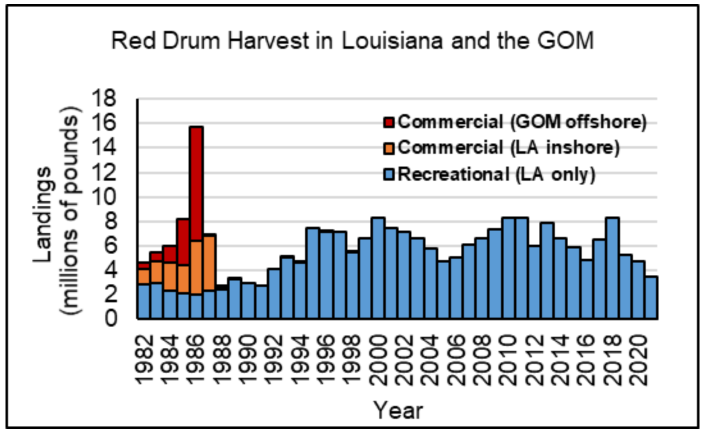
Assessment of Red Drum *Sciaenops ocellatus* in Louisiana
2022 Report

<u>*Executive Summary*</u>

Landings of Red Drum in Louisiana have remained above 5 million pounds per year in the most recent decade with the exceptions of 2016, 2020, and 2021. The highest harvest on record (over 15 million pounds) occurred in 1986. After commercial regulations were enacted in the late 1980's, Red Drum landings substantially declined from the 1986 peak. The recreational fishery now comprises 100 percent of the directed Louisiana Red Drum harvest.



A statistical catch-at-age model is used in this stock assessment to describe the dynamics of Red Drum in Louisiana and adjacent federal waters from 1982-2021. The assessment model projects abundance-at-age from estimates of abundance in the initial year of the time-series and recruitment estimates in subsequent years. Minimum data requirements are fishery catch-at-age and an index of abundance. Landings are taken from the Louisiana Department of Wildlife and Fisheries (LDWF) Recreational Creel Survey, National Oceanic and Atmospheric Administration (NOAA) Fisheries commercial statistical records, and NOAA Fisheries Marine Recreational Information Program (MRIP). Indices of abundance are developed from the LDWF estuarine trammel net survey and the LDWF component of the Southeast Area Monitoring and Assessment Program (SEAMAP) nearshore bottom long line survey. Estimates of absolute abundance are taken from the NOAA Fisheries northern Gulf of Mexico (GOM) mark-recapture experiments. Age composition of fishery catches are estimated with age-length-keys derived from fishery age samples and a growth model.

Management thresholds have been established, though the Gulf of Mexico Fishery Management Council (GMFMC), for Red Drum in the state of Louisiana as a 20% spawning potential ratio, which is based on a 30% escapement rate from the inshore fishery. Based on results of this assessment, the Louisiana Red Drum stock is currently not overfished, but is experiencing overfishing. The current spawning potential ratio estimate is 40% and the current escapement rate estimate is 20%. The recent downturn in recreational landings are due to a series of below average annual recruitment to the stock where the most recent annual recruitment estimates are the lowest of the time-series examined. Management actions will be needed in order to prevent future overfishing and prevent the stock from becoming overfished.

Assessment of Red Drum *Sciaenops ocellatus* in Louisiana
2022 Report

Joe West, Erik Lang, Xinan Zhang and Jason Adriance
Office of Fisheries
Louisiana Department of Wildlife and Fisheries

Table of Contents

1. Introduction

A statistical catch-at-age model is used in this stock assessment to describe the dynamics of Red Drum *Sciaenops ocellatus* in Louisiana (LA) and adjacent federal waters from 1982-2021. The assessment model projects abundance-at-age from estimates of abundance in the initial year of the time-series and recruitment estimates in subsequent years. The model is fit to the data with a maximum likelihood fitting criterion. Derivation of each of the data elements used in this assessment are described in detail in the Data Sources Section, but are summarized here. Commercial landings are taken from National Oceanic and Atmospheric Administration (NOAA) Fisheries commercial statistical records. Recreational harvest estimates are obtained from the Louisiana Department of Wildlife and Fisheries (LDWF) Recreational Creel Program (LA Creel) and estimates hindcast to the historic NOAA Fisheries Marine Recreational Information Program (MRIP) time-series. Indices of relative abundance are developed from the LDWF estuarine trammel net survey and the LDWF component of the Southeast Area Monitoring and Assessment Program (SEAMAP) nearshore bottom long line survey. Estimates of absolute abundance are taken from the NOAA Fisheries northern Gulf of Mexico (GOM) mark-recapture experiments. Age composition of recreational fishery catches are estimated with age-length-keys derived from otolith samples of the fishery (2002-2021) and a growth model (1982-2001). Age composition of commercial landings are estimated with age samples of the fishery (offshore) and age-length-keys derived from a growth model (inshore).

1.1 Fishery Status

A comprehensive history of the Red Drum (RD) resource and associated fishery within LA is described in Hoese et al. (1991) and for the Gulf of Mexico in GMFMC/GSMFC (1984). A current summary of the Louisiana RD fishery is presented below.

Commercial

Red Drum are no longer allowed to be landed commercially in Louisiana. Prior to 1984, no specific commercial RD regulations existed in LA. Through the 1950s and 1960s, LA commercial landings of RD fluctuated between 400,000 to 500,000 pounds annually. By the late 1960s, LA landings began to increase steadily to nearly 1 million (M) lbs by 1972 and 2.2M lbs by 1976 with significant numbers of juvenile RD taken from inshore waters. Landings decreased to just over 1M lbs by the late 1970s, which can be attributed to restricting nets to 1,200 feet in length, prohibiting the use of monofilament gillnets, and changing the allowable mesh size for gill and trammel nets. Additionally, netting was prohibited in parts of Lake Pontchartrain, parts of Lake Borgne, and within one mile of the Chandeleur Islands beginning in 1978. Then, a rapid expansion of the fishery occurred in 1980 with landings reaching 7.8M lbs by 1986.

Prior to 1960, the majority of fish landed in Louisiana were from haul seines and hook-and-line, but starting in 1970, most of the increase in landings came from the use of gill and trammel nets. An additional increase in landings after 1985 was the result of an increase in the use of purse seines, which contributed an additional 3.4M lbs in landings in 1986. This increased pressure was directed at adults, whereas the entangling nets were mainly fished inshore and primarily targeted subadults and juveniles. Prior to the 1980s, most of the RD landed in LA supplied local markets, especially in New Orleans. However, the popularity of blackened redfish peaked nationwide, especially in New York markets, and lead to increased demand, which increased harvest of adult RD throughout the 1980s. Given the increased demand from restaurants, commercial fishermen responded by catching RD in record numbers during 1986 and 1987. Landings fell dramatically in 1988 as a quota of 1.8M lbs was established late in 1987 and was reached by the end of February in 1988. In July of 1988, a commercial harvest moratorium was established for three years through legislation and that moratorium was extended indefinitely in 1991, although a few thousand pounds were still reported landed sporadically until 1998.

Recreational

Red Drum has always been one of the more popular fish with LA anglers. There are numerous mentions of people targeting them along the extensive marsh coastline since the mid-1800s and early 1900s (Daily Picayune 1892; Meise 1930). Norris (1865) mentioned RD in the GOM as a fish that will "…afford fine sport. They strike boldly, and run off thirty or forty feet of line at the first dash; as the mouth is fleshy, they are seldom lost when fairly hooked."

In 1984, LDWF conducted a recreational angler survey of nearly 13,000 individuals at various access points coast-wide (Adkins et al. 1990). Spotted Seatrout and RD were the preferred species of most anglers (63.8% and 49.3% respectively). Their results indicated that RD catches were lowest in the late spring and peaked in the fall (October-December). In an earlier survey in Barataria Bay (1975-1977) published by Guillory and Hutton (1990), Louisiana recreational anglers caught RD primarily with live bait (38.4%) and dead/cut bait singly (29.1 %) or in combination with artificial baits (18.2%).

Kelso et al. (1994) surveyed LA saltwater anglers and found similar results to Adkins et al. (1990) with the majority of respondents (56.1%) preferring Spotted Seatrout and 36.2% of respondents indicating a preference for RD. The results were reversed when asked about night fishing activities with the majority (53.1%) preferring RD over Spotted Seatrout. Flounder was the third most targeted species in either day or night fishing (Kelso et al. 1994). Recent LDWF unpublished LA Creel data (2017-2020) of statewide private inshore and shore based anglers indicates RD are the target of choice 37% of the time (Spotted Seatrout = 40% and no target = 18%) with a higher proportion of anglers targeting RD from the Vermilion Basin westward.

There were no regulations on the recreational harvest of RD in Louisiana prior to 1984 when a recreational bag limit was set at 50 RD and/or spotted seatrout per day in combination with no minimum size limit and only two fish ≥36 inches allowed. The first minimum size limits of RD were established in 1987. After their popularity increased with the blackened redfish craze in the mid-1980s, the Louisiana legislature approved gamefish status for RD in 1988.

The trends in recreational harvest since 1982 follow regulatory changes fairly well with a gradual reduction in harvest through 1987 under the first minimum size limits and new bag/possession limits, and the sharp decline in 1988 with the closing of all RD fishing from February through June and the new daily bag of 5 fish/angler that began in July 1988. Recreational harvest has increased steadily since RD attained gamefish status with exceptions during extraordinary years with active tropical storm seasons or following severe winters with major freeze events.

1.2 Fishery Regulations

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

Commercial

The RD fishery in Louisiana was mostly unregulated until the late 1970s. In 1977, monofilament webbing was banned in all saltwater nets (except those engaged in the underutilized species program while fishing pompano and black drum). In that same year, a maximum net length of 1,200 feet with a minimum mesh size of 2-inch bar for saltwater gillnets and a minimum 1-inch bar for the inside wall of saltwater trammel nets and fish seines was established. Additionally, netting was prohibited in parts of Lake Pontchartrain, parts of Lake Borgne, and within one mile of the Chandeleur Islands beginning in 1978. In 1980, a minimum bar size of 3-inches was established for the outer layer of saltwater trammel nets and further restrictions in 1983 mandated that all saltwater trammel nets consist of three layers. Size limits were first established for the commercial RD fishery in 1984 when a commercial slot limit of a minimum of 16-inches and a maximum of 36-inches total length was established. Also in 1984, further net restrictions were put in place that required a 1 ¾-inch bar for all saltwater gillnets and a 1 5/8-inch bar for the inside wall of saltwater trammel nets with a maximum mesh size of 12-inches bar for the outside of trammel nets. By 1986, the commercial slot limit maximum was reduced to 30-inches total length and all vessels carrying purse seines were banned from possessing red drum. In 1987, commercial net and size regulations were changed again by adjusting the commercial slot limit to a minimum of 18-inches and a maximum of 30-inches total length and minimum bar mesh sizes were changed to 1 ¾-inches for the inside wall of trammel nets and 1 ¾-inches for saltwater gillnets. A commercial quota of 1.8M lbs was also established in September of 1987. In February of 1988 the commercial RD fishery in Louisiana was closed after reaching the quota and a 3-year moratorium was established on commercial harvest while the Louisiana legislature granted gamefish status to RD in the same year. In 1991 the commercial harvest moratorium on RD was extended indefinitely and remains in place to date with no commercial harvest of RD allowed in Louisiana.

Recreational

In 1984, recreational RD harvest regulations were implemented that established a recreational creel limit of 50 fish (combined RD and Spotted Seatrout) with no minimum size limit, but did include a maximum size limit of no more than two fish over 36-inches total length. In 1986, recreational size limits were adjusted to allow for no more than 2 fish over 30-inches total length. In 1987, a slot limit was enacted that established a minimum size of 14-inches total length and incorporated a maximum size of 30-inches total length, with no more than 2 fish over 30-inches allowed. Two changes in recreational size limits occurred in 1988, with a recreational minimum size limit of 15-inches total length implemented in January of that year with no change in creel or maximum size limits. In July of 1988, the recreational creel limit was changed to 5 fish per person and the slot limit was changed to a 16-inch total length minimum and a 27-inch total length maximum with no more than one fish over 27-inches allowed. In 1997, an allowance for two days possession of RD was made when on land or if a recreational saltwater angler is aboard a trawler engaged in commercial fishing for a consecutive period of longer than 25 hours. Further modifications to possession limits were made in 2018 that allowed for 3 times the daily possession limit if an angler launched from a publically accessible launch below Highway 90 and the angler has been actively on the water or at a remote camp only accessible by water for two days or more. In 2018, exceptions were also made for possession of red drum fillets. An angler, who launches from a access point south of Highway 90 and has been actively on the water or at a remote camp only accessible by water, can possess filleted RD, up to the possession limit of RD so long as there is sufficient skin remaining to identify the fillet to species and that the fillet is no less than 14-inches in length.

1.3 Trends in Harvest

Time-series of commercial RD landings (LA inshore and GOM offshore), and LA recreational RD landings and live releases (1982-2021) are presented (Tables 1, 2, and 3). See Section 2.2 for details of each data source.

Commercial

Time-series of commercial RD harvest in the Gulf of Mexico are presented in Tables 1-2 and Figure 1. Red Drum are no longer allowed to be landed commercially in Louisiana. Through the 1950s and 1960s commercial landings of RD in Louisiana fluctuated between 400,000 to 500,000 lbs annually. By the late 1960s, Louisiana RD landings began to increase steadily to nearly 1M lbs by 1972 and 2.2M lbs by 1976. Some of the decline in landings in the late 1970s can be attributed to net restrictions established throughout the decade. A rapid expansion of the fishery then occurred in 1980 with landings reaching 7.8M lbs by 1986. Most of the increase in landings came from the use of gill and trammel nets. An additional increase in landings after 1985 were the result of an increased use of purse seines, which contributed an additional 3M lbs to the landings in 1986. Landings fell dramatically in 1988 as a quota of 1.8M lbs was established late in 1987 and was reached by the end of February 1988. In July of 1988, a commercial harvest moratorium was established for three years through legislation and that moratorium was extended indefinitely in 1991, although some RD were reported landed in a few years until 1998.

Recreational

Recreational landing estimates of RD in LA has varied considerably over the available time-series from a minimum of 0.44M fish harvested in 1988 to a peak of 2.0M fish harvested in 2010. After 1988, recreational RD landings generally increased up to 1.7 million fish harvested in 2000. Landings decreased between 2000 and 2005 to 0.93 million fish harvested in 2005. After 2005, recreational landings increased again to the peak of 2.0 million fish in 2010 before declining to 1.0 million fish landed in 2016. Landings increased again in 2017 and 2018 to 1.6 and 2.0 million fish respectively and then declined to 1.1 million fish harvested in 2020 and 0.74 million fish harvested in 2021.

Estimates of recreational live release are substantial when compared to the landings estimates. After implementation of recreational minimum size limits, more RD were released than harvested. In the most recent decade, live releases comprised 59% of the total recreational catch.

2. Data Sources

2.1 Fishery Independent

LDWF Trammel Net Survey

The LDWF fishery-independent (FI) estuarine trammel net survey is used in this assessment to develop an index of relative abundance (1985-2021) and corresponding age compositions as inputs of the assessment model. Below is a brief descriptions 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.

The trammel net survey is conducted with standardized design from October-March. Hydrological and climatological measurements are taken with each biological sample, including water temperature, turbidity, conductivity and salinity. 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.

Samples are taken by 'striking' the net. All captured RD are enumerated and a maximum of 50 randomly selected RD are collected for length measurements, gender determination, and maturity information. When more than 50 RD are captured, catch-at-size is derived as the product of total catch and proportional subsample-at-size.

This survey was conducted from 1985 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. Beginning in 2013, the survey design was modified where sampling locations are now selected randomly from the established stations within each CSA (Figure 2).

SEAMAP Inshore Bottom Long Line Survey

The SEAMAP nearshore bottom long line (BLL) survey complements the existing long-term survey conducted by NOAA Fisheries but focuses on the shallow nearshore depths of the northern GOM. Study objectives are to characterize shark and finfish distributions and abundance in the shallow nearshore depths. The LA component of the SEAMAP nearshore BLL survey conducted by LDWF is used in this assessment to develop an index of relative abundance of adult RD (2015-2021) and corresponding age compositions as inputs of the assessment model. Below is a brief descriptions of the survey methodology. Complete details can be found in SEAMAP (2013).

The inshore BLL survey is conducted with standardized design using a 1 nautical mile longline with 100 equally spaced ganglions and hooks. A single bait type is used to reduce to minimize variability in catches associated with the bait used. Sample locations are chosen randomly (Figure 3) and the gear is fully deployed and allowed to soak for one-hour before retrieval at each location while environmental measurements are collected. The gear is typically set parallel to depth contours and catch data are collected as the long line is retrieved.

NOAA Fisheries Mark-Recapture Experiments

Estimates of absolute abundance of RD are available from experiments conducted in the northern GOM waters from Alabama to Texas in 1986-1987 (Nichols 1988) and a decade later (Mitchell and Henwood 1998). Below are brief descriptions of the two studies.

Both studies utilized purse seines to capture schooling red drum where a proportion of the catches were tagged and released. After several months at large, the offshore schools were resampled to determine the ratio of tagged to untagged fish in the population. Abundance estimates in the study area were then calculated using the Peterson method after accounting for tagging mortality, tag shedding, and the fraction of mortality that occurred between the initial sampling and resampling events. Because the studies did not cover the entire range of RD in offshore waters of the northern GOM, estimates were expanded to account for RD occurring outside of the study area. However, the study area did include all of Louisiana.

The estimate of adult RD from the first study (Nichols 1988) without expansion to outside the study area was 5.3 million fish with a relative standard error (RSE) of 17% (Table 4). The latter study (Mitchell and Henwood 1998) unfortunately encountered poor weather conditions which impeded the resampling of the adult RD schools, and no recaptures were made in the western zone of the study (west of the Mississippi River). Estimates of abundance were reported for 3 scenarios in the western zone (0 recaptures, 1 recapture, and 2 recaptures) due to the poor sampling conditions and lack of recaptures (Table 4). The estimated abundances for the entire study area without expansion to outside the study area from each recapture scenario were 15.1, 7.8, and 5.4 million fish respectively (RSE= 68%).

Age Composition of Offshore Schools

The age composition of offshore RD schools have been sampled by researchers with NOAA Fisheries and the Louisiana State University (LSU) College of the Coast and Environment (CCE) as part of the Marine Fisheries Initiative Program (MARFIN). These studies randomly sampled offshore RD schools using methods similar to the earlier offshore fishery (i.e., spotter planes and commercial purse seine vessels). Some of these data were collected to characterize the age composition of offshore RD as part of the mark-recapture studies described above. The age frequency data available from these projects, converted from biological to calendar ages, are presented in Table 5 (data courtesy of Dave Neiland, formerly with LSU CCE). The 1987 and 1997 age frequencies are used to represent the age composition of the NOAA Fisheries mark-recapture estimates in the assessment model.

2.2 Fishery Dependent

Commercial

Commercial RD landings are taken from NOAA Fisheries commercial statistical records as reported in the most recent federal red drum stock assessment (Porch 2000; Table 1). In the assessment model, inshore LA landings are used to represent the inshore commercial fishery operating in LA waters and the Gulf of Mexico (GOM) offshore landings are used to represent the offshore commercial fishery that operated across state boundaries. Estimates of commercial live releases are not available and are not considered further in this assessment.

Size compositions of LA inshore commercial harvest and GOM offshore commercial harvest are available from historical port sampling (Russell 1988; Figure 4). No age composition samples are available for the LA inshore commercial inshore fishery. The size composition information from the Russel samples collected from the inshore fishing gears (hook and line, trammel nets, and non-runaround gillnets) are pooled to develop a single size distribution to represent LA inshore commercial landings (Table 5). Ages are then assigned to the inshore commercial catches from a growth model (see *5. Catch at Age Estimation).* Age composition samples of landings of the offshore purse seine fishery are available for a limited number of years (Beckman 1989; Table 5). The size composition information from the Russel samples collected from the offshore fishing gears (purse seines, haul seines, and runaround gillnets) are pooled (Table 5) to represent GOM offshore commercial landings for purposes of mean weight calculations.

Recreational

Recreational RD landings and live release estimates (Table 3) are taken from the LDWF recreational creel survey (LA Creel; 2014-2021) 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). Furthermore, due to changes made to the MRIP Access Point Angler Intercept Survey (APAIS) in 2013 (see https://www.fisheries.noaa.gov/topic/recreational-fishing-data#making-improvements) and the recent transition from the MRIP Coastal Household Telephone Survey to the new Fishing Effort Survey (FES; see https://www.fisheries.noaa.gov/recreational-fishing-data/types-recreational-fishing-surveys#fishing-effort-survey), harvest estimates currently available from MRIP also differ from those used in prior LDWF RD stock assessments (LDWF 1997, Shepard 2005, Blanchet 2006). Live releases are further delineated as undersized/non-undersized with the LA Creel and MRIP catch disposition codes.

Annual seasonal size compositions of RD harvest estimates are derived from the LDWF Biological Sampling Program (2014-2021; Table 6) and MRIP (1982-2013, post APAIS and FES calibration changes; Table 6). Seasons represent January–April (season 1), May-August (season 2), and September-December (season 3). Size compositions from the LDWF Biological Sampling Program are derived by statistically weighting the size composition samples by the corresponding recreational landings estimates for each basin (CSA) and mode of fishing (Private and Charter). Size compositions of non-undersized live releases are assumed equivalent to harvest. Size composition of under-sized releases in each year and season are estimated by pooling the annual seasonal size frequency information available prior to implementation of the 16-inch MLL and using those distributions as a proxy of undersized catches beginning in 1988.

Ages of recreational red drum landings are derived from a growth model (1982-2001) and otoliths collected from the recreational fishery (2002-2021; see *5. Catch at Age Estimation*).

Bycatch

Menhaden Reduction Fishery

Time series of incidental catch of RD from the LA menhaden reduction fishery have been developed from observations of retained and released red drum CPUE (numbers per purse seine set) and annual effort estimates of the menhaden reduction fishery (LDWF 2020, see *Appendix 2*). The mean estimates of red drum bycatch in the most recent decade indicate low levels of RD bycatch relative to the landings of the directed LA fisheries (~2% in units of weight). The time series of mean RD bycatch estimates from the LA menhaden reduction fishery are included as a fleet in the base assessment model (see *6. Assessment Model*).

Shrimp Fishery

Bycatch has been characterized for the 2019-2020 inshore LA shrimp fishery (Cagle and West 2020; see *Appendix 3*). Incidental catches were only observed for 5 large red drum that were all released alive. The total LA inshore bycatch of red drum can be estimated over the study period (July 2019 through June 2020) as the product of inshore LA effort over that period (number of trips=37,203) and the RD CPUE estimate of the bycatch study (5 individuals/ 33 trips observed=0.152) which equates to 5,637 fish. Due to the low level of RD bycatch in the LA shrimp fishery relative to the landings of the LA directed fisheries

(<1% in units of fish in 2020), incidental RD catches of the LA inshore shrimp fishery are not considered further in this assessment.

Incidental RD catches also occur in the offshore GOM shrimp fishery. Estimates of offshore incidental RD catches presented in the most recent federal assessment (Porch 2000) indicates that gulf-wide offshore shrimp fishery RD bycatch was substantial when compared to the recent LA inshore bycatch estimates. The estimated bycatch of RD from the GOM offshore shrimp fishery was just over 200,000 fish in 1998 with estimates exceeding 300,000 fish in a few earlier years. The most recent bycatch study from the GOM offshore shrimp fishery (Scott-Denton et al. 2012) indicates RD as only a small fraction of the total catch (<0.25%). However, an up-to-date time series of estimates of incidental RD catches of the GOM offshore shrimp fishery is currently unavailable and are not considered further in this assessment (see *8. Research and Data Needs*).

3. Life History Information

3.1 Unit Stock Definition

Red drum occur in estuaries and the nearshore and offshore habitat along the Atlantic and Gulf Coasts from the Gulf of Maine southward through the GOM into northern Mexico (GMFMC/GSMFC 1984).

Studies using mitochondrial DNA markers (Gold and Richardson 1991, Gold et al. 1994) found significant differences in the frequencies of haplotypes of GOM and Atlantic RD, implying that GOM and Atlantic RD populations are genetically distinct. A more recent study using microsatellites to assess population structure and gene flow of RD in the northern GOM (Gold and Turner 2002) found significant genetic divergence across the northern GOM, but concluded that the genetic differences to not delineate subpopulations or stocks with fixed geographical boundaries. Approximate estimates of geographic neighborhood size from this study indicate that northern GOM adult red drum may migrate from 700 to 900 kilometers away from their natal estuaries.

For purposes of this assessment, the unit stock is defined as those RD occurring in LA and adjacent federal waters.

3.2 Morphometrics

Parameter estimates from a weight-length regression fit to LDWF FI red drum datasets (see *Appendix 4*) are used in this assessment to calculate weight from size as:

$$W = 0.000248 \times (TL)^{3.1003} \quad [1]$$

where W is whole weight in pounds and TL is total length in inches.

Fish with only FL measurements available are converted to TL from the following relationship reported in Porch (2000):

$$TL = 1.092 \times FL - 1.01 \quad [2]$$

where fork length is in units of inches.

3.3 Growth

Parameter estimates from a damped growth model (Porch et al. 2002) fit to LDWF FI red drum datasets (see Appendix 4) are used in this assessment to calculate RD length at age. This model provides a better fit to LDWF length at age data than the traditional three-parameter von Bertalanffy model. Red drum total length-at-age is calculated with the damped growth model as:

$$TL_a = 38.0 \times (1 - e^{\beta_1 - 0.460(t+0.321)}) \quad [3]$$

$$\beta_1 = \frac{-0.196}{0.298}(e^{-0.298t} - e^{0.321 \times 0.298})$$

where TL_a is TL-at-age in inches and years.

3.4 Fecundity / Maturity / Sex Ratio

Red drum are group-synchronous batch spawners that spawn each fall from mid-August into October (Wilson and Neiland 1994). To realistically estimate annual fecundity, the number of eggs spawned per batch and the number of batches spawned per season must be known.

For purposes of this assessment, estimates of batch fecundity and spawning frequency are calculated from the relationships reported in the latest federal assessment report (Porch 2000). Batch fecundity (BF) and spawning frequency (SF) are calculated as functions of age from:

$$SF_a = (1.07 + 0.847 \times \ln(a))^2 \quad [4]$$

$$BF_a = e^{(14.57 - \frac{19.5}{a^2})} \quad [5]$$

The maturity at age estimates reported in the latest federal assessment are also used for purposes of this assessment where the proportion of females estimated to be mature were 0, 0.05, 0.25, 0.62, 0.90, and 1.0 for ages 1-6 and older.

Wilson and Nieland (1994) reported sex ratios for mature RD sampled from offshore schools in the northern GOM were not significantly different from 1:1. Sex ratios observed in red drum catches of the SEAMAP nearshore BLL survey conducted by LDWF are also not significantly different from 1:1. For purposes of this assessment, the sex ratio is assumed to be 1:1 across ages.

The age-specific mean annual fecundity of a female fish is then estimated as the product of the batch fecundity, spawning frequency, maturity, and sex ratio at age estimates from above.

3.5 Natural Mortality

Red drum can live to at least 39 years of age (LDWF unpublished data). For purposes of this assessment, a value of average M is calculated based on the observed longevity of the species (max. age=39 yrs, M=0.116; Hoenig 1983), but is allowed to vary with weight-at-age to calculate a declining natural mortality rate with age (Table 7). Following SEDAR 12 (SEDAR 2006), the average value of M is rescaled where the mean mortality rate over ages vulnerable to the fishery is equivalent to the average M rate as:

$$M_a = M \frac{nL(a)}{\sum_{a_c}^{a_{max}} L(a)} \quad [6]$$

where M is the average natural mortality rate over exploitable ages a, a_{max} is the oldest age-class, a_c is the first fully-exploited age-class, n is the number of exploitable ages, and $L(a)$ is the Lorenzen curve as a function of age. The Lorenzen curve as a function of age is calculated from:

$$L(a) = W_a^{-0.288} \quad [7]$$

where -0.288 is the allometric exponent estimated for natural ecosystems (Lorenzen 1996) and W_a is weight-at-age.

3.6 Discard Mortality

Reported short-term discard mortality estimates of RD vary with fish size, bait/hook type, and anatomical hooking location (LDWF unpublished data, Vecchio and Wenner 2007). Discard mortality estimates from these studies range from 1% up to 10%. For purposes of this assessment, a constant rate of discard mortality across time and fish size/age is assumed (5%). For modeling purposes, stock losses due to discard mortalities are incorporated directly into the catch-at-age estimates (see *5. Catch at Age Estimation*).

3.7 Relative Productivity and Resilience

The key parameter in age-structured population dynamics models is the steepness parameter (h) of the stock-recruitment relationship. Steepness is defined as the ratio of recruitment levels when the spawning stock is reduced to 20% of its unexploited level relative to the unexploited level and determines the degree of compensation in the population (Mace and Doonan 1988). Populations with higher steepness values are more resilient to perturbation and if the spawning stock is reduced to levels where recruitment is impaired are more likely to recover sooner once overfishing has ended. Generally, this parameter is difficult to estimate due to a lack of contrast in spawning stock size (*i.e.*, stock size and corresponding recruitment information not available at both high and low levels of stock size) and is typically fixed or constrained during the model fitting process. Recent stock assessments of Red Drum in the Atlantic and in Florida waters have considered steepness values ranging from 0.99 to 0.65 (SEDAR 2015; Chagaris *et al*. 2015).

Productivity is a function of growth rates, natural mortality, age of maturity, and longevity and can be a reasonable proxy for resilience. We characterize the relative productivity of GOM RD based on life-history characteristics, following SEDAR 9 (SEDAR 2006a), with a classification scheme developed at the FAO second technical consultation on the suitability of the CITES criteria for listing commercially-exploited aquatic species (FAO 2001; Table 8). Each life history characteristic (von Bertalanffy growth rate, age at maturity, longevity, and natural mortality rate) is assigned a rank (low=1, medium=2, and high=3) and then is averaged to compute an overall productivity score. In this case, the overall productivity score is 1.50 for GOM RD indicating medium to low productivity. The von Bertalanffy growth rate typically used in the above analysis is substituted with the mean growth rate across ages from the damped growth model evaluated at the midpoint of the calendar year and weighted by expected survivorship-at-age ($\bar{k}$ = 0.259).

4. Abundance Index Development

Red drum indices of abundance (IOA) are developed from the LDWF FI estuarine trammel net survey and the LDWF component of the SEAMAP FI nearshore bottom long line survey.

Catch per unit effort (CPUE) for the trammel net survey is defined as the number of RD caught per trammel net sample. Trammel net samples collected during the months of January, February, and March are grouped with the previous year's October, November, and December samples for IOA development (e.g., October-March 1989-90 denoted as 1989). Catch per unit effort for the nearshore bottom long line survey is defined as the number of RD caught per 100 hook/hour. To reduce unexplained variability in catch rates unrelated to changes in abundance, each IOA was standardized using methods described below.

A delta lognormal approach (Lo *et al.* 1992; Ingram *et al.* 2010) is used to standardize RD catch-rates in each year as:

$$I_y = c_y p_y \quad [8]$$

where c_y are estimated annual mean CPUEs of non-zero red drum catches assumed as lognormal distributions and p_y are estimated annual mean probabilities of red drum 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 red drum are captured; the binomial model considers all samples. The IOA is then computed from equation [6] using the estimated least-squares means with variances calculated from:

$$V(I_y) \approx V(c_y)p_y^2 + c_y^2 V(p_y) + 2c_y p_y \mathrm{Cov}(c,p) \quad [9]$$

where Cov$(c,p)\approx \rho_{c,p}\left[SE(c_y)SE(p_y)\right]$ and $\rho_{c,p}$ represents the correlation of c and p among years.

Variables considered in model inclusion for the trammel net survey were year, CSA, and sampling location. Variables considered in model inclusion for the nearshore BLL survey were year and NOAA Fisheries statistical grid. All variables were categorical in both models. Because only seasonal samples are included (*i.e.*, October-March for the trammel net survey and May-September for the nearshore BLL survey), time of year was not considered in model inclusion. 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 trammel net IOA 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. In the final nearshore BLL IOA submodels, year was considered a fixed effect and NOAA Fisheries statistical grids were considered random block effects.

Sample sizes, nominal proportion of positive samples, nominal CPUE of positive samples, standardized indices of abundance, and coefficients of variation of the standardized indices are presented (Tables 9 and 10).

5. Catch at Age Estimation

Red drum spawn across a narrow window from mid-August into October (Wilson and Neiland 1994) with October 1st typically assumed as the biological birthdate. However, for purposes of this assessment, RD ages are assigned based on the calendar year by assigning a January 1st birthday, where RD spawned the previous year become age-1 on January 1st and remain age-1 until the beginning of the following year.

Seasonal age-length-keys (ALKs) are developed to estimate the annual age composition of recreational red drum landings, inshore commercial landings, and survey catches as described below. The age composition samples available from the offshore commercial fishery (1987-1988) and the nearshore BLL survey (2018-2020) are used to represent the annual age composition of the offshore landings and survey catches for those years with available age samples.

5.1 Fishery

1982-2001: Seasonal s probabilities of age a given length l for recreational and inshore commercial RD landings are computed from:

$$P(a|l)_s = \frac{P(l|a)_s}{\sum_a P(l|a)_s} \quad [10]$$

where the seasonal probabilities of length given age are estimated from normal probability densities as:

$$P(l|a)_s = \frac{1}{\sigma_{sa}\sqrt{2\pi}} \int_{l-d}^{l+d} exp\left[-\frac{(l-l_{sa})^2}{2\sigma_{sa}^2}\right] dl \quad [11]$$

where length bins are 1 inch TL intervals with midpoint l, maximum $l + d$, and minimum $l - d$ lengths. Seasonal mean total length-at-age l_{sa} are estimated from Equation [3]. Seasons represent January-April (season 1), May-August (season 2), and September-December (season 3). The standard deviation of seasonal mean length-at-age is calculated from $\sigma_{sa} = l_{sa}CV_l$, where the coefficient of variation in length-at-age is assumed normally distributed and changes linearly with age from a CV of 0.203 for age-0 fish to a CV of 0.0754 for age-5 fish and a uniform CV of 0.0499 for fish age-6 and older (see *Appendix 4*). To approximate changes in growth and vulnerability to the fishery through the year, mean l_{sa} is calculated at the mid-point of each season of the calendar/model year. The resulting $P(a|l)_s$ matrices (Table 11) are used to assign ages to recreational fishery RD landings from 1982-2001 and for instances discussed below where minimum sample size requirements are not met. The season 2 (May-August) ALK is used to assign ages to the LA inshore commercial RD landings.

2002-2021: Annual seasonal probabilities of age given length for recreational fishery landings are computed from:

$$P(a|l)_{sy} = \frac{n_{lasy}}{\sum_a n_{lasy}} \quad [12]$$

where n_{lasy} are annual seasonal recreational RD sample sizes occurring in each length/age bin. When row samples sizes ($\sum_a n_{lasy}$) are <10, the $P(a|l)$ for that total length interval is estimated with Equation [10]. Resulting $P(a|l)_{sy}$ matrices are presented (Table 12).

Annual recreational catch-at-age from 1982-2021 is then calculated as:

$$C_{ay} = \sum_{ls} C_{lsy} P(a|l)_{sy} \quad [13]$$

where C_{lsy} are annual seasonal catches-at-size in TL, and $P(a|l)_{sy}$ are taken from Equations [10 or 12]. Recreational discard mortalities are incorporated directly into the recreational catch-at-age by applying a

5% discard mortality rate to the estimated live releases-at-size and combining them with the harvest-at-size estimates.

For modeling purposes, catches≥age-10 are summed into a plus group. Resulting annual recreational catch-at-age, commercial catch-at-age (as proportions at age), and corresponding mean weights-at-age are presented (Tables 13-15). Annual recreational mean weights-at-age are calculated from the annual recreational size/age composition information. Inshore and offshore commercial mean weights are calculated from the available commercial size/age composition information.

5.2 Survey

Probabilities of age given length for RD catches of the LDWF estuarine trammel net survey (1985-2021) and the LDWF component of the SEAMAP nearshore BLL survey (2015-2017 only) are computed from equation [10]. Mean total length-at-age is estimated from equation [3]. The standard deviation in length-at-age is calculated as described above for the fishery. To approximate trammel net survey timing (i.e., a January 1st midpoint), mean total length-at-age is calculated at the beginning of the calendar year. To approximate the nearshore BLL survey timing, mean total length-at-age is calculated at the midpoint of the calendar/model year. The resulting $P(l|a)$ matrix for RD catches of the estuarine trammel net survey is presented (Table 18). The resulting $P(l|a)$ matrix for RD catches of the nearshore BLL survey is equivalent to the season 2 ALK in Table 11. Annual survey catch-at-age is also taken from Equation [13] with annual survey catch-at-size substituted (Tables 16 and 17). Resulting annual age compositions of RD catches of the LDWF marine trammel net survey and the LDWF component of the nearshore SEAMAP BLL survey are presented along with the age compositions for the years age samples were available (Tables 19 and 20). Also presented are the age compositions from the MARFIN age samples that are used to represent the NOAA Fisheries mark-recapture estimates of absolute abundance (Table 21).

6. Assessment Model

The Age-Structured Assessment Program (ASAP3 Version 3.0.17; NOAA Fisheries Toolbox) is used in this assessment to describe the dynamics of RD occurring in LA and adjacent federal waters. ASAP is a statistical catch-at-age model that allows internal estimation of a Beverton-Holt stock recruitment relationship and MSY-related reference points. Minimum data requirements are fishery catch-at-age, corresponding mean weights-at-age, and an index of abundance. ASAP projects abundance-at-age from estimates of abundance in the initial year of the time-series and recruitment estimates in subsequent years. The model is fit to the data with a maximum likelihood fitting criterion. An overview of the basic model configuration, equations, and their estimation, as applied in this assessment, are provided below. Specific details and full capabilities of ASAP can be found in the technical documentation (ASAP3; NOAA Fisheries Toolbox).

6.1 Model Configuration

For purposes of this assessment, the model is configured with annual time-steps (1982-2021) and a calendar year time-frame.

Mortality

Fishing mortality is assumed separable by age a year y and fishery f as:

$$F_{ayf} = v_{af} Fmult_{yf} \quad [14]$$

where v_{af} are age and fishery-specific selectivities and $Fmult_{yf}$ are annual fishery-specific apical fishing mortality rates. Apical fishing mortalities are estimated in the initial year and as deviations from the initial estimates in subsequent years.

Fishery-specific selectivities-at-age are modeled with single (commercial offshore) and double logistic functions (inshore commercial and recreational) as:

$$v_{af} = \left(\frac{1}{1+e^{-(a-\alpha_f)/\beta_f}}\right) \quad [15a]$$

$$v_{af} = \left(\frac{1}{1+e^{-(a-\alpha_f)/\beta_f}}\right)\left(1 - \frac{1}{1+e^{-(a-\alpha2_f)/\beta2_f}}\right) \quad [15b]$$

Total mortality for each age and year is estimated from the age-specific natural mortality rates M_a and estimated annual fishery-specific fishing mortalities as:

$$Z_{ay} = M_a + \sum_f F_{ayf} \quad [16]$$

For reporting purposes, annual age-specific fishing mortalities are averaged by weighting by estimated population numbers at age N_{ay} as:

$$F_y = \frac{\sum_a F_{ay} N_{ay}}{\sum_a N_{ay}} \quad [17]$$

Annual escapement rates of juvenile fish (biological ages 0-4) are calculated from the calendar age F rates as:

$$E_y = e^{-(F_{1y}+F_{2y}+F_{3y}+F_{4y}+0.75F_{5y})} \quad [18a]$$

Annual fishing mortality rates of adult fish (biological ages 5-10+) are calculated from the calendar age F rates as:

$$AF_y = 1 - e^{-(0.25F_{5y}+F_{6y}+F_{7y}+F_{8y}+F_{9y}+F_{10y})} \quad [18b]$$

Population Abundance

Abundance in the initial year of the time series and recruitment in subsequent years are estimated and used to forward calculate the remaining numbers at age from the age and year-specific total mortality rates as:

$$N_{ay} = N_{a-1,y-1}e^{-Z_{a-1,y-1}} \quad [19]$$

Numbers in the plus group A are calculated from:

$$N_{Ay} = N_{A-1,y-1}e^{-Z_{A-1,y-1}} + N_{A,y-1}e^{-Z_{A,y-1}} \quad [20]$$

Stock Recruitment

Expected recruitment is calculated from the Beverton-Holt stock recruitment relationship, reparameterized by Mace and Doonan (1988), with annual lognormal deviations as:

$$\hat{R}_{y+1} = \frac{\alpha SSF_y}{\beta + SSF_y} + e^{\delta_{y+1}} \quad [21]$$

$$\alpha = \frac{4\tau(SSF_0/SPR_0)}{5\tau - 1} \text{ and } \beta = \frac{SSF_0(1-\tau)}{5\tau - 1}$$

where SSF_0 is unexploited female spawning stock fecundity, SPR_0 is unexploited female spawning stock fecundity per recruit, τ is steepness, and $e^{\delta_{y+1}}$ are the annual lognormal recruitment deviations.

Spawning Stock Biomass

Female spawning stock fecundity in each year is calculated from:

$$SSF_y = \sum_{i=1}^{A} N_{ay}\Phi_{ay}\, e^{-Z_{ay}(0.75)} \quad [22]$$

where Φ_{ay} are annual mean per capita fecundity-at-age of mature females, and $e^{-Z_{ay}(0.75)}$ is the proportion of the population surviving prior to spawning on October 1st.

Expected Catch

Expected fishery catches are estimated from the Baranov catch equation as:

$$\hat{C}_{ayf} = N_{ay}F_{ayf}\,\frac{(1-e^{-Z_{ay}})}{Z_{ay}} \quad [23]$$

Expected age composition of fishery catches are then calculated from $\frac{\hat{C}_{ayf}}{\sum_a \hat{C}_{ayf}}$. Expected fishery yields are computed as $\sum_a \hat{C}_{ayf}\overline{W}_{ayf}$, where $\overline{W}_{ayf}$ are observed mean catch weights.

Survey Catch-rates

Expected survey catch-rates are computed from:

$$\hat{I}_{ay} = q \sum_a N_{ay}(1 - e^{-Z_{ay}(0.0)})v_a \quad [24]$$

where v_a are survey selectivities, q is the estimated catchability coefficient, and $1 - e^{-Z_{ay}(0.0)}$ is the proportion of the total mortality occurring prior to the time of the trammel net survey (January 1st midpoint). Survey timing for the nearshore BLL survey and NOAA Fisheries mark-recapture estimates was set to the middle of the year. Survey selectivities are modeled with a double logistic function (trammel net survey; Equation 15b) and single logistic functions (BLL survey and NOAA Fisheries mark-recapture estimates; Equation 15a). Expected survey age composition is then calculated as $\frac{\hat{I}_{ay}}{\sum_a \hat{I}_{ay}}$.

Parameter Estimation

The number of parameters estimated is dependent on the length of the time-series, number of fleets modeled, number of selectivity blocks modeled, and number of abundance indices modeled. Parameters are estimated in log-space and then back transformed. In this assessment, 235 parameters are estimated:

1. 22 selectivity parameters (1 block for the inshore commercial fishery, 1 block for the offshore commercial fishery that is also shared by the menhaden reduction bycatch fleet, 2 blocks for the recreational fishery, and 1 block for each survey)
2. 160 apical fishing mortality rates (F_{mult} in the initial year and 39 deviations in subsequent years for 4 fleets)
3. 40 recruitment deviations (1982-2021)
4. 9 initial population abundance deviations (age-2 through 10-plus)
5. 3 catchability coefficients (1 per survey, and 1 for the NOAA Fisheries mark-recapture estimates that is constrained to 1.0 to represent absolute abundance)
6. 1 stock-recruitment parameter (SSB_0; the steepness parameter is fixed at 1.0 for the base run).

The model is fit to the data by minimizing the objective function:

$$-ln(L) = \sum_i \lambda_i(-ln\, L_i) + \sum_j(-ln\, L_j) \quad [25]$$

where $-ln(L)$ is the entire negative log-likelihood , lnL_i are log-likelihoods of lognormal estimations, λ_i are user-defined weights applied to lognormal estimations, and lnL_j are log-likelihoods of multinomial estimations.

Negative log-likelihoods with assumed lognormal error are derived (ignoring constants) as:

$$-ln(L_i) = 0.5 \sum_i \frac{[ln(obs_i) - ln(pred_i)]^2}{\sigma^2} \quad [26]$$

where obs_i and $pred_i$ are observed and predicted values; standard deviations σ are user-defined CVs as $\sqrt{ln(CV^2+1)}$.

Negative log-likelihoods with assumed multinomial error are derived (ignoring constants) as:

$$-ln\left(L_j\right) = -ESS \sum_{i=1}^{A} p_i \, ln(\hat{p}_i) \quad [27]$$

where p_i and $\hat{p}_i$ are observed and predicted age composition. Effective sample-sizes ESS are used to create the expected numbers $\hat{n}_a$ in each age bin and act as multinomial weighting factors.

6.2 Model Assumptions/Inputs

Model assumptions include: 1) the unit stock is adequately defined and closed to migration, 2) observations are unbiased, 3) errors are independent and their structures are adequately specified, 4) fishery and survey vulnerabilities are adequately specified, 5) abundance indices are proportional to absolute abundance, and 6) fecundity, growth and sex ratio-at-age do not vary significantly with time. Lognormal error is assumed for catches, abundance indices, the stock-recruitment relationship, apical fishing mortality, selectivity parameters, initial abundance deviations, and catchability. Multinomial error is assumed for fishery and survey age compositions.

A base model was defined with an age-10 plus group, the steepness parameter fixed at 1.0, two commercial fishery selectivity blocks, two recreational selectivity blocks, a discard mortality rate of 5%, the 1997 absolute abundance estimate from the NOAA Fisheries mark-recapture experiments with a single tagged fish recaptured in the western study area, and input levels of error and weighting factors as described below.

For the commercial fleets, a single selectivity block is modeled per fishery (inshore and offshore). The offshore commercial selectivity block is also used to represent the selectivity of the menhaden reduction fishery bycatch (along with the available age composition and mean weight information). Within the recreational fleet, two selectivity blocks are modeled that correspond to the following time-periods of consistent regulation: 1) 1982-1987 (no recreational size regulations implemented) and 2) 1988-2021 (current recreational slot limit implemented).

Input levels of error for commercial fishery landings were specified with CV's of 0.20 for each year of the time-series. Input levels of error for recreational fishery landings estimates were specified with CV's of 0.05 for each year of the time-series under the assumption that recreational landings estimates are known with less error than the commercial landings. Input levels of error for survey catch-rates were specified with CV's estimated from each IOA standardization (Tables 9 and 10). Annual recruitment deviations were specified with CV's of 0.4 for all years of the time-series. The catchability coefficient of the NOAA Fisheries mark-recapture absolute abundance estimates was estimated, but constrained to be 1.0 in the assessment model with a CV of 0.0001. Ideally, the catchability coefficient of an absolute abundance estimate would be fixed at 1.0 (by setting its phase to a negative value) rather than constrained to be 1.0, but the current configuration of the ASAP graphical user interface does not allow each surveys catchability phase to be adjusted separately. All selectivity parameters are constrained to initial guesses with a CV of 1.0 to improve model stability. To allow reasonable (non-zero) estimates of stock numbers-at-age in the first year of the time series, the estimated deviations of initial stock numbers of age-2 through 10+ fish are also constrained with a CV of 1.0.

Lognormal components included in the objective function were equally weighted (all lambdas=1). Input effective sample sizes (ESS) for estimation of fishery and survey age compositions were specified with the observed annual sample sizes for the years where annual ALKs and annual age composition samples were available, but are capped at ESS=200 to prevent overfitting. For years where annual ALKs or annual age composition samples were not available and ages were assigned from size, the effective sample sizes were down-weighted to ESS=50.

6.3 Model Results

Objective function components, weighting factors, and likelihood values of the base model are summarized in Table 22.

Model Fit

The base model provides an overall reasonable fit to the data. Fits to the commercial landings, recreational landings, and menhaden reduction fishery bycatch match the observations well (Figure 5). Model estimated catch-rates of the LDWF component of the SEAMAP BLL survey provide reasonable fits to the data (Figure 6). Model estimated catch-rates of the trammel net survey also provide reasonable fits to the data given the relatively large CV's of the time series, but are generally overestimated in the initial years of the time series and underestimated in the more recent years (Figure 6). Model fit of the NOAA Fisheries mark-recapture absolute abundance estimates are also reasonable given the large input CV of the 1997 estimate (CV=0.682), but are underestimated by approximately 1 million fish (Figure 6). Model estimated fishery and survey age compositions provide adequate fits to the input age proportions (Figures 7-12) with noticeably better fits for the years annual recreational ALKs were available, with a few exceptions. The model overestimates the input trammel net age compositions of age-2 and age-3 fish beginning in 2018, which are some of the lowest observations of the time series examined. Model fits to the input trammel net age compositions in recent years consistently underestimate the age-10+ group.

Selectivities

Estimated fishery and survey selectivities are presented in Figure 13. Fishery estimates indicate full-vulnerability to the inshore commercial fishery at age-3 and to the offshore commercial fishery at age-4. Recreational selectivities for each regulation block indicates full vulnerability to the fishery at age-2. The estimated recreational selectively of age-1 fish was reduced by approximately 86% after the 1988 size regulations were implemented. Survey estimates indicate full vulnerability to the FI trammel net survey gear at age-2 and to the nearshore BLL survey at age-10+. Selectivity estimates of the NOAA Fisheries mark-recapture estimates also indicate full vulnerability to the sampling gear at age-10+.

Abundance, Recruitment, and Spawning Stock

Total stock size and abundance–at-age estimates are presented in Table 23. Stock size has varied considerably over the time-series examined. Stock size decreased from 13.8 million fish estimated in 1982 to 10.1 million fish estimated in 1989. After 1989, stock abundance increased to a peak of 23.0 million fish in 1999. Since 1999, stock size has generally declined. In the most recent decade, stock size has decreased from the 18.3 million fish estimated in 2012 to the lowest stock size of the modeled time series estimated in 2021 (8.7 million fish).

Estimates of age-1 recruitment are presented in Table 23 and Figure 14. Recruitment generally declined from the initial years of the time series from 3.5 million age-1 fish estimated in 1982 to a low of 1.7 million age-1 fish estimated in 1989. Following 1989, recruitment increased to a peak of 7.6 million age-1 fish estimated in 1994. Since 1994, recruitment has generally declined. In the most recent decade, age-1 recruitment has decreased from the 4.5 million fish estimated in 2012 to some of the lowest recruitment estimates of the modeled time series estimated in 2019-2021 (1.4, 1.4, and 1.7 million fish respectively). The average recruitment (geometric mean) of the time-series is 3.8 million age-1 fish. The average recruitment of the most recent decade of the time-series is 2.5 million age-1 fish.

Female spawning stock fecundity (SSF) estimates are presented in Figure 15. Estimates decreased from over 60 trillion eggs in the first years of the time-series to a minimum of 36.6 trillion eggs estimated in 1991. After 1991, SSF increased to a peak of 78.6 trillion eggs estimated in 2004. Since 2004, SSF has decreased to 50.7 trillion eggs estimated in 2021.

Fishing Mortality

Estimated fishing mortality rates are presented in Table 24 (total apical, average N-weighted, age-specific, juvenile escapement, and adult F rates) and Figure 16 (average F rates) and Figure 17 (escapement rates).

Average fishing mortality rates have varied over the time-series with a steep increase in the earlier years up to peaks of 0.29 and 0.28 estimated in 1986 and 1987. After 1987, average fishing mortality rates declined steeply after RD harvest in the EEZ was prohibited and then became relatively stable in the years after inshore entanglement nets regulations were enacted. In the most recent decade, average fishing mortality rates increased from 0.10 estimated in 2012 to another peak of 0.23 estimated in 2018. Since 2018, average fishing mortality estimates have declined. The 2021estimate of average F is 0.11.

Escapement rates of juvenile fish calculated from Equation [18a] (i.e., the proportion of juvenile fish that survive the inshore fishery to become adults) have also varied through time, where the lowest escapement rates occurred in 1986 and 1987 (8.6 and 9.9%) before increasing steeply in 1988 to 66.4%. Since 1988, escapement has generally declined. In the most recent decade, escapement estimates have declined overall from an estimate of 38.2% in 2012 to an estimate of 22.2% in 2021 with lows of 17.4 and 17.1% escapement estimated in 2018 and 2020.

Fishing mortality rates of adult fish calculated from Equation [18b] (i.e., the proportion of adult fish that die due to fishing) follow a trend similar to average F and escapement rates, where the highest adult F (46.8%) occurred in 1986 before declining to a relatively stable level between 5 and 8% after harvest in the EEZ was prohibited. Beginning in 2010, adult F rates increased above 10% which corresponds with the decline observed in stock size and female spawning stock fecundity in the most recent decade. The 2021 estimate of adult F is 14.7%.

Stock-Recruitment

No discernable relationship is observed between female SSF and subsequent age-1 recruitment estimates (Figure 18). The steepness parameter was fixed at 1.0 in the ASAP base model run. The estimated unexploited SSF and age-1 recruitment was 133 trillion eggs and 3.80 million age-1 fish. Alternate runs with steepness values fixed at 0.9, 0.8, and 0.7 are discussed in the *Model Diagnostics* Section below.

Parameter Uncertainty

In the ASAP base model, 235 parameters are estimated. Asymptotic standard errors of the recruitment, spawning stock fecundity, and fishing mortality (average F and escapement rates) time-series are presented (Figures 14-17).

6.4 Management Benchmarks

Overfishing and overfished limits should be defined for exploitable stocks. The implication is that when spawning 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.

Management thresholds have been established for GOM red drum in the Gulf of Mexico Fishery Management Council (GMFMC) Red Drum Fishery Management Plan (FMP). Amendment 2 of the FMP, implemented in 1988, designates a 20% spawning potential ratio (SPR) limit and requests the GOM States to enact rules to achieve that standard by providing 30% escapement of juvenile fish to offshore waters (GMFMC 1988). The state of Louisiana has endorsed that standard, as it was included in Act 889 of the 1988 Regular Legislative Session. A provision of Act 889, which was to become effective September 1, 1991, authorized the Wildlife and Fisheries Commission to set a quota for commercial harvest of red drum, based on 30% escapement to offshore waters. This provision never became effective, since the section was repealed by Act 157 of the 1991 Regular Legislative Session. However, it does seem to have established legislative intent to endorse the conservation standard recommended by the GMFMC. The method for calculating equilibrium reference points that correspond to the 20% SPR_{limit} are presented below.

When the stock is in equilibrium, equation [22] can be solved, excluding the year index, for any given exploitation rate as:

$$\frac{SSF}{R}(F) = \sum_{i=1}^{A} N_a \Phi_a \, e^{-Z_a(0.75)} \quad [28]$$

where total mortality at age Z_a is computed as $M_a + v_a \times Fmult$; vulnerability at age v_a is taken by rescaling the current F-at-age estimate (geometric mean 2019-2021) to the maximum. Per recruit abundance-at-age is estimated as $N_a = S_a$, where survivorship at age is calculated recursively from $S_a = S_{a-1}e^{-Z_a}$, $S_1 = 1$. Per recruit catch-at-age is then calculated from the Baranov catch equation [23], excluding the year index. Yield per recruit (Y/R) is then taken as $\sum_a C_a \overline{W}_a$ where $\overline{W}_a$ are current mean fishery weights at age (arithmetic mean 2019-2021). Fishing mortality is averaged by weighting by survivorship at age.

Equilibrium spawning stock fecundity SSF_{eq} is calculated by substituting SSF/R estimated from equation [28] into the Beverton-Holt stock recruitment relationship as $\alpha \times SSF/R - \beta$. Equilibrium recruitment R_{eq} and yield Y_{eq} are then taken as $SSF_{eq}/(SSF/R)$ and $Y/R \times R_{eq}$. Equilibrium SPR (e.g. SPR_{limit}) is then computed as the ratio of SSF/R when F>0 to SSF/R when F=0. Equilibrium escapement rates are calculated from equation [18a] excluding the year index with equilibrium F-at-age calculated as $v_a \times Fmult$ where v_a is the current (2019-2021) vulnerability at age estimate. The equilibrium spawning stock fecundity, escapement rate, and average fishing morality rate that lead to the 20% SPR_{limit} (SSF_{limit}, E_{limit}, F_{limit}) are then calculated.

The established limits of fishing are presented in Figure 19 relative to each time-series. Limit reference points are also presented in Table 25. Current estimates are taken as the geometric mean of the 2019-2021 estimates.

Also presented are a plot of the stock-recruitment data, equilibrium recruitment, and diagonals from the origin intersecting R_{eq} at the SSF_{limit}, and the minimum and maximum SSF estimates of the time-series, corresponding with a SPR_{limit} of 20%, and a minimum and maximum SPR of 27.4% and 58.7% (Figure 20).

6.5 Model Diagnostics

Sensitivity Analysis

In addition to the base model run, a series of sensitivity runs were used to explore uncertainty in the base model's configuration.

The ASAP base model was run with steepness fixed at 1.0. Alternate runs were conducted examining reference point estimates with steepness fixed at 0.9, 0.8, and 0.7 (Models 1-3).

Additional sensitivity runs were conducted by separately up-weighting the contributions of fishery yield and the IOA components within the base models objective function (lambdas increased from 1 to 10; Models 4 and 5).

An additional sensitivity run was conducted where all input ESS were reduced by half (Model 6)

Another sensitivity run was conducted by increasing the discard mortality rate from 5% to 8% (Model 7).

An additional sensitivity run was conducted where the fishery ALK developed from the damped growth model was used to assign ages to the entire time-series of recreational fishery landings (Model 8).

Another sensitivity run was conducted that only included the LA offshore commercial landings rather than the GOM offshore commercial landings (Model 9).

An additional sensitivity run was conducted with spawning stock biomass estimated rather than spawning stock fecundity (Model 10).

Sensitivity runs were also conducted where the 1987 and 1997 NOAA Fisheries absolute abundance estimates are excluded from the assessment model (Model 11) and where only the 1997 NOAA Fisheries absolute abundance estimate is excluded (Model 12).

Final sensitivity runs were conducted where the base natural mortality rate was increased 20% (Model 13) and decreased 20% (Model 14).

Results of each sensitivity run relative to the limit reference points are presented in Table 26. Current estimates of female SSF, average F, and escapement rates are taken as the geometric mean of the 2019-2021 estimates. Estimates from all sensitivity runs with the exception of Model 11 indicate the stock is currently above the SSF_{limit}. Model 5 is the only run where the fishery is currently not overfishing in terms of escapement rates (>30%).

Also presented are estimates of maximum sustainable yield (MSY) and associated reference points for those sensitivity runs with the steepness parameter not fixed at 1 (Models 1-3; Table 27). Results of each run indicate that the fishery is currently overfishing in terms of escapement rates (<30%), where the inverse of ratios of current E to E_{MSY} are above 1. Spawning stock fecundity estimates from each run indicate the stock is currently above $SSF_{MSY.}$

Retrospective Analysis

A retrospective analysis was conducted by sequentially truncating the base model by a year (terminal years 2016-2021; Figure 21). Retrospective estimates of age-1 recruits and the average fishing mortality rate differ marginally from the base run where recruitment estimates generally tend to increase and fishing mortality rate estimates tend to decrease as years are added to the model. Retrospective estimates of spawning stock fecundity reveal a pattern where estimates in the initial year of the time series tend to decrease slightly as additional years are added to the model while estimates in the terminal year increase as additional years are added. The terminal retrospective pattern in female SSF can be explained by the addition of the LDWF component of the SEAMAP BLL survey that began in 2015. As more years of the BLL survey and corresponding age compositions (primarily age-10+ fish) are included in the modeled time series, the model estimates of age-10+ fish and female SSF increase as more information of the adult offshore population becomes available to the assessment model. When the BLL survey is not used as an input of the assessment model, the scale of the retrospective pattern in female SSF and age-10+ stock numbers is greatly reduced.

7. Stock Status

The history of the LA red drum stock relative to E/E_{limit} and SSB/SSB_{limit} are presented in Figure 22. Escapement rate estimates below E_{limit} (1/ (E/E_{limit}) >1.0) are defined as overfishing; spawning stock fecundity estimates below SSB_{limit} (SSB/SSB_{limit}< 1.0) are defined as the overfished condition.

Overfishing Status

The current estimate of 1/ (E/E_{limit}) is >1.0 (1.49), indicating the stock is currently undergoing overfishing. The current assessment model also indicates that overfishing occurred in earlier years of the time-series. The current escapement rate estimate is 20.1%.

Overfished Status

The current estimate of SSB/SSB_{limit} is >1.0 (2.00), indicating the stock is not currently overfished. The current SPR estimate is 40.1%.

8. 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 red drum.

Continuing the SEAMAP nearshore bottom longline survey and corresponding age composition sampling are critical to estimating stock status since this survey supplies the only current estimates of adult RD abundance.

Updated estimates of offshore abundance with reasonable precision would provide more certainty in estimation of stock status in future assessments.

Only limited age data are available from the LDWF estuarine trammel net survey. Ages of survey catches in this assessment were assigned from size with a growth function. Continuing the age composition sampling from the survey would allow a more accurate representation of survey age composition in future assessments.

Development of a new fishery independent survey that better tracks red drum recruitment through time (full selection to survey gear at age-1) would provide better certainty in age-1 relative abundance estimates in future stock assessments.

Estimates of red drum batch fecundity, spawning frequency, and maturity used in this assessment were developed in 1996. Updated estimates of red drum batch fecundity, spawning frequency, and maturity at age/size are needed.

Investigations of the habitat utilization of younger adult red drum (5-10 yrs), which are presumed to have escaped the inshore fishery and migrated to the offshore adult stock in the EEZ, are needed to determine what proportion of red drum truly escape the inshore fishery, as well as the efficacy of the current juvenile escapement rate based management policy.

Incidental catches of RD from the offshore GOM shrimp fishery were not considered in this assessment. Some previously reported estimates of incidental RD catches in the offshore shrimp fishery indicated a relatively large bycatch when compared to estimates of RD incidental catches of the LA inshore shrimp fishery. Development of a current time series of offshore shrimp fishery RD bycatch would allow for a better understanding of the current magnitude of offshore shrimp fishery bycatch relative to the directed fisheries.

Factors that influence year-class strength of red drum are poorly understood. Investigation of these factors, including inter-annual variation in seasonal factors (seasonal salinities, winter severity, 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 red drum 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 RD 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.

9. References

Adkins, G., V. Guillory, and M. Bourgeois. 1990. A creel survey of Louisiana recreational saltwater anglers. Louisiana Department of Wildlife and Fisheries, Technical Bulletin Number 41:1-58.

Beckman, D.W. 1989. Age and Growth of Red Drum, *Sciaenops Ocellatus*, and Black Drum, *Pogonias Cromis*, in the Northern Gulf of Mexico. LSU Historical Dissertations and Theses. 4699. https://digitalcommons.lsu.edu/gradschool_disstheses/4699

Blanchet, H. 2005. 2005 Louisiana’s Red Drum Escapement Rate Update. Louisiana Department of Wildlife and Fisheries, Office of Fisheries, Baton Rouge, LA.

Cagle, P., and J. West. 2020. Evaluation of Commercial Shrimp Fishery Bycatch in Louisiana Waters. Louisiana Department of Wildlife and Fisheries, Office of Fisheries, Baton Rouge, LA.

Chagaris, D., Mahmoudi, B., & Murphy, M. 2015. The 2015 Stock Assessment of Red Drum, Sciaenops ocellatus, in Florida.

Daily Picayune. 1892. Gulf Fisheries. Interesting Results of the Investigation by the United States Fish Commission. Vol LVI, No. 132. Page 7. New Orleans, LA

Food and Agriculture Organization (FAO). 2001. Second Technical Consultation on the Suitability of the CITES Criteria for Listing Commercially-exploited Aquatic Species: A background analysis and framework for evaluating the status of commercially-exploited aquatic species in a CITES context. Windhoek, Namibia, 22-25 October 2001. Available: http://www.fao.org/docrep/MEETING/003/Y1455E.htm

GMFMC and GSMFC. 1984. Fishery profile of red drum. Gulf of Mexico Fishery Management Council and Gulf States Marine Fisheries Commission, Tampa, FL and Ocean Springs, MS.

GMFMC. 1988. Amendment number 2 and environmental assessment, and regulatory impact review, and initial regulatory flexibility analysis to the fishery management plan of the red drum fishery of the Gulf of Mexico. Gulf of Mexico Fishery Management Council, Tampa, FL.

GMFMC. 2021. Status Determination Criteria and Optimum Yield for Reef Fish and Red Drum. Final Amendment 48 to the Fishery Management Plan for Reef Fish Resources of the Gulf of Mexico and Amendment 5 to the Fishery Management Plan for the Red Drum Fishery of the Gulf of Mexico Including Environmental Assessment and Fishery Impact Statement. Gulf of Mexico Fishery Management Council, Tampa, FL.

Gold, J.R., and L. R. Richardson. 1991. Genetic studies in marine fishes. IV. An analysis of population structure in the red drum (*Sciaenops ocellatus*) using mitochondrial DNA. Fish. Res. 12: 213-241.

Gold, J.R., King, T. L., Richardson, L.R., Bohlmeyer, D. A., and Matlock, G.C. 1994. Allozyme differentiation within and between red drum (*Sciaenops ocellatus*) from the Gulf of Mexico and Atlantic Ocean. J. Fish Biol. 44: 567-590.

Gold, J.R., and T. F. Turner. 2002. Population structure of red drum (Sciaenops ocellatus) in the northern Gulf of Mexico, as inferred from variation in nuclear-encoded microsatellites. Marine Biology (2002) 140: 249–265.

Guillory, V., and G. Hutton. 1990. A survey of the marine recreational fishery of lower Barataria Bay, Louisiana, 1975-1977. Pages 59-73 In: Louisiana Department of Wildlife and Fisheries Technical Bulletin Number 41.

Hoenig, J. M. 1983. Empirical use of longevity data to estimate mortality rates, Fishery Bulletin 82: 899-903.

Hoese, H. D., D. W. Beckman, R. H. Blanchet, D. Drullinger, and D. L. Nieland. 1991. A biological and fisheries profile of Louisiana red drum *Sciaenops ocellatus*. LDWF Fishery Management Plan Series. Number 4 Part 1 (Final Draft)

Ingram, G.W., Jr., W.J. Richards, J.T. Lamkin, and B. Muhling. 2010. Annual indices of Atlantic bluefin tuna (*Thunnus thynnus*) larvae in the Gulf of Mexico developed using delta-lognormal and multivariate models. Aquat. Living Resour. 23:35–47.

Kelso, W.E., B.D. Rogers, T.A. Bahel, D.A. Rutherford, and D.R. Rogers. 1994. A 1993 survey of Louisiana saltwater anglers. School of Forestry, Wildlife, and Fisheries, Louisiana State University Agricultural Center, Louisiana Agricultural Experiment Station, Baton Rouge, Louisiana. 93p.

LDWF. 1997. 1997 Report on the Status of Red Drum. Louisiana Department of Wildlife and Fisheries, Baton Rouge, LA.

LDWF. 2018. Marine Fisheries Section Independent Sampling Activities Field Manual. Louisiana Department of Wildlife and Fisheries, Office of Fisheries, Baton Rouge, LA.

LDWF. 2020. Estimates of Spotted Seatrout and Red Drum Bycatch in the Louisiana Menhaden Reduction Fishery. Louisiana Department of Wildlife and Fisheries, Office of Fisheries, Baton Rouge, LA.

Lo, N.C.H., Jacobson, L.D., and Squire, J.L. 1992. Indices of relative abundance from fish spotter data based on delta-lognormal models. Canadian Journal of Fisheries and Aquatic Science. 49:2515–2526.

Lorenzen, K. 1996. The relationship between body weight and natural mortality in juvenile and adult fish: a comparison of natural ecosystems and aquaculture. Journal of Fish Biology. 49:627-642.

Mace, P.M. [ed.]. 2000. Incorporating ecosystem considerations into stock assessments and management advice. Proceedings of the 6th NMFS National Stock Assessment Workshop (NSAW). NOAA Technical Memorandum NMFS-F/SPO-46. 78 pp.

Mace, P.M., and Doonan, I.J. 1988. A generalized bioeconomic simulation model for fish population dynamics. Technical Report 88, New Zealand Fisheries Assessment Resource Document.

Meise, J.A. 1930. Gifts of nature yield millions; Forest products, oil, gas, minerals, game, fish add to wealth. New Orleans States Newspaper. January 3. page 9.

Mitchell, K. and T. Henwood. Red Drum (*Sciaenops ocellatus*) Tag/Recapture Experiment (1997-1998). Mississippi Laboratories, NMFS, 15 p.

Nichols, S. 1988. An estimate of the size of the red drum spawning stock using mark/recapture. US Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Pascagoula Laboratories, Pascagoula, MS., March 1988. 24 p.

NMFS. 2001. Marine Fisheries Stock Assessment Improvement Plan. Report of the National Marine Fisheries Service National Task Force for Improving Fish Stock Assessments. U.S. Dep. Commerce, NOAA Tech. Memo. NMFS-F/SPO-56, 69 p., 25 appendices.

NMFS. 2019. Annual commercial landings statistics. National Marine Fisheries Service, Fisheries Statistics and Economics Division. Available: http://www.st.nmfs.noaa.gov/commercial-fisheries/index [accessed 2/2021].

NOAA Fisheries Toolbox. 2013. Age Structured Assessment Program (ASAP), Version 3.0.17. Available: https://www.nefsc.noaa.gov/nft/.

Norris, T. 1865. The American angler's book: embracing the natural history of sporting fish, and the art of taking them. With instructions in fly-fishing, fly-making, and rod-making; and directions for fish-breeding. Porter and Coates, Philadelphia. 733p.

Porch, C. E. 2000. Status of the red drum stocks of the Gulf of Mexico (Version 2.1). Sustainable Fisheries Division Contribution No. SFD-99/00-85 67 pp.

Porch C. E., C.A. Wilson C.A., D.L. Nieland. 2002. A new growth model for red drum (*Sciaenops ocellatus*) that accommodates seasonal and ontogenic changes in growth rates. Fish Bull 100:149–152.

Russell, S. J. 1988. Bioprofile sampling of red drum. Appendix B. in J. A Shepard [Ed.], Louisiana Red Drum Research, MARFIN final report, Contract No. NA87-WC-H-06122. Louisiana Department of Wildlife and Fisheries, Seafood Division, Finfish Section, Baton Rouge, Louisiana, 18 pp.

SAS Institute Inc. 2008. SAS/STAT® 9.2 User's Guide. Cary, NC: SAS Institute Inc.

Scott-Denton, E., P. Cryer, M. Duffy, J. Gocke, M. Harrelson, D. Kinsella, J. Nance, J. Pulver, R. Smith, J. Williams. 2012. Characterization of the U.S. Gulf of Mexico and South Atlantic penaeid and rock shrimp fisheries based on observer data. Marine Fisheries Review. 74.

SEDAR. 2006. Gulf of Mexico Vermilion Snapper SEDAR 9 Assessment Report 3. SEDAR, Charleston, SC. Available at: https://sedarweb.org/docs/sar/SEDAR9_SAR3%20GOM%20VermSnap.pdf

SEDAR. 2006. Gulf of Mexico Red Grouper SEDAR 12 Assessment Report 1. SEDAR, Charleston, SC. Available at: http://sedarweb.org/docs/sar/S12SAR1%20Gulf%20Red%20Grouper%20Completev2.pdf

SEDAR. 2015. SEDAR 44 – Atlantic Red Drum Stock Assessment Report. SEDAR, North Charleston SC. 890 pp. available online at: http://sedarweb.org/sedar-44.

SEAMAP. 2013. Bottom Longline Survey Protocol. Gulf States Marine Fisheries Commission. 2404 Government St. Ocean Springs, MS 39564. Version 2.0

Shepard, J. A. 2004. 2004 Louisiana's Red Drum Escapement Rate Update. Louisiana Department of Wildlife and Fisheries, Baton Rouge, LA.

Vecchio, J.L., and C. A. Wenner. 2007. Catch-and-Release Mortality in Subadult and Adult Red Drum Captured with Popular Fishing Hook Types. North American Journal of Fisheries Management 27:891–899, 2007.

Wilson, C. A., and D. L. Neiland. 1994. Reproductive biology of red drum, *Sciaenops ocellatus*, from the neritic waters of the northern Gulf of Mexico. Fishery Bulletin 92:841-850.

10. Tables

Table 1: Louisiana annual commercial inshore Red Drum landings and offshore Red Drum landings by state and for the Gulf of Mexico in units of pounds taken from NOAA Fisheries statistical records. Offshore landings post-1988 are assumed as miscoded inshore catches and not included in the GOM offshore landings values.

	Inshore_lbs	Offshore_lbs					
Year	LA	LA	TX	MS	AL	FL	GOM
1982	1,278,130	176,380	0	27,190	55,010	233,530	492,110
1983	1,761,350	177,270	0	10,000	342,320	198,860	728,450
1984	2,247,680	360,710	0	10,680	841,490	135,020	1,347,900
1985	2,229,310	704,280	0	16,270	2,841,650	215,610	3,777,810
1986	4,465,900	3,351,800	0	22,470	5,303,020	582,520	9,259,810
1987	4,528,900	42,280	0	27,510	11,520	53,220	134,530
1988	243,590	1,790	0	2,760	210	680	5,440
1989	24,810	0	0	1,340	890	0	0
1990	0	0	0	430	0	0	0
1991	0	0	0	890	10	0	0
1992	0	0	0	220	0	0	0
1993	1,880	0	0	20	0	0	0
1994	2,960	0	0	910	0	0	0
1995	0	0	0	0	0	0	0
1996	1,930	0	0	60	0	0	0
1997	0	0	0	1,030	0	0	0
1998	4,770	0	0	0	0	0	0
1999	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0

Table 2: Louisiana annual recreational and inshore commercial Red Drum landings along with the Gulf of Mexico offshore landings in units of pounds derived from NOAA Fisheries statistical records, LDWF Trip Ticket Program, MRIP, and LA Creel.

	Recreational	Inshore commercial	Offshore commercial	%Recreational	%Inshore commercial	%Offshore commercial
Year	LA	LA	GOM	LA	LA	GOM
1982	2,855,725	1,278,130	492,110	61.7%	27.6%	10.6%
1983	2,952,651	1,761,350	728,450	54.3%	32.4%	13.4%
1984	2,367,474	2,247,680	1,347,900	39.7%	37.7%	22.6%
1985	2,174,399	2,229,310	3,777,810	26.6%	27.2%	46.2%
1986	1,993,626	4,465,900	9,259,810	12.7%	28.4%	58.9%
1987	2,306,832	4,528,900	134,530	33.1%	65.0%	1.9%
1988	2,424,843	243,590	5,440	90.7%	9.1%	0.2%
1989	3,251,530	24,810	0	99.2%	0.8%	0.0%
1990	2,977,243	0	0	100.0%	0.0%	0.0%
1991	2,804,216	0	0	100.0%	0.0%	0.0%
1992	4,072,597	0	0	100.0%	0.0%	0.0%
1993	5,087,621	1,880	0	100.0%	0.0%	0.0%
1994	4,610,560	2,960	0	99.9%	0.1%	0.0%
1995	7,502,450	0	0	100.0%	0.0%	0.0%
1996	7,157,264	1,930	0	100.0%	0.0%	0.0%
1997	7,128,952	0	0	100.0%	0.0%	0.0%
1998	5,442,578	4,770	0	99.9%	0.1%	0.0%
1999	6,642,380	0	0	100.0%	0.0%	0.0%
2000	8,288,060	0	0	100.0%	0.0%	0.0%
2001	7,417,608	0	0	100.0%	0.0%	0.0%
2002	7,196,064	0	0	100.0%	0.0%	0.0%
2003	6,592,330	0	0	100.0%	0.0%	0.0%
2004	5,778,575	0	0	100.0%	0.0%	0.0%
2005	4,733,062	0	0	100.0%	0.0%	0.0%
2006	5,098,331	0	0	100.0%	0.0%	0.0%
2007	6,061,853	0	0	100.0%	0.0%	0.0%
2008	6,672,823	0	0	100.0%	0.0%	0.0%
2009	7,355,418	0	0	100.0%	0.0%	0.0%
2010	8,346,255	0	0	100.0%	0.0%	0.0%
2011	8,304,959	0	0	100.0%	0.0%	0.0%
2012	6,044,853	0	0	100.0%	0.0%	0.0%
2013	7,928,973	0	0	100.0%	0.0%	0.0%
2014	6,623,057	0	0	100.0%	0.0%	0.0%
2015	5,866,044	0	0	100.0%	0.0%	0.0%
2016	4,872,001	0	0	100.0%	0.0%	0.0%
2017	6,552,359	0	0	100.0%	0.0%	0.0%
2018	8,286,649	0	0	100.0%	0.0%	0.0%
2019	5,276,636	0	0	100.0%	0.0%	0.0%
2020	4,768,147	0	0	100.0%	0.0%	0.0%
2021	3,538,227	0	0	100.0%	0.0%	0.0%

Table 3: Louisiana annual recreational Red Drum harvest and live release (discards) estimates as numbers of fish derived from MRIP and LA Creel.

	Recreational			
Year	Harvest	Discards	%Harvest	%Discards
1982	1,227,523	146,809	89.3%	10.7%
1983	1,724,488	278,284	86.1%	13.9%
1984	1,083,042	121,176	89.9%	10.1%
1985	921,499	97,125	90.5%	9.5%
1986	895,241	166,739	84.3%	15.7%
1987	1,012,788	795,733	56.0%	44.0%
1988	436,543	1,038,796	29.6%	70.4%
1989	768,754	1,154,280	40.0%	60.0%
1990	553,138	634,266	46.6%	53.4%
1991	657,584	2,660,087	19.8%	80.2%
1992	1,036,207	2,043,424	33.6%	66.4%
1993	1,053,450	1,597,268	39.7%	60.3%
1994	954,950	1,534,416	38.4%	61.6%
1995	1,577,999	1,630,496	49.2%	50.8%
1996	1,371,690	1,269,247	51.9%	48.1%
1997	1,219,791	1,888,189	39.2%	60.8%
1998	1,151,118	2,157,019	34.8%	65.2%
1999	1,464,900	2,090,305	41.2%	58.8%
2000	1,708,900	2,307,833	42.5%	57.5%
2001	1,784,616	2,203,119	44.8%	55.2%
2002	1,389,950	2,285,344	37.8%	62.2%
2003	1,237,995	1,915,836	39.3%	60.7%
2004	1,092,037	1,407,440	43.7%	56.3%
2005	929,005	1,369,888	40.4%	59.6%
2006	996,732	1,741,012	36.4%	63.6%
2007	1,298,861	1,820,225	41.6%	58.4%
2008	1,448,257	2,036,602	41.6%	58.4%
2009	1,572,292	2,507,394	38.5%	61.5%
2010	2,008,538	2,848,129	41.4%	58.6%
2011	1,911,866	1,878,382	50.4%	49.6%
2012	1,430,510	2,021,773	41.4%	58.6%
2013	1,876,299	2,586,608	42.0%	58.0%
2014	1,282,923	2,337,498	35.4%	64.6%
2015	1,244,926	2,267,997	35.4%	64.6%
2016	1,045,128	1,711,377	37.9%	62.1%
2017	1,642,516	2,495,551	39.7%	60.3%
2018	1,977,147	2,741,797	41.9%	58.1%
2019	1,224,198	1,736,637	41.3%	58.7%
2020	1,053,003	1,472,163	41.7%	58.3%
2021	736,739	736,769	50.0%	50.0%

Table 4: Abundance estimates of the NMFS Red Drum mark-recapture experiments (without estimate expansion to outside the study areas).

	N estimates					
Year	west	east	total	SE	RSE	notes
1987	--	--	5,274,405	900,000	0.171	
1997	14,606,407	526,176	15,132,583	10,326,004	0.682	0 recapture west
1997	7,303,203	526,176	7,829,379	5,342,525	0.682	1 recapture west
1997	4,868,802	526,176	5,394,978	3,681,365	0.682	2 recapture west

Table 5: Size frequency of inshore and offshore commercial landings (Russell 1988), age compositions of offshore commercial purse seine landings (Beckman 1989), and the age composition of offshore fishery-independent purse seine samples of Red Drum schools conducted by NOAA Fisheries and the LSU Coastal Fisheries Institute (MARFIN). Biological ages have been adjusted to calendar ages.

Beckman

Years	n	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+
85-86	788	0.000	0.012	0.049	0.058	0.039	0.048	0.055	0.051	0.027	0.662
86-87	540	0.000	0.010	0.038	0.041	0.053	0.045	0.033	0.049	0.057	0.674

MARFIN

Year	n	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+
1986	174	0.000	0.017	0.046	0.052	0.029	0.023	0.029	0.052	0.017	0.736
1987	562	0.000	0.000	0.043	0.036	0.055	0.053	0.032	0.041	0.064	0.676
1988	614	0.000	0.000	0.036	0.042	0.065	0.052	0.046	0.062	0.054	0.643
1997	556	0.000	0.002	0.004	0.043	0.070	0.113	0.160	0.018	0.020	0.570
1998	371	0.000	0.000	0.003	0.024	0.159	0.084	0.137	0.162	0.027	0.404

Russell (gears combined) 1985-1987		
TL_in	inshore	offshore
10	0.000	0.000
11	0.001	0.000
12	0.001	0.000
13	0.001	0.000
14	0.000	0.000
15	0.001	0.000
16	0.029	0.000
17	0.054	0.000
18	0.074	0.000
19	0.157	0.000
20	0.173	0.000
21	0.103	0.000
22	0.045	0.001
23	0.105	0.000
24	0.050	0.000
25	0.103	0.000
26	0.039	0.000
27	0.026	0.002
28	0.028	0.001
29	0.003	0.003
30	0.004	0.010
31	0.000	0.017
32	0.000	0.026
33	0.000	0.058
34	0.000	0.095
35	0.000	0.138
36	0.000	0.177
37	0.003	0.199
38	0.000	0.101
39	0.000	0.086
40	0.000	0.048
41	0.000	0.027
42	0.000	0.008
43	0.000	0.002
44	0.000	0.003
45	0.000	0.001

Table 6: Annual seasonal size frequencies of Louisiana recreational Red Drum harvest taken from MRIP (1982-2013) and the LDWF Biological Sampling Program. Seasons represent January-April (season1), May-August (season 2), and September-December (season 3).

season	TL_IN	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
1	**5**																				
1	**6**												0.007								
1	**7**			0.005																	
1	**8**		0.033	0.029		0.019							0.024								
1	**9**	0.019		0.034	0.004									0.003		0.006					
1	**10**		0.010	0.097	0.009							0.002	0.024				0.001				
1	**11**		0.106	0.230								0.010	0.021			0.007	0.008				
1	**12**	0.008	0.178	0.068	0.019	0.005	0.039	0.015				0.008	0.007		0.006	0.011	0.006				
1	**13**	0.073	0.153	0.122	0.007	0.064	0.082	0.161				0.036	0.006		0.014	0.006	0.015	0.010		0.003	
1	**14**	0.128	0.015	0.150	0.083	0.067	0.103	0.426	0.015	0.023		0.044		0.012	0.019	0.004	0.007	0.045	0.008	0.003	0.006
1	**15**	0.059	0.065	0.129	0.061	0.099	0.114	0.118	0.123	0.009		0.149	0.012	0.086	0.016	0.013	0.013	0.115	0.015	0.025	0.022
1	**16**		0.028	0.035	0.173	0.116	0.230	0.037	0.121	0.032	0.016	0.249	0.069	0.049	0.059	0.072	0.048	0.203	0.103	0.084	0.089
1	**17**	0.078	0.111	0.060	0.207	0.213	0.130	0.044	0.225	0.090	0.169	0.179	0.090	0.060	0.079	0.085	0.073	0.140	0.138	0.126	0.081
1	**18**	0.044	0.141	0.003	0.229	0.243	0.050	0.040	0.121	0.088	0.113	0.072	0.130	0.059	0.039	0.060	0.076	0.044	0.075	0.053	0.075
1	**19**	0.107		0.003	0.024	0.014	0.055	0.059	0.164	0.030	0.066	0.007	0.040	0.127	0.060	0.083	0.082	0.016	0.085	0.057	0.080
1	**20**	0.055		0.004	0.047	0.042	0.023	0.042	0.055	0.229	0.060	0.010	0.127	0.127	0.133	0.140	0.079	0.053	0.112	0.045	0.099
1	**21**	0.128	0.051		0.004	0.002	0.006	0.030	0.046	0.128	0.039	0.013	0.113	0.118	0.115	0.101	0.056	0.035	0.096	0.078	0.106
1	**22**	0.111				0.002		0.010	0.005	0.131	0.057	0.016	0.088	0.075	0.090	0.076	0.066	0.046	0.079	0.115	0.101
1	**23**	0.003			0.008	0.003	0.082		0.027	0.050	0.103	0.020	0.072	0.101	0.069	0.091	0.108	0.034	0.085	0.103	0.117
1	**24**			0.013	0.009	0.027	0.026		0.028	0.041	0.083	0.014	0.027	0.045	0.025	0.060	0.054	0.061	0.050	0.044	0.080
1	**25**	0.126			0.004		0.002		0.026	0.017	0.116	0.019	0.023	0.081	0.089	0.044	0.088	0.064	0.032	0.053	0.041
1	**26**	0.059	0.064		0.060	0.060	0.010		0.003	0.026	0.068	0.054	0.024	0.029	0.081	0.040	0.075	0.046	0.045	0.082	0.034
1	**27**		0.029		0.008	0.012	0.042		0.029		0.052	0.046	0.022	0.019	0.033	0.043	0.025	0.032	0.012	0.028	0.022
1	**28**				0.002	0.003	0.001				0.022	0.013	0.020	0.001	0.023	0.020	0.023	0.017	0.018	0.036	0.012
1	**29**		0.015	0.009	0.012	0.007	0.003				0.033	0.009	0.019	0.002	0.002	0.018	0.025	0.009	0.011	0.031	0.020
1	**30**				0.004		0.000		0.000	0.007		0.004	0.008	0.002	0.003	0.010	0.020	0.001	0.007	0.005	0.003
1	**31**						0.001		0.012	0.014		0.003	0.010	0.001	0.019	0.003	0.011	0.010	0.001	0.000	0.006
1	**32**			0.009						0.000		0.002	0.002		0.002	0.002		0.006	0.004	0.005	
1	**33**									0.000						0.003	0.001		0.002	0.000	0.003
1	**34**									0.000		0.000		0.003	0.003	0.000		0.001	0.000		
1	**35**				0.009					0.000		0.003	0.000				0.000		0.002		
1	**36**					0.000				0.000		0.003					0.006	0.001	0.001		0.002
1	**37**				0.009	0.002				0.004		0.003	0.000	0.001		0.000	0.005	0.001	0.004		
1	**38**									0.040		0.004			0.013	0.000	0.004	0.001	0.004	0.002	
1	**39**				0.011						0.003	0.000			0.000	0.000	0.006	0.002	0.009		
1	**40**								0.000	0.040		0.004	0.001		0.000	0.001	0.007	0.001	0.001	0.002	0.002
1	**41**		0.000									0.002				0.001	0.009	0.002		0.004	
1	**42**							0.019				0.000						0.001		0.004	
1	**43**									0.000		0.000			0.003			0.001	0.000	0.007	
1	**44**																	0.001		0.003	
1	**45**																		0.002	0.002	
1	**46**												0.012		0.004						
1	**47**																				

Table 6 (continued):

season	TL_IN	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1	**5**																				
1	**6**																				
1	**7**																				
1	**8**																				
1	**9**																				
1	**10**																				
1	**11**																		0.001		
1	**12**										0.002			0.002							
1	**13**	0.002						0.002				0.001	0.003	0.002	0.005		0.003	0.003			
1	**14**			0.002			0.007	0.006	0.005	0.012	0.002	0.002	0.002	0.002		0.000	0.001	0.003		0.004	
1	**15**	0.003	0.027	0.042	0.065	0.057	0.040	0.021	0.084	0.015	0.046	0.026	0.020	0.014	0.035	0.034	0.059	0.046	0.037	0.038	0.050
1	**16**	0.028	0.106	0.091	0.119	0.195	0.105	0.097	0.117	0.080	0.111	0.092	0.105	0.046	0.105	0.107	0.186	0.103	0.077	0.096	0.135
1	**17**	0.060	0.056	0.047	0.076	0.132	0.075	0.088	0.135	0.055	0.060	0.083	0.091	0.083	0.068	0.092	0.161	0.059	0.101	0.105	0.103
1	**18**	0.096	0.023	0.028	0.012	0.078	0.061	0.090	0.066	0.080	0.037	0.098	0.095	0.084	0.038	0.053	0.083	0.065	0.089	0.052	0.078
1	**19**	0.132	0.060	0.056	0.069	0.060	0.108	0.083	0.035	0.071	0.053	0.060	0.069	0.119	0.034	0.079	0.035	0.054	0.100	0.034	0.060
1	**20**	0.129	0.055	0.086	0.049	0.024	0.070	0.135	0.073	0.081	0.120	0.099	0.048	0.131	0.076	0.107	0.032	0.109	0.115	0.092	0.051
1	**21**	0.070	0.103	0.116	0.044	0.034	0.076	0.055	0.099	0.077	0.125	0.094	0.074	0.121	0.115	0.095	0.060	0.104	0.094	0.060	0.067
1	**22**	0.060	0.062	0.051	0.101	0.062	0.066	0.105	0.117	0.127	0.077	0.068	0.046	0.071	0.085	0.076	0.053	0.086	0.113	0.066	0.069
1	**23**	0.054	0.057	0.062	0.075	0.094	0.056	0.076	0.061	0.124	0.088	0.079	0.067	0.066	0.067	0.048	0.071	0.069	0.084	0.054	0.068
1	**24**	0.049	0.087	0.088	0.054	0.042	0.136	0.046	0.049	0.066	0.083	0.036	0.055	0.045	0.059	0.048	0.069	0.062	0.042	0.081	0.064
1	**25**	0.083	0.137	0.039	0.044	0.067	0.050	0.062	0.049	0.049	0.051	0.026	0.083	0.043	0.081	0.046	0.041	0.068	0.043	0.056	0.042
1	**26**	0.047	0.053	0.065	0.041	0.021	0.050	0.030	0.018	0.058	0.059	0.045	0.037	0.029	0.055	0.041	0.019	0.038	0.017	0.088	0.021
1	**27**	0.018	0.024	0.014	0.044	0.018	0.020	0.026	0.020	0.051	0.025	0.033	0.071	0.033	0.044	0.038	0.031	0.023	0.022	0.054	0.044
1	**28**	0.021	0.046	0.035	0.027	0.033	0.038	0.019	0.046	0.020	0.017	0.035	0.038	0.023	0.035	0.030	0.027	0.032	0.017	0.032	0.043
1	**29**	0.013	0.028	0.009	0.032	0.032	0.007	0.016	0.006	0.013	0.009	0.088	0.008	0.018	0.030	0.039	0.023	0.045	0.014	0.030	0.025
1	**30**	0.035	0.018	0.006	0.002	0.010	0.008	0.004	0.003	0.006	0.007	0.015	0.027	0.014	0.016	0.024	0.009	0.006	0.009	0.020	0.024
1	**31**	0.001	0.025	0.003	0.022	0.000	0.014	0.010	0.001	0.006	0.000	0.004	0.018	0.010	0.011	0.006	0.012	0.013	0.007	0.014	0.018
1	**32**	0.007		0.005	0.007	0.010		0.007	0.003	0.000	0.010	0.003	0.002	0.008	0.017	0.004	0.011	0.001	0.006	0.008	0.010
1	**33**		0.004	0.003	0.001	0.003	0.005		0.001	0.003	0.009	0.000	0.002	0.002	0.001	0.009		0.003	0.003	0.008	0.001
1	**34**	0.001	0.004	0.000	0.013	0.008		0.002	0.001				0.007	0.001	0.005			0.001	0.000		0.001
1	**35**	0.003	0.000	0.010	0.000	0.002	0.005	0.001	0.001	0.001		0.003	0.004	0.005	0.000	0.003	0.003	0.002	0.003		0.004
1	**36**	0.003	0.005	0.008	0.009	0.002	0.003	0.003	0.005	0.001				0.005	0.004	0.007	0.000	0.001	0.003		0.001
1	**37**	0.000	0.007	0.019	0.022	0.006		0.005	0.001	0.001		0.008	0.003	0.000	0.000	0.003			0.000		0.003
1	**38**	0.001	0.003	0.048	0.013	0.002	0.000	0.001	0.001	0.000	0.000	0.002	0.014	0.003	0.003	0.009	0.002	0.002	0.003	0.004	0.002
1	**39**	0.001	0.005	0.032	0.009	0.003	0.000	0.001	0.001	0.001		0.002	0.002	0.004	0.003		0.003		0.000	0.005	0.007
1	**40**	0.047	0.003	0.011	0.028	0.000		0.004	0.001	0.001			0.008	0.006	0.001		0.004	0.000	0.001		0.005
1	**41**	0.035	0.000	0.009	0.019	0.001	0.001	0.004			0.009	0.001	0.002	0.001	0.001	0.000		0.001	0.000		0.002
1	**42**	0.001	0.001		0.001	0.001			0.000					0.002	0.001		0.003	0.000			0.002
1	**43**		0.001						0.000					0.005	0.003						0.001
1	**44**			0.015										0.001			0.000				
1	**45**							0.001						0.000					0.000		
1	**46**																				
1	**47**																				

Table 6 (continued):

season	TL_IN	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
2	**4**				0.002																
2	**5**	0.010			0.002		0.012														
2	**6**																				
2	**7**	0.055		0.009		0.002	0.006	0.014					0.002								
2	**8**	0.084	0.040		0.011	0.017	0.044						0.011								
2	**9**	0.134	0.039	0.056	0.091	0.036	0.152	0.008				0.003	0.004								
2	**10**	0.147	0.043	0.021	0.072	0.181	0.088	0.023				0.001	0.002	0.002	0.001	0.000	0.001				
2	**11**	0.180	0.128	0.061	0.184	0.168	0.220	0.003		0.006	0.004	0.005		0.002	0.004		0.006		0.010		
2	**12**	0.070	0.116	0.274	0.106	0.162	0.034	0.028				0.006		0.002	0.007	0.001	0.009				
2	**13**	0.033	0.066	0.063	0.127	0.063	0.010	0.037	0.003		0.013	0.005		0.008	0.013	0.001		0.000	0.003	0.005	0.004
2	**14**	0.028	0.097	0.032	0.019	0.067	0.070	0.036	0.008	0.019	0.006	0.009	0.004	0.005	0.006	0.025	0.001	0.009	0.006		0.002
2	**15**	0.029	0.115	0.027	0.003	0.028	0.114	0.102	0.051	0.019		0.026	0.049	0.020	0.061	0.023	0.037	0.032	0.026	0.004	0.017
2	**16**	0.014	0.070	0.038	0.045	0.027	0.046	0.048	0.121	0.012		0.215	0.132	0.090	0.189	0.050	0.123	0.131	0.095	0.050	0.090
2	**17**	0.021	0.067	0.057	0.083	0.055	0.022	0.130	0.158	0.034		0.220	0.187	0.119	0.176	0.060	0.140	0.208	0.175	0.176	0.180
2	**18**	0.033	0.081	0.147	0.060	0.043	0.065	0.133	0.186	0.071	0.109	0.165	0.111	0.119	0.123	0.074	0.074	0.145	0.133	0.149	0.130
2	**19**	0.062	0.055	0.080	0.022	0.032	0.012	0.195	0.115	0.076	0.062	0.099	0.057	0.064	0.048	0.092	0.059	0.111	0.088	0.095	0.073
2	**20**	0.025	0.060	0.060	0.043	0.045	0.030	0.077	0.089	0.119	0.065	0.101	0.079	0.090	0.049	0.114	0.041	0.059	0.107	0.080	0.081
2	**21**	0.033		0.015	0.024	0.018	0.026	0.079	0.038	0.142	0.324	0.038	0.046	0.085	0.035	0.060	0.072	0.035	0.069	0.065	0.054
2	**22**	0.025			0.046	0.024	0.009	0.022	0.030	0.068	0.138	0.013	0.054	0.075	0.039	0.081	0.059	0.030	0.059	0.034	0.061
2	**23**	0.005	0.004	0.027		0.009	0.019	0.038	0.023	0.174	0.073	0.007	0.069	0.087	0.071	0.076	0.032	0.016	0.045	0.048	0.059
2	**24**	0.002		0.018	0.013	0.002	0.008	0.010	0.024	0.017	0.028	0.018	0.086	0.070	0.026	0.090	0.083	0.033	0.030	0.052	0.046
2	**25**	0.001	0.000	0.007	0.009	0.003		0.004	0.028	0.138	0.036	0.015	0.049	0.042	0.057	0.065	0.058	0.063	0.036	0.064	0.045
2	**26**		0.008	0.000	0.001	0.001	0.004		0.018	0.026	0.044	0.016	0.025	0.047	0.023	0.084	0.045	0.017	0.038	0.049	0.038
2	**27**		0.007			0.003	0.003	0.006	0.021	0.036	0.022	0.007	0.009	0.026	0.021	0.026	0.040	0.016	0.015	0.042	0.015
2	**28**	0.002		0.000	0.013	0.004	0.005		0.004	0.002	0.051	0.007	0.003	0.013	0.019	0.019	0.030	0.023	0.019	0.015	0.018
2	**29**	0.008	0.004	0.000	0.009	0.000			0.019	0.015	0.021	0.016	0.006	0.006	0.011	0.006	0.030	0.008	0.015	0.013	0.011
2	**30**			0.000	0.008	0.000	0.002	0.002	0.009			0.001		0.002	0.004	0.011	0.006	0.004	0.005	0.022	0.039
2	**31**					0.001		0.003	0.013	0.001		0.001			0.002		0.009	0.001	0.008	0.006	0.002
2	**32**	0.002			0.004	0.006			0.005	0.001							0.005	0.002	0.001	0.004	0.002
2	**33**				0.004				0.007						0.002		0.004		0.000	0.004	
2	**34**							0.000					0.002	0.003		0.003	0.002	0.001	0.001	0.003	0.001
2	**35**								0.002	0.000			0.002		0.001	0.005	0.001	0.007	0.001	0.001	0.009
2	**36**								0.016			0.001	0.002	0.002	0.002	0.001	0.004	0.004	0.002	0.000	0.000
2	**37**			0.000				0.000	0.001	0.006		0.002			0.001	0.003	0.006	0.014	0.000	0.006	0.000
2	**38**			0.000						0.012	0.005	0.002	0.000	0.003	0.002	0.002	0.002	0.009	0.002	0.001	0.010
2	**39**								0.001			0.001	0.006	0.002	0.003	0.002	0.004	0.004	0.003	0.001	0.001
2	**40**			0.002					0.006	0.006		0.000	0.001	0.004	0.001	0.007		0.005	0.004	0.001	0.007
2	**41**			0.002				0.000	0.003			0.001	0.000	0.003	0.001	0.007	0.006	0.004	0.002	0.003	0.004
2	**42**							0.002				0.001		0.003		0.009	0.010	0.003	0.001	0.005	
2	**43**					0.003				0.000			0.000		0.000		0.001	0.007	0.000	0.004	
2	**44**													0.003		0.001	0.001				
2	**45**																0.002		0.003		
2	**46**											0.000						0.000	0.000	0.001	0.003
2	**47**																				

Table 6 (continued):

season	TL_IN	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
2	**4**																				
2	**5**																				
2	**6**																				
2	**7**																				
2	**8**																				
2	**9**							0.002		0.000		0.000									
2	**10**																				
2	**11**				0.001			0.000									0.001	0.001			
2	**12**						0.001						0.001				0.001		0.000		
2	**13**	0.000			0.000					0.001		0.003	0.001		0.001	0.002	0.001	0.001	0.006		0.000
2	**14**	0.000		0.005	0.002		0.000	0.001	0.003	0.002	0.005	0.001	0.001	0.003	0.002		0.004	0.003	0.006		
2	**15**	0.033	0.031	0.031	0.021	0.004	0.025	0.027	0.015	0.026	0.021	0.016	0.052	0.020	0.053	0.033	0.030	0.039	0.050	0.071	0.019
2	**16**	0.149	0.111	0.160	0.096	0.047	0.150	0.121	0.068	0.180	0.109	0.073	0.166	0.119	0.179	0.145	0.147	0.204	0.141	0.136	0.095
2	**17**	0.118	0.217	0.121	0.237	0.123	0.179	0.134	0.106	0.206	0.111	0.200	0.210	0.144	0.147	0.138	0.173	0.184	0.152	0.177	0.144
2	**18**	0.101	0.122	0.117	0.123	0.153	0.104	0.104	0.105	0.121	0.131	0.118	0.128	0.098	0.086	0.091	0.148	0.130	0.096	0.144	0.165
2	**19**	0.092	0.051	0.114	0.078	0.154	0.071	0.072	0.072	0.072	0.103	0.118	0.078	0.069	0.054	0.064	0.116	0.083	0.066	0.104	0.122
2	**20**	0.072	0.064	0.050	0.042	0.122	0.047	0.066	0.091	0.036	0.085	0.083	0.039	0.071	0.047	0.110	0.082	0.046	0.063	0.070	0.084
2	**21**	0.078	0.055	0.053	0.049	0.069	0.049	0.062	0.064	0.045	0.083	0.046	0.047	0.101	0.054	0.059	0.043	0.035	0.080	0.049	0.063
2	**22**	0.046	0.061	0.049	0.046	0.044	0.041	0.073	0.048	0.060	0.057	0.058	0.019	0.073	0.065	0.055	0.036	0.040	0.078	0.043	0.047
2	**23**	0.034	0.065	0.073	0.060	0.055	0.047	0.064	0.076	0.057	0.054	0.063	0.056	0.057	0.057	0.055	0.027	0.046	0.069	0.042	0.044
2	**24**	0.062	0.044	0.038	0.034	0.043	0.045	0.058	0.054	0.044	0.046	0.046	0.031	0.045	0.047	0.053	0.035	0.045	0.053	0.045	0.046
2	**25**	0.054	0.047	0.028	0.055	0.031	0.043	0.057	0.075	0.037	0.048	0.040	0.033	0.031	0.039	0.038	0.034	0.037	0.038	0.029	0.028
2	**26**	0.021	0.027	0.023	0.035	0.043	0.040	0.045	0.057	0.032	0.061	0.038	0.030	0.029	0.031	0.029	0.033	0.027	0.022	0.030	0.041
2	**27**	0.019	0.022	0.021	0.040	0.037	0.043	0.025	0.057	0.018	0.032	0.023	0.023	0.032	0.041	0.027	0.030	0.023	0.015	0.014	0.030
2	**28**	0.030	0.021	0.021	0.019	0.021	0.029	0.022	0.031	0.008	0.018	0.016	0.033	0.028	0.034	0.027	0.014	0.013	0.016	0.010	0.016
2	**29**	0.017	0.025	0.016	0.010	0.024	0.027	0.022	0.029	0.028	0.013	0.013	0.004	0.024	0.023	0.021	0.014	0.007	0.011	0.004	0.018
2	**30**	0.007	0.010	0.003	0.011	0.003	0.018	0.009	0.015	0.004	0.007	0.009	0.013	0.011	0.008	0.022	0.004	0.011	0.004	0.006	0.011
2	**31**	0.000	0.005	0.003	0.013	0.004	0.009	0.003	0.012		0.002	0.004	0.004	0.016	0.011	0.003	0.006	0.003	0.006	0.006	0.008
2	**32**	0.013	0.004	0.004	0.003	0.003	0.012	0.001	0.002	0.001	0.001	0.003	0.004	0.006	0.004	0.007	0.004	0.001	0.007	0.004	0.008
2	**33**	0.002	0.002	0.002	0.004	0.000	0.001	0.003	0.008		0.005	0.002	0.003	0.004	0.003	0.004	0.002	0.002	0.009	0.001	0.002
2	**34**	0.007	0.001	0.005	0.001	0.002	0.000	0.004	0.000		0.000	0.000	0.007	0.001	0.003	0.002	0.003	0.002			0.001
2	**35**	0.004	0.001	0.006	0.003		0.003	0.003	0.000	0.000	0.005	0.000	0.011	0.003		0.004	0.002	0.002	0.003	0.000	0.003
2	**36**	0.007	0.002	0.006		0.002	0.000	0.004	0.001		0.000	0.000	0.002	0.000	0.002	0.003	0.003	0.001	0.005	0.002	0.000
2	**37**	0.008	0.002	0.017	0.005	0.003	0.007	0.005	0.001	0.022	0.000	0.002	0.003	0.003	0.003	0.004	0.003	0.002	0.001	0.001	0.000
2	**38**	0.006	0.002	0.017	0.005	0.003	0.002	0.005	0.003	0.000	0.001	0.012	0.002	0.004		0.003	0.001	0.003		0.000	0.000
2	**39**	0.013	0.001	0.009	0.002	0.001		0.004	0.005		0.000	0.002		0.001	0.000	0.002	0.001	0.004	0.002	0.004	0.001
2	**40**	0.005	0.001	0.004	0.004	0.002	0.001	0.001	0.001		0.001	0.003		0.001	0.002		0.002	0.006	0.000	0.003	0.000
2	**41**	0.002	0.002	0.004		0.001		0.001	0.000		0.001	0.002		0.004	0.002		0.000			0.002	
2	**42**	0.001	0.002	0.001		0.007		0.001	0.001		0.001	0.002			0.002					0.002	0.001
2	**43**	0.000	0.000				0.001					0.003	0.000		0.002			0.001			0.000
2	**44**		0.001										0.000	0.001							0.001
2	**45**		0.000		0.001														0.000		
2	**46**		0.000																		
2	**47**																				

Table 6 (continued):

season	TL_IN	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
3	**4**	0.003																			
3	**5**	0.006																			
3	**6**	0.001																			
3	**7**	0.012	0.006																		
3	**8**	0.016	0.014		0.007								0.002								
3	**9**	0.005	0.008		0.007	0.000															
3	**10**	0.038	0.019	0.005	0.012	0.009						0.007	0.001								
3	**11**	0.090	0.044	0.015	0.018	0.059	0.008	0.001				0.006	0.009	0.002				0.001			
3	**12**	0.090	0.097	0.045	0.031	0.176	0.016		0.008			0.012	0.009	0.002	0.003	0.003	0.018	0.009		0.001	
3	**13**	0.074	0.131	0.098	0.146	0.134	0.067	0.026	0.002		0.013	0.007	0.025		0.002	0.006	0.005	0.005	0.002	0.002	
3	**14**	0.146	0.212	0.154	0.153	0.171	0.228	0.018	0.018	0.004	0.008	0.014	0.005	0.005	0.001	0.013	0.008	0.016	0.006		0.006
3	**15**	0.073	0.178	0.298	0.162	0.113	0.265	0.064	0.028	0.024	0.046	0.023	0.022	0.011	0.015	0.020	0.008	0.039	0.032	0.012	0.006
3	**16**	0.089	0.163	0.142	0.133	0.095	0.239	0.101	0.024	0.128	0.168	0.079	0.073	0.034	0.045	0.046	0.035	0.062	0.065	0.068	0.043
3	**17**	0.091	0.056	0.084	0.117	0.074	0.043	0.149	0.074	0.167	0.155	0.107	0.109	0.064	0.105	0.062	0.057	0.070	0.099	0.073	0.066
3	**18**	0.021	0.010	0.013	0.042	0.042	0.007	0.143	0.088	0.105	0.101	0.122	0.098	0.111	0.106	0.068	0.064	0.057	0.093	0.090	0.096
3	**19**	0.053	0.014	0.019	0.029	0.020	0.018	0.097	0.136	0.158	0.080	0.118	0.093	0.107	0.107	0.103	0.093	0.105	0.091	0.119	0.123
3	**20**	0.053	0.008	0.003	0.018	0.009	0.016	0.119	0.121	0.035	0.050	0.140	0.113	0.114	0.171	0.122	0.086	0.102	0.100	0.128	0.112
3	**21**	0.022		0.028	0.010	0.011	0.021	0.052	0.111	0.078	0.060	0.127	0.075	0.083	0.109	0.139	0.097	0.099	0.059	0.101	0.121
3	**22**	0.017	0.011	0.001	0.013	0.019	0.011	0.043	0.080	0.023	0.057	0.089	0.071	0.089	0.069	0.108	0.069	0.093	0.065	0.079	0.086
3	**23**	0.028	0.002	0.036	0.027	0.019	0.017	0.061	0.066	0.050	0.029	0.062	0.067	0.057	0.060	0.089	0.039	0.069	0.103	0.061	0.076
3	**24**	0.015		0.005	0.017	0.012	0.019	0.052	0.061	0.028	0.025	0.031	0.080	0.081	0.048	0.058	0.043	0.062	0.062	0.051	0.090
3	**25**	0.029	0.009	0.003	0.024	0.013	0.001	0.034	0.055	0.032	0.056	0.019	0.058	0.071	0.045	0.055	0.091	0.068	0.051	0.064	0.073
3	**26**	0.014	0.002	0.043	0.013	0.009		0.014	0.049	0.093	0.051	0.012	0.038	0.042	0.041	0.047	0.093	0.032	0.047	0.038	0.039
3	**27**	0.003		0.004	0.005	0.007		0.012	0.030	0.050	0.015	0.008	0.017	0.045	0.024	0.024	0.090	0.033	0.028	0.048	0.021
3	**28**	0.005	0.006	0.002	0.008	0.002		0.010	0.017	0.003	0.045	0.002	0.004	0.026	0.019	0.007	0.033	0.023	0.018	0.023	0.015
3	**29**	0.002		0.000	0.008	0.005		0.000	0.016	0.002	0.024	0.001	0.002	0.020	0.016	0.008	0.013	0.019	0.027	0.013	0.001
3	**30**					0.000	0.000	0.000	0.003		0.005	0.005	0.006	0.014	0.002	0.004	0.012	0.003	0.015	0.011	0.005
3	**31**		0.011					0.002	0.002	0.003			0.001	0.002	0.002	0.003	0.004	0.010	0.008	0.002	0.004
3	**32**			0.001		0.001		0.000		0.001	0.008	0.002	0.007	0.005	0.002	0.002	0.007	0.000	0.011	0.005	0.006
3	**33**			0.000				0.000	0.000			0.000		0.003	0.000	0.006	0.001	0.005	0.004	0.008	0.004
3	**34**			0.000			0.009	0.000	0.004	0.000		0.000	0.003	0.000	0.001		0.002	0.004	0.004		
3	**35**							0.000		0.001			0.000	0.001	0.001	0.002	0.003	0.003			
3	**36**							0.000	0.000	0.007		0.000	0.003	0.000	0.002		0.001	0.002	0.001		0.002
3	**37**			0.000				0.001	0.007	0.002		0.000	0.000	0.001	0.000	0.000	0.002	0.003	0.003		
3	**38**			0.000				0.001	0.000	0.001	0.005	0.001	0.001	0.000	0.001	0.000	0.005	0.000	0.001	0.002	
3	**39**			0.000			0.005	0.000	0.002	0.001		0.000		0.003	0.001	0.001	0.002		0.003		0.003
3	**40**						0.002	0.000	0.000	0.004		0.001	0.003	0.000	0.001	0.001	0.011			0.000	
3	**41**			0.000		0.000		0.000		0.001		0.000	0.002	0.000	0.001	0.003	0.004	0.002	0.000		
3	**42**						0.006	0.000		0.001		0.002		0.000	0.000	0.000	0.005	0.003	0.002	0.000	
3	**43**								0.001			0.000			0.000						
3	**44**									0.000				0.001						0.000	
3	**45**												0.002	0.002				0.002			
3	**46**																				
3	**47**											0.000		0.001							
3	**48**																				

Table 6 (continued):

season	TL_IN	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
3	**4**																				
3	**5**																				
3	**6**																				
3	**7**																				
3	**8**																				
3	**9**																				
3	**10**																				
3	**11**			0.001												0.002					
3	**12**				0.010			0.002				0.002				0.003	0.001	0.004	0.000		
3	**13**	0.003		0.003		0.002		0.001	0.002							0.017	0.001	0.002		0.004	0.000
3	**14**	0.004		0.002	0.008		0.002		0.007				0.009		0.006	0.017			0.004	0.006	
3	**15**	0.034	0.026	0.020	0.028	0.027	0.029	0.010	0.020	0.004	0.010	0.005	0.012	0.007	0.009	0.033	0.010	0.015	0.028	0.030	0.022
3	**16**	0.095	0.044	0.087	0.090	0.034	0.061	0.057	0.041	0.033	0.040	0.050	0.062	0.043	0.065	0.061	0.054	0.061	0.072	0.090	0.074
3	**17**	0.099	0.061	0.093	0.055	0.039	0.079	0.080	0.084	0.095	0.067	0.105	0.154	0.086	0.121	0.074	0.103	0.141	0.073	0.054	0.073
3	**18**	0.071	0.092	0.093	0.044	0.041	0.080	0.116	0.118	0.148	0.101	0.075	0.140	0.116	0.107	0.085	0.117	0.124	0.101	0.075	0.056
3	**19**	0.083	0.092	0.139	0.095	0.050	0.111	0.119	0.077	0.105	0.105	0.082	0.091	0.086	0.113	0.091	0.117	0.142	0.112	0.107	0.049
3	**20**	0.073	0.085	0.092	0.060	0.104	0.091	0.096	0.099	0.115	0.099	0.088	0.071	0.099	0.090	0.103	0.117	0.119	0.085	0.068	0.068
3	**21**	0.116	0.116	0.105	0.078	0.090	0.083	0.094	0.108	0.096	0.047	0.129	0.065	0.090	0.051	0.088	0.115	0.092	0.060	0.072	0.081
3	**22**	0.086	0.071	0.045	0.109	0.107	0.047	0.084	0.068	0.096	0.072	0.109	0.049	0.090	0.067	0.067	0.071	0.055	0.073	0.089	0.061
3	**23**	0.103	0.089	0.046	0.092	0.098	0.053	0.085	0.066	0.063	0.092	0.077	0.093	0.046	0.058	0.063	0.081	0.048	0.078	0.070	0.081
3	**24**	0.070	0.075	0.033	0.054	0.101	0.067	0.074	0.091	0.042	0.074	0.045	0.049	0.075	0.048	0.065	0.046	0.046	0.087	0.100	0.056
3	**25**	0.065	0.051	0.039	0.031	0.060	0.086	0.060	0.051	0.043	0.081	0.058	0.045	0.035	0.041	0.061	0.048	0.043	0.061	0.055	0.074
3	**26**	0.025	0.048	0.071	0.035	0.043	0.070	0.041	0.048	0.030	0.098	0.066	0.036	0.060	0.055	0.038	0.040	0.034	0.037	0.053	0.071
3	**27**	0.030	0.033	0.046	0.036	0.038	0.031	0.040	0.043	0.026	0.045	0.044	0.031	0.036	0.038	0.034	0.017	0.031	0.062	0.035	0.065
3	**28**	0.006	0.023	0.027	0.136	0.038	0.029	0.030	0.024	0.032	0.029	0.014	0.022	0.036	0.031	0.027	0.022	0.013	0.030	0.032	0.044
3	**29**	0.015	0.015	0.007	0.003	0.024	0.017	0.004	0.021	0.029	0.014	0.014	0.009	0.016	0.016	0.020	0.018	0.006	0.013	0.023	0.032
3	**30**	0.005	0.011	0.008	0.008	0.013	0.015	0.005	0.004	0.012	0.009	0.008	0.018	0.023	0.016	0.012	0.006	0.002	0.006	0.010	0.026
3	**31**	0.006	0.006	0.014		0.006	0.012	0.000	0.009	0.001	0.003	0.009	0.011	0.008	0.010	0.007	0.002	0.002	0.005	0.013	0.020
3	**32**	0.000	0.017	0.000	0.001	0.002	0.006		0.002	0.005	0.003	0.001	0.007	0.010	0.013	0.009	0.003	0.002	0.003	0.001	0.013
3	**33**	0.000	0.004		0.000	0.003	0.002	0.000	0.007	0.002	0.009	0.004		0.004	0.001	0.004	0.002	0.002	0.002	0.002	0.003
3	**34**	0.001	0.001	0.002	0.000	0.003	0.000	0.000	0.001	0.008	0.000	0.002	0.004	0.003	0.010	0.002	0.001		0.004	0.004	0.010
3	**35**	0.001	0.003	0.006	0.002	0.002	0.003	0.000	0.000		0.000			0.003	0.003	0.002	0.002	0.000	0.000	0.004	0.005
3	**36**	0.000		0.001		0.001	0.002	0.001	0.001	0.003	0.000	0.001	0.009	0.004	0.007	0.005		0.007		0.001	0.005
3	**37**	0.001	0.005	0.004	0.002	0.004	0.006		0.004	0.004		0.001		0.002	0.005		0.004	0.003		0.001	0.003
3	**38**	0.003	0.003	0.008		0.022	0.007		0.000		0.000	0.007		0.002	0.006	0.003	0.000	0.001	0.002	0.000	0.004
3	**39**	0.001	0.004	0.001	0.021	0.046	0.002			0.003	0.001	0.000		0.009	0.004	0.000		0.003		0.000	0.002
3	**40**	0.000	0.004	0.007			0.003		0.003	0.002	0.000	0.000		0.006	0.005		0.001	0.003		0.000	
3	**41**	0.001	0.003	0.000			0.002			0.000		0.000	0.011	0.002	0.001	0.001		0.001		0.000	0.001
3	**42**	0.002	0.012		0.002	0.001	0.005					0.004		0.002		0.001			0.001		0.000
3	**43**	0.000	0.004			0.002										0.003	0.001				
3	**44**	0.000								0.002					0.002						
3	**45**																				
3	**46**															0.003					
3	**47**				0.001																0.000
3	**48**																				0.000

Table 7: Natural mortality at age vector used in ASAP base model.

Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+
0.349	0.206	0.157	0.134	0.122	0.115	0.110	0.108	0.106	0.104

Table 8: FAO proposed guideline for indices of productivity for exploited fish species and the parameter values and productivity score of Red Drum.

Parameter	**Productivity**			**Species**	**Score**
	Low	Medium	High	red drum	
M	<0.2	0.2 - 0.5	>0.5	**0.116**	1
K	<0.15	0.15 - 0.33	>0.33	**0.259**	2
tmat	>8	3.3 - 8	<3.3	**6**	2
tmax	>25	14 - 25	<14	**39**	1
Examples	orange roughy, many sharks	cod, hake	sardine, anchovy	**Red Drum Productivity Score = 1.50**	

Table 9: Annual sample sizes, nominal percent positive samples and CPUE of positive samples, standardized index of abundance, and corresponding coefficients of variation for Red Drum derived from the LDWF fishery-independent marine trammel net survey. Nominal CPUE and the standardized index of abundance have been normalized to their individual long-term means for comparison.

Year	n	%Pos	CPUE	IOA	CV
1985	95	6.3%	0.51	0.123	0.795
1986	92	30.4%	0.73	0.664	0.476
1987	180	22.2%	0.76	0.391	0.478
1988	165	34.5%	0.89	0.727	0.417
1989	202	20.8%	1.11	0.449	0.479
1990	191	12.6%	0.40	0.113	0.555
1991	207	37.7%	1.09	0.988	0.391
1992	220	42.7%	1.27	1.414	0.351
1993	225	41.3%	1.33	1.629	0.350
1994	213	40.8%	2.71	1.726	0.360
1995	215	35.3%	3.00	1.647	0.390
1996	216	40.3%	1.03	1.055	0.359
1997	219	34.7%	1.05	0.856	0.386
1998	223	36.3%	0.88	0.882	0.380
1999	217	35.5%	1.35	1.281	0.384
2000	209	39.7%	1.36	1.124	0.363
2001	219	31.1%	1.13	0.842	0.412
2002	217	41.0%	1.19	1.107	0.350
2003	222	38.3%	1.45	0.949	0.367
2004	222	49.1%	0.75	1.286	0.301
2005	215	41.9%	0.88	1.097	0.346
2006	217	47.5%	0.64	1.171	0.308
2007	226	48.7%	0.61	1.305	0.302
2008	219	40.6%	0.86	1.068	0.353
2009	222	45.9%	1.41	1.550	0.320
2010	508	43.9%	0.98	1.311	0.315
2011	543	43.8%	0.61	1.028	0.310
2012	515	45.8%	0.69	1.264	0.294
2013	263	40.3%	1.05	1.095	0.343
2014	263	41.4%	0.71	0.977	0.340
2015	271	43.9%	0.52	0.921	0.323
2016	271	43.5%	0.65	1.025	0.329
2017	269	44.6%	1.18	1.296	0.322
2018	270	38.5%	0.62	0.846	0.356
2019	271	34.7%	0.60	0.680	0.383
2020	265	34.7%	0.55	0.609	0.388
2021	264	31.4%	0.45	0.503	0.402

Table 10: Annual sample sizes, nominal percent positive samples and CPUE of positive samples, standardized index of abundance, and corresponding coefficients of variation for Red Drum derived from the LDWF fishery-independent bottom long line survey. Nominal CPUE and the standardized index of abundance have been normalized to their individual long-term means for comparison.

Year	n	%Pos	CPUE	IOA	CV
2015	79	46.8%	0.85	0.902	0.236
2016	74	24.3%	1.36	0.800	0.354
2017	91	47.3%	1.16	1.329	0.224
2018	96	38.5%	0.97	0.889	0.254
2019	88	46.6%	1.46	1.639	0.229
2020	25	36.0%	0.72	0.901	0.427
2021	80	35.0%	0.48	0.540	0.283

Table 11: Seasonal probabilities of age given length used in age assignments of Red Drum recreational and inshore commercial fishery landings from 1982-2001. Seasons represent January-April (season1), May-August (season 2), and September-December (season 3).

Season 1 (Jan-April)

TL_in	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.83	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.69	0.30	0.01	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.49	0.49	0.02	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.27	0.68	0.05	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.12	0.78	0.10	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.04	0.79	0.16	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.01	0.73	0.25	0.01	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.62	0.35	0.03	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.48	0.46	0.06	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.33	0.55	0.12	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.21	0.58	0.21	0.01	0.00	0.00	0.00	0.00
27	0.00	0.00	0.12	0.55	0.31	0.02	0.00	0.00	0.00	0.00
28	0.00	0.00	0.06	0.46	0.41	0.06	0.00	0.00	0.00	0.00
29	0.00	0.00	0.03	0.35	0.47	0.15	0.01	0.00	0.00	0.00
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

Season 2 (May-Aug)

TL_in	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.01	0.95	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.89	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.82	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.70	0.29	0.01	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.53	0.44	0.03	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.35	0.59	0.06	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.19	0.69	0.12	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.09	0.71	0.20	0.01	0.00	0.00	0.00	0.00	0.00
24	0.00	0.04	0.65	0.30	0.02	0.00	0.00	0.00	0.00	0.00
25	0.00	0.01	0.54	0.40	0.04	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.41	0.49	0.09	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.28	0.53	0.18	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.17	0.52	0.29	0.01	0.00	0.00	0.00	0.00
29	0.00	0.00	0.10	0.45	0.39	0.05	0.00	0.00	0.00	0.00
30	0.00	0.00	0.05	0.34	0.45	0.14	0.02	0.00	0.00	0.01
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

Table 11 (continued):

Season 3 (Sept-Dec)

TL_in	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.62	0.37	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.34	0.64	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.13	0.83	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.04	0.89	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.01	0.86	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.78	0.21	0.01	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.67	0.32	0.02	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.52	0.44	0.04	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.36	0.56	0.08	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.22	0.63	0.15	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.12	0.63	0.25	0.01	0.00	0.00	0.00	0.00	0.00
26	0.00	0.06	0.56	0.35	0.03	0.00	0.00	0.00	0.00	0.00
27	0.00	0.02	0.45	0.45	0.08	0.00	0.00	0.00	0.00	0.00
28	0.00	0.01	0.33	0.50	0.16	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.21	0.50	0.27	0.01	0.00	0.00	0.00	0.00
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

Table 12: Annual seasonal probabilities of age given length used in age assignments of recreational Red Drum landings 2002-2013. Probabilities of age given length from Table 11 are substituted where the annual row sample sizes (total column) are <10. Seasons represent January-April (season1), May-August (season 2), and September-December (season 3).

2002 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.00	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
16	0.00	0.83	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
17	0.00	0.69	0.30	0.01	0.00	0.00	0.00	0.00	0.00	0.00	
18	0.00	0.49	0.49	0.02	0.00	0.00	0.00	0.00	0.00	0.00	
19	0.00	0.27	0.68	0.05	0.00	0.00	0.00	0.00	0.00	0.00	
20	0.00	0.12	0.78	0.10	0.00	0.00	0.00	0.00	0.00	0.00	
21	0.00	0.04	0.79	0.16	0.00	0.00	0.00	0.00	0.00	0.00	
22	0.00	0.01	0.73	0.25	0.01	0.00	0.00	0.00	0.00	0.00	
23	0.00	0.00	0.62	0.35	0.03	0.00	0.00	0.00	0.00	0.00	
24	0.00	0.00	0.48	0.46	0.06	0.00	0.00	0.00	0.00	0.00	
25	0.00	0.00	0.33	0.55	0.12	0.00	0.00	0.00	0.00	0.00	
26	0.00	0.00	0.21	0.58	0.21	0.01	0.00	0.00	0.00	0.00	
27	0.00	0.00	0.12	0.55	0.31	0.02	0.00	0.00	0.00	0.00	
28	0.00	0.00	0.06	0.46	0.41	0.06	0.00	0.00	0.00	0.00	
29	0.00	0.00	0.03	0.35	0.47	0.15	0.01	0.00	0.00	0.00	
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2002 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.01	0.95	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
16		0.92	0.08								24
17		0.80	0.17	0.03							30
18		0.93	0.07								27
19		0.85	0.15								13
20		0.47	0.53								17
21		0.21	0.68	0.11							19
22		0.11	0.78	0.11							18
23		0.13	0.87								15
24	0.00	0.04	0.65	0.30	0.02	0.00	0.00	0.00	0.00	0.00	9
25			0.63	0.38							16
26	0.00	0.00	0.41	0.49	0.09	0.00	0.00	0.00	0.00	0.00	6
27	0.00	0.00	0.28	0.53	0.18	0.00	0.00	0.00	0.00	0.00	6
28			0.17	0.67		0.17					12
29			0.31	0.69							13
30	0.00	0.00	0.05	0.34	0.45	0.14	0.02	0.00	0.00	0.01	5
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	1
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	4
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	1
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	2
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	2
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	2
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	3
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	2
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	1
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	2
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2002 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.62	0.37	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5
16	0.66	0.34									29
17	0.65	0.35									26
18	0.40	0.60									15
19		0.94	0.06								17
20	0.05	0.86	0.10								21
21		0.87	0.13								30
22	0.04	0.58	0.38								26
23		0.54	0.39	0.07							28
24		0.29	0.47	0.24							17
25		0.07	0.53	0.40							15
26	0.00	0.06	0.56	0.35	0.03	0.00	0.00	0.00	0.00	0.00	9
27	0.00	0.02	0.45	0.45	0.08	0.00	0.00	0.00	0.00	0.00	5
28	0.00	0.01	0.33	0.50	0.16	0.00	0.00	0.00	0.00	0.00	3
29	0.00	0.00	0.21	0.50	0.27	0.01	0.00	0.00	0.00	0.00	3
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01	
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2003 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15	0.00	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
16	0.70	0.30									20
17	0.68	0.16	0.16								19
18	0.23	0.46	0.31								13
19	0.17		0.83								12
20	0.08		0.92								12
21	0.10	0.05	0.81	0.05							21
22			0.94	0.06							16
23	0.00	0.00	0.62	0.35	0.03	0.00	0.00	0.00	0.00	0.00	4
24			0.63	0.31	0.06						16
25			0.40	0.60							10
26			0.18	0.64	0.18						11
27			0.20	0.60	0.20						10
28	0.00	0.00	0.06	0.46	0.41	0.06	0.00	0.00	0.00	0.00	2
29	0.00	0.00	0.03	0.35	0.47	0.15	0.01	0.00	0.00	0.00	4
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	4
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	1
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	1
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	1
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	1
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	2
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	1
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	2
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2003 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.01	0.95	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6
16		0.95	0.05								19
17		0.97	0.03								36
18	0.03	0.83	0.14								29
19		0.76	0.24								25
20		0.38	0.62								26
21		0.23	0.73	0.04							26
22		0.13	0.77	0.10							31
23		0.10	0.59	0.31							29
24			0.35	0.65							26
25		0.03	0.35	0.61							31
26			0.27	0.65	0.08						26
27			0.18	0.71	0.12						17
28	0.00	0.00	0.17	0.52	0.29	0.01	0.00	0.00	0.00	0.00	6
29	0.00	0.00	0.10	0.45	0.39	0.05	0.00	0.00	0.00	0.00	9
30	0.00	0.00	0.05	0.34	0.45	0.14	0.02	0.00	0.00	0.01	5
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	3
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	2
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	1
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	3
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	1
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2003 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15	0.62	0.37	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
16	0.34	0.64	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9
17	0.20	0.73	0.07								15
18	0.11	0.85	0.04								27
19	0.06	0.94									35
20		0.63	0.31	0.06							16
21		0.69	0.23	0.08							26
22		0.56	0.40	0.04							25
23		0.45	0.45	0.09							22
24		0.20	0.68	0.12							25
25		0.21	0.56	0.21	0.03						39
26		0.12	0.41	0.47							17
27		0.10	0.45	0.35	0.10						20
28		0.10	0.30	0.60							10
29	0.00	0.00	0.21	0.50	0.27	0.01	0.00	0.00	0.00	0.00	8
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01	3
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	1
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	4
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	4
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	1
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	2
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	1
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	2
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	2
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	3
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	3
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2004 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.00	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9
16	0.40	0.47	0.13								15
17	0.54	0.31	0.15								13
18	0.00	0.49	0.49	0.02	0.00	0.00	0.00	0.00	0.00	0.00	6
19			1.00								12
20			1.00								10
21	0.00	0.04	0.79	0.16	0.00	0.00	0.00	0.00	0.00	0.00	9
22			0.85	0.15							13
23			0.79	0.16	0.05						19
24			0.50	0.50							10
25			0.12	0.88							17
26			0.18	0.65	0.18						17
27			0.08	0.77	0.15						13
28			0.36	0.36	0.27						11
29	0.00	0.00	0.03	0.35	0.47	0.15	0.01	0.00	0.00	0.00	4
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	5
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	1
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	2
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	1
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	2
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	1
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	2
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	2
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	2
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2004 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15		0.81	0.19								16
16		0.89	0.11								37
17		0.98	0.02								51
18		0.98	0.02								48
19		0.83	0.17								35
20		0.71	0.24	0.05							21
21		0.24	0.65	0.06	0.06						17
22		0.13	0.73	0.13							15
23		0.09	0.55	0.36							11
24			0.56	0.31	0.13						16
25			0.50	0.50							16
26			0.38	0.50	0.13						16
27			0.18	0.65	0.18						17
28	0.00	0.00	0.17	0.52	0.29	0.01	0.00	0.00	0.00	0.00	9
29	0.00	0.00	0.10	0.45	0.39	0.05	0.00	0.00	0.00	0.00	8
30	0.00	0.00	0.05	0.34	0.45	0.14	0.02	0.00	0.00	0.01	5
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	6
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	3
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	2
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	4
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	2
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	1
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	2
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2004 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15	0.62	0.37	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
16	0.45	0.55									22
17	0.21	0.79									28
18	0.03	0.95	0.03								38
19		1.00									37
20		0.91	0.06		0.03						34
21		0.95	0.05								39
22		0.79	0.21								34
23		0.76	0.24								17
24		0.22	0.61	0.17							18
25		0.11	0.56	0.33							18
26			0.55	0.30	0.15						20
27		0.06	0.61	0.28	0.06						18
28	0.00	0.01	0.33	0.50	0.16	0.00	0.00	0.00	0.00	0.00	7
29	0.00	0.00	0.21	0.50	0.27	0.01	0.00	0.00	0.00	0.00	2
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01	1
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	3
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	3
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	3
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	1
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	1
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2005 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.00	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5
16		1.00									23
17		0.95	0.05								20
18		0.64	0.36								14
19	0.00	0.27	0.68	0.05	0.00	0.00	0.00	0.00	0.00	0.00	6
20		0.04	0.92	0.04							24
21			0.91	0.09							23
22			1.00								29
23			0.90	0.10							21
24			0.71	0.29							14
25		0.07	0.40	0.53							15
26			0.36	0.36	0.18	0.09					11
27			0.08	0.46	0.38	0.08					13
28	0.00	0.00	0.06	0.46	0.41	0.06	0.00	0.00	0.00	0.00	8
29	0.00	0.00	0.03	0.35	0.47	0.15	0.01	0.00	0.00	0.00	7
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	2
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	2
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	1
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	2
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	1
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	1
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	3
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2005 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15	0.01	0.95	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
16		1.00									14
17	0.03	0.94		0.03							32
18	0.13	0.84	0.03								31
19		0.88	0.13								40
20		0.85	0.15								20
21		0.60	0.40								20
22		0.11	0.89								18
23			0.84	0.16							19
24		0.10	0.85	0.05							20
25			0.59	0.36	0.05						22
26			0.43	0.43	0.07	0.07					14
27			0.13	0.69	0.13	0.06					16
28			0.11	0.74	0.11	0.05					19
29	0.00	0.00	0.10	0.45	0.39	0.05	0.00	0.00	0.00	0.00	9
30			0.15	0.38	0.08	0.31	0.08				13
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	2
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	5
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	4
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	1
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	2
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	1
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2005 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
15	0.62	0.37	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5
16	1.00										17
17	0.80	0.10	0.10								10
18	0.04	0.89	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8
19	0.43	0.57									14
20	0.14	0.77	0.09								22
21	0.06	0.88		0.06							17
22		0.82	0.18								33
23		0.59	0.41								27
24	0.06	0.59	0.35								17
25		0.41	0.55	0.05							22
26		0.23	0.77								13
27		0.10	0.60	0.30							10
28	0.00	0.01	0.33	0.50	0.16	0.00	0.00	0.00	0.00	0.00	4
29	0.00	0.00	0.21	0.50	0.27	0.01	0.00	0.00	0.00	0.00	2
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01	
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	2
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	1
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	3
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	1
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	2
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	1
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	1
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	3
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2006 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15	0.00	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7
16		1.00									38
17		1.00									41
18		1.00									22
19		1.00									12
20		0.58	0.42								12
21	0.00	0.04	0.79	0.16	0.00	0.00	0.00	0.00	0.00	0.00	2
22	0.00	0.01	0.73	0.25	0.01	0.00	0.00	0.00	0.00	0.00	5
23	0.00	0.00	0.62	0.35	0.03	0.00	0.00	0.00	0.00	0.00	8
24			0.82	0.18							11
25			0.58	0.42							19
26			0.38	0.46	0.15						13
27			0.21	0.71			0.07				14
28			0.18	0.73	0.09						11
29	0.00	0.00	0.03	0.35	0.47	0.15	0.01	0.00	0.00	0.00	6
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	6
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	2
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	2
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	1
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	1
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	1
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	1
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	1
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2006 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.01	0.95	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
16	0.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6
17		1.00									25
18	0.03	0.95	0.03								37
19		1.00									48
20		1.00									39
21		1.00									28
22		0.90	0.10								20
23		0.83	0.17								12
24		0.22	0.72	0.06							18
25		0.04	0.96								24
26			0.95	0.05							20
27			0.40	0.60							15
28			0.60	0.30		0.10					10
29	0.00	0.00	0.10	0.45	0.39	0.05	0.00	0.00	0.00	0.00	6
30	0.00	0.00	0.05	0.34	0.45	0.14	0.02	0.00	0.00	0.01	8
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	3
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	1
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	1
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	1
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	1
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	1
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	1
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2006 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15	0.90		0.10								10
16	1.00										17
17	0.93	0.07									14
18	0.33	0.67									15
19	0.08	0.92									24
20		0.98		0.02							48
21		0.96	0.04								53
22		0.94	0.06								49
23		0.88	0.09	0.03							33
24		0.75	0.25								24
25		0.38	0.46	0.15							26
26		0.21	0.63	0.16							19
27			0.72	0.28							18
28			0.80	0.20							20
29		0.09	0.55	0.27	0.09						11
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01	6
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	1
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	2
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	1
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	1
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	3
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	2
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	1
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2007 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
15	0.00	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7
16		1.00									24
17		0.95	0.05								19
18		0.64	0.36								11
19	0.00	0.27	0.68	0.05	0.00	0.00	0.00	0.00	0.00	0.00	7
20		0.08	0.92								13
21	0.00	0.04	0.79	0.16	0.00	0.00	0.00	0.00	0.00	0.00	6
22			1.00								19
23			0.88	0.12							26
24			1.00								15
25			0.71	0.24	0.06						17
26			0.58	0.42							12
27	0.00	0.00	0.12	0.55	0.31	0.02	0.00	0.00	0.00	0.00	9
28			0.21	0.57	0.21						14
29				0.50	0.30	0.10				0.10	10
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	5
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	1
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	2
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	3
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	1
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	1
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	3
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2007 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15	0.01	0.95	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5
16		0.95	0.05								39
17		0.98	0.02								48
18		0.97	0.03								30
19		1.00									23
20		0.81	0.16	0.03							31
21		0.67	0.33								15
22	0.00	0.19	0.69	0.12	0.00	0.00	0.00	0.00	0.00	0.00	9
23		0.13	0.75	0.06	0.06						16
24		0.13	0.87								15
25			0.95	0.05							19
26			0.78	0.22							23
27		0.05	0.38	0.52	0.05						21
28			0.30	0.70							10
29			0.23	0.54	0.15		0.08				13
30	0.00	0.00	0.05	0.34	0.45	0.14	0.02	0.00	0.00	0.01	9
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	6
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	5
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	1
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	3
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	6
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	2
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	6
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	5
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2007 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15	0.80	0.10	0.10								10
16	0.41	0.59									22
17	0.07	0.93									30
18	0.06	0.90	0.04								50
19		0.98	0.02								48
20	0.02	0.96	0.02								48
21		0.98	0.02								43
22		0.78	0.22								37
23		0.65	0.35								23
24		0.33	0.67								18
25		0.13	0.83	0.04							23
26			0.95	0.05							21
27		0.08	0.79	0.08	0.04						24
28			0.86	0.14							14
29		0.09	0.45	0.27	0.18						11
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01	2
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	4
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	3
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	2
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	4
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	4
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	4
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	5
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	4
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	6
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	2
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	3
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	5
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2008 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15		1.00									20
16		1.00									35
17		0.88	0.13								32
18		0.38	0.63								16
19		0.05	0.95								22
20		0.02	0.98								42
21			1.00								35
22			0.95	0.05							40
23			0.94	0.06							36
24			0.82	0.18							33
25			0.38	0.63							16
26	0.00	0.00	0.21	0.58	0.21	0.01	0.00	0.00	0.00	0.00	9
27			0.08	0.85					0.08		13
28				0.83	0.17						12
29				0.85	0.15						13
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	6
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	3
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	2
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	2
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	1
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	1
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	1
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	1
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	3
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2008 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5
15		0.94	0.06								18
16		0.96	0.04								71
17		0.87	0.13								55
18		0.81	0.19								37
19	0.03	0.62	0.35								34
20		0.26	0.74								39
21		0.03	0.93	0.03							29
22		0.07	0.91	0.02							46
23		0.11	0.86	0.03							37
24			0.89	0.11							27
25		0.04	0.78	0.13	0.04						23
26		0.05	0.43	0.52							21
27			0.13	0.80	0.07						15
28			0.30	0.60	0.10						10
29			0.20	0.67	0.13						15
30	0.00	0.00	0.05	0.34	0.45	0.14	0.02	0.00	0.00	0.01	7
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	7
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	1
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	2
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	2
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	3
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	3
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	2
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	2
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	2
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	1
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	2
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2008 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.62	0.37	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9
16	0.59	0.38			0.03						29
17	0.19	0.78	0.03								36
18	0.05	0.86	0.08								37
19		0.86	0.14								44
20		0.81	0.19								48
21		0.88	0.12								41
22		0.66	0.34								35
23		0.32	0.66	0.03							38
24		0.15	0.82	0.03							33
25		0.03	0.97								32
26		0.04	0.93	0.04							28
27		0.08	0.67	0.25							12
28	0.00	0.01	0.33	0.50	0.16	0.00	0.00	0.00	0.00	0.00	6
29	0.00	0.00	0.21	0.50	0.27	0.01	0.00	0.00	0.00	0.00	4
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01	4
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	3
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	2
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	2
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	1
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	2
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	2
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2009 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15		0.92	0.04	0.04							26
16		0.98	0.02								54
17		0.84	0.16								32
18		0.53	0.40	0.07							15
19		0.09	0.91								22
20		0.06	0.87	0.06							31
21			0.89	0.11							35
22			0.84	0.16							37
23			0.74	0.26							39
24			0.48	0.48	0.04						25
25			0.06	0.94							16
26			0.05	0.82	0.14						22
27			0.13	0.75	0.13						16
28				0.55	0.45						11
29	0.00	0.00	0.03	0.35	0.47	0.15	0.01	0.00	0.00	0.00	5
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	9
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	1
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	2
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	3
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	1
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	1
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	1
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	2
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2009 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
15		1.00									17
16		1.00									61
17		1.00									52
18		0.86	0.14								59
19		0.75	0.25								28
20		0.39	0.56	0.06							36
21		0.25	0.73	0.02							44
22		0.17	0.69	0.14							29
23		0.08	0.86	0.06							36
24		0.06	0.47	0.47							36
25			0.37	0.63							38
26			0.36	0.61	0.03						33
27			0.19	0.69	0.12						26
28			0.18	0.76	0.06						17
29			0.08	0.54	0.38						13
30	0.00	0.00	0.05	0.34	0.45	0.14	0.02	0.00	0.00	0.01	6
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	1
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	1
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	1
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	1
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2009 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.62	0.37	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9
16	0.73	0.27									15
17	0.27	0.73									26
18	0.04	0.96									27
19	0.04	0.88	0.08								24
20		0.74	0.26								46
21		0.65	0.33	0.02							49
22		0.46	0.44	0.10							50
23		0.37	0.50	0.13							30
24		0.08	0.75	0.17							24
25		0.05	0.68	0.26							19
26			0.55	0.45							29
27			0.40	0.60							15
28	0.00	0.01	0.33	0.50	0.16	0.00	0.00	0.00	0.00	0.00	9
29	0.00	0.00	0.21	0.50	0.27	0.01	0.00	0.00	0.00	0.00	8
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01	1
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	1
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	4
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	3
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	3
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	2
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	3
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	3
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	5
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2010 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15	0.00	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9
16		0.79	0.21								24
17		0.55	0.45								20
18		0.31	0.69								16
19		0.05	0.85	0.10							20
20		0.04	0.88	0.04	0.04						25
21		0.03	0.72	0.22	0.03						32
22			0.82	0.18							28
23			0.90	0.10							21
24			0.39	0.55	0.06						31
25			0.20	0.73	0.07						30
26			0.32	0.42	0.26						19
27	0.00	0.00	0.12	0.55	0.31	0.02	0.00	0.00	0.00	0.00	8
28			0.10	0.30	0.60						10
29	0.00	0.00	0.03	0.35	0.47	0.15	0.01	0.00	0.00	0.00	6
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	2
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	2
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	1
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	2
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	1
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	2
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	1
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	2
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	2
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2010 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15		1.00									13
16		1.00									41
17		0.98	0.02								41
18		0.95	0.05								40
19		0.93	0.07								27
20		0.43	0.57								14
21		0.21	0.68	0.11							19
22			0.83	0.17							12
23		0.12	0.82	0.06							17
24			0.80	0.13	0.07						15
25			0.83	0.17							12
26			0.69	0.23	0.08						13
27			0.36	0.45	0.18						11
28	0.00	0.00	0.17	0.52	0.29	0.01	0.00	0.00	0.00	0.00	7
29	0.00	0.00	0.10	0.45	0.39	0.05	0.00	0.00	0.00	0.00	8
30	0.00	0.00	0.05	0.34	0.45	0.14	0.02	0.00	0.00	0.01	1
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	3
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	1
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	1
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2010 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.62	0.37	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6
16	0.10	0.90									21
17	0.04	0.96									48
18	0.02	0.98									48
19		0.98	0.02								43
20		0.96	0.04								51
21		0.87	0.13								38
22		0.69	0.28	0.03							32
23		0.48	0.48	0.04							23
24		0.18	0.82								11
25		0.07	0.73	0.20							15
26			0.82	0.09	0.09						11
27	0.00	0.02	0.45	0.45	0.08	0.00	0.00	0.00	0.00	0.00	9
28	0.00	0.01	0.33	0.50	0.16	0.00	0.00	0.00	0.00	0.00	8
29	0.00	0.00	0.21	0.50	0.27	0.01	0.00	0.00	0.00	0.00	6
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01	1
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	1
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	1
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2011 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.00	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
15		0.82	0.18								17
16		0.46	0.54								28
17		0.30	0.70								10
18			1.00								23
19			1.00								13
20			1.00								22
21			0.94	0.06							17
22			1.00								23
23			0.54	0.46							13
24	0.00	0.00	0.33	0.55	0.12	0.00	0.00	0.00	0.00	0.00	6
25			0.62	0.38							13
26	0.00	0.00	0.12	0.55	0.31	0.02	0.00	0.00	0.00	0.00	8
27	0.00	0.00	0.06	0.46	0.41	0.06	0.00	0.00	0.00	0.00	8
28	0.00	0.00	0.03	0.35	0.47	0.15	0.01	0.00	0.00	0.00	8
29	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	7
30	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	2
31	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	2
32	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	
33	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	
34	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	1
35	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	
36	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	3
37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	2
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2011 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.01	0.95	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8
16		0.96	0.02	0.02							51
17		0.95	0.05								65
18		0.92	0.08								59
19		0.85	0.15								41
20		0.76	0.24								25
21		0.35	0.65								26
22		0.16	0.84								38
23			1.00								40
24			0.79	0.21							29
25			0.92	0.08							26
26		0.05	0.55	0.40							20
27		0.06	0.56	0.38							16
28			0.33	0.42	0.17	0.04				0.04	24
29			0.05	0.67	0.24	0.05					21
30				0.58	0.42						12
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	6
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	2
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	1
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	3
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	2
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	2
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	4
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	3
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	1
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	1
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2011 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.62	0.37	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5
16	0.35	0.62	0.04								26
17	0.03	0.97									63
18		1.00									85
19		0.97	0.03								69
20		0.91	0.09								85
21		0.82	0.18								77
22		0.61	0.39								57
23		0.37	0.61	0.02							51
24		0.02	0.91	0.07							57
25		0.04	0.91	0.04							47
26		0.02	0.85	0.11	0.02						47
27			0.67	0.30	0.04						27
28			0.53	0.29	0.18						17
29			0.55	0.27	0.18						11
30			0.29	0.64	0.07						14
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	3
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	1
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	4
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	1
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	2
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	1
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2012 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15		1.00									14
16		0.98	0.02								44
17		0.80	0.20								25
18		0.38	0.63								16
19			1.00								27
20			1.00								51
21		0.02	0.98								64
22			0.94	0.06							49
23			0.81	0.19							27
24			0.29	0.71							21
25			0.30	0.65	0.04						23
26			0.05	0.89		0.05					19
27			0.07	0.93							29
28			0.06	0.83	0.11						18
29				0.76	0.24						17
30				0.70	0.30						10
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	5
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	1
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	2
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2012 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15		1.00									14
16		0.99	0.01								81
17		0.98	0.02								95
18		0.93	0.07								57
19		0.42	0.52	0.06							33
20		0.39	0.61								56
21		0.10	0.90								50
22		0.10	0.86	0.03							59
23		0.04	0.89	0.07							27
24			0.79	0.17	0.03						29
25			0.76	0.24							21
26			0.68	0.32							31
27			0.44	0.56							18
28			0.22	0.72	0.06						18
29		0.09	0.18	0.73							11
30	0.00	0.00	0.05	0.34	0.45	0.14	0.02	0.00	0.00	0.01	5
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	2
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	5
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	2
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	4
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	2
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	3
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	3
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	2
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	3
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	2
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2012 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.62	0.37	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
16	0.34	0.64	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9
17	0.13	0.83	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7
18	0.04	0.89	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9
19	0.01	0.86	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9
20		1.00									11
21		0.83	0.17								24
22		0.67	0.33								15
23		0.38	0.62								13
24	0.00	0.22	0.63	0.15	0.00	0.00	0.00	0.00	0.00	0.00	9
25	0.00	0.12	0.63	0.25	0.01	0.00	0.00	0.00	0.00	0.00	6
26		0.08	0.75	0.17							12
27	0.00	0.02	0.45	0.45	0.08	0.00	0.00	0.00	0.00	0.00	5
28	0.00	0.01	0.33	0.50	0.16	0.00	0.00	0.00	0.00	0.00	3
29	0.00	0.00	0.21	0.50	0.27	0.01	0.00	0.00	0.00	0.00	
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01	1
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	1
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	1
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	1
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2013 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15		0.80		0.10	0.10						10
16		0.85	0.15								13
17	0.00	0.69	0.30	0.01	0.00	0.00	0.00	0.00	0.00	0.00	7
18	0.00	0.49	0.49	0.02	0.00	0.00	0.00	0.00	0.00	0.00	8
19		0.27	0.73								11
20			0.90	0.10							21
21			0.92	0.08							25
22		0.09	0.65	0.26							23
23		0.03	0.63	0.28	0.06						32
24			0.68	0.26	0.05						19
25			0.73	0.27							11
26			0.30	0.60	0.10						10
27	0.00	0.00	0.12	0.55	0.31	0.02	0.00	0.00	0.00	0.00	8
28				0.27	0.67	0.07					15
29		0.10	0.10	0.40	0.40						10
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	6
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	6
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	5
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	5
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	7
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	6
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	3
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	7
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	9
39				0.10						0.90	10
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	9
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	4
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2013 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15		1.00									26
16		1.00									75
17		0.97	0.03								72
18		0.93	0.04	0.02							46
19		0.77	0.23								35
20		0.50	0.50								16
21		0.33	0.67								15
22		0.07	0.79	0.14							14
23			0.60	0.40							10
24			0.63	0.37							19
25			0.56	0.36	0.08						25
26			0.65	0.29	0.06						17
27			0.38	0.62							13
28	0.00	0.00	0.17	0.52	0.29	0.01	0.00	0.00	0.00	0.00	8
29	0.00	0.00	0.10	0.45	0.39	0.05	0.00	0.00	0.00	0.00	6
30	0.00	0.00	0.05	0.34	0.45	0.14	0.02	0.00	0.00	0.01	7
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	2
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	1
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	2
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	1
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	2
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	4
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	1
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2013 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4
15	0.17	0.83									24
16	0.24	0.76									63
17	0.09	0.91									67
18	0.01	0.99									82
19		0.96	0.04								52
20	0.01	0.93	0.06								71
21		0.88	0.13								56
22		0.73	0.28								40
23		0.33	0.63	0.04							24
24		0.10	0.76	0.14							21
25		0.04	0.52	0.43							23
26			0.74	0.26							23
27			0.57	0.43							23
28			0.63	0.32	0.05						19
29			0.50	0.40	0.10						10
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01	8
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	1
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	1
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	4
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	4
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	1
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	5
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	4
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	3
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2014 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15		0.86	0.14								10
16		0.73	0.27								24
17		0.23	0.77								35
18			1.00								43
19		0.02	0.96							0.02	49
20			1.00								65
21		0.01	0.92	0.08							71
22			0.89	0.05	0.07						34
23			0.76	0.19	0.05						32
24			0.58	0.31	0.11						24
25		0.06	0.35	0.47	0.12						26
26			0.17	0.60	0.24						20
27			0.07	0.69	0.24						26
28			0.03	0.72	0.24						17
29				0.50	0.50						12
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	8
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	9
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	4
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	3
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	1
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	1
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	3
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	2
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	6
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	6
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	5
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1

2014 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15		0.91	0.09								11
16		0.97	0.03								101
17		0.92	0.08								138
18		0.89	0.11								93
19		0.56	0.42	0.01							71
20		0.27	0.73								67
21		0.09	0.91								79
22		0.08	0.87	0.05							45
23			0.96	0.04							37
24			0.85	0.15							35
25			0.61	0.38	0.01						28
26			0.52	0.44	0.04						25
27			0.24	0.65	0.12						26
28			0.11	0.85	0.01	0.03					15
29			0.16	0.63	0.21						16
30				0.49	0.51						14
31				0.33	0.24	0.21	0.21				10
32				0.38	0.41	0.09		0.12			11
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	6
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	2
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	5
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	3
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	4
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	8
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	2
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	3
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	3
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2014 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.62	0.37	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
16	0.41	0.49		0.10							17
17	0.08	0.79	0.05	0.03						0.05	39
18	0.06	0.85	0.03	0.03	0.03						62
19	0.05	0.80	0.07	0.08							42
20		0.84	0.16								40
21		0.77	0.23	0.01							44
22		0.56	0.35	0.09					0.00		41
23		0.24	0.76								28
24		0.28	0.60	0.12							39
25		0.02	0.82	0.04	0.12						22
26		0.11	0.67	0.13	0.06	0.03				0.00	32
27		0.00	0.79	0.21							21
28			0.50	0.49						0.00	19
29		0.01	0.42	0.56						0.01	11
30		0.41	0.01	0.51	0.06	0.00					14
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	7
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	8
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	1
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	2
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	2
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	5
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	7
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	6
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	7
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	5
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	2
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2015 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15		1.00									18
16		1.00									37
17		0.84	0.16		0.00						29
18		0.46	0.54								16
19		0.01	0.97	0.01			0.01				25
20			0.98	0.02							43
21			0.97	0.03							43
22			0.83	0.17							27
23			0.55	0.45							30
24		0.01	0.09	0.88	0.03						20
25			0.27	0.71	0.02						31
26			0.02	0.84	0.14						17
27			0.01	0.93	0.06						21
28			0.14	0.63	0.20	0.03					17
29				0.43	0.56	0.01					15
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	9
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	6
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	2
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	3
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	1
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	2
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	3
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	1
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	2
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	7
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	2
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2015 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
15		1.00									36
16		1.00	0.00								120
17		1.00	0.00								112
18		0.85	0.15	0.01							75
19		0.78	0.17	0.04							41
20		0.33	0.62	0.05							37
21		0.09	0.87	0.04							45
22		0.02	0.75	0.22	0.01						47
23		0.01	0.63	0.36	0.01						41
24			0.49	0.51							34
25			0.40	0.55	0.05						26
26			0.26	0.58	0.11	0.05					22
27			0.16	0.73	0.11	0.01					26
28			0.11	0.67	0.22						25
29				0.62	0.24	0.05	0.09				16
30	0.00	0.00	0.05	0.34	0.45	0.14	0.02	0.00	0.00	0.01	4
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	9
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	3
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	1
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	2
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	1
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	4
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	1
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2015 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
15	0.62	0.37	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9
16	0.12	0.88									46
17	0.05	0.91	0.02	0.02							76
18		0.97	0.03	0.01							78
19		0.96	0.04	0.00							80
20	0.02	0.77	0.16	0.05							80
21		0.65	0.30	0.04	0.01						52
22		0.44	0.45	0.10							46
23		0.09	0.66	0.24							56
24		0.15	0.68	0.16	0.01		0.00				40
25		0.03	0.51	0.42	0.03	0.01					41
26		0.08	0.46	0.46	0.00		0.00				49
27		0.07	0.25	0.63	0.02	0.02					27
28			0.24	0.66	0.08	0.03					16
29		0.11	0.15	0.48	0.26						12
30			0.17	0.51	0.20	0.12					15
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	9
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	9
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	5
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	2
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	3
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	2
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	3
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	2
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	2
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2016 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15		1.00									25
16		0.96	0.04								39
17		0.80	0.20								32
18		0.41	0.59								24
19		0.12	0.81	0.07							27
20		0.03	0.94	0.03							33
21			0.91	0.07	0.01						31
22			0.98	0.02							17
23		0.02	0.75	0.23							18
24			0.68	0.28	0.04						17
25		0.12	0.14	0.68	0.06						17
26			0.15	0.57	0.23	0.03		0.03			17
27				0.28	0.72						10
28			0.01	0.61	0.38						13
29				0.41	0.59	0.00					15
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	7
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	1
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	1
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	4
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	1
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	5
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	1
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	3
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2016 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.06	0.80	0.15								26
16		0.95	0.03		0.02						110
17		0.92	0.06	0.01	0.02						97
18		0.86	0.09	0.02	0.03						69
19		0.66	0.32	0.01							40
20		0.46	0.54								72
21		0.39	0.55	0.07							39
22		0.23	0.77								35
23		0.08	0.81	0.03	0.07						40
24			0.71	0.17	0.10			0.03			33
25			0.80	0.18	0.02						29
26			0.38	0.43	0.19						26
27			0.30	0.59	0.11						19
28			0.17	0.47	0.31	0.05					19
29				0.25	0.75						16
30		0.21	0.06	0.08	0.65						14
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	1
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	6
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	3
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	3
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	2
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	3
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	2
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	2
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	2
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2016 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4
15	0.51	0.49									16
16	0.48	0.52									45
17	0.22	0.75	0.04								48
18	0.04	0.86	0.07	0.02							63
19	0.02	0.92	0.06								61
20	0.01	0.90	0.08	0.01							67
21	0.00	0.72	0.26	0.02							60
22	0.02	0.70	0.25	0.03							44
23		0.44	0.52		0.04						49
24		0.43	0.43	0.14							52
25		0.25	0.63	0.09	0.03						41
26		0.09	0.83	0.08							27
27		0.03	0.70	0.28							31
28			0.33	0.31	0.25	0.11					20
29			0.22	0.36	0.42						13
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01	9
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	5
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	8
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	4
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	2
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	1
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	4
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2017 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
15		1.00									43
16		0.97	0.02	0.01							122
17		0.92	0.06		0.02						96
18		0.83	0.12	0.04							54
19		0.58	0.35	0.07							20
20		0.11	0.81	0.08							19
21		0.05	0.83	0.07	0.04						35
22			0.91	0.09							27
23		0.06	0.81	0.11	0.01						46
24		0.01	0.73	0.23	0.03						39
25			0.88	0.12							31
26			0.48	0.47	0.05						16
27			0.22	0.74	0.01	0.03					17
28		0.11	0.28	0.46	0.14						12
29				0.65	0.09	0.27					13
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	6
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	7
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	4
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	1
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	1
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	2
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	2
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2017 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
15		1.00									32
16		0.99	0.01								110
17	0.00	0.98	0.02								123
18	0.00	0.98	0.02								111
19	0.02	0.95	0.03								86
20		0.96	0.04								66
21	0.07	0.68	0.23	0.00	0.02						35
22		0.39	0.57	0.01	0.03						23
23		0.23	0.77								15
24		0.17	0.83								16
25		0.05	0.86	0.04	0.04						21
26		0.04	0.91	0.04							24
27		0.05	0.72	0.24							17
28	0.00	0.00	0.17	0.52	0.29	0.01	0.00	0.00	0.00	0.00	9
29			0.26	0.56	0.18						11
30	0.00	0.00	0.05	0.34	0.45	0.14	0.02	0.00	0.00	0.01	5
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	5
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	2
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	2
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	1
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	2
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	1
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	1
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	1
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	2
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2017 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.39	0.61									10
16	0.12	0.88									38
17		0.97	0.03								71
18		0.95	0.05								84
19	0.02	0.98	0.00								83
20		0.96	0.04								84
21	0.01	0.93	0.06								85
22		0.89	0.10	0.02							58
23		0.78	0.22	0.01							60
24		0.44	0.44	0.05	0.07						37
25		0.23	0.73	0.04							33
26		0.13	0.76	0.08	0.03						28
27			0.83	0.11			0.06				14
28		0.05	0.48	0.47							19
29			0.53	0.41		0.07					15
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01	6
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	2
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	2
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	1
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	1
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	1
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	2
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	2
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2018 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
15		0.92	0.08								33
16		0.90	0.10								67
17		0.86	0.14								50
18		0.33	0.67								38
19		0.11	0.89				0.00				35
20		0.03	0.95	0.02							60
21		0.05	0.89	0.06							59
22		0.02	0.98								58
23			0.98	0.02							55
24		0.02	0.81	0.17							45
25			0.60	0.34	0.06		0.00				45
26			0.41	0.55	0.04						27
27			0.17	0.58	0.25						15
28			0.13	0.71	0.09		0.08				21
29			0.03	0.49	0.30	0.15	0.03				25
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	4
31				0.29	0.71						11
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	2
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	3
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	1
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	1
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	1
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2018 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4
15		0.99	0.01								54
16		0.97	0.03								256
17	0.00	0.96	0.03								237
18		0.90	0.10								167
19		0.69	0.31								120
20		0.44	0.54	0.02							73
21		0.21	0.78	0.01							44
22		0.15	0.79	0.06	0.00						53
23		0.06	0.91	0.03							56
24		0.00	0.94	0.06							60
25			0.89	0.11							61
26			0.76	0.23	0.00						45
27			0.69	0.23	0.08						29
28			0.66	0.13	0.11	0.10					19
29			0.06	0.69	0.19	0.06					10
30				0.59	0.41						12
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	5
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	2
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	2
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	2
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	2
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	2
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	6
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	8
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	8
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	4
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2018 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.45	0.55									12
16	0.24	0.74	0.02								45
17	0.07	0.93	0.00								103
18	0.00	0.95	0.05								97
19	0.01	0.94	0.05								109
20		0.96	0.04								101
21	0.00	0.74	0.26								81
22		0.60	0.40								56
23	0.00	0.22	0.77	0.01							50
24		0.10	0.84	0.06							50
25		0.06	0.94	0.00	0.00						42
26			0.92	0.08							33
27			0.80	0.20							26
28			0.99	0.01							10
29	0.00	0.00	0.21	0.50	0.27	0.01	0.00	0.00	0.00	0.00	6
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01	3
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	2
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	1
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	1
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	1
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	4
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	2
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	3
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	3
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2019 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15		0.81	0.19								22
16		0.69	0.31								50
17		0.36	0.64								54
18		0.08	0.92								44
19		0.00	0.99	0.01							46
20			1.00	0.00							52
21			0.81	0.16	0.04						47
22			0.88	0.12							51
23			0.72	0.28							37
24			0.51	0.49							22
25			0.38	0.62							17
26			0.27	0.59	0.14						13
27	0.00	0.00	0.12	0.55	0.31	0.02	0.00	0.00	0.00	0.00	9
28	0.00	0.00	0.06	0.46	0.41	0.06	0.00	0.00	0.00	0.00	8
29	0.00	0.00	0.03	0.35	0.47	0.15	0.01	0.00	0.00	0.00	9
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	3
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	4
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	3
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	2
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	1
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	1
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	3
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	2
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	6
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	2
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	5
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1

Table 12 (continued):

2019 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4
15		1.00									48
16		0.97	0.03								119
17		0.94	0.06								129
18		0.74	0.24	0.02							81
19		0.55	0.45								54
20		0.18	0.79	0.03							48
21		0.10	0.89	0.01							62
22		0.03	0.94	0.03							59
23		0.06	0.86	0.08							61
24			0.89	0.11							42
25			0.74	0.26							41
26			0.56	0.44							22
27			0.19	0.78					0.03		12
28			0.19	0.51	0.31						15
29			0.19	0.79		0.02					10
30	0.00	0.00	0.05	0.34	0.45	0.14	0.02	0.00	0.00	0.01	3
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	6
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	3
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	5
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	4
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	5
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	2
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	1
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2019 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
15	0.22	0.78									21
16	0.28	0.68	0.03								69
17	0.08	0.92	0.00								80
18	0.03	0.89	0.06	0.01							100
19		0.85	0.15	0.00							102
20		0.68	0.29	0.02							86
21		0.39	0.61								61
22		0.36	0.62	0.02							70
23		0.18	0.77	0.03		0.01					71
24		0.05	0.85	0.10							84
25		0.03	0.86	0.11							68
26			0.81	0.19							40
27		0.03	0.54	0.42	0.01						56
28			0.54	0.39	0.07						28
29			0.46	0.54							14
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01	7
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	5
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	3
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	2
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	4
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	2
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2020 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
15		0.76	0.24								14
16		1.00									37
17		0.66	0.25	0.09							31
18		0.48	0.52								17
19		0.08	0.92								11
20		0.05	0.86	0.09							27
21			0.86	0.14							19
22			0.80	0.20							20
23			0.30	0.70							13
24			0.54	0.46							23
25			0.35	0.48	0.17						14
26			0.18	0.77	0.05						24
27			0.08	0.82	0.10						16
28	0.00	0.00	0.06	0.46	0.41	0.06	0.00	0.00	0.00	0.00	9
29	0.00	0.00	0.03	0.35	0.47	0.15	0.01	0.00	0.00	0.00	8
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	5
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	6
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	2
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	2
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	2
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2020 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15		0.91	0.09								28
16		0.86	0.14								91
17		0.89	0.10	0.01							122
18		0.81	0.19								93
19		0.75	0.25								63
20		0.33	0.63	0.05							50
21		0.35	0.55	0.09							42
22		0.13	0.82	0.05							27
23		0.07	0.82	0.10	0.01						24
24		0.01	0.78	0.21							24
25			0.73	0.27							23
26			0.25	0.67	0.08						15
27			0.27	0.38	0.34	0.02					17
28			0.30	0.36	0.34						13
29	0.00	0.00	0.10	0.45	0.39	0.05	0.00	0.00	0.00	0.00	8
30	0.00	0.00	0.05	0.34	0.45	0.14	0.02	0.00	0.00	0.01	4
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	6
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	2
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	2
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	1
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	1
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	3
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	4
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	5
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2020 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
15	0.84		0.16								11
16	0.48	0.27	0.25								42
17	0.53	0.33	0.14								25
18	0.08	0.77	0.15								31
19	0.01	0.95	0.04								42
20	0.03	0.91	0.06								31
21		0.94	0.06								35
22	0.05	0.54	0.35	0.05							39
23		0.79	0.21								32
24		0.26	0.68	0.07							46
25		0.27	0.59	0.14							30
26		0.11	0.71	0.18							32
27		0.09	0.66	0.25							21
28		0.03	0.31	0.66							22
29			0.64	0.22	0.14						12
30	0.00	0.00	0.12	0.42	0.38	0.05	0.01	0.00	0.00	0.01	7
31	0.00	0.00	0.06	0.29	0.40	0.14	0.03	0.01	0.01	0.06	6
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	4
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	3
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	3
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	5
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	6
37						0.10				0.90	10
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	4
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	3
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	2
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2021 (season 1)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.15	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.01	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15		1.00									36
16		0.93	0.06		0.01						78
17		0.96	0.04								69
18		0.82	0.14	0.04							38
19		0.53	0.47								32
20		0.20	0.80								30
21		0.06	0.90	0.04							34
22			0.98		0.02						35
23		0.01	0.85	0.12	0.02						40
24		0.01	0.71	0.13	0.16						31
25			0.31	0.46	0.14	0.10					27
26			0.35	0.49	0.16						14
27			0.19	0.69	0.07	0.05					25
28			0.18	0.30	0.45	0.07					19
29		0.04	0.04	0.31	0.60						13
30	0.00	0.00	0.01	0.23	0.46	0.26	0.03	0.01	0.00	0.01	9
31	0.00	0.00	0.00	0.12	0.36	0.34	0.08	0.02	0.01	0.07	6
32	0.00	0.00	0.00	0.05	0.20	0.30	0.15	0.05	0.02	0.23	5
33	0.00	0.00	0.00	0.01	0.08	0.17	0.15	0.07	0.04	0.48	
34	0.00	0.00	0.00	0.00	0.03	0.07	0.10	0.07	0.05	0.69	1
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.82	2
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90	1
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.94	3
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	6
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	2
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 12 (continued):

2021 (season 2)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.34	0.65	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.08	0.90	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15		1.00									17
16	0.01	0.99									80
17		0.99	0.01								125
18		1.00	0.00								140
19		0.97	0.02	0.02							110
20		0.93	0.07	0.00							81
21		0.74	0.18	0.09							60
22		0.57	0.36	0.06							48
23		0.22	0.67	0.11							39
24		0.01	0.91	0.09							37
25			0.82	0.13	0.05						23
26		0.09	0.54	0.34	0.03						34
27			0.44	0.45	0.05	0.06					30
28			0.48	0.46	0.06						15
29		0.05	0.28	0.53	0.08	0.06					14
30			0.01	0.67	0.29		0.02				12
31	0.00	0.00	0.02	0.21	0.39	0.24	0.05	0.02	0.01	0.06	8
32	0.00	0.00	0.01	0.09	0.25	0.27	0.10	0.04	0.02	0.22	7
33	0.00	0.00	0.00	0.03	0.11	0.18	0.12	0.06	0.03	0.46	4
34	0.00	0.00	0.00	0.01	0.04	0.09	0.09	0.06	0.04	0.68	1
35	0.00	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.04	0.81	4
36	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.89	1
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.93	
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.96	1
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.97	2
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	1
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

2021 (season 3)

TL_IN	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	total
10	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
12	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
13	0.92	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
14	0.82	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.93				0.07						15
16	0.89	0.07	0.03								42
17	0.68	0.29		0.04							42
18	0.23	0.68	0.09								33
19	0.05	0.82	0.13								33
20	0.02	0.94		0.04							44
21		0.93	0.04	0.03							54
22	0.03	0.81	0.16								43
23	0.02	0.75	0.19	0.03							58
24		0.52	0.39	0.09							38
25		0.40	0.56	0.04							40
26		0.35	0.44	0.21							39
27		0.28	0.43	0.29	0.00						39
28		0.22	0.32	0.46							25
29		0.08	0.51	0.37	0.05						20
30		0.25	0.22	0.37	0.17						14
31			0.13	0.20	0.60	0.07					16
32	0.00	0.00	0.02	0.15	0.29	0.21	0.07	0.03	0.02	0.22	7
33	0.00	0.00	0.01	0.05	0.14	0.18	0.09	0.05	0.03	0.45	4
34	0.00	0.00	0.00	0.02	0.05	0.10	0.08	0.05	0.04	0.66	5
35	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.04	0.04	0.80	2
36	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.88	4
37	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.92	2
38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95	3
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97	2
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98	
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98	1
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	1
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	

Table 13: Annual recreational Red Drum catch-at-age (harvest + dead discards) as numbers of fish and yield in pounds used as inputs of the ASAP base model.

	Recreational										
Year	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	Yield (lbs)
1982	490,379	406,163	238,310	80,678	13,789	512	65	24	12	124	2,351,778
1983	982,417	640,810	77,836	22,487	10,754	2,352	524	182	88	950	2,335,466
1984	475,519	486,993	97,647	22,579	2,599	523	193	94	71	2,882	1,783,195
1985	341,920	398,575	131,424	34,451	10,803	1,749	419	266	218	6,530	1,817,233
1986	476,084	315,141	84,439	20,388	4,931	803	213	88	51	1,441	1,378,567
1987	484,539	441,583	87,559	19,782	4,453	1,014	526	377	322	12,367	1,846,816
1988	73,363	309,148	87,263	13,857	1,355	150	39	24	29	3,211	1,114,779
1989	70,397	440,666	223,926	61,535	13,602	2,620	914	542	421	11,786	2,786,333
1990	50,195	263,892	184,041	58,122	8,051	1,298	411	321	358	18,138	2,213,214
1991	169,767	344,297	174,211	75,934	19,711	1,993	398	190	137	3,792	2,458,057
1992	111,243	723,480	227,139	50,912	14,464	1,981	354	212	194	8,332	3,003,262
1993	112,314	553,476	333,790	95,834	17,470	3,512	938	507	388	15,029	3,724,493
1994	64,383	431,764	367,753	128,442	23,464	2,128	635	370	296	12,381	3,746,849
1995	91,857	879,308	465,222	161,253	36,783	4,977	1,288	667	511	17,609	5,749,211
1996	59,061	539,358	548,144	205,996	47,091	6,952	1,475	786	617	25,587	5,660,025
1997	92,150	509,772	404,372	195,047	52,725	8,820	2,147	1,208	1,033	46,857	5,913,754
1998	102,367	646,762	316,794	117,521	30,346	5,050	1,724	1,102	937	36,290	4,569,354
1999	112,701	728,752	480,604	163,821	43,587	8,081	2,189	1,120	828	27,660	5,709,160
2000	106,754	804,657	560,350	237,174	67,020	11,499	2,566	1,186	809	32,196	7,199,702
2001	79,193	859,290	631,104	220,521	55,918	10,799	2,381	1,263	969	33,278	7,107,845
2002	176,011	624,979	421,575	168,899	34,532	11,405	2,569	1,505	1,314	61,345	6,263,101
2003	137,110	541,505	368,652	183,085	43,527	12,062	3,111	1,544	1,153	41,953	5,728,435
2004	85,928	562,996	268,031	124,622	35,287	4,758	2,099	1,756	1,773	75,120	5,262,071
2005	133,705	451,010	232,369	95,725	29,942	10,892	2,165	1,108	969	39,564	4,299,753
2006	107,676	654,274	179,265	70,311	15,985	5,805	2,010	1,232	1,151	46,010	4,715,369
2007	87,905	710,794	431,827	86,973	29,268	9,037	3,796	1,392	994	27,818	5,502,870
2008	98,430	662,295	622,068	115,554	20,346	4,458	1,685	952	1,403	22,837	5,698,988
2009	138,168	705,788	512,695	265,557	41,230	7,531	2,480	1,249	863	21,995	6,540,034
2010	85,870	1,087,728	654,421	202,708	72,235	8,244	2,206	1,393	1,158	34,919	7,723,879
2011	69,423	910,686	813,571	145,694	31,495	8,329	2,988	1,482	928	21,137	7,618,956
2012	86,739	714,744	515,575	152,796	23,529	4,898	1,482	888	766	30,107	5,870,340
2013	104,725	1,100,334	475,188	191,932	59,418	14,692	4,571	2,551	1,865	50,279	7,500,684
2014	87,931	543,062	531,992	140,748	37,471	8,800	3,869	1,727	1,216	42,902	5,802,226
2015	75,969	618,561	328,569	237,402	41,053	12,929	4,758	1,833	1,299	35,880	5,459,462
2016	93,690	525,955	328,712	86,991	60,024	7,863	2,236	2,032	871	22,266	4,344,263
2017	82,037	1,202,342	342,406	76,621	25,658	10,318	3,116	1,275	871	22,582	5,902,240
2018	95,092	1,170,988	675,524	96,261	28,936	7,630	3,175	1,115	968	34,506	7,175,799
2019	58,711	507,748	586,005	110,370	19,842	7,826	2,492	1,223	1,083	15,692	4,598,094
2020	76,361	518,590	343,176	131,829	29,689	8,451	2,113	911	572	14,888	4,099,834
2021	58,517	421,405	171,283	69,618	24,370	8,209	2,001	970	657	16,532	3,234,525

Table 14: Annual inshore and offshore commercial Red Drum catch-at-age compositions (proportion at age) and yield in pounds used as inputs of the ASAP base model.

Commercial Inshore											
Year	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	Yield (lbs)
1982	0.000	0.171	0.549	0.222	0.050	0.004	0.000	0.000	0.000	0.003	1,278,130
1983	0.000	0.171	0.549	0.222	0.050	0.004	0.000	0.000	0.000	0.003	1,761,350
1984	0.000	0.171	0.549	0.222	0.050	0.004	0.000	0.000	0.000	0.003	2,247,680
1985	0.000	0.171	0.549	0.222	0.050	0.004	0.000	0.000	0.000	0.003	2,229,310
1986	0.000	0.171	0.549	0.222	0.050	0.004	0.000	0.000	0.000	0.003	4,465,900
1987	0.000	0.171	0.549	0.222	0.050	0.004	0.000	0.000	0.000	0.003	4,528,900
1988	0.000	0.171	0.549	0.222	0.050	0.004	0.000	0.000	0.000	0.003	243,590
1989	0.000	0.171	0.549	0.222	0.050	0.004	0.000	0.000	0.000	0.003	24,810
1990	0.000	0.171	0.549	0.222	0.050	0.004	0.000	0.000	0.000	0.003	2,410
1991	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
1992	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
1993	0.000	0.171	0.549	0.222	0.050	0.004	0.000	0.000	0.000	0.003	1,880
1994	0.000	0.171	0.549	0.222	0.050	0.004	0.000	0.000	0.000	0.003	2,960
1995	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
1996	0.000	0.171	0.549	0.222	0.050	0.004	0.000	0.000	0.000	0.003	1,930
1997	0.000	0.171	0.549	0.222	0.050	0.004	0.000	0.000	0.000	0.003	2,200
1998	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
1999	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2000	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2001	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2002	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2003	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2004	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2005	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2006	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2007	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2008	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2009	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2010	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2011	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2012	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2013	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2014	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2015	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2016	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2017	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2018	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2019	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2020	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2021	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0

Commercial Offshore											
Year	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+	Yield (lbs)
1982	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	492,110
1983	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	728,450
1984	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1,347,900
1985	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	3,777,810
1986	0.000	0.012	0.049	0.058	0.039	0.048	0.055	0.051	0.027	0.662	9,259,810
1987	0.000	0.010	0.038	0.041	0.053	0.045	0.033	0.049	0.057	0.674	134,530
1988	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	5,440
1989	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
1990	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
1991	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
1992	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
1993	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
1994	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
1995	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
1996	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
1997	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
1998	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
1999	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2000	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2001	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2002	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2003	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2004	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2005	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2006	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2007	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2008	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2009	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2010	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2011	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2012	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2013	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2014	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2015	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2016	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2017	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2018	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2019	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2020	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
2021	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0

Table 15: Annual mean weights-at-age in pounds of recreational and commercial inshore and commercial offshore Red Drum landings used as inputs in the ASAP base model.

Recreational										
Year	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+
1982	0.59	1.74	3.54	5.18	6.32	8.67	11.51	11.75	11.84	11.92
1983	0.85	1.47	3.25	7.23	9.38	10.58	10.90	10.93	10.95	11.18
1984	0.91	1.55	3.81	5.77	7.64	11.31	12.56	14.39	17.12	21.80
1985	0.80	1.68	3.22	6.16	8.02	10.13	13.15	15.11	16.49	18.62
1986	0.75	1.67	3.42	6.01	7.95	10.83	11.92	12.49	13.87	22.05
1987	0.92	1.54	3.20	5.29	7.61	12.34	14.60	15.71	17.36	21.63
1988	0.97	1.85	3.47	5.26	7.94	10.82	12.41	16.60	21.23	26.15
1989	0.99	2.40	3.97	6.19	8.43	11.26	13.28	15.02	16.29	18.53
1990	1.20	2.29	4.06	5.54	7.46	11.02	13.64	17.28	19.28	21.30
1991	1.02	2.23	4.42	6.48	7.98	10.07	11.99	13.81	15.67	18.46
1992	0.91	2.09	3.37	5.96	7.86	9.69	12.55	15.64	17.98	21.47
1993	0.86	2.24	3.94	5.50	7.93	10.65	12.83	14.63	16.48	23.10
1994	0.87	2.31	3.98	5.64	7.45	10.61	12.99	14.81	16.91	23.13
1995	1.07	2.33	4.07	6.00	7.78	10.46	12.53	14.59	16.54	20.83
1996	0.93	2.36	3.92	5.61	7.52	9.99	12.72	14.68	17.00	22.13
1997	0.83	2.28	4.46	6.31	8.07	10.48	12.71	15.20	17.73	22.55
1998	0.92	2.11	3.98	6.13	7.95	10.95	13.48	15.49	17.23	21.33
1999	0.94	2.26	3.92	6.04	8.39	10.77	12.47	14.14	16.01	20.79
2000	0.95	2.34	4.11	6.12	8.03	10.34	12.23	13.54	15.58	23.22
2001	0.90	2.29	3.92	5.76	8.20	10.32	12.53	14.57	16.44	20.91
2002	1.32	2.42	4.01	5.98	8.24	10.16	12.96	15.29	17.74	21.77
2003	1.32	2.45	4.27	6.23	8.84	10.74	12.38	14.26	16.54	21.69
2004	1.17	2.28	4.27	6.14	7.63	11.42	14.32	16.79	18.30	20.70
2005	1.44	2.44	4.72	6.91	8.41	9.41	12.52	15.50	17.68	21.05
2006	1.12	2.83	5.72	6.84	9.37	10.59	12.93	16.44	18.35	20.83
2007	0.99	2.32	4.98	7.31	9.31	11.17	11.54	14.20	15.84	19.16
2008	1.00	2.26	4.15	6.97	8.32	11.37	13.01	14.82	12.02	19.45
2009	1.05	2.26	4.30	6.32	8.96	11.38	12.59	13.89	15.29	18.32
2010	0.72	2.14	4.18	6.09	7.70	10.45	13.32	15.47	16.81	18.74
2011	0.83	2.27	4.54	6.72	8.72	11.18	12.92	13.52	14.37	17.94
2012	0.91	2.31	4.14	6.95	9.13	10.77	12.94	15.36	17.49	20.98
2013	0.93	2.08	4.51	6.39	8.65	10.90	13.03	14.50	15.75	18.70
2014	0.99	2.41	4.02	6.77	8.03	10.96	12.40	14.50	15.96	19.27
2015	0.84	2.02	4.16	6.26	8.79	10.63	11.57	14.26	15.66	19.36
2016	1.04	2.38	4.18	6.60	7.98	10.63	13.01	10.76	15.47	18.90
2017	0.88	2.29	5.02	7.17	8.14	10.66	11.69	13.97	15.35	18.68
2018	0.85	2.04	4.33	7.03	9.10	10.12	11.15	15.81	17.39	20.14
2019	0.86	1.95	3.89	6.27	9.05	10.88	12.69	13.63	12.49	16.70
2020	1.14	2.25	3.97	6.09	8.71	10.66	12.11	13.28	14.83	19.10
2021	1.40	2.70	5.06	7.02	8.89	10.28	12.67	13.93	15.13	18.65

Commercial Inshore										
Year	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+
1982	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1983	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1984	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1985	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1986	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1987	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1988	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1989	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1990	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1991	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1992	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1993	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1994	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1995	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1996	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1997	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1998	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
1999	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2000	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2001	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2002	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2003	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2004	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2005	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2006	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2007	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2008	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2009	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2010	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2011	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2012	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2013	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2014	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2015	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2016	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2017	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2018	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2019	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2020	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86
2021	0.49	2.15	3.38	5.12	6.69	8.36	11.10	15.67	17.69	18.86

Table 15 (continued):

Commercial Offshore										
Year	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+
1982	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1983	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1984	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1985	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1986	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1987	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1988	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1989	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1990	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1991	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1992	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1993	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1994	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1995	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1996	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1997	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1998	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
1999	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2000	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2001	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2002	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2003	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2004	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2005	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2006	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2007	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2008	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2009	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2010	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2011	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2012	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2013	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2014	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2015	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2016	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2017	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2018	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2019	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2020	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76
2021	3.86	4.30	9.16	11.30	12.53	13.93	15.37	16.46	17.25	18.76

Table 16: Annual Red Drum catch-at-size in total length inch bins from the LDWF fishery-independent marine trammel net survey.

Year	n	<10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40+
1985	21	0			14	1	1	2	1								1		1													0
1986	140	0		4	10	20	40	21	15	5	3	1	2	1	1	1	3	5	4	4												0
1987	208	1		12	48	47	46	32	12	2				2	4	1	1						1									0
1988	347	1	1	14	47	63	58	35	19	10	4	7	10	6	26	22	13	2	3	1	1	2										1
1989	318	0		11	21	27	18	23	5	5	13	24	36	31	37	28	20	8	2	6	1				1							0
1990	66	0				2	8	12	13	8	7	2		2	4	2	2	2	1			1										0
1991	578	1	3	84	172	155	87	37	13	7	1		1		2		3	4	3	2	2									1		1
1992	815	1	5	91	219	144	53	24	16	21	36	48	43	59	31	11	5	4	1	1	1											1
1993	840	0	1	47	157	147	84	41	15	20	41	49	45	31	27	42	44	16	16	8	6											3
1994	1605	0	34	380	481	337	112	12	4	9	30	38	24	34	29	27	15	12	13	3	3	3	5									0
1995	1551	2	3	68	171	233	146	64	58	95	119	113	92	51	40	51	68	66	18	32	14	23	12	5	4	1	1					0
1996	613	0	1	33	70	90	59	26	9	32	24	45	36	31	36	31	17	23	18	12	10	3	1	2	1	1	1			1		0
1997	541	4	2	35	103	104	56	24	3	10	13	9	22	14	23	18	23	18	18	15	12	7	4			2	1			1	1	1
1998	484	0		19	62	86	86	45	16	6	11	12	12	18	16	13	12	10	14	11	3	8	6	1		3	2		4	1	1	4
1999	710	0	1	30	93	107	126	72	51	18	12	10	21	21	25	32	17	9	8	16	12	11	7	4			2	1	1		1	0
2000	770	2	2	21	80	97	79	59	19	22	28	62	61	48	33	28	23	22	18	14	13	5	11	2	2	3	4	3	1		1	6
2001	525	0	2	36	68	70	25	9	9	16	28	42	40	29	35	21	13	25	15	13	6	5	2	4	1	4		5		1	1	0
2002	719	1	1	27	123	148	94	29	20	13	28	22	19	24	18	13	14	21	27	16	17	10	7	4	4	4	3	5	1	1	2	4
2003	839	1	10	154	191	83	26	4	1	17	30	28	20	28	21	22	26	21	27	35	21	10	15	9	11	6	5	3	4	4	5	3
2004	554	0		2	26	48	58	27	22	8	16	25	32	37	40	32	25	19	24	13	14	12	10	19	7	7	6	5	7	6	1	6
2005	537	0		13	58	81	65	32	21	10	13	17	26	18	14	24	14	20	10	14	14	13	7	11	5	9	6	5	3	2	4	6
2006	444	1	2	27	69	79	51	16	14	6	5	10	8	10	13	9	16	8	13	9	6	7	5	3	11	12	7	7	7	5	5	3
2007	456	5	7	30	65	57	17	28	10	9	11	15	22	17	15	8	5	9	3	9	10	10	6	12	11	10	15	13	10	8	1	8
2008	522	0	6	31	45	52	37	9	19	25	19	19	16	16	10	8	8	6	6	7	5	5	2	5	12	24	38	26	35	8	8	15
2009	976	0	15	132	159	151	26	27	12	4	16	32	26	16	34	43	39	24	30	40	24	26	18	8	7	11	8	8	10	7	12	10
2010	1485	5	9	97	125	119	64	32	35	35	26	63	58	81	49	37	35	36	59	53	48	34	25	21	18	23	39	65	76	66	26	24
2011	986	1	4	37	65	80	51	27	17	15	20	36	26	20	23	28	20	27	22	32	18	17	10	8	16	41	46	68	58	58	45	51
2012	1107	1	9	101	177	93	32	10	6	9	7	10	16	8	8	14	17	14	12	15	23	24	29	25	41	53	67	57	77	48	42	61
2013	757	2	5	54	67	53	24	13	25	26	54	45	38	34	27	26	40	20	26	21	21	26	11	7	7	12	10	8	21	11	8	16
2014	527	0	1	32	48	22	13	7	6	10	13	11	8	12	6	14	21	29	21	13	16	14	8	12	23	23	31	20	29	14	23	25
2015	422	0		4	21	24	3	6	3	1	4	2	2	2	4	3	3	10	12	13	26	13	14	16	15	22	23	43	42	27	28	36
2016	523	1	1	16	84	60	27	16	7	4	4	7	5	5	11	12	12	19	24	13	19	17	16	15	19	11	17	21	19	15	9	17
2017	962	1	7	128	221	116	80	24	24	18	20	29	15	15	16	8	19	14	19	8	7	11	8	10	25	10	21	29	18	15	11	15
2018	436	14	6	11	18	10	12	9	12	13	11	8	10	11	4	13	12	27	31	39	17	12	6	9	10	12	15	25	29	12	6	12
2019	387	0		8	22	20	15	21	12	13	11	9	7	8	5	7	8	18	16	12	13	14	13	21	6	18	27	20	15	11	7	10
2020	344	0		2	7	11	12	6	3	1		2	6	13	6	8	4	11	7	6	9	12	8	9	22	23	33	34	31	19	20	22
2021	254	0		1	3	1	2	2	2			3	5	2	2	4	2	2	4	7	18	26	19	16	24	18	13	22	14	13	12	17

Table 17: Annual Red Drum catch-at-size as total length in inches from the LDWF component of the SEAMAP nearshore bottom long line survey.

Year	n	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
2015	145					1	6	3	16	18	28	16	28	15	8	5			1						
2016	116				2			3	1	9	14	17	19	21	23	5	2								
2017	223			1		3	7	7	12	28	37	56	37	22	8	4					1				
2018	152						2	8	5	12	26	30	35	17	9	7	1								
2019	262		1	1		2	2	7	19	25	37	56	39	43	24	5			1						
2020	28			1		4		1		5	5	8	1	2	1										
2021	56								1	10	9	15	9	10	2										

Table 18: Probabilities of age given length used for age assignments of Red Drum catches from the LDWF fishery-independent marine trammel net survey.

TL_in	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+
8	0.18	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.92	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.83	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.67	0.32	0.01	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.43	0.55	0.02	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.21	0.75	0.05	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.08	0.84	0.09	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.02	0.83	0.15	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.01	0.76	0.23	0.01	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.64	0.33	0.02	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.50	0.45	0.05	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.35	0.55	0.10	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.22	0.60	0.18	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.12	0.59	0.28	0.02	0.00	0.00	0.00	0.00
27	0.00	0.00	0.06	0.51	0.38	0.04	0.00	0.00	0.00	0.00
28	0.00	0.00	0.03	0.40	0.46	0.11	0.00	0.00	0.00	0.00
29	0.00	0.00	0.01	0.28	0.49	0.21	0.01	0.00	0.00	0.00
30	0.00	0.00	0.00	0.17	0.45	0.32	0.04	0.01	0.00	0.01
31	0.00	0.00	0.00	0.09	0.33	0.37	0.11	0.03	0.01	0.07
32	0.00	0.00	0.00	0.03	0.18	0.30	0.17	0.06	0.03	0.23
33	0.00	0.00	0.00	0.01	0.07	0.15	0.16	0.08	0.04	0.48
34	0.00	0.00	0.00	0.00	0.02	0.06	0.10	0.07	0.05	0.69
35	0.00	0.00	0.00	0.00	0.01	0.02	0.05	0.05	0.04	0.83
36	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.90
37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.95
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.97
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.98
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99
41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

Table 19: Annual Red Drum survey age composition and sample sizes from the LDWF fishery-independent marine trammel net survey.

Year	n	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+
1985	21	0.000	0.809	0.107	0.055	0.027	0.002	0.000	0.000	0.000	0.000
1986	140	0.000	0.621	0.252	0.082	0.040	0.005	0.000	0.000	0.000	0.000
1987	208	0.000	0.801	0.171	0.021	0.004	0.002	0.001	0.000	0.000	0.000
1988	347	0.003	0.578	0.262	0.123	0.027	0.003	0.000	0.000	0.000	0.003
1989	318	0.000	0.288	0.416	0.240	0.048	0.004	0.001	0.000	0.000	0.002
1990	66	0.000	0.369	0.466	0.125	0.033	0.006	0.001	0.000	0.000	0.000
1991	578	0.000	0.861	0.109	0.016	0.008	0.001	0.000	0.000	0.000	0.003
1992	815	0.000	0.630	0.275	0.083	0.009	0.001	0.000	0.000	0.000	0.001
1993	840	0.000	0.531	0.284	0.140	0.037	0.004	0.000	0.000	0.000	0.004
1994	1605	0.000	0.802	0.131	0.050	0.014	0.003	0.000	0.000	0.000	0.000
1995	1551	0.000	0.434	0.343	0.147	0.053	0.014	0.003	0.001	0.000	0.004
1996	613	0.000	0.432	0.324	0.169	0.056	0.011	0.002	0.001	0.000	0.006
1997	541	0.000	0.557	0.201	0.144	0.068	0.017	0.002	0.001	0.000	0.010
1998	484	0.000	0.556	0.228	0.113	0.052	0.016	0.003	0.001	0.001	0.029
1999	710	0.000	0.562	0.248	0.111	0.049	0.017	0.003	0.001	0.001	0.009
2000	770	0.003	0.404	0.334	0.158	0.055	0.016	0.004	0.002	0.001	0.024
2001	525	0.000	0.390	0.328	0.179	0.062	0.015	0.004	0.002	0.001	0.021
2002	719	0.000	0.549	0.215	0.116	0.063	0.021	0.005	0.002	0.001	0.029
2003	839	0.000	0.541	0.174	0.129	0.075	0.028	0.008	0.003	0.002	0.042
2004	554	0.000	0.272	0.296	0.204	0.091	0.038	0.013	0.006	0.004	0.076
2005	537	0.000	0.431	0.239	0.140	0.073	0.031	0.010	0.005	0.003	0.067
2006	444	0.000	0.517	0.170	0.106	0.057	0.024	0.011	0.007	0.005	0.104
2007	456	0.007	0.425	0.206	0.099	0.055	0.033	0.016	0.009	0.006	0.144
2008	522	0.000	0.344	0.210	0.079	0.035	0.020	0.016	0.013	0.011	0.273
2009	976	0.000	0.496	0.165	0.143	0.083	0.031	0.008	0.004	0.003	0.068
2010	1485	0.001	0.295	0.208	0.144	0.084	0.034	0.012	0.008	0.007	0.207
2011	986	0.001	0.254	0.160	0.110	0.063	0.027	0.015	0.012	0.011	0.348
2012	1107	0.000	0.364	0.074	0.059	0.055	0.041	0.023	0.016	0.012	0.355
2013	757	0.000	0.294	0.289	0.170	0.085	0.033	0.009	0.005	0.004	0.111
2014	526	0.000	0.230	0.137	0.141	0.093	0.044	0.023	0.015	0.011	0.307
2015	422	0.000	0.129	0.051	0.085	0.100	0.062	0.029	0.019	0.016	0.508
2016	523	0.000	0.366	0.110	0.120	0.097	0.051	0.021	0.012	0.008	0.216
2017	962	0.000	0.573	0.153	0.069	0.037	0.019	0.010	0.007	0.005	0.128
2018	436	0.014	0.175	0.158	0.185	0.137	0.048	0.017	0.011	0.009	0.247
2019	387	0.000	0.214	0.169	0.130	0.105	0.060	0.027	0.016	0.011	0.267
2020	344	0.000	0.100	0.089	0.099	0.077	0.052	0.033	0.023	0.019	0.508
2021	254	0.000	0.034	0.054	0.098	0.149	0.119	0.051	0.027	0.019	0.449

Table 20: Annual Red Drum survey age composition and sample sizes from the LDWF component of the SEAMAP nearshore bottom long-line survey.

Year	n	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+
2015	145	0.000	0.000	0.000	0.007	0.022	0.034	0.032	0.028	0.026	0.851
2016	116	0.000	0.000	0.001	0.007	0.013	0.013	0.015	0.018	0.020	0.913
2017	223	0.000	0.000	0.001	0.010	0.023	0.030	0.028	0.027	0.026	0.855
2018	167	0.000	0.000	0.000	0.000	0.000	0.007	0.013	0.007	0.007	0.967
2019	293	0.000	0.000	0.000	0.008	0.011	0.000	0.011	0.015	0.004	0.951
2020	32	0.000	0.000	0.033	0.067	0.000	0.100	0.033	0.033	0.000	0.733
2021	60	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000

Table 21: Annual Red Drum age composition and sample sizes of the MARFIN dataset used to represent the NMFS mark-recapture estimates.

Year	n	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10+
1987	562	0.000	0.000	0.043	0.036	0.055	0.053	0.032	0.041	0.064	0.676
1997	556	0.000	0.002	0.004	0.043	0.070	0.113	0.160	0.018	0.020	0.570

Table 22: Summary of objective function components and likelihood values of the ASAP base model.

Objective function =12515.0			
Component	Lambda	ESS	Obj_fun
Catch_Fleet_Total	4		332.86
Index_Fit_Total	3		-22.76
Catch_Age_Comps		6450	8409.93
Index_Age_Comps		2859	3666.57
Sel_Params_Total	14		12.36
Index_Sel_Params_Total	8		5.36
q_dev (IOA NMFS)	1		-9.21
N_year1_dev	1		135.49
Recruit_devs	1		-15.61

Table 23: Annual Red Drum abundance-at-age and total stock size estimates from the ASAP base model.

Year	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Totals
1982	3,532,120	1,802,770	1,164,770	753,774	296,153	162,926	175,665	189,543	197,425	5,496,760	13,771,906
1983	3,759,580	1,932,190	956,761	617,822	512,868	239,506	140,848	155,268	168,726	5,099,880	13,583,449
1984	4,225,460	2,093,510	1,040,530	479,257	404,826	409,515	206,165	124,158	137,868	4,706,790	13,828,079
1985	4,086,860	2,532,130	1,237,790	500,493	302,284	318,879	350,383	180,731	109,593	4,300,810	13,919,953
1986	3,754,080	2,466,420	1,517,550	605,490	311,810	233,216	266,417	299,698	155,624	3,819,190	13,429,495
1987	3,603,440	2,339,060	1,418,060	443,688	264,428	206,972	179,995	213,733	242,712	3,238,720	12,150,808
1988	2,867,880	2,115,040	1,248,580	442,888	220,200	194,716	175,870	158,865	190,481	3,122,370	10,736,890
1989	1,656,690	1,999,830	1,513,310	913,497	355,738	187,576	170,539	156,124	141,834	2,976,430	10,071,568
1990	3,231,080	1,143,890	1,297,670	1,046,430	714,587	297,888	162,641	150,616	139,050	2,800,490	10,984,342
1991	6,926,780	2,235,640	759,270	918,744	828,944	601,952	259,020	143,846	134,248	2,640,860	15,449,304
1992	5,830,070	4,793,560	1,486,580	538,454	728,372	698,525	523,473	229,090	128,209	2,492,950	17,449,283
1993	6,048,970	4,043,300	3,260,820	1,076,650	431,643	617,206	609,168	463,669	204,357	2,355,570	19,111,353
1994	7,621,000	4,202,010	2,798,600	2,399,580	870,133	367,209	539,243	540,015	413,746	2,300,290	22,051,826
1995	5,622,630	5,302,660	2,958,850	2,092,240	1,955,060	743,156	321,417	478,427	482,040	2,438,290	22,394,770
1996	4,347,420	3,895,550	3,569,340	2,122,460	1,669,520	1,653,300	647,594	284,656	426,841	2,624,390	21,241,071
1997	5,601,000	3,011,210	2,614,520	2,553,480	1,691,430	1,411,010	1,440,390	573,501	253,972	2,742,500	21,893,013
1998	5,945,670	3,871,520	1,977,520	1,833,310	2,013,850	1,422,200	1,226,220	1,274,020	511,368	2,693,240	22,768,918
1999	5,328,200	4,121,920	2,623,140	1,427,220	1,467,900	1,706,110	1,240,590	1,086,670	1,137,160	2,880,850	23,019,760
2000	4,903,250	3,680,700	2,689,480	1,828,430	1,122,130	1,232,360	1,481,570	1,096,900	968,762	3,608,750	22,612,332
2001	4,318,560	3,366,630	2,252,320	1,767,130	1,394,580	928,235	1,062,680	1,305,730	976,493	4,111,300	21,483,658
2002	3,970,100	2,955,370	1,989,240	1,432,950	1,325,690	1,144,340	797,380	934,919	1,161,510	4,569,430	20,280,929
2003	3,634,800	2,721,440	1,777,300	1,286,270	1,083,930	1,092,180	984,863	702,095	831,930	5,146,860	19,261,668
2004	3,247,770	2,493,320	1,648,640	1,157,020	976,440	894,598	940,810	867,574	624,913	5,371,400	18,222,485
2005	5,195,980	2,225,530	1,494,020	1,062,510	873,784	803,851	769,685	828,307	772,010	5,387,680	19,413,357
2006	5,809,700	3,579,590	1,410,890	1,014,220	824,339	728,960	696,086	679,771	738,203	5,536,570	21,018,329
2007	4,399,330	4,015,020	2,346,150	987,620	799,415	693,047	633,572	615,836	606,304	5,641,040	20,737,334
2008	4,483,190	3,035,210	2,585,030	1,615,520	771,834	669,272	601,128	559,972	549,010	5,615,950	20,486,116
2009	5,221,960	3,086,620	1,911,640	1,744,280	1,249,420	642,888	579,091	530,690	498,947	5,541,520	21,007,056
2010	4,049,680	3,575,640	1,834,800	1,222,970	1,312,310	1,026,680	552,636	509,635	472,148	5,427,670	19,984,169
2011	3,624,130	2,748,330	1,934,410	1,076,230	879,753	1,054,910	873,270	483,917	452,348	5,298,510	18,425,808
2012	4,474,040	2,458,180	1,478,220	1,128,510	771,828	706,025	896,425	764,216	429,330	5,163,060	18,269,834
2013	2,583,240	3,050,170	1,395,380	906,323	830,497	627,360	603,698	786,870	679,041	5,023,210	16,485,789
2014	2,657,420	1,738,240	1,507,950	753,234	624,445	653,543	528,117	525,966	696,672	5,116,160	14,801,747
2015	2,698,430	1,795,100	895,285	845,326	529,229	496,155	552,737	461,160	466,190	5,217,030	13,956,642
2016	4,295,580	1,809,560	856,053	467,483	572,433	412,919	415,923	480,575	407,871	5,098,300	14,816,697
2017	3,735,150	2,905,790	946,069	486,523	330,747	456,340	349,754	363,417	426,043	4,942,480	14,942,313
2018	1,990,060	2,511,970	1,428,270	507,959	334,247	259,894	383,859	304,592	321,676	4,817,030	12,859,557
2019	1,446,350	1,319,560	1,063,300	668,170	324,919	253,568	214,918	331,547	268,525	4,606,100	10,496,957
2020	1,394,100	966,122	603,718	534,378	443,547	251,026	211,541	186,415	292,881	4,371,810	9,255,538
2021	1,693,560	923,801	406,188	280,667	340,697	335,934	207,415	182,636	164,304	4,180,800	8,716,002

Table 24: Annual age-specific, apical, and average (N-weighted) Red Drum fishing mortality rates along with the escapement rates (E) of juvenile fish and F rates of adults (%) estimated from the ASAP base model.

Year	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10	Apical F	Avg. F	Escape	F_adults
1982	0.254	0.428	0.477	0.251	0.090	0.031	0.013	0.008	0.007	0.006	0.646	0.180	22.8%	8.4%
1983	0.236	0.413	0.534	0.289	0.103	0.035	0.016	0.011	0.009	0.009	0.693	0.183	21.2%	10.0%
1984	0.163	0.320	0.575	0.327	0.117	0.041	0.022	0.017	0.015	0.015	0.691	0.163	23.0%	13.0%
1985	0.156	0.306	0.558	0.339	0.137	0.065	0.046	0.042	0.040	0.040	0.689	0.182	23.2%	23.4%
1986	0.124	0.347	1.073	0.694	0.288	0.144	0.110	0.103	0.101	0.101	1.228	0.295	8.6%	46.8%
1987	0.184	0.422	1.007	0.567	0.184	0.048	0.015	0.007	0.005	0.005	1.129	0.280	9.9%	11.8%
1988	0.012	0.129	0.155	0.085	0.038	0.018	0.009	0.005	0.004	0.003	0.167	0.052	66.4%	4.7%
1989	0.021	0.226	0.212	0.112	0.055	0.028	0.014	0.008	0.005	0.003	0.231	0.094	54.2%	6.9%
1990	0.019	0.204	0.188	0.099	0.050	0.025	0.013	0.007	0.004	0.003	0.206	0.064	57.8%	6.2%
1991	0.019	0.202	0.187	0.098	0.049	0.025	0.013	0.007	0.004	0.003	0.204	0.057	58.1%	6.2%
1992	0.017	0.179	0.166	0.087	0.044	0.022	0.011	0.006	0.004	0.003	0.181	0.075	61.8%	5.5%
1993	0.015	0.162	0.150	0.079	0.040	0.020	0.010	0.006	0.004	0.003	0.164	0.071	64.7%	5.1%
1994	0.014	0.145	0.134	0.071	0.036	0.018	0.010	0.006	0.004	0.003	0.147	0.059	67.7%	4.8%
1995	0.018	0.190	0.175	0.092	0.046	0.023	0.011	0.006	0.004	0.002	0.191	0.087	60.1%	5.6%
1996	0.018	0.193	0.178	0.093	0.046	0.023	0.012	0.006	0.003	0.002	0.194	0.084	59.7%	5.6%
1997	0.020	0.214	0.198	0.103	0.051	0.025	0.013	0.007	0.004	0.002	0.216	0.077	56.3%	6.2%
1998	0.017	0.183	0.169	0.088	0.044	0.022	0.011	0.006	0.003	0.002	0.184	0.064	61.2%	5.3%
1999	0.021	0.221	0.204	0.107	0.053	0.026	0.013	0.007	0.004	0.002	0.222	0.081	55.3%	6.4%
2000	0.027	0.285	0.263	0.137	0.068	0.033	0.016	0.008	0.004	0.003	0.286	0.102	46.6%	7.8%
2001	0.030	0.320	0.295	0.153	0.076	0.037	0.018	0.009	0.005	0.003	0.321	0.109	42.5%	8.6%
2002	0.029	0.303	0.279	0.145	0.072	0.035	0.017	0.009	0.005	0.003	0.303	0.096	44.5%	8.3%
2003	0.028	0.295	0.272	0.142	0.070	0.034	0.017	0.008	0.004	0.003	0.296	0.089	45.4%	8.1%
2004	0.029	0.306	0.282	0.147	0.072	0.035	0.017	0.009	0.005	0.003	0.307	0.090	44.1%	8.3%
2005	0.024	0.250	0.230	0.120	0.059	0.029	0.014	0.007	0.004	0.002	0.251	0.065	51.3%	6.9%
2006	0.020	0.216	0.200	0.104	0.051	0.025	0.012	0.006	0.003	0.002	0.217	0.065	56.0%	6.1%
2007	0.022	0.234	0.216	0.113	0.056	0.027	0.013	0.007	0.004	0.002	0.235	0.084	53.4%	6.5%
2008	0.024	0.256	0.236	0.123	0.061	0.030	0.015	0.007	0.004	0.002	0.257	0.087	50.4%	7.1%
2009	0.030	0.314	0.290	0.151	0.074	0.036	0.018	0.009	0.005	0.003	0.315	0.099	43.2%	8.5%
2010	0.039	0.408	0.376	0.195	0.096	0.047	0.023	0.011	0.006	0.003	0.409	0.138	33.6%	10.8%
2011	0.039	0.414	0.382	0.198	0.098	0.048	0.023	0.012	0.006	0.003	0.415	0.131	33.0%	11.0%
2012	0.034	0.360	0.332	0.173	0.085	0.042	0.020	0.010	0.005	0.003	0.361	0.102	38.2%	9.7%
2013	0.047	0.498	0.460	0.239	0.118	0.057	0.028	0.014	0.007	0.004	0.499	0.163	26.4%	13.0%
2014	0.043	0.457	0.422	0.219	0.108	0.053	0.026	0.013	0.006	0.004	0.458	0.125	29.4%	12.0%
2015	0.051	0.534	0.493	0.256	0.126	0.061	0.030	0.015	0.008	0.004	0.536	0.136	24.0%	13.9%
2016	0.042	0.443	0.408	0.212	0.105	0.051	0.025	0.012	0.006	0.004	0.444	0.104	30.6%	11.7%
2017	0.048	0.504	0.465	0.241	0.119	0.058	0.028	0.014	0.007	0.004	0.505	0.154	26.0%	13.2%
2018	0.062	0.654	0.603	0.313	0.154	0.075	0.037	0.018	0.009	0.005	0.655	0.226	17.4%	16.7%
2019	0.055	0.576	0.531	0.276	0.136	0.066	0.032	0.016	0.008	0.005	0.577	0.160	21.5%	14.9%
2020	0.063	0.660	0.609	0.316	0.156	0.076	0.037	0.018	0.009	0.005	0.662	0.150	17.1%	16.8%
2021	0.053	0.562	0.519	0.270	0.133	0.065	0.032	0.016	0.008	0.005	0.564	0.114	22.2%	14.7%

Table 25: Limit reference point estimates for the Louisiana Red Drum stock. Spawning stock fecundity units are trillions of eggs. Fishing mortality and escapement rate (E) units are per year.

Management Benchmarks		
Parameters	Derivation	Value
SPR_{limit}	GMFMC Amendment 2	20.0%
SSB_{limit}	Equation [24] and SPR_{limit}	26.8
F_{limit}	Equation [24] and SPR_{limit}	0.212
E_{limit}	GMFMC Amendment 2 and ACT 889 of the 1988 Regular Legislative Session	30.0%

Table 26: Sensitivity analysis table of proposed limit reference points. Current estimates are taken as the geometric mean of the 2019-2021 estimates. Yield units are millions of pounds, spawning stock fecundity units are trillions of eggs (with the exception of Model 10 where SSB units are millions of pounds), and fishing mortality and escapement rate units are per year.

Model run	negLL	SPR_{limit}	$Yield_{limit}$	F_{limit}	E_{limit}	SSB_{limit}	$SPR_{current}$	$SSB_{current}$	$F_{current}$	$E_{current}$	$F_{current}/F_{limit}$	$1/(E_{current}/E_{limit})$	$SSB_{current}/SSB_{limit}$
Base Model (h=1)	12515.0	20.0%	6.11	0.212	30.0%	26.8	40.1%	53.7	0.140	20.1%	0.661	1.49	2.00
Model 1 (h=0.9)	12515.5	20.0%	5.62	0.212	30.0%	24.6	39.9%	53.1	0.141	19.9%	0.668	1.51	2.16
Model 2 (h=0.8)	12516.1	20.0%	4.91	0.211	30.0%	21.5	40.0%	52.6	0.142	19.7%	0.674	1.52	2.45
Model 3 (h=0.7)	12517.0	20.0%	3.76	0.211	30.0%	16.4	40.1%	51.9	0.144	19.3%	0.684	1.55	3.16
Model 4 (Yield lambdas*10)	13283.8	20.0%	4.10	0.203	30.0%	17.3	24.7%	21.4	0.289	7.79%	1.42	3.85	1.24
Model 5 (IOA lambdas*10)	12262.0	20.0%	6.83	0.217	30.0%	30.5	51.3%	78.1	0.0861	37.6%	0.397	0.799	2.56
Model 6 (Input ESS/2)	6305.3	20.0%	5.97	0.209	30.0%	25.9	37.7%	48.8	0.137	24.1%	0.655	1.24	1.88
Model 7 (Discard M=0.08)	12577.2	20.0%	6.23	0.216	30.0%	28.0	43.0%	60.2	0.134	20.6%	0.620	1.46	2.15
Model 8 (Rec. Growth ALK only)	8415.2	20.0%	6.43	0.212	30.0%	29.9	51.5%	76.9	0.103	24.4%	0.485	1.23	2.57
Model 9 (LA comm. offshore yield only)	12449.9	20.0%	6.09	0.212	30.0%	26.6	39.9%	53.1	0.141	20.0%	0.666	1.50	1.99
Model 10 (SSB)	12515.0	20.0%	6.14	0.217	30.0%	26.9	36.3%	48.9	0.140	20.1%	0.645	1.49	1.82
Model 11 (Without NOAA N estimates)	11959.6	20.0%	4.87	0.183	30.0%	18.9	13.9%	13.1	0.312	9.05%	1.70	3.32	0.695
Model 12 (Without 1997 NOAA N estimate)	12198.3	20.0%	6.17	0.212	30.0%	27.1	41.4%	56.0	0.135	21.0%	0.636	1.43	2.07
Model 13 (Base M up 20%)	12551.4	20.0%	6.35	0.219	30.0%	20.8	41.0%	42.7	0.155	20.6%	0.707	1.46	2.05
Model 14 (Base M down 20%)	12476.1	20.0%	5.91	0.198	30.0%	36.3	38.3%	69.5	0.121	20.0%	0.614	1.50	1.92

Table 27: Sensitivity analysis table of MSY related reference points. Current estimates are taken as the geometric mean of 2019-2021 estimates. Yield units are millions of pounds, spawning stock fecundity units are trillions of eggs, and fishing mortality and escapement rate units are per year.

Model run	negLL	SPR_{MSY}	MSY	F_{MSY}	E_{MSY}	SSB_{MSY}	$SPR_{current}$	$SSB_{current}$	$F_{current}$	$E_{current}$	$F_{current}/F_{MSY}$	$1/(E_{current}/E_{MSY})$	$SSB_{current}/SSB_{MSY}$
Base Model (h=1)	12515.0	--	--	--	--	--	40.1%	53.7	0.140	20.1%	--	--	--
Model 1 (h=0.9)	12515.5	20.5%	5.62	0.208	24.0%	25.3	39.9%	53.1	0.141	19.9%	0.680	1.20	2.10
Model 2 (h=0.8)	12516.1	28.1%	5.16	0.156	31.9%	34.1	40.0%	52.6	0.142	19.7%	0.912	1.62	1.55
Model 3 (h=0.7)	12517.0	35.2%	4.83	0.122	39.1%	43.3	40.1%	51.9	0.144	19.3%	1.19	2.02	1.20

11. Figures

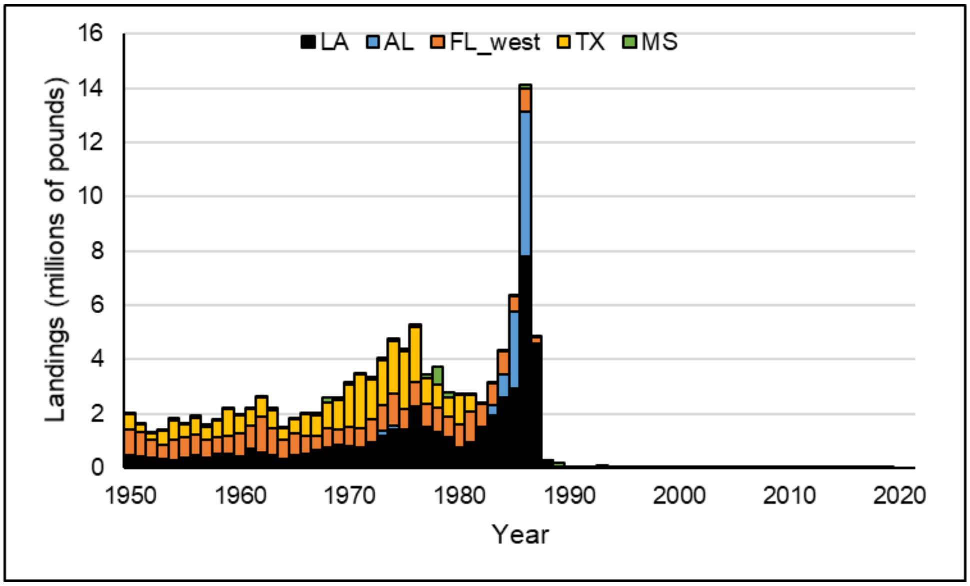


Figure 1: Commercial landings of Red Drum in the Gulf of Mexico by state, 1950-2021.

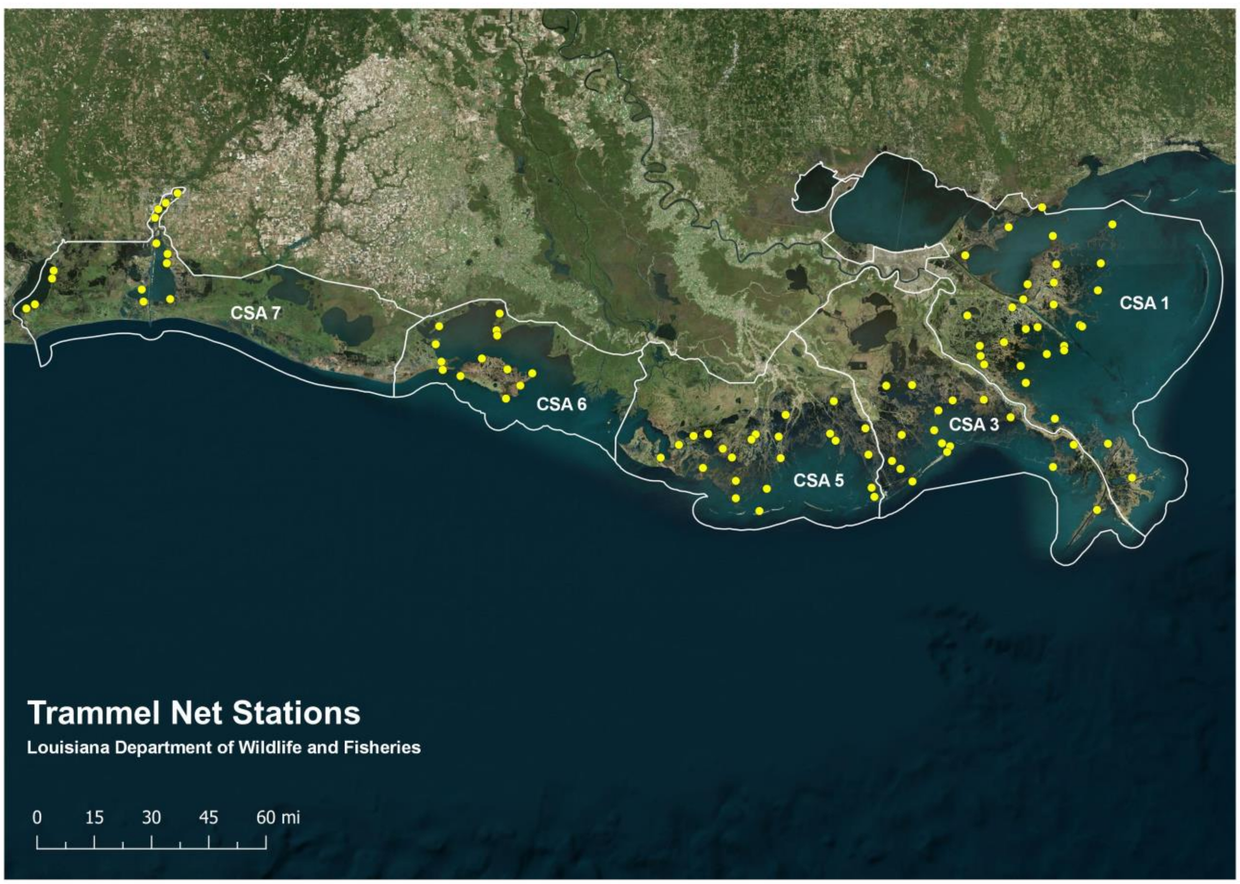


Figure 2: Station locations of the LDWF trammel net survey. Yellow lines delineate LDWF Coastal Study Areas and state/federal waters.

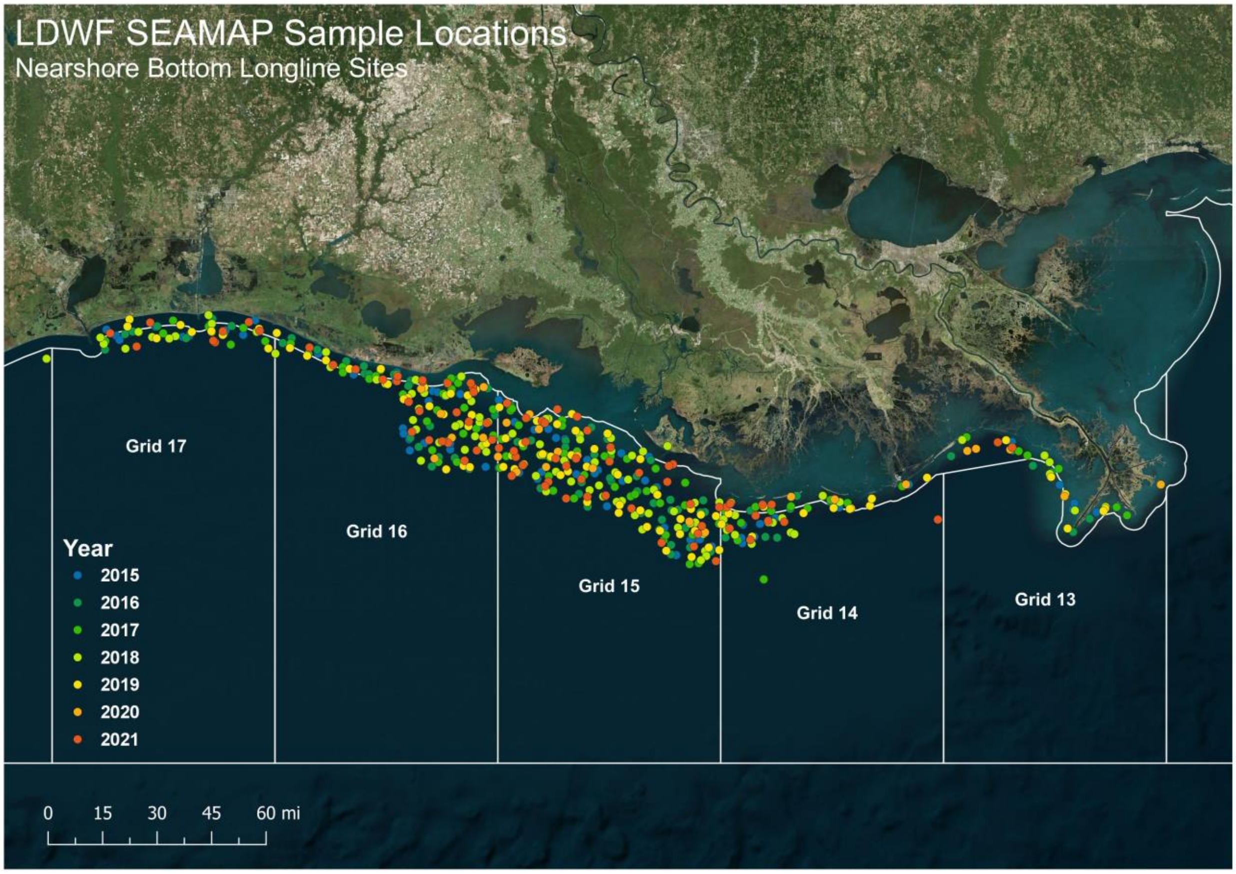


Figure 3: Sample locations of the LDWF SEAMAP bottom long line survey. White lines delineate state/federal waters and the NOAA Fisheries statistical grids.

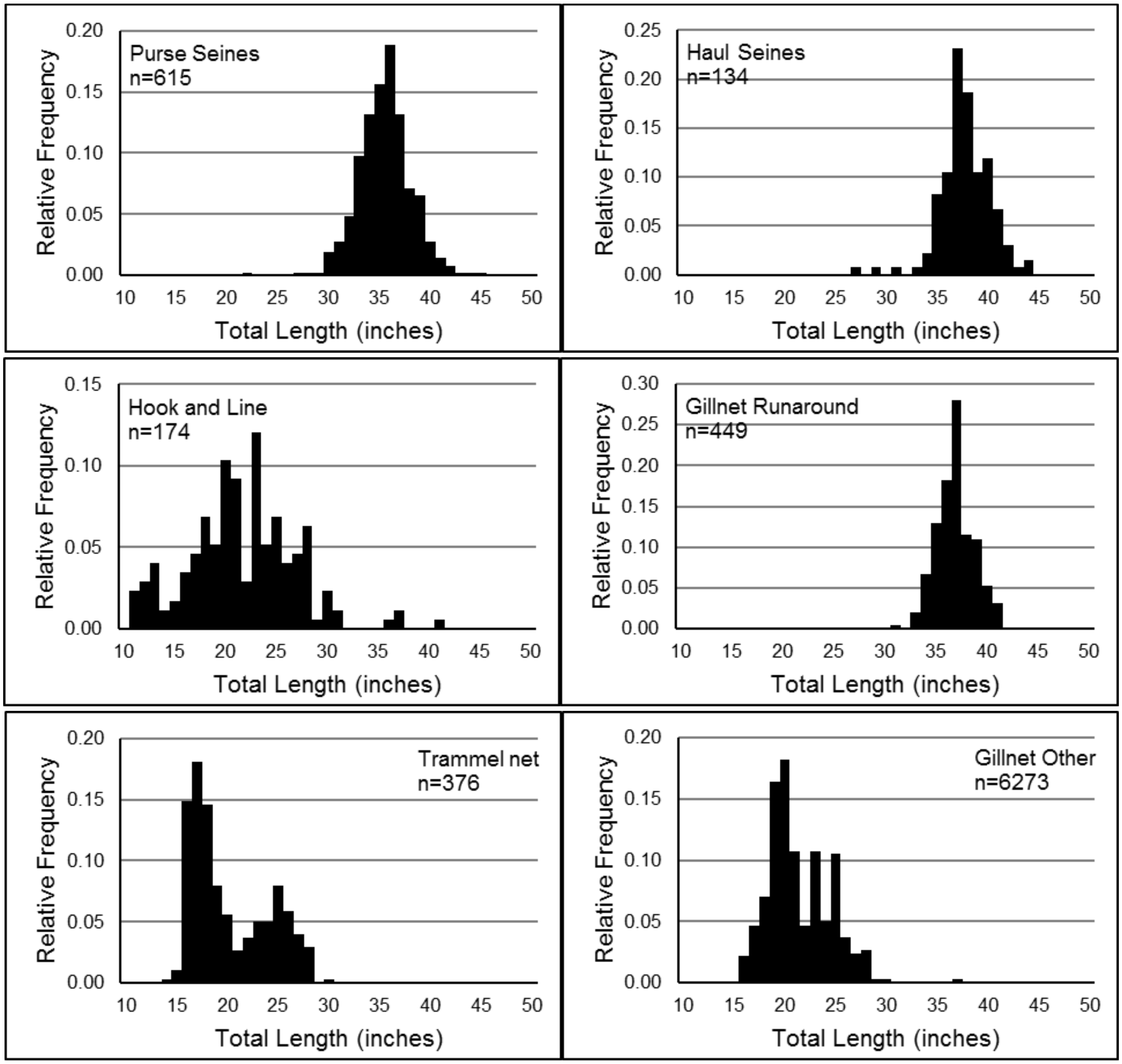


Figure 4: Length frequencies of Louisiana commercial Red Drum landings (1985-1987).

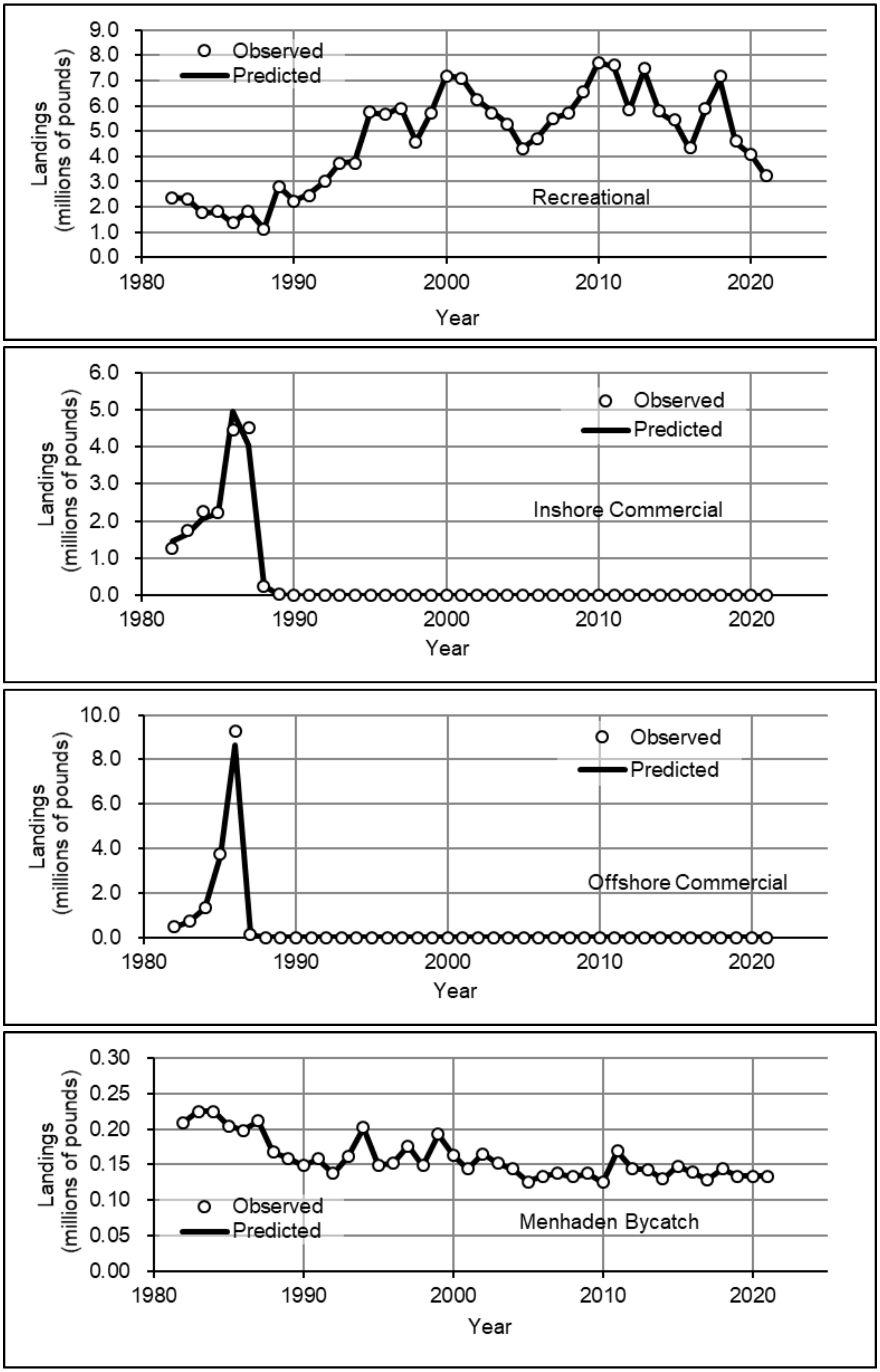


Figure 5: Observed and ASAP base model estimated Red Drum yield (top to bottom: recreational, inshore commercial, offshore commercial, menhaden reduction fishery dead bycatch).

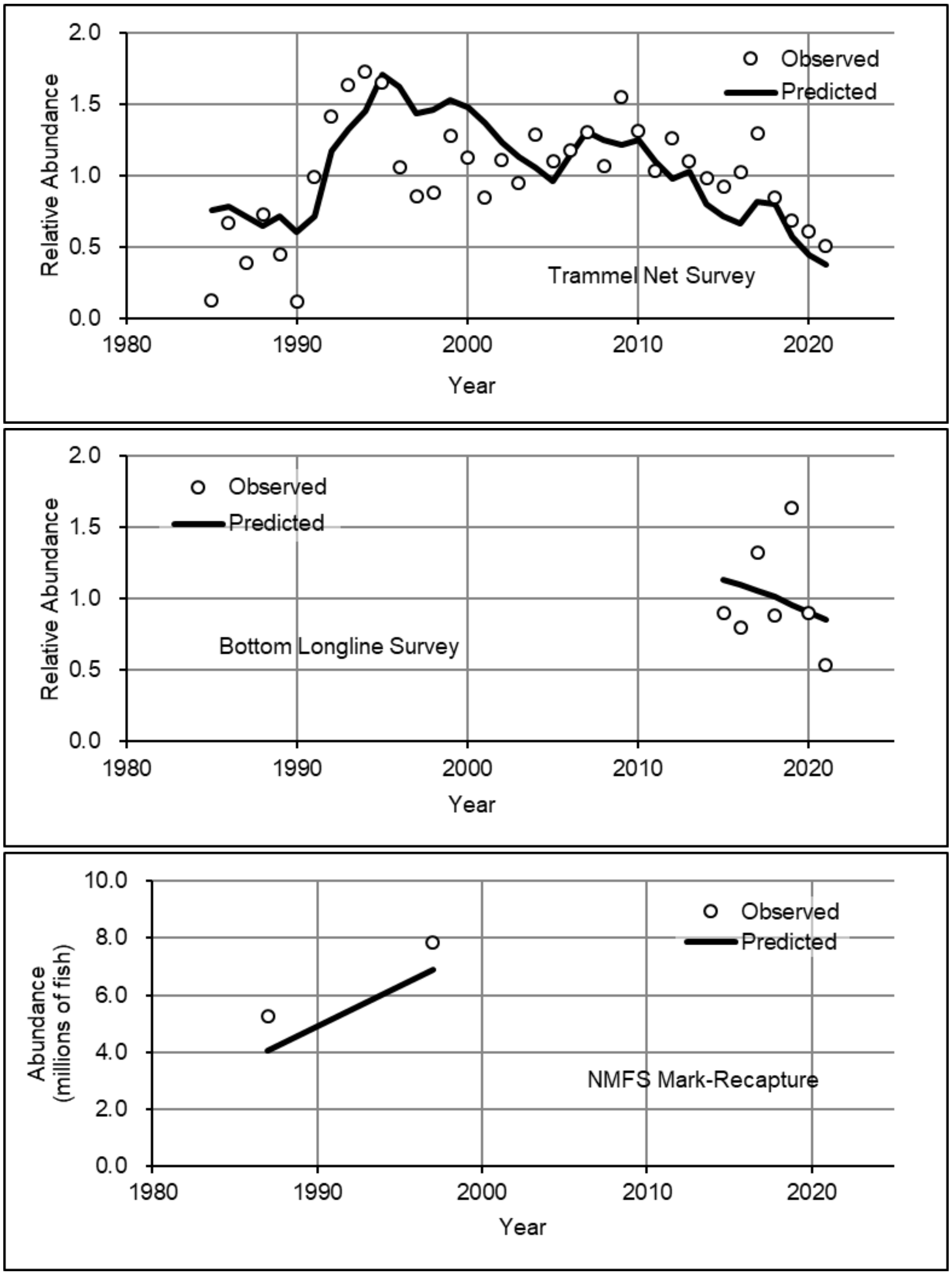


Figure 6: Observed and ASAP base model estimated abundance estimates (top to bottom: LDWF trammel net survey, SEAMAP nearshore bottom long-line survey, and NOAA Fisheries mark-recapture estimates).

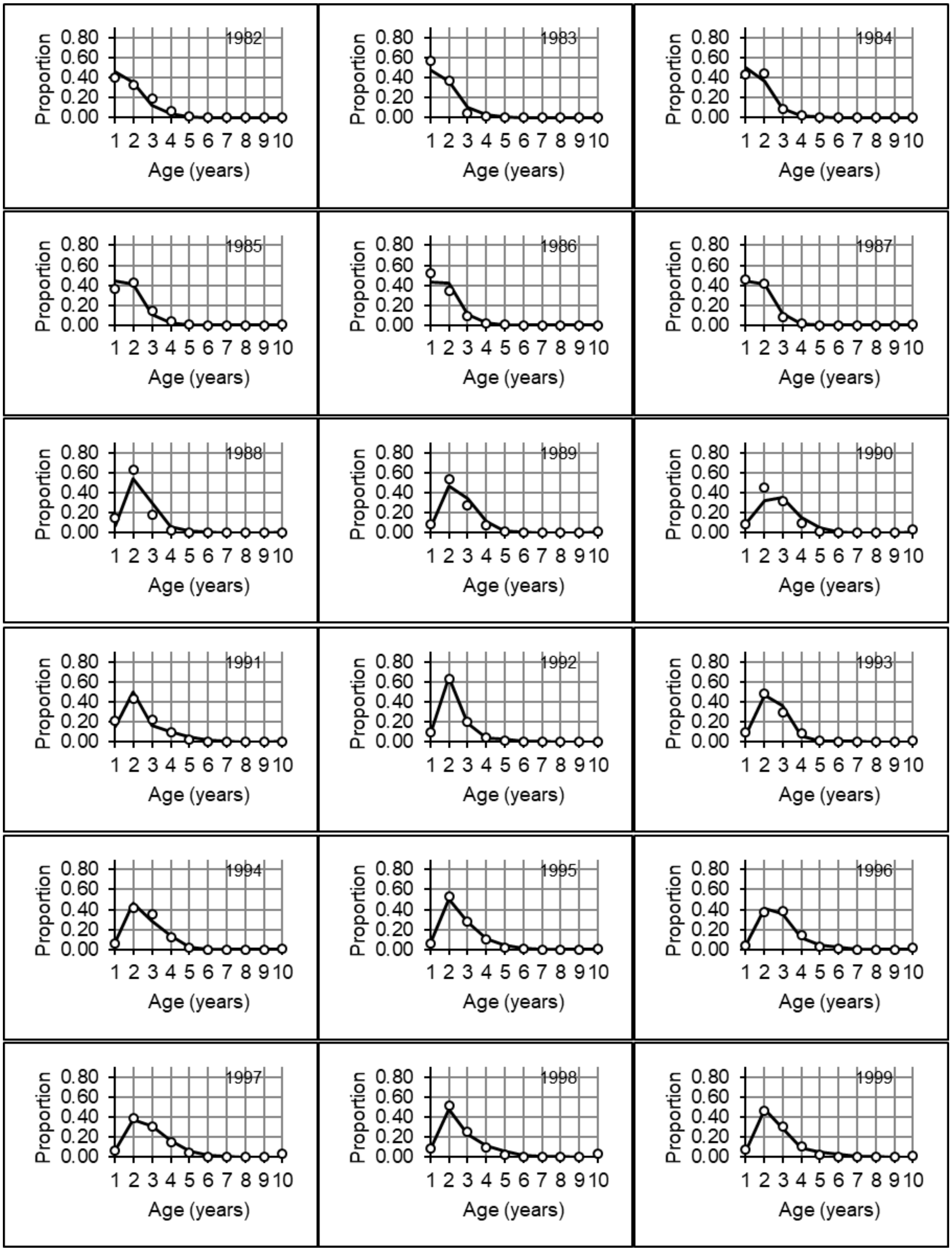


Figure 7: Annual input (open circles) and ASAP estimated (bold lines) recreational Red Drum landings age compositions.

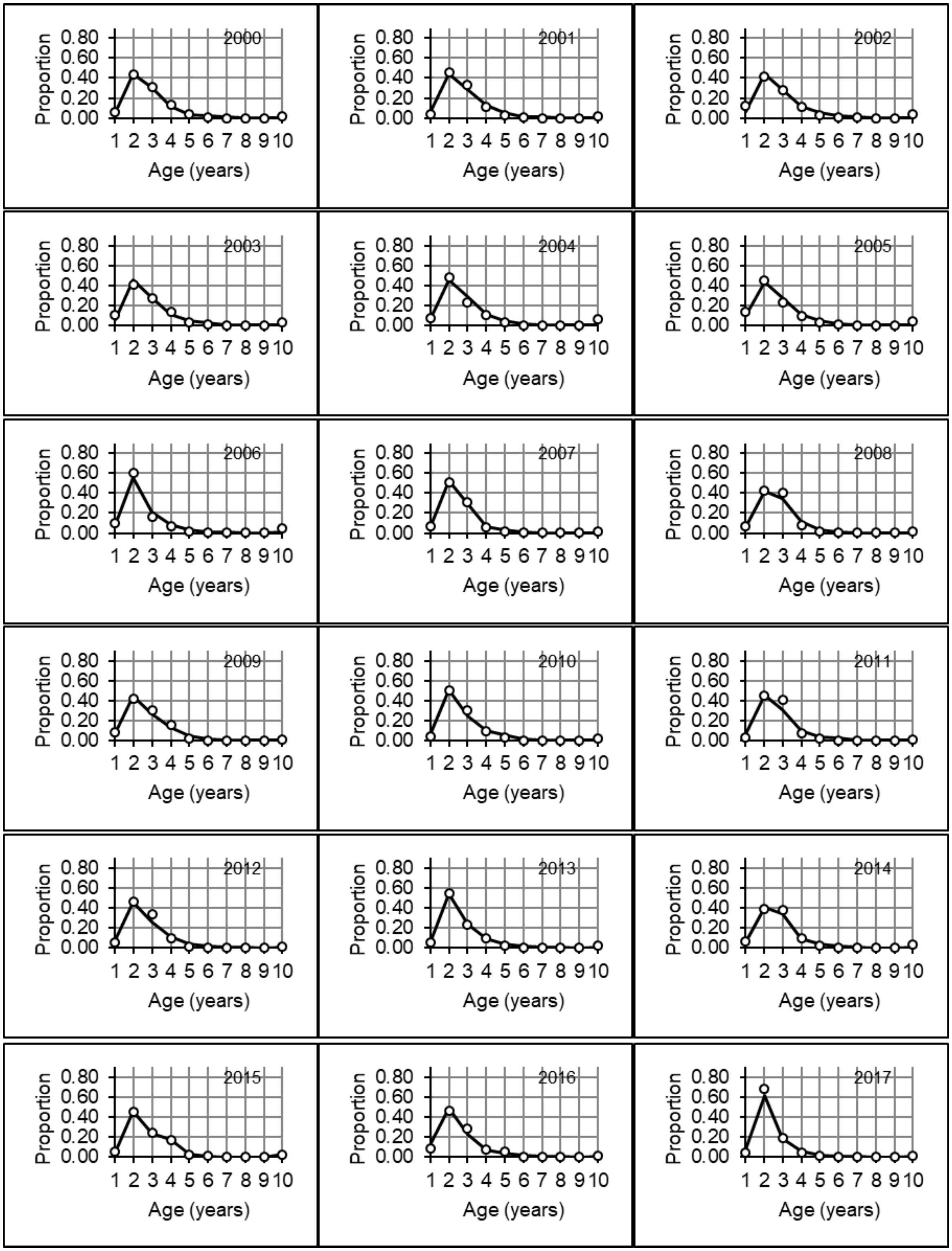


Figure 7 (continued):

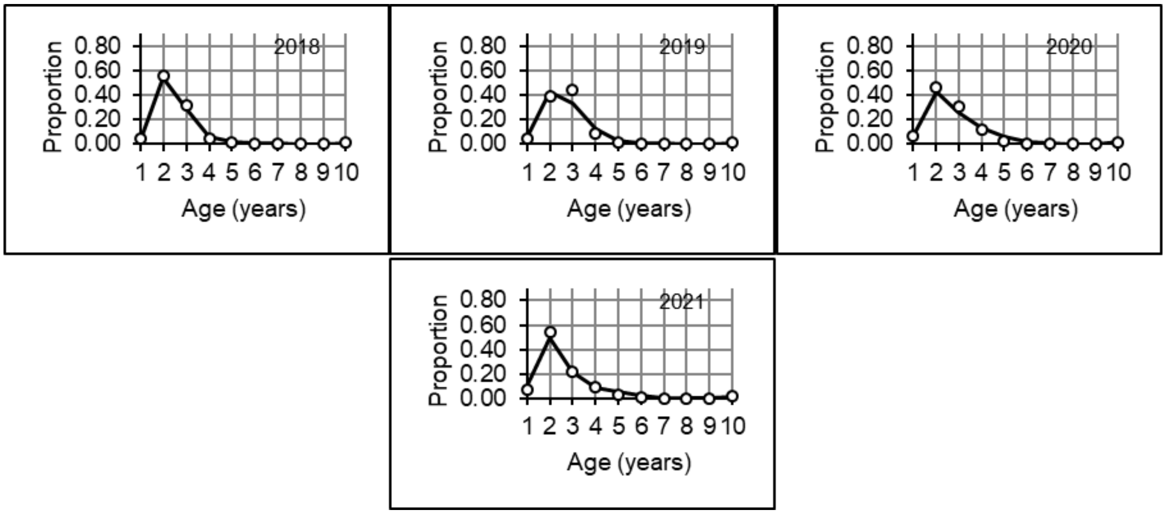


Figure 7 (continued):

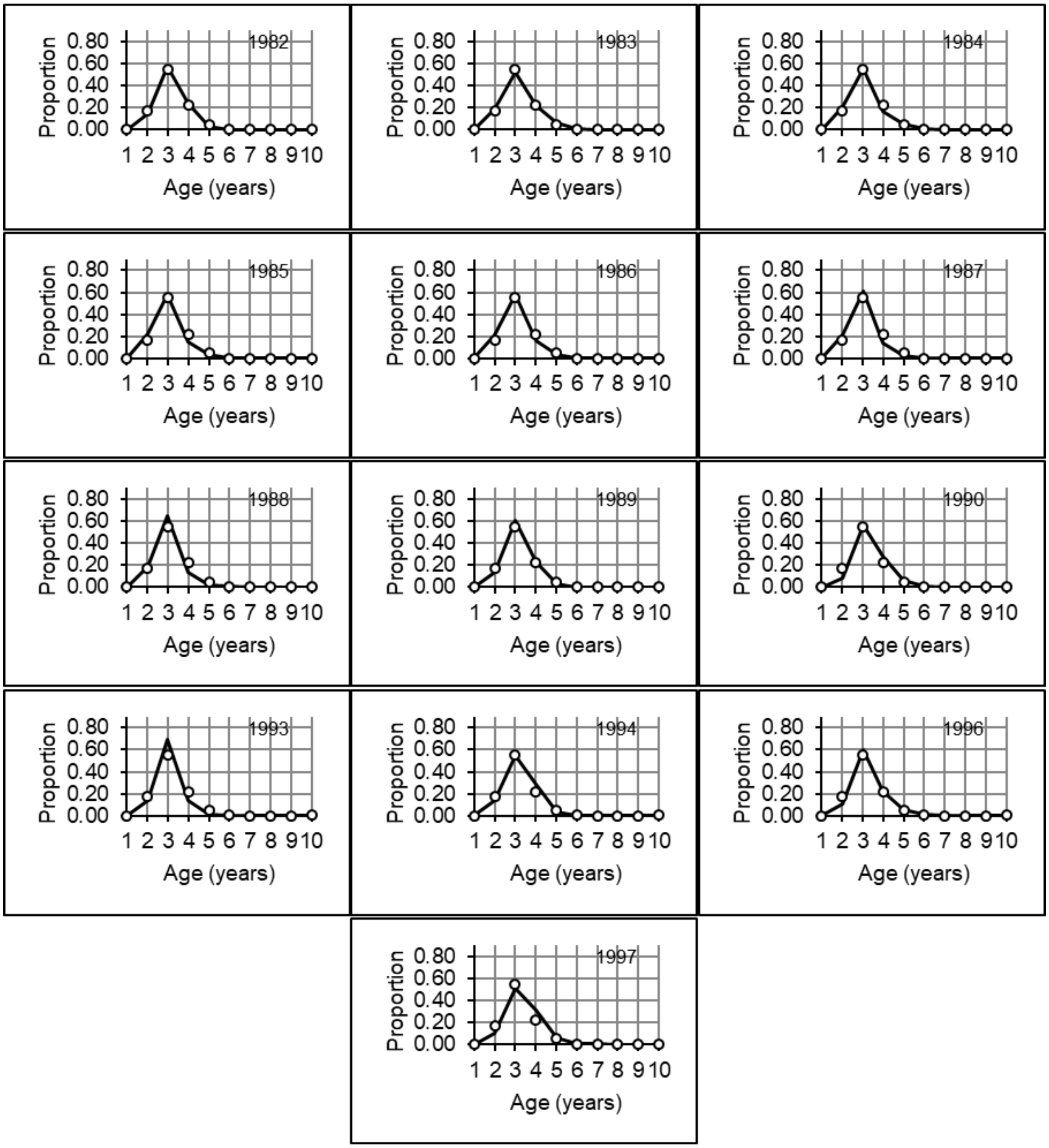


Figure 8: Annual input (open circles) and ASAP estimated (bold lines) inshore commercial Red Drum landings age compositions.

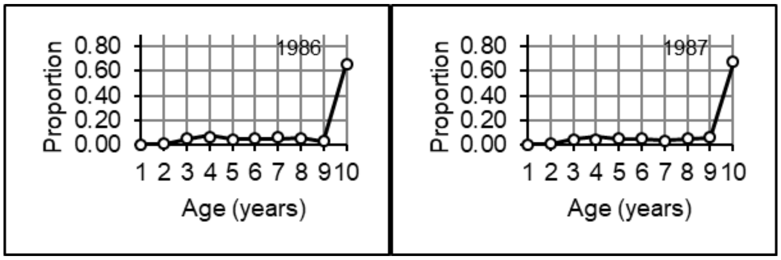


Figure 9: Annual input (open circles) and ASAP estimated (bold lines) offshore commercial Red Drum landings age compositions.

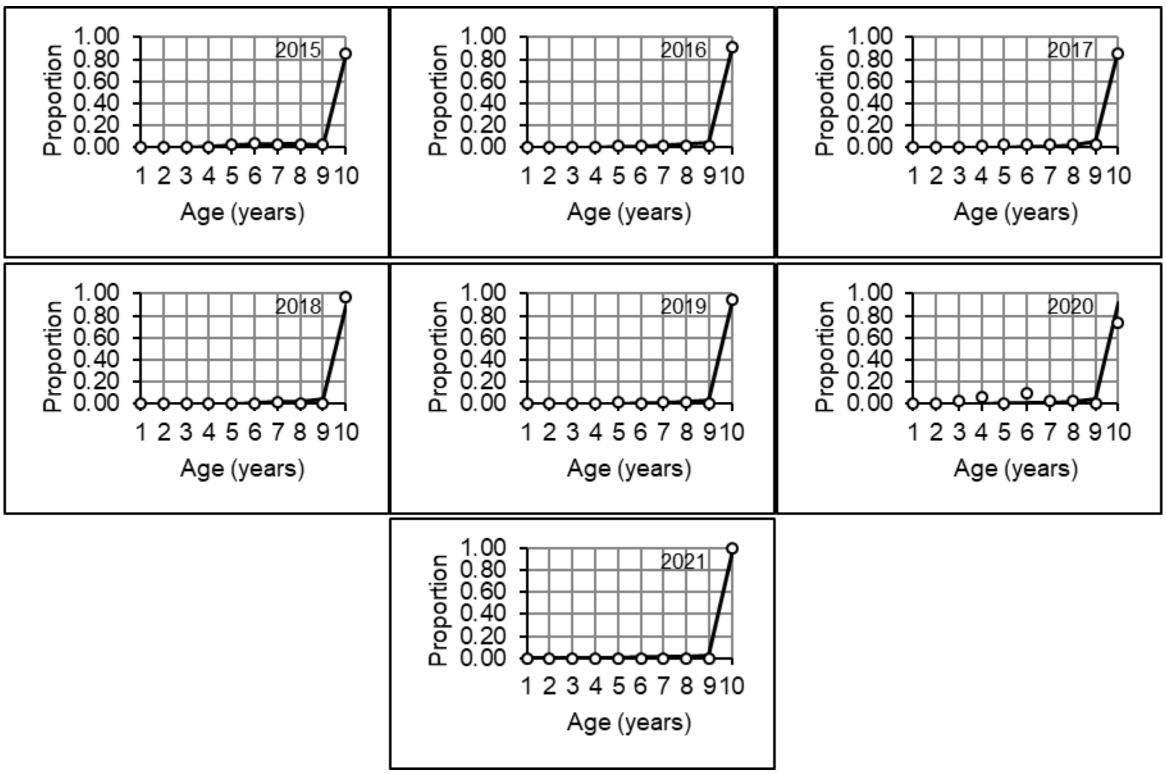


Figure 10: Annual input (open circles) and ASAP estimated (bold lines) age compositions of Red Drum catches of the LDWF component of the SEAMAP nearshore bottom long line survey.

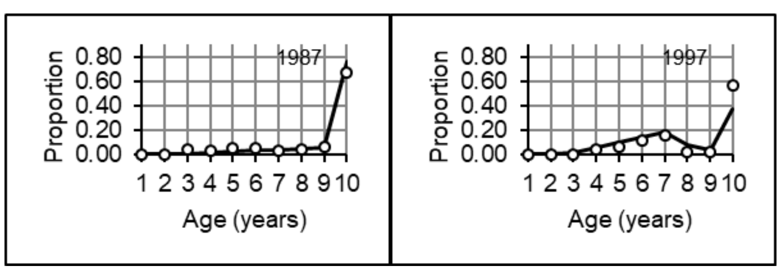


Figure 11: Annual input (open circles) and ASAP estimated (bold lines) age compositions of Red Drum catches from the MARFIN dataset used to represent the age composition of the NOAA Fisheries mark-recapture estimates.

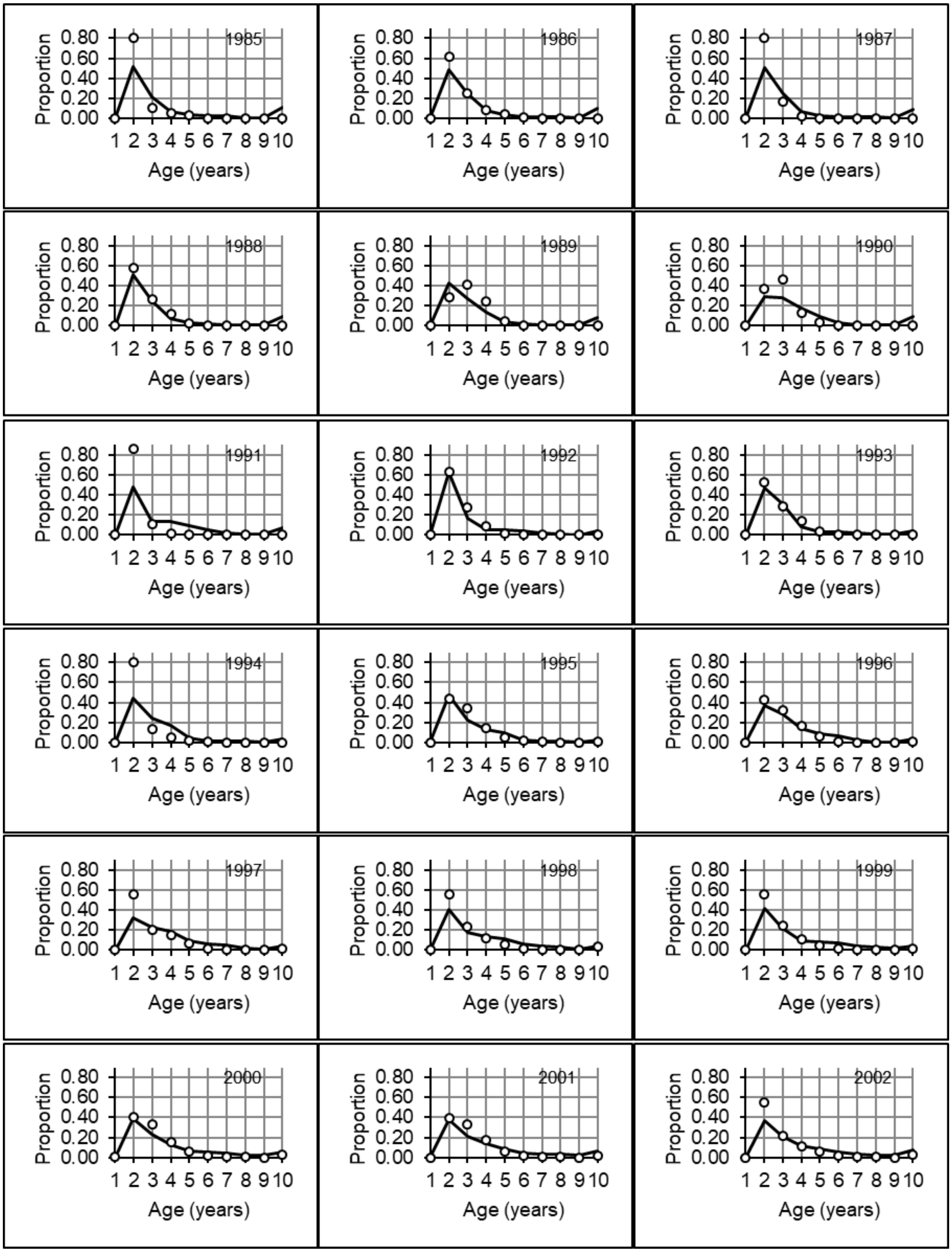


Figure 12: Annual input (open circles) and ASAP estimated (bold lines) age compositions of Red Drum catches from the LDWF marine FI trammel net survey.

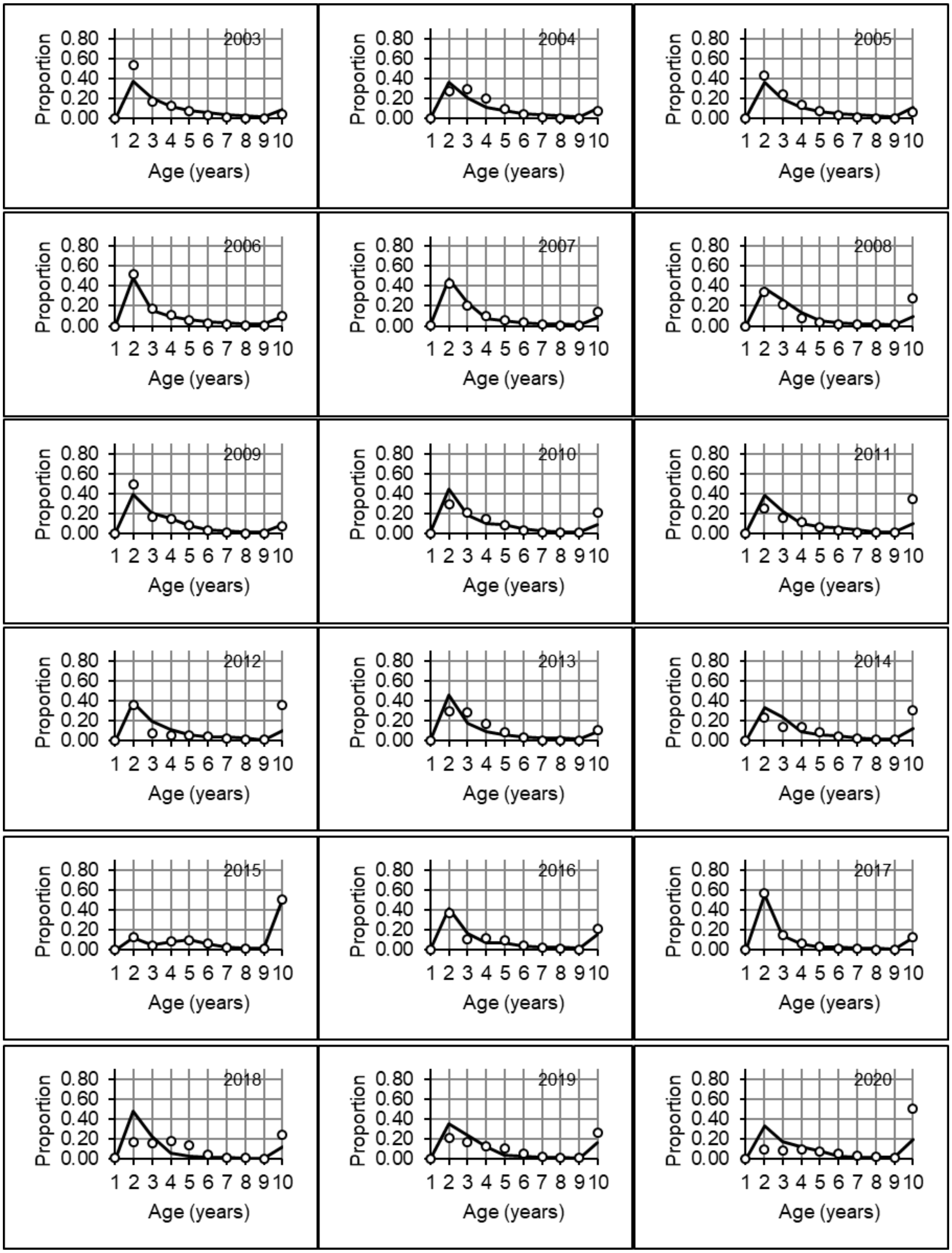


Figure 12 (continued):

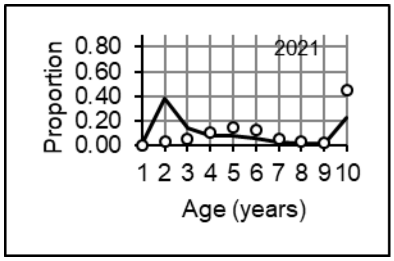


Figure 12 (continued):

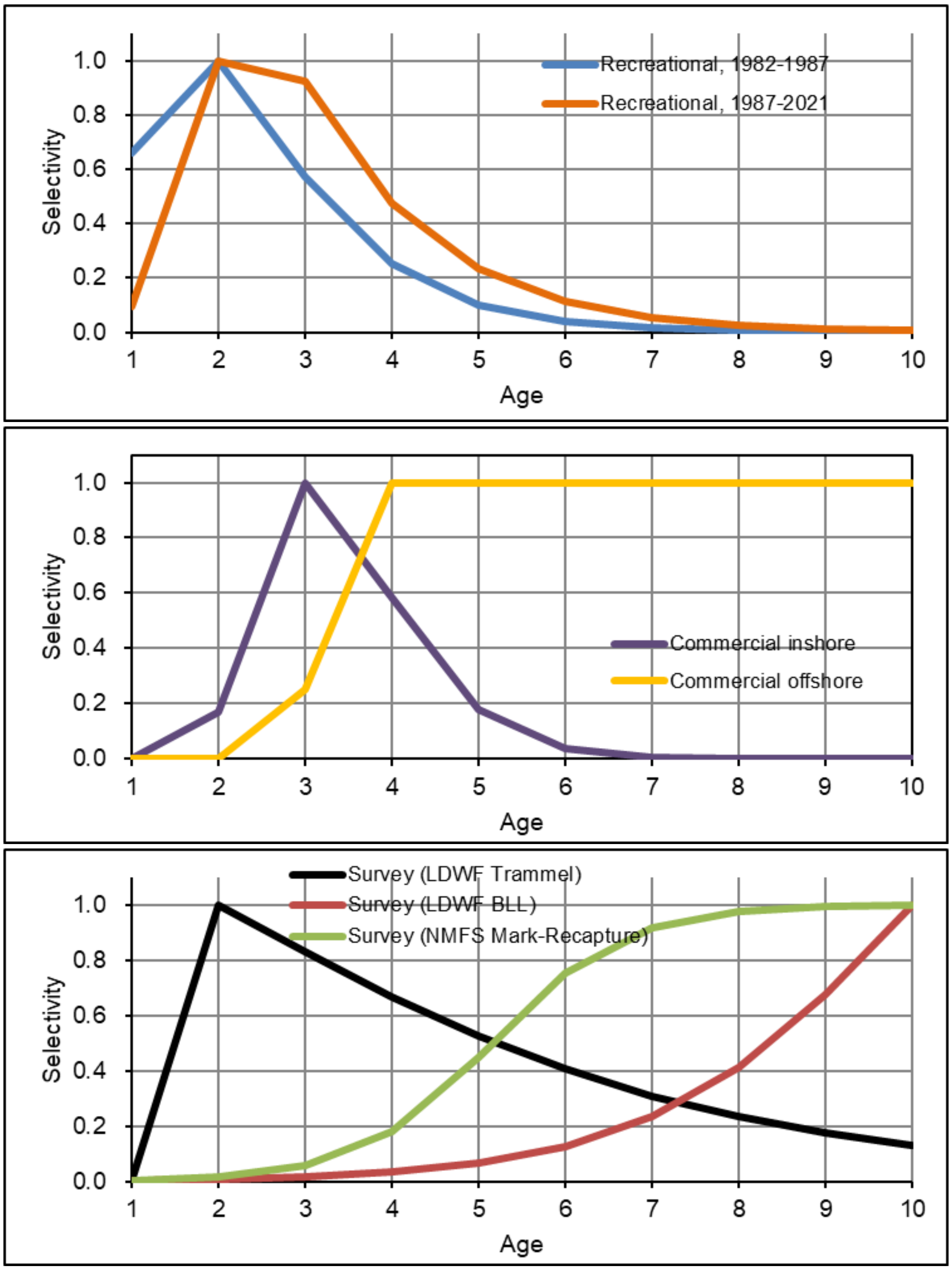


Figure 13: ASAP base model estimated recreational (top), commercial (middle), and survey (bottom) selectivities.

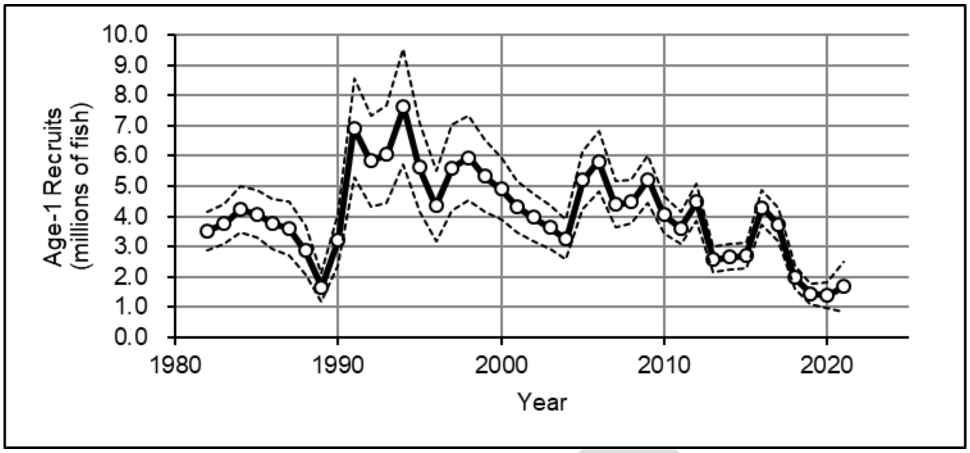


Figure 14: ASAP base model age-1 recruitment estimates. Dashed lines represent ±2 asymptotic standard errors.

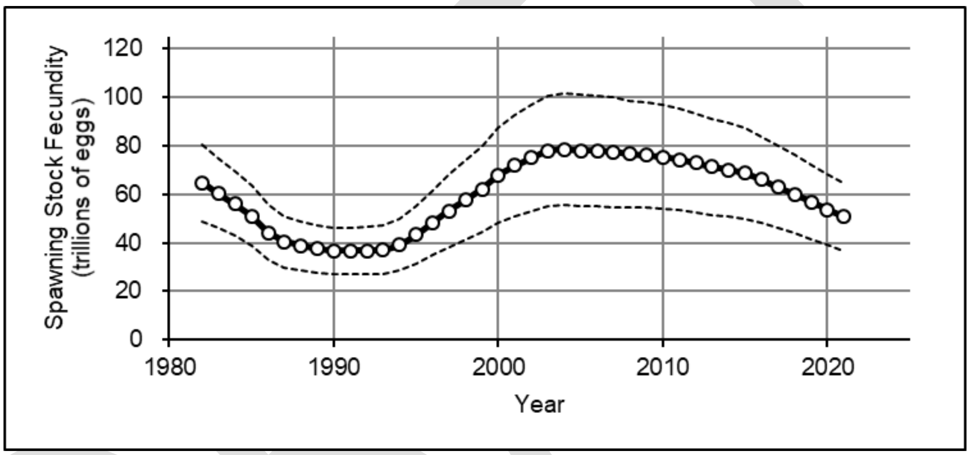


Figure 15: ASAP base model estimated spawning stock fecundity estimates. Dashed lines represent ±2 asymptotic standard errors.

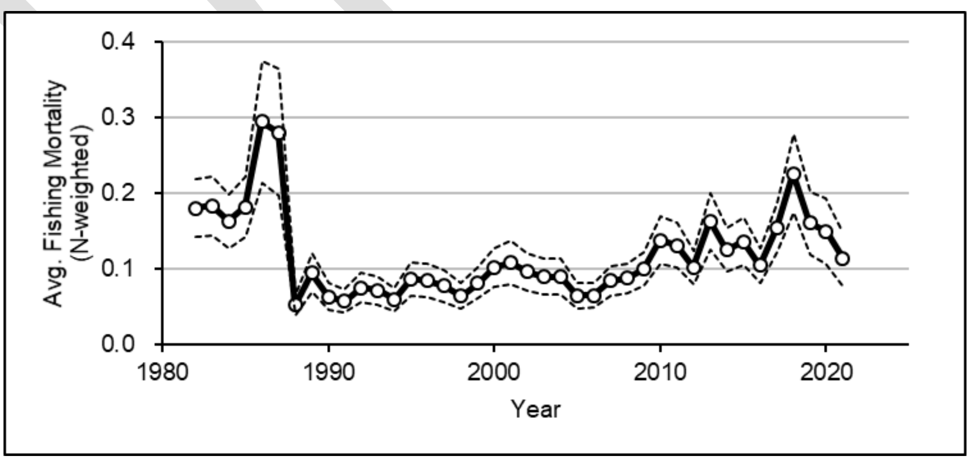


Figure 16: ASAP base model estimated average fishing mortality rates (N-weighted). Dashed lines represent ±2 asymptotic standard errors.

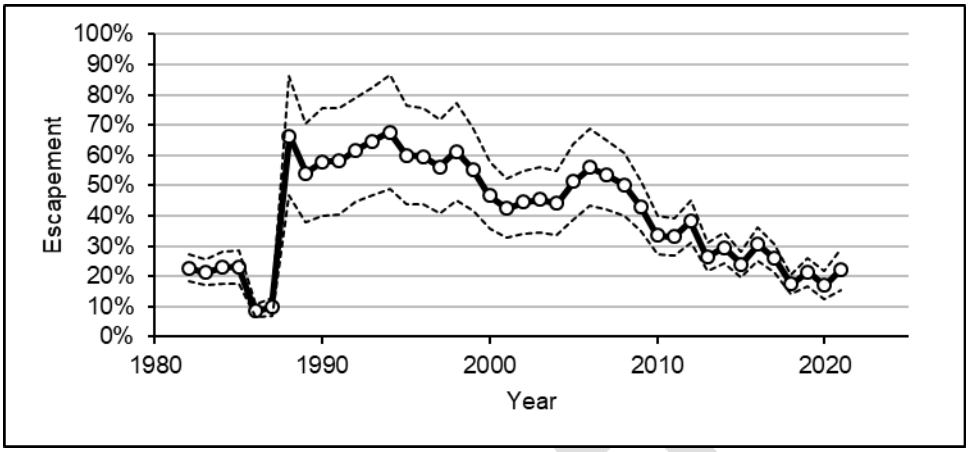


Figure 17: ASAP base model estimated escapement rates. Dashed lines represent ±2 asymptotic standard errors.

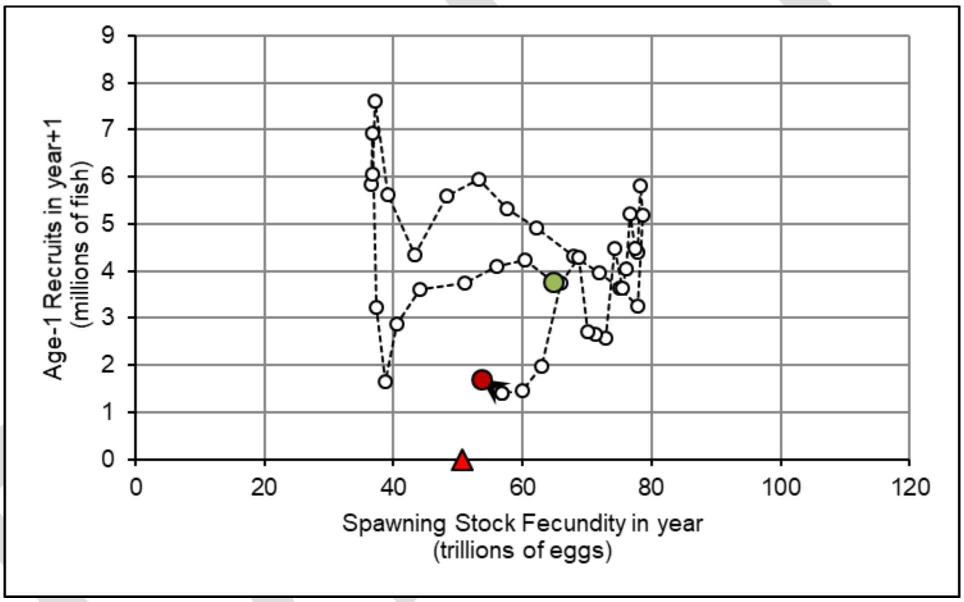


Figure 18: ASAP base model estimated age-1 recruits and female spawning stock fecundity. Arrow represents direction of the time-series. The red circle represents the most current data pair (2021 age-1 recruits / 2020 SSF) and the red triangle represents the 2021 SSF estimate. The green circle represents the first data pair (1983 age-1 recruits / 1982 female SSF).

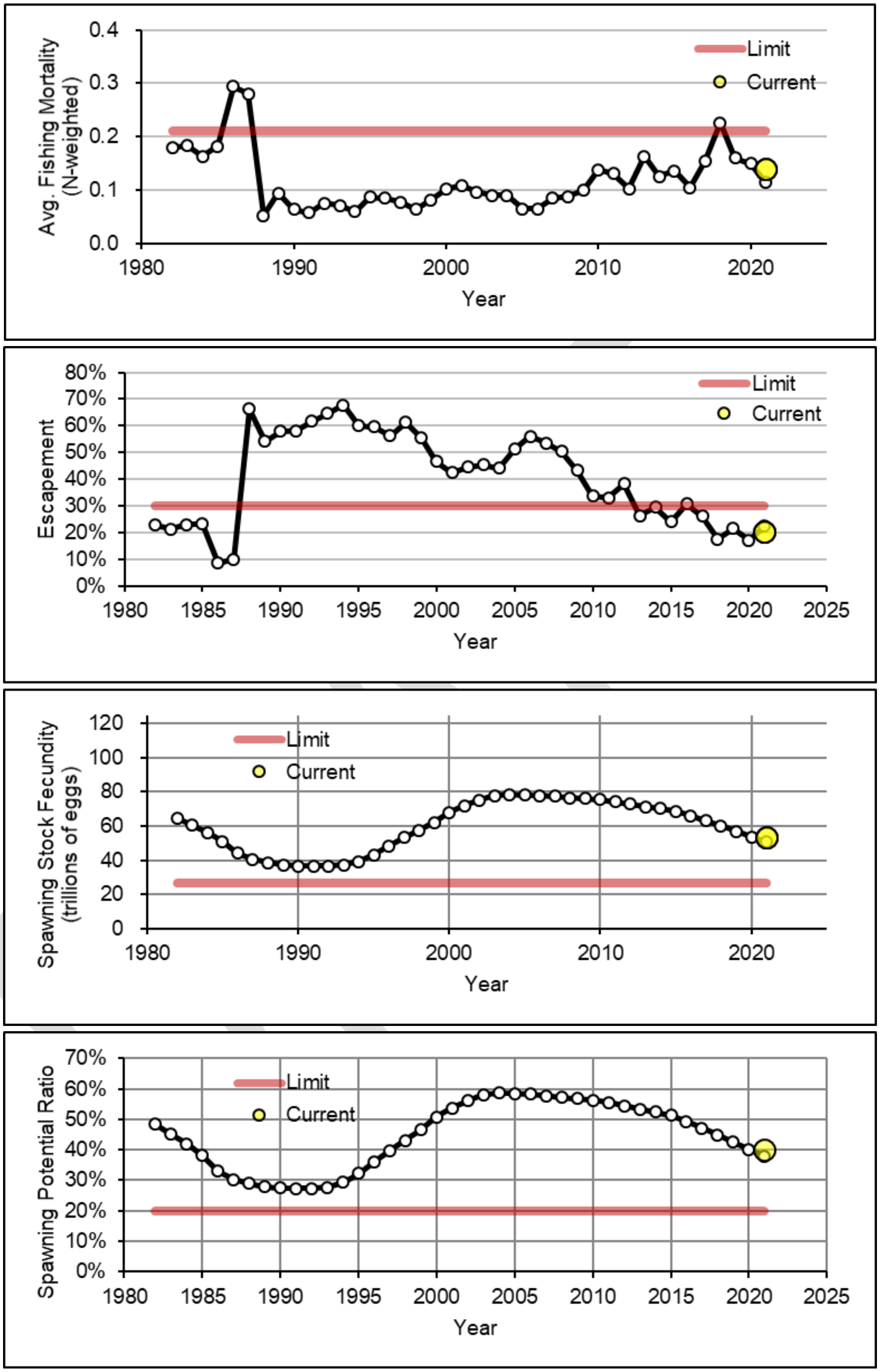


Figure 19: Time-series of ASAP base model estimated average fishing mortality rates (N-weighted), escapement rates, spawning stock fecundity, and spawning potential ratio relative to established limit reference points. Current values represent the geometric mean of the 2019-2021 estimates.

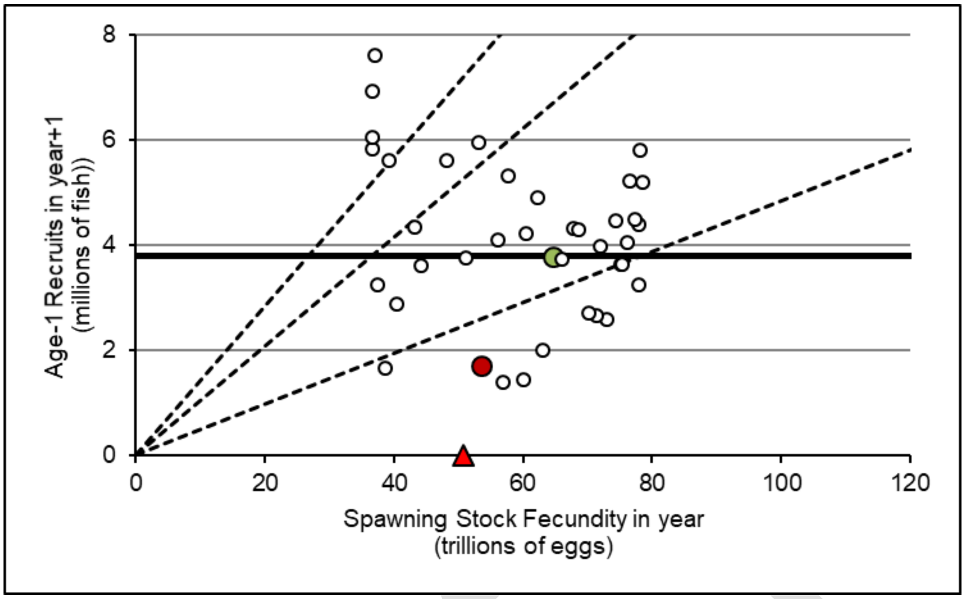


Figure 20: ASAP base model estimated age-1 recruits and spawning stock fecundity (open circles). Equilibrium recruitment is represented by the bold horizontal. The red circle represents the most current data pair (2021 age-1 recruits / 2020 SSF) and the red triangle represents the 2021 SSF estimate. The green circle represents the first data pair (1983 age-1 recruits / 1982 female SSF). Equilibrium recruitment per spawning stock biomass corresponding with the limit spawning stock fecundity reference point estimate and the minimum and maximum spawning stock fecundity estimates are represented by the slopes of the dashed diagonals (SSB_{limit}=20% SPR; min. SSB=27.4% SPR; max. SSB=58.7% SPR).

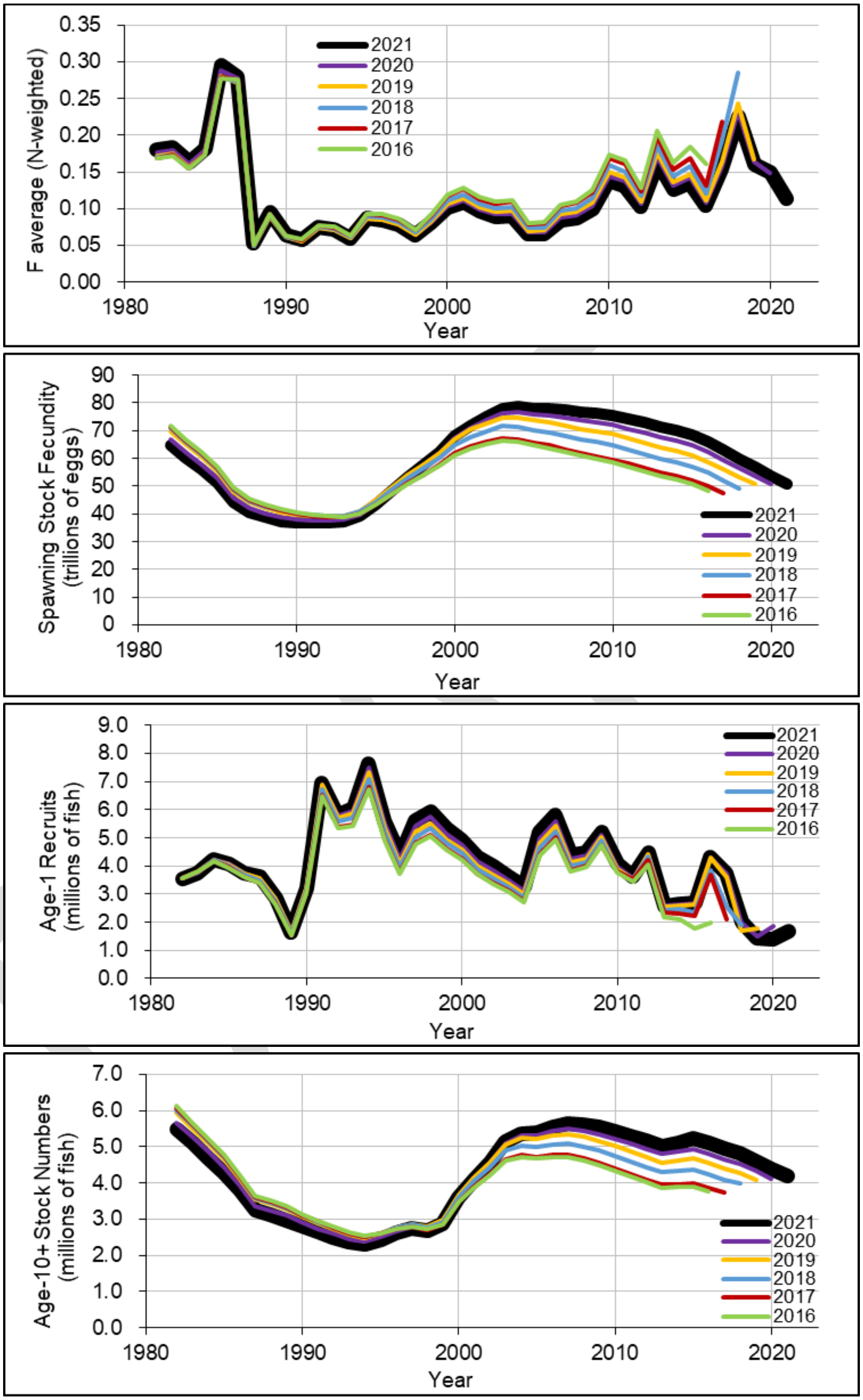


Figure 21: Retrospective analysis of ASAP base model estimates (top to bottom: average fishing mortality, spawning stock fecundity, age-1 recruits, and age 10+ stock numbers).

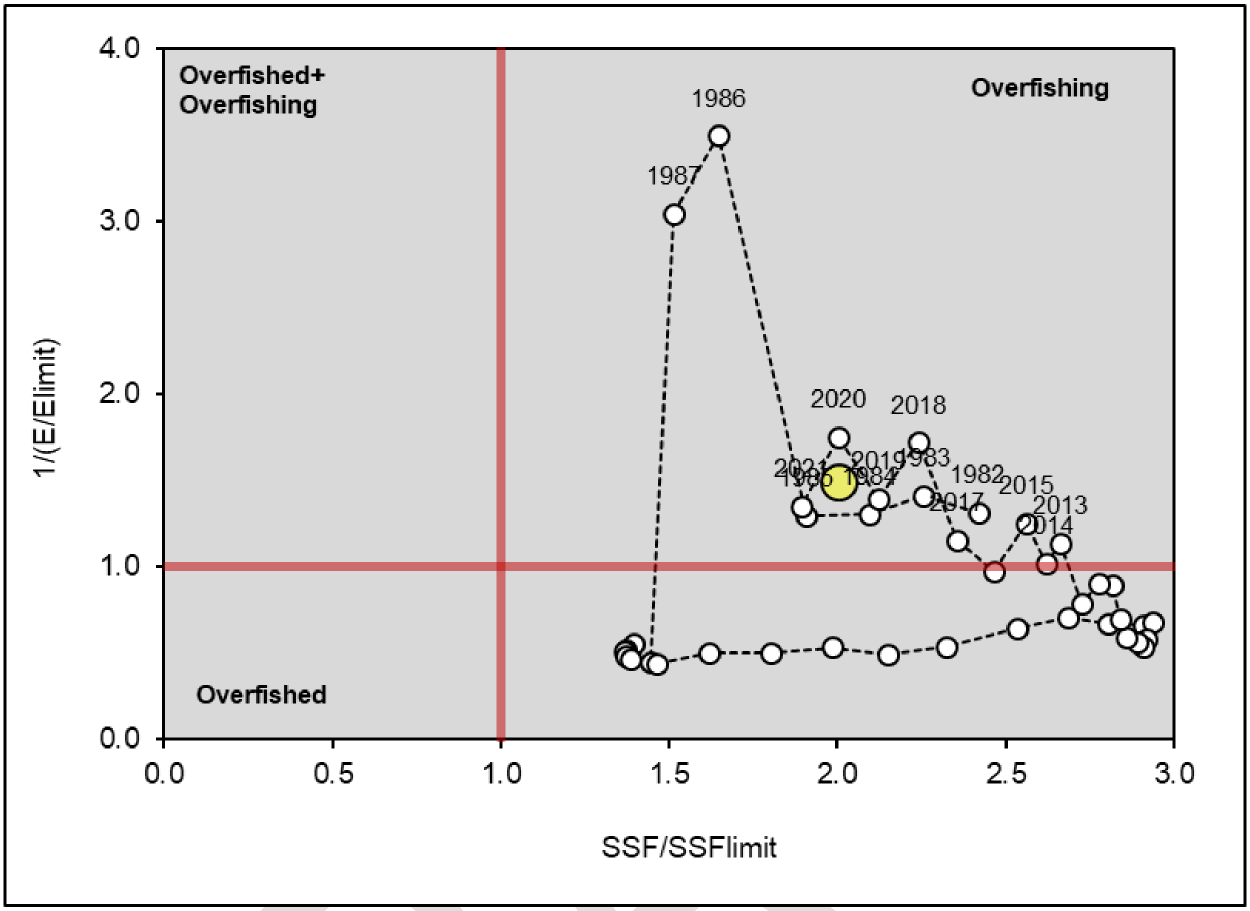


Figure 22: ASAP base model estimated ratios of annual escapement rates and spawning stock fecundity to limit reference points (E_{limit} and SSF_{limit}). The first and last year of the time-series are identified along with the other years overfishing occurred. The yellow circle represents current status (geometric mean 2019-2021).

Appendix 1:

LA Creel/MRIP Calibration Procedure

Joe West and Xinan Zhang
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.

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

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

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 below.

FM = Private

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	
	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	422,174	33.0	3,046,664	12.0	921,357	20.0	511,387	34.3	188,413	39.4	497,263	19.5	190,627	25.9	9,160,786	16.2	3,146,198	22.6
1983	1,659,509	34.3	610,662	39.0	4,758,470	32.7	1,605,600	40.4	1,064,824	38.1	346,803	43.1	1,929,817	51.4	594,965	59.9	7,402,179	20.0	2,710,035	27.4
1984	362,104	26.0	137,134	32.9	2,976,458	38.9	983,477	41.9	548,364	47.5	174,784	39.8	213,064	23.0	72,613	29.7	2,503,426	29.8	807,030	34.7
1985	356,406	30.0	111,625	33.3	2,563,074	14.5	859,464	20.3	340,142	32.1	117,102	34.8	431,284	24.5	153,297	29.0	5,947,072	15.2	2,157,908	23.9
1986	918,541	24.1	310,194	28.1	2,635,843	10.0	855,348	17.9	252,644	15.5	85,391	21.7	1,464,132	48.5	500,797	49.1	14,077,720	7.8	5,037,007	16.1
1987	683,049	25.6	227,818	31.7	2,602,974	23.0	885,506	29.4	270,702	33.7	86,011	33.5	147,601	25.2	51,262	28.5	11,023,715	10.1	4,044,859	17.9
1988	344,681	15.4	117,966	20.7	1,160,955	20.2	351,623	22.6	277,793	21.3	92,972	25.8	358,099	13.2	123,938	18.5	6,890,452	14.3	2,445,984	20.4
1989	227,336	20.4	76,687	24.4	2,015,801	12.6	687,964	21.3	789,892	49.3	250,017	49.1	341,489	25.9	109,591	28.7	8,082,318	11.9	2,714,014	17.3
1990	231,168	22.9	80,781	26.4	1,469,547	16.8	477,778	22.0	270,726	27.1	102,078	30.5	805,964	23.6	271,576	27.4	4,881,711	13.7	1,677,370	19.8
1991	183,005	19.4	62,124	24.1	1,824,768	20.0	597,343	28.0	402,935	32.6	141,868	35.1	694,466	16.1	242,476	20.3	13,468,560	9.9	4,784,368	16.8
1992	333,217	23.9	116,216	27.5	2,807,145	8.7	926,924	15.4	563,816	25.3	178,285	27.1	615,928	14.6	218,119	18.7	10,680,755	9.3	3,608,794	16.9
1993	246,588	17.6	89,348	23.4	2,581,130	9.9	868,002	16.6	885,380	26.7	306,149	33.0	500,023	14.8	172,917	19.0	7,757,436	12.1	2,638,017	18.0
1994	234,272	16.9	80,413	23.5	2,311,786	9.5	770,586	15.8	508,883	17.8	172,554	23.1	578,264	21.0	211,204	25.3	10,418,883	10.5	3,491,233	17.0
1995	335,507	18.4	109,171	21.7	3,842,177	8.7	1,281,488	17.2	920,809	20.4	272,993	23.5	398,528	14.0	144,829	21.1	12,135,672	13.2	4,042,945	22.9
1996	414,798	12.9	136,121	18.6	3,197,497	9.0	1,088,408	15.6	760,607	21.7	248,066	27.2	416,737	11.4	147,144	16.9	10,306,475	11.3	3,538,044	17.9
1997	477,705	16.1	156,723	19.9	2,861,918	9.6	982,355	16.2	1,005,406	18.2	308,997	20.7	445,579	11.7	157,583	17.8	10,415,118	11.9	3,628,093	17.9
1998	920,933	14.6	306,943	20.2	2,762,600	8.0	943,728	15.0	1,138,280	15.6	360,910	21.7	393,018	13.8	147,920	19.9	10,005,379	8.7	3,642,009	17.6
1999	681,905	11.9	233,143	17.5	3,459,681	6.9	1,193,797	14.2	793,093	16.2	245,601	22.1	758,946	10.4	266,165	16.0	14,037,235	8.5	4,711,633	15.7
2000	1,017,717	12.8	346,026	17.7	4,249,272	6.9	1,462,416	14.3	769,653	28.0	250,138	32.0	670,295	13.3	239,347	18.6	15,977,551	7.7	5,316,672	16.1
2001	765,815	13.7	255,378	18.9	4,322,843	7.7	1,429,691	14.1	567,945	15.8	193,752	20.5	427,914	12.2	156,040	18.3	12,618,114	8.0	4,299,637	14.9
2002	908,616	12.6	311,241	18.7	3,445,574	8.2	1,156,118	14.6	1,249,437	18.7	412,469	26.6	443,758	18.8	172,816	26.5	9,816,916	10.3	3,471,004	16.7
2003	659,209	14.7	223,268	20.0	2,977,090	7.4	1,006,043	14.9	1,257,175	23.2	386,996	26.1	647,034	15.7	247,872	22.9	10,528,223	9.6	3,722,763	17.5
2004	546,776	12.0	180,874	17.0	2,605,118	8.1	887,098	14.8	1,722,589	24.9	554,019	30.5	408,006	12.6	149,051	18.1	9,728,915	10.5	3,369,942	17.4
2005	461,775	13.0	155,544	18.9	2,236,920	9.4	769,288	15.5	962,130	23.6	301,610	26.7	286,521	12.9	107,932	19.5	10,699,116	8.5	3,636,945	15.9
2006	354,910	14.3	114,788	18.6	2,385,907	10.7	805,677	15.9	430,504	25.3	121,203	28.8	285,429	11.9	96,047	16.6	13,779,620	8.7	5,041,323	16.9
2007	415,104	15.7	140,658	18.9	3,049,990	8.3	1,033,903	14.7	320,952	21.9	94,883	22.0	355,606	19.0	125,321	23.1	11,790,003	8.3	3,996,827	15.8
2008	668,820	12.8	223,760	19.0	3,336,041	7.9	1,138,176	14.5	623,988	17.6	205,956	24.0	239,893	10.9	85,657	16.7	15,551,638	9.5	5,406,002	17.2
2009	908,297	13.6	306,083	18.4	3,414,547	8.2	1,181,030	15.3	1,055,358	22.6	294,230	26.8	398,573	14.6	138,485	19.0	15,667,348	8.8	5,486,627	16.4
2010	697,188	14.5	231,978	18.5	5,128,842	8.0	1,770,689	14.5	753,414	22.4	253,947	26.8	571,870	14.4	214,835	20.6	14,465,717	10.7	5,109,130	20.0
2011	679,614	15.1	229,698	19.5	4,548,266	8.3	1,572,134	15.1	1,425,042	35.5	484,582	42.3	544,173	14.7	199,173	19.5	17,697,003	9.6	6,056,375	16.8
2012	694,257	12.8	239,881	19.1	3,458,029	8.8	1,205,064	16.3	577,843	16.7	173,799	20.6	524,259	14.8	186,030	19.6	17,938,248	8.9	6,291,503	18.2
2013	528,084	14.3	170,664	20.1	4,523,043	8.7	1,495,702	15.3	311,155	16.9	93,968	20.4	930,394	13.1	323,565	21.0	12,928,606	9.4	4,379,022	16.6

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	105,131	42.4	2,388,907	23.1	274,159	38.6	676,628	29.0	62,101	32.8	834,940	21.4	95,797	40.1	2,787,818	23.5	281,415	36.0
1983	500,922	29.9	58,639	38.2	1,351,640	25.0	115,437	35.1	2,326,172	25.9	262,151	40.7	327,205	34.7	28,920	38.1	2,927,094	47.2	245,487	47.3
1984	536,866	34.1	47,392	47.4	660,866	35.0	54,017	35.4	987,229	41.9	80,659	41.6	112,657	45.9	9,158	48.8	331,308	40.5	29,935	42.2
1985	181,986	27.0	15,182	33.5	618,693	30.8	44,043	36.4	656,976	30.2	48,274	39.6	284,046	29.1	21,773	35.3	500,629	27.9	40,577	34.6
1986	469,638	52.0	36,857	49.3	243,647	45.9	17,936	49.4	782,112	81.2	54,471	79.8	189,325	42.5	16,675	48.5	1,815,727	55.4	135,153	52.9
1987	260,971	52.0	24,154	52.0	665,407	54.3	47,110	56.1	65,880	46.2	4,511	55.2	185,090	37.3	13,993	39.7	965,130	44.3	107,313	59.3
1988	429,974	36.6	44,760	47.2	237,418	45.6	16,866	48.4	662,260	57.5	53,517	54.6	90,283	40.5	7,779	40.9	398,803	39.6	39,377	48.7
1989	484,955	58.2	43,202	67.8	472,062	35.4	42,270	44.0	179,471	40.2	15,201	44.3	127,388	33.6	11,241	39.5	402,794	68.4	28,735	67.9
1990	122,352	47.4	15,053	64.0	627,617	29.6	51,503	40.2	80,673	46.7	7,133	53.2	238,834	24.9	20,903	33.4	1,178,966	28.6	114,639	44.3
1991	80,287	38.8	7,218	45.5	497,827	35.7	36,833	41.6	109,726	43.1	7,730	46.2	617,776	26.6	64,608	38.5	1,611,329	29.8	181,444	48.6
1992	266,722	39.0	22,670	43.9	535,731	21.7	54,124	31.7	1,470,811	61.9	102,204	66.6	197,948	31.2	16,495	33.6	1,622,752	18.8	151,030	26.5
1993	332,409	38.4	30,470	47.2	1,058,829	26.2	95,426	32.6	438,233	37.3	32,297	40.7	152,286	34.8	14,130	36.6	1,262,891	19.3	133,129	31.7
1994	111,090	26.4	11,042	37.0	973,065	30.5	79,607	36.6	339,821	55.8	25,980	51.8	245,182	26.2	24,551	30.8	2,585,733	32.7	212,925	35.3
1995	122,762	40.4	10,232	37.8	747,219	23.9	57,820	33.9	338,135	43.2	31,308	40.9	56,558	30.7	5,633	40.1	1,432,447	21.4	134,570	30.5
1996	529,054	58.3	39,338	55.7	864,227	22.6	79,139	28.0	682,583	41.1	50,882	43.8	134,402	31.1	13,588	42.7	2,327,551	27.4	260,453	42.7
1997	123,564	39.8	13,754	56.7	347,632	21.5	31,628	29.5	283,171	25.4	26,246	33.0	307,330	23.1	29,895	35.4	1,905,584	21.5	186,083	32.5
1998	86,575	34.3	11,317	53.9	397,083	31.2	36,709	34.9	450,254	36.2	32,677	41.5	128,645	26.4	14,741	40.5	2,415,887	30.1	303,726	52.7
1999	385,329	39.6	31,947	45.0	492,350	25.7	54,909	38.8	202,445	35.8	16,600	36.7	641,276	32.9	54,674	38.0	3,530,688	27.9	288,942	35.4
2000	625,217	26.3	51,753	31.9	822,698	21.3	69,669	26.6	202,744	52.7	17,790	51.6	136,953	43.0	12,753	44.5	2,697,901	36.0	222,046	40.3
2001	675,474	30.1	69,123	38.6	621,324	23.2	53,291	31.1	399,908	49.4	43,424	54.5	305,296	67.4	37,260	72.2	2,657,545	28.5	269,017	35.7
2002	399,178	23.6	36,575	30.2	945,520	31.8	80,339	37.4	872,663	35.4	72,526	43.6	323,826	31.2	33,693	40.6	923,988	31.5	99,269	39.8
2003	288,546	23.4	27,192	30.4	280,366	33.2	24,715	34.7	983,844	36.8	102,183	38.4	199,400	38.3	16,524	38.0	945,730	42.3	67,249	45.2
2004	137,240	36.0	12,726	38.9	559,991	19.0	50,246	28.0	603,693	36.9	46,089	43.2	395,552	36.1	38,056	47.6	1,303,971	45.1	178,356	62.5
2005	138,758	28.0	12,505	38.3	704,981	30.9	53,900	41.0	563,322	29.6	48,230	38.5	450,207	38.7	33,234	52.7	632,798	30.7	51,805	37.7
2006	261,544	30.8	23,555	40.8	389,280	25.4	32,980	36.4	593,305	31.2	42,006	38.8	335,766	29.1	32,038	32.6	788,193	22.7	71,014	31.4
2007	286,213	35.5	26,082	38.6	187,726	25.1	16,635	36.1	257,091	36.2	25,721	43.8	348,752	28.0	36,807	37.0	771,812	27.5	79,384	35.9
2008	247,234	25.5	20,967	34.3	374,463	27.9	28,401	32.9	1,396,084	30.3	106,247	36.9	260,865	36.4	22,101	34.7	1,140,758	33.3	125,464	47.3
2009	100,842	26.9	9,449	34.4	123,122	28.0	11,253	34.3	523,105	46.9	57,138	57.2	470,681	44.6	37,214	45.7	611,298	25.2	58,398	33.3
2010	184,668	41.2	15,662	42.7	531,708	32.4	47,942	35.0	561,648	40.1	42,755	40.8	94,348	29.4	8,368	33.9	584,064	43.3	42,629	45.1
2011	380,669	21.7	34,092	28.5	983,461	22.1	91,170	28.1	1,318,064	44.8	114,952	55.5	430,717	40.0	37,441	40.4	651,281	27.8	64,311	37.5
2012	283,508	22.6	24,574	32.7	279,299	36.1	21,571	40.0	695,553	42.6	50,298	45.6	155,170	30.6	14,154	34.0	727,577	29.5	76,733	39.3
2013	471,823	13.0	34,758	29.7	849,762	9.3	74,732	28.1	659,450	12.4	45,522	36.7	573,922	18.3	47,486	33.0	2,682,372	11.4	228,143	24.3

Appendix

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:

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

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	342,393	62.2	274,870	40.0	98,227	42.3	515,459	44.8	204,110	48.5	1,083,668	45.5	421,148	51.2	1,654,868	35.7	594,062	39.0
1983	671,251	47.1	221,158	50.2	793,805	34.3	276,867	39.3	833,079	71.7	283,429	76.2	145,644	54.4	50,016	55.2	2,092,864	42.4	785,069	46.9
1984	284,254	68.2	95,815	67.1	346,317	56.3	115,622	57.6	309,986	35.6	95,232	44.2	65,411	64.9	20,866	65.9	197,040	21.8	65,344	29.3
1985	291,106	38.5	96,316	41.4	243,413	40.1	94,362	47.4	317,951	28.8	111,945	33.6	61,785	68.0	21,053	66.7	1,709,137	23.1	602,297	28.0
1986	448,236	20.4	147,784	25.7	451,777	15.3	165,090	21.0	393,569	19.8	127,576	25.2	367,830	40.1	163,383	47.5	4,745,760	10.2	1,657,453	17.8
1987	300,153	41.9	93,818	46.4	2,360,122	24.5	767,630	32.3	210,127	21.2	72,374	25.9	10,809	42.4	4,030	45.8	6,980,249	12.7	2,392,248	20.4
1988	350,541	21.1	121,213	26.8	3,062,822	16.2	1,010,477	21.1	398,058	25.6	130,073	30.3	375,399	58.9	118,042	59.6	5,610,284	10.4	2,046,380	17.6
1989	228,012	35.0	73,311	38.8	2,998,273	20.9	1,009,167	28.0	483,464	37.6	167,906	42.3	260,401	93.8	81,599	91.0	5,656,036	14.2	1,867,058	19.1
1990	653,511	28.7	222,412	33.7	1,880,922	19.7	577,599	22.7	408,363	25.1	142,262	28.8	334,821	40.3	110,310	41.6	4,750,794	18.0	1,592,531	22.9
1991	389,398	26.0	131,179	29.7	7,412,013	11.2	2,496,220	22.1	272,267	26.1	102,330	29.6	114,636	37.5	33,497	32.0	12,341,402	9.3	4,362,600	16.5
1992	559,417	33.2	180,394	37.5	5,753,237	9.1	1,822,782	15.9	440,289	16.8	139,865	21.4	42,988	21.4	14,639	24.4	8,795,484	8.4	2,990,434	15.1
1993	710,873	18.2	238,220	22.8	4,143,002	11.2	1,376,592	17.8	758,778	20.8	258,952	26.3	45,686	33.2	16,433	36.2	6,905,906	11.3	2,273,152	17.2
1994	440,825	29.8	142,921	32.2	4,086,816	12.5	1,285,719	18.2	608,190	19.3	203,610	24.0	34,050	29.6	11,784	31.8	7,780,829	9.7	2,535,516	16.2
1995	816,070	17.5	287,267	22.7	4,248,542	15.4	1,351,245	19.8	558,424	25.6	182,168	30.3	59,357	34.4	21,519	34.0	7,603,172	11.0	2,500,637	19.7
1996	525,560	20.4	179,994	25.3	3,312,106	11.9	1,042,253	16.2	878,282	23.1	281,778	28.4	80,897	23.0	27,331	27.1	8,055,743	10.2	2,831,212	16.9
1997	1,057,203	18.5	362,214	24.4	5,150,476	11.3	1,635,185	17.7	1,138,193	23.4	399,291	30.0	98,494	29.1	34,023	32.0	10,917,063	19.7	3,786,705	24.2
1998	1,439,547	24.7	481,648	27.7	5,753,271	10.8	1,828,452	16.4	1,056,926	17.9	345,562	24.6	99,007	29.1	32,671	32.2	9,977,400	9.3	3,575,231	16.7
1999	820,371	13.6	271,531	18.2	5,477,613	9.4	1,861,757	16.1	699,825	18.9	220,631	25.4	84,447	20.8	28,690	25.4	11,688,515	8.8	3,908,262	15.9
2000	1,833,450	16.2	626,732	20.2	6,018,948	8.2	2,025,284	15.8	586,993	21.9	201,858	26.3	121,790	28.3	35,906	27.9	11,091,619	7.9	3,712,515	15.0
2001	1,781,293	17.4	641,567	22.3	6,184,966	9.5	1,849,989	14.6	816,650	16.4	290,637	21.3	88,936	21.8	33,982	27.9	7,365,829	11.2	2,409,330	16.7
2002	1,670,431	17.1	545,567	22.6	6,266,166	10.8	2,053,397	18.0	854,311	17.0	273,201	20.2	90,982	26.1	33,016	29.7	6,778,238	11.5	2,352,328	17.5
2003	1,172,837	17.8	404,338	21.7	5,286,909	10.2	1,718,114	18.6	930,576	20.8	289,313	26.9	172,327	23.4	66,101	29.7	10,682,302	9.5	3,736,073	17.8
2004	1,155,649	17.0	386,806	22.6	3,841,642	10.1	1,223,227	15.4	701,938	19.9	252,030	25.3	149,844	27.6	52,254	29.8	9,847,326	11.5	3,369,107	17.0
2005	954,552	24.2	329,037	28.2	3,505,968	11.8	1,131,872	17.0	770,173	15.0	255,092	21.8	87,557	25.3	30,737	27.2	10,903,988	9.7	3,744,965	16.4
2006	699,933	16.3	227,405	20.2	4,124,647	11.7	1,361,914	18.2	616,668	30.1	178,526	30.8	41,784	27.7	13,966	30.2	11,930,250	9.1	4,301,096	16.2
2007	818,643	15.4	279,147	19.4	4,630,404	11.5	1,539,046	18.3	308,039	21.2	100,962	24.9	78,231	25.8	27,959	31.2	9,924,934	8.4	3,372,169	15.8
2008	1,320,182	14.8	443,174	20.6	5,074,358	8.1	1,689,068	14.6	609,401	23.6	195,937	28.0	50,063	26.0	17,563	28.6	13,158,192	9.4	4,636,757	16.2
2009	1,788,575	14.5	600,705	21.0	6,242,208	9.6	2,054,138	17.3	744,464	19.5	222,282	23.8	89,961	28.4	31,515	31.9	13,919,234	10.0	4,676,052	16.5
2010	1,813,254	14.9	631,758	20.5	7,335,948	10.2	2,550,321	16.2	711,836	21.9	247,398	26.3	111,912	23.5	40,390	25.4	9,190,616	12.6	3,268,802	20.1
2011	1,390,360	14.9	469,280	19.0	4,744,947	9.7	1,522,357	15.5	259,735	17.7	86,003	21.4	85,027	24.1	31,292	27.7	10,091,732	9.5	3,470,918	16.1
2012	1,136,427	13.3	367,841	18.5	5,374,152	8.9	1,783,819	16.5	422,968	13.4	135,356	18.5	152,363	24.3	53,816	27.4	13,175,745	8.7	4,589,246	17.3
2013	1,709,164	12.2	581,107	17.5	6,088,863	9.9	1,998,284	15.9	398,767	14.8	132,773	20.6	197,844	21.3	73,027	25.1	13,404,945	10.3	4,614,319	17.0
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																				
	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	19,100	81.1	364,343	26.2	48,582	45.4	89,674	57.7	10,792	71.0	128,975	30.5	14,650	50.4	386,524	48.1	47,837	62.3
1983	69,276	40.0	5,936	60.9	15,283	79.9	1,417	73.4	25,959	61.6	2,774	59.0					7,794	83.8	1,312	88.6
1984	285,887	32.0	19,441	48.5	83,103	84.6	5,554	90.6	12,248	103.2	2,062	105.1	3,384	99.3	290	100.4	59,529	52.1	4,649	51.5
1985	138,851	42.9	11,318	55.3	32,336	53.0	2,763	51.6	155,985	38.0	10,990	48.3	12,292	79.8	830	80.6	603,943	44.5	44,912	47.2
1986	107,212	49.6	7,372	54.2	19,379	65.3	1,624	60.4	473,615	72.5	33,039	74.9	11,853	75.8	921	77.8	267,044	41.3	21,357	38.9
1987	102,949	71.9	7,886	73.2	352,180	47.9	25,506	49.6	36,133	89.7	3,098	95.1	13,517	87.5	1,091	89.2	642,898	37.9	60,579	42.2
1988	185,774	51.5	14,729	61.3	329,574	30.8	26,758	37.1	116,937	36.7	10,189	42.4	7,726	52.0	576	57.0	205,385	41.4	22,996	51.5
1989	61,484	38.9	5,308	46.9	1,080,247	72.5	118,259	82.8	115,300	39.3	10,975	45.9	49,549	66.9	3,412	67.5	311,869	36.9	26,408	40.8
1990	96,587	44.0	12,814	60.3	327,612	37.7	26,362	47.2	18,485	89.3	1,251	93.7	783,955	82.6	66,386	86.0	736,838	34.5	62,271	40.6
1991	237,878	30.6	23,323	37.8	1,544,560	43.0	117,501	46.9	207,958	30.7	14,069	48.3	91,471	44.6	9,555	47.5	1,902,261	22.7	209,051	37.4
1992	860,902	31.0	70,997	33.3	1,833,394	25.8	156,676	29.2	514,453	32.0	39,314	41.6	49,674	57.6	4,294	56.5	1,468,815	20.7	134,383	28.7
1993	1,345,395	39.9	104,766	45.9	1,630,396	23.1	162,446	32.3	1,109,224	51.0	81,363	54.2	51,220	62.5	3,660	68.3	2,544,151	26.7	310,186	44.4
1994	947,564	31.5	92,207	35.4	2,220,435	25.8	177,992	32.1	690,548	35.8	51,181	37.4	27,765	64.3	1,973	67.3	2,280,973	19.3	200,469	28.0
1995	602,888	40.5	45,117	41.0	942,643	25.9	80,564	29.3	72,571	30.1	8,291	38.9	18,216	63.3	1,249	63.7	1,617,673	19.6	152,401	30.0
1996	493,436	28.1	49,281	33.9	1,516,179	39.1	113,893	40.7	295,818	49.5	22,680	48.2	123,621	57.8	15,883	74.4	2,271,614	31.3	295,972	53.1
1997	1,032,761	51.8	83,634	50.5	1,179,933	27.3	95,188	34.5	199,864	33.2	16,220	37.9	71,388	41.3	7,967	48.9	2,076,029	22.6	197,373	33.0
1998	1,033,214	43.8	78,806	45.8	2,262,074	26.0	189,917	33.0	207,500	34.3	18,802	41.7	39,280	40.3	3,078	43.3	1,721,873	25.1	211,949	48.4
1999	532,125	37.2	41,454	46.1	1,281,413	23.5	123,086	32.0	51,091	32.2	4,175	42.3	68,459	49.6	6,737	57.2	4,103,241	23.1	353,553	30.9
2000	955,854	28.8	67,785	40.4	1,948,980	22.8	174,209	30.3	265,642	61.1	20,300	56.9	24,518	50.4	1,952	53.5	2,552,559	34.6	197,526	37.5
2001	1,404,055	37.8	132,125	44.9	1,702,671	23.4	149,553	28.9	627,865	66.9	46,605	65.6	267,359	75.6	34,971	75.6	2,252,160	31.5	175,034	33.5
2002	559,039	30.6	42,687	35.5	1,187,635	24.6	93,346	28.8	192,094	28.9	15,190	36.7	132,712	47.7	10,853	49.7	1,035,758	30.9	89,243	35.9
2003	1,024,308	33.3	97,787	39.2	744,196	31.1	68,597	37.0	114,932	46.8	10,857	48.3	299,436	63.4	28,993	64.7	1,546,106	34.1	113,669	37.9
2004	477,328	44.0	35,200	46.7	944,587	31.1	78,277	32.1	83,683	37.1	8,907	46.5	24,033	55.8	1,613	59.6	1,547,223	44.2	171,926	58.2
2005	793,236	24.4	72,502	32.7	1,986,884	22.7	184,683	38.9	322,768	29.1	25,309	36.5	127,575	57.7	10,118	61.3	895,780	34.2	84,088	37.7
2006	1,085,517	44.4	88,671	42.9	2,355,407	21.3	234,798	36.0	670,528	47.6	47,895	50.2	109,904	38.3	14,008	53.5	1,144,271	28.0	108,628	34.3
2007	464,018	30.3	50,691	42.4	1,109,367	20.9	102,287	30.2	256,654	49.1	21,786	44.7	96,680	53.7	15,629	66.9	929,550	25.0	96,819	36.3
2008	901,587	24.4	74,919	30.1	1,912,635	19.8	149,123	25.8	248,799	29.8	17,155	39.8	12,748	60.9	1,198	65.4	1,377,270	27.7	114,490	31.4
2009	417,567	31.0	37,138	32.2	1,414,008	28.6	120,295	33.9	384,706	30.4	34,876	34.0	87,082	93.5	5,992	93.7	927,737	30.0	103,308	44.0
2010	572,004	29.7	53,063	30.8	1,506,818	23.6	146,558	36.2	583,189	30.2	43,420	36.4	74,678	40.5	7,322	49.4	828,375	54.9	59,780	56.2
2011	1,434,105	21.3	125,761	28.7	1,860,121	22.2	152,108	27.7	249,435	48.1	20,780	45.8	103,717	65.2	6,984	66.3	719,286	25.7	60,778	32.8
2012	1,263,476	24.4	124,775	32.1	977,186	35.2	84,370	34.7	175,964	43.2	12,527	46.9	52,159	45.4	5,726	57.4	674,174	31.1	71,681	37.4
2013	2,271,755	9.7	183,679	24.0	3,675,890	9.3	307,193	20.5	939,354	18.9	71,453	33.6	41,427	37.2	2,945	43.0	5,525,367	8.1	482,847	23.7
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:

JOHN BEL EDWARDS
GOVERNOR

JACK MONTOUCET
SECRETARY

Estimates of Spotted Seatrout and Red Drum Bycatch in the Louisiana Menhaden Reduction Fishery

Louisiana Department of Wildlife and Fisheries

Office of Fisheries

Overview

The Gulf menhaden reduction fishery is the largest commercial fishery operating in the Gulf of Mexico with the majority of landings occurring in Louisiana (LA) waters. Estimates of spotted seatrout (SST) and red drum (RD) incidental bycatch from the menhaden fishery have been requested to allow comparisons of menhaden fishery bycatch in LA waters relative to the directed LA fisheries.

Incidental bycatch has been characterized in the Gulf menhaden fishery from both at-sea and processing plant studies that were reviewed in SEDAR49-DW-04 (Sagarese et al. 2016). The earlier bycatch studies reviewed did not characterize released catches, only the retained portion, limiting their utility for total bycatch estimation. The more recent studies conducted characterized both released and retained catches (Condrey 1994, de Silva and Condrey 1997, Pulver and Scott Denton 2012* as reviewed in Sagarese et al. 2016). Bycatch observations categorized as kept in Pulver and Scott Denton 2012* are considered retained catches.

Methods

The bycatch information from the Gulf menhaden fishery used in this analysis was limited to the studies where both retained and released catches were reported along with the number of purse-seine sets observed allowing calculation of per set catch rates for SST and RD (Tables 1 and 2). Catch per set observations are summarized across studies (mean, minimum, and maximum) to provide a range of catch rates that are assumed constant through time and representative of catches in LA waters. The most recent study (Pulver and Scott-Denton 2012*) accounted only for bycatch >50 cm (19.7 inches) and is excluded from the SST analysis for that reason.

Annual bycatch can be estimated by expanding the catch per set observations from the annual menhaden fishery effort (number of purse-seine sets per year). Annual menhaden fishery effort observations in LA waters are confidential. To avoid issues reporting bycatch estimates developed from confidential observations, fishery effort is estimated for all years included in this analysis (1982-2019, Figure 1) from a linear regression between the currently available annual effort observations (2000-2018) and the corresponding landings in pounds (sets=1.114E-05*landings + 8.247E+03, p=0.01, r^2=0.37).

Time-series of LA spotted seatrout and red drum incidental bycatch from the menhaden fishery (1982-2019, Table 3) are estimated by summing the product of the retained and released catches per set (mean, minimum, and maximum), the estimated annual LA menhaden fishery effort, and assumed mortality rates of the catches. All retained catches are assumed to die and released SST and RD catches are assumed to have 100% and 75% mortality rates respectively. No information is available on the mortality of released SST in the menhaden fishery, and observations of RD dead releases averaged across studies included in this analysis indicates a 45% mortality rate. That estimate is increased to account for delayed mortality of the live releases that are disoriented or injured.

Bycatch in units of numbers are converted into weight with assumptions of mean weight of the catches. Mean weight of red drum catches are assumed to be 12.6 pounds based on observations of the LDWF nearshore bottom longline survey and 1.44 pounds for SST assuming a 16-inch mean total length of the catches and applying the conversions in West et al. (2019).

Recreational landings estimates are taken from the LA Creel survey (2014-2019) and estimates hindcast to the historic MRIP time-series (1982-2013, West et al. 2019). Commercial landings are taken from the LDWF Trip Ticket program (1999-2019) and NOAA Fisheries commercial statistical records (1982-1998, NOAA Fisheries 2020).

Results

Louisiana bycatch estimates (mean, minimum, and maximum) in units of weight are compared to the SST and RD landings from the recreational and commercial LA fisheries (Table 4).

Bycatch estimates of SST relative to the landings of the directed LA fisheries are minimal. Estimates of SST bycatch from the menhaden fishery in units of weight in the most recent decade are all less than one tenth of one percent (maximum=0.09%, mean=0.07%, minimum=0.06%) when compared to the landings of the commercial and recreational LA fisheries (Figure 2).

Bycatch estimates of red drum relative to the directed LA fisheries are also minimal but of greater magnitude than SST estimates. Estimates of RD bycatch from the menhaden fishery in units of weight in the most recent decade range from 4.4% (maximum) to 0.3% (minimum) with a mean of 2.1% when compared to the landings of the directed LA fisheries (Figure 3).

Literature Cited

Condrey, R. 1994. Bycatch in the U.S. Gulf of Mexico menhaden fishery. Results of onboard sampling conducted in the 1992 fishing season. Louisiana State University, Baton Rouge, LA.

de Silva, J.A., and R. Condrey. 1997. Bycatch in the U.S. Gulf of Mexico menhaden fishery. Results of onboard sampling conducted in the 1994 and 1995 fishing seasons. Louisiana State University, Baton Rouge, LA.

NOAA Fisheries 2020. NOAA Fisheries Office of Science and Technology, Commercial Landings Query, Available at: https://foss.nmfs.noaa.gov (Accessed 6/15/2020)

Pulver, J. R., and E. Scott-Denton. 2012. Observer coverage of the 2011 Gulf of Mexico menhaden fishery. *Publication not available, data taken from Sagarese et al. 2016.

Sagarese, S.R., Matthew A. Nuttall, Joseph E. Serafy and Elizabeth Scott-Denton. 2016. Review of bycatch in the Gulf menhaden fishery with implications for the stock assessment of red drum. SEDAR49-DW-04. SEDAR, North Charleston, SC. 30 pp.

West, J., X. Zhang, and J. Adriance. 2019. Assessment of spotted seatrout in Louisiana waters. 2019 Report of the Louisiana Department of Wildlife and Fisheries. 73 pp.

Tables

Table 1: Spotted seatrout released and retained catches, number of sets observed, and the mean, minimum, and maximum catches per set across studies.

			released catch			retained catch		
Study	Year	Species	fish	sets	fish/set	fish	sets	fish/set
Condrey 1994	1992	SST	19	127	0.15	0	49	0.00
de Silva and Condrey 1997	1994	SST	26	235	0.11	3	220	0.01
de Silva and Condrey 1997	1995	SST	41	257	0.16	1	199	0.01
Pulver and Scott-Denton 2012*	2011	SST	0	223	0.00	0	223	0.00
		Min			**0.11**			**0.000**
		Mean			**0.14**			**0.006**
		Max			**0.16**			**0.014**

Table 2: Red drum released and retained catches, number of sets observed, and the mean, minimum, and maximum catches per set across studies.

			released catch			retained catch		
Study	Year	Species	fish	sets	fish/set	fish	sets	fish/set
Condrey 1994	1992	Rdrum	15	127	0.12	0	49	0.00
de Silva and Condrey 1997	1994	Rdrum	116	235	0.49	3	220	0.01
de Silva and Condrey 1997	1995	Rdrum	245	257	0.95	0	199	0.00
Pulver and Scott-Denton 2012*	2011	Rdrum	368	223	1.65	32	223	0.14
		Min			**0.12**			**0.00**
		Mean			**0.80**			**0.04**
		Max			**1.65**			**0.14**

Table 3: Time-series of LA spotted seatrout and red drum total bycatch estimates (numbers of fish) from 1982-2019 for the maximum, mean, and minimum catch per set observations.

	SST Bycatch			RD Bycatch		
Year	max	mean	min	max	mean	min
1982	4,478	3,779	2,861	35,684	16,597	2,291
1983	4,813	4,062	3,075	38,355	17,839	2,462
1984	4,818	4,066	3,078	38,393	17,857	2,464
1985	4,377	3,694	2,797	34,884	16,225	2,239
1986	4,244	3,582	2,712	33,823	15,731	2,171
1987	4,535	3,827	2,897	36,139	16,808	2,320
1988	3,583	3,024	2,289	28,555	13,281	1,833
1989	3,395	2,865	2,169	27,056	12,584	1,737
1990	3,184	2,687	2,034	25,371	11,800	1,629
1991	3,377	2,850	2,157	26,910	12,516	1,727
1992	2,947	2,487	1,883	23,484	10,923	1,507
1993	3,471	2,929	2,218	27,659	12,865	1,775
1994	4,331	3,655	2,767	34,513	16,052	2,215
1995	3,206	2,706	2,048	25,548	11,883	1,640
1996	3,253	2,746	2,079	25,926	12,059	1,664
1997	3,776	3,186	2,412	30,089	13,995	1,931
1998	3,181	2,684	2,032	25,347	11,789	1,627
1999	4,134	3,488	2,641	32,941	15,321	2,114
2000	3,509	2,961	2,242	27,962	13,005	1,795
2001	3,088	2,606	1,973	24,607	11,445	1,580
2002	3,540	2,988	2,262	28,211	13,121	1,811
2003	3,269	2,759	2,088	26,049	12,116	1,672
2004	3,094	2,611	1,977	24,653	11,466	1,582
2005	2,697	2,277	1,723	21,497	9,998	1,380
2006	2,869	2,421	1,833	22,862	10,633	1,468
2007	2,952	2,491	1,886	23,526	10,942	1,510
2008	2,859	2,413	1,826	22,781	10,595	1,462
2009	2,944	2,485	1,881	23,463	10,913	1,506
2010	2,680	2,262	1,712	21,356	9,933	1,371
2011	3,615	3,051	2,310	28,811	13,400	1,849
2012	3,078	2,598	1,967	24,533	11,410	1,575
2013	3,072	2,593	1,963	24,485	11,388	1,572
2014	2,775	2,342	1,773	22,118	10,287	1,420
2015	3,165	2,671	2,022	25,219	11,730	1,619
2016	2,992	2,525	1,912	23,843	11,089	1,530
2017	2,767	2,335	1,768	22,047	10,254	1,415
2018	3,087	2,606	1,973	24,604	11,444	1,579
2019	2,862	2,416	1,829	22,810	10,609	1,464

Table 4: Comparisons of LA spotted seatrout and red drum recreational and commercial landings (in pounds), and bycatch estimates (in pounds) from 1982-2019 for the maximum, mean, and minimum catch per set observations. Confidential commercial landings records (***) are not presented

	SST Landings		SST Bycatch			RD Landings		RD Bycatch		
Year	rec	com	max	mean	min	rec	com	max	mean	min
1982	4,869,061	727,606	6,429	5,426	4,107	2,855,725	1,454,503	450,138	209,363	28,894
1983	4,173,565	1,340,625	6,910	5,832	4,415	2,952,651	1,938,615	483,829	225,033	31,057
1984	1,362,509	973,250	6,917	5,837	4,419	2,367,474	2,608,383	484,310	225,257	31,088
1985	2,903,358	1,161,598	6,285	5,304	4,015	2,174,399	2,933,573	440,046	204,669	28,246
1986	6,140,234	1,978,038	6,094	5,143	3,893	1,993,626	7,817,694	426,663	198,445	27,387
1987	4,854,132	1,801,874	6,511	5,495	4,160	2,306,832	4,571,177	455,876	212,032	29,263
1988	5,313,332	1,433,408	5,145	4,342	3,287	2,424,843	245,365	360,214	167,539	23,122
1989	4,553,228	1,488,878	4,874	4,114	3,114	3,251,530	24,811	341,302	158,742	21,908
1990	2,246,316	648,645	4,571	3,858	2,920	2,977,243	0	320,042	148,854	20,543
1991	6,131,699	1,220,231	4,848	4,092	3,098	2,804,216	0	339,464	157,888	21,790
1992	4,047,596	971,481	4,231	3,571	2,703	4,072,597	0	296,240	137,784	19,016
1993	3,680,464	1,138,070	4,983	4,205	3,184	5,087,621	1,884	348,913	162,282	22,397
1994	5,287,571	1,023,687	6,218	5,248	3,973	4,610,560	2,957	435,373	202,496	27,946
1995	5,897,013	658,084	4,603	3,884	2,941	7,502,450	0	322,280	149,895	20,687
1996	5,633,898	774,474	4,671	3,942	2,984	7,157,264	1,925	327,053	152,115	20,993
1997	5,429,323	549,505	5,421	4,575	3,463	7,128,952	0	379,562	176,537	24,364
1998	5,177,850	111,979	4,567	3,854	2,918	5,442,578	4,769	319,748	148,717	20,524
1999	7,323,715	***	5,935	5,009	3,792	6,642,380	0	415,536	193,269	26,673
2000	8,118,153	***	5,038	4,251	3,219	8,288,060	0	352,729	164,057	22,642
2001	7,185,774	***	4,433	3,741	2,832	7,417,608	0	310,406	144,373	19,925
2002	5,012,133	***	5,082	4,289	3,247	7,196,064	0	355,868	165,517	22,843
2003	5,186,776	***	4,693	3,961	2,998	6,592,330	0	328,603	152,836	21,093
2004	4,332,901	***	4,442	3,748	2,838	5,778,575	0	310,993	144,646	19,963
2005	4,564,983	***	3,873	3,268	2,474	4,733,062	0	271,174	126,125	17,407
2006	6,745,371	***	4,119	3,476	2,632	5,098,331	0	288,400	134,137	18,512
2007	5,530,280	***	4,238	3,577	2,708	6,061,853	0	296,768	138,029	19,049
2008	7,164,674	***	4,104	3,464	2,622	6,672,823	0	287,370	133,658	18,446
2009	7,817,443	***	4,227	3,568	2,701	7,355,418	0	295,983	137,664	18,999
2010	6,184,412	***	3,848	3,247	2,458	8,346,255	0	269,401	125,301	17,293
2011	8,525,814	***	5,191	4,381	3,316	8,304,959	0	363,442	169,040	23,329
2012	8,163,839	***	4,420	3,730	2,824	6,044,853	0	309,474	143,939	19,865
2013	5,622,064	***	4,411	3,723	2,818	7,928,973	0	308,867	143,657	19,826
2014	3,251,893	***	3,985	3,363	2,546	6,367,723	0	279,007	129,769	17,909
2015	4,686,909	***	4,543	3,834	2,903	6,072,877	0	318,130	147,965	20,421
2016	5,367,655	***	4,295	3,625	2,744	4,711,394	0	300,766	139,889	19,306
2017	5,721,125	***	3,972	3,352	2,538	6,422,647	0	278,114	129,353	17,852
2018	2,982,455	***	4,433	3,741	2,832	7,633,391	0	310,375	144,358	19,923
2019	3,811,437	***	4,109	3,468	2,626	5,171,537	0	287,740	133,830	18,470

Figures

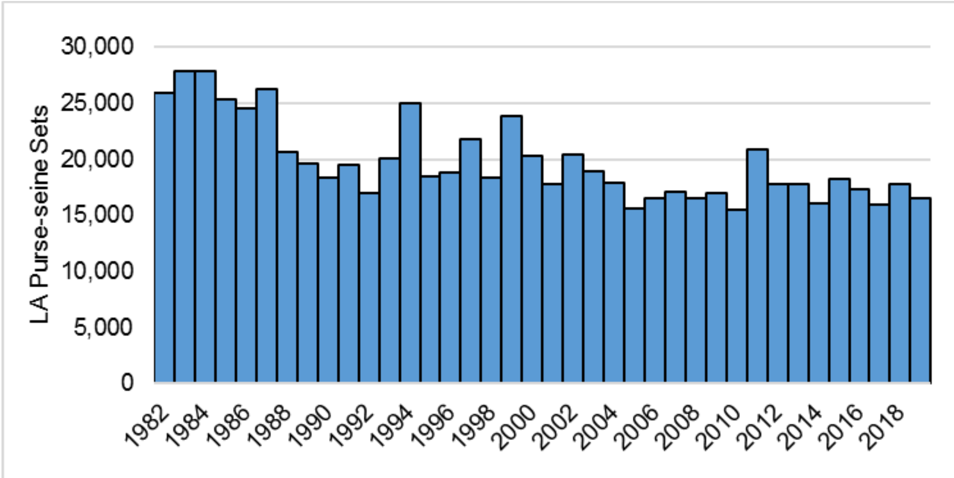


Figure 1: Time-series of estimated LA menhaden fishery effort (number of purse-seine sets per year).

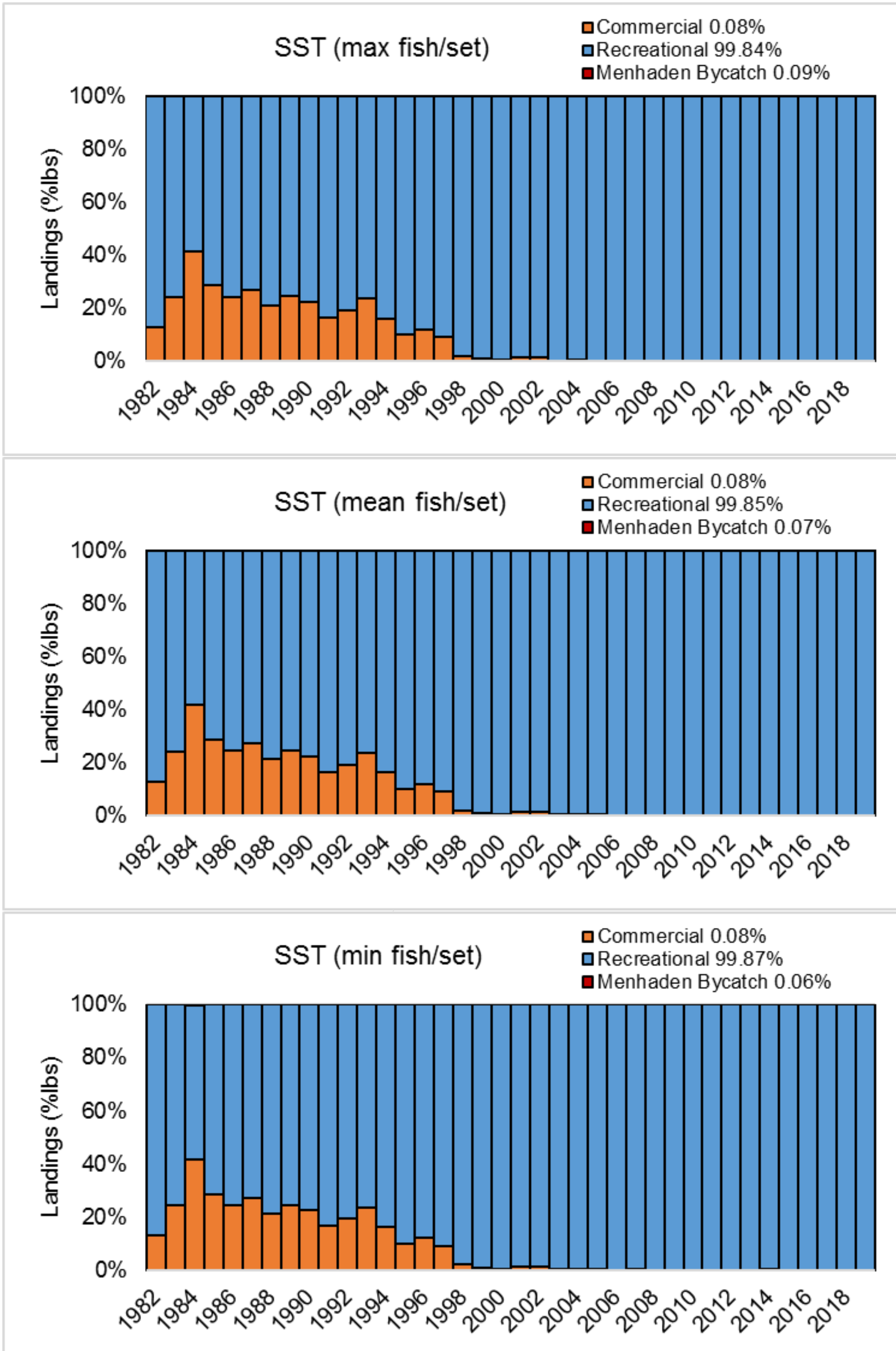


Figure 2: Comparison of LA spotted seatrout commercial and recreational landings, and LA menhaden bycatch estimates for the maximum (top), mean (center), and minimum (bottom) catch per set observations. Values in legends represent the mean landings percentages from 2010-2019.

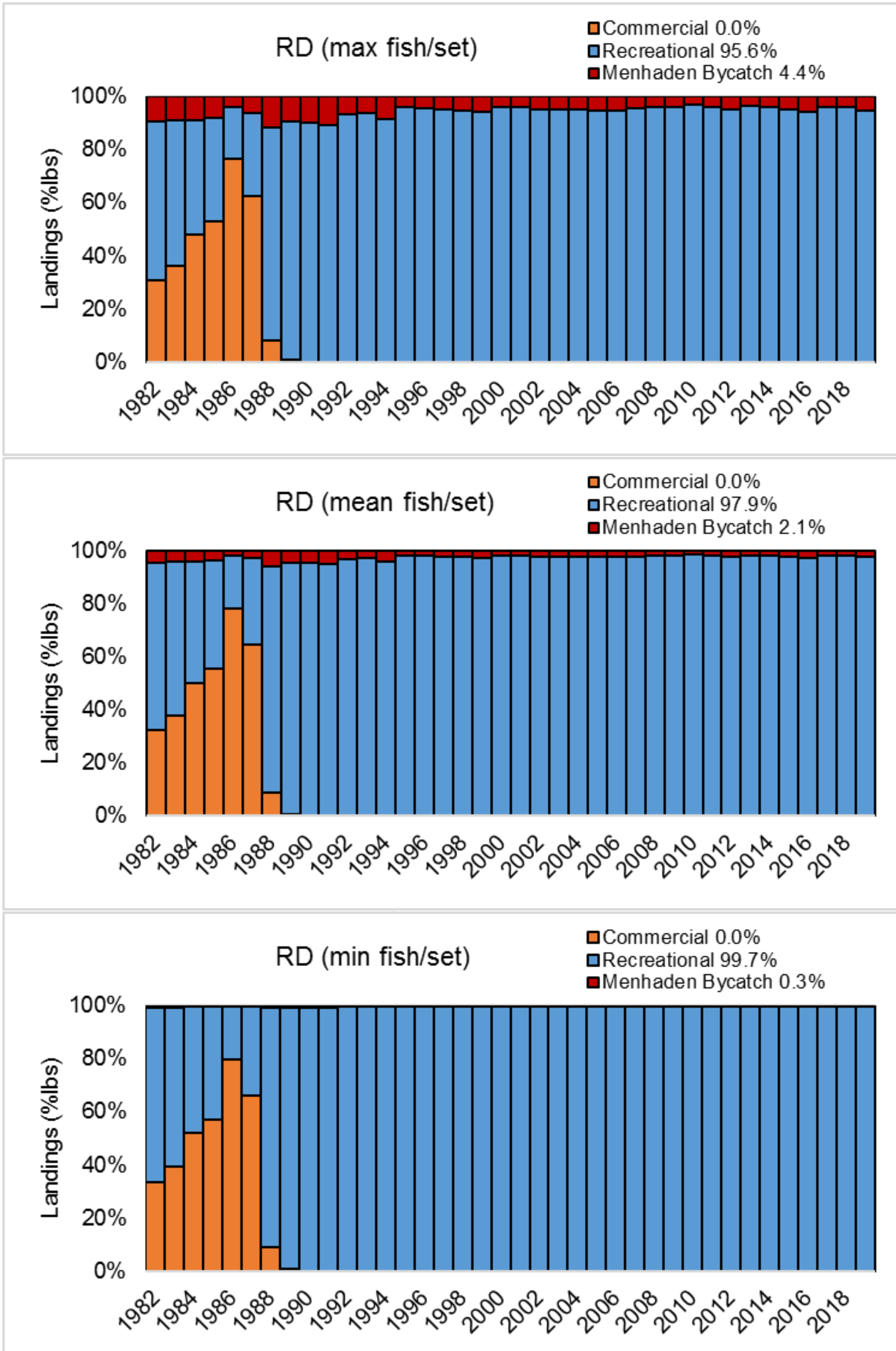


Figure 3: Comparison of LA red drum commercial and recreational landings, and LA menhaden bycatch estimates for the maximum (top), mean (center), and minimum (bottom) catch per set observations. Values in legends represent the mean landings percentages from 2010-2019.

Appendix 3:

JOHN BEL EDWARDS
GOVERNOR

JACK MONTOUCET
SECRETARY

Evaluation of Commercial Shrimp Fishery Bycatch in Louisiana Waters

Peyton Cagle and Joe West
Office of Fisheries
Louisiana Department of Wildlife and Fisheries
November 2020

Overview

Project Need

In 2010, a Fisheries Improvement Project (FIP) was initiated for the commercial shrimp fishery operating in Louisiana (LA) waters as a first step in the process of achieving a sustainability certification for the fishery. This was followed by an official improvement plan for the fishery in 2012. By 2015, the LA shrimp fishery met the goals outlined in the initial plan which allowed the fishery to progress into a comprehensive FIP that addresses all issues within the fishery to ensure the fishery is in compliance with the sustainability standards outlined by the certifying body.

Several action items were outlined in the comprehensive FIP, including the need for current bycatch data from the fishery to assess the main bycatch species per standards of the certifying body. The Louisiana Shrimp Task Force (LSTF) and involved members of the industry approached the Louisiana Department of Wildlife and Fisheries (LDWF) in 2016 and initiated discussions to conduct a study to characterize the current bycatch of the fishery in LA waters. In 2018, LDWF partnered with the LSTF and the American Shrimp Processors Association (ASPA) to fund a one-year observer study designed by the LDWF to focus exclusively on the bycatch of the shrimp fishery operating in LA waters, as the bycatch of the fishery operating in federal waters is monitored and reported by NOAA Fisheries.

Project Objectives

Objectives of this study were:

1. Characterize the current bycatch of the commercial shrimp fishery operating in LA waters.
2. Identify the main bycatch species of the fishery per standards of the Audubon Nature Institute (ANI) Gulf United for Lasting Fisheries (GULF) Responsible Fisheries Management (RFM) program (ANI 2020).
3. Assess the population resilience of the main bycatch species to fisheries exploitation.

Fishery Description

The commercial harvest of shrimp in LA dates back to the 1800s (LDWF 2016). As the popularity of shrimp as a food source grew in the early 1900s, the LA commercial shrimp industry expanded and commercial landings began to increase above 20 million pounds annually. Continued expansion of the industry into current times has led to the most valuable commercial fishery operating in LA waters with landings averaging over 70 million pounds annually in the most recent decade.

In the early 1900s, the otter trawl was developed and became the primary fishing gear used by LA shrimp fishers. This was followed by introduction of the butterfly net in the 1950s that allowed stationary fishing in tidal passes. The introduction of skimmer nets in the 1980s, which allowed fishers to focus efforts in shallower water and fish the entire water column, was widely accepted by the LA shrimp fishery.

A shift in gear preference of the LA commercial shrimp fishery has occurred over time as well as an overall decrease in license sales (Table 1). Based on commercial gear license sales, the use of otter trawl and butterfly net gear has decreased since 2000 while the use of skimmer nets has increased. The overall number of commercial licenses sold has decreased by over 70% since 2000.

Commercial shrimp landings in LA waters and the corresponding number of fishery trips have also decreased since 2000 (Figure 1). Commercial landings have decreased over 30% since 2000 while the number of fishery trips has declined by over 65%. This disproportionate decrease is primarily due to the characteristics of the shrimp fishery operating in LA waters changing over time, where a noticeable decline occurred in the mid-2000’s in the number of trips less than 1-day at sea.

Regulatory Authority

Regulatory authorities for the LA shrimp fishery are the Governor of Louisiana, the Louisiana Legislature, the Louisiana Wildlife and Fisheries Commission (LWFC), and the Secretary of LDWF. The Governor has the authority to issue executive orders, in limited instances, which are enforced in the same manner as statutes passed by the legislature. The LA Legislature has the authority to enact laws to protect, conserve, and replenish the natural resources of the state, such as gear regulations, licensing requirements, and entry limitations. Some of the authority of the legislature has been delegated to the LWFC, allowing regulatory authority of seasons, quotas, size limits, and possession limits.

Specific to commercial shrimping, the LWFC has the authority to open and close state outside waters, set the inshore shrimp season dates, and modify gear mesh sizes during the special shrimp seasons. The LWFC also has the authority to promulgate regulations regarding the use and configuration of excluder devices. Some authority of the LWFC is delegated to the Secretary of LDWF, including the ability to open or close special and regular shrimp seasons as well as open or close state outside waters.

Methods

Bycatch Characterization

In 2019, LDWF, along with the LSTF and ASPA, initiated an observer study of the commercial shrimp fishery operating in Louisiana waters to characterize bycatch of the fishery from July 2019 through June 2020. LGL Ecological Research Associates, Inc. (LGL) was contracted for this study to provide biological staff to act as observers onboard commercial shrimp fishing vessels operating in LA waters.

Fishery participants were solicited though the LSTF, social media, and LDWF news releases, and an online portal was developed for interested commercial fishers to enroll. All commercial fishers operating out of LA ports were eligible to participate in this study. Commercial vessels in which observers were placed were selected randomly from the pool of participating commercial fishers. Commercial fishers randomly drawn from this group were compensated $350 per day for each fishing trip where bycatch was observed by an LGL biologist. Fishing trips conducted with observers onboard were not to exceed 48 hours. Trips in which observers were placed were randomly assigned proportional to the recent fishery effort (number of trips) by fishing gear, LDWF Coastal Study Area (CSA), and fishing season (spring, fall, inshore closed).

Bycatch information was collected over the duration of each observed trip by sampling each tow. On vessels containing multiple nets, samples were collected by alternating which net the samples were collected from after each tow. Any observed interactions with sea turtles were to be documented, regardless of which net was sampled.

For each net sampled, the total weight of the tow was estimated through a volumetric approach as described in the NOAA Observer Training Manual (NOAA Fisheries 2010). Multiple fish baskets were equally filled with the entire catch of the sampled tow and then one fish basket was randomly chosen, weighed and used to extrapolate the weight of the entire tow's catch from the number of baskets filled. Catch of the randomly chosen basket was also characterized by sorting, enumerating, and weighing each species to the nearest gram with the exception of white and brown shrimp and jellyfish species where only weight measurements were recorded. The species weight composition of the subsample was then used to extrapolate the total catch weight of each tow.

Size measurements of up to thirty individuals per sampled tow were recorded for penaeid shrimp species and other selected species that are managed or commonly harvested. Large specimens that weren't included in the volumetric sampling method were identified by species, counted, released condition documented, and size or weight measurements recorded when possible. Tow times and locations were also recorded along with the position of the sampled net for each tow.

Main Bycatch Identification

The ANI GULF RFM program identifies relevant bycatch (non-target catches), whether discarded or retained, as managed non-target species (species regulated for commercial, bait, or recreational use) greater than 1% of total catch and non-managed non-target species greater than 10% of total catch (ANI 2020).

Resilience to Exploitation

Population resilience is a population's ability to withstand perturbation. Populations with higher resilience are at less risk of extinction due to fishery exploitation than populations with lower resilience. Productivity, which is a function of growth rates, fecundity, natural mortality, age at maturity, and longevity, can be a reasonable proxy for population resilience. Productivity classification indices were developed for each species identified as main bycatch from their life history characteristics based on a classification scheme developed at the Food and Agricultural Organization of the United Nations (FAO) second technical consultation on the suitability of the Convention on International Trade in Endangered Species (CITES) criteria for listing commercially-exploited aquatic species (FAO 2001).

<u>Results</u>

Bycatch Characterization

Thirty-three shrimp fishing trips with 363 tows and 501 hours of tow time were observed from July 2019 through June 2020 from 12 individual commercial fishing vessels. Of the twelve participating vessels, 9 fished with skimmer nets, 2 with otter trawls, and 1 with butterfly net gear. The otter trawls were all equipped with bycatch reduction devices (BRDs) and turtle excluder devices, and two-thirds of the skimmer nets were equipped with BRDs.

Observer coverage of the fishery over the course of this study was approximately 0.1% (33 observed trips/37,203 fishery trips) and nearly proportional to the number of fishery trips by gear, CSA, and fishing season with the exception of CSA 6 and 7 due to the lack of fishery participation in those areas (Table 2, Figure 2).

From the 363 observed tows, 14,266 kg of total catch was observed consisting of 105 unique species or grouped species (Table 3). Four species of penaeid shrimp, 82 finfish species, 12 crustacean species (excluding penaeid shrimp), and 7 non-crustacean invertebrate species were observed. Penaeid shrimp species were the highest group caught by weight (48.1%), followed by finfish (40.2%), crustaceans other than penaeid shrimp (5.0%), and invertebrates (3.0%). Debris made up 3.7% of the total catch by weight.

The most abundant species caught consisting of >1% by weight of the total catch were white shrimp (44.3%), Gulf menhaden, (14.1%), Atlantic croaker (5.4%), blue crab (4.9%), brown shrimp (3.7%), spot (3.2%), jellyfish sp. (2.9%), sand seatrout (2.8%), hardhead catfish (2.2%), gafftopsail catfish (2.1%), and Atlantic cutlassfish (2.1%).

The bycatch to shrimp sample ratio error distribution was assumed lognormal and the corresponding sample ratio geometric mean in units of weight was 1.01 (Table 4). Size compositions and mean sizes of penaeid shrimp and the managed and commonly harvested species catches are presented in Table 5. Catch composition of large specimens not represented in the volumetric samples are presented in Table 6 along with released condition and corresponding size and weight measurements if available. Interactions with diamondback terrapins were observed in which all were released alive (Table 6). No interactions with sea turtles were observed.

Main Bycatch Identification

Gulf menhaden and blue crab were identified as the main bycatch species of the current LA commercial shrimp fishery per ANI standards. Both are managed species that are greater than 1% of the total catch by weight. The other non-target species consisting of greater than 1% of the total catch are non-managed species not regulated for recreational, bait, or commercial use. No non-managed non-target species was greater than 10% of the total catch by weight.

Resilience to Exploitation

Blue crab and Gulf menhaden were assigned productivity/resilience levels (high, medium, or low) based on each species life history characteristics (Table 7). Life history parameter values were taken from the most recent stock assessments if available (SEDAR 2018, West et al. 2019). Parameter values not available in the stock assessment reports were taken from FishBase (Froese and Pauly 2011) and

SeaLifeBase (Palomares and Pauly 2020). Parameter values for each of the main bycatch species indicate overall high productivity/resilience.

<u>Discussion</u>

Historic Bycatch Ratios

The bycatch to penaeid shrimp sample ratio mean from this study (1.01) is less than an earlier LDWF shrimp bycatch study conducted in LA waters (Adkins 1993). The bycatch to penaeid shrimp sample ratio mean in that study, recalculated as a geometric mean, was 1.24, suggesting bycatch in the LA shrimp fishery has decreased through time. This decrease is likely due to the changing characteristics of the fishery where skimmer nets have become the preferred gear of the fishery, along with the use of BRDs. An earlier NOAA Fisheries bycatch study conducted in LA waters (Scott-Denton et al. 2006), which only characterized bycatch from the skimmer net fishery operating primarily in Vermilion Bay (CSA 6), reported an overall ratio of bycatch to penaeid shrimp of 0.63.

Management Implications

For managed species identified as main bycatch, the ANI standards require the effects of the fishery to be considered. Consideration of managed non-target species aims primarily at establishing whether the overall effects of fishing on the stock under consideration and all significant removals are accounted for; and that the management strategy and relative measures are effective in maintaining other managed species from experiencing overfishing and other impacts that are likely to be irreversible or very slowly reversible (ANI 2020).

The main bycatch species of the LA commercial shrimp fishery per ANI standards (Gulf menhaden and blue crab) are regulated species which undergo periodic stock assessments that output estimates used as metrics of stock status (SEDAR 2018, West et al. 2019) with fisheries that currently hold Global Sustainable Seafood Initiative (GSSI) accredited sustainability certifications. Removals of Gulf menhaden and blue crab as bycatch from the LA shrimp fishery have not been considered in the respective stock assessments. Bycatch from the offshore Gulf of Mexico shrimp fishery was considered in the most recent Gulf menhaden stock assessment (SEDAR 2018), but was ultimately not used as a model input by the assessment panelists due to the high uncertainty in the estimated time-series and the relatively insignificant level of bycatch when compared to the landings of the fishery.

Future LDWF blue crab and SEDAR Gulf menhaden stock assessments would be required to consider removals from the LA shrimp fishery per ANI standards. Time-series of bycatch removals could be estimated directly from annual LA shrimp landings from the mean bycatch to shrimp ratio from this study and the earlier LDWF study (Adkins 1993) along with the percent composition of blue crab and Gulf menhaden in the catches and assumptions of discard mortality. These time-series would unfortunately be considered highly uncertain due to the few bycatch to shrimp ratio estimates available in LA waters over time coupled with the changing characteristics of the fishery, but would allow accurate estimation of the current bycatch removals of the LA shrimp fishery to determine their significance relative to the directed landings of each fishery.

Literature Cited

Adkins, G. 1993. A Comprehensive Assessment of Bycatch in the Louisiana Shrimp Fishery. Technical Bulletin 42. Louisiana Department of Wildlife and Fisheries, Baton Rouge, LA

ANI. 2020. Gulf United for Lasting Fisheries Responsible Fisheries Management Guidance to Assessment. Issue 1.3, 22 January 2020. Available at: https://www.audubongulf.org/wp-content/uploads/2020/05/GULF-RFM-Guidance-Doc-V-1.3_Final_1.22.2020.pdf

FAO. 2001. Second Technical Consultation on the Suitability of the CITES Criteria for Listing Commercially-exploited Aquatic Species: A background analysis and framework for evaluating the status of commercially-exploited aquatic species in a CITES context. Available at: http://www.fao.org/docrep/MEETING/003/Y1455E.htm

Froese, R. and D. Pauly. Editors. 2011. FishBase. Available at: www.fishbase.org (accessed on 10/1/2020).

LDWF. 2016. Louisiana Shrimp Fishery Management Plan. Louisiana Department of Wildlife and Fisheries, Office of Fisheries. 158pp. Available at: https://www.wlf.louisiana.gov/assets/Resources/Publications/Marine_Fishery_Management_Plans/2016_Shrimp_Fishery_Management_Plan.pdf

NOAA Fisheries. 2010. Characterization of the US Gulf of Mexico and Southeastern Atlantic Otter Trawl and Bottom Reef Fish Fisheries: Observer Training Manuel. NOAA Fisheries, Southeast Fishery Science Center, Galveston Lab, September 2010.

Palomares, M.L.D. and D. Pauly. Editors. 2020. SeaLifeBase. Available at: www.sealifebase.ca (accessed on 10/26/2020).

Scott-Denton, E., P. Cryer, J. Gocke, M. Harrelson, K. Jones, J. Pulver, J. Nance, R. Smith, and J.A. Williams. 2007. Skimmer trawl fishery catch evaluations in coastal Louisiana, 2004 and 2005. Marine Fisheries Review 68: 30-35.

SEDAR. 2018. Gulf Menhaden SEDAR 63 Stock Assessment Report. SEDAR, Charleston, SC. Available at: http://sedarweb.org/docs/sar/S63_GulfMenSAR_12.17.2018_FINAL.pdf

West, J., H. Blanchet, and P. Cagle. 2019. Update Assessment of Blue Crab *Callinectes sapidus* in Louisiana Waters. 2019 Report of the Louisiana Department of Wildlife and Fisheries. 32 pp. Available at: https://www.wlf.louisiana.gov/assets/Resources/Publications/Stock_Assesments/Blue_Crab/2019_Update_Assessment_of_Blue_Crab.pdf

<u>Tables</u>

Table 1. Louisiana annual commercial shrimp gear license sales (percent by gear and total sales), 2000-2019.

Year	Trawl	Skimmer	Butterfly	Total
2000	54%	34%	12%	22,218
2001	52%	37%	10%	22,865
2002	51%	40%	9%	21,627
2003	48%	44%	8%	20,586
2004	48%	43%	8%	17,347
2005	46%	45%	9%	15,420
2006	44%	48%	9%	13,646
2007	43%	48%	9%	12,590
2008	42%	49%	10%	11,476
2009	40%	50%	10%	12,082
2010	38%	52%	10%	12,806
2011	37%	54%	9%	13,234
2012	38%	53%	8%	12,728
2013	29%	64%	7%	10,123
2014	42%	49%	9%	7,319
2015	41%	50%	9%	7,551
2016	41%	51%	9%	7,340
2017	41%	51%	8%	6,867
2018	41%	51%	8%	6,236
2019	40%	51%	8%	5,791

Table 2: Louisiana shrimp fishery trips and observer coverage (July 2019 – June 2020) by gear, CSA, and fishing season.

Fishery trips	37,203
Observed trips	33

	Fishery trips		Observed trips	
Gear	Frequency	Percent	Frequency	Percent
Butterfly net	2276	6.1%	3	9.1%
Otter trawl	6452	17.3%	6	18.2%
Skimmer net	28475	76.5%	24	72.7%

	Fishery trips		Observed trips	
CSA	Frequency	Percent	Frequency	Percent
1	6564	17.6%	7	21.2%
3	11136	29.9%	12	36.4%
5	14607	39.3%	14	42.4%
6	1108	3.0%	0	0.0%
7	3788	10.2%	0	0.0%

	Fishery trips		Observed trips	
Season	Frequency	Percent	Frequency	Percent
Spring	7823	21.0%	7	21.2%
Fall	24457	65.7%	24	72.7%
Inshore closed	4923	13.2%	2	6.1%

Table 3: Species total catch composition and corresponding mean weights. Species mean weights are calculated from the subsampled weights and counts.

Species	total kg	% kg	mean kg
WHITE SHRIMP	6321.765	44.313	--
GULF MENHADEN	2013.137	14.111	0.014
ATLANTIC CROAKER	768.736	5.389	0.011
BLUE CRAB	700.646	4.911	0.054
BROWN SHRIMP	527.423	3.697	--
DEBRIS	521.480	3.655	--
SPOT	449.081	3.148	0.030
JELLYFISH SP.	415.590	2.913	--
SAND SEATROUT	402.123	2.819	0.012
HARDHEAD CATFISH	314.820	2.207	0.018
GAFFTOPSAIL CATFISH	302.624	2.121	0.015
ATLANTIC CUTLASSFISH	299.163	2.097	0.021
ATLANTIC THREAD HERRING	117.899	0.826	0.015
BAY ANCHOVY	102.212	0.716	0.001
GIZZARD SHAD	94.846	0.665	0.019
THREADFIN SHAD	68.982	0.484	0.014
COWNOSE RAY	68.401	0.479	0.772
SPANISH MACKEREL	67.702	0.475	0.023
SPOTTED SEATROUT	66.077	0.463	0.080
ATLANTIC MOONFISH	62.295	0.437	0.008
CATFISH SP.	54.260	0.380	0.022
STRIPED MULLET	43.462	0.305	0.039
ATLANTIC STINGRAY	41.300	0.289	0.215
HARVESTFISH	36.490	0.256	0.025
PINFISH	31.478	0.221	0.039
STRIPED ANCHOVY	31.222	0.219	0.012
HOGCHOKER	25.958	0.182	0.016
SHEEPSHEAD	23.683	0.166	1.203
SOUTHERN FLOUNDER	23.201	0.163	0.337
SOUTHERN KINGFISH	20.237	0.142	0.032
SILVER PERCH	17.558	0.123	0.026
SEABOB	17.386	0.122	0.005
BLUE CATFISH	16.445	0.115	0.007
LEAST PUFFER	16.150	0.113	0.007
WHITE MULLET	16.042	0.112	0.023
ATLANTIC BRIEF SQUID	15.726	0.110	0.009
BAY WHIFF	15.136	0.106	0.009
SCALED SARDINE	14.126	0.099	0.007
LADYFISH	10.005	0.070	0.102
CREVALLE JACK	9.887	0.069	0.028
STAR DRUM	8.882	0.062	0.014
INSHORE LIZARDFISH	8.292	0.058	0.034
ATLANTIC SPADEFISH	7.770	0.054	0.013
HIGHFIN GOBY	7.558	0.053	0.027
ATLANTIC BUMPER	6.027	0.042	0.003
VIOLET GOBY	5.584	0.039	0.030
LOOKDOWN	4.889	0.034	0.015
FLORIDA POMPANO	4.535	0.032	0.092
BLUE RUNNER	4.382	0.031	0.045
BLACK DRUM	3.471	0.024	0.088
GRAY SNAPPER	3.053	0.021	0.044
HERMIT CRAB SP.	2.905	0.020	0.018

Table 3 (continued):

Species	total kg	% kg	mean kg
BANDED DRUM	2.866	0.020	0.006
ATLANTIC MIDSHIPMAN	2.304	0.016	0.022
GULF STONE CRAB	2.166	0.015	0.440
ATLANTIC NEEDLEFISH	2.048	0.014	0.026
BLACKTIP SHARK	1.970	0.014	0.200
ATLANTIC SILVERSTRIPE HALFBEAK	1.871	0.013	0.035
SPINY SEAROBIN	1.723	0.012	0.004
LEATHERJACKET	1.615	0.011	0.008
INLAND SILVERSIDE	1.600	0.011	0.004
BIGHEAD SEAROBIN	1.590	0.011	0.005
ROUGH SILVERSIDE	1.492	0.010	0.002
BLACKCHEEK TONGUEFISH	0.985	0.007	0.033
GULF TOADFISH	0.886	0.006	0.036
PIGFISH	0.886	0.006	0.060
STRIPED BURRFISH	0.886	0.006	0.180
GULF BUTTERFISH	0.768	0.005	0.005
NEEDLEFISH SP.	0.704	0.005	0.029
SNAIL SP.	0.689	0.005	0.016
NAKED SOLE	0.596	0.004	0.020
NORTHERN KINGFISH	0.596	0.004	0.040
SHARKSUCKER	0.566	0.004	0.038
ISOPODA SP.	0.502	0.004	0.034
BAYOU KILLIFISH	0.478	0.003	0.019
GIANT TIGER PRAWN	0.359	0.003	0.073
FALSE SILVERSTRIPE HALFBEAK	0.355	0.002	0.024
ATLANTIC MENHADEN	0.345	0.002	0.070
MOJARRA SP.	0.295	0.002	0.015
BLUNTNOSE JACK	0.251	0.002	0.009
FALSE SHARK EYE	0.246	0.002	0.013
CRESTED CUSK EEL	0.197	0.001	0.040
THINSTRIPE HERMIT CRAB	0.197	0.001	0.013
FAT SLEEPER	0.177	0.001	0.018
FRINGED FLOUNDER	0.158	0.001	0.004
FLORIDA ROCKSNAIL	0.148	0.001	0.015
OYSTER TOADFISH	0.148	0.001	0.030
RIVER SHRIMP	0.148	0.001	0.030
SPOTFIN MOJARRA	0.148	0.001	0.015
YELLOWFIN MOJARRA	0.148	0.001	0.008
PYGMY SEA BASS	0.108	0.001	0.022
SMOOTH PUFFER	0.103	0.001	0.011
AMERICAN PADDLEFISH	0.098	0.001	0.020
BIVALVE CLAM SP.	0.098	0.001	0.020
MANTIS SHRIMP	0.098	0.001	0.010
PINK PURSE CRAB	0.098	0.001	0.010
WHITE RIVER CRAWFISH	0.098	0.001	0.010
SILVER ANCHOVY	0.079	0.001	0.008
BIGCLAW SNAPPING SHRIMP	0.049	0.000	0.010
REDEAR SUNFISH	0.049	0.000	0.010
FLORIDA LADY CRAB	0.044	0.000	0.009
TIDEWATER MOJARRA	0.044	0.000	0.009
ESTUARINE MUD CRAB	0.015	0.000	0.001
BIGEYE ROBIN	0.005	0.000	0.001
GULF PIPEFISH	0.005	0.000	0.001
SPECKLED SWIMMING CRAB	0.005	0.000	0.001

Table 4: Bycatch to penaeid shrimp (brown, white, seabob) sample ratio summary statistics in units of weight. The sample ratio mean and error estimates are geometric.

Ratio (bycatch /shrimp)		
Bin	Frequency	Percent
0.0	163	50.309
1.0	55	16.975
2.0	39	12.037
3.0	18	5.556
4.0	16	4.938
5.0	12	3.704
6.0	5	1.543
7.0	4	1.235
8.0	2	0.617
9.0	--	--
10.0	2	0.617
11.0	--	--
12.0	--	--
13.0	1	0.309
14.0	--	--
15.0	1	0.309
16.0	2	0.617
17.0	--	--
18.0	--	--
19.0	2	0.617
--	--	--
51.0	1	0.309
--	--	--
111.0	1	0.309

Ratio (bycatch/shrimp)	
Mean	1.013
L95%CI	0.882
U95%CI	1.163
CV	1.986
Tows	324

Table 5: Bycatch size compositions of managed and commonly harvested species. Size measurements are fork length (finfish), total length (shrimp), and carapace width (crab).

Size bin (cm)	ATLANTIC CROAKER	BLACK DRUM	BLUE CRAB	BROWN SHRIMP	GRAY SNAPPER	GULF MENHADEN	SEABOB	SHEEPSHEAD	SOUTHERN FLOUNDER	SPOTTED SEATROUT	STRIPED MULLET	WHITE SHRIMP
0	2	--	--	--	--	--	--	--	--	--	--	--
1	1	--	30	1	--	--	--	--	--	--	--	--
2	--	--	96	1	2	1	--	--	--	--	--	1
3	3	--	291	--	1	6	--	--	--	--	--	6
4	1	--	358	15	--	64	--	--	--	--	--	14
5	39	--	285	91	--	302	--	--	--	--	--	74
6	284	--	177	419	--	627	1	--	--	--	1	263
7	485	--	139	1,087	--	1,074	6	--	--	--	2	700
8	748	1	111	1,246	--	970	28	--	--	--	4	1,039
9	632	--	91	635	--	579	34	--	--	5	9	1,043
10	618	--	94	260	1	742	15	--	--	9	24	788
11	988	--	123	112	1	830	1	--	--	12	39	1,035
12	822	--	116	20	--	330	--	--	--	18	25	1,395
13	513	--	89	4	1	156	--	--	--	11	30	1,562
14	261	--	82	1	--	172	--	--	--	6	27	1,021
15	120	--	99	--	--	126	--	--	--	6	16	336
16	55	--	124	--	--	53	--	--	--	6	12	78
17	24	2	71	--	--	11	--	--	--	8	6	9
18	10	--	24	1	--	5	--	--	--	1	8	2
19	3	3	6	--	--	1	--	--	--	4	6	2
20	1	1	--	--	--	1	--	--	1	8	3	--
21	3	1	--	--	--	--	--	--	1	12	2	--
22	--	--	--	--	--	1	--	--	--	13	1	--
23	--	--	--	--	--	--	--	--	1	5	2	--
24	--	--	--	--	--	--	--	--	1	6	--	--
25	--	--	--	--	--	--	--	--	--	8	--	--
26	--	--	--	--	--	--	--	--	1	3	--	--
27	--	--	--	--	--	--	--	--	--	5	--	--
28	--	--	--	--	--	--	--	--	1	4	--	--
29	--	--	--	--	--	--	--	--	1	2	--	--
30	--	--	--	--	--	--	--	1	1	2	--	--
31	--	--	--	--	--	--	--	--	--	--	--	--
32	--	--	--	--	--	--	--	1	--	--	--	--
33	--	--	--	--	--	--	--	--	--	2	--	--
34	--	--	--	--	--	--	--	1	--	3	--	--
35	--	--	--	--	--	--	--	--	2	--	--	--
36	--	--	--	--	--	--	--	--	1	1	--	--
37	--	--	--	--	--	--	--	--	1	--	--	--
38	--	--	--	--	--	--	--	--	--	--	--	--
39	--	--	--	--	--	--	--	--	--	--	--	--
40	--	--	--	--	--	--	--	--	--	--	--	--
41	--	--	--	--	--	--	--	--	--	--	--	--
42	--	--	--	--	--	--	--	--	--	--	--	--
43	--	--	--	--	--	--	--	1	--	--	--	--
Mean size (mm)	107	176	83	82	73	94	91	354	290	187	135	113
n	5613	8	2406	3893	6	6051	85	4	12	160	217	9368

Table 6: Large specimen catch composition. Size measurements are fork length.

Species	numbers	released condition			weight (kg)				size (mm)			
		alive	dead	unknown	mean	n	min	max	mean	n	min	max
Black Drum	33	20	2	11	7.67	2	6.98	8.35	905	1	905	905
Cownose Ray	27	5	--	22	0.81	5	0.60	0.96	323	4	136	410
Atlantic Stingray	25	10	11	4	0.86	3	0.41	1.16	146	1	146	146
Sheepshead	15	10	1	4	2.59	3	2.48	2.78	494	3	460	528
Longnose Gar	12	12	--	--	--	--	--	--	--	--	--	--
Diamondback Terrapin	5	5	--	--	--	--	--	--	--	--	--	--
Red Drum	5	5	--	--	--	--	--	--	--	--	--	--
Hardhead Catfish	5	5	--	--	--	--	--	--	--	--	--	--
Alligator Gar	4	4	--	--	--	--	--	--	1140	2	450	1829
Atlantic Tripletail	3	2	--	1	--	--	--	--	--	--	--	--
Bull shark	2	2	--	--	4.92	2	4.83	5.01	--	--	--	--
Spotted Seatrout	2	2	--	--	--	--	--	--	--	--	--	--
Bonnethead	1	1	--	--	--	--	--		--	--	--	--
Blacktip Shark	1	1	--	--	3.62	1	3.62	3.62	566	1	566	566

Table 7: FAO proposed guideline for indices of productivity/resilience for exploited aquatic species (top table) and corresponding productivity/resilience levels for blue crab and Gulf menhaden (bottom table). Parameter values are taken from the latest stock assessment reports (West et al. 2019, SEDAR 63) unless noted by an * where values are taken from FishBase (Froese and Pauly 2011) for Gulf menhaden and SeaLifeBase (Palomares and Pauly 2020) for blue crab.

Parameter	Productivity/Resilience		
	Low	Medium	High
Intrinsic rate of population growth (r per yr)	<0.14	0.14 - 0.35	>0.35
Natural mortality rate (M per yr)	<0.2	0.2 - 0.5	>0.5
Individual growth rate (K per yr)	<0.15	0.15 - 0.33	>0.33
Age at maturity (yrs)	>8	8 - 3.3	<3.3
Maximum age (yrs)	>25	14 - 25	<14
Generation time (yrs)	>10	10.0 - 5.0	<5

Parameter	Blue Crab		Gulf Menhaden	
	Value	Index	Value	Index
Intrinsic rate of population growth (r per yr)	0.6*	High	3.0*	High
Natural mortality rate (M per yr)	1.0	High	1.1	High
Individual growth rate (K per yr)	1.9	High	0.3	High
Age at maturity (yrs)	1.0	High	2.0	High
Maximum age (yrs)	3.0	High	6.0	High
Generation time (yrs)	<3.0	High	2.4*	High
Overall productivity /resilience level	High		High	

Figures

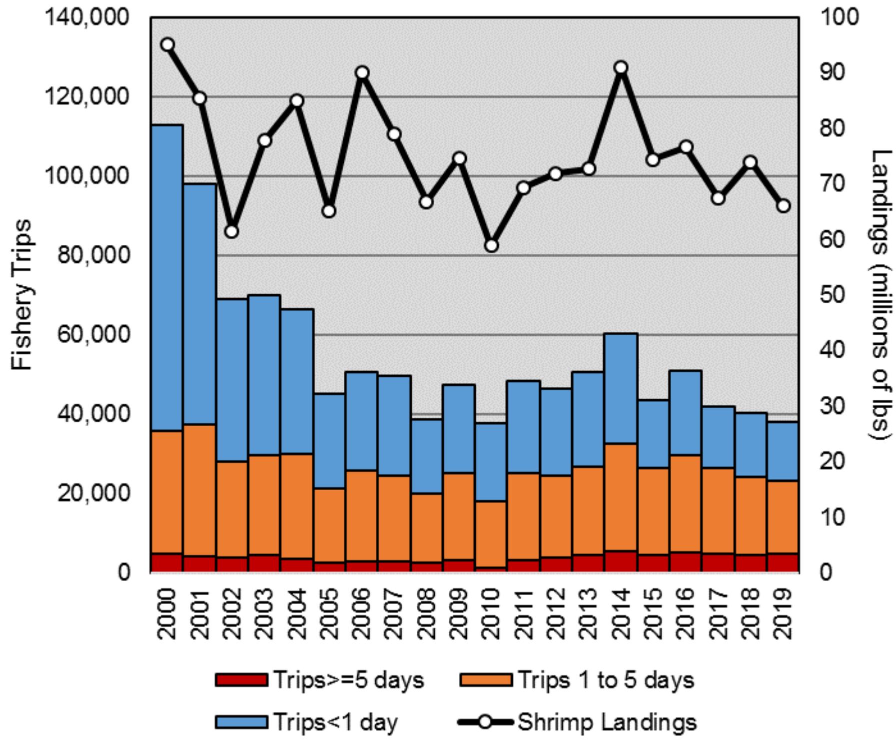


Figure 1: Shrimp fishery trips in LA waters by number of days at sea and corresponding total penaeid shrimp landings taken from the LDWF Trip Ticket program, 2000-2019. Note: Landings and fishery trips do not include records from out of state or federal waters.

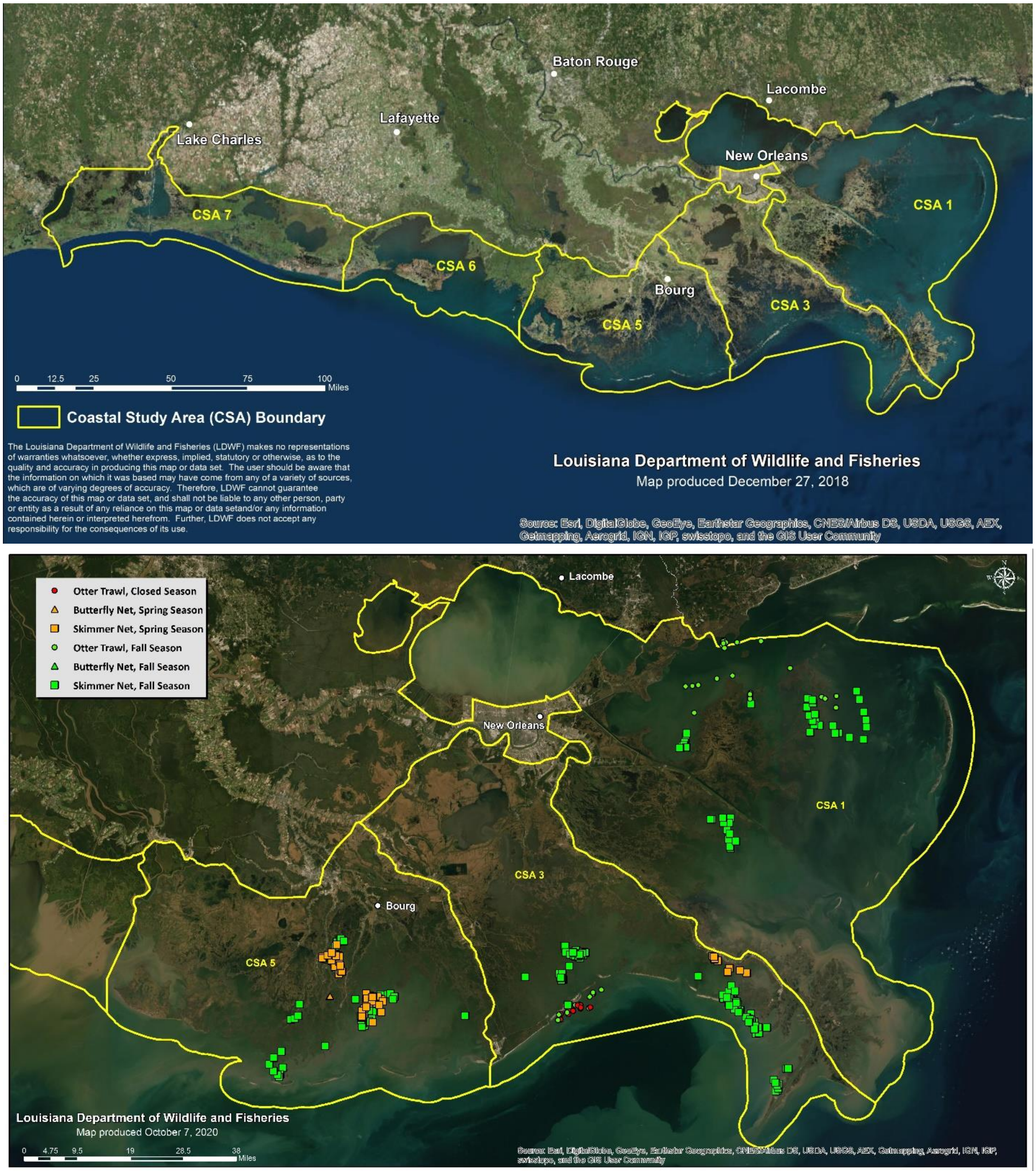


Figure 2: Louisiana state waters and LDWF Coastal Study Areas delineated by the yellow lines (top graphic) and locations of observed fishery tows (bottom graphic) by gear fished (otter trawl, skimmer net, butterfly net) and fishing season (spring, fall, inshore closed).

Appendix 4:

Louisiana Red Drum (*Sciaenops ocellatus*) Life History

Erik Lang and Joe West
Office of Fisheries
Louisiana Department of Wildlife and Fisheries

Overview

Red drum (*Sciaenops ocellatus*) growth and weight-length models are developed from Louisiana Department of Wildlife and Fisheries (LDWF) datasets for use in stock assessment.

Methods

Growth

The von Bertalanffy growth model is the most common function used to model length-at-age and is configured as:

$$L_t = L_\infty\left(1 - e^{-k(t-t_0)}\right) \quad [1]$$

where L_t is mean length at age in years (t), L_∞ is the asymptotic average maximum size, k is the rate at which length approaches L_∞, and t_0 is the theoretical age when length=0.

The von Bertalanffy growth model has been proven inadequate for fitting some sciaenid species length-at-age data, including Red Drum (Beckman et al. 1988). Because of the very rapid growth exhibited in juveniles and the relatively slow growth of adult Red Drum (RD), predicted lengths-at-age of younger fish tend to be overestimated and predicted lengths-at-age of older fish underestimated with the standard von Bertalanffy model.

A different growth model has been developed that accounts for growth rates changing continuously with age (damped growth; Porch et al. 2002), rather than the constant growth rate (k) across ages inherent to the von Bertalanffy model. The damped growth model allows a continuous change in growth rates across ages rather than a single discontinuous change at a particular age such as the “double” von Bertalanffy generalization. Length-at-age is calculated with the damped model as:

$$L_t = L_\infty(1 - e^{\beta - k_0(t-t_0)}) \quad [2]$$

$$\beta = \frac{k_1}{\lambda}(e^{-\lambda t} - e^{-\lambda t_0})$$

where $k = k_0 + k_1 e^{-\lambda t} \geq 0$ (i.e., assuming fish will not shrink with age). The λ parameter is the damping coefficient allowing growth rates to change with age.

Both growth models above were fit to a LDWF RD dataset with the SAS nonlinear regression fitting procedure (PROC NLIN; SAS 2008). To determine the most suitable model for stock assessment purposes, residual plots of each model were examined for normality and each model was ranked using Akaike's (1973) information criterion (AIC).

Due to the minimum size limit in the RD fishery, only LDWF FI information was used for model fitting. The FI length-at-age dataset (n=1,333) consists of age samples from RD catches (2019-2021) collected from the LDWF estuarine trammel net and bag seine survey (LDWF 2018), and the LDWF component of the SEAMAP nearshore bottom longline survey (SEAMAP 2013). Biological ages are assigned with an assumed birthdate of October 1st.

The young-of-the-year fish (yoy) included from the marine bag seine survey are not directly aged, but are assigned ages using the assumed October 1st birthdate and the sample collection date, and assuming only fish less than 8 inches total length are yoy fish after removing fish clearly not yoy. To not overfit the yoy data, a random draw of 100 yoy fish were selected from the available length-at-age samples from the seine survey and included in the modeled dataset.

Weight-Length

The relationship between fish length and weight is modeled with a power function configured as:

$$W = aL^b \quad [3]$$

where W is weight, L is length, a is the weight-length constant and b is the allometric exponent.

The power function above is fit to a LDWF RD weight-length dataset (n=17,780) from fish samples collected from LDWF recreational sportfish sampling (2002-2021) and the LDWF marine trammel net survey (2019-2021) with the SAS nonlinear regression fitting procedure (PROC NLIN; SAS 2008). Outliers were identified with studentized residuals over an absolute value of 3 and removed from the dataset, and the model refit.

Results

Growth

The damped growth model was chosen over the traditional von Bertalanffy model due to a lower AIC value (von Bertalanffy=2196; damped=2167) after examination of each models residual plot (Figure 1).

The damped growth model parameter estimates, standard errors, and confidence limits are presented in Table 1. The damped growth curve and length at age observations are also presented in Figure 2.

Examination of age-specific coefficient of variations (CV) from the damped growth model (Figure 3) shows a declining pattern through age-5 until becoming relatively uniform for fish age-6 and greater.

Weight-Length

Parameter estimates, standard errors, and confidence limits of the weight-length regression are presented in Table 2. Expected values and weight-length observations are also presented in Figure 4.

Literature Cited

Akaike, H. 1973. Information theory and an extension of the maximum likelihood principle. In Second international symposium on information theory (B. N. Petrov and F. Csaki, eds.), p. 267–281. Akademiai Kiado, Budapest.

Beckman, D. W., C. A. Wilson, and A. L. Stanley. 1988. Age and growth of red drum, Sciaenops ocellatus from offshore waters of the Gulf of Mexico. Fish. Bull. 87: 17–28.

LDWF 2018. Marine Fisheries Section Independent Sampling Activities Field Manual. Louisiana Department of Wildlife and Fisheries, Baton Rouge, LA.

Porch, C.E., C.A. Wilson, D.L. Nieland. 2002. A New Growth Model for Red Drum (*Sciaenops ocellatus*) that Accommodates Seasonal and Ontogenic Changes in Growth Rates. Fisheries Bulletin. 100:149-152.

SEAMAP. 2013. Bottom Longline Survey Protocol. Gulf States Marine Fisheries Commission. 2404 Government St. Ocean Springs, MS 39564. Version 2.0.

SAS Institute Inc. 2008. SAS/STAT® 9.2 User's Guide. Cary, NC: SAS Institute Inc.

Tables

Table 1: Damped growth model parameters with standard errors and 95% confidence limits for Louisiana Red Drum (Sciaenops ocellatus).Units are total length in inches and age in years.

Parameters	Estimate	SE	U95%CL	L95%CL
L_∞	37.9864	0.1161	38.2141	37.7586
k_0	0.4596	0.0911	0.6382	0.2810
t_0	-0.3206	0.0800	-0.1636	-0.4775
k_1	-0.1957	0.0742	-0.0501	-0.3412
λ	0.2981	0.2640	0.8159	-0.2197

Table 2: Weight-length regression parameter estimates with standard errors and 95% confidence limits for Louisiana Red Drum (Sciaenops ocellatus). Units are total length in inches and whole weight in pounds.

Parameters	Estimate	SE	U95%CL	L95%CL
a	0.000248	0.0000034	0.000255	0.000242
b	3.1003	0.00399	3.1081	3.0925

Figures

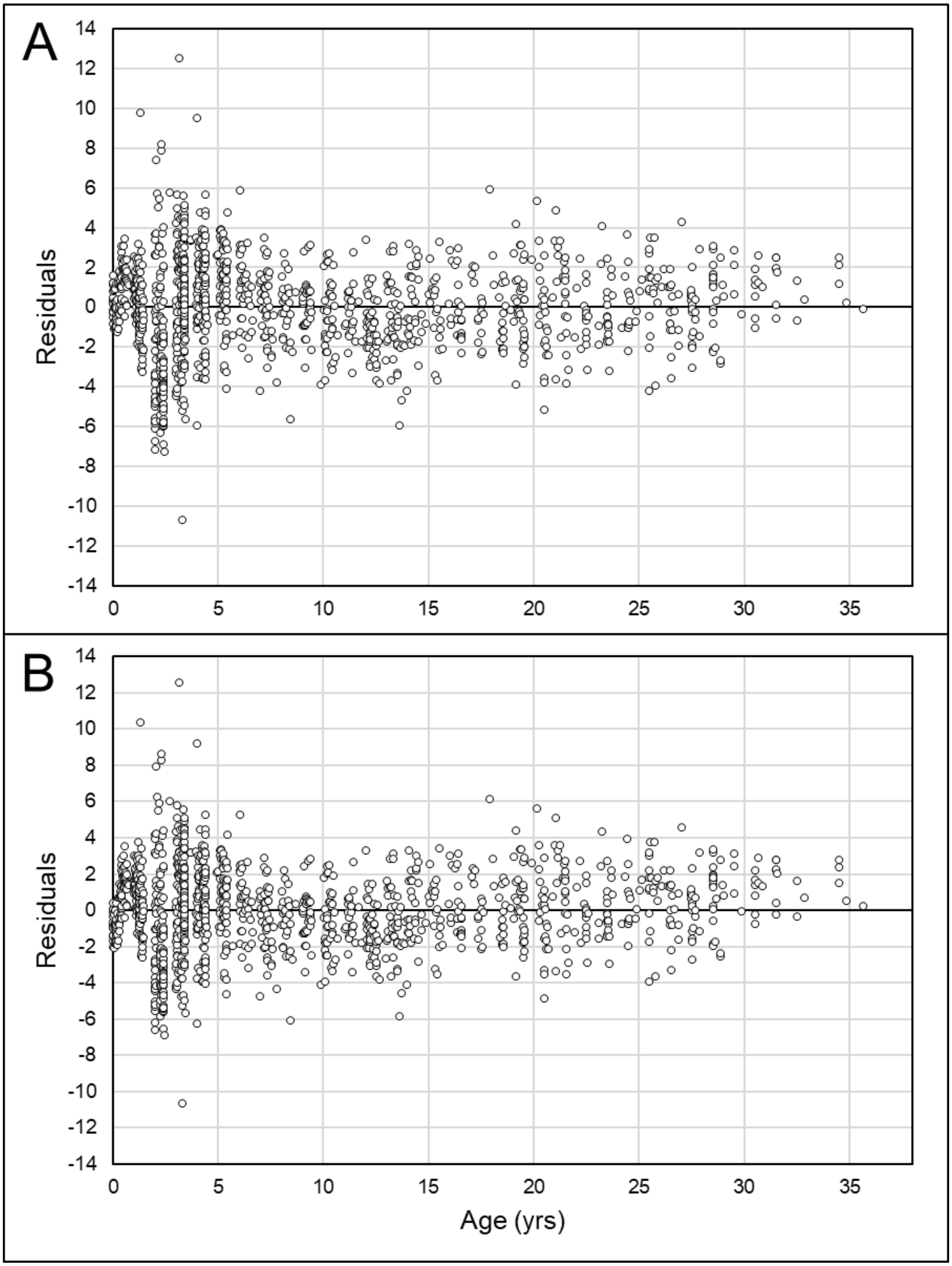


Figure 1. Residual plots for fits to the Louisiana red drum (Sciaenops ocellatus) age and length data of the traditional 3-parameter Von Bertalanffy growth model (A) and the 5-parameter damped Von Bertalanffy growth model (B).

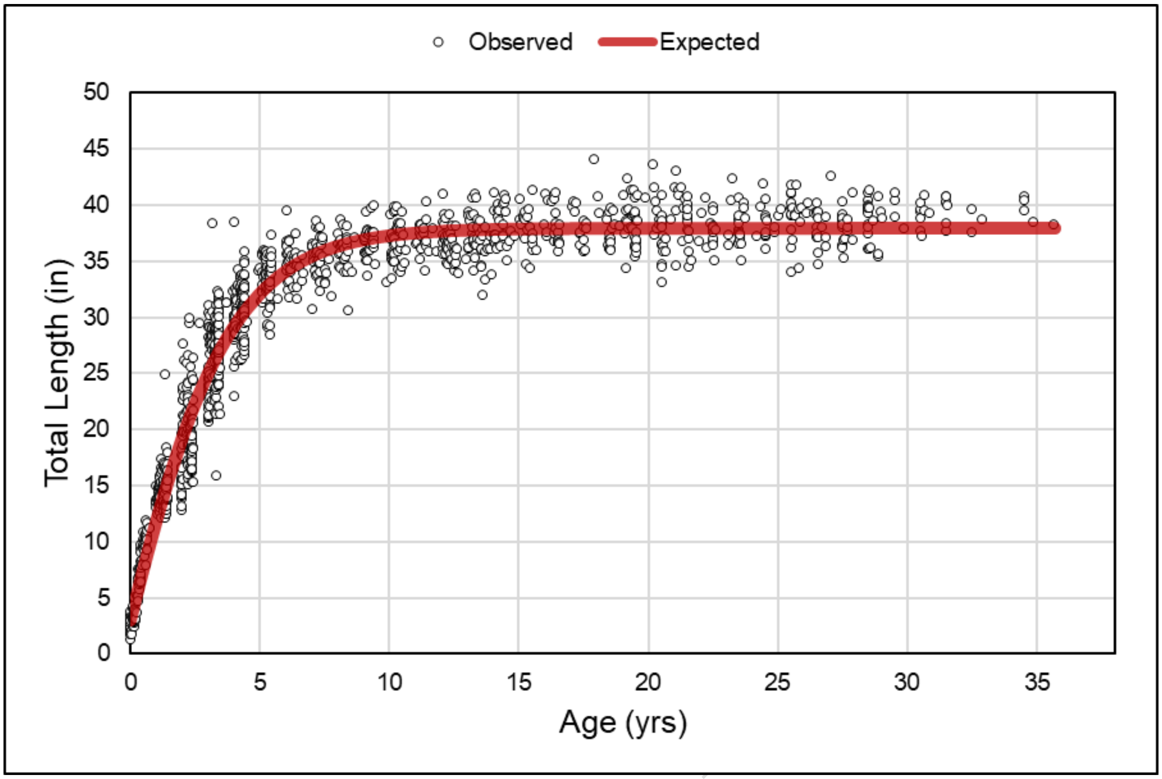


Figure 2: Louisiana Red Drum (*Sciaenops ocellatus*) total length-at-age observations and predicted total length-at-age from the damped growth model. Units are total length in inches and age in years**.**

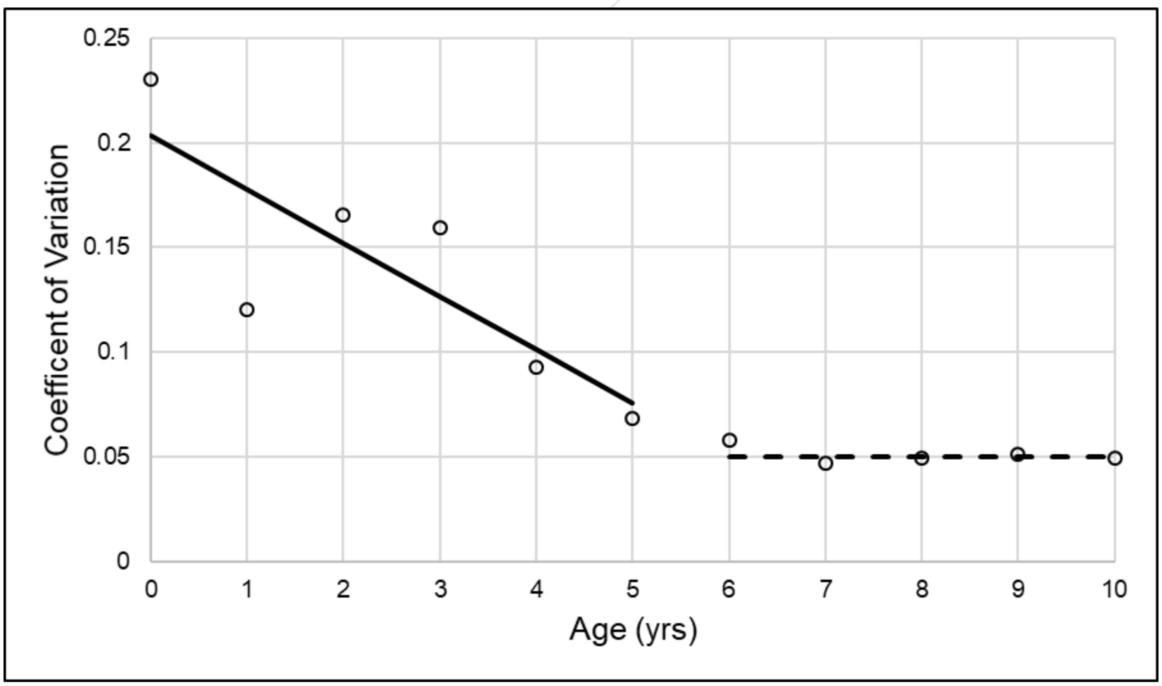


Figure 3: Age-specific (0-10+) coefficient of variations (CV) for Louisiana Red Drum (*Sciaenops ocellatus*) from the damped growth model with a linear regression fit from the age-0 to the age-5 CV represented by the solid diagonal and a uniform CV of the age-6 plus group represented by the dashed horizontal.

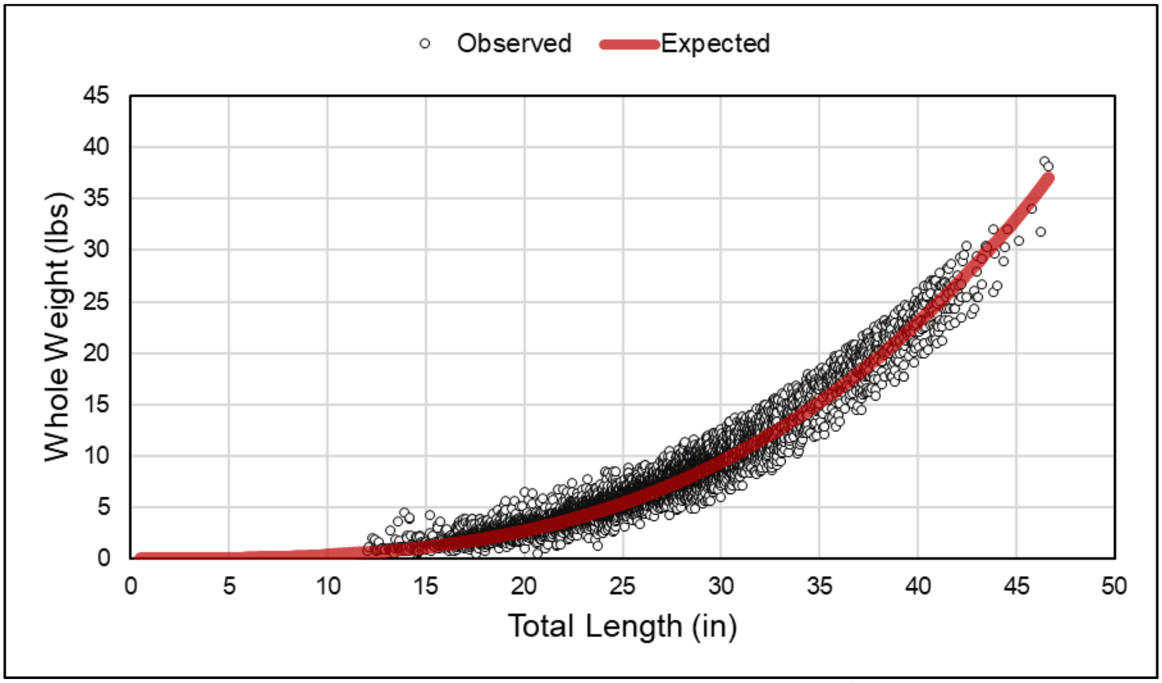


Figure 4: Louisiana Red Drum (*Sciaenops ocellatus*) whole weight/total length observations and predicted values from the power model. Units are total length in inches and whole weight in pounds.