4. Recreational Fishery Statistics

Gulf of America Gray Triggerfish Report

4.1 Overview

4.1.1 Group Membership

Lead
Matthew Nuttall - National Marine Fisheries Service (NMFS) Southeast Fisheries Science Center (SEFSC) Sustainable Fisheries Division (SFD)

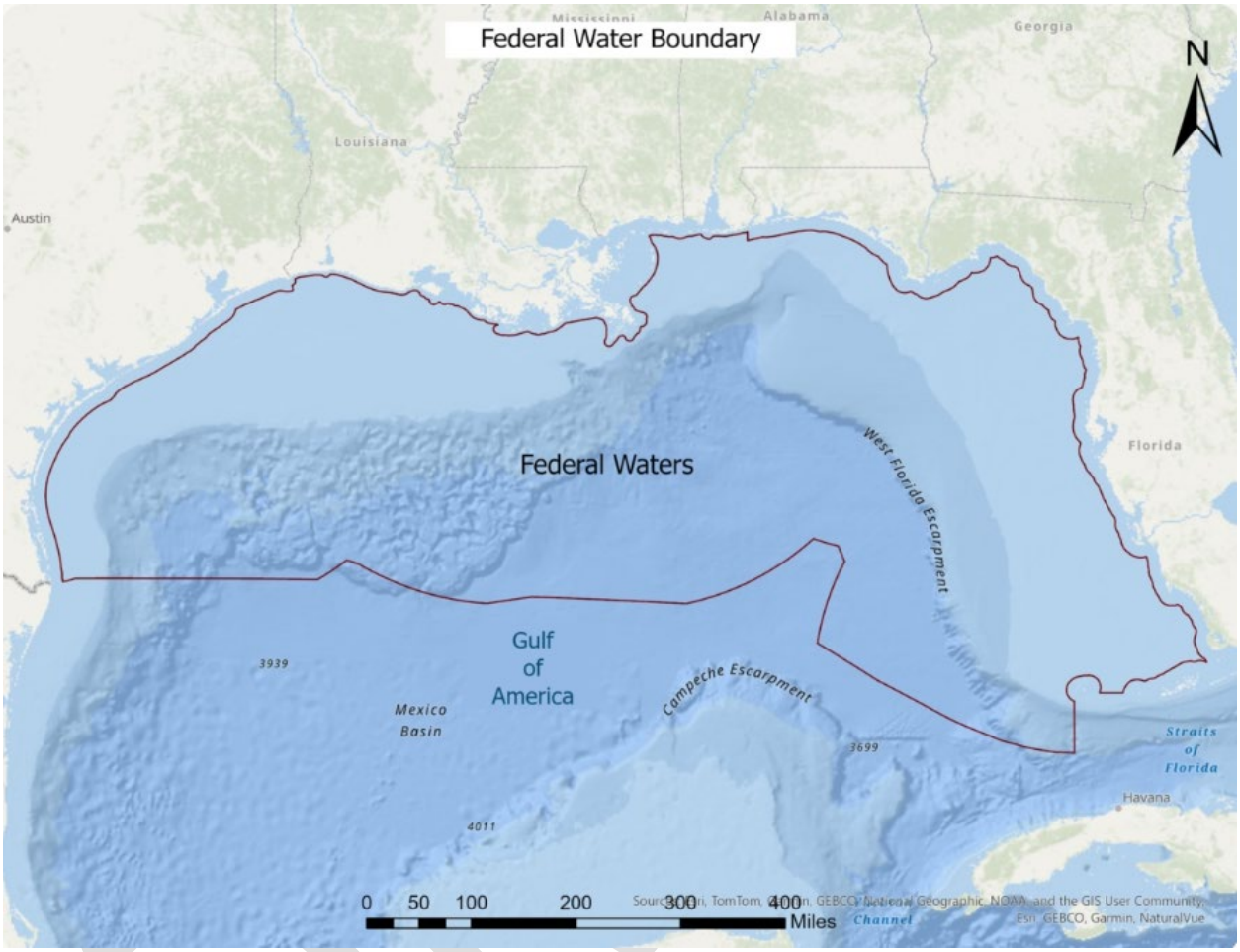
Members
Abby Carrigan - Florida Fish and Wildlife Conservation Commission (FWCC)
Alicia Paul - FL Charter Fisherman
Challen Hyman - FWCC
David Griffith - Gulf Scientific and Statistical Committee (SSC)
Ellie Corbett - FWCC
Erin Driscoll - FWCC
*Gaitlyn Malone - NMFS SEFSC SFD
Genine McClair – FWCC
Juan Cortes - FWCC
Maria McGirl - FWCC
Mark Tryon - FL Commercial Fisherman
Matthew Nuttall - NMFS SEFSC SFD
Michael Larkin - NMFS SERO
Mike Rowell - AL Charter Fisherman
Olivia Wilms - FWCC
*Rob Cheshire - NMFS SEFSC Fisheries Statistics Division (FSD)
Samantha Binion-Rock - NMFS SEFSC SFD
Sascha Cushner - NMFS SEFSC SFD
Sean Wilms - FWCC
Vivian Matter - NMFS SEFSC SFD

* *indicates virtual participation*

4.1.2 Tasks

1. Review fully calibrated MRIP Fishing Effort Survey (FES)/Access Point Angler Intercept Survey (APAIS)/For-Hire Survey (FHS) landings and discard estimates.
2. Allocate MRIP catch estimates from Monroe County to the Gulf of America or South Atlantic.
3. Evaluate MRIP catch estimates by mode of fishing and determine how to incorporate all appropriate modes into the Gray Triggerfish stock assessment.
4. Review calibrations between federal (e.g., MRIP-FES) and state survey estimates.
5. Determine whether MRIP or SRFS estimates should be used to inform Florida Private mode landings and discards.
6. Evaluate usefulness of historical data sources such as the Fishing, Hunting, and Wildlife-Associated Recreation Survey (FHWAR) to generate estimates of landings prior to 1981.
7. Provide input on an appropriate "start year" for the SEDAR 100 Assessment Model.
8. Provide estimates of uncertainty around each set of landings and discard estimates.
9. Review whether SRHS discard estimates (2004+) are reliable for use and determine if there are other sources of data prior to 2004 that could be used as a proxy to estimate headboat discards.
10. Evaluate if the recreational fleet structure should be updated.
11. Provide nominal and weighted length and age distributions for landings, if feasible.
12. Provide nominal and weighted length distributions for discards, if feasible.
13. Evaluate adequacy of available data.
14. Provide research recommendations to improve recreational data.

4.1.3 Gulf Council Gray Triggerfish Group Management Boundaries



4.2 Review of Working Papers

Headboat Data for Gray Triggerfish in the US Gulf of America (SEDAR 100-DW-01)

This document provides an overview of the Southeast Region Headboat Survey, the catch estimates of Gray Triggerfish in numbers and weight, the uncertainty associated with these catch estimates, a description of the number of fish measured by the survey, a summary of average lengths and weights, total effort by headboats in the Gulf of America, and the number of vessels by strata to determine confidentiality. The public version is limited to non-confidential records, but the lead assessment analyst was provided with a confidential version of the working paper to include more detailed information and maps of Gray Triggerfish catch.

General Recreational Survey Data for Gray Triggerfish in the Gulf of America (SEDAR 100-DW-02)

General recreational survey data for Gray Triggerfish from the Marine Recreational Information Program (MRIP), Texas Parks and Wildlife Department (TPWD), and Louisiana Creel Survey (LA Creel) are summarized from 1981 to 2024 for Gulf of America states from Texas to western Florida, excluding the Florida Keys. Estimates from the Charter, Private, Headboat (1981-1985 from Texas to the Florida Keys) fishing modes are presented. These fully calibrated MRIP estimates take into account the change in the Fishing Effort Survey, the redesigned Access Point Angler Intercept Survey, and the For Hire Survey. Tables and figures presented include calibration comparisons, landing and discard estimates, associated CVs, sample sizes, fish sizes, and effort estimates.

Historical Recreational Landings for Gulf of America Gray Triggerfish (Balistes capriscus) estimated using the FHWAR Census Method (SEDAR 100-DW-03)

The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation Survey (FHWAR) is one of the oldest and most comprehensive recreational surveys in the US and was conducted every 5 years between 1955-1985. The FHWAR census method utilizes information from these surveys including U.S. angler population estimates and angling effort estimates from 1955–1985 for the Gulf of America. To obtain historical Gray Triggerfish landings prior to 1981, FHWAR effort estimates in saltwater angler trips (1955-1980) are multiplied by average catch rates from early years (1981-1989) of the MRIP and SRHS data. Interpolation is used to complete the time series.

Gulf of America Gray Triggerfish (Balistes capriscus) length and age compositions from the recreational fishery (SEDAR 100-DW-04)

This working paper describes the data and methodologies used to estimate nominal length and age compositions, conditional age-at-length (CAAL), and mean length-at-age (MLAA) for a combined recreational fleet (i.e., Headboat, Charter, and Private combined) included in the SEDAR 100 Gulf of America Gray Triggerfish Assessment. Changes from SEDAR 62 are also described in this document. Weighting methodologies were discussed during the Data Workshop

and an updated working paper was submitted that documents the final nominal and weighted length and age compositions, CAAL, and MLAA for the combined recreational fleet.

Proxy Discard Estimates of Gray Triggerfish (Balistes capriscus) from the US Gulf of America Headboat Fishery (SEDAR 100-DW-08)

Discard data from the Southeast Region Headboat Survey (SRHS) were not routinely collected until 2004, and there are concerns with underreporting during the first few years of data collection (2004-2007). These data are self-reported and not currently validated within the SRHS program. This paper describes the method used and decisions applied in the SRHS (proxy) discards provided in SEDAR 100 for years lacking discard estimates (e.g., 1981-2003) or years with unreliable discard estimates (e.g., 2004-2007) and provides relevant summaries of these proxy discards.

A Summary of Gulf of America Gray Triggerfish Discard Length Data Collected from At-Sea Observers in For-Hire Fishery Surveys in Florida (SEDAR 100-DW-11)

Detailed information on the size and release condition of discarded fish is not collected in traditional dockside surveys of recreational fisheries. At-sea observer surveys provide valuable information on the size and condition of discarded fish, and have been conducted on for-hire vessels in Florida since 2005. At-sea observer surveys have not been consistently funded on both coasts of Florida, which has led to short breaks in the time series in some regions. The majority of these observer trips were conducted on headboat vessels, with charter vessels being surveyed intermittently starting in 2009. This report provides a summary of available information on the size composition, release condition, and disposition of Gray Triggerfish collected by trained observers since 2005 during at-sea surveys on for-hire vessels along the Gulf Coast of Florida.

A ratio-based method for calibrating estimates of total landings (numbers and pounds of fish), releases (numbers of fish), and total trips from MRIP-FCAL to SRFS for Gulf Gray Triggerfish (Balistes capriscus) (SEDAR 100-DW-12)

The Fishery Dependent Monitoring subsection (FDM) of the Florida Fish and Wildlife Conservation Commission's Fish and Wildlife Research Institute (FWRI) generates private recreational landings, release, and effort estimates for a suite of reef fish in Florida using the State Reef Fish Survey (SRFS). SRFS estimates for Florida Gray Triggerfish (*Balistes capriscus*) from 2016-2024 are provided in this report. Additionally, historical (1981-2015) MRIP-FCAL estimates for Florida have been calibrated into SRFS currency using a peer-reviewed, ratio-based method that has been applied in previous SEDAR stock assessments (e.g. 72, 79, 88, 90, 96), which are also provided.

Length and age compositions of Gulf Gray Triggerfish, Balistes capriscus, collected in association with fishery-dependent projects along Florida's Gulf Coast (SEDAR 100-DW-13)

The Fishery Dependent Monitoring subsection (FDM) of the Florida Fish and Wildlife Conservation Commission's Fish and Wildlife Research Institute (FWRI) monitors commercial and recreational fishing in marine environments along the Florida coast in association with

several fishery-dependent research and monitoring projects. FDM administers three federal surveys: The Marine Recreational Information Program (MRIP) and the Southeast Region Headboat Survey (SRHS) for the recreational sector, and the Trip Interview Program (TIP) for the commercial sector. Additionally, FDM conducts several unique surveys of recreational anglers that allow for the collection of supplemental biological data. Each fishery-dependent research or monitoring project that contributed age and length data to the Life History Group is detailed in this report.

4.3 Recreational Data Sources

4.3.1 Marine Recreational Information Program (MRIP)

Introduction
The Marine Recreational Information Program (MRIP), formerly the Marine Recreational Fisheries Statistics Survey (MRFSS), conducted by NOAA Fisheries (NMFS) provides estimates of catch per unit effort, total effort, landings, and discards for six two-month periods (waves) each year. In all states where MRIP samples, MRIP provides estimates for three main recreational fishing modes: shore-based fishing (Shore), private and rental boat fishing (Priv), and for-hire charter and guide fishing (Cbt). MRIP covers all Gulf of America states from western Florida to Mississippi. Louisiana was covered by the survey until 2014 and Texas is not covered to avoid overlap with the TPWD survey (discussed below in 4.3.3). When the survey first began in Wave 2 (Mar/Apr) of 1981, headboats were included in the for-hire mode, but this component has been excluded after 1985 to avoid overlap with the Southeast Region Headboat Survey (SRHS), conducted by the NMFS Beaufort laboratory.

Recreational catch, effort, and participation were estimated through a suite of independent but complementary surveys that are described in SEDAR 68-DW-13. Over the years, effort data have been collected from three different surveys: (1) the Coastal Household Telephone Survey (CHTS) which used random digit dialing of coastal households to obtain information about recreational fishing trips, (2) the weekly For-Hire Survey which interviews charterboat operators (captains or owners) to obtain trip information and replaced the CHTS for the charter mode (in 2000 for the Gulf of America and East Florida and 2004 for the Atlantic coast north of Georgia), and (3) the Fishing Effort Survey which is a mail based survey whose sample frame consists of anglers from the National Saltwater Angler Registry and replaced the CHTS for the private and shore modes in 2018. Catch data are collected through dockside angler interviews in the Access Point Angler Intercept Survey (APAIS), which samples recreational fishing trips after they have been completed. In 2013, MRIP implemented a new APAIS procedure to remove sources of potential bias from the sampling process. Catch rates from dockside intercept surveys are combined with estimates of effort to estimate total landings and discards by wave, mode, and area fished (e.g. inland, state, and federal waters).

Catch estimates from the early years of the survey are highly variable with high proportional standard errors (PSE's), and sample sizes in the dockside intercept portion have been increased over time to improve precision of catch estimates. Several quality assurance and quality control

improvements were implemented for the intercept surveys in 1990. Prior to 1990, the contractor did not have regional representatives hired to supervise the samplers in any given area. All samplers were hired as independent sub-contractors and communicated directly with the contractor's home office staff. It is more likely that the samplers who worked in the 80's would have varied more in their interpretation of sampling protocols and their ability to identify at least some of the more difficult-to-recognize species. There were a number of other changes made to enhance consistency in sampling protocols and improve error-checking in the Statement of Work for the 1990-1992 contracts. Improvements have continued over the years, but the biggest changes happened during that time (personal communication, NMFS). Catch rate data have improved through increased sample quotas and additional sampling (requested and funded by the states) to the intercept portion of the survey.

Task 1: In order to maintain a consistent time series, charter estimates were calibrated on the Gulf coast prior to 2000 (SEDAR 64-RD-12), and MRIP estimates for private and shore prior to 2018 were calibrated to FES (Papacostas and Foster 2021). CHTS and calibrated FHS charter catch estimates for Gulf of America Gray Triggerfish from 1981 to 1999 are shown in Figure 1 of SEDAR 100-DW-02. Calibrated APAIS and FES estimates for Gulf of America Gray Triggerfish from 1981 to 2024 are shown in Figure 2 of SEDAR 100-DW-02.

Monroe County

MRIP catch from Monroe County is allocated to the official estimates for West Florida. However, they can be estimated separately using domain estimation. The Monroe County domain includes only intercepted trips returning to that county as identified in the intercept survey data. Estimates are then calculated within this domain using standard design-based estimation which incorporates the MRIP design stratification, clustering, and sample weights (SEDAR 68-DW-13). Although Monroe county estimates can be separated from the rest of western Florida using this process, they do not distinguish catch from the Atlantic Ocean and that from the Gulf of America (SEDAR-PW-07).

Task 2: For SEDAR 100, MRIP estimates from Monroe County were allocated to the Atlantic because Gray Triggerfish is a species associated with hard-bottoms and Monroe County catches are most likely from the Atlantic side of the Florida Keys. This recommendation differs from that applied in SEDAR 9 for Gulf Gray Triggerfish, which included the Florida Keys (SEDAR 9), but is in agreement with Gulf of America (SEDAR 43 and 62) and South Atlantic (SEDAR 32, 41, and 82) Gray Triggerfish assessments thereafter.

Adjustment to Fishing Modes

Task 3a: Between 1981 and 1985, MRIP charter and headboat modes were combined into a single mode for estimation purposes. Since the NMFS Southeast Region Headboat Survey (SRHS) began in the Gulf in 1986, the MRIP combined charter/headboat mode must be split in order to provide estimates of headboat landings in these early years. The MRIP charter/headboat mode (1981-1985) was split by using a ratio of SRHS headboat angler trip estimates to MRIP charterboat angler trip estimates for 1986-1990. In accordance with SEDAR Best Practices, the mean ratio was calculated by state (or state equivalent to match SRHS areas to MRIP states) and

then applied to the 1981-1985 estimates to split out the headboat component when needed (SEDAR-PW-07). The MRIP headboat component from this split was used to represent headboat fishing in the Gulf (Louisiana to western Florida) from 1981-1985 and SRHS headboat estimates were used for all years after 1985.

Task 3b: As done in SEDAR 43, shore mode was excluded from MRIP landings and discard estimates. Gray Triggerfish are strongly associated with reefs and hard-bottom and are unlikely to be caught from shore access sites in the Gulf. This is supported by the relatively low contribution of shore catch to general recreational catch. This recommendation is in agreement with decisions made during SEDARs 43 and 62.

Unidentified Triggerfish
Catch estimates of unidentified triggerfish (i.e., leatherjacket family) are present in the MRIP dataset. For SEDAR 100, 100% of unidentified Triggerfish landings and discards were assumed to be Gray Triggerfish. This is consistent with SEDAR 62. For all Triggerfish species (e.g. Gray, Ocean, and Queen), Gray Triggerfish account for almost 100% of all landings and discards, except for a few years in the 1980s (Table 12 in SEDAR 100-DW-02). This is consistent with observations made by commercial and charter fishermen work group members, who reported rarely (~1-2 total occasions spanning many years) catching other Triggerfish species.

Uncertainty
Coefficient of variation (CV) estimates for Marine Recreational Information Program (MRIP) survey catch totals are provided for stock assessments by the Southeast Fisheries Science Center (SEFSC). Variances of total catch-in-number estimates are computed directly from the raw survey data to obtain CVs appropriate for custom aggregations by year, wave, sub-region, state, and mode using standard survey methods (SEDAR 68-DW-10).

4.3.2 Louisiana Creel Survey (LA Creel)

The Louisiana Department of Wildlife and Fisheries (LDWF) began conducting the Louisiana Creel (LA Creel) survey program on January 1, 2014 to monitor marine recreational fishery catch and effort. The program is designed to sample guided (e.g., charter) and unguided (i.e., combined private/shore) fishing modes and is comprised of three separate surveys: an intercept survey, a private telephone/email survey, and a for-hire telephone/email survey. The dockside/shoreside survey is used to collect data needed to estimate the mean numbers of fish landed by species for each of five different inshore basins and one offshore area. The private telephone/email survey samples from a list of people who possess either a LA fishing license or a LA offshore fishing permit and provided a valid telephone number. The for-hire telephone/email survey samples from a list of Louisiana's registered for-hire captains who provided a valid telephone number. Both telephone/email surveys are conducted weekly. Dockside/shoreside discard information has been collected since 2016 but only for a subset of finfish species which includes Gray Triggerfish.

Calibration to MRIP-FES units

Task 4a: The MRIP and LA Creel surveys were conducted simultaneously in 2015 for benchmarking purposes. A ratio estimator is used to calibrate private mode LA Creel landings and discards in numbers of fish to MRIP FES units. Because the charter fishing frame used by the LA Creel and MRIP surveys are functionally equivalent, charter fishing estimates of the two surveys are assumed equivalent and are not adjusted (SEDAR 98-DW-18). The ratio of the 2015 private mode landings estimates from the LA Creel and MRIP FES surveys (ratio = 3.55) is used to calibrate LA Creel private estimates (2014-2024) to MRIP FES units as the product of the 2015 MRIP/LA Creel landings ratio and the annual LA Creel estimates. Discard and effort estimates between surveys are calibrated using the same ratio as applied to landings. Note that the LA Creel calibration ratios applied to date in SEDAR 100 are considered preliminary and may be revised in the future after MRIP-FES estimates are updated with the new survey design (Gulf Transition Plan 2025).

Uncertainty

Coefficients of variation for annual LA Creel landings and discards estimates are provided by the LDWF. Variances are calculated from the survey data for each week of year, area, and fishing mode and are summed to estimate annual CV's of landings and discards. These variances, in LA Creel units, are then scaled into MRIP-FES units using a Taylor Series expansion that assumes the MRIP and LA Creel point estimates are independent (i.e., correlation = 0). This is the same approach used to calibrate the TPWD time series into MRIP-FES units, as discussed in section 4.3.3 below.

4.3.3 Texas Parks and Wildlife Department's (TPWD) Marine Sport-Harvest Monitoring Program

The TPWD Coastwide Creel Survey samples fishing trips made by sport-boat anglers fishing in Texas marine waters. Sampling occurs at recreational boat access sites along the Texas coast. Data collected from dockside interviews includes information regarding trip satisfaction, angler county of origin, species sought and landed, geographical area of fish landed, length composition, bait utilized, as well as trip length for sampled boat-trips. Texas Parks and Wildlife began dockside survey methods for recreational anglers in 1974, but only generate recreational catch and effort estimates beginning in May 1983, when methods became largely standardized (SEDAR 70-WP-03). The Coastwide Creel Survey is designed to estimate landings and effort by parsing out seasons based on fishing pressure, for high-use (May 15-November 20) and low-use seasons (November 21-May 14). From there, TPWD disaggregates seasons into waves for all estimates, using the fraction of the total catch for each species from each two-month wave, to make the TPWD time series compatible with the MRIP time series. TPWD surveys private and charterboat fishing trips. While TPWD samples all trips (private, charterboat, ocean, bay/pass), most of the sampled trips are associated with private boats fishing in bay/pass areas, as these trips represent most of the fishing effort in Texas waters. Charterboat trips in ocean waters are

the least encountered by the survey. Additional information on the TPWD survey can be found in SEDAR 70-WP-03.

Calibration to MRIP-FES units

Task 4b: The MRIP-FES was implemented in Texas in 2016 (SEDAR 74-RD-110) to compare MRIP-FES effort estimates with the associated effort estimates from the TPWD survey. A ratio estimator was calculated from these two sets of estimates and reviewed during the data workshop for SEDAR 74. This calibration is described in SEDAR 74-DW-10 and may be applied to landings, discards, and effort estimates to calibrate private TPWD estimates into MRIP-FES units. The MRIP-FHS has never been conducted in Texas and so an appropriate TPWD:MRIP calibration for the Texas charter mode is not available.

The Recreational Working Group (RecWG) was tasked with providing a continuous and consistent time series of recreational catch statistics by area for the combined recreational fleet. In accordance with the Terms of Reference, state survey catch estimates were calibrated to a common data unit to be comparable across time and Gulf states. While concerns were raised regarding the current calibration approach in adjusting TPWD private estimates into MRIP FES units (SEDAR 74-DW-10), the SEDAR 100 RecWG recommended application of this approach in the absence of a better alternative. This decision is in agreement with that from a joint TPWD/SEFSC collaboration that explored potential calibrations between TPWD and MRIP during SEDAR 98, and supported use of the SEDAR 74-DW-10 approach until additional benchmarking becomes feasible (Gulf Transition Plan 2025).

Catch and Uncertainty Estimates

TPWD provides catch estimates by matching high- and low-use seasons (the months included in each) to MRIP waves. Data are summarized by daily angler hours, trips, number of anglers, total catch, length measurement, mean length, and mean weight. These summaries are joined with seasonal and yearly relative pressure to calculate TPWD and NOAA pound estimates. Estimates for trips, anglers, angler hours, total catch, and mean weight incorporate relative pressure from boat ramps. Further breakdown includes estimates by Gulf area, day type, and wave. Overall totals are provided, along with standard errors for effort (angler hours), landings (fish count), and catch per unit effort (fish per angler hour) which are applied as measures of uncertainty. These variances, in TPWD units, are then scaled into MRIP-FES units using a Taylor Series expansion that assumes the MRIP and TPWD point estimates are independent (i.e., correlation = 0). This approach is described in SEDAR 74-DW-10.

4.3.4 Southeast Region Headboat Survey (SRHS)

The Southeast Region Headboat Survey estimates landings and effort for headboats in the South Atlantic and Gulf of America. The SRHS incorporates two components for estimating catch and effort. 1) Information about the size of fish landed is collected by port samplers during dockside

sampling, where fish are measured to the nearest mm and weighed to the nearest 0.01 kg. These data are used to generate mean weights for all species by area and month. Port samplers also collect otoliths for aging studies during dockside sampling events. 2) Information about total landings, discards (numbers), and effort (trip duration and number of anglers) are collected via the logbook, a form (electronic since 2013) filled out by vessel personnel for individual trips. These logbooks are summarized by vessel and expanded for known missing trips to generate estimated landings by species, area, and time strata.

The SRHS was started in 1972 but only included vessels from North Carolina and South Carolina. In 1975, the survey was expanded to northeast Florida (Nassau-Indian River counties), followed by Georgia in 1976 and southeast Florida (St. Lucie-Monroe counties) in 1978. In 1986, the survey expanded to include west Florida, Alabama, Louisiana, and Texas. There have been a few changes to the spatial strata definitions within the SRHS over the years. Most notably, Mississippi was added to the survey in 2010 and Alabama was split from Northwest Florida in 2013.

Texas Headboat Landings (1981-1985)

Landings estimates for Gulf of America headboats between 1981 and 1985 come from the MRFSS/MRIP survey for all states except Texas. As in previous SEDARs, Texas headboat landings for 1981 to 1985 were estimated as a five-year average (1986-1990) from SRHS Texas headboat landings.

Uncertainty

The SRHS is designed to be a census and so reporting compliance and accuracy are the primary components of the uncertainty in landings and discard estimates over time. Headboat activity is monitored by port agents to validate trips. Three proxy estimates of SRHS uncertainty were provided for consideration in the assessment model: (1) unweighted, (2) weighted by landings-in-number, and (3) weighted by landings-in-weight. Unweighted proxy uncertainty estimates (CV) applied the annual proportions of reported to estimated trips by region as a proxy for CV with an additional buffer of 0.05 to prevent the estimate from reaching a zero value:

$$proxyCV = 1 - \frac{n}{N} + 0.05$$

where n is the number of reported trips and N is the number of estimated trips. Weighted proxy CVs were developed to approximate uncertainty by scaling the unweighted CVs with either landings-in-number or weight within each region:

$$proxyCV_i = 1 - \sum_{j=1}^{n} \left[\frac{n_{i,j}}{N_{i,j}} * \frac{L_{i,j}}{L_i} \right] + 0.05$$

where n is the number of reported trips, N is the number of estimated trips, and L is the landings (in number or weight) for year *i* and subregion/region *j*. The weighted proxy CVs by landings-in-number were recommended for use in characterizing SRHS landings and discard uncertainty in the SEDAR 100 assessment model.

4.3.5 For-Hire At-Sea Observer Coverage

At-sea observer sampling is conducted to provide detailed information on the size and release condition (e.g. live, dead) of discarded fish. In Florida, at-sea sampling by FWC, for the headboat and charter boat modes has occurred since 2005 and 2009, respectively, however there have been breaks in coverage (Table 1 in SEDAR 100-DW-11). From 2005-2007, FWC also included Alabama in their at-sea coverage of headboats. ADNR conducted at-sea observer sampling on headboats from 2017-2019. In 2022, the Return 'Em Right program began in Florida, Alabama, and Mississippi. Return 'Em Right is an ongoing program where at-sea observers sample both headboat and charter trips.

4.3.6 State Reef Fish Survey (SRFS)

In response to the need for more precise estimates of recreational catch for reef fishes, particularly from private boats, the Florida Fish and Wildlife Conservation Commission developed and implemented a new survey that runs side-by-side with the historical Marine Recreational Information Program (MRIP), described in Section 4.3.1. The MRIP is a general survey of all saltwater recreational fishing in both state and federal waters, whereas the State Reef Fish Survey (SRFS) is a supplemental, more specialized survey that directly targets participants in the reef fish fishery to collect information on effort and catch. The SRFS is the result of a decade of development and testing in Florida, in collaboration with independent statistical consultants and NOAA Fisheries scientists. The survey provides year-round, monthly estimates of fishing effort, landings, and discards for a suite of reef fish species commonly targeted by recreational anglers fishing from private boats in Florida. Initially named the Gulf Reef Fish Survey (GRFS), the methodology was implemented in May 2015 and was only conducted on the west coast of Florida, north of Monroe County. In 2018, the survey design and estimation methods were peer-reviewed and subsequently certified by NOAA Fisheries as statistically valid and suitable for use (SRFS Certification Memo and design documentation, available online: https://www.fisheries.noaa.gov/recreational-fishing-data/transitioning-new-recreational-fishingsurvey-designs). The SRFS runs concurrently with the MRIP survey in Florida, which has provided vital statistics on recreational fishing effort and catch in the Gulf of America and Atlantic Ocean off the coast of Florida since 1981. The SRFS and MRIP surveys use independent methods to estimate fishing effort (angler trips). However, catch estimates derived from each method are not completely independent. To estimate catch-per-unit-effort (CPUE), MRIP uses data collected in the Access Point Angler Intercept Survey (APAIS), and SRFS uses a combination of data from the APAIS and supplemental reef fish angler intercepts. Assignments for both intercept surveys are drawn together so that sample weights are compatible (Foster, 2018). SRFS effort is estimated through a mail survey that is used to estimate effort for the suite of reef fish found in Florida, which include Gray Triggerfish. This survey is sent out monthly to 10,000 anglers with the Florida State Reef Fish Angler designation on their Florida saltwater fishing license. This designation is free, but is a required add-on for Florida anglers who intend to or may incidentally catch any of the fish in our reef fish suite. Information on whether anglers targeting or catching this suite of reef fish have the required designation is used as an undercoverage estimate to account for all the anglers who should have been eligible to receive the mail survey, but did not. Combining dockside intercepts for reef fish collected by

APAIS with the supplemental SRFS dockside estimates at offshore angling site to estimate CPUE and large sample sizes for the mail survey allows for the generation of precise estimates of landings and releases for reef fish in the suite.

Consideration of SRFS in SEDAR 100
Task 5: The SEDAR 100 RecWG was tasked with evaluating whether MRIP (SEDAR 100-DW-02) or SRFS estimates (SEDAR 100-DW-12) should be used as a source of landings and discards for the private boat mode in Florida. Responsible for providing a continuous and consistent time series of recreational catch statistics, the Group recommended the use of MRIP-FES estimates for the Florida private boat mode. This decision was largely based on the non-negligible catch coming from private fishing outside of Florida, with catches from Florida comprising 69% and 79% of regional private landings and discards respectively.

4.4 Recreational Landings

4.4.1 MRIP Landings

Weight Estimation
The Southeast Fisheries Science Center used the MRIP, TPWD, and LA Creel sample data to obtain an average weight by strata using the following hierarchy: species, region, year, state, mode, wave, and area (SEDAR 32-DW-02). The minimum number of weights used at each level of substitution is 15 fish, except for the final species level where the minimum is 1 fish (SEDAR 67-WP-06). Average weights are then multiplied by the landings estimates in numbers to obtain estimates of landings in weight. These estimates are provided in pounds whole weight.

Uncertainties for average weight estimates were calculated from approach #2 in SEDAR 74-DW-12. All observations of fish weight are averaged at the trip level, from which the mean and standard error of these trip-level summaries are calculated at the same strata used in SEFSC weight estimation (e.g., syrsmwa), combined to the year/mode level, and converted to coefficients of variation (CV). These uncertainty estimates for SEFSC average weights are then combined with those for landings-in-number, using the variance product law (Goodman 1960), as an uncertainty estimate for landings-in-weight.

Catch Estimates
Final MRIP landings estimates, in numbers of fish, are shown by year and mode in Table 4.12.1, and associated coefficients of variation by year, region and mode in Tables 3.1-3.3 of SEDAR 100-DW-02 and by year and region in Tables 5.1-5.3 of SEDAR 100-DW-02. Estimates are provided for all Gulf of America states from Louisiana to western Florida, excluding the Florida Keys. Final MRIP landings estimates in pounds whole weight are shown by year and mode in Table 4.12.1, and associated coefficients of variation in Tables 6.1-6.3 of SEDAR 100-DW-02.

4.4.2 LA Creel Landings

Starting in 2014, recreational data for Louisiana are only available from the LA Creel survey. LA Creel landings estimates, calibrated to MRIP-FES units for the private mode, for Louisiana Gray Triggerfish (2014-2024) are provided in Table 4.12.2. These landings-in-number estimates are then multiplied by the corresponding SEFSC average weights to estimate landings-in-weight. Uncertainties for average weight and landings-in-weight are calculated using the same approach described above for MRIP (approach #2 in SEDAR 74-DW-12).

4.4.3 TPWD Landings

TPWD average estimates from 1983 to 1985 (by wave and mode) were used to impute missing estimates for Texas charter and private boat fishing from 1981 until the survey started in May 1983. TPWD Gray Triggerfish landings estimates, calibrated to MRIP-FES units for the private mode (SEDAR 74-DW-10), from 1981 to 2024 are provided in Table 4.12.3. These landings-in-number estimates are then multiplied by the corresponding SEFSC average weights to estimate landings-in-weight. Uncertainties for average weight and landings-in-weight are calculated using the same approach described above for MRIP (approach #2 in SEDAR 74-DW-12).

4.4.4 SRHS Headboat Logbook Landings

Final SRHS landings estimates (in number and weight) for the eastern and western Gulf of America are shown in Tables 2 and 3, respectively, in SEDAR 100-DW-01. CVs are provided for landings estimates in number of fish and can be used as a proxy for uncertainty of estimates in weight. This would assume there is no additional uncertainty from the average weights calculated from the SRHS dockside biological sampling.

The paper headboat logbook forms have changed multiple times throughout the history of the SRHS. The primary changes have been which species are explicitly listed on the forms, although there have always been blank lines to write-in species not listed. Gray Triggerfish has been listed on SRHS logbook forms since the beginning of this survey in the Gulf of America. Electronic reporting started in 2013 and all species were available for selection.

4.4.5 Historical Recreational Landings

Introduction
The historical recreational landings time period is defined as pre-1981 for the charter, private, and headboat fishing modes, which represents the start of the Marine Recreational Information Program (MRIP) and availability of landings estimates for Gray Triggerfish. The RecWG was tasked with evaluating historical sources and methods to compile landings estimates for Gray Triggerfish prior to 1981.

FHWAR Census Method

The 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (FHWAR) presents summary tables of U.S. population estimates, along with estimates of hunting and fishing participation and effort from surveys conducted by the US Fish and Wildlife Service every 5 years from 1955 to 1985 (SEDAR 100-DW-03). This information was used to develop a method for estimating recreational landings prior to 1981. The two key FHWAR survey components that were used in this census method were the estimates of U.S. saltwater anglers and U.S. saltwater days. These estimates are used to calculate the historical effort of Gulf of America saltwater anglers. Landings estimates from modern surveys (e.g., MRIP, SRHS) were used to calculate mean catch rates from 1981-1989 for Gray Triggerfish. The Gray Triggerfish fishery was largely unregulated over these years (e.g., no bag limits, no size restrictions), a characteristic shared with the historical fishery prior to 1981. The nine-year time period is meant to offset the relatively high variability in MRIP catch estimates from the early years of the survey, as described in section 4.3.1. For this calculation, MRIP effort for 1981-wave1 and TPWD effort for 1981-May 1983 were imputed using the best practice approaches described in SEDAR-PW-07. This mean CPUE is applied to the historical FHWAR effort estimates for Gulf of America saltwater anglers to provide estimates of recreational Gray Triggerfish landings prior to 1981.

The final stock ID for Gulf Gray Triggerfish will not be decided until the assessment phase. The lead analyst requested historical recreational landings estimates for two different stock structures. The first treats the entire Gulf as a single stock. The second structure splits the Gulf into West (Texas and Louisiana) and East (Mississippi to west Florida). The mean proportion of landings (MRIP and SRHS) for the West and East was calculated from 1981-1989. The Gulf-wide historical recreational landings estimates were delineated into East and West landings by applying the mean West and East proportions.

Task 6: The SEDAR 100 RecWG reviewed the FHWAR method and preliminary estimates. The Group recommended using the historical estimates calculated using the FHWAR method for the Recreational fleet from 1955-1980. Historical Gray Triggerfish landings estimates in numbers of fish are shown in Table 4.12.4 by region.

Uncertainty
The CV calculated using the FHWAR method for total recreational landings is 0.577, which is the CV of the mean CPUE multiplied by historical FHWAR effort estimates (in saltwater days) and assumed to reflect the uncertainty in historical landings estimates (SEDAR 100-DW-03). The historical FHWAR estimates are believed to be highly uncertain given the limited information available to describe historical recreational fisheries.

Potential Start Year for SEDAR 100 Assessment Model

Task 7: As requested by the assessment analyst, the SEDAR 100 RecWG provided input on an appropriate start year for the Gulf Gray Triggerfish assessment model. Acknowledging the relatively high uncertainty in historical FHWAR estimates, the RecWG highlighted the highly variable trends in recreational landings between 1981-1985, which were part of the time series applied to FHWAR effort estimates to back-calculate historical landings back to 1955. There are

also no recreational length or age compositions available over the historical time period, so FHWAR estimates are likely to have a relatively large influence on the model's parameterization of virgin conditions. However, the RecWG also agreed the FHWAR time series constitutes the "best available" representation of historical recreational landings. They were provided and used in past SEDAR stock assessments for Gulf Gray Triggerfish (SEDARs 43 and 62), and their inclusion reduces the chances of a potential one-way trip in the recreational time series, which shows a general decline after the early 1990s. Given these concerns, the RecWG proposed two configurations for the SEDAR 100 stock assessment model:

- Historical Model – to include FHWAR, with potential start years of 1955 or 1945, the latter being a continuity with SEDARs 43 and 62
- Modern Model – to exclude FHWAR, with potential start years of 1981 or 1986

The ultimate choice of which start year is most appropriate is recommended to be left to the SEDAR 100 assessment modeling team, who have access to all available data sources and can better determine whether a model built from unfished conditions or a fished state provides a more defensible representation of the Gulf Gray Triggerfish stock.

4.4.6 Total Recreational Landings

Combined landings estimates from all sources by stock ID region are shown in Table 4.12.4, Figure 4.13.1, and mapped in Figure 4.13.2. Comparisons of landings across stock ID regions for individual modes are shown in Figure 4.13.3, including historical recreational landings estimates for all modes combined. Overall, landings estimates for Gray Triggerfish showed a general increase into the early 1990s and subsequent decrease thereafter, and with peaks occurring in the early-1990s and mid-2000s. The majority of the recreational landings in the Gulf of America come from the private mode (about 57.4%). The charter mode contributes about 33.6% and the headboat mode makes up the remaining 9.0% of recreational landings. Geographically, most landings come from the East (about 87.4%).

Uncertainty
Task 8a: To provide an associated measure of uncertainty for total recreational landings estimates, coefficients of variation (CVs) are calculated from the sum total of variance across all recreational data sources (i.e., SRHS logbook landings, MRIP landings data, and calibrated TPWD and LA Creel landings data). Details of this approach are outlined in SEDAR 68-DW-31, and are applied to estimates of both landings-in-number and landings-in-weight.

4.5 Recreational Discards

4.5.1 MRIP Discards

Fish reported to have been discarded alive are not seen by MRIP interviewers and so neither the identity nor the quantities of discarded fish can be verified. The size and weight of discarded fish

are also unknown for all modes of fishing. MRIP discard estimates, in numbers of fish, are shown by year and mode in Table 4.12.1, and associated coefficients of variation are shown by year, region, and mode in Tables 4.1-4.3 of SEDAR 100-DW-02 and by year and region in Tables 5.1-5.3 of SEDAR 100-DW-02. Estimates are provided for all Gulf of America states from Louisiana to western Florida, excluding the Florida Keys.

4.5.2 LA Creel Discards

Gray Triggerfish are a target species of the LA Creel survey and so discard estimates for Louisiana Gray Triggerfish are available starting in 2016. Because MRIP discards in Louisiana from 1981 to 2013 are sparse and negligible relative to the Gulf-wide estimates, Louisiana Gray Triggerfish discards in 2014 and 2015 are also considered negligible and were not imputed. This is consistent with the decision for SEDAR 62. Discard estimates for Louisiana Gray Triggerfish are provided in Table 4.12.2, with LA Creel private mode estimates calibrated to MRIP FES units.

4.5.3 TPWD Discards

Self-reported catch is not monitored by the TPWD survey and so discards of Gray Triggerfish from Texas are not estimated by this survey (SEDAR 70-WP-03). As a proxy for recreational discards from Texas private and charter boat anglers, discard:landings ratios (B2:AB1) are calculated (by year) from Louisiana catch estimates and multiplied by TPWD landings estimates. This is a deviation from the best practice approach of calculating discard:landings ratios that are year *and* mode specific (SEDAR-PW-07). Using the best practice approach, the discard ratios were highly variable and there were two years of imputed Texas discard estimates that were unusually high (Figure 5a in SEDAR 100-DW-02). In an effort to stabilize the applied discard ratios, the RecWG considered applying 1) Louisiana ratios calculated by collapsing mode and 2) mode-specific ratios calculated by collapsing state in a Gulf-wide dataset. The RecWG recommended using the combined mode ratio from LA, which aligns with the combined recreational fleet structure (i.e., charter, headboat, and private combined) applied in previous assessments. The RecWG also expressed concern in calculating discard rates from combined eastern and western data, the latter of which tends to support lower landings. Texas estimates of Gray Triggerfish discards (1981-2024) are provided in Table 4.12.3, including those calibrated to MRIP FES units for the private mode (SEDAR 74-DW-10).

4.5.4 SRHS Headboat Logbook Discards

The SRHS logbook form was modified in 2004 to include a category to collect self-reported discards for each reported trip. This category is described on the form as the number of fish by species released alive and number released dead. Port agents instructed each captain on criteria for determining the condition of discarded fish. A fish is considered “released alive” if it is able to swim away on its own. If the fish floats off or is obviously dead or unable to swim, it is considered “released dead”. As of Jan 1, 2013 the SRHS began collecting logbook data

electronically. Changes to the trip report were also made at this time, one of which removed the condition category for discards (i.e., released alive vs. released dead) due to difficulties in standardizing these determinations. The form now collects only the total number of fish released, regardless of condition. The SRHS discard data provided for this assessment is in total discards for all years.

As a proxy for SRHS headboat discards of Gulf of America Gray Triggerfish from 1986:2007, the ratio of the mean ratio of SRHS discard:landings (2008-2012) to the mean ratio of MRFSS CH discard:landings (2008-2012) was applied to the yearly MRIP charter boat discard:landings ratio (1986-2007) to estimate the yearly SRHS discard:landings ratio (1986-2007). This ratio was then applied to the SRHS landings (1986-2007) as a proxy for SRHS headboat discards (1986-2007). This method is termed the Super-Ratio approach and is the current SEDAR "Best Practice" method, allowing for changes in both management and year class effects to be incorporated into the proxy discard time series (SEDAR-PW-07). Details of this approach and the associated decision points for SEDAR 100 are described in SEDAR 100-DW-08.

Task 9: The SEDAR 100 RecWG recommended using the Best Practice Super-Ratio proxy method (1986-2007) and the SRHS estimated discards from 2008-2024. Alternative approaches are only considered when the preferred approach fails (SEDAR-PW-07) and given no clear indication of failure, the Super-Ratio approach was chosen for SEDAR 100 (SEDAR 100-DW-08). Final headboat proxy discard estimates are summarized in Table 1 and Figure 2 of SEDAR 100-DW-08.

Uncertainty
Uncertainty proxies for SRHS discards between 2008-2024 by stock ID region and for the entire Gulf of America (Tables 10 and 12 in SEDAR 100-DW-01) are calculated using the same method described for landings. Prior to 2008, uncertainty estimates for SRHS proxy discards are calculated from SRHS estimates of landings, the associated uncertainty for that year, and estimates of the applied discard rate and associated variance. Given proxy discards are calculated as the product of these two terms, the associated variance is approximated using Goodman's Formula for the product of two independent random variables (SEDAR 74-DW-10). Final uncertainty estimates for headboat discards are shown in Figure 2 of SEDAR 100-DW-08.

4.5.5 Total Recreational Discards

Combined discard estimates from all sources by stock ID region are shown in Table 4.12.5, Figure 4.13.4, and mapped in Figure 4.13.5. Comparisons of discards across stock ID regions for individual modes are shown in Figure 4.13.6. Overall, discard estimates for Gray Triggerfish remained low before 2015 and consistently high thereafter, which seemingly coincides with management changes (e.g., short season in 2015, no season in 2017, reduced bag limit in 2018). The majority of the recreational discards in the Gulf of America come from the private mode (about 83.0%). The charter mode contributes about 13.5% and the headboat mode makes up the remaining 3.5% of recreational discards. Geographically, most discards come from the East (about 93.9%).

Uncertainty
Task 8b: Uncertainties for total recreational discards-in-number are calculated using the same approach as that described above for total recreational landings (in Section 4.4.6).

4.6 Biological Sampling

4.6.1 Landings

4.6.1.1 MRIP Biological Sampling

The MRIP Access Point Angler Intercept Survey (APAIS) includes the collection of fish lengths from the harvested catch (landed, whole condition). Up to 15 individuals of each landed species per angler interviewed are measured to the nearest mm along a centerline (defined as tip of snout to center of tail along a straight line, not curved over body). For all fish, the centerline is equivalent to fork length. For fish with truncate or rounded tails, centerline length, forked length, and natural total length are considered to be equivalent. Weights are typically collected for the same fish measured, although weights are preferred when time is constrained. Ageing structures and other biological samples are not collected during MRIP assignments because of concerns over the introduction of bias to survey data collection. Information on discarded fish size is not collected during MRIP APAIS sampling.

Summaries of fish size (pounds whole weight) for MRIP-sampled Gray Triggerfish in the Gulf of America by stock ID region and fishing mode (1981-2024) are provided in Tables 7.1-7.3 of SEDAR 100-DW-02. Table 8 in SEDAR 100-DW-02 provides annual summaries for all stock ID regions and fishing modes combined. These summaries include the number of Gray Triggerfish weighed, number of angler trips from which Gray Triggerfish were weighed, and the minimum, average, and maximum weights. The number of Gray Triggerfish sampled for lengths by MRIP are available in Table 1 of SEDAR 100-DW-04.

4.6.1.2 LDWF Biological Sampling

Size, weight, and age structures of recreationally landed Gray Triggerfish have been collected from the LDWF Biological Sampling Program starting in 2014. During the open season for Louisiana Gray Triggerfish, sampling targets for size measurements have been 30 fish per area per mode (charter and private) per week. Sizes are largely measured as maximum total length, with associated weight measurements collected as time permits. Otolith sampling targets are obtained from the federal GulfFIN grants. Summaries of fish size, in pounds whole weight, for LDWF-sampled Gray Triggerfish by mode (2014-2024) are provided in Table 9 of SEDAR 100-DW-02. These summaries include the number of Gray Triggerfish weighed, number of angler trips from which Gray Triggerfish were weighed, and the minimum, average, and maximum weights. The number of Gray Triggerfish sampled for age by LDWF is available in Table 2 of SEDAR 100-DW-04. The number of Gray Triggerfish sampled for lengths by LDWF is available in Table 1 of SEDAR 100-DW-04.

4.6.1.3 TPWD Biological Sampling

Length composition of the catch of Texas sport-boat anglers has been sampled by the TPWD since the high-use season of 1983 (mid-May). Maximum total length is measured by compressing the caudal fin lobes dorsoventrally. Weights of sampled fish are not recorded, but lengths can be converted to weights using length-weight equations (Table 1 in SEDAR 70-WP-03). The number of Gray Triggerfish sampled for lengths by TPWD is available in Table 1 of SEDAR 100-DW-04.

4.6.1.4 SRHS Biological Sampling

SRHS dockside sampling has been conducted in all Gulf states since 1986, except for Mississippi where sampling started in 2010. Weights are typically collected for the same fish measured during dockside sampling. Biological samples (scales, otoliths, spines, stomachs, and/or gonads) are also collected routinely and processed for aging, diet studies, and maturity studies.

The number of Gray Triggerfish sampled by SRHS for lengths are available in Tables 1 and 2 and the number sampled for age are available in Tables 1 and 3 of SEDAR 100-DW-04. Mean lengths and mean weights by year and stock ID region from biologically sampled Gray Triggerfish in the SRHS are summarized in Tables 20 and 22 of SEDAR 100-DW-01.

4.6.1.5 Length Frequency Distributions of Landings

Length data from the recreational fisheries of the Gulf of America are collected by multiple federal surveys (MRIP 1981-2024, SRHS 1986-2024) and state agencies. Data collected by state agencies (described above and in SEDAR 100-DW-04) are warehoused by the Gulf States Marine Fisheries Commission (GSMFC) in the GulfFIN database (2001-2024).

Length sample sizes from all data sources are shown in Tables 1 and 2 of SEDAR 100-DW-04. Length sample sizes for each potential stock ID (e.g. Gulf, West, East) are provided in Table A1 of SEDAR 100-DW-04.

Task 10a: Nominal length distributions by year and mode are shown in Figure 4.13.7. For most years, the length distributions for Gray Triggerfish sampled from the private, charter, and headboat modes are very similar. There are years where the distributions are different, especially in the early 1980s. These years are typically associated with lower sample sizes and do not appear to be indicative of true differences in length distributions among Gray Triggerfish landed by the different modes. Based on the length distribution of retained Gray Triggerfish, there is not strong evidence to support differences in selectivity among the fishing modes. It is recommended to continue modeling the recreational sector as a combined recreational fleet consisting of the private, charter, and headboat modes, as done in SEDAR 62 and 43.

Task 11a: Nominal (Figures A1-A3 in SEDAR 100-DW-04) and weighted (Figure 4.13.8) length frequencies were generated for recreational landings for each potential stock ID. At the request of the stock assessment analyst, length compositions for SEDAR 100 were generated using 2-cm length bins, with the bin label representing the bin floor. The majority of samples come from the East stock and the Gulf-wide and East length distributions are very similar for all years. Sample sizes in the West are much lower and the length distribution from the West does not always align with the East and Gulf-wide distributions, especially in years where the sample sizes are the lowest in the 2010s. In the 1990s when sample sizes were higher, there was generally high overlap in the length distributions from the three different stock options. It is not clear if the observed differences are a reflection of lower sample sizes or indicative of true differences in the length distribution of fish from the West stock.

4.6.1.6 Aging Data

Age samples were collected from 13 sampling programs (Tables 1 and 3 in SEDAR 100-DW-04). The largest number of samples are provided through FIN-BIOSTAT. FIN-BIOSTAT sampling began in 2003 and is administered by the Gulf States Marine Fisheries Commission (GSMFC) through GulfFIN. All recreational fishing modes are sampled through FIN-BIOSTAT (Bray, personal communication 2024). FIN-BIOSTAT (n=1,664 from TX-AL) is conducted in every Gulf state, however, in FL it is called RECFIN (n=2,608) from 2003-2018 and RepBio (n=593) from 2018-2024 (Bray and Cermak, personal communication 2023). Descriptions of the various sampling programs are available in SEDAR 100-DW-04 and SEDAR 100-DW-13.

The number of Gray Triggerfish sampled for age from the recreational fishery by year and stock ID region are summarized in Table A3 in SEDAR 100-DW-04. Sample sizes are much higher in the East compared to the West. All years in the East have sufficient sample sizes (n_fish and n_trip ≥ 10) for age compositions, while there were only six years in the early 2000s with sufficient samples for the West.

4.6.1.7 Age Compositions

Task 10b: Nominal age compositions by mode are shown in Figure 4.13.9. The age distributions are fairly similar across the three modes, especially for fish between 1-4 years. It is recommended to continue modeling the recreational sector as a combined recreational fleet consisting of the private, charter, and headboat modes, as done in SEDAR 62 and 43.

Comparisons of nominal and weighted age compositions are shown in Figures A5-A7 of SEDAR 100-DW-04. Weighting had a minimal impact on the age compositions and nominal and weighted age distributions are very similar for all stock scenarios.

Task 11b: Weighted age compositions for all potential stock ID regions are shown in Figure 4.13.10. The age distribution of Gray Triggerfish is more truncated in the West compared to the East. The maximum observed age in the West is 11 years while it is 16 years in the East.

4.6.2 Discards

4.6.2.1 For-Hire At-Sea Observer Biological Sampling

Cooperative headboat and charterboat vessels were randomly selected each month throughout the year in each state. Biologists board selected vessels with permission from the captain and observe anglers as they fish. Data collected for catch include the species, number, final disposition, and size of landed and discarded fish, and that describing effort include the length of the trip and area fished (inland, state, and federal waters). Annual sample sizes of discarded live Gray Triggerfish sampled for length are shown in Table 4.12.6.

4.6.2.2 Length Frequency Distributions of Discards

At-sea observers collected length measurements from 20,470 discarded Gray Triggerfish and 2,565 harvested Gray Triggerfish (Table 4.12.7). Harvested Gray Triggerfish are generally larger than discarded Gray Triggerfish (Figure 4.13.11). The range of harvested Gray Triggerfish constricts in 2009 and this corresponds to a change in the minimum size limit from a 12 inch total length to a 14 inch fork length in 2009. Table 4.12.7 provides the annual number of discarded and harvested Gray Triggerfish measured by at-sea observers for length.

For many assessments (e.g. SEDAR 98, SEDAR 90), the headboat mode is modelled as a separate fleet from the charter and private modes. When headboat is a separate fleet, nominal headboat discard length compositions are weighted by sample weights that correct for under- or over-sampling of a trip duration (e.g. half day, full day) relative to its contribution to the total number of trips of that type conducted across all headboats (SEDAR 100-DW-11) to produce weighted discard length compositions. For SEDAR 100, this approach cannot be used because there is a single recreational fleet and there are discard lengths from both headboat and charter modes. The RecWG discussed two potential weighting options for discard length compositions that use the proportion of discarded Gray Triggerfish. The first option weighted the nominal discard length compositions by mode while the second option weighted them spatially using North (Mississippi - Florida panhandle) and South (Florida peninsula) regions. The Group recommended using the spatial weighting because there were more pronounced spatial differences (Figure 4.13.12) in discard length compositions of fish than there were between modes (Figure 4.13.13).

Task 12: Florida-only discard length compositions for headboat and charter modes are shown in Figures 2 and 4, respectively, in SEDAR 100-DW-11. Final nominal and weighted discard length compositions, using the combined MS, AL, and FL data are shown in Figure 4.13.14. Weighting had minimal impacts on the discard length compositions of Gray Triggerfish from the Recreational fleet.

4.7 Recreational Effort

4.7.1 MRIP Effort

MRIP effort estimates are produced via the Fishing Effort Survey (FES) for private/rental boats and shore mode and the For-Hire Survey (FHS) for charterboat mode. MRIP effort is calculated in units of angler trips, which represents a single day of fishing in the specified mode that does not exceed 24 hours, and is included in the year and mode summaries provided by Table 4.12.1. This table includes MRIP effort estimates for all Gulf of America states from Louisiana to western Florida, excluding the Florida Keys.

4.7.2 LA Creel Effort

Louisiana effort estimates (in angler trips) are provided by LA Creel for years 2014-2024. These estimates are included in Table 4.12.2, which summarizes effort by year and mode and includes the calibration of LA Creel private effort estimates into MRIP-FES units.

4.7.3 TPWD Effort

Texas effort estimates (in angler trips) are provided by TPWD for years 1983-2024. TPWD average estimates from 1983 to 1985 (by wave and mode) were used to impute estimates for Texas charter and private boat fishing from 1981 until the survey started in May 1983**.** These estimates are included in Table 4.12.3, which summarizes effort by year and mode and includes the calibration of TPWD private effort estimates into MRIP-FES units (SEDAR 74-DW-10).

4.7.4 SRHS Effort

Effort data from the SRHS is self-reported by headboat captains as the number of anglers on and the duration of a given trip in their logbooks, which is standardized to “angler days” based on the length of the trip (e.g., 40 anglers on a half-day trip would yield 40 * 0.5 = 20 angler days). Angler days are summed by month for individual vessels. Each month, port agents collect these logbook trip reports and check for accuracy and completeness. Although reporting via the logbooks is mandatory, compliance is not 100% and is variable by location. To account for non-reporting, a correction factor is developed based on sampler observations, angler numbers from office books, and any available information. This information is used to provide estimates of total catch by month and area, along with estimates of effort.

SRHS effort estimates (in angler days) for the eastern and western Gulf of America are provided in Table 16 and Figure 7 of SEDAR 100-DW-01. Estimated headboat angler days have remained relatively stable in the Gulf of America in recent years. Reports from industry staff, captains/owners, and port agents indicated fuel prices, the economy, and fishing restrictions most

affected the number of trips and number of passengers, reducing overall fishing effort over the entire time series. The impact of COVID in 2020 is also reflected in fishing effort, especially in the East.

To standardize recreational fishing effort across the Gulf of America, SRHS effort estimates are also provided in the coarser units of angler trips to match estimates provided by the MRIP, TPWD, and LA Creel surveys. Monthly estimates of angler trips are calculated as the product of the reported number of anglers and ratios for the estimated number of total trips to the reported number of total trips. SRHS effort estimates (in angler trips) for the eastern and western Gulf of America are provided in Tables 17 and Figure 7 of SEDAR 100-DW-01.

4.7.5 Total Recreational Fishing Effort

Combined effort estimates from all sources in angler trips by stock ID region are shown in Table 4.12.8, Figure 4.13.15, and mapped in Figure 4.13.16. Comparisons of effort for the entire Gulf of America for individual modes are shown in Figure 4.13.17. These effort estimates depict all recreational fishing activity in the Gulf of America and are not specific to Gray Triggerfish. Effort estimates have steadily increased between the early 1980s and mid-2000s and have since remained consistently high. The majority of the recreational effort in the Gulf of America comes from the private mode (96.5%) and, geographically, relatively similar amounts of effort are noted in the West and East (43.7% and 56.3% respectively).

4.8 Comments on Adequacy of Data for Assessment Analyses

Task 13: Regarding the adequacy of available recreational data for SEDAR 100, the Recreational Working Group discussed the following:

- Calibrations to MRIP-FES units for TPWD (1981-2024) and LA Creel (2014-2024) were presented and recommended for use during the Data Workshop.
- Historical landings have a high uncertainty based on data availability and assumptions made in the methodology. Nonetheless, the RecWG considered these historical estimates as the best scientific information available for the historical period (1955-1980) in SEDAR 100.
- Landings, as adjusted, appear to be adequate for the time period covered (1955-2024).
- Since there are no discard estimates from Texas, a proxy discard rate from Louisiana was used to fill this data gap. Similarly, headboat discards prior to 2008 used a proxy discard rate from the charter mode. Discards are self-reported from all data sources. Discards, as adjusted, appear to be adequate for the time period covered (1981-2024).
- Size data appear to adequately represent the landed catch for all modes.
- Discard size data from the headboat and charterboat modes appear to be adequate for describing the size composition of discarded Gray Triggerfish.

4.9 Itemized List of Tasks for Completion following Workshop

- Final recreational catch estimates were completed after the Data Workshop by applying an updated LA Creel calibration factor (Task 4a) and modified approach in imputing TPWD discards (described in Section 4.5.3).
- Final nominal and weighted length and age compositions, conditional age-at-length, and mean length-at-age were completed after the Data Workshop. All analyses are presented in an updated Appendix added to SEDAR 100-DW-04 (completion of Tasks 10 and 11).

4.10 Research Recommendations

4.10.1 Evaluation and Progress of Research Recommendations from Last Assessment

Task 13: Research recommendations for the improvement of recreational datasets from SEDAR 43 were evaluated and progress on each item is outlined below:

1. *Evaluate existing methods for deriving historical discard numbers and discard rates and improve methods as appropriate*
   - No information on historical (1955-1980) discard rates were presented for consideration at the SEDAR 100 Data Workshop, so hindcasting of historical discards remains unfeasible.
   - As is now the best practice (SEDAR-PW-07), proxy estimates of SRHS discards (1986-2007) for SEDAR 100 were calculated using the Super-Ratio approach, which differs from the MRIP-charter approach applied in SEDAR 43.
   - Conversely, the best practice approach (SEDAR-PW-07) to impute TPWD discards (1981-2024) resulted in highly variable discard rates, and so a modified approach was applied in SEDAR 100 to stabilize those ratios.

4.10.2 Research Recommendations for SEDAR 100

Task 14: The Recreational Working Group provided the following recommendations to improve recreational data in the Gulf of America:

1. Continued evaluation of LA Creel Calibration Ratios for Gulf Gray Triggerfish
2. Additional MRIP Study in TX to include additional year(s) of benchmarking with TPWD
3. Collection of additional biological samples, particularly from the West
4. Continued funding of at-sea observer programs for tagging and estimation of associated discard mortalities
5. Tagging studies to estimate discard mortalities from recreational fisheries as well as additional sources of mortality, including shrimp trawl bycatch

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4.12 Tables

Table 4.12.1. Annual landings (AB1), discard (B2), and effort (EFF) estimates for Gulf of America Gray Triggerfish from the MRIP survey. Estimates are provided in numbers of fish and angler trips by mode.

	Cbt			Hbt			Priv			Total		
Year	AB1	B2	EFF	AB1	B2	EFF	AB1	B2	EFF	AB1	B2	EFF
1981	85,258	9,112	418,390	46,432	4,192	199,301	431,749	53,499	11,566,424	563,438	66,803	12,184,115
1982	736,728	16,476	523,703	442,158	4,448	260,912	100,996	197,783	11,539,636	1,279,883	218,707	12,324,251
1983	87,911	7,739	546,272	48,089	4,504	256,493	472,799	790,110	13,790,884	608,798	802,353	14,593,649
1984	76,749	334	515,534	37,736	29	242,211	11,527	207,186	13,385,940	126,012	207,550	14,143,685
1985	74,547	621	558,783	29,631	389	277,516	130,803	210,968	14,380,401	234,982	211,978	15,216,700
1986	451,982	4,320	539,606				64,011	112,747	13,911,468	515,993	117,067	14,451,074
1987	283,043	3,763	552,897				543,971	205,682	13,690,478	827,014	209,446	14,243,375
1988	233,909	1,923	485,592				486,277	175,147	16,173,554	720,187	177,070	16,659,146
1989	375,257	8,955	553,840				914,189	372,400	15,737,950	1,289,446	381,355	16,291,790
1990	895,710	216,342	546,723				717,464	290,254	16,787,633	1,613,174	506,595	17,334,356
1991	1,055,219	17,670	490,070				113,586	132,105	16,489,495	1,168,804	149,775	16,979,565
1992	576,125	20,520	513,244				623,147	230,574	16,957,686	1,199,272	251,094	17,470,930
1993	414,588	41,507	576,894				450,894	279,771	17,380,947	865,482	321,278	17,957,841
1994	456,952	12,042	583,209				278,823	120,700	17,771,476	735,776	132,743	18,354,685
1995	633,920	68,180	693,208				265,412	79,333	18,405,474	899,332	147,513	19,098,682
1996	143,237	31,457	650,088				187,096	212,707	18,383,317	330,333	244,164	19,033,405

1997	152,224	23,822	675,842	199,320	143,274	19,908,220	351,544	167,095	20,584,062
1998	152,418	54,979	656,598	394,671	466,021	21,376,286	547,090	521,000	22,032,884
1999	144,550	21,282	666,626	329,897	282,501	23,454,761	474,447	303,783	24,121,387
2000	83,087	8,147	598,494	280,331	131,876	23,083,653	363,418	140,023	23,682,147
2001	128,291	16,902	622,204	283,327	296,309	25,731,352	411,618	313,211	26,353,556
2002	142,286	17,062	606,183	780,771	683,660	25,015,041	923,058	700,723	25,621,224
2003	144,959	9,885	582,222	980,484	420,015	25,759,681	1,125,443	429,899	26,341,903
2004	191,992	22,708	662,228	784,270	610,291	29,061,390	976,262	632,999	29,723,618
2005	150,953	22,715	579,682	525,209	260,554	28,138,681	676,162	283,269	28,718,363
2006	100,330	10,635	666,576	336,351	234,013	26,013,602	436,681	244,648	26,680,178
2007	81,992	16,857	713,469	314,681	581,304	26,520,209	396,673	598,161	27,233,678
2008	68,659	13,298	665,103	225,331	192,877	28,822,603	293,990	206,175	29,487,706
2009	35,915	65,097	657,134	107,493	232,102	28,052,491	143,408	297,199	28,709,625
2010	30,779	37,761	472,909	255,805	456,281	29,142,688	286,584	494,042	29,615,597
2011	73,557	112,695	595,483	353,819	379,318	29,504,829	427,376	492,014	30,100,312
2012	15,780	63,071	718,252	194,617	587,534	30,808,704	210,397	650,605	31,526,956
2013	30,100	85,685	731,778	282,975	684,105	28,722,437	313,075	769,791	29,454,215
2014	15,421	131,176	592,321	108,214	419,094	20,242,471	123,635	550,270	20,834,792
2015	370	202,416	687,136	50,169	1,545,992	18,925,709	50,540	1,748,408	19,612,845

2016	62,729	358,386	717,394		225,325	1,794,438	20,338,425	288,054	2,152,824	21,055,819
2017	8,967	475,491	719,153		73,824	2,874,019	21,236,945	82,791	3,349,510	21,956,098
2018	45,320	364,917	738,980		137,747	1,629,900	19,666,722	183,067	1,994,816	20,405,702
2019	28,681	295,910	746,964		63,931	1,614,250	17,175,116	92,612	1,910,159	17,922,080
2020	35,939	355,933	828,833		168,557	1,363,499	19,356,174	204,496	1,719,432	20,185,007
2021	44,809	489,124	942,495		60,652	1,872,536	18,336,229	105,461	2,361,660	19,278,724
2022	50,438	305,686	926,284		153,726	2,590,087	20,440,718	204,164	2,895,773	21,367,002
2023	59,791	507,428	912,866		119,115	1,534,110	19,751,275	178,906	2,041,538	20,664,141
2024	35,326	350,522	800,538		158,464	1,723,876	20,747,929	193,791	2,074,398	21,548,467

Table 4.12.2. Annual landings (AB1), discard (B2), and effort (EFF) estimates for Louisiana Gray Triggerfish from the LA Creel survey. Estimates are provided in numbers of fish and angler trips by mode, and those for the private mode are calibrated into MRIP-FES units.

	Cbt			Priv			Total		
Year	AB1	B2	EFF	AB1	B2	EFF	AB1	B2	EFF
2014	43	0	130,622	10,572	0	7,441,673	10,615	0	7,572,295
2015	128	0	159,794	14,275	0	8,043,022	14,403	0	8,202,816
2016	17	92	179,238	10,597	11,033	7,321,861	10,614	11,125	7,501,099
2017	0	0	178,723	1,111	9,003	7,560,183	1,111	9,003	7,738,906
2018	117	31	183,313	7,348	2,077	7,428,797	7,466	2,108	7,612,110
2019	0	456	168,571	1,640	195	6,886,585	1,640	651	7,055,156
2020	5	20	115,424	852	1,246	8,469,878	857	1,266	8,585,302
2021	0	23	163,233	1,157	1,654	6,122,422	1,157	1,677	6,285,655
2022	338	0	162,620	756	774	5,135,536	1,094	774	5,298,156
2023	264	8	177,812	2,545	3,628	5,618,166	2,809	3,636	5,795,978
2024	29	86	151,402	1,892	3,287	5,418,986	1,921	3,373	5,570,388

Table 4.12.3. Annual landings (AB1), discard (B2), and effort (EFF) estimates for Texas Gray Triggerfish from the TPWD survey. Estimates are provided in numbers of fish and angler trips by mode, and those for the private mode are calibrated into MRIP-FES units (SEDAR 74-DW-10).

	Cbt			Priv			Total		
Year	AB1	B2	EFF	AB1	B2	EFF	AB1	B2	EFF
1981	0	0	29,441	7,804	392	7,092,619	7,804	392	7,122,060
1982	0	0	29,441	7,804	4,481	7,092,619	7,804	4,481	7,122,060
1983	0	0	33,666	11,825	13,187	7,091,080	11,825	13,187	7,124,746
1984	0	0	23,029	4,894	14,384	6,553,605	4,894	14,384	6,576,634
1985	0	0	31,627	6,692	44,094	7,633,172	6,692	44,094	7,664,799
1986	0	0	27,050	17,950	1,856	7,370,607	17,950	1,856	7,397,657
1987	74	0	31,084	16,043	0	9,524,327	16,117	0	9,555,411
1988	9	19	28,090	35,214	73,715	9,052,763	35,223	73,734	9,080,853
1989	40	24	42,075	11,629	6,860	7,976,082	11,669	6,884	8,018,157
1990	22	1	35,645	50,745	2,569	7,975,280	50,767	2,570	8,010,925
1991	24	14	47,448	21,514	12,313	7,764,966	21,538	12,327	7,812,414
1992	0	0	49,213	61,677	28,493	8,965,716	61,677	28,493	9,014,929
1993	0	0	54,657	43,007	266,122	9,011,231	43,007	266,122	9,065,888
1994	267	198	90,317	56,609	41,898	9,821,149	56,876	42,096	9,911,466
1995	138	30	74,001	101,000	22,310	9,950,180	101,138	22,341	10,024,181
1996	0	0	75,918	50,168	269	10,192,861	50,168	269	10,268,779
1997	945	450	93,868	42,942	20,441	8,482,200	43,887	20,890	8,576,068
1998	141	129	108,462	62,135	57,064	8,935,940	62,276	57,194	9,044,402
1999	543	249	112,579	24,969	11,430	10,785,527	25,512	11,679	10,898,106
2000	0	0	161,994	69,764	25,307	10,251,717	69,764	25,307	10,413,711
2001	1,519	1,768	141,584	19,019	22,142	8,900,805	20,538	23,911	9,042,389
2002	474	817	136,232	16,010	27,587	8,585,891	16,484	28,403	8,722,123
2003	197	13	117,498	12,850	844	9,400,971	13,047	857	9,518,469
2004	697	271	118,538	33,721	13,109	9,324,533	34,418	13,380	9,443,071
2005	280	271	106,073	44,751	43,351	8,839,997	45,031	43,622	8,946,070
2006	384	62	150,840	59,671	9,668	9,192,171	60,055	9,730	9,343,011
2007	781	527	148,253	28,195	19,034	8,277,571	28,976	19,561	8,425,824

2008	779	159	144,898	38,233	7,828	7,923,028	39,012	7,988	8,067,926
2009	100	719	117,112	14,899	107,097	8,557,970	14,999	107,816	8,675,082
2010	56	0	122,375	3,172	0	8,320,638	3,228	0	8,443,013
2011	32	0	161,208	10,583	0	8,858,407	10,615	0	9,019,615
2012	0	0	220,969	14,735	6,269	8,811,048	14,735	6,269	9,032,017
2013	32	85	142,993	9,722	25,707	9,087,384	9,754	25,792	9,230,377
2014	0	0	138,603	6,790	0	8,913,324	6,790	0	9,051,927
2015	182	0	144,328	10,528	0	8,414,272	10,710	0	8,558,600
2016	0	0	157,452	1,744	1,859	9,955,896	1,744	1,859	10,113,348
2017	0	0	188,501	894	7,241	9,107,944	894	7,241	9,296,445
2018	38	11	298,884	1,875	528	8,476,571	1,913	539	8,775,455
2019	12	13	377,936	2,202	2,435	9,317,226	2,214	2,448	9,695,162
2020	0	0	237,375	1,689	2,558	10,500,343	1,689	2,558	10,737,718
2021	11	16	243,182	796	1,193	8,948,138	807	1,210	9,191,320
2022	0	0	318,026	262	103	9,105,874	262	103	9,423,900
2023	98	103	552,716	5,776	6,065	11,196,487	5,874	6,168	11,749,203
2024	71	128	206,194	534	962	8,110,547	605	1,090	8,316,741

Table 4.12.4. Total recreational landings estimates in numbers (AB1) and pounds (LBS) for Gulf of America Gray Triggerfish combined across all surveys by year and mode. Estimates and their associated coefficients of variation (CV) are provided for recreational landings in numbers of fish (AB1 CV) and in pounds whole weight (LBS CV).

	West				East			
YEAR	AB1	AB1 CV	LBS	LBS CV	AB1	AB1 CV	LBS	LBS CV
1955	44,939	0.58			190,900	0.58		
1956	49,773	0.58			211,434	0.58		
1957	54,607	0.58			231,968	0.58		
1958	59,440	0.58			252,502	0.58		
1959	64,274	0.58			273,036	0.58		
1960	69,108	0.58			293,570	0.58		
1961	71,082	0.58			301,955	0.58		
1962	73,056	0.58			310,339	0.58		
1963	75,029	0.58			318,723	0.58		
1964	77,003	0.58			327,107	0.58		
1965	78,977	0.58			335,492	0.58		
1966	81,605	0.58			346,658	0.58		
1967	84,234	0.58			357,824	0.58		
1968	86,863	0.58			368,991	0.58		
1969	89,491	0.58			380,157	0.58		
1970	92,120	0.58			391,323	0.58		
1971	100,613	0.58			427,403	0.58		
1972	109,107	0.58			463,483	0.58		
1973	117,600	0.58			499,563	0.58		
1974	126,093	0.58			535,643	0.58		
1975	134,587	0.58			571,723	0.58		

	West				East			
YEAR	AB1	AB1 CV	LBS	LBS CV	AB1	AB1 CV	LBS	LBS CV
1976	135,038	0.58			573,640	0.58		
1977	135,489	0.58			575,556	0.58		
1978	135,941	0.58			577,473	0.58		
1979	136,392	0.58			579,390	0.58		
1980	136,843	0.58			581,307	0.58		
1981	87,917	0.50	148,286	0.53	506,603	0.46	1,115,442	0.50
1982	68,712	0.51	83,641	0.52	1,242,253	0.33	3,351,908	0.36
1983	376,569	0.02	1,827,527	0.02	267,332	0.36	623,012	0.38
1984	55,621	0.20	161,395	0.27	98,563	0.49	238,961	0.51
1985	64,316	0.50	292,180	0.81	200,637	0.56	561,834	0.54
1986	45,432	0.18	65,796	0.20	533,553	0.20	1,307,221	0.23
1987	37,961	0.20	56,997	0.19	843,900	0.47	2,326,768	0.49
1988	89,003	0.17	95,049	0.18	734,968	0.27	1,378,942	0.26
1989	133,751	0.52	229,780	0.53	1,247,873	0.20	2,054,995	0.22
1990	241,555	0.32	525,820	0.34	1,553,288	0.18	4,203,634	0.22
1991	112,336	0.18	240,335	0.22	1,167,254	0.26	2,924,127	0.28
1992	156,762	0.10	260,202	0.12	1,214,863	0.17	2,911,565	0.19
1993	98,638	0.12	170,472	0.13	912,823	0.21	2,264,706	0.23
1994	174,934	0.18	348,516	0.19	727,897	0.16	1,598,181	0.23
1995	239,978	0.25	430,965	0.25	858,158	0.25	1,595,306	0.26
1996	99,038	0.14	166,371	0.14	357,986	0.17	668,441	0.23
1997	100,281	0.15	178,695	0.16	358,834	0.14	999,400	0.18
1998	97,801	0.16	171,184	0.26	564,752	0.21	1,197,033	0.22
1999	108,715	0.29	309,872	0.34	432,223	0.12	944,519	0.14
2000	168,122	0.27	404,708	0.29	297,282	0.20	728,359	0.21
2001	59,265	0.44	115,089	0.46	412,946	0.14	792,637	0.15
2002	38,888	0.19	79,279	0.19	954,509	0.24	2,147,548	0.29
2003	46,505	0.27	88,370	0.26	1,155,466	0.27	2,292,969	0.38
2004	95,172	0.29	170,620	0.29	971,723	0.18	1,755,471	0.20

	West				East			
YEAR	AB1	AB1 CV	LBS	LBS CV	AB1	AB1 CV	LBS	LBS CV
2005	63,833	0.08	105,891	0.13	705,630	0.17	1,301,294	0.22
2006	91,584	0.12	140,058	0.23	439,060	0.21	731,634	0.21
2007	61,016	0.20	102,829	0.22	397,383	0.17	717,319	0.19
2008	74,720	0.24	149,062	0.26	280,864	0.19	568,667	0.20
2009	19,900	0.14	32,443	0.25	150,611	0.20	438,450	0.24
2010	3,642	0.05	10,296	0.05	295,622	0.23	901,197	0.26
2011	12,357	0.06	18,302	0.09	442,025	0.19	1,248,379	0.21
2012	29,364	0.33	65,860	0.35	201,690	0.22	645,294	0.25
2013	17,033	0.34	36,613	0.34	315,622	0.36	1,203,388	0.39
2014	17,585	0.06	33,599	0.06	126,417	0.31	394,149	0.33
2015	25,161	0.05	47,959	0.24	51,621	0.48	119,238	0.48
2016	12,728	0.09	40,763	0.19	298,692	0.20	974,112	0.22
2017	2,050	0.09	6,004	0.09	82,792	0.56	209,151	0.55
2018	9,637	0.10	39,036	0.10	198,018	0.37	870,646	0.40
2019	3,930	0.06	10,865	0.06	97,879	0.29	516,021	0.31
2020	2,590	0.05	6,599	0.05	209,663	0.32	998,924	0.35
2021	2,004	0.09	7,598	0.09	110,972	0.25	430,909	0.26
2022	1,421	0.23	4,742	0.25	209,791	0.21	753,356	0.25
2023	8,756	0.04	22,017	0.04	184,273	0.22	666,943	0.24
2024	2,576	0.10	8,203	0.11	198,119	0.20	699,644	0.24

Table 4.12.5. Total recreational discard estimates in numbers (B2) for Gulf of America Gray Triggerfish combined across all surveys by year and mode. Associated coefficients of variation (CV) are also provided.

	West		East	
YEAR	B2	CV	B2	CV
1981	3,439	0.82	63,757	0.61
1982	25,303	0.43	197,885	0.63
1983	392,779	0.00	422,760	0.58
1984	90,191	0.84	131,743	1.00
1985	252,208	0.56	3,865	0.75
1986	3,042	0.32	116,131	0.89
1987	0	0.00	209,715	0.67
1988	99,569	0.18	151,447	0.74
1989	64,217	0.52	324,820	0.28
1990	10,935	0.54	522,657	0.35
1991	46,476	0.70	116,268	0.52
1992	53,131	0.25	228,733	0.21
1993	336,953	0.25	256,192	0.28
1994	87,500	0.28	88,028	0.30
1995	41,559	0.41	132,961	0.35
1996	315	0.15	251,846	0.38
1997	33,822	0.36	159,201	0.32
1998	75,031	0.56	517,465	0.34
1999	46,637	0.33	273,651	0.23
2000	58,818	0.51	108,785	0.40
2001	60,274	0.50	280,973	0.21
2002	51,504	0.28	680,602	0.43
2003	1,937	0.55	431,939	0.46
2004	31,900	0.32	619,486	0.32
2005	50,872	0.11	280,428	0.25
2006	13,085	0.14	243,688	0.31
2007	33,121	0.26	588,983	0.30
2008	14,848	0.32	202,691	0.45

	West		East	
YEAR	B2	CV	B2	CV
2009	135,544	0.19	280,877	0.21
2010	372	0.06	501,614	0.36
2011	531	0.05	507,392	0.24
2012	12,823	0.47	674,278	0.24
2013	43,795	0.36	789,135	0.51
2014	177	0.05	589,924	0.14
2015	272	0.05	1,833,917	0.24
2016	13,247	0.10	2,244,101	0.16
2017	16,371	0.07	3,501,502	0.16
2018	2,759	0.11	2,083,234	0.32
2019	3,234	0.06	1,994,272	0.18
2020	4,049	0.06	1,789,046	0.18
2021	2,899	0.07	2,488,480	0.24
2022	1,811	0.07	3,000,710	0.22
2023	9,904	0.09	2,158,110	0.13
2024	4,464	0.10	2,162,793	0.22

Table 4.12.6. The number of fish and trips, by state, where at-sea observers measured **discarded** Gray Triggerfish for length from the charter and headboat modes.

	Number of Fish						Number of Trips					
	Charter			Headboat			Charter			Headboat		
Year	MS	AL	FL	MS	AL	FL	MS	AL	FL	MS	AL	FL
2005	0	0	0	0	0	10	0	0	0	0	0	10
2006	0	0	0	0	3	10	0	0	0	0	3	10
2007	0	0	0	0	0	11	0	0	0	0	0	11
2009	0	0	159	0	0	52	0	0	20	0	0	20
2010	0	0	201	0	0	115	0	0	38	0	0	34
2011	0	0	540	0	0	249	0	0	59	0	0	52
2012	0	0	435	0	0	292	0	0	57	0	0	50
2013	0	0	432	0	0	212	0	0	57	0	0	40
2015	0	0	983	0	0	738	0	0	94	0	0	103
2016	0	0	1,223	0	0	1,314	0	0	115	0	0	124
2017	0	4	984	0	0	914	0	4	102	0	0	105
2018	0	1	980	0	0	719	0	1	113	0	0	101
2019	0	71	1,590	0	0	1,094	0	19	133	0	0	122
2020	0	0	83	0	0	124	0	0	15	0	0	14
2021	0	0	716	0	0	451	0	0	67	0	0	79
2022	0	99	830	0	129	756	0	27	78	0	11	126
2023	1	275	1,011	0	15	912	1	44	84	0	1	130
2024	0	358	603	0	16	755	0	50	79	0	1	135

Table 4.12.7. The number of fish and trips, in the eastern Gulf of America, where at-sea observers measured harvested and discarded Gray Triggerfish, for length, from charter and headboat modes.

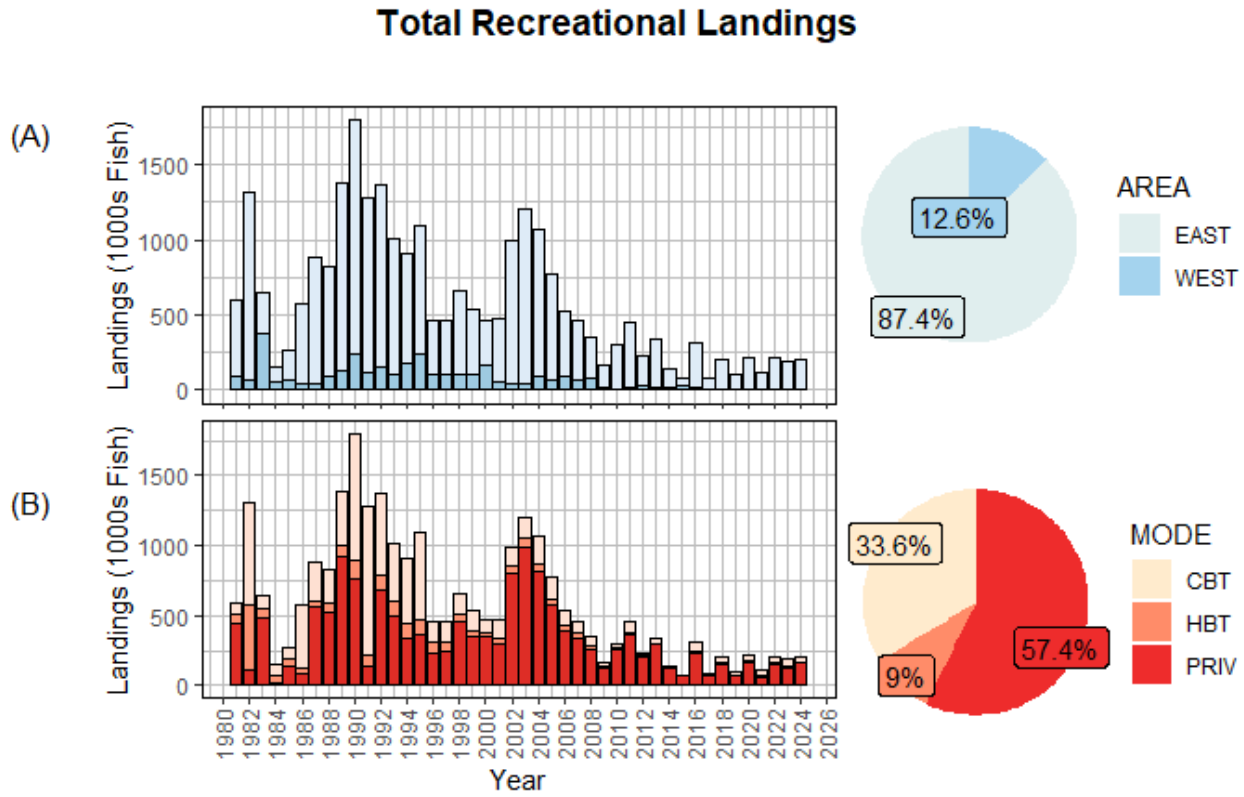
	Charter				Headboat			
	Number of Fish		Number of Trips		Number of Fish		Number of Trips	
Year	Harvest	Discard	Harvest	Discard	Harvest	Discard	Harvest	Discard
2005	0	0	0	0	51	10	51	10
2006	0	0	0	0	68	13	68	13
2007	0	0	0	0	56	11	56	11
2009	38	159	13	20	14	52	8	20
2010	152	201	33	38	32	115	18	34
2011	177	540	52	59	67	249	30	52
2012	62	435	17	57	34	292	15	50
2013	62	432	26	57	21	212	12	40
2015	1	983	1	94	7	738	4	103
2016	123	1,223	30	115	307	1,314	42	124
2017	0	988	0	106	0	914	0	105
2018	105	981	20	114	283	719	25	101
2019	112	1,661	23	152	93	1,094	17	122
2020	0	83	0	15	3	124	2	14
2021	36	716	9	67	14	451	8	79
2022	143	929	33	105	103	885	41	137
2023	100	1,287	40	129	110	927	42	131
2024	96	961	46	129	95	771	42	136

Table 4.12.8. Total recreational fishing effort (in angler trips) for east and west Gulf of America Gray Triggerfish combined across all surveys and modes by year. The combined private-shore mode in the LA Creel survey is allocated as private fishing. MRIP headboat estimates are used for the Gulf of America from 1981-1985, and SRHS from 1986+.

YEAR	East	West
1981	8,807,774	10,570,364
1982	8,789,874	10,728,400
1983	10,856,694	10,933,664
1984	10,660,003	10,132,280
1985	11,695,943	11,257,520
1986	11,342,387	10,836,518
1987	11,243,580	12,906,747
1988	13,746,792	12,352,485
1989	13,184,116	11,484,677
1990	14,010,126	11,710,060
1991	13,510,344	11,600,220
1992	13,798,085	13,031,411
1993	14,176,522	13,209,309
1994	14,638,075	14,018,208
1995	15,295,847	14,191,401
1996	15,003,003	14,636,333
1997	16,342,960	13,117,133
1998	17,739,135	13,664,484
1999	19,324,986	15,913,881
2000	18,489,919	15,904,715
2001	20,987,187	14,680,728
2002	20,615,625	13,987,766
2003	21,268,029	14,868,904
2004	24,965,082	14,477,412
2005	24,447,339	13,457,553
2006	22,294,012	13,977,674
2007	22,519,771	13,469,611
2008	24,285,062	13,485,552

YEAR	East	West
2009	23,016,961	14,632,148
2010	23,601,098	14,666,622
2011	24,288,791	15,112,273
2012	25,927,969	14,932,081
2013	24,089,111	14,888,902
2014	21,091,530	16,680,368
2015	19,872,594	16,821,956
2016	21,324,435	17,672,636
2017	22,221,201	17,091,515
2018	20,666,221	16,443,252
2019	18,171,060	16,805,059
2020	20,369,629	19,375,967
2021	19,545,324	15,563,159
2022	21,604,871	14,801,880
2023	20,874,962	17,609,942
2024	21,736,344	13,943,437

4.13 Figures



Cbt	8,379,925	325,763
Hbt	1,664,215	664,082
Priv	12,568,288	2,269,312

Figure 4.13.1. Total recreational landings (AB1) for Gulf of America Gray Triggerfish across all surveys. Landings are provided (A) by area and year in thousands of fish, (B) by mode and year in thousands of fish, and (C) by mode and area in percent numbers of fish.

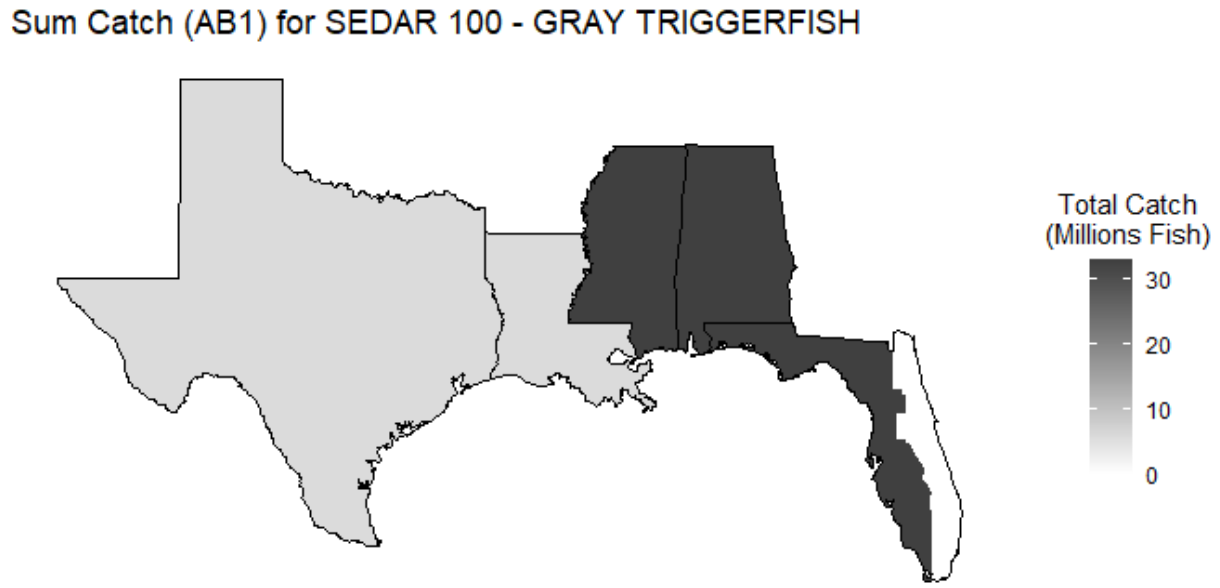


Figure 4.13.2. Distribution of total recreational landings (AB1), in millions of fish, for Gray Triggerfish across the Gulf of America. Estimates are combined across all surveys and years and summarized by region.

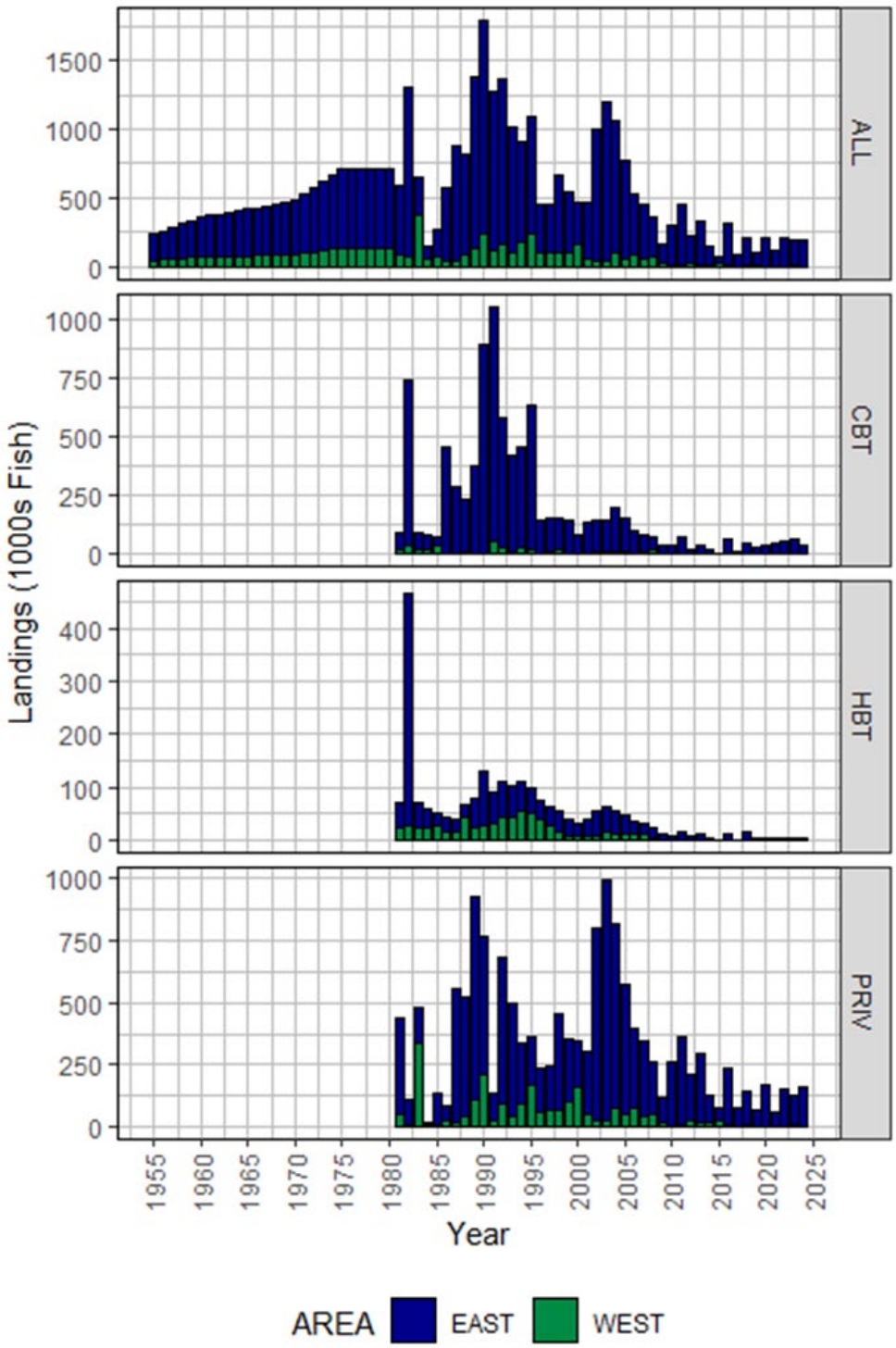
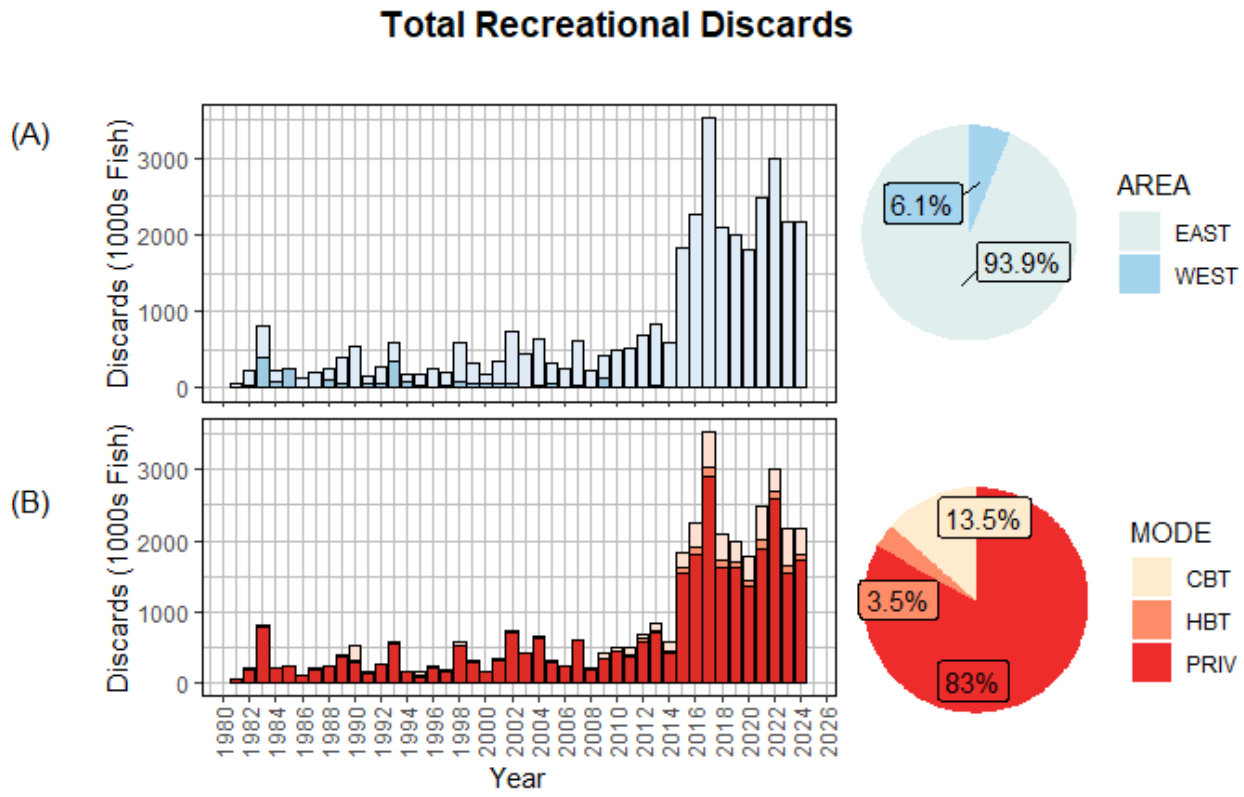
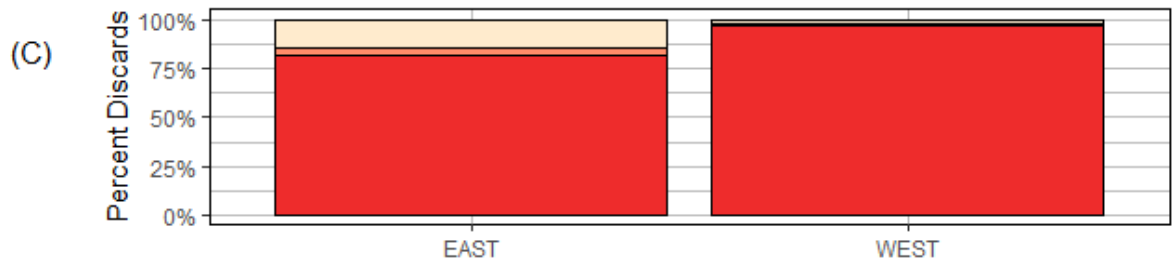


Figure 4.13.3. Recreational landings (AB1) for Gulf of America Gray Triggerfish for each fishing mode. Landings are provided by year and area in thousands of fish. Note that the 'ALL' timeseries includes historical FHWAR estimates (1955-1980) and the sums of mode-specific estimates from other recreational surveys shown in the lower panels (1981+).





Cbt	4,851,619	55,726
Hbt	1,264,026	5,967
Priv	28,090,439	2,170,026

Figure 4.13.4. Total recreational discards (B2) for Gulf of America Gray Triggerfish across all surveys. Discards are provided (A) by area and year in thousands of fish, (B) by mode and year in thousands of fish, and (C) by mode and area in percent numbers of fish.

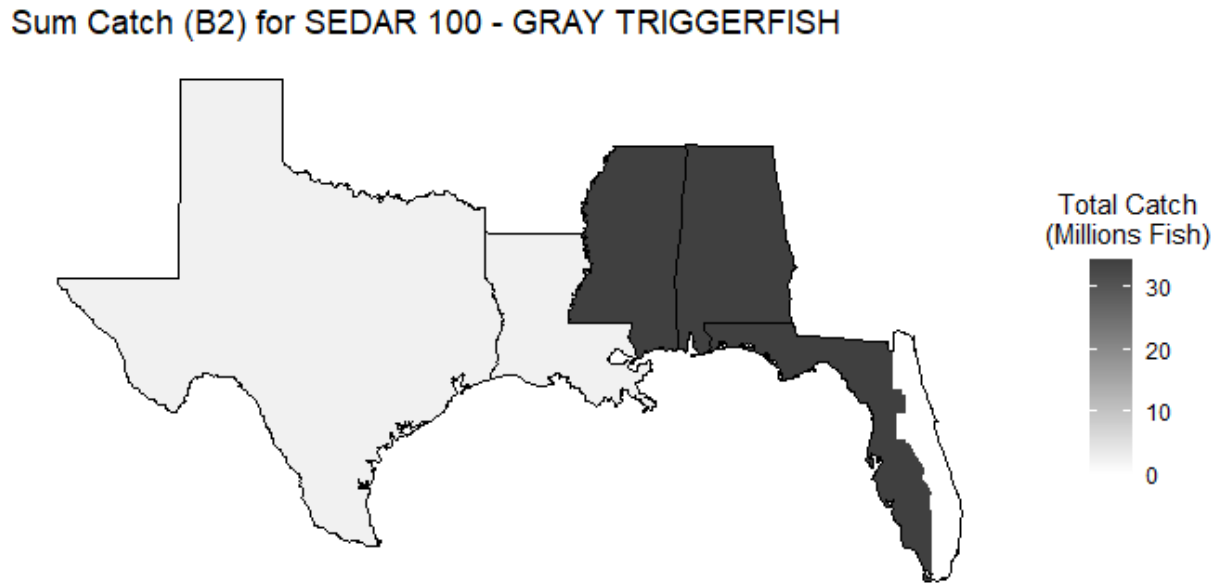


Figure 4.13.5. Distribution of total recreational discards (B2), in millions of fish, for Gray Triggerfish across the Gulf of America. Estimates are combined across all surveys and years and summarized by region.

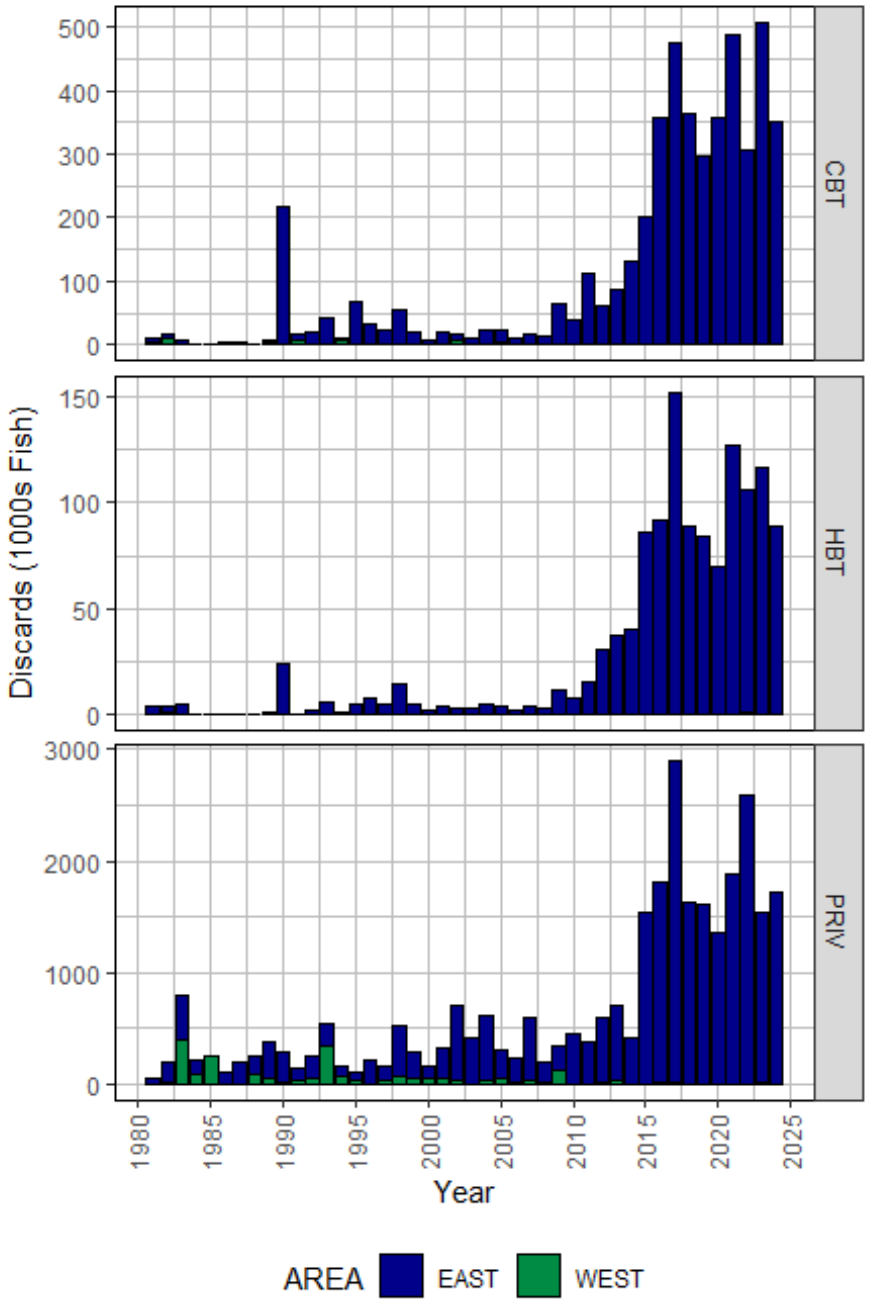


Figure 4.13.6. Recreational discards (B2) for Gulf of America Gray Triggerfish for each fishing mode. Discards are provided by year and area in thousands of fish.

Figure 4.13.7. Nominal length distributions by **mode** (CB= charter, HB = headboat, and PR = private) for Gulf Gray Triggerfish.

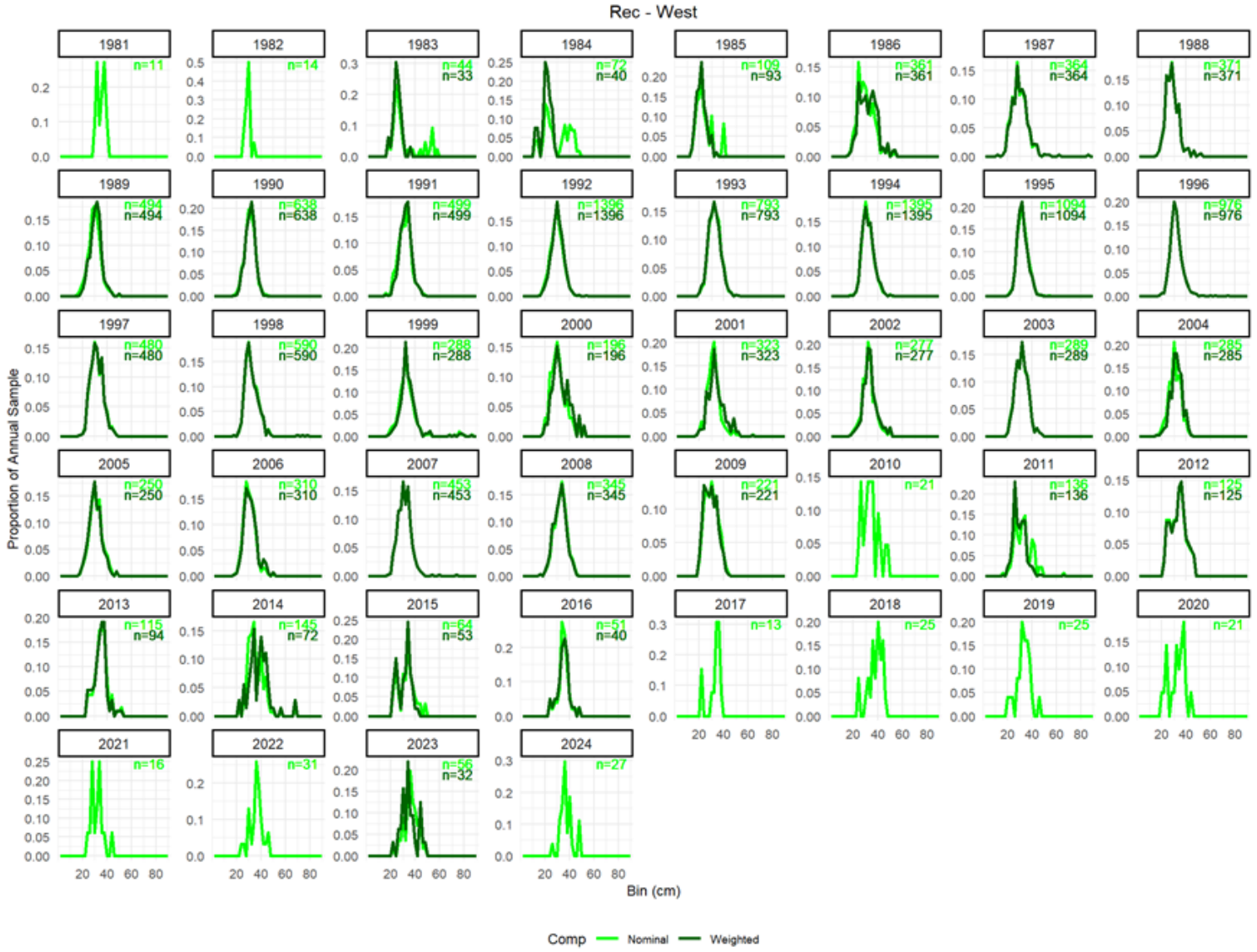


Figure 4.13.8a. Nominal and weighted length distributions for Gulf Gray Triggerfish in the **West** (TX and LA). Refer to Table A2 in SEDAR 100-DW-04 for which years do not meet sample size criteria for inclusion based on weighting.

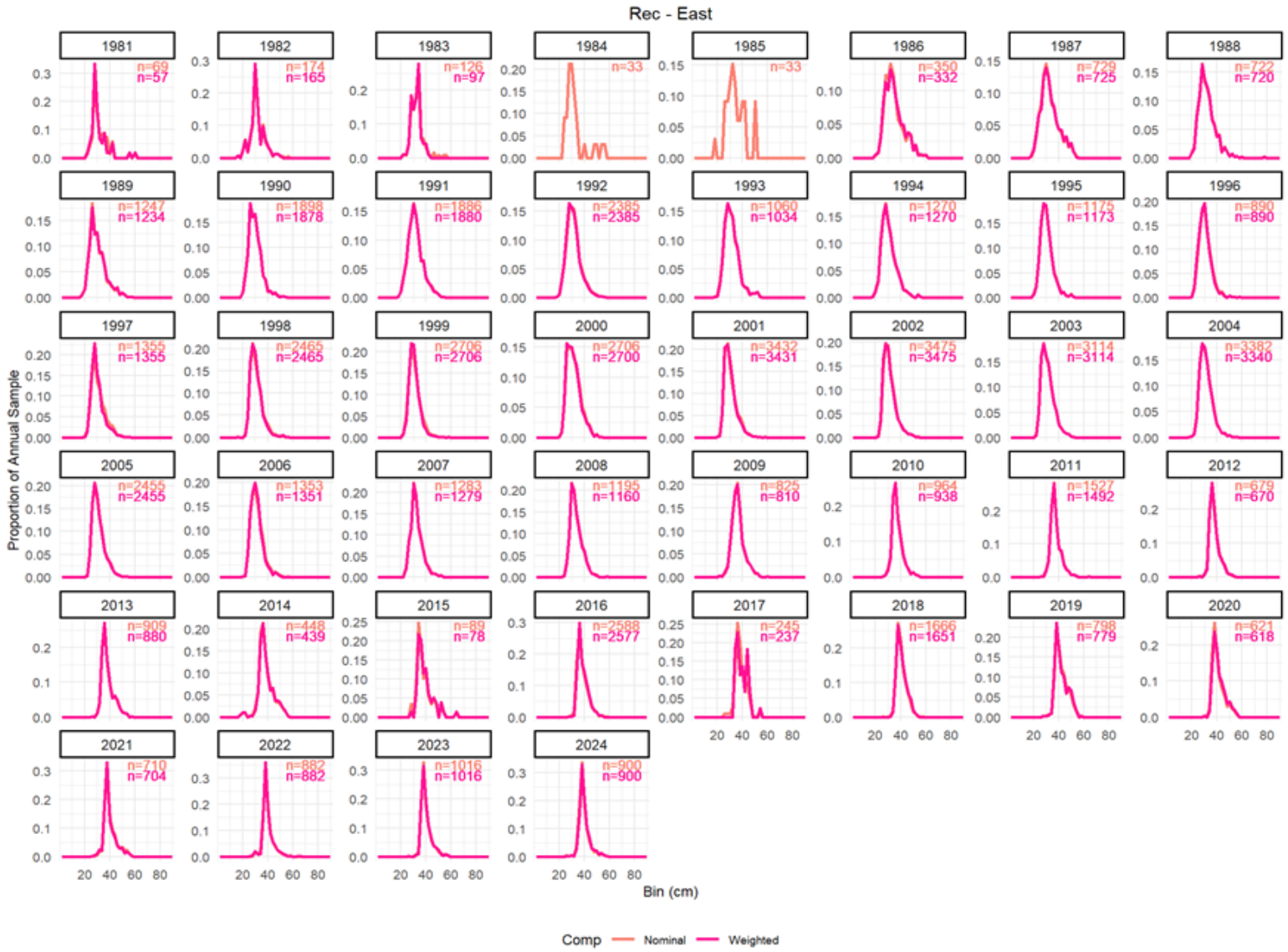


Figure 4.13.8b. Nominal and weighted length distributions for Gulf Gray Triggerfish in the **East** (MS-FL). Refer to Table A2 in SEDAR 100-DW-04 for which years do not meet sample size criteria for inclusion based on weighting.

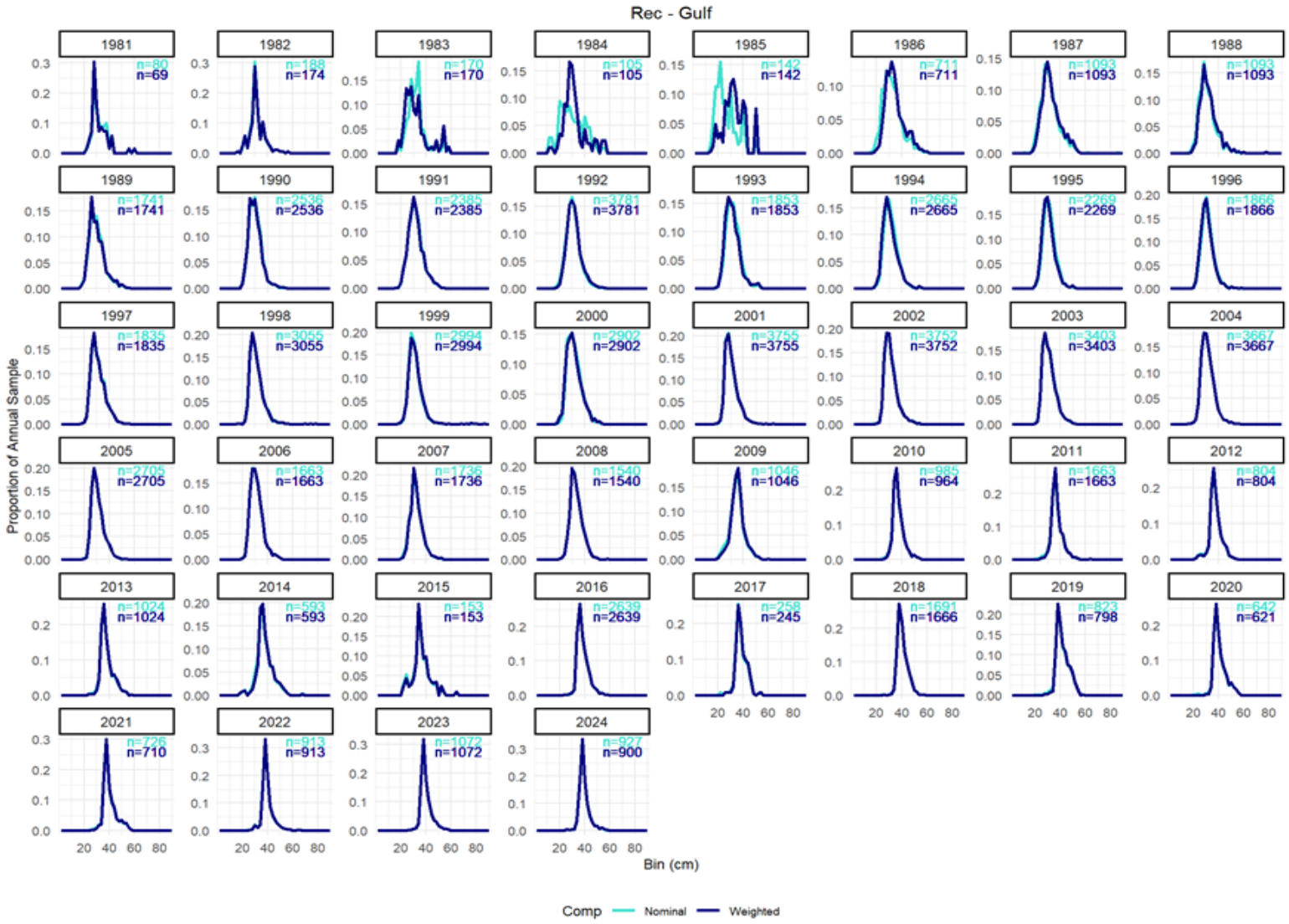


Figure 4.13.8c. Nominal and weighted length distributions for Gulf Gray Triggerfish **Gulf-wide** (TX-FL). Refer to Table A1 in SEDAR 100-DW-04 for which years do not meet sample size criteria for inclusion based on weighting.

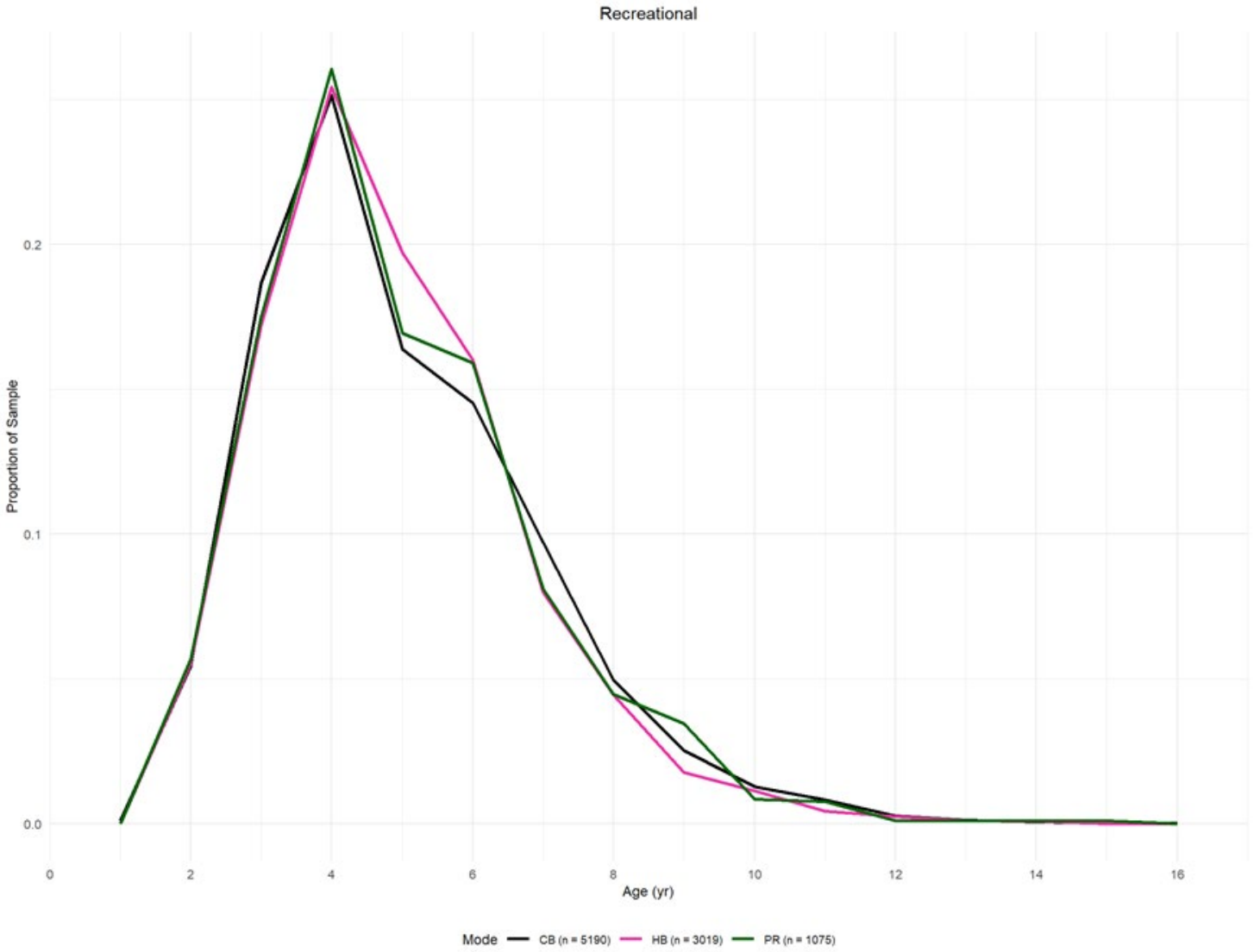


Figure 4.13.9. Nominal age distribution of Gray Triggerfish from the charter (CB), headboat (HB), and private (PR) modes.

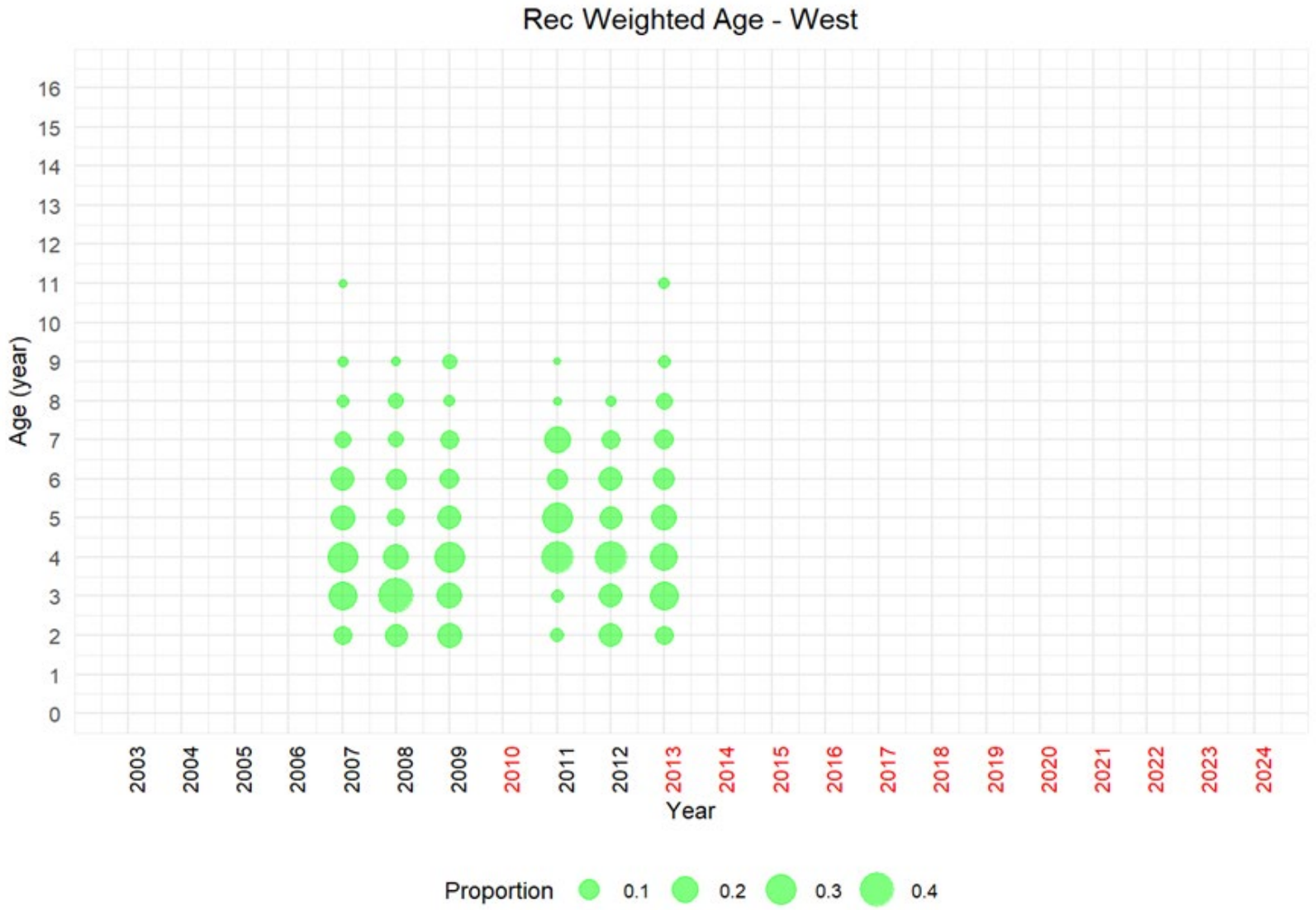


Figure 4.13.10a. Weighted age composition for Gulf Gray Triggerfish from the **West** (TX and LA). The weighted length compositions used for weighting did not meet minimum sample size thresholds for years in red.

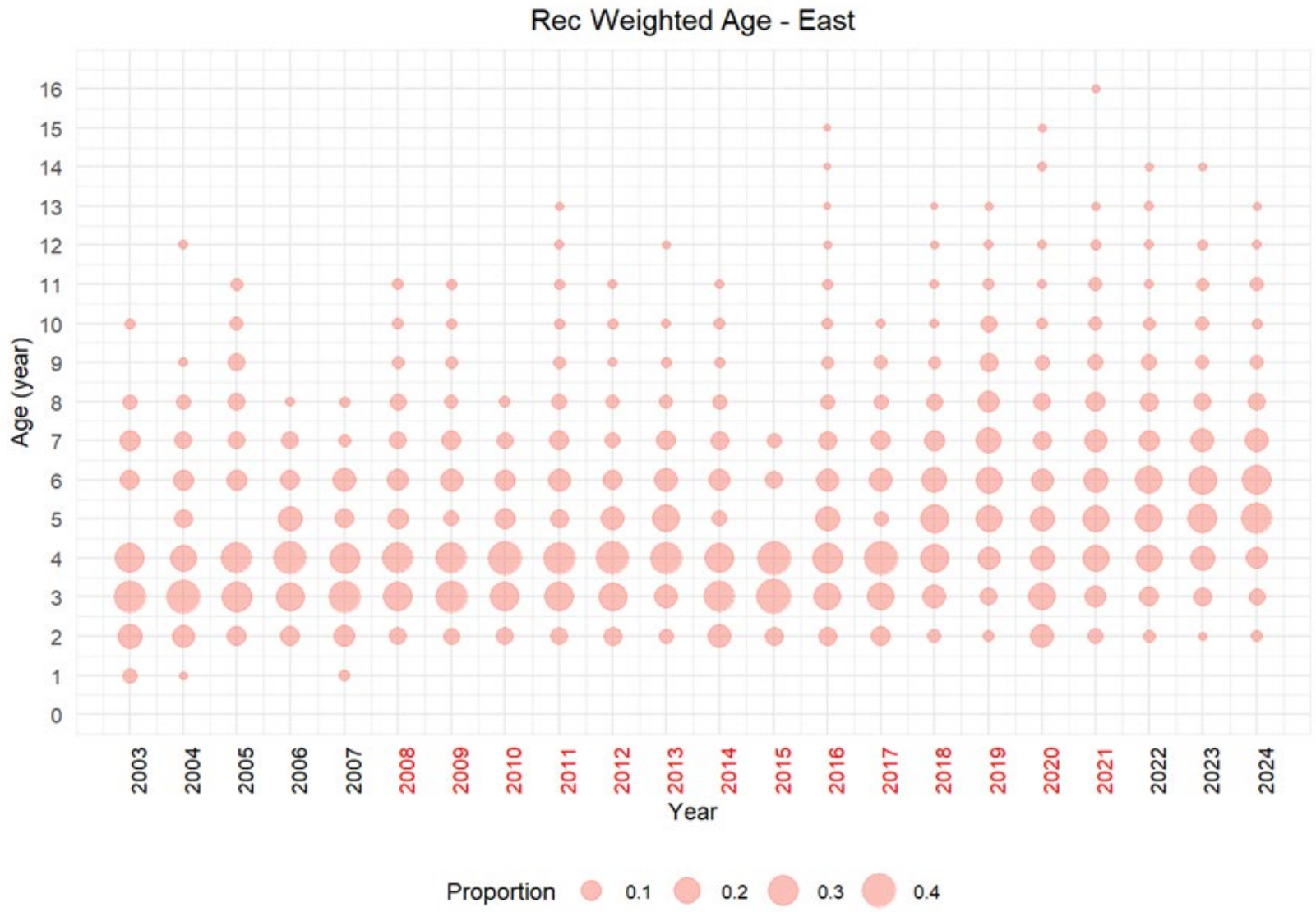


Figure 4.13.10b. Weighted age composition for Gulf Gray Triggerfish from the **East** (MS to FL). The weighted length compositions used for weighting did not meet minimum sample size thresholds for years in red.

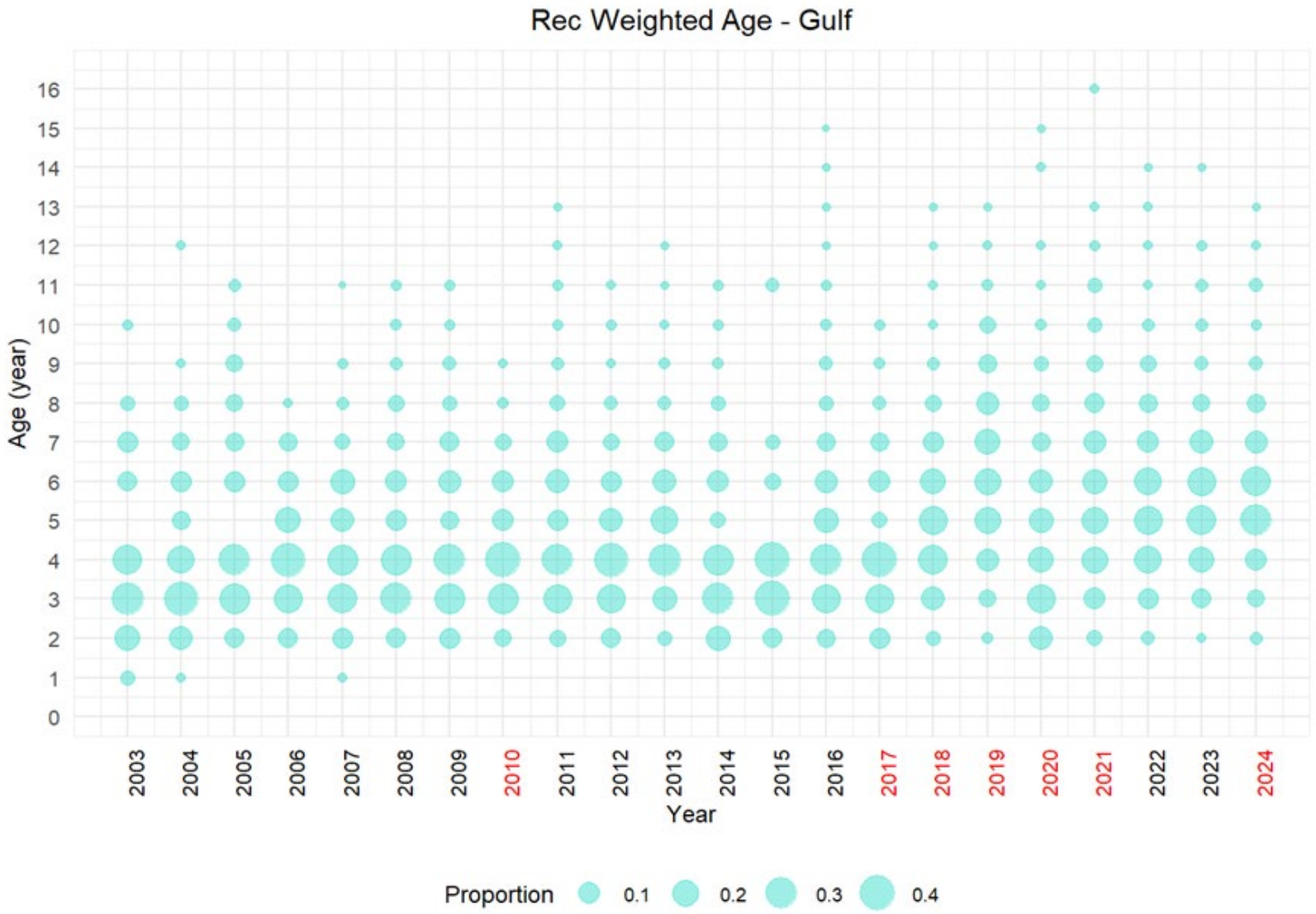


Figure 4.13.10c. Weighted age composition for Gulf Gray Triggerfish **Gulf-wide** (TX-FL). The weighted length compositions used for weighting did not meet minimum sample size thresholds for years in red.

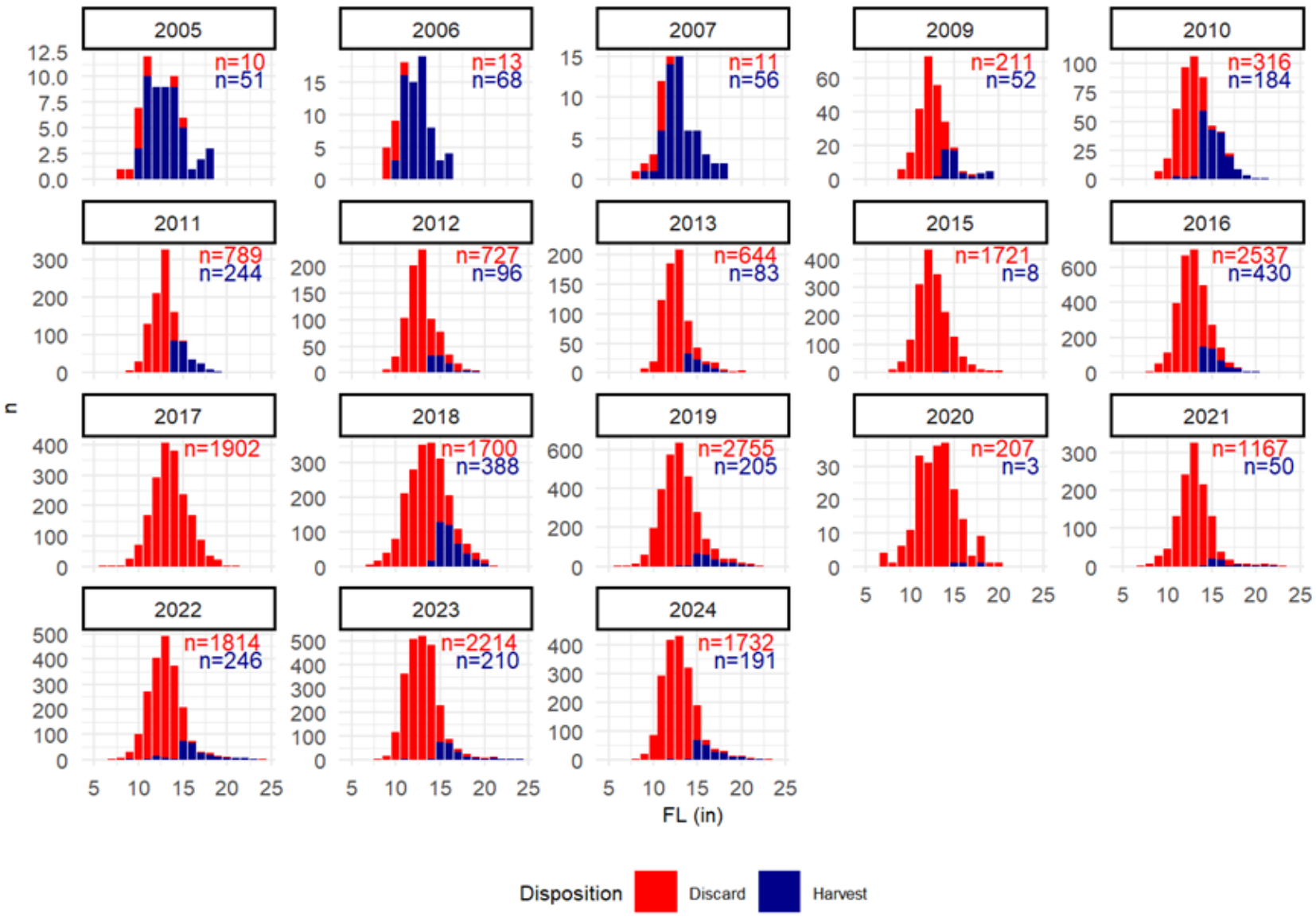


Figure 4.13.11. Length distribution of discarded and harvested Gulf Gray Triggerfish sampled by at-sea observers.

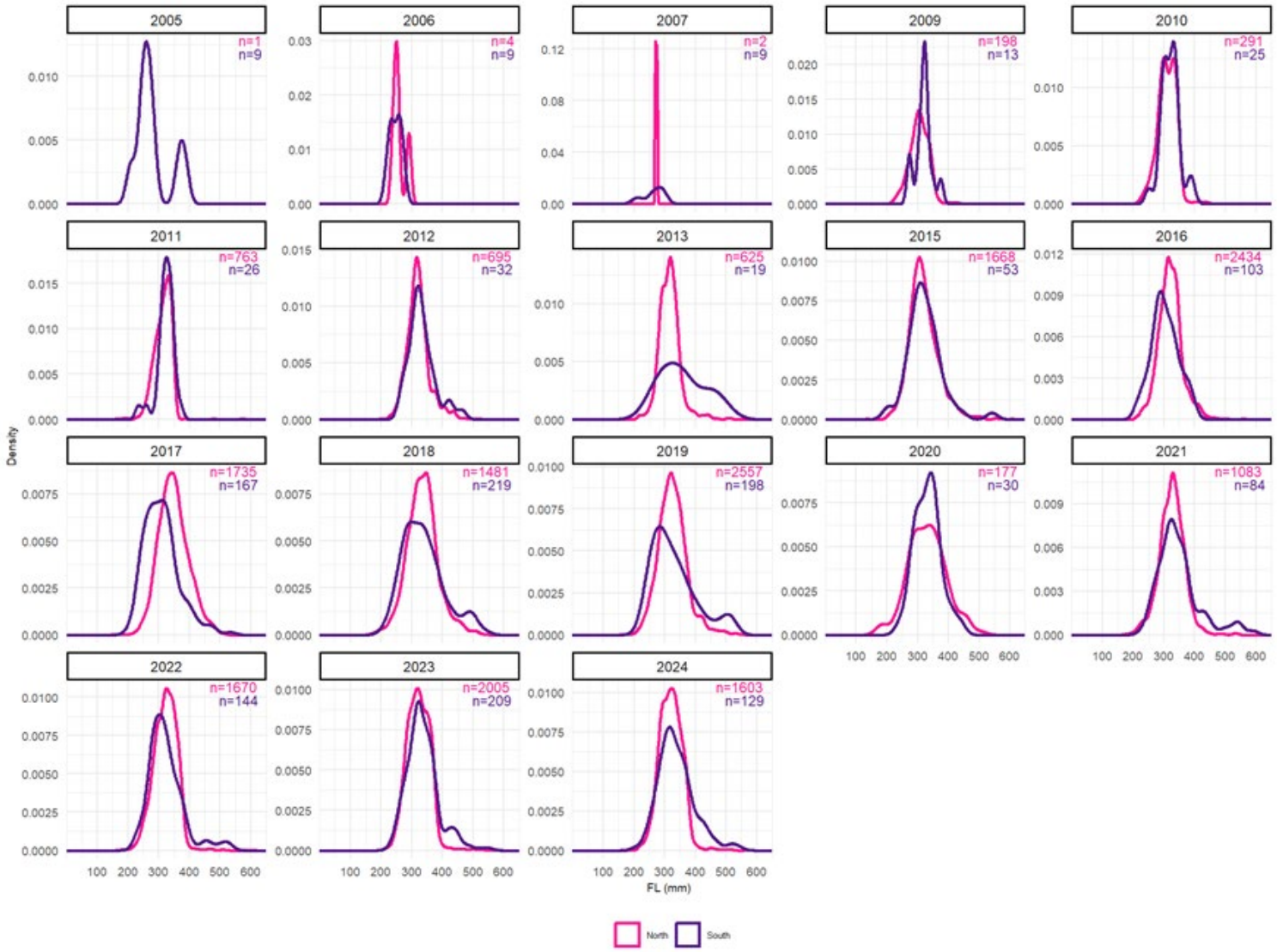


Figure 4.13.12. Comparison of discard length distributions from Gray Triggerfish sampled from the North (MS-FL panhandle) and South (FL peninsula) weighting subregions.

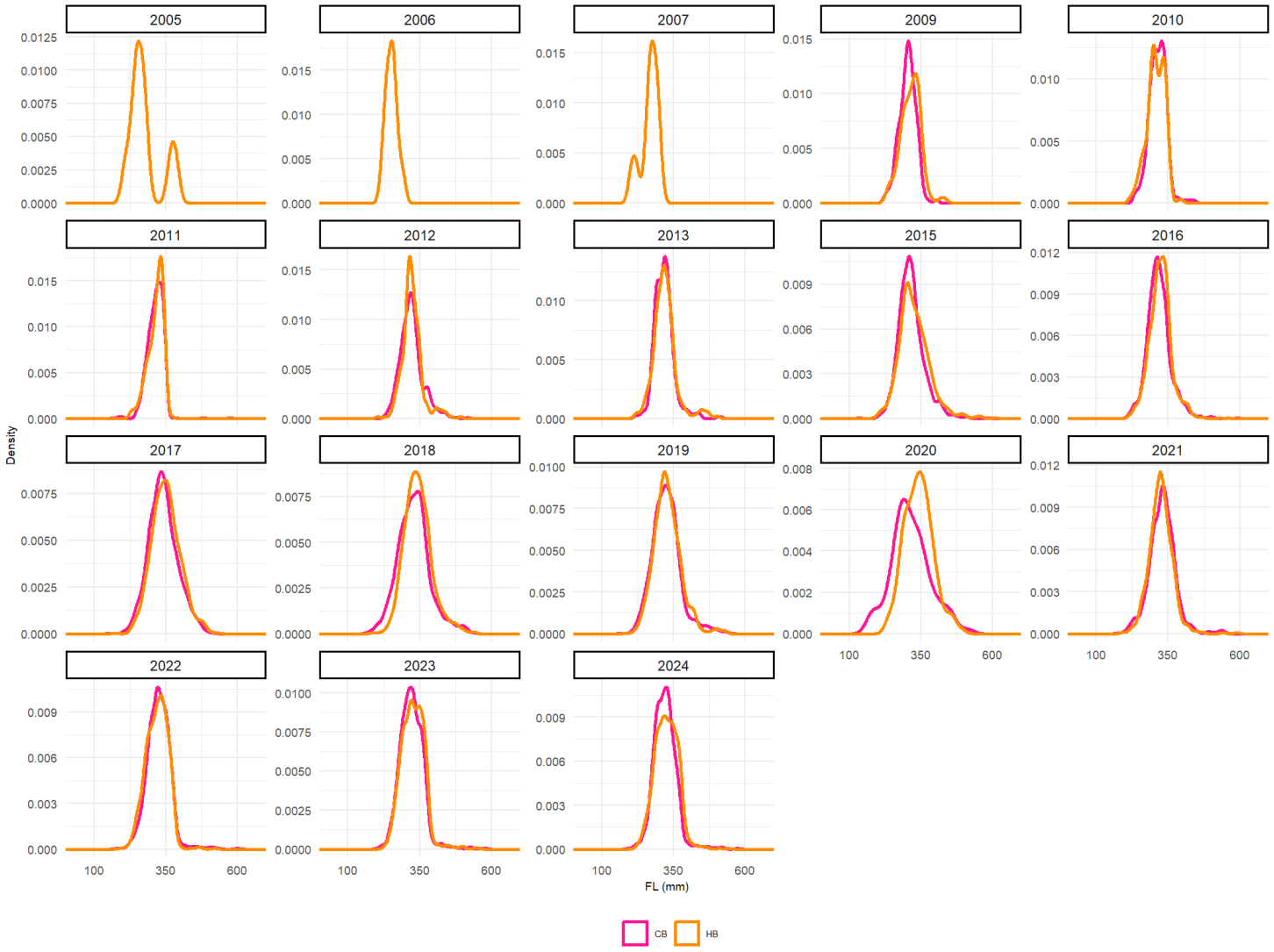


Figure 4.13.13. Discard length distributions by mode (CB = charter, HB = headboat) from Gulf Gray Triggerfish sampled by at-sea observers.

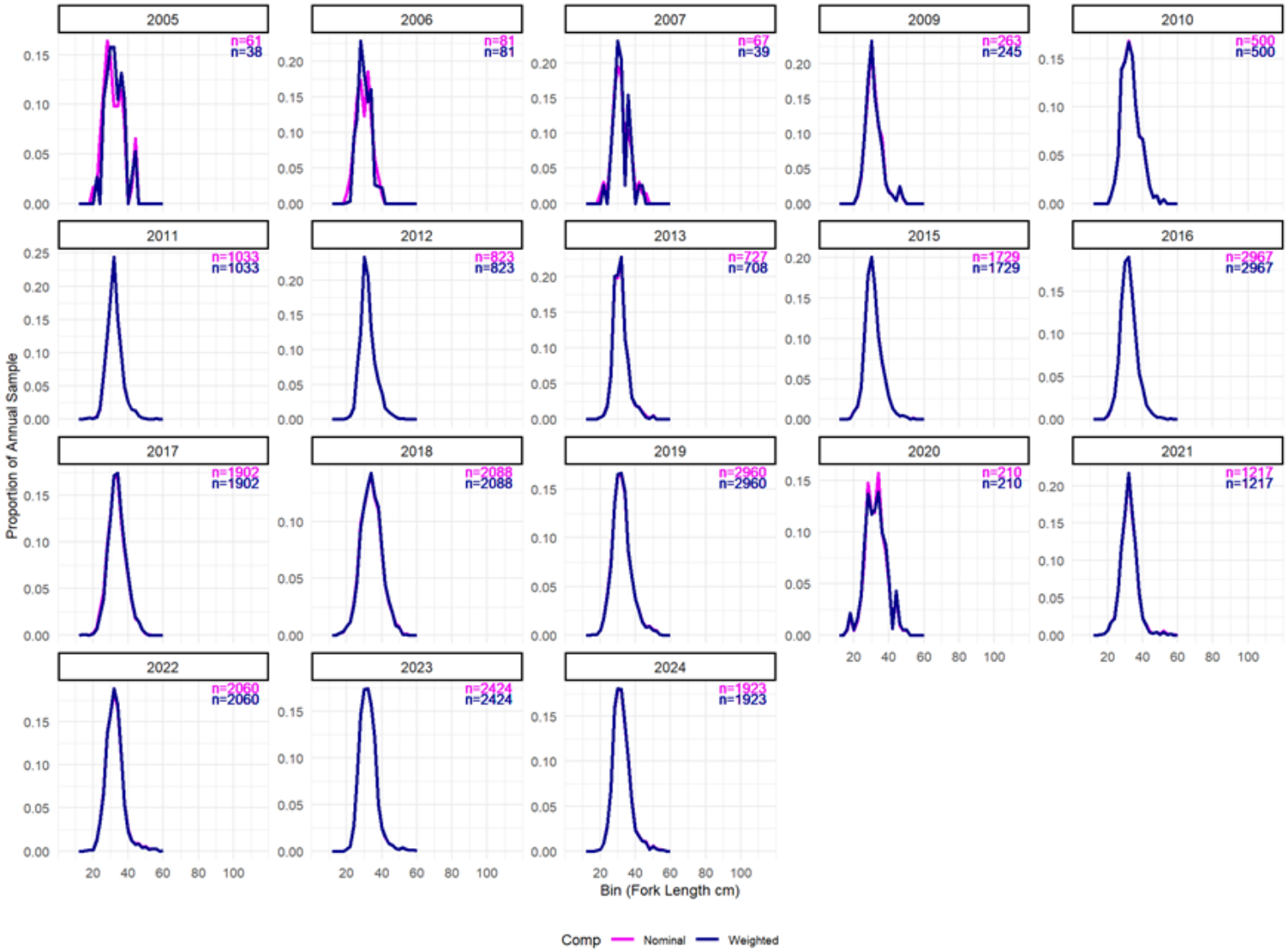
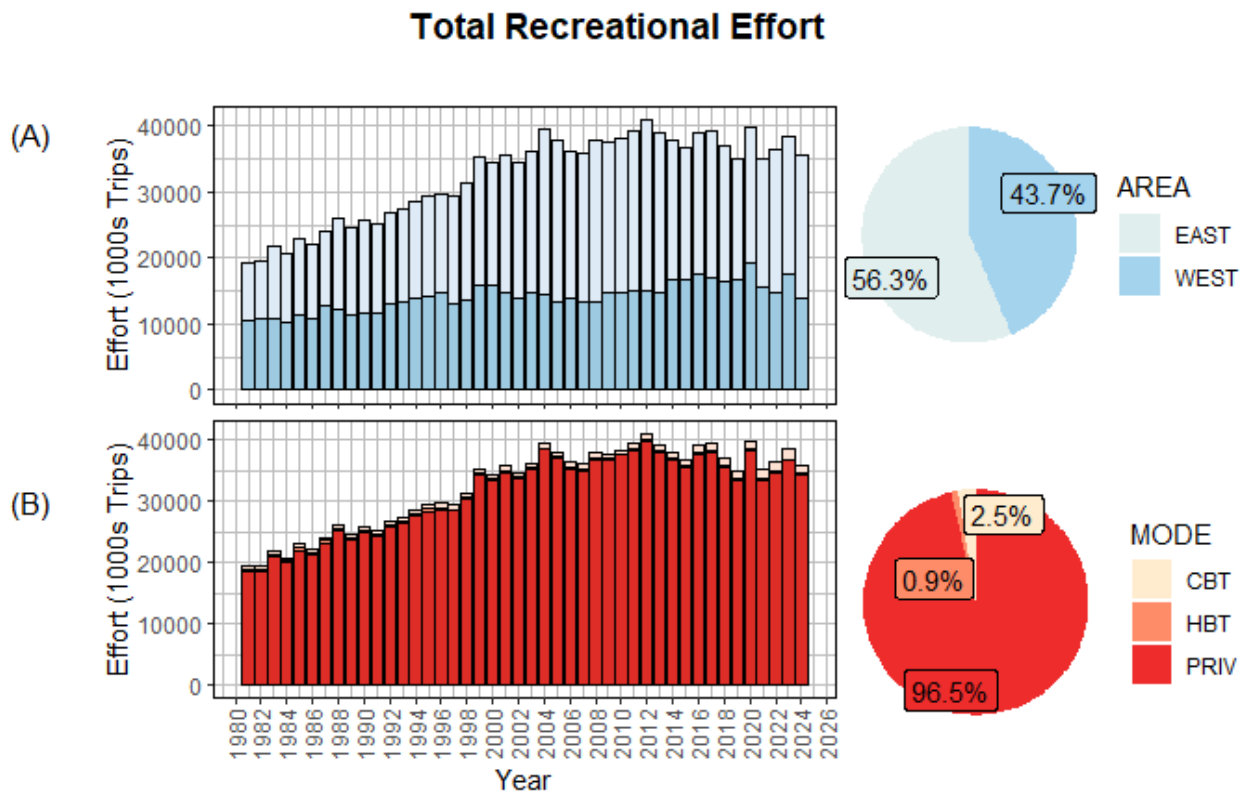


Figure 4.13.14. Nominal and weighted discard length distributions of Gulf Gray Triggerfish (MS-FL) sampled by at-sea observers.



Cbt	24,548,657	11,325,271
Hbt	10,169,208	3,258,550
Priv	767,722,509	607,062,381

Figure 4.13.15. Total recreational effort (angler trips) for Gulf of America Gray Triggerfish across all surveys. Effort is provided (A) by area and year in thousands of trips, (B) by mode and year in thousands of trips, and (C) by mode and area in percent numbers of trips.

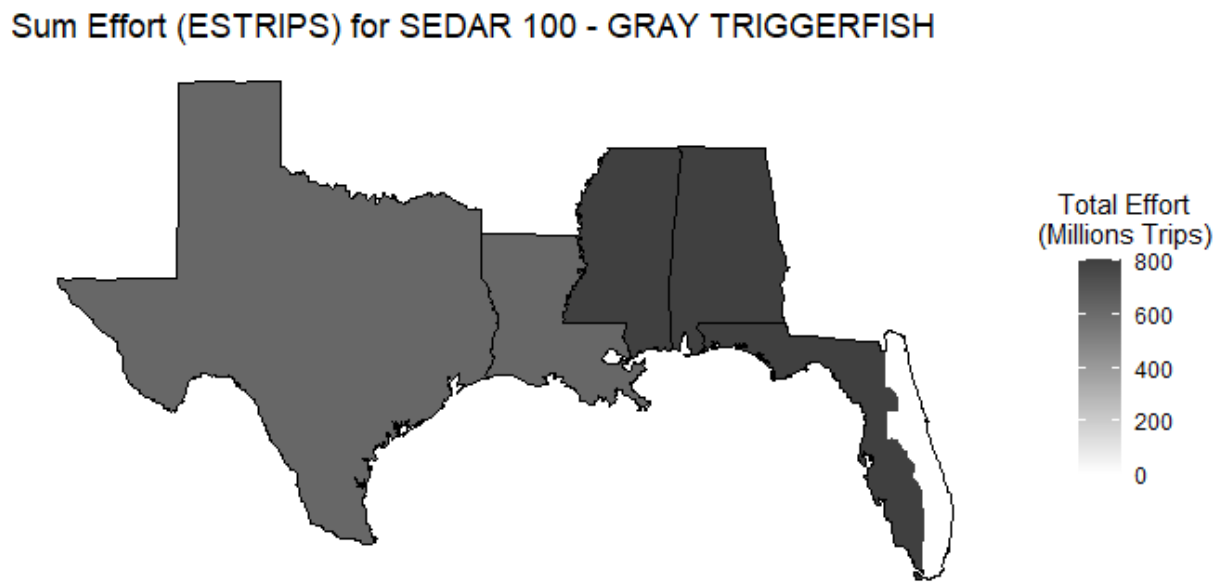


Figure 4.13.16. Distribution of total recreational effort (angler trips), in millions of trips, for Gray Triggerfish across the Gulf of America. Estimates are combined across all surveys and years and summarized by region.

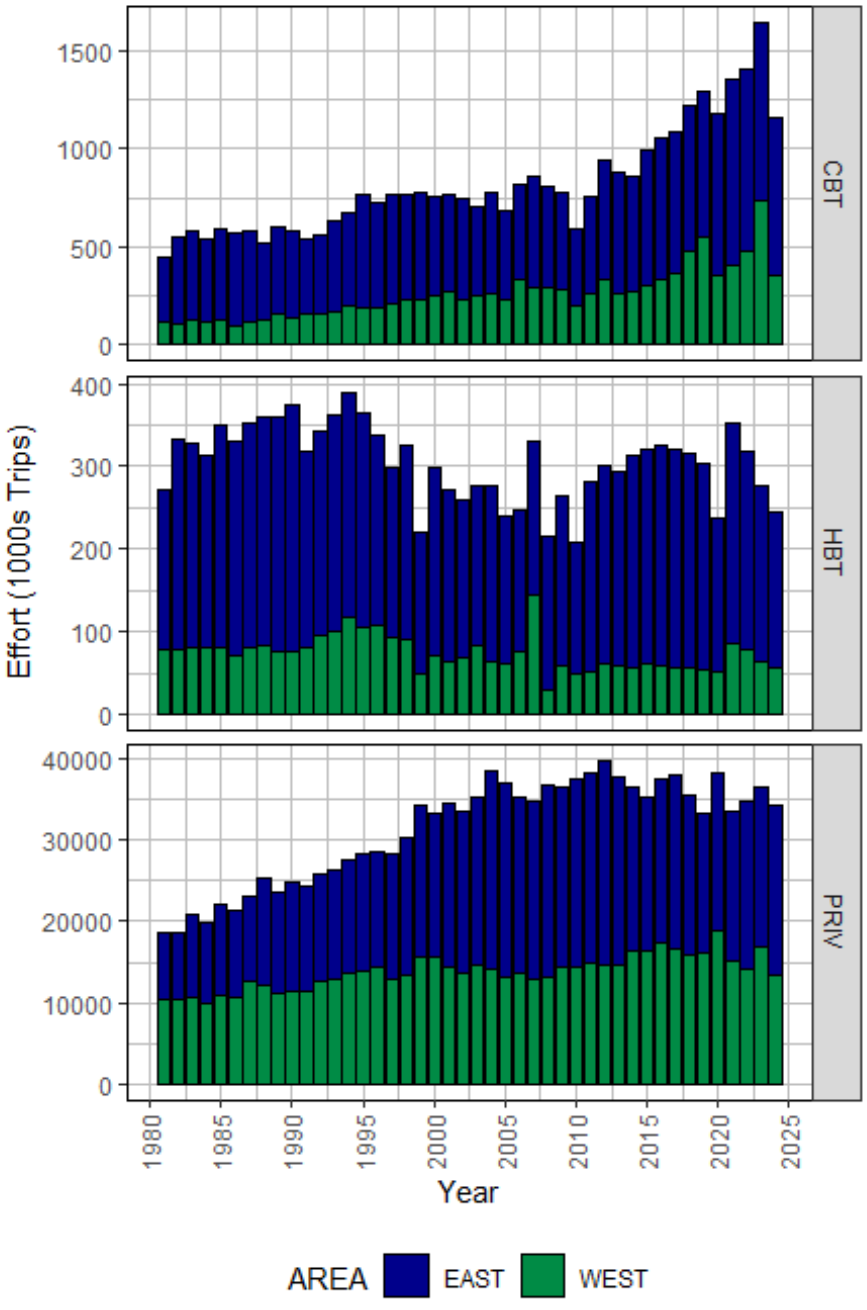


Figure 4.13.17. Recreational effort (angler trips) for Gulf of America Gray Triggerfish for each fishing mode. Effort is provided by year and area in thousands of trips.