       0       0       0
2019    12.99   3       0       0       82      0       0       0       0       0       0       0
        0.0244  0       0       0.0122  0.0732  0.1463  0.0732  0.1463  0.1098  0.1220  0.0488  0.1341
        0.0854  0.0122  0.0122  0       0       0       0       0       0       0       0       0
2020    12.99   3       0       0       140     0       0       0       0       0       0       0
        0       0       0.0071  0.0143  0.0071  0.0286  0.0357  0.1214  0.1071  0.1357  0.1286  0.1786
        0.1643  0.0500  0.0143  0       0.0071  0       0       0       0       0       0       0
2021    12.99   3       0       0       64      0       0       0       0       0       0       0
        0.0156  0       0       0       0.0156  0       0.0469  0.0469  0.1094  0.0938  0.2969  0.1406
        0.1719  0.0469  0       0.0156  0       0       0       0       0       0       0       0
2022    12.99   3       0       0       67      0       0       0       0       0       0       0.0149
        0.0299  0.0299  0.0149  0.0746  0.0896  0.0448  0       0.0299  0.0299  0.0597  0.2239  0.1194
        0.1791  0.0448  0.0149  0       0       0       0       0       0       0       0       0
2023    12.99   3       0       0       86      0       0       0       0       0       0       0.0116
        0       0.0116  0.0116  0.0116  0.0698  0.1163  0.0814  0.0349  0.1744  0.1512  0.1512  0.0814
        0.0233  0.0349  0.0349  0       0       0       0       0       0       0       0       0


-9999   0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0
        0       0       0       0       0       0       0       0       0       0       0       0
11 # N_age_bins
 0  1  2  3  4 5 6 7 8 9 10
1 # N_ageerror_definitions
 0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5
 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001
#_mintailcomp: upper and lower distribution for females and males separately are accumulated until exceeding this level.
#_addtocomp:  after accumulation of tails; this value added to all bins
#_combM+F: males and females treated as combined gender below this bin number
#_compressbins: accumulate upper tail by this number of bins; acts simultaneous with mintailcomp; set=0 for no forced
accumulation
#_Comp_Error:  0=multinomial, 1=dirichlet
#_ParmSelect:  parm number for dirichlet
#_minsamplesize: minimum sample size; set to 1 to match 3.24, minimum value is 0.001
#
#_mintailcomp addtocomp combM+F CompressBins CompError ParmSelect minsamplesize
0.001 1e-03 0 0 1 4 1 #_fleet:1_FISHERY1
0.001 1e-03 0 0 1 5 1 #_fleet:2_FISHERY2
0.001 1e-03 0 0 1 6 1 #_fleet:3_SURVEY1
3 # Lbin_method_for_Age_Data: 1=poplenbins; 2=datalenbins; 3=lengths
# sex codes:  0=combined; 1=use female only; 2=use male only; 3=use both as joint sexxlength distribution
# partition codes:  (0=combined; 1=discard; 2=retained
```

```
#_yr month fleet sex part ageerr Lbin_lo Lbin_hi Nsamp datavector(female-male)
2002	7	1	0	2	1	11	11	6	0	0.1667	0.6667	0.1667
	0	0	0	0	0	0	0
2002	7	1	0	2	1	12	12	2	0	0	1.0000	0
	0	0	0	0	0	0	0
2002	7	1	0	2	1	13	13	2	0	0	1.0000	0
	0	0	0	0	0	0	0
2002	7	1	0	2	1	14	14	12	0	0	0.6667	0.1667
	0	0	0	0	0	0	0.1667
2002	7	1	0	2	1	15	15	4	0	0	0.2500	0.2500
	0.5000	0	0	0	0	0	0
2002	7	1	0	2	1	16	16	12	0	0	0	0.5833
	0.3333	0	0.0833	0	0	0	0
2002	7	1	0	2	1	17	17	10	0	0	0	0.2000
	0.3000	0.2000	0.2000	0.1000	0	0	0
2002	7	1	0	2	1	18	18	8	0	0	0.1250	0.1250
	0.1250	0	0.2500	0.1250	0.2500	0	0
2002	7	1	0	2	1	19	19	6	0	0	0	0.3333
	0	0	0.1667	0.1667	0.1667	0	0.1667
2002	7	1	0	2	1	20	20	4	0	0	0	0.5000
	0	0	0.2500	0	0	0.2500	0
2002	7	1	0	2	1	21	21	2	0	0	0	0
	0	0	0.5000	0	0	0	0.5000
2003	7	1	0	2	1	9	9	2	0	0	0.5000	0.5000
	0	0	0	0	0	0	0
2003	7	1	0	2	1	10	10	5	0	0.4000	0.4000	0.2000
	0	0	0	0	0	0	0
2003	7	1	0	2	1	11	11	7	0	0.2857	0.1429	0.5714
	0	0	0	0	0	0	0
2003	7	1	0	2	1	12	12	8	0	0	0.3750	0.6250
	0	0	0	0	0	0	0
2003	7	1	0	2	1	13	13	8	0	0	0	0.5000
	0.2500	0.1250	0	0	0	0.1250	0
2003	7	1	0	2	1	14	14	15	0	0	0.0667	0.4667
	0.2667	0.0667	0	0	0.1333	0	0
2003	7	1	0	2	1	15	15	21	0	0	0.0952	0.2857
	0.3333	0.2381	0	0	0	0	0.0476
2003	7	1	0	2	1	16	16	11	0	0	0	0.5455
	0.1818	0.2727	0	0	0	0	0
2003	7	1	0	2	1	17	17	18	0	0	0	0.1667
	0.4444	0.1111	0.0556	0.1111	0	0.0556	0.0556
2003	7	1	0	2	1	18	18	12	0	0	0	0.2500
	0.3333	0.1667	0	0.2500	0	0	0
2003	7	1	0	2	1	19	19	9	0	0	0	0
	0.6667	0	0.1111	0	0	0	0.2222
2003	7	1	0	2	1	20	20	4	0	0	0	0
	0.2500	0.2500	0	0	0.2500	0.2500	0
2003	7	1	0	2	1	21	21	3	0	0	0	0
	0.6667	0.3333	0	0	0	0	0
2003	7	1	0	2	1	22	22	2	0	0	0	0.5000
	0	0	0	0.5000	0	0	0
2004	7	1	0	2	1	10	10	2	0	0.5000	0.5000	0
	0	0	0	0	0	0	0
2004	7	1	0	2	1	11	11	1	0	1.0000	0	0
	0	0	0	0	0	0	0
2004	7	1	0	2	1	12	12	4	0	0.5000	0.2500	0.2500
	0	0	0	0	0	0	0
2004	7	1	0	2	1	13	13	7	0	0.1429	0.1429	0.1429
	0.2857	0.2857	0	0	0	0	0
2004	7	1	0	2	1	14	14	17	0	0.1176	0.0588	0.2941
	0.4706	0	0	0	0	0	0.0588
2004	7	1	0	2	1	15	15	28	0	0	0.1071	0.1071
	0.6071	0.1429	0.0357	0	0	0	0
2004	7	1	0	2	1	16	16	31	0	0	0.0645	0.1935
	0.4194	0.2258	0.0968	0	0	0	0
2004	7	1	0	2	1	17	17	31	0	0	0	0.0645
	0.3871	0.3548	0.0645	0.0323	0.0323	0.0645	0
2004	7	1	0	2	1	18	18	38	0	0	0	0.1053
	0.2105	0.2632	0.1053	0.0526	0.1842	0	0.0789
2004	7	1	0	2	1	19	19	14	0	0	0.2143	0
	0.4286	0.0714	0.0714	0	0.0714	0.0714	0.0714
2004	7	1	0	2	1	20	20	5	0	0	0	0
	0.4000	0.2000	0.4000	0	0	0	0
2004	7	1	0	2	1	21	21	2	0	0	0	0
	0	0	0	0	0.5000	0	0.5000
2004	7	1	0	2	1	22	22	2	0	0	0	0
	0.5000	0	0	0	0	0	0.5000
2005	7	1	0	2	1	10	10	2	0	0	1.0000	0
	0	0	0	0	0	0	0
2005	7	1	0	2	1	11	11	7	0	0.2857	0.4286	0.1429
	0.1429	0	0	0	0	0	0
2005	7	1	0	2	1	12	12	22	0	0.0494	0.7035	0.1976
	0	0.0494	0	0	0	0	0
2005	7	1	0	2	1	13	13	20	0	0	0.3500	0.6000
	0	0.0500	0	0	0	0	0
2005	7	1	0	2	1	14	14	27	0	0	0.2680	0.5360
	0.0766	0.0428	0	0	0	0	0.0766
2005	7	1	0	2	1	15	15	49	0	0	0.0660	0.2691
	0.2199	0.2691	0.1099	0.0220	0	0	0.0440
2005	7	1	0	2	1	16	16	55	0	0	0.0410	0.2457
	0.1073	0.4759	0.1073	0	0	0	0.0229
2005	7	1	0	2	1	17	17	67	0	0	0	0.0307
	0.0613	0.4923	0.1993	0.1533	0.0172	0.0460	0
2005	7	1	0	2	1	18	18	45	0	0	0	0
	0.0227	0.4760	0.2040	0.0707	0.1133	0.0453	0.0680
```

2005	7	1	0	2	1	19	19	17	0	0	0	0.0656
	0	0.2625	0.3281	0.1312	0.0656	0.0734	0.0734					
2005	7	1	0	2	1	20	20	4	0	0	0	0
	0.3206	0	0.3588	0	0	0	0.3206					
2005	7	1	0	2	1	21	21	4	0	0	0	0
	0	0	0.2500	0.5000	0	0.2500	0					
2005	7	1	0	2	1	22	22	1	0	0	0	0
	0	1.0000	0	0	0	0	0					
2006	7	1	0	2	1	8	8	1	0	1.0000	0	0
	0	0	0	0	0	0	0					
2006	7	1	0	2	1	9	9	7	0	1.0000	0	0
	0	0	0	0	0	0	0					
2006	7	1	0	2	1	10	10	2	0	0	1.0000	0
	0	0	0	0	0	0	0					
2006	7	1	0	2	1	11	11	7	0	0.4286	0.5714	0
	0	0	0	0	0	0	0					
2006	7	1	0	2	1	12	12	8	0	0.1250	0.6250	0.2500
	0	0	0	0	0	0	0					
2006	7	1	0	2	1	13	13	9	0	0	0.6667	0.3333
	0	0	0	0	0	0	0					
2006	7	1	0	2	1	14	14	26	0	0	0.5769	0.3846
	0.0385	0	0	0	0	0	0					
2006	7	1	0	2	1	15	15	27	0	0	0.2306	0.2313
	0.3843	0	0.0769	0	0.0384	0	0.0384					
2006	7	1	0	2	1	16	16	36	0	0	0.0857	0.2004
	0.2284	0.0571	0.1999	0.1999	0	0	0.0286					
2006	7	1	0	2	1	17	17	47	0	0	0	0.2128
	0.2128	0.0426	0.3830	0.0851	0	0.0213	0.0426					
2006	7	1	0	2	1	18	18	26	0	0	0	0.0385
	0.0769	0.0769	0.2692	0.3077	0.0769	0.0769	0.0769					
2006	7	1	0	2	1	19	19	15	0	0	0	0
	0.2140	0.1427	0.2140	0.1427	0	0	0.2867					
2006	7	1	0	2	1	20	20	7	0	0	0	0
	0	0.2857	0.2857	0.4286	0	0	0					
2006	7	1	0	2	1	21	21	2	0	0	0	0
	0	0.5000	0	0.5000	0	0	0					
2006	7	1	0	2	1	22	22	1	0	0	0	0
	0	0	0	0	0	0	1.0000					
2006	7	1	0	2	1	23	23	3	0	0	0	0
	0	0.3333	0.3333	0	0	0	0.3333					
2006	7	1	0	2	1	24	24	1	0	0	0	0
	0	0	0	0	1.0000	0	0					
2006	7	1	0	2	1	25	25	1	0	0	0	0
	0	1.0000	0	0	0	0	0					
2007	7	1	0	2	1	8	8	3	0	1.0000	0	0
	0	0	0	0	0	0	0					
2007	7	1	0	2	1	9	9	12	0	0.6667	0.3333	0
	0	0	0	0	0	0	0					
2007	7	1	0	2	1	10	10	16	0	0.3125	0.6875	0
	0	0	0	0	0	0	0					
2007	7	1	0	2	1	11	11	24	0	0.1332	0.8668	0
	0	0	0	0	0	0	0					
2007	7	1	0	2	1	12	12	37	0	0	0.9189	0.0811
	0	0	0	0	0	0	0					
2007	7	1	0	2	1	13	13	48	0	0	0.7780	0.1998
	0	0	0	0	0	0	0.0222					
2007	7	1	0	2	1	14	14	31	0	0	0.5948	0.2974
	0.0991	0.0087	0	0	0	0	0					
2007	7	1	0	2	1	15	15	38	0	0	0.3285	0.4380
	0.1513	0	0.0548	0.0274	0	0	0					
2007	7	1	0	2	1	16	16	51	0	0	0.0624	0.4064
	0.3801	0.1095	0	0	0.0208	0	0.0208					
2007	7	1	0	2	1	17	17	44	0	0	0.0248	0.1554
	0.4530	0.0809	0.0248	0.1488	0.0744	0.0379	0					
2007	7	1	0	2	1	18	18	46	0	0	0	0.1348
	0.2246	0.1348	0.1123	0.1856	0.0898	0.0449	0.0733					
2007	7	1	0	2	1	19	19	31	0	0	0	0.1069
	0.1520	0	0.0356	0.2495	0.1613	0	0.2946					
2007	7	1	0	2	1	20	20	17	0	0	0	0.0712
	0.0712	0.1423	0.2322	0.2135	0	0.0187	0.2509					
2007	7	1	0	2	1	21	21	6	0	0	0	0
	0.1667	0	0.1667	0.1667	0.3333	0	0.1667					
2007	7	1	0	2	1	22	22	3	0	0	0	0
	0	0	0.4419	0	0	0	0.5581					
2007	7	1	0	2	1	23	23	1	0	0	0	0
	0	0	0	0	0	0	1.0000					
2007	7	1	0	2	1	24	24	3	0	0	0	0
	0	0	0	0	0.3333	0	0.6667					
2007	7	1	0	2	1	26	26	1	0	0	0	0
	0	0	1.0000	0	0	0	0					
2008	7	1	0	2	1	8	8	3	0	0.6667	0.3333	0
	0	0	0	0	0	0	0					
2008	7	1	0	2	1	9	9	13	0	0.3077	0.6154	0.0769
	0	0	0	0	0	0	0					
2008	7	1	0	2	1	10	10	15	0	0.2667	0.6000	0.1333
	0	0	0	0	0	0	0					
2008	7	1	0	2	1	11	11	28	0	0	0.5000	0.4286
	0.0357	0.0357	0	0	0	0	0					
2008	7	1	0	2	1	12	12	42	0	0.0243	0.2699	0.6328
	0.0730	0	0	0	0	0	0					
2008	7	1	0	2	1	13	13	61	0	0.0676	0.2028	0.6789
	0.0169	0	0	0	0	0.0169	0.0169					
2008	7	1	0	2	1	14	14	75	0	0	0.1093	0.7801
	0.0695	0.0273	0.0137	0	0	0	0					

2008	7	1	0	2	1	15	15	71	0	0	0.0610	0.6602
	0.2011	0.0624	0	0	0	0	0.0153					
2008	7	1	0	2	1	16	16	61	0	0	0.0366	0.3527
	0.4243	0.0948	0.0549	0.0183	0	0	0.0183					
2008	7	1	0	2	1	17	17	63	0	0	0.0196	0.1386
	0.3019	0.2593	0.1369	0	0.0604	0.0230	0.0604					
2008	7	1	0	2	1	18	18	51	0	0	0	0.0659
	0.0879	0.1776	0.1557	0.0220	0.2674	0.0879	0.1357					
2008	7	1	0	2	1	19	19	33	0	0	0	0.0681
	0.0681	0.2415	0.1052	0	0.3066	0.0341	0.1764					
2008	7	1	0	2	1	20	20	19	0	0	0	0.0739
	0.1478	0.1609	0.1478	0	0.0804	0.0804	0.3087					
2008	7	1	0	2	1	21	21	9	0	0	0	0
	0.1393	0.2910	0.1393	0	0.2787	0.1517	0					
2008	7	1	0	2	1	22	22	3	0	0	0	0
	0	0.3333	0	0	0.6667	0	0					
2008	7	1	0	2	1	23	23	3	0	0	0	0
	0	0.8498	0	0	0	0.0751	0.0751					
2008	7	1	0	2	1	24	24	1	0	0	0	0
	0	1.0000	0	0	0	0	0					
2009	7	1	0	2	1	8	8	1	0	1.0000	0	0
	0	0	0	0	0	0	0					
2009	7	1	0	2	1	9	9	4	0	0.7500	0.2500	0
	0	0	0	0	0	0	0					
2009	7	1	0	2	1	10	10	12	0	0.5000	0.4167	0.0833
	0	0	0	0	0	0	0					
2009	7	1	0	2	1	11	11	19	0	0.2105	0.3158	0.3158
	0.1579	0	0	0	0	0	0					
2009	7	1	0	2	1	12	12	19	0	0.1664	0.4993	0.1109
	0.2234	0	0	0	0	0	0					
2009	7	1	0	2	1	13	13	54	0	0	0.1926	0.4419
	0.3079	0.0192	0	0	0	0.0192	0.0192					
2009	7	1	0	2	1	14	14	55	0	0	0.1131	0.2832
	0.5848	0	0.0188	0	0	0	0					
2009	7	1	0	2	1	15	15	74	0	0	0.0778	0.2654
	0.5635	0.0467	0.0156	0	0	0	0.0311					
2009	7	1	0	2	1	16	16	69	0	0	0	0.2124
	0.5753	0.1634	0.0163	0.0163	0	0	0.0163					
2009	7	1	0	2	1	17	17	69	0	0	0.0174	0.0349
	0.4050	0.1924	0.1235	0.0872	0	0.0698	0.0698					
2009	7	1	0	2	1	18	18	68	0	0	0.0156	0.0312
	0.1560	0.1720	0.1560	0.1252	0.0156	0.1412	0.1872					
2009	7	1	0	2	1	19	19	33	0	0	0	0.1473
	0.1105	0.0378	0.1105	0	0.0378	0.1871	0.3692					
2009	7	1	0	2	1	20	20	15	0	0	0	0.3064
	0.1532	0.0021	0.1532	0.0021	0	0	0.3830					
2009	7	1	0	2	1	21	21	10	0	0	0	0.2216
	0	0	0.2216	0	0	0.3323	0.2245					
2009	7	1	0	2	1	22	22	5	0	0	0	0
	0	0	0.2483	0	0.0067	0.2483	0.4967					
2009	7	1	0	2	1	23	23	6	0	0	0	0
	0	0.1667	0.1667	0	0	0.3333	0.3333					
2009	7	1	0	2	1	24	24	2	0	0	0	0
	0	0	0	0	1.0000	0	0					
2010	7	1	0	2	1	8	8	1	0	0	1.0000	0
	0	0	0	0	0	0	0					
2010	7	1	0	2	1	9	9	2	0	1.0000	0	0
	0	0	0	0	0	0	0					
2010	7	1	0	2	1	10	10	1	0	1.0000	0	0
	0	0	0	0	0	0	0					
2010	7	1	0	2	1	11	11	22	0	0.1439	0.7134	0
	0.0951	0.0476	0	0	0	0	0					
2010	7	1	0	2	1	12	12	19	0	0	0.5007	0.4438
	0.0555	0	0	0	0	0	0					
2010	7	1	0	2	1	13	13	34	0	0.0322	0.3235	0.3870
	0.2252	0.0322	0	0	0	0	0					
2010	7	1	0	2	1	14	14	51	0	0	0.1664	0.2715
	0.4784	0.0837	0	0	0	0	0					
2010	7	1	0	2	1	15	15	65	0	0	0.0491	0.1314
	0.4755	0.3441	0	0	0	0	0					
2010	7	1	0	2	1	16	16	54	0	0	0.0200	0.1197
	0.2999	0.4806	0.0399	0	0.0200	0	0.0200					
2010	7	1	0	2	1	17	17	50	0	0	0.0443	0.1551
	0.2000	0.2892	0.0886	0.0665	0.0222	0.0222	0.1120					
2010	7	1	0	2	1	18	18	34	0	0	0	0.0996
	0.0664	0.2325	0.0664	0.0673	0.0664	0.0664	0.3348					
2010	7	1	0	2	1	19	19	22	0	0	0	0
	0	0.2949	0.1167	0.1167	0.0584	0	0.4132					
2010	7	1	0	2	1	20	20	12	0	0	0	0.1234
	0.1234	0.2500	0	0.1234	0	0	0.3799					
2010	7	1	0	2	1	21	21	3	0	0	0	0
	0	0.3333	0	0	0	0	0.6667					
2010	7	1	0	2	1	22	22	4	0	0	0	0
	0	0	0	0.2500	0	0	0.7500					
2010	7	1	0	2	1	23	23	5	0	0	0	0
	0	0	0	0.2000	0.4000	0	0.4000					
2011	7	1	0	2	1	9	9	4	0	0.2500	0.7500	0
	0	0	0	0	0	0	0					
2011	7	1	0	2	1	10	10	6	0	0.3333	0.6667	0
	0	0	0	0	0	0	0					
2011	7	1	0	2	1	11	11	5	0	0	0.2000	0.8000
	0	0	0	0	0	0	0					
2011	7	1	0	2	1	12	12	17	0	0	0.3529	0.6471
	0	0	0	0	0	0	0					

2011	7	1	0	2	1	13	13	19	0	0	0.2938	0.4706
	0.2351	0.0005	0	0	0	0	0					
2011	7	1	0	2	1	14	14	41	0	0	0.3076	0.2563
	0.2309	0.1025	0.1027	0	0	0	0					
2011	7	1	0	2	1	15	15	44	0	0	0.1281	0.3078
	0.1283	0.2309	0.1793	0	0	0	0.0256					
2011	7	1	0	2	1	16	16	44	0	0	0	0.3861
	0.1944	0.1615	0.2258	0	0	0	0.0322					
2011	7	1	0	2	1	17	17	47	0	0	0	0.1351
	0.1079	0.2429	0.2708	0.0270	0.0272	0.0539	0.1353					
2011	7	1	0	2	1	18	18	68	0	0	0.0001	0.0357
	0.1070	0.1071	0.3219	0.0893	0.0891	0.0357	0.2142					
2011	7	1	0	2	1	19	19	29	0	0	0	0.0373
	0.0740	0.0370	0.2591	0.0373	0.1110	0	0.4442					
2011	7	1	0	2	1	20	20	18	0	0	0	0
	0.0666	0.1331	0.2007	0.0666	0.1331	0	0.3999					
2011	7	1	0	2	1	21	21	5	0	0	0	0
	0	0	0.4000	0.4000	0.2000	0	0					
2011	7	1	0	2	1	22	22	5	0	0	0	0
	0.2000	0.2000	0.2000	0.2000	0	0	0.2000					
2011	7	1	0	2	1	23	23	3	0	0	0	0
	0	0.3333	0	0	0	0	0.6667					
2012	7	1	0	2	1	9	9	2	0	0.5000	0.5000	0
	0	0	0	0	0	0	0					
2012	7	1	0	2	1	10	10	4	0	0	1.0000	0
	0	0	0	0	0	0	0					
2012	7	1	0	2	1	11	11	8	0	0.2500	0.6250	0
	0.1250	0	0	0	0	0	0					
2012	7	1	0	2	1	12	12	15	0	0.0713	0.5708	0.2865
	0.0713	0	0	0	0	0	0					
2012	7	1	0	2	1	13	13	23	0	0	0.2510	0.3492
	0.2502	0.0998	0.0499	0	0	0	0					
2012	7	1	0	2	1	14	14	19	0	0	0.3320	0.3320
	0.2012	0.0685	0.0664	0	0	0	0					
2012	7	1	0	2	1	15	15	39	0	0	0.1567	0.3742
	0.3747	0.0316	0.0316	0.0311	0	0	0					
2012	7	1	0	2	1	16	16	50	0	0	0.0232	0.1856
	0.3490	0.1403	0.1627	0.1160	0.0232	0	0					
2012	7	1	0	2	1	17	17	58	0	0	0	0.0873
	0.2169	0.1529	0.1959	0.2385	0.0653	0.0217	0.0217					
2012	7	1	0	2	1	18	18	62	0	0	0	0.0181
	0.0363	0.0363	0.2909	0.3272	0.1089	0.0369	0.1454					
2012	7	1	0	2	1	19	19	29	0	0	0	0
	0.0473	0.0007	0.1901	0.2840	0	0.1908	0.2870					
2012	7	1	0	2	1	20	20	8	0	0	0	0
	0.1250	0.2500	0	0.2500	0	0	0.3750					
2012	7	1	0	2	1	21	21	2	0	0	0	0
	0	0	0	0	0	0.5000	0.5000					
2013	7	1	0	2	1	9	9	4	0	0.7500	0.2500	0
	0	0	0	0	0	0	0					
2013	7	1	0	2	1	10	10	6	0	1.0000	0	0
	0	0	0	0	0	0	0					
2013	7	1	0	2	1	11	11	6	0	0.3333	0.3333	0.3333
	0	0	0	0	0	0	0					
2013	7	1	0	2	1	12	12	14	0	0.2143	0.2143	0.5714
	0	0	0	0	0	0	0					
2013	7	1	0	2	1	13	13	16	0	0	0.2500	0.4375
	0.3125	0	0	0	0	0	0					
2013	7	1	0	2	1	14	14	25	0	0	0.1749	0.5217
	0.2167	0.0433	0	0.0433	0	0	0					
2013	7	1	0	2	1	15	15	58	0	0	0.0185	0.3395
	0.2854	0.1784	0.0713	0.0535	0.0535	0	0					
2013	7	1	0	2	1	16	16	55	0	0	0.0196	0.2367
	0.2347	0.3520	0.0391	0.0202	0.0978	0	0					
2013	7	1	0	2	1	17	17	91	0	0	0.0119	0.1195
	0.2734	0.2616	0.1424	0.0954	0.0483	0.0237	0.0237					
2013	7	1	0	2	1	18	18	90	0	0	0	0.0004
	0.0495	0.1341	0.1949	0.1337	0.3533	0.0612	0.0729					
2013	7	1	0	2	1	19	19	39	0	0	0	0.0310
	0.1251	0.2171	0.0631	0.1273	0.2791	0.0310	0.1262					
2013	7	1	0	2	1	20	20	18	0	0	0	0
	0.1415	0.0732	0.0025	0.0707	0.2829	0.0025	0.4268					
2013	7	1	0	2	1	21	21	5	0	0	0	0
	0	0	0	0	0	0	1.0000					
2013	7	1	0	2	1	22	22	3	0	0	0	0
	0	0	0	0.3333	0.3333	0	0.3333					
2013	7	1	0	2	1	23	23	1	0	0	0	0
	0	0	0	1.0000	0	0	0					
2014	7	1	0	2	1	9	9	4	0	0.3962	0.6038	0
	0	0	0	0	0	0	0					
2014	7	1	0	2	1	10	10	4	0	0.1176	0.8824	0
	0	0	0	0	0	0	0					
2014	7	1	0	2	1	11	11	8	0	0	1.0000	0
	0	0	0	0	0	0	0					
2014	7	1	0	2	1	12	12	25	0	0.0516	0.8658	0.0826
	0	0	0	0	0	0	0					
2014	7	1	0	2	1	13	13	28	0	0	0.9956	0.0042
	0.0002	0	0	0	0	0	0					
2014	7	1	0	2	1	14	14	39	0	0	0.4788	0.4172
	0.1018	0	0	0	0	0	0.0022					
2014	7	1	0	2	1	15	15	51	0	0	0.1297	0.1685
	0.4768	0.1147	0.0753	0.0040	0.0020	0.0289	0					
2014	7	1	0	2	1	16	16	49	0	0	0.0056	0.0739
	0.4671	0.3319	0.0587	0.0206	0.0211	0.0211	0					

2014	7	1	0	2	1	17	17	37	0	0	0.0262	0.1052
	0.3750	0.1228	0.0254	0.0290	0	0.2034	0.1129					
2014	7	1	0	2	1	18	18	44	0	0	0	0
	0.0059	0.2597	0.0392	0.0976	0.2025	0.2513	0.1438					
2014	7	1	0	2	1	19	19	27	0	0	0	0.0402
	0	0.0444	0.3462	0.1383	0.0154	0.0990	0.3165					
2014	7	1	0	2	1	20	20	16	0	0	0	0.0684
	0	0.0107	0.0684	0.0769	0.0862	0.2442	0.4453					
2014	7	1	0	2	1	21	21	4	0	0	0	0
	0	0.8041	0.1087	0	0	0	0.0873					
2014	7	1	0	2	1	22	22	5	0	0	0	0
	0	0.2926	0.0457	0	0	0.3690	0.2926					
2015	7	1	0	2	1	9	9	1	0	1.0000	0	0
	0	0	0	0	0	0	0					
2015	7	1	0	2	1	10	10	3	0	0	0.3333	0.6667
	0	0	0	0	0	0	0					
2015	7	1	0	2	1	11	11	2	0	0	0	0.2646
	0	0.7354	0	0	0	0	0					
2015	7	1	0	2	1	12	12	10	0	0.3946	0.2185	0.3870
	0	0	0	0	0	0	0					
2015	7	1	0	2	1	13	13	10	0	0.1871	0.4565	0.3564
	0	0	0	0	0	0	0					
2015	7	1	0	2	1	14	14	46	0	0	0.1952	0.6607
	0.0901	0.0540	0	0	0	0	0					
2015	7	1	0	2	1	15	15	42	0	0	0.1502	0.7020
	0	0.0789	0	0.0689	0	0	0					
2015	7	1	0	2	1	16	16	45	0	0	0	0.7629
	0.0640	0.1093	0.0400	0.0116	0.0002	0.0116	0.0003					
2015	7	1	0	2	1	17	17	36	0	0	0.0389	0.4433
	0.1994	0.0984	0.1337	0.0740	0	0.0120	0.0003					
2015	7	1	0	2	1	18	18	43	0	0	0	0.1459
	0.2212	0.2009	0.1560	0.1323	0.0062	0.0619	0.0757					
2015	7	1	0	2	1	19	19	26	0	0	0	0.0654
	0.1828	0.0850	0.2611	0.2099	0.1656	0	0.0303					
2015	7	1	0	2	1	20	20	14	0	0	0	0
	0.1845	0.1872	0.1845	0.1647	0.0840	0.0961	0.0991					
2015	7	1	0	2	1	21	21	6	0	0	0	0
	0	0	0.2491	0	0	0	0.7509					
2015	7	1	0	2	1	22	22	3	0	0	0	0
	0.4544	0	0.0912	0	0.4544	0	0					
2015	7	1	0	2	1	23	23	1	0	0	0	0
	0	0	0	0	0	0	1.0000					
2016	7	1	0	2	1	10	10	2	0	0	1.0000	0
	0	0	0	0	0	0	0					
2016	7	1	0	2	1	11	11	4	0	0	0.6521	0
	0.3479	0	0	0	0	0	0					
2016	7	1	0	2	1	12	12	9	0	0	0.6909	0.0687
	0.2404	0	0	0	0	0	0					
2016	7	1	0	2	1	13	13	25	0	0.0702	0.5081	0.0668
	0.3348	0	0	0	0	0	0.0200					
2016	7	1	0	2	1	14	14	25	0	0	0.3312	0.3442
	0.3137	0	0.0108	0	0	0	0					
2016	7	1	0	2	1	15	15	37	0	0	0.1198	0.2160
	0.6048	0.0507	0	0.0086	0	0	0					
2016	7	1	0	2	1	16	16	62	0	0	0.0405	0.3496
	0.4344	0.0278	0.0312	0.0581	0	0.0036	0.0548					
2016	7	1	0	2	1	17	17	57	0	0	0.0203	0.2229
	0.5301	0.0535	0.0989	0.0414	0	0	0.0331					
2016	7	1	0	2	1	18	18	61	0	0	0	0.1336
	0.5833	0.0446	0.0990	0.0045	0.0655	0.0335	0.0360					
2016	7	1	0	2	1	19	19	35	0	0	0.0336	0.0360
	0.3902	0.0363	0.1812	0.1209	0.0453	0.0678	0.0888					
2016	7	1	0	2	1	20	20	14	0	0	0	0
	0.0917	0.2071	0	0.5039	0.1973	0	0					
2016	7	1	0	2	1	21	21	11	0	0	0	0
	0.1217	0.1302	0.1302	0.4963	0	0.1217	0					
2016	7	1	0	2	1	22	22	3	0	0	0	0
	0	0	0	0.7898	0.2102	0	0					
2016	7	1	0	2	1	23	23	2	0	0	0	0
	0	0.4978	0	0	0	0	0.5022					
2016	7	1	0	2	1	24	24	1	0	0	0	0
	0	0	0	0	0	0	1.0000					
2017	7	1	0	2	1	8	8	1	0	1.0000	0	0
	0	0	0	0	0	0	0					
2017	7	1	0	2	1	9	9	1	0	1.0000	0	0
	0	0	0	0	0	0	0					
2017	7	1	0	2	1	10	10	2	0	0.3715	0.6285	0
	0	0	0	0	0	0	0					
2017	7	1	0	2	1	11	11	5	0	0.6502	0.0246	0.3251
	0	0	0	0	0	0	0					
2017	7	1	0	2	1	12	12	12	0	0.1299	0.0648	0.8053
	0	0	0	0	0	0	0					
2017	7	1	0	2	1	13	13	29	0	0.0287	0.0961	0.7447
	0.0135	0.1170	0	0	0	0	0					
2017	7	1	0	2	1	14	14	40	0	0	0.0351	0.8525
	0.0205	0.0919	0	0	0	0	0					
2017	7	1	0	2	1	15	15	45	0	0	0.0977	0.4662
	0.0147	0.4170	0	0	0.0045	0	0					
2017	7	1	0	2	1	16	16	48	0	0	0.0062	0.3004
	0.1624	0.4627	0.0615	0	0.0068	0	0					
2017	7	1	0	2	1	17	17	64	0	0	0.0067	0.1543
	0.1608	0.6082	0.0670	0.0003	0	0	0.0027					
2017	7	1	0	2	1	18	18	64	0	0	0	0.0663
	0.1379	0.5605	0.0792	0.0797	0.0634	0.0083	0.0047					

2017	7	1	0	2	1	19	19	33	0	0	0	0.0981
	0.0603	0.5706	0.0170	0.1050	0.0113	0.0064	0.1312					
2017	7	1	0	2	1	20	20	22	0	0	0	0
	0.2121	0.2929	0.2252	0.0327	0.0222	0.0340	0.1808					
2017	7	1	0	2	1	21	21	8	0	0	0	0
	0.0281	0.2588	0	0.2284	0.0281	0	0.4567					
2017	7	1	0	2	1	22	22	2	0	0	0	0
	0	0	0	0	0.0778	0	0.9222					
2017	7	1	0	2	1	24	24	1	0	0	0	0
	0	1.0000	0	0	0	0	0					
2018	7	1	0	2	1	9	9	1	0	1.0000	0	0
	0	0	0	0	0	0	0					
2018	7	1	0	2	1	10	10	13	0	0.5048	0.4952	0
	0	0	0	0	0	0	0					
2018	7	1	0	2	1	11	11	22	0	0.7621	0.2299	0
	0.0079	0	0	0	0	0	0					
2018	7	1	0	2	1	12	12	26	0	0.1601	0.5990	0.1946
	0.0464	0	0	0	0	0	0					
2018	7	1	0	2	1	13	13	24	0	0	0.7047	0.2109
	0.0650	0	0.0194	0	0	0	0					
2018	7	1	0	2	1	14	14	43	0	0	0.5575	0.1231
	0.3057	0	0	0	0	0	0.0137					
2018	7	1	0	2	1	15	15	66	0	0	0.2864	0.0350
	0.5833	0.0797	0.0157	0	0	0	0					
2018	7	1	0	2	1	16	16	85	0	0	0.1045	0.0851
	0.5681	0.0862	0.1107	0.0059	0	0	0.0395					
2018	7	1	0	2	1	17	17	69	0	0	0.0176	0.0528
	0.3681	0.2008	0.2942	0	0.0228	0.0038	0.0399					
2018	7	1	0	2	1	18	18	49	0	0	0.0229	0.0927
	0.2588	0.1204	0.4439	0	0.0132	0.0219	0.0261					
2018	7	1	0	2	1	19	19	30	0	0	0	0.0223
	0.2059	0.0816	0.2619	0	0.0902	0.0342	0.3038					
2018	7	1	0	2	1	20	20	18	0	0	0	0.0736
	0.0975	0	0.2757	0	0.2353	0.0005	0.3174					
2018	7	1	0	2	1	21	21	6	0	0	0	0
	0	0	0.1522	0	0	0.4117	0.4361					
2018	7	1	0	2	1	22	22	8	0	0	0	0
	0	0	0.4352	0.1271	0.0009	0.3097	0.1271					
2018	7	1	0	2	1	23	23	3	0	0	0	0
	0	0.6032	0.0044	0.3925	0	0	0					
2018	7	1	0	2	1	25	25	1	0	0	0	1.0000
	0	0	0	0	0	0	0					
2019	7	1	0	2	1	9	9	5	0	0	1.0000	0
	0	0	0	0	0	0	0					
2019	7	1	0	2	1	10	10	10	0	0.1175	0.8825	0
	0	0	0	0	0	0	0					
2019	7	1	0	2	1	11	11	18	0	0	0.9453	0
	0	0.0547	0	0	0	0	0					
2019	7	1	0	2	1	12	12	34	0	0	0.8997	0.1003
	0	0	0	0	0	0	0					
2019	7	1	0	2	1	13	13	46	0	0	0.7948	0.1996
	0.0056	0	0	0	0	0	0					
2019	7	1	0	2	1	14	14	39	0	0	0.5854	0.3783
	0	0.0363	0	0	0	0	0					
2019	7	1	0	2	1	15	15	45	0	0	0.3347	0.5732
	0.0229	0.0081	0	0.0306	0	0.0306	0					
2019	7	1	0	2	1	16	16	38	0	0	0.1798	0.4186
	0.0780	0.1708	0.0363	0.0764	0	0	0.0401					
2019	7	1	0	2	1	17	17	57	0	0	0.0702	0.3483
	0.0739	0.4731	0.0137	0.0207	0	0	0.0001					
2019	7	1	0	2	1	18	18	40	0	0	0	0.1799
	0.0796	0.3883	0.0484	0.2626	0.0051	0.0001	0.0359					
2019	7	1	0	2	1	19	19	30	0	0	0	0.0481
	0	0.2989	0.1555	0.1971	0.0008	0.0596	0.2401					
2019	7	1	0	2	1	20	20	18	0	0	0	0.0733
	0.0317	0	0.2057	0.3615	0	0.1115	0.2163					
2019	7	1	0	2	1	21	21	7	0	0	0	0
	0	0	0	0.1625	0.1743	0.1743	0.4890					
2019	7	1	0	2	1	22	22	4	0	0	0	0
	0	0	0.5827	0.2914	0	0	0.1259					
2019	7	1	0	2	1	23	23	1	0	0	0	0
	0	0	0	0	0	0	1.0000					
2019	7	1	0	2	1	25	25	1	0	0	0	0
	0	0	0	0	0	0	1.0000					
2020	7	1	0	2	1	9	9	1	0	0	1.0000	0
	0	0	0	0	0	0	0					
2020	7	1	0	2	1	10	10	3	0	0.4766	0	0.5234
	0	0	0	0	0	0	0					
2020	7	1	0	2	1	11	11	11	0	0	0.3718	0.6282
	0	0	0	0	0	0	0					
2020	7	1	0	2	1	12	12	17	0	0	0.1108	0.7856
	0.1036	0	0	0	0	0	0					
2020	7	1	0	2	1	13	13	52	0	0	0.0903	0.8336
	0.0761	0	0	0	0	0	0					
2020	7	1	0	2	1	14	14	79	0	0	0.0393	0.9302
	0.0170	0.0135	0	0	0	0	0					
2020	7	1	0	2	1	15	15	95	0	0	0.0014	0.8738
	0.0838	0.0125	0.0237	0.0048	0	0	0					
2020	7	1	0	2	1	16	16	65	0	0	0.0076	0.7962
	0.1782	0	0.0180	0	0	0	0					
2020	7	1	0	2	1	17	17	50	0	0	0	0.6042
	0.2686	0.0487	0.0391	0.0109	0.0286	0	0					
2020	7	1	0	2	1	18	18	31	0	0	0	0.3727
	0.2423	0.0469	0.2115	0.0030	0.1236	0	0					

2020	7	1	0	2	1	19	19	33	0	0	0.0603	0.2162
	0.2295	0.0610	0.2156	0.0509	0.0345	0.0938	0.0382					
2020	7	1	0	2	1	20	20	7	0	0	0	0
	0	0	0	0	0.3205	0.0122	0.6674					
2020	7	1	0	2	1	21	21	9	0	0	0	0.0950
	0	0	0.1886	0.0815	0.3097	0	0.3251					
2021	7	1	0	2	1	10	10	1	0	0	1.0000	0
	0	0	0	0	0	0	0					
2021	7	1	0	2	1	11	11	5	0	0	0.8457	0
	0.1543	0	0	0	0	0	0					
2021	7	1	0	2	1	12	12	12	0	0.0567	0.3109	0.4286
	0.0903	0.0567	0	0	0	0	0.0567					
2021	7	1	0	2	1	13	13	38	0	0	0.1316	0.1634
	0.7049	0	0	0	0	0	0					
2021	7	1	0	2	1	14	14	76	0	0	0.0752	0.1417
	0.7762	0.0069	0	0	0	0	0					
2021	7	1	0	2	1	15	15	98	0	0	0	0.1018
	0.8404	0.0369	0	0.0005	0.0045	0.0159	0					
2021	7	1	0	2	1	16	16	142	0	0	0.0044	0.0346
	0.8091	0.0929	0.0080	0.0401	0.0062	0.0044	0					
2021	7	1	0	2	1	17	17	141	0	0	0	0.0302
	0.7001	0.1692	0.0332	0.0510	0.0118	0.0045	0					
2021	7	1	0	2	1	18	18	113	0.0089	0	0	0.0218
	0.4729	0.1855	0.0861	0.1305	0.0258	0.0382	0.0303					
2021	7	1	0	2	1	19	19	93	0	0	0.0062	0
	0.3937	0.1612	0.0253	0.1636	0.0891	0.0795	0.0814					
2021	7	1	0	2	1	20	20	57	0	0	0	0
	0.1162	0.0737	0.0873	0.2697	0.0461	0.2157	0.1912					
2021	7	1	0	2	1	21	21	18	0	0	0	0
	0.1141	0.0331	0	0	0.1053	0.4667	0.2809					
2021	7	1	0	2	1	22	22	6	0	0	0	0.1469
	0	0	0	0	0	0.1591	0.6940					
2021	7	1	0	2	1	23	23	2	0	0	0	0
	0.5000	0	0.5000	0	0	0	0					
2022	7	1	0	2	1	9	9	2	0	1.0000	0	0
	0	0	0	0	0	0	0					
2022	7	1	0	2	1	10	10	8	0	0.8750	0.1250	0
	0	0	0	0	0	0	0					
2022	7	1	0	2	1	11	11	14	0	0.7068	0.2932	0
	0	0	0	0	0	0	0					
2022	7	1	0	2	1	12	12	24	0	0.4264	0.2965	0.2771
	0	0	0	0	0	0	0					
2022	7	1	0	2	1	13	13	36	0	0.2597	0.3961	0.2222
	0.0326	0.0894	0	0	0	0	0					
2022	7	1	0	2	1	14	14	31	0	0.0309	0.3527	0.4982
	0.0873	0.0309	0	0	0	0	0					
2022	7	1	0	2	1	15	15	52	0	0	0.1993	0.4093
	0.0176	0.3435	0.0101	0	0	0	0.0203					
2022	7	1	0	2	1	16	16	84	0	0	0.0702	0.2167
	0.1726	0.4897	0.0509	0	0	0	0					
2022	7	1	0	2	1	17	17	109	0	0	0.0083	0.1351
	0.0396	0.7538	0.0300	0.0027	0.0222	0	0.0083					
2022	7	1	0	2	1	18	18	82	0	0	0.0138	0.0213
	0.0260	0.7497	0.1159	0.0061	0.0510	0.0162	0					
2022	7	1	0	2	1	19	19	59	0	0	0	0
	0	0.7077	0.0938	0.0004	0.1297	0.0242	0.0442					
2022	7	1	0	2	1	20	20	22	0	0	0	0
	0	0.4663	0.1113	0	0.1113	0.0520	0.2591					
2022	7	1	0	2	1	21	21	16	0	0	0	0
	0	0.3239	0.0617	0	0.1933	0.0681	0.3530					
2022	7	1	0	2	1	23	23	2	0	0	0	0
	0	0.4588	0	0	0.5412	0	0					
2022	7	1	0	2	1	24	24	2	0	0	0	0
	0	0.4588	0	0	0	0	0.5412					
2022	7	1	0	2	1	25	25	1	0	0	0	0
	0	0	0	0	0	0	1.0000					
2023	7	1	0	2	1	9	9	3	0	1.0000	0	0
	0	0	0	0	0	0	0					
2023	7	1	0	2	1	10	10	9	0	0.5477	0.4523	0
	0	0	0	0	0	0	0					
2023	7	1	0	2	1	11	11	23	0	0.4679	0.4890	0.0431
	0	0	0	0	0	0	0					
2023	7	1	0	2	1	12	12	45	0	0.0859	0.8455	0.0687
	0	0	0	0	0	0	0					
2023	7	1	0	2	1	13	13	46	0	0	0.8818	0.1182
	0	0	0	0	0	0	0					
2023	7	1	0	2	1	14	14	37	0	0.0170	0.8212	0.0491
	0.1127	0	0	0	0	0	0					
2023	7	1	0	2	1	15	15	38	0	0	0.4552	0.2003
	0.1461	0.0509	0.1408	0.0067	0	0	0					
2023	7	1	0	2	1	16	16	70	0	0.0264	0.1199	0.2831
	0.3242	0.0361	0.1431	0.0264	0	0.0277	0.0129					
2023	7	1	0	2	1	17	17	69	0	0	0.0271	0.0412
	0.3525	0.0728	0.4596	0.0230	0.0035	0.0036	0.0168					
2023	7	1	0	2	1	18	18	66	0	0	0	0.0315
	0.1449	0.0947	0.6195	0.0366	0.0001	0.0371	0.0356					
2023	7	1	0	2	1	19	19	61	0	0	0	0
	0.0639	0.0406	0.6457	0.0846	0.0472	0.0073	0.1107					
2023	7	1	0	2	1	20	20	37	0	0	0	0
	0.0508	0	0.5639	0.1495	0.0254	0.0974	0.1129					
2023	7	1	0	2	1	21	21	11	0	0	0	0
	0	0	0.3636	0.1309	0	0	0.5056					
2023	7	1	0	2	1	22	22	4	0	0	0	0
	0	0	0.1485	0	0	0	0.8515					

2002	7	2	0	0	1	14	14	2	0	0	1.0000	0
	0	0	0	0	0	0	0					
2002	7	2	0	0	1	15	15	3	0	0	0.6667	0
	0	0.3333	0	0	0	0	0					
2002	7	2	0	0	1	16	16	3	0	0	0.3333	0.3333
	0	0	0.3333	0	0	0	0					
2002	7	2	0	0	1	17	17	4	0	0	0	0.5000
	0	0.2500	0.2500	0	0	0	0					
2002	7	2	0	0	1	18	18	2	0	0	0	0.5000
	0	0	0.5000	0	0	0	0					
2002	7	2	0	0	1	19	19	5	0	0	0.2000	0.4000
	0	0	0.2000	0	0	0	0.2000					
2002	7	2	0	0	1	20	20	7	0	0	0	0.5714
	0	0	0.1429	0	0.1429	0.1429	0					
2002	7	2	0	0	1	21	21	2	0	0	0	1.0000
	0	0	0	0	0	0	0					
2002	7	2	0	0	1	22	22	1	0	0	0	0
	1.0000	0	0	0	0	0	0					
2002	7	2	0	0	1	24	24	1	0	0	0	0
	0	0	1.0000	0	0	0	0					
2003	7	2	0	0	1	13	13	2	0	0	0.5000	0
	0	0	0	0	0	0	0.5000					
2003	7	2	0	0	1	14	14	16	0	0	0.0625	0.2500
	0.3750	0.1875	0.0625	0	0	0	0.0625					
2003	7	2	0	0	1	15	15	20	0	0	0.1000	0.3000
	0.2500	0.0500	0.0500	0.1000	0	0.0500	0.1000					
2003	7	2	0	0	1	16	16	70	0	0	0.0143	0.1286
	0.3429	0.2143	0.0571	0.1143	0.0286	0.0429	0.0571					
2003	7	2	0	0	1	17	17	80	0	0	0	0.0250
	0.3375	0.1875	0.1125	0.2250	0.0500	0.0125	0.0500					
2003	7	2	0	0	1	18	18	69	0	0	0	0.0435
	0.1159	0.2174	0.1159	0.2609	0.1014	0.0435	0.1014					
2003	7	2	0	0	1	19	19	28	0	0	0	0.0357
	0.0357	0.1786	0.1429	0.1786	0.0357	0.2143	0.1786					
2003	7	2	0	0	1	20	20	9	0	0	0	0
	0.2222	0	0.2222	0.1111	0.1111	0.3333	0					
2003	7	2	0	0	1	21	21	16	0	0	0	0.0625
	0.2500	0.1250	0.0625	0.1875	0.0625	0	0.2500					
2003	7	2	0	0	1	22	22	11	0	0	0	0.0909
	0.2727	0	0	0.2727	0	0.0909	0.2727					
2003	7	2	0	0	1	23	23	1	0	0	0	0
	0	0	0	0	0	0	1.0000					
2003	7	2	0	0	1	24	24	2	0	0	0	0
	0	0	0	0	0	0	1.0000					
2003	7	2	0	0	1	28	28	1	0	0	0	0
	0	0	0	0	0	0	1.0000					
2004	7	2	0	0	1	13	13	9	0	0	0.2222	0.2222
	0.4444	0.1111	0	0	0	0	0					
2004	7	2	0	0	1	14	14	16	0	0	0	0.2500
	0.6250	0.1250	0	0	0	0	0					
2004	7	2	0	0	1	15	15	26	0	0	0	0.0385
	0.5000	0.3462	0.0769	0	0	0	0.0385					
2004	7	2	0	0	1	16	16	31	0	0	0	0.0323
	0.3548	0.3226	0.0968	0.0323	0.0968	0	0.0645					
2004	7	2	0	0	1	17	17	90	0	0	0	0.0222
	0.1000	0.4222	0.1889	0.0222	0.1333	0.0111	0.1000					
2004	7	2	0	0	1	18	18	93	0	0	0	0
	0.0323	0.3226	0.1935	0.0860	0.1398	0.0538	0.1720					
2004	7	2	0	0	1	19	19	35	0	0	0	0
	0	0.1429	0.1714	0.1429	0.1714	0.0286	0.3429					
2004	7	2	0	0	1	20	20	2	0	0	0	0
	0	0	0.5000	0	0	0	0.5000					
2004	7	2	0	0	1	22	22	1	0	0	0	0
	0	0	0	0	0	0	1.0000					
2005	7	2	0	0	1	13	13	8	0	0	0.7500	0.2500
	0	0	0	0	0	0	0					
2005	7	2	0	0	1	14	14	14	0	0	0.3571	0.2857
	0	0.1429	0.2143	0	0	0	0					
2005	7	2	0	0	1	15	15	20	0	0	0.1000	0.5000
	0.1000	0.3000	0	0	0	0	0					
2005	7	2	0	0	1	16	16	36	0	0	0	0.1667
	0.2778	0.5000	0.0556	0	0	0	0					
2005	7	2	0	0	1	17	17	67	0	0	0	0.0896
	0.0746	0.4478	0.1493	0.0597	0.0149	0.0896	0.0746					
2005	7	2	0	0	1	18	18	56	0	0	0	0.0357
	0.0357	0.3393	0.1786	0.0893	0.0536	0.1429	0.1250					
2005	7	2	0	0	1	19	19	37	0	0	0	0
	0	0.1351	0.3514	0.1351	0.0541	0.1622	0.1622					
2005	7	2	0	0	1	20	20	5	0	0	0	0
	0	0	0	0.2000	0	0.4000	0.4000					
2005	7	2	0	0	1	21	21	1	0	0	0	0
	0	0	0	1.0000	0	0	0					
2005	7	2	0	0	1	22	22	1	0	0	0	0
	0	0	0	0	0	1.0000	0					
2006	7	2	0	0	1	14	14	10	0	0	0.1000	0.7000
	0.1000	0	0	0.1000	0	0	0					
2006	7	2	0	0	1	15	15	17	0	0	0.0588	0.8235
	0.0588	0	0.0588	0	0	0	0					
2006	7	2	0	0	1	16	16	14	0	0	0	0.0714
	0.2143	0.2143	0.5000	0	0	0	0					
2006	7	2	0	0	1	17	17	37	0	0	0	0.0270
	0	0.1351	0.3514	0.2703	0.0811	0.0541	0.0811					
2006	7	2	0	0	1	18	18	58	0	0	0	0.0172
	0.0172	0.1034	0.4310	0.1724	0.1034	0.0172	0.1379					

2006	7	2	0	0	1	19	19	51	0	0	0	0
	0.0196	0.0392	0.3137	0.2353	0.1569	0.0196	0.2157					
2006	7	2	0	0	1	20	20	18	0	0	0	0.0556
	0	0	0.2778	0.1667	0.2778	0	0.2222					
2006	7	2	0	0	1	21	21	16	0	0	0	0
	0	0	0	0.1875	0.0625	0.0625	0.6875					
2006	7	2	0	0	1	22	22	4	0	0	0	0
	0	0	0	0	0	0	1.0000					
2006	7	2	0	0	1	23	23	2	0	0	0	0
	0	0	0	0	0	0	1.0000					
2006	7	2	0	0	1	24	24	1	0	0	0	0
	0	0	0	0	1.0000	0	0					
2007	7	2	0	0	1	12	12	2	0	0	1.0000	0
	0	0	0	0	0	0	0					
2007	7	2	0	0	1	13	13	5	0	0	0.2000	0.4000
	0.4000	0	0	0	0	0	0					
2007	7	2	0	0	1	14	14	20	0	0	0.1500	0.6500
	0.1000	0.0500	0	0.0500	0	0	0					
2007	7	2	0	0	1	15	15	27	0	0	0	0.5556
	0.3333	0.1111	0	0	0	0	0					
2007	7	2	0	0	1	16	16	64	0	0	0.0156	0.1250
	0.4531	0.2031	0.0156	0.1094	0.0469	0.0313	0					
2007	7	2	0	0	1	17	17	100	0	0	0.0100	0.0200
	0.1400	0.2000	0.0600	0.3100	0.1100	0.0700	0.0800					
2007	7	2	0	0	1	18	18	188	0	0	0	0.0106
	0.0532	0.1011	0.0691	0.2819	0.1702	0.1064	0.2074					
2007	7	2	0	0	1	19	19	163	0	0	0	0
	0.0491	0.0429	0.0491	0.2638	0.2331	0.0920	0.2699					
2007	7	2	0	0	1	20	20	102	0	0	0	0
	0.0294	0.0490	0.0490	0.1569	0.2549	0.1667	0.2941					
2007	7	2	0	0	1	21	21	36	0	0	0	0
	0.0556	0.0556	0.1944	0.1944	0.1667	0.1389	0.1944					
2007	7	2	0	0	1	22	22	10	0	0	0	0
	0	0	0.2000	0	0.4000	0.2000	0.2000					
2008	7	2	0	0	1	13	13	2	0	0	0.5000	0.5000
	0	0	0	0	0	0	0					
2008	7	2	0	0	1	14	14	16	0	0	0.0625	0.3750
	0.1875	0.3125	0	0	0.0625	0	0					
2008	7	2	0	0	1	15	15	24	0	0	0.0417	0.4583
	0.1667	0.2500	0.0417	0	0	0	0.0417					
2008	7	2	0	0	1	16	16	55	0	0	0	0.4000
	0.2000	0.2000	0.0909	0.0182	0.0545	0.0364	0					
2008	7	2	0	0	1	17	17	145	0	0	0	0.0828
	0.1172	0.2345	0.1172	0.0552	0.2069	0.0759	0.1103					
2008	7	2	0	0	1	18	18	205	0	0	0	0.0098
	0.0537	0.1561	0.1463	0.0341	0.1805	0.1463	0.2732					
2008	7	2	0	0	1	19	19	199	0	0	0	0
	0.0101	0.0854	0.0553	0.0302	0.2462	0.2161	0.3568					
2008	7	2	0	0	1	20	20	58	0	0	0	0
	0	0.0345	0.1379	0.1207	0.3276	0.1034	0.2759					
2008	7	2	0	0	1	21	21	14	0	0	0	0
	0	0.0714	0	0	0.4286	0.2857	0.2143					
2008	7	2	0	0	1	22	22	3	0	0	0	0
	0	0	0	0	0	0.3333	0.6667					
2009	7	2	0	0	1	12	12	1	0	0	0	0
	1.0000	0	0	0	0	0	0					
2009	7	2	0	0	1	13	13	8	0	0	0.1250	0.1250
	0.7500	0	0	0	0	0	0					
2009	7	2	0	0	1	14	14	18	0	0	0	0.1111
	0.8333	0.0556	0	0	0	0	0					
2009	7	2	0	0	1	15	15	35	0	0	0	0.0857
	0.8571	0	0.0286	0	0	0.0286	0					
2009	7	2	0	0	1	16	16	43	0	0	0	0
	0.4419	0.1395	0.2791	0.0465	0	0.0698	0.0233					
2009	7	2	0	0	1	17	17	78	0	0	0	0.0128
	0.2436	0.1026	0.2308	0.1154	0.0256	0.0897	0.1795					
2009	7	2	0	0	1	18	18	144	0	0	0	0
	0.0208	0.0486	0.2986	0.1111	0.0139	0.2292	0.2778					
2009	7	2	0	0	1	19	19	139	0	0	0	0
	0.0216	0.0504	0.1511	0.1007	0.0791	0.2518	0.3453					
2009	7	2	0	0	1	20	20	43	0	0	0	0
	0	0.0233	0.0930	0.1163	0.0465	0.3953	0.3256					
2009	7	2	0	0	1	21	21	3	0	0	0	0
	0	0	0	0	0	0.6667	0.3333					
2009	7	2	0	0	1	22	22	1	0	0	0	0
	0	0	1.0000	0	0	0	0					
2009	7	2	0	0	1	23	23	1	0	0	0	0
	0	0	0	0	0	1.0000	0					
2010	7	2	0	0	1	13	13	2	0	0	0	0
	0	1.0000	0	0	0	0	0					
2010	7	2	0	0	1	14	14	21	0	0	0	0.0476
	0.5238	0.4286	0	0	0	0	0					
2010	7	2	0	0	1	15	15	32	0	0	0	0
	0.1563	0.7500	0.0313	0	0.0313	0	0.0313					
2010	7	2	0	0	1	16	16	60	0	0	0	0.0167
	0.0667	0.6167	0.1333	0.1000	0	0	0.0667					
2010	7	2	0	0	1	17	17	45	0	0	0	0.0222
	0.0222	0.2667	0.0667	0.1556	0.1111	0.0222	0.3333					
2010	7	2	0	0	1	18	18	49	0	0	0	0
	0	0.1633	0.0408	0.1429	0.0816	0.0612	0.5102					
2010	7	2	0	0	1	19	19	27	0	0	0	0
	0	0.1111	0	0.2222	0.0741	0.0741	0.5185					
2010	7	2	0	0	1	20	20	3	0	0	0	0
	0	0	0	0	0	0	1.0000					

2011	7	2	0	0	1	13	13	12	0	0	0.9167	0
	0	0	0.0833	0	0	0	0					
2011	7	2	0	0	1	14	14	51	0	0	0.8627	0.0784
	0	0.0196	0.0392	0	0	0	0					
2011	7	2	0	0	1	15	15	69	0	0	0.3913	0.4783
	0.0435	0.0290	0.0580	0	0	0	0					
2011	7	2	0	0	1	16	16	113	0	0	0.2655	0.3628
	0.1239	0.0708	0.1150	0.0177	0.0442	0	0					
2011	7	2	0	0	1	17	17	105	0	0	0.1714	0.3714
	0.1619	0.0857	0.1524	0.0190	0.0095	0.0190	0.0095					
2011	7	2	0	0	1	18	18	114	0	0	0.0614	0.2807
	0.0965	0.0965	0.2807	0.0088	0.0702	0.0175	0.0877					
2011	7	2	0	0	1	19	19	110	0	0	0.0455	0.2727
	0.1000	0.1455	0.1818	0.0727	0.0364	0.0273	0.1182					
2011	7	2	0	0	1	20	20	53	0	0	0.0189	0.3208
	0.2075	0.1132	0.1132	0.0377	0.0566	0	0.1321					
2011	7	2	0	0	1	21	21	63	0	0	0.0317	0.2222
	0.1111	0.2063	0.1270	0.0317	0.0635	0.0476	0.1587					
2011	7	2	0	0	1	22	22	28	0	0	0.0357	0.0714
	0.1071	0.1429	0.1071	0.0357	0.2143	0.1071	0.1786					
2011	7	2	0	0	1	23	23	2	0	0	0	0
	0	0	0.5000	0	0	0.5000	0					
2011	7	2	0	0	1	24	24	4	0	0	0	0
	0.2500	0.2500	0.2500	0	0	0.2500	0					
2011	7	2	0	0	1	25	25	3	0	0	0	0
	0.3333	0.3333	0.3333	0	0	0	0					
2012	7	2	0	0	1	12	12	3	0	0	0.6667	0.3333
	0	0	0	0	0	0	0					
2012	7	2	0	0	1	13	13	12	0	0	0.4167	0.5000
	0	0	0	0.0833	0	0	0					
2012	7	2	0	0	1	14	14	26	0	0	0.0769	0.7692
	0.1154	0	0	0.0385	0	0	0					
2012	7	2	0	0	1	15	15	37	0	0	0	0.5135
	0.4054	0.0541	0	0.0270	0	0	0					
2012	7	2	0	0	1	16	16	52	0	0	0	0.4231
	0.2115	0.1154	0.1346	0.0577	0	0.0577	0					
2012	7	2	0	0	1	17	17	75	0	0	0	0.1867
	0.2400	0.1600	0.0933	0.2267	0	0.0533	0.0400					
2012	7	2	0	0	1	18	18	78	0	0	0	0.0769
	0.1923	0.1026	0.1410	0.2949	0.0513	0.0769	0.0641					
2012	7	2	0	0	1	19	19	81	0	0	0	0.0123
	0.2963	0.1605	0.0617	0.2346	0.0370	0.0494	0.1481					
2012	7	2	0	0	1	20	20	50	0	0	0	0
	0.2000	0.1800	0.2200	0.0600	0.0800	0.0600	0.2000					
2012	7	2	0	0	1	21	21	43	0	0	0	0
	0.0698	0.0465	0.1860	0.2093	0.0930	0.1860	0.2093					
2012	7	2	0	0	1	22	22	22	0	0	0	0
	0.0455	0.0455	0	0.2273	0.1364	0.1364	0.4091					
2012	7	2	0	0	1	23	23	2	0	0	0	0
	0	0	0	0	0	0	1.0000					
2013	7	2	0	0	1	13	13	1	0	0	1.0000	0
	0	0	0	0	0	0	0					
2013	7	2	0	0	1	14	14	5	0	0	0	0.4000
	0.2000	0.4000	0	0	0	0	0					
2013	7	2	0	0	1	15	15	17	0	0	0	0.4706
	0.1765	0.1176	0	0.2353	0	0	0					
2013	7	2	0	0	1	16	16	16	0	0	0.0625	0.2500
	0.2500	0.1875	0.0625	0	0.0625	0	0.1250					
2013	7	2	0	0	1	17	17	36	0	0	0.1111	0.0556
	0.2222	0.1111	0.1111	0.1111	0.1111	0.0278	0.1389					
2013	7	2	0	0	1	18	18	65	0	0	0	0.0462
	0.0462	0.1231	0.1692	0.1385	0.4154	0	0.0615					
2013	7	2	0	0	1	19	19	39	0	0	0	0.0256
	0.0513	0.0769	0.1026	0.0769	0.5385	0.0256	0.1026					
2013	7	2	0	0	1	20	20	4	0	0	0	0
	0	0	0.2500	0	0.5000	0	0.2500					
2013	7	2	0	0	1	21	21	4	0	0	0	0
	0	0	0.2500	0	0	0	0.7500					
2013	7	2	0	0	1	22	22	2	0	0	0	0
	0.5000	0	0.5000	0	0	0	0					
2013	7	2	0	0	1	24	24	1	0	0	0	0
	1.0000	0	0	0	0	0	0					
2013	7	2	0	0	1	25	25	1	0	0	0	0
	0	0	0	1.0000	0	0	0					
2014	7	2	0	0	1	10	10	2	0	0	1.0000	0
	0	0	0	0	0	0	0					
2014	7	2	0	0	1	11	11	2	0	0	1.0000	0
	0	0	0	0	0	0	0					
2014	7	2	0	0	1	12	12	6	0	0	1.0000	0
	0	0	0	0	0	0	0					
2014	7	2	0	0	1	13	13	12	0	0	0.9801	0
	0	0.0199	0	0	0	0	0					
2014	7	2	0	0	1	14	14	17	0	0	0.4635	0.3309
	0.1688	0	0	0	0	0	0.0369					
2014	7	2	0	0	1	15	15	25	0	0	0.1082	0.1803
	0.4037	0.1679	0.0541	0.0202	0.0454	0.0202	0					
2014	7	2	0	0	1	16	16	52	0	0	0.1161	0.0644
	0.3662	0.1552	0.1219	0.0498	0.1116	0.0147	0					
2014	7	2	0	0	1	17	17	84	0	0	0.0977	0.1054
	0.1495	0.2416	0.1433	0.0805	0.0734	0.0702	0.0385					
2014	7	2	0	0	1	18	18	103	0	0	0	0.0492
	0.1565	0.1812	0.1179	0.1756	0.1121	0.1554	0.0519					
2014	7	2	0	0	1	19	19	73	0	0	0	0.0240
	0.0240	0.1892	0.1454	0.0823	0.0836	0.2294	0.2221					

2014	7	2	0	0	1	20	20	41	0	0	0.0159	0
	0.0517	0.1651	0.1149	0.1719	0.0517	0.2478	0.1810					
2014	7	2	0	0	1	21	21	21	0	0	0	0
	0.0017	0.2047	0.2639	0.2243	0.1651	0	0.1404					
2014	7	2	0	0	1	22	22	9	0	0	0	0
	0	0.1182	0.1182	0	0.0540	0.2365	0.4730					
2014	7	2	0	0	1	23	23	5	0	0	0	0
	0	0	0	0	0.4000	0.2000	0.4000					
2014	7	2	0	0	1	24	24	2	0	0	0	0
	0	0	0	0	0.5000	0.5000	0					
2015	7	2	0	0	1	12	12	4	0	0	0	1.0000
	0	0	0	0	0	0	0					
2015	7	2	0	0	1	13	13	10	0	0	0.0006	0.9994
	0	0	0	0	0	0	0					
2015	7	2	0	0	1	14	14	43	0	0	0.0083	0.9773
	0.0087	0.0056	0	0	0	0	0					
2015	7	2	0	0	1	15	15	90	0	0	0.0002	0.8689
	0.0589	0.0540	0.0170	0	0.0008	0	0					
2015	7	2	0	0	1	16	16	54	0	0	0	0.6279
	0.1568	0.1925	0.0071	0.0069	0.0014	0.0046	0.0028					
2015	7	2	0	0	1	17	17	50	0	0	0	0.1448
	0.3728	0.1118	0.0807	0.0010	0.0917	0.0296	0.1677					
2015	7	2	0	0	1	18	18	60	0	0	0	0
	0.2146	0.1778	0.1502	0.0499	0.1140	0.0801	0.2136					
2015	7	2	0	0	1	19	19	75	0	0	0	0
	0.0625	0.1297	0.2815	0.0721	0.1396	0.0516	0.2630					
2015	7	2	0	0	1	20	20	53	0	0	0	0
	0.0410	0.0410	0.2870	0.1525	0.1092	0.0345	0.3348					
2015	7	2	0	0	1	21	21	12	0	0	0	0.0548
	0	0.0039	0.3901	0.0548	0.0044	0	0.4920					
2016	7	2	0	0	1	11	11	1	0	0	0	1.0000
	0	0	0	0	0	0	0					
2016	7	2	0	0	1	13	13	4	0	0	0	0.5000
	0.5000	0	0	0	0	0	0					
2016	7	2	0	0	1	14	14	13	0	0	0.0033	0.5636
	0.4331	0	0	0	0	0	0					
2016	7	2	0	0	1	15	15	43	0	0	0	0.8779
	0.1167	0.0012	0.0015	0.0015	0	0	0.0012					
2016	7	2	0	0	1	16	16	73	0	0	0.0030	0.5573
	0.3308	0.0626	0.0388	0.0026	0.0010	0	0.0038					
2016	7	2	0	0	1	17	17	76	0	0	0	0.1164
	0.7320	0.0330	0.0048	0.0793	0.0268	0.0010	0.0069					
2016	7	2	0	0	1	18	18	84	0	0	0	0.0236
	0.6642	0.1966	0.0154	0.0461	0.0174	0.0007	0.0360					
2016	7	2	0	0	1	19	19	50	0	0	0	0.0046
	0.3435	0.2209	0.0318	0.1449	0.0672	0.0557	0.1315					
2016	7	2	0	0	1	20	20	32	0	0	0	0.0020
	0.1501	0.3939	0.1444	0.0714	0.0788	0.0404	0.1191					
2016	7	2	0	0	1	21	21	18	0	0	0	0
	0	0.3145	0.0739	0.1735	0.0036	0.1632	0.2713					
2016	7	2	0	0	1	22	22	13	0	0	0	0
	0	0.2234	0.0790	0.3161	0	0.0790	0.3025					
2016	7	2	0	0	1	23	23	3	0	0	0	0
	0	0	0	0	0.3333	0	0.6667					
2016	7	2	0	0	1	24	24	1	0	0	0	0
	0	0	0	0	0	0	1.0000					
2017	7	2	0	0	1	13	13	8	0	0	0.3918	0.6014
	0.0069	0	0	0	0	0	0					
2017	7	2	0	0	1	14	14	14	0	0	0.3473	0.1367
	0.2442	0.1538	0	0	0	0.1180	0					
2017	7	2	0	0	1	15	15	32	0	0	0.2571	0.4717
	0.0660	0.1024	0	0.0514	0	0	0.0514					
2017	7	2	0	0	1	16	16	46	0	0	0.1335	0.4621
	0.1724	0.1265	0.0502	0.0041	0.0511	0	0					
2017	7	2	0	0	1	17	17	34	0	0	0.0460	0.2850
	0.2274	0.3847	0.0026	0.0073	0	0.0009	0.0460					
2017	7	2	0	0	1	18	18	60	0	0	0.0233	0.1058
	0.2571	0.3901	0.0541	0.0233	0.0699	0.0013	0.0751					
2017	7	2	0	0	1	19	19	75	0	0	0	0.0162
	0.0274	0.4902	0.0567	0.1048	0.1202	0.0410	0.1435					
2017	7	2	0	0	1	20	20	54	0	0	0	0
	0.0455	0.3396	0.1707	0.1264	0.0683	0.1287	0.1208					
2017	7	2	0	0	1	21	21	16	0	0	0	0.0722
	0	0.1914	0	0	0.1192	0.3536	0.2636					
2017	7	2	0	0	1	22	22	3	0	0	0	0
	0	0	0	0	0.4341	0.2830	0.2830					
2017	7	2	0	0	1	23	23	2	0	0	0	0
	0	0	0	0	0	0.3946	0.6054					
2018	7	2	0	0	1	12	12	1	0	0	1.0000	0
	0	0	0	0	0	0	0					
2018	7	2	0	0	1	13	13	8	0	0.0814	0.5880	0
	0.2773	0.0533	0	0	0	0	0					
2018	7	2	0	0	1	14	14	30	0	0.0381	0.3935	0.3394
	0.1831	0.0459	0	0	0	0	0					
2018	7	2	0	0	1	15	15	48	0	0.0144	0.2881	0.1622
	0.3182	0.0692	0.0440	0	0	0	0.1038					
2018	7	2	0	0	1	16	16	69	0	0	0.2446	0.1025
	0.3298	0.1207	0.1543	0	0	0.0058	0.0424					
2018	7	2	0	0	1	17	17	71	0	0	0.1417	0.0659
	0.2332	0.1843	0.2797	0	0.0001	0	0.0952					
2018	7	2	0	0	1	18	18	71	0	0	0.0271	0.0599
	0.1321	0.1570	0.4487	0.0484	0.0417	0.0213	0.0639					
2018	7	2	0	0	1	19	19	79	0	0	0	0.0169
	0.0891	0.1637	0.4444	0.0512	0.0075	0.0751	0.1521					

2018	7	2	0	0	1	20	20	60	0	0	0	0.0238
	0.0238	0.1337	0.3248	0.0466	0.0843	0.0540	0.3091					
2018	7	2	0	0	1	21	21	33	0	0	0	0
	0	0.0251	0.3127	0.1500	0.1540	0.1626	0.1956					
2018	7	2	0	0	1	22	22	15	0	0	0	0
	0	0.0302	0.0302	0.3137	0.2518	0.1525	0.2216					
2018	7	2	0	0	1	23	23	4	0	0	0	0
	0	0	0	0	0	0.1546	0.8454					
2018	7	2	0	0	1	24	24	2	0	0	0	0
	0	0	0.5000	0.5000	0	0	0					
2018	7	2	0	0	1	25	25	1	0	0	0	0
	0	0	0	0	0	1.0000	0					
2019	7	2	0	0	1	10	10	2	0	0	1.0000	0
	0	0	0	0	0	0	0					
2019	7	2	0	0	1	11	11	6	0	0	1.0000	0
	0	0	0	0	0	0	0					
2019	7	2	0	0	1	12	12	12	0	0	0.9880	0.0120
	0	0	0	0	0	0	0					
2019	7	2	0	0	1	13	13	42	0	0	0.7496	0.1645
	0.0478	0	0	0.0190	0	0.0190	0					
2019	7	2	0	0	1	14	14	38	0	0	0.3638	0.5080
	0.0517	0	0.0524	0	0	0	0.0241					
2019	7	2	0	0	1	15	15	51	0	0	0	0.8058
	0.0579	0.0309	0.0496	0.0279	0	0.0184	0.0095					
2019	7	2	0	0	1	16	16	53	0	0	0.0476	0.1816
	0.1825	0.5179	0.0023	0.0393	0	0.0098	0.0189					
2019	7	2	0	0	1	17	17	87	0	0	0	0.0954
	0.1397	0.5868	0.0808	0.0352	0	0.0005	0.0616					
2019	7	2	0	0	1	18	18	84	0	0	0	0.0374
	0.0368	0.4982	0.1079	0.1848	0.0244	0	0.1104					
2019	7	2	0	0	1	19	19	89	0	0	0	0.0106
	0.0444	0.2829	0.0837	0.4108	0.0258	0.0496	0.0922					
2019	7	2	0	0	1	20	20	61	0	0	0	0
	0	0.1459	0.0852	0.4515	0.0633	0.0777	0.1764					
2019	7	2	0	0	1	21	21	26	0	0	0	0
	0	0.1024	0.0196	0.6037	0.0761	0.0828	0.1153					
2019	7	2	0	0	1	22	22	5	0	0	0	0
	0	0.3513	0	0.1756	0	0	0.4731					
2019	7	2	0	0	1	23	23	1	0	0	0	0
	0	0	0	1.0000	0	0	0					
2019	7	2	0	0	1	24	24	1	0	0	0	0
	0	0	0	0	0	1.0000	0					
2020	7	2	0	0	1	11	11	3	0	0	0.0138	0.9862
	0	0	0	0	0	0	0					
2020	7	2	0	0	1	12	12	9	0	0	0	1.0000
	0	0	0	0	0	0	0					
2020	7	2	0	0	1	13	13	20	0	0	0.0827	0.8345
	0.0827	0	0	0	0	0	0					
2020	7	2	0	0	1	14	14	29	0	0	0	1.0000
	0	0	0	0	0	0	0					
2020	7	2	0	0	1	15	15	22	0	0	0	0.7504
	0.2496	0	0	0	0	0	0					
2020	7	2	0	0	1	16	16	35	0	0	0	0.6606
	0.1763	0.1618	0.0004	0	0.0009	0	0					
2020	7	2	0	0	1	17	17	18	0	0	0	0.3987
	0.2258	0.0013	0.2242	0.1495	0	0	0.0005					
2020	7	2	0	0	1	18	18	18	0	0	0	0.1078
	0.2132	0.2125	0.0348	0.3196	0.1086	0	0.0034					
2020	7	2	0	0	1	19	19	20	0	0	0	0
	0	0	0.3215	0.2374	0.1362	0	0.3049					
2020	7	2	0	0	1	20	20	11	0	0	0	0
	0	0	0.0570	0.2930	0.3430	0.2930	0.0140					
2020	7	2	0	0	1	21	21	6	0	0	0	0
	0	0	0.0016	0.4982	0.0019	0	0.4982					
2020	7	2	0	0	1	22	22	1	0	0	0	0
	0	0	0	1.0000	0	0	0					
2021	7	2	0	0	1	12	12	1	0	0	1.0000	0
	0	0	0	0	0	0	0					
2021	7	2	0	0	1	13	13	15	0	0	0	0
	1.0000	0	0	0	0	0	0					
2021	7	2	0	0	1	14	14	58	0	0	0	0.1605
	0.8126	0.0269	0	0	0	0	0					
2021	7	2	0	0	1	15	15	100	0	0	0.0005	0.0160
	0.9674	0.0001	0	0	0	0.0160	0					
2021	7	2	0	0	1	16	16	128	0	0	0	0.0135
	0.9334	0.0199	0.0192	0.0137	0.0003	0	0					
2021	7	2	0	0	1	17	17	129	0	0	0	0.0005
	0.8375	0.1103	0.0126	0.0008	0	0.0383	0					
2021	7	2	0	0	1	18	18	51	0	0	0	0
	0.8392	0.0713	0.0021	0.0869	0.0002	0.0003	0					
2021	7	2	0	0	1	19	19	32	0	0	0	0
	0.3112	0.0788	0.0002	0.1222	0.1703	0.0565	0.2608					
2021	7	2	0	0	1	20	20	28	0	0	0	0
	0.0870	0.0005	0.0733	0.4457	0.1270	0.1660	0.1005					
2021	7	2	0	0	1	21	21	17	0	0	0	0
	0	0	0	0.5580	0.1472	0.0555	0.2393					
2021	7	2	0	0	1	22	22	2	0	0	0	0
	0	0	0	0	0	0.0083	0.9917					
2022	7	2	0	0	1	13	13	6	0	0	0.9254	0
	0.0746	0	0	0	0	0	0					
2022	7	2	0	0	1	14	14	1	0	0	1.0000	0
	0	0	0	0	0	0	0					
2022	7	2	0	0	1	15	15	10	0	0	0.3095	0.3749
	0.0014	0.3141	0	0	0	0	0					

2022	7	2	0	0	1	16	16	54	0	0	0	0.0832
	0.0633	0.8227	0.0308	0	0	0	0					
2022	7	2	0	0	1	17	17	92	0	0	0	0.0197
	0.0006	0.9399	0.0146	0.0187	0.0045	0	0.0020					
2022	7	2	0	0	1	18	18	101	0	0	0	0.0007
	0.0318	0.8963	0.0496	0	0.0186	0	0.0030					
2022	7	2	0	0	1	19	19	39	0	0	0	0
	0	0.8842	0.0496	0	0.0015	0.0557	0.0090					
2022	7	2	0	0	1	20	20	14	0	0	0	0
	0	0.4465	0.0603	0	0.1994	0	0.2938					
2022	7	2	0	0	1	21	21	1	0	0	0	0
	0	1.0000	0	0	0	0	0					
2022	7	2	0	0	1	24	24	1	0	0	0	0
	0	1.0000	0	0	0	0	0					
2023	7	2	0	0	1	11	11	1	0	0	0	0
	0	0	1.0000	0	0	0	0					
2023	7	2	0	0	1	13	13	1	0	0	1.0000	0
	0	0	0	0	0	0	0					
2023	7	2	0	0	1	14	14	4	0	0	0.7517	0.2483
	0	0	0	0	0	0	0					
2023	7	2	0	0	1	15	15	21	0	0	0.4778	0.4453
	0.0769	0	0	0	0	0	0					
2023	7	2	0	0	1	16	16	36	0	0	0.1599	0.2994
	0.1058	0.0706	0.3460	0	0	0.0184	0					
2023	7	2	0	0	1	17	17	110	0	0	0.0059	0.1553
	0.1204	0.1063	0.5946	0.0117	0	0	0.0059					
2023	7	2	0	0	1	18	18	120	0	0	0.0097	0.0341
	0.0310	0.0803	0.7906	0.0254	0	0.0144	0.0144					
2023	7	2	0	0	1	19	19	96	0	0	0	0.0108
	0.0376	0.0330	0.8084	0.0754	0.0058	0	0.0290					
2023	7	2	0	0	1	20	20	56	0	0	0	0.0184
	0.0017	0.0740	0.8105	0.0466	0.0372	0	0.0116					
2023	7	2	0	0	1	21	21	12	0	0	0	0
	0	0	0.4715	0.0932	0.0932	0.0932	0.2489					
2023	7	2	0	0	1	22	22	12	0	0	0	0
	0	0	0.4477	0.1385	0.0692	0.2754	0.0692					
2023	7	2	0	0	1	23	23	3	0	0	0	0
	0	0	0.6667	0	0	0	0.3333					
2023	7	2	0	0	1	24	24	5	0	0	0	0
	0	0	0.4000	0.2000	0	0	0.4000					
2019	12.99	3	0	0	1	7	7	2	0	1.0000	0	0
	0	0	0	0	0	0	0					
2019	12.99	3	0	0	1	10	10	1	0	0	1.0000	0
	0	0	0	0	0	0	0					
2019	12.99	3	0	0	1	11	11	5	0	0	0.8000	0.2000
	0	0	0	0	0	0	0					
2019	12.99	3	0	0	1	12	12	9	0	0	0.4444	0.5556
	0	0	0	0	0	0	0					
2019	12.99	3	0	0	1	13	13	5	0	0	0.4000	0.6000
	0	0	0	0	0	0	0					
2019	12.99	3	0	0	1	14	14	8	0	0	0.3750	0.6250
	0	0	0	0	0	0	0					
2019	12.99	3	0	0	1	15	15	8	0	0	0.1250	0.7500
	0.1250	0	0	0	0	0	0					
2019	12.99	3	0	0	1	16	16	11	0	0	0.0909	0.4545
	0.2727	0	0.0909	0	0	0	0.0909					
2019	12.99	3	0	0	1	17	17	3	0	0	0.3333	0
	0	0	0.3333	0	0	0.3333	0					
2019	12.99	3	0	0	1	18	18	10	0	0	0	0.1000
	0	0.2000	0.1000	0.2000	0	0	0.4000					
2019	12.99	3	0	0	1	19	19	6	0	0	0	0
	0	0.1667	0	0.1667	0.1667	0.1667	0.3333					
2019	12.99	3	0	0	1	20	20	2	0	0	0	0
	0	1.0000	0	0	0	0	0					
2019	12.99	3	0	0	1	21	21	2	0	0	0	0
	0	0.5000	0	0	0	0	0.5000					
2020	12.99	3	0	0	1	9	9	1	0	1.0000	0	0
	0	0	0	0	0	0	0					
2020	12.99	3	0	0	1	10	10	2	0	1.0000	0	0
	0	0	0	0	0	0	0					
2020	12.99	3	0	0	1	11	11	1	0	0	1.0000	0
	0	0	0	0	0	0	0					
2020	12.99	3	0	0	1	12	12	4	0	0	1.0000	0
	0	0	0	0	0	0	0					
2020	12.99	3	0	0	1	13	13	6	0	0	0.6667	0
	0.3333	0	0	0	0	0	0					
2020	12.99	3	0	0	1	14	14	15	0	0	0	0.6667
	0.3333	0	0	0	0	0	0					
2020	12.99	3	0	0	1	15	15	14	0	0	0	0.2143
	0.6429	0.0714	0.0714	0	0	0	0					
2020	12.99	3	0	0	1	16	16	19	0	0	0	0.2632
	0.6316	0.1053	0	0	0	0	0					
2020	12.99	3	0	0	1	17	17	18	0	0	0	0.1111
	0.4444	0.2222	0.1111	0.0556	0.0556	0	0					
2020	12.99	3	0	0	1	18	18	24	0	0	0	0
	0.0833	0.1667	0.1250	0.2500	0.0833	0.0833	0.2083					
2020	12.99	3	0	0	1	19	19	23	0	0	0	0
	0	0.0870	0.1739	0.1304	0.1304	0.0870	0.3913					
2020	12.99	3	0	0	1	20	20	6	0	0	0	0
	0.1667	0	0	0.1667	0.1667	0.3333	0.1667					
2020	12.99	3	0	0	1	21	21	1	0	0	0	0
	0	0	0	0	0	0	1.0000					
2020	12.99	3	0	0	1	23	23	1	0	0	0	0
	0	0	0	0	0	1.0000	0					

2021	12.99	3	0	0	1	7	7	1	0	0	1.0000	0
	0	0	0	0	0	0	0					
2021	12.99	3	0	0	1	13	13	4	0	0	0.2500	0.5000
	0.2500	0	0	0	0	0	0					
2021	12.99	3	0	0	1	14	14	2	0	0	0.5000	0
	0.5000	0	0	0	0	0	0					
2021	12.99	3	0	0	1	15	15	6	0	0	0	0.6667
	0	0.3333	0	0	0	0	0					
2021	12.99	3	0	0	1	16	16	7	0	0	0	0
	0.1429	0.5714	0.1429	0	0	0	0.1429					
2021	12.99	3	0	0	1	17	17	18	0	0	0.0556	0
	0.2222	0.5000	0.0556	0.0556	0.0556	0.0556	0					
2021	12.99	3	0	0	1	18	18	9	0	0	0	0
	0	0.6667	0.2222	0.1111	0	0	0					
2021	12.99	3	0	0	1	19	19	11	0	0	0	0
	0.2727	0.4545	0.0909	0.0909	0	0	0.0909					
2021	12.99	3	0	0	1	20	20	3	0	0	0	0
	0	0.6667	0	0.3333	0	0	0					
2021	12.99	3	0	0	1	22	22	1	0	0	0	0
	0	0	0	0	0	0	1.0000					
2022	12.99	3	0	0	1	6	6	1	1.0000	0	0	0
	0	0	0	0	0	0	0					
2022	12.99	3	0	0	1	7	7	2	1.0000	0	0	0
	0	0	0	0	0	0	0					
2022	12.99	3	0	0	1	8	8	2	0.5000	0.5000	0	0
	0	0	0	0	0	0	0					
2022	12.99	3	0	0	1	9	9	1	0	0	1.0000	0
	0	0	0	0	0	0	0					
2022	12.99	3	0	0	1	10	10	4	0	1.0000	0	0
	0	0	0	0	0	0	0					
2022	12.99	3	0	0	1	11	11	3	0	0.3333	0.6667	0
	0	0	0	0	0	0	0					
2022	12.99	3	0	0	1	12	12	3	0	0.6667	0.3333	0
	0	0	0	0	0	0	0					
2022	12.99	3	0	0	1	14	14	1	0	0	0	0
	1.0000	0	0	0	0	0	0					
2022	12.99	3	0	0	1	15	15	2	0	0	0	0.5000
	0	0	0.5000	0	0	0	0					
2022	12.99	3	0	0	1	16	16	4	0	0	0	0.2500
	0	0.2500	0.2500	0.2500	0	0	0					
2022	12.99	3	0	0	1	17	17	14	0	0	0	0
	0.2857	0.1429	0.2857	0.0714	0.1429	0	0.0714					
2022	12.99	3	0	0	1	18	18	8	0	0	0	0
	0	0.2500	0.5000	0	0.2500	0	0					
2022	12.99	3	0	0	1	19	19	11	0	0	0	0
	0	0	0.5455	0.0909	0	0.2727	0.0909					
2022	12.99	3	0	0	1	20	20	5	0	0	0	0
	0	0	0	0	0.2000	0.2000	0.6000					
2022	12.99	3	0	0	1	21	21	2	0	0	0	0
	0	0	0.5000	0	0	0.5000	0					
2023	12.99	3	0	0	1	6	6	1	0	1.0000	0	0
	0	0	0	0	0	0	0					
2023	12.99	3	0	0	1	8	8	1	0	1.0000	0	0
	0	0	0	0	0	0	0					
2023	12.99	3	0	0	1	9	9	1	0	1.0000	0	0
	0	0	0	0	0	0	0					
2023	12.99	3	0	0	1	10	10	1	0	1.0000	0	0
	0	0	0	0	0	0	0					
2023	12.99	3	0	0	1	11	11	4	0	0.5000	0.5000	0
	0	0	0	0	0	0	0					
2023	12.99	3	0	0	1	12	12	10	0	0.2000	0.8000	0
	0	0	0	0	0	0	0					
2023	12.99	3	0	0	1	13	13	7	0	0	0.5714	0.2857
	0	0.1429	0	0	0	0	0					
2023	12.99	3	0	0	1	14	14	3	0	0	0.3333	0.6667
	0	0	0	0	0	0	0					
2023	12.99	3	0	0	1	15	15	15	0	0	0.3333	0.3333
	0.2667	0.0667	0	0	0	0	0					
2023	12.99	3	0	0	1	16	16	13	0	0	0.0769	0.6923
	0.2308	0	0	0	0	0	0					
2023	12.99	3	0	0	1	17	17	12	0	0	0.0833	0.4167
	0.1667	0	0.2500	0.0833	0	0	0					
2023	12.99	3	0	0	1	18	18	6	0	0	0	0.1667
	0.1667	0.3333	0	0.3333	0	0	0					
2023	12.99	3	0	0	1	19	19	2	0	0	0	0
	0	1.0000	0	0	0	0	0					
2023	12.99	3	0	0	1	20	20	3	0	0	0	0
	0	0	0	0.6667	0	0	0.3333					
2023	12.99	3	0	0	1	21	21	3	0	0	0	0
	0	0	0.3333	0.6667	0	0	0					
-9999	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0					

```
#
0 # Use_MeanSize-at-Age_obs (0/1)
#
0 # N_environ_variables
# -2 in yr will subtract mean for that env_var; -1 will subtract mean and divide by stddev (e.g. Z-score)
#Yr Variable Value
#
0 # N sizefreq methods to read
#
0 # do tags (0/1)
```

```
#
0 # morphcomp data(0/1)
# Nobs, Nmorphs, mincomp
# yr, seas, type, partition, Nsamp, datavector_by_Nmorphs
#
0 # Do dataread for selectivity priors(0/1)
# Yr, Seas, Fleet,  Age/Size,  Bin,  selex_prior,  prior_sd
# feature not yet implemented
#
999

ENDDATA
```

Control:

```
#V3.30.20.00;_safe;_compile_date:_Sep 30 2022;_Stock_Synthesis_by_Richard_Methot_(NOAA)_using_ADMB_13.0
#_Stock_Synthesis_is_a_work_of_the_U.S._Government_and_is_not_subject_to_copyright_protection_in_the_United_States.
#_Foreign_copyrights_may_apply._See_copyright.txt_for_more_information.
#_User_support_available_at:NMFS.Stock.Synthesis@noaa.gov
#_User_info_available_at:https://vlab.noaa.gov/group/stock-synthesis
#_Source_code_at:_https://github.com/nmfs-stock-synthesis/stock-synthesis

#C growth parameters are estimated
#C spawner-recruitment bias adjustment Not tuned For optimality
#_data_and_control_files: Seatrout_dat.ss // Seatrout_ctl.ss
0  # 0 means do not read wtatage.ss; 1 means read and use wtatage.ss and also read and use growth parameters
1  #_N_Growth_Patterns (Growth Patterns, Morphs, Bio Patterns, GP are terms used interchangeably in SS3)
1 #_N_platoons_Within_GrowthPattern
#_Cond 1 #_Platoon_within/between_stdev_ratio (no read if N_platoons=1)
#_Cond  1 #vector_platoon_dist_(-1_in_first_val_gives_normal_approx)
#
4 # recr_dist_method for parameters:  2=main effects for GP, Area, Settle timing; 3=each Settle entity; 4=none (only when N_GP*Nsettle*pop==1)
1 # not yet implemented; Future usage: Spawner-Recruitment: 1=global; 2=by area
1 #  number of recruitment settlement assignments
0 # unused option
#GPattern month  area  age (for each settlement assignment)
 1 4 1 0
#
#_Cond 0 # N_movement_definitions goes here if Nareas > 1
#_Cond 1.0 # first age that moves (real age at begin of season, not integer) also cond on do_migration>0
#_Cond 1 1 1 2 4 10 # example move definition for seas=1, morph=1, source=1 dest=2, age1=4, age2=10
#
2 #_Nblock_Patterns
 2 2 #_blocks_per_pattern
# begin and end years of blocks
 1985 2012 2013 2023
 1955 1996 1997 2023
#
# controls for all timevary parameters
1 #_time-vary parm bound check (1=warn relative to base parm bounds; 3=no bound check); Also see env (3) and dev (5) options to constrain with base bounds
#
# AUTOGEN
 1 1 1 1 1 # autogen: 1st element for biology, 2nd for SR, 3rd for Q, 4th reserved, 5th for selex
# where: 0 = autogen time-varying parms of this category; 1 = read each time-varying parm line; 2 = read then autogen if parm min==-12345
#
#_Available timevary codes
#_Block types: 0: P_block=P_base*exp(TVP); 1: P_block=P_base+TVP; 2: P_block=TVP; 3: P_block=P_block(-1) + TVP
#_Block_trends: -1: trend bounded by base parm min-max and parms in transformed units (beware); -2: endtrend and infl_year direct values; -3: end and infl as fraction of base range
#_EnvLinks:  1: P(y)=P_base*exp(TVP*env(y));  2: P(y)=P_base+TVP*env(y);  3: P(y)=f(TVP,env_Zscore) w/ logit to stay in min-max; 4: P(y)=2.0/(1.0+exp(-TVP1*env(y) - TVP2))
#_DevLinks:  1: P(y)*=exp(dev(y)*dev_se;  2: P(y)+=dev(y)*dev_se;  3: random walk;  4: zero-reverting random walk with rho;  5: like 4 with logit transform to stay in base min-max
#_DevLinks(more):  21-25 keep last dev for rest of years
#
#_Prior_codes:  0=none; 6=normal; 1=symmetric beta; 2=CASAL's beta; 3=lognormal; 4=lognormal with biascorr; 5=gamma
#
# setup for M, growth, wt-len, maturity, fecundity, (hermaphro), recr_distr, cohort_grow, (movement), (age error), (catch_mult), sex ratio
#_NATMORT
3 #_natM_type:_0=1Parm; 1=N_breakpoints;_2=Lorenzen;_3=agespecific;_4=agespec_withseasinterpolate;_5=BETA:_Maunder_link_to_maturity;_6=Lorenzen_range
0.3454    0.2885    0.2593    0.2423    0.2318    0.2249    0.2204    0.2174    0.2153    0.2138    0.2116

#
1 # GrowthModel: 1=vonBert with L1&L2; 2=Richards with L1&L2; 3=age_specific_K_incr; 4=age_specific_K_decr; 5=age_specific_K_each; 6=NA; 7=NA; 8=growth cessation
0.5 #_Age(post-settlement)_for_L1;linear growth below this
999 #_Growth_Age_for_L2 (999 to use as Linf)
0.28 #_exponential decay for growth above maxage (value should approx initial Z; -999 replicates 3.24; -998 to not allow growth above maxage)*************
0  #_placeholder for future growth feature
#
0 #_SD_add_to_LAA (set to 0.1 for SS2 V1.x compatibility)
1 #_CV_Growth_Pattern:  0 CV=f(LAA); 1 CV=F(A); 2 SD=F(LAA); 3 SD=F(A); 4 logSD=F(A)
#
1 #_maturity_option:  1=length logistic; 2=age logistic; 3=read age-maturity matrix by growth_pattern; 4=read age-fecundity; 5=disabled; 6=read length-maturity
2 #_First_Mature_Age
3 #_fecundity_at_length option:(1)eggs=Wt*(a+b*Wt);(2)eggs=a*L^b;(3)eggs=a*Wt^b; (4)eggs=a+b*L; (5)eggs=a+b*W
0 #_hermaphroditism option:  0=none; 1=female-to-male age-specific fxn; -1=male-to-female age-specific fxn
```

```
1 #_parameter_offset_approach for M, G, CV_G:  1- direct, no offset**; 2- male=fem_parm*exp(male_parm); 3: male=female*exp(parm)
then old=young*exp(parm)
#_** in option 1, any male parameter with value = 0.0 and phase <0 is set equal to female parameter
#
#_growth_parms
#_ LO HI INIT PRIOR PR_SD PR_type PHASE env_var&link dev_link dev_minyr dev_maxyr dev_PH Block Block_Fxn
# Sex: 1  BioPattern: 1  NatMort
#0.1      2         0.3150    0         0         0         -1        0         0         0         0         0         0
          0         #         N_Mort
# Sex: 1  BioPattern: 1  Growth
5.5       7         6.3       6.3       0.05      0         4         0         0         0         0         0         0
          0         #         L_at_Amin_Fem_1
18        22        20        20        0.05      0         4         0         0         0         0         0         0
          0         #         L_at_Amax_Fem_1
0.3       0.35      0.32      0.32      0.05      0         4         0         0         0         0         0         0
          0         #         VonBert_K_Fem_1
0.05      0.25      0.18      0.18      0.05      0         4         0         0         0         0         0         0
          0         #         CV_young_Fem_1
0.05      0.2       0.09      0.09      0.05      0         4         0         0         0         0         0         0
          0         #         CV_old_Fem_1

# Sex: 1  BioPattern: 1  WtLen
 0        1         7.1e-4    7.1e-4    0.05      0         -1        0         0         0         0         0         0
          0 # Wtlen_1_Fem_GP_1
 2        4         2.9791    2.9791    0.05      0         -1        0         0         0         0         0         0
          0 # Wtlen_2_Fem_GP_1
# Sex: 1  BioPattern: 1  Maturity&Fecundity
 10       29        15.9319   15.9319   0.05      0         -1        0         0         0         0         0         0
          0 # Mat50%_Fem_GP_1
 -2       1         -0.3819   -0.3819   0.05      0         -1        0         0         0         0         0         0
          0 # Mat_slope_Fem_GP_1
 1        1         1         1         0.8       0         -1        0         0         0         0         0         0
          0 # Eggs_scalar_Fem_GP_1
 1        1         1         1         0.8       0         -1        0         0         0         0         0         0
          0 # Eggs_exp_wt_Fem_GP_1
# Sex: 2  BioPattern: 1  NatMort
#0.2      2         0         0         0         0         -1        0         0         0         0         0         0
          0         #         N_Mort
# Sex: 2  BioPattern: 1  Growth
#1        5         0         0         0         0         -4        0         0         0         0         0         0
          0         #         L_at_Amin_Fem_1
#12       50        0         0         0         0         -4        0         0         0         0         0         0
          0         #         L_at_Amax_Fem_1
#0.3      0.6       0         0         0         0         -4        0         0         0         0         0         0
          0         #         VonBert_K_Fem_1
#0.05     0.6       0         0         0         0         -4        0         0         0         0         0         0
          0         #         CV_young_Fem_1
#0.05     0.6       0         0         0         0         -4        0         0         0         0         0         0
          0         #         CV_old_Fem_1
# Sex: 2  BioPattern: 1  WtLen
#0        1         0         0         0         0         -1        0         0         0         0         0         0
          0 # Wtlen_1_Fem_GP_1
#2        4         0         0         0         0         -1        0         0         0         0         0         0
          0 # Wtlen_2_Fem_GP_1
# Hermaphroditism
#  Recruitment Distribution
#  Cohort growth dev base
0.1       10        1         1         1         0         -1        0         0         0         0         0         0
          0 # CohortGrowDev
#  Movement
#  Age Error from parameters
#  catch multiplier
#  fraction female, by GP
 0.1      1         0.5       0.5       0         0         -4        0         0         0         0         0         0
          0 # FracFemale_GP_1
#  M2 parameter for each predator fleet
#
#_no timevary MG parameters
#
#_seasonal_effects_on_biology_parms
 0 0 0 0 0 0 0 0 0 0 #_femwtlen1,femwtlen2,mat1,mat2,fec1,fec2,Malewtlen1,malewtlen2,L1,K
#_ LO HI INIT PRIOR PR_SD PR_type PHASE
#_Cond -2 2 0 0 -1 99 -2 #_placeholder when no seasonal MG parameters
#
3 #_Spawner-Recruitment; Options: 1=NA; 2=Ricker; 3=std_B-H; 4=SCAA; 5=Hockey; 6=B-H_flattop; 7=survival_3Parm; 8=Shepherd_3Parm;
9=RickerPower_3parm
1  # 0/1 to use steepness in initial equ recruitment calculation
0  #  future feature:  0/1 to make realized sigmaR a function of SR curvature
#LO       HI        INIT        PRIOR          PR_SD               PR_type             PHASE               env-var   use_dev
dev_mnyr   dev_mxyr     dev_PH      Block    Blk_Fxn #  parm_name
8         9         8.4                 8.4            0.05                0                   1                   0
0          0          0          0          0          0 # SR_LN(R0)
0.5       1         0.99                0.99           0.05                0                   -7                  0
0          0          0          0          0          0 # SR_BH_steep
0.2       0.9       0.5                 0.5            0.05                0                   7                   0
0          0          0          0          0          0 # SR_sigmaR
-5        5         0                   0              0.05                0                   -1                  0
0          0          0          0          0          0 # SR_regime
0         0         0                   0              0                   0                   -1                  0
0          0          0          0          0          0 # SR_autocorr
#_no timevary SR parameters
1 #do_recdev:  0=none; 1=devvector (R=F(SSB)+dev); 2=deviations (R=F(SSB)+dev); 3=deviations (R=R0*dev; dev2=R-f(SSB)); 4=like 3
with sum(dev2) adding penalty
1982 # first year of main recr_devs; early devs can preceed this era
2023 # last year of main recr_devs; forecast devs start in following year
```

```
5 #_recdev phase
1 # (0/1) to read 13 advanced options
0 #_Cond 0 #_recdev_early_start (0=none; neg value makes relative to recdev_start)
6 #_Cond -4 #_recdev_early_phase
-1 #_Cond 0 #_forecast_recruitment phase (incl. late recr) (0 value resets to maxphase+1)
1 #_Cond 1 #_lambda for Fcast_recr_like occurring before endyr+1
1976.5  #_Cond 982 #_last_yr_nobias_adj_in_MPD; begin of ramp
1995.8 #_Cond 1976 #_first_yr_fullbias_adj_in_MPD; begin of plateau
2018.6 #_Cond 2019 #_last_yr_fullbias_adj_in_MPD
2025.4 #_Cond 2022 #_First_recent_yr_nobias_adj_in_MPD (can be in forecast to shape ramp, but SS3 sets bias_adj to 0.0 for fcast
yrs)
0.9748 #_Cond 1 #_max_bias_adj_in_MPD (typical ~0.8; -3 sets all years to 0.0; -2 sets all non-forecast yrs w/ estimated recdevs
to 1.0; -1 sets biasadj=1.0 for all yrs w/ recdevs)
0 #_Cond 0 #_period of cycles in recruitment (N parms read below)
-5 #_Cond -5 #min rec_dev
5 #_Cond 5 #max rec_dev
0 #_Cond 0 #_read_recdevs
#_end of advanced SR options
#
#_placeholder for full parameter lines for recruitment cycles
# read specified recr devs
#_Yr Input_value
# all recruitment deviations

#Fishing Mortality info
0.3 # F ballpark value in units of annual_F
-2001 # F ballpark year (neg value to disable)
4 # F_Method:  1=Pope midseason rate; 2=F as parameter; 3=F as hybrid; 4=fleet-specific parm/hybrid (#4 is superset of #2 and #3
and is recommended)
4 # max F (methods 2-4) or harvest fraction (method 1)
#Fleet    Parameter Phase
1         0.1       99
2         0.1       99
-9999     0         0
4  # N iterations for tuning in hybrid mode; recommend 3 (faster) to 5 (more precise if many fleets)
#
#_initial_F_parms; for each fleet x season that has init_catch; nest season in fleet; count = 2
#         overall   start     F         value;    overall   phase;    N         detailed  inputs    to        read
#_for unconstrained init_F, use an arbitrary initial catch and set lambda=0 for its logL
#LO       HI        INIT      PRIOR     PR_SD     PR_type   PHASE
0         0.05      0.02      0.1       0.05      0         1 # InitF_seas_1_flt_1FISHERY1
0         0.01      0.005     0.1       0.05      0         1 # InitF_seas_1_flt_2FISHERY2
#
# F rates by fleet x season
# Yr:  1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
# seas:  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
# FISHERY1 9.82304e-05 3.72409e-05 7.38148e-06 2.72446e-05 7.16417e-05 7.40515e-05 7.96852e-05 0.000104733 8.3897e-05 0.000288107
0.000274882 0.000279637 0.000475506 0.000675889 0.000743153 0.000964839 0.00123204 0.00188252 0.0023705 0.00254327 0.00219753
0.00284675 0.00303124 0.0037502 0.00578817 0.00511713 0.00773471 0.00949694 0.00868472 0.0122432 0.0152069 0.0135373 0.010036
0.0160772 0.0243028 0.0288925 0.0178388 0.0297319 0.0395718 0.037092
# FISHERY2 9.55191e-05 0.000110698 5.87194e-05 4.25583e-05 5.82148e-05 5.847e-05 5.1623e-05 6.79603e-05 3.75276e-05 8.95674e-05
9.01642e-05 0.000133202 0.00015005 0.000118968 0.000170963 0.000147799 3.59702e-05 2.94626e-05 1.87282e-05 6.05319e-05 4.55848e-
05 1.40925e-05 1.64449e-05 1.56414e-05 2.07295e-06 1.25118e-05 1.31774e-05 1.51364e-06 3.94684e-07 4.69933e-07 2.5259e-07
3.89049e-06 4.21031e-06 8.85591e-06 1.03866e-05 2.48013e-05 3.35468e-05 2.23036e-06 2.76545e-06 3.0888e-06
#
#_Q_setup for fleets with cpue or survey data
#_1:  fleet number
#_2:  link type: (1=simple q, 1 parm; 2=mirror simple q, 1 mirrored parm; 3=q and power, 2 parm; 4=mirror with offset, 2 parm)
#_3:  extra input for link, i.e. mirror fleet# or dev index number
#_4:  0/1 to select extra sd parameter
#_5:  0/1 for biasadj or not
#_6:  0/1 to float
#fleet      link link_info  extra_se   biasadj     float  #  fleetname
#1         1        0         0         0         0  #  Fishery1
2         1        0         0         0         0  #  Fishery2
3         1        0         0         0         0  #  SURVEY1
-9999 0 0 0 0 0
#
#_Q_parms(if_any);Qunits_are_ln(q)
#LO          HI          INIT         PRIOR         PR_SD       PR_type      PHASE    env-var    use_dev   dev_mnyr   dev_mxyr
dev_PH      Block    Blk_Fxn  #  parm_name
4          15          7           0             1             0          2           0           0           0           0
0          0          0  #  LnQ_base_Fishery2(4)
-20          -2          -11           0             1             0         -2          0           0           0           0
0          1          2  #  LnQ_base_SURVEY1(3)

# timevary Q parameters
#LO          HI          INIT         PRIOR         PR_SD       PR_type     PHASE  #  parm_name
-9                -8        -8.5          0             1            0      2  # LnQ_base_SURVEY1(3)_BLK1repl_1986
-10               -7        -8.3            0             1            0      2  # LnQ_base_SURVEY1(3)_BLK1repl_2013

# info on dev vectors created for Q parms are reported with other devs after tag parameter section
#
#_size_selex_patterns
#Pattern:_0;  parm=0; selex=1.0 for all sizes
#Pattern:_1;  parm=2; logistic; with 95% width specification
#Pattern:_5;  parm=2; mirror another size selex; PARMS pick the min-max bin to mirror
#Pattern:_11; parm=2; selex=1.0  for specified min-max population length bin range
#Pattern:_15; parm=0; mirror another age or length selex
#Pattern:_6;  parm=2+special; non-parm len selex
#Pattern:_43; parm=2+special+2;  like 6, with 2 additional param for scaling (average over bin range)
#Pattern:_8;  parm=8; double_logistic with smooth transitions and constant above Linf option
#Pattern:_9;  parm=6; simple 4-parm double logistic with starting length; parm 5 is first length; parm 6=1 does desc as offset
#Pattern:_21; parm=2+special; non-parm len selex, read as pairs of size, then selex
```

```
#Pattern:_22; parm=4; double_normal as in CASAL
#Pattern:_23; parm=6; double_normal where final value is directly equal to sp(6) so can be >1.0
#Pattern:_24; parm=6; double_normal with sel(minL) and sel(maxL), using joiners
#Pattern:_2;  parm=6; double_normal with sel(minL) and sel(maxL), using joiners, back compatibile version of 24 with 3.30.18 and
older
#Pattern:_25; parm=3; exponential-logistic in length
#Pattern:_27; parm=special+3; cubic spline in length; parm1==1 resets knots; parm1==2 resets all
#Pattern:_42; parm=special+3+2; cubic spline; like 27, with 2 additional param for scaling (average over bin range)
#_discard_options:_0=none;_1=define_retention;_2=retention&mortality;_3=all_discarded_dead;_4=define_dome-shaped_retention
#_Pattern Discard Male Special
1         2         0         0         #         1         FISHERY1
1         0         0         0         #         2         FISHERY2
1         0         0         0         #         3         SURVEY1


#
#_age_selex_patterns
#Pattern:_0; parm=0; selex=1.0 for ages 0 to maxage
#Pattern:_10; parm=0; selex=1.0 for ages 1 to maxage
#Pattern:_11; parm=2; selex=1.0  for specified min-max age
#Pattern:_12; parm=2; age logistic
#Pattern:_13; parm=8; age double logistic. Recommend using pattern 18 instead.
#Pattern:_14; parm=nages+1; age empirical
#Pattern:_15; parm=0; mirror another age or length selex
#Pattern:_16; parm=2; Coleraine - Gaussian
#Pattern:_17; parm=nages+1; empirical as random walk  N parameters to read can be overridden by setting special to non-zero
#Pattern:_41; parm=2+nages+1; // like 17, with 2 additional param for scaling (average over bin range)
#Pattern:_18; parm=8; double logistic - smooth transition
#Pattern:_19; parm=6; simple 4-parm double logistic with starting age
#Pattern:_20; parm=6; double_normal,using joiners
#Pattern:_26; parm=3; exponential-logistic in age
#Pattern:_27; parm=3+special; cubic spline in age; parm1==1 resets knots; parm1==2 resets all
#Pattern:_42; parm=2+special+3; // cubic spline; with 2 additional param for scaling (average over bin range)
#Age patterns entered with value >100 create Min_selage from first digit and pattern from remainder
#_Pattern Discard Male Special
0         0         0         0         #         1         FISHERY1
0         0         0         0         #         2         FISHERY2
0         0         0         0         #         3         SURVEY1


#
#LO       HI        INIT      PRIOR     PR_SD     PR_type   PHASE    env-var    use_dev   dev_mnyr   dev_mxyr     dev_PH
Block    Blk_Fxn  #  parm_name
# 1   FISHERY1 LenSelex
10        14        11.5      11.5      0.05      1         3         0         0         0         0         0         0
          0         #         SizeSel_Base_P1_FISHERY1      1
5         10        7         7         0.05      1         3         0         0         0         0         0         0
          0         #         SizeSel_Base_P2_FISHERY1      2


2         29        10        10        0         0         -3        0         0         0         0         0         0
          0         #         P1_Ascending Inflection
0         5         2.6       2.6       0         0         -3        0         0         0         0         0         0
          0         #         P2_ascending slope
-1        2         1.5       1.5       0.05      1         3         0         0         0         0         0         0
          0         #         P3_height of asymtote (value of 999 assumes retention=1)    5
-20       20        11        11        0         0         -3        0         0         0         0         0         0
          0         #         P4_male offset to ascending inflection
-20       20        -10       0         0         0         -1        0         0         0         0         0         0
          0         #         P1_DiscardMort_Descending Inflection
1         1         1         0         0         0         -1        0         0         0         0         0         0
          0         #         P2_descending slope
0         0.1       0.05      0         0         0         -1        0         0         0         0         0         0
          0         #         P3_Max Discard Mort #change to 1% next time
0         0         0         0         0         0         -1        0         0         0         0         0         0
          0         #         P4_male offset      10

# 2   FISHERY2 LenSelex
10        20        15        15        0.05      1         -3        0         0         0         0         0         2
          2         #         SizeSel_P1_FISHERY2
0.1       10        1         1         0.05      1         -3        0         0         0         0         0         2
          2         #         SizeSel_P2_FISHERY2

# 3   SURVEY1(Trammel) LenSelex
12        15        14        14        0.05      1         3         0         0         0         0         0         0
          0         #         SizeSel_P1_SURVEY1
6         9         8         8         0.05      1         3         0         0         0         0         0         0
          0         #         SizeSel_P2_SURVEY1


#_Dirichlet parameters
#LO       HI        INIT      PRIOR     PR_SD     PR_type   PHASE env-var    use_dev   dev_mnyr   dev_mxyr     dev_PH      Block
Blk_Fxn #  parm_name
-5        0         -2.2      0         0         0         3         0         0                    0         0
          0         0         0         #         Fleet1_LengthComps  15
-5        0         -2.1      0         0         0         3         0         0                    0         0
          0         0         0         #         Fleet2_LengthComps
-5        0         -1.5      0         0         0         3         0         0                    0         0
          0         0         0         #         Survey1_LengthComps
-2        2         0.6       0         0         0         3         0         0                    0         0
          0         0         0         #         Fleet1_AgeComps
-3        3         -0.5      0         0         0         3         0         0                    0         0
          0         0         0         #         Fleet2_AgeComps
-1        5         1.6       0         0         0         3         0         0                    0         0
          0         0         0         #         Survey1_AgeComps    20
```

```
# timevary selex parameters
#LO       HI        INIT      PRIOR     PR_SD     PR_type   PHASE  #  parm_nam
12        15        13.5      13.5      0.05      1         3         #         SizeSel_P1_FISHERY2_1955
14        17        16        16        0.05      1         3         #         SizeSel_P1_FISHERY2_1997
2         4         2.9       2.9       0.05      1         3         #         SizeSel_P2_FISHERY2_1955
2         4         3.1       3         0.05      1         3         #         SizeSel_P2_FISHERY2_1997       24

# info on dev vectors created for selex parms are reported with other devs after tag parameter section
#
0   #  use 2D_AR1 selectivity(0/1)
#_no 2D_AR1 selex offset used
#
# Tag loss and Tag reporting parameters go next
0  # TG_custom:  0=no read and autogen if tag data exist; 1=read
#_Cond -6 6 1 1 2 0.01 -4 0 0 0 0 0 0 0  #_placeholder if no parameters
#
# deviation vectors for timevary parameters
#  base   base first block   block  env  env   dev   dev   dev   dev   dev
#  type  index  parm trend pattern link  var  vectr link _mnyr  mxyr phase  dev_vector
#      3     1     1     1     2     0     0     0     0     0     0     0
#      3     2     3     1     2     0     0     0     0     0     0     0
#      3     3     5     1     2     0     0     0     0     0     0     0
#      5     1     7     2     2     0     0     0     0     0     0     0
#      5     2     9     2     2     0     0     0     0     0     0     0
#      5     3    11     2     2     0     0     0     0     0     0     0
#      5     4    13     2     2     0     0     0     0     0     0     0
#      5    15    15     2     2     0     0     0     0     0     0     0
#      5    16    17     2     2     0     0     0     0     0     0     0
#      5    17    19     2     2     0     0     0     0     0     0     0
#      5    18    21     2     2     0     0     0     0     0     0     0
#      5    19    23     2     2     0     0     0     0     0     0     0
#      5    20    25     2     2     0     0     0     0     0     0     0
     #
# Input variance adjustments factors:
 #_1=add_to_survey_CV
 #_2=add_to_discard_stddev
 #_3=add_to_bodywt_CV
 #_4=mult_by_lencomp_N
 #_5=mult_by_agecomp_N
 #_6=mult_by_size-at-age_N
 #_7=mult_by_generalized_sizecomp
#_Factor  Fleet  Value
 -9999   1    0  # terminator
#
2 #_maxlambdaphase
1 #_sd_offset; must be 1 if any growthCV, sigmaR, or survey extraSD is an estimated parameter
# read 0 changes to default Lambdas (default value is 1.0)
# Like_comp codes:  1=surv; 2=disc; 3=mnwt; 4=length; 5=age; 6=SizeFreq; 7=sizeage; 8=catch; 9=init_equ_catch;
# 10=recrdev; 11=parm_prior; 12=parm_dev; 13=CrashPen; 14=Morphcomp; 15=Tag-comp; 16=Tag-negbin; 17=F_ballpark; 18=initEQregime
#like_comp fleet  phase  value  sizefreq_method
-9999  1  1  1  1  #  terminator
#
# lambdas (for info only; columns are phases)
# 0 #_CPUE/survey:_1
#  0 #_CPUE/survey:_2
#  1 #_CPUE/survey:_3
#  1 #_CPUE/survey:_4
#  1 #_CPUE/survey:_5
#  1 #_discard:_1
#  0 #_discard:_2
#  0 #_discard:_3
#  0 #_discard:_4
#  0 #_discard:_5
#  1 #_lencomp:_1
#  0 #_lencomp:_2
#  1 #_lencomp:_3
#  1 #_lencomp:_4
#  1 #_lencomp:_5
#  1 #_agecomp:_1
#  0 #_agecomp:_2
#  0 #_agecomp:_3
#  0 #_agecomp:_4
#  0 #_agecomp:_5
#  0 #_init_equ_catch1
#  0 #_init_equ_catch2
#  0 #_init_equ_catch3
#  0 #_init_equ_catch4
#  0 #_init_equ_catch5
#  1 #_recruitments
#  1 #_parameter-priors
#  1 #_parameter-dev-vectors
#  1 #_crashPenLambda
#  0 # F_ballpark_lambda
0 # (0/1/2) read specs for more stddev reporting: 0 = skip, 1 = read specs for reporting stdev for selectivity, size, and
numbers, 2 = add options for M,Dyn. Bzero, SmryBio
 # 0 2 0 0 # Selectivity: (1) fleet, (2) 1=len/2=age/3=both, (3) year, (4) N selex bins
 # 0 0 # Growth: (1) growth pattern, (2) growth ages
 # 0 0 0 # Numbers-at-age: (1) area(-1 for all), (2) year, (3) N ages
 # -1 # list of bin #'s for selex std (-1 in first bin to self-generate)
 # -1 # list of ages for growth std (-1 in first bin to self-generate)
 # -1 # list of ages for NatAge std (-1 in first bin to self-generate)
999
```