# SEDAR

## Southeast Data, Assessment, and Review

# SEDAR 90

# South Atlantic Red Snapper

## SECTION II: Data Workshop Report

December 2025

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

# Contents

# 1. INTRODUCTION

## 1.1 WORKSHOP TIME AND PLACE

The SEDAR 90 Data Workshop was held April 28- May 2, 2025, in Charleston, SC. In addition to the in-person workshop, a series for webinars were held before (November 2024 to April 2025) and after (May to August 2025) the meeting.

## 1.2 TERMS OF REFERNCE

Definition of assessment unit stock was determined by the Red Snapper planning team. The northern threshold is the default boundary between South Atlantic and Mid-Atlantic council jurisdictions, and the southern threshold is default boundary between the South Atlantic and the Gulf of Mexico council jurisdictions.

1. Review, discuss, and tabulate available life history information that is appropriate for use in a stock assessment model.
    - Evaluate age, growth, natural mortality, and reproductive characteristics.
        - Explore the validity of age data and methodology across fish age readers and facilities.
        - Explore emerging technologies (e.g., Near IR spectroscopy).
        - Explore evidence of changes in life history characteristics over time.
    - Explore differences in growth parameters, spawning fractions, and fecundity data.
    - Provide appropriate models to describe population and stock specific (if warranted) growth, maturation, and fecundity by age, sex, or length as applicable.
    - Evaluate and discuss the sources of uncertainty and error, and data limitations (such as temporal and spatial coverage) for each data source. Provide estimates or ranges of uncertainty for all life history information.
    - Recommend the best measure of stock productivity (e.g. SSB vs total egg production) for use in the assessment stage.

2. Provide measures of population abundance that are appropriate for this stock assessment.
    - Consider all available and relevant fishery-dependent and -independent data sources, including:
        - State of Florida Data Surveys
        - SCDNR Juvenile Survey
        - South Atlantic Deepwater Longline (SADL) Survey
    - Document all programs evaluated: address program objectives, methods, coverage, sampling intensity, and other relevant characteristics.
    - Provide maps of fishery and independent survey coverage.

- Develop fishery and survey CPUE indices by appropriate strata (e.g., age, size, area, and fishery).
- Provide appropriate measures of uncertainty for the abundance indices to be used in stock assessment models.
- Document pros and cons of available indices regarding their ability to represent abundance.
- Categorize the available indices into one of three tiers: Suitable and Recommended, Suitable and Not Recommended, or Not Suitable.
- For recommended indices, document any known or suspected temporal patterns in catchability not accounted for by standardization.

3. Provide commercial catch statistics including both landings and discards in both pounds and number.
    - Evaluate and discuss the adequacy of available data for accurately characterizing landings and discards by fishery sector or gear.
    - Provide length and age distributions for both landings and discards if feasible.
    - Provide estimates of uncertainty around each set of landings and discard estimates.

4. Provide recreational catch statistics including both landings and discards in both pounds and number.
    - Evaluate and discuss the adequacy of available data for accurately characterizing landings and discards by fishery sector or gear.
    - Provide length and age distributions for both landings and discards if feasible.
    - Provide estimates of uncertainty around each set of landings and discard estimates.
    - Evaluate the utility of mini-season landings estimates, Florida State Reef Fish Survey, FISHstory and SEFHIER.

5. Recommend discard mortality rates for the fleets recommended by the panel.
    - Review available research and published literature (e.g., RELEASE, NMFS Observer Program).
    - Provide estimates of discard mortality rate by fleet, depth, and other feasible or appropriate strata.
    - Provide estimates of uncertainty around recommended discard mortality rates.
    - Document the rationale for recommended rates and uncertainties.

6. Consider social and economic information for inclusion into the stock assessment as practicable.

7. Consider any known evidence regarding ecosystem, climate, species interactions (e.g., predation studies), habitat considerations, species range modifications (expansions or contractions), regime shifts, larval movement between stock boundaries, and/or episodic events (for example: upwelling events*)* that would reasonably be expected to affect Red Snapper population dynamics and are appropriate for inclusion in the stock assessment (e.g., Larval Transport Modeling (*Karnauskas et al. 2022*)).

8. Consider the life history and spatial abundance data from the South Atlantic Red Snapper Research Project (SARSRP). Provide recommendations for use in the

assessment process.

9. Provide recommendations for future research that will improve the stock assessment model.

10. Prepare a Data Workshop report providing complete documentation of workshop actions and decisions in accordance with project schedule deadlines.

## 1.3 LIST OF PARTICIPANTS

***Assessment Team via Webinar***

Kyle Shertzer, Co-Lead Analyst .................... SEFSC/NMFS
Matthew Vincent, Co-Lead Analyst .................... SEFSC/NMFS
Erik Williams .................... SEFSC/NMFS

***Data Process Participants***

Alan Bianchi .................... NCDEQ
Anna-Mai Christmas-Svajdlenka .................... ACCSP
Anne Markwith .................... NCDEQ
Brendan Runde .................... TNC
Bridget Cermak .................... FWC
Chloe Ramsay .................... FWC
Dawn Franco .................... GADNR
Ellie Corbett .................... FWC
Julie DeFilippi-Simspon .................... ACCSP
Julie Dingle .................... SCDNR
Julie Vecchio .................... SCDNR
Kevin Thompson .................... SEFSC/NMFS
Lauren Gentry .................... FWC
Luiz Barbieri .................... FWC
Marcel Reichert .................... SA SSC
Matthew Nuttall .................... SEFSC/NMFS
Russ Brodie .................... FWC
Samantha Binion-Rock .................... SEFSC/NMFS
Sarina Atkinson .................... SEFSC/NMFS
Scott Crosson .................... SEFSC/NMFS
Steve Turner .................... SA SSC
Sue Barbieri .................... FWC
Ted Switzer .................... FWC
Tracey Smart .................... SCDNR
Walter Bubley .................... SCDNR
Wiley Sinkus .................... SCDNR
Will Patterson .................... UF

***Data Process Participants via Webinar***

Andrew Cathey .................... NCDEQ
Andy Ostrowski .................... SEFSC/NMFS

Dominique Lazzare ........ SEFSC/NMFS
Gaitlyn Malone ........ SEFSC/NMFS
Gary DeCossas ........ SEFSC/NMFS
Mandy Karnauskus ........ SEFSC/NMFS
Michaela Pawluk ........ SEFSC/NMFS
Nate Bacheler ........ SEFSC/NMFS
Paul McLaughlin ........ LDWF
Rob Cheshire ........ SEFSC/NMFS
Steve Garner ........ CIMAS
Vivian Matter ........ SEFSC/NMFS
Walt Rogers ........ SEFSC/NMFS

***Workshop Attendees***
Ashley Oliver ........ SAFMC
Chris Bradshaw ........ FWC
Genine McClair ........ FWC
Judd Curtis ........ SAFMC
Julia Byrd ........ SAFMC
Kevin Kolmos ........ SCDNR
Kristin Foss ........ FWC
Maria McGirl ........ USF
Martha Guyas ........ ASA
Meg Withers ........ SAFMC
Michael Schmidtke ........ SAFMC
Olivia Wilms ........ FWC
Sean Wilms ........ FWC
Sydney Bates ........ SCDNR

***Council Representation***
Jessica McCawley ........ FWC
Amy Dukes ........ SCDNR

***Staff***
Julie Neer ........ SEDAR
Emily Ott ........ SEDAR

***Workshop Attendees via Webinar***
Aimee Griffin ........ FWC
Amanda Rezek ........ SEFSC/NMFS
Jessica Stephen ........ SEFSC/NMFS
Jie Cao ........ NCSU
Kyle Dettloff ........ SEFSC/NMFS
Brandon Reding ........ SCDNR
Christina Wiegand ........ SAFMC
CJ Sweetman ........ FWC
David Wyanski ........ SCDNR

Elizabeth Bullard ............ SCDNR
Greyson Webb ............ SAFMC
Haley Stephens............ FL Industry
Heather Christiansen ............ FWC
Hunter Brown............ FL Industry
Jason Rock ............ NCDEQ
Jeanette Huber............ SCDNR
Jeff Buckel ............ NCSU
Jenny Grossmann ............ ClientEarth
Julia Lynch............ USGS
Justin Lewis ............ Bonefish and Tarpon Trust
Kathleen Howington ............ SAFMC
Liam Kehoe............ SEFSC/NMFS/Sea Grant
Manuel Coffill-Rivera............ University of South Alabama
Margaret Finch............ SCDNR
Mary Sterling ............ COFC
Michelle Masi ............ SEFSC/NMFS
Michelle Willis............ SCDNR
Paige Spratt ............ FWC
Peter Barile............ Marine Research and Consulting Inc.
Phil Rodgers............ Oregon State University
Rachael Silvas ............ SAFMC
Selia Zimmerman............ UF
Stephen Long ............ SCDNR
Suz Thomas............ SAFMC
Thomas Newman ............ NC Fisheries Association

## 1.4 LIST OF DATA WORKSHOP WORKING PAPERS & REFERNCE DOCUMENTS

# 2. LIFE HISTORY

## 2.1 OVERVIEW

The Life History Working Group (LHWG) was tasked with compiling all relevant data, analyzing, and providing recommendations to the panel as outlined in the Terms of Reference (below) for South Atlantic Red Snapper. In each section, we discuss the data inputs, analyses undertaken, and recommendations of data to use in the assessment model.

### *2.1.1 Work Group members and participants in Life History Work Group*

Andy Ostrowski– NMFS, Beaufort, NC, Leader of LHWG
Anne Markwith – SSC member, NCDMF, Wilmington, NC
Brendon Reding – SCDNR, Charleston, SC
Kevin Kolmos – SCDNR, Charleston, SC
Kyle Shertzer– NMFS, Beaufort, NC
Lauren Gentry – FL FWC, St. Petersburg, FL
Luiz Barbieri – FL FWC, St. Petersburg, FL
Marcel Reichert- SSC member, Walhalla, SC
Michelle Willis – SCDNR, Charleston, SC

Steve Garner– NMFS, Panama City FL
Susan Lowerre-Barbieri – FL FWC, St. Petersburg, FL
Tracey Smart – SCDNR, Charleston, SC
Walter Bubley – SCDNR, Charleston, SC
Wiley Sinkus – SCDNR, Charleston, SC

### *2.1.2 Topics Reviewed by the Life History Group*

1. Age Data
2. Reproduction
3. Growth
4. Natural Mortality
5. Research Recommendations

### *2.1.3 Life History Data Workshop ToRs*

1. Review, discuss, and tabulate available life history information that is appropriate for use in a stock assessment model.
    a. Evaluate age, growth, natural mortality, and reproductive characteristics. o
        i. Explore the validity of age data and methodology across fish age readers and facilities.
        ii. Explore emerging technologies (e.g., Near IR spectroscopy).
        iii. Explore evidence of changes in life history characteristics over time.
    b. Explore differences in growth parameters, spawning fractions, and fecundity data.
    c. Provide appropriate models to describe population and stock specific (if warranted) growth, maturation, and fecundity by age, sex, or length as applicable.
    d. Evaluate and discuss the sources of uncertainty and error, and data limitations (such as temporal and spatial coverage) for each data source. Provide estimates or ranges of uncertainty for all life history information.
    e. Recommend the best measure of stock productivity (e.g. SSB vs total egg production) for use in the assessment stage.

## 2.2 AGE DATA

The LHWG was tasked with combining age data from SEDAR73 with new age data sets from four sources: National Marine Fisheries Service Beaufort Laboratory (NMFS), South Carolina Department of Natural Resources (SCDNR), Georgia Department of Natural Resources (GADNR), and Florida Fish and Wildlife Conservation Commission (FL FWC).

Samples were received from SCDNR (n=18,775), GADNR (n=2,784), FWC (n=44,059) and NMFS Southeast Fisheries Science Center/Beaufort Laboratory (n=17,147). Prior to ageing using a stereo microscope, samples were processed using similar methods using low speed saws and taking a thin section of the otolith core (Bubley and Murdock, 2025; Shertzer and Ostrowski , 2025).

Ages ranged from 0 to 54 years old, maximum total length (MTL) 36 to 1116 mm, and encompassed years 1977 to 2024. A total of 82,438 ages were used for analysis from fishery independent (n=31,124), recreational (n= 33,063), and commercial samples (n= 18,251).

### *2.2.1 Reader Precision and Ageing Error*

Reader precision among data providers was compared using two independent otolith reference sets of consensus ages provided by NMFS Beaufort (n = 300) and SCDNR (n = 300). The primary data provider for SEDAR90 (FWC) also maintains a reference set, but it was not included for error estimation because the other two sets were deemed adequate for determining age data quality based on their sample size (n > 500) and representativeness of the production age distribution (Campana 2001). Average percent error (APE; Beamish and Fournier, 1981) was used to estimate the precision of each reader. A reader-specific APE of ≤ 5% is considered acceptable for a moderately long-lived species with moderately difficult to read otoliths (Morison et al. 1998; Campana 2001), such as red snapper. Readers from FWC, SCDNR, and NMFS Beaufort submitted reference set reads for SEDAR90. GADNR did not provide reference set reads for SEDAR90 because their samples are processed and aged by FWC, therefore are not necessary to be included in this exercise. Production ages submitted by FWC, SCDNR, and NMFS Beaufort comprised 63.7, 25.6, and 9.2% of total number of production age estimates, respectively. Only one set of reference set reads was below the APE threshold (SCDNR #1 = 4.08), while the other readers' APE values ranged from 5.49 to 9.32. Bland-Altman plots indicated no consistent bias (e.g., consistent underaging/overageing of several consecutive age classes) for any reader throughout the full age range of the reference set. Very few age-specific mean-age values were significantly different (t-test; $\alpha = 0.05$) from their respective reference set age-class (*FSA* package; Ogle et al. 2025). There were a few samples that were grossly over-aged (>2 yrs) by multiple readers, indicating that a few samples may be especially difficult to age correctly. Closer inspection may be needed to check for damage or possible replacement if they are effectively unreadable even by an experienced reader.

Ageing error was estimated with a suite of model parameterizations for precision and bias using the Northwest Fisheries Science Center's *AgeingError* package (Punt et al. 2025) in R. The *AgeingError* package converts raw (reference set) age reads to a set of counts for each combination of age estimates. Parameters for each set of model options are then fit to the mode-predicted ages. Precision options included constant coefficient of variation (CV), Michaelis-Menten (MM) standard deviation (SD), MM CV, SD as a linear function of age, or CV as a linear function of age; parameterizations assuming no error or error fit with spline functions were not fit to these data. Bias options included no bias, linear bias, and curvilinear bias. Ages for the reference set were always assumed to be unbiased. Visual inspection of the age estimates indicated no consistent bias in age-specific means for any set of reference reads from any data provider, therefore, all readers were assumed to age without bias, and bias options were not included in the model parameterizations. All three readers were mirrored to produce a single set of error (SD)-at-age values for the same age-range as is specified in the assessment model (1-20 years). Estimates of error-at-age were fit through age-25, but were pooled in the age-20 probability value for ages 21-25 in any instance where the probability value was >0 so that columns would sum to 1. Truncating the error estimation models to only ages 1-20 years provided nonsensical output in preliminary model explorations of that approach. Model fit and selection of the best model was based on Akaike's Information Criterion (AIC). AIC values indicated that a model fit with constant CV for each reader was the best fit (lowest AIC/ΔAIC=0) to the reference set reads (Figure 1).

LHWG Recommendations:

1. Use all available ages provided for the assessment.

## 2.3 REPRODUCTION

### *2.3.1 Reproductive Strategy and Data Availability*

Red snapper are batch spawners with indeterminate fecundity that do not change sex during their lifetime (gonochorism). Fishery-independent and fishery-dependent data were collected primarily with chevron traps by the Marine Resources Monitoring Assessment and Prediction (MARMAP) program and the Southeast Area Monitoring and Assessment Program, South Atlantic (SEAMAP-SA) at SCDNR between 1978 and 2009 and then by the collaborative Southeast Reef Fish Survey (SERFS; consisting of

MARMAP, SEAMAP-SA, and the Southeast Fisheries Independent Survey (SEFIS) at the Southeast Fisheries Science Center (SEFSC)) from 2010 to 2024 (Sinkus et al. 2025). FWC collected fisheries independent samples from 2012 to 2015 off the Atlantic coast of Florida using mainly hook and line repetitive time dropped gear (Lowerre-Barbieri et al. 2015). Specimens with reproductive phase data were collected by a combination of all programs from 1979 to 2023. Specimens identified histologically as female with known reproductive phases (n=8,043 with calendar age data; n=8,077 with length data) were analyzed for sexual maturity. Males were not analyzed for sexual maturity due to extremely low numbers of immature specimens and lack of recent samples staged histologically due to funding constraints. Specimens with sex characterized by histological or macroscopic methods were collected by a combination of all programs from 1978 to 2024. For sex ratio analysis 16,729 specimens had known sex and age information and 16,808 specimens had sex and length information available. All age-related results presented in this section were based on calendar age and length-related results were based on maximum (pinched tail) total length (MTL). Information below on sexual maturity, sex ratio, fecundity, spawning seasonality, spawning fraction, and spawning frequency are based on Sinkus et al. 2025.

### *2.3.2 Sexual Maturity*

Recent research indicates the importance of maturity on both gonadal development and movement to the spawning grounds (Prince et al. 2022), therefore mature females were determined based on those with spawning indicators following the recent unified framework outlined in Lowerre-Barbieri et al. (2023). Spawning fish (oocyte maturation or postovulatory follicles) have 100% certainty of having recruited to the spawning population. This differs from previous assessments, where all females other than those assigned as immature were considered mature (i.e., early and late developing (previously called spawning capable), regressing, or regenerating).

There was deep discussion about using the entire time series as well as how it might be broken up to look at changes in maturity over time. The LHWG looked at the temporal distribution of samples and could not justify using samples from early in the time series, given the small sample sizes (n=200 from 1978 to 2009) and limited size/maturity range covered. In addition, it was noted that fishery independent sampling efforts have changed spatially over time with sampling in earlier years (MARMAP) being more concentrated off South Carolina and Georgia, while in more recent years, a large number of sampling stations were added off North Carolina, Florida, and Georgia. This combined with the changes in criteria for assigning reproduction phases from Brown-Peterson et al. 2011 led to the LHWG recommending using data from 2010 to 2023.

The Gompertz model (proportion mature = $\exp((-\beta / \beta_1) * \exp(-\beta_1 * \text{age}))$) provided the best fit for estimating female age at maturity based on AIC values, with female age at 50% maturity (A50) from 2010 to 2023 being 1.65 year (95% CI = 1.37-1.93; n =4401; Table 1). The Logit link of a logistic model (proportion mature = $1 - 1/(1 + \exp(\beta + \beta_1 * \text{Max TL}))$) provided the best fit for estimating female length at maturity based on AIC values. The overall estimate of L50 for females, based on data from 2010 to 2023, was 322 mm TL (Logistic, 95% CI = 273-380 mm; Table 1).

Investigation into temporal changes in maturity within the years 2010 to 2023 was conducted by Sinkus et al. (2025) and reviewed by the LHWG, but ultimately statistical differences in $L_{50}$ between time periods were deemed not to be biologically significant and could possibly be the result of the dramatic increase in the number of small/young fish being sampled in more recent years.

### *2.3.3 Sex Ratio*

The ratio of females to males for all MARMAP/SERFS samples is slightly less than would be expected if the population sex ratio was 1:1(0.96; n=16,937; Female = 8,295; Males = 8,642; chi squared p =0.013), but the significant result is likely the result of a large dataset and has no biological significance. When comparing sex-ratios across years using a regression test, there was no significant change from 1:1 sex ratio regardless of whether the data were from all gears or limited to chevron trap (logarithmic: $t\ (42) = 1.94$, $p = 0.059$, Figure 2; $t\ (31) = 0.89$, $p = 0.378$, Figure 2A, respectively). When examining age-specific sex-ratios, regression analysis did not find a significant difference from a 1:1 overall, but a distinct trend was observed in the data when looking over individual age groups. The youngest fish (ages 1-3) had more male oriented sex ratios, while being progressively skewed towards more female oriented sex ratios in older fish (6-20) until the oldest ages (20-48) that were pooled due to sample size (n =27), which exhibited a 1:1 sex ratio (Figure 3A). There was a similar trend with total length and sex ratio, as sizes over 600 mm were more female dominant (Figure 3B). Both trends became more pronounced when we limited the data to just chevron traps and excluded or binned sizes or ages with low sample size. This trend, which was noted in the SEDAR 41 reproduction section from the Data Workshop Report (SEDAR 2017), and the potential underlying cause was discussed at length. There were two hypotheses about how or why this may be showing up in the data. The first was a difference in mortality between males and females and the second was behavioral differences that lead to sexually-specific catchability in the chevron traps (since the high volume of trap data seem to be driving this trend). It was noted that the lengths at which this divergence in sex ratio begins to take place was similar to the lengths at which trap catches and stereo video measurements from the selectivity study (Bubley et al. 2025) begin to diverge from each other (Figure 4). While neither of these theories could be confirmed or discounted at this point, looking at the overall population, the LHWG recommends using a 1:1 sex-ratio, regardless of size or age.

### *2.3.4 Measure of reproductive potential*

While SEDAR 41 and 73 used Total Egg Production (TEP) as the measure of reproductive potential, the SEDAR 90 LHWG recommends using Spawning Stock Biomass (SSB). Calculating TEP requires several different estimated parameters including the number of batches a female of a certain size or age can have per year (spawning frequency) and the number of eggs per batch (batch fecundity). In order to calculate the spawning frequency, the spawning season duration and the daily spawning fraction must first be estimated and fecundity data are needed for most of a species' age range. These data are not available for red snapper due to uncertainty with calculating spawning seasons and a truncated age structure in the population due to previous fishing pressure. Because of this, the uncertainty and potential bias associated with estimation of TEP was considered too high for using TEP in the assessment, similar to the decision for SEDAR 74 (Lowerre-Barbieri et al. 2022). Below is a discussion on the uncertainty associated in each parameter that goes into calculating TEP.

### *2.3.5 Batch Fecundity*

A total of 129 red snapper samples were collected from 1999 to 2023 to assess batch fecundity (Sinkus et al 2025). The specimens ranged in length from 314 to 958 mm MTL, in whole weight from 470 g to 11,830 g and in calendar age from 2 to 18 years. Having few samples over the length of 900 mm (n=2), weight of 9,000 g (n=5) and the age of 10 (n=8) led to high uncertainty in batch fecundity at larger sizes and ages (Figure 5). The LHWG was cautious about applying the calculated batch fecundity to ages greater than 10 due to the limited sample size and high uncertainty.

### *2.3.6 Spawning Season Duration*

The overall difficulty with calculating a spawning season duration for South Atlantic Red Snapper is due to the period where specimens with spawning indicators (oocyte maturation, including germinal vesicle migration and hydration or postovulatory follicle complexes, POC) have been captured (January – December) is well outside of the regularly sampled window (May – October). Therefore, limiting the spawning season to the period for which sampling occurs may not accurately capture the spawning season duration. There are several published methods used to calculate spawning season duration; Maximum duration, plateau, and core methods (Lowerre-Barbieri et al. 2011; Lowerre-Barbieri et al. 2023; Klibansky 2015), each with its associated uncertainties. While SEDAR 41 and 73 used the plateau method which bases calculations on daily spawning fraction, it was suggested by members of the LHWG to use the core method due to the potential for low numbers of spawning individuals on a daily basis under estimating spawning potential. The spawning season duration using the core method (calculated between 144 Julian days and 303 Julian days using logit link model) was 158 days for all ages combined compared to 207 days for all ages combined when using the maximum spawning season method. The LHWG noted the uncertainty involved in determining the spawning season duration based on which method was applied and the unique spawning characteristics of Red Snapper having a prolonged spawning season that may exist outside of the main sampling period; these issues ultimately lead to the decision to recommend using SSB rather than TEP.

### *2.3.7 Spawning Frequency*

Spawning frequency refers to the number of spawning events within a spawning season and is calculated by dividing the number of days in the spawning season by the spawning interval. Spawning interval is the inverse of the daily spawning fraction (Hunter and Macewicz 1985; Lowerre-Barbieri et al. 2011). Daily spawning fraction is the proportion of actively spawning specimens to all adult specimens multiplied by a daily correction factor to adjust for the period of time the spawning indicators can persist in the gonad (Fitzhugh et al. 2012). It was discussed in the LHWG about the uncertainty surrounding these calculations, with questions arising about the accuracy of the daily correction factor applied to the spawning proportion and what data went into determining how long the spawning indicators persisted. It was suggested, instead of applying one daily correction factor to all actively spawning individuals, to perform two separate calculations for spawning frequency, one for imminent spawners and one for recent spawners. However, issues arose with the MARMAP/SERFS data due to historical changes in how staging and aging POCs occurred that led to an inability to assign all POC's to the proper group for this calculation. This uncertainty involved in calculating spawning frequency contributed to the LHWG's decision to recommend using SSB rather than TEP as an estimation of stock productivity.

LHWG Recommendations:

1. Use maturity age/length vector from MARMAP/SERFS/FWC data from 2010-2023.

2. Use sex ratio of the red snapper as presented (1:1) for the population, with no age specific component.

3. Use Spawning Stock Biomass as the measure of stock productivity as opposed to Total Egg Production.

## 2.4 GROWTH

We fit the standard von Bertalanffy growth model to the various data sets. This three-parameter model predicts length ($L_a$, here Maximum Total Length) as a function of age (a),

$$L_a=L_\infty (1-\exp(-k(a-t_0)))$$

where $L_\infty$ is the average asymptotic length in mm, k is the growth coefficient, and $t_0$ is the theoretical age at which length is zero (von Bertalanffy 1938). Each model was fitted using maximum likelihood, assuming that error followed a normal distribution, which adds a fourth estimated parameter to characterize the variance of length-at-age. For fishery dependent data collected under the influence of a size limit, we applied a truncated normal distribution, bounded below by the relevant minimum legal size (McGarvey & Fowler 2002). Other SEDAR stock assessments have referred to this methodology as the "Diaz correction." This correction was applied when developing the population growth curve, but not when evaluating fishery dependent curves for which the goal is to describe length-at-age of the retained catch whether or not it is influenced by a size limit.

For each data set, we fit von Bertalanffy growth models assuming either a constant standard deviation (SD) of length-at-age or a constant coefficient of variation (CV) of length-at-age. In all cases, the model with constant SD provided the better fit, based on maximum likelihood, suggesting that the variance of length-at-age does not increase with age. Thus, we report only results from those models with constant SD. All models were fitted using AD Model Builder (Fournier et al. 2012).

An alternative to fitting a growth model is to use empirical estimates of mean length-at-age and standard deviation of length-at-age. Empirical estimates may be most useful for describing fishery dependent data, where the goal is simply to represent mean and variance of length-at-age, and where a mechanistic underpinning of growth is unnecessary (Table 3).

Time periods considered for fishery dependent curves were 1983-1991, 1992-2009, 2010-2024. The earlier period had a 12-inch (305 mm) federal size limit, the middle period had a 20-inch (508 mm) federal size limit, and the latter period had no federal size limit. However, in the latter period, if a red snapper was landed outside of the mini-season, it was assumed to have come from state waters (coast-side of the Exclusive Economic Zone) where a 20-inch limit applied in the following way: Georgia and Florida had size limits for all years after 2010, South Carolina enacted a size limit starting in 2022, and North Carolina did not have a state size limit.

### *2.4.1 Growth results*

**Population Growth Curve**
The population growth curve is shown in Figure 6. Parameter estimates, their standard errors (SEs), and correlations are shown in Table 2. The data set used for these was the full dataset, which included all fish aged from all data sources and years.

**Fishery-dependent length-at-age – Pre1983**
Because there was no size limit in place prior to 1983, the population growth curve should be adequate to describe length-at-age of landings in this early period.

**Fishery-dependent length-at-age – 1983-1991**

A growth curve was fitted to fishery dependent data from the period 1983-1991, however, due to the relatively small sample size (n=2306), especially ages 6+, it is recommended that empirical estimates of mean and standard deviation of length-at-age be used for ages 1 to 5. (Shertzer and Ostrowski, 2025). For ages 6+, we propose using the means and standard deviations from the population growth curve, as the distribution of sizes at those ages should be well above the 12-inch size limit (Shertzer and Ostrowski, 2025).

**Fishery-dependent length-at-age – 1992-2009**

A von Bertalanffy model was computed but due to residual patterns, empirical estimates are recommended for use in the assessment.

**Fishery dependent length-at-age – 2010-2024**
A von Bertalanffy model was computed, but, due to residual patterns, empirical estimates are recommended for use in the assessment.

LHWG Recommendations:

1: Population growth model: use the von Bertalanffy model to describe growth

2: Fishery dependent length-at-age – Pre1983: Use the population growth curve

3: Fishery dependent length-at-age (1983-1991, 1992-2009, and 2010-2014): empirical estimates are more reliable, and if necessary, the proposed alternative values for ages with low sample sizes (Shertzer and Ostrowski, 2025)

For more details, please refer to the working paper SEDAR90-DW-32

## 2.5 NATURAL MORTALITY

Natural mortality was reviewed using newer methods since SEDAR 73. Discussion started by looking at maximum age, as established in SEDAR 41. No older ages were observed in current data sets, therefore the workgroup felt confident reusing maximum age of 51 with a range of 48 to 53 years for use in uncertainty analysis.

The workgroup thought that age-varying M was the most appropriate technique for estimating natural mortality. This is more biologically realistic than age-invariant M, as younger fish generally have higher natural mortality (e.g., due to predation) than older fish (Lorenzen et al., 2022). The shape of the age-varying M vector was based on Lorenzen (2022), which relates M inversely to body length, as $M_a = L_a^{-1}$. Next, the workgroup discussed scaling that vector to the age-invariant M of Hamel and Cope (2022), which used data from Then et al. (2015). The Hamel and Cope estimator was used in a previous SEDAR-89 assessment of tilefish. Here, the Hamel and Cope point estimate was based on Lutjanidae data and the maximum age of 51, which resulted in M=0.1. Uncertainty in the point estimate was estimated by bootstrapping (with replacement) the Lutjanidae data and applying the range of maximum age (48-53) (Figure 7, top panel). The age-varying M was then scaled, such that its cumulative survival of ages 4+ fish was equivalent to that of the Hamel and Cope estimator (Figure 7, bottom panel).

*LHWG Recommendations:*

1. Use a maximum age of 51 and range of 48-53.
2. Use a point estimate of M= 0.1 with a range of 0.08-0.12

## 2.6 RESEARCH RECOMMENDATIONS

### *2.6.1 General*

- Further investigate possible evidence of compensatory changes in life history parameters including size at age and A50, L50, etc (*short-term, realistic*).
    - Explore episodic trends

- Continue exploring Ecosystem modeling to investigate intra- and inter-species and other interactions. (*short-term, realistic*)
- Continue investigating the location of juvenile fish and early life history, possibly consider a juvenile survey.
- Continue to investigate red snapper diet/stomach fullness data from SERFS traps for evidence of male/female differences in trap selectivity.

### *2.6.2 M*

- Continue exploring issues identified in the Reding et al paper (2025) (*short-term, realistic*).
  - Brandon's presentation on the effect of sample size on estimation of M and potential correction factors
  - Requested next steps: more complex simulations, i.e. explore age-varying mortality, truncated population due to fishing pressure, using 99 percentile vs. oldest fish, etc.
- Explore direct methods to determine M (*unrealistic*).
  - i.e. mark-recapture

### *2.6.3 Growth*

- Annually involve all ageing labs in reading reference sets (*short-term, realistic, high priority*).
- Explore changes in size at age over time potentially via cohorts. Further explore how to incorporate results into assessment model (*short-term, realistic*)
  - Time blocks: pre-2010, 2010-2016, 2016-2023
  - Cannot currently assign different growth curves to cohorts in the model
- Continue to explore emerging technologies (epigenetic and NIR) for use to determine fish age (*medium-term, realistic, medium priority*).

### *2.6.4 Reproduction*

- Increase/continue histology/fecundity sampling of older red snapper (> age 10)
  - Prioritize targeted sampling to close data gaps for older age classes, particularly females, for use in maturity and fecundity models.
  - *Short term, Realistic, high priority*
- Standardize maturity estimation protocols
  - Develop consistent methodologies across the region using reproductive phase filters and histology-based classification of mature samples to include immature samples. This includes better standardization for comparisons and pooled analysis of samples.
  - *Realistic, medium priority*
- Evaluate how different spawning markers and combined markers affects estimates of spawning fraction. Conduct the research needed to assign age to consistently age these spawning markers and determine their duration.
  - *Realistic, medium priority*

- Collaborative regional workshops
    - Organize workshops or working groups specifically to update, review, and implement new standards for reproductive analysis and life history parameter estimation.
    - *Realistic, medium priority*
- Exchange of histological slides between labs
- Perhaps re-examine historic histological slides to resolve potential changes in interpretation.

Consider histological from FWC RTD samples for examining sex ratio

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## 2.8 TABLES

Table 1. Regression model analyses for Age and Length at 50% maturity for female Red Snapper. Data for all projects and gears were combined. Age is in Calendar Age and length is maximum (pinched tail) total length (MTL) in mm. $A_{50}/L_{50}$=Age/length at which 50% of the population has reached sexual maturity. Analysis was conducted using "Spawning" definition for maturity (Any individuals with immanent spawning markers per Lowerre-Barbieri et al. 2023). The equation for Calendar Age was proportion mature = $\exp((-\beta / \beta_1)*\exp(-\beta_1)*age))$ and for MTL was proportion mature = $1 - 1/(1 + \exp(\beta + \beta_1 *Max\ TL)$.

| Analysis | Period | Model | n | $A_{50}/L_{50}$ | 95% CI | $\beta$ (Std Err) | $\beta_1$ (Std Err) |
|---|---|---|---|---|---|---|---|
| Female Age at Maturity | 2010-2023 | Gompertz | 4401 | 1.65 | 1.37-1.93 | 16.088 (2.192) | 1.618 (0.054) |
| Female Length at Maturity | 2010-2023 | Logit Logistic | 4421 | 322.24 | 273-380 | -18.088 (0.774) | 0.056 (0.002) |

Table 2. Parameter estimates, standard errors (SEs), and correlations (in italics) for the population growth curve for South Atlantic red snapper.

| Parameter | Estimate | SE | Linf | k | t0 | SD |
|---|---|---|---|---|---|---|
| Linf | 890.03 | 1.26 | *1.0* | - | - | - |
| k | 0.23 | 0.001 | *-0.89* | *1.0* | - | - |
| t0 | -0.41 | 0.009 | *-0.58* | *0.86* | *1.0* | - |
| SD | 66.50 | 0.17 | *0.01* | *-0.01* | *0.01* | *1.0* |

Table 3: The proposed vectors of size at age and SD of size at age for the various for the population growth curves for South Atlantic red snapper

| | Population Growth | | | Empirical 1983-1991 | | Empirical 1992-2009 | | Empirical 2010-2024 | |
|---|---|---|---|---|---|---|---|---|---|
| Age | TL (mm) | TL (mm, midyear) | SD | TL (mm) | SD | TL (mm) | SD | TL (mm) | SD |
| 1 | 246.5 | 316.4 | 66.5 | 339.0 | 45.8 | 520.9 | 35.6 | 336.3 | 55.8 |
| 2 | 378.7 | 434.3 | 66.5 | 391.9 | 48.1 | 520.9 | 35.6 | 412.9 | 43.8 |
| 3 | 483.8 | 527.9 | 66.5 | 450.4 | 79.5 | 543.2 | 41.5 | 498.9 | 59.7 |
| 4 | 567.3 | 602.3 | 66.5 | 511.6 | 105.6 | 609.2 | 61.4 | 590.9 | 66.1 |
| 5 | 633.6 | 661.4 | 66.5 | 640.3 | 107.8 | 668.1 | 76.1 | 661.5 | 63.2 |
| 6 | 686.3 | 708.4 | 66.5 | 686.3 | 66.5 | 727.0 | 68.4 | 710.8 | 60.0 |
| 7 | 728.1 | 745.7 | 66.5 | 728.1 | 66.5 | 763.3 | 58.6 | 752.5 | 48.2 |
| 8 | 761.4 | 775.4 | 66.5 | 761.4 | 66.5 | 790.9 | 50.4 | 773.5 | 45.2 |
| 9 | 787.8 | 798.9 | 66.5 | 787.8 | 66.5 | 805.7 | 45.5 | 791.9 | 42.9 |
| 10 | 808.8 | 817.6 | 66.5 | 808.8 | 66.5 | 832.2 | 41.8 | 785.6 | 45.0 |
| 11 | 825.5 | 832.5 | 66.5 | 825.5 | 66.5 | 841.2 | 40.3 | 801.9 | 48.8 |
| 12 | 838.8 | 844.3 | 66.5 | 838.8 | 66.5 | 859.0 | 43.1 | 816.1 | 43.5 |
| 13 | 849.3 | 853.7 | 66.5 | 849.3 | 66.5 | 857.8 | 43.6 | 817.5 | 38.4 |
| 14 | 857.7 | 861.2 | 66.5 | 857.7 | 66.5 | 868.9 | 39.1 | 818.6 | 47.9 |
| 15 | 864.3 | 867.1 | 66.5 | 864.3 | 66.5 | 875.6 | 41.3 | 827.5 | 47.2 |
| 16 | 869.6 | 871.8 | 66.5 | 869.6 | 66.5 | 882.4 | 41.3 | 847.0 | 46.7 |
| 17 | 873.8 | 875.6 | 66.5 | 873.8 | 66.5 | 889.2 | 41.3 | 840.6 | 44.2 |
| 18 | 877.1 | 878.5 | 66.5 | 877.1 | 66.5 | 895.9 | 41.3 | 848.3 | 56.8 |
| 19 | 879.8 | 880.9 | 66.5 | 879.8 | 66.5 | 902.7 | 41.3 | 860.7 | 44.8 |
| 20+ | 881.9 | 882.8 | 66.5 | 881.9 | 66.5 | 909.5 | 39.5 | 883.9 | 42.0 |

## 2.9 FIGURES

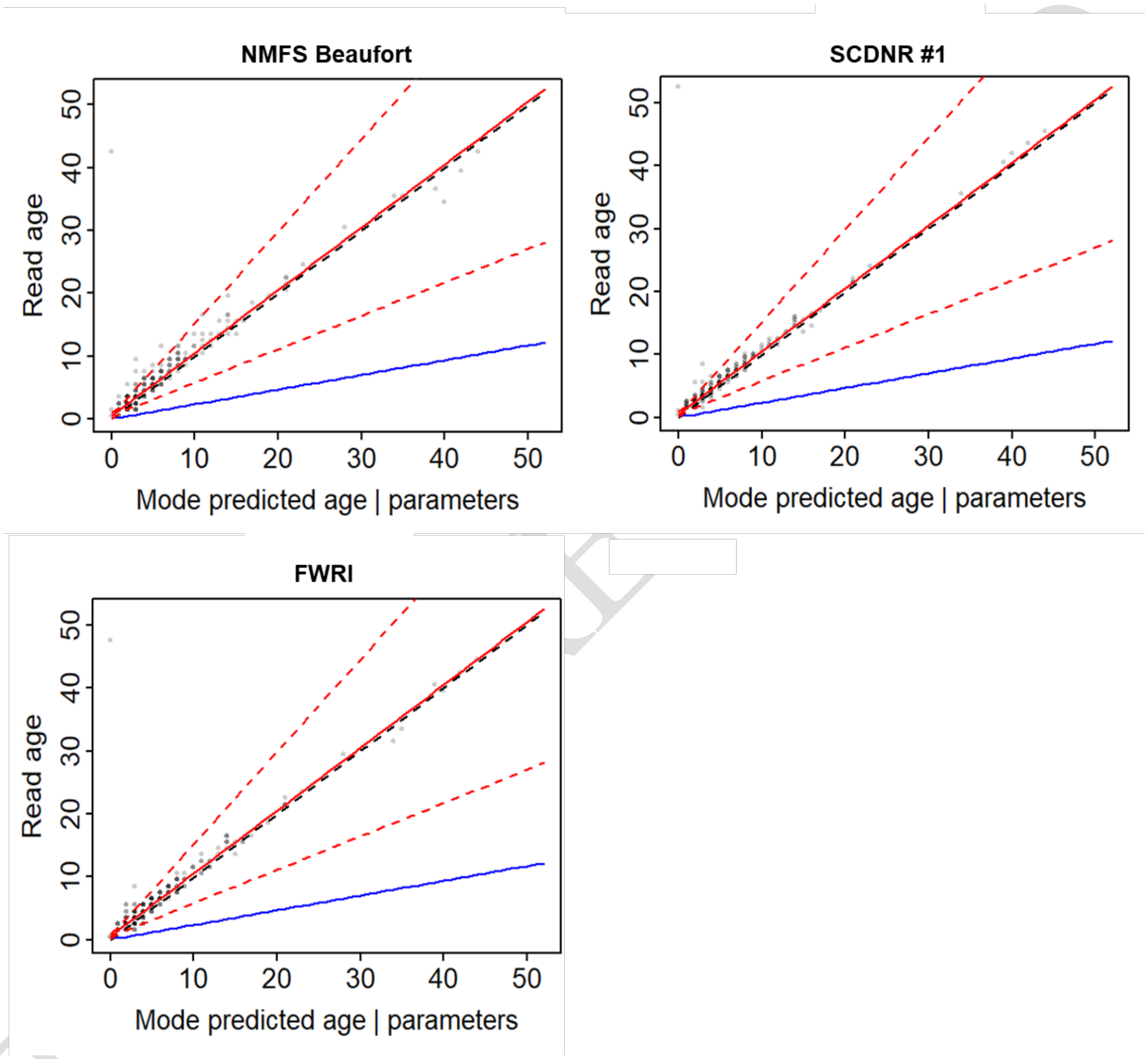


Figure 1. Linear fit to mode predicted ages (gray-scale with intensity) of reference set reads from each data provider of red snapper age data. Each panel indicates the 1:1 line (black), expected age (red), 95% CI of expected age (red dashed), and the SD-at-age (blue).

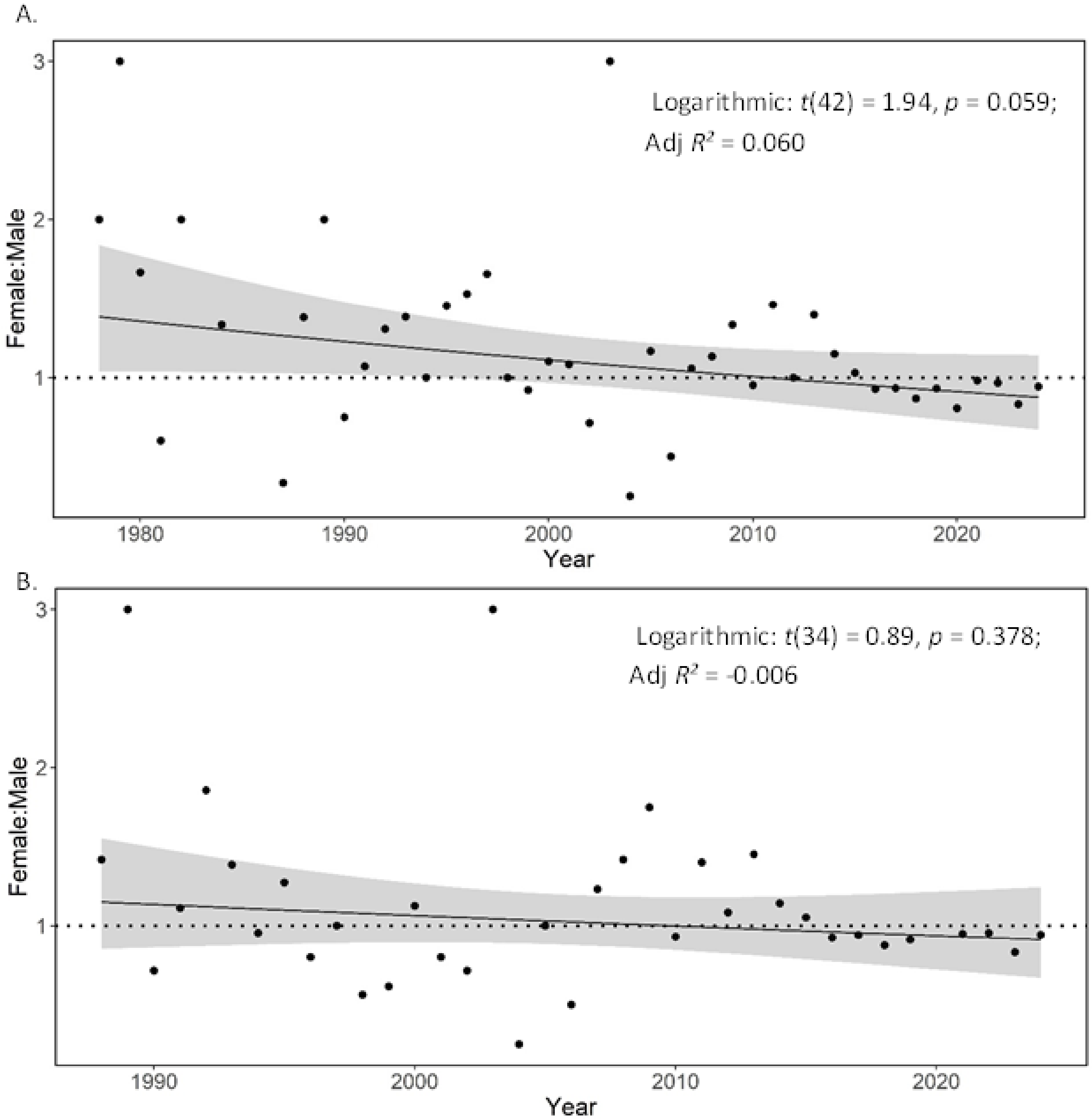


Figure 2. Female to male sex ratio for red snapper by year A) all gear and B) chevron trap only. Black line represents the linear regression of sex ratio by the respective variable, the gray shaded region represents standard error and the black dotted line represents the 1:1 sex ratio.

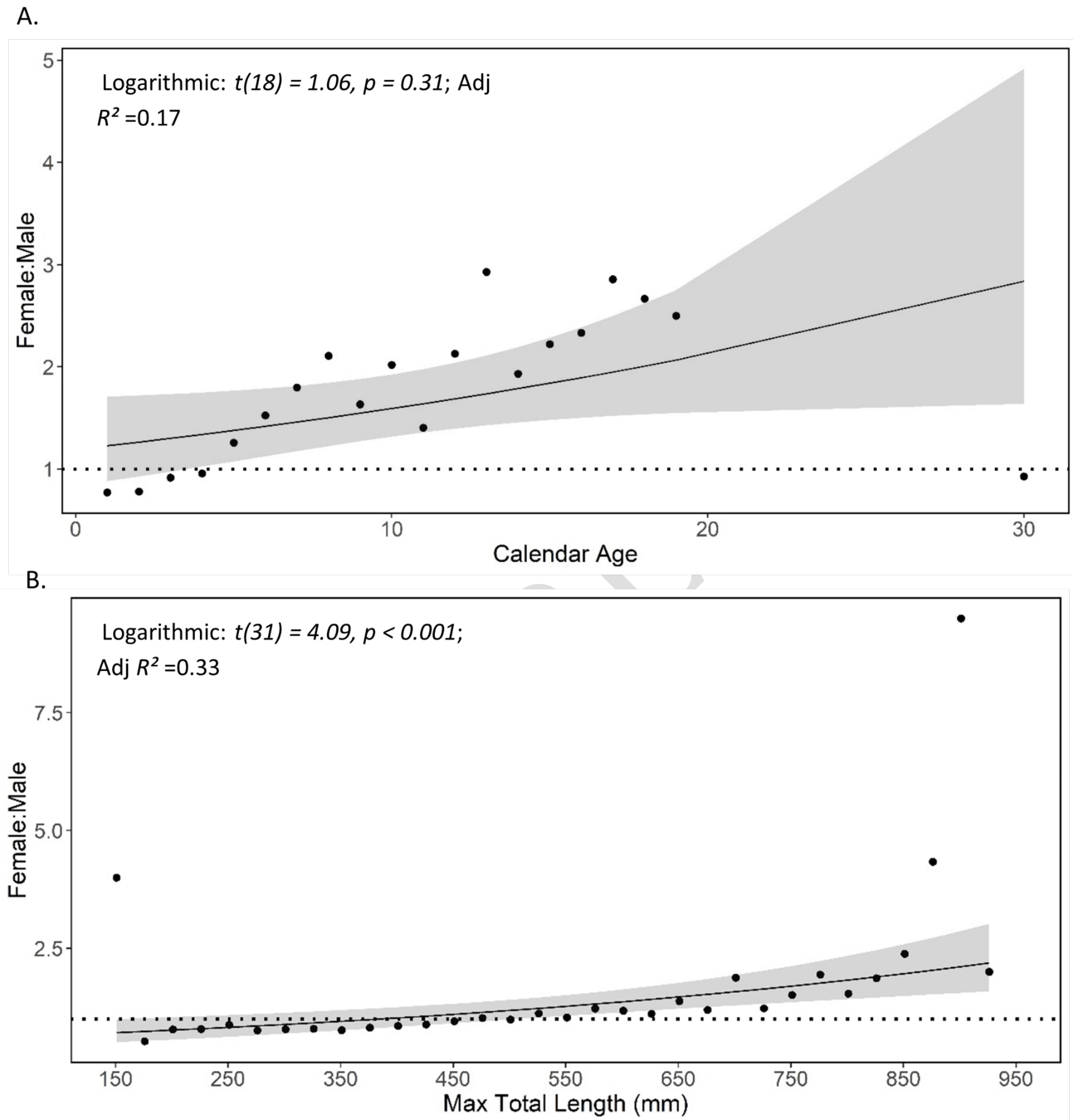


Figure 3. Female to male sex ratio for red snapper by A) calendar age and B) max TL in mm. Black dots represent sex ratios for a specific calendar age or length bin. Calendar ages 20 and above were grouped in 20+ age bin. Black line represents the linear regression of sex ratio by the respective variable, the gray shaded region represents standard error and the black dotted line represents the 1:1 sex ratio.

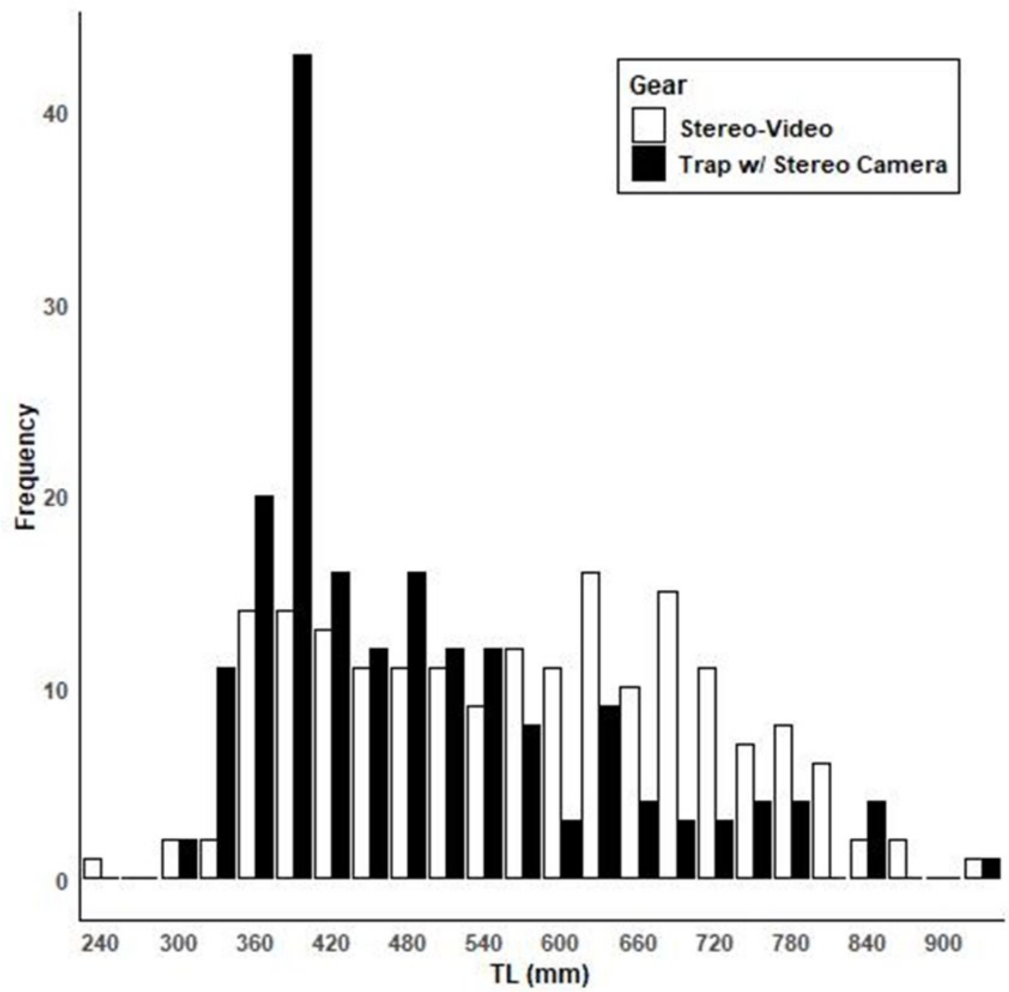


Figure 4. Length frequency of red snapper from stereo-video and trap measurements in 30 mm bins from Bubley et al. 2025.

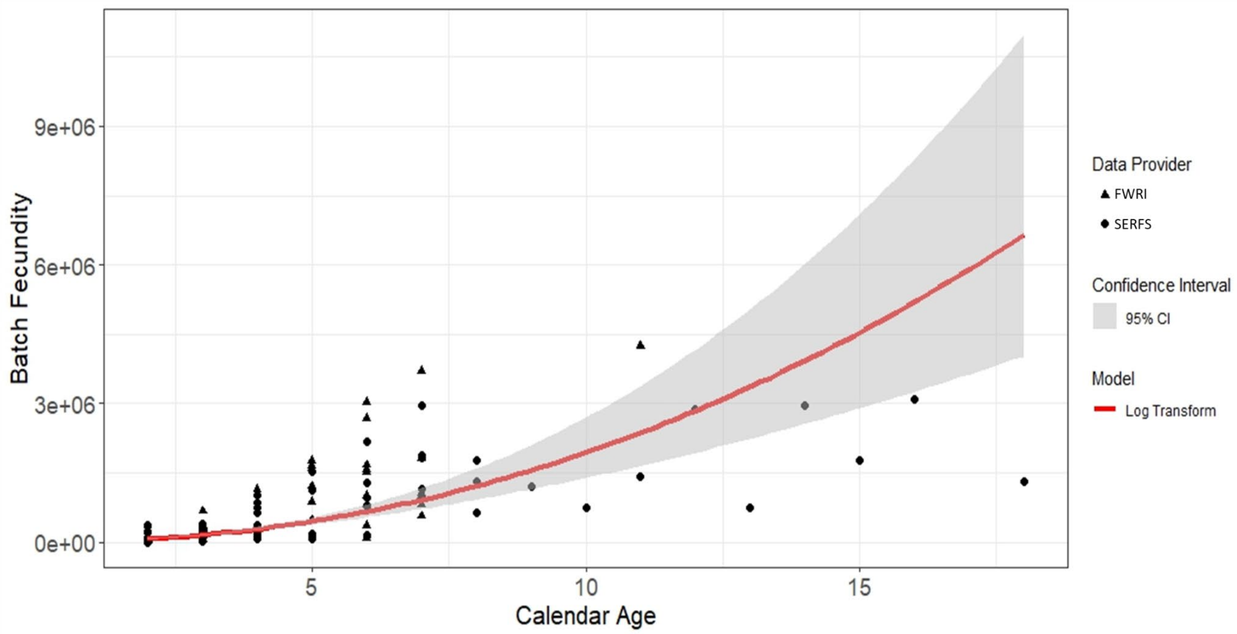


Figure 5. Non-linear regression analysis of batch fecundity versus Calendar Age in red snapper using the logarithmic function (Red Line, BF= EXP a+b*Log(X)) with 95% confidence intervals (gray shaded region). The red snapper were collected in 1999-2023 by Florida's Fish & Wildlife Research Institute (FWRI, closed triangles) and the SouthEast Reef Fish Survey (SERFS, closed circles).

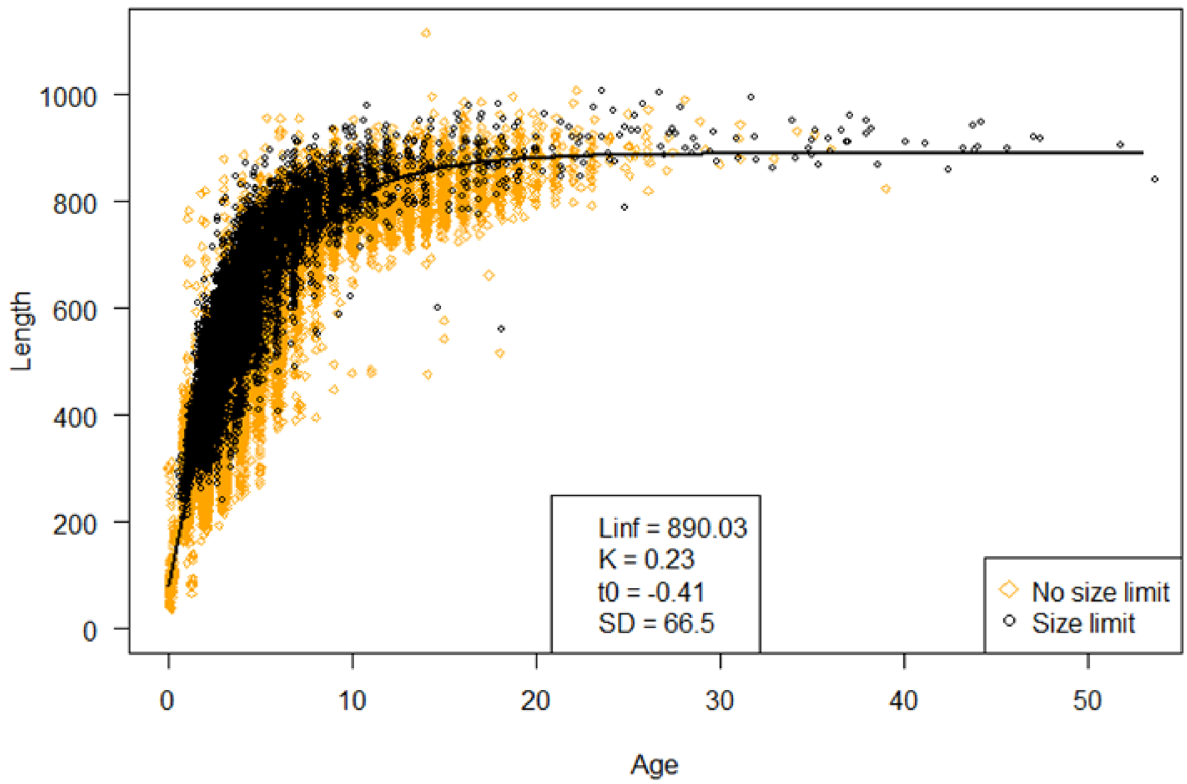


Figure 6. Population growth curve for South Atlantic red snapper.

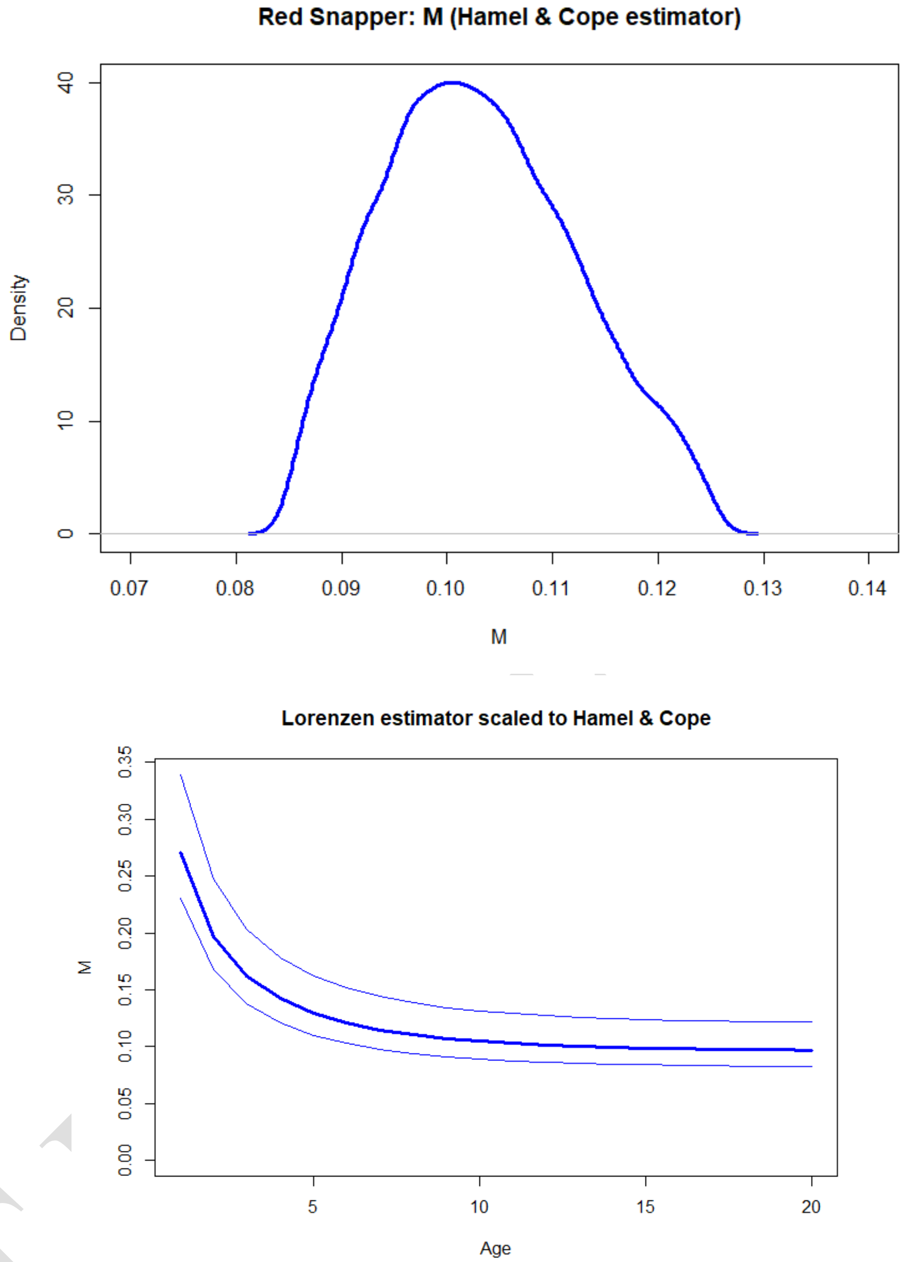


Figure 7: Top panel: Hamel and Cope estimator of age-invariant natural mortality (M), used to scale the age-varying M. Bottom panel: Lorenzen age-varying M scaled to the Hamel and Cope estimator. The upper and lower blue line indicates minima and maxima.

# 3. COMMERCIAL FISHERY

## 3.1 OVERVIEW

Stock boundaries for Red Snapper in previous assessments were along the Gulf of Mexico Fishery Management Council (GMFMC) and South Atlantic Fishery Management Council (SAFMC) jurisdiction line in the Florida Keys to the North Carolina and Virginia border. Topics discussed by the Commercial Workgroup began with a discussion of stock boundary definitions for both the southern boundary with the Gulf of America (formally Gulf of Mexico) and the northern boundary (north of North Carolina).

Commercial landings for the U.S. South Atlantic Red Snapper stock were developed in whole weight for the period of 1950 through 2024 based on federal and state databases. Overall the methodology used to develop commercial landings followed previous South Atlantic Red Snapper assessments (SEDAR 15, 24, 41, and 73).

Discards were estimated in both number and whole weight from 1993 to 2024 using commercial observer and coastal fisheries logbook data. Different methods were used to estimate discards for the open and closed season separately.

Nominal and weighted length and age compositions of retained Red Snapper were provided by year. Length compositions of discarded Red Snapper were provided to inform selectivity in the model.

### *3.1.1 Work Group members and participants in Commercial Fishery Work Group*

Sarina AtkinsonWorkgroup - SEFSC, Miami, FL, Co-Leader of CWG
Anna-Mai Christmas-Svajdlenka - ACCSP, Arlington,VA, Co-Leader of CWG
Julie DeFilippi-Simpson - ACCSP, Arlington, VA
Julie Dingle - SC DNR, Charleston, SC
Chris Bradshaw - FWC, St. Petersburg, FL
Alan Bianchi – NCDEQ, Raleigh, NC
Michaela Pawluk, Data Provider,SEFSC, Galveston, TX
Gaitlyn Malone, Data Provider, UM CIMAS, Maimi, FL

### *3.1.2 Topics Reviewed by the Commercial Fishery Group*

1. Review of Working Papers and Reference Documents
2. Commercial Landings
3. Commercial Discards and Bycatch
4. Commercial Effort
5. Biological Sampling
6. Comments on Adequacy of Data for Assessment Analyses
7. Research Recommendations

### *3.1.3 Commercial Data Workshop ToRs*

***DW ToR**: Provide commercial catch statistics including both landings and discards in both pounds and number. Evaluate and discuss the adequacy of available data for accurately* *characterizing landings and discards by fishery sector or gear. Provide length and age distributions for both landings and discards if feasible. Provide estimates of uncertainty around each set of landings and discard estimates.*

Landings issues discussed at the data workshop include historic landings, apportionment of Florida landings, and quantifying uncertainty. Data from Maine to the Virginia-North Carolina border was considered for inclusion. To more accurately account for Florida landings fished along the South Atlantic coast, the Southeast Fisheries Science Center (SEFSC) Coastal Logbook Program was used to apportion catch landed in Monroe County, Florida for years when area information was not considered reliable. Landings reported by federal and state sources are considered a census and no direct value of uncertainty can be calculated. It was therefore discussed to use the methodologies used in SEDAR 73 to estimate uncertainty based on method of data collection over time by state.

The methodology presented during the workshop for estimating discards was a new approach and therefore thoroughly discussed. The main issue regarding discards is the accuracy of estimates during the closed season from 2010 to 2024. This is where input from industry members was essential feedback.

Methods of filtering Trip Interview Program (TIP) length data and weighting of retained length and age compositions were also discussed by the workgroup. Lastly, the best approach for providing discard length compositions was discussed.

## 3.2 REVIEW OF WORKING PAPERS AND REFRENCE DOCUMENTS

**SEDAR90-DW-01:** South Atlantic Red Snapper Management History

This report summarizes those federal and state management history actions that directly affect the South Atlantic Red Snapper portion of the snapper-grouper fishery. These management actions include annual catch limits (ACLs), fishery closures, minimum size limits, and trips limits.

**SEDAR90-DW-07:** CPUE Expansion Estimation for Commercial Discards of South Atlantic Red Snapper

This working paper documents the proposed methodology for estimating commercial discards of South Atlantic Red Snapper. The general approach for estimating discards for the commercial reef fish fleet uses catch-per-unit-effort (CPUE) from the reef fish observer program and total fishing effort from the SEFSC Coastal Logbook Program to estimate total catch. Overall, the discard estimation methods initially developed using Gulf of America data suited South Atlantic Red Snapper with the exception of the closed season. Therefore, an alternative approach was presented specifically for estimating closed season discards. Discard length compositions using observer data are also included in this working paper.

**SEDAR90-DW-24:** South Atlantic Red Snapper (*Lutjanus campechanus*) Preliminary Length and Age Compositions for the Commercial Handline Fishery

This document outlines the data and methodologies used to estimate nominal length and age compositions of the commercial handline fishery. All length data were converted to maximum total length and prepared into 3 centimeters (cm) length bins with the midpoint of the bin being labeled following SEDAR 73 procedure. The proposed weighting scheme was included as a section for discussion during the workshop. The final weighted compositions will be added as an appendix after discussion and approval at the data workshop.

**SEDAR90-RD-33:** DRAFT Snapper Grouper Advisory Panel Red Snapper Fishery Performance Report

This document summarized by the Snapper-Grouper Advisory Panel provides various observations (i.e. distribution, fishing practice, environmental, etc.) of the Red Snapper fishery from east Florida to North Carolina.

## 3.3 COMMERCIAL LANDINGS

Commercial landings of Red Snapper were compiled from 1950 through 2024. Sources for landings in the U.S. South Atlantic included Florida Fish and Wildlife Conservation Commission (FWC), South Carolina Department of Natural Resources (SCDNR), North Carolina Division of Marine Fisheries (NCDMF), and Atlantic Coastal Cooperative Statistics Program (ACCSP). Red Snapper landings from Georgia and the Mid and North Atlantic (north of the NC-VA border) were solely from ACCSP.

### *3.3.1 Data Sources*

Statistics on commercial landings for all species on the Atlantic coast are housed in the Atlantic Coastal Cooperative Statistics Program (ACCSP) Data Warehouse. The Data Warehouse is an online database of fisheries dependent data provided by the ACCSP state and federal partners. Data sources and collection methods are illustrated by state in Figure 3.1. Prior to state trip ticket programs, landings were submitted and maintained by the National Marine Fisheries Service (NMFS) SEFSC in the Accumulated Landings System (ALS) database (Gloeckner 2014, FSD 1990). The ACCSP Data Warehouse contains a copy of ALS data so that the entire time series can be queried from a single source. The ACCSP Data Warehouse was queried in February 2025 for all Red Snapper landings from 1950 to 2023 and April 2025 for 2024 data from Florida (Atlantic coast plus Monroe County) through Maine (Atlantic Coastal Cooperative Statistics Program, 2025). Commercial landings in gutted weight were converted to whole weight using the SEDAR 41 conversion factor data (1.10) for the entire time series.

<u>Florida</u>

The Florida trip ticket program began in 1986. Landings from the ACCSP data warehouse were selected for 1950-1985. During the early years of Florida landings reporting, several key fields such as the gear and area fished were not required. Therefore, additional processing was needed to obtain accurate Red Snapper landings from Florida for the South Atlantic stock. The method for acquiring the Red Snapper landings for the South Atlantic stock from Florida are detailed in Section 3.3.2 Stock Boundary.

Years where data from the Florida trip ticket system and the ACCSP data warehouse are considered reliable as reported were compared. Both datasets were very similar in landings trends and level of landings reported for matching years and fishing area. The workgroup decided to use the data from the warehouse after the validation with Florida's trip ticket data so that all data could be extracted at the same time. Red Snapper have always been reported to species in Florida trip ticket. Red Snapper are typically landed in a gutted state but any landings reported in whole pounds were converted back to gutted using the state conversion factor of 1.11 and reconverted to whole pounds using the 1.10 conversion factor.

Georgia

Prior to 1977, NMFS collected commercial landings data from Georgia. From 1977 to 2001 state port agents visited dealers and docks to collect the information on a regular basis. Compliance was mandatory for the fishing industry. To collect more timely and accurate data, Georgia initiated a trip ticket program in 1999, but the program was not fully implemented to allow complete coverage until 2001. Both the seafood dealer and the seafood harvester are responsible for ensuring the ticket is completed in full. Georgia Department of Natural Resources (GA DNR) landings maintained in the ACCSP database were selected for 1950 to 2024.

South Carolina

Landings data for Red Snapper in South Carolina came from two different data sources. The NMFS ALS data, supplied by ACCSP, provided annually reported landings data for the state from 1956 to 1971. Data from 1972 to 2024 was provided by SCDNR. The data from SCDNR, incorporated two different data reporting styles, the first from 1972 to 2003, allowed wholesale seafood dealers to report total monthly landings by species. The second data reporting style, 2004 to 2024, required wholesale seafood dealers to complete individual trip-level forms. All landings data are provided by year.

Red Snapper were mainly landed in gutted pounds. The South Carolina conversion factor (1.075) used to calculate whole pounds was different from the SEDAR 41 conversion factor (1.10). From 1956 to 2003, landings were only available in whole pounds; and since 2004, both gutted and whole pounds were available. To be consistent, all whole pounds were back calculated using the state applied conversion to determine gutted pounds and then the SEDAR 41 conversion factor was applied to determine whole pounds for all years of data.

North Carolina

Prior to 1978, NMFS collected commercial landings data for North Carolina. Port agents would conduct monthly surveys of the state's major commercial seafood dealers to determine the commercial landings for the state. Starting in 1978, the NCDMF entered into a cooperative program with NMFS to maintain the monthly surveys of North Carolina's major commercial seafood dealers and to obtain data from more dealers.

The NCDMF Trip Ticket Program (NCTTP) began on 1 January 1994. The NCTTP was initiated due to a decrease in cooperation in reporting under the voluntary NMFS/North Carolina Cooperative Statistics Program in place prior to 1994, as well as an increase in demand for complete and accurate trip-level commercial harvest statistics by fisheries managers. The detailed data obtained through the NCTTP allows for the calculation of effort (i.e. trips, licenses, participants, vessels) in a given fishery that was not available prior to 1994 and provides a much more detailed record of North Carolina's seafood harvest.

Landings for North Carolina before 1994 were provided by ACCSP. Most Red Snapper in North Carolina are reported in gutted condition. Any landings reported in whole pounds were converted back to gutted using the state conversion code of 1.08 and reconverted to whole pounds using the 1.10 conversion factor.

**Decision 1:** Landings data would come from the following sources:

- NC: 1950-1993 (ACCSP)
  1994-2024 (NCDMF)
- SC: 1950-1979, 2020-2024 (ACCSP)
  1980-2019 (SCDNR)
- GA: 1950-2024 (ACCSP)
- FL: 1950-1985 (ACCSP)
  1986-2024 (FL FWC/ACCSP)
- VA north: 1950-2024 (ACCSP)

*This decision was approved by the plenary.*

### *3.3.2 Stock Boundaries*

Landings were initially considered throughout the Atlantic coast from east Florida to Maine (Figure 3.2). This spatial range extended from the GMFMC/SAFMC boundary in the Florida Keys (Figure 3.3) to the most northern extent of reported Red Snapper. Virginia North (North Carolina-Virginia border to Maine) data were provided for SEDAR 73, but ultimately not used. The working group discussed the potential use of these data in this assessment. These landings represented a very small proportion of total landings (less than 0.05% of the total landings). Additionally, considering there is no biological data available for this region to convert whole weight to number of fish, the group decided to exclude landings north of Virginia.

**Decision 2:** Commercial landings are provided from the GMFMC/SAFMC boundary to the North Carolina-Virginia border.

*This decision was approved by the plenary.*

For the southern boundary, SEDAR 73 and previous Red Snapper assessments used the state landed and Monroe County was parsed by area fished at the GMFMC/SAFMC boundary in Figure 3.2. In order to establish a more replicable and consistent methodology between the Atlantic, the Gulf, and the quota monitoring process, the following approach was used. This methodology discussed at the data workshop was meant to apply generally to most SEDAR species and applied to Red Snapper in the following manner.

For Monroe County, Florida, methodology differs depending on years of data collection.

- From 1950 to 1992, the area and gear information were either unavailable or unreliable. Therefore, annual logbook proportions were calculated by gear (handline, diving, and other) for the period of 1993-1997. The five-year average was then applied to the data for all years from 1950 to 1992.
- From 1993 to 2009, area and gear information were reported on the Florida trip ticket system but not considered reliable. Therefore, annual logbook proportions were calculated by gear (handline, diving, and other), applied to Florida trip ticket landings, then aggregated by year.
- From 2010 to 2024, the area and gear information are considered reliable so the data were used as reported without proportioning.

It was noted that for non-Monroe County Florida data, exceptions may be made for certain species. However for Red Snapper, data were split between the Atlantic and Gulf using a single approach for the entire time series. For data from 1950 to 1962, where there was no area code or county information, reported subregion was used. For all other years, area code was used first to determine Atlantic and Gulf coasts. When fishing area code was not available, the landed county for Red Snapper was used.

For non-Florida data (Red Snapper landed in North Carolina, South Carolina, or Georgia), the respective state landed was used to determine South Atlantic Red Snapper for SEDAR 90. The decision to use the state landed for non-Florida data has an exception for species with sub-stocks where area fished will need to be considered.

**Decision 3:** The work group concurs that the South Atlantic Red Snapper stock includes catch landed in North Carolina, South Carolina, and Georgia. Red Snapper landings within the stock boundary for Florida counties other than Monroe County, were determined first based on area fished. If the area was missing, the county where catch was landed was used. Monroe County, Florida data was apportioned to the South Atlantic stock boundary using SEFSC coastal logbook data from 1950 to 2009 and Florida trip ticket reported area fished from 2010 to 2024.

*This decision was approved by the plenary.*

### *3.3.3 Commercial Gears Considered*

In preparation for the SEDAR 90 Data Workshop, the commercial working group prepared Red Snapper commercial landings by three gear categories used in SEDAR 73. These gears included handline, diving/spears, and other (including unknown). Red Snapper commercial landings are predominately caught using handlines, which accounts for over 95% of the landings. Less than 3% of Red Snapper landings are reportedly caught diving or spearfishing and less than 1% are caught using all gears. At the Data Workshop, the analysts informed all working groups that the commercial fleet will not be gear specific for SEDAR 90. Because of this, all commercial gears were aggregated.

### *3.3.4 Misidentification and Unclassified Snappers*

Other topics included whether misidentification of Red Snapper with other snapper species was a concern and whether Red Snapper landings may be incorporated in significant quantities in the unclassified snapper category. Neither of these issues were considered significant by the SEDAR 15, SEDAR 24, and SEDAR 41 Commercial Work Groups. The SEDAR 90 Commercial Working Group discussed and agreed with this decision. There are similar species to Red Snapper being landed, but markets and regulations are different leading to no misidentifications. Also, Red Snapper have always been kept separate from the unclassified snappers because of their value. The group noted that while occasionally some of these species are labeled as Red Snapper to get a better price, this occurs rarely. If any unclassified snappers were actually Red Snapper then it is considered negligible. Data supporting this is anecdotal.

**Decision 4:** The work group concurs with prior SEDAR decisions that concerns about mis-identification and unclassified snappers are not significant, and no adjustments are needed.

*This decision was approved by the plenary.*

### *3.3.5 Uncertainty*

No measure of variance can be calculated for commercial landings, therefore, the work group recommended using the methodology presented in previous assessments for Red Snapper. The group reviewed the landings uncertainty table that was used in SEDAR 73. While there have been some improvements in data collection and processing, none of the states felt comfortable reducing the upper bound of uncertainty of 0.05 in the more recent years. Therefore, the uncertainty estimates for SEDAR 90 were unchanged. Note that prior to 1977, uncertainty was estimated as an upper and lower limit. Uncertainty estimates over time by state are presented in Table 3.1.

**Decision 5**: The workgroup recommends the uncertainty estimates used in SEDAR 73 for commercial landings.

*This decision was approved by the plenary.*

### *3.3.6 Historical Landings*

While historic landings from 1927 to 1949 were provided for SEDAR 41 with both reported and interpolated years, the start year of the assessment was 1950. For this reason, commercial landings prior to 1950 were not discussed at the workshop and not provided again.

### *3.3.7 Landings in Weight*

Historically, conversions between whole and gutted pounds have been based on state specific values. The standard conversion of snappers for Georgia and Florida from gutted weight to whole weight is determined by multiplying the gutted weight by 1.11. South Carolina uses a gutted to whole conversion of 1.075. North Carolina uses a gutted to whole conversion multiplier of 1.08. During SEDAR 90, data by state were converted back from whole to gutted pounds using the state-specific conversion factors and then reconverted from gutted weight to whole weight using the SEDAR 90 conversion factor of 1.10.

Landings are presented in Table 3.2 and Figures 3.4. Trends in total landings follow management of extended closures. Since 1950, Florida has produced over 81% of the commercial harvest, Georgia ~5%, South Carolina ~8%, and North Carolina ~6%.

**Decision 6:** The work group will provide Red Snapper landings in pounds whole weight.

*This decision was approved by the plenary.*

Confidentiality Issues

Landings of Red Snapper in this report were pooled across states and gears to meet confidentiality standards. At this level of stratification, only one year was confidential for Florida through North Carolina landings. Confidential landings will be provided to the assessment analysts for use in the assessment model.

*3.3.8 Landings in Number*

Commercial landings in weight were converted to commercial landings in numbers based on average weight (in pounds whole weight) from the SEFSC TIP database for each year. For 1950-1983, a total average weight pooled across all years (1984-2024), states, and gears was applied. For 1984 to 2024, coastwide annual estimates of mean weight were derived from the length compositions using the TIP data pooled across states and gears. If an annual mean weight was calculated from less than 30 fish, the overall mean weight was used instead. The calculated annual number of Red Snapper can be found in Table 3.3 and Figure 3.5. Annual coastwide mean weights are provided in Table 3.4.

## 3.4 COMMERCIAL DISCARDS AND BYCATCH

*3.4.1 Directed Fishery Discards*

Commercial discards of South Atlantic Red Snapper were previously estimated using SEFSC coastal fisheries discard logbook data. This is fisher-reported data with issues of reliability due to the lack of validation and the increasing number of trips reported with no discards of any species. As a result, the SEFSC no longer recommends the use of discard logbook data for commercial discard estimation (Alhale et al. 2024). For SEDAR 90, commercial discards were estimated using catch-per unit-effort (CPUE) from the commercial observer programs and total fishing effort from the Coastal Fisheries Logbook Program. A more detailed overview of the analysis is documented in Atkinson et al. 2025 (SEDAR90-DW-07).

Commercial discards were estimated by open and closed season. For the open season, Red Snapper are typically discarded for management actions including a 20-inch total length minimum size limit from 1993 to 2009 and trip limit starting in 2012. Using the kept observer CPUE, a verification step was conducted during the open season to compare annual total landed catch of Red Snapper to observer-estimated landed catch. This verification evaluates the representativeness of the observer data to the total fleet. Since the CPUE expansion estimates of

Red Snapper compared favorably, discards were estimated following the same stratification scheme. The logbook total effort used in the expansion followed standard methodologies where the logbook data are filtered for trips reporting landings of Red Snapper and was adjusted by the proportion of observer trip effort that reported only discards of Red Snapper.

For the closed season, the observer data indicates that discards are coming from non-Red Snapper targeted trips. Therefore, logbook effort used in the expansion was filtered using methods adopted from Shertzer & Williams (2008) to account for trips targeting one of the other eighteen species likely within Red Snapper habitat. Annual discard estimates from 1993-2024 by open and closed season are shown in Table 3.5. The workgroup reviewed the methods and data through 2023. An appendix was added to the SEDAR90-DW-07 working paper to include 2024 data.

There was concern that discard estimates during the closed season may be an overestimate if fishers are able to actively avoid Red Snapper at certain times of the year or in certain areas. The work group reached out to several members of the industry regarding this question. One industry member from South Carolina indicated that it was possible to avoid Red Snapper when targeting Vermilion Snapper or Gray Triggerfish during the shallow-water grouper closed season from January to April. However, another industry member from Florida expressed that Red Snapper was unavoidable, which is a similar sentiment from the Red Snapper Fishery Performance Report (SEDAR90-RD-33). The workgroup was unsure how to proceed with conflicting feedback and thought this question of Red Snapper interactions during the closed season needs additional research, especially if interactions change spatially.

The workgroup also briefly discussed discard estimates prior to 1993. There was a 12-inch total length minimum size limit for Red Snapper from 1983 to 1991 which increased to 20 inches total length in January 1992. It was noted fishermen were not catching Red Snapper smaller than the 12-inch minimum size limit indicating total discards were likely minimal. Discard estimates prior to 1993 were not considered in previous assessments and therefore a low priority for the workgroup. Given the lack of effort data during this time period, discard estimates from 1983-1992 were not estimated.

**Decision 7:** The work group accepts the discard estimates of Red Snapper for 1993-2024 as the best available.

*This decision was approved by the plenary.*

### *3.4.2 Bycatch from the Shrimp Fishery*

It was felt by the SEDAR 41 workgroup that total bycatch is negligible from the shrimp fishery and therefore not considered for SEDAR 90.

## 3.5 COMMERCIAL EFFORT

While commercial effort as the number of trips reported to the SEFSC Coastal Fisheries

Logbook Program were generated in previous assessments, it was not generated for SEDAR 90.

## 3.6 BIOLOGICAL SAMPLING

### *3.6.1 Length Distribution of Commercial Landings*

Annual length distributions for commercial handline landings were constructed using length data available from TIP. At the time of the data workshop, length data were available from 1984 to 2023; however, following the data workshop, 2024 data were provided and length distributions were updated. The available length data were filtered to exclude lengths from interviews that spanned multiple trips, and any data that had identified bias (e.g. size or effort bias, non-random sampling). Additionally, a maximum length of 1500 mm was used to filter out any erroneous samples. As a single handline plus fleet is being used in this assessment, only length samples collected from handline gears were included in the compositions to avoid any potential size biases from other gears. Sample sizes and number of trips by year are provided in Table 3.6. Strata with fewer than 30 fish and/or fewer than 10 trips are recommended to be dropped from further analyses.

For the data workshop, only nominal compositions were provided (SEDAR90-DW-24). Following the methodology of SEDAR 41 and SEDAR 73, nominal compositions were constructed using length bins of 3 centimeters (cm) maximum Total Length, labeled at the bin center, with a minimum length bin of 21 cm and a maximum length bin of 99 cm; lengths falling outside of this range were pooled into the minimum and maximum length bins. Nominal compositions by year for the commercial handline fleet are shown in Figure 3.6. Following the data workshop, weighted length compositions were provided. The working paper has since been updated with an appendix describing the weighting methodology and providing results of the weighted length compositions. For weighting, the data were separated into two subregions (North Carolina & South Carolina; Florida & Georgia), and the proportion of landings caught in each subregion was used to weight the nominal length compositions, yielding a single, coast-wide weighted composition in each year. For further information on the methodology used to weight the compositions please refer to the working paper (SEDAR90-DW-24).

**Decision 8:** The work group decided to use the same weighting method for weighted length compositions as used in the previous SEDARs.

*This decision was approved by the plenary.*

### *3.6.2 Age Distribution of Commercial Landings*

In order to inform the age composition of the landings, annual age compositions were provided. Data for constructing commercial age compositions were available from TIP as well as from state sampling programs (NCDMF, SCDNR, GA DNR, FWC). The commercial age data were compiled by the SEFSC, and were filtered to include only age samples from the commercial handline fleet. Data were further filtered to remove any samples lacking length information and any samples with associated size or effort bias. Sample sizes and number of trips by year are provided in Table 3.7. Strata with fewer than 10 ages and/or fewer than 10 trips are recommended to be dropped from further analyses.

For the data workshop, only nominal age compositions were provided (**SEDAR90-DW-24**). The maximum age of Red Snapper used in the model is 51. Following the methodology of SEDAR 41 and SEDAR 73 a plus group for the age compositions of 13 was used, meaning all fish older than 13 were lumped together with age 13 fish. In order to maximize the information retained in the age compositions, a single coastwide nominal age composition was constructed for each year. Nominal age compositions by year for the commercial handline fleet are shown in Figure 3.7. Following the data workshop, these nominal compositions were weighted by the coastwide weighted length compositions which have been weighted to account for discrepancies in landings proportions compared to sampling effort across subregions. This weighting methodology differs slightly from what was done in previous assessments, however, it allows for more information to be retained while still accounting for potential sampling bias. Further details on weighting methodology are provided in the appendix of the working paper (**SEDAR90-DW-24**).

**Decision 9:** The work group decided to modify the weighting methodology for the weighted age compositions such that a single weighted length composition is used to reweight the nominal age compositions.

*This decision was approved by the plenary.*

### *3.6.3 Length Distribution of Commercial Discards*

Nominal annual discard length compositions were provided prior to the data workshop (SEDAR90-DW-07). Due to low observer sample sizes, several years would be excluded due to standard procedure to remove compositions calculated from less than 10 trips (Table 3.8). Discard length compositions will likely be used in the assessment model to inform selectivity. Therefore, aggregated discard length compositions are preferred. From 2007-2009 a pooled nominal composition is weighted by annual discard estimates by effort stratification where trips less than or equal to 75 fishing hours is considered low effort and trips fishing longer than 75 hours is considered high effort. This corrects for bias in the observer data that over-sampled high effort trips relative to the commercial fleet. During the closed season (2010-2024), a pooled nominal composition was suggested with two time periods (2010-2017 and 2018-2024) determined by changes in observer sampling over time. Even though observer data from 2010-2017 captures two sampling designs, a comparison of compositions by the observer program shows no bias between the two sources. Additional detail on the discard length composition methodology and results were added as an Appendix to SEDAR90-DW-07. The discard length compositions provided for SEDAR 90 are shown in Figure 3.8.

**Decision 10:** The work group recommends a weighted discard length composition from 2007 to 2009 and a pooled nominal composition from 2010 to 2017 and 2018 to 2024.

*This decision was approved by the plenary.*

## 3.7 COMMENTS ON ADEQUACY OF DATA FOR ASSESSMENT ANALYSES

The work group considered the majority of landings data from the U.S. south Atlantic to be adequate for assessment analyses. Data appeared to be most accurate and reliable from the various state databases in the most recent years. This is likely due to the implementation of state trip ticket programs, beginning with Florida in 1986. Reliable monthly landings data can be found back to 1978. Historic landings prior to 1950 were found to be the least reliable, as there appears to be missing data for various years and states. It was also felt that proper species identification for reporting were made as Red Snapper is a highly sought fish and therefore handled separately from other snappers.

Discard estimates appear adequate for assessment analyses. Given the known issues with using discard logbook data which was used for SEDAR 73, the use of observer data for this assessment is the preferred data source. Additionally, the observer discard approach has a built-in verification procedure, enhancing the reliability of discard estimates during the open season. While there were concerns of accuracy during the closed season, there is currently a lack of data to support a change in the methodology presented.

Length samples from the handline fishery appeared to be adequate for assessment analyses. However, length samples from diving and other gear may be insufficient for analyses.

## 3.8 RESEARCH RECOMMENDATIONS

The work group reviewed recommendations from SEDAR 41 and offered additional recommendations:

Landings
- Learn more about how the Catch Accounting and Monitoring System (CAMS) data maintained by the Greater Atlantic Regional Fisheries Office (GARFO) and the Northeast Fisheries Science Center (NEFSC) are being used for assessments so that we can ensure fish are not double counted or missed along the entire U.S. Atlantic coast.
- Improve gear, area, and effort data reported for each trip on state trip ticket programs to ensure more accurate data for future assessments.

Discards
- Continue to research alternative methods and analyses for estimating total effort during the closed season of a fishery.
- Increase observer coverage in the South Atlantic temporally, across multiple gears, and trip durations.

Biosampling
- Hold more frequent TIP trainings and increase port agent buy-in through information exchange with assessment and SEDAR staff focused on the usage of data collected by TIP staff to continue to refine data quality.

*These recommendations were approved by the plenary.*

3.9 REFERENCES

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3.10 TABLES

**Table 3.1** Estimated coefficients of variation (CV) to be applied to commercial landings. High and low means uncertainty in both directions. High means uncertainty in the upper bound only because of confidence in the landings that are reported.

| Year Range | NC | GA | SC | FL | Uncertainty direction |
|---|---|---|---|---|---|
| 1950-1961 | 0.25 | 0.25 | 0.25 | 0.25 | High and Low |
| 1962-1977 | 0.2 | 0.2 | 0.2 | 0.2 | |
| 1978-1985 | 0.1 | 0.1 | 0.1 | 0.1 | High Only |
| 1986-1989 | 0.1 | 0.1 | 0.1 | 0.05 | |
| 1990-1993 | 0.1 | 0.1 | 0.1 | 0.05 | |
| 1994-2001 | 0.05 | 0.1 | 0.1 | 0.05 | |
| 2002-2003 | 0.05 | 0.05 | 0.1 | 0.05 | |
| 2004-Present | 0.05 | 0.05 | 0.05 | 0.05 | |

**Table 3.2** Annual South Atlantic Red Snapper landings in pounds (lbs) whole weight from 1950 to 2024. Confidential landings have been replaced with a '*'.

| Year | Total Whole Lbs | Year | Total Whole Lbs | Year | Total Whole Lbs |
|---|---|---|---|---|---|
| **1950** | 368,351 | **1975** | 600,790 | **2000** | 104,165 |
| **1951** | 499,765 | **1976** | 571,504 | **2001** | 196,648 |
| **1952** | 385,930 | **1977** | 596,339 | **2002** | 187,955 |
| **1953** | 398,279 | **1978** | 594,356 | **2003** | 138,291 |
| **1954** | 593,207 | **1979** | 420,936 | **2004** | 171,912 |
| **1955** | 493,315 | **1980** | 385,485 | **2005** | 129,131 |
| **1956** | 483,907 | **1981** | 378,759 | **2006** | 86,041 |
| **1957** | 867,291 | **1982** | 308,445 | **2007** | 114,732 |
| **1958** | 612,508 | **1983** | 316,716 | **2008** | 251,992 |
| **1959** | 657,736 | **1984** | 253,431 | **2009** | 362,152 |
| **1960** | 671,075 | **1985** | 250,824 | **2010** | 5,961 |
| **1961** | 796,374 | **1986** | 219,440 | **2011** | * |
| **1962** | 645,983 | **1987** | 191,294 | **2012** | 7,788 |
| **1963** | 488,789 | **1988** | 173,587 | **2013** | 30,300 |
| **1964** | 537,589 | **1989** | 266,942 | **2014** | 69,306 |
| **1965** | 558,108 | **1990** | 226,542 | **2015** | 4,604 |
| **1966** | 554,506 | **1991** | 143,546 | **2016** | 3,019 |
| **1967** | 725,503 | **1992** | 104,371 | **2017** | 88,619 |
| **1968** | 865,520 | **1993** | 220,138 | **2018** | 127,622 |
| **1969** | 538,190 | **1994** | 194,879 | **2019** | 120,052 |
| **1970** | 512,717 | **1995** | 177,230 | **2020** | 132,296 |
| **1971** | 457,393 | **1996** | 138,603 | **2021** | 127,246 |
| **1972** | 406,641 | **1997** | 110,494 | **2022** | 125,534 |
| **1973** | 296,560 | **1998** | 89,556 | **2023** | 126,858 |
| **1974** | 478,352 | **1999** | 93,224 | **2024** | 96,403 |

**Table 3.3** Annual South Atlantic Red Snapper landings in number of fish from 1950 to 2024.

| Year | Total Number | Year | Total Number | Year | Total Number |
|---|---|---|---|---|---|
| **1950** | 52,334 | **1975** | 85,358 | **2000** | 13,019 |
| **1951** | 71,005 | **1976** | 81,197 | **2001** | 27,999 |
| **1952** | 54,832 | **1977** | 84,726 | **2002** | 25,238 |
| **1953** | 56,586 | **1978** | 84,444 | **2003** | 16,908 |
| **1954** | 84,281 | **1979** | 59,805 | **2004** | 18,878 |
| **1955** | 70,089 | **1980** | 54,768 | **2005** | 12,377 |
| **1956** | 68,752 | **1981** | 53,813 | **2006** | 8,045 |
| **1957** | 123,222 | **1982** | 43,823 | **2007** | 11,937 |
| **1958** | 87,023 | **1983** | 44,998 | **2008** | 35,358 |
| **1959** | 93,449 | **1984** | 62,468 | **2009** | 45,090 |
| **1960** | 95,344 | **1985** | 50,097 | **2010** | 976 |
| **1961** | 113,146 | **1986** | 36,864 | **2011** | * |
| **1962** | 91,779 | **1987** | 34,482 | **2012** | 806 |
| **1963** | 69,445 | **1988** | 34,343 | **2013** | 3,813 |
| **1964** | 76,379 | **1989** | 46,176 | **2014** | 9,622 |
| **1965** | 79,294 | **1990** | 38,815 | **2015** | 654 |
| **1966** | 78,782 | **1991** | 21,413 | **2016** | 429 |
| **1967** | 103,077 | **1992** | 10,242 | **2017** | 14,805 |
| **1968** | 122,970 | **1993** | 25,158 | **2018** | 20,921 |
| **1969** | 76,464 | **1994** | 25,299 | **2019** | 17,206 |
| **1970** | 72,845 | **1995** | 19,189 | **2020** | 16,922 |
| **1971** | 64,985 | **1996** | 14,535 | **2021** | 24,148 |
| **1972** | 57,774 | **1997** | 10,476 | **2022** | 22,117 |
| **1973** | 42,134 | **1998** | 10,251 | **2023** | 17,446 |
| **1974** | 67,963 | **1999** | 11,595 | **2024** | 12,832 |

Confidential landings have been replaced with a ‘*’.

**Table 3.4** Mean whole weight (in pounds) of South Atlantic Red Snapper derived from the 1984 to 2024 length data using the Southeast Fisheries Science Center TIP database. An average weight across all gears was applied to the earlier years from 1950 to 1983 based on observations from 1984-2024, and any years with fewer than 30 fish used to calculate the mean (*).

| Year | Mean Weight |
|---|---|
| **1950-1983** | 7.038 |
| **1984** | 4.057 |
| **1985** | 5.007 |
| **1986** | 5.953 |
| **1987** | 5.548 |
| **1988** | 5.054 |
| **1989** | 5.781 |
| **1990** | 5.837 |
| **1991** | 6.704 |
| **1992** | 10.190 |
| **1993** | 8.750 |
| **1994** | 7.703 |
| **1995** | 9.236 |
| **1996** | 9.536 |
| **1997** | 10.548 |
| **1998** | 8.736 |
| **1999** | 8.040 |
| **2000** | 8.001 |
| **2001** | 7.023 |
| **2002** | 7.447 |
| **2003** | 8.179 |
| **2004** | 9.106 |
| **2005** | 10.433 |
| **2006** | 10.695 |
| **2007** | 9.611 |
| **2008** | 7.127 |
| **2009** | 8.032 |
| **2010** | 6.108 |
| **2011** | 7.038* |
| **2012** | 9.665 |
| **2013** | 7.947 |
| **2014** | 7.203 |
| **2015** | 7.038* |
| **2016** | 7.038* |
| **2017** | 5.986 |
| **2018** | 6.100 |
| **2019** | 6.978 |
| **2020** | 7.818 |
| **2021** | 5.269 |
| **2022** | 5.676 |
| **2023** | 7.272 |
| **2024** | 7.512 |

**Table 3.5** South Atlantic Red Snapper vertical line discards in whole weight (lbs.) and number (with associated standard errors) from 1993-2024.

| Year | Season | Estimated Discards in Weight | SE of Estimated Discards in Weight | Estimated Discards in Number | SE of Estimated Discards in Number |
|---|---|---|---|---|---|
| 1993 | Open | 62,548 | 21,899 | 17,258 | 5,205 |
| 1994 | Open | 67,503 | 23,513 | 18,658 | 5,598 |
| 1995 | Open | 65,953 | 23,580 | 18,067 | 5,572 |
| 1996 | Open | 50,953 | 18,211 | 13,959 | 4,303 |
| 1997 | Open | 41,785 | 14,363 | 11,605 | 3,435 |
| 1998 | Open | 34,353 | 12,247 | 9,419 | 2,896 |
| 1999 | Open | 35,723 | 12,939 | 9,743 | 3,048 |
| 2000 | Open | 38,174 | 13,920 | 10,388 | 3,274 |
| 2001 | Open | 63,462 | 21,588 | 17,692 | 5,185 |
| 2002 | Open | 70,011 | 23,633 | 19,574 | 5,694 |
| 2003 | Open | 50,380 | 16,477 | 14,265 | 4,035 |
| 2004 | Open | 55,004 | 18,900 | 15,278 | 4,521 |
| 2005 | Open | 46,643 | 16,647 | 12,784 | 3,935 |
| 2006 | Open | 28,963 | 9,779 | 8,097 | 2,356 |
| 2007 | Open | 53,386 | 22,915 | 14,950 | 5,763 |
| 2008 | Open | 64,566 | 27,714 | 17,672 | 6,812 |
| 2009 | Open | 65,216 | 27,993 | 17,815 | 6,867 |
| 2010 | Open | 225 | 61 | 46 | 10 |
| 2010 | Closed | 182,613 | 26,163 | 28,102 | 4,610 |
| 2011 | Closed | 177,523 | 25,433 | 27,319 | 4,482 |
| 2012 | Open | 1,204 | 325 | 245 | 56 |
| 2012 | Closed | 149,414 | 21,406 | 22,993 | 3,772 |
| 2013 | Open | 5,034 | 1,358 | 1,024 | 234 |
| 2013 | Closed | 139,426 | 19,975 | 21,456 | 3,520 |
| 2014 | Open | 9,946 | 2,684 | 2,023 | 462 |
| 2014 | Closed | 137,406 | 19,686 | 21,145 | 3,469 |
| 2015 | Closed | 160,137 | 22,943 | 24,643 | 4,043 |
| 2016 | Closed | 151,001 | 21,634 | 23,237 | 3,812 |
| 2017 | Open | 5,803 | 1,566 | 1,180 | 269 |
| 2017 | Closed | 131,238 | 18,802 | 20,196 | 3,313 |
| 2018 | Open | 14,535 | 3,922 | 2,956 | 675 |
| 2018 | Closed | 110,992 | 13,996 | 17,062 | 2,178 |

| | | | | | |
|---|---|---|---|---|---|
| 2019 | Open | 10,081 | 2,721 | 2,050 | 468 |
| 2019 | Closed | 140,699 | 17,742 | 21,628 | 2,761 |
| 2020 | Open | 11,060 | 2,985 | 2,249 | 513 |
| 2020 | Closed | 133,749 | 16,865 | 20,560 | 2,624 |
| 2021 | Open | 10,323 | 2,786 | 2,099 | 479 |
| 2021 | Closed | 113,910 | 14,364 | 17,510 | 2,235 |
| 2022 | Open | 8,993 | 2,427 | 1,829 | 417 |
| 2022 | Closed | 118,507 | 14,943 | 18,217 | 2,325 |
| 2023 | Open | 7,756 | 2,093 | 1,577 | 360 |
| 2023 | Closed | 112,207 | 14,149 | 17,248 | 2,202 |
| 2024 | Open | 4,376 | 1,181 | 890 | 203 |
| 2024 | Closed | 101,436 | 12,791 | 15,593 | 1,990 |

**Table 3.6** Number of Red Snapper trips and fish length samples from the SEFSC TIP database, 1983-2024. Years with fewer than 30 fish are highlighted in red.

| *Year* | *Number of Fish* | *Number of Trips* |
|---|---|---|
| *1984* | 1,775 | 129 |
| *1985* | 1,551 | 151 |
| *1986* | 706 | 97 |
| *1987* | 645 | 97 |
| *1988* | 530 | 100 |
| *1989* | 702 | 90 |
| *1990* | 520 | 68 |
| *1991* | 501 | 120 |
| *1992* | 347 | 93 |
| *1993* | 645 | 132 |
| *1994* | 609 | 115 |
| *1995* | 822 | 144 |
| *1996* | 777 | 171 |
| *1997* | 427 | 118 |
| *1998* | 450 | 131 |
| *1999* | 856 | 182 |
| *2000* | 829 | 160 |
| *2001* | 1,378 | 205 |
| *2002* | 790 | 148 |
| *2003* | 1,252 | 170 |
| *2004* | 762 | 141 |
| *2005* | 557 | 135 |
| *2006* | 465 | 145 |
| *2007* | 608 | 195 |
| *2008* | 712 | 180 |
| *2009* | 2,789 | 289 |
| *2010* | 67 | 3 |
| *2011* | 1 | 1 |
| *2012* | 145 | 42 |
| *2013* | 665 | 119 |
| *2014* | 908 | 138 |
| *2015* | 10 | 4 |
| *2016* | 9 | 4 |
| *2017* | 1,113 | 130 |
| *2018* | 1,867 | 209 |
| *2019* | 951 | 126 |
| *2020* | 1,487 | 174 |
| *2021* | 1,675 | 147 |
| *2022* | 1,314 | 119 |
| *2023* | 1,675 | 178 |
| *2024* | 1,507 | 164 |

**Table 3.7** Number of Red Snapper trips and fish age samples from the SEFSC TIP database and state sampling programs, 1983-2024. Years with fewer than 10 fish are highlighted in red.

| *Year* | *Number of Fish* | *Number of Trips* |
|---|---|---|
| *1992* | 15 | 3 |
| *1993* | 7 | 1 |
| *1994* | 1 | 1 |
| *1995* | 13 | 1 |
| *1996* | 120 | 16 |
| *1997* | 57 | 12 |
| *1998* | 54 | 16 |
| *1999* | 12 | 4 |
| *2000* | 45 | 8 |
| *2001* | 144 | 21 |
| *2002* | 35 | 6 |
| *2003* | 55 | 10 |
| *2004* | 99 | 28 |
| *2005* | 148 | 56 |
| *2006* | 192 | 80 |
| *2007* | 291 | 138 |
| *2008* | 416 | 156 |
| *2009* | 2,602 | 269 |
| *2010* | 67 | 3 |
| *2011* | 1 | 1 |
| *2012* | 160 | 42 |
| *2013* | 723 | 108 |
| *2014* | 721 | 102 |
| *2015* | 1 | 1 |
| *2017* | 950 | 106 |
| *2018* | 1,707 | 185 |
| *2019* | 903 | 122 |
| *2020* | 1,412 | 163 |
| *2021* | 1,616 | 165 |
| *2022* | 1,332 | 171 |
| *2023* | 1,483 | 203 |
| *2024* | 1,116 | 113 |

**Table 3.8** Number of observer trips and Red Snapper discard samples from 2007-2024.

| Year | Observer Trips | Discard Lengths |
|---|---|---|
| 2007 | 4 | 84 |
| 2008 | 1 | 3 |
| 2009 | 5 | 13 |
| 2010 | 3 | 23 |
| 2011 | 10 | 31 |
| 2012 | 0 | 0 |
| 2013 | 0 | 0 |
| 2014 | 7 | 35 |
| 2015 | 11 | 193 |
| 2016 | 13 | 157 |
| 2017 | 0 | 0 |
| 2018 | 2 | 49 |
| 2019 | 6 | 110 |
| 2020 | 5 | 89 |
| 2021 | 16 | 105 |
| 2022 | 64 | 340 |
| 2023 | 29 | 216 |
| 2024 | 17 | 52 |

## 3.11 FIGURES

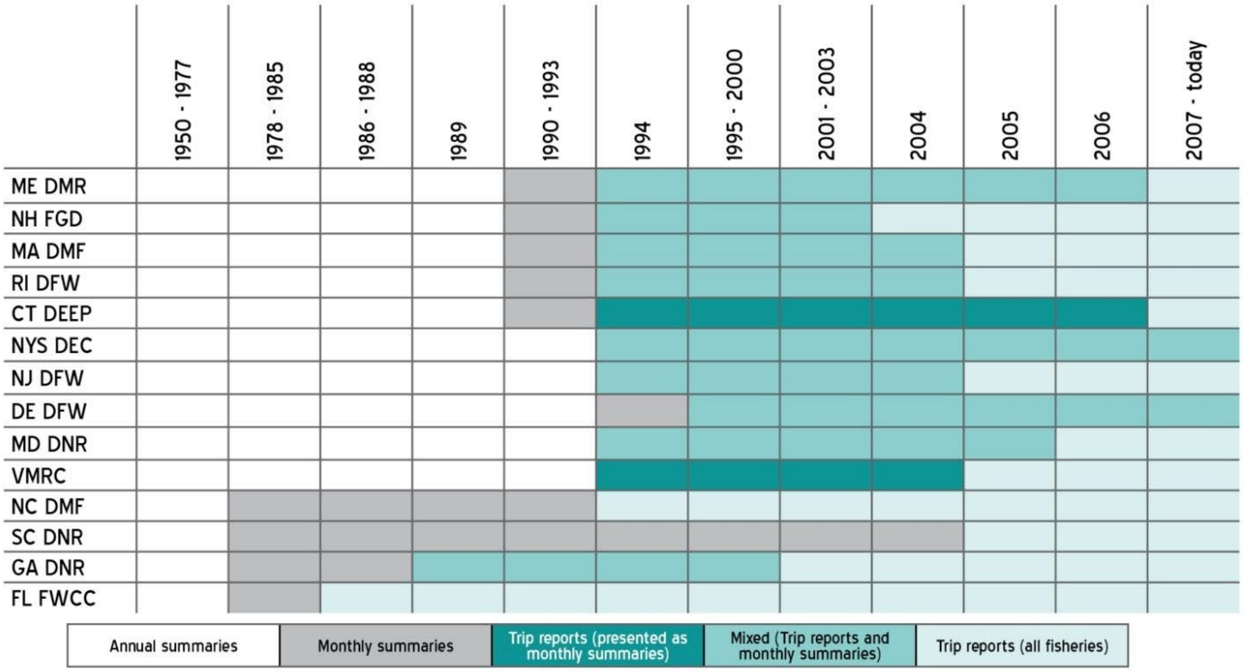



**Figure 3.1** Atlantic Coastal Cooperative Statistics Program (ACCSP) Data Warehouse - data sources and collection methods by state.

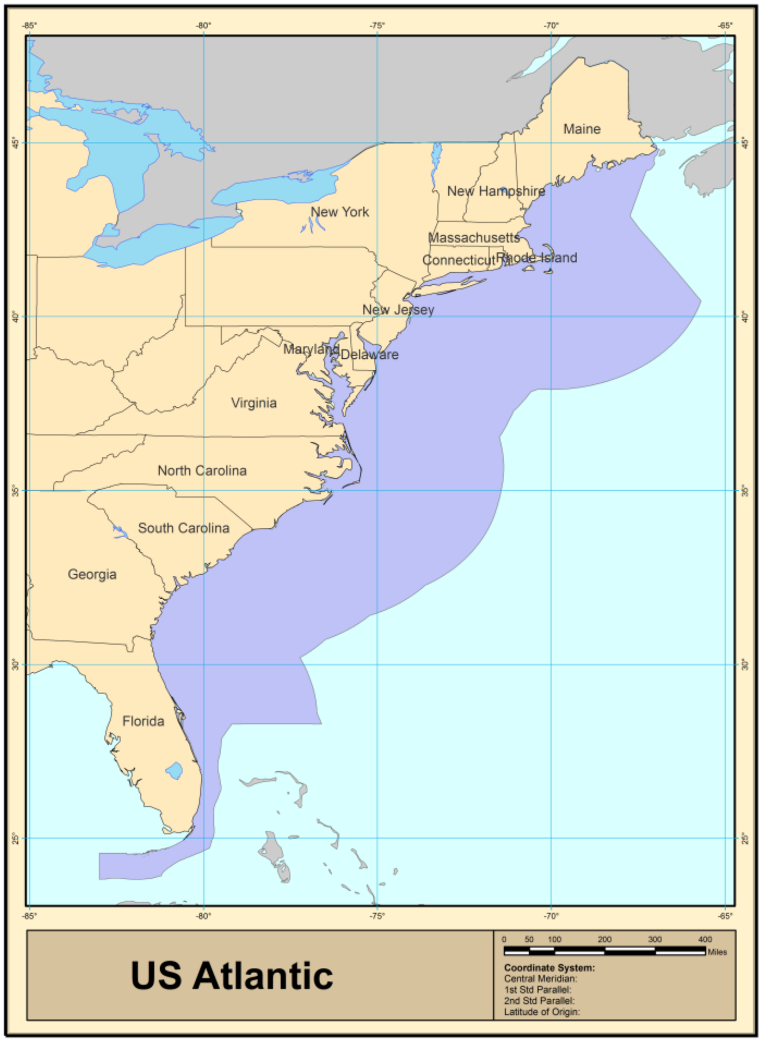



**Figure 3.2** Region of Red Snapper landings initially considered for SEDAR 90. Upon review, fish landed north of the North Carolina border were excluded since they accounted for less than 0.05% of the total landings.

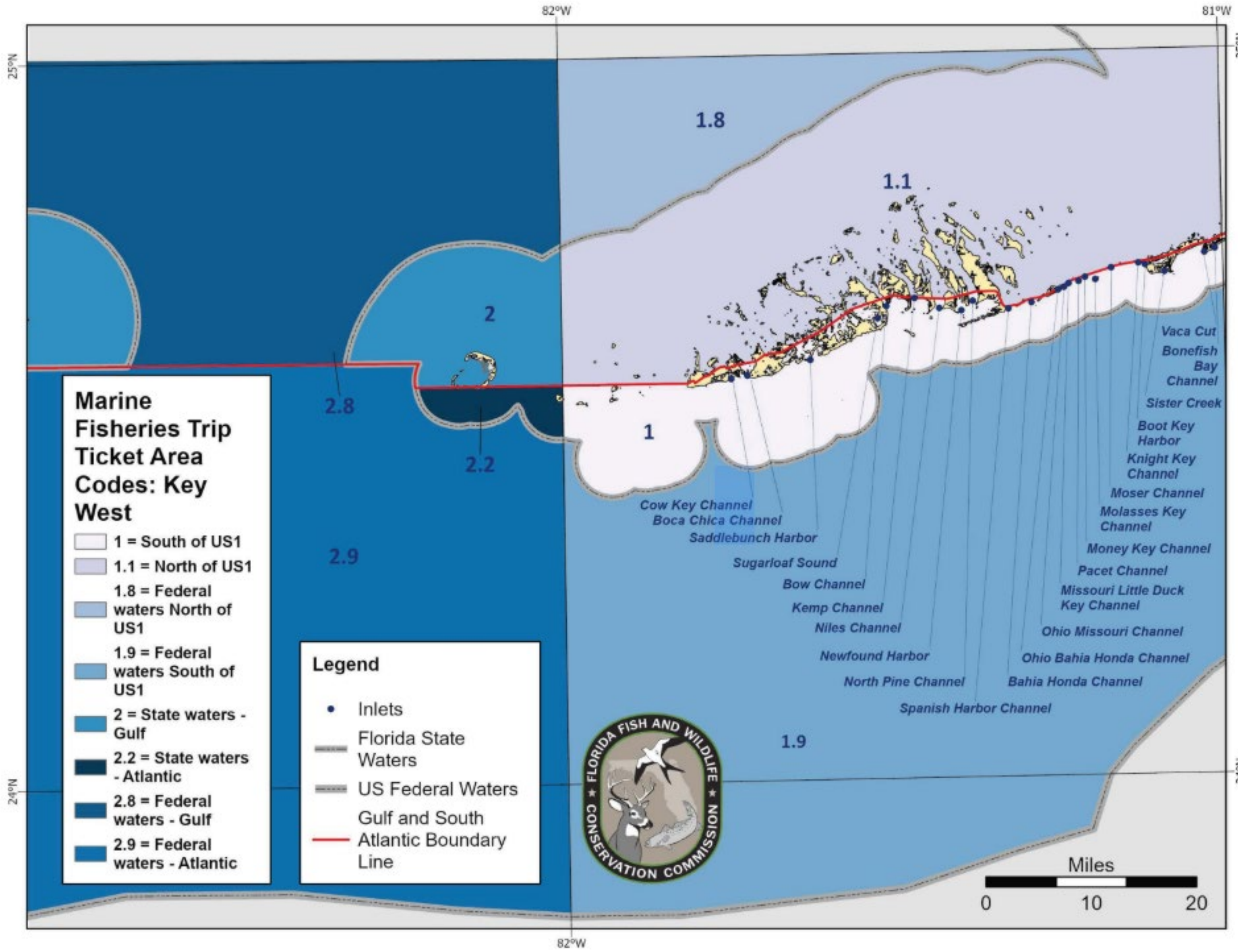



**Figure 3.3** Close-up of the southern boundary as defined by the Gulf of Mexico and South Atlantic Council boundary.

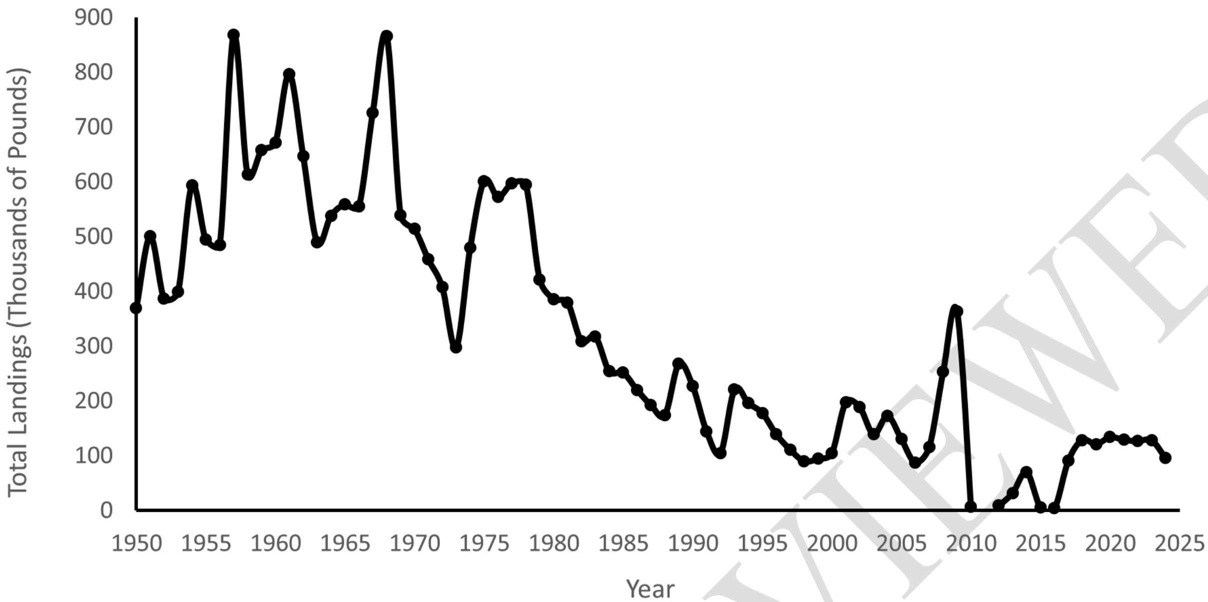



**Figure 3.4** Red Snapper landings, in thousands of pounds (whole weight) in the U.S. South Atlantic from 1950 to 2024.

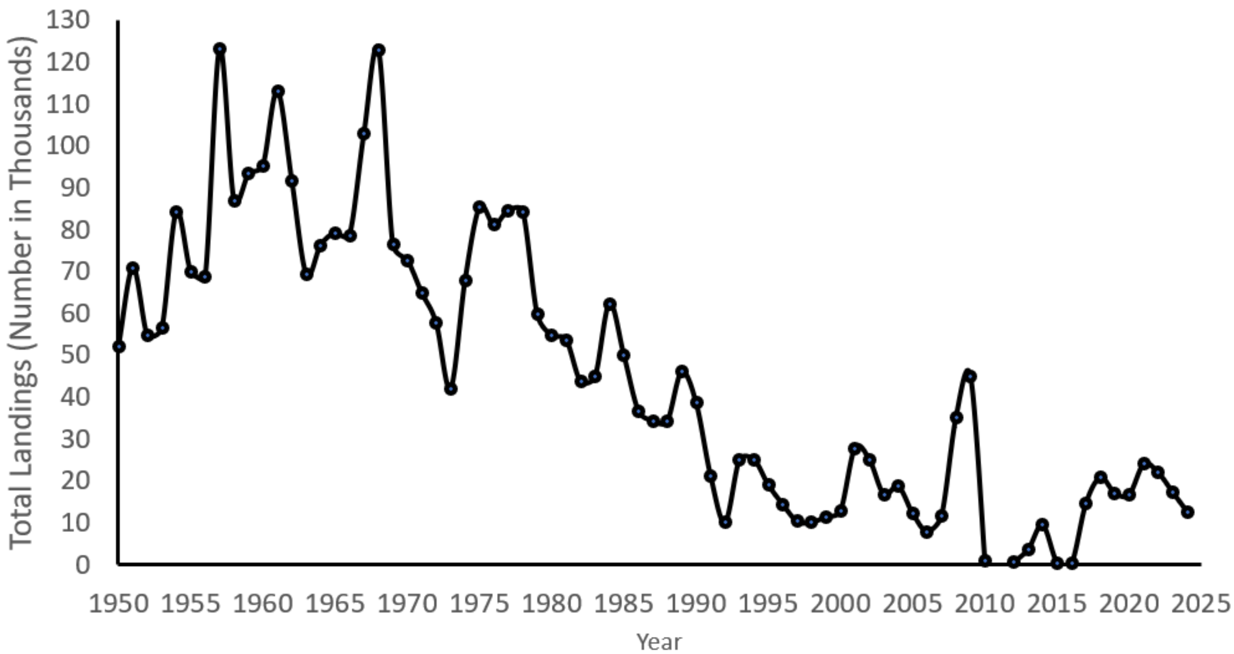



**Figure 3.5** Red Snapper landings, in numbers of fish in the U.S. South Atlantic from 1950 to 2024.

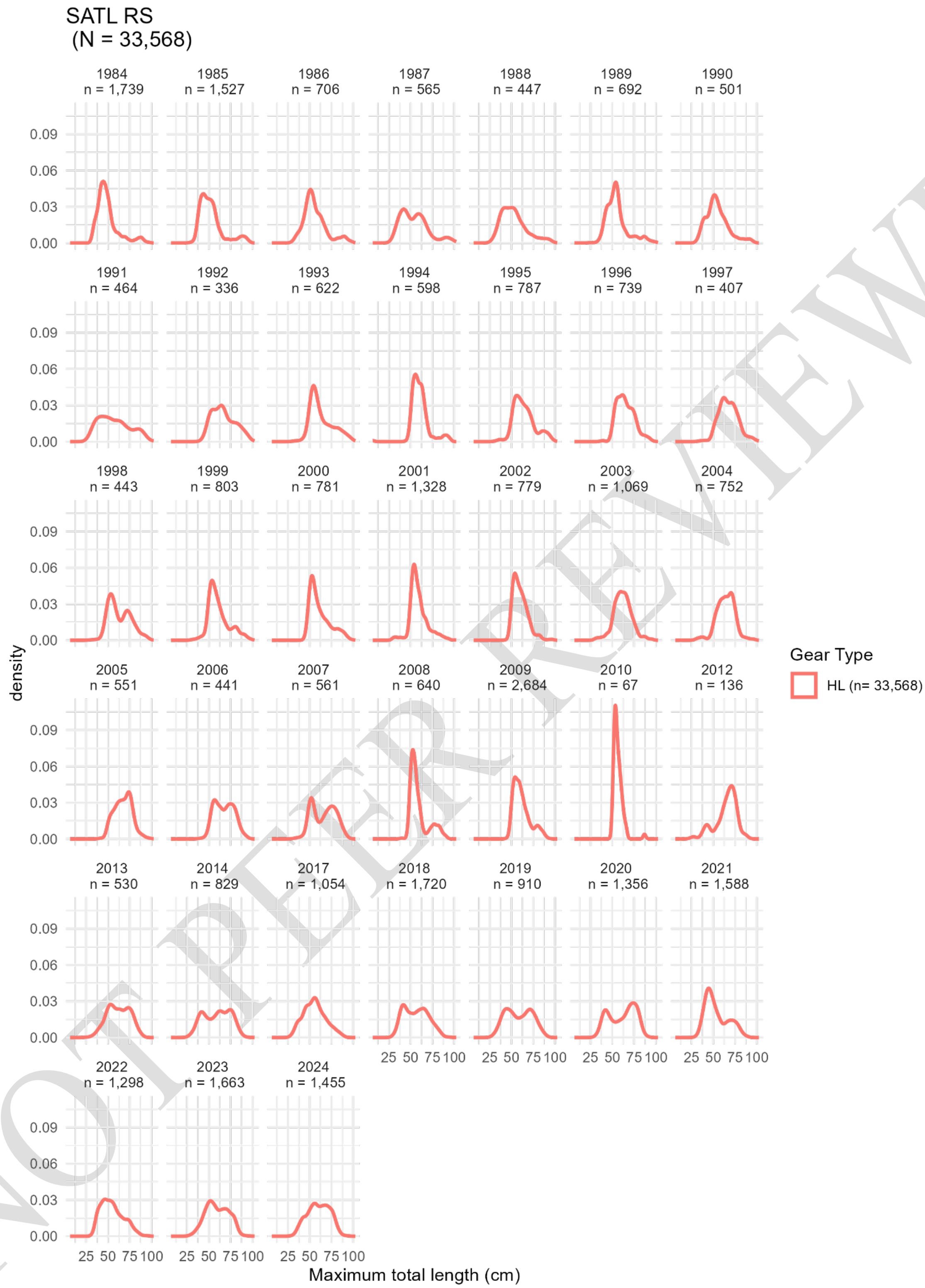



**Figure 3.6** Nominal length compositions for the South Atlantic Red Snapper commercial handline fleet.

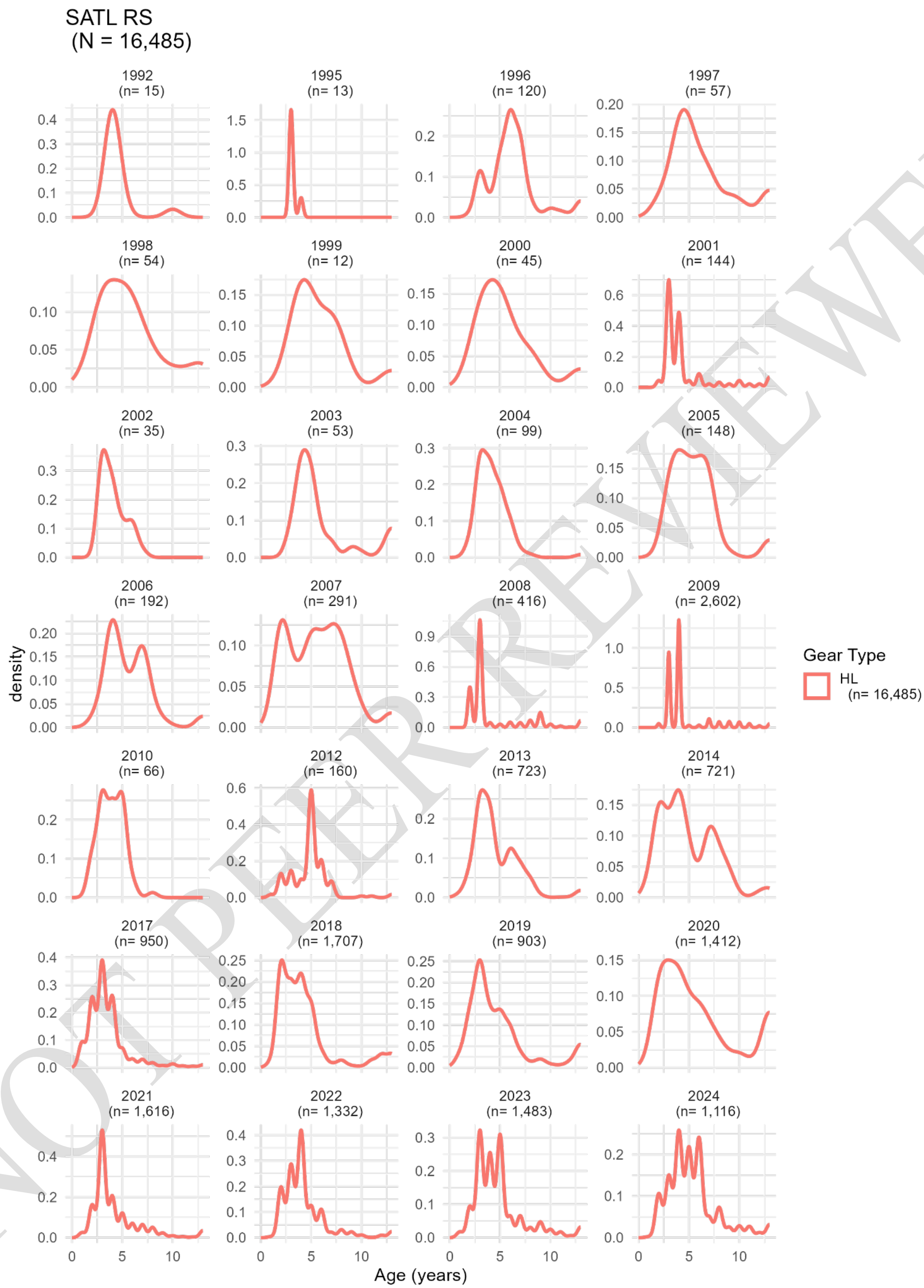



**Figure 3.7** Nominal age compositions for the South Atlantic Red Snapper commercial handline fleet.

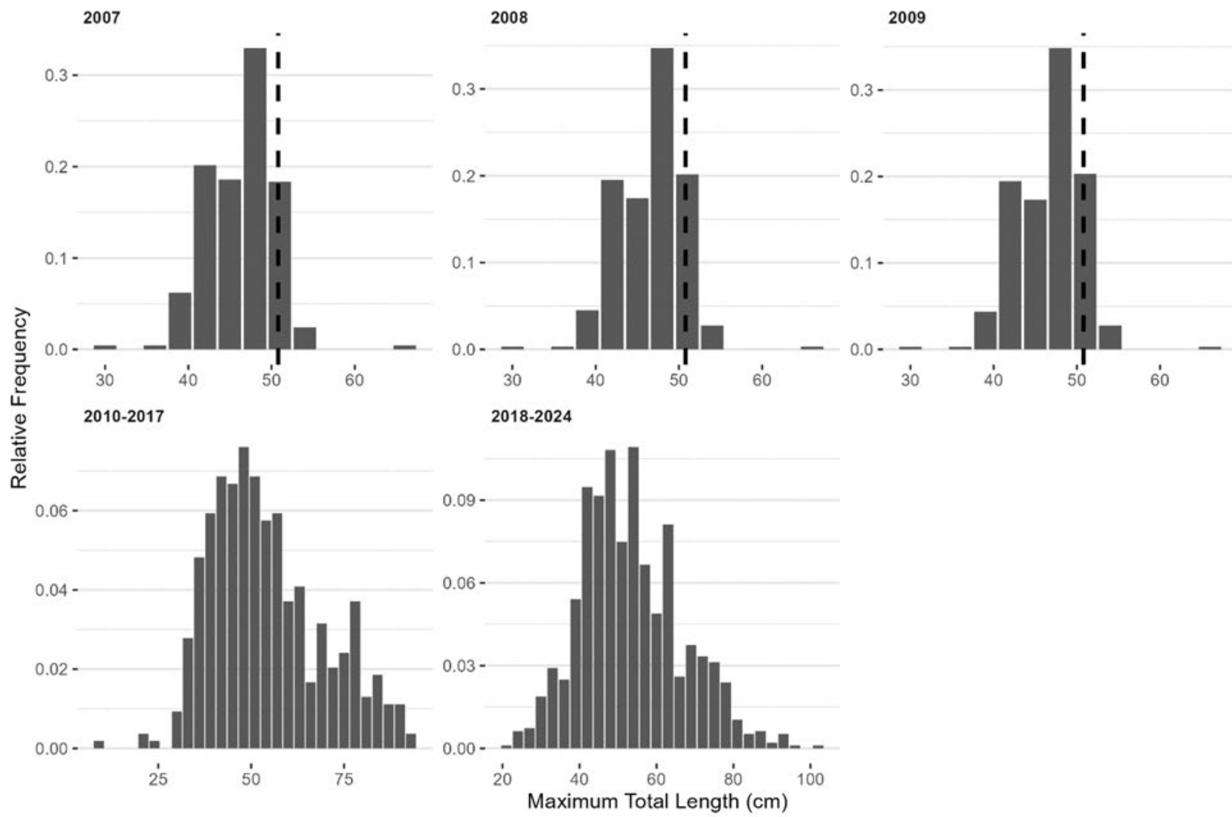



**Figure 3.8** Discard length composition of Red Snapper using commercial observer data. The dashed line indicates the minimum size limit from 2007-2009 of 20 inches total length.

# 4. RECREATIONAL FISHERY

## 4.1 OVERVIEW

### *4.1.1 Work Group members and participants in Recreational Fishery Work Group*

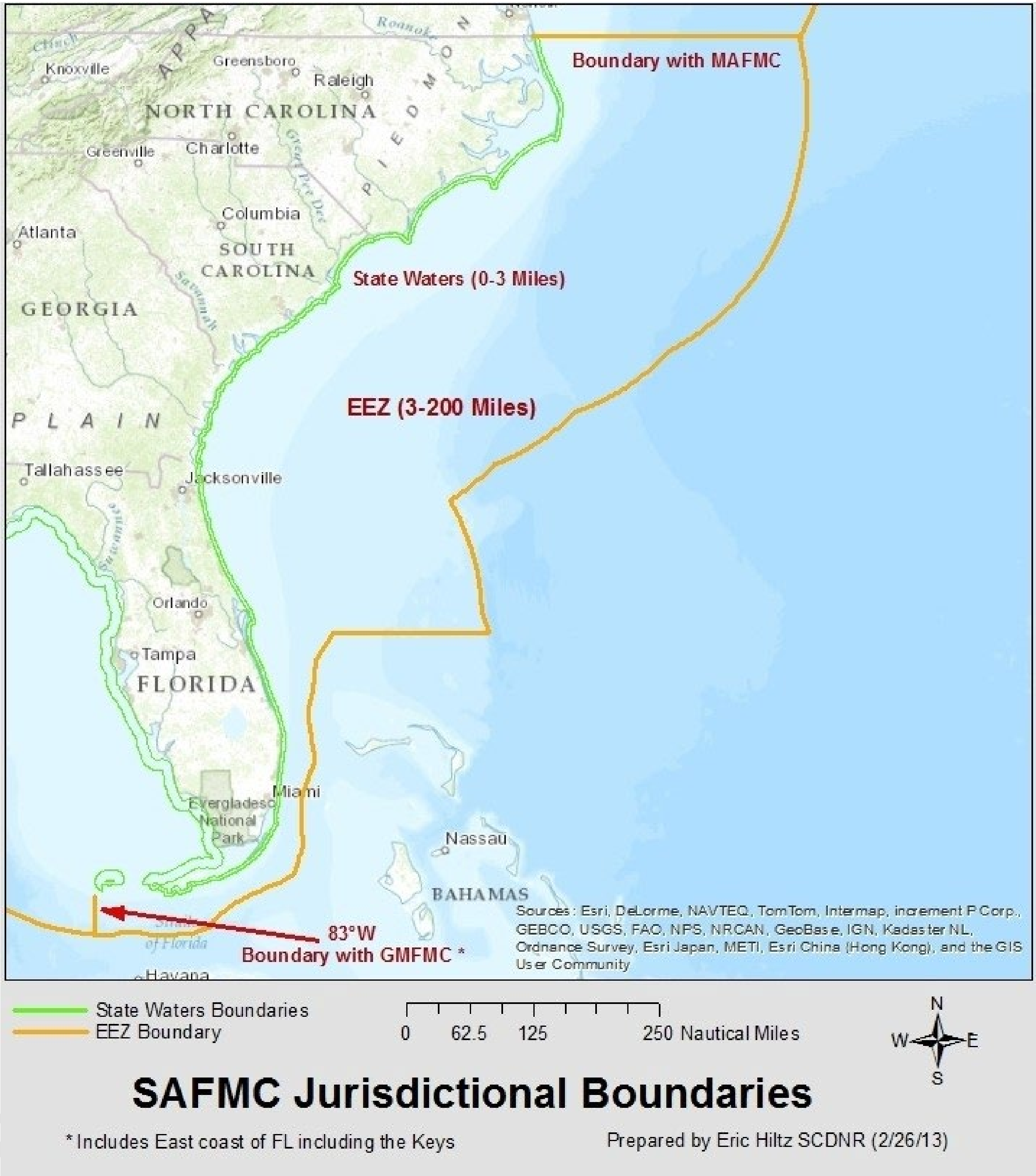
Amy Dukes- SCDNR, Charleston SC
Anne Markwith – NCDMF, Wilmington, NC
Andrew Cathey – SEFSC, Beaufort, NC
Bridget Cermak – FWC, St. Petersburg, FL
Chloe Ramsay – FWC, St. Petersburg, FL
Dawn Franco – GADNR, Brunswick, GA
Dominique Lazzare – SERO, St. Petersburg, FL
Ellie Corbett – FWC, St. Petersburg, FL
Erik Williams – SEFSC, Beaufort, NC
Genine McClair – FWC, St. Petersburg, FL
Jessica McCawley – FWC, St. Petersburg, FL
Jessica Stephen – SERO, St. Petersburg, FL
Jie Cao – NCSU, Raleigh, NC
Judd Curtis – SAFMC, Charleston, SC
Julia Byrd – SAFMC, Charleston, SC
Kristin Foss – FWC, St. Petersburg
Maria McGirl – USF, Gainesville, FL
Martha Guyas – ASA, Alexandria, VA
Matthew Vincent – SEFSC, Beaufort, NC
Meg Withers – SAFMC, Charleston, SC
Michael Schmidtke – SAFMC, Charleston, SC
Olivia Wilms – FWC, St. Petersburg, FL
Rob Cheshire– SEFSC, Beaufort, NC, Leader of RWG
Samantha Binion-Rock – SEFSC, Beaufort, NC, Leader of RWG
Sean Wilms – FWC, St. Petersburg, FL
Sydney Bates – SCDNR, Charleston, SC
Vivian Matter – SEFSC, Miami, FL

### *4.1.2 Topics Reviewed by the Recreational Fishery Group*

1. Review fully calibrated MRIP Fishing Effort Survey (FES)/Access Point Angler Intercept Survey (APAIS)/For-Hire Survey (FHS) landings and discard estimates.
2. Evaluate 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.
3. Review SRFS landings and discards estimates.
4. Discuss Florida's Exempted Fishing Projects (EFP) and determine whether and how the associated removals and biological data should be included.
5. Evaluate usefulness of the Fishing, Hunting, and Wildlife-Associated Recreation Survey (FHWAR) to generate estimates of landings prior to 1981.
6. Determine whether MRIP or SRFS estimates should be used to inform Florida Private mode landings and discards outside of the mini-season.

7. Discuss if the same ‘decision tree’ approach that was used in SEDARs 41 and 73 should be used to select estimates for SEDAR 90.
8. Compare catch estimates of South Atlantic Red Snapper for individual strata and identify the most representative estimate for those years where mini-seasons may have adversely affected their reliability (i.e., 2012+).
9. Provide estimates of uncertainty around each set of landings and discard estimates.
10. Provide alternative time series for sensitivity analyses.
11. Provide nominal length and age distributions for landings, if feasible.
12. Evaluate if the recreational fleet structure should be updated.
13. Evaluate the use of FISHstory to provide information on historical length distributions of landings prior to 1981.
14. Provide nominal length distributions for discards, if feasible.
15. Evaluate adequacy of available data.
16. Provide research recommendations to improve recreational data.

*4.1.3 South Atlantic Fishery Management Council Red Snapper Group Management Boundaries*



## 4.2 REVIEW OF WORKING PAPERS

***Headboat Data for Red Snapper in the Southeast US Atlantic (SEDAR 90-DW-02)***

This document provides an overview of the Southeast Region Headboat Survey, the catch estimates of Red Snapper in number and weight, the uncertainty associated with the estimates, a description of the number of fish measured by the survey, a summary of average lengths and weights, the total effort by headboats in the South Atlantic, and the number of vessels by strata to determine confidentiality. The public version is limited to non-confidential records. The lead analysts were provided with a confidential version of the working paper that includes more detailed information and maps of Red Snapper catch.

***General Recreational Survey Data for Red Snapper in the South Atlantic (SEDAR 90-DW-03)***

General recreational survey data for Red Snapper from the Marine Recreational Information Program (MRIP) are summarized from 1981 to 2024 for South Atlantic states from eastern Florida to North Carolina. Charter and Private fishing modes are presented. These fully calibrated MRIP estimates account for 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. Note, this working paper was submitted ahead of the SEDAR 90 Data Workshop to foster discussions on MRIP-specific questions and concerns. It does not include any other state or federal estimates that were ultimately incorporated into the final general recreational survey data, which were discussed at the Data Workshop and summarized in this report.

***Historical Recreational Landings for South Atlantic Red Snapper (Lutjanus campechanus) estimated using the FHWAR Census Method (SEDAR 90-DW-11)***

The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation Survey (FHWAR) has been conducted and is one of the oldest and most comprehensive recreational surveys. From 1955 to 1985 the FHWAR survey was conducted every five years. The FHWAR census method uses information from this survey including U.S. angler population estimates and angling effort estimates from 1955to 1985 for the South Atlantic region. To obtain historical Red Snapper landings prior to 1981, saltwater angler trips from FHWAR (1955-1980) are multiplied by average catch rates from the early years (1981-1983) of the MRFSS/MRIP and SRHS data. Interpolation is used to complete the time series. Improvements were made to the FHWAR method to adjust how Florida FHWAR effort was partitioned and to the adjustment for recall bias. These improvements are discussed in this document and the impacts of these improvements are illustrated by comparing the estimates using the original and updated methods using data from the last time historical catch was estimated (SEDAR 41). Preliminary historical catch estimates for SEDAR 90 are also provided.

***South Atlantic Red Snapper (Lutjanus campechanus) length and age compositions from the recreational fishery (SEDAR 90-DW-12)***

This working paper describes the data and methodologies used to estimate nominal length and age compositions for two recreational fleets (e.g. Headboat, Gen Rec) included in the SEDAR 90

South Atlantic Red Snapper Assessment. Changes from SEDAR 73 are also described in this document. Weighting methodologies were discussed during the Data Workshop and an updated working paper will be submitted that documents final nominal and weighted length and age compositions and mean length-at-age for the Headboat and Gen Rec fleets.

***Discard length compositions for South Atlantic Red Snapper (Lutjanus campechanus) from the headboat fishery from North Carolina to Florida (SEDAR 90-DW-13)***

An At-Sea Observer Program began in 2005 to collect more detailed information on the species composition and size distribution of fish discarded alive from headboats in the South Atlantic. For SA Red Snapper 15,150 fish were sampled for length from 2005-2024 before being discarded alive. Nominal discard length compositions for fish sampled from headboats from North Carolina to Florida are presented in this working paper.

***Proxy Discard Estimates of Red Snapper (Lutjanus campechanus) from the US South Atlantic Headboat Fishery (SEDAR 90-DW-14)***

Discard data were not routinely collected as part of the Southeast Region Headboat Survey (SRHS) until 2004, prior to which SRHS discard estimates are not available. These data are self-reported and not currently validated within the SRHS program. To validate SRHS discards, the discard rates from self-reported SRHS data were compared to those from the Headboat At-Sea Observer Program. Proxy discards are estimated for years prior to 2004, when discard data were not routinely collected by the SRHS, and for years when discard data were collected but not deemed reliable when validated against the Headboat At-Sea Observer data. The decision for SEDAR 90 was to retain SRHS discard estimates between 2007 and 2024 and to calculate proxy discard estimates for those years prior (1984-2006) using the SRHS-Bio approach, with annual calculations conducted at the subregional level (i.e., South, North).

***Length frequencies for South Atlantic Red Snapper from the FISHstory project (SEDAR 90-DW-16)***

FISHstory, a citizen science project developed under the SAFMC's Citizen Science Program, has developed a standardized protocol for archiving and analyzing historical fishing photos from the for-hire fleet from the 1940s to 1990s. These historical photos document the beginning of the South Atlantic for-hire fishery and can help recreate information on catch and length composition prior to when dedicated fishery dependent surveys began. The FISHstory project has three primary components: digitizing and archiving historical fishing photos; analyzing historical photos to estimate catch and effort using the crowdsourcing platform Zooniverse; and estimating historical length compositions for key species. This working paper provides an overview of the methodology used to estimate length compositions from historical photos and summarizes Red Snapper length composition estimates produced through the FISHstory project.

***Summary of the SAFMC Release Project for SEDAR 90 (SEDAR 90-DW-17)***

SAFMC Release, a citizen science project developed under the SAFMC's Citizen Science Program, provides a streamlined approach for fishermen to provide a photograph of released fish along with details such as length, depth caught, release condition, and use of barotrauma mitigation techniques using the free mobile app, SciFish. The project focuses on collecting data on the size of released fish and data that can help inform how many released fish survive. SAFMC Release began as a pilot project in June 2019 working with fishermen to collect information on released Scamp Grouper. In August 2021 it expanded to collect information on all shallow water grouper species, and in April 2022 Red Snapper was added to the project. SAFMC Release is open access, meaning any interested fishermen that encounter shallow water grouper or Red Snapper can participate in data collection efforts. Recruitment for SAFMC Release has largely been through opportunistic outreach strategies. This working paper summarizes SAFMC Release data on Red Snapper from private recreational and charter trips taken from April 2022 (when Red Snapper was added to the project) through December 2024. Additionally, analyses were done to compare SAFMC Release length data to other datasets that collect similar information in the South Atlantic for overlapping years (2022-2024) including the MRIP Headboat At-Sea Observer Program and the FL FWC For-Hire Observer Program. SAFMC Release data were reviewed by the Recreational work group and the Discard Mortality Ad-Hoc work group.

***Florida East Coast Red Snapper (ECRS) Mini-Season Sampling (SEDAR 90-DW-18)***

Since 2012 the state of Florida has conducted a specialized East Coast Red Snapper (ECRS) survey to provide more precise and timely estimates of Red Snapper effort and catch during the recreational mini-season in the South Atlantic. These mini-seasons have ranged from 0 to 9 days in the last 12 years, which is a shorter season than other fishing surveys are designed for. Private recreational effort and catch during the mini-seasons are estimated from vessel count monitoring at nine major egress points on Florida's Atlantic coast combined with dockside intercept sampling at offshore pressure fishing sites. Charter effort and catch during the mini-seasons are estimated from a mail/telephone survey which is distributed to federally permitted charter vessel owners who own a snapper-grouper permit in Florida. These estimates are provided for the private recreational and charter fishing fleets, for all season openings from 2012 to 2024.

***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 Red Snapper (Lutjanus campechanus) in the South Atlantic (SEDAR 90-DW-19)***

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). Red Snapper *(Lutjanus campechanus)* SRFS estimates for Florida, in the South Atlantic, are provided as part of this report. Additionally, historical MRIP-FCAL estimates for this region have been calibrated into SRFS currency using a peer-reviewed, ratio-based method that has been used in previous assessments (e.g. SEDAR 72, SEDAR 79). This calibration reduced historical MRIP-FCAL landings by 77%, releases by 53%, and effort by 22%. Therefore, calibrated MRIP-FCAL or SRFS estimates are provided for this species from 1981 to 2024.

***A Summary of South Atlantic Red Snapper Discard Length Data Collected from At-Sea Observers in For-Hire Fishery Surveys in Florida 2005-2024 (SEDAR 90-DW-20)***

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 such surveys have been conducted on for-hire vessels in Florida since 2005. For-hire observer surveys have not been consistently funded in Florida, which has led to short breaks in the time series in some regions. In the first three years observer trips were only conducted on headboat vessels, and surveys were expanded after 2008 to include both headboats and charter vessels across a larger geographic area. This report provides a summary of available information on the size composition of Red Snapper collected by trained observers since 2005 during at-sea surveys on for-hire vessels on the Atlantic Coast of Florida.

***Length and age composition of Red Snapper, Lutjanus campechanus, collected in association with fishery-dependent projects along Florida's Atlantic coast (SEDAR 90-DW-21)***

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. This report describes each fishery-dependent research or monitoring project that contributed to the age and length data provided to the Life History Group. During these surveys, priority was given to collecting the left otolith when removing both otoliths was not feasible, to ensure the prompt return of fish to anglers.

***A Summary of Red Snapper data collection from 2009 to 2024 in Georgia (SEDAR 90-DW-26)***

Starting in 2009, Georgia Department of Natural Resources Coastal Resources Division (GADNR CRD) staff initiated a special data collection effort working with two for-hire captains, at one location, that had previously participated extensively in voluntary Red Snapper research to increase Red Snapper lengths and age data for the for-hire fleet. This sampling methodology was continued, or modified, during mini seasons that occurred from 2012 to 2024. Two effort surveys were conducted over the time series, including phone surveys of for-hire captains (2012-2020) and an electronic survey open to private recreational anglers (2012-2014). Recreational anglers were also encouraged to donate carcasses to freezers stationed along the coast as part of our Marine Sportfish Carcass Recovery Program. Commercial biological sampling was conducted when available from 2013 to 2024. Biological data collected included fork length, maximum total length, whole weight (or gutted weight if applicable), sex, age and fin clips (2021-2024). General fishing location or depth were requested for each sampled trip. A total of 2,895 biological samples were collected from 2009 to 2024. A total of 2,793 were successfully aged. Results for charter, headboat and commercial fleet are not shown by year due to confidentiality. Participation in the carcass program steadily increased from 2012 to 2019 as familiarity with the programs increased but then declined after seasons were shorter in duration.

***Summary of Southeast For-Hire Integrated Electronic Reporting Program Records for Red Snapper Catch in the South Atlantic Region (SEDAR 90-DW-31)***

The Southeast For-Hire Integrated Electronic Reporting (SEFHIER) program was created to collect required electronic logbook data from for-hire vessels (excluding vessels reporting to the Southeast Region Headboat Survey) permitted to fish for snapper grouper, dolphin wahoo, and coastal migratory pelagic species. Logbooks from SEFHIER participants in the South Atlantic region (North Carolina through the east coast of Florida), submitted between 2022 and 2024, were summarized to describe red snapper catch. SEFHIER catch summaries of retained and discarded catch were compared to Marine Recreational Information Program (MRIP) estimates for the charter mode. Lastly, the use of self-reported SEFHIER catch estimates was discussed to describe data uncertainty.

## 4.3 RECREATIONAL DATA SOURCES

### *4.3.1 Marine Recreational Information Program (MRIP)*

#### 4.3.1.1 Program Description

*Introduction*

The Marine Recreational Information Program (MRIP), formerly the Marine Recreational Fisheries Statistics Survey, 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. 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 also provides estimates for headboat mode (Hbt) in the mid and north Atlantic regions. MRIP covers all coastal Atlantic states from Maine to Florida. When the survey first began in Wave 2 (Mar/Apr) of 1981, headboats were included in the for-hire mode, but were 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 charter 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/Florida border), 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 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 (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 much more likely 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 at 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.

In order to maintain a consistent time series, charter estimates were calibrated on the Atlantic prior to 2004 (SEDAR64-RD-12). CHTS and calibrated FHS charter catch estimates for South Atlantic Red Snapper from 1981 to 2003 are shown in Figure 1 of SEDAR 90-DW-03. Calibrated APAIS and FES estimates for South Atlantic Red Snapper from 1981 to 2024 are shown in Figure 2 of SEDAR 90-DW-03.

*Monroe County*

Monroe County MRIP landings are included in the official west Florida estimates. 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 (SEDAR68-DW-13). Although Monroe county estimates can be separated using this process, they cannot be partitioned into those from the Atlantic Ocean and those from the Gulf of America (SEDAR-PW-07).

For SEDAR 90, MRIP Red Snapper landings from Monroe County were allocated to the Gulf of America because Red Snapper are less common on the extreme south Atlantic coast of Florida. This recommendation is in agreement with previous Gulf of America (SEDAR 31, 52, 74, and 98) and South Atlantic (SEDAR 24, 41, and 73) Red Snapper assessments.

*Adjustment to Fishing Modes*

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 Atlantic in 1981, the MRIP combined charter/headboat mode must be split in order to not double the estimated 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). To avoid duplication of headboat estimates, the MRIP headboat component from this split was deleted for all South Atlantic states (North Carolina to eastern Florida) and SRHS estimates are used to represent headboat fishing for all years (1981+).

Shore mode estimates for Red Snapper were excluded because Red Snapper is an offshore species with a strong association with reefs and hard bottoms, and unlikely to be caught from shore (SEDAR 31-DW-04). This decision is in agreement with decisions made during SEDARs 24, 41, and 73.

*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).

### 4.3.1.2 MRIP Landings

*Weight Estimation*

The Southeast Fisheries Science Center used the MRIP sample data to obtain an average weight by strata using the following hierarchy: species, region, year, state, mode, wave, and area (SEDAR32-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 (SEDAR67-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 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*

***Task 1***: The Recreational Work Group (RWG) reviewed fully calibrated MRIP landings and discard estimates. Final MRIP landings estimates and associated coefficients of variation, in numbers of fish, are shown by year and mode in Table 3 of SEDAR 90-DW-03 and by year in Table 5 of SEDAR 90-DW-03. Estimates are provided for all South Atlantic states from eastern Florida to North Carolina. Final MRIP landings estimates in pounds whole weight are shown by year and state in Table 6 of SEDAR 90-DW-03.

The RWG investigated the 2022, wave 6 landings estimate for private anglers in North Carolina, which seemed relatively high compared to other landings estimates from similar strata (i.e., outside the Red Snapper fishing season). A single intercept contributed to the estimate for this strata, with an observed harvest of twelve Red Snappers that were seen by the interviewer and resulted in a landings estimate of 10,408 fish. The RWG attributed this intercept to a record of illegal harvest, perhaps the anglers believing they were landing a different species (e.g., Vermilion Snapper), and recommended leaving it unaltered in the MRIP time series.

#### 4.3.1.3 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 and associated coefficients of variation, in numbers of fish, are shown by year and mode in Table 4 of SEDAR 90-DW-03 and by year in Table 5 of SEDAR 90-DW-03. Estimates are provided for all South Atlantic states from eastern Florida to North Carolina.

### *4.3.2 Southeast Region Headboat Survey (SRHS)*

#### 4.3.2.1 Program Description

The Southeast Region Headboat Survey estimates landings, discards, and effort for headboats in the South Atlantic and Gulf of America. SRHS incorporates two components for estimating catch and effort. 1) Information about total catch (number), discards (number), 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 and expanded for known missing trips by vessel to generate estimated landings by species, area, and time strata. 2) 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/spines for ageing studies and other biological information during dockside sampling events.

SRHS 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. For SEDAR 90, data from fish landed in North Carolina through the Florida Keys were included. This area generally includes 60 - 70 vessels participating in the area annually.

*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. The SEDAR 74 approach to calculating 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. For SEDAR 90, an additional step was added to weight the uncertainty by the landings in both number and landings in weight within each region. The weighted proxy CVs by landings in number were recommended for use in characterizing SRHS landings and discard uncertainty in the assessment model:

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

where *n* is the number of reported trips, *N* is the number of estimated trips, and *L* is the landings in number for year *i* and subregion/region *j*.

#### 4.3.2.2 SRHS Landings

Final SRHS landings estimates (in number and weight) are shown by region in Tables 6 and 8, respectively, in SEDAR 90-DW-02. Weighted and unweighted proxy CVs are provided for landings and discard estimates. The coastwide CVs weighted by landings in number are recommended for use in the assessment (SEDAR 90-DW-02, Table 19). CVs weighted by landings averaged 0.47 across the first 5 years of the SRHS (1981-1985) and decreased to near 0.05 in recent years. The largest CV (0.55) across 1981-1985 should be used as the proxy CV for the early SRHS years from 1978 to 1980.

The paper headboat logbook forms have changed multiple times throughout the history of the SRHS. The primary changes were to the specific species names listed on the forms, although there have always been blank lines to write in species not listed. Red snapper was listed on the logbook forms from the beginning of the survey in the South Atlantic. Electronic reporting started in 2013 and all species were available for selection.

#### 4.3.2.3 SRHS 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". On 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 the determination. The form now collects only the total number of fish released, regardless of condition. The discard data provided for the assessment is in total discards for all years.

As a proxy for headboat discards of South Atlantic Red Snapper from 1984 to 2006, the difference in ratios of the number of biologically-sampled fish below a given size limit to those above between time periods without and with that size limit was applied as a measure of the discards (relative to landings) expected in the time block under that size limit. This ratio was then applied to the SRHS landings to estimate headboat discards. This method is termed the SRHS-Bio approach and is the same approach selected and applied in SEDARs 41 and 73. Details of this approach and the associated decision points for SEDAR 90 are described in SEDAR 98-DW-14. Due to the lack of management regulations (i.e., size limits) aimed at South Atlantic Red Snapper prior to 1984, it is assumed that headboat discards were negligible before 1984.

***Task 2:*** The SEDAR 90 Recreational Working Group recommended using the SRHS-Bio proxy method for 1984-2006 described above and the SRHS estimated discards for 2007-2024. This approach produced proxy discard estimates with less variability and were more in-line with subsequent SRHS discard estimates than those from the "Best Practice" Super-Ratio approach. Final headboat proxy discard estimates are summarized in Table 3 and Figure 3 of SEDAR 90-DW-14.

*Uncertainty*

Uncertainty in SRHS discards for 2007-2024 was calculated using the same method described for landings. Prior to 2007, uncertainty estimates for SRHS proxy discards are calculated from SRHS estimates of landings and the associated uncertainty for that year (Table 17 in SEDAR 90-DW-02) 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 3 in SEDAR 90-DW-14.

*4.3.3 State Reef Fish Survey (SRFS)*

**4.3.3.1 Program Description**

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 survey that runs side-by-side with the historical Marine Recreational Information Program (MRIP). 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, meet survey objectives, and provide key estimates (SRFS Certification Memo and design documentation, available online: https://www.fisheries.noaa.gov/recreational-fishing-data/transitioning-new-recreational-fishingsurvey-designs). In 2020, the survey expanded to include Monroe County and the east coast of Florida.

SRFS runs concurrently with the MRIP survey in Florida, the latter 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 offshore intercept assignments. Assignments for both intercept surveys are drawn together so that sample weights are compatible and the CPUE data from both surveys can be combined (Foster, 2018). SRFS supplemental dockside assignments are drawn only from a selection of sites from which anglers fish offshore or for SRFS species. SRFS effort is estimated through a mail survey that is used to estimate effort for the suite of reef fish found in Florida, namely: Gag (*Mycteroperca microlepis*), Black Grouper (*M. bonaci*), Red Grouper (*Epinephelus morio*), Gray Triggerfish (*Balistes capriscus*), Red Snapper (*Lutjanus campechanus*), Mutton Snapper (*L. analis*), Vermilion Snapper (*Rhomboplites aurorubens*), Yellowtail Snapper (*Ocyurus chrysurus*), Amberjacks (*Seriola spp.;* greater/lesser, Almaco Jack, and Banded Rudderfish), and Hogfish (*Lachnolaimus maximus*). 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 a free, but 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. Error around the CPUE and effort estimates are calculated separately and combined for the final landings and discard estimates using Goodman's variance of product. Combining dockside intercepts for reef fish collected by APAIS with the supplemental SRFS dockside data from offshore angling intercepts 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 SRFS species suite.

### 4.3.3.2 SRFS Landings

***Task 3a***. SRFS landings estimates were provided for 2021-2024, with historical SRFS landings (1981-2020) provided as MRIP estimates for the FL private mode calibrated to SRFS currency. SRFS and SRFS-calibrated landings of Red Snapper from 1981to 2024 from the Atlantic coast for the FL private mode were provided in SEDAR 90-DW-19.

*4.3.3.3 SRFS Discards*

***Task 3b***. SRFS discards estimates were provided for 2021-2024, with historical SRFS landings (1981-2020) provided as MRIP estimates for the FL private mode calibrated to SRFS currency. SRFS and SRFS-calibrated discards of Red Snapper from 1981 to 2024 from the Atlantic coast for the FL private mode were provided in SEDAR 90-DW-19.

*4.3.4 East Coast Red Snapper (ECRS)*

**4.3.4.1 Program Description**

In 2012, the recreational Red Snapper season re-opened after a two-year closure as a short mini-season for limited harvest. In response to a short season with a "derby-style" fishery, the state of Florida has conducted a specialized East Coast Red Snapper (ECRS) survey to provide more timely and precise effort and catch estimates. The South Atlantic Red Snapper season has ranged between zero and nine days since 2012. Surveys used for longer seasons, such as Florida's State Reef Fish Survey (SRFS) or NOAA's Marine Recreational Information Program (MRIP), generate estimates at longer time scales and are not designed to provide accurate catch estimates when the season is shorter than a month. This specialized ECRS survey is used to estimate landings and releases for the private recreational and charter fleets during the South Atlantic Red Snapper mini-seasons. Estimates from this mini-season sampling were used as estimated landings for the wave when this fishery was open in the previous Red Snapper stock assessment (SEDAR 73; SEDAR73-WP10). Private recreational estimates are generated from a combined effort and catch survey design. Biologists stationed at the nine major inlets on Florida's Atlantic coast (Fig. 1 in SEDAR 90-DW-18) count private recreational boats exiting and entering the inlet to assess effort. Data from samplers interviewing anglers at offshore dockside boat ramps randomly selected according to their fishing pressure is used to calculate catch-per-unit-effort (CPUE). Data are collected on the duration of the trip, the distance from shore, depth fished, and information on the number of harvested and released Red Snapper is recorded. The CPUE, effort estimates, and the associated error are combined to estimate landings and releases. Charter estimates are generated from a dual mail/telephone survey. Prior to the season opening, federally permitted charter vessels with a snapper-grouper permit are mailed a log sheet to record fishing trips during the open season. Charter vessels who are already sampled by the MRIP For-Hire Survey in the fishing season wave are excluded. If the sheet is not returned shortly after the season closes, samplers follow up by telephone. Data are collected on the number of trips taken and the number of Red Snapper harvested and released on each trip. This data is used to estimate the total number of Red Snapper harvested and released and the associated error around these estimates by the charter fleet in Florida during the mini-season.

**4.3.4.2 ECRS Landings**

ECRS landings estimates were provided for the private recreational fleet from 2012 to 2024 and for the charter fleet from 2017 to 2024. A breakdown of estimates by year and by fleet were provided in SEDAR 90-DW-18.

#### 4.3.4.3 ECRS Discards

ECRS discard estimates were provided for the private recreational fleet from 2012 to 2024 and for the charter fleet from 2017 to 2024. A breakdown of estimates by year and by fleet were provided in SEDAR 90-DW-18.

### *4.3.5 Georgia Department of Natural Resources (GADNR)*

#### 4.3.5.1 Program Descriptions

Starting in 2009, Georgia Department of Natural Resources Coastal Resources Division (CRD) staff initiated a special dockside data collection effort to increase Red Snapper length and age data for the recreational fishery. In that same year we also encouraged all anglers to donate their Red Snapper carcasses to our established carcass project. The dockside sampling was initially a coordinated effort between two charter captains and CRD staff and was later modified to incorporate more locations and captains. All other programs were initiated when mini-seasons for Red Snapper were first introduced in 2012. The timing of these mini-seasons were sporadic and occurred anywhere from July to November from 2012 to 2014 and 2017 to 2024. Due to the short nature of the seasons, ranging from one to nine days, it would be difficult to capture catch and effort data using existing recreational surveys. The goal of these programs was to incorporate additional methods to capture more catch, effort, lengths and ages. Different strategies were used to collect data from the for-hire and private recreational fleets.

For-hire

GA Telephone catch and effort survey:

Telephone interviews were conducted with eligible for-hire vessel operators (e.g., licensed for-hire captains who were known to be actively fishing and operated a vessel with a current South Atlantic Snapper-Grouper CH/HB permit). The purpose of the survey was to collect catch and effort data for all trips targeting Red Snapper during the open season. Captains were notified in advance that they would be contacted. For 2012 and 2013, calls were placed on the Monday following the fishing weekend, and repeated attempts were made throughout the week until the captains were reached. Starting in 2014, calls were initiated the Monday following the last week of fishing. Data included whether the trip targeted Red Snapper, number of anglers, number of fish released, and number of fish harvested. The number of eligible vessels, in which a captain had a For-Hire license in GA and a South Atlantic Snapper-Grouper CH/HB permit for the vessel, for the telephone survey ranged from 17 to 43 vessels with an average response rate of 88% (Table 4.10.1). The telephone catch and effort survey was discontinued when the SEFHIER program was created in 2021. Asking captains to participate in the For-Hire Telephone Survey, a mandatory logbook plus this extra telephone survey was believed to be too burdensome on the captains and would be duplicative to data already collected in the logbook.

- Catch and Effort estimation: For years when a complete census of eligible for-hire vessels was not possible, survey responses from the Telephone catch and effort survey were used to estimate the total number of charter boat trips targeting Red Snapper, angler trips, and the number of Red Snapper harvested and discarded. The steps used to calculate the total boat trips, angler trips, and numbers of fish harvested and released for each year were:

Total boat trips = mean reported trips per boat * total eligible vessels
Total angler trips = mean reported anglers per trip * total boat trips
Number Harvested = total angler trips * mean reported harvest per angler
Number Released = total angler trips * mean reported discard per angler

Uncertainty: Standard error for all estimated parameters (number harvested, number released, total boat trips and total angler trips) are computed directly from the respective raw survey data for each year.

Dockside sampling:

From 2009 forward, staff coordinated with several for-hire captains to meet them on site when trips returned with Red Snapper to collect trip data and biological samples. Staff also coordinated with SRHS port samplers to avoid duplication of sampling effort. Port samplers received priority for sampling the headboat fleet and CRD only collected samples on days the port sampler was not on site. Data were provided to this assessment as an alternative source of landings for timeframe after the telephone survey was discontinued. Information from dockside sampling are raw data, not estimates, and may not be an accurate representation of the charter fleet catch each year. Estimates of uncertainty are not available for these data.

Marine Sportfish Carcass Recovery Project:

Data were provided to this assessment as an alternative source of landings for timeframe after the telephone survey was discontinued. Discard information from this project was only provided if applicable information was provided on the card. Information from the carcass project are raw data, not estimates, and may not be an accurate representation of the charter fleet catch each year. Estimates of uncertainty are not available for these data.

Private Boat

Voluntary Angler Electronic Catch Survey (via Survey Monkey):

Anglers were asked to complete a voluntary electronic catch survey for any fishing trips that targeted Red Snapper. Each completion of a survey represented one vessel trip. Data elements included trip date and duration, trip departure location (public or private access point), depth fished, artificial reef if applicable, number of anglers, number and size of harvested fish, number and size category (12-16 in, 16-20 in, >20 in) of released fish, and whether the harvested fish were donated to a CRD carcass freezer. Gift cards were offered as an incentive to participate. The survey was discontinued once MyFishCount web portal was created in 2017. Data is shown as reported without validation and have not been expanded. These numbers are not likely an accurate representation of catch for recreational anglers fishing from private vessels. Estimates of uncertainty are not available for these data.

Dockside sampling:

Private boats were sampled opportunistically while staff were on site to collect for-hire samples. Tournament sites, where Red Snapper were targeted, were added to the biological sampling plans in 2018, 2019 and 2020. Data were provided to this assessment as an alternative source of landings. Information from dockside sampling are raw data, not estimates, and may not be an accurate representation of the private recreational fleet catch each year. Estimates of uncertainty are not available for these data.

Marine Sportfish Carcass Recovery Project:

Data from the carcass program were provided to this assessment as an alternative source of landings and discards. Discard information is only provided if applicable information was provided on the card. Information from the carcass project are raw data, not estimates, and may not be an accurate representation of the private recreational fleet catch each year. Estimates of uncertainty are not available for these data.

### 4.3.5.2 GADNR Landings

*Charter*
Number of harvested Red Snapper are available from the Georgia Telephone Catch and Effort Survey from 2012 to 2020. Raw data was expanded to create an estimate for non-reporting when 100% census was not achieved. Only 2012 had full participation by all eligible captains/vessels and were not expanded (Table 4.10.1). After the telephone survey was discontinued, the only available landings data were a combination of dockside sampling and donated carcasses (Table 4.10.2).

*Private*
From 2012 to 2014 landings are provided through the Voluntary Angler Electronic Catch Survey. For 2017 through 2024, landings provided were supplied via a combination of dockside sampling and donated carcasses (Table 4.10.2). Data provided from electronic survey and carcass program are raw data, not estimates, and may not be an accurate representation of the private recreational catch each year.

### 4.3.5.3 GADNR Discards

*Charter*
Number of released Red Snapper are available from the Georgia Telephone Catch and Effort survey from 2012 to 2020. Raw data was expanded to create an estimate for non-reporting when 100% census was not achieved. Only 2012 had full participation by all eligible captains/vessels and were not expanded (Table 4.10.1). After the telephone survey was discontinued, the only available discard data was from the carcass program if the captain included released fish on the card. Only one boat trip provided this information in 2021 and is not shown in the table due to confidentiality (Table 4.10.3).

*Private*
From 2012 to 2014 discards are available from the Voluntary Angler Electronic Catch

Survey. For 2017 through 2024, number of discards is from information included on the carcass card from the Marine Sportfish Carcass Recovery Project (Table 4.10.3). Data provided from electronic survey and carcass program are raw data, not estimates, and may not be an accurate representation of the private recreational catch each year.

*4.3.6 South Carolina Department of Natural Resources (SCDNR)*

**4.3.6.1 Program Description**

*Charter*

*SCDNR Charterboat Logbook Program:* The SCDNR Charterboat Logbook Program is a mandatory trip-level reporting system, with compliance tracked monthly for licensed state only vessels and weekly for dually licensed/federal permitted vessels. Failure to comply with reporting requirements may result in a misdemeanor if SCDNR Law Enforcement tickets are adjudicated. These data ideally represent total catch and effort of 6-pack charter trips off South Carolina with a census data collection effort, although the data is self-reported with limited field validation.

*Private*

*State Finfish Survey (SFS):* The SFS collects finfish intercept data in South Carolina through a non-random intercept survey at public boat landings along the SC coast. The survey focuses on known productive sample sites, targets primarily the private boat mode, and was conducted year-round (January-December) from its inception through 2012, after which time the SFS was only conducted in wave 1 (January-February). The survey uses a questionnaire and interview procedure similar to the MRIP dockside intercept survey. Mid-line lengths were measured from 1988 to March 2009, but total lengths have been measured since April 2009.

*Marine Recreational Information Program (MRIP):* SCDNR began collecting MRIP data in waves 2-6 in March 2013. In 2025, SCDNR ceased SFS and began wave 1 sampling through catch assignments associated with MRIP. This effort will continue; however, it is unknown when NOAA Office of Science and Technology will be able to begin the effort survey for wave 1 in South Carolina.

**4.3.6.2 SCDNR Landings**

South Carolina landings used in SEDAR 90 are from various data collection efforts. Landings data from the charter sector are provided by the SCDNR Charterboat Logbook Program. Landings data from the private sector are provided by MRIP. In certain years no MRIP data was available and state carcass collection data was supplemented.

*Charter*

The number of harvested red snapper are collected via SCDNR Charterboat Logbook Program. All licensed charter vessels are required to submit mandatory trip-level logbooks. Staff perform ample outreach efforts to support the accuracy and validity of the fishing trip data reported, and couple that with internal data quality assurances/checks.

*Private*

Landings data are collected through dockside sampling efforts by way of the Marine Recreational Information Program. These efforts may collect biological data (finfish lengths and otoliths) along with catch information.

*Carcass Collection Programs*

Recreational anglers are encouraged to donate red snapper to SCDNR through a carcass collection program during open fishing seasons to obtain biological samples. There are typically seven designated freezers located throughout coastal South Carolina dedicated for this effort. Standardized catch cards are provided at each location for anglers to provide contact and fishing trip information, including name, phone/email, vessel registration, trip type, date of catch, fishing location (lat/long), water depth, additional catch of Red Snapper if no carcass was donated, number of released fish, and use of descending devices or barotrauma mitigation tools. The carcasses are later processed, including length measurements and otolith removal and those data are included in the Life History Working Groups analysis.

#### 4.3.6.3 SCDNR Discards

South Carolina discards used in SEDAR 90 are from various data collection efforts. Discard data from the charter sector are provided by the SCDNR Charterboat Logbook Program. Discard data from the private sector are provided by MRIP.

*Charter*

The number of released Red Snapper are collected via SCDNR Charterboat Logbook Program. All licensed charter vessels are required to submit mandatory trip-level logbooks. Staff perform ample outreach efforts to support the accuracy and validity of the fishing trip data reported, and couple that with internal data quality assurances/checks.

*Private*

Discard data are collected through dockside sampling efforts by MRIP.

### *4.3.7 North Carolina Division of Marine Fisheries (NCDMF)*

#### 4.3.7.1 Program Description

In September 2012, the N.C. Division of Marine Fisheries (NCDMF) began a pilot carcass collection program in conjunction with the mini seasons of the South Atlantic Red Snapper recreational fishery. The goal of the pilot program was to collect biological information needed for the SEDAR 41 stock assessment. Data collection efforts from the pilot program continued during the 2013 and 2014 mini seasons. Chest freezers were placed at eight locations throughout the state based on focal points for Red Snapper effort. The northernmost site was Hatteras, NC while the southernmost site was Calabash, NC. This pilot program demonstrated that a collection program properly conducted and managed is an excellent source of length, age and sex data for recreationally important finfish for use in stock assessment models.

NCDMF received grant funding to expand the pilot program statewide during the

2014/2015 fiscal year. The primary focus was enhanced data collection for state-managed recreational species of importance, but NCDMF continued to use the carcass program for Red Snapper data collection during the mini seasons. The NCDMF Carcass Collection Program deploys chest freezers throughout coastal NC at bait and tackle shops and charter/headboat fishing centers where recreational anglers can deposit fish carcasses. The number of locations available for donations has expanded from the original eight sites used during the pilot program. During the Red Snapper mini seasons NCDMF supplements the designated carcass collection sites with additional chest freezers and coolers to increase donation opportunities. All freezer locations are stocked with a supply of heavy-duty plastic bags, bag ties, catch cards and informational pamphlets (explaining program purpose, fish identification, etc.). Catch cards ask anglers to provide information on fishing mode, water depth, water body, and species harvested and discarded.

The information collected through this program represents nominal numbers only. Due to lack of effort information collected, these numbers cannot be expanded.

#### 4.3.7.2 NCDMF Landings

A total of 877 Red Snapper carcasses were collected between 2012 and 2024 (Table 4.10.4), from 207 trips (or number of catch cards received). In 2024, no samples were collected as weather during the one-day season prevented anyone from fishing; this is also reflected in the MRIP sampling. While effort is made to collect samples from all recreational fishing modes, most samples collected have come from the charter and headboat modes each year (Table 4.10.5). For years were Charter samples have been collected, Charter samples accounted for 6 – 52% of samples annually. Headboats have accounted for 31 – 100% of samples annually. Private recreational have accounted for 0 – 20% of samples annually. Additionally, in 2014 (n=66), 2018 (n=3), 2019 (n=1), and 2020 (n=1) there are samples that could not be attributed to a particular fleet and are recorded as recreational unclassified. In 2018 (n=1), 2019 (n=3), and 2022 (n=2) there were carcasses donated outside of the mini season (Table 4.10.4).

#### 4.3.7.3 NCDMF Discards

Anglers have the ability to report the number of Red Snapper that they discard on the catch cards. The number of reported discards annually has ranged from 0 to 27 fish (Table 4.10.4). However, this information is not always filled out on the catch, and it is hard to determine the accuracy of these totals.

### *4.3.8 Southeast For-Hire Integrated Electronic Reporting (SEFHIER)*

#### 4.3.8.1 Program Description

The Southeast For-Hire Electronic Integrated Reporting (SEFHIER) program was implemented to improve timeliness and accuracy of data from the for-hire fleet, by using a census approach to improve catch statistics used to monitor and manage federal fisheries under the purview of the South Atlantic Council. While the purview of the federal fisheries under the South Atlantic Council extends through Maine for certain permits, this report is limited to the waters off of Florida through North Carolina. Federally permitted for-hire vessels not selected for the Southeast Region Headboat Survey (SRHS) program, are required to submit weekly trip level or no-fishing reports to SEFHIER through an approved electronic application. Logbook records that provide fishing information include: trip start and end dates/times, end port, vessel and captain information, number of angles, number of crew, fishing method, hours fished, primary fishing depth, common name and count for each species kept or discarded, charter fee, fuel used, and fuel price per gallon. SEFHIER vessel reporting has been required since January of 2021, however, this year is considered a "burn-in" year due to very low compliance. Therefore, this report only includes data from trips that occurred between 2022 and 2024. All trip reports that landed or discarded Red Snapper in the South Atlantic region from North Carolina through the east coast of Florida (Duval through Miami-Dade County), were subset to aggregate catch statistics for SEFHIER vessels (data provided March 20, 2025).

#### 4.3.8.2 SEFHIER Landings

SEFHIER self-reported landings records correspond with observed harvest (MRIP type A catch) only. These retained catch values were summed annually for the South Atlantic region from 2022 to 2024 (Table 4.10.6). Additionally, Wave 4 and the federal Red Snapper mini-season retained catch were aggregated for each year (Figure 4.11.1).

#### 4.3.8.3 SEFHIER Discards

SEFHIER self-reported discard records correspond with unobserved harvest (MRIP type B1 catch) and live releases (MRIP type B2 catches). These discard values were summed annually for the South Atlantic region from 2022 to 2024 (Table 4.10.6). Additionally, Wave 4 and the federal red snapper mini-season discards were aggregated for each year (Figure 4.11.1).

#### 4.3.8.4 Utility of SEFHIER Estimates

While SEFHIER was designed as a census, low compliance from SEFHIER participants introduces uncertainty in whether the SEFHIER logbooks fully represent all fishing activity from participants. SEFHIER estimates were compared to MRIP Charter estimates, aggregated at the vessel level, to investigate any difference in magnitude between the SEFHIER reports and current estimates from the most comparable recreational fleet. Annually, MRIP estimates a much higher number of Red Snapper vessel trips, as compared to SEFHIER, but show similar trends in fishing pressure throughout the year (Figure 4.11.2). Some of the difference in magnitude between vessel trip estimates for MRIP vs SEFHIER may be attributed to the inclusion of state permitted charter trips in the estimation for MRIP. Despite these differences, both programs have the highest estimates or reports of Red Snapper trips in summer months (May-August). MRIP charter catch data from the ACL monitoring file (MRIP FES ACL file, downloaded February 25, 2025) was aggregated from 2022 to 2024, to match the retained and discard catch dispositions reported in SEFHIER logbooks for the same time period. Wave 4 catch data was compared between the two programs, to investigate differences at the finest temporal scale available for both programs, when the short federal season is open (Figure 4.11.3). Overall, the SEFHIER and MRIP programs show similar trends in the effort distribution throughout the year, similar magnitudes of retained Red Snapper in Wave 4 in recent years, but vastly different magnitudes of reported discards as compared to MRIP estimates.

The SEFHIER program has suffered from low compliance in the South Atlantic region since its inception. A large proportion (>50%) of SEFHIER vessels report late, and more than half of federally permitted SEFHIER vessels that do report, submit “Did Not Fish” reports in each month of the calendar year (Figure 4.11.4). These low reporting compliance rates undercut the value of the data provided by SEFHIER vessels, as a census count of charter fishing effort in the South Atlantic region. The aggregated counts of retained and discarded Red Snapper reported by the SEFHIER fleet do not have an accompanying trip or effort validation survey that can be used to correct for mis- or non-reporting. The lack of a trip validation method also limits the availability of biological data to describe the size, weight and age of the fish retained by SEFHIER participants, inhibiting the ability to generate an estimate of the weight and age distribution of Red Snapper retained by the fleet. In a letter to the South Atlantic Council, both SERO and the Southeast Fisheries Science Center (SEFSC) stated that SEFHIER program data should not be used for science or management due to low compliance and lack of independent validation. Without independent validation, the data cannot be evaluated for representativeness nor can the magnitude or direction of any biases be determined**.** It is recommended that the data should be used only in a qualitative nature as SERO and SEFSC indicated in the letter to the South Atlantic Council that SEFHIER does not represent best scientific information available.

### *4.3.9 Exempted Fishing Projects (EFP)*

#### 4.3.9.1 Program Description

The Atlantic Red Snapper Exempted Fishing Permit Projects (EFP) are three projects that began in August 2024 and aim to collaborate with recreational anglers to test alternative management strategies and collect more detailed catch and discard data for the snapper grouper complex through mandatory electronic reporting. Each of the projects creates an experimental fishing fleet that operates differently than the general recreational fishery for Red Snapper.

The Hot Spot Fleet Project occurs in the area extending from the Florida/Georgia line south to Cape Canaveral. The Southeast Fleet Project is very similar to the Hot Spot Fleet Project, except it is conducted in the area extending from Cape Canaveral south to the Atlantic side of the Florida Keys. In both projects, participants are selected by random lottery draw to participate as part of the 1) experimental group testing out an alternative management strategy and may keep up to three Red Snapper per trip (100 participants per quarter), but otherwise must adhere to all current state and federal regulations or the 2) control group that must fish under all current state and federal regulations and may not keep any Red Snapper (100 participants per quarter). Each participant in the Hot Spot Fleet can take up to three trips per quarter. Participants in the Southeast Fleet can take up to two. The exempted fishing permit is provided to all experimental group participants and exempts them from Atlantic Red Snapper recreational season closures and bag and possession limits. FL FWC also issues each experimental participant a Special Activities License (SAL) that exempts them from Atlantic Red Snapper recreational season closures, bag limits, and size limits in state waters within the project region. Gear for all projects is limited to hook and line only.

For each trip, the participant must hail out, report detailed information about their fishing trip in the reporting system after the trip is completed and allow a biologist to sample their catch when they return. Biologists attempt to sample as many trips taken by participants in each of these projects as possible, with a goal of 20% of trips intercepted. In 2024, an average of 49% of trips were intercepted when they returned to the dock. During the dockside intercept, all harvested Red Snapper are measured (fork length in mm) and an otolith is extracted.

The third project is the Hot Spot Full Retention Study Fleet. Five charter captains and five private boat captains are selected to participate each quarter and can take up to four trips per quarter. Participants for this project are selected based on several criteria including the area intended to be fished, vessel type, homeport of the vessel, as well as comprehensive answers to application questions. All participants in this project must fish under the alternative management strategy. Participants are instructed to keep all Red Snapper (full retention) while fishing under the alternative management strategy. Participants must stop bottom fishing when they reach 36 Red Snapper per vessel per trip or if they reach the alternative management strategy snapper grouper bag limit, whichever comes first. Participating private boat captains are required to hail out and report detailed fishing information in the reporting system for each trip. They also record every trip using a temporary electronic monitoring system (i.e. two cameras, GPS, and recording device) and a biologist samples all harvested fish when they return to the dock. Participating charter captains have the same requirements, also record their trips using a temporary electronic monitoring system and carry observers for all trips taken as part of the project. The observers also sample all harvested fish when they return to the dock. Like the other two projects, all harvested Red Snapper are measured (fork length in mm) and an otolith is extracted.

### 4.3.9.2 EFP Landings

From August 13, 2024 to December 31, 2024, 151 participants took 236 total fishing trips as part of the EFP project. Table 4.10.7. shows the number of completed trips by project and group type. Reporting is mandatory for all participants and compliance is high (94%). A total of 2,153 red snapper were reported harvested by project participants during this time. Table 4.10.8 shows the number of reported Red Snapper harvest by project and group type. Harvested Red Snapper were validated by at-sea observers for the Hot Spot Full Retention Study Fleet charter trips and via dockside intercepts by biologists for 49% of remaining trips. Preliminary analysis shows high agreement between the number of Red Snapper reported by the participant and the number of Red Snapper observed by the biologists.

Red Snapper harvested by the project ranged in size from 261 to 873 mm FL and in age from 1 to 25 years. Length and age compositions vary by project and group type and were found to be different from the general recreational fishery age and length composition.

***Task 4a:*** The RWG recommended to include EFP landings with the Gen Rec landings time series. Some EFP project trips were intercepted by MRIP and SRFS dockside samplers. The Recreational Working Group recommended excluding data from these intercepted EFP trips when generating MRIP or SRFS landings or discard estimates to ensure these fish are not double counted.

#### 4.3.9.3 EFP Discards

Validation steps for Red Snapper discards from the EFP projects are not finalized and therefore this data is not available for use in the stock assessment.

### *4.3.10 Historical Landings (FHWAR)*

*Introduction*

The historic recreational landings time period is defined as pre-1981 for the charter, headboat, and private fishing modes, which represents the start of the Marine Recreational Information Program (MRIP) and availability of landings estimates for Red Snapper. The Recreational Working Group was tasked with evaluating historical sources and methods to compile landings estimates for Red Snapper 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 90-DW-11). 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 South Atlantic saltwater anglers. Landings estimates from modern surveys (e.g. MRIP, SRFS, SRHS) were used to calculate the mean CPUE from 1981 to 1983 for Red Snapper. The mean CPUE is applied to the historical effort estimates for South Atlantic saltwater anglers to provide estimates of recreational Red Snapper landings prior to 1981.

***Task 5:*** The SEDAR 90 RWG reviewed the FHWAR census method and preliminary estimates. The recreational workgroup recommended using the historical estimates calculated using the FHWAR census method for all fleets for 1955-1977 and only for the Gen Rec fleet for 1978-1980.

As done in SEDAR 41, historical landing estimates from the FHWAR census method were calculated using the mean CPUE from 1981 to 1983. A 12-inch minimum size limit for Red Snapper was enacted in the Fall of 1983 (SEDAR 90-WP-01). The 1981 to 1983 year range was deemed to be most representative of the historic period because of the minimal amount of overlap with management regulations.

The RWG recommended only using the historical estimates from the FHWAR census method through 1977 for the headboat fleet. From 1972 to 1977, SRHS only covered portions of the South Atlantic. Beginning in 1978, SRHS covered the entire South Atlantic (NC - south FL) and complete headboat landings for the entire region are available. The RWG recommends calculating the mean proportion of headboat landings to the total (headboat + charter + private) recreational landings from 1981 to 1983 and using this proportion to remove headboat landings from the historical estimates calculated from the FHWAR census method for 1978 to 1980.

Historical landings are shown in Table 4.10.9.

### *4.3.11 Evaluation of MRIP and SRFS for Florida Private Mode Catch*

The RWG was tasked with evaluating whether MRIP or SRFS estimates should be used to inform landings (except during mini seasons) and discards for the private boat mode in Florida and discussed the strengths and weaknesses of both surveys. MRIP is a large-scale survey that was designed to produce recreational catch estimates at the wave (i.e. 2-month) level. The general approach of the MRIP survey allows for data collection over large (regional) scales and does not limit sampling to a subset of species or recreational anglers (e.g. only reef fish). SRFS expands upon MRIP and collects additional dockside intercepts at sites where reef fish have been historically intercepted more frequently. Additionally, SRFS conducts a separate effort survey that only samples anglers with a reef fish designation that is mandatory for anglers targeting 13 reef fish species (see section 4.3.3) in Florida waters.

One strength of using MRIP FES estimates for the Florida private mode instead of SRFS is MRIP estimates are the source of private catch data for all other South Atlantic states, and catch estimates across the South Atlantic would be in consistent units (except for mini season). The center of Red Snapper distribution in the South Atlantic is off of northeast Florida. When using MRIP data for the Florida private mode, removals from Florida have always exceeded the combined removals from North Carolina, South Carolina, and Georgia (Figure 4.11.5). This pattern does not change if SRFS catch is substituted for MRIP private catch estimates in Florida, but the relative contribution of Florida to overall catch is reduced and this change is more pronounced for landings than discards (Figure 4.11.5). Some RWG members expressed concerns about the perceived change in spatial pattern of private boat catch when using SRFS instead of MRIP for the Florida private mode, which is likely more reflective of differences in survey units than a real spatial pattern in catch.

The RWG discussed the results of the pilot study (NMFS OST 2023) released by OST in 2023. This study showed that telescoping error is the predominate form of measurement error in the current FES design which likely overestimates fishing effort for all states. The pilot study also suggested the bias is relatively small for the east coast of Florida, but it is unclear if these results will hold when the full study and updated FES numbers are released. The RWG expressed concerns about the potentially large bias in MRIP FES catch estimates and also discussed the plan to update the assessment with updated FES estimates after they are released (expected in the Spring of 2026). The plan to update the assessment with new numbers mitigated concerns for some RWG members about the potential bias in MRIP identified from the pilot study. Some RWG members also expressed concerns about using MRIP because of the negative perception many anglers have right now about MRIP FES because of the pilot study and their potential frustration in continuing to use MRIP FES when other data (e.g. SRFS) are available.

One strength for using SRFS private catch data instead of MRIP is the specialized nature of SRFS. The sampling frame from SRFS focuses exclusively on a suite of 13 reef fish species and conducts additional dockside sampling at sites where the probability of intercepting reef fish is high. The increased number of intercepts (Table 4.10.10), especially for discarded Red Snapper, was seen as another advantage of choosing SRFS, since reef species are not typically sampled as well by MRIP when compared to nearshore species.

The SRFS effort survey was discussed at length during the SEDAR 90 Data Workshop. The RWG thought the survey being distributed monthly was an advantage over the MRIP FES and reduced the potential for telescoping error. The specialized focus of the SRFS effort survey on reef fish was seen as both a strength and weakness among different RWG members. Some members expressed concern about the potential of undercoverage for the SRFS sampling frame and how fishing effort targeting other species, such as Black Sea Bass, may constitute a sizable portion of Red Snapper catch (e.g. discards) that would be missed in the SRFS survey design. An additional analysis was conducted during the Data Workshop to evaluate the potential for undercoverage in the SRFS effort survey. Using MRIP APAIS intercept data, the top 10 most frequently caught (landings and discards) species co-occurring with discarded Red Snapper off the east coast of Florida were identified. Five of the top 10 species co-occurring with discarded Red Snapper are not included as a specific target species in the SRFS dockside survey (Table 4.10.11). There was discussion that the data from these trips would most likely still be captured because these species are most likely being captured with a reef fish species that is included in the SRFS effort survey. The target species and species caught are all taken into consideration for the SRFS effort survey, which is sent to anglers with the SRFS designation. The SRFS designation is a free, but required add-on for Florida anglers who intend to or may incidentally catch any of the fish in our reef fish suite. There is an undercoverage adjustment that is applied during the estimation process to account for harvest from anglers that do not have a SRFS designation on their saltwater license and this undercoverage adjustment was designed to mitigate effects on effort when anglers are targeting co-occuring species, but catching SRFS species.

There is an approved method to calibrate Florida private mode estimates between MRIP and SRFS currencies. A ratio for each estimate type (e.g. landings in numbers, discards) is developed by dividing the summed (across years) SRFS estimate by the summed MRIP estimates and this ratio is then multiplied by the MRIP estimate to produce an MRIP estimate that is in calibrated SRFS units. The calibration ratio for Red Snapper discards was similar to ratios seen for other fish species, however the ratios for landings (numbers and pounds) is much smaller than those observed for other species (SEDAR 90-DW-19). This difference is most likely the result of neither MRIP or SRFS being designed to sample pulse fisheries. Some RWG members expressed concerns that the calibration ratio being applied to landings data could be inaccurate because of this.

When directly comparing MRIP and SRFS estimates, there were a few points that were highlighted. The first is that the estimates for landings (numbers and pounds), discards, and effort were very similar for 2021 but have deviated from each other from 2022 to 2024 (Figure 2 in SEDAR 90-DW-19). The relative trends are also different between the MRIP and SRFS estimates. MRIP is showing an increasing trend for landings, discards, and effort from 2021 to 2024 while SRFS estimates are showing declining trends. The RWG highlighted that MRIP discard estimates for South Atlantic Red Snapper from Florida private anglers were relatively imprecise, with uncertainties over those years that overlap the SRFS (2021-2024) below the National Standard (i.e., CV < 0.5) but high enough to warrant caution in their use (i.e., CV ~ 0.3). Conversely, uncertainties in SRFS discards were lower over these years, having an average CV = 0.19.

The main criticism of using the SRFS data for the Florida private mode was the lack of consistency in units with the other states' data for landings outside of the mini season and discards. Some RWG members felt the mixed currency approach introduced more bias and were worried about the trends being different between SRFS and MRIP. Other RWG members felt that SRFS is more representative of the actual landings and discards in Florida and the precedent for mixed currencies has already been set with South Atlantic Red Snapper because of the use of mixed currencies, in past assessments, to inform catch since the onset of the mini seasons. The precedent has also been set to use SRFS estimates for Florida centric species (e.g. Gulf of America Red Grouper, Florida Mutton Snapper) and prior to the onset of the mini seasons in 2012 Florida private landings accounted for an average of 94% of the landings in the South Atlantic.

***Task 6****:* The RWG recommends using SRFS estimates for landings (except during mini seasons) and discards for 2021-2024 and MRIP estimates calibrated to SRFS for 1981-2020 for the private boat mode in Florida. This decision was not unanimous among the RWG members because of concerns associated with mixing MRIP and SRFS currencies for the private mode. The RWG also recommends that a sensitivity run be conducted using MRIP FES estimates instead of SRFS for the Florida private boat mode (except during mini seasons). After the data workshop, the lead analysts requested two additional time series due to the lack of consistency across the spatial region. The additional requested time series are described in 4.3.15.

*4.3.12 Mini Season Landings and Discards*

*Introduction*

In 2009, an interim rule was enacted to prohibit harvest of Red Snapper from January 4, 2010 to June 2, 2010. This rule was extended until December and an emergency rule was used to prohibit harvest through 2011. In 2012-2014 and 2017-2024, emergency rules were used to re-open the fishery for very short durations ranging from one to nine days long (Table 4.10.12). The key issue is that neither MRIP or SRFS were designed to capture short pulses of fishing. MRIP is designed to capture 2-month intervals (waves) of landings, discards, and effort, while SRFS is designed to capture 1-month intervals. When a short opening occurs in a fishery, it is unlikely that MRIP or SRFS will adequately capture the event during its random sampling. Additionally, if MRIP or SRFS happen to capture the event, the mini season catch rate will be scaled up by the total effort across that wave (MRIP) or month (SRFS) and not just the pulse effort associated with the short mini season.

For SEDAR 90, state and federal partners in the South Atlantic supplied data from studies conducted in each state during the 2012-2024 mini-seasons to supplement the MRIP and SRFS data. Brief synopses of the type of data provided are described in the above sections. Full descriptions of methods and data collected are available in the working papers SEDAR90-DW03 (MRIP), SEDAR90-DW18 (ECRS), SEDAR90-DW19(SRFS), SEDAR90-DW26 (GA), and SEDAR90-RD31 (SEFHIER).

The sources of mini-season data that were reviewed for potential use are as follows:

- Marine Recreational Information Program (MRIP)
- North Carolina Division of Marine Fishers (NCDMF) carcass collection data
- South Carolina Department of Natural Resources (SCDNR) charter logbook and carcass collection data
- Georgia Department of Natural Resources (GADNR) charter telephone survey, voluntary private angler survey, targeted dockside sampling and carcass collection data
- Florida Fish and Wildlife Conservation (FWC) Commission State Reef Fish Survey (SRFS)
- FWC East Coast Red Snapper (ECRS)
- Southeast For-Hire Integrated Electronic Reporting (SEFHIER) Program

During SEDAR 41 (SEDAR 41-DW-27), the RWG developed a set of guidelines to determine which data set was more appropriate for landings by state (NC, SC, GA, and FLE), mode (charter and private), and wave (1-6). This decision tree was also applied in SEDAR 73 (SEDAR 73-DW-10) and is provided below:

*Option 1*: Use State number if no MRIP number is available, making note of any potential bias
*Option 2*: Use MRIP number if no State number is available
*Option 3*: Use the estimate/number (MRIP or State) that is more reliable (considering sample sizes, variability, and/or biases associated with the survey) when both MRIP and State numbers were available.

***Task** 7:* The RWG was tasked with evaluating whether to use a new approach in selecting recreation catch estimates for years with Red Snapper mini-seasons or to continue applying the decision tree used in SEDARs 41 and 73. The RWG recommended to continue using the decision tree for SEDAR 90. The RWG did modify the decision tree though to reflect new data sources that were available for SEDAR 90. For the private mode in Florida, SRFS (and MRIP calibrated to SRFS) was considered instead of MRIP. For the charter mode, SEFHIER estimates were considered as a minimum due to compliance issues and were only selected if no other estimate (e.g. MRIP For-Hire or state survey) was available.

As a general overview of the decisions made by the SEDAR 90 RWG:

- SEFHIER: Designed to be a census of for-hire vessels, the SEFHIER program has suffered from low compliance since its inception in January of 2021 and is likely to underestimate true catch (SEDAR 90-DW-31). No validation approach currently exists to evaluate these concerns with SEFHIER, which also does not collect biological samples (e.g., of fish size) or estimate uncertainty. Additionally, the SEFHIER fleet does not include for-hire vessels permitted solely in state waters, a mismatch for the MRIP data used in prior assessments to represent the charter mode. For-hire estimates from

SEFHIER were only selected when no other (non-zero) estimate was available for a given strata. For those strata where SEFHIER estimates were used, the associated uncertainty was assumed to have a CV = 1.0.

- North Carolina: Estimates from MRIP were favored over those from the NCDMF carcass collection program, the latter being a count of observed fish. For those strata where NCDMF carcass counts were used (i.e., only available), the associated uncertainty was assumed to have a CV = 1.0.
- South Carolina: Charter estimates from the SCDNR Charter Logbook program were selected over those from MRIP. The logbook program is considered a census, for which uncertainty estimates are not available. All estimates selected from SCDNR charter logbooks were assumed to have a CV = 0.01. Private estimates from MRIP were favored over those from dockside intercepts and the SCDNR carcass collection program, the latter being simple counts of observed fish. For those strata where SCDNR fish counts were used (i.e., only available), the associated uncertainty was assumed to have a CV = 1.0.
- Georgia: Charter estimates from the GADNR Charter Telephone Survey were selected over those from MRIP. The telephone survey is considered a census, and the associated estimates include an expansion to account for any non-response in the survey. GADNR estimates for years that did not require a non-response adjustment were assumed to have an uncertainty of CV=0.01. Estimates from MRIP were selected over all other GADNR datasets, the latter providing unexpanded counts of observed fish. For those strata where GADNR fish counts were used (i.e., only available), the associated uncertainty was assumed to have a CV = 1.0.

- Florida: Mini-season landings estimates from the ECRS were favored over those from SRFS. The ECRS was explicitly designed to sample the pulse fishery for Florida Red Snapper, and tends to have larger sample sizes and produce more precise estimates. With ECRS sampling limited to mini-seasons, ECRS discard estimates were not recommended for use as they only encompass the mini-season and not the entire month. MRIP estimates were favored for charter discards, and SRFS estimates were favored for private discards.

The updated decision tree used for SEDAR 90 is:

*Option 1*: Use State number if no MRIP number is available for charter mode, making note of any potential bias. For private mode, use state number if no MRIP (NC-GA) or SRFS (FL) number is available, making note of any potential bias.
*Option 2*: Use MRIP number if no State number for charter mode is available. Use MRIP (NC-GA) or SRFS (FL) number if no State number for private mode is available.
*Option 3*: Use the estimate/number (MRIP, SRFS, or State) that is more reliable (considering sample sizes, variability, and/or biases associated with the survey) when both (NC-GA MRIP/FL SRFS and State) numbers are available.
*Option 4*: Use SEFIER estimate when no other number is available for the charter mode. This estimate is considered a minimum due to compliance issues.

Most decisions from SEDARs 41 and 73 were not updated by the RWG and are available from 2012-2014 are in (SEDAR 41-DW-27) and in SEDAR 73-DW-10 for 2017-2019. However, wave 4 charter estimates for Georgia in 2018 and 2019 from MRIP were replaced with numbers from the charter telephone survey. This decision was updated because Georgia has developed an expansion factor to adjust for non-responses and the estimates from the survey are now considered a census and were viewed as the more reliable estimate after this adjustment.

***Task 8a:*** All available numbers and the estimates selected for landings using the decision tree from 2012 to 2024 are shown in Table 4.10.13. The specific decisions for each state from 2020 to 2024 are provided below.

***North Carolina Landings Decisions*:**

*Option 1:*

- State Private – 2022 and 2023 Wave 4.

The private landings from NC were based on number of donated carcasses and are therefore not considered to be a random sample. These estimates are considered a minimum because the counts are not a census and have not been scaled-up into an estimate of total catch.

*Option 2:*

- MRIP Charter – 2020 Wave 4
- MRIP Charter - 2021 Waves 3 and 4
- MRIP Private – 2022 Wave 6

*Option 3:*

- MRIP Charter – 2023 Wave 4

The NC charter MRIP estimate was selected over the state number because the state number was based on donated carcasses and is therefore not considered to be a random sample.

*Option 4:*

- SEFHIER Charter – 2022 Waves 3 and 4. No MRIP charter estimates were available. These estimates are considered to be a minimum number of harvested fish because of compliance issues.

***South Carolina Landings Decisions*:**

*Option 1:*

- State Charter – 2021, 2022, and 2024 Wave 4
- State Private – 2021, 2022, and 2024 Wave 4
- State Charter – 2022 Wave 3
- State Charter – 2022 and 2023 Wave 5

The charter landings from SC were self-reported through the logbook program, without methods to validate the reported landings, but are considered to be a census of all charter captains that would have been fishing during the mini-season.

*Option 2:*

- MRIP Private – 2020 Wave 4
- MRIP Private – 2023 Wave 5

*Option 3:*

- State Charter – 2020 Wave 4

The state charter estimate was considered more robust because the estimate was based on logbooks from 44 vessels while the MRIP charter estimate was based on two charter boat surveys.

*Option 4:*

- None

***Georgia Landings Decisions*:**

*Option 1:*

- State Charter – 2020 Wave 4

GA charter estimates in 2020 were from the Charter Telephone Survey that includes an adjustment for non-responses. Estimates from this survey are treated as a census.

- State Charter – 2021, 2022, 2023, and 2024 Wave 4

The charter landings from 2021 to 2024 Wave 4 landings were based on number of donated carcasses and are therefore not considered to be a random sample.

*Option 2:*

- None

*Option 3:*

- MRIP Private – 2020, 2021, 2022, 2023, and 2024 Wave 4

The GA private MRIP estimate was selected over the state number because the state number was based on donated carcasses and is therefore not considered to be a random sample or a representative estimate for the private recreational fleet.

*Option 4:*

- SEFHIER Charter – 2024 Wave 1

No MRIP charter estimate was available. This estimate is considered to be a minimum number of harvested fish because of compliance issues.

***Florida Landings Decisions*:**

*Option 1:*

- none

*Option 2:*

- SRFS Private – 2021 and 2023 Wave 1
- SRFS Private – 2024 Wave 2
- SRFS Private – 2021, 2022, 2023, and 2024 Wave 3
- SRFS Private – 2023 and 2024 Wave 5
- SRFS Private – 2021, 2022, 2023, and 2024 Wave 6

*Option 3:*

- ECRS Charter – 2020, 2021, 2022, 2023, and 2024 Wave 4
- ECRS Private - 2020, 2021, 2022, 2023, and 2024 Wave 4

ECRS CH and PR estimates were selected for mini-season (wave 4) landings over SRFS due to larger sample sizes and robust survey methodology that included randomly selected intercept sites and weighted estimates. ECRS is explicitly designed to sample and produce estimates for the short pulse fishery. However, it was noted that ECRS could be an underestimate of recreational landings since there was no accounting for any fishing that may have occurred outside of the season.

*Option 4:*

- SEFHIER Charter – 2024 Wave 1
- SEFHIER Charter – 2022 Wave 2
- SEFHIER Charter – 2022 and 2024 Wave 5
- SEFHIER Charter – 2022 and 2024 Wave 6

No MRIP charter estimates were available. These estimates are considered to be a minimum number of harvested fish because of compliance issues.

***Task 8b:*** All available numbers and the estimates selected for discards using the decision tree from 2012 to 2024 are shown in Table 4.10.14. The specific decisions for each state from 2020 to 2024 are provided below.

***North Carolina Discards Decisions*:**

*Option 1:*

- none

*Option 2:*

- MRIP Charter – 2020, 2021, 2022, and 2024 Wave 2
- MRIP Charter – 2020, 2021, 2022, 2023, and 2024 Wave 3
- MRIP Charter – 2020, 2021, 2022, 2023, and 2024 Wave 4
- MRIP Charter – 2020, 2021, 2022, 2023, and 2024 Wave 5
- MRIP Charter – 2020 and 2021 Wave 6
- MRIP Private – 2020, 2021, 2022, and 2024 Wave 1
- MRIP Private – 2023 and 2024 Wave 2
- MRIP Private – 2020, 2021, 2022, 2023, and 2024 Wave 3
- MRIP Private – 2020, 2021, 2022, 2023, and 2024 Wave 4
- MRIP Private – 2020, 2021, and 2022 Wave 5
- MRIP Private – 2020, 2021, 2023, and 2024 Wave 6

*Option 3:*

- none

*Option 4:*

- SEFHIER Charter – 2023 and 2024 Wave 1
- SEFHIER Charter – 2023 Wave 2
- SEFHIER Charter – 2022 and 2024 Wave 6

No MRIP charter estimates were available. These estimates are considered to be a minimum number of discarded fish because of compliance issues.

***South Carolina Discards Decisions*:**

*Option 1:*

- State Charter – 2020, 2021, 2022, 2023, and 2024 Wave 1
- State Charter – 2022 and 2023 Wave 2
- State Charter – 2022 Wave 4
- State Charter – 2022 Wave 5
- State Charter – 2021, 2022, 2023, and 2024 Wave 6

The charter discards from SC were self-reported through the logbook program, without methods to validate the reported discards, and are considered to be a census of all charter captains that would have been fishing during the mini-season.

*Option 2:*

- MRIP Private – 2021 Wave 1
- MRIP Private – 2021 and 2024 Wave 2
- MRIP Private – 2020, 2021, 2022, 2023, and 2024 Wave 3
- MRIP Private – 2020, 2021, 2022, 2023, and 2024 Wave 4
- MRIP Private – 2020, 2021, 2023, and 2024 Wave 5
- MRIP Private – 2022 and 2026 Wave 6

*Option 3:*

- State Charter – 2020, 2021, and 2024 Wave 2
- State Charter – 2020, 2021, 2022, 2023, and 2024 Wave 3
- State Charter – 2020, 2021, 2023, and 2024 Wave 4
- State Charter – 2020, 2021, 2023, and 2024 Wave 5
- State Charter – 2020 Wave 6

The state charter estimates were considered more robust than MRIP because the state estimates are based on charter logbooks which provide information from more vessels and trips than were sampled by MRIP.

*Option 4:*

- none

***Georgia Discards Decisions*:**

*Option 1:*

- State Charter –2021 and 2022 Wave 4

The charter discards from GA were self-reported through the number of discarded Red Snapper recorded on carcass collection cards and are therefore not expanded into an estimate, does not cover the entire wave and is not considered to be a random sample.

*Option 2:*

- MRIP Charter – 2020, 2021, 2023, and 2024 Wave 2
- MRIP Charter – 2020, 2021, 2023, and 2024 Wave 3

- MRIP Charter – 2022 Wave 5
- MRIP Charter – 2020 and 2021 Wave 6
- MRIP Private – 2020, 2021, 2022, 2023, and 2024 Wave 2
- MRIP Private – 2020, 2021, 2022, and 2024 Wave 3
- MRIP Private – 2021 and 2024 Wave 5
- MRIP Private – 2020, 2021, and 2024 Wave 6

*Option 3:*

- State Charter – 2020 Wave 4

GA charter estimates in 2020 were from the Charter Telephone Survey which includes an adjustment for non-responses and these estimates are treated as a census. While the state survey only covers the mini-season dates and discards from the remainder of the wave are not included in this estimate, the state charter estimates were considered more robust than MRIP because the state estimates were based on larger sample sizes (e.g. trips) than MRIP estimates. The state charter estimate was also selected because the state charter estimate (n = 517) was larger than the MRIP (n = 19) estimate.

- MRIP Private – 2020, 2021, 2022, 2023, and 2024 Wave 4

GA private MRIP estimates were selected over the state number because the state number was based on self-reported discarded Red Snapper recorded on carcass collection cards and is therefore not expanded into an estimate, does not cover the entire wave and is not considered to be a random sample.

*Option 4:*

- SEFHIER Charter - 2022 Wave 1
- SEFHIER Charter – 2022 and 2024 Wave 6

No MRIP charter estimates were available. These estimates are considered to be a minimum number of discarded fish because of compliance issues.

***Florida Discards Decisions*:**

*Option 1:*

- none

*Option 2:*

- MRIP Charter – 2021, 2022, 2022, 2023, and 2024 Wave 1
- MRIP Charter – 2020, 2021, 2022, 2023, and 2024 Wave 2
- MRIP Charter – 2020, 2021, 2022, 2023, and 2024 Wave 3

- MRIP Charter – 2022, 2021, 2022, 2023, and 2024 Wave 5
- MRIP Charter – 2020, 2021, 2022, 2023, and 2024 Wave 6
- SRFS Private – 2020*, 2021, 2022, 2023, and 2024 Wave 1
- SRFS Private – 2020*, 2021, 2022, 2023, and 2024 Wave 2
- SRFS Private – 2020*, 2021, 2022, 2023, and 2024 Wave 3
- SRFS Private – 2020*, 2021, 2022, 2023, and 2024 Wave 5
- SRFS Private – 2020*, 2021, 2022, 2023, and 2024 Wave 6

*SRFS estimates for 2020 are derived by calibrating MRIP estimates to SRFS units

*Option 3:*

- MRIP Charter – 2022, 2021, 2022, 2023, and 2024 Wave 4
- SRFS Private – 2020, 2021, 2022, 2023, and 2024 Wave 4

MRIP Charter and SRFS Private estimates were selected over concerns ECRS would be an underestimate of discards. ECRS only provides estimates for mini season discards and with the short season duration (1-3 days), the majority of days in the wave (MRIP) or month (SRFS) would not be included in the estimate.

*Option 4:*

- none

*Uncertainty concerning data landings and discard data sources*

There was extensive discussion about which data source to choose when multiple data sources (e.g. MRIP, SRFS, state surveys) were available for an individual mode and wave. The merits and deficiencies of each data source were discussed at length for Red Snapper catch from 2020-2024. Several RWG members expressed concerns that MRIP is likely to overestimate mini season landings of Red Snapper because of expansion by effort from the entire wave. Each state survey was unique and there was little similarity in methods used. The only consistent method was the carcass collection program for anglers to donate their Red Snapper carcasses in NC, SC, and GA. A consistent comment concerning voluntary angler reported data, such as carcass collections, was it was likely to produce an underestimate since not all anglers who caught fish will participate. The SC logbook was a census of all charter captains that would have been targeting Snapper/Grouper species over an entire month/wave, but it was also noted these data are self-reported without validation and there may be some recall bias when logs are handed in one month after the fishing occurred. The GA charter telephone survey has a high response rate and recall bias is believed to be low because phone calls were made the Monday following the last weekend off fishing, but only collects data during the mini-season and, like SC, these are all self-reported data without validation. The ECRS charter private boat surveys directly targeted the mini-season and should be an accurate estimate of total catch and effort during the mini-season, but does not capture any catch from outside the mini-season. SEFHIER estimates should be considered minimum estimates because of persistent issues with compliance. Evidence of this is seen in South Carolina where SEFHIER estimates are typically lower than the SC Charter Logbook numbers which are considered a census. The RWG took all of these points under consideration when deciding which data to use.

### *4.3.13 Total Recreational Landings*

Combined landings estimates from all sources are shown in Table 4.10.15 and Figure 4.11.6 and mapped in Figure 4.11.7. The majority of the recreational landings in the South Atlantic come from the private mode (48.9%). The charter mode contributes about 33% and the headboat mode makes up the remaining 18% of recreational landings. Geographically, most recreational landings come from the southern region (80.9%), which includes eastern Florida and Georgia. Landings estimates were relatively high at the beginning of the time series, averaging about 140,000 fish annually from 1981 to 1989. Recreational landings remained low in subsequent years, averaging about 30,000 fish annually from 1990 to 1999 and about 70,000 fish from 2000 to 2007. Red Snapper harvest in 2008 and 2009 were similar to that in the 1980s, averaging 133,000 fish, after which managers limited harvest to distinct fishing seasons. Landings estimates from 2010 to 2017 averaged 10,000 fish, and 62,000 fish from 2018 to 2024.

*Uncertainty*

***Task 9a:*** 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 (e.g., SRHS logbook landings, MRIP landings data, ECRS and SRFS estimates, and assumed variances for catch estimates from other programs). Details of this approach are outlined in SEDAR 68-DW-31 and are applied to estimates of both landings-in-number and landing-in-weight. Uncertainties in landings estimates for the general recreational fleet were largely consistent over the first thirty years of the time series, with an average annual CV of 0.38 between 1981 and 2009. The annual CVs for mini-season years tended to be smaller, over which more precise estimates from other surveys (e.g., SRFS private, GADNR & SCDNR charter) were preferred over MRIP estimates. Similarly, uncertainties in headboat landings were also relatively high over the first thirty years of the time series, with an average CV of 0.42 between 1981 and 2007. This average CV dropped to 0.09 from 2008+, as reporting compliance increased in the SRHS logbook program.

### *4.3.14 Total Recreational Discards*

Combined discard estimates from all sources are shown in Table 4.10.16 and Figure 4.10.8 and mapped in Figure 4.10.9. The majority of the recreational discards in the South Atlantic come from the private mode (82.4%). The charter mode contributes about 10% and the headboat mode makes up the remaining 8% of recreational discards. Geographically, most recreational discards come from the southern region (94.1%), which includes eastern Florida and Georgia. Discard estimates were relatively negligible at the start of the time series, but seem to increase with the implementation of the 20” size limit from 1992 to 2010. A larger increase in discards was observed over years where Red Snapper harvest was limited to distinct mini-seasons.

*Uncertainty*

**Task 9b**: Uncertainties for total recreational discards-in-number are calculated using the same approach as that described above for total recreational landings (in Section 4.3.13). Uncertainties in discard estimates for the general recreational fleet were largely consistent over the first thirty years of the time series, with an average annual CV of 0.43 between 1981 and 2011. The annual CVs for mini-season years tended to be smaller, averaging 0.19 from 2012+, over which more precise estimates from other surveys (e.g., SRFS private and SCDNR charter) were preferred over MRIP estimates. Similarly, uncertainties in headboat landings were also relatively high over the first thirty years of the time series, with an average CV of 0.48 between 1981 and 2007. This average CV dropped to 0.09 from 2008+, as reporting compliance increased in the SRHS logbook program.

*4.3.15 Time Series for Sensitivity Analyses*

During the Data Workshop, the RWG recommended a sensitivity analysis where MRIP FES catch data was used for the Florida private mode instead of SRFS catch data. After the Data Workshop, the stock assessment analysts requested two additional catch time series for sensitivity analyses. The first additional requested time series that calibrated SRFS Florida private mode estimates from 2021 to 2024 into MRIP FES units. The calibration for FL private SRFS estimates to MRIP units is 1.193 for effort, 3.682 for landings in pounds, 3.379 for landings in numbers, and 2.021 for numbers of releases. These ratios and associated estimates are calculated the same way as the MRIP to SRFS calibrations (Ramsay 2025), but the total MRIP estimate is divided by the total SRFS estimate for each variable instead of the dividing the total SRFS estimate by the total MRIP estimate.

The second additional time series was for all private mode estimates across the South Atlantic to be in SRFS units. SRFS is not conducted in North Carolina, South Carolina, or Georgia so there is no calibration available to convert MRIP FES into SRFS units for these states. Imputation based on the annual proportions of total landings and discards from MRIP in each state out of the total for all of the South Atlantic were used to produce private mode estimates for North Carolina, South Carolina, and Georgia. For each year, the proportion each state contributed to overall landings and discards was calculated using the MRIP time series. These proportions were then multiplied by the corresponding SRFS catch estimate to impute catch estimates, in SRFS units, for North Carolina, South Carolina, and Georgia. Here is a hypothetical example of how this imputation was calculated. The landings for SRFS private mode for a year was 85 fish. The proportions calculated from MRIP landings for each state was 85% from Florida, 10% from Georgia, 2% from South Carolina, and 3% from North Carolina. If Florida private landings account for 85% of the total catch, then imputed landings would be 10 fish from Georgia, 2 fish from South Carolina, and 3 fish from North Carolina. For this method, the assumption was made that there was no spatial bias in MRIP and the observed proportions for landings and discards were indicative of the true underlying spatial pattern. Proportions were calculated annually and separately for discards, in-season landings, and out-of-season landings. For the mini season estimates beginning in 2012 North Carolina, South Carolina, and Georgia mini season landings estimates were imputed based on ECRS instead of SRFS estimates to keep the time series scaled to the same units. The estimated CVs from FL private from SRFS were assumed to be the minimum level of uncertainty associated with the estimates for this time series.

***Task 10:*** Estimates for the base model (base), MRIP sensitivity (FES), FL SRFS calibrated to MRIP sensitivity (calMRIP) and imputed SRFS (impSRFS) are available in Table 4.10.17 and shown in Figure 4.11.10). A summary of the data for each time series is provided in Table 4.10.18.

## 4.4 BIOLOGICAL SAMPLING

### *4.4.1 Landings*

#### 4.4.1.1 MRIP APAIS 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 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 length 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 Red Snapper in the South Atlantic by fishing mode (1981-2024) are provided in Table 7 of SEDAR 90-DW-03. Table 8 in SEDAR 90-DW-03 provides annual summaries for all fishing modes combined. These summaries include the number of Red Snapper weighed, number of angler trips from which Red Snapper were weighed, and the minimum, average, and maximum weights. The number of Red Snapper sampled for lengths by MRIP are available in Tables 1 and 2 of SEDAR 90-DW-12.

#### 4.4.1.2 SRHS Biological Sampling

Lengths were collected by headboat dockside samplers beginning in 1972. From 1972 to 1975, only North Carolina and South Carolina were sampled and expanded to Georgia and northeast Florida in 1976. The SRHS conducted dockside sampling throughout the southeast portion of the US (from the NC-VA border to the Florida Keys) beginning in 1978. Weights are typically collected for the same fish measured during dockside sampling. Biological samples (scales, otoliths, spines, stomachs, and gonads) are also collected routinely and processed for aging, diet studies, and maturity studies.

The number of Red Snapper sampled by SRHS for lengths are available in Tables 1 and 2 of SEDAR 90-DW-12. Mean weights by year and state from biologically sampled Red Snapper in SRHS are summarized in Table 34, of SEDAR 90-DW-02. The number of age samples collected by SRHS are available in Tables 1 and 3 of SEDAR 90-DW-12.

#### 4.4.1.3 SRFS Biological Sampling

SRFS's dockside intercept survey stations biologists at sampling sites to interview anglers on angler catches and fishing practices. Interview assignments are drawn from a subset of sampling sites known to have offshore fishing activity to intercept fishers that target reef fish. Data collected during dockside assignments include information regarding fishing depths, distances from shore while fishing for offshore species, number of harvested fish, and self-reported estimates of fish released during the fishing day. All available harvested fish are measured (fork length in mm), weighed (in kilograms), and an otolith is collected during the survey.

#### 4.4.1.4 ECRS Biological Sampling

The Red Snapper harvest season provides an opportunity to collect fishery dependent biological samples from a species with a very short open season. Assignments are randomly selected from a subset of sampling sites with offshore fishing pressure to intercept anglers targeting or catching Red Snapper. Biologists collect data on trip duration, distance from shore, fishing depth, and number of harvested Red Snapper. Data is also collected on self-reported estimates of discarded Red Snapper and use of barotrauma mitigation tool use. Each harvested fish is measured (at midline in mm), weighed (kg), and one otolith is extracted for aging.

#### 4.4.1.5 Other FLFWC Biological Sampling

<u>Southeast Recreational Fisheries Information Network (RecFin):</u>

Fish age and length collected for GULF FIN on the Florida Gulf and Atlantic Coast, and a handful of other short-term projects that used opportunistic biological sampling methods between 2000 and 2018. Sampling assignments were conducted opportunistically to maximize the number of biological samples collected, primarily from busy charter landing sites. While the sampling sites were not selected using a randomized methodology, the fish sampled were not sampled in a biased manner.

<u>Marine Fisheries Initiative (MARFIN):</u>

MARFIN implemented a randomized survey on the Atlantic coast (2017-2019) to collect representative data on the biological composition of catch from private and charter boat-based sectors of the recreational fishery. In addition, MARFIN also includes a panel study with cooperative charter vessels that target deep-water grouper and tilefish species to evaluate the effectiveness of the regional-scale random sampling design and pilot test alternative methods for producing representative size and age compositions for rare fisheries. Both survey methods allow samplers to collect spatially explicit data to characterize depths and areas fished during private and charter boat trips in the Keys and South Atlantic at dockside interviews.

<u>The Representative Biological (RepBio):</u>

The Representative Biological (RepBio) sampling program conducts supplemental biological sampling along the Gulf coast of the Florida peninsula (Escambia to Collier County) and the Florida Keys (Monroe). The survey began a pilot phase in 2018 and was fully implemented in January of 2019, along the Gulf coast of Florida and was expanded to the Atlantic coast in November 2020. A randomized draw process is used to ensure representative collection of biological samples, along with a species list that prioritizes collection of biological samples from data-poor, state-managed, and federally managed species when encountered. Interviews of recreational anglers are conducted at fishing access points identified via the MRIP Site Register and assigned via a weekly draw by sub-region.

For-Hire At-Sea Observer Program:

The At-Sea Observer Program uses trained fishery observers working alongside crew on previously recruited charter and headboat vessels to collect high quality data on regulatory discards and harvested catch. Participating headboats and charter boats were randomly selected weekly throughout the year in regional, fleet-specific draws. Funding was from different sources but methods were similar between projects. For-hire 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 2005-2024.

Exempted Fishing Permit (EFP):

FWC has developed three separate Exempted Fishing Permit (EFP) projects that allow anglers opportunities to harvest Atlantic Red Snapper outside of the one-day (July 12, 2024) federal recreational season to get better data and test new, innovative ideas aimed at reducing dead discards. EFPs are permits that allow harvest for certain purposes otherwise prohibited under current federal regulations. Two of the EFP projects allow anglers to harvest up to three red snappers while fishing for the snapper-grouper bag limit. The final EFP project, with a much smaller sample size, encourages full retention of all Red Snapper while fishing for the bag limit. EFP biological samples were found to be inconsistent with samples collected from the general recreational fleet in Florida and were not used to inform the general recreational fishery length and age compositions.

#### 4.4.1.6 GADNR Biological Sampling

Starting in 2009, Georgia Department of Natural Resources Coastal Resources Division (GADNR CRD) staff initiated a special data collection effort working with two for-hire captains, at one location, that had previously participated extensively in voluntary Red Snapper research to increase Red Snapper lengths and age data for the for-hire fleet. This sampling methodology was continued, and occasionally modified to include more locations, during mini-seasons that occurred from 2012 through 2024. Staff coordinated with participating captains to be on site when trip targeting Red Snapper returned to the dock. Trip information collected dockside included date, trip type (CH, HB or PR), gear, fishing location, depth, trip date, vessel name, and captain/angler name. Biological data collected included fork length (mm), maximum total length (mm), sex, whole weight (kg) and otoliths. Fin clips were collected for the South Atlantic Red Snapper Research Project starting in 2021.

#### 4.4.1.7 SCDNR State Finfish Survey (SFS)

The SFS collects finfish intercept data in South Carolina through a non-random intercept survey at public boat landings along the SC coast. The survey focuses on known productive sample sites, targets primarily the private boat mode, and was conducted year-round (January-December) from its inception through 2013, after which time the SFS was only conducted in wave 1 (January-February). The survey uses a questionnaire and interview procedure similar to the intercept portion of the MRIP survey. Mid-line lengths were measured from 1988 to March 2009, but total lengths have been measured since April 2009.

#### 4.4.1.8 Carcass Collection Programs

*NCDMF*

See section 4.3.7 for description

*SCDNR*

See section 4.3.6 for description

*GADNR*

The Marine Sportfish Carcass Recovery Project, a partnership with recreational anglers along the Georgia coast, is used to collect biological data from recreationally harvested finfish such as Red Drum, Spotted Seatrout, Southern Flounder, Sheepshead, and Southern Kingfish. Red Snapper was added to the list of species requested in 2009. Press releases were distributed prior to the opening of the season to notify the public about the program and location of freezers. For-hire captains were notified by email about the program and invited to participate. Chest freezers are located at public access points along the Georgia coast. Each freezer is clearly marked and contains a supply of plastic bags, pencils, and data cards. During mini-seasons, posters and magnets were also placed on each freezer to draw further attention. Anglers or captains place their filleted whole fish carcasses in a bag along with a completed data card in the freezer. In 2018, a carcass card was created with additional questions such as depth, total number released and harvested, and descending device usage. CRD personnel collect the carcasses and process them to determine species, fork length (FL), and sex (when possible). Sagittal otoliths are removed and processed to determine the age of the fish. Gift cards were offered as an incentive to participate during the Red Snapper mini-seasons.

#### 4.4.1.9 FISHstory

FISHstory, a citizen science project developed under the SAFMC's Citizen Science Program, has developed a standardized protocol for archiving and analyzing historical fishing photos for the for-hire fleet from the 1940s to 1990s. These historical photos document the beginning of the South Atlantic for-hire fishery and can help recreate information on catch and length composition prior to when dedicated fishery dependent surveys began. The FISHstory project has three primary components: digitizing and archiving historical fishing photos; analyzing historic photos to estimate catch and effort using the crowdsourcing platform Zooniverse; and estimating historical length compositions for key species. Red Snapper length composition estimates from the FISHstory project were provided for the SEDAR90 Data Workshop. SEDAR90-DW16 provides an overview of the methodology used to estimate length compositions from historical photos and summarizes length composition estimates produced through the FISHstory project.

To be included in FISHstory length analyses, archived photos need to be taken at the end of fishing trips where fishermen are displaying their harvested catch; must have fish hanging from a lumber leaderboard; have a known year or range of years; and a known state where the fishing trip occurred. Photos included in these analyses are from the for-hire sector, primarily headboats. Each photo is assumed to represent a trip. Many photos currently in the FISHstory archive are from northern Florida, however the FISHstory team are working to grow and expand the geographic and temporal coverage of photos. An example of the type of photos included in the FISHstory length analyses is in Figure 4.11.11.

#### 4.4.1.10 Nominal Length Frequencies of Retained Fish

*Modern Time Period (1972 to 2024)*

Length data collected by federal surveys (e.g. MRIP, SRHS) and state agencies (e.g. NCDMF, SCDNR, GADNR, and FLFWC) were compiled by a SEFSC data analyst. Improvements in data provision, facilitated by the Life History Template, allowed for the inclusion of more length samples in SEDAR 90 than were available for SEDAR 73. Previously, not all records would have sample IDs and other information needed to link a sample in the length data with the corresponding sample in the age data. Now records that are only submitted in the age data are able to be identified and unique records (n=25,344) in the age data were added to the length-only data for inclusion in length composition analyses.

The numbers of fish sampled for length, by fleet, are shown in Table 4 of SEDAR 90-WP-12. In the earlier years, sample sizes were higher for the Headboat fleet, however, in the early 2000s, the number of length samples from the Gen Rec fleet were higher.

The RWG discussed the representativeness of the headboat length data in the early years of the SRHS survey. SRHS was only conducted in NC and SC from 1972 to 1975. The survey expanded to GA and northeast FL in 1976 and to southeast FL in 1978. In the 1970s and 1980s, there was a size difference observed for Red Snapper harvested in NC and SC versus those harvested in GA and FL. Red Snapper harvested in NC and SC were larger than those from GA and FL (Fig. 4.11.12). Headboat length compositions prior to 1978, especially those from 1972 to 1975, may not be representative of the headboat fleet due to limited spatial coverage of SRHS.

***Task 11a:*** Nominal length frequencies were generated for each fleet. A comparison of the nominal length distributions for the Gen Rec and Headboat fleets are shown in figure

4.11.13. In the 1980s and 1990s, there was no clear pattern between the Headboat and Gen Rec nominal length distributions. During this time, the length distributions from the Gen Rec often skew smaller than the Headboat length distributions, however, there are years where the opposite pattern exists. In the early 2000s, the length distributions were very similar among the two fleets. Beginning in 2013, the length distribution from the Gen Rec fleet is typically skewed larger than the length distribution from the Headboat fleet.

***Task 12:*** During SEDAR 41, the recreational sector was delineated into two fleets, Gen Rec (charter and private modes) and Headboat. This decision was made because the length compositions between the Gen Rec and Headboat fleets began to diverge in the 2010s (SEDAR 41 SAR). The RWG did not see any reason to deviate from this decision and recommended keeping the same recreational fleet structure (Gen Rec and Headboat) for SEDAR 90.

*Historical Time Period (1954-1973)*

FISHstory Red Snapper length composition data were provided in two different ways: annual length compositions and compositions by time block.

For annual length compositions, photos were excluded from analysis that

- didn’t have time stamp metadata (e.g., those without a specific year designation; photos with year ranges were excluded from the analysis) and
- had a minimum annual photo count <10 and/or minimum annual fish measurements <30 individuals.

Methods to produce annual length compositions including uncertainty estimation and realized sample size are detailed in SEDAR90-DW-16. The number of photos and measurements included in developing FISHstory annual length frequencies are in Table 4.10.19. Photos included in the annual length compositions are from Florida. Annual Red Snapper length compositions from FISHstory are provided in Figures 4.11.14 and 4.11.15. Evidence of year class strength can be seen in the FISHstory annual length composition estimates (Figure 4.11.15).

Length compositions were also provided by time blocks. These blocks were based on technological changes during the historical time period which could impact selectivity. Time blocks are described in the bullets below and were determined based on information from SEDAR41-DW-23: Atlantic Red Snapper Fishing History Timeline, the SEDAR 74 Gulf Red Snapper Stock Assessment, and conversations with Florida fishermen during the SEDAR 90 Data Workshop. Photos with associated year ranges (as opposed to a specific year) were included in these length composition estimates, when the year range fell within a time block.

- Pre 1964: limited availability of Loran A
- 1965-1974: Loran A is more available; mostly used by for-hire and commercial vessels; very limited for private anglers; advent of Loran C but limited use
- 1975 – early 1980s: transition to Loran C; Loran C more feasible to use on private vessels; Loran A discontinued in early 1980s

Length compositions by time block, including sample sizes, are provided in Figure 4.11.16.

FISHstory data are the only length composition data available for any recreational fleet prior to the early 1970s. SRHS length composition data became available in 1972 for the Carolinas and in the mid-1970s for GA/FL. FISHstory and SRHS length composition data were compared for the two overlapping years (1972-1973; Figure 4.11.17). Differences in size composition for FISHstory (FL only) and SRHS (Carolinas only in 1972-73) matched expectations of regional differences with larger fish being seen in the Carolinas. This spatial size difference is seen in SRHS data in the mid-late 1970s when length data from NC/SC and GA/FL were both available within this program (Figure 4.11.12).

***Task 13:*** The RWG recommended incorporating length compositions from FISHstory into the assessment. Both FISHstory annual and time block compositions are provided for use in the assessment to give flexibility to explore both and see how they behave in the model. FISHstory length data are the only length composition data available for any recreational fleet during this historical time period. The annual length compositions show evidence of year class strength, comparisons between SRHS and FISHstory match expectations, and there are adequate sample sizes.

It is important to note that FISHstory photographs are concentrated for headboats in northeast Florida – however that is the center of the range for Red Snapper (~70% of Red Snapper catch from the SRHS is from this area).

### 4.4.1.11 Nominal Age Compositions

The majority (n=5,646) of age samples for the Headboat fleet (n=8,547) were collected as part of the SRHS dockside sampling. Age samples collected from the private and charter boat modes, in addition to some headboat samples come from a number of sources including state fishery-dependent sampling programs (described above) and special projects (Table 3 in SEDAR 90-DW-12). The largest numbers of age samples for the Gen Rec fleet were collected during ECRS (n=11,537), RECFIN (n=5,797), and GADNR mini season sampling (n=2,030). The numbers of Red Snapper aged from the recreational fishery by year and fleet are summarized in Table 4 of SEDAR 90-WP-12. Age samples were collected for Red Snapper in the Headboat fleet beginning in 1977 and were not routinely collected for the Gen Rec fleet until 2000. Even with this temporal difference in age samples being collected, the number of age samples from the Gen Rec fleet (n=22,593) is much higher than from the Headboat fleet (n=8,547).

***Task 11b:*** Nominal age frequencies were generated for each fleet. For most years where age samples were collected from both fleets, fish from the Gen Rec fleet skewed older than fish in the Headboat fleet. For both fleets, the width of the age distributions expands in more recent years (Figure 4.11.18).

*4.4.2 Discards*

### 4.4.2.1 For Hire At-Sea Observer Biological Sampling

*MRIP Headboat Survey*

An observer survey of the recreational headboat fishery was launched in NC and SC in 2004 and in GA and FL in 2005 to characterize the size distribution of live discarded fish. While MRIP does not produce headboat catch estimates in the South Atlantic, MRIP does provide the headboat sample assignment draws and the state APAIS samplers follow the Northeast Region (ME-VA) APAIS headboat procedures. The South Atlantic states decide on sample sizes and sample allocations and this work is funded separately by the states, independent of APAIS sampling of shore, private, and charter modes (J. Foster, personal comm 2025).

APAIS samplers board the randomly-selected headboat vessels with permission from the captain and observe anglers as they fish on the recreational trip. The APAIS samplers record the length of the trip and area fished (e.g. inland, state, or federal waters) for all trips. For trips with only a few anglers, APAIS samplers will monitor the discards from all anglers. For trips with a large number of anglers, the APAIS samplers select a sub-sample of anglers and monitor their catch for discards. Data collected from the discarded fish includes the species, number, final disposition, and size. APAIS samplers will also collect data on the species composition, number, and size of the harvested fish (ACCSP 2025). Collecting the information on discarded fish is the priority of the APAIS samplers and information on the harvested fish is not always recorded if the sampler does not have time to accurately record information on both harvested and discarded fish.

*FL For-Hire Observer Survey (Headboat and Charter)*

In 2011, a Florida FWC led observer project was expanded to the Atlantic coast and replaced the MRIP Headboat Survey, effectively expanding the sampling coverage by increasing trip coverage and incorporating for-hire charter trips. This transition from MRIP to the state survey began in the Gulf in 2009 and resulted from changes in funding and opportunity to enhance and refine the focus of discard-oriented observer methods. The new observer survey provides more detailed information on the size and condition of discarded fish. For-Hire vessels are randomly selected each week from a list of participating vessels in each region statewide. Selected vessels are contacted in advance to schedule trips during the selected week and availability is based on vessel capacity and trip demand. Participating vessel operators permit up to two FWC biologists to board during a scheduled trip, and captains and mates actively assist biologists by permitting them to observe and collect data from fish as they are removed from anglers' gear and before fish are released or placed in the fish box. Vessel operators also provide biologists with information on depth and area fished (commercial statistical area and degrees and minutes latitude and longitude) for each fishing station during each observed trip. For each fish, biologists record the species, number, disposition, size (fork length in mm), hook location, and the condition of fish that were released. Additionally, a subset of anglers is tracked by the biologist(s) for the entirety of the trip. For these anglers, hook type, hook size, and fishing time are recorded for each station and all fish that they catch. These methods are consistent for both the charter and headboat modes in Florida.

#### 4.4.1.2 Citizen Science

*MyFishCount*

MyFishCount is a mobile and web-based application developed by the South Atlantic Fishery Management Council and the Angler Action Foundation to pilot recreational reporting for the Snapper Grouper Fishery and engage anglers in fisheries science and management. The app allows anglers to log and share voluntary catch data in near real-time, fostering a better understanding of recreational fishing activity and enabling more informed management decisions (Collier et al. 2019).

Key features of MyFishCount include trip information, catch information focused on federally managed species, disposition of catch, and effort information. Data was used to help inform management decisions such as re-opening the Red Snapper mini season in 2017 when many app users reported cancelling their trip due to weather conditions.

Outreach for the app occurred from 2017 (available in July 2017) to 2020. Since then, the app has been available for use but outreach has not engaged anglers to continue using the app.

Lengths collected through MyFishCount were considered in SEDAR 73 and recommended for consideration as a sensitivity run due to the short timeseries of data. A working paper was developed for SEDAR 73 (Errigo and Collier 2020, SEDAR 73-WP-16) and not updated due to few additional lengths being collected in 2020 and since. The lengths were converted from nearest inch (some reported fractions) to millimeter and adjusted to maximum total length depending on the measurement reported by the angler.

*SAFMC Release*

SAFMC Release, a citizen science project developed under the SAFMC's Citizen Science Program, works with fishermen to collect information on released shallow water grouper and Red Snapper using the free mobile app, SciFish. The project focuses on collecting data on the size of released fish and data that can help inform how many released fish survive (e.g., depth caught, descending device and venting tool usage). SAFMC Release began as a pilot project in June 2019 working with fishermen to collect information on released Scamp Grouper. In August 2021 it expanded to collect information on all shallow water grouper species, and in April 2022 Red Snapper was added into the project. SAFMC Release is open access, meaning that any interested fishermen that encounter shallow water grouper or Red Snapper can participate in data collection efforts. Recruitment for SAFMC Release has largely been through opportunistic outreach strategies. More details on the SAFMC Release project are available in SEDAR90-DW-17.

SAFMC Release sample sizes by year are summarized in Table 4.10.20. Approximately half of the Red Snapper release submissions came from FL and half were from NC-GA. The majority of submissions were from the private recreational sector (86%) followed by the charter sector (14%). SAFMC Release data were converted from natural total length (in) to maximum total length (mm) using the conversion equations provided for SEDAR 90. Length composition data are provided in Figure 4.11.19.

Analyses were done to compare SAFMC Release length data to the MRIP Headboat At-Sea Observer data (NC-GA) and FL FWC For-Hire Observer data for overlapping years (2022-2024). When making these comparisons, it is important to note that the datasets use different methodologies and sample different areas and/or cover different sectors. SAFMC Release length data (2022-2024) were most similar to the MRIP HB At-sea Observer data. Both had higher median length values and larger proportions of fish in the mid-to large size bins than the FWC For-Hire At-Sea Observer data (Figure 4.11.20). The differences seen may be influenced by regional size differences.

The RWG recommended the use of SAFMC Release and MyFishCount Red Snapper release lengths in combination with the FL FWC Charter Observer Program lengths for the discard length compositions for the general recreational fleet. Limited data are available on lengths of released Red Snapper from the charter (outside of Florida) and private recreational sectors. Length frequency data from two voluntary citizen science projects, SAFMC Release (2022-2024) and MyFishCount (2017-2019), are the only release length data available from charter boats north of FL and from the private recreational sector. SAFMC Release and MyFishCount length frequency data were compared with the MRIP HB At-Sea Observer (NC-GA) and FWC For-Hire At-Sea Observer data for overlapping years. Data comparisons showed relatively similar trends. The MRIP Headboat At-Sea Observer, SAFMC Release, and MyFishCount data had larger proportions of fish in mid-to-large length bins than the FWC For-Hire At-Sea Observer data which may indicate regional and/or sector differences in length of released fish. The SAFMC Release and MyFishCount length data for released Red Snapper can be used to help fill data gaps in the lengths of released fish in the recreational sector.

### 4.4.1.3 Length Compositions of Discarded Fish

***Task 14:*** Nominal and weighted discard length compositions were provided for the Headboat fleet using At-Sea Observer data. Nominal discard length compositions for the Gen Rec fleet were provided using data from the FL At-Sea Charter Observer Program, MyFishCount, and SAFMC Release.

*Headboat*

Prior to 2010, discarded fish were rarely larger than 20 inches. Beginning in 2010 and continuing through 2024, there is an increase in the lengths of Red Snapper that are being discarded alive and most observed Red Snapper > 20 inches were discarded and not harvested (Fig. 1 in SEDAR 90-DW-20). These years correspond to a period of increased management regulations with years with either no open season or shortened mini seasons (SEDAR 90-DW-01).

The majority of discarded fish measured from the Headboat fleet were from Florida (Fig. 2 in SEDAR 90-DW-13). The lower sample sizes in NC and SC make it difficult to make inferences about any spatial differences in the length distribution of discards (Fig. 1 in SEDAR 90-DW-13). Nominal headboat discard lengths were weighted by state in SEDAR 41 (SEDAR 41-DW-33); however, since the sample sizes outside of FL are low and would not reach the minimum sample size of 30 lengths per strata, this approach was not pursued.

In SEDAR 73, nominal headboat discard length compositions were weighted by the proportional effort calculated for each combination of headboat trip duration and spatial region (Lazarre et al. 2020). Headboat trips were classified as half day (< 6 hours), three quarter day (6-8 hours), full day (9-24 hours), or multi-day (> 24 hours) trip types. Regions were defined as NC, SC, GA-NEFL, SEFL, and FL Keys. Creating weights that are specific to each combination of trip duration and region results in strata with low sample sizes (< 30 fish) and discard length compositions that are 'spikey'. For SEDAR 90, the weighting procedure was simplified and proportional effort was calculated for each trip duration category with samples combined across regions. The year-specific weighting factors were estimated as

$$W_t = \frac{N_t/N}{n_t/n}$$

where *t* is the trip duration category type, *N* is the number of headboat trips reported in the logbook trip reports, and *n* are the number of trips sampled by At-Sea observers. There is no clear trend in the discard length distribution by trip duration category, but the length distribution of discarded Red Snapper from full day trips often skews larger than discarded Red Snapper sampled in half and three-quarter day trips (Fig. 4.11.21). FL-only weighted headboat discard length compositions are shown in Figure 1 of SEDAR 90-DW-20. A comparison of nominal and weighted headboat discard length compositions from NC to FL are shown in Figure 4.11.22. Although differences between the nominal and weighted discard length distributions are minimal, it is recommended to use the weighted discard length distributions for the headboat fleet since the weighting corrects for under and over-sampling based on trip duration.

*Charter*

From 2013 to 2015, 2021, and 2023 the majority of discarded Red Snapper were between 30 and 60 cm and the discard length compositions are skewed towards smaller fish (Figure 4.11.23). From 2017 to 2020 there is an increase in the number of fish larger than 60 cm and the distributions are less skewed towards the smaller fish. In 2024, the discard charter nominal discard length composition is skewed towards smaller fish, however, the importance of larger fish is higher than in the previous year.

## 4.5 RECREATIONAL EFFORT

### *4.5.1 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 charter 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 provided by year and state in Table 12 of SEDAR 90-DW-03 and by year and mode in Table 13 of SEDAR 90-DW-03. These summaries include all South Atlantic states from eastern Florida to North Carolina.

### *4.5.2 SRHS Effort*

Effort data from the SRHS is provided as the number of anglers on a given trip, 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.

In order to summarize recreational fishing effort across the South Atlantic, SRHS effort estimates are also provided in units of angler trips to match that provided by the MRIP survey. 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 (SEDAR 28-DW-12). SRHS effort estimates (in angler days) are provided in Table 25 of SEDAR 90-DW-02. Estimated headboat angler days have steadily decreased in the South Atlantic in recent years.

### *4.5.3 SRFS Effort*

SRFS effort for private recreational boats in Florida is estimated through a mail survey. This survey is used to estimate effort for the suite of reef fish found in Florida. The SRFS reef fish effort provided for this assessment includes Gag (*Mycteroperca microlepis*), Black Grouper (*M. bonaci*), Red Grouper (*Epinephelus morio*), Gray Triggerfish (*Balistes capriscus*), Red Snapper, Vermilion Snapper (*Rhomboplites aurorubens*), and Amberjacks (*Seriola* spp.; greater/lesser, Almaco Jack, and Banded Rudderfish). SRFS effort estimates are split into two species suites based on regional differences in where these species are encountered. The SRFS effort survey is sent out monthly to a stratified random selection of 10,000 anglers with the Florida State Reef Fish Angler designation on their Florida saltwater fishing license. This designation is a free, but required add-on for Florida anglers who intend to or may incidentally catch any of the fish in the permit defined reef fish suite. Sampling is stratified by regions in Florida (North, South, Panhandle, Keys), whether an angler's home is in a coastal county, and whether an angler owns a boat. Neyman allocation is used to determine sample size. The response rate to this mail survey averages around 20%. The average number of trips per angler is calculated, weighting for nonrespondents and individuals with the Florida State Reef Fish Angler designation that did not receive the survey in a given month. Error around this average is calculated.

Not all anglers who target or catch reef fish are signed up for this designation. This designation is not required for anglers under 16 (the minimum age for a saltwater license to be required in Florida). Additionally, there is noncompliance to this designation requirement. Therefore, an undercoverage adjustment is made to the initial effort estimates to account for individuals that were not eligible for the survey, but did fish for reef fish. This undercoverage estimate is a multiplier of the total individuals intercepted at the dockside targeting, harvesting, or releasing a member of the SRFS species suite divided by the number of individuals targeting, harvesting, or releasing SRFS species with the designation. All dockside samplers in Florida (APAIS and SRFS samplers) ask anglers if they have the designation if they were reef fish fishing. If a sampler is not able to visually verify that the angler has or does not have the designation, they are removed from calculations. Effort with the undercoverage included is considered ‘adjusted effort’. Goodman’s formula is used to combine error around the undercoverage estimate and error around the initial effort estimate to generate error for the adjusted effort estimate. Effort estimates are in the number of angler trips. Monthly SRFS effort estimates are available in Table 5 of SEDAR 90-DW-19.

#### *4.5.4 ECRS Effort*

For the private recreational fleet, effort is measured by vessel count monitoring at all inlets from Cumberland Sound (FL/GA border) to St. Lucie Inlet. In 2012, the private recreational estimates were generated by sampling Saint Augustine Inlet continuously in daylight hours as a reference inlet. In the remaining inlets, boat traffic was monitored on randomly selected days and shift times (0700-1359h or 1400-1900h). A ratio method was used to expand the estimated landings, releases, and effort from the reference inlet to encompass the whole sampling range (Sauls et al. 2017). In all other sampled years, all inlet sampling shifts were selected through random sampling. In 2013 the shift times were the same as in 2012, two per day. From 2014 on there were three potential sampling shifts each day between dawn and dusk. The primary sampling weight for each sampling shift was the inverse proportion of the number of days sampled out of the entire season length. If sampling could not be conducted for the entire sampling shift (i.e., due to lightning) then a secondary sampling weight, the inverse proportion of time sampled over total shift time, was applied to account for this missed sampling period.

The following steps were used to estimate private fishing effort: 1) The numbers of recreational boats observed exiting through each inlet during daylight hours was expanded to generate an unadjusted estimate of boat trips in the Atlantic Ocean across all inlets. 2) The estimated number of boat trips taken by federally permitted charter vessels was subtracted to estimate the number of private recreational boat trips. 3) The estimated private recreational boat trips were multiplied by the proportion of private recreational boat parties and non-federally permitted charter parties that reported targeting Red Snapper during intercept survey interviews. 4) The estimated boat trips that targeted Red Snapper were adjusted to account for additional boat parties that reported exiting through inlets before sunrise to target Red Snapper. 5) The adjusted boat trips that targeted Red Snapper were multiplied by the mean number of anglers per intercepted boat party to get the total estimated number of angler trips targeting Red Snapper.

For the charter fleet, effort estimates are calculated using data from a mail/telephone survey. The survey is distributed to federally permitted charter vessels that are not pre-selected for the MRIP For-Hire Survey in the fishing season wave. To estimate the number of charter trips and angler trips targeting Red Snapper, as well as the number of harvested and discarded Red Snapper by the charter fleet, the number of trips or fish reported by respondents per region during the open season was summed. Then a sampling weight was calculated as an inverse proportion of responses to the charter mail survey, where the numerator is the total number of federally permitted charter vessels in a given region and the denominator is the number of vessels that responded to the survey.

### *4.5.5 Total Recreational Fishing Effort*

Combined effort estimates in angler trips (MRIP, SRFS, and SRHS) are shown by year and mode in Table 4.10.21 and Figure 4.11.24. MRIP and SRHS effort estimates depict all recreational fishing activity in the South Atlantic and are not specific to Red Snapper, while SRFS effort is for a reef fish species suite that includes Red Snapper. The majority of the recreational effort in the South Atlantic comes from the private mode (88.6%). The charter mode contributes about 6% and the headboat mode makes up the remaining 5% of recreational effort. Geographically, most recreational effort comes from the northern region (73.5%), with North Carolina comprising 47.5% of all recreational effort expended across the South Atlantic. This spatial pattern is being driven by the mixing of different surveys to estimate private effort in the South Atlantic with MRIP FES (where effort is calculated as all angler trips for any saltwater species, used in North Carolina, South Carolina, and Georgia) and SRFS (where effort is calculated as effort for a suite of reef fish species, used in Florida). Neither effort estimate is directed effort for Red Snapper only. Effort estimates have steadily increased across the time series, with a relatively large increase noted between 1998 and 2010.

## 4.6 COMMENTS ON ADEQUACY OF DATA FOR ASSESSMENT ANALYSES

***Task 15:*** Regarding the adequacy of the available recreational data for assessment analyses, the Recreational Working Group discussed the following:

- The landings use the best scientific information available to inform both out of season and mini season landings. The pulse nature of the recreational fishery from 2012 to 2024 does create a mismatch in the temporal scale (e.g. wave, month) of current recreational fishery surveys and the Red Snapper recreational fishery (e.g. on the order of days). The biases for all data sources were thoroughly discussed and documented by the RWG. The landings appear to be adequate for the time period covered (1981-2024).

- Red Snapper are discarded year-round in the recreational fishery, so the mini season does not pose as much of an issue for the discard data, other than causing an increase in regulatory discards. The discard data appear adequate for the time period covered.

- Size data appear to adequately represent the landed catch for all modes

- Discard size data from At-Sea Observer Programs and Citizen Science programs appear to be adequate for describing the size composition of discarded Red Snapper

## 4.7 ITEMIZED LIST OF TASKS FOR COMPLETION FOLLOWING WORKSHOP

- Weighted length and age compositions were completed after the Data Workshop once the final landings were available.
- Nominal discard length compositions were completed after the Data Workshop once all data from MyFishCount were available.
- Two additional sensitivity time series for recreational removals were requested after the Data Workshop and have been completed.

## 4.8 RESEARCH RECOMMENDATIONS

### *4.8.1 Evaluation and Progress of Research Recommendations from Last Assessment*

Research recommendations from SEDARs 41 and 73 were evaluated and progress on each item is outlined below:

1. Estimates of recreational landings and discards are critical for this assessment and for monitoring the stock. Thus, it remains important to continue estimation of recreational landings during mini-seasons and discards year-round, and any potential methodological or sampling improvements should be implemented if possible.

    - SRFS was expanded to the east coast of Florida in 2020.
    - SEFHIER began in 2022 to collect detailed catch information from the federally permitted For-Hire fleet that is not monitored through SRHS.
    - GDNR developed an expansion for their Charter Telephone Survey to adjust for non-responses.

2. Complete analysis of available historical photos for trends in CPUE and mean size of landed Red Snapper and Gray Triggerfish for pre-1981 time period. (Ultimately all species).

    - Photographs have been analyzed and size distributions of historical Red Snapper from the for-hire fishery were provided through FISHstory

3. Formally archive data and photos for all other SEDAR target species.

    - Photos archived through the FISHstory project are being analyzed to collect information on several other SAFMC managed species.

4. For-Hire Survey (FHS) should collect additional variables (e.g. depth fished).

    - No progress noted

5. Increasing sample sizes for At-Sea headboat observers (i.e. number of trips sampled).

    - The number of trips sampled through time varies and is dependent on available funding.

6. Compute variance estimate for headboat landings.

    - Proxy CVs have been developed for headboat landings that is based on compliance rates and is weighted spatially by area (SEDAR 90-DW-02).

7. Mandatory logbooks for all federally permitted for-hire vessels.

    - A mandatory logbook program (SEFHIER), started in 2021, to collect logbooks from federally permitted vessels not participating in the Southeast Region Headboat Survey. The Gulf component of the program was set aside by a lawsuit in February of 2023, preventing the use of any data collected by those reporting to that more restrictive logbook program. Low compliance and lack of validation limit the ability to use these data in stock assessments or management.

### *4.8.2 Research Recommendations for SEDAR 90*

***Task 16: The RWG provided the following research recommendations to improve recreational data in the South Atlantic.***

1. Explore adjustments to imprecise estimates, such as multi-year averaging to improve precision.
2. Develop more opportunities (e.g. citizen science, catch cards) to collect discard lengths from the recreational fleets.
3. Continue to evaluate the potential for underestimation in SRFS discard estimates due to the directed effort and undercoverage correction.
4. Improve the quality of discard data available for all recreational fleets.
5. Expand spatial and temporal range of historical records (e.g. FISHstory).
6. Increase the number of offshore angler intercepts during dockside surveys.
7. Develop methodology to validate SEFHIER data and correct for mis- and underreporting.
8. Expand spatial coverage of observer at-sea for-hire fleet sampling.

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## 4.10 TABLES

Table 4.10.1 Results of Georgia telephone catch and effort survey (±SE) of for-hire captains licensed by Georgia and possessing South Atlantic Snapper-Grouper CH/HB permit 2012-2020.

| Year | Sample Size | Response rate | For-hire Boat trips | Angler trips | Harvested (Num) | Released (Num) |
|---|---|---|---|---|---|---|
| 2012 | 17 | 100% | 14 | 76 | 52 | 25 |
| 2013 | 19 | 95% | 10.83(±0.18) | 56.53(±0.36) | 33.35(±0.15) | 5(±0.07) |
| 2014 | 23 | 96% | 38.41(±0.51) | 197.43(±0.22) | 159.92(±0.08) | 82.92(±0.16) |
| 2017 | 43 | 86% | 10.32(±0.08) | 52.94(±0.69) | 53.47(±0.18) | 86.29(±1.09) |
| 2018 | 38 | 84% | 55.86(±0.36) | 268.69(±0.19) | 284.81(±0.07) | 290.18(±0.2) |
| 2019 | 37 | 81% | 50.69(±0.32) | 218.98(±0.24) | 260.59(±0.07) | 188.32(±0.36) |
| 2020 | 34 | 85% | 47.94(±0.32) | 246.01(±0.17) | 307.51(±0.03) | 516.62(±0.42) |
| TOTAL | 211 | 88% | 252.43(±0.14) | 1,237.15.08(±0.10) | 1,271.21(±0.03) | 965.53(±0.15) |

Table 4.10.2 Raw number of Red Snapper landings from Georgia Voluntary Online Catch Survey for private boats (2012-2014) and combination of dockside sampling and carcass program for private boats (2017-2024) and charter (2021-2024). Red dash indicates that data are confidential.

| Year | Mode | Angler trips | Boat trips | Harvested (Num) |
|---|---|---|---|---|
| 2012 | PR | 31 | | 22 |
| 2013 | PR | 53 | | 41 |
| 2014 | PR | 120 | | 106 |
| 2017 | PR | | 7 | 43 |
| 2018 | PR | | 64 | 157 |
| 2019 | PR | | 104 | 257 |
| 2020 | PR | | 47 | 147 |
| 2021 | PR | | 35 | 83 |
| 2022 | PR | | 4 | 10 |
| 2023 | PR | | 23 | 94 |
| 2024 | PR | | 29 | 81 |
| 2021 | CH | | 8 | 38 |
| 2022 | CH | - | - | - |
| 2023 | CH | | 10 | 55 |
| 2024 | CH | - | - | - |

Table 4.10.3 Raw number of Red Snapper discards from Georgia Voluntary Angler Electronic Catch Survey for private boats (2012-2014) and combination of dockside sampling and carcass program for private boats (2017-2024) and charter (2021-2024). Fewer trips provided the number of released fish compared to harvested fish. Red dash indicates that data are confidential.

| Year | Mode | Angler trips | Boat trips | Released (Num) |
|---|---|---|---|---|
| 2012 | PR | 31 | | 6 |
| 2013 | PR | 53 | | 13 |
| 2014 | PR | 120 | | 265 |
| 2017 | PR | | | |
| 2018 | PR | | | |
| 2019 | PR | | 48 | 342 |
| 2020 | PR | | 27 | 189 |
| 2021 | PR | | 9 | 113 |
| 2022 | PR | | 1 | |
| 2023 | PR | | 3 | 45 |
| 2024 | PR | | 10 | 31 |
| 2021 | CH | - | - | - |
| 2022 | CH | - | - | - |
| 2023 | CH | | | |
| 2024 | CH | | | |

**Table 4.10.4. Number of trips (or number of catch cards received), carcasses collected, and reported discards by recreational fishing mode and year, 2012 – 2024 by the North Carolina Division of Marine Fisheries Carcass Collection Program.**

| Year | Mode | Trips (no. catch cards) | Carcasses | Discards |
|---|---|---|---|---|
| 2012 | Charter | 8 | 40 | 3 |
| | Headboat | 10 | 39 | 0 |
| | Private Recreational | 3 | 3 | 0 |
| | Recreational Unclassified | 0 | 0 | 0 |
| 2013 | Charter | 1 | 2 | 0 |
| | Headboat | 4 | 29 | 0 |
| | Private Recreational | 3 | 3 | 0 |
| | Recreational Unclassified | 0 | 0 | 0 |
| 2014 | Charter | 14 | 38 | 0 |
| | Headboat | 15 | 87 | 0 |
| | Private Recreational | 13 | 15 | 27 |
| | Recreational Unclassified | 7 | 66 | 0 |
| 2015 | Charter | No mini-season | | |
| | Headboat | | | |
| | Private Recreational | | | |
| | Recreational Unclassified | | | |
| 2016 | Charter | | | |
| | Headboat | | | |
| | Private Recreational | | | |
| | Recreational Unclassified | | | |
| 2017 | Charter | 5 | 22 | 1 |
| | Headboat | 4 | 22 | 0 |
| | Private Recreational | 4 | 10 | 9 |
| | Recreational Unclassified | 0 | 0 | 0 |
| 2018 | Charter | 13 | 43 | 8 |
| | Headboat | 9 | 26 | 0 |
| | Private Recreational | 5 | 13 | 4 |
| | Recreational Unclassified | 2 | 3 | 0 |
| 2019 | Charter | 7 | 28 | 8 |
| | Headboat | 5 | 30 | 0 |
| | Private Recreational | 2 | 4 | 0 |
| | Recreational Unclassified | 1 | 1 | 0 |
| 2020 | Charter | 22 | 70 | 0 |
| | Headboat | 7 | 53 | 0 |
| | Private Recreational | 10 | 15 | 20 |
| | Recreational Unclassified | 1 | 1 | 0 |
| 2021 | Charter | 0 | 0 | 0 |
| | Headboat | 4 | 58 | 7 |
| | Private Recreational | 4 | 16 | 7 |

| Year | Mode | Trips (no. catch cards) | Carcasses | Discards |
|---|---|---|---|---|
| | Recreational Unclassified | 0 | 0 | 0 |
| 2022 | Charter | 0 | 0 | 0 |
| | Headboat | 1 | 23 | 1 |
| | Private Recreational | 0 | 0 | 0 |
| | Recreational Unclassified | 0 | 0 | 0 |
| 2023 | Charter | 12 | 62 | 3 |
| | Headboat | 5 | 32 | 1 |
| | Private Recreational | 6 | 23 | 8 |
| | Recreational Unclassified | 0 | 0 | 0 |
| 2024 | Charter | 0 | 0 | 0 |
| | Headboat | 0 | 0 | 0 |
| | Private Recreational | 0 | 0 | 0 |
| | Recreational Unclassified | 0 | 0 | 0 |
| | **Total** | 207 | 877 | 107 |

**Table 4.10.5. Number of carcasses collected each month by recreational fishing mode and year, 2012 – 2024 by the North Carolina Division of Marine Fisheries Carcass Collection Program.**

| | Month | | | | | | |
|---|---|---|---|---|---|---|---|
| **Year** | Jan | Jun | Jul | Aug | Sep | Nov | **Total** |
| 2012 | | | | | 82 | | 82 |
| 2013 | | | | 34 | | | 34 |
| 2014 | | | 206 | | | | 206 |
| 2015 | No mini-season | | | | | | 0 |
| 2016 | | | | | | | 0 |
| 2017 | | | | | | 54 | 54 |
| 2018 | | 1 | | 84 | | | 85 |
| 2019 | 3 | | 59 | | | | 62 |
| 2020 | | | 139 | | | | 139 |
| 2021 | | | 73 | | | | 73 |
| 2022 | | | 23 | 2 | | | 25 |
| 2023 | | | 117 | | | | 117 |
| 2024 | | | | | | | 0 |
| **Total** | 3 | 1 | 617 | 120 | 82 | 54 | 877 |

Table 4.10.6. Annual number of Red Snapper reported as retained and discarded by SEFHIER vessels between 2022 and 2024. Discarded fish corresponds with Red Snapper that were released alive and dead.

| Year | Trips | Retained | Discarded |
|---|---|---|---|
| 2022 | 1,803 | 1,094 | 24,137 |
| 2023 | 2,201 | 1,665 | 23,730 |
| 2024 | 1,705 | 1,153 | 20,508 |

Table 4.10.7. Total number of FL FWC Atlantic Red Snapper Exempted Fishing Permit Project trips completed by participants between August 13, 2024 and December 31, 2024 by project and group types.

| Project | Group Type | Completed Trips |
|---|---|---|
| Hot Spot Fleet Project | Control Group | 24 |
| Hot Spot Fleet Project | Experimental Group | 90 |
| Southeast Fleet Project | Control Group | 22 |
| Southeast Fleet Project | Experimental Group | 52 |
| Hot Spot Snapper Full Retention Study Fleet | For Hire | 25 |
| Hot Spot Snapper Full Retention Study Fleet | Private Boat | 23 |

Table 4.10.8. Total number of Red Snapper reported harvested by FL FWC Atlantic Red Snapper Exempted Fishing Permit Project participants between August 13, 2024 and December 31, 2024 by project and group types.

| **Project** | **Group Type** | **Red Snapper Reported Harvest (no. fish)** |
|---|---|---|
| Hot Spot Fleet Project | Private Angler | 252 |
| Southeast Fleet Project | Private Angler | 99 |
| Hot Spot Snapper Full Retention Study Fleet | For Hire | 1,023 |
| Hot Spot Snapper Full Retention Study Fleet | Private Boat | 779 |
| **TOTAL** | | 2,153 |

**Table 4.10.9. Historical recreational landings (in number) for the combined Gen Rec and Headboat fleets for 1955-1977 and only Gen Rec (1978-1980) estimated using the FHWAR census method. Headboat landings were removed from the historical catch estimates from 1978-1980 by using the average proportion (0.29) of Headboat landings to Gen Rec landings from 1981-1983.**

| Year | Landings | CV |
|---|---|---|
| 1955 | 38,494 | 0.631 |
| 1956 | 42,256 | 0.631 |
| 1957 | 46,018 | 0.631 |
| 1958 | 49,780 | 0.631 |
| 1959 | 53,542 | 0.631 |
| 1960 | 57,304 | 0.631 |
| 1961 | 62,493 | 0.631 |
| 1962 | 67,682 | 0.631 |
| 1963 | 72,871 | 0.631 |
| 1964 | 78,061 | 0.631 |
| 1965 | 83,250 | 0.631 |
| 1966 | 83,737 | 0.631 |
| 1967 | 84,225 | 0.631 |
| 1968 | 84,713 | 0.631 |
| 1969 | 85,200 | 0.631 |
| 1970 | 85,688 | 0.631 |
| 1971 | 94,157 | 0.631 |
| 1972 | 102,625 | 0.631 |
| 1973 | 111,094 | 0.631 |
| 1974 | 119,563 | 0.631 |
| 1975 | 128,032 | 0.631 |
| 1976 | 129,477 | 0.631 |
| 1977 | 130,921 | 0.631 |
| 1978 | 94,122 | 0.631 |
| 1979 | 95,149 | 0.631 |
| 1980 | 96,177 | 0.631 |

**Table 4.10.10. Annual number of Red Snapper dockside intercepts for MRIP, supplemental SRFS (SRFS Suppl), and total SRFS (MRIP+SRFS).**

| | Landings | | | | Discards | | | |
|---|---|---|---|---|---|---|---|---|
| Survey | 2021 | 2022 | 2023 | 2024 | 2021 | 2022 | 2023 | 2024 |
| MRIP | 20 | 33 | 53 | 31 | 156 | 104 | 168 | 127 |
| SRFS Suppl. | 27 | 9 | 3 | 4 | 141 | 79 | 110 | 133 |
| Total SRFS | 47 | 42 | 56 | 31 | 297 | 183 | 278 | 260 |

**Table 4.10.11. The top ten species co-occurring with discarded Red Snapper from the east coast of Florida from 1981 to 2024 from the private and charter modes.**

| Species | Number of Trips |
|---|---|
| Red Snapper | 5,990 |
| Black Sea Bass | 1,394 |
| Vermilion Snapper | 1,220 |
| Tomtate | 1,070 |
| Gray Triggerfish | 730 |
| Atlantic Sharpnose Shark | 457 |
| Greater Amberjack | 454 |
| Gag | 449 |
| King Mackerel | 447 |
| Lane Snapper | 433 |
| Gray Snapper | 348 |

**Table 4.10.12. The dates the recreational Red Snapper fishery was open since the mini season began in 2012 and the total number of days the season was open annually.**

| Year | Dates Open | Duration of Open Season (Days) |
|---|---|---|
| 2012 | Sept 14th-16th & Sept 21st-23rd | 6 |
| 2013 | Aug 23rd–25th | 3 |
| 2014 | July 11th-13th, July 18th-20th, & July 25th-26th | 8 |
| 2015 | NA | 0 |
| 2016 | NA | 0 |
| 2017 | Nov 3rd-5th, Nov 10th-12th, & Dec 8th-10th | 9 |
| 2018 | Aug 10th-12th & Aug 17th-19th | 6 |
| 2019 | July 12th-14th & July 19th-20th | 5 |
| 2020 | July 10th-12th & July 17th | 4 |
| 2021 | July 9th- 11th | 3 |
| 2022 | July 8th–9th | 2 |
| 2023 | July 14th-15th | 2 |
| 2024 | July 12th | 1 |

**Table 4.10.13a. Recreational mini season landings from 2020 to 2024 for North Carolina. The estimate/number selected by the RWG is highlighted in yellow. Cells with an * indicates confidentiality.**

| | | NORTH CAROLINA LANDINGS AB1 (N) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHARTER | | | | | | | | | PRIVATE | | | | | |
| | | MRIP | | | SEFHIER | | | Carcass Collection* | | | MRIP | | | Carcass Collection* | | |
| Year | Wave | Est | #trips | CV | Est | #trips | CV | Est/Numb | #trips | CV | Est | #trips | CV | Est/Number** | #trips | CV |
| 2020 | 1 | | | | | | | | | | | | | | | |
| | 2 | | | | | | | | | | | | | | | |
| | 3 | | | | | | | | | | | | | | | |
| | 4 | 208 | 4 | 0.65 | | | | 68 | | | 1,226 | 1 | 1.00 | 15 | | |
| | 5 | | | | | | | | | | | | | | | |
| | 6 | | | | | | | | | | | | | | | |
| **2020 Total** | | **208** | **4** | | | | | **68** | **-** | | **1,226** | **1** | | **15** | **-** | |
| 2021 | 1 | | | | | | | | | | | | | | | |
| | 2 | | | | | | | | | | | | | | | |
| | 3 | 40 | 1 | 1.00 | | | | | | | | | | | | |
| | 4 | 104 | 1 | 1.00 | | | | | | | 7,486 | 3 | 1.00 | 15 | | |
| | 5 | | | | | | | | | | | | | | | |
| | 6 | | | | | | | | | | | | | | | |
| **2021 Total** | | **144** | **2** | | | | | **-** | **-** | | **7,486** | **3** | | **15** | **-** | |
| 2022 | 1 | | | | | | | | | | | | | | | |
| | 2 | | | | | 21 (6 vessels) | | | | | | | | | | |
| | 3 | | | | 21 | 63 (17 vessels) | | | | | | | | | | |
| | 4 | | | | 20 | 47 (17 vessels) | | | | | | | | 20 | | |
| | 5 | | | | | 39 (12 vessels) | | | | | | | | | | |
| | 6 | | | | | 16 (6 vessels) | | | | | 10,408 | 1 | 1.00 | | | |
| **2022 Total** | | **-** | **-** | | | | | **-** | **-** | | **10,408** | **1** | | **20** | **-** | |
| 2023 | 1 | | | | | 6 (3 vessels) | | | | | | | | | | |
| | 2 | | | | | 9 (7 vessels) | | | | | | | | | | |
| | 3 | | | | | 64 (21 vessels) | | | | | | | | | | |
| | 4 | 769 | 4 | 0.63 | 204 | 100 (40 vessels) | | 62 | | | | | | 23 | | |
| | 5 | | | | | 29 (13 vessels) | | | | | | | | | | |
| | 6 | | | | | * | | | | | | | | | | |
| **2023 Total** | | **769** | **4** | | | | | **62** | **-** | | **-** | **-** | | **23** | **-** | |
| 2024 | 1 | | | | | * | | | | | | | | | | |
| | 2 | | | | | 5 (5 vessels) | | | | | | | | | | |
| | 3 | | | | | 56 (21 vessels) | | | | | | | | | | |
| | 4 | | | | | 19 (8 vessels) | | | | | | | | | | |
| | 5 | | | | | 14 (6 vessels) | | | | | | | | | | |
| | 6 | | | | | 3 (3 vessels) | | | | | | | | | | |
| **2024 Total** | | **-** | **-** | | | | | **-** | **-** | | **-** | **-** | | **-** | **-** | |

**Table 4.10.13b. Recreational mini season landings from 2020 to 2024 for South Carolina. The estimate/number selected by the RWG is highlighted in yellow. Cells with an * indicates confidentiality.**

| | | SOUTH CAROLINA LANDINGS AB1 (N) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHARTER | | | | | | | | | PRIVATE | | | | | |
| | | MRIP | | | SEFHIER | | | Charter Logbook | | | MRIP | | | Carcass Collection | | |
| Year | Wave | Est | #trips | CV | Est | #trips | CV | Est | #trips | CV | Est | #trips | CV | Number | #trips | CV |
| 2020 | 3 | | | | | | | | 32 vessels | | | | | | | |
| | 4 | 396 | 2 | 0.89 | | | | 217 | 44 vessels | | 22,966 | 5 | 0.71 | 42 | | |
| | 5 | | | | | | | | 29 vessels | | | | | | | |
| | 6 | | | | | | | | 16 vessels | | | | | | | |
| **2020 Total** | | **396** | **2** | | | | | **217** | - | | **22,966** | **5** | | **42** | - | |
| 2021 | 1 | | | | | | | | 8 vessels | | | | | | | |
| | 2 | | | | | | | | 34 vessels | | | | | | | |
| | 3 | | | | | | | | 49 vessels | | | | | | | |
| | 4 | | | | | | | 147 | 60 vessels | | | | | 34 | | |
| | 5 | | | | | | | | 33 vessels | | | | | | | |
| | 6 | | | | | | | | 14 vessels | | | | | | | |
| **2021 Total** | | - | - | | | | | **147** | - | | - | - | | **34** | - | |
| 2022 | 1 | | | | | * | | | 3 vessels | | | | | | | |
| | 2 | | | | | 43 (18 vessels) | | | 25 vessels | | | | | | | |
| | 3 | | | | 12 | 106 (35 vessels) | | 12 | 50 vessels | | | | | | | |
| | 4 | | | | 23 | 87 (25 vessels) | | 33 | 40 vessels | | | | | 11 | | |
| | 5 | | | | 8 | 38 (18 vessels) | | 8 | 27 vessels | | | | | | | |
| | 6 | | | | | 5 (4 vessels) | | | 9 vessels | | | | | | | |
| **2022 Total** | | - | - | | | | | **53** | - | | - | - | | **11** | - | |
| 2023 | 1 | | | | | 13 (7 vessels) | | | 9 vessels | | | | | | | |
| | 2 | | | | | 35 (13 vessels) | | | 24 vessels | | | | | | | |
| | 3 | | | | | 84 (40 vessels) | | | 60 vessels | | | | | | | |
| | 4 | | | | 176 | 128 (45 vessels) | | 211 | 62 vessels | | | | | 46 | | |
| | 5 | | | | | 32 (17 vessels) | | | 29 vessels | | 685 | 1 | 1.00 | | | |
| | 6 | | | | | 9 (7 vessels) | | | 10 vessels | | | | | | | |
| **2023 Total** | | - | - | | | | | **211** | - | | **685** | **1** | | **46** | - | |
| 2024 | 1 | | | | | 5 (4 vessels) | | | 7 vessels | | | | | | | |
| | 2 | | | | | 29 (13 vessels) | | | 27 vessels | | | | | | | |
| | 3 | | | | | 81 (36 vessels) | | | 48 vessels | | | | | | | |
| | 4 | | | | 37 | 88 (35 vessels) | | 59 | 46 vessels | | | | | 1 | | |
| | 5 | | | | | 25 (16 vessels) | | | 21 vessels | | | | | | | |
| | 6 | | | | | 16 (10 vessels) | | | 15 vessels | | | | | | | |
| **2024 Total** | | - | - | | | | | **59** | - | | - | - | | **1** | - | |

**Table 4.10.13c. Recreational mini season landings from 2020 to 2024 for Georgia. The estimate/number selected by the RWG is highlighted in yellow. Cells with an * indicates confidentiality.**

| | | GEORGIA LANDINGS AB1 (N) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHARTER | | | | | | | | | | | | PRIVATE | | | | | | | | |
| | | MRIP | | | SEFHIER | | | Charter Telephone Survey | | | Carcass Collection | | | MRIP | | | Voluntary Online Survey | | | Carcass Collection | | |
| Year | Wave | Est | #trips | CV | Est | #trips | CV | Est | #trips | CV | Number | #trips | CV | Est | #trips | CV | Number | #trips | CV | Number | #trips | CV |
| 2020 | 1 | | | | | | | | | | | | | | | | | | | | | |
| | 2 | | | | | | | | | | | | | | | | | | | | | |
| | 3 | | | | | | | | | | | | | | | | | | | | | |
| | 4 | | | | | | | 308 | 246 (48 boats) | 0.00 | | | | 14,406 | 10 | 0.63 | | | | 147 | 47 boats | NA |
| | 5 | | | | | | | | | | | | | | | | | | | | | |
| | 6 | | | | | | | | | | | | | | | | | | | | | |
| **2020 Total** | | - | - | | | | | **308** | - | | | | | **14,406** | **10** | | | | | **147** | - | |
| 2021 | 1 | | | | | | | | | | | | | | | | | | | | | |
| | 2 | | | | | | | | | | | | | | | | | | | | | |
| | 3 | | | | | | | | | | | | | | | | | | | | | |
| | 4 | | | | | | | | | | 38 | 8 boats | NA | 6,779 | 2 | 0.75 | | | | 83 | 35 boats | NA |
| | 5 | | | | | | | | | | | | | | | | | | | | | |
| | 6 | | | | | | | | | | | | | | | | | | | | | |
| **2021 Total** | | - | - | | | | | | | | **38** | - | | **6,779** | **2** | | | | | **83** | - | |
| 2022 | 1 | | | | | * | | | | | | | | | | | | | | | | |
| | 2 | | | | | 5 (3 vessels) | | | | | | | | | | | | | | | | |
| | 3 | | | | | 18 (5 vessels) | | | | | | | | | | | | | | | | |
| | 4 | | | | 10 | 33 (10 vessels) | | | | | * | 4 (1boat) | NA | 2,689 | 3 | 1.00 | | | | 10 | 4 boats | NA |
| | 5 | | | | | 11 (4 vessels) | | | | | | | | | | | | | | | | |
| | 6 | | | | | * | | | | | | | | | | | | | | | | |
| **2022 Total** | | - | - | | | | | | | | - | - | | **2,689** | **3** | | | | | **10** | - | |
| 2023 | 1 | | | | | 4 (3 vessels) | | | | | | | | | | | | | | | | |
| | 2 | | | | | 17 (7 vessels) | | | | | | | | | | | | | | | | |
| | 3 | | | | | 36 (12 vessels) | | | | | | | | | | | | | | | | |
| | 4 | | | | 69 | 45 (16 vessels) | | | | | 55 | 10 boats | NA | 45,086 | 5 | 0.94 | | | | 94 | 23 boats | NA |
| | 5 | | | | | 17 (9 vessels) | | | | | | | | | | | | | | | | |
| | 6 | | | | | 3 (3 vessels) | | | | | | | | | | | | | | | | |
| **2023 Total** | | - | - | | | | | | | | **55** | - | | **45,086** | **5** | | | | | **94** | - | |
| 2024 | 1 | | | | 2 | 5 (5 vessels) | | | | | | | | | | | | | | | | |
| | 2 | | | | | 12 (8 vessels) | | | | | | | | | | | | | | | | |
| | 3 | | | | | 33 (11 vessels) | | | | | | | | | | | | | | | | |
| | 4 | | | | 31 | 22 (11 vessels) | | | | | 7 | 2 boats | NA | 2,949 | 5 | 0.71 | | | | 81 | 29 boats | NA |
| | 5 | | | | | 5 (4 vessels) | | | | | | | | | | | | | | | | |
| | 6 | | | | | * | | | | | | | | | | | | | | | | |
| **2024 Total** | | - | - | | | | | | | | **7** | - | | **2,949** | **5** | | | | | **81** | - | |

**Table 4.10.13d. Recreational mini season landings from 2020 to 2024 for Florida. The estimate/number selected by the RWG is highlighted in yellow. Cells with an * indicates confidentiality.**

| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | FLORIDA LANDINGS AB1 (N) | | | | | | | | | | | | | | | | | |
| | | CHARTER | | | | | | | | | PRIVATE | | | | | | | | |
| | | MRIP | | | SEFHIER | | | ECRS* | | | MRIP | | | ECRS* | | | SRFS | | |
| State | Wave | Est | #trips | CV | Est | #trips | CV | Est/Numb | #trips | CV | Est | #trips | CV | Est/Numb | #trips | CV | Est/Number** | #trips | CV |
| 2020 | 1 | | | | | | | | | | | | | | | | | | |
| | 2 | | | | | | | | | | | | | | | | | | |
| | 3 | | | | | | | | | | | | | | | | | | |
| | 4 | 2,628 | 3 | 0.71 | | | | 2,900 | 284 | 0.07 | 516,372 | 37 | 0.84 | 30,921 | 826 | 0.19 | 129,516 | | 0.38 |
| | 5 | | | | | | | | | | | | | | | | | | |
| | 6 | | | | | | | | | | | | | | | | | | |
| **2020 Total** | | **2,628** | **3** | | | | | **2,900** | **284** | | **516,372** | **37** | | **30,921** | **826** | | **129,516** | **-** | |
| 2021 | 1 | | | | | | | | | | | | | | | | 2,827 | | 0.94 |
| | 2 | | | | | | | | | | | | | | | | | | |
| | 3 | 385 | 1 | 1.00 | | | | | | | | | | | | | 2,155 | | 0.97 |
| | 4 | 4,653 | 15 | 0.77 | | | | 4,196 | 332 | 0.04 | 66,144 | 19 | 0.55 | 30,206 | 990 | 0.10 | 79,384 | | 0.30 |
| | 5 | 129 | 3 | 1.00 | | | | | | | | | | | | | | | |
| | 6 | | | | | | | | | | 4,328 | 1 | 1.00 | | | | 4,992 | | 0.78 |
| **2021 Total** | | **5,167** | **19** | | | | | **4,196** | **332** | | **70,472** | **20** | | **30,206** | **990** | | **89,358** | **47 boats** | |
| 2022 | 1 | | | | - | 97 (40 vessels) | | | | | | | | | | | | | |
| | 2 | | | | 28 | 161 (57 vessels) | | | | | | | | | | | | | |
| | 3 | 233 | 3 | 0.74 | 28 | 334 (77 vessels) | | | | | 7,797 | 3 | 0.89 | | | | 1,726 | | 0.70 |
| | 4 | 2,053 | 8 | 0.70 | 939 | 413 (109 vessels) | | 1,582 | 118 | 0.16 | 118,325 | 30 | 0.60 | 16,324 | 883 | 0.28 | 29,053 | | 0.35 |
| | 5 | | | | 3 | 79 (37 vessels) | | | | | | | | | | | | | |
| | 6 | | | | 2 | 71 (30 vessels) | | | | | | | | | | | 908 | | 1.06 |
| **2022 Total** | | **2,286** | **11** | | **1,000** | **-** | | **1,582** | **118** | | **126,122** | **33** | | **16,324** | **883** | | **31,687** | **42 boats** | |
| 2023 | 1 | 64 | 1 | 1.00 | 2 | 160 (60 vessels) | | | | | 33,994 | 2 | 0.76 | | | | 6,490 | | 0.80 |
| | 2 | - | | | 4 | 199 (64 vessels) | | | | | - | | | | | | - | | |
| | 3 | 2,674 | 6 | 1.00 | 47 | 360 (78 vessels) | | | | | 4,114 | 2 | 0.79 | | | | 605 | | 0.77 |
| | 4 | 2,400 | 11 | 0.75 | 1,163 | 528 (122 vessels) | | 1,547 | 320 | 0.06 | 321,427 | 47 | 0.63 | 26,915 | 1,057 | 0.25 | 42,539 | | 0.30 |
| | 5 | 1,203 | 6 | 0.82 | 0 | 92 (42 vessels) | | | | | 1,999 | 1 | 1.00 | | | | 326 | | 0.90 |
| | 6 | - | | | 0 | 68 (35 vessels) | | | | | 1,218 | 1 | 1.00 | | | | 744 | | 0.44 |
| **2023 Total** | | **6,341** | **24** | | **1,216** | **-** | | **1,547** | **320** | | **362,752** | **53** | | **26,915** | **1,057** | | | | |
| 2024 | 1 | | | | 48 | 121 (46 vessels) | | | | | | | | | | | | | |
| | 2 | 93 | 1 | 1.00 | 9 | 244 (65 vessels) | | | | | 30,971 | 5 | 0.94 | | | | 13,290 | | 0.74 |
| | 3 | 251 | 2 | 0.93 | 49 | 397 (88 vessels) | | | | | 6,317 | 2 | 0.80 | | | | 1,404 | | 0.80 |
| | 4 | 3,651 | 12 | 0.87 | 569 | 321 (106 vessels) | | 763 | 324 | 0.09 | 277,784 | 22 | 0.84 | 11,822 | 576 | 0.21 | 40,259 | | 0.36 |
| | 5 | | | | 257 | 64 (29 vessels) | | | | | | | | | | | 384 | | 0.39 |
| | 6 | | | | 151 | 34 (24 vessels) | | | | | 41,201 | 3 | 1.00 | | | | 2,569 | | 0.81 |
| **2024 Total** | | **3,995** | **15** | | **1,083** | **0** | | **763** | **324** | | **356,273** | **32** | | **11,822** | **576** | | **57,906** | **31 boats** | |

**Table 4.10.14a. Recreational mini season discards from 2020 to 2024 for North Carolina. The estimate/number selected by the RWG is highlighted in yellow. Cells with an * indicates confidentiality.**

| | | NORTH CAROLINA DISCARDS B2 (N) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | CHARTER | | | | | | PRIVATE | | |
| | | MRIP | | | SEFHIER | | | MRIP | | |
| Year | Wave | Est | #trips | CV | Est | #trips | CV | Est | #trips | CV |
| 2020 | 1 | | | | | | | 1,598 | 4 | 0.73 |
| | 2 | 8 | 1 | 1.00 | | | | - | | |
| | 3 | 392 | 11 | 0.63 | | | | 1,238 | 1 | 1.00 |
| | 4 | 607 | 17 | 0.39 | | | | 1,521 | 3 | 0.71 |
| | 5 | 792 | 15 | 0.76 | | | | 4,989 | 4 | 0.94 |
| | 6 | 369 | 4 | 0.87 | | | | 9,321 | 7 | 0.95 |
| 2020 Total | | 2,168 | 48 | | | | | 18,667 | 19 | |
| 2021 | 1 | - | | | | | | 2,024 | 3 | 0.73 |
| | 2 | 196 | 5 | 1.00 | | | | - | | |
| | 3 | 1,074 | 18 | 0.67 | | | | 3,561 | 5 | 1.00 |
| | 4 | 701 | 22 | 0.47 | | | | 7,250 | 4 | 0.74 |
| | 5 | 2,058 | 27 | 0.45 | | | | 296 | 1 | 1.00 |
| | 6 | 242 | 6 | 1.00 | | | | 622 | 2 | 1.00 |
| 2021 Total | | 4,271 | 78 | | | | | 13,753 | 15 | |
| 2022 | 1 | - | | | | | | 272 | 1 | 1.00 |
| | 2 | 53 | 2 | 1.00 | 229 | 21 (6 vessels) | | - | | |
| | 3 | 1,612 | 31 | 0.46 | 1,593 | 63 (17 vessels) | | 36,157 | 15 | 0.71 |
| | 4 | 483 | 9 | 0.81 | 534 | 47 (17 vessels) | | 6,259 | 5 | 0.65 |
| | 5 | 225 | 8 | 0.77 | 497 | 39 (12 vessels) | | 706 | 3 | 0.73 |
| | 6 | - | | | 286 | 16 (6 vessels) | | - | | |
| 2022 Total | | 2,373 | 50 | | | | | 43,394 | 24 | |
| 2023 | 1 | | | | 82 | 6 (3 vessels) | | - | | |
| | 2 | | | | 54 | 9 (7 vessels) | | 2,997 | 2 | 1.00 |
| | 3 | 1,674 | 29 | 0.47 | 681 | 64 (21 vessels) | | 23,763 | 7 | 0.68 |
| | 4 | 1,487 | 39 | 0.40 | 598 | 100 (40 vessels) | | 30,639 | 12 | 0.59 |
| | 5 | 290 | 7 | 0.87 | 175 | 29 (13 vessels) | | - | | |
| | 6 | | | | **** | 2 (2 vessels) | | 1,158 | 2 | 1.00 |
| 2023 Total | | 3,451 | 75 | | | | | 58,557 | 23 | |
| 2024 | 1 | | | | **** | 3 (2 vessels) | | 1,182 | 2 | 1.00 |
| | 2 | 3 | 1 | 1.00 | 57 | 5 (5 vessels) | | 609 | 1 | 1.00 |
| | 3 | 2,040 | 24 | 0.58 | 589 | 56 (21 vessels) | | 67,332 | 13 | 0.68 |
| | 4 | 268 | 10 | 0.74 | 163 | 19 (8 vessels) | | 517 | 1 | 1.00 |
| | 5 | 10 | 1 | 1.00 | 122 | 14 (6 vessels) | | - | | |
| | 6 | | | | 17 | 3 (3 vessels) | | 3,556 | 6 | 0.65 |
| 2024 Total | | 2,321 | 36 | | | | | 73,196 | 23 | |

**Table 4.10.14b. Recreational mini season discards from 2020 to 2024 for South Carolina. The estimate/number selected by the RWG is highlighted in yellow. Cells with an * indicates confidentiality.**

| | | SOUTH CAROLINA DISCARDS B2 (N) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHARTER | | | | | | | | | PRIVATE | | |
| | | MRIP | | | SEFHIER | | | Charter Logbook | | | MRIP | | |
| Year | Wave | Est | #trips | CV | Est | #trips | CV | Est | #trips | CV | Est | #trips | CV |
| 2020 | 1 | | | | | | | 57 | 4 vessels | | | | |
| | 2 | 66 | 2 | 0.82 | | | | 472 | 18 vessels | | - | | |
| | 3 | 433 | 6 | 0.72 | | | | 1,116 | 32 vessels | | 2,135 | 3 | 0.73 |
| | 4 | 1,549 | 10 | 0.62 | | | | 1,025 | 44 vessels | | 114,175 | 10 | 0.82 |
| | 5 | 43 | 1 | 1.00 | | | | 813 | 29 vessels | | 9,597 | 5 | 0.69 |
| | 6 | 1,317 | 3 | 0.80 | | | | 367 | 16 vessels | | - | | |
| **2020 Total** | | **3,408** | **22** | | | | | **3,850** | **-** | | **125,907** | **18** | |
| 2021 | 1 | | | | | | | 203 | 8 vessels | | | | |
| | 2 | 423 | 3 | 1.00 | | | | 710 | 34 vessels | | 2,412 | 3 | 0.77 |
| | 3 | 2,472 | 3 | 1.00 | | | | 2,181 | 49 vessels | | 57,279 | 5 | 0.94 |
| | 4 | 700 | 6 | 0.64 | | | | 2,015 | 60 vessels | | 6,690 | 4 | 0.71 |
| | 5 | 2,378 | 2 | 0.95 | | | | 1,215 | 33 vessels | | 12,802 | 4 | 0.98 |
| | 6 | - | | | | | | 340 | 14 vessels | | - | | |
| **2021 Total** | | **5,973** | **14** | | | | | **6,664** | **-** | | **79,183** | **16** | |
| 2022 | 1 | | | | **** | 1 (1 vessel) | | 53 | 3 vessels | | | | |
| | 2 | | | | 401 | 43 (18 vessels) | | 761 | 25 vessels | | - | | |
| | 3 | 16,162 | 11 | 0.73 | 1,253 | 106 (35 vessels) | | 2,004 | 50 vessels | | 10,226 | 11 | 0.52 |
| | 4 | | | | 965 | 87 (25 vessels) | | 1,602 | 40 vessels | | 45,802 | 12 | 0.58 |
| | 5 | | | | 300 | 38 (18 vessels) | | 1,227 | 27 vessels | | - | | |
| | 6 | | | | 71 | 5 (4 vessels) | | 265 | 9 vessels | | 1,382 | 1 | 1.00 |
| **2022 Total** | | **16,162** | **11** | | | | | **5,912** | **-** | | **57,410** | **24** | |
| 2023 | 1 | | | | 119 | 13 (7 vessels) | | 180 | 9 vessels | | | | |
| | 2 | | | | 308 | 35 (13 vessels) | | 453 | 24 vessels | | - | | |
| | 3 | 1,994 | 6 | 1.00 | 621 | 84 (40 vessels) | | 1,142 | 60 vessels | | 14,370 | 4 | 0.92 |
| | 4 | 1,837 | 5 | 1.00 | 1,022 | 128 (45 vessels) | | 1,440 | 62 vessels | | 35,856 | 13 | 0.66 |
| | 5 | 4,742 | 7 | 0.77 | 348 | 32 (17 vessels) | | 482 | 29 vessels | | 685 | 1 | 1.00 |
| | 6 | | | | 88 | 9 (7 vessels) | | 132 | 10 vessels | | - | | |
| **2023 Total** | | **8,573** | **18** | | | | | **3,829** | **-** | | **50,911** | **18** | |
| 2024 | 1 | | | | 24 | 5 (4 vessels) | | 63 | 7 vessels | | | | |
| | 2 | 293 | 3 | 0.72 | 268 | 29 (13 vessels) | | 495 | 27 vessels | | 3,866 | 3 | 0.87 |
| | 3 | 3,303 | 7 | 1.00 | 738 | 81 (36 vessels) | | 1,032 | 48 vessels | | 21,924 | 5 | 0.73 |
| | 4 | 156 | 4 | 0.88 | 865 | 88 (35 vessels) | | 1,072 | 46 vessels | | 5,199 | 4 | 0.68 |
| | 5 | 47 | 2 | 1.00 | 217 | 25 (16 vessels) | | 378 | 21 vessels | | 53,185 | 5 | 1.00 |
| | 6 | | | | 155 | 16 (10 vessels) | | 251 | 15 vessels | | 15,742 | 5 | 0.78 |
| **2024 Total** | | **3,799** | **16** | | | | | **3,291** | **-** | | **99,916** | **22** | |

**Table 4.10.14c. Recreational mini season discards from 2020 to 2024 for Georgia. The estimate/number selected by the RWG is highlighted in yellow. Cells with an * indicates confidentiality.**

| | | GEORGIA DISCARDS B2 (N) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHARTER | | | | | | | | | | | | PRIVATE | | | | | |
| | | MRIP | | | SEFHIER | | | Charter Telephone Survey | | | Carcass Cards | | | MRIP | | | Carcass Cards | | |
| Year | Wave | Est | #trips | CV | Est | #trips | CV | Est | #trips | CV | Number | | | Est | #trips | CV | Number | #trips | CV |
| 2020 | 1 | | | | | | | | | | | | | | | | | | |
| | 2 | 122 | 15 | 0.68 | | | | | | | | | | 25,365 | 1 | 1.00 | | | |
| | 3 | 164 | 6 | 0.72 | | | | | | | | | | 31,957 | 7 | 0.73 | | | |
| | 4 | 19 | 2 | 1.00 | | | | 517 | 246 (48 boats) | 0.00 | | | | 24,179 | 9 | 0.51 | 189 | 27 boats | |
| | 5 | - | | | | | | | | | | | | - | | | | | |
| | 6 | 1,284 | 4 | 1.00 | | | | | | | | | | 26,597 | 3 | 0.90 | | | |
| 2020 Total | | 1,589 | 27 | | | | | 517 | - | | | | | 108,098 | 20 | | 189 | - | |
| 2021 | 1 | | | | | | | | | | | | | | | | | | |
| | 2 | 2,749 | 6 | 1.00 | | | | | | | | | | 12,757 | 5 | 0.80 | | | |
| | 3 | 699 | 3 | 1.00 | | | | | | | | | | 44,552 | 7 | 0.95 | | | |
| | 4 | - | | | | | | | | | 20 | 1 boat | NA | 9,710 | 6 | 0.81 | 113 | 9 boats | NA |
| | 5 | - | | | | | | | | | | | | 1,408 | 4 | 0.71 | | | |
| | 6 | 38 | 1 | 1.00 | | | | | | | | | | 640 | 1 | 1.00 | | | |
| 2021 Total | | 3,486 | 10 | | | | | | | | 20 | - | | 69,067 | 23 | | 113 | - | |
| 2022 | 1 | | | | **** | 3 (1 vessel) | | | | | | | | | | | | | |
| | 2 | - | | | 139 | 5 (3 vessels) | | | | | | | | 122,075 | 2 | 1.00 | | | |
| | 3 | 714 | 6 | 0.94 | 217 | 18 (5 vessels) | | | | | | | | 14,133 | 5 | 0.83 | | | |
| | 4 | - | | | 832 | 33 (10 vessels) | | | | | * | 4 (1 boat) | NA | 32,057 | 10 | 0.86 | - | 1 boat | NA |
| | 5 | 938 | 5 | 1.00 | 350 | 11 (4 vessels) | | | | | | | | - | | | | | |
| | 6 | - | | | **** | 2 (2 vessels) | | | | | | | | - | | | | | |
| 2022 Total | | 1,652 | 11 | | | | | | | | - | - | | ##### | 17 | | - | - | |
| 2023 | 1 | | | | 57 | 4 (3 vessels) | | | | | | | | | | | | | |
| | 2 | 341 | 6 | 1.00 | 203 | 17 (7 vessels) | | | | | | | | 617 | 1 | 1.00 | | | |
| | 3 | 391 | 5 | 0.74 | 742 | 36 (12 vessels) | | | | | | | | - | | | | | |
| | 4 | 155 | 15 | 0.50 | 459 | 45 (16 vessels) | | | | | - | 10 boats | NA | 13,941 | 7 | 0.85 | 45 | 3 boats | NA |
| | 5 | | | | 196 | 17 (9 vessels) | | | | | | | | - | | | | | |
| | 6 | | | | 56 | 3 (3 vessels) | | | | | | | | - | | | | | |
| 2023 Total | | 887 | 26 | | | | | | | | - | - | | 14,558 | 8 | | 45 | - | |
| 2024 | 1 | | | | 70 | 5 (5 vessels) | | | | | | | | | | | | | |
| | 2 | 211 | 6 | 0.71 | 77 | 12 (8 vessels) | | | | | | | | 40,609 | 8 | 0.59 | | | |
| | 3 | 1,978 | 11 | 0.83 | 333 | 33 (11 vessels) | | | | | | | | 60,141 | 9 | 0.63 | | | |
| | 4 | 13 | 3 | 1.00 | 168 | 22 (11 vessels) | | | | | - | 2 boats | NA | 17,028 | 7 | 0.60 | 31 | 10 boats | NA |
| | 5 | | | | 139 | 5 (4 vessels) | | | | | | | | 1,344 | 3 | 1.00 | | | |
| | 6 | | | | **** | 3 (2 vessels) | | | | | | | | 42,177 | 2 | 1.00 | | | |
| 2024 Total | | 2,202 | 20 | | | | | | | | | | | 161,299 | 29 | | 31 | - | |

**Table 4.10.14d. Recreational mini season discards from 2020 to 2024 for Florida. The estimate/number selected by the RWG is highlighted in yellow. Cells with an * indicates confidentiality.**

| | | FLORIDA DISCARDS B2 (N) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CHARTER | | | | | | | | | PRIVATE | | | | | | | | |
| | | MRIP | | | SEFHIER | | | ECRS* | | | MRIP | | | ECRS* | | | SRFS* | | |
| State | Wave | Est | #trips | CV | Est | #trips | CV | Est/Numb | #trips | CV | Est | #trips | CV | Est/Numb | #trips | CV | Est/Number** | #trips | CV |
| 2020 | 1 | | | | | | | | | | 775,271 | 2 | 0.94 | | | | 361,623 | | 0.20 |
| | 2 | 12,591 | 42 | 0.36 | | | | | | | 333,179 | 25 | 0.60 | | | | 155,411 | | 0.45 |
| | 3 | 47,422 | 17 | 0.65 | | | | | | | 456,650 | 26 | 0.55 | | | | 213,003 | | 0.47 |
| | 4 | 56,042 | 34 | 0.55 | | | | 4,907 | 284 | 0.12 | 964,042 | 51 | 0.58 | - | 826 | - | 449,675 | | 0.25 |
| | 5 | 2,281 | 19 | 0.55 | | | | | | | 196,110 | 4 | 0.67 | | | | 91,475 | | 0.20 |
| | 6 | 3,344 | 5 | 1.00 | | | | | | | 309,330 | 10 | 0.95 | | | | 144,286 | | 0.95 |
| **2020 Total** | | **121,680** | **117** | | | | | **4,907** | **284** | | **3,034,582** | **118** | | **-** | **826** | | **1,415,473** | **-** | |
| 2021 | 1 | 3,799 | 26 | 0.48 | | | | | | | 13,014 | 3 | 0.71 | | | | 379,306 | | 0.80 |
| | 2 | 51,794 | 38 | 0.89 | | | | | | | 179,527 | 9 | 0.87 | | | | 187,615 | | 0.38 |
| | 3 | 33,016 | 72 | 0.37 | | | | | | | 668,698 | 60 | 0.39 | | | | 454,123 | | 0.32 |
| | 4 | 29,295 | 99 | 0.38 | | | | 8,713 | 332 | 0.11 | 421,314 | 49 | 0.40 | 54,685 | 990 | 0.10 | 340,456 | | 0.26 |
| | 5 | 9,513 | 94 | 0.32 | | | | | | | 236,549 | 39 | 0.58 | | | | 99,283 | | 0.31 |
| | 6 | 13,147 | 26 | 0.90 | | | | | | | 351,508 | 26 | 0.65 | | | | 186,805 | | 0.34 |
| **2021 Total** | | **140,564** | **355** | | | | | **8,713** | **332** | | **1,870,610** | **186** | | **54,685** | **990** | | **1,647,587** | **297 boats** | |
| 2022 | 1 | 1,441 | 16 | 0.80 | 1,642 | 97 (40 vessels) | | | | | 1,235,048 | 10 | 0.83 | | | | 449,023 | | 0.53 |
| | 2 | 14,815 | 31 | 0.47 | 2,967 | 161 (57 vessels) | | | | | 37,868 | 6 | 0.97 | | | | 57,980 | | 0.38 |
| | 3 | 21,877 | 93 | 0.32 | 4,842 | 334 (77 vessels) | | | | | 118,902 | 38 | 0.36 | | | | 108,134 | | 0.29 |
| | 4 | 21,373 | 54 | 0.37 | 4,225 | 413 (109 vessels) | | 2,053 | 118 | 0.28 | 736,209 | 57 | 0.40 | 24,273 | 883 | 0.29 | 232,817 | | 0.32 |
| | 5 | 2,540 | 10 | 0.57 | 1,057 | 79 (37 vessels) | | | | | 92,255 | 9 | 0.82 | | | | 41,708 | | 0.35 |
| | 6 | 3,381 | 12 | 0.65 | 1,709 | 71 (30 vessels) | | | | | 6,109 | 1 | 1.00 | | | | 42,510 | | 0.75 |
| **2022 Total** | | **65,427** | **216** | | **16,442** | **-** | | **2,053** | **118** | | **2,226,391** | **121** | | **24,273** | **883** | | **932,173** | **183 boats** | |
| 2023 | 1 | 3,312 | 5 | 0.78 | 2,631 | 160 (60 vessels) | | | | | 330,963 | 14 | 0.94 | | | | 91,273 | | 0.37 |
| | 2 | 17,129 | 32 | 0.60 | 3,213 | 199 (64 vessels) | | | | | 67,190 | 7 | 0.67 | | | | 113,130 | | 0.35 |
| | 3 | 31,368 | 84 | 0.53 | 4,782 | 360 (78 vessels) | | | | | 539,041 | 49 | 0.39 | | | | 127,198 | | 0.27 |
| | 4 | 22,022 | 97 | 0.35 | 4,731 | 528 (122 vessels) | | 2,155 | 320 | 0.17 | 728,678 | 101 | 0.40 | 34,864 | 1,057 | 0.26 | 119,368 | | 0.24 |
| | 5 | 15,243 | 27 | 0.58 | 1,322 | 92 (42 vessels) | | | | | 162,761 | 16 | 0.55 | | | | 74,306 | | 0.39 |
| | 6 | 994 | 9 | 0.72 | 1,226 | 68 (35 vessels) | | | | | 16,911 | 2 | 0.93 | | | | 31,956 | | 0.38 |
| **2023 Total** | | **90,068** | **254** | | **17,905** | **-** | | **2,155** | **320** | | **1,845,544** | **189** | | **34,864** | **1,057** | | **557,231** | **278 boats** | |
| 2024 | 1 | 9,464 | 7 | 0.78 | 1,934 | 121 (46 vessels) | | | | | 421,788 | 16 | 0.68 | | | | 103,049 | | 0.31 |
| | 2 | 12,164 | 58 | 0.45 | 4,141 | 244 (65 vessels) | | | | | 134,837 | 16 | 0.67 | | | | 100,087 | | 0.28 |
| | 3 | 48,557 | 175 | 0.37 | 5,152 | 397 (88 vessels) | | | | | 465,122 | 56 | 0.40 | | | | 172,217 | | 0.29 |
| | 4 | 28,893 | 69 | 0.40 | 3,754 | 321 (106 vessels) | | 1,436 | 324 | 0.21 | 893,801 | 51 | 0.82 | 19,064 | 576 | 0.23 | 186,746 | | 0.22 |
| | 5 | 3,032 | 20 | 0.63 | 1,022 | 64 (29 vessels) | | | | | 261,429 | 13 | 0.88 | | | | 49,769 | | 0.28 |
| | 6 | 9,916 | 7 | 0.71 | 416 | 34 (24 vessels) | | | | | 133,648 | 13 | 0.97 | | | | 100,809 | | 0.37 |
| **2024 Total** | | **112,026** | **336** | | **16,419** | **0** | | **1,436** | **324** | | **2,310,625** | **165** | | **19,064** | **576** | | **712,678** | **260 boats** | |

Table 4.10.15. Total recreational landings estimates (AB1) for South Atlantic Red Snapper combined across all surveys by year and fleet for the mixed currency base model. Estimates and their associated coefficients of variation (CV) are provided for recreational landings in numbers of fish (AB1) and in pounds whole weight (LBS).

| | GenRec | | | | Headboat | | | |
|---|---|---|---|---|---|---|---|---|
| **YEAR** | **AB1** | **CV** | **LBS** | **CV** | **AB1** | **CV** | **LBS** | **CV** |
| 1978 | | | | | 47,207 | 0.55 | | |
| 1979 | | | | | 33,659 | 0.55 | | |
| 1980 | | | | | 21,982 | 0.55 | | |
| 1981 | 148,741 | 0.42 | 313,712 | 0.44 | 36,031 | 0.26 | 118,031 | 0.24 |
| 1982 | 26,974 | 0.59 | 97,217 | 0.61 | 19,553 | 0.43 | 98,024 | 0.37 |
| 1983 | 91,352 | 0.31 | 122,194 | 0.51 | 30,698 | 0.36 | 74,004 | 0.31 |
| 1984 | 208,747 | 0.38 | 209,870 | 0.49 | 31,146 | 0.55 | 81,417 | 0.51 |
| 1985 | 258,040 | 0.44 | 534,351 | 0.46 | 50,336 | 0.47 | 132,084 | 0.41 |
| 1986 | 82,208 | 0.37 | 55,394 | 0.38 | 16,625 | 0.45 | 54,381 | 0.40 |
| 1987 | 76,358 | 0.30 | 186,737 | 0.34 | 24,996 | 0.37 | 81,840 | 0.35 |
| 1988 | 72,028 | 0.40 | 394,069 | 0.40 | 36,527 | 0.36 | 130,070 | 0.36 |
| 1989 | 85,207 | 0.38 | 126,003 | 0.36 | 23,453 | 0.44 | 70,796 | 0.39 |
| 1990 | 12,316 | 0.45 | 28,074 | 0.51 | 20,919 | 0.50 | 65,686 | 0.47 |
| 1991 | 46,239 | 0.41 | 166,663 | 0.43 | 13,857 | 0.47 | 72,030 | 0.38 |
| 1992 | 45,778 | 0.44 | 186,774 | 0.43 | 5,301 | 0.19 | 28,916 | 0.20 |
| 1993 | 10,239 | 0.37 | 70,412 | 0.37 | 7,347 | 0.17 | 42,718 | 0.17 |
| 1994 | 18,012 | 0.33 | 97,748 | 0.36 | 8,225 | 0.32 | 43,017 | 0.38 |
| 1995 | 14,206 | 0.45 | 48,369 | 0.47 | 8,826 | 0.24 | 57,474 | 0.24 |
| 1996 | 9,576 | 0.52 | 53,982 | 0.51 | 5,543 | 0.34 | 46,235 | 0.29 |
| 1997 | 13,052 | 0.53 | 32,399 | 0.57 | 5,770 | 0.29 | 51,205 | 0.24 |
| 1998 | 26,968 | 0.46 | 166,708 | 0.47 | 4,741 | 0.37 | 26,848 | 0.36 |
| 1999 | 50,694 | 0.27 | 161,972 | 0.29 | 6,836 | 0.39 | 43,559 | 0.38 |
| 2000 | 54,744 | 0.32 | 282,682 | 0.30 | 8,437 | 0.55 | 49,403 | 0.52 |
| 2001 | 44,948 | 0.33 | 295,935 | 0.33 | 12,028 | 0.37 | 68,385 | 0.39 |
| 2002 | 81,938 | 0.27 | 568,907 | 0.27 | 12,931 | 0.36 | 70,797 | 0.38 |
| 2003 | 31,907 | 0.24 | 226,199 | 0.25 | 5,706 | 0.50 | 41,353 | 0.45 |
| 2004 | 44,722 | 0.28 | 321,273 | 0.29 | 10,842 | 0.54 | 80,349 | 0.48 |
| 2005 | 32,534 | 0.29 | 248,068 | 0.32 | 8,907 | 0.65 | 58,695 | 0.60 |

| YEAR | GenRec | | | | Headboat | | | |
|---|---|---|---|---|---|---|---|---|
| | AB1 | CV | LBS | CV | AB1 | CV | LBS | CV |
| 2006 | 37,867 | 0.32 | 308,955 | 0.35 | 5,945 | 0.70 | 41,432 | 0.67 |
| 2007 | 21,365 | 0.33 | 171,318 | 0.35 | 6,889 | 0.59 | 37,460 | 0.57 |
| 2008 | 101,191 | 0.36 | 649,127 | 0.35 | 18,943 | 0.23 | 115,309 | 0.24 |
| 2009 | 125,044 | 0.38 | 806,412 | 0.37 | 21,507 | 0.12 | 141,087 | 0.12 |
| 2010 | 58 | 0.99 | 339 | 0.99 | 477 | 0.08 | 2,610 | 0.07 |
| 2011 | 0 | 0.00 | 0 | 0.00 | 1,359 | 0.07 | 8,660 | 0.07 |
| 2012 | 17,459 | 0.19 | 176,633 | 0.19 | 2,127 | 0.11 | 10,471 | 0.11 |
| 2013 | 8,162 | 0.16 | 81,977 | 0.16 | 1,520 | 0.11 | 12,036 | 0.12 |
| 2014 | 34,978 | 0.20 | 432,828 | 0.21 | 2,952 | 0.04 | 22,450 | 0.05 |
| 2015 | 1,061 | 0.77 | 7,235 | 0.73 | 750 | 0.06 | 4,010 | 0.06 |
| 2016 | 77 | 1.00 | 448 | 1.00 | 331 | 0.20 | 1,844 | 0.20 |
| 2017 | 12,668 | 0.20 | 82,875 | 0.18 | 2,724 | 0.05 | 17,523 | 0.05 |
| 2018 | 57,719 | 0.41 | 502,593 | 0.40 | 4,435 | 0.05 | 30,126 | 0.05 |
| 2019 | 71,661 | 0.26 | 735,778 | 0.28 | 4,055 | 0.05 | 26,279 | 0.05 |
| 2020 | 73,152 | 0.27 | 504,225 | 0.21 | 3,224 | 0.05 | 18,305 | 0.05 |
| 2021 | 59,518 | 0.18 | 549,488 | 0.19 | 2,519 | 0.04 | 9,308 | 0.04 |
| 2022 | 34,032 | 0.35 | 268,968 | 0.34 | 1,593 | 0.09 | 8,751 | 0.09 |
| 2023 | 87,443 | 0.50 | 750,780 | 0.53 | 1,884 | 0.05 | 10,703 | 0.05 |
| 2024 | 31,366 | 0.34 | 265,525 | 0.24 | 1,031 | 0.06 | 9,444 | 0.06 |

Table 4.10.16. Total recreational discard estimates (B2) for South Atlantic Red Snapper combined across all surveys by year and fleet for the mixed currency base model. Associated coefficients of variation (CV) are also provided.

| | GenRec | | Headboat | |
|---|---|---|---|---|
| **YEAR** | **B2** | **CV** | **B2** | **CV** |
| 1981 | 855 | 1.00 | 0 | 0.00 |
| 1982 | 0 | 0.00 | 0 | 0.00 |
| 1983 | 21,042 | 0.71 | 0 | 0.00 |
| 1984 | 104,702 | 0.83 | 73 | 0.52 |
| 1985 | 80,702 | 0.65 | 132 | 0.42 |
| 1986 | 0 | 0.00 | 40 | 0.42 |
| 1987 | 75,758 | 0.86 | 69 | 0.34 |
| 1988 | 28,815 | 0.49 | 110 | 0.34 |
| 1989 | 26,644 | 0.57 | 66 | 0.41 |
| 1990 | 0 | 0.00 | 54 | 0.45 |
| 1991 | 21,869 | 0.55 | 38 | 0.43 |
| 1992 | 24,360 | 0.39 | 12,674 | 0.40 |
| 1993 | 94,399 | 0.63 | 15,363 | 0.35 |
| 1994 | 60,402 | 0.43 | 38,347 | 0.49 |
| 1995 | 44,301 | 0.43 | 30,720 | 0.46 |
| 1996 | 18,473 | 0.72 | 20,883 | 0.64 |
| 1997 | 8,888 | 0.43 | 25,304 | 0.47 |
| 1998 | 55,260 | 0.49 | 26,527 | 0.49 |
| 1999 | 173,677 | 0.28 | 30,315 | 0.64 |
| 2000 | 314,927 | 0.28 | 49,193 | 0.69 |
| 2001 | 265,417 | 0.33 | 46,673 | 0.67 |
| 2002 | 195,888 | 0.25 | 43,836 | 0.72 |
| 2003 | 202,252 | 0.37 | 29,187 | 0.71 |
| 2004 | 360,845 | 0.28 | 58,183 | 0.74 |
| 2005 | 79,522 | 0.26 | 57,454 | 0.75 |
| 2006 | 245,331 | 0.36 | 41,331 | 0.74 |
| 2007 | 511,067 | 0.28 | 73,401 | 0.63 |
| 2008 | 704,898 | 0.30 | 74,686 | 0.25 |
| 2009 | 469,794 | 0.31 | 57,906 | 0.12 |

| YEAR | GenRec | | Headboat | |
|---|---|---|---|---|
| | B2 | CV | B2 | CV |
| 2010 | 236,803 | 0.38 | 38,840 | 0.08 |
| 2011 | 124,504 | 0.48 | 41,982 | 0.07 |
| 2012 | 197,728 | 0.21 | 47,305 | 0.11 |
| 2013 | 114,329 | 0.20 | 46,740 | 0.12 |
| 2014 | 414,431 | 0.20 | 46,612 | 0.05 |
| 2015 | 658,983 | 0.21 | 54,405 | 0.06 |
| 2016 | 1,201,896 | 0.18 | 66,511 | 0.19 |
| 2017 | 934,428 | 0.23 | 41,301 | 0.06 |
| 2018 | 1,587,842 | 0.27 | 47,286 | 0.05 |
| 2019 | 1,047,995 | 0.18 | 48,561 | 0.05 |
| 2020 | 1,799,801 | 0.14 | 53,042 | 0.05 |
| 2021 | 1,964,597 | 0.19 | 72,067 | 0.04 |
| 2022 | 1,277,058 | 0.22 | 45,482 | 0.08 |
| 2023 | 779,952 | 0.11 | 35,723 | 0.05 |
| 2024 | 1,154,654 | 0.11 | 26,671 | 0.05 |

**Table 4.10.17a. Landings estimates from the base (FL private = SRFS, NC-GA = MRIP FES) model and additional time series requested for sensitivities. FES = MRIP FES for NC-FL private mode; SRFScalMRIP = SRFS calibrated to MRIP for FL private and MRIP FES for NC-GA private; impSRFS = SRFS for FL private and imputed SRFS for NC-GA private.**

| YEAR | Base | FES | SRFScalMRIP | impSRFS |
|---|---|---|---|---|
| 1981 | 87,988 | 353,410 | 353,410 | 87,988 |
| 1982 | 22,901 | 91,983 | 91,983 | 22,901 |
| 1983 | 10,902 | 34,990 | 34,990 | 8,711 |
| 1984 | 92,344 | 370,907 | 370,907 | 92,344 |
| 1985 | 108,114 | 407,079 | 407,079 | 101,350 |
| 1986 | 27,773 | 102,231 | 102,231 | 25,452 |
| 1987 | 34,823 | 80,997 | 80,997 | 20,166 |
| 1988 | 49,364 | 174,506 | 174,506 | 43,446 |
| 1989 | 59,410 | 225,497 | 225,497 | 56,142 |
| 1990 | 5,950 | 23,394 | 23,394 | 5,824 |
| 1991 | 9,534 | 35,780 | 35,780 | 8,908 |
| 1992 | 11,366 | 41,693 | 41,693 | 10,380 |
| 1993 | 6,606 | 26,534 | 26,534 | 6,606 |
| 1994 | 6,889 | 21,585 | 21,585 | 5,374 |
| 1995 | 1,006 | 4,040 | 4,040 | 1,006 |
| 1996 | 7,663 | 28,064 | 28,064 | 6,987 |
| 1997 | 1,221 | 4,903 | 4,903 | 1,221 |
| 1998 | 5,253 | 20,215 | 20,215 | 5,033 |
| 1999 | 17,947 | 66,455 | 66,455 | 16,545 |
| 2000 | 42,642 | 129,920 | 129,920 | 32,346 |
| 2001 | 31,892 | 122,008 | 122,008 | 30,376 |
| 2002 | 24,426 | 95,005 | 95,005 | 23,653 |

| YEAR | Base | FES | SRFScalMRIP | impSRFS |
|---|---|---|---|---|
| 2003 | 11,608 | 40,391 | 40,391 | 10,056 |
| 2004 | 31,130 | 89,609 | 89,609 | 22,310 |
| 2005 | 16,858 | 37,697 | 37,697 | 9,385 |
| 2006 | 21,802 | 46,165 | 46,165 | 11,494 |
| 2007 | 14,795 | 53,516 | 53,516 | 13,324 |
| 2008 | 89,767 | 317,299 | 317,299 | 78,997 |
| 2009 | 105,626 | 402,561 | 402,561 | 100,225 |
| 2010 | 0 | 0 | 0 | 0 |
| 2011 | 0 | 0 | 0 | 0 |
| 2012 | 14,052 | 14,769 | 14,769 | 14,402 |
| 2013 | 7,082 | 7,082 | 7,082 | 7,082 |
| 2014 | 32,193 | 36,190 | 36,190 | 24,342 |
| 2015 | 323 | 1,297 | 1,297 | 323 |
| 2016 | 0 | 0 | 0 | 0 |
| 2017 | 11,661 | 24,884 | 24,884 | 10,268 |
| 2018 | 53,714 | 56,106 | 56,106 | 31,893 |
| 2019 | 67,871 | 67,871 | 67,871 | 44,469 |
| 2020 | 69,519 | 69,519 | 69,519 | 33,232 |
| 2021 | 54,479 | 53,814 | 84,411 | 46,728 |
| 2022 | 32,086 | 38,157 | 39,993 | 22,857 |
| 2023 | 80,920 | 114,080 | 105,423 | 39,013 |
| 2024 | 29,748 | 89,699 | 74,690 | 26,924 |

**Table 4.10.17b. Discards estimates from the base (FL private = SRFS, NC-GA = MRIP FES) model and additional time series requested for sensitivities. FES = MRIP FES for NC-FL private mode; SRFScalMRIP = SRFS calibrated to MRIP for FL private and MRIP FES for NC-GA private; impSRFS = SRFS for FL private and imputed SRFS for NC-GA private.**

| YEAR | Base | FES | SRFScalMRIP | impSRFS |
|---|---|---|---|---|
| 1981 | 0 | 0 | 0 | 0 |
| 1982 | 0 | 0 | 0 | 0 |
| 1983 | 0 | 0 | 0 | 0 |
| 1984 | 14,417 | 30,866 | 30,866 | 14,417 |
| 1985 | 51,528 | 110,324 | 110,324 | 51,528 |
| 1986 | 0 | 0 | 0 | 0 |
| 1987 | 75,749 | 162,180 | 162,180 | 75,749 |
| 1988 | 28,815 | 61,695 | 61,695 | 28,815 |
| 1989 | 26,644 | 57,047 | 57,047 | 26,644 |
| 1990 | 0 | 0 | 0 | 0 |
| 1991 | 21,824 | 45,681 | 45,681 | 21,336 |
| 1992 | 13,167 | 27,514 | 27,514 | 12,851 |
| 1993 | 77,347 | 160,961 | 160,961 | 75,179 |
| 1994 | 55,637 | 119,120 | 119,120 | 55,637 |
| 1995 | 38,180 | 81,744 | 81,744 | 38,180 |
| 1996 | 17,867 | 38,048 | 38,048 | 17,771 |
| 1997 | 7,029 | 15,049 | 15,049 | 7,029 |
| 1998 | 47,809 | 101,248 | 101,248 | 47,289 |
| 1999 | 134,658 | 285,751 | 285,751 | 133,464 |
| 2000 | 284,371 | 524,502 | 524,502 | 244,976 |
| 2001 | 238,585 | 508,469 | 508,469 | 237,488 |
| 2002 | 126,682 | 271,113 | 271,113 | 126,627 |
| 2003 | 179,521 | 382,002 | 382,002 | 178,420 |
| 2004 | 319,284 | 669,974 | 669,974 | 312,921 |
| 2005 | 44,093 | 94,405 | 94,405 | 44,093 |
| 2006 | 223,635 | 430,823 | 430,823 | 201,222 |
| 2007 | 438,209 | 890,716 | 890,716 | 416,022 |
| 2008 | 671,391 | 1,388,975 | 1,388,975 | 648,741 |
| 2009 | 444,978 | 936,080 | 936,080 | 437,210 |

| YEAR | Base | FES | SRFScalMRIP | impSRFS |
|---|---|---|---|---|
| 2010 | 215,943 | 445,137 | 445,137 | 207,908 |
| 2011 | 111,074 | 237,813 | 237,813 | 111,074 |
| 2012 | 172,372 | 357,210 | 357,210 | 166,836 |
| 2013 | 107,088 | 203,538 | 203,538 | 95,059 |
| 2014 | 377,770 | 706,769 | 706,769 | 330,107 |
| 2015 | 581,483 | 1,231,259 | 1,231,259 | 575,078 |
| 2016 | 1,080,469 | 2,271,135 | 2,271,135 | 1,060,766 |
| 2017 | 716,326 | 1,400,278 | 1,400,278 | 654,020 |
| 2018 | 1,481,964 | 3,120,392 | 3,120,392 | 1,457,424 |
| 2019 | 966,459 | 1,884,046 | 1,884,046 | 879,971 |
| 2020 | 1,670,017 | 3,287,254 | 3,287,254 | 1,535,360 |
| 2021 | 1,809,591 | 2,032,614 | 3,486,655 | 1,790,276 |
| 2022 | 1,201,243 | 2,495,461 | 2,150,093 | 1,044,831 |
| 2023 | 681,257 | 1,969,570 | 1,248,457 | 594,679 |
| 2024 | 1,040,175 | 2,625,991 | 1,764,510 | 813,376 |

**Table 4.10.18. Summary of the data sources for each recreational time series.**

| Time Series | Source for Private Landings and Discards |
|---|---|
| Base Model (base) | NC-GA 1981-2024: MRIP FES<br><br>FL 2021-2024: SRFS<br><br>FL 1981-2020: MRIP FES calibrated to SRFS<br><br>Mini Season: Data selected by RWG using decision tree |
| MRIP sensitivity (FES) | NC-FL 1981-2024: MRIP FES<br><br>Mini Season: Data selected by RWG using decision tree |
| FL SRFS calibrated to MRIP sensitivity (SRFScalMRIP) | NC-GA 1981-2024: MRIP FES<br><br>FL 2021-2024: SRFS calibrated to MRIP FES<br><br>FL 1981-2020: MRIP FES<br><br>Mini Season: Data selected by RWG using decision tree |
| Imputed SRFS sensitivity (impSRFS) | NC-GA 1981-2024: imputed SRFS<br><br>FL 2021-2024: SRFS<br><br>FL 1981-2020: MRIP FES calibrated to SRFS<br><br>Mini Season nonMRIP: Data selected by RWG using decision tree<br><br>Mini Season MRIP: imputed ECRS |

Table 4.10.19. Number of FISHstory photos and measurements included in developing annual length frequencies.

| Year | # of photos | # of measurements | # of boats | State |
|---|---|---|---|---|
| 1954 | 33 | 532 | 1 | FL |
| 1956 | 38 | 1,128 | 3 | FL |
| 1959 | 39 | 1,393 | 2 | FL |
| 1960 | 65 | 3,031 | 4 | FL |
| 1961 | 105 | 3,891 | 3 | FL |
| 1962 | 180 | 9,573 | 3 | FL |
| 1963 | 125 | 5,609 | 3 | FL |
| 1964 | 128 | 5,186 | 4 | FL |
| 1965 | 25 | 755 | 2 | FL |
| 1966 | 16 | 518 | 2 | FL |
| 1967 | 11 | 575 | 3 | FL |
| 1968 | 55 | 2,509 | 4 | FL |
| 1969 | 22 | 585 | 2 | FL |
| 1970 | 36 | 585 | 3 | FL |
| 1971 | 62 | 1,746 | 3 | FL |
| 1972 | 23 | 454 | 4 | FL |
| 1973 | 22 | 745 | 5 | FL |

Table 4.10.20. SAFMC Release sample size by year.

| Year | All Submissions | All Trips | Submissions with Length | Trips with Length |
|---|---|---|---|---|
| 2022 | 41 | 10 | 36 | 10 |
| 2023 | 155 | 36 | 119 | 36 |
| 2024 | 100 | 25 | 96 | 23 |
| Total | 296 | 71 | 251 | 69 |

Table 4.10.21 Total recreational fishing effort (in angler trips) for South Atlantic Red Snapper combined across all surveys by year and fleet. For the private mode, NC-GA effort is in MRIP FES units and FL is in SRFS units. Effort for the charter mode is MRIP FHS.

| YEAR | SouthAtlantic | |
|---|---|---|
| | **GenRec** | **Headboat** |
| 1981 | 3,459,018 | 392,582 |
| 1982 | 3,682,205 | 492,606 |
| 1983 | 3,842,368 | 440,260 |
| 1984 | 4,288,562 | 563,371 |
| 1985 | 4,487,375 | 582,528 |
| 1986 | 4,983,180 | 613,712 |
| 1987 | 4,738,601 | 629,483 |
| 1988 | 4,665,660 | 566,307 |
| 1989 | 5,082,283 | 576,728 |
| 1990 | 4,911,148 | 596,940 |
| 1991 | 4,987,412 | 568,273 |
| 1992 | 5,024,560 | 535,684 |
| 1993 | 5,043,329 | 477,228 |
| 1994 | 5,010,517 | 500,800 |
| 1995 | 4,928,593 | 456,414 |
| 1996 | 5,256,752 | 449,817 |
| 1997 | 5,618,068 | 395,596 |
| 1998 | 5,680,290 | 354,069 |
| 1999 | 6,287,016 | 375,615 |
| 2000 | 6,804,948 | 406,838 |
| 2001 | 6,812,474 | 363,286 |
| 2002 | 7,188,848 | 330,417 |
| 2003 | 7,612,845 | 345,668 |
| 2004 | 8,240,062 | 394,368 |
| 2005 | 8,358,320 | 392,462 |
| 2006 | 8,756,007 | 419,239 |
| 2007 | 9,233,997 | 342,745 |
| 2008 | 9,429,124 | 283,299 |
| 2009 | 9,629,429 | 289,138 |

| YEAR | SouthAtlantic | |
|---|---|---|
| | GenRec | Headboat |
| 2010 | 9,326,750 | 285,413 |
| 2011 | 9,396,128 | 296,527 |
| 2012 | 9,199,711 | 328,980 |
| 2013 | 9,123,407 | 354,387 |
| 2014 | 9,562,504 | 419,744 |
| 2015 | 9,797,029 | 419,991 |
| 2016 | 10,222,523 | 422,328 |
| 2017 | 10,966,876 | 282,412 |
| 2018 | 10,282,206 | 267,082 |
| 2019 | 10,352,667 | 270,159 |
| 2020 | 11,341,194 | 195,841 |
| 2021 | 10,829,234 | 284,343 |
| 2022 | 11,504,031 | 245,000 |
| 2023 | 10,506,229 | 239,809 |
| 2024 | 11,900,914 | 219,186 |

4.11 FIGURES

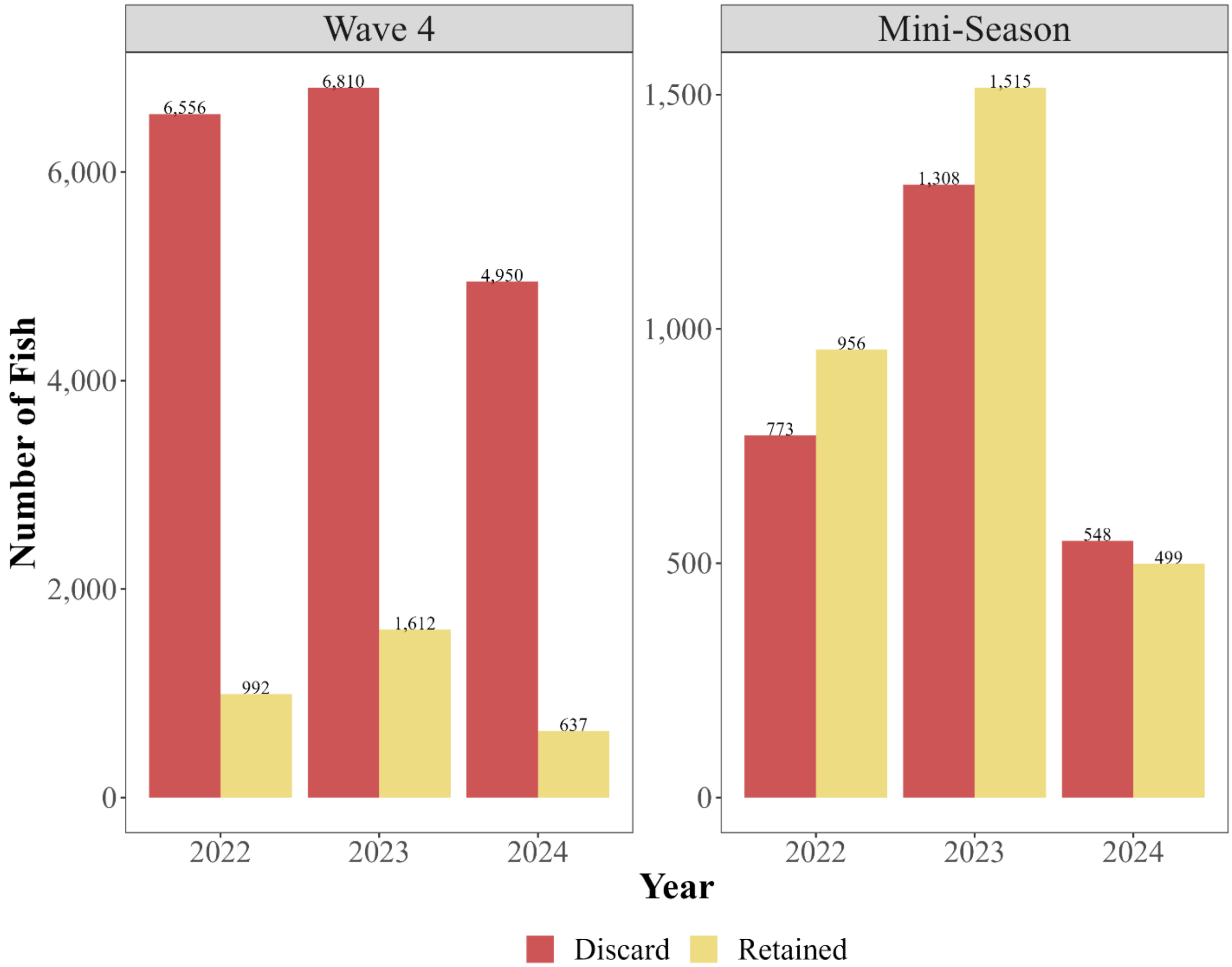


Figure 4.11.1. Number of Red Snapper reported as retained and discarded by SEFHIER vessels in Wave 4 (July & August) or during the federal mini-season openings between 2022 and 2024, in the South Atlantic region. Discarded fish correspond with red snapper that were released alive or dead.

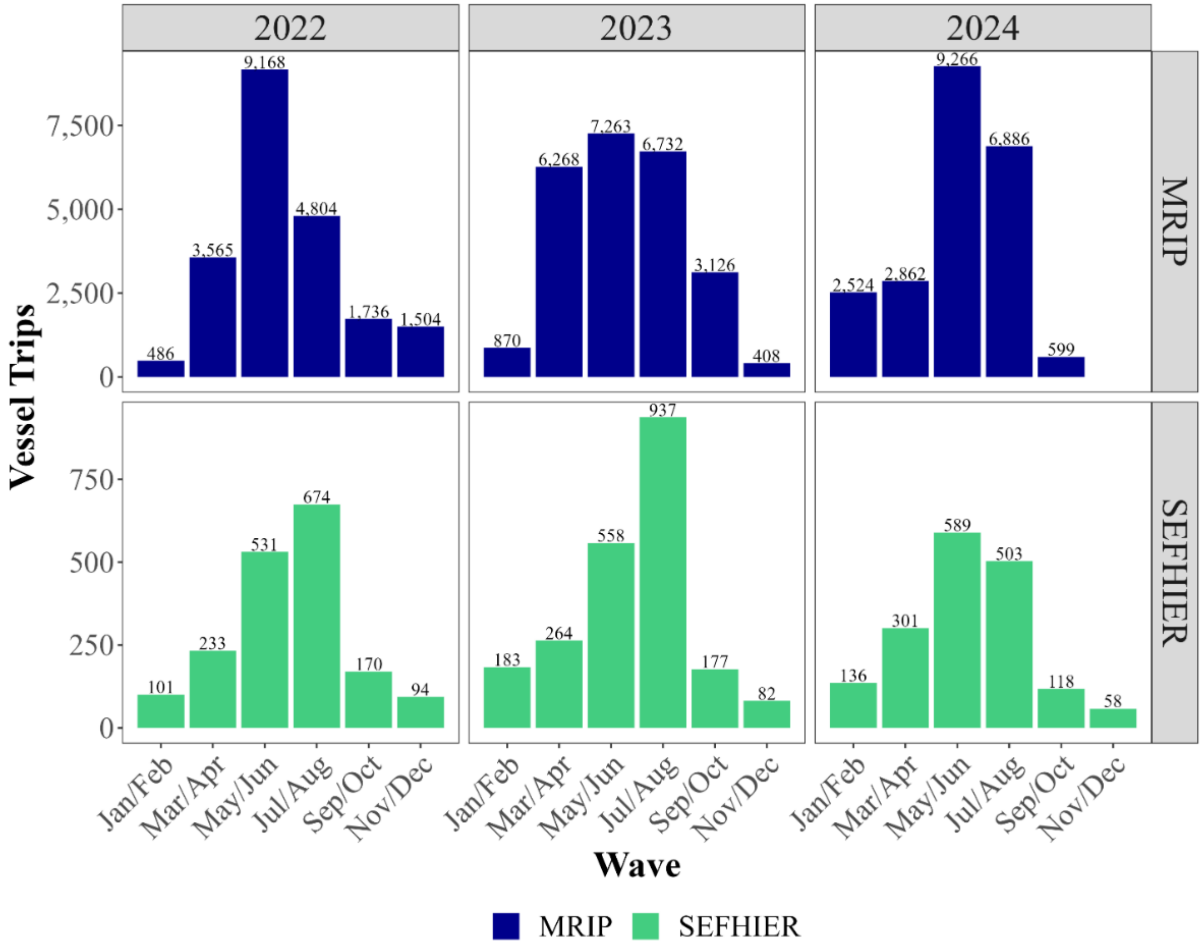


Figure 4.11.2. Number of Red Snapper charter vessel trips estimated by MRIP (blue) or reported in SEFHIER logbooks (green) by year and wave, from 2022 to 2024. Data from 2024 are considered preliminary for MRIP.

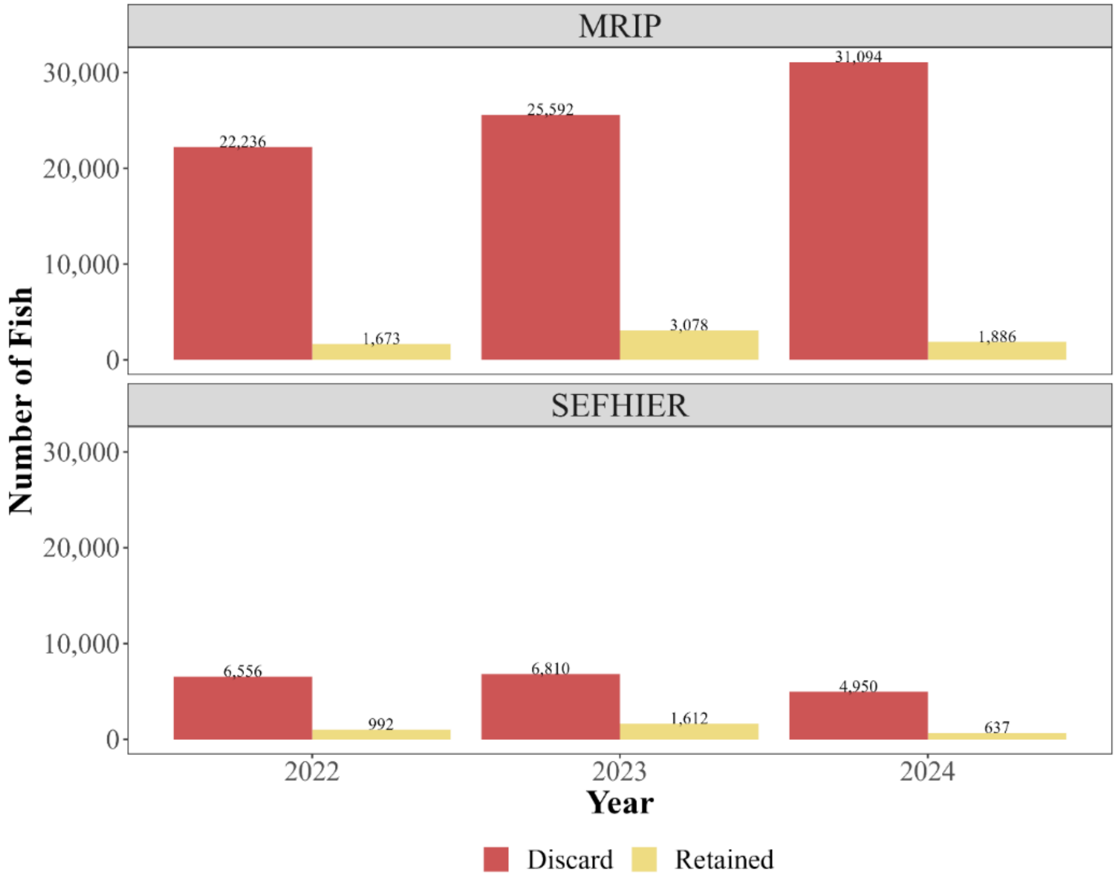


**Figure 4.11.3. Number of retained and discarded Red Snapper (from the charter boat mode) by sampling program in Wave 4 of each, from 2022 to 2024. Data from 2024 are considered preliminary for MRIP.**

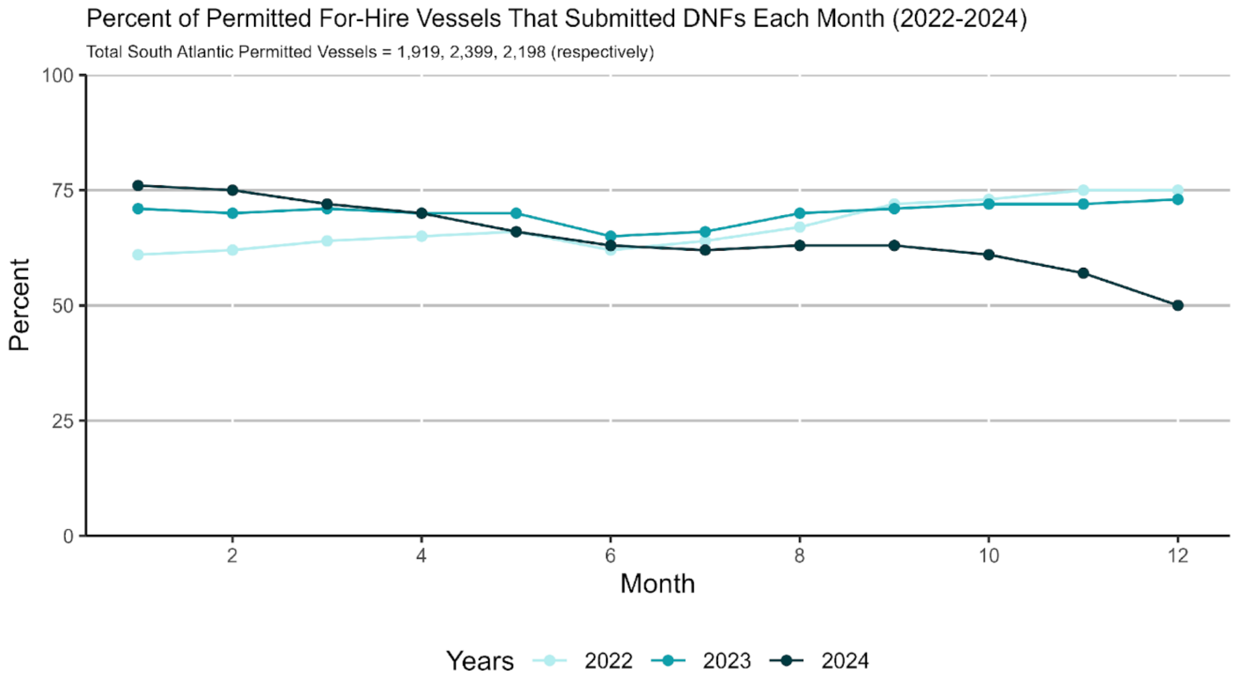


**Figure 4.11.4. Proportion of South Atlantic federal for-hire permitted vessels, excluding vessels that report to the Southeast Region Headboat, submitting "Did Not Fish Reports", from 2022 to 2024.**

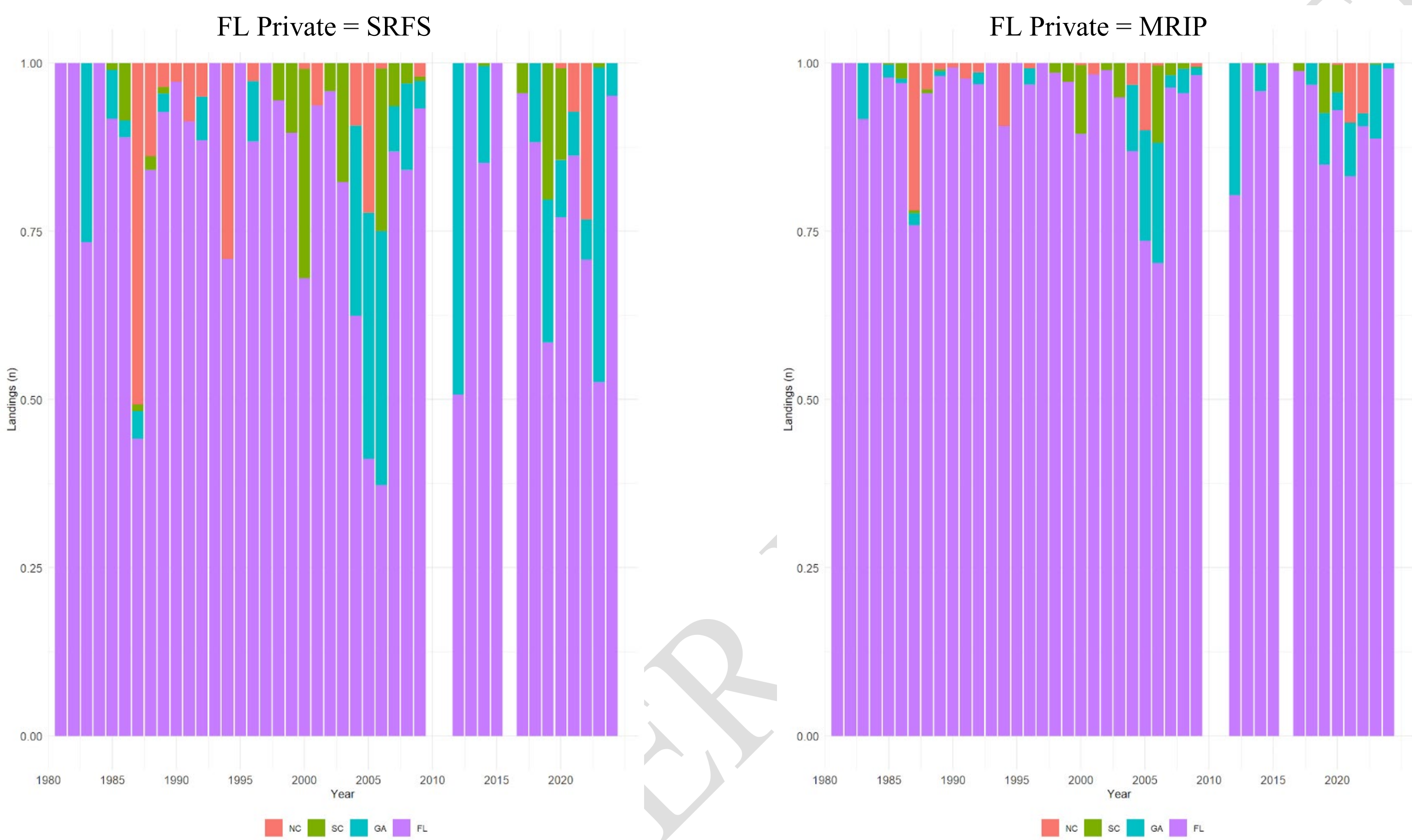


**Figure 4.11.5a. Comparison of relative landings, by state, from the private mode when SRFS (left panel) or MRIP (right panel) is used to inform Florida landings.**

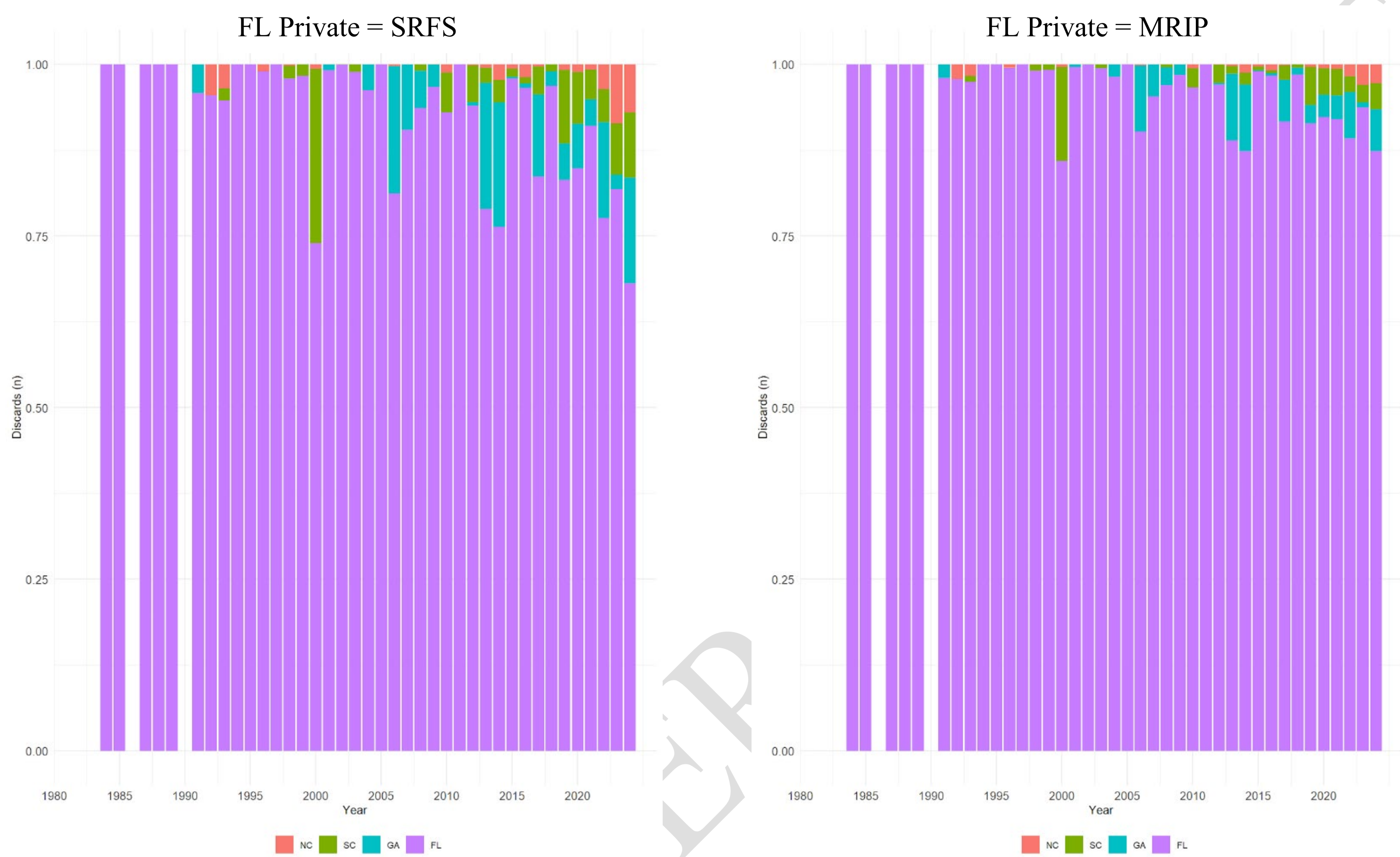


**Figure 4.11.5b. Comparison of relative discards, by state, from the private mode when SRFS (left panel) or MRIP (right panel) is used to inform Florida discards.**

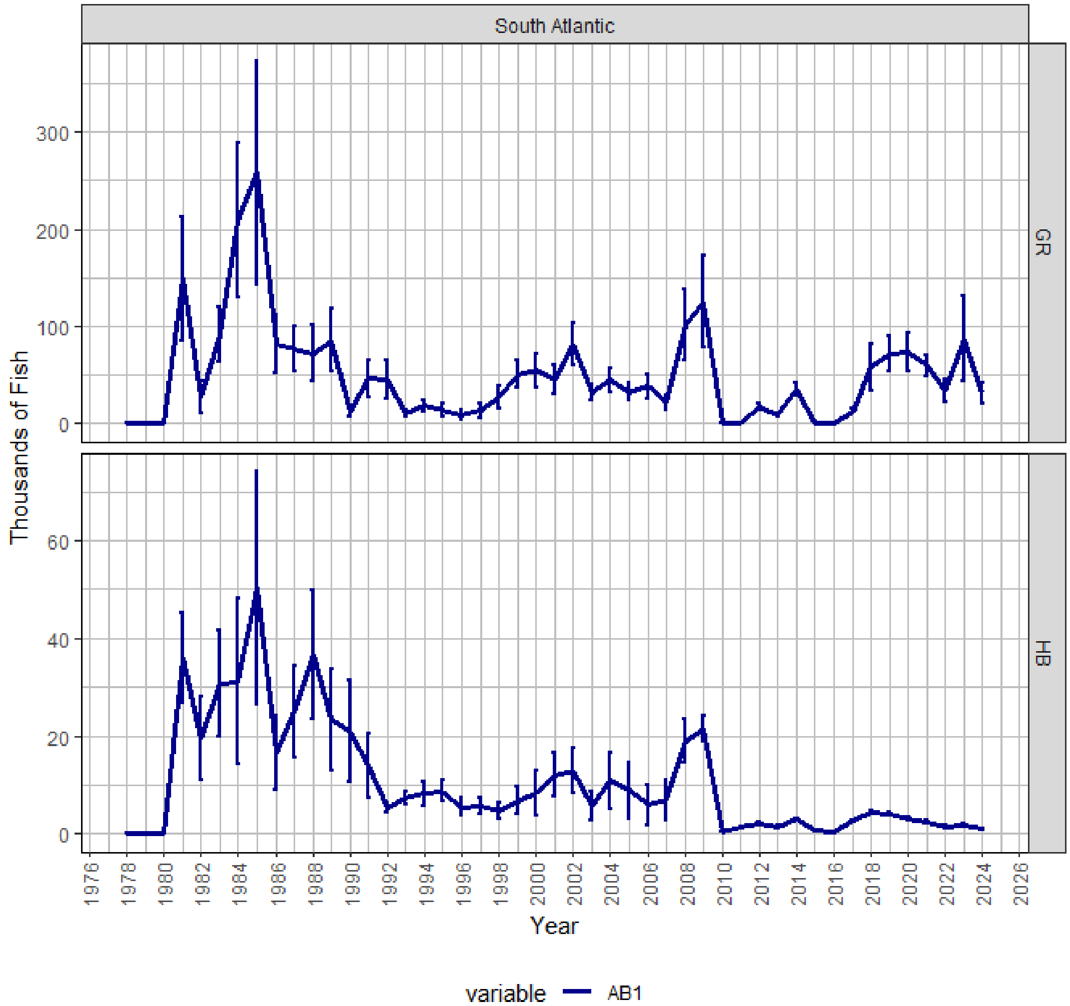


**Figure 4.11.6a. Total recreational landings estimates (AB1), in 1,000s of fish, for South Atlantic Red Snapper combined across all surveys by year and fleet. Catch estimates are in thousands of fish and provided with associated error bars (i.e., standard deviations).**

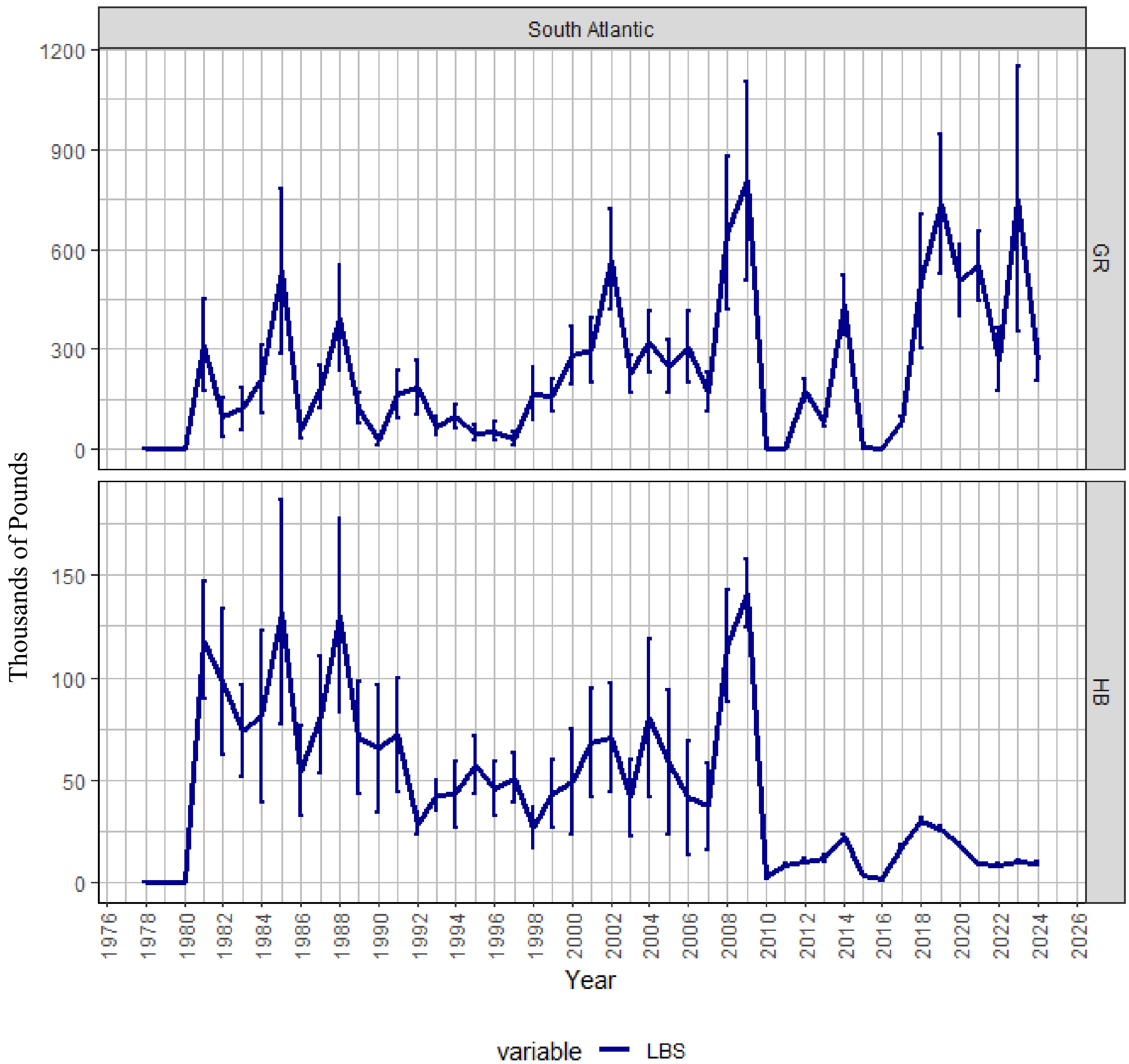


**Figure 4.11.6b. Total recreational landings estimates (LBS), in 1,000s of pounds, for South Atlantic Red Snapper combined across all surveys by year and fleet. Catch estimates are in thousands of fish and provided with associated error bars (i.e., standard deviations).**

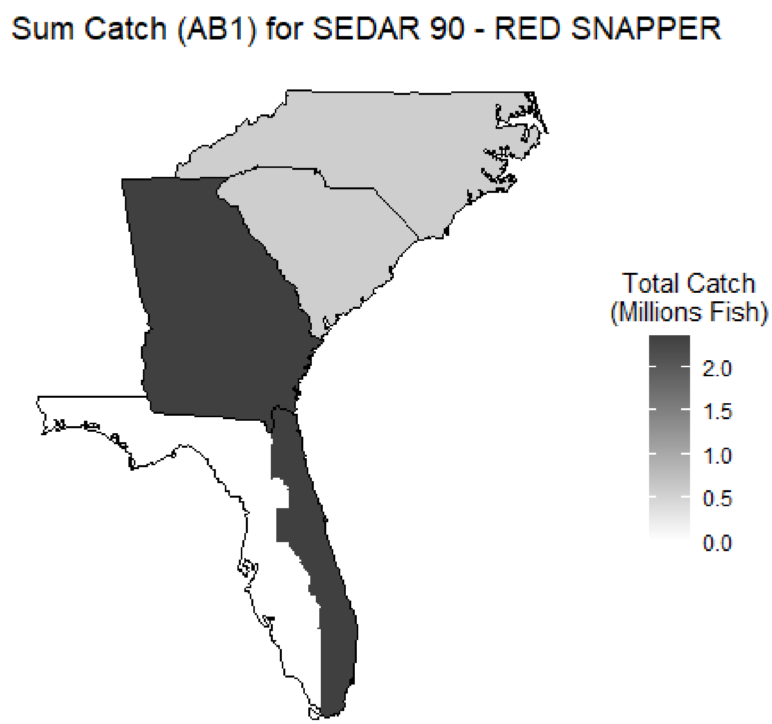


Figure 4.11.7. Distribution of total recreational landings (AB1), in thousands of fish, for Red Snapper across the South Atlantic. Estimates are combined across all surveys and years.

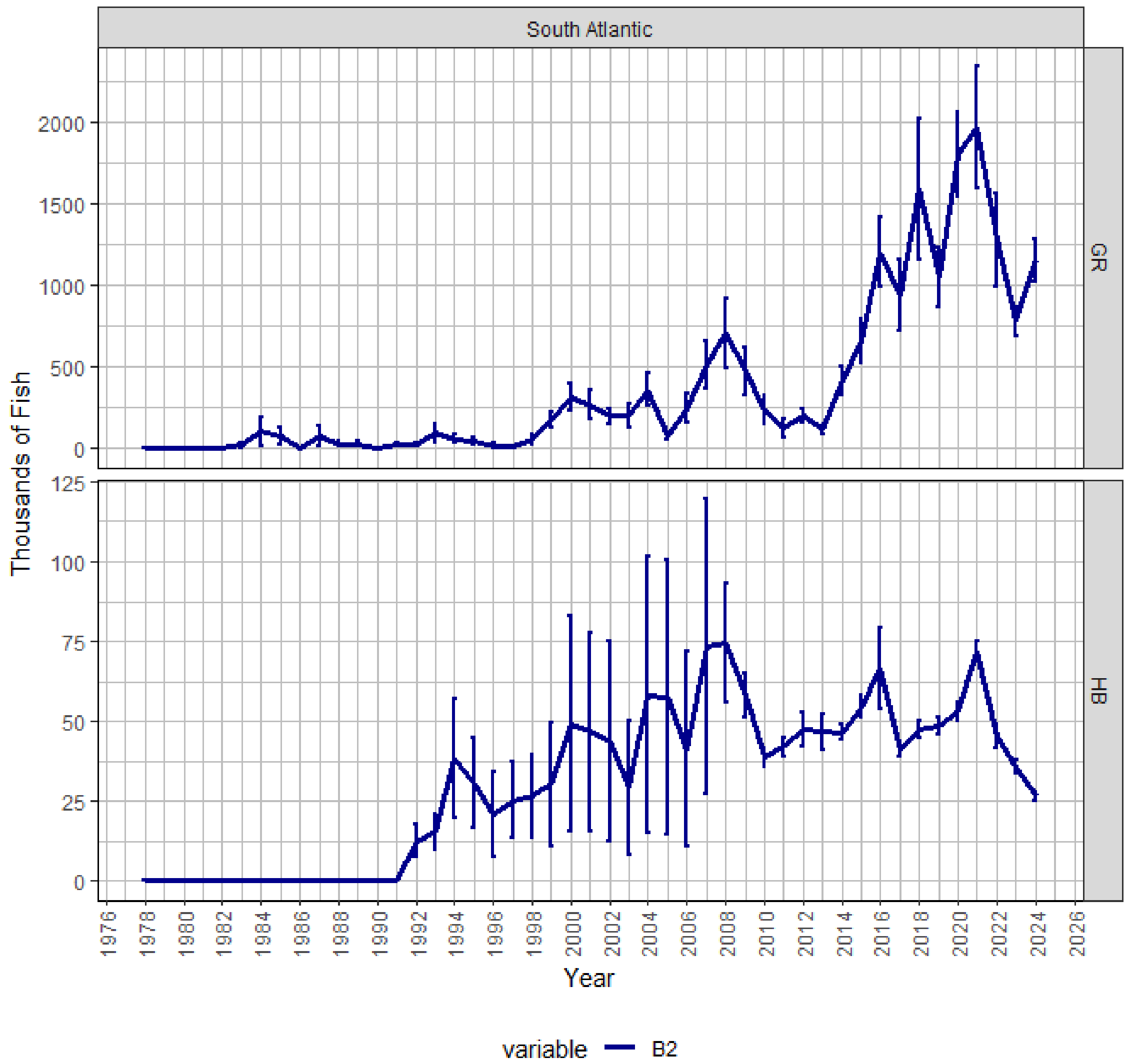


Figure 4.11.8. Total recreational discards estimates (B2) for South Atlantic Red Snapper combined across all surveys by year and fleet. Catch estimates are in thousands of fish and provided with associated error bars (i.e., standard deviations).

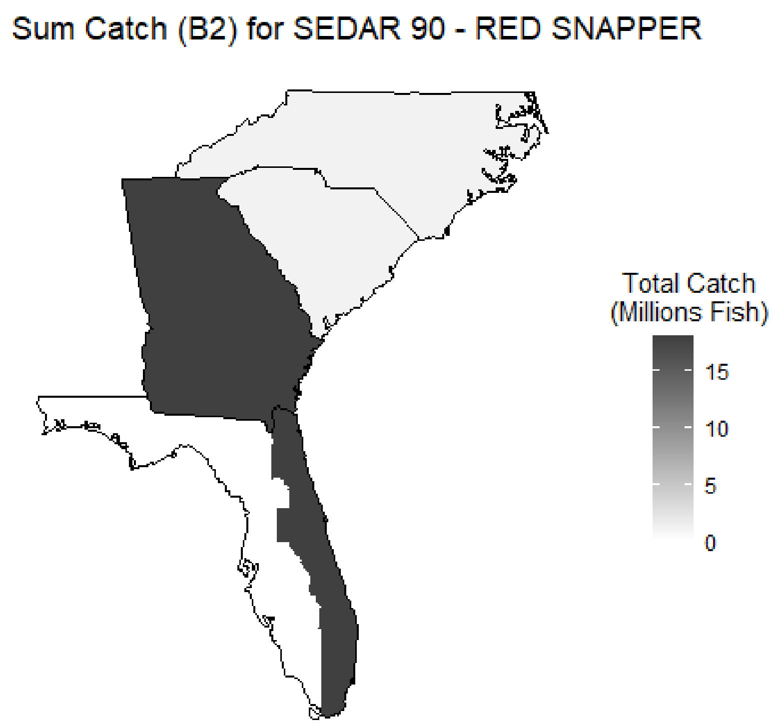


Figure 4.11.9. Distribution of total recreational discards (B2), in thousands of fish, for Red Snapper across the South Atlantic. Estimates are combined across all surveys and years.

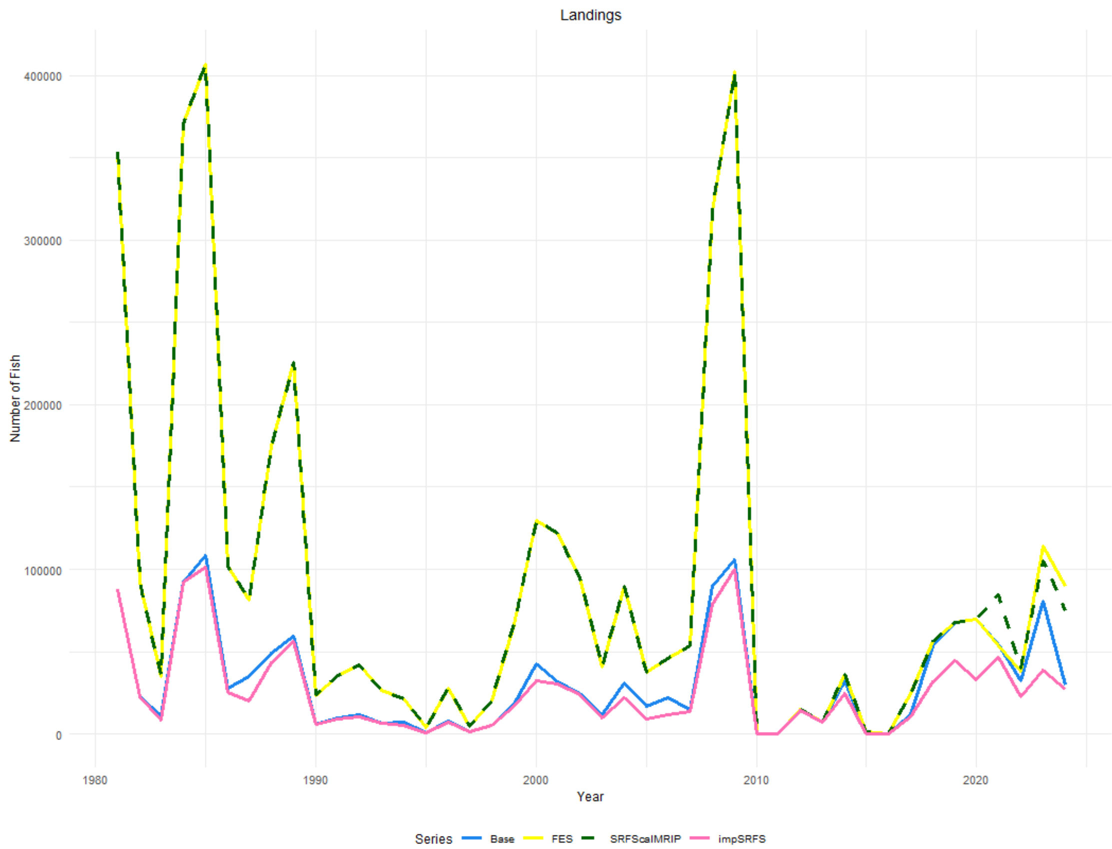


**Figure 4.11.10a. Comparison of the landings from the base (FL private = SRFS, NC-GA = MRIP FES) model and additional time series requested for sensitivities. FES = MRIP FES for NC-FL private mode; SRFScalMRIP = SRFS calibrated to MRIP for FL private and MRIP FES for NC-GA private; impSRFS = SRFS for FL private and imputed SRFS for NC-GA private.**

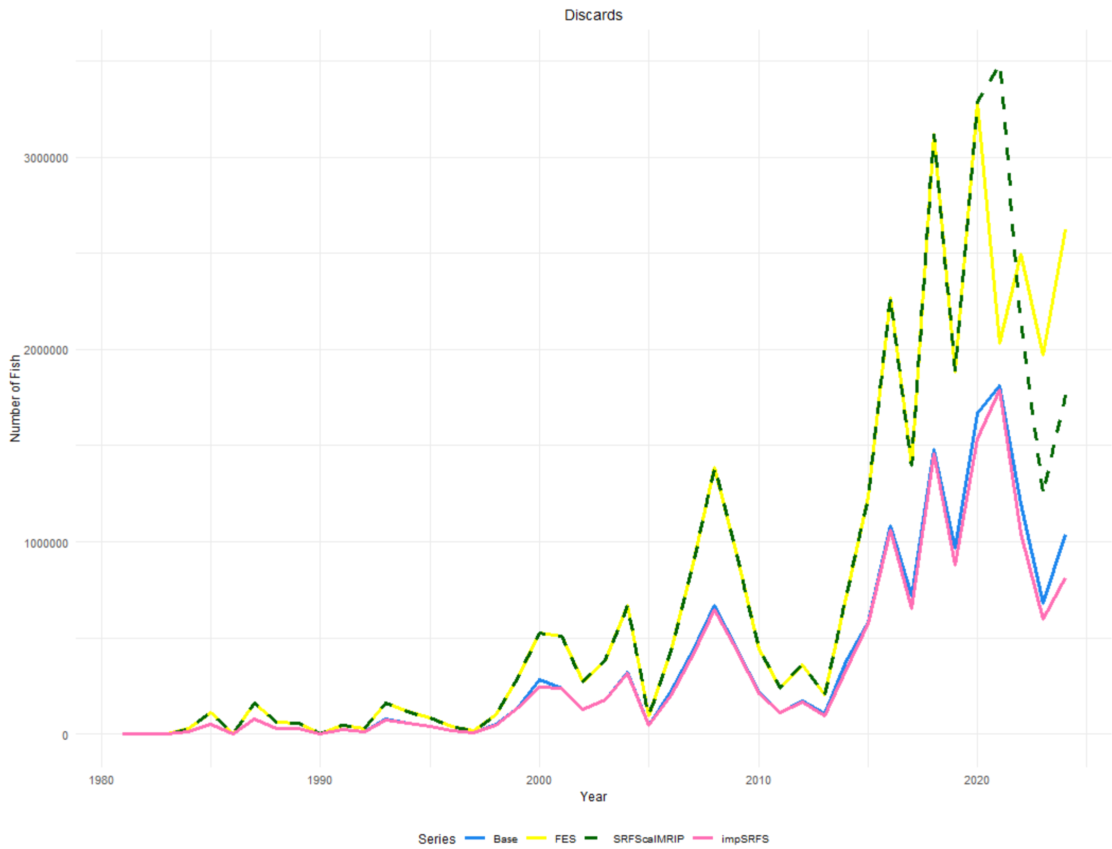


**Figure 4.11.10b. Comparison of the discards from the base (FL private = SRFS, NC-GA = MRIP FES) model and additional time series requested for sensitivities. FES = MRIP FES for NC-FL private mode; SRFScalMRIP = SRFS calibrated to MRIP for FL private and imputed SRFS for NC-GA private.**


Figure 4.11.11. An example photo from the FISHstory photo set used for length analyses from a completed fishing trip on the Marianne from Sept 4, 1962. Photo credit: Rusty Hudson and Hudson, Stone, and Timmons families.

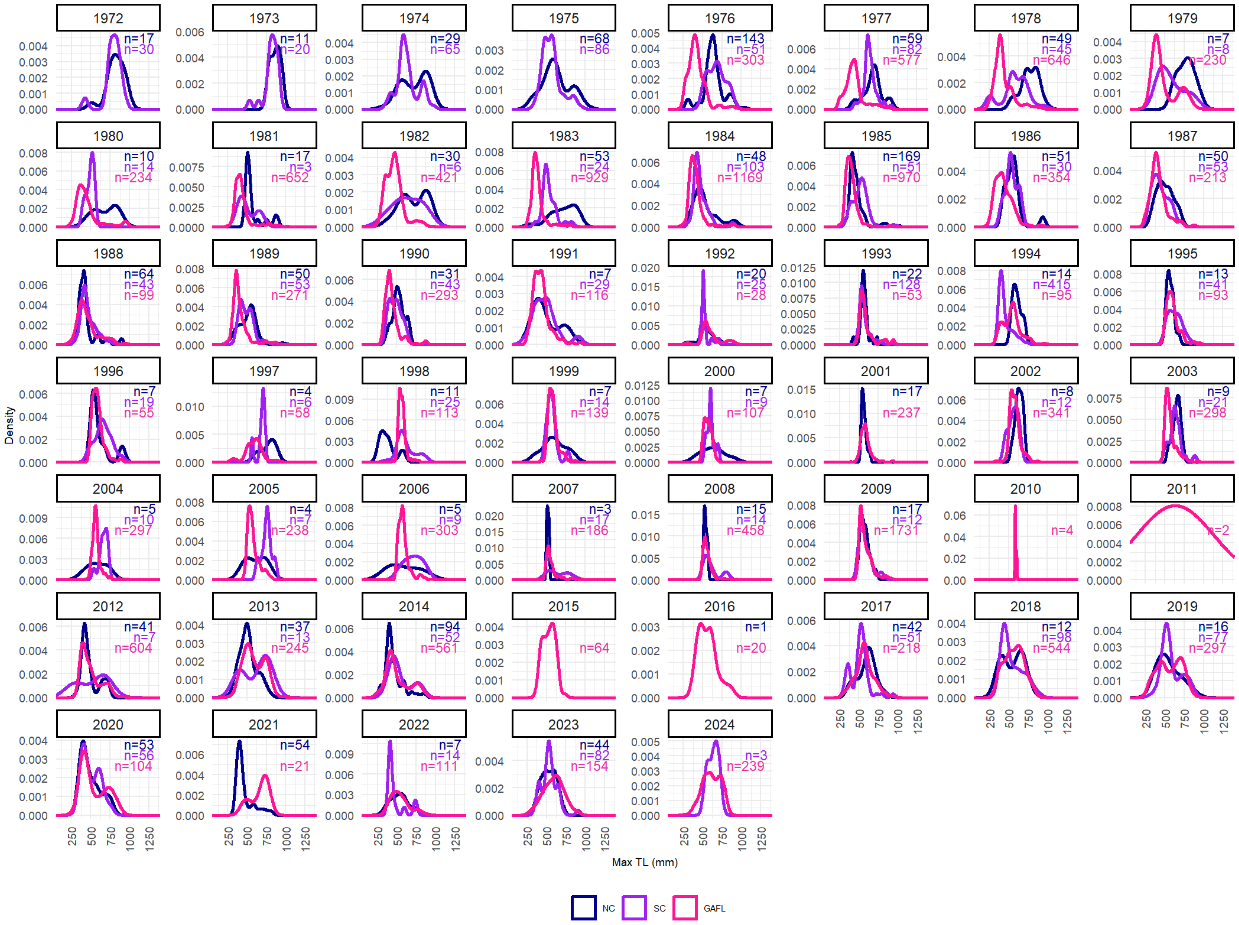


**Figure 4.11.12. Length distribution, by state, of Red Snapper sampled for length from the Headboat fleet. To ensure confidentiality, samples from GA and FL are combined.**

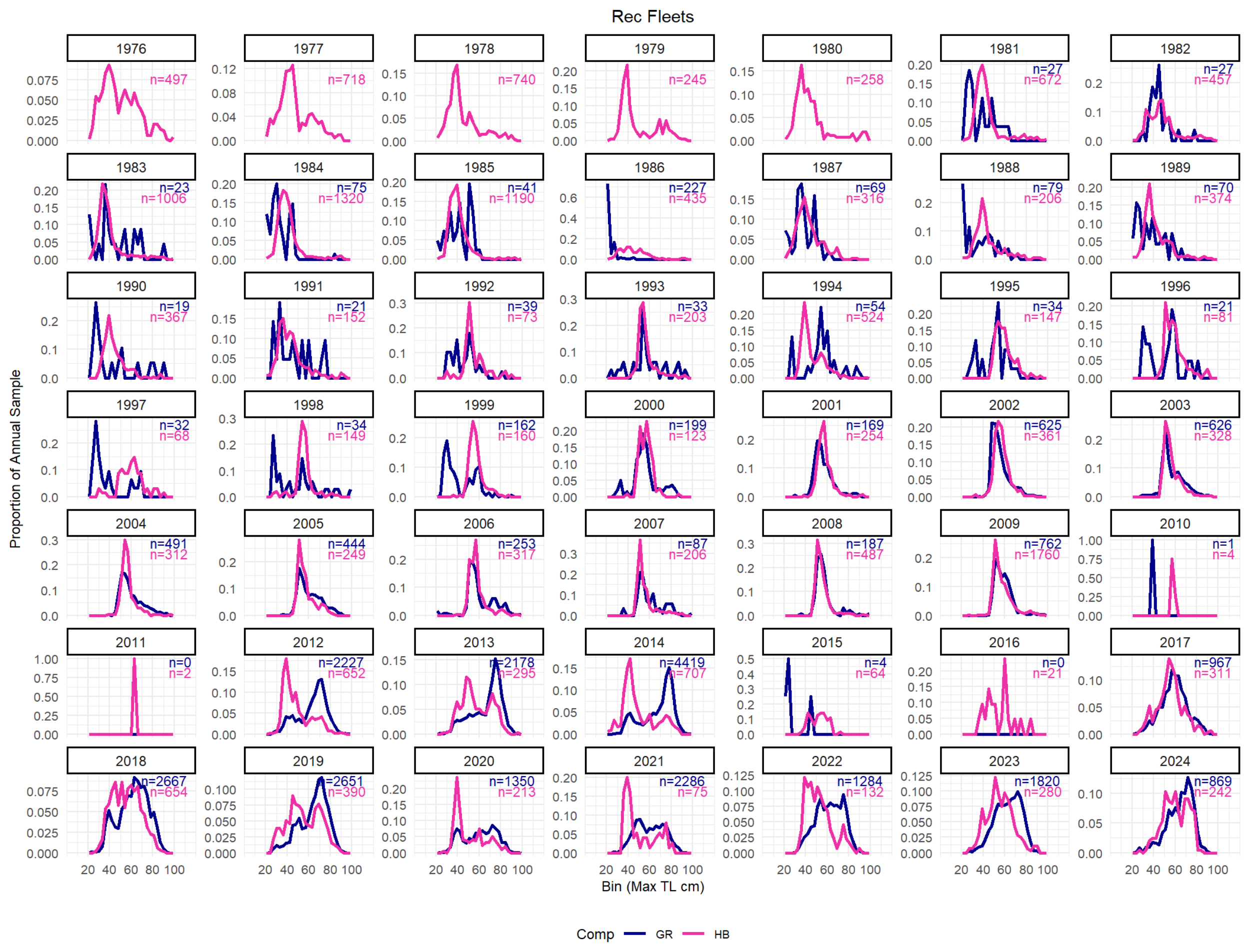


**Figure 4.11.13. Nominal length distributions of South Atlantic Red Snapper sampled from the Gen Rec (GR) and Headboat (HB) fleets. The number of fish sampled for length are included in the upper right corner of each panel.**

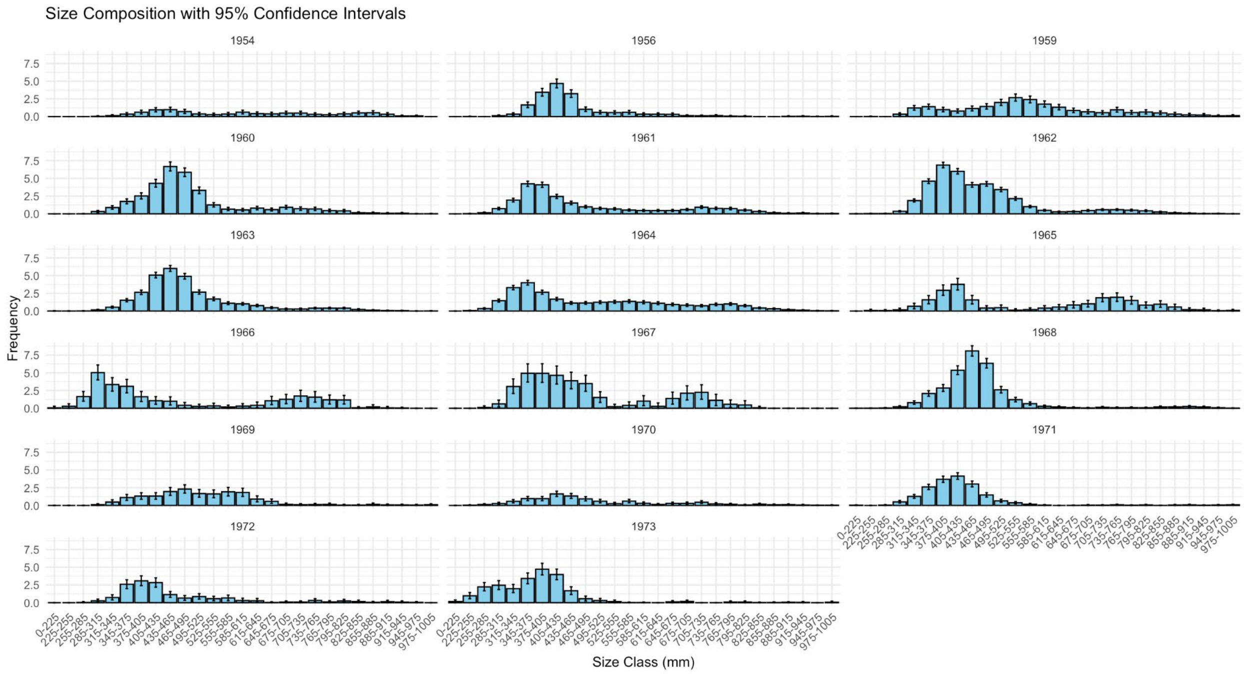


Figure 4.11.14. Estimated length frequency and uncertainty by year from FISHstory data using the bootstrap method.

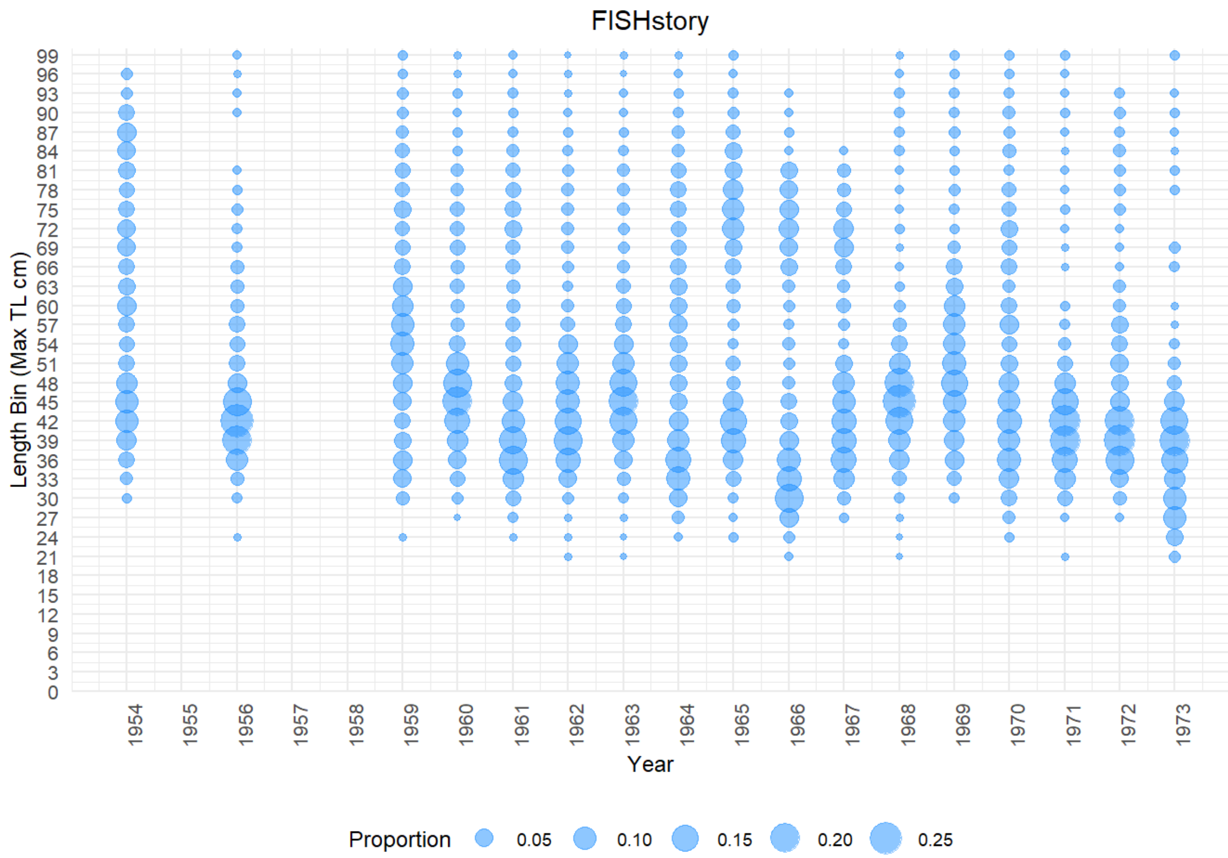


Figure 4.11.15. Estimated annual length frequency from FISHstory data.

Table:

| year_block | n.photo | n.fish |
|:---:|:---:|:---:|
| Block 1: Pre 1964 | 736 | 30781 |
| Block 2: 1965-1974 | 279 | 8757 |
| Block 3: 1975 - early 1980s | 17 | 211 |

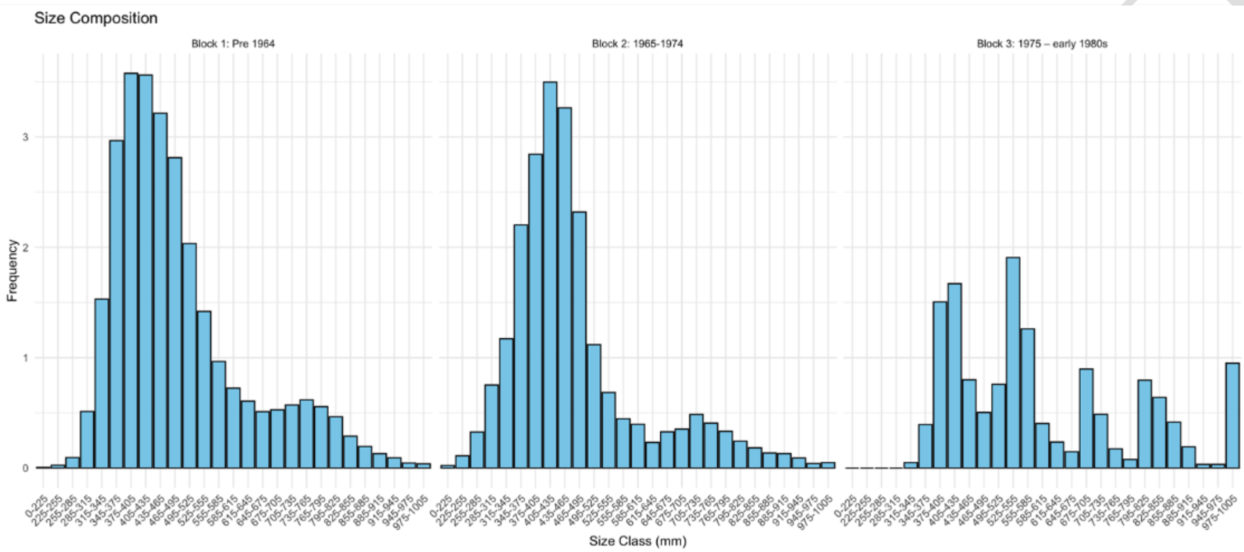


**Figure 4.11.16. Estimated length frequency from FISHstory data by time block**

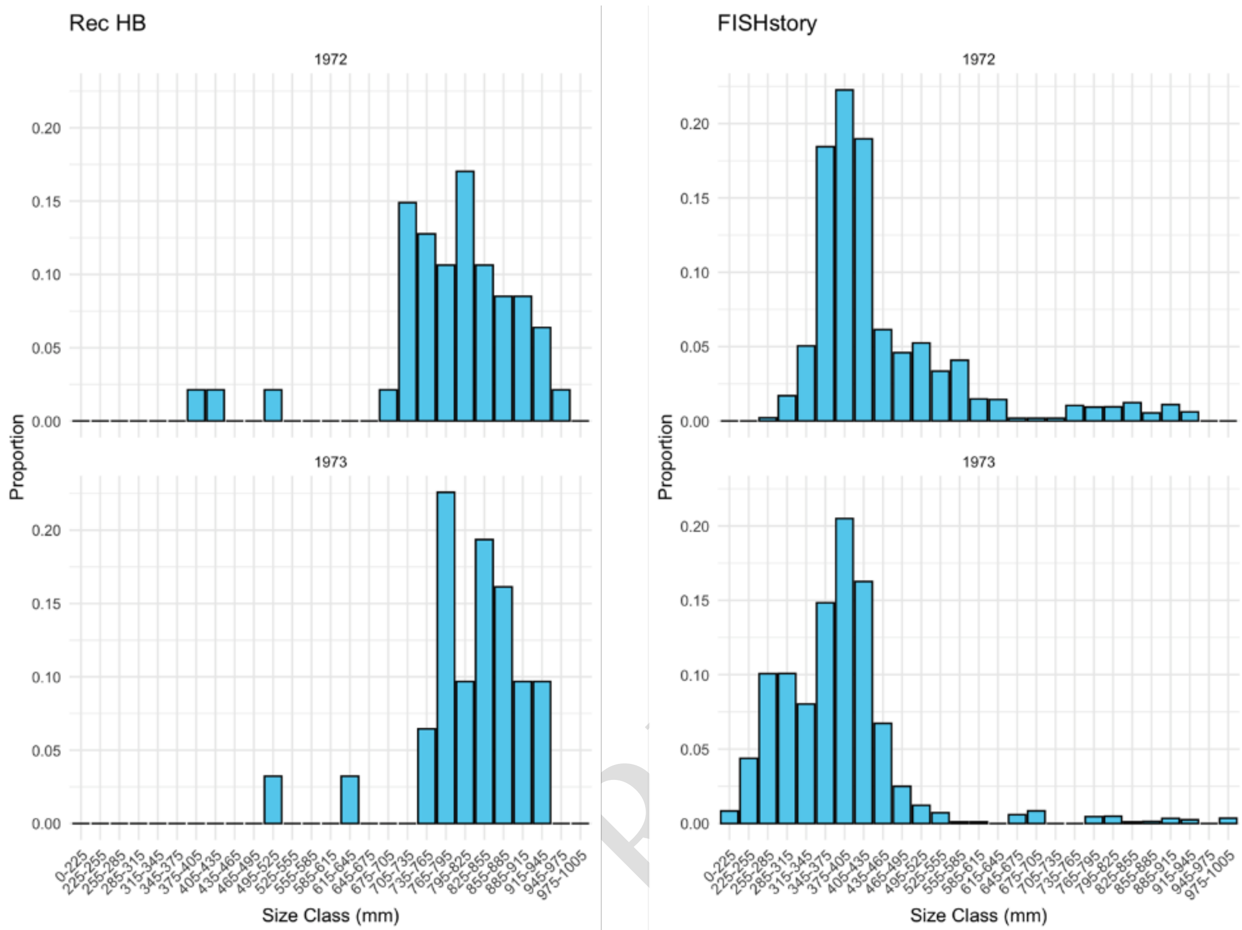


Figure 4.11.17. Comparison of length composition data from SRHS and FISHstory for overlapping years (1972 and 1973). SRHS data were only available from the Carolinas in 1972-73 and FISHstory data are from FL. Differences in size composition matched expectations of regional differences with larger fish being seen in the Carolinas and reflect spatial size differences seen in the SRHS data in the mid-late 1970s when length data were available from all South Atlantic states.

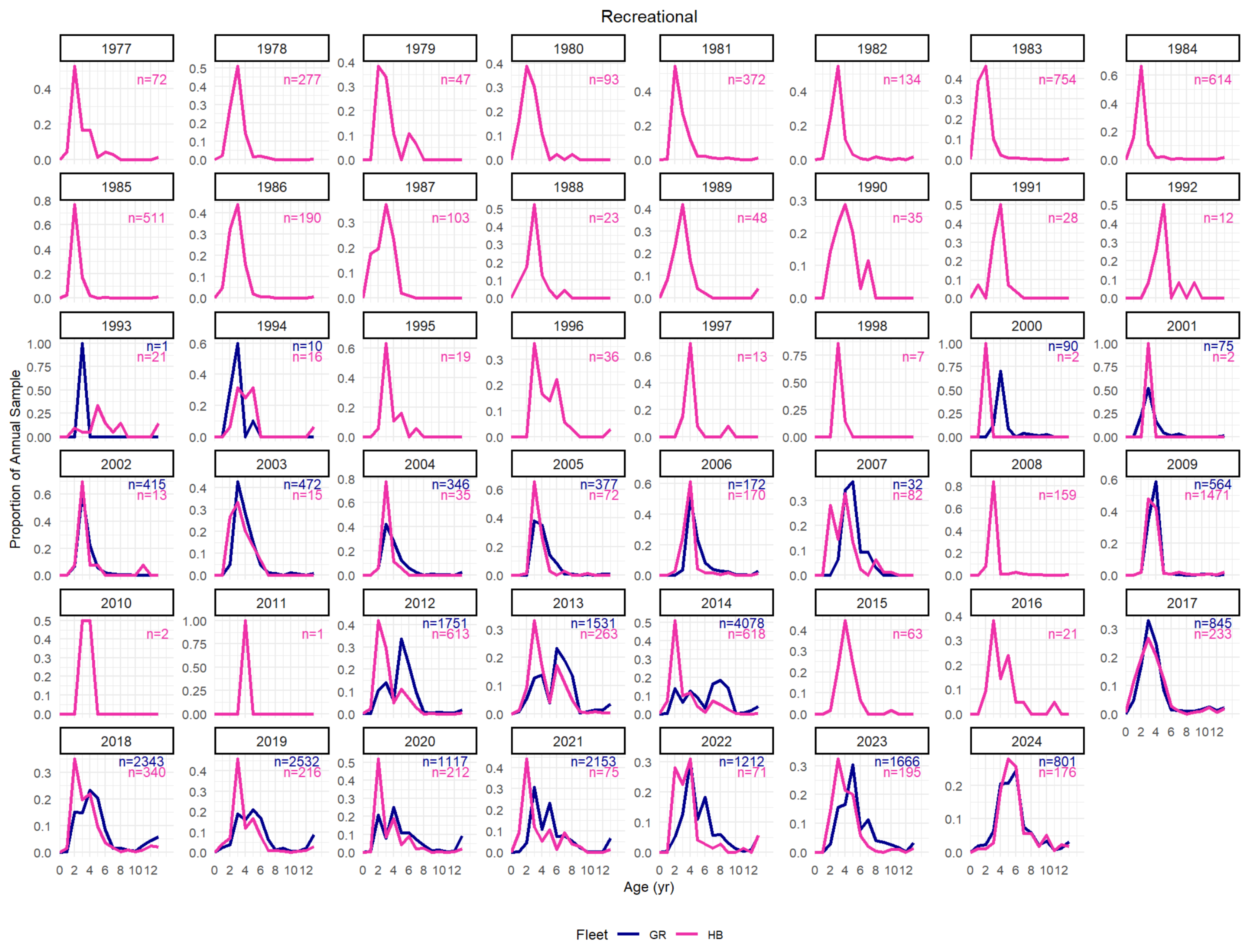


**Figure 4.11.18 – Nominal age distributions of South Atlantic Red Snapper sampled from the Gen Rec (GR) and Headboat (HB) fleets. The number of fish sampled for age is included in the top right corner of each panel.**

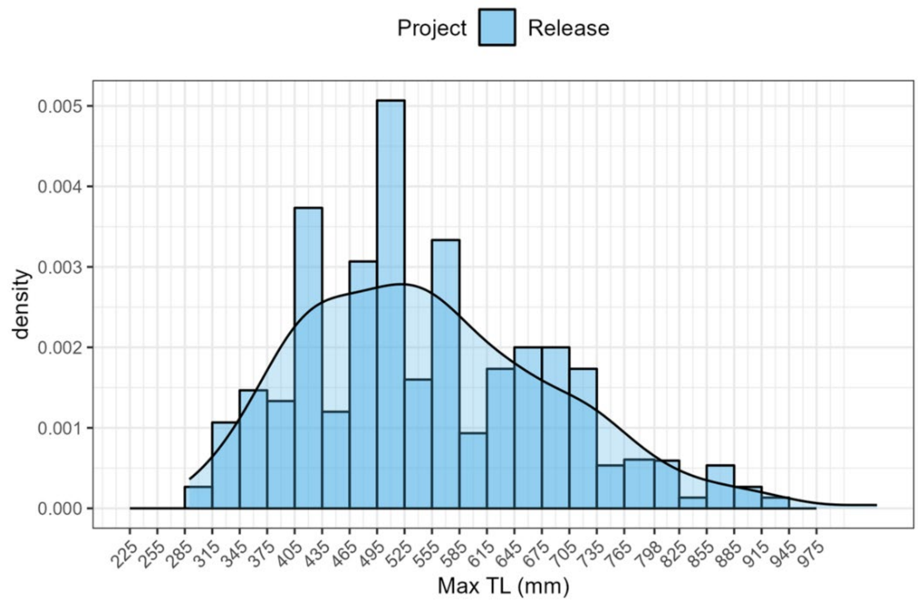


Figure 4.11.19. Released Red Snapper length frequency histogram with kernel-density estimation from SAFMC Release, 2022-2024.

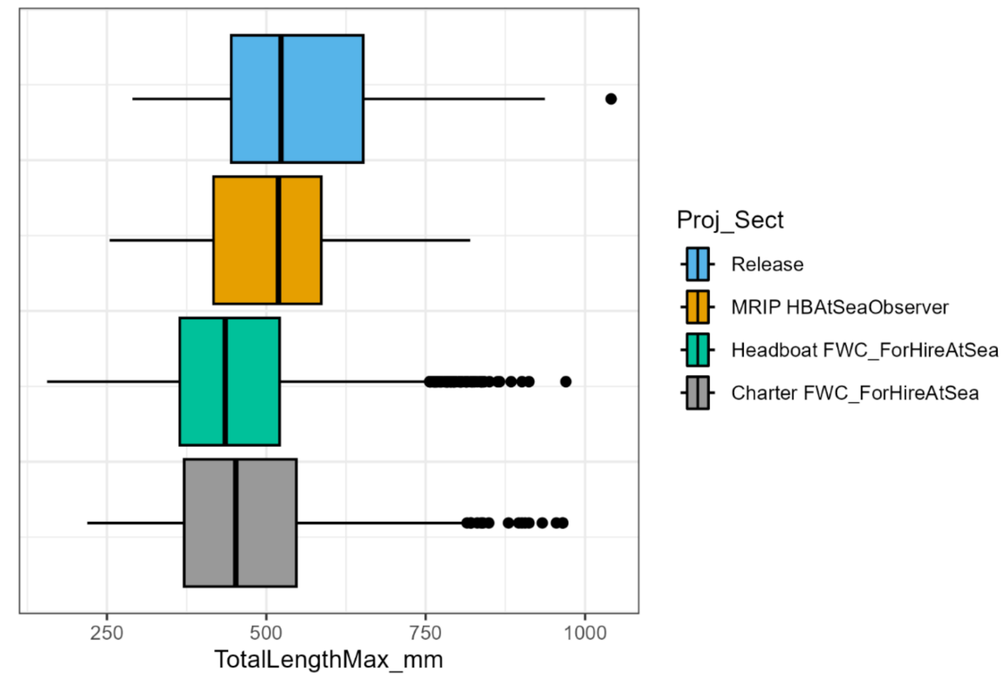


Figure 4.11.20. Box and whisker plot illustrating the Red Snapper release length distribution from the FWC For-Hire Observer Program (HB: n=2094, CH: n=761), MRIP Headboat At-sea Observer Program (n=153) and SAFMC Release (all, n=251), 2022-2024

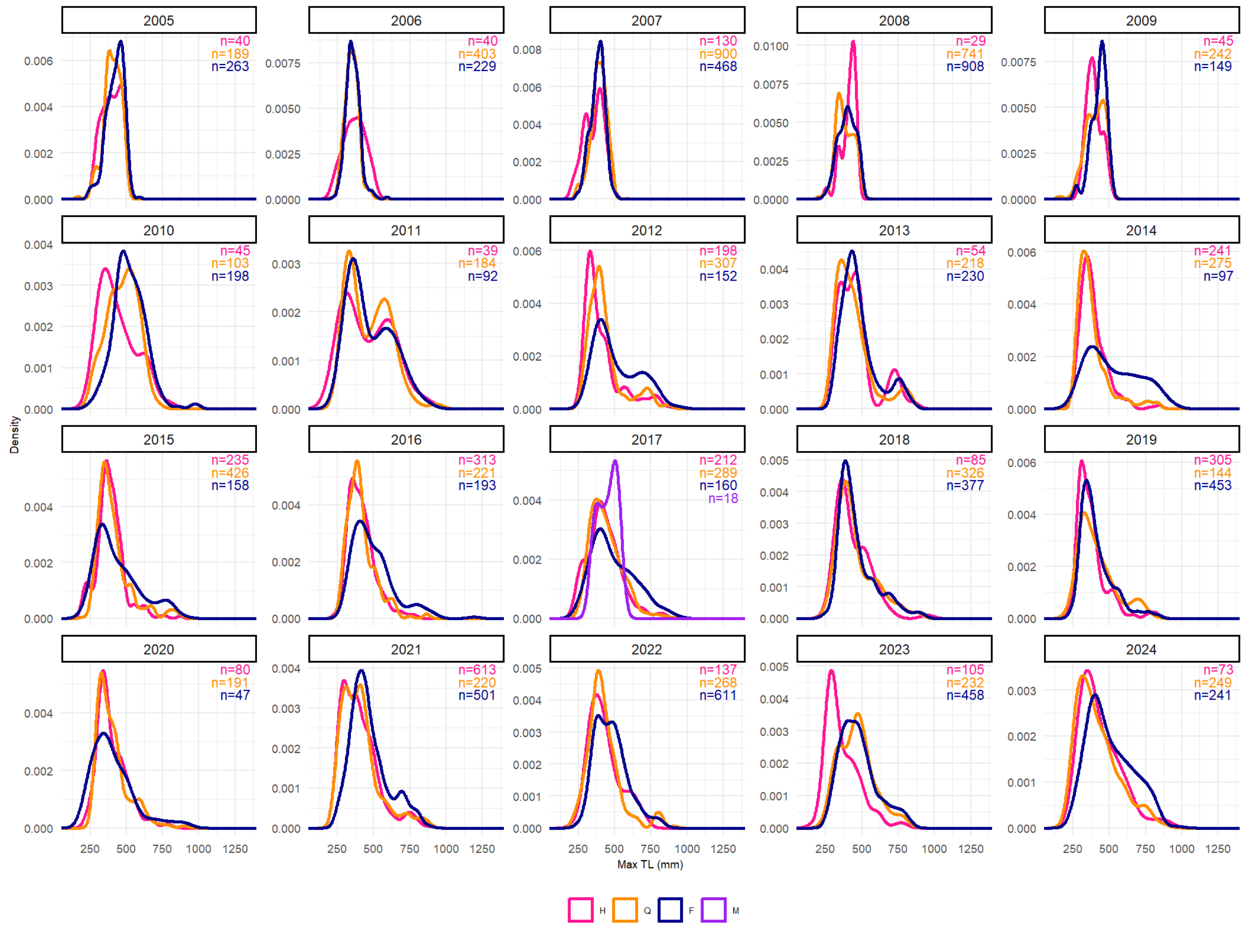


**Figure 4.11.21. Nominal length distributions of discarded Red Snapper sampled At-Sea from half (H), three-quarter (Q), full (F), and multi day headboat trips in the South Atlantic.**

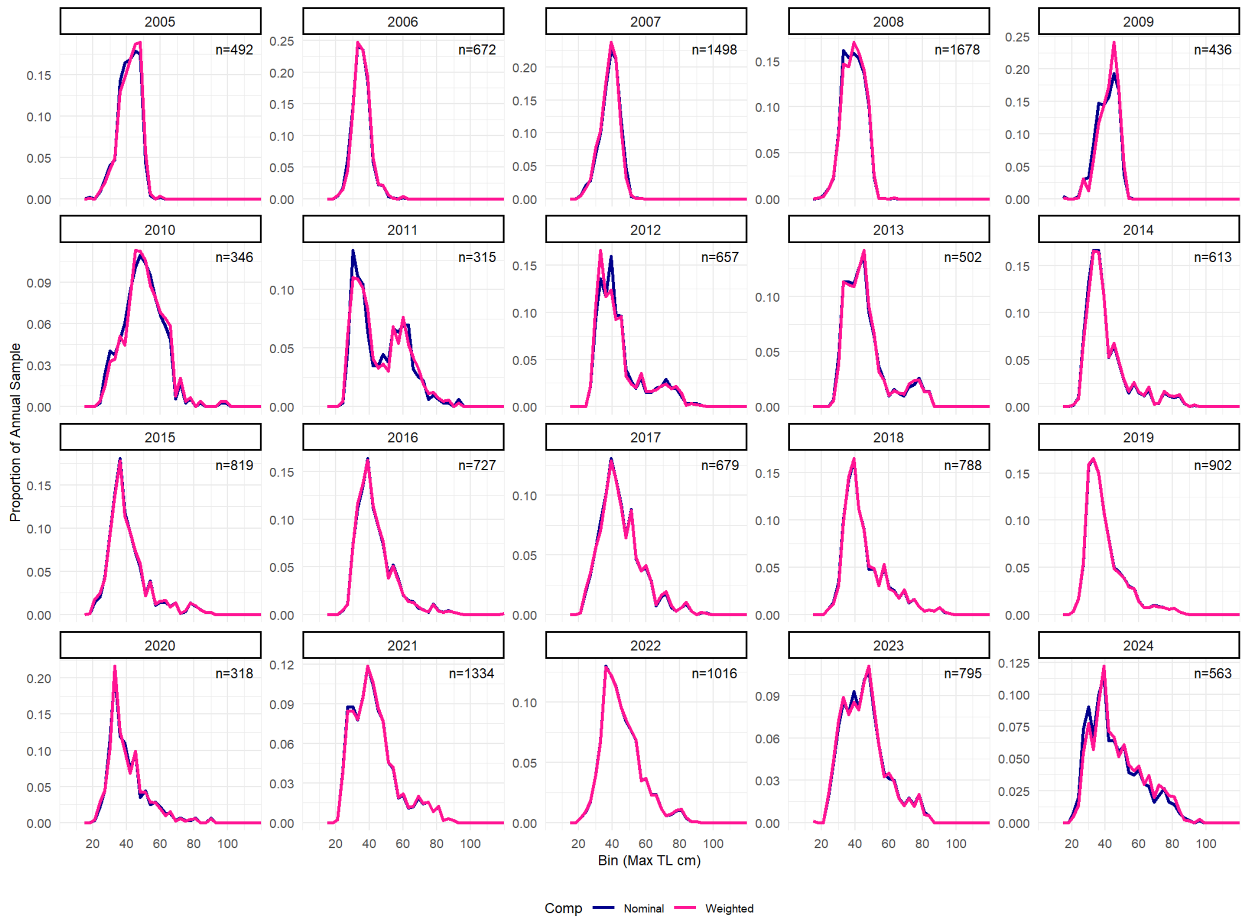


**Figure 4.11.22. Nominal and weighted length distributions of discarded Red Snapper from the South Atlantic Headboat fleet.**

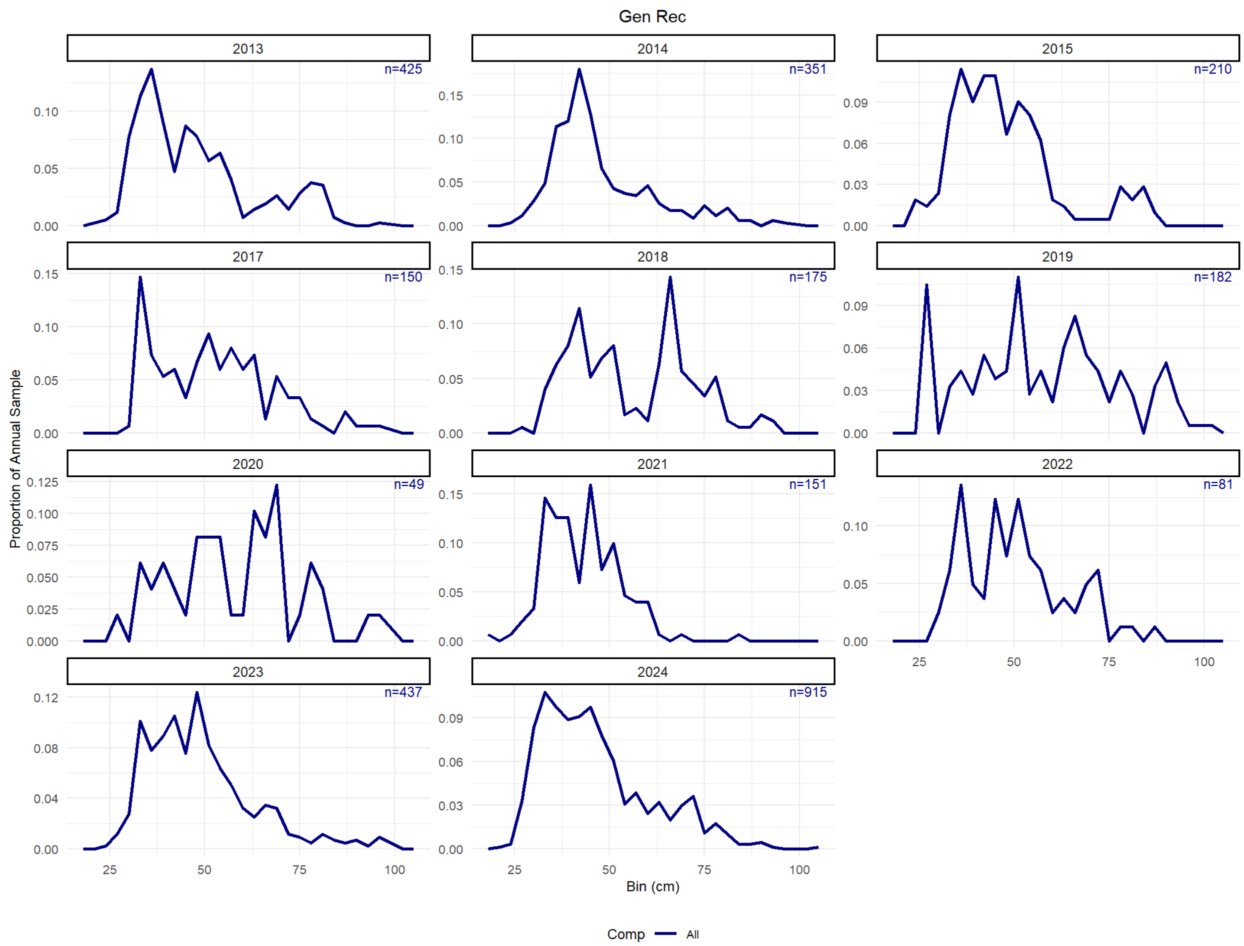


Figure 4.11.23 – Nominal length distribution of discarded Red Snapper from the South Atlantic Gen Rec fleet.

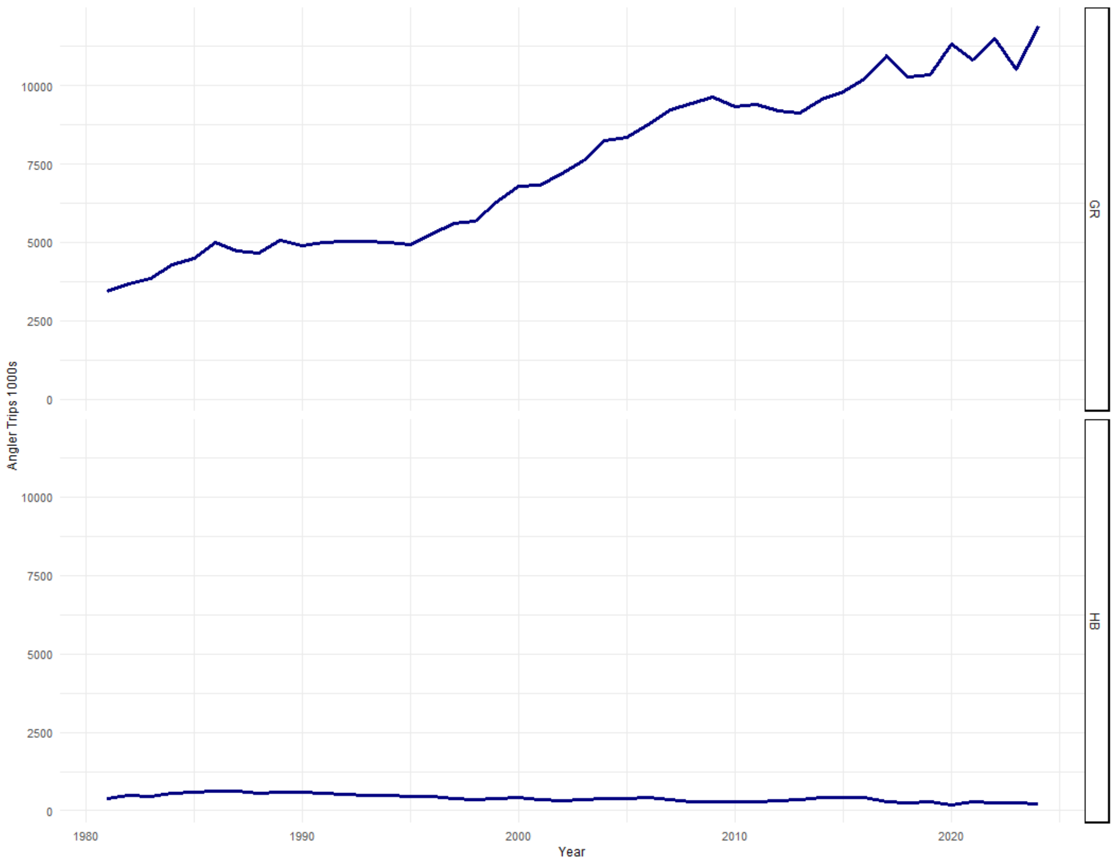


**Figure 4.11.24. Annual effort for the Gen Rec (GR) and Headboat (HB) fleets. The Gen Rec fleet contains the charter and private boat modes. Effort for the charter mode is from MRIP FHS. For the private mode, NC-GA effort is from MRIP FES and from SRFS for FL.**

# 5. INDICES OF POPULATION ABUNDANCE

## 5.1 OVERVIEW

The Index Working Group (IWG) reviewed indices and accompanying analyses from four fishery-independent datasets and four fishery-dependent datasets that represented regional relative abundance trends in the South Atlantic. Section 5.1.1 lists all the working papers, which contain the full descriptions of the datasets, analytical methods and model diagnostics, reviewed by the IWG. The IWG reviewed and evaluated indices independently following the criteria listed in Section 5.3. Rationalizations for the recommendation or exclusion of an index are given in the 'Comments on Adequacy for Assessment' in Sections 5.4 (fishery-independent) and 5.5 (fishery-dependent).

### *5.1.1 Work Group members and participants in Indices of Population Abundance Work Group*

Julie Vecchio - SCDNR, Charleston, SC
Kevin Thompson – SEFSC, Miami, FL, Leader of IWG
Kyle Shertzer – SEFSC, Beaufort, NC
Mandy Karnauskus – SEFSC, Miami, FL
Matthew Vincent – SEFSC, Beaufort, NC
Nate Bacheler – SEFSC, Beaufort, NC
Paul McLaughlin – LDWF, Lake Charles, LA
Rob Cheshire – SEFSC, Beaufort, NC
Russ Brodie – FWC, St. Petersburg,FL
Ted Switzer– FWC, St. Petersburg,FL
Tracey Smart - SCDNR, Charleston, SC

### *5.1.2 Topics Reviewed by the Indices of Population Abundance Group*

1. Consensus Recommendations and Survey Evaluations
2. Fishery Independent Indices
3. Fishery Dependent Indices
4. Research Recommendations

### *5.1.3 Indices Data Workshop ToRs*

The IWG was tasked with completing objectives associated with the following Terms of Reference (note that the numbering follows to the original Terms of Reference):

Provide measures of population abundance that are appropriate for this stock assessment

- Consider all available and relevant fishery-dependent and -independent data sources, including:
    - State of Florida Data Surveys
    - SCDNR Juvenile Survey
    - South Atlantic Deepwater Longline (SADL) Survey
- Document all programs evaluated: address program objectives, methods, coverage, sampling intensity, and other relevant characteristics
- Provide maps of survey coverage
- Develop fishery and survey CPUE indices by appropriate strata (e.g., age, size, area, and fishery)

- Provide appropriate measures of uncertainty for the abundance indices to be used in stock assessment models
- Document pros and cons of available indices regarding their ability to represent abundance
- Categorize the available indices into one of three tiers: Suitable and Recommended, Suitable and Not Recommended, or Not Suitable
- For recommended indices, document any known or suspected temporal patterns in catchability not accounted for by standardization

## 5.2 CONSENSUS RECOMMENDATIONS AND SURVEY EVALUATION

All indices presented to the IWG were evaluated based on the following criteria:

- Fishery Dependent or Independent
- Data Sources
- Temporal Range
- Spatial Range
- Survey Design (e.g., fixed sampling sites, stratified random etc.)
- Sampling Methodology (e.g., gear, vessels, effort etc.)
- Ages and/or sizes represented
- Analytical Methods Appropriate?

After the index was evaluated, it was deemed either Suitable or Not Suitable, following the guidance in the Terms of Reference). Once all the indices were evaluated on their own merits and determined to be Suitable or Not Suitable, they entered the second stage of review that determined whether or not they would be recommended for use in the assessment. Indices were then assigned one of the following categories.

- Suitable and Recommended: Based on the criteria listed above, the index met the requirements for being considered for use in the assessment and was deemed to be a representative example of the population trends for a given area.

- Suitable and Not Recommended: Based on the criteria listed above, the index met the minimum requirements for being considered for use in the assessment but was deemed not to be a representative example of the population trends for a given area.

- Not Suitable (Not Recommended): Based on the criteria listed above, the index did not meet the minimum requirements for being considered for use in the assessment.

## 5.3 FISHERY INDEPENDENT INDICES

### *5.3.1 Southeast Reef Fish Survey video index*

Standardized video counts of Red Snapper (*Lutjanus campechanus*) were generated from video cameras attached to baited fish traps deployed by the Southeast Reef Fish Survey during 2011–

2024 (except 2020). The analysis included samples taken between Cape Hatteras, North Carolina, and St. Lucie Inlet, Florida, in water 15–121 m deep. The index is meant to describe population trends of Red Snapper in the region using a variety of predictor variables that could influence abundance and video detection. We compared multiple model structures using AIC and ultimately applied a zero-inflated negative binomial model to standardize the video count data with eight predictor variables; the final model fit well based on various model diagnostics. The 2011–2024 index values and uncertainty included a calibration factor to account for a change in camera type after 2014.

#### 5.3.1.1 Methods of Estimation

**Working Paper Number:** SEDAR90-DW-08
**Data Type:** Fishery Independent
**Time Series:** 2011–2024 (except 2020)
**Sampling Intensity:** 15,507 over 12 years (1292/year)
**Size/Age Data:** Unknown but assumed to be flat-topped selectivity
**Data Filtering Techniques:** Video samples were only included if 41 frames were read and all predictor variable values were known.
**Standardization:** Zero-inflated negative binomial model
**Submodel Variables** *year, season, depth, latitude, bottom temperature, water clarity, current direction, substrate composition*
**Annual Abundance Indices**: Table 3 in SEDAR 90-DW-08

#### 5.3.1.2 Comments on Adequacy for Assessment

Following discussions within the index working group this index was identified as sampling the majority of the range of the species, had a broad selectivity and was a well-designed survey. This index was also used in previous assessments for this species as well as several other species and SEDARs. This index was deemed “suitable and recommended” for use in this assessment.

### *5.3.2 Southeast Reef Fish Survey Chevron Trap*

This index presents annual standardize nominal abundance and abundance estimates using zero-inflated negative binomial (ZINB) of Red Snapper in chevron video traps from 2010 to 2024. Corresponding age and length compositions from the video trap catches are displayed for informational purposes.

#### 5.3.2.1 Methods of Estimation

**Working Paper Number:** SEDAR90-DW-05
**Data Type:** Fishery Independent
**Time Series:** 2010-2024
**Sampling Intensity:** 19,743 total stations (731-1882 stations per year)

**Size/Age Data:** This survey generates both size and age composition data. The sizes of Red Snapper ranged from 160 mm to 990 mm total length (Figure 8 from the working paper) and the age ranged from 0 to 26 years (Figure 9 from the working paper).
Max TL distribution 16-99 cm, Calendar age distribution 0-26 years
**Data Filtering Techniques:** CVT catch data (Gear = 324) were limited to:

- Projects conducting monitoring sampling
  - P05 – MARMAP
  - T59 – SEAMAP-SA
  - T60 – SEFIS
- CVTs that fished properly (i.e., appropriate catch IDs)
  - 0 – no catch
  - 1 – catch with finfish
  - 2 – catch without finfish
  - 8 - Species catch subsampled for Length Frequency
- CVTs on hard-bottom habitat (i.e., appropriate station types)
  - Included all station types except for reconnaissance and experimental
- CVTs with soak times that were neither extremely short nor long which often indicates an issue with the deployment not captured elsewhere (included 45-150 minutes)
  - SERFS targets a soak time of 90 minutes for all CVT deployments
- Excluded any CVTs missing covariate information
- Excluded all CVTs sampled prior to 2010

**Standardization:** Zero inflated negative binomial
**Count Submodel:** Year, latitude, depth, bottom temperature, day of year
**Binomial Submodel:** Latitude, depth (other variables tested, not selected)

**Annual Abundance Indices**: Table 2 in SEDAR 90-DW-05

### 5.3.2.2 Comments on Adequacy for Assessment

This index has been used in the current form in both SEDAR 41 and SEDAR 73. The index, as provided, begins in the first year of sampling that includes approximately equal sampling intensity for all parts of the survey region. Prior to 2010, sampling in the core latitudinal range for Red Snapper (northern Florida) was sparse and tended to be inconsistent. However, starting in 2010, sampling was consistently dense from Cape Canaveral to Cape Hatteras. The proportion positive has been between 0.1 and 0.2 throughout the timeseries presented and the CVs have consistently remained below 0.2. The chevron trap index was evaluated and found to be both “suitable and recommended” for inclusion in the assessment.  Selectivity for this gear seems to be dome-shaped, as was found in SEDAR 73 (SEDAR90-DW-06); however, the shape of the curve should be updated with the newest trap catch information that was provided with the dataset.

### *5.3.3 Florida Repetitive Timed Drop (RTD) Hooked Gear Index*

To complement ongoing Southeast Reef Fish Survey (SERFS) trap/camera surveys and provide an additional source of fishery-independent data for assessing the status of managed reef fish stocks, the Florida Fish and Wildlife Research Institute (FWRI) developed a standardized hooked-gear survey of hard-bottom habitats in the U.S. South Atlantic (SA) beginning in 2012. The actively-fished hooked-gear survey developed by FWRI is a standardized sampling approach in which a series of repetitive timed drops (RTD) are conducted at each sampling station to standardize overall maximum bottom soak time and effort for each individual fisher. This survey involves a stratified-random survey design where annual sampling sites are randomly-selected from a universe of known reef sites. Annual sampling effort is stratified in three National Marine Fisheries Service (NMFS) statistical reporting zones (722, 728, and 732) and two depth strata (inshore: 10 – 30 m and offshore: 30–150 m), and annual sampling effort is proportionally allocated based on the percentage of the total number of possible reef sites in the sampling frame that fell within each spatial stratum. At each sampling station, a series of ten standardized, two-minute team drops were conducted using a combination of 8/0, 11/0, and 15/0 hooks. The FWRI completed annual hooked-gear surveys in 2012, 2014, 2016-2018, and 2021-2024 resulting in a potential thirteen-year time series on which an index of abundance for Red Snapper could be generated.

#### 5.3.3.1 Methods of Estimation

**Working Paper Number:** SEDAR90-DW-23
**Data Type:** Fishery Independent
**Time Series:** 2016 – 2024
**Sampling Intensity:** Annual sampling intensity ranged from 87 – 311 sampling sites per year
**Size/Age Data:** This survey generates both size and age composition data. The sizes of Red Snapper ranged from 205 mm to 965 mm total length (Figure 7 from the working paper) and the age ranged from 1 to 33 years (Figure 8 from the working paper).
**Data Filtering Techniques:** Data from September and October were excluded because only very limited sampling occurred within these months. Data from artificial reef habitats were excluded because they were infrequently sampled. Initial model runs included the full time series of data (2012 – 2024), however, a final model was fit where data from 2012 and 2014 were excluded because the number of hooks deployed by hook size at each sampling site varied, and differed from standardized effort implemented in 2016.
**Standardization:** Model used zero-inflated negative binomial, retained variables from backwards selection listed below.
**Binomial Model Variables**

1. ***Year (Y)*** *– Year was included since standardized catch rates by year are the objective of the analysis. We modeled data collected from 2016, 2017, 2018, 2021, 2022, 2023, and 2024.*
2. ***Month (MQ)*** *– A temporal parameter based on month of sampling. Sampling occurred from April to August and was treated as a quantile factor.*

3. ***Depth (DQ)*** *– Water depth may be an important component affecting the distribution of reef fish. All depths sampled (11-90 m) were included and treated as a quantile factor.*
4. ***Bottom Temperature (TQ)*** *– Temperature may affect the distribution of reef fish. Temperature ranged from 10.5 to 36.7°C and was treated as a quantile factor.*
5. ***Statistical Zone (Zone)*** *– National Marine Fisheries Service (NMFS) statistical reporting zones (722, 728, and 732) were included.*

**Count Model Variables**

1. ***Year (Y)***
2. ***Month (MQ)***
3. ***Depth (DQ)***
4. ***Temperature (TQ)***
5. ***Statistical Zone (Zone)***

**Annual Abundance Indices**: See Table 2 in SEDAR90-DW-23

**5.3.3.2 Comments on Adequacy for Assessment**

Initial model results presented at the data workshop included data from 2012 – 2024. During initial index workgroup discussions, concerns were raised as to whether the model was adequately accounting for variability in the number of hooks dropped by size during the early years of the survey (2012 and 2014), before hook deployments were standardized in 2016. Based on workgroup recommendations, the index model was revised to exclude data from 2012 and 2014.

The RTD index appears to index larger, older Red Snapper that may not be as effectively captured in the chevron trap survey, and although the video survey likely captures these individuals in their observations, there are currently no methods in place to generate proxy size/age composition for the video survey. The RTD index also uses complementary methods to the trap/video survey that are comparable to industry methods, which has been expressed as a point of interest by stakeholders. Potential limitations of the RTD index include the limited spatial scope of the survey, although it does cover a significant proportion of the Red Snapper population density. There were concerns raised by members of the workgroup about potential for hyperstability given the limitations in number of hooks (N = 60) deployed at each site. However, there does not yet appear to be conclusive evidence of hyperstability, and currently there is no evidence of significant issues with hook saturation. Another potential cause of hyperstability could be due to the limited spatial range of this survey in the area of highest abundance for this species. This was also discussed at the data workshop and was recommended that this issue be evaluated continually as this survey is used in future data products for this species.

The final recommendation of the index working group is that the RTD index was deemed “suitable and recommended” for use in the assessment. The working group recommended a sensitivity run of the assessment model be conducted that excluded the RTD index to explore whether model fit is impacted by potential issues of hyperstability. Should the determination be made that the RTD index be excluded from the final assessment model, the index working group recommended that analysts develop approaches to incorporate age composition data originating from this survey.

### *5.3.4 SCDNR Juvenile Survey*

In 2022 and 2023, the South Carolina Department of Natural Resources (SCDNR), conducted pilot sampling to test gear types and habitat types for occurrence and abundance of juvenile snapper-grouper. This work occurred from the lower estuary to mid continental shelf and from northern Florida to southern North Carolina. Gears included small-mesh pinfish traps (baited) and timed, standardized hook and line with Sabiki (flasher) rig terminal tackle. Habitat types included artificial reefs, natural reef, and soft bottom.

#### 5.3.4.1 Methods of Estimation

**Working Paper Number:** SEDAR90-DW-10
**Data Type:** Fishery Independent
**Time Series:** 2022-2023
**Sampling Intensity:** 257 traps and 69 standardized hook and line deployments per year average
**Size/Age Data:** 19-41 cm Max TL
**Data Filtering Techniques:** None applied
**Standardization:** None applied
**Submodel Variables** *None applied*
**Annual Abundance Indices**: None provided

#### 5.3.4.2 Comments on Adequacy for Assessment

The SCDNR Juvenile Survey was listed in the TORs for evaluation (see section 5.1), but only encountered 7 total Red Snapper in 2022 and 2023, on 4 total deployments of timed, standardized hook and line gear. The survey was also only a pilot study with no additional funding identified for additional years of effort. As such, given the short time series and low catch rates, this survey was deemed “unsuitable” for inclusion in this assessment.

### *5.3.5 South Atlantic Deepwater Longline (SADL)*

The SADL survey was designed to work in partnership with industry vessels using a stratified random sampling design to collect data on deep water reef species in the region. The design uses two depth strata: 75-145 m and 146-366 m. Data collection began in 2020 though there were survey design changes following the first year of sampling to the more standardized approach currently being used.

#### 5.3.5.1 Methods of Estimation

**Working Paper Number:** N/A
**Data Type:** Fishery Independent

**Time Series:** 2021-2024
**Sampling Intensity:** 174-187 sites per year
**Size/Age Data:** Collected, not available for this assessment
**Data Filtering Techniques:** None applied
**Standardization:** None applied
**Submodel Variables** *None applied*
**Annual Abundance Indices**: Nominal (average) annual values evaluated for trends and discussion only

#### 5.3.5.2 Comments on Adequacy for Assessment

This dataset was evaluated as it was listed in the TORs for this assessment (see section 5.1). However, it doesn't meet the threshold of 5 years of continuous data as established in previous best practices for indices in the region. As such, for this assessment it was deemed "unsuitable" for inclusion. However, the members of the index working group agreed that this dataset will likely provide important trend information on larger, adult Red Snapper when there are enough years of data, particularly in the shallower of the two strata. As such, we recommend its evaluation in subsequent Red Snapper assessment processes with exploration to determine the most appropriate data sub setting and modeling methodologies for this survey.

## 5.4 FISHERY DEPENDENT INDICES

### *5.4.1 Headboat-at-Sea Observer Index*

Standardized catch rates were generated from the Southeast headboat at-sea-observer program for 2005-2024 Data from Georgia, South Carolina, and North Carolina were provided as part of the NOAA-NMFS headboat observer program. Florida data were provided by the state observer program beginning in 2005. The index is meant to describe population trends of fish in the size/age range of fish discarded by headboat vessels. Data filtering and sub-setting steps were applied to the data to model trips that were likely to have fished over Red Snapper habitats.

#### 5.4.1.1 Methods of Estimation

**Working Paper Number:** SEDAR90-DW-30
**Data Type:** Fishery Dependent
**Time Series:** 2005-2024
**Sampling Intensity:** ~180-250 trips per year (36 in 2020)
**Size/Age Data:** This index was for undersize (20") and below only fish due to size limit regulation consistency from 1992 and later
**Data Filtering Techniques:** The South Atlantic Red Snapper season is primarily closed throughout the year starting in 2010, therefore to index population status the trips included in this analysis were during closed season so limited to discarded fish, rather than the brief open seasons where Red Snapper would have been recorded as landed. To create a representative dataset that included only headboat trips with observers that fished on potential Red Snapper habitat, a species association approach was used where species

identified to be closely associated with Red Snapper were used to filter trips. Trips were retained for the index when one of the following species were observed: Bank Seabass, Black Seabass, Gag, Gray Triggerfish, Greater Amberjack, Knobbed Porgy, Red Porgy, Red Snapper, Scamp, Tomtate, Vermillion Snapper, White Grunt, Whitebone Porgy (Shertzer and Williams 2008). A 20” TL minimum size regulation has been in place since 1992 followed by fishery closures starting in 2010. Therefore, while discard behavior was initially limited to fish under 20”, discards of larger fish are common in the later time period, however these fish are not included as to allow for a consistent, longer time series for this index.
**Standardization:** Delta-lognormal
**Submodel Variables:** The complete list of evaluated variables were retained and used in both the binomial and presence submodels for this index, they are:
*YEAR* – all years of the time series were included
*AREA* –Area was defined as North Carolina, South Carolina, Georgia, North Florida (nFL), and South Florida, (excluding Monroe County/the keys, flreg=3)
*SEASON* – The seasons were defined as winter (January, February, March), spring (April, May, June), summer (July, August, September) and fall (October, November, December).
*PARTY* – Four categories (quantiles) for the number of anglers on a vessel were considered in the standardization process.
*HRSF*– Four categories (quantiles) for the number of hours fished were considered in the standardization process.

**Annual Abundance Indices**: See Table 2 in S90-DW-30

#### 5.4.1.2 Comments on Adequacy for Assessment

This dependent index starts in 2005, whereas the earliest fishery-independent datasets begin in 2010. This index has several advantages over standard commercial or recreational dependent indices in that it is from directly observed fish on vessels rather than self-reported logbooks. As such, the index was determined to be reflecting the population status of undersized (under 20”) Red Snapper sampled through the fishery. This index was deemed “suitable and recommended” for this assessment.

### *5.4.2 Commercial Logbook Vertical Line*

#### 5.5.2.1 Methods of Estimation

**Working Paper Number:** SEDAR41-DW-19
**Data Type:** Fishery Dependent
**Time Series:** 1993-2009
**Sampling Intensity:** ~720-1750 trips per year
**Size/Age Data:** N/A
**Data Filtering Techniques:**
For each fishing trip, the Commercial Fisheries Logbook Program (CFLP) database included a unique trip identifier, the landing date, fishing gear deployed, areas fished, number of days at sea, number of crew, gear-specific fishing effort, species caught, and

weight (in pounds) of the landings. Data were restricted to include only those trips with landings data reported within 45 days of the completion of the trip (some reporting delays were longer than one year). Also excluded were records reporting multiple gears fished, which prevents designating catch and effort to specific gears. Therefore, only trips which reported one gear fished were included in these analyses. For records where more than one area was reported, the first area reported was used to determine the latitude associated with the trip. Data were then further subset using the Stephens-MacCall procedure to determine trips that could be included based on associated species.
**Standardization:** Delta-lognormal
**Submodel Variables:** The complete list of evaluated variables was retained and used in both the binomial and presence submodels for this index, they are:
*YEAR* – all years of the time series were included
*AREA* –Area was defined as North Carolina, South Carolina, Georgia, North Florida (nFL), and South Florida, (excluding Monroe County/the keys, flreg=3)
*SEASON* – The seasons were defined as winter (January, February, March), spring (April, May, June), summer (July, August, September) and fall (October, November, December).
*CEW SIZE* – pooled as 1, 2, or 3+
*DAYS AT SEA* – pooled for 1-2 days, 3-4 days, and 5+

**Annual Abundance Indices**: See Table 6 in S41-DW-19

### 5.4.2.2 Comments on Adequacy for Assessment

This index was not updated for this assessment and the index model and values presented in SEDAR 41 were evaluated to confirm its continued inclusion in this assessment of Red Snapper. Given the consistency of the time series from 1993 to 2009, no independent indices go back in time as long, and no further information was provided to cause concerns or reasons to exclude it, this index was deemed “suitable and recommended” for this assessment.

### *5.4.3 Headboat Logbook*

The for-hire fishery in the South Atlantic includes headboats. The fishery uses hook and line gear, generally targets hard bottom reefs as the fishing grounds, and generally targets multiple species in the snapper-grouper complex.

### 5.5.3.1 Methods of Estimation

**Working Paper Number:** SEDAR41-DW-12
**Data Type:** Fishery Dependent
**Time Series:** 1976-2009
**Sampling Intensity:** ~680-2,000 trips per year included in the index
**Size/Age Data:** N/A
**Data Filtering Techniques:**
Stephens-MacCall was used to select for trips that were sampling potential Red Snapper habitat.

**Standardization:** Delta-lognormal
**Submodel Variables:** The complete list of potential variables is listed below as outlined in the working paper and included in a model selection procedure. The working paper does not outline specifically which variable was included in each of the presence absence or positive catch submodels.

*CPUE* – catch per unit effort (CPUE) has units of fish/angler and was calculated as the number of Red Snapper caught divided by the number of anglers.

*YEAR* – all years of the time series were included
*AREA* – Areas were pooled into regions of North Carolina (NC=2,3,9,10), South Carolina (SC=4,5), Georgia and North Florida (GNFL=6,7,8), and south Florida (SFL=11,12,17).

*SEASON* – The seasons were defined as winter (January, February, March), spring (April, May, June), summer (July, August, September) and fall (October, November, December).

*PARTY* – Five categories for the number of anglers on a boat were considered in the standardization process. The categories included: ≤20 anglers, 20-40 anglers, 40-60 anglers, 60-80 anglers, and >80 anglers. The minimum number of anglers per vessel was set at 6, which excluded the lower 0.5% of trips. These trips were excluded because they were possibly misreported and likely don't reflect the behavior of headboats in general.

*TRIP TYPE* – Trip types of half and full day trips were included in the analysis. Three-quarter day trips were pooled with half-day trips (<10%). Multi-day trips were removed because most were in Florida and likely targeting deepwater species for some portion of the trip. The codes for first and second half-day trips designation for day and night trips were combined.

**Annual Abundance Indices**: See Table 3 in S41-DW-12

### 5.4.3.2 Comments on Adequacy for Assessment

This index was not updated for this assessment and the index model and values presented in SEDAR 41 were evaluated to confirm its continued inclusion in this assessment of Red Snapper. Given the length of the time series from 1976 to 2009 (the furthest back of any index), and no further information was provided to cause concerns or reasons to exclude it, this index was deemed "suitable and recommended" for this assessment. This continues its inclusion from SEDAR 41 and 73.

## 5.5. RESEARCH RECOMMENDATIONS

The workgroup discussions lead to several future research recommendations regarding the available population trends for Red Snapper, these included:

- Continued research regarding the SERFS Video Survey length comps as a function of the trap comps. It is not currently possible to incorporate video-based lengths into this survey, therefore we recommend evaluation of stereo cameras for future use.

- Evaluation of whether data from 2012 and 2014 is able to be included for the FWRI RTD survey by standardizing the hook size variation in those years.
- When the SADL survey has adequate data, we recommend an in-depth data analysis to determine how to best subset the data spatially or by depth and which variables are most explanatory in modeling abundance through time for that dataset.
- As a group, we support continued efforts by federal, state, or non-governmental research programs to determine how to consistently survey the juvenile portion of this population so that a recruitment/juvenile index can be incorporated into future stock assessments of Red Snapper.
- Given the continued interest in managers and stakeholders in artificial reefs in the region, we recommend researching the relative contributions to this population from these habitats. We also recommend researching whether the best approach would be to survey artificial habitats independently or incorporate these habitats into existing surveys of natural reef areas.

## 5.6 TABLES

**Table 5.6.1.** Relative abundance (Index) scaled to a mean of one for each time series and the coefficient of variation on the mean (CV, standard error/mean) of indices recommended for consideration in the assessment.

| | SERFS Trap | | SERFS Video | | Headboat At-Sea Observer | | FWRI RTD | | Commercial Vertical Line Logbook | | Headboat Logbook | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Index | CV | Index | CV | Index | CV | Index | CV | Index | CV | Index | CV |
| 1976 | | | | | | | | | | | 2.360 | 0.052 |
| 1977 | | | | | | | | | | | 2.160 | 0.080 |
| 1978 | | | | | | | | | | | 2.130 | 0.029 |
| 1979 | | | | | | | | | | | 2.220 | 0.050 |
| 1980 | | | | | | | | | | | 1.450 | 0.046 |
| 1981 | | | | | | | | | | | 2.940 | 0.043 |
| 1982 | | | | | | | | | | | 1.200 | 0.052 |
| 1983 | | | | | | | | | | | 1.640 | 0.054 |
| 1984 | | | | | | | | | | | 1.420 | 0.029 |
| 1985 | | | | | | | | | | | 2.070 | 0.048 |
| 1986 | | | | | | | | | | | 0.477 | 0.067 |
| 1987 | | | | | | | | | | | 0.570 | 0.046 |
| 1988 | | | | | | | | | | | 0.560 | 0.058 |
| 1989 | | | | | | | | | | | 0.900 | 0.046 |
| 1990 | | | | | | | | | | | 0.860 | 0.056 |
| 1991 | | | | | | | | | | | 0.690 | 0.044 |
| 1992 | | | | | | | | | | | 0.077 | 0.095 |
| 1993 | | | | | | | | | 1.086 | 0.063 | 0.160 | 0.083 |
| 1994 | | | | | | | | | 0.891 | 0.051 | 0.250 | 0.045 |
| 1995 | | | | | | | | | 0.891 | 0.046 | 0.270 | 0.064 |
| 1996 | | | | | | | | | 0.612 | 0.055 | 0.250 | 0.065 |
| 1997 | | | | | | | | | 0.589 | 0.054 | 0.260 | 0.093 |
| 1998 | | | | | | | | | 0.659 | 0.055 | 0.240 | 0.076 |
| 1999 | | | | | | | | | 0.798 | 0.06 | 0.280 | 0.048 |
| 2000 | | | | | | | | | 0.737 | 0.056 | 0.410 | 0.054 |
| 2001 | | | | | | | | | 1.274 | 0.049 | 0.750 | 0.068 |
| 2002 | | | | | | | | | 1.383 | 0.046 | 0.870 | 0.050 |
| 2003 | | | | | | | | | 1.042 | 0.053 | 0.510 | 0.045 |
| 2004 | | | | | | | | | 1.423 | 0.054 | 0.760 | 0.037 |
| 2005 | | | | | 0.429 | 0.338 | | | 1.188 | 0.058 | 0.750 | 0.043 |
| 2006 | | | | | 0.264 | 0.351 | | | 0.597 | 0.071 | 0.430 | 0.051 |
| 2007 | | | | | 1.804 | 0.188 | | | 0.665 | 0.064 | 0.430 | 0.082 |
| 2008 | | | | | 1.768 | 0.252 | | | 1.223 | 0.066 | 1.700 | 0.052 |
| 2009 | | | | | 0.501 | 0.250 | | | 1.942 | 0.073 | 1.800 | 0.028 |
| 2010 | 0.230 | 0.18 | | | 0.187 | 0.323 | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2011 | 0.250 | 0.18 | 0.208 | 0.154 | 0.127 | 0.336 | | |
| 2012 | 0.480 | 0.13 | 0.401 | 0.131 | 0.534 | 0.296 | | |
| 2013 | 0.360 | 0.15 | 0.342 | 0.110 | 0.262 | 0.305 | | |
| 2014 | 0.630 | 0.13 | 0.466 | 0.158 | 0.262 | 0.283 | | |
| 2015 | 0.920 | 0.13 | 0.985 | 0.147 | 0.768 | 0.261 | | |
| 2016 | 1.220 | 0.11 | 0.851 | 0.133 | 0.772 | 0.303 | 0.344 | 0.190 |
| 2017 | 1.350 | 0.11 | 1.249 | 0.110 | 0.796 | 0.236 | 0.534 | 0.159 |
| 2018 | 1.700 | 0.1 | 1.274 | 0.103 | 1.621 | 0.225 | 0.966 | 0.062 |
| 2019 | 1.230 | 0.08 | 1.376 | 0.112 | 1.791 | 0.207 | | |
| 2020 | | | | | 2.205 | 0.379 | | |
| 2021 | 1.460 | 0.09 | 1.501 | 0.102 | 2.748 | 0.190 | 1.240 | 0.064 |
| 2022 | 1.590 | 0.08 | 1.711 | 0.114 | 1.384 | 0.247 | 1.312 | 0.066 |
| 2023 | 1.240 | 0.1 | 1.453 | 0.101 | 1.045 | 0.261 | 1.421 | 0.061 |
| 2024 | 1.350 | 0.1 | 1.182 | 0.107 | 0.732 | 0.318 | 1.182 | 0.069 |

## 5.7 FIGURES

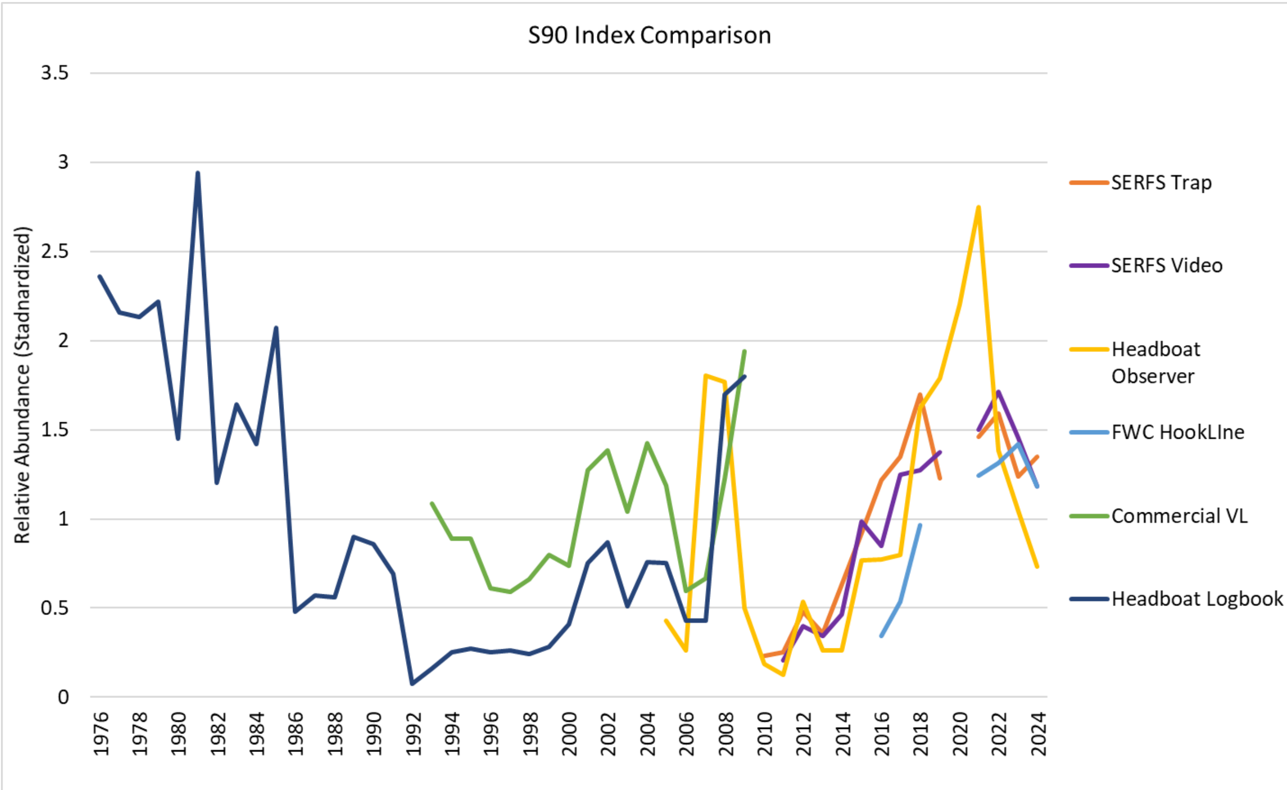


**Figure 5.7.1.** Recommended relative abundance indices for South Atlantic Red Snapper, scaled to a mean of one for each time series independently.

# 6. ENVIRONMENTAL CONSIDERATIONS

## 6.1 OVERVIEW

This report outlines environmental considerations that influence red snapper, with respect to the various steps in the life history and/or stock assessment processes.

### *6.1.1 Work Group members and participants in Environmental Considerations Work Group*

Lauren Gentry – FWC, St. Petersburg, FL
Mandy Karnauskus – SEFSC, Miami, FL
Sarah Roberts – SEFSC, Miami,FL
Sue Lowerre-Barbieri – FWC, St. Petersburg, FL
Ted Switzer – FWC, St. Petersburg, FL

### *6.1.2 Topics Reviewed by the Environmental Considerations Group*

1. Spawning
2. Recruitment
3. Species Interactions
4. Habitat Considerations

## 6.2 SPAWNING

Various factors influenced by water temperature can impact reproductive success, including spawning site selection, time to larval settlement, size and age at sexual maturity, and both spawning seasonality and peak spawning months. However, addressing these issues for ecosystem-based management necessitates standardized reproductive methods and long-term datasets. Although southeast red snapper have been collected since 1978, samples sizes were small in the early period (n=200 from 1978 to 2009) and fishery independent sampling efforts have changed spatially over time with sampling in earlier years (MARMAP) being more concentrated off South Carolina and Georgia, while in more recent years, a large number of sampling stations were added off North Carolina, Florida, and Georgia. Investigation into temporal changes in maturity within the years 2010 to 2023 was conducted in Sinkus et al. (2025) and reviewed by the LHWG, but statistical differences in L50 between time periods were deemed not to be biologically significant and potentially biased by the dramatic increase in the number of small and young fish sampled in more recent years. Similarly, it was not possible to detect differences in spawning seasonality. Red snapper have one of the most extensive and asynchronous spawning seasons amongst federally-managed fish species in the Southeast, with some spawning activity noted throughout the year (Lowerre-Barbieri et al., 2023). As noted in the life history report, this seasonality extends past the regularly sampled window (May – October), making it difficult to detect any changes in seasonality.

## 6.3 RECRUITMENT

It has been hypothesized that the Gulf is a source of recruits to the South Atlantic. Using a biophysical model, Karnauskas et al. (2022) showed that substantial numbers of recruits are likely sourced from the Gulf; the Gulf may supply as much as one-third of the recruitment in the Atlantic in some years (though this estimate is highly dependent on the relative abundance in each region which has been rapidly shifting as well as the oceanographic model used to represent hydrodynamics). The areas of the Gulf that supply the South Atlantic are on the West Florida Shelf, south of Tampa Bay. Red snapper abundance in this area has increased in recent years, due to the overall recovery of red snapper in the Eastern Gulf (SEDAR, 2024) and the relatively low fishing pressure in this area (Gardner et al., 2022). Results from the biophysical modeling are supported by genetic work, which has shown that although red snapper in the Gulf display metapopulation structure, samples from the East Coast of Florida were not genetically distinct from some samples taken from the West Florida Shelf (Portnoy et al., 2022).

## 6.4 SPECIES INTERACTIONS

Species interactions associated with red snapper were explored using the South Atlantic Region Ecopath with Ecosim (EwE) Model as part of a predation analysis (SAFMC, 2021). This effort used temporal simulations to explore the impact of increased biomass of red snapper by 2044 as a result of high recruitment on the biomass of other managed species. When accounting for predation, direct competition, and trophic cascades, results indicated that impacts on other managed species were minimal (<4% decrease in biomass). The modeling team concluded that red snapper is a generalist predator unlikely to disproportionately affect a single stock on a large scale. However, it was noted that the analysis would need to be repeated with the South Atlantic Reef Fish Ecospace model which is currently in calibration.

Diet data compiled for these EwE models indicate that red snapper is an opportunistic, generalist predator feeding upon invertebrates (including crustaceans, squids, octopods, zooplankton, and other benthic invertebrates) and various fish prey (including grunts, herrings, and a wide assortment of benthic and demersal fishes). Juvenile red snapper primarily feed upon invertebrates and shift to fish-focused diets as they grow. Analyses of diet comparison and trophic interaction from the South Atlantic Region EwE Model suggest ecological overlap with other managed reef predators (e.g., greater amberjack, red grouper, gag, and black seabass).

## 6.5 HABITAT CONSIDERATIONS

Fisheries independent data from the MARMAP/SEAMAP and SEFIS chevron trap surveys and the Georgia–Florida longline survey suggest that depth distributions of red snapper in the South Atlantic vary across ontogonies with older, larger red snapper (age 2+) distributed across all depths (shallow: <29.0m , middle: 29.0–48.9 m and deep: ≥49.0 m), while younger and smaller red snapper (age 0-1) occur more in shallow waters (Mitchell et. al, 2014). Data from the SERFS chevron trap and video trap data survey show red snapper are most commonly observed at moderate (40 m) depths and almost all (~95%) red snapper are observed in depths <75m (Bachelor et al. 2024)

To create temperature and depth preference functions for use in the South Atlantic Reef Fish Ecospace Model, SERFS chevron trap and video trap data were fitted to binomial generalized additive models, and values were predicted across the range of habitat values derived from the Global Ocean Physics Reanalysis (GLORYS) (**Figures 1&2**).

## 6.6 CATCHABILITY/DETECTABILITY

Catchability of red snapper with respect to environmental parameters has been studied extensively for both trap and video surveys. Red snapper catchability appears to be influenced most strongly by water temperatures and habitat substrate; catchability increases rapidly with water temperature, and decreases as the percent hardbottom habitat increases (Bacheler & Shertzer, 2020). Bacheler et al. (2021) showed how red snapper behavior changes with the presence of cold water upwelling that can occur due to prevailing winds in the summer months that push surface water offshore, causing deep, cool, nutrient-rich water to be pulled along the bottom up near shore (Hyun & He, 2010). Red snapper primarily forage near the seafloor at night. When upwelling is present, they tend to move up in the water column into warmer waters, likely to aid in digestion (Bacheler et al., 2021). Catchability in video surveys appears to be less influenced by environmental parameters (Bacheler et al., 2025). Additionally, video surveys have shown that red snapper are often present but are disinterested in traps, for reasons that do not appear to be related to environmental factors (N. Bacheler, pers. comm.). These results emphasize the benefits of using multiple paired gears to disentangle abundance trends from surveys. Currently, environmental factors such as habitat composition and water temperature are included in the survey standardization process.

## 6.7 RANGE SHIFTS

Currently there appears to be limited evidence for range shifts in red snapper across the region. Cao et al., 2024 used a joint spatiotemporal modeling framework based on reef video surveys (SERFS) and found no significant shift in red snapper centroids of distribution between 2011 and 2021 (neither offshore nor northward). In 2024, a preliminary SERFS video trap survey was conducted north of Cape Hatteras (baited fish traps with attached gopro cameras); two days of sampling was in the Kitty Hawk Wind Energy Area (all sand) and one day of sampling was conducted offshore of the Currituck Lighthouse in a mix of artificial and natural areas. No red snapper were captured in traps or on video; however, the water was likely too cold (~14 degrees C, which can be typical for this region). One day of sampling was conducted at Avon Rocks just east of Avon, NC, where a few snapper were captured in 18 traps in warmer waters (video could not be read for comparison to understand detectability of trap). It is difficult to draw conclusions from a single sampling trip but results thus far suggest a limited number of red snapper north of Hatteras (N. Bacheler, pers. comm.). While some North Carolina commercial landings of red snapper have been recorded north of Cape Hatteras, with highest landings in 2023, the overall number remains small (Alan Bianchi, pers. comm.). A further look into confidential commercial and recreational landings data could identify historical shifts.

## 6.8 DISCARD MORTALITY

The impacts of water temperature on discard mortality have been well studied and mortality generally increases with temperature ((Rudershausen et al., 2025) and references within). However, the impact of the environment is typically swamped out by more proximate factors (e.g., depth of fishing, release condition, hook position). There are widespread concerns and perceptions that predation after release as well as depredation are increasing in the region.

Depredation would not increase discard mortality per se as depredated fish are not released; however, it could be a cryptic source of additional mortality, as depredation created mortality of fish that might have been otherwise captured and released with some percentage of survival.

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6.10 FIGURES

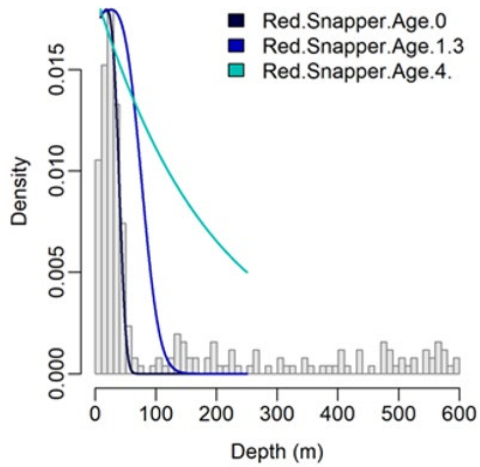


**Figure 1.** Depth preference functions extrapolated from SERFS data for use in the South Atlantic Reef Fish Ecospace Model for red snapper age stanzas (black = Age 0, blue = Age 1-3, green = Age 4+). The preference function values range from 1-0, with the top of the line representing the depth at which that age of red snapper are most likely to occur and be in suitable habitat. The functions are overlaid on a grey histogram of grid cells of depth of the U.S. South Atlantic shelf included in the SARF Ecospace model. All age groups of red snapper displayed a strong preference for depths <75m.

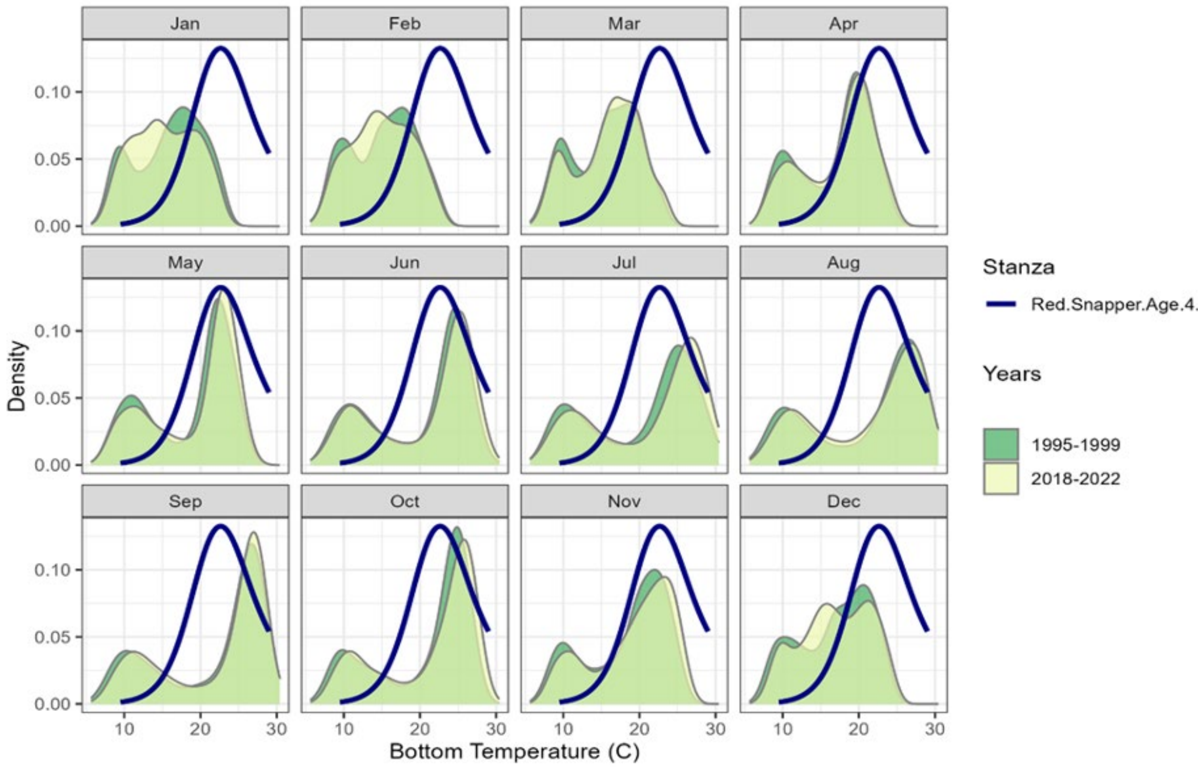


**Figure 2.** Bottom temperature preference functions for the adult age stanza of red snapper overlaid on smoothed histograms of grid cells of average monthly temperatures in GLORYS spatial temporal driver maps. To visualize changes in temperature over the model period, average monthly temperatures from the first five years of the model (1995-1999) are shown in dark green, with average monthly temperatures from the last five years of the model (2018-2022) shown in yellow.

# 7. DISCARD MORTALITY

## 7.1 OVERVIEW

Discard mortality estimation in recreational and commercial red snapper fisheries of the US South Atlantic

### *7.1.1 Work Group members and participants in Discard Mortality Work Group*

Brendan Runde–TNC, Charlottesville, VA, Leader of DMWG
Jeffrey Buckel –NCSU, Morehead City, NC
Julie Vecchio – SCDNR, Charleston, SC
Chloe Ramsay – FWCC, St. Petersburg, FL
Maria McGirl– USF, Tampa, FL
Will Patterson – UF, Gainesville, FL
Genine McClair – FWCC, St. Petersburg, FL
Sean Wilms – FWCC, St. Petersburg, FL

### *7.1.2 Topics Reviewed by Discard Mortality Group*

1. Telemetry meta-analysis
2. Proportional hazards model
3. Commercial discard mortality

## 7.2 BACKGROUND

Discard mortality has comprised the majority of overall fishing mortality (i.e., removals) for red snapper (*Lutjanus campechanus*) in the US South Atlantic region over the past decade or more (SEDAR 2021). In addition to mortality from fishing injuries, such as deep hooking, this species is well-known for suffering from barotrauma (Rummer 2007; Pulver 2017), and substantial effort has been made to both quantify the contribution of barotrauma to mortality (Burns and Froeschke 2012; Drumhiller et al. 2014) and reduce this effect (Curtis et al. 2015; Bohaboy et al. 2020; Rudershausen et al. 2025; Zimmermann et al. in review). Mitigating barotrauma via venting or descending (i.e., recompression) has shown promise in several species of reef fishes (Runde et al. 2020; Wegner et al. 2021; Rudershausen et al. 2023) including red snapper (Bohaboy et al. 2020; Rudershausen et al. 2025). Indeed, as a result of past studies showing improved survival after recompression, descender devices are now required gear on any vessel in the South Atlantic region targeting or possessing reef species (SAFMC 2020). In Florida in 2024, barotrauma mitigation was used on approximately 57% of released red snapper in the for-hire fishery and 45% of released red snapper in the private recreational fishery (McGirl et al. 2025). While the usage rate of barotrauma mitigation devices remains unknown in other states in the South Atlantic region, many factors impact angler decisions to treat individual fish, and real descender use remains below 100% (Vecchio et al. 2020; Responsive Management 2022).

Deploying acoustic telemetry for estimating discard mortality is considered state-of-the-art (Rudershausen et al. 2025), especially when using fine-scale positioning via a Vemco Positioning System (VPS) array (Espinoza et al. 2011). Numerous studies have estimated discard mortality of red snapper using acoustic telemetry (Table 1). A general conclusion of this body of research (and other research on discard mortality) is that release condition (based on factors including barotrauma and deep-hooking) substantially influences discard mortality (Vecchio et al. 2020). Further, the proportion of released red snapper that are impaired increases with increasing depth of capture (Campbell et al. 2014; Bohaboy et al. 2020; Ramsay et al. 2025). Conventional tagging and tag return data can also be used to generate estimates of discard mortality. Acoustic telemetry allows for more confidence in the fate of released fish, but this technique is resource intensive. Conventional tagging allows for larger sample sizes but generally relies on assumptions about A) the fate of each fish not recaptured and B) the absolute survival of fish in a control or baseline condition group (Davis 2002; Pollock and Pine 2007; Rudershausen et al. 2014). Additionally, factors such as tag shedding and non-reporting can create further uncertainty in the results of conventional tagging studies.

We sought to synthesize condition-specific telemetry-based estimates of discard mortality for red snapper. We then applied those estimates to data on released red snapper collected by Florida's for-hire observer program to estimate discard mortality for general recreational (charter and private) and headboat fleets. As a comparative model, we used conventional tagging data to estimate discard mortality by depth from the Florida observer tagging program and applied it to Florida for-hire observer data on releases by depth to estimate a general recreational and headboat discard mortality. Estimates of discard mortality in the commercial fishery were made using the telemetry-based estimate approach and commercial observer data. Included herein is a discussion of the usage of barotrauma mitigation devices in the recreational fishery, which could be used to estimate the magnitude of reduction in dead discards that might be achieved with greater adoption of descender devices.

## 7.3 METHODS

We sought to provide discard mortality rates for red snapper released by each fishing fleet (headboat, charter + private recreational, and commercial). As in SEDAR 73, we assumed there was temporal variation in fleet-specific discard mortality based on the adoption of circle hooks and barotrauma mitigation devices. We adopted the same first two temporal blocks and their mortality rates used in SEDAR 73 for both recreational sectors (start - 2010, 2011-2016) and the commercial sector (start - 2007, 2007 - 2016). Where SEDAR 73 used blocks 3 (2017-2020) and 4 (projections only), we elected to use a combined block 3 (2017 and onward) for all fleets, which is reflective of recent and current conditions with respect to gear use and release practices. Discard mortality estimates for blocks 1 and 2 used in SEDAR 73 were not re-estimated for this assessment as the workgroup felt the estimates used in these blocks were the best available at this time. Updated estimates of discard mortality covered here are for the third block only (see below).

### *7.3.1 Main estimate: telemetry meta-analysis*

We compiled results from available studies that used telemetry to estimate discard mortality of red snapper (Tables 1 and 2). The search for studies involved querying an online database (Google Scholar) for relevant publications, examining a recent meta-analysis of red snapper discard mortality (Ramsay et al. 2025), and asking SEDAR 90 Data Workshop participants for relevant data. Our search yielded results from studies across a range of depths, geographic locations, and seasons.

The available data suggest the recreational fishery for red snapper (which is responsible for the majority of catch for this stock) operates mainly in depths shallower than 40 m. In Florida waters (where granular data has been collected to date), 92.9% of charter, 98.7% of headboat, and

90.5% of private recreational releases were either observed or reported occurring in this range (Table 3; Figure 2). Indeed, most releases occur shallower than 30 m, yet the availability of telemetry studies in this range was very low (likely due to the relative lack of a variety of barotrauma conditions in shallower water). Therefore, we focused our analysis on studies that have been conducted in 40 m or shallower, in an attempt to be as reflective of the fishery as possible while collecting information from a robust number of telemetry trials and individual fish. Given the relatively low number of studies from the South Atlantic, we included studies from the Gulf as well. We sought data from published studies (or their authors, where necessary; Appendix 1) on the condition and release treatment of individual telemetered (i.e., tagged) red snapper. Condition categories were intended to approximately follow categories used in SEDAR 52 and SEDAR 73 (Sauls et al. 2017; Vecchio et al. 2020), which combine variables recorded by the Florida Fish and Wildlife Conservation Commission (FWC) for-hire observer program (Table 4). The Florida for-hire observer program has been continuously sampling headboats on the east coast since 2005. Charter boat sampling was conducted during 2013 to 2015 and from 2021 through the terminal year of the assessment (McGirl et al. 2025).

For each study, we tabulated the number of red snapper tagged and the number that were determined to have survived discarding. We divided the fish in each study into condition categories to match the FWC categories (Table 4). Red snapper that were treated for barotrauma but were otherwise unimpaired were considered equivalent, regardless of the method of barotrauma treatment (i.e., venting versus descending). Some studies have shown marginal to moderate differences in survival rates between these mitigation methods (Curtis et al. 2015; Sauls et al. 2017), but we analyzed them together due to consensus and because sample sizes are insufficient to treat them separately. However, within each overall study, trials using different mitigation techniques were tabulated as separate items (Table 1). In addition, trials at different depths (all ≤ 40m) and trials in different seasons were also considered separately. While we do not explicitly model or otherwise account for the potential effect of season and depth, we include them separately because of inherent biotic and abiotic differences that also affect discard mortality among trials.

We conducted a meta-analysis to estimate the pooled discard mortality-rate-by-condition of tagged red snapper across trials from the studies we identified. We fit a generalized linear mixed-effects model using the *rma.glmm* function from the *metafor* package (Viechtbauer 2010) in R (R Core Team 2025), specifying a logit-transformed proportion (measure = "PLO") to model survival as a binomial outcome. The model accounts for within-study binomial sampling variance and between-study heterogeneity using a random-effects framework. For trials with 100% observed survival, a continuity correction was applied automatically by the software to allow logit transformation. The estimated pooled logit survival probability and its 95% confidence interval were back-transformed to the proportion scale using the inverse logit function. We report mortality as (1 – survival) with corresponding confidence intervals. Discard mortality was calculated separately for conditions of ‘Good, no treatment’, ‘Good, treated’, and ‘Deep hooked’ from the telemetry meta-analysis (Table 1). We did not provide a telemetry-based estimate for red snapper in ‘Impaired’ condition due to insufficient sample sizes.

We applied meta-analysis-based condition-specific estimates of discard mortality to data on proportions of release conditions for the charter and headboat fleets (Figure 1; Table 5). For this analysis, we assumed condition data from the charter fleet are reflective of the private recreational fleet that has no observer coverage. This assumption was also made in SEDAR 73 (SEDAR 2021) and is further corroborated by the observation that capture depths of released red snapper from the SAFMC RELEASE program are similar to the depths of releases observed in the Florida at-sea observer program (J. Byrd, SAFMC, pers. comm.).

Individual released red snapper in the Florida for-hire observer dataset in each condition category were assigned their associated discard mortality estimate from the telemetry meta-analysis and the error around that estimate. Because telemetry data were not available from fish released in the 'Impaired' condition, we applied the same mortality estimate for this category as was used in SEDAR 52, SEDAR 73, and SEDAR 74. For a description of this estimation, refer to SEDAR 52 WP-09 (Sauls et al. 2017). An attempt to update this model using more current data was made, but the model fit violated the assumptions of a proportional hazards model ($X^2_2$=10.7, p=0.011) and was deemed unfit for use.
Finally, the overall discard mortality for each recreational fleet was calculated as the mean discard mortality of all fish in each fleet and the associated error estimate. Separate estimates were generated using releases calculated from charter and headboat trips.

*7.3.2 Secondary estimate: proportional hazards model*

We also performed a separate discard mortality analysis using data from the Florida at-sea observer and tag return program. A Cox proportional hazards model using red snapper data on the Atlantic coast of Florida was used to calculate discard mortality by depth; this Cox model included fish in all release conditions. At-sea observers record general information about the fishing trip (e.g., depth fished) and information on fish anglers release (e.g., hooking injury, barotrauma, venting or descending, etc.). Whenever possible, fish are tagged with a Hallprint plastic-tipped dart tag. More information about the Florida for-hire observer program and the overall proportional hazards model format are available in DW-27 (McGirl et al. 2025). The model presented here is a highly simplified version of that model which only uses predictors of depth and a stratification of year. The model was run using the *survival* package and *coxph* function in R (Therneau 2015). The hazards ratios provided from this model were used to calculate relative increases in red snapper discard mortality compared to the base condition of 21-25 m fishing depths. This base condition is the median fishing depth for red snapper in the dataset.

For this secondary analysis, we estimated overall discard mortality from each fleet using the proportional hazards model. The base mortality was determined from the 'Good, untreated' condition of the telemetry model. This base value was added to the relative discard mortality from each depth grouping from the proportional hazards model to generate an estimated mortality for each depth bin. Released fish in each depth from the Florida for-hire observer dataset were assigned a relative mortality and associated error from the proportional hazards model. As the proportional hazards model is based only on depth fished (and not any other metric that might have required observer data), we were also able to use data on depths red snapper were released from the private recreational fleet. Released red snapper and depth data from Florida State Reef Fish Survey (SRFS) and East Coast Red Snapper (ECRS) are from angler reports collected by dockside samplers. SRFS data are available on Florida's Atlantic coast from January 2021 through 2024 (Ramsay 2025) and ECRS sampling ran from 2012 to 2014 and 2017 to 2024 (Ramsay and Corbett 2025). Data from these two datasets for the private recreational fleet were combined with the Florida for-hire observer charter data to provide a general recreational estimate of the distribution of release depths for red snapper. Headboat data come exclusively from the Florida for-hire observer dataset. Released fish in these datasets were assigned a mortality and associated error based on the depth fished. The overall discard mortality for each fleet was calculated separately as the mean discard mortality of all fish in the fleet and the associated 95% confidence intervals.

### *7.3.3 Commercial discard mortality*

We obtained condition-specific proportions of released red snapper by depth bin for the commercial sector from the NMFS Observer Program. Due to data confidentiality requirements, the depth bins for these data were coarse: 0-30 m, 30-60 m, and 60+ m. Condition categories were also coarse, and did not perfectly agree with the categories used for the recreational discard mortality analysis (Table 6a). We assumed commercial releases in the 'Alive' condition encompassed fish that would have been categorized as 'Good, no treatment' and 'Good, treated'. The proportion of 'Alive' assumed to be 'Good, treated' was equal to the mean rate of barotrauma mitigation device usage observed by the NMFS Observer Program beginning in 2018 (i.e., 10.8%; Table 7). The remaining 'Alive' fish were assumed to be 'Good, no treatment.' Fish in the group 'Alive, trauma' were assumed to be either 'Impaired' or 'Deep hooked.' We assumed a fixed rate of deep hooking at 11.5% of all releases, which is approximately equivalent to the average rate across all depths and fleets in the Florida for-hire observer program for the for-hire sector (Table 5). This assumption comes with the caveat that not all red snapper released from the commercial sector are caught with vertical hook-and-line, yet we assume most are. For each depth bin the proportion of commercial releases assumed to be 'Impaired' was the proportion in 'Alive, trauma' minus 0.115.

We subsequently applied condition-specific discard mortality estimates from the telemetry meta-analysis to the proportions-by-depth in the commercial sector to generate depth-specific estimates of discard mortality. For 'Impaired' fish, we assumed the discard mortality estimate for this condition category from SEDAR 52, 73, and 74 (described above; Sauls et al. (2017)) was reflective of the commercial sector. Discard mortality for fish in the 'Dead' category was assumed to be 1.0. Uncertainty ranges were developed by conducting this same procedure with the 2.5% and 97.5% estimates from the telemetry meta-analysis or from Sauls et al. (2017).

## 7.4 RESULTS

### *7.4.1 Main estimate: telemetry meta-analysis*

We identified 10 telemetry trials with 104 total red snapper released at the surface that swam down unassisted and had no or only minor other impairments ('Good, no treatment'; Table 1a). We identified 17 trials with 235 total red snapper released with barotrauma mitigation but unimpaired otherwise ('Good, treated'; Table 1b). Finally, we identified 3 trials with 16 total red snapper released after experiencing hooking trauma ('Deep-hooked'; Table 1c). We did not identify an adequate sample size of telemetry-tagged 'Impaired' fish to estimate mortality for that release condition category. Details of each study may be found in their original source documents (Table 2), and where reported numbers of tagged fish and survivors are not reconcilable with figures in those sources, please refer to Appendix 1.

Results of our meta-analyses indicated estimates of 'Good, no treatment' mortality was 10.7%

(95% confidence interval 2.3% - 38.0%), 'Good, treated' mortality was 16.9% (11.1% - 24.8%), and 'Deep hooked' mortality was 88.9% (64.8% - 97.2%) (Table 9). Tests of the assumption of heterogeneity among studies showed substantial heterogeneity for the 'Good, no treatment' analysis ($\tau^2 = 3.14$), moderate heterogeneity for the 'Good, treated' analysis ($\tau^2 = 0.37$), and no among-study heterogeneity for the 'Deep hooked' analysis ($\tau^2 = 0$).

For the Florida for-hire observer charter data, 22% of red snapper were 'Good, no treatment', 59% of fish were 'Good, treated', 10% of fish were 'Impaired', and 9% were 'Deep-hooked'. In the headboat fleet, 20% of red snapper were 'Good, no treatment', 60% of fish were 'Good, treated', 8% of fish were 'Impaired', and 12% were 'Deep-hooked' (Table 5, Figure 1). In the 'Impaired' condition, discard mortality was assumed to be equivalent to the value used in SEDAR 52, SEDAR 73, and SEDAR 74, which was estimated as 53.6% (38.6% - 68.6%).

Multiplying condition-specific mortality estimates (Table 9) by proportions-by-condition in each fleet (Table 5; Figure 1) resulted in an overall discard mortality of 25.7% (16.8-38.6) for the charter + private recreational fleet (estimated using charter data only) and a discard mortality of 27.4% (18.1-39.7) for the headboat fleet from the telemetry meta-analysis (Table 10).

### *7.4.2 Secondary estimate: proportional hazards model*

The proportional hazards model produced percent changes in mortality for each depth bin relative to the baseline depth of 21-25 m (the median range from Florida for-hire observer data; Table 11). Discard estimates using the proportional hazards model produced an estimate of 35.3% (14.2-50.2) discard mortality for the general recreational fleet (charter and private recreational fleet data combined) and 23.5% (8.1-40.4) discard mortality for the headboat fleet (Table 12). The discard mortality in this model was predicted by depth fished. Therefore, the difference in discard mortality across fleets is a direct reflection of the fact that, in Florida, the charter and private boat fleets fish at deeper depth than the headboat fleet (Figure 2). Additionally, this model included data from the private recreational fleet. The telemetry model generated estimates of discard mortality for the general recreational fleet from data for the charter fleet only.

### *7.4.3 Commercial discard mortality*

We applied the telemetry-based (and prior SEDAR) condition-specific discard mortality estimates (Table 9) to finer scale proportion-by-condition data (Table 6b) estimated from coarser scale number by release condition data (Table 6a). Our estimates of discard mortality for the commercial sector are 27.0% (16.2% - 48.6%) in 0-30 m, 34.2% (22.1% - 54.1%) in 30-60 m, and 34.3% (22.1% - 54.2%) for 60+ m. We make no attempt to provide a combined estimate across depths given difficulties with presenting confidential data.

## 7.5 DISCUSSION

In this document, we estimated overall discard mortality rates for two fleets within the recreational sector (general recreational (charter + private) and headboat). We also provide depth-specific estimates of commercial discard mortality.

We performed two separate estimation procedures for the recreational fishery, one using a telemetry-based meta-analysis and one using conventional tagging data and a proportional hazards model. **The workgroup recommendation is for the assessment to use the discard**

**mortality estimates generated from the telemetry-based meta-analysis for the recreational fishery,** because telemetry generally offers higher certainty in fate of individual fish than conventional tagging. Our overall recommended discard mortality rates, by fleet and temporal block, are provided in Table 13. However, we provide the proportional hazards model as a comparison that could be used in sensitivity runs at the discretion of the analysts. Indeed, the overall estimates of mortality in this secondary model differed by approximately 10% for the charter + private recreational sector, while they were nearly identical between models for the headboat sector. As described above, the difference for charter + private is largely driven by their operating in deeper depths than the headboat sector. Additionally, the telemetry model did not incorporate conditions from the private recreational fleet, as discard information by condition for that fleet was unavailable. We estimated discard mortality for the commercial fishing using telemetry data only because we did not have depth-specific numbers of releases at a fine enough scale for the secondary approach.
It is possible that future telemetry studies will fill remaining knowledge gaps about depth-, season-, and condition-specific discard mortality of red snapper, and that better fishery-dependent data on these factors will further elucidate on-water conditions to which those estimates could be applied. Despite the data limitations in the telemetry analysis, the workgroup maintains that over a decade of telemetry research, representing eight studies (Table 2) and 30 trials with 355 total red snapper tagged in the appropriate depth range (Table 1), is collectively the best scientific information available on discard mortality of red snapper in the United States South Atlantic.

Past SEDARs have included recommendations pertaining to adjusting discard mortality rates based on estimated and projected barotrauma mitigation device use. Our data show that a large proportion (~80%) of released red snapper in the Florida for-hire observer dataset are either already treated for barotrauma (‘Good, treated’) or did not require treatment because their barotrauma was not significant enough to require intervention (‘Good, no treatment’) (Figures 1 and 3). Another ~10% were deep-hooked and therefore unlikely to benefit from barotrauma mitigation. The remaining ~10%, fish considered ‘Impaired’, may have benefitted from barotrauma mitigation. The proportion of ‘Good, treated’ fish (~60%; Figure 1), taken from the Florida for-hire observer program for the for-hire sector, appears to be biased high when applied to the entire private and for-hire fleet, given the average rate of descender and venting tool use from multiple sources is 30 and 35%, respectively (Table 14). Indeed, most of the estimates in Table 14 are extremely limited in geographic and/or temporal scope, and most represent data from sub-fleet-level users who volunteered data. These users are probably more likely to use barotrauma mitigation than users who do not volunteer their own data. Therefore, we believe the proportions of red snapper in ‘Good, treated’ used in this analysis (~60%, Figure 1) represent a best-case scenario for the entire fleet for the current on-water conditions. The reason for the higher values in the ‘Good, treated’ category for the Florida for-hire observer data is unknown but potentially because of higher use of venting or descenders in the charter/headboat fleet (e.g., by captains or mates) or potential increased use in the presence of observers. Future discard mortality estimates would benefit from additional region- and fleet-specific estimates of barotrauma mitigation use.

Within ‘Impaired’ are several separate categories, including fish that floated, struggled before resubmerging, were improperly vented (i.e., tool other than a hollow needle was used, and/or was applied in the incorrect anatomical location), or were chased by a predator at the surface. Fish in each of these categories may have benefitted from appropriate barotrauma mitigation, particularly from the use of a descender device, which not only eliminates the possibility of improper or detrimental venting but also may assist released fish with predator avoidance. 'Impaired' discard mortality was assumed to be 53.6% (Sauls et al. 2017). In theory, fish in 'Impaired' condition category could *at best* achieve the discard mortality rate of 'Good, treated' fish, which was 16.9% from the telemetry analysis. This improvement, of a maximum of 36.7%, could be applied to the ~10% of fish in 'Impaired' condition as a best-case scenario to account for future increases in barotrauma mitigation device use. If every fish that was 'Impaired' was moved to the 'Good, treated' category (which is unrealistic), the overall estimates of discard mortality from the telemetry analysis would become 21.9% for charter + private and 24.4% for headboat. These improvements are marginal because such a large proportion of released red snapper in our dataset are already treated for barotrauma or do not require barotrauma treatment because they were caught in shallow water. Given these marginal improvements for even a 100% transition from 'Impaired' to 'Good, treated' and given that we believe the for-hire observer data already represent a best-case scenario, we do not recommend adoption of lower discard mortality estimates for a fourth block but rather recommend Block 3 numbers be used for projections.

## 7.6 RESEARCH RECOMMENDATIONS

- *Telemetry studies in shallower than 30 m:* As described above, most telemetry studies we located for our meta-analysis occurred in depths greater than 30 m. We recommend future research applying acoustic telemetry to estimate discard mortality of red snapper in shallower depths, which are more reflective of where the recreational fishery operates.

- *Telemetry studies examining discard mortality of impaired individuals:* We were unable to locate telemetry-based estimates of discard mortality for red snapper in the Impaired category. We recommend future research use acoustic telemetry to better quantify mortality of individuals meeting the definition of this category. In particular, one avenue for future research that would be easily studied is discard mortality of red snapper that were vented in various anatomical locations or with various tools used by the fishery (e.g., knives, hooks, gaffs, stringers).

- *Studies in the South Atlantic examining the seasonal effect on discard mortality:* We located only a few studies of red snapper discard mortality in the South Atlantic region, and none that explicitly tested the effect of season. Future studies could seek to identify any such effect.

- *Studies gathering for-hire observer data north of Florida:* All observational data on fishing depths and release conditions come from the east coast of Florida. There is currently no information on these factors in other states included in the region (NC, SC, GA).

- *Studies gathering information on hook type usage or hooking location of released red snapper for the general recreational fleet:* One finding of our meta-analysis is markedly higher discard mortality for deep-hooked red snapper versus those hooked in the jaw. Information on fleet-wide rates of hook type usage or hooking location, beyond the

Florida for-hire observer data used herein, would assist future coastwide estimates of discard mortality.

- *Studies gathering information on the distribution of release depths for red snapper in the general recreational fleet:* To our knowledge, the only information on the distribution of release depths from the private recreational fleet is self-reported and unverified. In our telemetry analysis, we use release depths from the charter fleet as a proxy for the private recreational fleet. Information on the veracity of this assumption or empirical data on release depths from the private recreational fleet would greatly benefit future estimates.
- *Conventional tag study using SCUBA to release some tagged red snapper at depth, to accompany the FWC tagging program:* Conventional-tag-based estimates of discard mortality generally rely on assumptions about the survival of a baseline or control group. Yet, even best-condition surface-released red snapper may experience increased mortality relative to animals that were not caught and brought to the surface for tagging. One way to obtain a robust control group is to use SCUBA divers and fish traps to tag fish at the seafloor. Performing such a study with red snapper in tandem with surface tagging would increase confidence in conventional-tag-based estimates.
- *Additional estimates of barotrauma mitigation usage in all fleets:* Barotrauma mitigation devices and best fishing practices may reduce discard mortality if applied appropriately. Knowledge of usage rates of mitigation devices including descender devices is lacking, particularly on the Atlantic coast north of Florida. We recommend studies to generate more precise estimates of these rates, in tandem with outreach and education on best practices where practicable.
- *Retrospective analysis to revise temporal blocks:* In this analysis, we adopted temporal blocks 1 and 2 from prior SEDARs. Future analyses could examine the validity of the rates used in these blocks by applying our updated condition-specific discard mortality rates. This exercise would require data on hook-type-use or deep hooking rates, as well as data on barotrauma mitigation device usage.

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## 7.9 TABLES

Table 1: A list of studies that used acoustic telemetry to estimate discard mortality in red snapper. The average depth, months of the year, region (WG=western Gulf region, CG=central Gulf region, SA-NC=US south Atlantic-North Carolina, and SA-FL=US south Atlantic-Florida) and tag sample sizes (n = number tagged and n surv = number of those tagged where survival was inferred) are provided for each study by condition treatment.

Table 1a. Telemetry trials of red snapper released at the surface that swam down unassisted and had no impairment, i.e., 'Good, no treatment.

| Study | Depth (m) | Months | Region | n | n surv |
|---|---|---|---|---|---|
| Curtis et al. 2015 | 30 | May | WG | 9 | 9 |
| Stunz et al. 2017 | 40 | Feb | WG | 10 | 10 |
| Stunz and Curtis 2018 | 30 | Sep | WG | 10 | 9 |
| Stunz and Curtis 2018 | 40 | Sep | WG | 6 | 4 |
| Stunz and Curtis 2018 | 40 | Feb | WG | 10 | 10 |
| Bohaboy et al. 2020 | 30 | Sep | CG | 18 | 12 |
| Bohaboy et al. 2020 | 30 | Apr, May | CG | 8 | 2 |
| Runde et al. 2021 | 38 | May, Aug | SA - NC | 3 | 3 |
| Rudershausen et al. 2025 (unpub) | 38 | Aug, Sep | SA - NC | 4 | 4 |
| Zimmerman et al. in review | 27 | May | SA - FL | 26 | 17 |

Table 1b. Telemetry trials of red snapper released after barotrauma mitigation with either a descender device (D) or venting tool (V) that had no impairment other than barotrauma, i.e. 'Good, treated'.

| Study | Depth (m) | Months | Region | Trt | n | n surv |
|---|---|---|---|---|---|---|
| Curtis et al. 2015 | 30 | May | WG | D | 7 | 7 |
| Curtis et al. 2015 | 30 | May | WG | V | 7 | 6 |
| Tomkins 2017 | 29 | Jul, Aug, Nov | WG | D | 14 | 12 |
| Tomkins 2017 | 40 | Jul, Nov | WG | D | 12 | 10 |
| Stunz et al. 2017 | 40 | Feb | WG | D | 7 | 7 |
| Stunz et al. 2017 | 40 | Feb | WG | V | 9 | 8 |
| Stunz and Curtis 2018 | 30 | Sep | WG | D | 11 | 9 |
| Stunz and Curtis 2018 | 30 | Sep | WG | V | 10 | 10 |
| Stunz and Curtis 2018 | 40 | Sep | WG | D | 10 | 8 |
| Stunz and Curtis 2018 | 40 | Sep | WG | V | 10 | 4 |
| Stunz and Curtis 2018 | 40 | Feb | WG | D | 10 | 6 |
| Stunz and Curtis 2018 | 40 | Feb | WG | V | 10 | 7 |
| Bohaboy et al. 2020 | 30 | Sep | CG | D | 22 | 17 |
| Bohaboy et al. 2020 | 30 | Apr, May | CG | D | 7 | 5 |
| Runde et al. 2021 | 38 | May, Aug, Sep | SA - NC | D | 35 | 31 |
| Rudershausen et al. 2025 new fish | 38 | Aug, Sep | SA - NC | D | 27 | 26 |
| Zimmerman et al. in review | 27 | May | SA - FL | D | 27 | 20 |

Table 1c. Telemetry trials of red snapper that had been hooked in the gut, esophagus, gill, or other vital organ, i.e., 'Deep hooked'.

| Study | Depth (m) | Months | n | n surv |
|---|---|---|---|---|
| Bohaboy et al. 2020 | 30 | Apr, May | 2 | 0 |
| Runde et al. 2021 | 38 | May, Aug | 2 | 0 |
| Rudershausen et al. 2025 (new fish) | 38 | Aug, Sep | 14 | 2 |

Table 2. Studies containing telemetry tagging trials of released red snapper. Document number refers to the index number where these files may be located.

| Study | Document number |
|---|---|
| Curtis et al. 2015 | SEDAR 74-RD96 |
| Tomkins et al. 2017 | SEDAR 90-RD18 |
| Stunz et al. 2017 | SEDAR 74-RD104 |
| Stunz and Curtis 2018 | SEDAR 90-RD34 |
| Bohaboy et al. 2020 | SEDAR 90-RD36 |
| Runde et al. 2021 | SEDAR 74-RD90 |
| Rudershausen et al. 2025 | SEDAR 90-RD19 |
| Zimmerman et al. in review | SEDAR 90-DW-28 |

Table 3: The number of released red snapper in Florida by 5-meter depth bin in each fleet. Headboat and charter data comes from Florida's at-sea observer program. The private data comes from the red snapper reported released to Florida's State Reef Fish Survey (SRFS) or the East Coast Red Snapper (ECRS) sampling program at each reported depth fished.

| Depth (m) | Charter | Headboat | Private | Total |
|---|---|---|---|---|
| <20 | 195 | 1,108 | 4,778 | **6,081** |
| 21-25 | 823 | 4,924 | 10,703 | **16,450** |
| 26-30 | 823 | 3,038 | 6,145 | **10,006** |
| 31-35 | 473 | 451 | 1,682 | **2,606** |
| 36-40 | 267 | 296 | 3,362 | **3,925** |
| 41-45 | 105 | 76 | 668 | **849** |
| 46+ | 93 | 61 | 2,462 | **2,616** |
| **Total** | **2,779** | **9,954** | **29,800** | **42,533** |

Table 4. Condition categories to which released fish were assigned.

| Condition | Description |
|---|---|
| Good, no treatment | Not vented or descended, not deep hooked, may show minor external signs of barotrauma (bloating or minor stomach or intestinal extrusion). Swam down unassisted. |
| Good, treated | Not deep hooked, may show minor external signs of barotrauma. Vented properly (in the correct anatomical location and tool) and swam down rapidly, or descended. |
| Impaired | Any fish that exhibited one or more of the following impairments:<br>1) Chased by a predator near the surface<br>2) Disoriented or unresponsive at the surface before submerging<br>3) Buoyant at the surface, unable to resubmerge<br>4) Improperly vented by puncturing the stomach or anus or use of improper venting tool (i.e., not a hollow needle).<br>5) Exophthalmia, major intestinal extrusion, raised scales leaching air and/or blood, indicative of severe barotrauma |
| Deep hooked | Any fish that was hooked in the gill, eye, esophagus, gut, or other vital organ. |

Table 5. By-fleet numbers of released red snapper observed in four condition categories from Florida at-sea observer data.

| Fleet | Good, no treatment | Good, treated | Impaired | Deep Hooked | Total |
|---|---|---|---|---|---|
| Charter | 537 | 1462 | 256 | 219 | 2474 |
| Headboat | 1887 | 5851 | 779 | 1177 | 9694 |
| Total | 2424 | 7313 | 1035 | 1396 | 12168 |

Table 6a. Proportions-by-condition in each of three depth bins for red snapper releases observed by the NMFS Observer Program.

| Depth (m) | Alive | Alive, trauma | Dead |
|---|---|---|---|
| 0-30 | 0.7379 | 0.2519 | 0.0102 |
| 30-60 | 0.5631 | 0.4300 | 0.0069 |
| 60+ | 0.5533 | 0.4467 | 0 |

Table 6b. Estimated finer scale proportion-by-condition in each of three depth bins, generated by applying deep hooking rates (taken from Florida at-sea for-hire observer data) along with barotrauma mitigation rates (Table 7) and coarser proportion-by-condition data (Table 6a) from the NMFS Observer Program.

| Depth | Good, no treatment | Good, treated | Impaired | Deep hooked | Dead |
|---|---|---|---|---|---|
| 0-30 | 0.6567 | 0.0812 | 0.1369 | 0.1150 | 0.0102 |
| 30-60 | 0.5012 | 0.0619 | 0.3150 | 0.1150 | 0.0069 |
| 60+ | 0.4924 | 0.0609 | 0.3317 | 0.1150 | 0.0000 |

Table 7. Proportions of released red snapper in the South Atlantic commercial fishery that were observed to be treated with either venting or descending tools, from the NMFS Observer Program. A temporary increase in funding for 2022 and 2023 provided enhanced coverage in those years.

| Year | Number treated | Number observed | Proportion treated |
|---|---|---|---|
| 2018 | 0 | 57 | 0.00 |
| 2019 | 51 | 126 | 0.405 |
| 2020 | 9 | 78 | 0.115 |
| 2021 | 8 | 305 | 0.026 |
| 2022 | 124 | 1130 | 0.110 |
| 2023 | 96 | 804 | 0.119 |
| 2024 | 17 | 239 | 0.071 |
| 2025 | 8 | 165 | 0.048 |
| Total | 313 | 2904 | 0.108 |

Table 8. Depth-specific numbers of released red snapper observed in four condition categories from Florida at-sea observer data (charter and headboat combined; no private recreational).

| Depth | Good, no treatment | Good, treated | Impaired | Deep hooked | Total |
|---|---|---|---|---|---|
| 0-19 | 131 | 346 | 39 | 69 | 585 |
| 20-29 | 1928 | 5304 | 673 | 1085 | 8990 |
| 30-39 | 338 | 1329 | 230 | 197 | 2094 |
| 40-49 | 17 | 262 | 61 | 33 | 373 |
| 50-59 | 6 | 47 | 22 | 10 | 85 |
| 60+ | 4 | 25 | 10 | 2 | 41 |
| Total | 2424 | 7313 | 1035 | 1396 | 12168 |

Table 9. Condition-specific estimates of discard mortality

| Condition | % Mortality | 2.5% CI | 97.5% CI | Source |
|---|---|---|---|---|
| Good, no treatment | 10.7% | 2.3% | 38.0% | Telemetry meta-analysis |
| Good, treated | 16.9% | 11.1% | 24.8% | Telemetry meta-analysis |
| Impaired | 53.6% | 38.6% | 68.6% | SEDAR 52, 73, and 74 |
| Deep-hooked | 88.9% | 64.8% | 97.2% | Telemetry meta-analysis |

Table 10. Discard mortality estimates and 95% confidence intervals by recreational fleet. Estimates were calculated using a meta-analysis of acoustic telemetry data and information about released red snapper from Florida's at-sea observer program in the for hire fishery. Only charter boat data was used for the general recreational fleet estimate.

| Fleet | |
|---|---|
| General Rec | Headboat |
| 25.7 (16.8-38.6) | 27.4 (18.1-39.7) |

Table 11. Model results from the cox proportional hazards model survival analysis on South Atlantic Red Snapper (*Lutjanus campechanus*) tagged by Florida's at-sea observer and tag return programs. Reported percent changes in mortality for significant predictors are increases in release mortality (unless the value is negative) compared to the base conditions of a fish caught at 21-25m. This base condition is the median value seen in the at-sea data. For the final calculated estimates, the base condition mortality was determined to be 10.7%. This is the estimated release mortality of a 'good' condition fish from the telemetry meta-analysis.

| Depth | Estimate | Standard Error | Hazard Ratio | Z Statistic | P value | Sig | % Change in Mortality |
|---|---|---|---|---|---|---|---|
| <=20m | 0.011 | 0.113 | 1.011 | 0.098 | 0.922 | | -1.06% |
| 26-30m | -0.264 | 0.083 | 0.768 | -3.178 | <0.002 | ** | 22.28% |
| 31-35m | -0.968 | 0.199 | 0.38 | -4.859 | <0.001 | *** | 60.83% |
| 36-40m | -1.407 | 0.306 | 0.245 | -4.602 | <0.001 | *** | 74.57% |
| 41-45m | -1.414 | 0.504 | 0.243 | -2.806 | 0.005 | ** | 74.74% |
| 46+m | -1.342 | 0.581 | 0.261 | -2.309 | 0.021 | * | 72.87% |

Table 12. Secondary discard mortality estimates and 95% confidence intervals by recreational fleet. Estimates were calculated using a cox proportional hazards model using Florida's at-sea observer and tag return programs. Information about released red snapper from charter and headboats came from Florida's at-sea observer program. Information on released red snapper from private recreational boats came from Florida's State Reef Fish Survey (SRFS) and the East Coast Red Snapper (ECRS) sampling program. Charter fleet data was combined with SRFS and ECRS data to generate the overall General Rec estimate shown here.

| Fleet | |
|---|---|
| General Rec | Headboat |
| 35.3<br>(14.16-50.15) | 23.5<br>(8.10-40.40) |

Table 13. Recommended fleet-specific rates of discard mortality for SEDAR 90. General recreational encompasses charter and private recreational. For commercial, Block 1 and Block 2 are *Start - 2006* and *2007 - 2016* respectively. For both recreational fleets, Block 1 and Block 2 are *Start - 2010* and *2011 - 2016* respectively. For all fleets, Block 3 is *2017 and on*.

| Fleet | Block 1 | Block 2 | Block 3 |
|---|---|---|---|
| Commercial | 0.48 (0.38 – 0.58) | 0.38 (0.28 – 0.48) | 0 – 30 m: 0.27 (0.16 – 0.49)<br>30 – 60 m: 0.34 (0.22 – 0.54)<br>60+ m: 0.34 (0.22 – 0.54) |
| Headboat | 0.37 (0.27 – 0.45) | 0.26 (0.18 – 0.34) | 0.27 (0.18 – 0.40) |
| General Rec | 0.37 (0.27 – 0.45) | 0.28 (0.20 – 0.36) | 0.26 (0.17 – 0.39) |

Table 14. Estimates of barotrauma mitigation usage in the private recreational sector in the US South Atlantic region. “Chance of upward bias” reflects the authors’ perception of how representative the source is likely to be of the greater private recreational sector coastwide, where “low” is more representative.

| Rate | Treatment | Source | Notes | Chance for upward bias |
|---|---|---|---|---|
| 45.0% | Venting | FL ECRS | 2022-2024 | High |
| 34.0% | Venting | FL SRFS | 2022-2024 | Low |
| 13.5% | Venting | SAFMC Release | | Moderate |
| 56.7% | Venting | Responsive Management 2022 | Combined FL and SC; % used at least once | High |
| 28.9% | Venting | MyFishCount | | Moderate |
| **Mean: 35.6%** | | | | |
| | | | | |
| 26.0% | Descending | FL ECRS | 2022-2024 | High |
| 13.0% | Descending | FL SRFS | 2022-2024 | Low |
| 53.0% | Descending | SAFMC Release | Combined descend and both | Moderate |
| 32.4% | Descending | Responsive Management 2022 | Combined FL and SC; % used at least once | High |
| 24.4% | Descending | MyFishCount | Combined descend and both | Moderate |
| **Mean: 29.8%** | | | | |

## 7.10 FIGURES

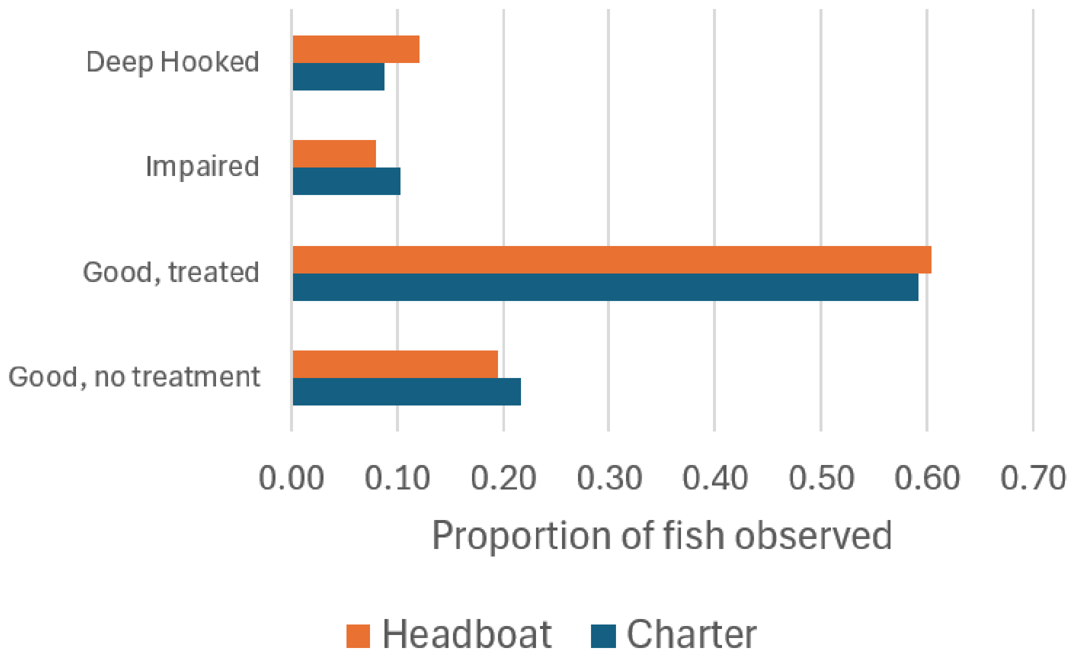


Figure 1. Proportions of red snapper released in each of four condition categories in the two for-hire fleets of the recreational sector, from the Florida at-sea observer program.

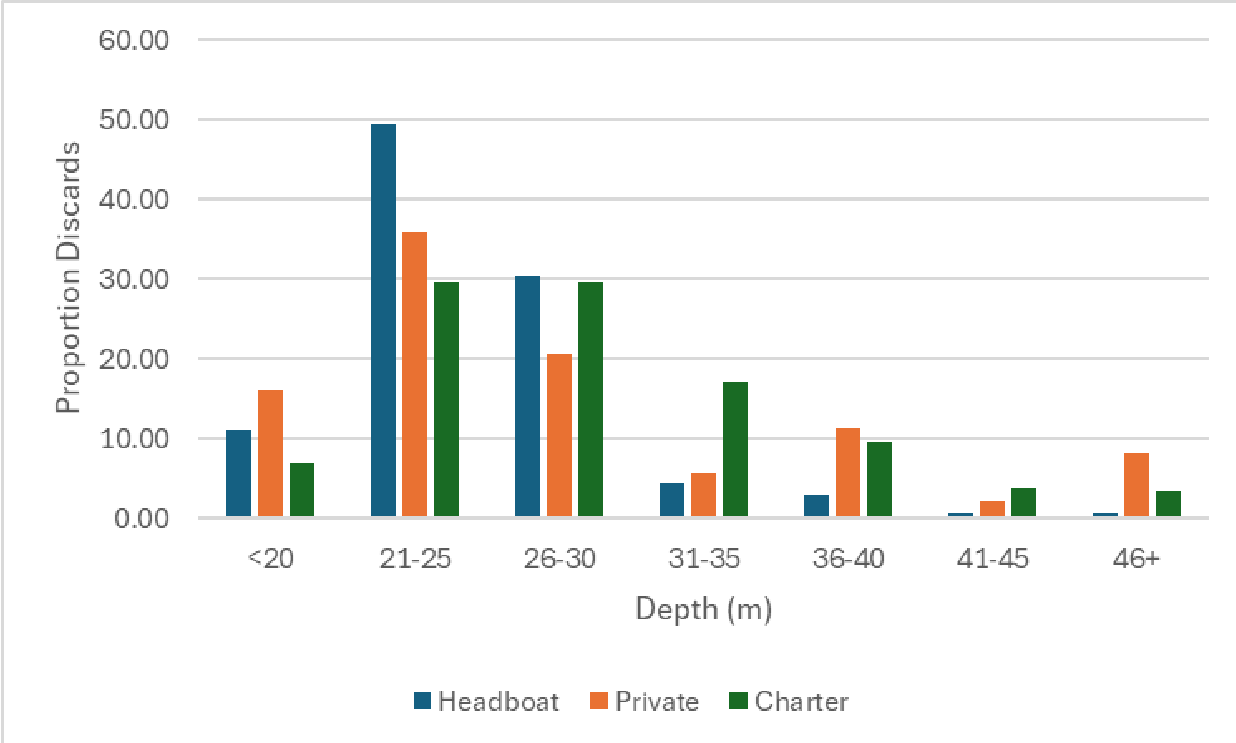


Figure 2. The reported depths fished of red snapper discarded across the headboat, private, and charter fleets. Headboat and charter data comes from Florida's at-sea observer program. Private recreational data comes from Florida's State Reef Fish Survey (SRFS) and the East Coast Red Snapper (ECRS) sampling program.

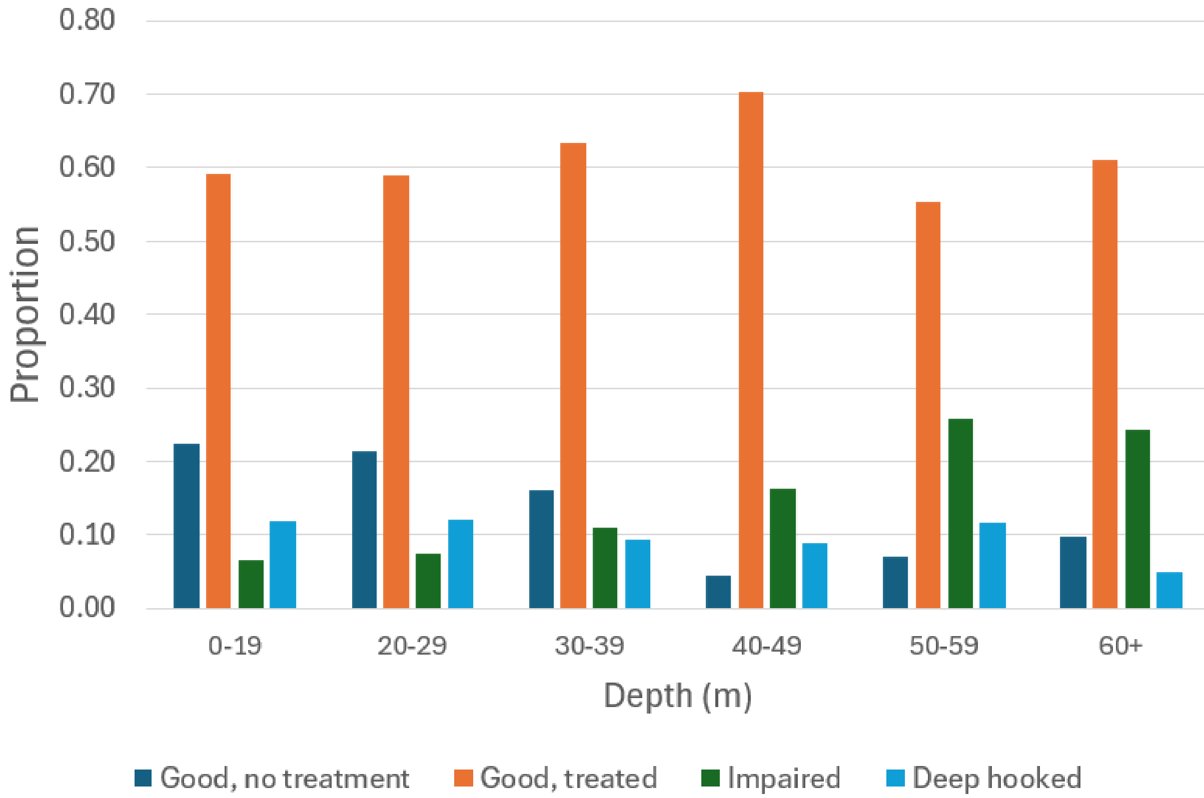

Figure 3. Proportion of observed released red snapper in each of four condition categories from the Florida at-sea observer program (combined Charter and Headboat).

## 7.11 Appendix

Appendix 1: Commentary on numbers of tagged fish and survivors from each telemetry study, where numbers do not match what is reported in the primary source.

Curtis et al. 2015
For their Spring 30 m trial, Curtis et al. (2015) reports tagging six fish in the "Control" treatment, meaning they showed no barotrauma prior to release and were not treated. Of these six, we censored three with unknown fates. The remaining three survived. In the same trial, Curtis et al. (2015) tagged 10 fish via their "Nonvent" treatment, of which two had unknown fates and two experienced surface mortality. This leaves six fish that swam down, all of which survived. Hence, between these two trials, nine of nine untreated surface-released fish that swam down survived.

Stunz et al. (2017) and Stunz and Curtis (2018)
Numbers for these two documents, which are both final grant reports, are based on a personal communication from one of the authors of both (JC). Original datasheets were consulted to identify and exclude from the descended and vented groups fish that were determined to have significant barotrauma.

Bohaboy et al. (2020)
The source document does not contain detailed information on numbers of non-deep-hooked red snapper tagged in each trial. Numbers for each trial contained herein are from a personal communication from the first author of Bohaboy et al. (2020) to the authors of this document.

Runde et al. (2021)
Rudershausen et al. (2021) includes the same fish that were tagged in Runde et al. (2021). Given slight differences in methodology, we treat these studies separately herein. Therefore, in this document, references to fish tagged in Rudershausen et al. (2025) are exclusively for new fish tagged in that study.
Two fish in Runde et al. (2021) lost their tag within the first 24 hours. These fish were excluded here.

Rudershausen et al. (2025)
As described above, Rudershausen et al. (2025) includes the same fish that were tagged in Runde et al. (2021). Given slight differences in methodology, we treat these studies separately herein. Therefore, in this document, references to fish tagged in Rudershausen et al. (2025) are exclusively for new fish tagged in that study.

Rudershausen et al. (2025) does not report information on surface released fish, as their study intended to descend all tagged fish. On a personal communication from the first author (and personal observation of the primary authors of the present document, BR and JB), we include here four red snapper that were accidentally released at the surface after tagging during Rudershausen et al.'s field work. All four of these fish survived.

Zimmerman et al. (in review)

Based on a personal communication from the authors, one fish in Zimmerman et al. (in review) experienced failed descent and died at the surface. We exclude that fish here.
We excluded two fish from Zimmerman et al.'s (in review) group of descended fish because one lost its tag within 24 hours and one emigrated between 24 and 48 hours.