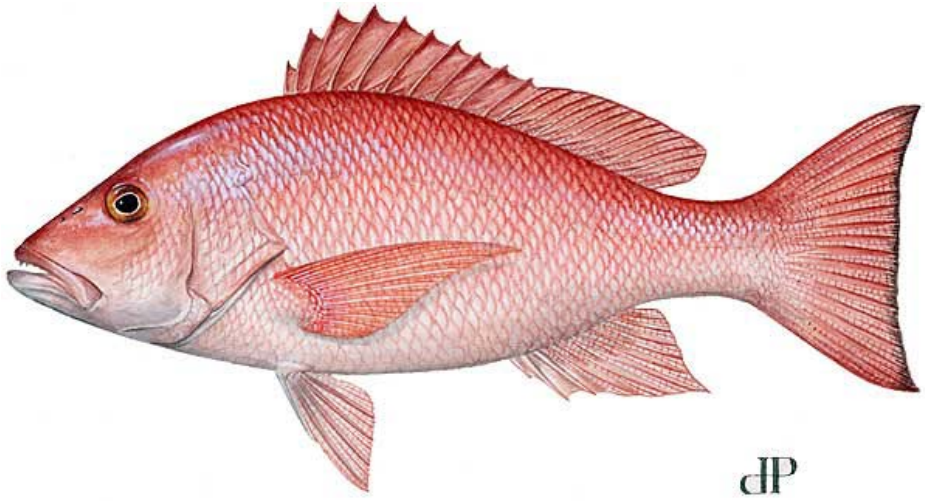
Specification of Annual Catch Limits for Red Snapper (*Lutjanus campechanus*) in the South Atlantic Region



Temporary Measures through Emergency Action

August 30, 2017

Environmental Assessment **Regulatory Impact Review** **Fishery Impact Statement**

Abbreviations and Acronyms Used in the FMP

ABC	acceptable biological catch
ACL	annual catch limit
AM	accountability measure
ACT	annual catch target
B	a measure of stock biomass in either weight or other appropriate unit
B_{MSY}	the stock biomass expected to exist under equilibrium conditions when fishing at F_{MSY}
B_{OY}	the stock biomass expected to exist under equilibrium conditions when fishing at F_{OY}
B_{CURR}	the current stock biomass
CPUE	catch per unit effort
DEIS	draft environmental impact statement
EA	environmental assessment
EEZ	exclusive economic zone
EFH	essential fish habitat
F	a measure of the instantaneous rate of fishing mortality
$F_{30\%SPR}$	fishing mortality that will produce a static SPR = 30%
F_{CURR}	the current instantaneous rate of fishing mortality
F_{MSY}	the rate of fishing mortality expected to achieve MSY under equilibrium conditions and a corresponding biomass of B_{MSY}
F_{OY}	the rate of fishing mortality expected to achieve OY under equilibrium conditions and a corresponding biomass of B_{OY}
FMP	fishery management plan
FMU	fishery management unit
M	natural mortality rate
MARMAP	Marine Resources Monitoring Assessment and Prediction Program
MFMT	maximum fishing mortality threshold
MMPA	Marine Mammal Protection Act
MRFSS	Marine Recreational Fisheries Statistics Survey
MRIP	Marine Recreational Information Program
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	minimum stock size threshold
MSY	maximum sustainable yield
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OFL	overfishing limit
OY	optimum yield
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SAFMC	South Atlantic Fishery Management Council
SEDAR	Southeast Data Assessment and Review
SEFSC	Southeast Fisheries Science Center
SERO	Southeast Regional Office
SIA	social impact assessment
SPR	spawning potential ratio
SSC	Scientific and Statistical Committee

Temporary Measures through Emergency Action for Red Snapper in the South Atlantic

Proposed action:	Specify annual catch limits for red snapper in 2017
Lead agency:	Draft Environmental Assessment – National Marine Fisheries Service (NMFS) Southeast Regional Office
For Further Information Contact:	NMFS, Southeast Region Regional Office 263 13th Avenue South St. Petersburg, FL 33701 727- 824-5305 Frank Helies Frank.Helies@noaa.gov Nikhil Mehta Nikhil.Mehta@noaa.gov

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Chapter 1. Introduction

1.1 What action is being proposed?

Red snapper has been closed in the South Atlantic from 2010 to 2017 except for short seasons in 2012, 2013, and 2014. The National Marine Fisheries Service (NMFS) is proposing temporary measures through emergency action[1] to allow a limited fishing season for the recreational and commercial sectors in 2017.

1.2 Who is proposing the action?

NMFS, which is an agency within the National Oceanic and Atmospheric Administration and the Department of Commerce, is proposing the action.

1.3 Where is the Project Located?

Management of the federal snapper grouper fishery located off the southeastern United States (South Atlantic) in the 3-200 nautical miles U.S. Exclusive Economic Zone (EEZ) is conducted under the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (Snapper Grouper FMP) (SAFMC 1983) (**Figure 1.3.1**). The Snapper Grouper FMP and its amendments are developed under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), and other applicable law. Red snapper is among the 55 species managed by the South Atlantic Fishery Management Council (Council) under the Snapper Grouper FMP.

[1] The terms “emergency rule”, “emergency regulations”, “temporary measures”, and “temporary measures through emergency action” are interchangeable for the purposes of this document.

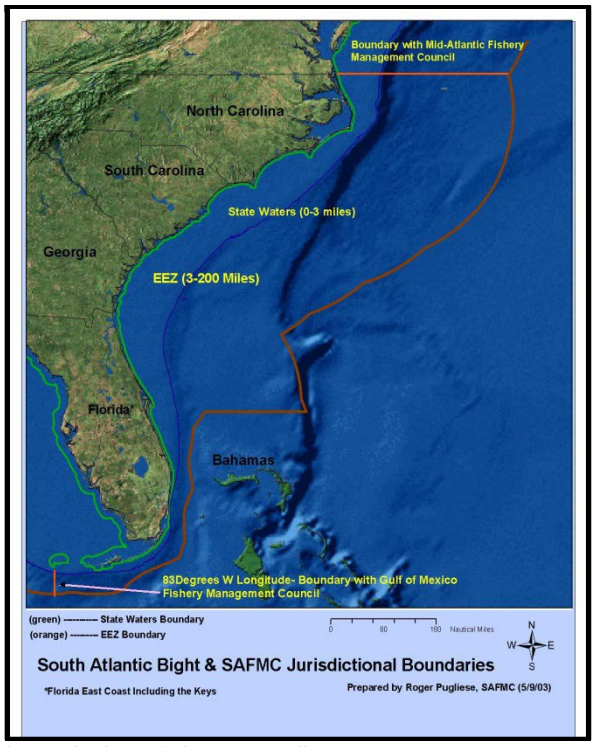


Figure 1.3.1. Jurisdictional boundaries of the Council.

1.4 Why is NMFS considering action (Purpose and Need statement)?

NMFS is considering whether to specify recreational and commercial annual catch limits (ACLs) for red snapper in 2017, while long-term ACLs and management measures for red snapper are being developed in Amendments 43 and 46 to the Snapper Grouper FMP. The goal of temporary measures through emergency action is to minimize adverse socio-economic effects to fishermen and fishing communities that utilize red snapper as part of the snapper grouper fishery in 2017 (see **Section 3.3**) while preventing overfishing from occurring and continuing to rebuild the stock (see **Section 1.8**).

Need for Action

Reduce, to the extent practicable, existing adverse socio-economic impacts to fishermen and fishing communities that utilize the red snapper portion of the snapper grouper fishery, without overfishing, and while continuing to rebuild the stock as per the Magnuson-Stevens Fishery Conservation and Management Act.

1.5 What is an emergency rule how has NMFS determined that an emergency exists?

Section 305(c) of the Magnuson-Stevens Act specifies that the Secretary of Commerce (Secretary) may promulgate emergency regulations if the Secretary finds that an emergency exists. As outlined in the Magnuson-Stevens Act, emergency regulations may remain in effect for up to 180 days after the date of publication of the notice in the *Federal Register*. Fishery management councils may also request the Secretary to implement emergency regulations. If the Council vote is unanimous for the emergency regulations, NMFS shall implement the temporary actions. If the vote is not unanimous, NMFS may implement the actions.

NMFS has issued guidelines for fishery management councils and NMFS Regional Administrators in determining whether the use of an emergency rule is justified under the authority of the Magnuson-Stevens Act (62 FR 44421, August 21, 1997). The guidelines clarify the use of an emergency under Section 305(c), and define it as a situation that: (1) results from recent, unforeseen events or recently discovered circumstances; and (2) presents serious conservation or management problems in the fishery; and (3) can be addressed through emergency regulations for which the immediate benefits outweigh the value of notice, public comment and consideration of the impacts on participants to the same extent as would be expected under normal rulemaking process (62 FR 44422, August 21, 1997).

Recently discovered and unforeseen data from the long-term Southeast Reef Fish Survey (SERFS) fishery independent index of abundance (see **Section 1.8**) were presented to the Council at their June 2017 meeting. These data showed the red snapper population has increased substantially since 2014, with a steep upward trend in relative abundance, reaching the highest levels to date in 2016. The increase had occurred despite limited fishing seasons from 2012 to 2014, and the large number of dead discards since harvest restrictions were put into place on red snapper fishing in 2010.

The continued closure of South Atlantic red snapper poses serious management problems to NMFS and the Council. Input from fishermen indicates that fishers are increasingly frustrated with the perceived waste of the resource due to the continued discarding of red snapper when they target species that co-occur with red snapper. Fishers report that they are increasingly encountering large numbers of red snapper, which is further supported by the long-term SERFS fishery independent index, as explained above. Allowing a limited amount of harvest through this temporary measure through emergency action would allow fishermen to harvest red snapper, and would also generate revenue for charter/headboat and commercial fishing businesses. Furthermore, the time it would take to complete notice-and-comment rulemaking would not allow for a fishing season in 2017, and would be expected to result in substantial loss to fishing industry participants and communities (see **Sections 4.1.2** and **4.1.3**).

1.6 Since the temporary measures through emergency action will expire, will there be long-term measures?

The Council and NMFS are developing Amendment 43 to the Snapper Grouper FMP that would establish red snapper ACLs and allow harvest of red snapper beginning in 2018. The Council and NMFS are also developing Amendment 46 to the Snapper Grouper FMP that would modify red snapper management reference points, commercial and recreational management measures, recreational permitting and reporting, and best fishing practices. In addition, the Southeast Fisheries Science Center (SEFSC) is exploring alternative methods to further investigate and develop an index based approach as an alternative way to monitor red snapper, for review and consideration by the Council and Council's SSC (see **Section 1.8** for more information).

1.7 What are the current red snapper ACLs and management measures and how are fishing seasons determined?

Amendment 28 to the Snapper Grouper FMP (Amendment 28, SAFMC 2013) set the commercial and recreational red snapper ACLs at zero and established a process for specifying fishing seasons to allow limited harvest of red snapper in the South Atlantic EEZ. Based on the Amendment 28 process, limited harvest was allowed in 2012, 2013, and 2014 fishing years in federal waters. Combined landings and estimated dead discards in 2014, 2015, and 2016 exceeded the total ABC and no harvest has been allowed since 2014 (**Table 2.1.1**).

Process implemented by Snapper-Grouper Amendment 28

The annual ABCs for red snapper were recommended by the SSC in numbers of fish based on projections in SEDAR 24 (2010). If NMFS determines that the estimated landings and dead discards that occurred in the previous year were equal to or greater than the projected ABC, no harvest would be allowed in the upcoming fishing season. If NMFS determines that the estimated landings and dead discards that occurred in the previous year were less than the ABC, harvest *may* be allowed. (Note: The commercial and recreational fishing seasons would not open if the projected season length is three days or less.)

NMFS calculates the total ACL following the formula implemented through the amendment and the sector-ACLs based on the Council's approved allocations. NMFS projects the length of the commercial and recreational fishing seasons.

If harvest is allowed, NMFS announces the pre-determined commercial and recreational fishing year start dates. The commercial red snapper season closes when the commercial sector ACL is met or projected to be met. The recreational red snapper season is projected and announced before the start of the season. The NMFS Regional Administrator has the authority to delay the opening of red snapper fishing seasons in the event of a tropical storm or hurricane affecting the South Atlantic Council's area of authority.

The process would be repeated each year unless modified.

1.8 Will the Action Prevent Overfishing and Continue to Rebuild the Stock?

NMFS has determined that allowing limited harvest of red snapper in 2017 is not expected to result in overfishing, nor prevent continued stock rebuilding. This section provides the rationale for these determinations.

In 2009, NMFS notified the Council that the red snapper stock was overfished and undergoing overfishing based on the results of the Southeast Data, Assessment, and Review (SEDAR) 15 (2009) benchmark stock assessment, using data through 2006. SEDAR is a cooperative process by which stock assessment projects are conducted in Southeast Region. In response to the stock assessment, the Council approved, and NMFS implemented, a 35-year rebuilding plan for South Atlantic red snapper in 2010. The stock was reassessed in 2010 using data through 2009 (SEDAR 24 2010). SEDAR 24 (2010) determined that the red snapper stock was overfished and undergoing overfishing; however, the rate of overfishing was less than the rate of overfishing found in the previous assessment (SEDAR 15 2009).

The most recent stock assessment for South Atlantic red snapper was completed in 2016, through SEDAR 41 (2017)[2]. SEDAR 41 (2017) evaluated data from 1950 to 2014, and determined that overfishing was occurring from 2012 to 2014 because the estimated fishing mortality (based on the average over the last three years represented in the model) exceeded the maximum fishing mortality threshold. The red snapper overfishing determination in the assessment came from 2012-2014 when only a small amount of harvest was allowed to occur. However, discards during this time period were very high due to fishermen targeting species that co-occur with red snapper, which likely contributed to the overfishing determination. SEDAR 41 (2017) stated "during the most recent years of the stock assessment series (i.e., the 2010-2014 moratorium), recreational discards were one of the most important and most uncertain sources of information." However, despite small fishing seasons that occurred during 2012-2014, the Southeast Reef Fish Survey (SERFS) showed a steep increase in the relative abundance of red snapper following 2014 (**Figure 1.8.1**), suggesting that the limited amount of harvest during 2012-2014 did not negatively affect the red snapper stock. Further, at the June 2016 Council meeting, the SSC chair stated that when taking all of the available information into account, particularly the fishery-independent data, the progress in rebuilding of red snapper was unquestionable.

In May 2016, the SSC accepted the results from SEDAR 41(2017) as providing information useful for management and adequate to support fishing level recommendations. However, the SSC noted there was high uncertainty in the degree of overfishing (i.e., the actual numerical value of the current fishing mortality estimate). The SSC indicated that the most significant sources of uncertainty include: the stock-recruitment relationship, natural mortality at age, the age structure of the unfished population, the composition and magnitude of recreational discards (where dead discards vastly outnumbered the landings during 2012-2014; **Table 2.1.1**), potential changes in catch per unit effort catchability, and the selectivities for the different fishery fleets (SAFMC 2017).

On January 18, 2017, the Council requested the SEFSC provide red snapper projections under the assumption that all fish caught are subsequently discarded. The SEFSC reported in a letter dated February 15, 2017, that the proposed projections were not appropriate for management use because the uncertainty with the assessment was already large (**Appendix F**) and would increase due to Marine Recreational Information Program (MRIP) discard data. The SEFSC noted that the Council's SSC had indicated that overfishing was occurring but could not quantify by how much, and stated that the fishing mortality rates in the last few years of the assessment are very sensitive to 2014 data, and retrospective analyses indicate the fishing mortality rates are considerably lower if these data are excluded. The SEFSC stated in their February 15, 2017, letter that the uncertainty in the stock assessment inhibits the ability to set an ABC that can be effectively monitored. The SEFSC further stated in an April 21, 2017, letter, that the use of an ABC based primarily on fishery discards for monitoring the effectiveness of management action is likely ineffective.

[2] Subsequent to completion of the assessment, the SEFSC made a small correction to the base run, and the SSC provided review in April 2017. The change to the outcome of the assessment was minimal.

NMFS informed the Council in a letter dated March 3, 2017 (**Appendix F**) that based on the results of SEDAR 41 (2017) the red snapper stock was still overfished, but was rebuilding in accordance with the rebuilding plan, and that adequate management action has been taken to address overfishing of red snapper and continue to rebuild the stock through harvest prohibitions in 2015 and 2016. This determination is supported by an increase in stock biomass since 2010 and increasing abundance of older age classes (ages greater than six) (SEDAR 41 2017).

The abundance of snapper grouper species, including red snapper, has been monitored by the Marine Resources Monitoring Assessment and Prediction (MARMAP) Program since 1978. MARMAP[3] is the only existing long-term program off the Atlantic coast of the southeastern U.S. that monitors reef fish length frequency, abundance, and life history based on fishery-independent data. These data provide critical input for the assessments of stock status conducted through the SEDAR process.

Southeast Reef Fish Survey (SERFS)

- Includes three fishery independent sampling surveys.
  - MARMAP – since 1978
  - SEAMAP-SA – since 1986
  - SEFIS – since 2010
- Continuous sampling since 1972.
- Gear Used:
  - Fish traps (chevron)
  - Longlines
  - Rod and reel
  - Video
- Surveys conducted from April to October

[3] The NMFS SEFSC SouthEast Fishery-Independent Survey (SEFIS) was established in 2010 to complement MARMAP with identical gear types and sampling methodology, and to expand the sample size and spatial distribution of the ongoing MARMAP trap survey. The fishery independent survey will be attributed to SERFS through the remainder of the document.

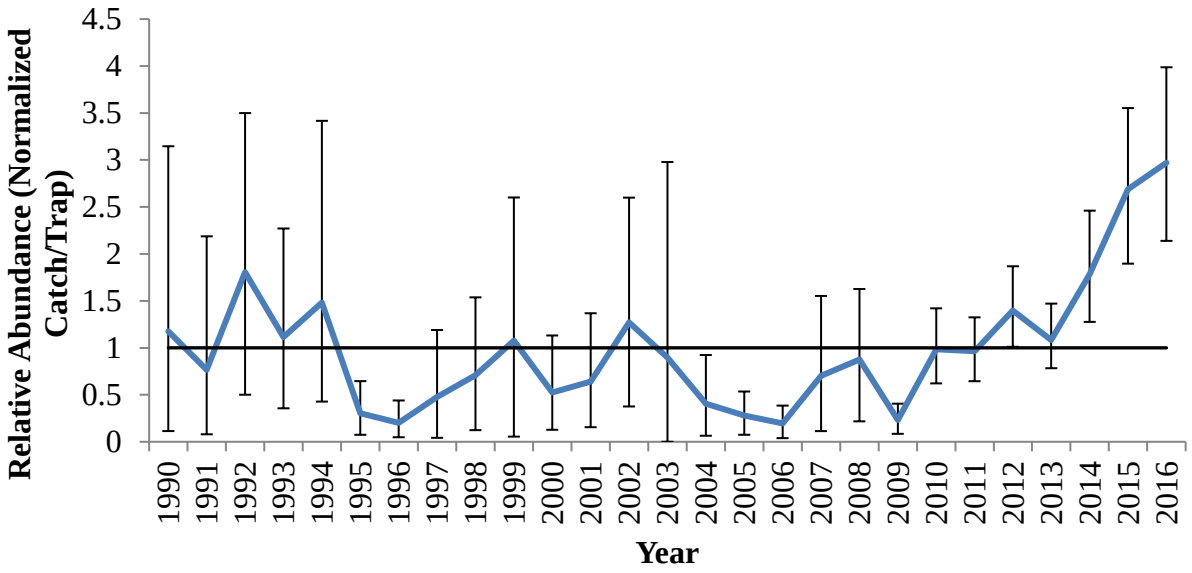


Figure 1.8.1. Relative abundance of red snapper collected in chevron traps in the South Atlantic Region calculated using methods developed in SEDAR 41 (2017) and 95% confidence interval of the relative abundance index based on 10,000 bootstraps. The solid black line indicates a relative index of one. See **Appendix H** for more details. **Note: Figure 1.8.1 does not include the video index. The video index is only available for the years 2010-2014 and was provided in SEDAR 41 (2017). Video data after 2014 are not yet available.** Source: SERFS

Figure 1.8.1 shows the relative abundance of red snapper collected in chevron traps in the South Atlantic Region calculated using methods developed in SEDAR 41 (2017). SEDAR 41 (2017) included both the fishery-independent trap index and the video index (2010-2014); however, the video index data subsequent to 2014 are not currently available. The long-term fishery independent survey shows a steep upward trend in relative abundance, reaching the highest levels to date in 2016 (**Figure 1.8.1, Appendix H**). The increase in relative abundance has occurred despite landings that occurred during the 2012-2014 mini-seasons, and despite the large number of dead discards that have occurred (see **Table 2.1.1**) since harvest was restricted for red snapper in 2010. The SSC was presented trends data from the sampling completed by SERFS at their April 2017 meeting. The SSC stated at their April 2017 meeting that, "Although estimates of discards may be highly uncertain, a continuing upward trend in the fishery independent index has a high probability of reflecting increases in population size" (SAFMC 2017). This is important because the determination of overfishing is based on the level of removals and the population size. If the population increases, as is indicated from the survey, then the fishing mortality estimate associated with a given level of removals is decreased. Overfishing is defined in the Magnuson-Stevens Act as "a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis" (16 U.S. C. 1802(10)). The removal levels in 2014 (highest since 2010) did not appear to jeopardize the stock because the population increased substantially after 2014 landings occurred.

Since recently discovered and unforeseen red snapper data from the long-term fishery independent index of abundance collected by the SERFS program suggests the South Atlantic

red snapper population has increased substantially since 2014; the Council's SSC indicated that the trends in SERFS relative abundance supported a population increase in their April 2017 report; and red snapper relative abundance from SERFS is currently the highest observed in the entire time series (1990-2016), allowing a small amount of harvest of red snapper in 2017 at the highest landings observed during the limited openings in 2012-2014 is neither expected to result in overfishing, nor prevent continued stock rebuilding.

The SSC provided annual ABCs for the years of 2012-2019 following a review of SEDAR 24 (2010). These ABCs were the basis of management advice for Amendment 28 (SAFMC 2013). As previously discussed, in response to the Council request to provide red snapper projections under the assumption that all fish caught are subsequently discarded, the SEFSC stated (in their February 15, 2017, letter, **Appendix F**) that uncertainty in SEDAR 41 (2017) is already large and will increase due to the Marine Recreational Information Program (MRIP) discard data, and future changes to MRIP estimates due to the new effort survey (results of which are anticipated to be available in mid-2018). The SEFSC also stated in their January 18, 2017, letter that uncertainty in SEDAR 41 (2017) inhibits the ability to set an ABC that can be effectively monitored. Additionally, on April 21, 2017, the SEFSC stated that the use of an ABC based primarily on fishery discards for monitoring the effectiveness of management action is likely ineffective due to uncertainty in measures of discards and changes in the MRIP effort estimation methodology.

In April 2017, the SSC considered a request from the Council to consider approaches for deriving ABC recommendations for red snapper in light of the recent guidance of the agency regarding red snapper projections and uncertainties as detailed above (SAFMC 2017). The following statements were provided by the SSC:

- *Clarification was provided by NMFS to the SSC that the assessment is still considered BSIA (Best Scientific Information Available). However, the data available to monitor the landings and discards are too uncertain to track any projected ABC. Therefore, an index-based approach is being proposed to track and monitor the condition of red snapper.*
- *The current projected yield streams are still considered BSIA, but are not useful for management and monitoring because of the uncertainty in the catch data (as most of the catch is discarded).*
- *The SSC acknowledged that at this point it is unable to provide an ABC recommendation for red snapper.*
- *Although estimates of discards may be highly uncertain, a continuing upward trend in the fishery independent index has a high probability of reflecting increases in population size.*

Since the SEFSC indicates that uncertainty in SEDAR 41 (2017) inhibits the ability to set an ABC that can be effectively monitored and that the SERFS fishery-independent index shows a continued upward trend in red snapper relative abundance, further investigation of an index based approach as an alternative approach for monitoring red snapper is warranted.

The Council is developing amendments to address ACLs and management actions for red snapper. The current version of Amendment 43 proposes to allow some harvest of red snapper beginning in 2018, and the Council plans on reviewing and taking action on that amendment at their September 2017 meeting. Amendment 46 is being developed and it would revisit red snapper management reference points, commercial and recreational management measures, recreational permitting and reporting, and best fishing practices. Additionally, the SEFSC is exploring alternative methods to develop future ABCs for red snapper.

1.9 What is the history of management for red snapper?

Red snapper has been regulated since the development of the snapper grouper fishery management plan in 1983. A detailed history of management for all species in the snapper grouper fishery management unit may be found in **Appendix B**. Below is an annotated list of fishery management plan/amendments that contained actions specifically related to red snapper.

Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (1983)

The original Snapper Grouper FMP included provisions to prevent growth overfishing in thirteen species in the snapper grouper complex and established a procedure for preventing overfishing in other species; established minimum size limits for red snapper, yellowtail snapper, red grouper, Nassau grouper, and black sea bass; established a 4-inch trawl mesh size to achieve a 12 inch total length minimum size limit for vermilion snapper; and included additional harvest and gear limitations.

Amendment 4 (1991)

Amendment 4 prohibited the use of various gear, including fish traps, the use of bottom longlines for wreckfish, and powerheads in special management zones off South Carolina; established bag limits and minimum size limits for several species (20 inch total length minimum size limit and two fish bag limit for red snapper); required permits (commercial & for-hire) and specified data collection regulations; and required that all snapper grouper species possessed in the South Atlantic EEZ must have heads and fins intact through landing.

Amendment 11 (1998)

Amendment 11 amended the FMP to make definitions of maximum sustainable yield (MSY), optimum yield (OY), overfishing, and overfished consistent with National Standard Guidelines. Amendment 11 also identified and defined fishing communities, addressed bycatch management measures, and defined the red snapper F_{MSY} proxy as $F_{30\%SPR}$.

Interim Rule for Red Snapper (2009)

In 2008, the Council received notification (letter dated July 8) that the South Atlantic red snapper stock was undergoing overfishing and was overfished. In March 2009 the Council requested that the NMFS establish interim measures to reduce overfishing and fishing pressure on the red snapper stock. Interim measures became effective on January 4, 2010. The interim rule was effective until June 2, 2010, but was extended for an additional 186 days since the Council was developing long-term management measures in Amendment 17A to the Snapper Grouper FMP to end overfishing of red snapper and rebuild the stock.

Amendment 17A (2010)

Definitions

Acceptable Biological Catch (ABC)
Maximum amount of fish stock that can be harvested without adversely affecting recruitment of other components of the stock.

Annual Catch Limits (ACL)
The level of annual catch (pounds or numbers) that triggers accountability measures to ensure that overfishing is not occurring.

Annual Catch Targets (ACT)
The level of annual catch (pounds or numbers) that is the management target of the fishery, and accounts for management uncertainty in controlling the actual catch at or below the ACL.

Accountability Measures (AM)
Management controls to prevent ACLs, including sector ACLs, from being exceeded, and to correct or mitigate overages of the ACL if they occur.

Allocations
A division of the overall ACL among sectors (e.g., recreational and commercial) to create sector ACLs.

Maximum Sustainable Yield (MSY)
Largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions.

Optimum Yield (OY)
The amount of catch that will provide the greatest overall benefit to the nation, particularly with respect to food production and recreational opportunities and taking into account the protection of marine ecosystems.

Minimum Stock Size Threshold (MSST)
A status determination criterion. If current stock size is below MSST, the stock is overfished.

Actions in Amendment 17A (SAFMC 2010) included a harvest prohibition for red snapper and an area closure for all snapper grouper species. The area closure was 4,827 square miles and extended from southern Georgia to northern Florida where harvest and possession of all snapper grouper species would be prohibited (except when fishing with black sea bass pots or spearfishing gear for species other than red snapper). The red snapper prohibition was effective on January 3, 2011; however, NMFS delayed the effective date of the area closure until June 1, 2011, via an emergency rule, to allow time to review the results of a new red snapper stock assessment (SEDAR 24 2010).

The results of SEDAR 24 showed red snapper to be overfished and undergoing overfishing; however, the rate of overfishing found in SEDAR 24 was less than the rate of overfishing found in the previous stock assessment (SEDAR 2009). Based on the results from SEDAR 24, evidence of decreased effort in the recreational sector, and recommendations from their SSC, the Council determined that the snapper grouper area closure approved in Amendment 17A, in addition to the harvest prohibition, was more conservative than what was necessary to end overfishing of red snapper.

Amendment 17A also required the use of non-stainless steel circle hooks when fishing for snapper grouper species with hook-and-line gear and natural baits in the South Atlantic EEZ north of 28 degrees North latitude and specified a fishery-independent monitoring program for red snapper.

Regulatory Amendment 10 (2011)

In December 2010, the Council approved Regulatory Amendment 10 for review by the Secretary of Commerce by a unanimous vote. The action in Regulatory Amendment 10 eliminated the snapper grouper area closure approved in Amendment 17A. Regulatory Amendment 10 was implemented and became effective on May 31, 2011 (SAFMC 2011a).

Comprehensive Annual Catch Limits Amendment (Snapper Grouper Amendment 25) (2011)

Established sector allocations for many snapper grouper species, including red snapper, using an allocation formula based on historic and recent average landings (SAFMC 2011b). The commercial allocation for red snapper was set at 28.07% and the recreational allocation was set at 71.93%.

Emergency Rule (2012)

The rule established red snapper seasons for the commercial and recreational sectors in the South Atlantic EEZ in 2012.

Amendment 28 (2013)

The amendment set the commercial and recreational ACLs and seasons to allow limited harvest of red snapper in 2013. In addition, the amendment established a process to determine whether limited commercial and recreational fishing seasons in the South Atlantic EEZ could occur during a given fishing year, and specified management measures should limited harvest be allowed.

Regulatory Amendment 21 (2014)

The amendment changed the minimum stock size threshold (MSST) definition for eight snapper grouper species including red snapper from MSST = [(1-M) or 0.5 whichever is greater]*B_{MSY} to 0.75*$B_{MS.}$ (SAFMC 2014)

Chapter 2. Proposed Actions and Alternatives

2.1 Allow Limited Harvest and Possession of Red Snapper in 2017

Alternative 1 (No Action). The 2017 commercial and recreational annual catch limits for red snapper are zero. The process and formula established in Amendment 28 to the Fishery Management Plan of the Snapper Grouper Fishery of the South Atlantic Region (Amendment 28) specifies current fishing year annual catch limits if the National Marine Fisheries Service determines that the previous year's estimated red snapper landings and dead discards are less than the acceptable biological catch.

Alternative 2. Temporarily allow limited harvest of red snapper in 2017 and specify a total annual catch limit equal to 23,623 fish. Commercial annual catch limit equals 69,360 pounds (whole weight) and recreational annual catch limit equals 16,480 fish.

Alternative 3. Temporarily allow limited harvest of red snapper in 2017 and specify a total annual catch limit equal to 44,411 fish. Commercial annual catch limit equals 130,396 pounds (whole weight) and recreational annual catch limit equals 30,982 fish.

Preferred Alternative 4. Temporarily allow limited harvest of red snapper in 2017 and specify a total annual catch limit equal to 42,510 fish. Commercial annual catch limit equals 124,815 pounds (whole weight) and recreational annual catch limit equals 29,656 fish.

Alternative 5. Temporarily allow limited harvest of red snapper in 2017 and specify a total annual catch limit equal to 79,919 fish. Commercial annual catch limit equals 234,652 pounds (whole weight) and recreational annual catch limit equals 55,753 fish.

Note: In Alternatives 2 through 5, the sector annual catch limits (ACL) were calculated using the South Atlantic Fishery Management Council's (Council) established allocation from the Comprehensive ACL Amendment to the Fishery Management Plan of the Snapper Grouper Fishery of the South Atlantic Region (Comprehensive ACL Amendment, SAFMC 2011b). The sector allocations for red snapper are 28.07% commercial and 71.93% recreational.

The National Marine Fisheries Service (NMFS) would announce the pre-determined commercial and recreational fishing year start dates. The commercial red snapper season would close when the commercial sector ACL is met or projected to be met. The end of the recreational red snapper season would be projected and announced before the start of the recreational season. The NMFS Southeast Regional Administrator has the authority to delay the opening of red snapper fishing seasons in the event of a tropical storm or hurricane affecting the Council's area of authority.

Process implemented by Amendment 28 (Alternative 1, No Action)

NMFS would announce the pre-determined commercial and recreational fishing season start dates. The commercial red snapper season would close when the commercial ACL is met or projected to be met. The recreational red snapper season would be projected and announced before the start of the season based on catch rates from previous years. The NMFS Regional Administrator would have the authority to delay the opening of red snapper fishing seasons in the event of a tropical storm or hurricane affecting the South Atlantic Council's area of authority.

- The commercial fishing season would begin at 12:01 am on the second Monday in July. The recreational fishing season (weekends) would begin 12:01 am on the first Friday in July.
- There would be no minimum size limit for either the commercial or recreational sector.
- The commercial trip limit would be 75 pounds gutted weight (lbs gw).
- The recreational bag limit would be one fish per person per day.

2.1.1 Comparison of Alternatives:

Under **Alternative 1 (No Action)**, harvest of red snapper would not be allowed in 2017 for either the commercial or recreational sector because the landings and discards exceeded the acceptable biological catch (ABC) in 2016 as per the process established in Amendment 28 (**Table 2.1.1**). The existing management measures such as commercial trip limit, minimum size limit, and recreational bag limit would remain unchanged from those implemented by the final rule for Amendment 28 (see examples in text box above; 78 FR 44461, July 24, 2013). The overall red snapper ACL in **Alternative 1 (No Action)** and **Alternatives 2** through **5** is set in numbers of fish. The sector ACLs are apportioned to each sector based on allocation percentages determined by the Council (see **Appendix E** for calculation of ACLs). ACLs for the recreational sector are specified in numbers of fish because it is a more reliable estimate for that sector than specifying the ACL in weight of fish. Surveys that estimate recreational landings collect information on numbers of fish and convert those numbers to weights using limited biological samples, so there is considerable uncertainty in estimates of recreational landings by weight. The commercial sector's ACL is set in pounds of fish because that is how the commercial sector reports landings and thus weight is a more accurate representation of commercial landings.

Alternative 2 through **Alternative 5** are based on landings from 2012 to 2014, when mini-seasons were open for red snapper (**Tables 2.1.1** and **2.1.2**). **Alternative 2** is the average of landings from 2012 to 2014. **Alternative 3** is the average of landings from 2012 to 2014, multiplied by an adjustment factor (1.88; **Figure 2.1.1, Appendices E** and **H**) intended to account for the observed population growth since 2012-2014. The adjustment factor is based on the observed increase in numbers of red snapper from a long-term scientific survey (SERFS). The scientific survey indicated the average population of red snapper increased by a factor of 1.88 when comparing the time period 2012 to 2014 to the time period 2015 to 2016 (**Figure 2.1.1**; **Appendices E** and **H**).

Preferred Alternative 4 is based on the highest observed landings that occurred in a single year from 2012 to 2014. **Alternative 5** is the highest landings that occurred in a single year from 2012 to 2014, multiplied by the adjustment factor (described above). Proposed ACLs under each alternative are shown in **Table 2.1.2**.

Table 2.1.1. Red snapper ABCs as prescribed by the SSC from projections included in SEDAR 24 (2010). Landings and estimates of dead discards of red snapper from the South Atlantic region since 2012, including during mini-seasons from 2012 to 2014.

Year	Total ABC (Numbers of Fish)	ACL for Landings only (Numbers of Fish)	Landings (Numbers of Fish)	Landings + Dead Discards* (Numbers of Fish)
2012	86,000	13,067	16,591	80,516
2013	96,000	13,325	11,767	72,881
2014	106,000	31,387	42,510	205,859
2015	114,000	0	2,850	276,729
2016	121,000	0	830	407,025
2017	128,000	0**		
Average 2012 to 2014			23,623	
Max observed 2012 to 2014			42,510	

*Values were reported in the SEFSC annual report on red snapper landings. The report was presented at the June Council meetings from 2013-2016.

**NMFS announced there would be no red snapper season in 2017 under the process established in Amendment 28 at the June 2017 Council meeting.

Table 2.1.2. Proposed total, commercial, and recreational red snapper ACLs calculated in numbers of fish and whole weight.

Alternative	ACL Numbers of Fish	ACL Weight (ww) *	Commercial ACL Weight (ww) **	Recreational ACL Numbers of Fish***
Alt 1	0	0	0	0
Alt 2	23,623	247,097	69,360	16,480
Alt 3	44,411	464,539	130,396	30,982
Preferred Alt 4	**42,510**	444,655	**124,815**	**29,656**
Alt 5	79,919	835,953	234,652	55,753

*Allocations are based on weight. ACL numbers of fish is converted to ACL weight by using the projected average weight from four different projection scenarios (10.46 lbs) from SEDAR 41 (2017).
**The conversion factor used to derive numbers of fish from commercial weight is 9.71 pounds and is based on the average weight of commercially caught red snapper from 2012 to 2014 (SEDAR 41 2017).
***The recreational ACL is the difference between total ACL number and commercial number.

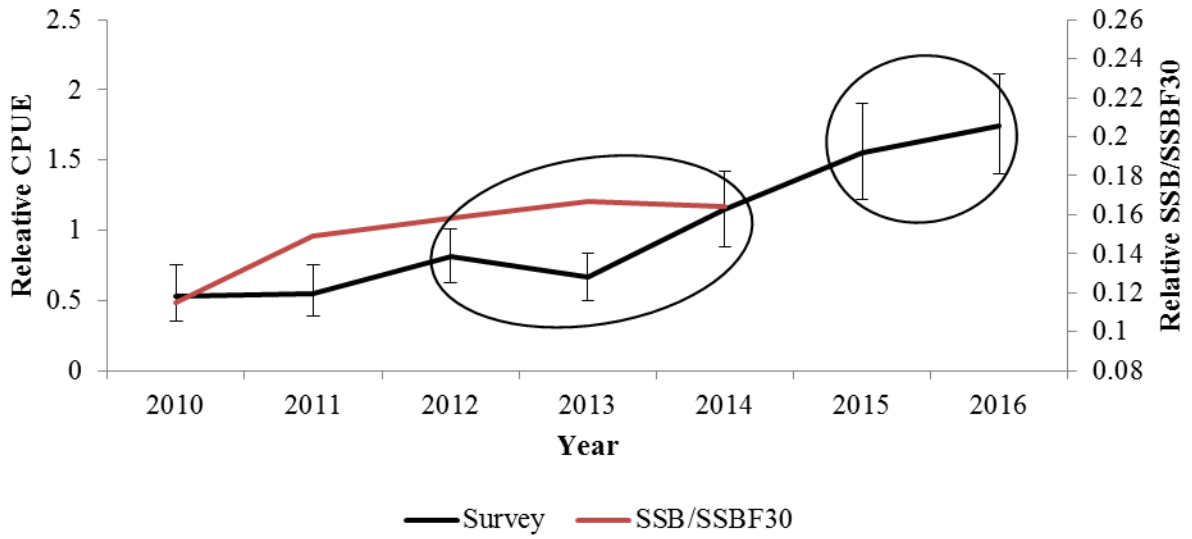


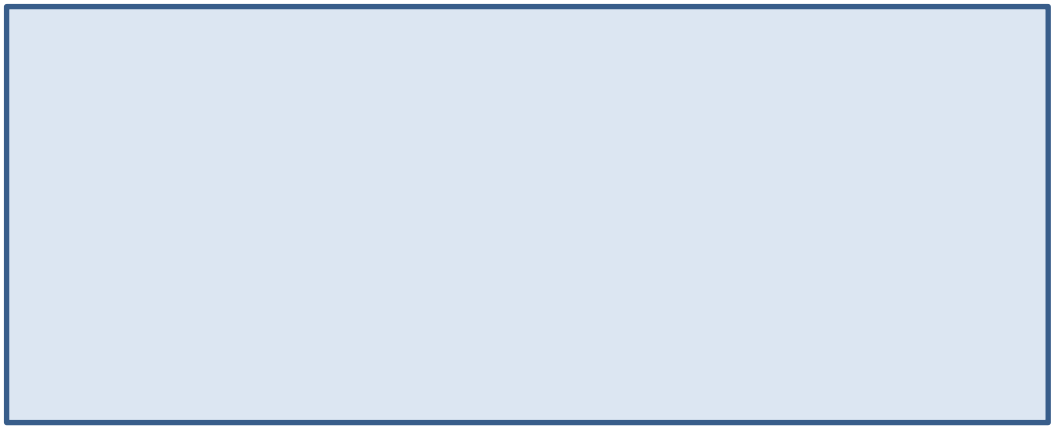
Figure 2.1.1. Relative catch per unit effort (CPUE) from the chevron trap survey standardized (as shown in **Appendix H**) with the ratio of annual spawning stock biomass compared to spawning stock biomass at $F_{30\%}$ from SEDAR 41 (2017). Circles represent the two time periods that were compared to develop the adjustment factor.

While allowing no harvest under **Alternative 1 (No Action)** might be biologically beneficial to the stock, those benefits are easily lost to discard mortality in mixed species fisheries such as South Atlantic snapper grouper. As the population continues to increase as predicted in the rebuilding plan and indicated in the recent fishery-independent survey values, it is expected that dead discards would continue to increase. **Alternative 1 (No Action)** would result in foregone short-term economic benefits to the commercial and recreational sectors and could result in continued distrust in science and management due to inconsistency in what fishermen see on the water versus the scientific models.

Alternatives 2, 3, 4 (Preferred), and **5** would allow harvest of red snapper and provide social and economic benefits associated with providing access to the resource and to restore important fishery-dependent data streams such as catch observations and biological sampling. **Alternatives 3** and **5** propose ACLs that are adjusted to account for observed recent population growth by a factor of 1.88. Therefore, these alternatives might result in negative biological effects over the status quo since it is not known how the stock might be impacted and whether such levels of harvest could result in overfishing. **Alternatives 2** and **4 (Preferred)** would be less likely to result in negative biological effects than **Alternatives 3** and **5** since **Alternatives 2** and **4 (Preferred)** propose ACLs based on 2012-2014 average catch levels and abundance survey data suggests the average red snapper abundance since 2014 has increased (**Figure 2.1.1**; **Appendices E** and **H**). All of the alternatives (excluding **Alternative 1 (No Action)**) would be expected to have equivalent economic effects on the commercial sector. For the recreational sector, **Alternative 5** would be expected to have the largest economic benefit and most social benefits followed by **Alternative 3**, **Preferred Alternative 4**, and **Alternative 2**. **Alternative 1 (No Action)** would be expected to have the least economic and social benefits and a continued administrative burden to calculate the ACL each year when compared with **Alternatives 2, 3, 4 (Preferred)**, and **5**. Apart from **Alternative 1 (No Action)**, **Alternative 2** would be the least likely of the alternatives considered to result in indirect negative economic effects, because it has the most biologically conservative ACL, followed by **Preferred Alternative 4**, **Alternative 3** and **Alternative 5**.

Chapter 3. Affected Environment

This section describes the affected environment in the proposed project area. The affected environment is divided into four major components:



3.1 Habitat Environment

3.1.1 Inshore/Estuarine Habitat

Many snapper grouper species utilize both pelagic and benthic habitats during several stages of their life histories; larval stages of these species live in the water column and feed on plankton. Most juveniles and adults are demersal (bottom dwellers) and associate with hard structures on the continental shelf that have moderate to high relief (e.g., coral reef systems and artificial reef structures, rocky hard-bottom substrates, ledges and caves, sloping soft-bottom areas, and limestone outcroppings). Juvenile stages of some snapper grouper species also utilize inshore seagrass beds, mangrove estuaries, lagoons, oyster reefs, and embayment systems. In many species, various combinations of these habitats may be utilized during daytime feeding migrations or seasonal shifts in cross-shelf distributions. Additional information on the habitat utilized by species in the snapper grouper complex is included in Volume II of the Fishery Ecosystem Plan[4] (FEP; SAFMC 2009) and incorporated here by reference. The life history of red snapper is summarized in **Section 3.2.1**.

3.1.2 Offshore Habitat

Predominant snapper grouper offshore fishing areas are located in live bottom and shelf-edge habitats where water temperatures range from 11º to 27º C (52º to 81º F) due to the proximity of the Gulf Stream, with lower shelf habitat temperatures varying from 11º to 14º C (52º to 57º F). Water depths range from 16 to 55 meters (54 to 180 ft) or greater for live-bottom habitats, 55 to 110 meters (180 to 360 ft) for the shelf-edge habitat, and from 110 to 183 meters (360 to 600 ft) for lower-shelf habitat areas.

[4] http://safmc.net/ecosystem-management/fishery-ecosystem-plan/

The exact extent and distribution of productive snapper grouper habitat in South Atlantic continental shelf habitats is unknown. Current data suggest from 3% to 30% of the shelf is suitable habitat for these species. These live-bottom habitats may include low relief areas, supporting sparse to moderate growth of sessile (permanently attached) invertebrates, moderate relief reefs from 0.5 to 2 meters (1.6 to 6.6 ft), or high relief ridges at or near the shelf break consisting of outcrops of rock that are heavily encrusted with sessile invertebrates such as sponges and sea fan species. Live-bottom habitat is scattered irregularly over most of the shelf north of Cape Canaveral but is most abundant offshore from northeastern Florida. South of Cape Canaveral the continental shelf narrows from 56 to 16 kilometers (35 to 10 mi) wide off the southeast coast of Florida and the Florida Keys. The lack of a large shelf area, presence of extensive, rugged living fossil coral reefs, and dominance of a tropical Caribbean fauna are distinctive benthic characteristics of this area.

Rock outcroppings occur throughout the continental shelf from Cape Hatteras, North Carolina to Key West, Florida (MacIntyre and Milliman 1970; Miller and Richards 1979; Parker et al. 1983), which are principally composed of limestone and carbonate sandstone (Newton et al. 1971), and exhibit vertical relief ranging from less than 0.5 to over 10 meters (33 ft). Ledge systems formed by rock outcrops and piles of irregularly sized boulders are also common. Parker et al. (1983) estimated that 24% (9,443 km^2) of the area between the 27 and 101 meter (89 and 331 ft) depth contours from Cape Hatteras, North Carolina to Cape Canaveral, Florida is reef habitat. Although the bottom communities found in water depths between 100 and 300 meters (328 and 984 ft) from Cape Hatteras, North Carolina to Key West, Florida is relatively small compared to the whole shelf, this area, based upon landing information of fishers, constitutes prime reef fish habitat and probably significantly contributes to the total amount of reef habitat in this region.

Artificial reef structures are also utilized to attract fish and increase fish harvests; however, research on artificial reefs is limited and opinions differ as to whether or not these structures promote an increase of ecological biomass or merely concentrate fishes by attracting them from nearby, natural un-vegetated areas of little or no relief. There are several notable shipwrecks along the southeast coast in state and federal waters including *Lofthus* (eastern Florida), *SS Copenhagen* (southeast Florida), *Half Moon* (southeast Florida), *Hebe* (Myrtle Beach, South Carolina), *Georgiana* (Charleston, South Carolina), *U.S.S. Monitor* (Cape Hatteras, North Carolina), *Huron* (Nags Head, North Carolina), and *Metropolis* (Corolla, North Carolina).

The distribution of coral and live hard bottom habitat as presented in the Southeast Marine Assessment and Prediction Program (SEAMAP) bottom mapping project is a proxy for the distribution of the species within the snapper grouper complex. Maps are available on the South Atlantic Fishery Management Council's (Council) Habitat and Ecosystem Atlas[5].

Plots of the spatial distribution of offshore species were generated from the Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP) data. The plots serve as point confirmation of the presence of each species within the scope of the sampling program. These plots, in combination with the hard bottom habitat distributions previously mentioned, can

[5] http://ocean.floridamarine.org/safmc_atlas/

be employed as proxies for offshore snapper grouper complex distributions in the South Atlantic region. Maps of the distribution of snapper grouper species by gear type based on MARMAP data can also be generated through the Council's Internet Mapping System at the above address.

Additional information on the habitat utilized by snapper grouper species is included in Volume II of the Fishery Ecosystem Plan (FEP; SAFMC 2009).

3.1.3 Essential Fish Habitat

Essential Fish Habitat (EFH) is defined in the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S. C. 1802(10)). Specific categories of EFH identified in the South Atlantic Bight, which are utilized by federally managed fish and invertebrate species, include both estuarine/inshore and marine/offshore areas. Specifically, estuarine/inshore EFH includes: Estuarine emergent and mangrove wetlands, submerged aquatic vegetation, oyster reefs and shell banks, intertidal flats, palustrine emergent and forested systems, aquatic beds, and estuarine water column. Additionally, marine/offshore EFH includes: live/hard bottom habitats, coral and coral reefs, artificial and manmade reefs, *Sargassum* species, and marine water column.

EFH utilized by snapper grouper species in this region includes coral reefs, live/hard bottom, submerged aquatic vegetation, artificial reefs, and medium to high profile outcroppings on and around the shelf break zone from shore to at least 183 meters [600 ft (but to at least 2,000 ft for wreckfish)] where the annual water temperature range is sufficiently warm to maintain adult populations of members of this largely tropical fish complex. EFH includes the spawning area in the water column above the adult habitat and the additional pelagic environment, including *Sargassum*, required for survival of larvae and growth up to and including settlement. In addition, the Gulf Stream is also EFH because it provides a mechanism to disperse snapper grouper larvae.

For specific life stages of estuarine-dependent and near shore snapper grouper species, EFH includes areas inshore of the 30 meter (100-ft) contour, such as attached macroalgae; submerged rooted vascular plants (seagrasses); estuarine emergent vegetated wetlands (saltmarshes, brackish marsh); tidal creeks; estuarine scrub/shrub (mangrove fringe); oyster reefs and shell banks; unconsolidated bottom (soft sediments); artificial reefs; and coral reefs and live/hard bottom habitats.

3.1.4 Habitat Areas of Particular Concern

Areas which meet the criteria for Essential Fish Habitat-Habitat Areas of Particular Concern (EFH-HAPC) for species in the snapper grouper management unit include medium to high profile offshore hard bottoms where spawning normally occurs; localities of known or likely periodic spawning aggregations; near shore hard bottom areas; The Point, The Ten Fathom Ledge, and Big Rock (North Carolina); The Charleston Bump (South Carolina); mangrove habitat; seagrass habitat; oyster/shell habitat; all coastal inlets; all state-designated nursery habitats of particular importance to snapper grouper (e.g., Primary and Secondary Nursery Areas

designated in North Carolina); pelagic and benthic *Sargassum*; Hoyt Hills for wreckfish; the Oculina Bank HAPC; all hermatypic coral habitats and reefs; manganese outcroppings on the Blake Plateau; Council-designated artificial reef special management zones (SMZs); and deepwater marine protected areas (MPAs). Areas that meet the criteria for EFH-HAPCs include habitats required during each life stage (including egg, larval, postlarval, juvenile, and adult stages).

In addition to protecting habitat from fishing related degradation though fishery management plan regulations, the South Atlantic Fishery Management Council (Council), in cooperation with National Marine Fisheries Service (NMFS), actively comments on non-fishing projects or policies that may impact essential fish habitat. With guidance from the Habitat Advisory Panel, the Council has developed and approved policies on: energy exploration, development, transportation and hydropower re-licensing; beach dredging and filling and large-scale coastal engineering; protection and enhancement of submerged aquatic vegetation; alterations to riverine, estuarine and near shore flows; offshore aquaculture; and marine and estuarine invasive species.

The potential impacts the actions in this amendment may have on EFH, and EFH-HAPCs are discussed in **Chapter 4** of this document.

3.2 Biological and Ecological Environment

3.2.1 Fish Populations Affected by this Amendment

The reef environment in the South Atlantic management area affected by actions in this environmental impact statement is defined by two components (**Figure 3.2.1**). Each component will be described in detail in the following sections.

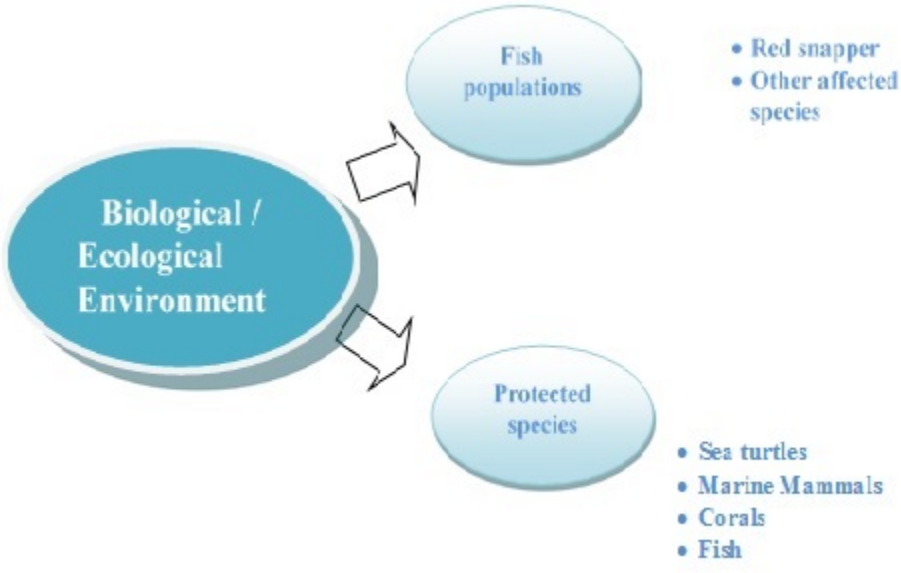


Figure 3.2.1. Two components of the biological environment described in this document.

The waters off the South Atlantic coast are home to a diverse population of fish. The snapper grouper fishery management unit contains 55 species of fish, many of them neither "snappers" nor "groupers." These species live in depths from a few feet (typically as juveniles) to hundreds of feet. As far as north/south distribution, the more temperate species tend to live in the upper reaches of the South Atlantic management area (e.g., black sea bass, red porgy) while the tropical variety's core residence is in the waters off south Florida, Caribbean Islands, and northern South America (e.g., black grouper, mutton snapper). These are reef-dwelling species that live amongst each other. These species rely on the reef environment for protection and food. There are several reef tracts that follow the southeastern coast. The fact that these fish populations congregate dictates the nature of the fishery (multi-species) and further forms the type of management regulations proposed in this document.

Red Snapper

The red snapper is found from North Carolina to the Florida Keys and throughout the Gulf of Mexico to the Yucatan Peninsula (Robins and Ray 1986). It can be found at depths from 10 to 190 m (33-623 ft). Adults usually occur over rocky bottoms. Juveniles inhabit shallow waters and are common over sandy or muddy bottom habitat (Allen 1985).

Juvenile red snapper are rarely encountered in the U.S. South Atlantic. The SEAMAP

fishery-independent trawling program captured three in 1999, two in 2000, seven in 2013, and four in 2014 in nearshore (<30 ft deep) habitat. A headboat fisherman landed one age-0 red snapper during the 2012 mini-season. One age-0 fish was landed in the commercial fishery in 1980. Fishermen have reported observing juvenile red snapper on artificial reefs in shallow water. Estimates of juvenile red snapper mortality have been developed in the Gulf of Mexico; however, little information is available for the U.S. South Atlantic (SEDAR 2017).

The maximum size reported for this species is 100 cm (40 in) total length (TL) (Allen 1985, Robins and Ray 1986) and 22.8 kg (50 lbs) (Allen 1985). For samples collected from North Carolina to eastern Florida, maximum reported age is 45 years (White and Palmer 2004). The most recent maximum observed age for red snapper is 51 years. This fish was a 904 mm (36 in) TL female, and was caught in 2003 at 67 meters depth off Florida by a charter boat fisherman (SEDAR 2017).

Red snapper Life History
An Overview

- Extend from North Carolina to the Florida Keys, and throughout the Gulf of Mexico to the Yucatan Peninsula
- Waters ranging from 33-623 feet
- Red snapper do not migrate but can move long distances
- The spawning season extends from May to October, peaking in July through September.
- Can live for at least 51 years

In the U.S. South Atlantic, recent analyses (SEDAR 2017) estimate that 50% of female red snapper are mature at 1.3 years old and 325 mm (12.8 in) TL. Fifty percent of male red snapper are mature at 166 mm (6.5 in) TL (SEDAR 2017). Grimes (1987) found that the spawning season of this species varies with location, but in most cases occurs nearly year round. Spawning along the Atlantic coast of the southeastern U.S. generally occurs from April through October peaking in June through September based on the presence of females with spawning indicators (i.e., the occurrence of hydrated oocytes and/or postovulatory follicles) (Farmer et al. 2017; SEDAR 2017).

Red snapper eat fishes, shrimps, crabs, worms, cephalopods, and some planktonic items (Szedlemayer and Lee 2004).

3.2.2 Bycatch

The action in this emergency rule is not expected to result in significant changes in bycatch of red snapper and other co-occurring species such as vermilion snapper, gag, red grouper, black sea bass, gray triggerfish, greater amberjack, and scamp. In addition, the Council, the NMFS, and the Southeast Fisheries Science Center (SEFSC) have implemented and plan to implement numerous management measures and reporting requirements that have improved, or are likely to improve monitoring efforts of discards and discard mortality. As summarized in **Appendix C (Bycatch Practicability Analysis),** this action is not expected to result in significant changes in bycatch of red snapper.

3.2.3 Other Species Affected

For details on the life histories and ecology of co-occurring species, the reader is referred to Volume II of the Fishery Ecosystem Plan (SAFMC 2009).

3.2.4 The Stock Assessment Process

The Southeast Data, Assessment, and Review (SEDAR) process is a cooperative Fishery Management Council initiative to improve the quality and reliability of fishery stock assessments in the South Atlantic, Gulf of Mexico, and U.S. Caribbean. The Caribbean, Gulf of Mexico, and South Atlantic Fishery Management Councils manage SEDAR in coordination with the National Marine Fisheries Service (NMFS) and the Atlantic and Gulf States Marine Fisheries Commissions. SEDAR seeks improvements in the scientific quality of stock assessments, constituent and stakeholder participation in assessment development, transparency in the assessment process, and a rigorous and independent scientific review of completed stock assessments.

SEDAR is organized around three workshops. First is the Data Workshop, during which fisheries monitoring and life history data are reviewed and compiled. Second is the Assessment Workshop, which may be conducted via a workshop and several webinars, during which assessment models are developed and population parameters are estimated using the information provided from the Data Workshop. Third and final is the Review Workshop, during which independent experts review the input data, assessment methods, and assessment products. The completed assessment, including the reports of all three workshops and all supporting documentation, are then forwarded to the Council's Scientific and Statistical Committee (SSC). The SSC considers whether the assessment represents the best available science and develops fishing level recommendations for Council consideration.

SEDAR workshops are public meetings organized by SEDAR. Workshop participants appointed by the lead Council are drawn from state and federal agencies, non-government organizations, Council members, Council advisors, and the fishing industry with a goal of

including a broad range of disciplines and perspectives. All participants are expected to contribute to this scientific process by preparing working papers, contributing data, providing assessment analyses, evaluating and discussing information presented, and completing the workshop report.

3.2.5 Protected Species

There are at least 51 species, or distinct population segments (DPS) of species, protected by federal law that may occur in the exclusive economic zone (EEZ) of the South Atlantic Region. Thirty-one of these species are marine mammals protected under the Marine Mammal Protection Act (MMPA) (Wynne and Schwartz 1999; Waring et al. 2013). The MMPA requires that each commercial fishery be classified by the number of marine mammals they seriously injure or kill. NMFS's List of Fisheries (LOF) classifies U.S. commercial fisheries into three categories based on the number of incidental mortality or serious injury they cause to marine mammals. More information about the LOF.[6]

Five of the marine mammal species (sperm whales, sei whales, fin whales, blue whales, and North Atlantic right whales (NARW)) protected by the MMPA, are also listed as endangered under the Endangered Species Act (ESA). In addition to those five marine mammals, six species or DPSs of sea turtles (green North Atlantic and South Atlantic DPSs, hawksbill, Kemp's ridley, leatherback, and the loggerhead Northwest Atlantic (NWA) DPS); the smalltooth sawfish; five DPSs of Atlantic sturgeon; Nassau grouper, and seven species of coral [elkhorn coral (*Acropora palmata*), staghorn coral (*A. cervicornis*) ("*Acropora*" collectively); lobed star coral (*Orbicella annularis*), mountainous star coral (*O. faveolata*), boulder star (*O. franksi*); rough cactus coral (*Mycetophylia ferox*), and pillar coral (*Dendrogyra cylindrus*)] are also protected under the ESA and occur within the action area of the snapper grouper fishery. Portions of designated critical habitat for NARW, the NWA DPS of loggerhead sea turtles, and *Acropora* corals occur within the Council's jurisdiction.

NMFS has conducted specific analyses ("Section 7 consultations") to evaluate the potential adverse effects from the South Atlantic snapper grouper federal fishery on species and critical habitat protected under the ESA. On December 1, 2016, NMFS completed its most recent biological opinion on the snapper grouper federal fishery of the South Atlantic Region (NMFS 2016). In this biological opinion, NMFS concluded that this fishery's continued authorization is likely to adversely affect but is not likely to jeopardize the continued existence of the NARW, loggerhead sea turtle Northwest Atlantic DPS, leatherback sea turtle, Kemp's ridley sea turtle, green sea turtle North Atlantic DPS, green sea turtle South Atlantic DPS, hawksbill sea turtle, smalltooth sawfish U.S. DPS, or Nassau grouper. NMFS also concluded that designated critical habitat and other ESA-listed species in the South Atlantic Region were not likely to be adversely affected. Summary information on the species that may be adversely affected by the snapper grouper fishery and how they are affected is presented below. The 2016 Opinion provides additional information on these species, how they are affected by the snapper grouper fishery, and the authorized incidental take levels of these species in the snapper grouper fishery (NMFS 2016).

[6] http://www.nmfs.noaa.gov/pr/interactions/fisheries/2017_list_of_fisheries_lof.html

3.2.5.1 North Atlantic Right Whales

The NARW, *Eubalaena glacialis* (Rosenbaum et al. 2000), is a large baleen whale. NARWs feed on larger species of zooplankton and almost exclusively on copepods. Feeding takes place subsurface (subsurface feeding) or at the water's surface (surface skim feeding), depending on the vertical distribution of their food species. NARW dive as deep as 306 m (1,003 ft) (Mate et al. 1992).

The coastal waters of the southeastern United States are a wintering and sole known calving area for NARW. NARW generally occur off South and North Carolina from November 1 through April 30 (NMFS 2008) and have been sighted as far as about 30 nmi offshore (Knowlton et al. 2002; Pabst et al. 2009). Sighting records of NARW spotted in the core calving area off Georgia and Florida consist of mostly mother-calf pairs and juveniles but also some adult males and females without calves (Cole et al. 2013; Kraus and Rolland 2007; Parks et al. 2007). Based on preliminary photo-identification analysis of right whale photographs collected in the southeastern U.S., the median number of NARWs (including calves, but excluding reported or assumed calf mortalities) documented in the southeastern U.S. from the 2009-2013 calving seasons is 165 (Waring et al. 2013; Pettis and Hamilton 2014; K. Jackson, personal communication, July 21, 2016). Right whale concentrations are highest in the core calving area from November 15 through April 15 (71 FR 36299, June 26, 2006); on rare occasions, right whales have been spotted as early as September and as late as July (Taylor et al. 2010). Most calves are likely born early in the calving season. NARW distribution off Georgia and Florida is restricted to the south and east by the warm waters of the Gulf Stream, which serves as a thermal limit for NARW (Keller et al. 2012). Water temperature, bathymetry, and surface chop are factors in the distribution of calving NARW in the southeastern U.S. (Good 2008; Keller et al. 2012). Systematic surveys conducted off the coast of North Carolina during the winters of 2001 and 2002 sighted eight calves, suggest the calving grounds may extend as far north as Cape Fear. Four of the calves were not sighted by surveys conducted further south. One of the cows photographed was new to researchers, having effectively eluded identification over the period of its maturation (McLellan et al. 2003).

Commercial and recreational fishers in the South Atlantic snapper grouper fishery use hook-and-line gear, spear/powerheads, and pot/traps to target black sea bass. The black seas bass pot component of the snapper grouper fishery is the only component of the fishery that NMFS determined may adversely affect NARWs; NMFS discounted effects from all the other gear in the biological opinion. NMFS estimated that the number of annual lethal takes for NARWs from black sea bass trap/pot gear ranged from an estimated minimum of 0.005 to a maximum of 0.08. This equates to one estimated lethal entanglement approximately every 25 to 42 years.

3.2.5.2 ESA-Listed Sea Turtles

Green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles are all highly migratory and travel widely throughout the South Atlantic. This section includes a brief overview of the general life history characteristics of the sea turtles found in the South Atlantic

region. Several volumes exist that cover the biology and ecology of these species more thoroughly (i.e., Lutz and Musick (eds.) 1997; Lutz et al. (eds.) 2002).

Green sea turtle hatchlings are thought to occupy pelagic areas of the open ocean and are often associated with *Sargassum* rafts (Carr 1987; Walker 1994). Pelagic stage green sea turtles are thought to be carnivorous. Stomach samples of these animals found ctenophores and pelagic snails (Hughes 1974; Frick 1976). At approximately 20 to 25 cm carapace length, juveniles migrate from pelagic habitats to benthic foraging areas (Bjorndal 1997). As juveniles move into benthic foraging areas a diet shift towards herbivory occurs. They consume primarily seagrasses and algae, but are also know to consume jellyfish, salps, and sponges (Paredes 1969; Bjorndal 1980, 1997; Mortimer 1981, 1982). The diving abilities of all sea turtles species vary by their life stages. The maximum diving range of green sea turtles is estimated at 110 m (360 ft) (Frick 1976), but they are most frequently making dives of less than 20 m (65 ft.) (Walker 1994). The time of these dives also varies by life stage. The maximum dive length is estimated at 66 minutes with most dives lasting from 9 to 23 minutes (Walker 1994).

The **hawksbill's** pelagic stage lasts from the time they leave the nesting beach as hatchlings until they are approximately 22-25 cm in straight carapace length (Meylan 1988; Meylan and Donnelly 1999). The pelagic stage is followed by residency in developmental habitats (foraging areas where juveniles reside and grow) in coastal waters. Little is known about the diet of pelagic stage hawksbills. Adult foraging typically occurs over coral reefs, although other hard-bottom communities and mangrove-fringed areas are occupied occasionally. Hawksbills show fidelity to their foraging areas over several years (Van Dam and Diéz 1998). The hawksbill's diet is highly specialized and consists primarily of sponges (Meylan 1988). Gravid females have been noted ingesting coralline substrate (Meylan 1984) and calcareous algae (Anderes Alvarez and Uchida 1994), which are believed to be possible sources of calcium to aid in eggshell production. The maximum diving depths of these animals are not known, but the maximum length of dives is estimated at 73.5 minutes. More routinely, dives last about 56 minutes (Hughes 1974).

Kemp's ridley hatchlings are also pelagic during the early stages of life and feed in surface waters (Carr 1987; Ogren 1989). Once the juveniles reach approximately 20 cm carapace length they move to relatively shallow (less than 50 m) benthic foraging habitat over unconsolidated substrates (Márquez-M. 1994). They have also been observed transiting long distances between foraging habitats (Ogren 1989). Kemp's ridleys feeding in these nearshore areas primarily prey on crabs, though they are also known to ingest mollusks, fish, marine vegetation, and shrimp (Shaver 1991). The fish and shrimp Kemp's ridleys ingest are not thought to be a primary prey item but instead may be scavenged opportunistically from bycatch discards or from discarded bait (Shaver 1991). Given their predilection for shallower water, Kemp's ridleys most routinely make dives of 50 m or less (Soma 1985; Byles 1988). Their maximum diving range is unknown. Depending on the life stage, Kemp's ridleys may be able to stay submerged anywhere from 167 minutes to 300 minutes, though dives of 12.7 minutes to 16.7 minutes are much more common (Soma 1985; Mendonca and Pritchard 1986; Byles 1988). Kemp's ridleys may also spend as much as 96% of their time underwater (Soma 1985; Byles 1988).

Leatherbacks are the most pelagic of all ESA-listed sea turtles and spend most of their time in the open ocean. Although they will enter coastal waters and are seen over the continental shelf on a seasonal basis to feed in areas where jellyfish are concentrated. Leatherbacks feed primarily on cnidarians (medusae, siphonophores) and tunicates. Unlike other sea turtles, leatherbacks' diets do not shift during their life cycles. Because leatherbacks' ability to capture and eat jellyfish is not constrained by size or age, they continue to feed on these species regardless of life stage (Bjorndal 1997). Leatherbacks are the deepest diving of all sea turtles. It is estimated that these species can dive in excess of 1,000 m (Eckert et al. 1989) but more frequently dive to depths of 50 m to 84 m (Eckert et al. 1986). Dive times range from a maximum of 37 minutes to more routines dives of 4 to 14.5 minutes (Standora et al. 1984; Eckert et al. 1986; Eckert et al. 1989; Keinath and Musick 1993). Leatherbacks may spend 74% to 91% of their time submerged (Standora et al. 1984).

Loggerhead hatchlings forage in the open ocean and are often associated with *Sargassum* rafts (Hughes 1974; Carr 1987; Walker 1994; Bolten and Balazs 1995). The pelagic stage of these sea turtles eat a wide range of organisms including salps, jellyfish, amphipods, crabs, syngnathid fish, squid, and pelagic snails (Brongersma 1972). Stranding records indicate that when pelagic immature loggerheads reach 40-60 cm straight-line carapace length they begin to live in coastal inshore and nearshore waters of the continental shelf throughout the U.S. Atlantic (Witzell 2002). Here they forage over hard- and soft-bottom habitats (Carr 1986). Benthic foraging loggerheads eat a variety of invertebrates with crabs and mollusks being an important prey source (Burke et al. 1993). Estimates of the maximum diving depths of loggerheads range from 211 m to 233 m (692-764ft.) (Thayer et al. 1984; Limpus and Nichols 1988). The lengths of loggerhead dives are frequently between 17 and 30 minutes (Thayer et al. 1984; Limpus and Nichols 1988; Lanyan et al. 1989; Limpus and Nichols 1994) and they may spend anywhere from 80 to 94% of their time submerged (Lanyan et al. 1989; Limpus and Nichols 1994).

Sea turtles are vulnerable to capture by bottom longline and vertical hook-and-line gear. Hook-and-line gear used in the fishery includes commercial bottom longline gear and commercial and recreational vertical line gear (e.g., handline, bandit gear, and rod-and-reel). The magnitude of the interactions between sea turtles and the South Atlantic snapper grouper fishery was most recently evaluated in the 2016 biological opinion (i.e., NMFS (2016)). In **Table 3.2.1** the 3-year estimated captures and mortalities authorized for the fishery in the 2016 biological opinion are specified. Section 5.2 of the 2016 Opinion presents a summary of the data sources considered for the sea turtle analyses, estimation methods, and data limitations and assumptions associated with the estimates for each fishery component. Loggerhead sea turtles are the species most affected by the proposed action. The majority of estimated sea turtle captures appear to occur in the recreational vertical lines targeting snapper grouper FMU species due to the large amount of recreation fishing effort. However, it is also important to recognize that the sea turtle capture estimates for the recreational vertical line are also likely the most uncertain.

Table 3.2.1. Estimated 3-year sea turtle (T) and mortalities (M) estimates in the South Atlantic Snapper Grouper Fishery by fishery component and overall.

Fishery Component	Loggerhead		Kemp's ridley		Green		Hawksbill		Leatherback	
	T	M	T	M	T	M	T	M	T	M
Commercial Bottom Longline*	9	5	1	1	1	1	1	1	3	2
Commercial Vertical Line**	62	26	18	8	11	5	1	1	1	1
Recreational Vertical Line ***	546	165	159	48	96	30	2	1	1	1
All Components Combined	617	196	178	57	108	36	5	3	5	4

*Only 10 hardshell sea turtles combined are estimated to be captured every 3 years; only 1 hawksbill, Kemp's ridley or green sea turtle is expected to be captured and killed every 3 years in this component. **No more than 90 hardshell sea turtles combined are estimated for this component. ***No more than 801 hardshell sea turtle combined are estimated for this component.

Regulations implemented through Amendment 15B to the Snapper Grouper FMP (74 FR 31225; June 30, 2009; SAFMC 2008) require all commercial or charter/headboat vessels with a South Atlantic snapper grouper permit, carrying hook-and-line gear on board, to possess required literature and release gear to aid in the safe release of incidentally caught sea turtles. Comprehensive Ecosystem-Based Amendment 2 modified these requirements (76 FR 82183; December 30, 2011; SAFMC 2011c) by requiring different gear for vessels with different freeboard heights, mirroring the requirements in the Gulf of Mexico. These regulations are thought to decrease the mortality associated with accidental interactions with sea turtles.

Snapper grouper vessels transiting to and from fishing areas and moving during fishing activity also pose a potential threat to sea turtles (NMFS 2016). As explained in the 2016 biological opinion, it is very difficult to definitively or even approximately evaluate the potential risk to sea turtles stemming from specific vessel traffic from any action because of the numerous variables (e.g., vessel type, speed, traffic, environmental conditions, sea turtle abundance in area transited) that may impact vessel strike rates. This difficulty is compounded by a general lack of information on vessel use trends, particularly in regard to offshore vessel traffic.

3.2.5.3 ESA-Listed Marine Fish

Historically the **smalltooth sawfish** in the U.S. ranged from New York to the Mexico border. Their current range is poorly understood but believed to have contracted from these historical areas. In the South Atlantic region, they are most commonly found in Florida, primarily off the Florida Keys (Simpfendorfer and Wiley 2004). Only two smalltooth sawfish have been recorded north of Florida since 1963 [the first was captured off North Carolina in 1963 and the other off Georgia in 2002 (National Smalltooth Sawfish Database, Florida Museum of Natural History)]. Historical accounts and recent encounter data suggest that immature individuals are most common in shallow coastal waters less than 25 meters (Bigelow and Schroeder 1953; Adams and Wilson 1995), while mature animals occur in waters in excess of 100 meters (Simpfendorfer pers. comm. 2006). Smalltooth sawfish feed primarily on fish. Mullet, jacks, and ladyfish are

believed to be their primary food sources (Simpfendorfer 2001). Smalltooth sawfish also prey on crustaceans (mostly shrimp and crabs) by disturbing bottom sediment with their saw (Norman and Fraser 1938; Bigelow and Schroeder 1953).

On June 29, 2016, NMFS published a final rule in the *Federal Register* listing Nassau grouper as threatened under the ESA due to a decline in its population (81 FR 42268). The final rule became effective on July 29, 2016. The Nassau grouper's confirmed distribution currently includes "Bermuda and Florida (USA), throughout the Bahamas and Caribbean Sea" (e.g., Heemstra and Randall 1993; Hill and Sadovy de Mitcheson 2013). The Nassau grouper is primarily a shallow-water, insular fish species that has long been valued as a major fishery resource throughout the wider Caribbean, South Florida, Bermuda, and the Bahamas (Carter et al. 1994). As larvae, Nassau grouper are planktonic. After an average of 35-40 days and at an average size of 32 millimeters total length (TL), larvae recruit from an oceanic environment into demersal habitats (Colin 1992; Eggleston 1995). Juvenile Nassau grouper (12-15 centimeters TL) are relatively solitary and remain in specific areas (associated with macroalgae, and both natural and artificial reef structure) for months (Bardach 1958). As juveniles grow, they move progressively to deeper areas and offshore reefs (Tucker et al. 1993; Colin et al. 1997). Smaller juveniles occur in shallower inshore waters (3.7-16.5 meters [m]) and larger juveniles are more common near deeper (18.3-54.9 m) offshore banks (Bardach et al. 1958; Cervigón 1966; Silva Lee 1974; Radakov et al. 1975; Thompson and Munro 1978). Adult Nassau grouper also tend to be relatively sedentary and are commonly associated with high-relief coral reefs or rocky substrate in clear waters to depths of 130 m. Generally, adults are most common at depths less than 100 m (Hill and Sadovy de Mitcheson 2013) except when at spawning aggregations where they are known to descend to depths of 255 m (Starr et al. 2007). Nassau grouper form spawning aggregations at predictable locations around the winter full moons, or between full and new moons (Smith 1971; Colin 1992; Tucker et al. 1993; Aguilar-Perera 1994; Carter et al. 1994; Tucker and Woodward 1994). The most serious threats to the status of Nassau grouper today are fishing at spawning aggregations and inadequate law enforcement protecting spawning aggregations in many foreign nations. There are no known spawning aggregations within the South Atlantic Region.

Of the three basic types of gear used in the South Atlantic snapper grouper fishery by commercial and/or recreational fishers (i.e., hook-and-line gear, spear/powerheads, and black sea bass pots), we believe only snapper grouper hook-and-line gear may adversely affect smalltooth sawfish and Nassau grouper. Interactions with smalltooth sawfish are limited to off of Florida; and are quite rare. In the 2016 biological opinion, NMFS anticipates only eight interactions every three years in all snapper grouper hook-and-line-gear components combined and they are anticipated to all be non-lethal. Nassau grouper incidental captures appear to be more frequent. The 2016 biological opinion relied on Farmer (2016) which estimated that over the last 10 years, a total of approximately 1,387 Nassau grouper have been captured annually in the fishery and these annual interactions are expected to continue in the future. Based on an estimated 20% mortality rate, an annual average expected mortality of approximately 282 fish. Future anticipated captures and mortalities are expected to remain at these same levels (NMFS 2016).

3.3 Economic and Social Environment

3.3.1 Economic Environment

Details on red snapper, and the South Atlantic snapper grouper fishery in general, can be found in **Section 3.2**, Snapper Grouper Amendment 17A (SAFMC 2010), and the Comprehensive ACL Amendment for the South Atlantic Region (SAFMC 2011a).

3.3.1.1 Economic Description of the Commercial Sector

The major sources of data summarized in this description are the NMFS Southeast Regional Office (SERO) Permits Information Management System (PIMS) and the SEFSC Social Science Research Group (SSRG) Socioeconomic Panel[7] data set. Inflation adjusted revenues and prices are reported in 2016 dollars.

Permits

Any fishing vessel that harvests and sells any of the snapper grouper species from the South Atlantic EEZ must have a valid South Atlantic commercial snapper grouper permit, which is a limited access permit. As of July 10, 2017, there were 544 valid or renewable South Atlantic Snapper Grouper Unlimited Permits and 114 valid or renewable 225-lb Trip-limited Permits. After a permit expires, it can be renewed or transferred up to one year after the date of expiration. The number of valid or renewable snapper grouper permits declined steadily from 2012 through 2016 (**Table 3.3.1**).

Table 3.3.1. Number of valid or renewable South Atlantic commercial snapper grouper permits, 2012-2016.

2012	604	132
2013	592	129
2014	584	125
2015	571	121
2016	565	116
Average	583	125

Source: NMFS SERO Permits Dataset, 2017.

[7] This data set is compiled by the SEFSC SSRG from Federal Logbook System (FLS) data, supplemented by average prices calculated from the Accumulated Landings System (ALS). Because these landings are self-reported, they may diverge slightly from dealer-reported landings presented elsewhere.

Landings, Value, and Effort

The number of federally permitted commercial vessels that landed South Atlantic red snapper increased from 2012 through 2014 and then dropped sharply in 2015 and 2016, during which time there was no federal commercial red snapper season (**Table 3.3.2**). Landings of red snapper followed a similar pattern. The landings reported in 2015 and 2016 are either from state water catches or misreported/out-of-season harvests. On average (2012 through 2016), vessels that landed red snapper did so on approximately 9% of their South Atlantic trips and red snapper accounted for only 2% of their annual all species revenue, including revenue from Gulf trips (**Table 3.3.2** and **Table 3.3.3**). Average all species vessel-level revenue for these vessels rose steadily from 2012 through 2016, increasing by approximately 45% overall. During this time period, the average annual price per pound gutted weight (gw) of red snapper ranged from $4.21 to $5.28 (2016 dollars) (**Table 3.3.3**).

Table 3.3.2. Number of vessels, number of trips, and landings (lbs gw) by year for South Atlantic red snapper, 2012-2016.

Year	# of vessels that caught red snapper (> 0 lbs gw)	# of trips that caught red snapper	Red snapper landings (lbs gw)	Other species' landings jointly caught w/ red snapper (lbs gw)	# of South Atlantic trips that only caught other species	Other species' landings on South Atlantic trips w/o red snapper (lbs gw)	All species landings on Gulf trips (lbs gw)
2012	74	171	14,668	111,275	1,997	1,452,577	285,312
2013	137	477	27,640	265,754	3,348	2,715,941	295,712
2014	164	999	60,881	538,255	5,046	3,354,953	504,522
2015	24	30	4,334	45,323	927	418,223	244,482
2016	24	29	13,662	22,078	736	467,136	254,278
Average	85	341	24,237	196,537	2,411	1,681,766	316,861

Source: SEFSC-SSRG Socioeconomic Panel v.4 July 2017

Table 3.3.3. Number of vessels and ex-vessel revenue by year (2016 dollars) for South Atlantic red snapper, 2012-2016.

Year	# of vessels that caught red snapper (> 0 lbs gw)	Dockside revenue from red snapper	Dockside revenue from 'other species' jointly caught w/ red snapper	Dockside revenue from 'other species' caught on South Atlantic trips w/o red snapper	Dockside revenue from 'all species' caught on Gulf trips	Total dockside revenue	Average total dockside revenue per vessel
2012	74	$68,560	$335,372	$4,109,121	$930,464	$5,443,517	$73,561
2013	137	$142,152	$895,319	$8,071,918	$1,049,147	$10,158,536	$74,150
2014	164	$321,452	$1,850,626	$9,867,241	$1,877,779	$13,917,098	$84,860
2015	24	$18,909	$176,013	$1,267,443	$935,197	$2,397,562	$99,898
2016	24	$57,463	$69,436	$1,424,709	$1,013,682	$2,565,290	$106,887
Average	85	$121,707	$665,353	$4,948,086	$1,161,254	$6,896,401	$87,871

Source: SEFSC-SSRG Socioeconomic Panel v.4 July 2017

Imports

Imports of seafood products compete in the domestic seafood market and have in fact dominated many segments of the seafood market. Imports aid in determining the price for domestic seafood products and tend to set the price in the market segments in which they dominate. Seafood imports have downstream effects on the local fish market. At the harvest level for snapper species, including red snapper, imports affect the returns to fishermen through the ex-vessel prices they receive for their landings. As substitutes to domestic production of snappers, imports tend to cushion the adverse economic effects on consumers resulting from a reduction in domestic landings. The following describes the imports of fish products that directly compete with domestic harvest of snappers, including red snapper.

Imports[8] of fresh snapper were 22.7 million lbs product weight (pw) in 2012. They increased steadily to 30.5 million lbs pw in 2016. Total revenue from fresh snapper imports increased from $69.4 million (2016 dollars[9]) in 2012 to a five-year high of $90.2 million in 2016. Imports of fresh snappers primarily originated in Mexico or Central America, and entered the U.S. through the port of Miami. Imports of fresh snapper were highest on average (2012 through 2016) during the months of March through July.

[8] NOAA Fisheries Service purchases fisheries trade data from the Foreign Trade Division of the U.S. Census Bureau. Data are available for download at http://www.st.nmfs.noaa.gov/st1/trade/index.html.
[9] Converted to 2016 dollars using the annual, not seasonally adjusted GDP implicit price deflator provided by the U.S. Bureau of Economic Analysis.

Imports of frozen snapper were substantially less than imports of fresh snapper from 2012 through 2016. The annual value of frozen snapper imports ranged from $25 million (2016 dollars) to $38 million during the time period, with a peak in 2016. Imports of frozen snapper primarily originated in South America (especially Brazil), Indonesia, Mexico, and Central America. The majority of frozen snapper imports entered the U.S. through the ports of Miami, New York, and San Juan. Imports of frozen snappers tended to be lowest during March through May when fresh snapper imports were high.

Business Activity

The commercial harvest and subsequent sales and consumption of fish generates business activity as fishermen expend funds to harvest the fish and consumers spend money on goods and services, such as red snapper purchased at a local fish market and served during restaurant visits. These expenditures spur additional business activity in the region(s) where the harvest and purchases are made, such as jobs in local fish markets, grocers, restaurants, and fishing supply establishments. In the absence of the availability of a given species for purchase, consumers would likely spend their money on substitute goods, such as other finfish or seafood products, and services, such as visits to different food service establishments. As a result, the analysis presented below represents a distributional analysis only; that is, it only shows how economic effects may be distributed through regional markets and should not be interpreted to represent the impacts if these species are not available for harvest or purchase.

Estimates of the U.S. average annual business activity associated with the commercial harvest of red snapper, and all species harvested by the vessels that harvested these red snapper, were derived using the model[10] developed for and applied in NMFS (2017) and are provided in **Table 3.3.4**. This business activity is characterized as jobs (full- and part-time), income impacts (wages, salaries, and self-employed income), output (sales) impacts (gross business sales), and value-added impacts, which represent the contribution made to the U.S. Gross Domestic Product (GDP). These impacts should not be added together because this would result in double counting. It should be noted that the results provided should be interpreted with caution and demonstrate the limitations of these types of assessments. These results are based on average relationships developed through the analysis of many fishing operations that harvest many different species. Separate models to address individual species are not available. For example, the results provided here apply to a general reef fish category rather than just red snapper, and a harvester job is "generated" for approximately every $32,000 (2016 dollars) in ex-vessel revenue. These results contrast with the number of harvesters (vessels) with recorded landings of red snapper presented in **Table 3.3.2**.

[10] A detailed description of the input/output model is provided in NMFS (2011).

Table 3.3.4. Average annual business activity (2012-2016) associated with the commercial harvest of red snapper and the harvest of all species by vessels that landed red snapper. All monetary estimates are in 2016 dollars.

Species	Average Ex-vessel Value ($ thousands)	Total Jobs	Harvester Jobs	Output (Sales) Impacts ($ thousands)	Income Impacts ($ thousands)	Value Added ($ thousands)
Red snapper	$122	16	4	$1,207	$443	$626
All species harvested by vessels that landed red snapper.	$6,896	921	219	$68,390	$25,115	$35,485

Source: Calculated by NMFS SERO using the model developed for and applied in NMFS (2017).
*Converted to 2016 dollars using the annual, not seasonally adjusted GDP implicit price deflator provided by the U.S. Bureau of Economic Analysis.

3.3.1.2 Economic Description of the Recreational Sector

The South Atlantic recreational sector is comprised of the private and for-hire modes. The private mode includes anglers fishing from shore (all land-based structures) and private/rental boats. The for-hire mode is composed of charter boats and headboats (also called partyboats). Charter boats generally carry fewer passengers and charge a fee on an entire vessel basis, whereas headboats carry more passengers and payment is per person. The type of service, from a vessel- or passenger-size perspective, affects the flexibility to search different fishing locations during the course of a trip and target different species since larger concentrations of fish are required to satisfy larger groups of anglers.

Angler Effort

Recreational effort derived from the Marine Recreational Information Program (MRIP) database can be characterized in terms of the number of trips as follows:

- Target effort - The number of individual angler trips, regardless of duration, where the intercepted angler indicated that the species or a species in the species group was targeted as either the first or the second primary target for the trip. The species did not have to be caught.
- Catch effort - The number of individual angler trips, regardless of duration and target intent, where the individual species or a species in the species group was caught. The fish did not have to be kept.
- Total recreational trips - The total estimated number of recreational trips in the South Atlantic, regardless of target intent or catch success.

A target trip may reveal an angler's preference for a certain species, and thus may carry more relevant information when assessing the economic effects of regulations on the subject species than the other two measures of recreational effort. The majority of red snapper target trips in the South Atlantic, as estimated by MRIP, were recorded in Florida on private vessels from 2012 through 2016 (**Table 3.3.5**). Estimates of red snapper target effort for additional years, and other measures of directed effort, are available[11].

Table 3.3.5. South Atlantic red snapper target trips, by mode and state, 2012-2016.*

	Florida	Georgia	North Carolina	South Carolina	Total
	Charter Mode				
2012	0	65	727	0	792
2013	673	0	0	0	673
2014	3,743	0	0	0	3,743
2015	0	0	0	0	0
2016	0	0	0	0	0
Average	883	13	145	0	1,042
	Private/Rental Mode				
2012	16,215	1,215	0	586	18,016
2013	32,154	345	0	0	32,500
2014	64,397	2,219	0	1,539	68,155
2015	1,408	0	0	0	1,408
2016	1,013	0	0	0	1,013
Average	23,037	756	0	425	24,218
	All Modes				
2012	16,215	1,280	727	586	18,807
2013	32,827	345	0	0	33,173
2014	68,141	2,219	0	1,539	71,898
2015	1,408	0	0	0	1,528
2016	1,013	0	0	0	1,013
Average	23,921	769	145	425	25,284

Source: MRIP database, SERO, NMFS.
*Headboat data are unavailable.

During the short red snapper seasons that occurred in 2012, 2013, and 2014, both Florida and Georgia also collected some recreational effort data as part of their state-run survey programs.[12] Florida estimated the total number of private recreational boat trips that targeted red snapper and these estimates are incorporated herein by reference (Sauls et al. 2017). Direct comparison of

[11] http://www.st.nmfs.noaa.gov/recreational-fisheries/access-data/run-a-data-query/queries/index.
[12] These survey programs were designed to maximize sampling opportunities during the mini-seasons.

these estimates to the MRIP estimates is not possible because MRIP data are recorded at the angler level rather than the vessel level. Georgia conducted telephone surveys of for-hire (charter vessel and headboat) captains to collect catch and effort data during the 2012-2014 recreational red snapper seasons and also administered a voluntary, private angler electronic catch survey during that time. These estimates are also incorporated herein by reference (Knowlton 2015). The number of for-hire red snapper target trips recorded by Georgia was greater than what was estimated by MRIP, but the number of voluntarily reported private angler trips was significantly lower than the MRIP estimate (**Table 3.3.6**). North Carolina and South Carolina did not collect target red snapper effort data in 2012-2014.

Table 3.3.6. Georgia estimates of angler trips that targeted red snapper, 2012-2014.

Year	For-hire (charter and headboat) angler trips*	Private angler trips
2012	100	31
2013	70	53
2014	312	120

Source: Knowlton (2015).
*There were 76, 47, and 180 charter angler trips targeting red snapper in 2012, 2013, and 2014, respectively.

Similar analysis of recreational angler trips (with the exception of the Georgia-based telephone survey) is not possible for the headboat mode because headboat data are not collected at the angler level. Estimates of effort by the headboat mode are provided in terms of angler days, or the total number of standardized full-day angler trips.[13] Headboat effort in the South Atlantic, in terms of angler days, increased substantially in Florida through Georgia from 2012 through 2014, and then leveled off through 2016. In North Carolina and South Carolina, it was mostly stable during this time period (**Table 3.3.7**). Headboat effort was the highest, on average, during the summer months of June through August (**Table 3.3.8**).

[13] Headboat trip categories include half-, three-quarter-, full-, and 2-day trips. A full-day trip equals one angler day, a half-day trip equals 0.5 angler days, etc. Angler days are not standardized to an hourly measure of effort and actual trip durations may vary within each category.

Table 3.3.7. South Atlantic headboat angler days and percent distribution by state (2012 through 2016).

	Angler Days			Percent Distribution		
	FL/GA*	NC	SC	FL/GA	NC	SC
2012	139,623	20,766	41,003	69.33%	10.31%	20.36%
2013	165,679	20,547	40,963	72.86%	9.13%	18.01%
2014	195,890	22,691	42,025	75.79%	7.95%	16.26%
2015	194,979	22,716	39,702	75.76%	8.82%	15.43%
2016	196,660	21,657	42,207	75.18%	8.68%	16.14%
Average	178,566	21,497	41,180	74%	9%	17%

*East Florida and Georgia are combined for confidentiality purposes.
Source: NMFS Southeast Region Headboat Survey (SRHS).

Table 3.3.8. South Atlantic headboat angler days and percent distribution by month (2012-2016).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Headboat Angler Days											
2012	9,230	9,663	17,307	19,587	18,232	27,819	35,115	25,052	15,894	8,677	6,564	8,252
2013	10,182	10,892	14,541	16,129	20,969	33,079	39,463	33,830	16,335	14,534	6,698	10,537
2014	8,748	13,512	19,808	22,570	25,764	39,115	44,066	32,886	15,203	15,235	9,088	14,611
2015	12,661	11,148	21,842	25,128	25,172	36,907	42,558	30,772	15,649	13,375	9,623	12,562
2016	9,818	12,243	23,872	22,217	27,374	37,454	45,744	29,223	17,061	9,202	12,820	13,404
Avg	10,128	11,492	19,474	21,126	23,502	34,875	41,389	30,353	16,028	12,205	8,959	11,873
	Percent Distribution											
2012	5%	5%	9%	10%	9%	14%	17%	12%	8%	4%	3%	4%
2013	4%	5%	6%	7%	9%	15%	17%	15%	7%	6%	3%	5%
2014	3%	5%	8%	9%	10%	15%	17%	13%	6%	6%	3%	6%
2015	5%	4%	8%	10%	10%	14%	17%	12%	6%	5%	4%	5%
2016	4%	5%	9%	9%	11%	14%	18%	11%	7%	4%	5%	5%
Avg	4%	5%	8%	9%	10%	14%	17%	13%	7%	5%	4%	5%

Source: NMFS Southeast Region Headboat Survey (SRHS).

Permits

For-hire vessels are required to have a for-hire snapper grouper permit to fish for or possess snapper grouper species in the South Atlantic EEZ. As of July 10, 2017, there were 1,649 valid for-hire snapper grouper permits. This sector operates as an open access fishery and not all permitted vessels are necessarily active in the fishery. Some vessel owners may have obtained open access permits as insurance for uncertainties in the fisheries in which they currently operate. The number of for-hire vessel permits issued for the South Atlantic snapper grouper fishery reached a five-year high of 1,867 permits in 2016 (**Table 3.3.9**). The majority of snapper grouper for-hire permitted vessels were home-ported in Florida; a relatively high proportion of these permitted vessels were also home-ported in North Carolina and South Carolina. Many

vessels with South Atlantic for-hire snapper grouper permits were home-ported in states outside of the Council's area of jurisdiction. On average (2012 through 2016), these vessels accounted for approximately 11% of the total number of for-hire snapper grouper permits issued.

Table 3.3.9. Number of South Atlantic for-hire snapper grouper permits, by homeport state, 2012-2016.

Home Port	2012	2013	2014	2015	2016	Average
North Carolina	313	308	294	308	331	311
South Carolina	138	150	160	188	212	170
Georgia	26	30	34	45	53	38
Florida	1,121	1,120	1,062	1,071	1,100	1,095
Gulf (AL-TX)	93	91	81	73	69	81
Others	106	100	96	94	102	100
Total	1,797	1,799	1,727	1,779	1,867	1,794

Source: NMFS SERO Permits Dataset, 2017.

Although the for-hire permit application collects information on the primary method of operation, the permit itself does not identify the permitted vessel as either a headboat or a charter vessel and vessels may operate in both capacities. However, only federally permitted headboats are required to submit harvest and effort information to the NMFS Southeast Region Headboat Survey (SRHS). Participation in the SRHS is based on determination by the SEFSC that the vessel primarily operates as a headboat. As of February 17, 2017, 63 South Atlantic headboats were registered in the SRHS (K. Fitzpatrick, NMFS SEFSC, pers. comm.). The majority of these headboats were located in Florida/Georgia (36), followed by North Carolina (16) and South Carolina (11).

There are no specific permitting requirements for recreational anglers to harvest snapper grouper species. Instead, anglers are required to possess either a state recreational fishing permit that authorizes saltwater fishing in general, or be registered in the federal National Saltwater Angler Registry system, subject to appropriate exemptions. As a result, it is not possible to identify with available data how many individual anglers would be expected to be affected by this proposed amendment.

Economic Value

Participation, effort, and harvest are indicators of the value of saltwater recreational fishing. However, a more specific indicator of value is the satisfaction that anglers experience over and above their costs of fishing. The monetary value of this satisfaction is referred to as consumer surplus (CS). The value or benefit derived from the recreational experience is dependent on several quality determinants, which include fish size, catch success rate, and the number of fish kept. These variables help determine the value of a fishing trip and influence total demand for recreational fishing trips. The estimated value of the CS for catching and keeping a second red

snapper on an angler trip is approximately $81 (values updated to 2016 dollars[14]), and decreases thereafter (approximately $54 for a third red snapper, $40 for a fourth red snapper, and $31 for a fifth red snapper in 2016 dollars) (Carter and Liese 2012).

The foregoing estimates of economic value should not be confused with economic impacts associated with recreational fishing expenditures. Although expenditures for a specific good or service may represent a proxy or lower bound of value (a person would not logically pay more for something than it was worth to them), they do not represent the net value (benefits minus cost), nor the change in value associated with a change in the fishing experience.

With regards to for-hire businesses, economic value can be measured by producer surplus (PS) per passenger trip (the amount of money that a vessel owner earns in excess of the cost of providing the trip). Estimates of the PS per for-hire passenger trip are not available. Instead, net operating revenue (NOR), which is the return used to pay all labor wages, returns to capital, and owner profits, is used as a proxy for PS. The estimated NOR value for an average South Atlantic charter angler trip is $165 (2016 dollars) and the estimated NOR value for a South Atlantic headboat angler trip is $45 (2016 dollars) (C. Liese, NMFS SEFSC, pers. comm.). Estimates of NOR per red snapper target trip are not available.

Business Activity

The desire for recreational fishing generates economic activity as consumers spend their income on various goods and services needed for recreational fishing. This spurs economic activity in the region where recreational fishing occurs. It should be clearly noted that, in the absence of the opportunity to fish, the income would presumably be spent on other goods and services and these expenditures would similarly generate economic activity in the region where the expenditure occurs. As such, the analysis below represents a distributional analysis only.

Estimates of the business activity (economic impacts) associated with recreational angling for South Atlantic red snapper were calculated using average trip-level impact coefficients derived from the 2015 Fisheries Economics of the U.S. report (NMFS 2017) and underlying data provided by the National Oceanic and Atmospheric Administration (NOAA) Office of Science and Technology. Economic impact estimates in 2015 dollars were adjusted to 2016 dollars using the annual, not seasonally adjusted GDP implicit price deflator provided by the U.S. Bureau of Economic Analysis.

Business activity (economic impacts) for the recreational sector is characterized in the form of jobs (full- and part-time), income impacts (wages, salaries, and self-employed income), output (sales) impacts (gross business sales), and value-added impacts (contribution to the GDP in a state or region). Estimates of the average annual economic impacts (2012-2016) resulting from South Atlantic red snapper target trips are provided in **Table 3.3.10**. These estimates are low due to the small number of estimated red snapper target trips that occurred during the mini-seasons in 2012-2014 and during the subsequent closed seasons in 2015 and 2016. The average

[14] Converted to 2016 dollars using the annual, not seasonally adjusted GDP implicit price deflator provided by the U.S. Bureau of Economic Analysis.

impact coefficients, or multipliers, used in the model are invariant to the "type" of effort and can therefore be directly used to measure the impact of other effort measures such as red snapper catch trips. To calculate the multipliers from **Table 3.3.10**, simply divide the desired impact measure (sales impact, value-added impact, income impact or employment) associated with a given state by the number of target trips for that state.

The estimates provided in **Table 3.3.10** only apply at the state-level. Addition of the state-level estimates to produce a regional (or national) total may underestimate the actual amount of total business activity, because state-level impact multipliers do not account for interstate and interregional trading. It is also important to note, that these economic impacts estimates are based on trip expenditures only and do not account for durable expenditures. Durable expenditures cannot be reasonably apportioned to individual species. As such, the estimates provided in **Table 3.3.10** may be considered a lower bound on the economic activity associated with those trips that targeted red snapper.

Estimates of the business activity associated with headboat effort are not available. Headboat vessels are not covered in MRIP, so, in addition to the absence of estimates of target effort, estimation of the appropriate business activity coefficients for headboat effort has not been conducted.

Table 3.3.10. Estimated annual average economic impacts (2012-2016) from South Atlantic recreational red snapper target trips, by state and mode, using state-level multipliers. All monetary estimates are in 2016 dollars.

	NC	SC	GA*	FL
	Charter Mode			
Target Trips	145	0	61	883
Value Added Impacts	$50,201	$0	$15,256	$358,425
Sales Impacts	$93,938	$0	$27,913	$647,923
Income Impacts	$34,124	$0	$10,412	$230,365
Employment (Jobs)	1	0	0	5
	Private/Rental Mode			
Target Trips	0	425	756	23,037
Value Added Impacts	$0	$8,627	$15,190	$476,689
Sales Impacts	$0	$15,656	$26,349	$811,147
Income Impacts	$0	$5,169	$9,107	$274,117
Employment (Jobs)	0	0	0	7

Source: effort data from MRIP; economic impact results calculated by NMFS SERO using NMFS (2017) and underlying data provided by the NOAA Office of Science and Technology.
*Georgia estimates of charter angler trips for 2012-2014 from Knowlton (2015) were used in place of the MRIP estimates.

3.3.2 Social Environment

This amendment affects commercial and recreational management of red snapper. This section provides the background for the proposed actions, which will be evaluated in **Chapter 4**. Commercial and recreational landings by state are included to provide information on the geographic distribution of fishing involvement. Descriptions of the top communities involved in commercial red snapper are included along with the top recreational fishing communities based on recreational engagement. Community level data are presented in order to meet the requirements of National Standard 8 of the Magnuson-Stevens Act, which requires the consideration of the importance of fishery resources to human communities when changes to fishing regulations are considered. Lastly, social vulnerability data are presented to assess the potential for environmental justice concerns. Additional information on the South Atlantic recreational and commercial red snapper fishery is provided in the Economic Environment in **Section 3.3**.

3.3.2.1 Landings by State

The South Atlantic red snapper season was closed in 2010, 2011, 2015, and 2016 and was open for a short season during 2012, 2013, and 2014. Landings by state for the years of 2012 through 2014 are described below because these data represent the most recent years that red snapper was open in federal waters. Red snapper were landed during 2015 and 2016; however because fishing was closed in federal waters and in all state waters except for Florida, the majority of landings were from waters adjacent to Florida with some reported landings from North Carolina and South Carolina (MRIP and SRHS Datasets).

Commercial

The majority of commercial red snapper landings came from waters adjacent to Florida (82.7% on average for years 2012-2014, SERO and SEFSC ACL Files), followed by South Carolina (9%) and North Carolina and Georgia (approximately 8.1%). Data for North Carolina are combined with Georgia in order to maintain confidentiality, but the majority of the landings reported for the combined category occurred in North Carolina. From 2012 to 2014, commercial landings ranged from 7,627 lbs ww to 65,807 lbs ww (SERO and SEFSC ACL Files).

Recreational

The majority of recreational red snapper landings come from waters adjacent to Florida (88.3% on average for years 2012-2014), followed by North Carolina (6.3%), Georgia (4.8%), and South Carolina (0.5%). From 2012 to 2014, recreational landings have ranged from 6,629 fish to 31,069 fish. Recreational landings were a combination of both MRIP and red snapper state surveys done by the individual states of the South Atlantic region. An ad-hoc group reviewed the MRIP and state survey results, and determined the better estimate of recreational red snapper landings for each state and year.

3.3.2.2 Fishing Communities

The descriptions of South Atlantic communities include information about the top communities based on a "regional quotient" (RQ) of commercial landings and value for red snapper. The RQ is the proportion of landings and value out of the total landings and value of that species for that region, and is a relative measure. These communities would be most likely to experience the effects of the proposed actions that could change the red snapper fishery and impact participants, associated businesses, and communities within the region. If a community is identified as a red snapper community based on the RQ, this does not necessarily mean that the community would experience significant impacts due to changes in the fishery if a different species or number of species was also important to the local community and economy. Additional detailed information about communities with the highest RQs can be found for South Atlantic communities on the Southeast Regional Office's Community Snapshots[15].

In addition to examining the RQs to understand how communities are engaged and reliant on fishing, indices were created using secondary data from permit and landings information for the commercial sector (Jacob et al. 2013; Jepson and Colburn 2013). Fishing engagement is primarily the absolute numbers of permits, landings, and value for all species. For commercial fishing, the analysis used the number of vessels designated commercial by homeport and owner address, value of landings, and total number of commercial permits for each community for all species. Fishing reliance includes the same variables as fishing engagement divided by population to give an indication of the per capita influence of this activity. Fishing engagement and reliance data rely on fishing data up to the year 2014 and population data from the U.S. Census American Community Survey (ACS) 2010 through 2014 five-year estimates.

Using a principal component and single solution factor analysis, each community receives a factor score for each index to compare to other communities. Factor scores of both engagement and reliance were plotted for the communities with the highest RQs. Two thresholds of one and one-half standard deviation above the mean are plotted to help determine a threshold for significance. The factor scores are standardized; therefore, a score above a value of 1.0 is also above one standard deviation. A score above one-half standard deviation is considered engaged or reliant with anything above one standard deviation to be very engaged or reliant.

The reliance index uses factor scores that are normalized. The factor score is similar to a z-score in that the mean is always zero, positive scores are above the mean, and negative scores are below the mean. Comparisons between scores are relative; however, like a z-score, the factor score puts the community on a point in the distribution. Objectively, that community will have a score related to the percent of communities with similar attributes. For example, a score of 2.0 means the community is two standard deviations above the mean and is among the 2.27% most vulnerable places in the study (normal distribution curve). Reliance score comparisons between communities are relative; however, if the community scores greater than two standard deviations above the mean, this indicates that the community is dependent on fishing. Examining the component variables on the reliance index and how they are weighted by factor score provides a measurement of commercial reliance. The reliance index provides a way to gauge change over time in these communities and also provides a comparison of one community with another.

[15] http://sero.nmfs.noaa.gov/sustainable_fisheries/social/community_snapshot/

Landings for the recreational sector are not available by species at the community level; therefore, it is not possible with available information to identify communities as dependent on recreational fishing for red snapper. Because limited data are available concerning how recreational fishing communities are engaged and reliant on specific species, indices were created using secondary data from permit and infrastructure information for the southeast recreational fishing sector at the community level (Jacob et al. 2013; Jepson and Colburn 2013). Recreational fishing engagement is represented by the number of recreational permits and vessels designated as "recreational" by homeport and owners address. Fishing reliance includes the same variables as fishing engagement, divided by population. Factor scores of both engagement and reliance were plotted. **Figure 3.4.3** identifies the top communities that are engaged and reliant upon recreational fishing in general.

A description of the social environment, including analysis of communities engaged in red snapper fishing, was provided in Amendment 28 (SAFMC 2013) and is incorporated herein by reference. The referenced description focuses on available geographic and demographic data to identify top commercial red snapper communities using 2009 Accumulated Landings System (ALS) data and engagement, reliance, and social vulnerability indicators from 2009. This section has been updated using 2014 ALS data and 2014 community social vulnerability indicators data, the most recent year available.

Commercial Fishing Communities

Figure 3.4.1 includes the top red snapper communities by regional quotient landings and value during 2014, the most recent year with a federal season for red snapper. The majority of the top red snapper communities are located in Florida; however, a few of top communities are located in South Carolina and North Carolina. About 53% of red snapper is landed in the top four communities (Cocoa, Mayport, Port Orange, and Cape Coral, Florida), representing about 52% of the South Atlantic-wide ex-vessel value for the species. The remaining top communities collectively represent about 32% of South Atlantic red snapper landings and 33% of ex-vessel value (including approximately 24% of landings and 24% of value for the Florida communities of Saint Augustine, Titusville, Melbourne, Ormond Beach, Key West, Winter Springs, Sebastian, and Merritt Island and approximatively 8% of landings and 9% of value for the South Carolina and North Carolina communities of Murrells Inlet, South Carolina and Morehead City and Beaufort, North Carolina).

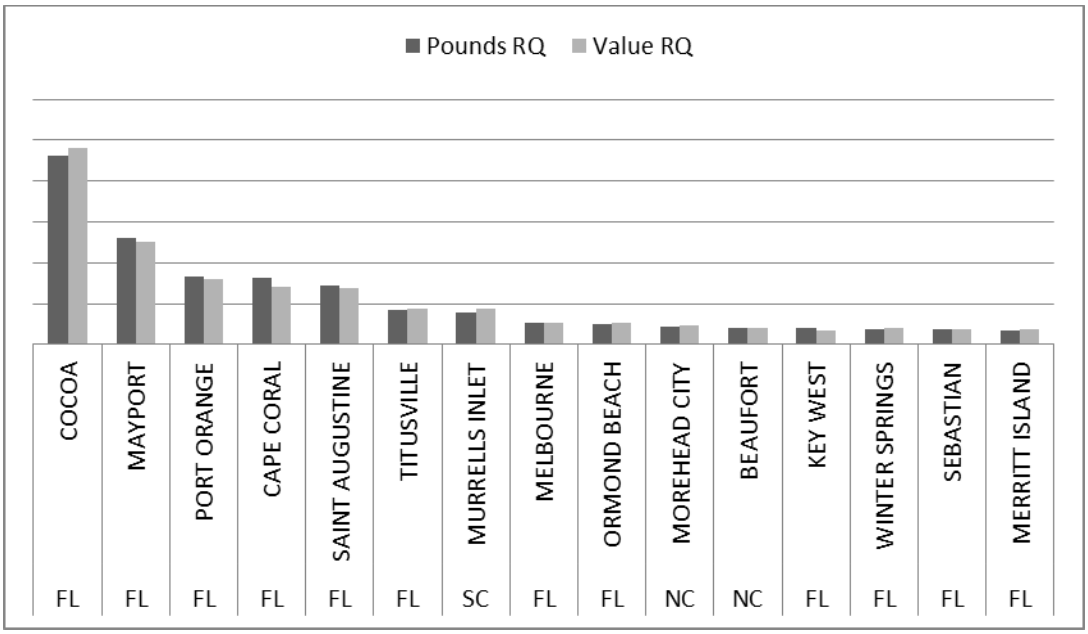


Figure 3.4.1. Top South Atlantic communities ranked by pounds and value regional of quotient (RQ) of red snapper.
The actual RQ values (y-axis) are omitted from the figure to maintain confidentiality.
Source: SERO, Community ALS 2014.

The commercial engagement and reliance indices of the top commercial red snapper communities are included in **Figure 3.4.2**. The details of how these indices are generated are explained at the beginning of the Fishing Communities section. Two thresholds of one and one-half standard deviation above the mean were plotted to help determine a threshold for significance. The primary communities that demonstrate high levels of commercial fishing engagement include Mayport, Cape Coral, Saint Augustine, Key West, Sebastian, and Merritt Island, Florida and Morehead City and Beaufort North Carolina. The community with substantial commercial reliance is Mayport, Florida.

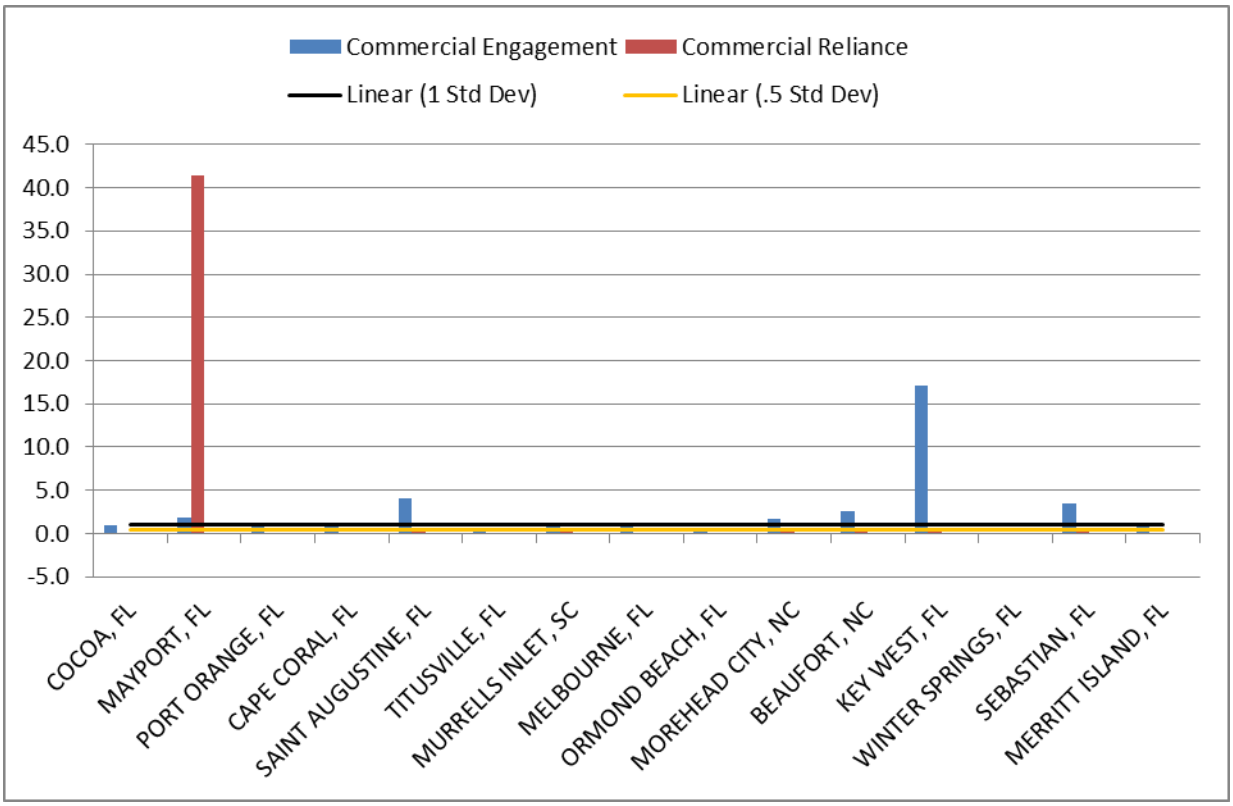


Figure 3.4.2. Commercial engagement and reliance for South Atlantic red snapper fishing communities. Source: SERO, Community Social Vulnerability Indicators Database 2014 (ACS 2010-2014).

Recreational Fishing Communities

Figure 3.4.3 identifies the top 20 recreational communities located in the South Atlantic that are the most engaged and reliant on recreational fishing, in general. All included communities demonstrate high levels of recreational engagement. Six communities (Key West, Florida; Marathon, Florida; Islamorada, Florida; Hatteras, North Carolina; Manteo, North Carolina; and Atlantic Beach, North Carolina) demonstrate high levels of recreational reliance.

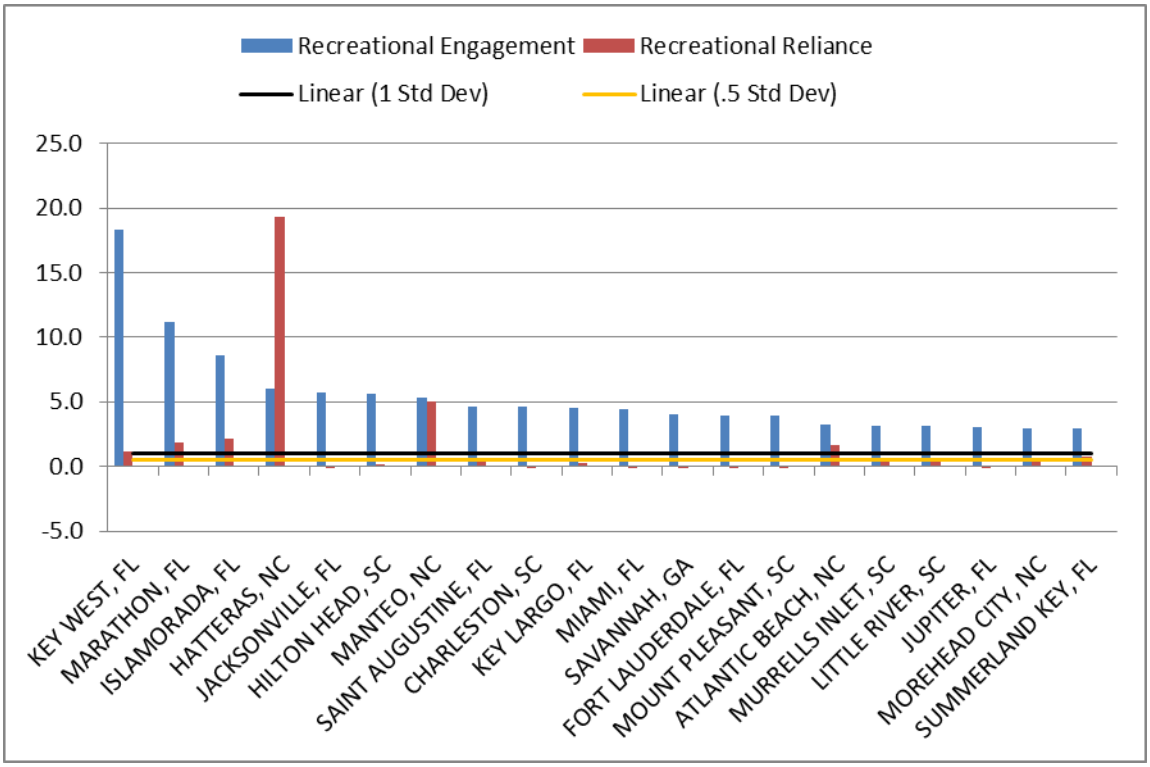


Figure 3.4.3. Top recreational fishing communities' engagement and reliance.
Source: SERO, Community Social Vulnerability Indicators Database 2014 (ACS 2010-2014).

3.3.2.3 Environmental Justice Considerations

Executive Order 12898 requires federal agencies conduct their programs, policies, and activities in a manner to ensure individuals or populations are not excluded from participation in, or denied the benefits of, or subjected to discrimination because of their race, color, or national origin. In addition, and specifically with respect to subsistence consumption of fish and wildlife, federal agencies are required to collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence. The main focus of Executive Order 12898 is to consider "the disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories…" This executive order is generally referred to as environmental justice (EJ).

Commercial and recreational fishermen and associated industries could be impacted by the proposed actions. However, information on the race and income status for groups at the different participation levels (individual fishermen and crew) is not available. Although information is available concerning communities overall status with regard to minorities and poverty (e.g., census data), such information is not available specific to fishermen and those involved in the industries and activities, themselves. To help assess whether any environmental justice concerns arise from the actions in this amendment, a suite of indices were created to examine the social vulnerability of coastal communities. These indices rely on data from the U.S. Census ACS 2010 through 2014 five-year estimates. The three indices are poverty, population composition, and personal disruptions. The variables included in each of these indices have been identified

through the literature as being important components that contribute to a community's vulnerability. Indicators such as increased poverty rates for different groups, more single female-headed households and households with children under the age of five, disruptions such as higher separation rates, higher crime rates, and unemployment all are signs of populations experiencing vulnerabilities. Again, for those communities that exceed the threshold it would be expected that they would exhibit vulnerabilities to sudden changes or social disruption that might accrue from regulatory change.

Figure 3.4.4 and **Figure 3.4.5** provide the social vulnerability of the top commercial and recreational communities. Several South Atlantic communities exceed the threshold of 0.5 standard deviation for at least one of the social vulnerability indices: Cocoa, Marathon, Miami, and St. Augustine, Florida; Savannah, Georgia; and Beaufort, Manteo, and Morehead City, North Carolina. The communities of Cocoa, Florida; Miami, Florida; and Savannah, Georgia exceed the threshold for all three social vulnerability indices. These communities have substantial vulnerabilities and may be susceptible to further effects from any regulatory changes depending upon the direction and extent of that change.

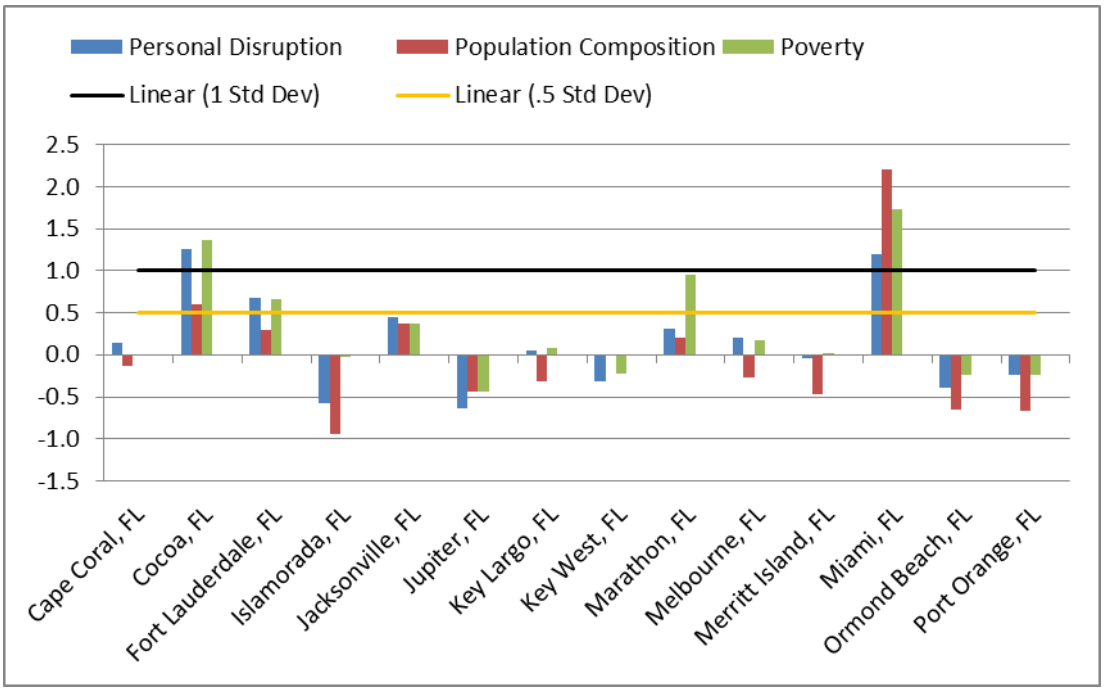


Figure 3.4.4. Social vulnerability indices for top commercial and recreational communities. Source: SERO, Community Social Vulnerability Indicators Database 2014 (ACS 2010-2014).

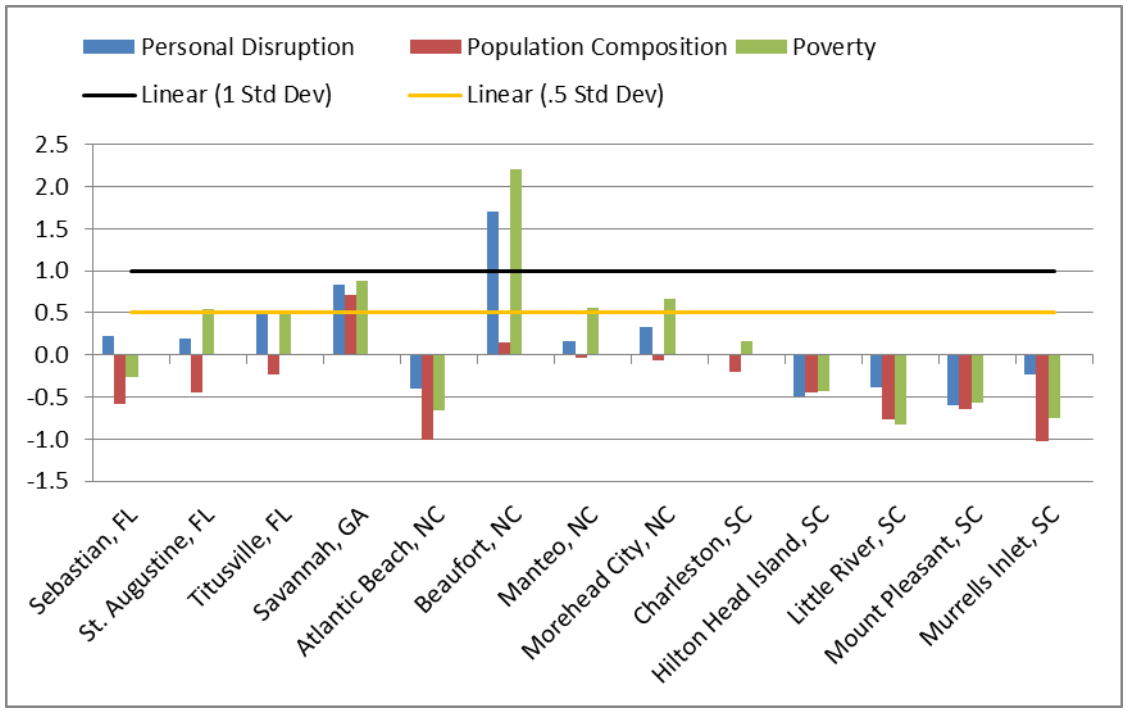


Figure 3.4.5. Social vulnerability indices for top commercial and recreational communities continued. Source: SERO, Community Social Vulnerability Indicators Database 2014 (ACS 2010-2014).

People in these communities may be affected by fishing regulations in two ways: participation and employment. Although these communities may have the greatest potential for EJ concerns, no data are available on the race and income status for those involved in the local fishing industry (employment), or for their dependence on red snapper specifically (participation). Although no EJ issues have been identified, the absence of potential EJ concerns cannot be assumed.

3.4 Administrative Environment

3.4.1 The Fishery Management Process and Applicable Laws

3.4.1.1 Federal Fishery Management

Federal fishery management is conducted under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. 1801 et seq.), originally enacted in 1976 as the Fishery Conservation and Management Act. The Magnuson-Stevens Act claims sovereign rights and exclusive fishery management authority over most fishery resources within the EEZ, an area extending 200 nm from the seaward boundary of each of the coastal states, and authority over U.S. anadromous species and continental shelf resources that occur beyond the U.S. EEZ.

Responsibility for federal fishery management decision-making is divided between the U.S. Secretary of Commerce (Secretary) and eight regional fishery management councils that

represent the expertise and interests of constituent states. Regional councils are responsible for preparing, monitoring, and revising management plans for fisheries needing management within their jurisdiction. The Secretary is responsible for collecting and providing the data necessary for the councils to prepare fishery management plans and for promulgating regulations to implement proposed plans and amendments after ensuring that management measures are consistent with the Magnuson-Stevens Act and with other applicable laws. In most cases, the Secretary has delegated this authority to NMFS.

The Council is responsible for conservation and management of fishery resources in federal waters of the U.S. South Atlantic. These waters extend from 3 to 200 mi offshore from the seaward boundary of North Carolina, South Carolina, Georgia, and east Florida to Key West. The Council has thirteen voting members: one from NMFS; one each from the state fishery agencies of North Carolina, South Carolina, Georgia, and Florida; and eight public members appointed by the Secretary. On the Council, there are two public members from each of the four South Atlantic States. Non-voting members include representatives of the U.S. Fish and Wildlife Service, U.S. Coast Guard, State Department, and Atlantic States Marine Fisheries Commission (ASMFC). The Council has adopted procedures whereby the non-voting members serving on the Council Committees have full voting rights at the Committee level but not at the full Council level. Council members serve three-year terms and are recommended by state governors and appointed by the Secretary from lists of nominees submitted by state governors. Appointed members may serve a maximum of three consecutive terms.

Public interests also are involved in the fishery management process through participation on Advisory Panels and through council meetings, which, with few exceptions for discussing personnel and legal matters, are open to the public. The Council uses its Scientific and Statistical Committee (SSC) to review the data and science being used in assessments and fishery management plans/amendments. In addition, the regulatory process is in accordance with the Administrative Procedure Act, in the form of "notice and comment" rulemaking.

3.4.1.2 State Fishery Management

The state governments of North Carolina, South Carolina, Georgia, and Florida have the authority to manage fisheries that occur in waters extending three nautical miles from their respective shorelines. North Carolina's marine fisheries are managed by the Marine Fisheries Division of the North Carolina Department of Environmental Quality. The Marine Resources Division of the South Carolina Department of Natural Resources regulates South Carolina's marine fisheries. Georgia's marine fisheries are managed by the Coastal Resources Division of the Department of Natural Resources. The Marine Fisheries Division of the Florida Fish and Wildlife Conservation Commission is responsible for managing Florida's marine fisheries. Each state fishery management agency has a designated seat on the Council. The purpose of state representation at the Council level is to ensure state participation in federal fishery management decision-making and to promote the development of compatible regulations in state and federal waters.

The South Atlantic States are also involved through the Atlantic States Marine Fisheries Commission (ASMFC) in management of marine fisheries. This commission was created to

coordinate state regulations and develop management plans for interstate fisheries. It has significant authority, through the Atlantic Striped Bass Conservation Act and the Atlantic Coastal Fisheries Cooperative Management Act, to compel adoption of consistent state regulations to conserve coastal species. The ASFMC is also represented at the Council level, but does not have voting authority at the Council level.

NMFS's State-Federal Fisheries Division is responsible for building cooperative partnerships to strengthen marine fisheries management and conservation at the state, inter-regional, and national levels. This division implements and oversees the distribution of grants for two national (Inter-jurisdictional Fisheries Act and Anadromous Fish Conservation Act) and two regional (Atlantic Coastal Fisheries Cooperative Management Act and Atlantic Striped Bass Conservation Act) programs. Additionally, it works with the ASMFC to develop and implement cooperative State-Federal fisheries regulations.

3.4.1.3 Enforcement

Both the NMFS Office for Law Enforcement (NOAA/OLE) and the United States Coast Guard (USCG) have the authority and the responsibility to enforce Council regulations. NOAA/OLE agents, who specialize in living marine resource violations, provide fisheries expertise and investigative support for the overall fisheries mission. The USCG is a multi-mission agency, which provides at sea patrol services for the fisheries mission.

Neither NOAA/OLE nor the USCG can provide a continuous law enforcement presence in all areas due to the limited resources of NOAA/OLE and the priority tasking of the USCG. To supplement at sea and dockside inspections of fishing vessels, NOAA entered into Cooperative Enforcement Agreements with all but one of the states in the Southeast Region (North Carolina), which granted authority to state officers to enforce the laws for which NOAA/OLE has jurisdiction. In recent years, the level of involvement by the states has increased through Joint Enforcement Agreements, whereby states conduct patrols that focus on federal priorities and, in some circumstances, prosecute resultant violators through the state when a state violation has occurred.

The NOAA Office of General Counsel Penalty Policy and Penalty Schedule is available online[16].

[16] http://www.gc.noaa.gov/enforce-office3.html

Chapter 4. Environmental Effects and Comparison of Alternatives

4.1 Allow Limited Harvest and Possession of Red Snapper in 2017

4.1.1 Biological Effects

Under the proposed action, the annual catch limits (ACL) for red snapper (total, commercial, and recreational) would be temporarily modified to allow harvest in 2017 (see alternatives in text box). Based on the information available (specifically the South Atlantic Fishery Management Council's (Council) Scientific and Statistical Committee (SSC) determinations and fishery independent index trends), allowing limited harvest of red snapper in 2017 is not expected to result in overfishing, nor prevent continued stock rebuilding (see **Section 1.8**, **Appendices F** and **H**).

Alternatives*

Alternative 1 (No Action): The 2017 commercial and recreational annual catch limits for red snapper are zero. Process in place to allow limited harvest based on ABC.

Alternative 2. Temporarily allow limited harvest of red snapper in 2017. Total ACL = 23,623 fish. Commercial ACL = 69,360 lbs (whole weight). Recreational ACL = 16,480 fish.

Alternative 3. Temporarily allow limited harvest of red snapper in 2017. Total ACL = 44,411 fish. Commercial ACL = 130,396 lbs (whole weight). Recreational ACL = 30,982 fish.

Preferred Alternative 4. Temporarily allow limited harvest of red snapper in 2017. Total ACL = 42,510 fish. Commercial ACL = 124,815 lbs (whole weight). Recreational ACL = 29,656 fish.

Alternative 5. Temporarily allow limited harvest of red snapper in 2017. Total ACL = 79,919 fish. Commercial ACL = 234,652 lbs (whole weight). Recreational ACL = 55,753 fish.

* Refer to Ch. 2 for detailed language of alternatives

Expected Effects to the Red Snapper Stock and Bycatch of Co-Occurring Species

The following documents outline the biological effects of the current red snapper management regime and provide the background for the biological effects of **Alternative 1 (No Action)**:

- Emergency rule to establish a limited 2012 fishing season (NMFS 2012a, b)
- Amendment 28 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (Amendment 28) (SAFMC 2013)

The reader is directed to these documents for details on the effects of the current management of red snapper. Amendment 28 is available at www.safmc.net, and hereby incorporated by reference. Additionally, the Bycatch Practicability Analysis (BPA; **Appendix C**) evaluates the practicability of taking additional action to minimize bycatch and bycatch mortality using the ten factors provided at 50 CFR section 600.350(d)(3)(i).

Alternative 1 (No Action) would use the process in place through Amendment 28 and the commercial and recreational ACLs for red snapper would be zero in 2017 (**Table 4.1.2**). **Alternatives 2** and **3** use the average landings from 2012 to 2014 in establishing the ACLs (**Table 2.1.1**). **Alternative 2** is based on the average landings from 2012 to 2014. **Alternative 3** is based on the average landings from 2012 to 2014 multiplied by an adjustment factor based on the increase in the average catch rate of red snapper observed in the scientific survey in 2015 and 2016 compared to average catch rate from 2012, 2013, and 2014 (1.88 times). **Preferred Alternative 4** and **Alternative 5** use maximum recorded landings from 2012 to 2014 in establishing an ACL. **Preferred Alternative 4** is set equal to the maximum landings from 2012 to 2014, which was in 2014.

Allowing no harvest under **Alternative 1 (No Action)** is expected to provide the greatest biological benefit to the stock among the alternatives considered as the alternative would continue the harvest prohibition in 2017. However, it is expected that the current level of dead discards would continue to increase as the population grows. In numbers of fish, estimates of discards and dead discards of red snapper in 2017 were 1,018,929 and 406,195, respectively (SEFSC 2017).

Allowing red snapper harvest in 2017 (**Alternatives 2-5**) could both increase and decrease occurrences of bycatch of red snapper. Bycatch would decrease when fishermen retain red snapper during the open season; if the season was closed (**Alternative 1, No Action**), these fish would be returned to the water and a portion would not survive. Bycatch could increase due to increased targeting and high-grading behavior.

Similar biological effects would be expected between **Alternative 1 (No Action)** and **Alternatives 2-5** if the total removals are similar. In other words, red snapper previously killed through the effects of removal from the ocean and returned to the water would now die through retention. Under this scenario, the net loss to red snapper between **Alternative 1 (No Action)** and **Alternatives 2-5** would be similar. However, the adverse biological effects to the stock under **Alternatives 2-5** would likely be greater than those under **Alternative 1 (No Action)** as limited harvest would be allowed and some level of red snapper discards would continue.

As changes to bycatch from allowing harvest in 2017 (**Alternatives 2-5**) would largely depend on fishermen's behavior, it is not possible to determine the net change to the bycatch between a closed season (**Alternative 1, No Action**) and an open one (**Alternatives 2-5**). In addition, there could be small difference in the level of dead discards in the fall versus winter due to factors such as water temperature and availability of predators, but the change in dead discards cannot be quantified. However, although fishery management actions can adversely impact non-target species, the proposed temporary measure is not anticipated to substantially increase bycatch of red snapper and co-occurring species. The red snapper open seasons in 2012, 2013, and 2014 were short in duration (total days open since 2010: 17 recreational and 122 commercial).

Because **Alternatives 2** and **4** are based on previous landings estimates, they are not expected to result in impacts greater than those resulting from the years where limited harvest was previous allowed (2012-2014). However, increasing the red snapper ACL beyond past landings levels could lead to increased impacts (**Alternatives 3** and **5**). **Alternatives 3** and **5** scale up the harvest allowed based on population growth and could scale up the risk of continued overfishing. **Preferred Alternative 4** relies on observed landings levels in 2014 and does not assume an increase in red snapper abundance; thereby, reducing the chances that allowing that level of harvest would lead to adverse impacts. The season length associated with **Preferred Alternative 4** represents a lower range of the estimated number of days that would be expected to meet the recreational and commercial ACLs (below).

The overfishing determination in the SEDAR 41 (2017) assessment came from 2012-2014 when a small amount of red snapper harvest was allowed to occur. However, discards during this period of time were very high due to fishermen targeting co-occurring species, which likely contributed to the overfishing determination. Since recently discovered and unforeseen red snapper data from the long-term fishery independent index of abundance collected by the Southeast Reef Fish Survey (SERFS) program suggests the South Atlantic red snapper population has increased substantially since 2014; the Council's Scientific and Statistical Committee indicated in their April 2017 report that the trends in SERFS relative abundance supported a population increase; and red snapper relative abundance from SERFS is currently the highest observed in the entire time series (1990-2016), allowing a limited harvest of red snapper in 2017 at the highest landings observed during the limited openings in 2012-2014 (**Preferred Alternative 4**) is neither expected to result in overfishing, nor prevent continued stock rebuilding.

As stated above, the preferred alternative for the temporary measure has the potential to reduce bycatch of red snapper during a limited opening of the recreational and commercial sectors as some bycatch is turned into retained catch. In addition, the Council, NMFS, and the Southeast Fisheries Science Center have implemented and plan to implement numerous management measures and reporting requirements that have improved, or are likely to improve monitoring efforts of discards and discard mortality.

Due to the small trip limit and no size limit, commercial harvest of red snapper is expected to be primarily a "bycatch allowance" while targeting other snapper grouper species. Potential high-grading should be minimal in this sector. Targeting of red snapper by the recreational sector during the limited season could lead to an increase in bycatch of other snapper grouper species and result in high-grading of caught red snapper. However, as stated in **Chapter 2** and **Appendix C**, the allowed harvest of red snapper in 2017 would likely be relatively limited in scope, and the proposed temporary measure is not anticipated to substantially increase bycatch of red snapper and co-occurring species.

Expected Closure Dates of the Commercial and Recreational Sectors Under Each Proposed Alternative

Under each of the proposed alternatives (**Alternative 1 (No Action)-Alternative 5**), assuming commercial and recreational fishing behavior in 2017 is similar to that in 2012-2014, it is expected that the recreational ACL would be met during the prescribed season and the commercial ACL would not be met in 2017 **(Tables 4.1.1** and **4.1.2)**.

Table 4.1.1 shows the predicted landings and closure dates in 2017, assuming the recreational sector opens to harvest on October 6, 2017. Under the "Predicted Landings" scenario, the recreational sector would be open for as short as 7 days (**Alternative 2**) and as long as 23 days (**Alternative 5**); and would be open for 12 days under **Preferred Alternative 4 (Table 4.1.1)**. Under the "High Landings" scenario, the recreational sector would be open for as short as three days (**Alternative 2**) and as long as 12 days (**Alternative 5**); and would be open for six days under **Preferred Alternative 4 (Table 4.1.1)**.

Table 4.1.1. Predicted closure dates (number of open days) for the recreational sector under the different proposed ACL alternatives for 2017. These closure dates assume the recreational sector starts on Friday, October 6, 2017. The "Predicted Landings" are a prediction of future landings, and the "High Landings" are the prediction of future landings with a 1.88 adjustment factor following the assumption of a larger stock size.

	Alternative 1 No Action	Alternative 2	Alternative 3	**Preferred Alternative 4**	Alternative 5
ACL	0	16,480 Fish	30,982 Fish	**29,656 Fish**	55,753 Fish
Predicted Landings	No season	20-Oct (7)	4-Nov (13)	**30-Oct (12)**	25-Nov (23)
High Landings	No season	9-Oct (3)	20-Oct (7)	**16-Oct (6)**	30-Oct (12)

The South Atlantic red snapper commercial sector was also closed in 2010, 2011, 2015, and 2016, and was only open for short periods of time in 2012 (22 days, harvesting 6,872 pounds gutted weight [lbs gw]), 2013 (43 days, 27,309 lbs gw), and 2014 (57 days, 54,887 lbs gw)[17].

Table 4.1.2 shows the predicted landings and closure dates in 2017, assuming the commercial sector opens to harvest on October 9, 2017. Under all the alternatives and "Landings" scenarios, the commercial sector would not close **(Table 4.1.2)**. Therefore, biological effects are not expected to vary among **Alternatives 2**, **3**, **Preferred 4,** and **5** because the commercial ACL is not expected to be met under any of these alternatives.

[17] (SERO web-site accessed on July 20, 2017: http://sero.nmfs.noaa.gov/sustainable_fisheries/acl_monitoring/commercial_sa/historical/index.html).

Table 4.1.2. Predicted closure dates (number of open days) for the commercial sector under the different proposed ACL alternatives for 2017. These closure dates assume the commercial sector starts on Monday, October 9, 2017. The "Predicted Landings" are a prediction of future landings, and the "High Landings" are the prediction of future landings with a 34% increase in landings following the assumption that more fishermen will meet the trip limit of 75 lbs gw due to an increased stock size.

	Alternative 1	Alternative 2	Alternative 3	**Preferred Alternative 4**	Alternative 5
ACL	0	69,360 lbs ww	130,396 lbs ww	124,815 lbs ww	234,652 lbs ww
Predicted Landings	No season	No Closure	No Closure	No Closure	No Closure
High Landings	No season	No Closure	No Closure	No Closure	No Closure

Expected Effects to Protected Species

In the 2016 biological opinion on the snapper grouper fishery, NMFS analyzed the effects of commercial and recreational hook-and line gear in the snapper grouper fishery on sea turtles, smalltooth sawfish, and Nassau grouper assuming 2012-2015 average hook-and-line effort levels are representative of future effort levels in the snapper grouper fishery (NMFS 2016). Therefore, the recreational and commercial red snapper component of the snapper grouper fishery was open for short periods of time and effort in the commercial component constrained by the limited ACL during three of the four years (i.e., 2012-2014) that were used to project future average effort levels. The status quo alternative by continuing to have no season for red snapper would potentially reduce overall future effort in the snapper grouper fishery in 2017 from 2012-2015 average hook-and-line effort levels and thus potentially decrease bycatch in the fishery in 2017 by some small amount. Overall snapper-grouper fishing effort would increase in the commercial and recreational sectors slightly in response to the limited opening of red snapper under **Alternatives 2-5**, and therefore, increase the potential for bycatch, relative to the status quo. However, as stated in **Chapter 2** and analyzed in detail in this chapter, the opening would be of short duration in the recreational sector and limited to an incidental catch limit (75 lbs) in the commercial sector. Consequently, potential increases in overall fishing effects would be very small, likely limited to the recreational component, and, given listed species low capture rates in the snapper-grouper fishery, potential increases in incidental captures of listed species from anticipated levels specified in the 2016 biological opinion would be very unlikely.

4.1.2 Economic Effects

As described in **Section 1.8**, it is expected that the red snapper stock would continue to rebuild under the action alternatives despite allowing limited harvest of red snapper. Because no fishing would be allowed to occur in 2017, **Alternative 1 (No Action)** would result in foregone short-term economic benefits to the commercial and recreational sectors.

The expected changes in commercial ex-vessel revenue and recreational consumer surplus (CS) relative to the status quo (**Action 1 (No Action)**) under **Alternative 2**, **Alternative 3**, **Preferred Alternative 4**, and **Alternative 5** are provided in **Table 4.1.2.1**. Where applicable, these values are presented as a range, using two sets of projected landings. The lower bound is based on predicted landings under the current stock size and the upper bound is based on higher predicted landings that are adjusted for an increased stock size (see **Appendix H**). Here, the status quo for 2017 is that there would be no federal red snapper season for either sector, and thus, no federal landings. Although some small level of state landings have occurred in recent years during the federal closures, it is not expected that the current action would affect state landings and so they are excluded from this analysis.

Under **Alternative 2**, **Alternative 3**, **Preferred Alternative 4**, and **Alternative 5**, it is estimated that ex-vessel revenue would increase, relative to the status quo, by a range of approximately $177,000 to $236,000 (2016 dollars; **Table 4.1.2.1**).[18] Under all of these alternatives the season would be open for 87 days from October 6, 2017, through the end of 2017. Therefore, all of these alternatives would be expected to have equivalent economic effects on the commercial sector. With regard to economic effects on the recreational sector, it is estimated that recreational CS and season length would scale up proportionally to the ACL that is implemented. Ranked in order of least to most economically beneficial to the recreational sector, the alternatives are **Alternative 1 (No Action)**, **Alternative 2**, **Preferred Alternative 4**, **Alternative 3**, and **Alternative 5**.[19]

[18] Only 2012-2014 (the years when commercial harvest of red snapper in federal waters of the South Atlantic was open) were used for average price calculations. This is to minimize potential bias from misreported landings or variations in the size and quality of state- versus federally-caught fish during fully-closed years.

[19] The estimates of CS are based on a willingness to pay of $81 for a second fish harvested on a trip (Carter and Liese 2012; 2016 dollars) (**Section 3.3.2**). An estimate for the first red snapper harvested on an angler trip is not available. Given the current one fish per person bag limit and the assumption of diminishing marginal utility per fish harvested, the CS estimate provided may potentially underestimate the true value of allowing for red snapper harvest in 2017.

Table 4.1.2.1. Estimated change in commercial ex-vessel revenue, recreational consumer surplus (CS), and season length relative to the status quo in 2017.

	Commercial ex-vessel revenue (2016 dollars)	Commercial season length (days)		Recreational CS (2016 dollars)	Recreational season length (days)
Alternative 1 (No Action)	0	0		0	0
Alternative 2	$176,940 to $236,279	87		$1,334,880	3 to 7
Alternative 3	$176,940 to $236,279	87		$2,509,542	7 to 13
Preferred Alternative 4	**$176,940 to $236,279**	**87**		**$2,402,136**	**6 to 12**
Alternative 5	$176,940 to $236,279	87		$4,515,993	12 to 23

Source: SERO LAPP/DM (**Appendix G**) for landings and season length projections; Willingness to pay per red snapper from Carter and Liese (2012) (see **Section 3.3.2**); Ex-vessel average annual price (2012-2014 only) of $4.59 (2016 dollars) whole weight from the SERO ACL dataset (May 2017).
*The recreational red snapper season would open on October 6, 2017, for Fridays, Saturdays, and Sundays only, until which time the ACL is projected to be met.

By allowing for recreational red snapper harvest in 2017, there is the potential that angler demand for for-hire (charter and headboat) trips would increase as well, resulting in increased booking rates and for-hire business net operating revenue (NOR). Due to the complex nature of angler behavior and the for-hire industry, it is not possible to quantify these potential economic effects with available data.[20] As such, no estimates of the change in for-hire NOR are provided, although they may exist. The estimates of NOR per charter and headboat trip in the South Atlantic are provided in **Section 3.3.2**. It is expected that as the ACL increases, so would the potential for increases in for-hire NOR. This is because a larger ACL would result in a longer red snapper fishing season, affording for-hire businesses greater opportunity to market and sell their services.

As discussed in **Section 3.3.1** and **Section 3.3.2**, commercial and recreational fishing for red snapper spurs business activity (economic impacts) in the region in which it occurs. This action may be reasonably expected to increase such business activity relative to the status quo, by increasing recreational and commercial expenditures on goods and services necessary for fishing and by increasing the supply of red snapper into the seafood value chain. Although retail prices for red snapper would likely be tempered by substitute finfish species and snapper imports, fresh locally-caught red snapper may fetch a price premium in seafood markets and restaurants, resulting in an increase in producer surplus. In addition, because seafood consumers may have strong preferences for locally-caught red snapper over other seafood options, it could result in an increase in consumer surplus as well. These potential economic benefits cannot be quantified with available data.

In addition to the short-term economic effects described above, medium to long-term indirect negative economic effects could ensue from this action as a result of its effects on the red

[20] Anglers have heterogeneous preferences and may target and/or harvest a diverse mix of snapper grouper and other species on a trip. The absence of the opportunity to fish for any single species may or may not affect their overall desire to take and pay for trips.

snapper stock, future management decisions, and future catch rates. If future catch limits and/or catch rates are reduced as a result of a declining red snapper stock, it could negatively affect profits for commercial and for-hire business, as well as CS for recreational anglers. It is not known if any of the alternatives would be likely to jeopardize the sustainability of the stock but indirect negative economic effects would become more likely with each incremental increase in the ACL. Apart from **Alternative 1 (No Action)**, **Alternative 2** would be the least likely of the alternatives considered to result in indirect negative economic effects, because it has the most biologically conservative ACL, followed by **Preferred Alternative 4**, **Alternative 3** and **Alternative 5**.

4.1.3 Social Effects

The communities with the largest levels of red snapper landings, in addition to communities with highest engagement and reliance on commercial and recreational fishing are described in **Section 3.4**. Red snapper is an extremely popular species, especially for participants in the recreational sector. The absence of a fishing season for red snapper in recent years has been highly controversial with negative effects on recreational anglers, for-hire businesses and commercial vessels, especially when compared to the benefits to fishermen during the allowed seasons in 2013 and 2014. The social effects of the proposed alternatives are expected to be associated with restricted access to the red snapper resource for several years, combined with distrust in science and management due to inconsistency in what fishermen see on the water versus the scientific models. Additionally, there would be positive social effects associated with transforming discards into landings if there is a fishing season, along with positive social effects of improved data collection during a fishing season.

Alternative 1 (No Action) would keep the current system that determines if red snapper harvest would be allowed each year, based on removals from the previous year. In the most recent two years (2015 and 2016), there has been no red snapper season, even for a few days. The rebuilding plan for red snapper implemented through Amendment 17A (SAFMC 2010) is considered to be working successfully, and this should lead to expected benefits to the fishermen. However, the outcome of the successful rebuilding plan is that interactions with red snapper have become more difficult to avoid, which leads to the discard rate that calculates to high levels of removals each year. Under current conditions, it is likely that there would be no open fishing seasons for red snapper in the foreseeable future under **Alternative 1 (No Action)**.

Input from fishermen indicates that they are increasingly frustrated with the perceived waste of the resource due to the continued discarding of red snapper. Additionally, under **Alternative 1 (No action)**, there is distrust in the science used in stock assessments because harvest is prohibited, but fishermen report that there are plenty of red snapper. The current system sends a conflicting message to fishermen in that regulations are intended to protect stocks and rebuild overfished stocks, but there would be no benefit to the fishermen because current regulations cannot allow any harvest of red snapper.

By specifying an ACL for red snapper in **Alternatives 2-5**, there should be positive social effects as it would allow fishermen to harvest this popular species, in addition to revenue generated for charter/headboat and commercial businesses when compared to **Alternative 1 (No Action)**. It is assumed that with available ACL, there would be increased fishing opportunities for private, for-hire, and commercial fishermen, and that there would be fewer discards as these fish are landed. However, because this is a temporary measure, these effects are short term. Therefore, with the expected ACLs under the proposed alternatives, the most social benefits would be expected under **Alternative 5**, followed by **Alternative 3**, **Preferred Alternative 4**, **Alternative 2, and Alternative 1 (No Action)**.

4.1.4 Administrative Effects

Under **Alternative 1 (No Action)**, administrative burden would continue with the enforcement of the current prohibition of red snapper and calculation of the ACL each year. **Alternatives 2, 3, Preferred 4,** and **5** would include the administrative burden of rule-making, data monitoring, outreach, and enforcement of the new ACLs. Therefore, administrative effects would be least under **Alternative 1 (No Action)** when compared with **Alternatives 2, 3, Preferred 4,** and **5**.

Chapter 5. Cumulative Effects

5.1 Affected Area

The immediate impact area would be the federal 200-mile limit of the Atlantic off the coasts of North Carolina, South Carolina, Georgia, and east Florida to Key West, which is also the South Atlantic Fishery Management Council's (Council) area of jurisdiction. In light of the available information, the extent of the boundaries would depend upon the degree of fish immigration/emigration and larval transport, whichever has the greatest geographical range. The ranges of affected species are described in **Section 3.2**. For the action found in the emergency rule, the cumulative effects analysis (CEA) includes an analysis of data from 2012 through 2017.

5.2 Past, Present, and Reasonably Foreseeable Actions Impacting the Affected Area

Fishery managers implemented the first significant regulations pertaining to red snapper in 1983 through the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (Snapper Grouper FMP; SAFMC 1983). The regulations included a 12-inch total length minimum size limit for red snapper. Listed below are other past, present, and reasonably foreseeable actions occurring in the South Atlantic region. These actions, when added to the proposed management measures, may result in cumulative effects on the biophysical and socio-economic environment. The complete history of management of the snapper grouper fishery can be found in **Appendix B**.

Past Actions

Amendment 28 to the Snapper Grouper FMP set the commercial and recreational red snapper annual catch limits (ACL) at zero and established a process for setting fishing seasons to allow limited harvest of red snapper in the South Atlantic. The regulations were effective on August 23, 2013.

The South Atlantic Headboat Reporting Amendment was implemented on January 27, 2014, and requires that all federally-permitted headboats on the South Atlantic report their landings information electronically, and on a weekly basis to improve the timeliness and accuracy of harvest data.

The Generic Dealer Reporting Amendment, which became effective on August 7, 2014, established one dealer permit for the Gulf of Mexico and South Atlantic regions and increased the reporting frequency requirements for species managed by the Council and Gulf of Mexico Fishery Management Council. This amendment is expected to improve fisheries data collection, through more timely and accurate dealer reporting, and streamline the dealer permit system.

Amendment 29 to the Snapper Grouper FMP, which became effective on July 1, 2015, updated the Council's acceptable biological catch (ABC) control rule to incorporate methodology for determining the ABC of "Only Reliable Catch Stocks"; (2) adjusted ABCs for the affected unassessed species; (3) specified annual catch limits (ACLs) for 7 species based on the updated ABCs; and (4) modified management measures for gray triggerfish in federal waters of the South Atlantic region.

The Generic Accountability Measures (AM) and Dolphin Allocation Amendment, in part, modified AMs for snapper grouper species (including mutton snapper) to make them more consistent with AMs already implemented for other species and other fishery management plans. The regulations became effective on February 22, 2016.

The final rule for Amendment 36 to the Snapper Grouper FMP established new Spawning Special Management Zones to protect spawning areas for snapper grouper species. The regulations were effective on July 31, 2017.

Present Actions

The final rule for Amendment 37 to the Snapper Grouper FMP modified the hogfish fishery management unit, specify fishing levels for the two South Atlantic hogfish stocks, established a rebuilding plan for the Florida Keys/East Florida stock, and established/revised management measures for both hogfish stocks in the South Atlantic Region, such as size limits, recreational bag limits, and commercial trip limits. Regulations became effective August 24, 2017.

Amendment 41 to the Snapper Grouper FMP would update the catch level recommendations, adjust the minimum stock size threshold, designate spawning months, and revise management measures for mutton snapper in the South Atlantic Region.

Reasonably Foreseeable Future Actions

The Vision Blueprint Recreational Amendment (Amendment 26) to the Snapper Grouper FMP considers actions to evaluate and modify the composition of the recreational aggregate snapper bag limit, recreational aggregate grouper bag limit, and the recreational aggregate for species without a bag limit. The amendment would also consider modifying the current recreational prohibition on harvest and possession of shallow water groupers, remove the recreational minimum size limit for deepwater species, modify the recreational minimum size limit for black sea bass, and modify the recreational minimums size limit for gray triggerfish off east Florida.

The Vision Blueprint Commercial Amendment (Amendment 27) to the Snapper Grouper FMP proposes revisions to commercial management measures such as split seasons and trip limits and proposes complementary changes to those proposed for the recreational sector in Vision Blueprint Recreational Amendment (Amendment 26).

A Joint Commercial Logbook Reporting Amendment would require electronic reporting of logbook information by federally-permitted vessels.

The Joint Charter Boat Reporting Amendment would require charter vessels to regularly report their landings information electronically. Including charter boats in the recreational harvest reporting system would further improve the agency's ability to monitor recreational catch rates in-season. The amendment has been submitted for review by the Secretary of Commerce.

Amendment 43 to the Snapper Grouper FMP would remove the process implemented by Amendment 28 to the Snapper Grouper FMP and specify ACLs for red snapper in 2018.

Amendment 46 to the Snapper Grouper FMP would consider acceptable biological catch levels and adaptive management measures (descending devices, etc.) to reduce discards in the red snapper component of the snapper grouper fishery.

Expected Impacts from Past, Present, and Future Actions

The temporary measures through emergency action for the red snapper segment of the snapper grouper fishery are not expected to result in significant cumulative adverse biological or socio-economic effects (see **Chapter 4**). The proposed action would allow limited harvest of red snapper in the South Atlantic in 2017, and is expected to reduce, to the extent practicable, existing adverse socio-economic impacts to fishermen and fishing communities that utilize the red snapper portion of the snapper grouper fishery, without overfishing, and while continuing to rebuild the stock as per the Magnuson-Stevens Fishery Conservation and Management Act.

The action (See **Chapter 4** for details) would allow limited harvest of red snapper in the South Atlantic in 2017. Positive socio-economic effects are expected. Fishery dependent and independent information supports evidence of an increasing red snapper population in the South Atlantic in recent years. Therefore, the limited harvest by the commercial and recreational sectors is expected to prevent overfishing from occurring and continuing to rebuild the stock (see Section 1.8).

The red snapper component of the snapper grouper fishery was been closed from 2010 to 2017 except for mini-seasons in 2012, 2013, and 2014. When combined with the impacts of past, present, and future actions affecting the snapper grouper fishery, specifically red snapper, minor cumulative impacts are likely to accrue, such as monitoring ACLs for the commercial and recreational sectors, and socio-economic benefits associated with improved management strategies. Amendments considered by the Council that are intended to increase the frequency of reporting by dealers and fishermen are likely to benefit the human environment through more timely biological protections and unnecessary delay in data availability, leading to more stable market conditions. Furthermore, Amendment 43 to the Snapper Grouper FMP would specify long-term ACLs and consider adaptive management measures to reduce the magnitude of discards in the red snapper component of the snapper grouper fishery. Therefore, the likely cumulative socio-economic effects would be improved commercial and recreational fishing opportunities, and benefits to associated businesses and communities.

5.3 Consideration of Climate Change and Other Non-Fishery Related Issues

Climate Change

Global climate changes could have significant effects on South Atlantic fisheries, though the extent of these effects on the snapper grouper fishery is not known at this time. The Environmental Protection Agency's climate change webpage (https://www.epa.gov/climate-indicators/marine-species-distribution), and NOAA's Office of Science and Technology climate webpage (https://www.st.nmfs.noaa.gov/ecosystems/climate/index), provides background information on climate change, including indicators which measure or anticipate effects on oceans, weather and climate, ecosystems, health and society, and greenhouse gases. The United Nations Intergovernmental Panel on Climate Change's Fifth Assessment Report also provides a compilation of scientific information on climate change (https://www.ipcc.ch/report/ar5/, November 2, 2014). Those findings are summarized below.

Ocean acidification, or a decrease in surface ocean pH due to absorption of anthropogenic carbon dioxide emissions, affects the chemistry and temperature of the water. Increased thermal stratification alters ocean circulation patterns, and causes a loss of sea ice, sea level rise, increased wave height and frequency, reduced upwelling, and changes in precipitation and wind patterns. Changes in coastal and marine ecosystems can influence organism metabolism and alter ecological processes such as productivity, species interactions, migration, range and distribution, larval and juvenile survival, prey availability, and susceptibility to predators. The "center of biomass," a geographical representation of each species' weight distribution, is being used to identify the shifting of fish populations. Warming sea temperature trends in the southeast have been documented, and animals must migrate to cooler waters, if possible, if water temperatures exceed survivable ranges (Needham et al. 2012). Harvesting and habitat changes also cause geographic population shifts. Changes in water temperatures may also affect the distribution of native and exotic species, allowing invasive species to establish communities in areas they may not have been able to survive previously. The combination of warmer water and expansion of salt marshes inland with sea-level rise may increase productivity of estuarine-dependent species in the short term. However, in the long term, this increased productivity may be temporary because of loss of fishery habitats due to wetland loss (Kennedy et al. 2002). The numerous changes to the marine ecosystem may cause an increased risk of disease in marina biota. An increase in the occurrence and intensity of toxic algae blooms will negatively influence the productivity of keystone animals, such as corals, and critical coastal ecosystems such as wetlands, estuaries, and coral reefs (Kennedy et al. 2002; IPCC 2014).

Climate change may impact snapper grouper species in the future, but the level of impacts cannot be quantified at this time, nor is the time frame known in which these impacts will occur. In the near term, it is unlikely that the management measures contained in the emergency rule would compound or exacerbate the ongoing effects of climate change on snapper grouper species.

Weather Variables

Hurricane season is from June 1 to November 30, and accounts for 97% of all tropical activity affecting the Atlantic basin. These storms, although unpredictable in their annual occurrence, can devastate areas when they occur. Although these effects may be temporary, those fishing-related businesses whose profitability is marginal may go out of business if a hurricane strikes.

Deepwater-Horizon Oil Spill

On April 20, 2010, an explosion occurred on the Deepwater Horizon MC252 oil rig, resulting in the release of an estimated 4.9 million barrels of oil into the Gulf of Mexico (Gulf). In addition, 1.84 million gallons of Corexit 9500A dispersant were applied as part of the effort to constrain the spill. The cumulative effects from the oil spill and response may not be known for several years. The oil spill affected more than one-third of the Gulf area from western Louisiana east to the panhandle of Florida and south to the Campeche Bank in Mexico. The impacts of the Deepwater Horizon MC252 oil spill on the physical environment are expected to be significant and may be long-term. Oil is dispersed on the surface, and because of the heavy use of dispersants, oil is also documented as being suspended within the water column, some even deeper than the location of the broken well head. Floating and suspended oil washed onto shore in several areas of the Gulf, as well as non-floating tar balls. Whereas suspended and floating oil degrades over time, tar balls are more persistent in the environment and can be transported hundreds of miles. Oil on the surface of the water could restrict the normal process of atmospheric oxygen mixing into and replenishing oxygen concentrations in the water column. In addition, microbes in the water that break down oil and dispersant also consume oxygen; this could lead to further oxygen depletion. Zooplankton that feed on algae could also be negatively impacted, thus allowing more of the hypoxia-fueling algae to grow. The highest concern is that the oil spill may have impacted spawning success of species that spawn in the summer months, either by reducing spawning activity or by reducing survival of the eggs and larvae. Effects on the physical environment, such as low oxygen, could lead to impacts on the ability of larvae and post-larvae to survive, even if they never encounter oil. In addition, effects of oil exposure may create sub-lethal effects on the eggs, larva, and early life stages. The stressors could potentially be additive, and each stressor may increase the susceptibility to the harmful effects of the other. The oil from the spill site was not detected in the South Atlantic region, and does not likely pose a threat to the South Atlantic species addressed in this amendment. However, the effects of the oil spill on fish species would be taken into consideration in future Southeast Data Assessment and Review assessments. Indirect and inter-related effects on the biological and ecological environment of the fisheries in concert with the Deepwater Horizon MC252 oil spill are not well understood. Changes in the population size structure could result from shifting fishing effort to specific geographic segments of populations, combined with any anthropogenically induced natural mortality that may occur from the impacts of the oil spill. The impacts on the food web from phytoplankton, to zooplankton, to mollusks, to top predators may be significant in the future.

5.4 Overall Impacts Expected from Past, Present, and Future Actions

The proposed management actions are summarized in **Chapter 2** of this document. Detailed discussions of the magnitude and significance of the impacts of the preferred alternative on the human environment appear in **Chapter 4** of this document. None of the impacts of the actions in this amendment, in combination with past, present, and future actions have been determined to be significant. Although several other management actions, in addition to this amendment, are expected to affect snapper grouper, including red snapper, any additive effects, beneficial and adverse, are not expected to result in a significant level of cumulative impacts.

The proposed actions would not adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places as these are not in the South Atlantic exclusive economic zone (EEZ). This action is not likely to result in direct, indirect, or cumulative effects to unique areas, such as significant scientific, cultural, or historical resources, park land, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas as the proposed action is not expected to substantially increase fishing effort or the spatial and/or temporal distribution of current fishing effort within the South Atlantic region. The U.S. Monitor, Gray's Reef, and Florida Keys National Marine Sanctuaries are within the boundaries of the South Atlantic EEZ. The proposed action is not likely to cause loss or destruction of these national marine sanctuaries because the actions are not expected to result in appreciable changes to current fishing practices. Additionally, the proposed action is not likely to change the way in which the snapper grouper fishery is prosecuted; therefore, the actions are not expected to result in adverse impacts on health or human safety beyond the status quo.

5.5 Monitoring and Mitigation

Fishery-independent and fishery-dependent data comprise a significant portion of information used in stock assessments. Fishery-independent data for red snapper are being collected through the Southeast Fishery Information Survey and the Marine Resources Monitoring Assessment and Prediction Program. The prohibition on harvest and possession of red snapper beginning in early 2010 reduced the collection of fishery-dependent data. The lack of this information has hindered the ability to assess the stock status of the red snapper population and the progress towards rebuilding to target levels. The retention of red snapper through this temporary measure through emergency action would create an opportunity to collect important life history information that fishery scientists could use in a future SEDAR stock assessment for red snapper. The effects of the proposed action are, and would continue to be, monitored through collection of red snapper landings data by all the four states in the South Atlantic Region (Florida, Georgia, South Carolina, and North Carolina). The National Marine Fisheries Service would continue to monitor and collect information on red snapper for stock assessments and stock assessment updates, life history studies, economic and social analyses, and other scientific observations. The proposed action relates to the harvest of indigenous species in the Atlantic, and the activities/regulations being altered does not introduce non-indigenous species, and is not reasonably expected to facilitate the spread of such species through depressing the populations of native species. Additionally, this temporary measure through emergency action does not propose any activity, such as increased ballast water

discharge from foreign vessels, which is associated with the introduction or spread on non-indigenous species.

Chapter 6. List of Preparers

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NMFS = National Marine Fisheries Service, SAFMC = South Atlantic Fishery Management Council, SF = Sustainable Fisheries Division, PR = Protected Resources Division, SERO = Southeast Regional Office, HC = Habitat Conservation Division, GC = General Counsel

Chapter 7. Agencies and Persons Consulted

Responsible Agency

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NMFS, Southeast Region
263 13th Avenue South
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List of Agencies, Organizations, and Persons Consulted

SAFMC Law Enforcement Advisory Panel
SAFMC Snapper Grouper Advisory Panel
SAFMC Scientific and Statistical Committee
North Carolina Coastal Zone Management Program
South Carolina Coastal Zone Management Program
Georgia Coastal Zone Management Program
Florida Coastal Zone Management Program
Florida Fish and Wildlife Conservation Commission
Georgia Department of Natural Resources
South Carolina Department of Natural Resources
North Carolina Division of Marine Fisheries
North Carolina Sea Grant
South Carolina Sea Grant
Georgia Sea Grant
Florida Sea Grant
Atlantic States Marine Fisheries Commission
Gulf and South Atlantic Fisheries Development Foundation
Gulf of Mexico Fishery Management Council
National Marine Fisheries Service
- Washington Office
- Office of Ecology and Conservation
- Southeast Regional Office
- Southeast Fisheries Science Center

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Appendix A. Glossary

Acceptable Biological Catch (ABC): Maximum amount of fish stock that can be harvested without adversely affecting recruitment of other components of the stock. The ABC level is typically higher than the total allowable catch, leaving a buffer between the two.

ALS: Accumulative Landings System. NMFS database which contains commercial landings reported by dealers.

Biomass: Amount or mass of some organism, such as fish.

B_{MSY}: Biomass of population achieved in long-term by fishing at F_{MSY}.

Bycatch: Fish harvested in a fishery, but not sold or kept for personal use. Bycatch includes economic discards and regulatory discards, but not fish released alive under a recreational catch and release fishery management program.

Caribbean Fishery Management Council (CFMC): One of eight regional councils mandated in the Magnuson-Stevens Fishery Conservation and Management Act to develop management plans for fisheries in federal waters. The CFMC develops fishery management plans for fisheries off the coast of the U.S. Virgin Islands and the Commonwealth of Puerto Rico.

Catch Per Unit Effort (CPUE): The amount of fish captured with an amount of effort. CPUE can be expressed as weight of fish captured per fishing trip, per hour spent at sea, or through other standardized measures.

Charter Boat: A fishing boat available for hire by recreational anglers, normally by a group of anglers for a short time period.

Cohort: Fish born in a given year. (See year class.)

Control Date: Date established for defining the pool of potential participants in a given management program. Control dates can establish a range of years during which a potential participant must have been active in a fishery to qualify for a quota share.

Constant Catch Rebuilding Strategy: A rebuilding strategy where the allowable biological catch of an overfished species is held constant until stock biomass reaches B_{MSY} at the end of the rebuilding period.

Constant F Rebuilding Strategy: A rebuilding strategy where the fishing mortality of an overfished species is held constant until stock biomass reached BMSY at the end of the rebuilding period.

Directed Fishery: Fishing directed at a certain species or species group.

Discards: Fish captured, but released at sea.

Discard Mortality Rate: The % of total fish discarded that do not survive being captured and released at sea.

Derby: Fishery in which the TAC is fixed and participants in the fishery do not have individual quotas. The fishery is closed once the TAC is reached, and participants attempt to maximize their harvests as quickly as possible. Derby fisheries can result in capital stuffing and a race for fish.

Effort: The amount of time and fishing power (i.e., gear size, boat size, horsepower) used to harvest fish.

Exclusive Economic Zone (EEZ): Zone extending from the shoreline out to 200 nautical miles in which the country owning the shoreline has the exclusive right to conduct certain activities such as fishing. In the United States, the EEZ is split into state waters (typically from the shoreline out to 3 nautical miles) and federal waters (typically from 3 to 200 nautical miles).

Exploitation Rate: Amount of fish harvested from a stock relative to the size of the stock, often expressed as a percentage.

F: Fishing mortality.

Fecundity: A measurement of the egg-producing ability of fish at certain sizes and ages.

Fishery Dependent Data: Fishery data collected and reported by fishermen and dealers.

Fishery Independent Data: Fishery data collected and reported by scientists who catch the fish themselves.

Fishery Management Plan: Management plan for fisheries operating in the federal produced by regional fishery management councils and submitted to the Secretary of Commerce for approval.

Fishing Effort: Usually refers to the amount of fishing. May refer to the number of fishing vessels, amount of fishing gear (nets, traps, hooks), or total amount of time vessels and gear are actively engaged in fishing.

Fishing Mortality: A measurement of the rate at which fish are removed from a population by fishing. Fishing mortality can be reported as either annual or instantaneous. Annual mortality is the percentage of fish dying in one year. Instantaneous is that percentage of fish dying at any one time.

Fishing Power: Measure of the relative ability of a fishing vessel, its gear, and its crew to catch fishes, in reference to some standard vessel, given both vessels are under identical conditions.

$F_{30\%SPR}$: Fishing mortality that will produce a static SPR = 30%.

$F_{45\%SPR}$: Fishing mortality that will produce a static SPR = 45%.

F_{OY}: Fishing mortality that will produce OY under equilibrium conditions and a corresponding biomass of B_{OY}. Usually expressed as the yield at 85% of F_{MSY}, yield at 75% of F_{MSY}, or yield at 65% of F_{MSY}.

F_{MSY}: Fishing mortality that if applied constantly, would achieve MSY under equilibrium conditions and a corresponding biomass of B_{MSY}.

Fork Length (FL): The length of a fish as measured from the tip of its snout to the fork in its tail.

Framework: An established procedure within a fishery management plan that has been approved and implemented by NMFS, which allows specific management measures to be modified via regulatory amendment.

Gear restrictions: Limits placed on the type, amount, number, or techniques allowed for a given type of fishing gear.

Growth Overfishing: When fishing pressure on small fish prevents the fishery from producing the maximum poundage. Condition in which the total weight of the harvest from a fishery is improved when fishing effort is reduced, due to an increase in the average weight of fishes.

Gulf of Mexico Fishery Management Council (GFMC): One of eight regional councils mandated in the Magnuson-Stevens Fishery Conservation and Management Act to develop management plans for fisheries in federal waters. The GFMC develops fishery management plans for fisheries off the coast of Texas, Louisiana, Mississippi, Alabama, and the west coast of Florida.

Headboat: A fishing boat that charges individual fees per recreational angler on board.

Highgrading: Form of selective sorting of fishes in which higher value, more marketable fishes are retained, and less marketable fishes, which could legally be retained are discarded.

Individual Fishing Quota (IFQ): Fishery management tool that allocates a certain portion of the TAC to individual vessels, fishermen, or other eligible recipients.

Longline: Fishing method using a horizontal mainline to which weights and baited hooks are attached at regular intervals. Gear is either fished on the bottom or in the water column.

Magnuson-Stevens Fishery Conservation and Management Act: Federal legislation responsible for establishing the fishery management councils and the mandatory and discretionary guidelines for federal fishery management plans.

Marine Recreational Information Program (MRIP): Survey operated by NMFS in cooperation with states that collects marine recreational data.

Maximum Fishing Mortality Threshold (MFMT): The rate of fishing mortality above which a stock's capacity to produce MSY would be jeopardized.

Maximum Sustainable Yield (MSY): The largest long-term average catch that can be taken continuously (sustained) from a stock or stock complex under average environmental conditions.

Minimum Stock Size Threshold (MSST): The biomass level below which a stock would be considered overfished.

Modified F Rebuilding Strategy: A rebuilding strategy where fishing mortality is changed as stock biomass increases during the rebuilding period.

Multispecies fishery: Fishery in which more than one species is caught at the same time and location with a particular gear type.

National Marine Fisheries Service (NMFS): Federal agency within NOAA responsible for overseeing fisheries science and regulation.

National Oceanic and Atmospheric Administration: Agency within the Department of Commerce responsible for ocean and coastal management.

Natural Mortality (M): A measurement of the rate at which fish are removed from a population by natural causes. Natural mortality can be reported as either annual or instantaneous. Annual mortality is the percentage of fish dying in one year. Instantaneous is that percentage of fish dying at any one time.

Optimum Yield (OY): The amount of catch that will provide the greatest overall benefit to the nation, particularly with respect to food production and recreational opportunities and taking into account the protection of marine ecosystems.

Overfished: A stock or stock complex is considered overfished when stock biomass falls below the minimum stock size threshold (MSST) (e.g., current biomass < MSST = overfished).

Overfishing: Overfishing occurs when a stock or stock complex is subjected to a rate of fishing mortality that exceeds the maximum fishing mortality threshold (e.g., current fishing mortality rate > MFMT = overfishing).

Quota: % or annual amount of fish that can be harvested.

Recruitment (R): Number or percentage of fish that survives from hatching to a specific size or age.

Recruitment Overfishing: The rate of fishing above which the recruitment to the exploitable stock becomes significantly reduced. This is characterized by a greatly reduced spawning stock, a decreasing proportion of older fish in the catch, and generally very low recruitment year after year.

Scientific and Statistical Committee (SSC): Fishery management advisory body composed of federal, state, and academic scientists, which provides scientific advice to a fishery management council.

Selectivity: The ability of a type of gear to catch a certain size or species of fish.

South Atlantic Fisheries Management Council (SAFMC): One of eight regional councils mandated in the Magnuson-Stevens Fishery Conservation and Management Act to develop management plans for fisheries in federal waters. The SAFMC develops fishery management plans for fisheries off North Carolina, South Carolina, Georgia, and the east coast of Florida.

Spawning Potential Ratio (Transitional SPR): Formerly used in overfished definition. The number of eggs that could be produced by an average recruit in a fished stock divided by the number of eggs that could be produced by an average recruit in an unfished stock. SPR can also be expressed as the spawning stock biomass per recruit (SSBR) of a fished stock divided by the SSBR of the stock before it was fished.

% Spawning Per Recruit (Static SPR): Formerly used in overfishing determination. The maximum spawning per recruit produced in a fished stock divided by the maximum spawning per recruit, which occurs under the conditions of no fishing. Commonly abbreviated as %SPR.

Spawning Stock Biomass (SSB): The total weight of those fish in a stock which are old enough to spawn.

Spawning Stock Biomass Per Recruit (SSBR): The spawning stock biomass divided by the number of recruits to the stock or how much spawning biomass an average recruit would be expected to produce.

Total Allowable Catch (TAC): The total amount of fish to be taken annually from a stock or stock complex. This may be a portion of the Allowable Biological Catch (ABC) that takes into consideration factors such as bycatch.

Total Length (TL): The length of a fish as measured from the tip of the snout to the tip of the tail.

Appendix B. History of Management

South Atlantic Snapper Grouper History of Management
Last Updated: 6/23/17

The snapper grouper fishery is highly regulated; some of the species included in this amendment have been regulated since 1983. The following table summarizes actions in each of the amendments to the original Snapper Grouper Fishery Management Plan (FMP), as well as some events not covered in amendment actions.

*Shaded rows indicate FMP Amendments

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
FMP (1983)	08/31/83	PR: 48 FR 26843 FR: 48 FR 39463	-12" total length (TL) limit – red snapper, yellowtail snapper, red grouper, Nassau grouper; -8" limit – black sea bass; -4" trawl mesh size; -Gear limitations – poisons, explosives, fish traps, trawls; -Designated modified habitats or artificial reefs as Special Management Zones (SMZs).
Regulatory Amendment #1 (1987)	03/27/87	PR: 51 FR 43937 FR: 52 FR 9864	-Prohibited fishing in SMZs except with hand-held hook-and-line and spearfishing gear; -Prohibited harvest of goliath grouper in SMZs.
Amendment #1 (1988a)	01/12/89	PR: 53 FR 42985 FR: 54 FR 1720	-Prohibited trawl gear to harvest fish south of Cape Hatteras, NC and north of Cape Canaveral, FL; -Directed fishery defined as vessel with trawl gear and ≥200 lb s-g on board; -Established rebuttable assumption that vessel with s-g on board had harvested such fish in the exclusive economic zone (EEZ).
Regulatory Amendment #2 (1988b)	03/30/89	PR: 53 FR 32412 FR: 54 FR 8342	-Established 2 artificial reefs off Ft. Pierce, FL as SMZs.
Emergency Rule	8/3/90	55 FR 32257	-Added wreckfish to the fishery management unit (FMU); -Fishing year beginning 4/16/90; -Commercial quota of 2 million pounds; -Commercial trip limit of 10,000 pounds per trip.
Fishery Closure Notice	8/8/90	55 FR 32635	- Fishery closed because the commercial quota of 2 million pounds was reached.
Notice of Control Date	09/24/90	55 FR 39039	-Anyone entering federal wreckfish fishery in the EEZ off S. Atlantic states after 09/24/90 was not assured of future access if limited entry program developed.

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Regulatory Amendment #3 (1989)	11/02/90	PR: 55 FR 28066 FR: 55 FR 40394	-Established artificial reef at Key Biscayne, FL as SMZ; -Fish trapping, bottom longlining, spear fishing, and harvesting of Goliath grouper prohibited in SMZ.
Amendment #2 (1990a)	10/30/90	PR: 55 FR 31406 FR: 55 FR 46213	-Prohibited harvest/possession of goliath grouper in or from the EEZ; -Defined overfishing for goliath grouper and other species.
Emergency Rule Extension	11/1/90	55 FR 40181	-Extended the measures implemented via emergency rule on 8/3/90.
Amendment #3 (1990b)	01/31/91	PR: 55 FR 39023 FR: 56 FR 2443	-Added wreckfish to the FMU; -Defined optimum yield (OY) and overfishing; -Required permit to fish for, land or sell wreckfish; -Required catch and effort reports from selected, permitted vessel; -Established control date of 03/28/90; -Established a fishing year for wreckfish starting April 16; -Established a process to set annual quota, with initial quota of 2 million pounds; provisions for closure; -Established 10,000 pound trip limit; -Established a spawning season closure for wreckfish from January 15 to April 15; -Provided for annual adjustments of wreckfish management measures.
Notice of Control Date	07/30/91	56 FR 36052	-Anyone entering federal snapper grouper fishery (other than for wreckfish) in the EEZ off S. Atlantic states after 07/30/91 was not assured of future access if limited entry program developed.
Amendment #4 (1991)	01/01/92	PR: 56 FR 29922 FR: 56 FR 56016	-Prohibited gear: fish traps except black sea bass traps north of Cape Canaveral, FL; entanglement nets; longline gear inside 50 fathoms; bottom longlines to harvest wreckfish; powerheads and bangsticks in designated SMZs off S. Carolina. -Defined overfishing/overfished and established rebuilding timeframe: red snapper and groupers ≤ 15 years (year 1 = 1991); other snappers, greater amberjack, black sea bass, red porgy ≤ 10 years (year 1 = 1991); -Required permits (commercial & for-hire) and specified data collection regulations; -Established an assessment group and annual adjustment procedure (framework); -Permit, gear, and vessel id requirements specified for black sea bass traps; -No retention of snapper grouper spp. caught in other fisheries with gear prohibited in snapper

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
			grouper fishery if captured snapper grouper had no bag limit or harvest was prohibited. If had a bag limit, could retain only the bag limit; -8" TL limit – lane snapper; -10" TL limit – vermilion snapper (recreational only); -12" TL limit – red porgy, vermilion snapper (commercial only), gray, yellowtail, mutton, schoolmaster, queen, blackfin, cubera, dog, mahogany, and silk snappers; -20" TL limit – red snapper, gag, and red, black, scamp, yellowfin, and yellowmouth groupers; -28" fork length (FL) limit – greater amberjack (recreational only); -36" FL or 28" core length – greater amberjack (commercial only); -Bag limits – 10 vermilion snapper, 3 greater amberjack -Aggregate snapper bag limit – 10/person/day, excluding vermilion snapper and allowing no more than 2 red snappers; -Aggregate grouper bag limit – 5/person/day, excluding Nassau and goliath grouper, for which no retention (recreational & commercial) is allowed; -Spawning season closure – commercial harvest greater amberjack > 3 fish bag prohibited in April; -Spawning season closure – commercial harvest mutton snapper >snapper aggregate prohibited during May and June; -Charter/headboats and excursion boat possession limits extended.
Amendment #5 (1992a)	04/06/92	PR: 56 FR 57302 FR: 57 FR 7886	For wreckfish: -Established limited entry system with individual transferable quotas (ITQs); -Required dealer to have permit; -Rescinded 10,000 lb. trip limit; -Required off-loading between 8 am and 5 pm; -Reduced occasions when 24-hour advance notice of offloading required for off-loading; -Established procedure for initial distribution of percentage shares of total allowable catch (TAC).
Emergency Rule	8/31/92	57 FR 39365	For Black Sea Bass (bsb): -Modified definition of bsb pot; -Allowed multi-gear trips for bsb; -Allowed retention of incidentally-caught fish on bsb trips.

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Emergency Rule Extension	11/30/92	57 FR 56522	For Black Sea Bass: -Modified definition of bsb pot; -Allowed multi-gear trips for bsb; -Allowed retention of incidentally-caught fish on bsb trips.
Regulatory Amendment #4 (1992b)	07/06/93	FR: 58 FR 36155	-For Black Sea Bass: -Modified definition of bsb pot; -Allowed multi-gear trips for bsb; -Allowed retention of incidentally-caught fish on bsb trips.
Regulatory Amendment #5 (1992c)	07/31/93	PR: 58 FR 13732 FR: 58 FR 35895	-Established 8 SMZs off South Carolina, where only hand-held, hook-and-line gear and spearfishing (excluding powerheads) was allowed.
Amendment #6 (1993)	07/27/94	PR: 59 FR 9721 FR: 59 FR 27242	-Set up separate commercial TAC levels for golden tilefish and snowy grouper; -Established commercial trip limits for snowy grouper, golden tilefish, speckled hind, and warsaw grouper; -Included golden tilefish in grouper recreational aggregate bag limits; -Prohibited sale of warsaw grouper and speckled hind; -100% logbook coverage upon renewal of permit; -Creation of the *Oculina* Experimental Closed Area; -Data collection needs specified for evaluation of possible future individual fishing quota system.
Amendment #7 (1994a)	01/23/95	PR: 59 FR 47833 FR: 59 FR 66270	-12” FL – hogfish; -16” TL – mutton snapper; -Required dealer, charter and headboat federal permits; -Allowed sale under specified conditions; -Specified allowable gear and made allowance for experimental gear; -Allowed multi-gear trips in NC; -Added localized overfishing to list of problems and objectives; -Adjusted bag limit and crew specs. for charter and head boats; -Modified management unit for scup to apply south of Cape Hatteras, NC; -Modified framework procedure.
Regulatory Amendment #6 (1994b)	05/22/95	PR: 60 FR 8620 FR: 60 FR 19683	-Established actions which applied only to EEZ off Atlantic coast of FL: Bag limits – 5 hogfish/person/day (recreational only), 2 cubera snapper/person/day > 30” TL; 12” TL – gray triggerfish.

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Notice of Control Date	04/23/97	62 FR 22995	-Anyone entering federal black sea bass pot fishery off South Atlantic states after 04/23/97 was not assured of future access if limited entry program developed.
Interim Rule Request	1/16/98		-The South Atlantic Fishery Management Council (Council) requested all Amendment 9 measures except black sea bass pot construction changes be implemented as an interim request under the Magnuson-Stevens Act.
Action Suspended	5/14/98		-NMFS informed the Council that action on the interim rule request was suspended.
Emergency Rule Request	9/24/98		-Council requested Amendment 9 be implemented via emergency rule.
Amendment #8 (1997)	12/14/98	PR: 63 FR 1813 FR: 63 FR 38298	-Established program to limit initial eligibility for snapper grouper fishery: -Must have demonstrated landings of any species in the snapper grouper FMU in 1993, 1994, 1995 or 1996; and have held valid snapper grouper permit between 02/11/96 and 02/11/97; -Granted transferable permit with unlimited landings if vessel landed ≥ 1,000 pounds (lb) of snapper grouper species in any of the years; -Granted non-transferable permit with 225 lb trip limit to all other vessels; -Modified problems, objectives, OY, and overfishing definitions; -Expanded the Council's habitat responsibility; -Allowed retention of snapper grouper species in excess of bag limit on permitted vessel with a single bait net or cast nets on board; -Allowed permitted vessels to possess filleted fish harvested in the Bahamas under certain conditions.
Request not Implemented	1/22/99		-NMFS informed the Council that the final rule for Amendment 9 would be effective 2/24/99; therefore they did not implement the emergency rule.
Regulatory Amendment #7 (1998a)	01/29/99	PR: 63 FR 43656 FR: 63 FR 71793	-Established 10 SMZs at artificial reefs off South Carolina.

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #9 (1998b)	2/24/99	PR: 63 FR 63276 FR: 64 FR 3624	-Red porgy: 14" TL (recreational and commercial); 5 fish rec. bag limit; no harvest or possession > bag limit, and no purchase or sale, in March and April; -Black sea bass: 10" TL (recreational and commercial); 20 fish rec. bag limit; required escape vents and escape panels with degradable fasteners in bsb pots; -Greater amberjack: 1 fish rec. bag limit; no harvest or possession > bag limit, and no purchase or sale, during April; quota = 1,169,931 lb; began fishing year May 1; prohibited coring; -Specified size limits for several snapper grouper species (indicated in parentheses in inches TL): including yellowtail snapper (12), mutton snapper (16), red snapper (20); red grouper, yellowfin grouper, yellowmouth grouper, and scamp (20) ; -Vermilion snapper: 11" TL (recreational), 12" TL commercial; -Gag: 24" TL (recreational); no commercial harvest or possession > bag limit, and no purchase or sale, during March and April; -Black grouper: 24" TL (recreational and commercial); no harvest or possession > bag limit, and no purchase or sale, during March and April; -Gag and Black grouper: within 5 fish aggregate grouper bag limit, no more than 2 fish may be gag or black grouper (individually or in combination); -All snapper grouper without a bag limit: aggregate recreational bag limit 20 fish/person/day, excluding tomtate and blue runner; -Vessels with longline gear aboard may only possess snowy, warsaw, yellowedge, and misty grouper, and golden, blueline and sand tilefish.
Emergency Action	9/3/99	64 FR 48326	-Reopened the Amendment 8 permit application process.
Emergency Interim Rule	09/08/99, expired 08/28/00	64 FR 48324 and 65 FR 10040	-Prohibited harvest or possession of red porgy.
Amendment #10 Comprehensive Essential Fish Habitat Amendment (1998c)	07/14/00	PR: 64 FR 37082 and 64 FR 59152 FR: 65 FR 37292	-Identified essential fish habitat (EFH) and established habitat areas of particular concern (HAPC) for species in the snapper grouper FMU.

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #11 Comprehensive Sustainable Fisheries Act Amendment (1998d)	12/02/99	PR: 64 FR 27952 FR: 64 FR 59126	-Maximum sustainable yield (MSY) proxy: goliath and Nassau grouper = 40% static spawning potential ratio (SPR); all other species = 30% static SPR; -OY: hermaphroditic groupers = 45% static SPR; goliath and Nassau grouper = 50% static SPR; all other species = 40% static SPR -Overfished/overfishing evaluations: BSB: overfished (minimum stock size threshold (MSST)=3.72 mp, 1995 biomass=1.33 mp); undergoing overfishing (maximum fishing mortality threshold (MFMT)=0.72, F1991-1995=0.95) Vermilion snapper: overfished (static SPR = 21-27%) Red porgy: overfished (static SPR = 14-19%). Red snapper: overfished (static SPR = 24-32%) Gag: overfished (static SPR = 27%) Scamp: no longer overfished (static SPR = 35%) Speckled hind: overfished (static SPR = 8-13%) Warsaw grouper: overfished (static SPR = 6-14%) Snowy grouper: overfished (static SPR = 5-15%) White grunt: no longer overfished (static SPR = 29-39%) Golden tilefish: overfished (couldn't estimate static SPR) Nassau grouper: overfished (couldn't estimate static SPR) Goliath grouper: overfished (couldn't estimate static SPR) -overfishing level: goliath and Nassau grouper = F>F40% static SPR; all other species: = F>F30% static SPR Approved definitions for overfished and overfishing. MSST = [(1-M) or 0.5 whichever is greater]*B_{MSY}. MFMT = $F_{MSY.}$
Amendment #12 (2000a)	09/22/00	PR: 65 FR 35877 FR: 65 FR 51248	For Red porgy: -MSY=4.38 mp; OY=45% static SPR; MFMT=0.43; MSST=7.34 mp; rebuilding timeframe=18 years (1999=year 1); -no sale of red porgy during Jan-April; -1 fish bag limit; -50 lb. bycatch commercial trip limit May-December; -Modified management options and list of possible framework actions.

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Regulatory Amendment #8 (2000b)	11/15/00	PR: 65 FR 41041 FR: 65 FR 61114	-Established 12 SMZs at artificial reefs off Georgia; revised boundaries of 7 existing SMZs off Georgia to meet CG permit specs; restricted fishing in new and revised SMZs.
Amendment #9 (1998b) resubmitted	10/13/00	PR: 63 FR 63276 FR: 65 FR 55203	-Commercial trip limit for greater amberjack.
Amendment #13A (2003)	04/26/04	PR: 68 FR 66069 FR: 69 FR 15731	-Extended for an indefinite period the regulation prohibiting fishing for and possessing snapper grouper species within the *Oculina* Experimental Closed Area.
Notice of Control Date	10/14/05	70 FR 60058	-Considered management measures to further limit participation or effort in the commercial fishery for snapper grouper species (excluding wreckfish).
Amendment #13C (2006)	10/23/06	PR: 71 FR 28841 FR: 71 FR 55096	-End overfishing of snowy grouper, vermilion snapper, black sea bass, and golden tilefish. Increase allowable catch of red porgy. Year 1 = 2006; 1. <u>Snowy Grouper</u> Commercial: -Quota = 151,000 lb gutted weight (gw) in year 1, 118,000 lb gw in year 2, and 84,000 lb gw in year 3 onwards. -Trip limit = 275 lb gw in year 1, 175 lb gw in year 2, and 100 lb gw in year 3 onwards; Recreational: -Limit possession to one snowy grouper in 5 grouper per person/day aggregate bag limit; 2. <u>Golden Tilefish</u> Commercial: Quota of 295,000 lb gw, 4,000 lb gw trip limit until 75% of the quota is taken when the trip limit is reduced to 300 lb gw. Do not adjust the trip limit downwards unless 75% is captured on or before September 1; Recreational: Limited possession to 1 golden tilefish in 5 grouper per person/day aggregate bag limit; 3. <u>Vermilion Snapper</u> Commercial: Quota of 1,100,000 lb gw; Recreational: 12” TL size limit. 4. <u>Black Sea Bass</u> Commercial: Quota of 477,000 lb gw in year 1, 423,000 lb gw in year 2, and 309,000 lb gw in year 3 onwards;

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
			-Required use of at least 2" mesh for the entire back panel of black sea bass pots effective 6 months after publication of the final rule; -Required black sea bass pots be removed from the water when the quota is met; -Changed fishing year from calendar year to June 1 – May 31; Recreational: Recreational allocation of 633,000 lb gw in year 1, 560,000 lb gw in year 2, and 409,000 lb gw in year 3 onwards. Increase minimum size limit from 10" to 11" in year 1 and to 12" in year 2; -Reduced recreational bag limit from 20 to 15 per person per day; -Changed fishing year from the calendar year to June 1 through May 31. 5. Red Porgy Commercial and recreational: -Retained 14" TL size limit and seasonal closure (retention limited to the bag limit); -Specified a commercial quota of 127,000 lb gw and prohibit sale/purchase and prohibit harvest and/or possession beyond the bag limit when quota is taken and/or during January through April; -Increased commercial trip limit from 50 lb ww to 120 red porgy (210 lb gw) during May through December;--Increased recreational bag limit from one to three red porgy per person per day.
Notice of Control Date	3/8/07	72 FR 60794	-Considered measures to limit participation in the snapper grouper for-hire sector.
Amendment #14 (2007)	2/12/09	PR: 73 FR 32281 FR: 74 FR 1621	-Established eight deepwater Type II marine protected areas (MPAs) to protect a portion of the population and habitat of long-lived deepwater snapper grouper species.
Amendment #15A (2008a)	3/14/08	73 FR 14942	- Established rebuilding plans and status determination criteria for snowy grouper, black sea bass, and red porgy.
Notice of Control Date	12/4/08	74 FR 7849	-Established a control date for the golden tilefish portion of the snapper grouper fishery in the South Atlantic.
Notice of Control Date	12/4/08	74 FR 7849	-Established control date for black sea bass pot sector in the South Atlantic.

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Amendment #15B (2008b)	2/15/10	PR: 74 FR 30569 FR: 74 FR 58902	-Prohibited the sale of snapper grouper harvested or possessed in the EEZ under the bag limits and prohibited the sale of snapper grouper harvested or possessed under the bag limits by vessels with a Federal charter vessel/headboat permit for South Atlantic snapper grouper were harvested; -Reduced the effects of incidental hooking on sea turtles and smalltooth sawfish; -Adjusted commercial permit renewal periods and transferability requirements; -Revised the management reference points for golden tilefish; -Implemented plan to monitor and assess bycatch; -Required a vessel that fished in the EEZ, if selected by NMFS, to carry an observer and install electronic logbook and/or video monitoring equipment provided by NMFS; -Established reference points for golden tilefish; -Established allocations for snowy grouper (95% commercial & 5% recreational); -Established allocations for red porgy (50% commercial & 50% recreational).
Amendment #16 (2009a)	7/29/09	PR: 74 FR 6297 FR: 74 FR 30964	-Specified status determination criteria for gag and vermilion snapper; For gag: -Specified interim allocations 51% commercial & 49% recreational; -Recreational and commercial shallow water grouper spawning closure January through April; -Directed commercial quota= 352,940 lb gw; -Reduced 5-fish aggregate grouper bag limit, including tilefish species, to a 3-fish aggregate; -Captain and crew on for-hire trips cannot retain the bag limit of vermilion snapper and species within the 3-fish grouper aggregate; For vermilion snapper: -Specified interim allocations 68% commercial & 32% recreational; -Directed commercial quota split Jan-June=315,523 lb gw and 302,523 lb gw July-Dec; -Reduced bag limit from 10 to 4 and a recreational closed season November through March; -Required venting and dehooking tools when catching snapper grouper species to reduce recreational and commercial bycatch mortality.

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Amendment #19 Comprehensive Ecosystem-Based Amendment 1 (CE-BA1) (2009b)	7/22/10	PR: 75 FR 14548 FR: 75 FR 35330	-Amended coral, coral reefs, and live/hardbottom habitat FMP to establish deepwater coral HAPCs; -Created a "shrimp fishery access area" (SFAA) within the Stetson-Miami Terrace CHAPC boundaries; -Created allowable "golden crab fishing areas" with the Stetson-Miami Terrace CHAPC and Pourtales Terrace CHAPC boundaries; -Amended the golden crab FMP to require vessel monitoring.
Amendment #17A (2010a)	12/3/10 red snapper closure; circle hooks 3/3/2011	PR: 75 FR 49447 FR: 75 FR 76874	-Required use of non-stainless steel circle hooks when fishing for snapper grouper species with hook-and-line gear north of 28 deg. N latitude in the South Atlantic EEZ; -Specified an annual catch limit (ACL) and an accountability measure (AM) for red snapper with management measures to reduce the probability that catches will exceed the stocks' ACL; -Specified a rebuilding plan for red snapper; -Specified status determination criteria for red snapper; -Specified a fishery-independent monitoring program for red snapper. -Implemented an area closure for snapper grouper species.
Emergency Rule	12/3/10	75 FR 76890	-Delayed the effective date of the area closure for snapper grouper species implemented through Amendment 17A.
Amendment #17B (2010b)	1/30/11	PR: 75 FR 62488 FR: 75 FR 82280	-Specify ACL of 0 and prohibit fishing for speckled hind and warsaw grouper; -Prohibited harvest of 6 deepwater species seaward of 240 feet to curb bycatch of speckled hind and warsaw grouper (snowy grouper, blueline tilefish, yellowedge grouper, misty grouper, queen snapper, silk snapper). -Specify allocations, ACLs and AMs for golden tilefish; -Modified management measures as needed to limit harvest to the ACL or ACT; -Updated the framework procedure for specification of total allowable catch; -Specified ACLs, ACTs, and AMs, where necessary, for 9 species undergoing overfishing (snowy grouper, black grouper, black sea bass, red grouper, vermilion snapper, gag, speckled hind, warsaw grouper, golden tilefish);

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Regulatory Amendment #9 (2010a)	Bag limit: 6/22/11 Trip limits: 7/15/11	PR: 76 FR 23930 FR: 76 FR 34892	-Established trip limits for vermilion snapper and gag; -Increased trip limit for greater amberjack; -Harvest management measures for black sea bass (trip limit, split season quotas, carry-over of unused ACL, gear restrictions, bag limit modification, and a spawning season closure).
Regulatory Amendment #10 (2010b)	5/31/11	PR: 76 FR 9530 FR: 76 FR 23728	-Eliminated closed area for snapper grouper species approved in Amendment 17A.
Regulatory Amendment #11 (2011c)	5/10/12	PR: 76 FR 78879 FR: 77 FR 27374	-Eliminated 240 ft harvest prohibition for six deepwater species (snowy grouper, blueline tilefish, yellowedge grouper, queen snapper, silk snapper, misty grouper);
Amendment # 25 Comprehensive Annual Catch Limit Amendment (2011d)	4/16/12	PR: 76 FR 74757 Amended PR: 76 FR 82264 FR: 77 FR 15916	-Reorganize FMUs to 6 complexes (deepwater, jacks, snappers, grunts, shallow-water groupers, porgies) (see final rule for species list); -Established acceptable biological catch (ABC) control rules and established ABCs, ACLs, and AMs for species not undergoing overfishing; -Removed some species from South Atlantic FMU (Tiger grouper, black margate, blue-striped grunt, French grunt, porkfish, smallmouth grunt, queen triggerfish, crevalle, yellow jack, grass porgy, sheepshead, puddingwife); -Designated species as ecosystem component species (schoolmaster, ocean triggerfish, bank triggerfish, rock triggerfish, longspine porgy); -Specified allocations between the commercial and, recreational sectors for species not undergoing overfishing; -Limited the total mortality for federally managed species in the South Atlantic to the ACLs.
Amendment #24 (2011e)	7/11/12	PR: 77 FR 19169 FR: 77 FR 34254	-Rebuilding plan (including MSY, ACLs, AMs, and OY, and allocations) for red grouper.
Amendment #23 Comprehensive Ecosystem-based Amendment 2 (CE-BA2) (2011f)	1/30/12	PR: 76 FR 69230 FR: 76 FR 82183	-Designated the Deepwater MPAs as EFH-HAPCs; -Modify management measures for Octocoral; -Limit harvest of snapper grouper species in SC SMZs to the bag limit; -Modify sea turtle release gear; -Designated new EFP for pelagic Sargassum habitat.

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Amendment #18A (2012a)	7/1/12	PR: 77 FR 16991 FR: 77FR3 2408	-Limited participation and effort in the black sea bass sector; -Modifications to management of the black sea bass pot sector; -Improved data reporting (accuracy, timing, and quantity of fisheries statistics).
Amendment #20A (2012b)	10/26/12	PR: 77 FR 19165 FR: 77 FR 59129	- Individual transfer quota (ITQ) program for wreckfish: -Defined and reverted inactive shares; -Redistributed reverted shares; -Established a share cap; -Established an appeals process.
Regulatory Amendment #12 (2012c)	10/9/12	PR: 77 FR 42688 FR: 77 FR 61295	-Revised the ACL and OY for golden tilefish; -Revised recreational AMs for golden tilefish;
Amendment #18B (2013a)	5/23/13	PR: 77 FR 75093 FR: 77 FR 23858	For Golden Tilefish: -Limited participation and effort in the commercial sector through establishment of a longline endorsement; -Established eligibility requirements and allowed transferability of longline endorsement; -Established an appeals process; -Modified trip limits; -Specified allocations ACLs for gear groups (longline and hook and line); -Adjusted the fishing year.
Amendment #28 (2013b)	8/23/13	PR: 78 FR 25047 FR: 78 FR 44461	-Established regulations to allow harvest of red snapper in the South Atlantic (formula used to compute ACLs, AMs, fishing seasons).
Regulatory Amendment #13 (2013c)	7/17/13	PR: 78 FR 17336 FR: 78 FR 36113	-Revised the ABCs, ACLs (including sector ACLs), and ACTs for 37 species implemented by the Comprehensive ACL Amendment (see final rule for list of species). The revisions may prevent a disjunction between the established ACLs and the landings used to determine if AMs are triggered.
Regulatory Amendment #15 (2013d)	9/12/13	PR: 78 FR 31511 FR: 78 FR 49183	-Modified ACLs and OY for yellowtail snapper; -Modified the commercial and recreational yellowtail snapper fishing years and commercial spawning season closure; -Modified the gag commercial ACL and AM to remove the requirement that all other shallow water groupers (black grouper, red grouper, scamp, red hind, rock hind, graysby, coney, yellowmouth grouper, and yellowfin grouper) are prohibited from harvest in the South Atlantic when the gag commercial ACL is met or projected to be met.

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Regulatory Amendment #18 (2013e)	9/5/13	PR: 78 FR 26740 FR: 78 FR 47574	-Revised ACLs and OY for vermilion snapper; -Modified commercial trip limit for vermilion snapper; -Modified commercial fishing season and recreational closed season for vermilion snapper; -Revised ACLs and OY for red porgy.
Regulatory Amendment #19 (2013f)	ACL: 9/23/13 Pot closure: 10/23/13	PR: 78 FR 39700 FR: 78 FR 58249	-Specified ABC, and adjusted the ACL, recreational ACT and OY for black sea bass; -Implemented an annual closure on the use of black sea bass pots from November 1 to April 30.
Amendment #27 (2013g)	1/27/2014	PR:78 FR 78770 FR: 78 FR 57337	-Established the Council as the responsible entity for managing Nassau grouper throughout its range including federal waters of the Gulf of Mexico; -Modified the crew member limit on dual-permitted snapper grouper vessels; -Modified the restriction on retention of bag limit quantities of some snapper grouper species by captain and crew of for-hire vessels; -Minimized regulatory delay when adjustments to snapper grouper species' ABC, ACLs, and ACTs are needed as a result of new stock assessments; -Removed blue runner from snapper grouper FMP; -Addressed harvest of blue runner by commercial fishermen who do not possess a South Atlantic Snapper Grouper Permit.
Amendment #31 Joint South Atlantic and Gulf of Mexico Generic Headboat Reporting Amendment (2013h)	1/27/2014	PR: 78 FR 59641 FR: 78 FR 78779	-Included under the Generic charter/headboat reporting amendment, that modified required logbook reporting for headboat vessels to require electronic reporting, regarding snapper grouper landings.
Amendment #?? (Revisions to Dealer Permitting and Reporting Requirements) (2013i)	8/7/2014	PR: 79 FR 81 FR: 79 FR 19490	- Modified permitting and reporting requirements for seafood dealers who first receive fish managed by the SA and Gulf through eight FMPs.
Regulatory Amendment #14 (2014a)	12/8/2014	PR: 79 FR 22936 FR: 79 FR 66316	-Modified the commercial and recreational fishing year for greater amberjack; -Modified the commercial and recreational sector fishing years for black sea bass; -Modified the recreational AM for black sea bass; -Modified the recreational AM for vermilion snapper; -Modify the commercial trip limit for gag.

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Regulatory Amendment # 21 (2014b)	11/6/2014	PR: 79 FR 44735 FR: 79 FR 60379	-Modified the definition of the overfished threshold (MSST) for red snapper, blueline tilefish, gag, black grouper, yellowtail snapper, vermilion snapper, red porgy, and greater amberjack.
Amendment #29 (2014c)	7/1/2015	NOA: 79 FR 69819 PR: 79 FR 72567 FR: 80 FR 30947	-Updated the ABC control rule to incorporate methodology for determining the ABC of unassessed species; -Adjusted the ABCs for fourteen unassessed snapper grouper species (see final rule); -Adjusted the ACLs and ACTs for three species complexes and four snapper grouper species based on revised ABCs; -Established ACLs for unassessed species; -Modified gray triggerfish minimum size limits; -Established a commercial split season and commercial trip limits for gray triggerfish.
Blueline Tilefish Emergency Rule	4/17/2014 through 10/10/2014 or 4/18/2015	PR: 79 FR 21636 FR:79 FR 61262	-Removed the blueline tilefish portion from the deep-water complex ACL; -Established separate commercial and recreational ACLs and AMs for blueline tilefish.
Regulatory Amendment #20 (2014d)	8/20/2015	PR: 80 FR 18797 FR: 80 FR 43033	-Adjusted the recreational and commercial ACLs for snowy grouper; -Adjusted the rebuilding strategy; -Modified the commercial trip limit; -Modified recreational bag limit; -Modified the recreational fishing season.
Amendment #32 (2014e)	3/30/2015	PR: 80 FR 3207 FR: 80 FR 16583	-End overfishing of blueline tilefish; -Removed blueline tilefish from the deepwater complex; -Specified AMs, ACLs, recreational ACLs, commercial trip limit, adjust recreational bag limit for blueline tilefish; -Specified ACLs and revised the AMs for the recreational section of the deepwater complex (yellowedge grouper, silk snapper, misty grouper, queen snapper, sand tilefish, black snapper, and blackfin snapper);
Regulatory Amendment #22 (2015a)	9/11/2015, except for the amendments to §§ 622.190(b) and 622.193(r)(1) which were effective 8/12/2015	PR: 80 FR 31880 FR: 80 FR 48277	-Adjusted ACLs and OY for gag and wreckfish;

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Amendment # 33 Dolphin Wahoo Amendment 7 and Snapper Grouper Amendment 33 (2015b)	12/28/2015	NOA:80 FR 55819 PR:80 FR 60601 FR:80 FR 80686	-Allowed dolphin and wahoo fillets to enter the U.S. EEZ after lawful harvest in The Bahamas; -Specified the condition of any dolphin, wahoo, and snapper grouper fillets; -Described how the recreational bag limit is determined for any fillets; -Prohibited the sale or purchase of any dolphin, wahoo, or snapper grouper recreationally harvested in The Bahamas; -Specified the required documentation to be onboard any vessels that have these fillets; -Specified transit and stowage provisions for any vessels with fillets.
Amendment #34 Generic Accountability Measures and Dolphin Allocation Amendment (2015c)	2/22/2016	NOA:80 FR 41472 PR:80 FR 58448 FR:81 FR 3731	-Modified AMs for snapper grouper species (golden tilefish, snowy grouper, gag, red grouper, black grouper, scamp, the shallow-water grouper complex (SASWG: red hind, rock hind, yellowmouth grouper, yellowfin grouper, coney, and graysby), greater amberjack, the jacks complex (lesser amberjack, almaco jack, and banded rudderfish), bar jack, yellowtail snapper, mutton snapper, the snappers complex (cubera snapper, gray snapper, lane snapper, dog snapper, and mahogany snapper), gray triggerfish, wreckfish (recreational sector), Atlantic spadefish, hogfish, red porgy, the porgies complex (jolthead porgy, knobbed porgy, whitebone porgy, scup, and saucereye porgy); -Modified the AM for commercial golden crab fishery; -Adjusted sector allocations for dolphin.
Amendment #35 (2015d)	6/22/2016	NOA:81 FR 6222 PR:81 FR 11502 FR:81 FR 32249	-Removed black snapper, dog snapper, mahogany snapper, and schoolmaster from the Snapper Grouper FMP; -Clarified regulations governing the use of Golden Tilefish Longline Endorsements.
Regulatory Amendment #16 (2016a)	12/29/2016 (closure) 1/30/2017 (gear markings)	NOI: 78 FR 72868 PR: 81 FR 53109 FR: 81 FR 95893	-Revise the area where fishing with black sea bass pots is prohibited from Nov.1-April 30. -Add additional gear marking requirements for black sea bass pot gear.
Regulatory Amendment #25 (2016b)	8/12/2016 except changes to blueline tilefish, effective 7/13/2016.	PR: 81 FR 34944 FR: 81 FR 45245	-Revised commercial and recreational ACL for blueline tilefish; -Revised the recreational bag limit for black sea bass; -Revised the commercial and recreational fishing year for yellowtail snapper.

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Amendment #37 (2016c)	TBD	NOI: 80 FR 45641 NOA: 81 FR 69774 PR: 81 FR 91104	-Modify the hogfish fishery management unit; -Specify fishing levels for the two South Atlantic hogfish stocks; -Establish a rebuilding plan for the Florida Keys/East Florida stock; -Establish/revised management measures for both hogfish stocks in the South Atlantic Region, such as size limits, recreational bag limits, and commercial trip limits.
Amendment #26 (Bycatch Reporting Amendment)	TBD	TBD	-Modifies bycatch and discard reporting for commercial and for-hire vessels.
Amendment #36 (2016d)	TBD	NOI: 82 FR 810 PR: 82 FR 5512	-Establish SMZs to enhance protection for snapper grouper species in spawning condition including speckled hind and warsaw grouper.
Amendment #39 (Generic For-Hire Reporting Amendment) (2017b)	TBD		-Weekly electronic reporting for charter vessel operators with a federal for-hire permit; reduce the time allowed for headboat operators to complete electronic reports; and requires location reporting by charter vessels with the same detail currently required for headboat vessels.
Amendment #41 (2017a)	TBD	TBD	-Update the MSY, ABC, ACL, OY, minimum stock size threshold, designate spawning months for regulatory purposes, and revise management measures for mutton snapper.

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SAFMC (South Atlantic Fishery Management Council). 2012c. Regulatory Amendment 12, Final Environmental Assessment, Regulatory Flexibility Analysis/Regulatory Impact Review, and Social Impact Assessment/Fishery Impact Statement for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2013a. Amendment 18B to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region with Final Environmental Impact Statement, Initial Regulatory Flexibility Analysis, Regulatory Impact Review, and Social Impact Assessment/Fishery Impact Statement. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2013b. Amendment 28 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2013c. Regulatory Amendment 13 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2013d. Regulatory Amendment 15 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2013e. Regulatory Amendment 18 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2013f. Regulatory Amendment 19 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2013g. Amendment 27 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2013h. Joint Headboat Reporting Amendment (Amendment 31). South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2013i. Modifications to federally permitted seafood dealer reporting requirements. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2014a. Regulatory Amendment 14 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2014b. Regulatory Amendment 21 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2014c. Amendment 29 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2014d. Regulatory Amendment 20 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2014e. Amendment 32 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2015a. Regulatory Amendment 15 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2015b. Amendment 33 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2015c. Amendment 34 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2015d. Amendment 35 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2016a. Regulatory Amendment 16 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2016b. Regulatory Amendment 25 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2016c. Amendment 37 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2016d. Amendment 36 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2017a. Amendment 41 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2017b. Modifications to Charter Vessel and Headboat Reporting Requirements (Generic For-hire Reporting Amendment, Snapper Grouper Amendment 39). South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

Appendix C. Bycatch Practicability Analysis (BPA)

1.1 Population Effects for the Bycatch Species

Background

In 2008, a stock assessment for red snapper indicated the red snapper stock was overfished and undergoing overfishing (Southeast Data, Assessment, and Review (SEDAR 15 2008a). Consequently, an interim rule was published on December 4, 2009 (National Marine Fisheries Service (NMFS) 2010), which prohibited harvest and possession of red snapper beginning on January 4, 2010. That rule was extended for 186 days. A new benchmark assessment completed in 2010, further confirmed that red snapper was experiencing overfishing and was overfished (SEDAR 24 2010b). Amendment 17A to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (Snapper Grouper FMP) (Amendment 17A; SAFMC 2010a), effective December 3, 2010, continued the harvest and possession prohibition of red snapper to end overfishing and also implemented a rebuilding plan. **Appendix R** of Amendment 17A contains the BPA conducted for that amendment, and is incorporated herein by reference. At their June 2012 meeting, the South Atlantic Fishery Management Council (Council) reviewed red snapper discard mortality estimates and compared them to the 2012 acceptable biological catch (ABC) from the rebuilding projection, which were recommended by the Council's Scientific and Statistical Committee (SSC) based on the results of SEDAR 24 (2010b). The estimated mortalities for 2012 were less than the ABC for 2012 suggesting some minimal level of harvest of red snapper could occur without negatively affecting the stock (**Appendix B** of Temporary Measures through Emergency Action)(NMFS 2012)). As a result, the Council recommended reopening red snapper to a small amount of harvest in 2012.

In 2012, the final rule for Amendment 28 to the Snapper Grouper FMP (Amendment 28) implemented a process to determine if a red snapper fishing season could occur each year and would specify annual catch limits (ACL) for landings (78 FR 44461, July 24, 2013; SAFMC 2013). NMFS Southeast Fisheries Science Center (SEFSC) provided a report on the level of landings and dead discards of red snapper to the Council each year since 2010. Based on the landings reports and calculation of ACLs from Amendment 28, season lengths for the commercial and recreational sectors would be projected. Limited red snapper fishing seasons were allowed in 2012, 2013, and 2014. Landings were not allowed in 2015 and 2016 because the acceptable biological catch was exceeded. The latest benchmark stock assessment for red snapper (SEDAR 41 2016a), indicated the red snapper stock was overfished and undergoing overfishing. During the review of the assessment, the SSC outlined several sources of uncertainty in the level of recreational landings and discards and determined the population was rebuilding (SAFMC 2016). This temporary measure through emergency action would revise ACLs to allow limited harvest of red snapper in 2017.

Since 2010, dead discards have accounted for most of the total removals (92%), likely a result of incidental catch of red snapper while fishermen targeted co-occurring species. There

have been very limited landings of red snapper in Florida state waters since Florida has not adopted compatible regulations (as of August 2017).

Amendment 17A indicated the top co-occurring species with red snapper are black sea bass, red grouper, gag, scamp, greater amberjack, vermilion snapper, and gray triggerfish. The directed snapper grouper fishery is executed primarily with hook-and-line gear for most of the top co-occurring species (**Table C-1**). However, commercial black sea bass are predominantly taken with pots. Red snapper were taken primarily (84%) with hook-and-line gear during the limited commercial openings in 2012, 2013, and 2014. This percentage is similar to the Amendment 17A BPA, which described the red snapper primary gear as hook-and-line prior to the closure.

Table C-1. Mean percentage of commercial landings by gear (2012-2014).

Species	Diving	Hook and Line	Longline	Pot	Other
Black sea bass	0.56%	41.12%	0.00%	54.62%	3.69%
Red grouper	6.04%	85.98%	7.28%	0.34%	0.36%
Gag	12.61%	85.85%	0.39%	0.27%	0.88%
Scamp	9.40%	89.07%	0.44%	0.16%	0.94%
Greater amberjack	5.02%	93.97%	0.05%	0.38%	0.57%
Vermilion snapper	0.53%	98.22%	0.31%	0.15%	0.78%
Gray triggerfish	2.51%	95.24%	0.32%	1.27%	0.66%

Between 2012 and 2014, the recreational sector dominated the landings of red grouper (>60% of landings) while black sea bass, greater amberjack, and gray triggerfish landings were evenly divided between the commercial and recreational sectors (**Table C-2).** The commercial sector dominated landings of gag and vermilion snapper that commonly occur with red snapper. **Appendix R** from Amendment 17A indicates the recreational sector took approximately 83% of the red snapper landings during 2005-2008.

Table C-2. Mean commercial and recreational landings (pounds whole weight) during 2012-2014. Commercial landings include all of Monroe County, Florida; MRIP landings do not include Monroe County, Florida; Headboat landings include Monroe County, Florida, for Atlantic-based vessels.

Species	Headboat	MRIP	Total Recreational	Commercial	Percent Recreational	Percent Commercial
Black sea bass	385,656	117,050	502,706	446,078	53%	47%
Red grouper	231,018	12,937	243,954	137,478	64%	36%
Gag	176,023	15,646	191,669	415,611	32%	68%
Scamp	36,528	14,639	51,167	167,390	23%	77%
Greater amberjack	802,835	66,939	869,774	908,878	49%	51%
Vermilion snapper	135,838	150,565	286,403	965,649	23%	77%
Gray triggerfish	268,536	116,971	385,507	303,214	56%	44%

Source: SEFSC commercial ACL data (May 2017); Recreational ACL data (June 2017).

Commercial Sector

Based on the commercial logbook, the average number of trips per year between 2012 and 2014 was 13,130; and fishermen spent an average of 1.64 days at sea per trip (**Table C-3**). Only trips that landed species under the Snapper Grouper FMP were used to calculate effort.

Table C-3. Snapper grouper commercial sector effort for South Atlantic.

Year	Trips	Days	Days per Trip
2012	12,737	20,899	1.64
2013	12,088	20,674	1.71
2014	14,564	23,019	1.58
Mean	13,130	21,531	1.64

Source: NMFS SEFSC coastal logbook program that records landings.

Among red snapper and co-occurring species during 2012-2014, the average percentage of trips that reported discards was greatest for red snapper and black sea bass (26.46% and 25.22%, respectively), followed by vermilion snapper (21.48%), gray triggerfish (14.13%), and gag (12.04%) **(Table C-4**). Species with the greatest number of individuals discarded during 2012-2014 were black sea bass (41,821), vermilion snapper (21,944), and red snapper (18,734) (**Table C-4**).

Release mortality estimates for the commercial sector compiled from the most recent stock assessments (as available) using the SEDAR process are included in **Table C-4**. Dead discards were estimated by applying the release mortality rates to the total discards. Discard mortality was highest for vermilion snapper (8,997), followed by red snapper (7,119) (**Table C-4**). **Table C-5** shows the discarded co-occurring species made during 2015 and 2016 when no red snapper harvest was allowed. The average percentage of trips that reported discards was greatest for red snapper and vermilion snapper (33.82% and 20.85%, respectively), followed by black sea bass 14.97%) and gray triggerfish (12.97%) **(Table C-5**). Discard mortality was highest for vermilion snapper (10,056), followed by red snapper (9,170) (**Table C-5**). See the "Finfish Bycatch Mortality" and "Practicability of Management Measures in Directed Fisheries Relative to their Impact on Bycatch and Bycatch Mortality" sections of this BPA for more details.

Table C-4. Percentage of commercial trips that discarded red snapper and co-occurring species from 2012-2014.

Species	Percentage of trips that discarded species	Total discards	Release mortality	Dead Discards	Source
Black sea bass	25.22%	41,821	7%	2,927	SEDAR 2011
Red grouper	5.56%	2,105	20%	421	SEDAR 2010a
Gag	12.04%	9,697	40%	3,879	SEDAR 2006b
Scamp	10.55%	1,268	Unknown	Unknown	
Greater Amberjack	6.64%	2,029	20%	406	SEDAR 2008b
Red snapper	26.46%	18,734	38%	7,119	SEDAR 2016a
Vermilion snapper	21.48%	21,944	41%	8,997	SEDAR 2008c
Gray triggerfish	14.13%	12,918	12.50%	1,615	SEDAR 2016b

Note: Computed using mean discard rates (2012-2014) of vertical line and longline from commercial discard logbook applied to overall commercial effort reported to commercial logbook. Discard logbook and commercial logbook data provided by SEFSC April 2017. Approximately 20% of fishermen are selected to fill out logbooks. Data are expanded to account for fishermen who are not selected.

Table C-5. Percentage of commercial trips that discarded species and expanded commercial discards of red snapper and co-occurring species from 2015-2016.

Species	Percentage of trips that discarded species	Total discards	Release mortality	Dead Discards
Black sea bass	14.97%	48,380	7%	3,387
Red grouper	1.70%	818	20%	164
Gag	8.54%	5,918	40%	2,367
Scamp	8.10%	1,132	Unknown	Unknown
Greater Amberjack	8.13%	4,300	20%	860
Red snapper	33.82%	24,131	38%	9,170
Vermilion snapper	20.85%	24,527	41%	10,056
Gray triggerfish	12.97%	15,236	12.50%	1,905

Note: Computed using mean discard rates (2015-2016) of vertical line and longline from commercial discard logbook applied to overall commercial effort reported to commercial logbook. Discard logbook and commercial logbook data provided by SEFSC April 2017.

Recreational Sector

For the recreational sector, estimates of the number of recreational discards are available from Marine Recreational Information Program (MRIP) and the NMFS headboat survey. The MRIP system classifies recreational catch into three categories:

- Type A - Fishes that were caught, landed whole, and available for identification and enumeration by the interviewers.

- Type B - Fishes that were caught but were either not kept or not available for identification:

    - Type B1 - Fishes that were caught and filleted, released dead, given away, kept but not observed by interviewer, or disposed of in some way other than Types A or B2.

    - Type B2 - Fishes that were caught and released alive.

During 2012-2014, recreational harvest of red snapper and co-occurring species was greatest for black sea bass followed by red snapper, gray triggerfish, vermilion snapper, red grouper, and gag (**Table C-6**). There were differences in the amount and variety of species harvested by the private recreational sector and the for-hire sectors (charter boats/headboats) (**Table C-6**). During 2012-2014, the percentage of discards were highest for black sea bass, followed by gag, red snapper, and red grouper in the private recreational sector (**Table C-6**). For charter boats, the percentage of discards were highest for gag, red snapper, black sea bass, and red grouper; while for the headboat sector, the percentage of discards were high for red snapper, black sea bass, and red grouper, followed by gag and scamp.

Release mortality estimates for the recreational sector compiled from the most recent stock assessments using data from SEDAR stock assessments (as available) are: 25% for gag (SEDAR 2006b); 7% for black sea bass (SEDAR 2011); 38% for vermilion snapper (SEDAR 2008c); 20% for red grouper (SEDAR 2010a); 20% for greater amberjack (SEDAR 2008b); and 12.5% for gray triggerfish (SEDAR 2016b) (**Table C-6**). Dead discards were estimated by applying the release mortality rates to the total discards. During 2012-2014, discard mortality was highest for black sea bass, red snapper, vermilion snapper, gag, and red grouper for the private recreational sector (**Table C-6**). For the for-hire sector (charter boats/headboats), discard mortality was highest for black sea bass, followed by red snapper, vermilion snapper, gag, and red grouper (**Table C-6**). Discard mortality was zero for scamp for all the components of the recreational sector during 2012-2014 (**Table C-6**). For 2015 and 2016, discard mortality was highest for black sea bass, vermilion snapper, red snapper, and gray triggerfish for the recreational sector (**Table C-7**).

Table C-6. Mean number (expanded) of fish based on harvest (A + B1) and discards (B2) from MRIP for private and charter boat trips and SHBS for headboat trips for the South Atlantic from 2012-2014.

	Private						Charter boat						Headboat					
Species	Total Catch	A+B1	B2	% B2	Release Mortality	Dead Discards	Total	A+B1	B2	% B2	Release Mortality	Dead Discards	Total	A+B1	B2	% B2	Release Mortality	Dead Discards
Black sea bass	3,868,459	234,732	3,633,727	94%	7%	254,361	412,777	53,573	359,204	87%	7%	25,144	822,707	91,929	730,778	89%	7%	51,154
Red grouper	123,088	30,611	92,477	75%	20%	18,495	18,059	3,479	14,580	81%	20%	2,916	9,780	1,484	8,297	85%	20%	1,659
Gag	93,529	9,745	83,784	90%	25%	20,946	21,914	2,700	19,214	88%	25%	4,803	3,855	1,508	2,347	61%	25%	587
Scamp	4,493	4,493	0	0%		-	1,479	1,154	325	22%			4,129	1,889	2,240	54%		
Greater amberjack	41,194	18,870	22,324	54%	20%	4,465	25,845	17,804	8,042	31%	20%	1,608	7,057	3,551	3,506	50%	20%	701
Vermilion snapper	140,761	70,674	70,087	50%	38%	26,633	49,030	38,945	10,085	21%	38%	3,832	189,572	122,253	67,319	36%	38%	25,581
Red Snapper	172,590	35,054	137,536	80%	28%	38,510	23,952	3,065	20,887	87%	28%	5,848	50,106	2,200	47,906	96%	28%	13,414
Gray triggerfish	177,398	83,390	94,008	53%	12.5%	11,751	48,684	38,824	9,860	20%	12.5%	1,233	64,320	52,898	11,422	18%	12.5%	1,428

Source: SEFSC Recreational ACL Dataset (June 2017), Headboat CRNF files (expanded; Mar 2017).

Table C-7. Percentage of recreational trips that discarded red snapper and co-occurring species from 2015-2016.

Species	Percentage of trips that discarded species	Total discards	Release mortality	Dead Discards
Black sea bass	6.74%	6,744,495	7%	472,115
Red grouper	0.28%	163,728	20%	32,746
Gag	0.34%	78,655	25%	19,664
Scamp	0.01%	4,552	Unknown	Unknown
Greater Amberjack	0.44%	151,320	20%	30,264
Red snapper	1.45%	798,657	28%	223,624
Vermilion snapper	0.87%	721,671	38%	274,235
Gray triggerfish	1.11%	791,070	12.50%	98,884

Note: Computed using Recreational Fishery Statistical Queries (http://www.st.nmfs.noaa.gov/st1//recreational/queries/index.html), SEFSC Recreational ACL Dataset (June 2017), and Headboat CRNF files (expanded; Mar 2017). Shore trips were removed from total trips to estimate percentage of trips that discarded species.

Finfish Bycatch Mortality

Red snapper release mortality rates utilized in the three most recent stock assessments are reported in **Table C-8**. The most recent release mortality estimate was based on Sauls et al. (2015), which was a working paper submitted to SEDAR 41 (2016a). In this paper, the researchers calculated the release mortality rate through a mark recapture study and relative risk of injury due to several factors. The estimate was revised due to suggestions at the workshop and recommended for use for the recreational sector in the assessment. The commercial sector used information from Burns et al. (2002), but the discard mortality was decreased due to use of circle hooks. Diamond and Campbell (2009) reported a delayed mortality rate of 64% off Texas. A study by Burns et al. (2004) conducted on headboats off Florida in the Atlantic and Gulf of Mexico found a release mortality of 64% for red snapper. The majority of acute mortalities in this study (capture depth of 9-42 m) were attributed to hooking (49%), whereas barotrauma accounted for 13.5%. An earlier study by Burns et al. (2002), also conducted in the Atlantic and Gulf of Mexico, had similar results, as J-hook mortality accounted for 56% of the acute mortalities of red snapper on headboats. Using tagging data and cage studies, Burns et al. (2002) determined the depth at which 50% of the released red snapper would die is 43.7 m (143 feet). SEDAR 15 (2008a) indicated red snapper were most often caught at depths of 141-190 feet by the recreational sector and 141-234 feet by the commercial sector. Rummer and Bennett (2005) reported over 70 different overexpansion injuries related to barotrauma in red snapper, and Wilde (2009) observed reduced survival of this species when vented.

Table C-8. Discard mortality rates for red snapper utilized in last three stock assessments.

Source	Commercial	For-hire	Private Recreational
SEDAR 15 (2008a)	90%	40%	40%
SEDAR 24 (2010b)	48%	41%	39%
SEDAR 41 (2016a)	38%	28%	28%

SEDAR 17 (2008c) recommended a release mortality rate for vermilion snapper of 41% for the commercial sector and 38% for the recreational sector. The commercial sector has a slightly higher discard mortality rate because that sector typically fishes in deeper water than the recreational sector. Ruderhshausen et al. (2007) estimated release mortality rate to be 15% for undersized vermilion snapper. Immediate mortality of vermilion snapper was estimated to be 10% at depths of 25-50 m and delayed mortality was estimated to be 45% at the same depths. Rudershausen et al. (2007) indicated minimum size limits are moderately effective in shallower water for vermilion snapper. Previously, SEDAR 2 (2003) estimated a release mortality rate of 40% and 25% for vermilion snapper taken by commercial and recreational fishermen, respectively. Release mortality rates for vermilion snapper from SEDAR 2 (2003) were based on cage studies conducted by Collins (1996) and Collins et al. (1999). Burns et al. (2002) suggested that release mortality rates of vermilion snapper could be higher than those estimated from cage studies because cages protect the fish from predators. A higher release mortality rate is supported by low recapture rates of vermilion snapper in tagging studies. Burns et al. (2002) estimated a 0.7% recapture rate for 825 tagged vermilion snapper; whereas, recapture rates for red grouper, gag, and red snapper ranged from 3.8% to 6.0% (Burns et al. 2002). McGovern and Meister (1999) estimated a 1.6% recapture rate for 3,827 tagged vermilion snapper. Alternatively, recapture rates could be low if population size was very high or tagged fish were

unavailable to fishing gear. Harris and Stephen (2005) indicated approximately 50% of released vermilion snapper caught by one commercial fisherman were unable to return to the bottom. Lower recapture rates were estimated for black sea bass (10.2%), gray triggerfish (4.9%), gag (11%), and greater amberjack (15.1%)(McGovern and Meister 1999; McGovern et al. 2005). Burns et al. (2002) suggested released vermilion snapper did not survive as well as other species due to predation. Vermilion snapper that do not have air removed from swim bladders are subjected to predation at the surface of the water. Individuals with a ruptured swim bladder or those that have air removed from the swim bladder are subject to bottom predators, since fish would not be able to join schools of other vermilion snapper hovering above the bottom (Burns et al. 2002). However, Wilde (2009) reports that venting appears to be increasingly harmful for fish captured from deep water.

SEDAR 10 (2006b) estimated release mortality rates of 40% and 25% for gag taken by commercial and recreational fishermen, respectively. A tagging study conducted by McGovern et al. (2005) indicated recapture rates of gag decreased with increasing depth. The decline in recapture rate was attributed to depth-related mortality. Assuming there was no depth-related mortality at 0 m, McGovern et al. (2005) estimated depth related mortality ranged from 14% at 11-20 m (36-65 feet) to 85% at 71-80 m (233-262 feet). Similar trends in depth related mortality were provided by a gag tagging study conducted by Burns et al. (2002). Overton et al. (2008) reported post-release mortality for gag as 13.3%. Release mortality rates are not known for other shallow water grouper species, but could be similar to gag since they have a similar depth distribution. Rudershausen et al. (2007) estimated release mortality rates of 33% for undersized gag taken with J-hooks in depths of 25-50 m off North Carolina. For other gag caught at depths of 25-50 m, no immediate mortality was observed but delayed mortality was estimated to be 49%. McGovern et al. (2005) estimated a release mortality rate of 50% at 50 m, which is similar to the findings of Rudershausen et al. (2007). Rudershausen et al. (2007) concluded minimum size limits are effective for gag in the shallower portions of their depth range.

Release mortality rates were estimated as 20% for red grouper taken by recreational and commercial fishermen in SEDAR 19 (2010a). There was limited information to estimate discard mortality for red grouper. Wilson and Burns (1996) reported potential mortality rates for released red grouper to be low (0 - 14%) as long as the fish were caught from waters shallower than 44 m. It was recommended to use a discard mortality of 20% based on gag discard mortality since some studies did not account for post release mortality. SEDAR 15 (2008a) estimated a 20% release mortality rate for greater amberjack. Although SEDAR 41 (2016b) assessment was not approved as best science for assessing the gray triggerfish stock, a literature review was conducted on the release mortality. The report recommended using a release mortality of 12.5% for gray triggerfish.

Release mortality of black sea bass is considered to be low (7% for the recreational sector and 7% for hook-and-line fishery and 1% for pot fishery in the commercial sector) (SEDAR 2011) indicating minimum size limits are probably an effective management tool for black sea bass. McGovern and Meister (1999) report a recapture rate of 10.2% for 10,462 that were tagged during 1993-1998 suggesting that survival of released black sea bass is high. Rudershausen et al. (2007) reported a sub-legal discard rate of 12% for black sea bass. Collins et al. (1999) reported venting of the swim bladder yielded reductions in release mortality of black sea bass, and the

benefits of venting increased with capture depth. The same study was analyzed by Wilde (2009) to suggest that venting increased the survival of black sea bass, although this was an exception to the general findings of Wilde's (2009) study.

Practicability of Management Measures in Directed Fisheries Relative to their Impact on Bycatch and Bycatch Mortality

Expected Impacts on Bycatch of Red Snapper and Co-occurring Species from the Proposed Action

The snapper grouper fishery represents many species occupying the same location at the same time. For example, the top co-occurring species with red snapper are black sea bass, red grouper, gag, scamp, greater amberjack, vermilion snapper, and gray triggerfish. Fishermen could harvest one of these species and return a co-occurring species to the water as "regulatory discards" (e.g., if the fish is under the size limit) or if undesirable. A portion of the population would not survive. Species with the greatest average annual number of individuals discarded by the commercial and recreational sectors during 2012 to 2014 are listed in **Tables C-4 and C-5**. Based on recent years where red snapper was open (2012-2014), the species that the commercial sector caught with red snapper were black sea bass, red grouper, gag, scamp, greater amberjack, vermilion snapper, and gray triggerfish (**Table C-4**). The species that closed after October 1 for the commercial sector in 2016 included greater amberjack (10/4/2016), vermilion snapper (10/11/2016), and gray triggerfish (12/16/2016). Therefore, if the red snapper commercial season remains open for October through December as predicted, and the same species close after October, bycatch could increase for greater amberjack, vermilion snapper, and gray triggerfish.

Alternative 1 (No action) would retain the current process to determine the ACL for red snapper. Under the current process, the ACL has been zero due to exceeding the ABC based on landings and discards in the previous year. Under **Alternative 1 (No Action),** no directed fishery for red snapper would be allowed in 2017. If trends in landings and dead discards continue on the current increasing trajectory seen since 2014, the red snapper portion of the snapper grouper fishery can expect a high level of regulatory discards.

Alternatives 2-5 would specify the red snapper ACL to allow limited harvest in 2017. Fishermen may produce "regulatory discards" under all the alternatives, which could have adverse effects on the red snapper since release mortality rates for red snapper range from 28.5 to 38% depending on the fishing sector (SEDAR 2016a). However, it is expected that some of the dead discards that would be expected under **Alternative 1 (No Action)** would be landed under **Alternatives 2-5**.

Projected season lengths and landings and dead discards under **Alternatives 2-5** would vary based on the selected alternative. However, all of the alternatives would allow a commercial ACL that is not projected to be met. Under the "Predicted Landings" scenario, the recreational sector would be open for as short as 7 days (**Alternative 2**) and as long as 23 days (**Alternative 5**); and would be open for 12 days under **Preferred Alternative 4 (Table 4.1.5)**. Under the "High Landings" scenario, the recreational sector would be open for as short as 3 days

(**Alternative 2**) and as long as 12 days (**Alternative 5**); and would be open for 6 days under **Preferred Alternative 4 (Table 4.1.5)**.

Preferred Alternative 4 would establish a red snapper total ACL of 42,510 fish. The commercial ACL would be 124,815 pounds (whole weight) and the recreational ACL would be 29,656 fish. This alternative could reduce discards because a portion of caught red snapper would be retained as landings.

Allowing a limited harvest in 2017 (**Alternatives 2-5), may increase bycatch** through an increase in effort and "high-grading" behavior. Fishermen have testified that the current red snapper prohibition forces avoidance tactics such as leaving an area with a large number of red snapper. During an open season, fishermen may not avoid red snapper to the degree as during a closed season. In addition, trips targeting red snapper may increase during the open season.

High-grading is a practice of selectively landing fish so that only the best quality (usually largest) fish are brought ashore. For example, recreational fishermen may discard smaller size fish to retain a larger, more desirable red snapper. High-grading can result in many dead discards. High-grading is more likely to occur in fisheries with low recreational bag limits, which applies to this action as the recreational bag limit would be restricted to one red snapper per person.

In conclusion, under **Alternative 1 (No Action)**, the current increasing trend in bycatch would be expected to continue as the stock rebuilds. In numbers of fish, estimates of discards and dead discards of red snapper in 2017 were 1,018,929 and 406,195 (SEFSC 2016). In comparison, allowing harvest in 2017 of red snapper (**Alternatives 2-5**) could both increase and decrease occurrences of bycatch of red snapper as discussed above. Bycatch would decrease when fishermen retain red snapper during the open season; if the season was closed **(Alternative 1 No Action)**, these fish would be returned to the water and a portion would not survive. Bycatch could increase due to increased targeting and high-grading behavior as discussed above.

As changes to bycatch from allowing harvest in 2017 (**Alternatives 2-5**) would largely depend on fishermen's behavior, it is not possible to determine the net change to the bycatch between a closed season **(Alternative 1 No Action)** and an open one (**Alternatives 2-5**). However, although fishery management actions can adversely impact non-target species, the proposed temporary measure is not anticipated to substantially increase bycatch of red snapper and co-occurring species. The red snapper open seasons in 2012, 2013, and 2014 were short in duration (total days open since 2010: 17 recreational and 122 commercial). The limited harvest under **Preferred Alternative 4** would occur in October for the recreational sector and until December 31, 2017, for the commercial sector unless the commercial ACL is met or projected to be met. Analysis in **Appendix C** of the temporary measure through emergency action shows that the commercial ACL would not be met in 2017 under all the alternatives considered; and the recreational sector would be open from a minimum of 6 days to a maximum of 12 days (depending on the predicted landings) under **Preferred Alternative 4**.

Past, Current, and Future Actions to Prevent Bycatch and Improve Monitoring of Harvest, Discards, and Discard Mortality.

Amendment 14 to the Snapper Grouper FMP (Amendment 14; SAFMC 2007) established eight marine protected areas (MPAs) from North Carolina to Florida where harvest of snapper grouper species is prohibited. One of the objectives of Amendment 14 was to protect some areas where spawning of snapper grouper species was known to occur. As all harvest of snapper grouper species is prohibited in the MPAs, no bycatch of snapper grouper species is assumed to be occurring in these areas.

Seasonal closures of shallow-water grouper species (commercial and recreational sectors) and vermilion snapper (recreational sector) implemented through Amendment 16 to the Snapper Grouper FMP (Amendment 16; SAFMC 2009) has likely reduced bycatch mortality of red snapper. Expected harvest reductions for red snapper from Amendment 16 in total mortality was estimated to be 16.5% (commercial sector), 1.1 to 7.7% (headboat sector), and 2.3% (private/charter sector) (SERO 2009a, b, c, d). A longer spawning seasonal closure could enhance the reproductive potential of grouper stocks. For example, Amendment 16 established a January-April spawning season closure for gag, red grouper, black grouper, and shallow-water grouper species. Gag are in spawning condition from December through April each year. There is some evidence spawning aggregations may be in place before and after a spawning season (Gilmore and Jones 1992). When aggregated, gag are extremely susceptible to fishing pressure since the locations are often well known by fishermen. Gilmore and Jones (1992) showed that the largest and oldest gag in aggregations are the most aggressive and first to be removed by fishing gear. Since gag change sex, larger and older males can be selectively removed. As a result, a situation could occur where there are not enough males in an aggregation to spawn with the remaining females. Furthermore, the largest, most fecund females could also be selectively removed by fishing gear. Therefore, a spawning season closure for all shallow-water grouper species is expected to protect grouper species when they are most vulnerable to capture, reduce bycatch of co-occurring grouper species, increase the percentage of males in grouper populations, enhance reproductive success, and increase the magnitude of recruitment. Other actions in Amendment 16 that could reduce bycatch of snapper grouper species include a reduction in the recreational bag limit to one gag or black grouper (combined) per day within a grouper aggregate bag limit of three fish and the establishment of a commercial quota for gag.

Unobserved mortality due to predation or trauma associated with capture could be substantial (Burns et al. 2002; Rummer and Bennett 2005; St. John and Syers 2005; Parker et al. 2006; Rudershausen et al. 2007; Hannah et al. 2008; Diamond and Campbell 2009). Amendment 16 also included actions that required the use of dehooking devices, which could help reduce bycatch mortality of vermilion snapper, black sea bass, gag, red grouper, black grouper, and red snapper. Dehooking devices can allow fishermen to remove hooks with greater ease and more quickly from snapper grouper species without removing the fish from the water. If a fish does need to be removed from the water, dehookers could still reduce handling time in removing hooks, thus increasing survival (Cooke et al. 2001).

In addition to prohibiting the harvest of red snapper, Amendment 17A implemented regulations requiring the use of non-stainless circle hooks north of 28 degrees N. latitude,

effective March 2, 2011**.** Circle hooks are generally thought to reduce the discard mortality rate for red snapper (SEDAR 2005; Rummer 2007); however, Burns et al. (2004) did not observe decreased discard mortality rate when comparing recapture rates of red snapper caught on circle and J-hooks. Rummer (2007), and Diamond and Campbell (2009) found that a greater differential between the surface and bottom temperature caused a higher discard mortality rate for red snapper. Amendment 17B to the Snapper Grouper FMP (Amendment 17B; SAFMC 2010b) established ACLs and accountability measures (AMs) and addressed overfishing for eight species in the snapper grouper management complex listed at that time as undergoing overfishing: snowy grouper; speckled hind; warsaw grouper; black sea bass; gag; and red grouper; in addition to black grouper, golden tilefish, and vermilion snapper.

The Comprehensive ACL Amendment (SAFMC 2011a) implemented ACLs and accountability measures (AMs) for species not undergoing overfishing in four FMPs, in addition to other actions such as allocations and establishing annual catch targets for the recreational sector. The Comprehensive ACL Amendment also established additional measures to reduce bycatch in the snapper grouper fishery with the establishment of species complexes based on biological, geographic, economic, taxonomic, technical, social, and ecological factors. ACLs were assigned to these species complexes, and when the ACL for the complex is met or projected to be met, fishing for species included in the entire species complex is prohibited for the fishing year. ACLs and AMs have likely reduced bycatch of target species and species complexes, as well as incidentally caught species such as red snapper.

Amendment 18A to the Snapper Grouper FMP (Amendment 18A; SAFMC 2011b) contains measures to limit participation and effort for black sea bass, and does not directly affect red snapper. Amendment 18A established an endorsement program than enables snapper grouper fishermen with a certain catch history to harvest black sea bass with pots. In addition, Amendment 18A included measures to reduce bycatch in the black sea bass pot sector, modify the rebuilding strategy, and other necessary changes to management of black sea bass as a result of a 2011 stock assessment (SEDAR 2011). Amendment 24 to the Snapper Grouper FMP (Amendment 24; SAFMC 2011c) established a rebuilding plan for red grouper which is overfished and undergoing overfishing. Amendment 24 also established ACLs and AMs for red grouper that could help to reduce bycatch of red grouper and co-occurring species such as red snapper.

1.2 Ecological Effects Due to Changes in the Bycatch

The ecological effects of bycatch mortality are the same as fishing mortality from directed fishing efforts. If not properly managed and accounted for, either form of mortality could potentially reduce stock biomass to an unsustainable level.

Overall fishing effort could increase in the commercial and recreational sectors in response to the limited opening of red snapper, and therefore, increase the potential for bycatch. However, as stated in **Chapter 2** and analyzed in detail in **Chapter 4**, the opening would be of short duration in the recreational sector and limited to an incidental catch limit (75 pounds gutted

weight) in the commercial sector, and therefore, the ecological effects due to changes in the bycatch would likely be small.

1.3 Changes in the Bycatch of Other Fish Species and Resulting Population and Ecosystem Effects

The action in the temporary measure through emergency action could allow a limited harvest of red snapper in 2017. Thus, ecological changes could occur in the community structure of reef ecosystems through the proposed action, due to increased fishing pressure on co-occurring species that could be caught as bycatch. These ecological changes could affect the nature and magnitude of bycatch over time. However, as stated in **Chapters 2** and **4**, the allowed harvest of red snapper beginning in 2017 would likely be relatively limited in scope, and changes in the bycatch of other fish species and resulting population and ecosystem effects could be minimal in nature.

The commercial red snapper season would close when the commercial sector ACL is met or projected to be met. The end of the recreational red snapper season would be projected and announced before the start of the recreational season

1.4 Effects on Marine Mammals and Birds

Under Section 118 of the Marine Mammal Protection Act (MMPA), NMFS must publish, at least annually, a List of Fisheries (LOF) that places all U.S. commercial fisheries into one of three categories based on the level of incidental serious injury and mortality of marine mammals that occurs in each fishery. The southeast U.S. Atlantic black sea bass pot sector is included in the grouping of the Atlantic mixed species trap/pot fisheries, which the final 2017 LOF classifies as a Category II (82 FR 3655, January 12, 2017). Gear types used in these fisheries are determined to have occasional incidental mortality and serious injury of marine mammals. The SEFSC Supplementary Discard Data Program (SDDP) was initiated in July of 2001. The SDDP sub-samples 20% of the vessels with an active permit. Since August 2001, only three interactions with marine mammals have been documented; each was taken by handline gear and each released alive (McCarthy SEFSC database). The longline and hook-and-line gear components of the snapper grouper fishery in the South Atlantic are classified in the final 2017 LOF (82 FR 3655, January 12, 2017) as Category III fisheries.

Although the black sea bass pot sector can pose an entanglement risk to large whales due to their distribution and occurrence, sperm, fin, sei, and blue whales are unlikely to overlap with the black sea bass pot fishery operated within the snapper grouper fishery since it is executed primarily off North Carolina and South Carolina (with some effort off Florida) in waters ranging from 70-120 feet deep (21.3-36.6 meters).

Bermuda petrels are occasionally seen in the waters of the Gulf Stream off the coasts of North and South Carolina during the summer. Sightings are considered rare and only occurring in low numbers (Alsop 2001). Roseate terns occur widely along the Atlantic coast during the

summer but in the southeast region, they are found mainly off the Florida Keys (unpublished U.S. Fish and Wildlife Service data). Interaction with fisheries has not been reported as a concern for either of these species.

These species are not commonly found and neither has been described as associating with vessels or having had interactions with the snapper grouper fishery. Thus, it is believed that the snapper grouper fishery has no effect on the Bermuda petrel and the roseate tern.

1.5 Changes in Fishing, Processing, Disposal, and Marketing Costs

With the exception of a limited opening in 2012, 2013, and 2014, landing red snapper from federal waters has been prohibited since January 4, 2010, for both the commercial and recreational sectors. The action in this temporary measure through emergency action would allow a limited harvest of red snapper in 2017. Since red snapper is a desirable species, it is highly likely that all opportunities to harvest this species would be entertained. Therefore, there could be changes to costs associated with the fishing, processing, disposal, and marketing of red snapper. It is likely that all four states (North Carolina, South Carolina, Georgia, and Florida) would be affected by the regulations associated with this action, since fishermen from all the states would be interested in participating in any reopening that allows landings of red snapper. Additionally, factors such as waterfront property values, availability of less expensive imports, etc. may affect economic decisions made by recreational and commercial fishermen.

The Council has discussed options to enhance current data collection programs in future amendments. This might provide more insight in calculating the changes in fishing, processing, disposal, and marketing costs. The states and the SEFSC would work together to collect as much biological information as possible during the limited commercial and recreational openings for red snapper. The life history information obtained through data collection efforts may help in assessing the status of the stock in the future.

1.6 Changes in Fishing Practices and Behavior of Fishermen

Allowing harvest of red snapper could result in a modification of fishing practices by commercial and recreational fishermen, thereby affecting the magnitude of discards. However, the red snapper ACLs proposed by this action would result in limited fishing seasons, and are not expected to substantially increase overall fishing effort or alter the spatial and/or temporal distribution of current fishing effort. With the exception of limited openings in 2012, 2013, and 2014, harvest of red snapper has been prohibited since January 4, 2010, for both the commercial and recreational sectors. Since red snapper is a desirable species, it is highly likely that all opportunities to harvest this species would be entertained. Predicting changes in angler behavior in response to a reopening is difficult. Many factors can influence fishing activity (see **Chapter 3** for more details) including: fuel costs and trip expenses; weather; changes in regulations; changes in fishing behavior; and conflicting activities (e.g., family activities, sporting events on weekends).

Landings of red snapper have only been allowed for 17 days for the recreational sector and 122 days for the commercial sector since 2010. Additionally, landings of red snapper from federal waters have not been allowed since 2014. The limited information available for red snapper makes it difficult to determine how fishermen will respond to a similar opening in 2017.

NMFS would announce the pre-determined commercial and recreational fishing year start dates. The commercial red snapper season would close when the commercial sector ACL is met or projected to be met. The end of the recreational red snapper season would be projected and announced before the start of the recreational season. The NMFS Southeast Regional Administrator has the authority to delay the opening of red snapper fishing seasons in the event of a tropical storm or hurricane affecting the Council's area of authority.

1.7 Changes in Research, Administration, and Enforcement Costs and Management Effectiveness

Research and monitoring is ongoing to understand the effectiveness of proposed management measures and their effect on bycatch. Efforts are underway by the states and the SEFSC to enhance data collection activities if a limited opening for red snapper were to occur. In 1990, the SEFSC initiated a logbook program for vessels with federal permits in the snapper grouper fishery from the Gulf of Mexico and South Atlantic. Approximately 20% of commercial fishermen are selected to fill out discard information in logbooks; however, a greater percentage of fishermen could be selected with emphasis on individuals that dominate landings. Recreational discards are obtained from the MRIP and logbooks from the NMFS headboat program.

The SEFSC has completed a pilot study for commercial electronic logbooks, which could be used to enable fishery managers to obtain information on species composition, size distribution, geographic range, disposition, and depth of fishes that are released. The Council will be developing an amendment that considers the use of electronic logbooks by commercial fishermen. Some observer information has been provided by Marine Fisheries Initiative and Cooperative Research Programs (CRP), but more is desired for the snapper grouper fishery. Electronic logbook reporting is in place for headboats in the southeast, which is expected to improve the quality of data in that sector. Further, the Council has approved an amendment that would require electronic reporting for snapper grouper charter vessels, which would be expected to improve data quality.

Cooperative research projects between scientists and industry are being used to a limited extent to collect bycatch information on the snapper grouper fishery in the South Atlantic. For example, Harris and Stephen (2005) characterized the entire (retained and discarded) catch of reef fishes from a selected commercial fisherman in the South Atlantic including total catch composition and disposition of fishes that were released. The Gulf and South Atlantic Fisheries Foundation, Inc., conducted a fishery observer program within the snapper grouper vertical hook-and-line (bandit rig) fishery of the South Atlantic United States. Through contractors they randomly placed observers on cooperating vessels to collect a variety of data quantifying the participation, gear, effort, catch, and discards within the fishery.

In the spring of 2010, Archipelago Marine Research Ltd. worked with North Carolina Sea Grant and several South Atlantic Unlimited Snapper Grouper Permit holders to test the effectiveness of electronic video monitoring to measure catch and bycatch. A total of 93 trips were monitored with video monitoring, 34 by self-reported fishing logbooks, and 5 by observers. Comparisons between electronic video monitoring data and observer data showed that video monitoring was a reliable source of catch and bycatch data.

Research funds for observer programs, as well as gear testing and testing of electronic devices are also available each year in the form of grants from the Marine Fisheries Initiative, Saltonstall-Kennedy program, and the CRP. Efforts are made to emphasize the need for observer and logbook data in requests for proposals issued by granting agencies. A condition of funding for these projects is that data are made available to the Councils and NMFS upon completion of a study.

Stranding networks have been established in the Southeast Region. The NMFS SEFSC is the base for the Southeast United States Marine Mammal Stranding Program (http://sero.nmfs.noaa.gov/protected_resources/marine_mammal_health_and_stranding_response_program/index.html). NMFS authorizes organizations and volunteers under the MMPA to respond to marine mammal strandings throughout the United States. These organizations form the stranding network whose participants are trained to respond to, and collect samples from live and dead marine mammals that strand along southeastern United State beaches. The SEFSC is responsible for: coordinating stranding events; monitoring stranding rates; monitoring human caused mortalities; maintaining a stranding database for the southeast region; and conducting investigations to determine the cause of unusual stranding events including mass strandings and mass mortalities (http://www.sefsc.noaa.gov/species/mammals/strandings.htm). The NMFS Southeast Regional Office and the SEFSC participate in a wide range of training and outreach activities to communicate bycatch related issues. The NMFS Southeast Regional Office issues public announcements, Southeast Fishery Bulletins, or News Releases on different topics, including use of turtle exclusion devices, bycatch reduction devices, use of methods and devices to minimize harm to turtles and sawfish, information intended to reduce harm and interactions with marine mammals, and other methods to reduce bycatch for the convenience of constituents in the southern United States. These are mailed out to various organizations, government entities, commercial interests and recreational groups. This information is also included in newsletters and publications that are produced by NMFS and the various regional fishery management councils. Announcements and news released are also available on the internet and broadcasted over NOAA weather radio.

NMFS established the SouthEast Fishery-Independent Survey in 2010 to strengthen fishery independent sampling efforts in southeast U.S. waters, addressing both immediate and long-term fishery-independent data needs, with an overarching goal of improving fishery-independent data utility for stock assessments. Meeting these data needs is critical to improving scientific advice to the management process, ensuring overfishing does not occur, and successfully rebuilding overfished stocks on schedule.

1.8 Changes in the Economic, Social, or Cultural Value of Fishing Activities and Non-Consumptive Uses of Fishery Resources

Any changes in economic, social, or cultural values from the proposed action are discussed in **Chapter 4** of the environmental assessment.

1.9 Changes in the Distribution of Benefits and Costs

The red snapper ACL for the commercial and recreational sectors was originally established in the Comprehensive ACL Amendment (SAFMC 2011a). The process to determine red snapper ACLs for both sectors was modified in Amendment 28 to the Snapper-Grouper FMP. Management measures proposed in the emergency rule have the potential to reduce bycatch of red snapper during a limited opening of the recreational and commercial sectors. See earlier section titled, "Practicability of Management Measures in Directed Fisheries Relative to their Impact on Bycatch and Bycatch Mortality", in this BPA for a list of amendments and a summary of actions within them that could help reduce bycatch and discard mortality in the snapper grouper fishery. The extent to which these management measures would increase or decrease the magnitudes of discards is unknown. However, this depends on the degree to which fishermen shift effort to other species, seasons, or fisheries and whether effort decreases in response to more restrictive management measures, as well as changes in community structure in fish species and age/size structures of red snapper that could result from ending overfishing. The distribution of benefits and costs expected from proposed actions in the environmental assessment are discussed in **Chapter 3**. Economic and social effects of the proposed actions are addressed in **Chapter 4** of this document.

1.10 Social Effects

The social effects of all the measures are described in **Chapter 4** of the environmental assessment.

1.11 Conclusion

This section evaluates the practicability of taking additional action to minimize bycatch and bycatch mortality using the ten factors provided at 50 CFR section 600.350(d)(3)(i). In summary, revising the process to determine ACLs for red snapper proposed in this temporary measure through emergency action has the potential to affect bycatch of red snapper during a limited opening of the recreational and commercial sectors as some bycatch is turned into retained catch. As summarized in **Section 1.3** of this BPA, the action is not expected to result in significant changes in bycatch of red snapper. In addition, the Council, NMFS, and the SEFSC have implemented, and plan to implement numerous management measures and reporting requirements that have improved, or are likely to improve monitoring efforts of discards and discard mortality.

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Appendix D. Regulatory Impact Review

Introduction

The National Marine Fisheries Service (NMFS) requires a Regulatory Impact Review (RIR) for all regulatory actions that are of public interest. The RIR does three things: 1) it provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action; 2) it provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problem; and, 3) it ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost-effective way. The RIR also serves as the basis for determining whether the regulations are a "significant regulatory action" under the criteria provided in Executive Order (E.O.) 12866.

Problems and Objectives

The purpose and need, issues, problems, and objectives of this action are presented in **Chapter 1**.

Description of Fisheries

A description of the red snapper component of the South Atlantic snapper grouper fishery is provided in **Chapter 3**.

Effects of Management Measures

A detailed analysis and discussion of the expected economic effects of each alternative for the proposed action is included in **Chapter 4**. The following discussion summarizes the expected economic effects of the preferred alternative for the action.

Action: Allow limited harvest and possession of red snapper in 2017

Preferred Alternative 4 for the **Action** would temporarily allow limited harvest of red snapper and establish an annual catch limit (ACL) of 42,510 fish, with a commercial sector ACL of 124,815 pounds whole weight (ww) and a recreational sector ACL of 29,656 fish. The allowable harvest levels under **Preferred Alternative 4** create the opportunity for increased consumer surplus on recreational fishing trips and more revenue to be generated on commercial fishing trips. It is anticipated that there will be an approximate short-term increase in recreational consumer surplus of $2.4 million (2016 dollars) and a short-term increase in commercial ex-vessel revenue of approximately $177,000 to $236,000, depending on the projected red snapper landings estimate examined.

By allowing recreational red snapper harvest in 2017 under **Preferred Alternative 4**, there is the potential that angler demand for for-hire (charter and headboat) trips will increase as well, resulting in increased booking rates and for-hire business net operating revenue (NOR). Due to the complex nature of angler behavior and the for-hire industry, it is not possible to quantify these potential economic effects with available data. Commercial and recreational fishing for red snapper also spurs business activity (economic impacts) in the region in which it occurs. **Preferred Alternative 4** may be reasonably expected to increase such business activity relative to the status quo, by increasing recreational and commercial expenditures on goods and services necessary for fishing and by increasing the supply of red snapper into the seafood value chain. Although retail prices for red snapper would likely be tempered by substitute finfish species and snapper imports, fresh locally-caught red snapper may fetch a price premium in seafood markets and restaurants, resulting in an increase in producer surplus. In addition, because seafood consumers may have strong preferences for locally-caught red snapper over other seafood options, it could result in an increase in consumer surplus as well. These potential economic benefits cannot be quantified with available data.

In addition to the short-term economic effects described above, medium to long-term indirect negative economic effects could ensue from **Preferred Alternative 4** as a result of its effects on the red snapper stock, future management decisions, and future catch rates. If increased fishing pressure associated with **Preferred Alternative 4** leads to a declining red snapper stock, and future catch limits and/or catch rates are reduced as a result, it could negatively affect profits for commercial and for-hire business, as well as CS for recreational anglers. These potential indirect negative economic effects cannot be estimated with available data.

Cumulative Economic Effects Summary

Preferred Alternative 4 for **Action 1** is anticipated to have direct positive economic effects on fishery participants, associated industries, and communities. The overall estimated direct short-term positive economic effects are expected to range from $2.58 million to $2.64 million (2016 dollars) in 2017.

Public and Private Costs of Regulations

The preparation, implementation, enforcement, and monitoring of this or any Federal action involves the expenditure of public and private resources which can be expressed as costs associated with the regulations. Costs associated with this temporary measure through emergency action include:

Council costs of document preparation, meetings, public hearings, and information dissemination……..$10,000

NMFS administrative costs of document preparation, meetings and review…….$15,000

TOTAL ……..$25,000

Law enforcement currently monitors regulatory compliance in these fisheries under routine operations and does not allocate specific budgetary outlays to these fisheries, nor are increased enforcement budgets expected to be requested to address components of this action. In practice, some enhanced enforcement activity might initially occur while the fishery becomes familiar with the new regulations. However, the costs of such enhancements cannot be forecast. Thus, no specific law enforcement costs can be identified.

Determination of Significant Regulatory Action

Pursuant to E.O. 12866, a regulation is considered a "significant regulatory action" if it is likely to result in: 1) an annual effect of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities; 2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; 3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; or 4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this executive order. Based on the information provided above, these actions have been determined to not be economically significant for the purposes of E.O. 12866.

Appendix E. Calculation of Red Snapper ACLs

Total Annual Catch Limit

The total annual catch limit (ACL) in Alternatives 2 through 5 were calculated using two different base values. One value was based on the average landings during the mini-seasons from 2012 to 2014, and the other was based on the highest landings reported during the mini-seasons (2014). **Alternative 3** and **Alternative 5** ACLs were calculated by multiplying an adjustment factor by the average landings (**Alternative 2** ACL) or highest landings (**Alternative 4** ACL), respectively. The adjustment factor was developed by comparing the average abundance index value from a scientific survey in 2012 to 2014 to the average abundance index from 2015 to 2016 (See **Appendix H** for information on the calculation of the abundance index). Over this time period, the average abundance index for red snapper increased by 1.88 times. Therefore the adjustment factor was 1.88.

Table E-1. Development of the ACL value for **Alternative 3** and **Alternative 5**. The landings were based on landings from 2012 to 2014 when mini-seasons for red snapper were open. The adjustment factor is based on the increase in the red snapper abundance index.

Landings Type	Landings (number)	Adjustment Factor	ACL (number)	Alternative
Average	23,623	1.88	44,411	**Alternative 3**
Maximum	42,510	1.88	79,919	**Alternative 5**

Sector ACL

The total ACL is developed in numbers of fish; however, the method to determine the allocations for each sector is based on pounds of fish. The allocations were established in Comprehensive ACL Amendment (SAFMC 2011). The allocation formula using landings data from 1986 to 2008. The allocation was calculated by using the following formula:

Allocation by sector = (0.5 * catch history) + (0.5 * current trend) whereby, catch history = average landings 1986-2008, current trend = average landings 2006-2008 for the Comprehensive ACL amendment (SAFMC 2011). The commercial and recreational ACLs specified for 2011 would remain in effect beyond 2011 until modified.

This resulted in the sector allocations in the Comprehensive ACL Amendment as 28.07% commercial and 71.93% recreational. These same allocations were used in the temporary measures through emergency action to specify sector ACLs in 2017.

The commercial ACL in whole weight was calculated by multiplying the total weight of the ACL by the commercial allocation (28.07%) (**Table E-2**). The commercial ACL in gutted weight was calculated by using the whole weight to gutted weight ratio developed in SEDAR 41 (2017), which was 1.1.

Table E-2. Development of the red snapper commercial ACL for **Alternatives 2** through **5**. ww=whole weight, gw=gutted weight

Alt	ACL Num	Average Weight from SEDAR 41 Projections	Total ACL Weight (ww)	Commercial Allocation	Commercial ACL (ww)	Commercial ACL (gw)
Alt 2	23,623	10.46	247,097	28.07%	69,360	63,055
Alt 3	44,411	10.46	464,539	28.07%	130,396	118,542
Alt 4	42,510	10.46	444,655	28.07%	124,815	113,468
Alt 5	79,919	10.46	835,953	28.07%	234,652	213,320

The recreational ACL in numbers of fish was calculated by removing the commercial sector ACL converted to numbers of fish from the total ACL in numbers of fish. Since the commercial ACL is calculated in pounds of fish, pounds of fish were converted to numbers of fish based on average weight of red snapper caught in the commercial sector from 2012 to 2014 (9.71 lbs ww) (SEDAR 2017). The commercial number of fish is then subtracted from the total ACL to get the recreational ACL.

Table E-3. Development of the red snapper recreational ACL for **Alternatives 2** through **5**.

Alt	ACL Num	Commercial ACL (lbs ww)	Commercial Avg Weight (lbs ww)	Commercial ACL Num	Recreational ACL Number
Alt 2	23,623	69,360	9.71	7,143	16,480
Alt 3	44,411	130,396	9.71	13,429	30,982
Alt 4	42,510	124,815	9.71	12,854	29,656
Alt 5	79,919	234,652	9.71	24,166	55,753

Appendix F. NMFS Guidance on MRIP Usage in Red Snapper Management

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center
75 Virginia Beach Drive
Miami, Florida 33149 U.S.A.
(305) 361-4204 Fax: (305) 361-4499

21 April, 2017

TO: Gregg Waugh, Executive Director, SAFMC
Michelle Duval, Ph.D., Chair, SAFMC

FROM: Bonnie J. Ponwith, Ph.D.,
Science and Research Director

SUBJECT: Red Snapper Guidance Request

The SEFSC concurs with the SEDAR Review Panel and SAFMC SSC's approval of SEDAR 41, the red snapper stock assessment. The SSC developed ABC recommendations based on the projection analysis that allowed the stock to reach a rebuilt status in the time allowed by the rebuilding plan (by 2044). The use of an ABC based primarily on fishery discards for monitoring the effectiveness of management action is likely ineffective due to the high level of uncertainty in measures of discards and the change in the effort estimation methodology that will be implemented in the MRIP survey.

Monitoring progress toward rebuilding will require a departure from the traditional techniques. SEFSC analysts are exploring an Index Projection Methodology as an alternative approach for monitoring stock response to management measures. They plan to discuss this with the SSC at their upcoming meeting to get input on the method. They will also discuss how these results may be used by the SSC to generate future catch level advice, given updated projections have not been provided. Information for the SSC regarding this is attached.

At the last SAFMC meeting we discussed holding a workshop to discuss ways to characterize the uncertainty of MRIP estimates (landings, discards) to provide guidance on: 1) at what point the uncertainty is sufficiently high to warrant alternative methods for accounting for catch; 2) what those alternative methods might be; 3) means to improve the precision of MRIP catch estimates; and 3) means to augment MRIP sampling to improve data quality. The SAFMC recognized this is a region-wide issue so a presentation was made to the GMFMC to request involvement of their SSC, and the GMFMC has agreed to participate. It has also been suggested that representation from the Mid-Atlantic Fishery Management Council may be advisable. We'll begin to stand up a steering committee to refine the workshop objectives, define the deliverables and begin work on the agenda. One deliverable from the workshop could evaluate the precision of red snapper discard estimates to help advise on their use for monitoring stock status when discards are the predominant contributor to fishing mortality. The target timeline for the workshop is this fall, however, we'll have more clarity on the timeline for delivery of advice to the SSC once the steering committee is stood up and begins their work on workshop planning.

Attachment

cc: Roy Crabtree, Jack McGovern, and Rick DeVictor
Monica Smit-Brunello
John Carmichael, Kari MacLauchlin, and Chip Collier
Theo Brainerd and Trika Gerard

SSC Input for April 2017 Meeting

The SAFMC SSC reviewed and approved the SEDAR 41 Red Snapper stock assessment in May 2016. The SSC developed ABC recommendations based on the projection analysis that allowed the stock to reach a rebuilt status in the time allowed by the rebuilding plan (by 2044). In our memo of February 15, 2017, the SEFSC indicated reasons why any further proposed projections would not be appropriate for management. These reasons revolve around the uncertainty and methodology changes for future estimates of discards from the MRIP survey. Non-traditional methods and data sources may need to be used to monitor management action effectiveness and progress toward rebuilding.

The SEFSC proposes creating and an Index Projection Methodology that uses trends in the fishery-independent survey to monitor rebuilding progress and serve as the basis for the SSC's future ABC advice to the Council.

The SEFSC would like to get feedback from the SSC on this proposed approach. Specifically:

1. The SEFSC is actively working on research into using SERFS video data to monitor future effectiveness of management actions, i.e. progress toward rebuilding. We ask the SSC to provide input on this proposed approach and its potential utility for determining management action effectiveness.
2. Discuss options for the appropriate baseline against which to compare the Index Projection.
3. Discuss how the index may be used by the SSC to develop ABC advice.

Dr. Erik Williams will be preparing a brief summary of the proposed approach and will be on hand to answer any questions the SSC may have at their next meeting.

We appreciate the SSC taking time to provide input on new methodology that has the potential to benefit management.

SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL
4055 Faber Place Drive, Suite 201, North Charleston SC 29405
Call: (843) 571-4366 | Toll-Free: (866) SAFMC-10 | Fax: (843) 769-4520 | Connect: www.safmc.net

Dr. Michelle Duval, Chair | Charlie Phillips, Vice Chair
Gregg T. Waugh, Executive Director

April 3, 2017

TO: Bonnie Ponwith

FROM: Gregg Waugh & Michelle Duval

SUBJECT: Red Snapper Guidance Request

At its March 2017 meeting, the South Atlantic Council requested that its SSC and the SEFSC work together to obtain an ABC for Red Snapper. This request was in response to two letters from NMFS addressing the status of Red Snapper. The first letter, from the SEFSC dated February 15, 2017 (**attached**), indicated that projections the Council requested in January 2017 could not be completed due to uncertainty in the assessment and the MRIP discard estimates. This letter also indicated that a complete evaluation of MRIP changes on the Red Snapper assessment (SEDAR 41) is necessary before it can be useful to management. The second letter, from SERO dated March 3, 2017 (**attached**), noted the SSC's concerns with uncertainty in the SEDAR 41 assessment and the resulting inability to reliably determine the degree of overfishing. In addition, NMFS noted that the assessment indicated overfishing was occurring during its terminal year of 2014 but the Council's actions to limit harvest since 2010, including harvest prohibitions in effect since 2015, have addressed overfishing and allowed the stock to continue rebuilding.

The SSC reviewed the SEDAR 41 Red Snapper assessment in May 2016 and considered it Best Scientific Information Available. However, because the Council has been informed in the past that SSC conclusions on BSIA are in fact recommendations, and that NMFS is actually responsible for the BSIA determinations, the Council requests the following:

1. The SEFSC concur with our determination that alternative methods are necessary to specify ABC and MSY for red snapper and that SEDAR 41 (original and revised) cannot be used to specify ABC or MSY for 2017 and beyond for the reasons outlined in your memo to Michelle Duval dated February 15, 2017. This is necessary to inform the SSC on the status of its existing ABC recommendation and to determine which sources of information used in the SEDAR 41 assessment can be considered for future ABC recommendations.
2. The SEFSC provide an evaluation of data limited techniques that can be considered by the SSC to develop an index-based ABC.
3. The SEFSC provide additional details on the proposed evaluation of the effect of MRIP changes on the Red Snapper assessment, particularly the types of evaluations to be considered and when they will be available for SSC review.

Given that the SEFSC will be providing the SSC a revised SEDAR 41 Red Snapper assessment to correct errors with some of the headboat input data, it is critical that a response to these issues

also be provided to the SSC. This will help inform the SSC on how to view the revised assessment.

Please provide this information needs to Council staff by noon on April 10, 2017 to be distributed to the SSC for review at their April 25-27, 2017 meeting. This is a complex matter and the SSC needs adequate time to review the revised assessment and responses prior to their meeting.

Please contact John Carmichael to address any questions concerning this request.

cc: Roy Crabtree, Jack McGovern, and Rick DeVictor
Monica Smit-Brunello
John Carmichael, Kari MacLauchlin, and Chip Collier
Theo Brainerd and Trika Gerard

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center
75 Virginia Beach Drive
Miami, Florida 33149 U.S.A.
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15 February, 2017

MEMORANDUM FOR: Gregg Waugh, Executive Director
South Atlantic Fishery Management Council

FROM: Bonnie J. Ponwith, Ph.D.
Science and Research Director

SUJBECT: **Red Snapper Projections**

On January 18, 2017, you sent a memo requesting, "Provide projections to 2044 (the end of the rebuilding period) based on fixed fishing mortality rates at Fmax, F20%SPR, F27%SPR, F30%SPR, and F40%SPR under the assumptions that all fish caught at each F level are subsequently discarded and the scenario mortality level is the total mortality (i.e., there are no additional discard mortalities). For each scenario, provide the full suite of projection outputs as provided for SEDAR 41 projections."

In working on those projections, Southeast Fisheries Science Center staff have advised, and I concur, that the proposed projections are not appropriate for management use for the following reasons:

- The uncertainty in the assessment is already large, and will increase due to the MRIP discard data, especially for the interim period (2015-16), the upcoming changes to MRIP from the new effort survey. For some background: the uncertainty in projections is generally high after 3-5 years, and these projections would have 2-3 years of an interim period (depending on whether 2017 or 2018 was the effective year of regulations).
- The SAFMC SSC has indicated that overfishing for this stock is occurring, but cannot quantify by how much. Fishing mortality rates in the last few years of the assessment are very sensitive to 2014 data and retrospective analyses indicate fishing mortality rates are considerably lower if these data are excluded. This uncertainty in the stock assessment inhibits the ability to set an ABC that can be effectively monitored.
- Fishing mortality in the interim period is calculated using actual landings and discards in 2015, though the status was determined using fishing mortality when there was a fishery occurring during mini-seasons (2012-2014). There were no fishing seasons for red snapper in 2015 or 2016 and final 2016 MRIP data are not yet available.
- The MRIP telephone survey will end this year and be replaced by a new mail-based effort survey. The new effort survey will be calibrated with the old telephone survey and undergo peer-review this summer. Preliminary results from the calibration study will be available in late-2017 and final results incorporating all three years of side-by-

side surveys will be available in 2018. Projections timed to benefit from the completed calibration study would be stronger than if based on the preliminary results.

- We feel that a more complete evaluation of the effect of the upcoming changes to MRIP on the Red Snapper assessment is needed before it can be useful to management.
    - We further recommend a thorough investigation, possibly through a workshop, into the reliability and utility of mail survey based MRIP estimates of catch and discards for many of our offshore species, which are known to have low intercept rates relative to other species covered by MRIP.

cc: Roy Crabtree
Andy Strelcheck
Jack McGovern
Theo Brainerd
Trika Gerard
Erik Williams

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
http://sero.nmfs.noaa.gov

F/SER25:FH

Dr. Michelle Duval, Chair
South Atlantic Fishery Management Council
4055 Faber Place Drive, Suite 201
North Charleston, South Carolina 29405

MAR 0 3 2017

Dear Dr. Duval:

The most recent South Atlantic red snapper stock assessment (SEDAR 41) was completed in April 2016 and indicated that the stock is undergoing overfishing and is overfished, but is rebuilding. The South Atlantic Fishery Management Council's (Council) Scientific and Statistical Committee (SSC) reviewed the assessment and determined the assessment is based on the best scientific information available. However, the SSC noted there is considerable uncertainty in the exploitation status, and thus, the degree of overfishing is highly uncertain. The uncertainty in exploitation status inhibits the Council's ability to set an acceptable biological catch that can be effectively monitored. Additionally, in the February 15, 2017, response to a Council request for red snapper projections, Dr. Bonnie Ponwith, Director of the National Marine Fisheries Service (NMFS) Southeast Fisheries Science Center noted that the overfishing determination was based on fishing mortality levels during 2012-2014 when a limited amount of harvest was allowed. Landings during 2012-2014 represented a high fraction of the overall fishing mortality, but since that time, harvest has been prohibited. Dr. Ponwith also noted that the uncertainty in the assessment is large and is predicted to increase as catch and effort estimates are updated through the new Marine Recreational Information Program (MRIP) effort survey.

NMFS has determined that the latest assessment identified the South Atlantic red snapper stock as undergoing overfishing, and adequate management action has been taken to address overfishing and continue to rebuild the stock through a harvest prohibition in 2015 and 2016. Due to uncertainty in the level of overfishing associated with the assessment and the new MRIP effort survey, data poor assessment methods for the red snapper stock, such as use of fishery independent indices, may be appropriate in the future. I look forward to continuing work with the Council on Amendment 43 to the Fishery Management Plan for the Snapper-Grouper Fishery of the South Atlantic Region to reduce discards of red snapper in the South Atlantic and continue to rebuild the stock.

Sincerely,

Roy E. Crabtree, Ph.D.
Regional Administrator

cc:
F/SEC - Bonnie Ponwith
F/SER2 - Jack McGovern
F/SER25 - Rick DeVictor

Appendix G. Season Length Based on ACL Alternatives

Predicting 2017 Closure Dates for Annual Catch Limit Alternatives for the South Atlantic Red Snapper Commercial and Recreational Sectors

Commercial Sector

In 2016, a stock assessment was conducted for the South Atlantic red snapper (SEDAR 41). Results from the assessment showed the red snapper stock is overfished and experiencing overfishing. Amendment 43 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (Amendment 43) is currently being drafted and its purpose is to establish new annual catch limits (ACL) that would allow limited harvest and continue to rebuild the stock.

A temporary measure through emergency action may be implemented in 2017 for South Atlantic red snapper, and several ACL alternatives are being considered. An estimate of future landings is required to determine potential closure dates for the alternative ACLs being considered. Frequently, future landings are predicted from taking an average of the most recent years of complete data following the assumption that recent landings will likely reflect future landings. However, for the commercial sector, the South Atlantic red snapper fishery was closed in 2010, 2011, 2015 and 2016, and was only open for short periods of time (57 days or less) in 2012, 2013, and 2014. The short opening in 2012, 2013, and 2014 occurred over different months; therefore, landings from different months and years were combined to predict future landings. Commercial landings for South Atlantic red snapper came from the Southeast Fisheries Science Center's (SEFSC) updated commercial ACL dataset, which was provided on May 2, 2017. Through this action, the 2017 commercial fishery may open Monday, October 6, 2017, and, if the ACL is not exceeded, close on December 31. Therefore, future landings were only predicted for October through December. Future landings were determined by calculating the daily catch rate for a month and then applying the catch rate to the total number of days in that month. Predicted landings for each month assumed a uniform distribution within a month, and were partitioned into a daily catch rate by dividing the landings for a month by the number of days in that month. The daily catch rates were projected forward and a closure date was determined when the landings exceeded the various ACLs proposed in the Environmental Assessment (EA) for the temporary measure. The projections start on October 6 because this is a likely predicted start of the commercial season. A 2017 commercial landings report was available from the SEFSC which had landings from January 1 to July 11, 2017. For 2017, there currently is 527 pounds whole weight (475 pounds gutted weight) of red snapper reported for the South Atlantic commercial sector, and for this analysis, these landings were first counted against the ACLs and then the season was projected from October 6 to December 31, 2017.

- October of 2013 was the most recent year when the commercial sector was open in October and the sector was open from October 1 through October 8 of 2013. Future October landings were determined from calculating the daily catch rate from October 2013 and then applying the catch rate to the total number of days in October (31 days).
- The most recent years where the commercial sector was open in November and December was in 2012 (8 days in November and 7 days for December). However, a reduced trip limit of 50 pounds gutted weight (lbs gw) was implemented in 2012 which is different than the trip limit of 75 lbs gw which was implemented in 2013 and continues today. A trip limit analysis was done for the red snapper temporary rule in 2012 (Red Snapper Rule 2012) and found that a change in the trip limit from 50 to 75 lbs gw resulted in a 51% increase in landings. Following the trip limit analysis done for the red snapper temporary rule, the landings in 2012 were increased by 51% to adjust for the increased trip limit from 50 to 75 lbs gw. These modified landings were used to determine future November and December landings from calculating the daily catch rate within each month when they were open in 2012. The catch rate was applied to the total number of days in each month. Details of the landings used to create the predicted landings are shown in Table G-1, and Figure G-2 displays landings by month.

Table G-1. Details of the commercial landings used to determine the predicted 2017 commercial landings for red snapper.

Month	Most Recent Year	Days open	Method
October	2013	8 days	Determined October 2013 average daily catch rate; applied to open days in October
November	2012	8 days	Landings adjusted for trip limit, then determined November 2012 average daily catch rate; applied to open days in November
December	2012	7 days	Landings adjusted for trip limit, then determined December 2012 average daily catch rate; applied to open days in December

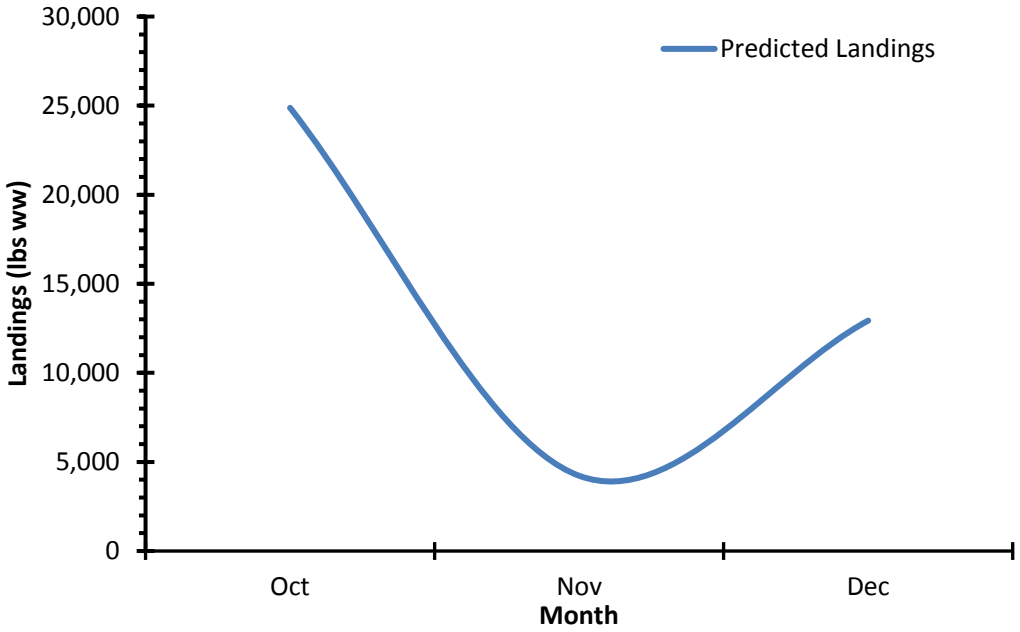

Figure G-1. Predicted South Atlantic red snapper commercial landings by month. The 2017 commercial sector is expected to open October 6, 2017, and close at the end of December; therefore, landings were only predicted for October through December.

The ACL alternatives are increased by an adjustment factor due to an increase in red snapper abundance based on a fish trap index of abundance. The adjustment factor is 1.88 and is based on the change in the average index of abundance from 2012 to 2014 compared to the average abundance from 2015 to 2016. Opening the fishery to an increased stock size will likely cause changes in harvest. However, there likely won't be any new commercial fishermen harvesting red snapper because the number of commercial fishermen is capped through a limited access permit. Also, the harvest per trip is capped by a 75 pound trip limit. The fishermen could conduct more trips for red snapper but it is not likely they will go fishing solely for red snapper because of the low trip limit (75 lbs gw). It's more likely that the increased stock size will cause more trips to meet the trip limit. This potential change in pounds per trip was analyzed by first examining the distribution of pounds per trip with the commercial logbook data (accessed April 17, 2017, from SEFSC). **Figure G-2** displays the pounds per trip distribution for the two most recent years that had the 75 lbs gw trip limit (2013 and 2014). Following the assumption that trips that did not meet the trip limit will now meet the trip limit, the logbook landings were modified. For example, trips that harvested red snapper and had less than 60 pounds per trip were modified to meet the 75 lbs gw trip limit. Trips of 60 lbs gw or more were assumed to have been close to meeting the current trip limit and were not modified. This modification leads to an increase in landings of 34%. This percentage was applied to the predicted landings describer earlier to provide a "high landings" estimate. Table I-2 provides the predicted closure dates for the proposed ACL alternatives for both landings predictions. With both the predicted and the high landings scenarios, none of the ACLs were met. The predicted landings expected from October 6 to December 31, 2017, is 38,549 pounds whole weight (lbs ww) and the predicted high

landings for the same time period are expected to be 51,477 lbs ww. Therefore, the commercial fishery will remain open until December 31, 2017.

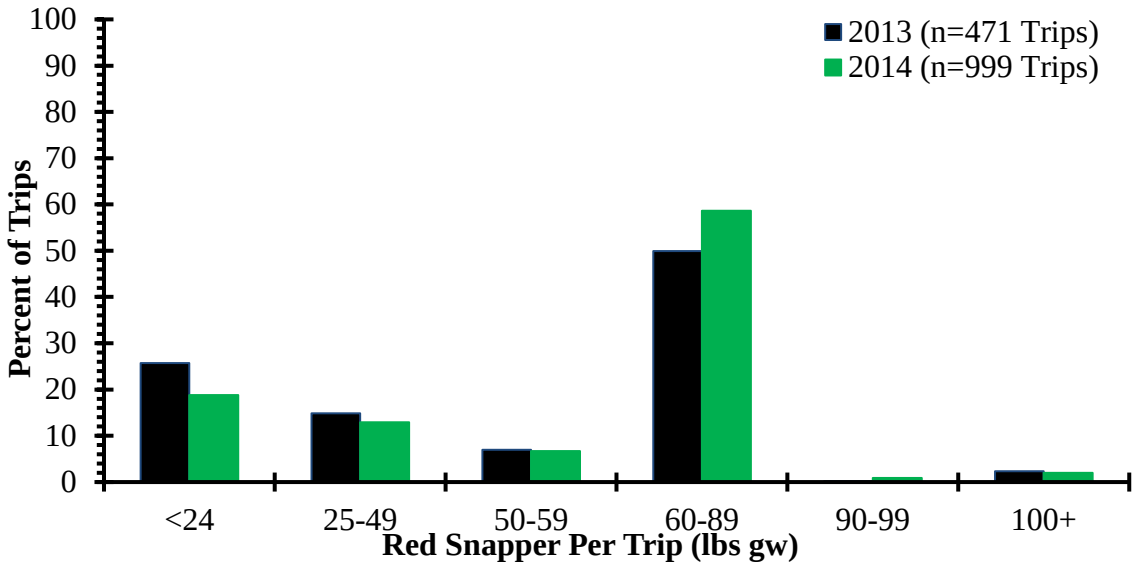

Figure G-2. Distribution of the South Atlantic red snapper harvested per trip (lbs gw) in 2013 and 2014. Data comes from the commercial logbook dataset.

Table G-2. South Atlantic predicted closure dates for the commercial sector for the different proposed ACL alternatives in the EA. These closure dates assume the commercial sector opens on October 6, 2017. The "Predicted Landings" are a prediction of future landings, and the "High Landings" are the prediction of future landings with a 34% increase in landings following the assumption that more fishermen will meet the trip limit of 75 lbs gw due to an increased stock size.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
ACL	0	69,360 lbs ww	130,396 lbs ww	124,815 lbs ww	234,652 lbs ww
Predicted Landings	No season	No Closure	No Closure	No Closure	No Closure
High Landings	No season	No Closure	No Closure	No Closure	No Closure

As with most projections, the reliability of the results is dependent upon the accuracy of the underlying data and input assumptions. This analysis attempted to create a baseline as a foundation for comparisons, under the assumption that projected past landings will accurately reflect actual future landings. Uncertainty exists in this projection, as economic conditions, weather events, changes in catch-per-unit effort, fisher response to management regulations, and a variety of other factors may cause departures from this assumption.

Recreational Sector

The recreational season for South Atlantic red snapper was closed in 2010 and 2011, then had a very short season in 2012, 2013, and 2014. The season varied each year and included two weekends (6 days) during September 2012, one weekend (3 days) in August 2013, and three weekends (8 days, with the third weekend only open on Friday and Saturday) during July 2014. Due to a short season and limitations of Marine Recreational Fisheries Statistics Survey (MRFSS) the South Atlantic states (North Carolina, South Carolina, Georgia, and Florida) conducted their own state specific red snapper surveys during the short red snapper recreational seasons in 2012, 2013, and 2014. A red snapper mini-season ad-hoc group call and webinar was held to review the MRFSS and individual state red snapper surveys to determine the best estimates to use to characterize the recreational catch. The ad-hoc group compared MRFSS against the specific state surveys for each state looking closely at estimates by wave and year. Then the ad-hoc group determined which survey best characterized the recreational catch. For example, in some years MRFSS was chosen as providing the best estimate of landings in Georgia but in other years the Georgia state survey was chosen. Following the recommendations determined from the ad-hoc group the recreational red snapper landings were compiled. However, since the recent assessment (SEDAR 41) used Marine Recreational Information Program (MRIP) instead of MRFSS in any cases where the MRFSS landings were chosen as the best estimate of landings, these MRFSS landings were replaced by MRIP landings. The recreational sector was closed in 2015 and 2016 and there were no state specific surveys during these years. Therefore, MRIP landings were used for 2015 and 2016 landings. Also, the Southeast Region Headboat Survey (SRHS) was conducted from 1972 to 2016 and was used to provide the red snapper landings from the headboat mode. Table G-3 reveals which recreational survey was chosen by the ad-hoc group to estimate the recreational landings for each state by mode and year. Table G-4 summarizes the South Atlantic red snapper recreational landings in numbers of fish by wave.

Table G-3. The recreational survey that was chosen by the ad-hoc group to estimate the recreational landings for each state by mode and year.

Year	State	Charter	Private	Headboat
2012	NC	MRIP	No Landings	SRHS
	SC	SC Survey	No Landings	SRHS
	GA	MRIP	MRIP	SRHS
	FL	FL Survey	FL Survey	SRHS
2013	NC	No Landings	No Landings	SRHS
	SC	SC Survey	No Landings	SRHS
	GA	GA Survey	GA Survey	SRHS
	FL	FL Survey	FL Survey	SRHS
2014	NC	MRIP	NC Survey	SRHS
	SC	SC Survey	SC Survey	SRHS
	GA	GA Survey	MRIP	SRHS
	FL	FL Survey	FL Survey	SRHS
2015	NC	MRIP	MRIP	SRHS
	SC	MRIP	MRIP	SRHS
	GA	MRIP	MRIP	SRHS
	FL	MRIP	MRIP	SRHS
2016	NC	MRIP	MRIP	SRHS
	SC	MRIP	MRIP	SRHS
	GA	MRIP	MRIP	SRHS
	FL	MRIP	MRIP	SRHS

Table G-4. South Atlantic red snapper recreational landings in numbers of fish by wave from 2012 to 2016.

	Jan/Feb	Mar/Apr	May/June	Jul/Aug	Sep/Oct	Nov/Dec	Total
2012	1	478	353	79	14,080	0	14,991
2013	0	2	403	2,050	4,160	14	6,629
2014	1,151	45	722	28,798	19	334	31,069
2015	0	847	467	486	56	14	1,870
2016	0	1	188	205	3	6	403

A temporary measure through emergency action may be implemented in 2017 for South Atlantic red snapper, and several ACL alternatives are being considered. An estimate of future landings is required to determine if the alternative ACLs being considered in will lead to a closure. Frequently, future landings are predicted from taking an average of the most recent years of complete data following the assumption that recent landings will likely reflect future landings. However, the South Atlantic red snapper recreational fishery was closed in 2010, 2011, 2015 and 2016, and was only open for short periods of time 2012 (6 days), 2013 (3 days), and 2014 (8 days). The short opening in 2012, 2013, and 2014 occurred over different months; therefore, landings from different months and years were combined to predict future landings. Recreational

landings for South Atlantic red snapper came from the annual total removals reports provided by the Southeast Fisheries Science Center's (SEFSC), and then when MRFSS landings were used they were replaced with MRIP landings. The recreational fishery may open on Friday October 6, 2017, and, if the ACL is not exceeded, would close on December 31. Future landings were only predicted for October through December. Future landings were determined by calculating the daily catch rate for a month and then applying the catch rate to the number of weekend days in that month (Friday, Saturday, and Sunday). Predicted landings for each month assumed a uniform distribution within a month, and were partitioned into a daily catch rate by dividing the landings for a month by the number of days in that month. The daily catch rates were projected forward and a closure date was determined when the landings exceeded the various proposed ACLs in the EA for the temporary measure. The projections start on Friday October 6, 2017, because this is a likely predicted start date of the recreational season in 2017. Additionally, the recreational season will only be open on Friday, Saturday, and Sunday. Therefore, landings were only predicted for each Friday, Saturday, and Sunday after October 6, 2017, and landings from Monday to Thursday were assumed to be zero.

- July 2014 was the most recent year when the recreational sector was open in July, and the recreational sector was open for 8 days. The July daily catch rate was applied to the open weekend days in July to match a potential opening in 2018.
- August 2013 was the most recent year when the recreational sector was open in August, and the recreational sector was open for 3 days. The August daily catch rate was applied to the open weekend days in August to match a potential opening in 2018.
- September 2012 was the most recent year when the recreational sector was open in September, and the recreational sector was open for 6 days. The September daily catch rate was applied to the open weekend days in September to match a potential opening in 2018.
- September and October are in the same two-month wave. October landings were predicted from assuming the catch rate per day in September was the same catch rate in October.
- The last time the recreational fishery was open in the two-month wave of November/December was in 2007, 2008, and 2009. Average landings from 2007-2009 were calculated and the proportional relationship between September/October to the wave of November/December was determined to be 0.995. This proportional relationship was applied to the September/October landings to predict the November/December landings.

Table G-5. Details of the recreational landings used to determine the predicted future recreational landings for red snapper.

Month	Most Recent Year	Days open	Method
July	2014	8 days	Determined July 2014 average daily catch rate; applied catch rate to open days in July
August	2013	3 days	Determined August 2013 average daily catch rate; applied catch rate to open days in August
September	2012	6 days	Determined September 2012 average daily catch rate; applied catch rate to open days in September

The EA includes different alternatives to develop ACLs. Some of the alternatives are increased by an adjustment factor due to an increase in red snapper abundance based on a fish trap index of abundance. The adjustment factor is 1.88 and is based on the change in the average index of abundance from 2012 to 2014 compared to the average abundance from 2015 to 2016. Opening the fishery to an increased stock size will likely cause changes in harvest. The adjustment factor of 1.88 was applied to the landings to provide a "high landings" estimate to replicate what the future harvest will be with an increased stock size. The bag limit is restricted to one fish per person and the recreational ACL is in numbers of fish so the size of fish is irrelevant for monitoring the ACL. Therefore, the "high landings" assumes more recreational trips will harvest red snapper because of the increase in red snapper abundance. Table G-6 provides the predicted closure dates and predicted number of open days for the proposed ACL alternatives for both landings predictions.

Table G-6. South Atlantic predicted closure dates and predicted number of open days for the recreational sector for the different proposed ACL alternatives. The predicted number of open days is provided in parentheses after the closure dates. These closure dates assume the recreational sector starts on Friday, October 6, 2017. The "Predicted Landings" are a prediction of future landings, and the "High Landings" are the prediction of future landings with a 1.88 adjustment factor following the assumption of a larger stock size.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
ACL	0	16,480 Fish	30,982 Fish	29,656 Fish	55,753 Fish
Predicted Landings	No season	20-Oct (7)	4-Nov (13)	30-Oct (12)	25-Nov (23)
High Landings	No season	9-Oct (3)	20-Oct (7)	16-Oct (6)	30-Oct (12)

As with most projections, the reliability of the results is dependent upon the accuracy of the underlying data and input assumptions. This analysis attempted to create a

baseline as a foundation for comparisons, under the assumption that projected past landings will accurately reflect actual future landings. Uncertainty exists in this projection, as economic conditions, weather events, changes in catch-per-unit effort, fisher response to management regulations, and a variety of other factors may cause departures from this assumption.

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Appendix H. SEFIS Chevron Trap Index

Red Snapper Fishery-Independent Index of Abundance in US South Atlantic Waters Based on a Chevron Trap Survey (1990-2016 & 2010-2016)

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SAFMC Amendment Development Team Reference Document
Amendment 43
MARMAP Technical Report # 2017-008

*Report documents development of Red Snapper relative abundance index based on the SERFS chevron trap survey. The document details two versions of the abundance index, one using the full time series of the chevron trap index (1990-2016) and the other only using data derived during the years 2010-2016.

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Objective

This report presents two standardized relative abundance indices of Red Snapper derived from the SERFS chevron trap survey: one spanning the years 1990-2016 and the other the years 2010-2016. The standardized index accounts for annual sampling distribution shifts with respect to covariates that affect catch of Red Snapper in chevron traps. This report uses the same methodology for index development as documented in Ballenger and Smart (2015) for the chevron trap index during SEDAR41:

http://sedarweb.org/docs/wpapers/SEDAR41_DW54_Ballenger%26Smart_RSChevron2010.2014_8.17.2015.pdf.

Methods

Survey Design and Gear

(see Smart et al. 2015 for full description)

Sampling area

- Cape Hatteras, NC, to St. Lucie Inlet, FL
  - General expansion of geographic coverage through time

Sampling season

- May through September
  - Limited earlier and later sampling in some years

Survey Design

- 1990-2014
  - Simple random sample survey design from a chevron trap universe of confirmed live-bottom and/or hard-bottom habitat stations
- 2015-2016
  - Stratified random sample survey design from a chevron trap universe of confirmed live-bottom and/or hard-bottom habitat stations
    - Depth and latitude strata
      - Depth strata: inner shelf (<30 m deep); mid-shelf (30-42 m deep); outer-shelf (43-63 m deep); slope (≥64 m deep)
      - Latitude strata: southern-latitudes (<29.71°N); mid-latitudes (29.71-32.60°N); northern-latitudes (≥32.61°N)
- In a given year, no two stations are selected for sampling that are closer than 200 m from each other
- Traps deployed on suspected live-bottom and/or hard-bottom in a given year (reconnaissance) are evaluated based on catch and/or video or photographic evidence of bottom type for inclusion in the universe in subsequent years
  - If added to the known habitat universe, data from the reconnaissance deployment is included in CPUE analysis

Sampling Gear – Chevron Traps

(see Collins 1990 and MARMAP 2009 for descriptions that are more complete)

Oceanographic and Environmental Data

- Latitude (°N) data collected via GPS
- Depth (m) data collected via fathometer
- Bottom temperature (°C) data collected via CTD

Data Filtering/Inclusion

(see Ballenger and Smart 2015 for more complete description)

Chevron trap data were limited to:

- Projects conducting monitoring efforts
- Reef fish monitoring samples
- Traps that fished properly
- Traps on live-bottom and/or hard-bottom habitat
- Traps with soak times between 45-150 minutes
  - SERFS targets a soak time of 90 minutes for all chevron trap deployments
- Traps deployed at depths between 15 and 75 m
  - Range of depth for which we have ever observed Red Snapper in our monitoring program
- Excluded any chevron trap samples missing covariate information (Table 1)

Standardized Index Model Formulation

Model Basics

- Response variable – Catch/Trap (Figures 1 and 2)
- Offset term – $\ln(\text{soak time})$
- Dependent variables
  - Year
  - Covariates
    - Depth (m), latitude (°N), bottom temperature (°C), and day of year
      - Annual summary of covariates available in Table 2
      - Distribution of covariates available in Figures 3 and 4
- Model structure – zero-inflated negative binomial GLM (ZINB)
- Annual year effect coefficients of variation (CVs) computed using bootstrapping

Zero-Inflated Model Background

(see Cameron & Trivedi 1998, Hardin and Hilbe 2007, Hilbe 2007, Zeileis et al. 2008, and Chapter 11 in Zuur et al. 2009)

Covariate Treatment

(see Ballenger and Smart 2015 for more complete description)

- Covariates modeled as continuous covariates using polynomials

- Pairs plots, variance inflation factors (Table 3), box plots and violin plots were used to investigate the possibility of collinearity between any of the considered variables
  - No indication of strong collinearity among any considered covariates
- Model selection based on Bayesian information criterion (BIC; Schwarz 1978)

Results

Sampling Summary

- 1990-2016
  - 14,306 chevron trap samples retained and used in the development of the relative abundance index (Table 1)
  - Proportion of traps positive for Red Snapper averaged 0.08 (range: 0.00 – 0.16)
  - Caught on average 148 (range: 5-1088) Red Snapper annually
- 2010-2016
  - 8,073 chevron trap samples retained and used in the development of the relative abundance index (Table 1)
  - Proportion of traps positive for Red Snapper averaged 0.12 (range: 0.09 – 0.16)
  - Caught on average 519 (range: 116-1088) Red Snapper annually

ZINB Index

Model Selection
(see Table 4 for model selection results)

- Both indices, covariate day of year is removed from the count sub-model
- Both indices, the covariates year and bottom temperature are removed from the zero-inflation sub-model
- Both indices, best fit model suggest little to no overdispersion remaining in the data

Covariate Effects
(see Figures 7 and 8)

- Relative effects of latitude and bottom temperature is larger than the effect of sampling depth or day of year
- Predicted covariate effects
  - Depth – catch is above average at depths of ~25-45 m
  - Latitude – catch is higher than average at latitudes 28-30°N
  - Bottom temperature – catch of Red Snapper increases exponentially as bottom temperature increases, over the range of bottom temperatures observed in the survey
  - Day of Year – linear decrease in catch of Red Snapper throughout the survey season

Final Index
(see Table 5 and Figure 8)

- 1990-2016 Index
  - General slight decreasing trend from index start through the mid-2000's
  - Increasing relative abundance from approximately 2006 through the terminal year
  - CV estimates generally decrease through time
    - 1990-2009 – avg. 0.54 (range: 0.35 – 0.98; SD: 0.14)
    - 2010-2016 – avg. 0.17 (range: 0.16 – 0.20; SD: 0.02)
- 2010-2016 Index
  - Increasing relative abundance throughout the time series
    - Rate of increase increases after 2013
  - CV estimates – avg. 0.14 (range: 0.10 – 0.19; SD: 0.03)
- Correlation between the indices was 0.99 for the period 2010-2016 (Table 6 and Figure 9)

Conclusions

Here I present two updated relative abundance indices derived from the SERFS chevron trap survey. Both of these indices were developed using the same methodology used for the development of the chevron trap index during SEDAR 41 (see Ballenger and Smart 2015). They differ only in the length of the time series, one using data from the full chevron trap index time series (1990-2016) and the other only using chevron trap data collected from 2010-2016. During SEDAR41 it was decided to use a reduced time series for the chevron trap index (2010-2014). The three primary reasons for this decision was the low proportion of traps positive for Red Snapper prior to 2010, the low absolute number of Red Snapper captured annually in the survey prior to 2010, and the lower level of sampling effort off the coasts of Georgia and Florida prior to 2010. The consequences of these three factors can be seen in the higher degree of uncertainty of the chevron trap index from 1990-2009 (Table 5), with the annual coefficient of variation being approximately three times higher during this period of time than it is from 2010-2016. However, during the overlapping period both indices depicted the same increase in relative abundance (Table 6 and Figure 9). Both suggest that Red Snapper relative abundance is more than three times higher in 2016 than it was in 2010 and is more than 1.5 times higher in 2016 than it was in 2014.

I also provide a quick comparison to the Red Snapper index of relative abundance presented in the 2016 SCDNR Reef Fish Survey annual trends report. SCDNR Reef Fish Survey staff presented the index as developed for the trends report to the SAFMC SSC in April 2017 and the SAFMC in June 2017. The trends report Red Snapper relative abundance index differs primarily in statistical framework (delta-lognormal versus the ZINB model used here), response variable (catch/(trap*hr) versus catch/trap), and treatment of covariates (discrete versus continuous). Despite these differences, the correlation of the trends report index with either index presented herein exceeds 0.91 (Table 6) and depicts a very similar pattern of increase since 2010. It suggests that Red Snapper relative abundance in 2016 is 3.3 times higher than it was in 2010 and is more than two times what it was in 2014.

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Tables

Table 1: Annual and total exclusion of chevron trap monitoring station collections from analysis due to missing covariate data (1 collection missing both latitude and water temperature information; 599 collections missing water temperature information). Pre-exclusion and post-exclusion refers to the sample size prior to or after exclusion of samples due to missing covariate data.

Year	Pre-exclusion	Post-exclusion	% Change
1990	343	308	10.20
1991	290	269	7.24
1992	315	288	8.57
1993	388	388	0.00
1994	404	379	6.19
1995	379	361	4.75
1996	357	347	2.80
1997	417	385	7.67
1998	425	414	2.59
1999	237	215	9.28
2000	299	293	2.01
2001	246	236	4.07
2002	238	238	0.00
2003	218	218	0.00
2004	275	275	0.00
2005	324	303	6.48
2006	302	291	3.64
2007	331	331	0.00
2008	297	297	0.00
2009	397	397	0.00
2010	726	697	3.99
2011	861	684	20.56
2012	1170	1114	4.79
2013	1353	1335	1.33
2014	1428	1428	0.00
2015	1440	1400	2.78
2016	1446	1415	2.14
1990-2016 Total	**14906**	**14306**	**4.03**
2010-2016 Total	**8424**	**8073**	**4.17**

Table 2: Number of chevron trap deployments on live/hard-bottom areas, proportion of traps positive for Red Snapper, total number of Red Snapper caught, and information regarding covariate distribution annually.

				Depth (m)				Latitude (°N)				Temperature (°C)				Day of Year			
					Range				Range				Range				Range		
Year	n	Prop. Pos.	# of Fish	Avg.	Min	Max	SE	Avg.	Min	Max	SE	Avg.	Min	Max	SE	Avg.	Min	Max	SE
1990	308	0.0227	23	33	17	62	0.60	32.52	30.42	33.82	0.037	22.1	18.4	27.8	0.14	149	114	222	1.6
1991	269	0.0223	17	33	17	57	0.64	32.64	30.75	34.61	0.049	25.0	20.6	27.5	0.10	216	163	268	2.1
1992	288	0.0278	20	34	17	62	0.59	32.77	30.42	34.32	0.041	21.3	15.3	24.5	0.16	155	92	227	2.5
1993	388	0.0309	31	34	16	60	0.62	32.41	30.44	34.32	0.040	22.8	17.7	28.5	0.14	176	131	226	1.5
1994	379	0.0501	45	38	16	64	0.61	32.37	30.74	33.82	0.031	22.8	18.1	26.9	0.10	173	130	300	1.8
1995	361	0.0194	13	34	16	60	0.71	32.14	29.78	33.75	0.042	24.6	20.1	28.3	0.13	198	124	299	2.6
1996	347	0.0173	6	36	15	62	0.63	32.38	27.92	34.33	0.052	22.2	14.2	27.0	0.16	190	121	261	2.4
1997	385	0.0156	24	38	15	74	0.69	32.00	27.87	34.59	0.080	22.9	17.8	28.0	0.12	194	126	273	1.5
1998	414	0.0193	25	39	15	75	0.71	32.03	27.44	34.59	0.071	21.4	9.5	28.6	0.22	178	126	231	1.9
1999	215	0.0186	22	37	15	75	0.88	31.88	27.27	34.41	0.123	22.9	17.9	28.8	0.14	202	154	272	1.8
2000	293	0.0273	17	35	15	75	0.75	32.29	28.95	34.28	0.064	24.0	18.0	28.5	0.13	202	138	294	2.7
2001	236	0.0297	9	37	15	67	0.82	32.36	27.87	34.28	0.074	23.6	16.0	29.2	0.17	203	144	298	2.2
2002	238	0.0546	33	37	15	70	0.84	31.87	27.86	33.95	0.087	24.3	15.2	28.3	0.20	207	169	268	1.9
2003	218	0.0046	7	38	16	62	0.79	32.07	27.43	34.33	0.112	18.9	13.4	25.1	0.15	203	155	266	2.2
2004	275	0.0145	5	40	15	75	0.92	32.26	29.00	33.97	0.064	20.9	16.7	25.8	0.17	176	127	303	2.2
2005	303	0.0231	12	38	15	69	0.74	32.08	27.33	34.32	0.084	23.0	18.0	28.5	0.17	191	124	273	2.8
2006	291	0.0172	6	37	15	69	0.76	32.29	27.27	34.39	0.088	22.6	15.0	26.7	0.17	203	158	272	2.0
2007	331	0.0242	29	37	15	73	0.75	32.17	27.33	34.33	0.079	23.4	15.3	28.9	0.16	200	142	268	2.1
2008	297	0.0236	19	37	15	70	0.70	32.16	27.27	34.59	0.086	21.8	15.2	27.2	0.14	193	127	274	2.6
2009	397	0.0202	10	36	15	73	0.69	32.23	27.27	34.6	0.082	22.6	15.4	27.2	0.13	202	127	282	2.4
2010	697	0.0875	148	38	15	72	0.51	31.41	27.34	34.59	0.063	22.1	12.3	29.4	0.16	219	125	301	2.0
2011	684	0.0950	116	40	15	75	0.53	30.86	27.23	34.54	0.070	21.7	14.8	28.8	0.15	210	140	300	1.8
2012	1114	0.1248	398	39	15	75	0.42	31.80	27.23	35.02	0.065	22.2	12.9	27.8	0.10	194	116	285	1.3
2013	1335	0.1049	367	37	15	75	0.36	31.24	27.23	35.01	0.054	22.1	12.4	28.1	0.08	197	115	278	1.3
2014	1428	0.1050	614	38	15	75	0.33	31.88	27.23	35.01	0.055	23.5	16.1	29.3	0.07	192	114	295	1.2
2015	1400	0.1129	903	37	16	75	0.35	31.84	27.26	35.02	0.055	22.7	13.6	28.5	0.07	186	112	296	1.2
2016	1415	0.1548	1088	38	17	75	0.35	32.06	27.23	35.01	0.055	24.1	15.5	29.3	0.06	217	126	302	1.2

Table 3: Variance inflation factor (VIF) estimates and degrees of freedom (df) for all considered covariates based on individual index time series.

	1990-2016		2010-2016	
Variable	**VIF**	**df**	**VIF**	**df**
Year	1.39	26	1.20	6
Depth (m)	1.28	1	1.29	1
Latitude (oN)	1.15	1	1.13	1
Bottom Temperature (oC)	1.80	1	1.69	1
Day of Year	1.41	1	1.33	1

Table 4: Results of BIC selection for the top 10 ranked ZINB models.

	Count Model					Zero-Inflation Model					
Rank	Latitude	Depth	Temperature	Day of Year	Year	Latitude	Depth	Temperature	Day of Year	BIC	Θ
					1990-2016 Index						
1	7	8	1	0	0	4	3	0	1	10565	1.100
2	7	8	1	0	0	4	4	0	1	10567	1.097
3	7	8	1	0	0	4	3	0	2	10567	1.107
4	7	8	1	0	0	5	3	0	1	10568	1.098
5	7	8	1	0	0	4	3	0	0	10568	1.124
6	7	8	1	0	0	4	4	0	2	10569	1.099
7	7	8	1	0	0	5	3	0	2	10569	1.105
8	7	8	1	0	0	5	4	0	1	10570	1.099
9	7	8	1	0	0	4	4	0	0	10570	1.122
10	7	8	1	0	0	5	4	0	2	10571	1.104
					2010-2016 Index						
1	8	3	1	0	0	4	3	0	1	8486	1.112
2	8	3	1	0	0	4	4	0	0	8486	1.121
3	8	3	1	0	0	8	4	0	0	8486	1.177
4	8	3	1	0	0	8	3	0	0	8487	1.117
5	8	3	1	0	0	4	4	0	1	8489	1.124
6	8	3	1	0	0	6	3	0	0	8489	1.064
7	8	3	1	0	0	4	3	1	0	8491	1.109
8	8	3	1	0	0	6	4	0	0	8491	1.058
9	8	3	1	0	0	8	4	0	1	8491	1.161
10	8	3	1	0	0	5	3	0	0	8491	1.106

Table 5: Red Snapper relative abundance index based on the SERFS chevron trap survey as standardized using a ZINB GLM. Index = relative abundance of Red Snapper, Bias = observed bias in bootstrap analysis, CV = coefficient of variation

	1990-2016 Index						2010-2016 Index					
					Confidence Interval						Confidence Interval	
Year	Index	Bias	SE	CV	Lower	Upper	Index	Bias	SE	CV	Lower	Upper
1990	1.1752	0.0030	0.8319	0.7079	0.1142	3.1460	–	–	–	–	–	–
1991	0.7657	0.0415	0.5712	0.7460	0.0797	2.1871	–	–	–	–	–	–
1992	1.8059	-0.0119	0.7724	0.4277	0.5011	3.4989	–	–	–	–	–	–
1993	1.1136	0.0027	0.4941	0.4437	0.3564	2.2705	–	–	–	–	–	–
1994	1.4820	0.0096	0.8147	0.5498	0.4279	3.4165	–	–	–	–	–	–
1995	0.3033	0.0013	0.1493	0.4923	0.0743	0.6456	–	–	–	–	–	–
1996	0.2011	0.0010	0.1010	0.5024	0.0482	0.4399	–	–	–	–	–	–
1997	0.4765	-0.0027	0.3072	0.6447	0.0422	1.1898	–	–	–	–	–	–
1998	0.7081	-0.0269	0.3771	0.5326	0.1238	1.5375	–	–	–	–	–	–
1999	1.0781	0.0464	0.6372	0.5910	0.0550	2.6007	–	–	–	–	–	–
2000	0.5232	-0.0004	0.2650	0.5066	0.1277	1.1317	–	–	–	–	–	–
2001	0.6394	0.0023	0.3179	0.4971	0.1553	1.3682	–	–	–	–	–	–
2002	1.2692	0.0263	0.5714	0.4502	0.3759	2.5989	–	–	–	–	–	–
2003	0.8969	-0.0207	0.8791	0.9801	0.0000	2.9783	–	–	–	–	–	–
2004	0.4063	-0.0030	0.2246	0.5527	0.0643	0.9236	–	–	–	–	–	–
2005	0.2797	-0.0034	0.1185	0.4237	0.0745	0.5352	–	–	–	–	–	–
2006	0.1955	-0.0017	0.0873	0.4464	0.0388	0.3852	–	–	–	–	–	–
2007	0.7004	-0.0367	0.3991	0.5698	0.1136	1.5524	–	–	–	–	–	–
2008	0.8762	-0.0167	0.3609	0.4119	0.2177	1.6263	–	–	–	–	–	–
2009	0.2318	-0.0034	0.0820	0.3538	0.0847	0.4057	–	–	–	–	–	–
2010	0.9839	-0.0126	0.1997	0.2029	0.6216	1.4206	0.5333	-0.0021	0.1023	0.1918	0.3498	0.7508
2011	0.9646	-0.0093	0.1740	0.1804	0.6449	1.3247	0.5490	0.0072	0.0948	0.1727	0.3893	0.7558
2012	1.3984	0.0011	0.2185	0.1563	1.0111	1.8683	0.8099	0.0017	0.0995	0.1229	0.6270	1.0136
2013	1.0847	0.0032	0.1754	0.1617	0.7832	1.4708	0.6657	-0.0054	0.0852	0.1280	0.5014	0.8362
2014	1.7807	0.0221	0.3052	0.1714	1.2763	2.4604	1.1501	-0.0132	0.1371	0.1192	0.8791	1.4210
2015	2.6890	-0.0291	0.4188	0.1558	1.8963	3.5523	1.5510	0.0027	0.1747	0.1127	1.2206	1.9063
2016	2.9708	0.0180	0.4737	0.1595	2.1387	3.9867	1.7409	0.0091	0.1794	0.1031	1.4045	2.1165

Table 6: Correlation table between the two indices provided in the current report and between those indices and the index provided in the 2016 SCDNR Reef Fish Survey trends report and presented to the SAFMC (June 2017) and SAFMC SSC (April 2017).

	1990-2016 ZINB	2010-2016 ZINB
2010-2016 ZINB	0.9949	
Trends Report	0.9155	0.9254

Figures

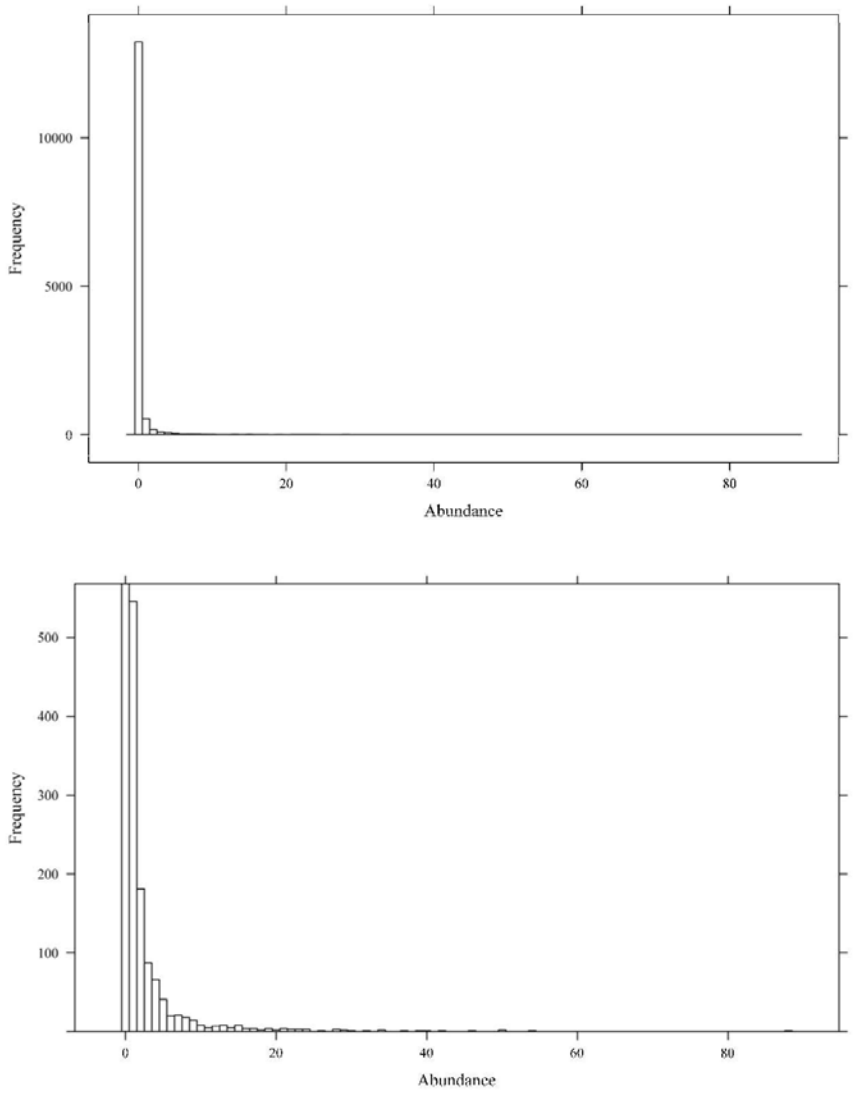

Figure 1: Frequency of occurrence of chevron traps (from 1990-2016) with a given catch of Red Snapper. Top panel – full distribution showing excess zeros; Bottom panel – restricted distribution better depicting frequency of traps with a given catch of Red Snapper.

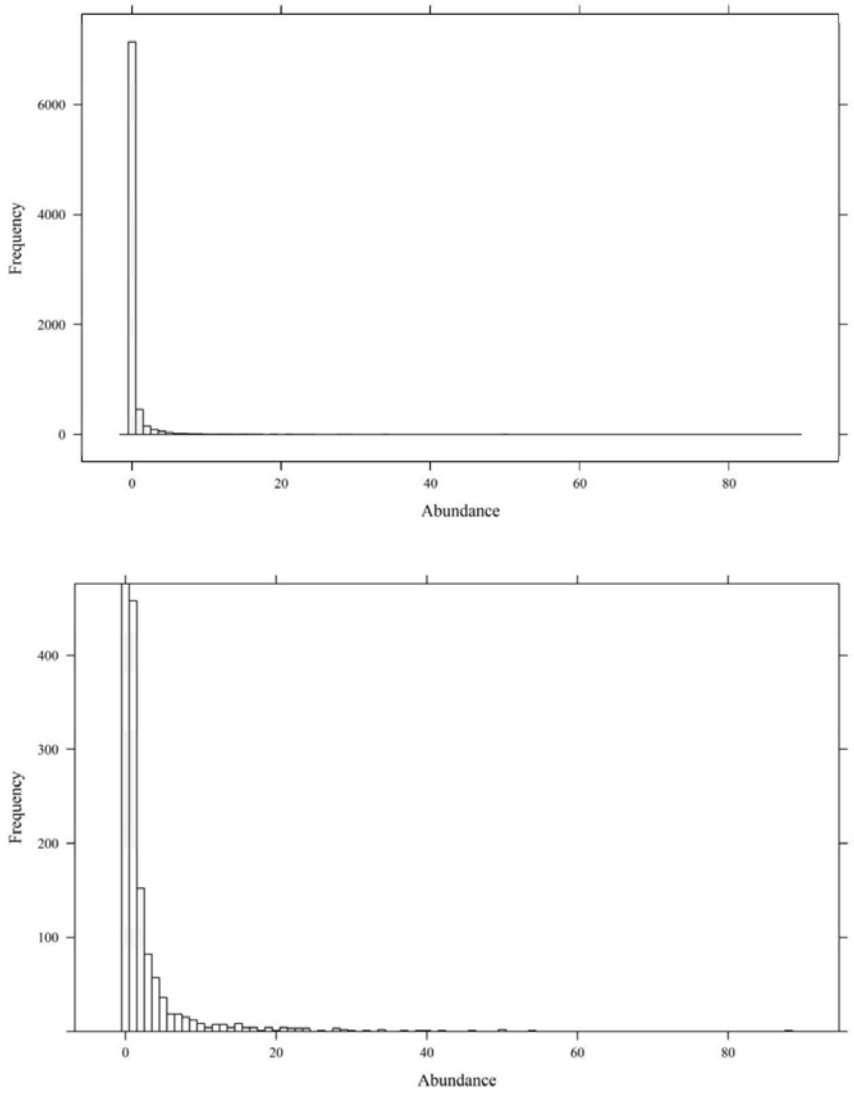

Figure 2: Frequency of occurrence of chevron traps (from 2010-2016) with a given catch of Red Snapper. Top panel – full distribution showing excess zeros; Bottom panel – restricted distribution better depicting frequency of traps with a given catch of Red Snapper.

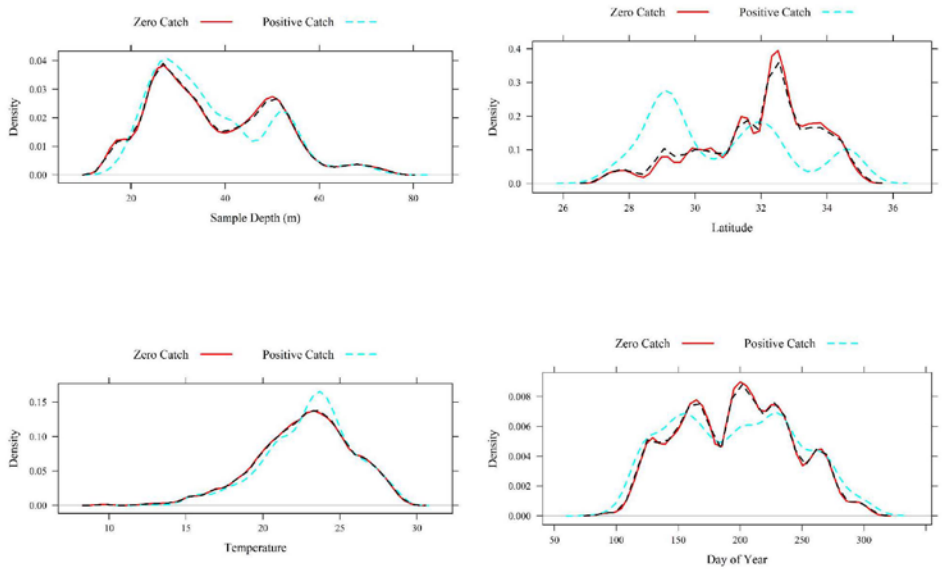

Figure 3: Density plots of all traps (1990-2016; dashed black line), negative (red line) and positive (dashed blue line) for Red Snapper with respect to each covariate considered in the model.

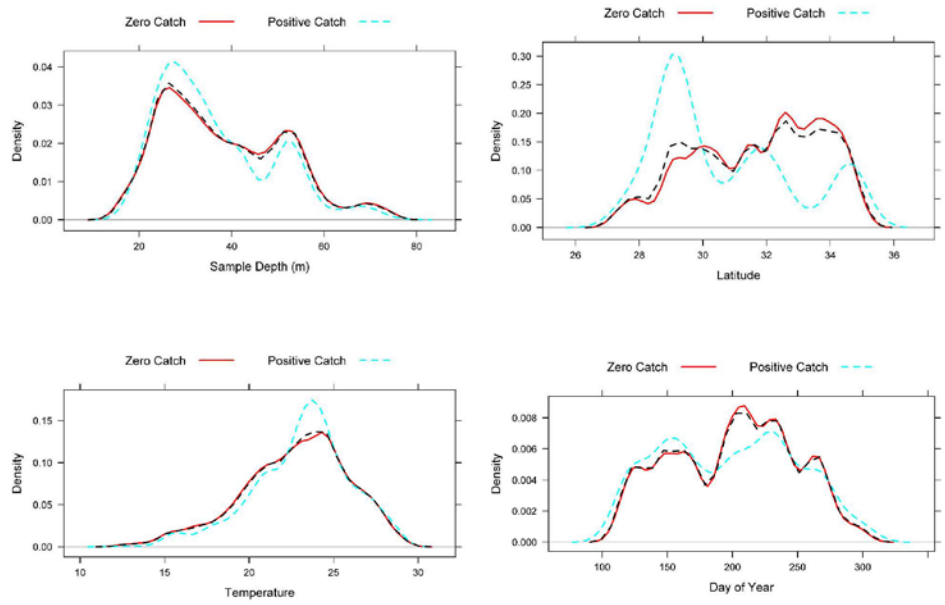

Figure 4: Density plots of all traps (2010-2016; dashed black line), negative (red line) and positive (dashed blue line) for Red Snapper with respect to each covariate considered in the model.

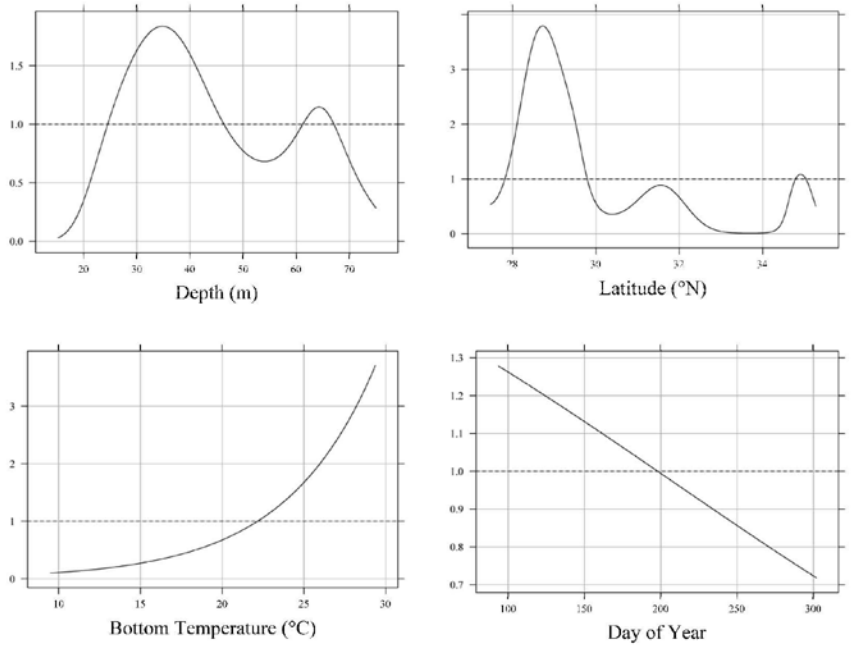

Figure 5: Predicted relative effect of each covariate on the catch of Red Snapper in chevron traps using the 1990-2016 data set. Note that the scale of the y-axis changes among panels, and hence y-axis scale can provide an indication of the magnitude of the effect of individual covariates.

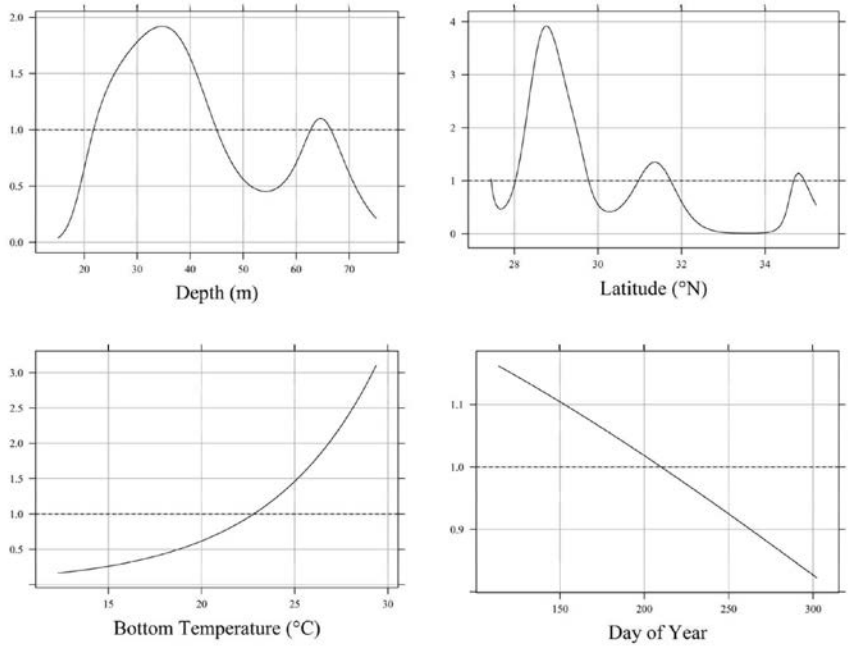

Figure 6: Predicted relative effect of each covariate on the catch of Red Snapper in chevron traps using the 2010-2016 data set. Note that the scale of the y-axis changes among panels, and hence y-axis scale can provide an indication of the magnitude of the effect of individual covariates.

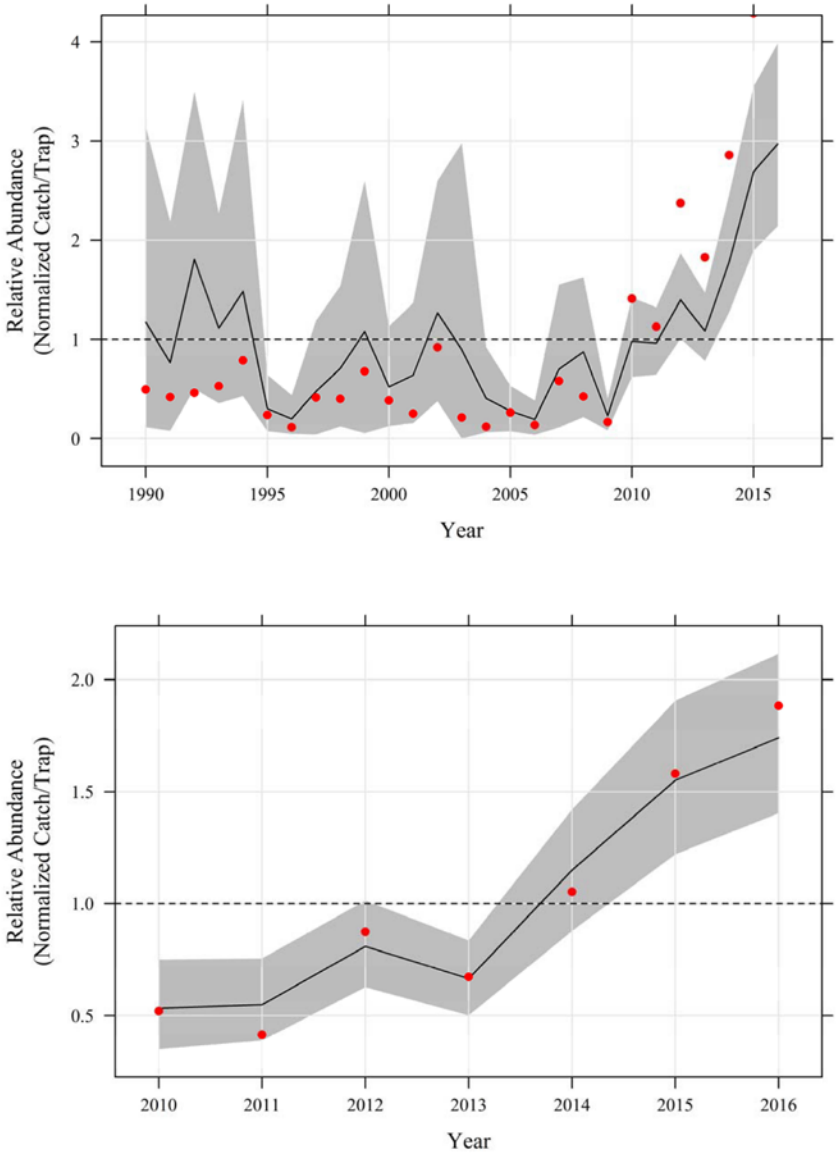

Figure 7: Red Snapper index of relative abundance based on the SERFS chevron trap survey. Top panel is the index based on the years 1990-2016. Bottom panel is the index based on the years 2010-2016. The ZINB standardized catch (solid black line) is normalized to the average relative abundance, as estimated by the model, during each surveys respective time series. Red dots represent normalized nominal annual relative abundance. Gray shaded region represents the 95% confidence interval of annual relative abundance based on 10,000 bootstraps.

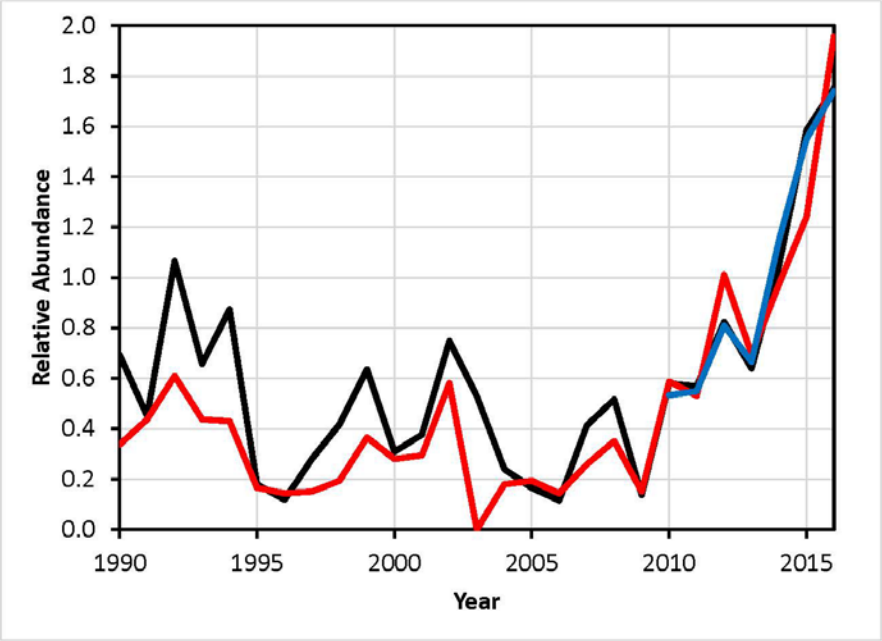

Figure 8: Red Snapper index of relative abundance based on the SERFS chevron trap survey, with annual relative abundance being normalized to the average relative abundance from 2010-2016. The different lines represent the relative abundance index developed using the full chevron trap time series and the methodology reported in Ballenger and Smart (2015; black line), the relative abundance index developed using the full chevron trap time series and the methodology reported in the SCDNR Reef Fish Survey 2016 trends report (red line), and the relative abundance index developed using only chevron trap data collected from 2010-2016 and the methodology reported in Ballenger and Smart (2015; blue line). The surveys are normalized to the average relative abundance from 2010-2016 here so that predicted changes in relative abundance in the overlapping period can be more easily compared.