Public Hearing Draft

AMENDMENT 17A to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region and Draft Environmental Impact Statement

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ABBREVIATIONS AND ACRONYMS

ABC	Acceptable biological catch
ACCSP	Atlantic Coastal Cooperative Statistics Program
ACL	Annual Catch Limits
AM	Accountability Measure
ACT	Annual Catch Target
APA	Administrative Procedures Act
ASMFC	Atlantic States Marine Fisheries Commission
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
CEA	Cumulative Effects Analysis
CEQ	Council on Environmental Quality
CFMC	Caribbean Fishery Management Council
CPUE	Catch per unit effort
CRP	Cooperative Research Program
CZMA	Coastal Zone Management Act
DEIS	Draft Environmental Impact Statement
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EFH-HAPC	Essential Fish Habitat - Habitat Area of Particular Concern
EIS	Environmental Impact Statement
ESA	Endangered Species Act of 1973
F	A measure of the instantaneous rate of fishing mortality
$F_{30\%SPR}$	Fishing mortality that will produce a static SPR = 30%.
$F_{45\%SPR}$	Fishing mortality that will produce a static SPR = 45%.
F_{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}
FEIS	Final Environmental Impact Statement
FMP	Fishery management plan
FMU	Fishery management unit
FONSI	Finding of No Significant Impact
GFMC	Gulf of Mexico Fishery Management Council
IFQ	Individual fishing quota
M	Natural mortality rate
MARFIN	Marine Fisheries Initiative
MARMAP	Marine Resources Monitoring Assessment and Prediction Program
MBTA	Migratory Bird Treaty Act

MFMT	Maximum Fishing Mortality Threshold
MMPA	Marine Mammal Protection Act of 1972
MRFSS	Marine Recreational Fisheries Statistics Survey
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	Minimum Stock Size Threshold
MSY	Maximum Sustainable Yield
NEPA	National Environmental Policy Act of 1969
NMFS	National Marine Fisheries Service
NMSA	National Marine Sanctuary Act
NOAA	National Oceanic and Atmospheric Administration
OFL	Overfishing Limit
OY	Optimum Yield
PQBM	Post Quota Bycatch Mortality
PSE	Percent Standard Error
R	Recruitment
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SAFE Report	Stock Assessment and Fishery Evaluation Report
SAMFC	South Atlantic Fishery Management Council
SDDP	Supplementary Discard Data Program
SEDAR	Southeast Data Assessment and Review
SEFSC	Southeast Fisheries Science Center
SERO	Southeast Regional Office
SFA	Sustainable Fisheries Act
SIA	Social Impact Assessment
SSC	Scientific and Statistical Committee
TAC	Total allowable catch
TL	Total length
T_{MIN}	The length of time in which a stock could rebuild to B_{MSY} in the absence of fishing mortality
USCG	U.S. Coast Guard

AMENDMENT 17A TO THE FISHERY MANAGEMENT PLAN FOR THE SNAPPER GROUPER FISHERY OF THE SOUTH ATLANTIC REGION

INCLUDING A DRAFT ENVIRONMENTAL IMPACT STATEMENT, INITIAL REGULATORY FLEXIBILITY ANALYSIS, DRAFT REGULATORY IMPACT REVIEW AND DRAFT SOCIAL IMPACT ASSESSMENT/FISHERY IMPACT STATEMENT

Proposed actions:	Specify a rebuilding plan for red snapper. Implement a red snapper monitoring program.
Lead agency:	FMP Amendment – South Atlantic Fishery Management Council EIS - NOAA Fisheries Service
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ABSTRACT

The need for action through Amendment 17A is to establish a rebuilding plan and implement new management for the overfished red snapper stock in the South Atlantic. Species in the fishery management unit are assessed on a routine basis and stock status may change as new information becomes available. In addition, changes in management regulations, fishing techniques, and social/economic structure can result in shifts in the percentage of harvest between user groups over time. More specifically, the actions proposed in Amendment 17A would:

- Specify an ACL and an AM for red snapper with management measures to reduce the probability that catches will exceed the stocks' ACL.
- Specify a rebuilding plan for red snapper.
- Specify status determination criteria for red snapper.
- Specify a monitoring program for red snapper.

This draft environmental impact statement (DEIS) has been prepared to analyze the effects of implementing regulations as listed above. Comments on this DEIS will be accepted for 45 days from publication of the Notice of Availability in the Federal Register.

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SUMMARY

The purpose of this amendment is to establish a rebuilding plan for red snapper, as well as Annual Catch Limits (ACLs), Accountability Measures (AMs), and updated management measures pursuant to reauthorized Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requirements. The SSC recommended at their December 2008 meeting that the ABC level for, and red snapper be set consistent with the rebuilding plan until it can be further amended on better scientific information. The SSC will meet in March and June 2009 to identify protocol for determining ABCs, which will be included in the Comprehensive ACL amendment. This amendment would also implement new status determination criteria for red snapper, including Maximum Sustainable Yield (MSY) and Optimum Yield (OY), which reflect current scientific information as provided by the assessments and approved by the SSC.

To summarize, actions proposed in Amendment 17A would:

- Specify an ACL and an AM for red snapper with management measures to reduce the probability that catches will exceed the stocks' ACL.
- Specify status determination criteria for red snapper.
- Specify a rebuilding plan for red snapper.
- Specify a monitoring program for red snapper.

1 Introduction `

1.1 Background

Management of the Federal snapper grouper fishery located off the South Atlantic in the 3-200 nautical mile (nm) U.S. Exclusive Economic Zone (EEZ) is conducted under the Fishery Management Plan for the snapper grouper Fishery (SAFMC 1983) (Figure 1-1). The fishery management plan (FMP) and its amendments are developed under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), other applicable Federal laws, and executive orders (E.O.s) and affect the management of 73 species (Table 1-1). The purpose of the FMP, as amended, is to manage the red snapper grouper fishery for optimum yield (OY) and specify an ACL and AM for red snapper which is undergoing overfishing.

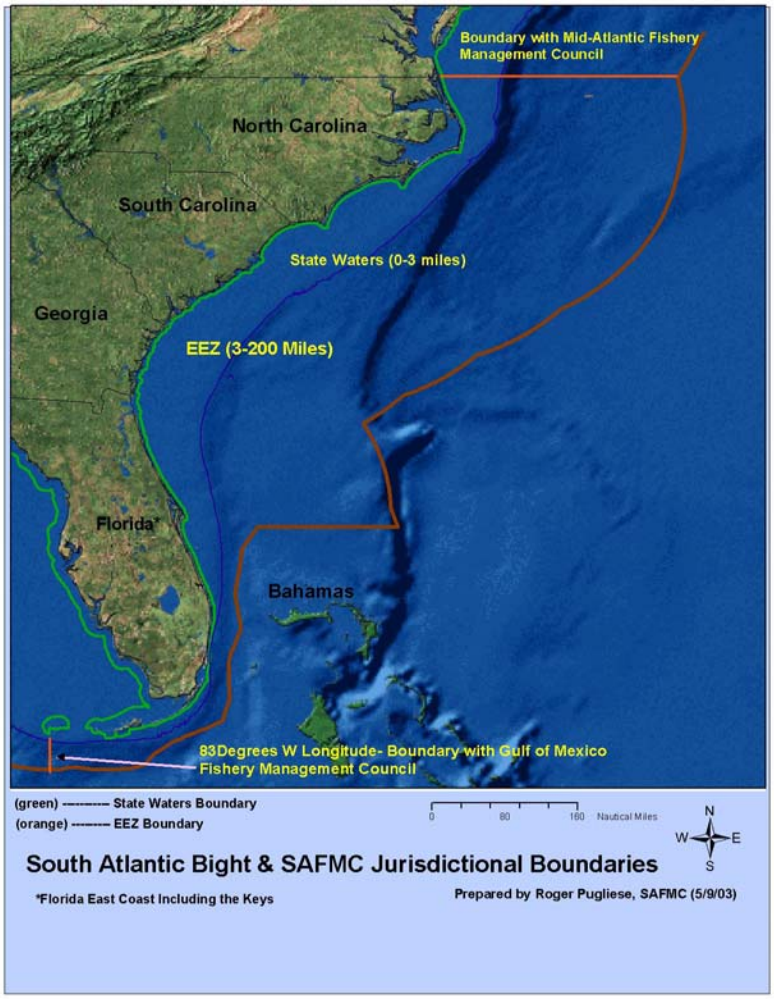

Figure 1-1. Jurisdictional boundaries of the South Atlantic Fishery Management Council.

Almaco jack, *Seriola rivoliana*
Atlantic spadefish, *Chaetodipterus faber*
Banded rudderfish, *Seriola zonata*
Bank sea bass, *Centropristis ocyurus*
Bar jack, *Carangoides ruber*
Black grouper, *Mycteroperca bonaci*
Black margate, *Anisotremus surinamensis*
Black sea bass, *Centropristis striata*
Black snapper, *Apsilus dentatus*
Blackfin snapper, *Lutjanus buccanella*
Blue runner, *Caranx crysos*
Blueline tilefish, *Caulolatilus microps*
Bluestriped grunt, *Haemulon sciurus*
Coney, *Cephalopholis fulva*
Cottonwick, *Haemulon melanurum*
Crevalle jack, *Caranx hippos*
Cubera snapper, *Lutjanus cyanopterus*
Dog snapper, *Lutjanus jocu*
French grunt, *Haemulon flavolineatum*
Gag, *Mycteroperca microlepis*
Golden tilefish, *Lopholatilus chamaeleonticeps*
Goliath grouper, *Epinephelus itajara*
Grass porgy, *Calamus arctifrons*
Gray (mangrove) snapper, *Lutjanus griseus*
Gray triggerfish, *Balistes capriscus*
Graysby, *Cephalopholis cruentata*
Greater amberjack, *Seriola dumerili*
Hogfish, *Lachnolaimus maximus*
Jolthead porgy, *Calamus bajonado*
Knobbed porgy, *Calamus nodosus*
Lane snapper, *Lutjanus synagris*
Lesser amberjack, *Seriola fasciata*
Longspine porgy, *Stenotomus caprinus*
Mahogany snapper, *Lutjanus mahogoni*
Margate, *Haemulon album*
Misty grouper, *Epinephelus mystacinus*
Mutton snapper, *Lutjanus analis*
Nassau grouper, *Epinephelus striatus*
Ocean triggerfish, *Canthidermis sufflamen*
Porkfish, *Anisotremus virginicus*
Puddingwife, *Halichoeres radiatus*
Queen snapper, *Etelis oculatus*
Queen triggerfish, *Balistes vetula*
Red grouper, *Epinephelus morio*
Red hind, *Epinephelus guttatus*
Red porgy, *Pagrus pagrus*
Red snapper, *Lutjanus campechanus*
Rock hind, *Epinephelus adscensionis*
Rock Sea Bass, *Centropristis philadelphica*
Sailors choice, *Haemulon parra*
Sand tilefish, *Malacanthus plumieri*
Saucereye porgy, *Calamus calamus*
Scamp, *Mycteroperca phenax*
Schoolmaster, *Lutjanus apodus*
Scup, *Stenotomus chrysops*
Sheepshead, *Archosargus probatocephalus*
Silk snapper, *Lutjanus vivanus*
Smallmouth grunt, *Haemulon chrysargyreum*
Snowy grouper, *Epinephelus niveatus*
Spanish grunt, *Haemulon macrostomum*
Speckled hind, *Epinephelus drummondhayi*
Tiger grouper, *Mycteroperca tigris*
Tomtate, *Haemulon aurolineatum*
Yellow jack, *Carangoides bartholomaei*
Yellowedge grouper, *Epinephelus flavolimbatus*
Yellowfin grouper, *Mycteroperca venenosa*
Yellowmouth grouper, *Mycteroperca interstitialis*
Yellowtail snapper, *Ocyurus chrysurus*
Vermilion snapper, *Rhomboplites aurorubens*
Warsaw grouper, *Epinephelus nigritus*
White grunt, *Haemulon plumierii*
Whitebone porgy, *Calamus leucosteus*
Wreckfish, *Polyprion americanus*

Stock assessments, through the evaluation of biological and statistical information, provide an evaluation of stock health and directionality of overall stock health under the current management regime and other potential future harvest conditions. More specifically, the assessments provide an estimation of the maximum sustainable yield (MSY) and a determination of the stock status (whether overfishing is occurring and whether the stock is overfished). Following the assessment, the Council's Scientific and Statistical Committee (SSC) reviews the stock assessment information and advises the Council on whether the stock assessment was performed utilizing the best available data and whether the outcome of the assessment is suitable for management purposes.

A stock assessment can range from simple (evaluation of trends in catch, average fish length, and catch-per-unit-effort) to complex (statistical catch-at-age models). The type of assessment varies based on available data and available resources used to conduct an assessment. In 1998, 2001, and 2003, the Council evaluated annual reports on major snapper grouper species compiled by the NOAA/NMFS Laboratory in Beaufort, NC. These reports outlined trends in catch data and estimated spawning potential ratio (SPR) values for species in the snapper grouper fishery management unit (FMU). In addition, the Council received a report on stock status and control rule alternatives in 2001 (Powers 2001). More recent stock assessments have been performed through the Southeast Data, Assessment, and Review (SEDAR) program. Stock assessments have determined that 10 species in the snapper grouper fishery management unit (FMU) are undergoing overfishing (Table 1-1). Red snapper is being addressed in this amendment and the other nine species determined be undergoing overfishing are being address in Snapper Grouper Amendment 17B.

Table 1-1. Assessment information for 10 species in the snapper grouper fishery management unit undergoing overfishing.

Species	**Most Recent Stock Assessment Source & Year Completed**	**Data Thru**	**Date SSC Approved**	**Overfishing?**	**Overfished?**	**Next Assessment Begins**
Golden tilefish[1]	SEDAR 4 (2004)	2002		Yes	No	2010
Snowy grouper[1]	SEDAR 4 (2004)	2002		Yes	Yes	2010
Speckled hind	Potts and Brennan (2001)	1999	n/a	Yes	Unknown	2010
Warsaw grouper	Huntsman *et al.* (1992)	1990	n/a	Yes	Unknown	2012
Black grouper	Potts and Brennan (2001)	1999	10/21/05	Yes	Unknown	2009
Black sea bass[1]	SEDAR Update 1 (2005)	2003	5/12/05	Yes	Yes	2011
Gag	SEDAR 10 (2006)	2004	6/12/07	Yes	No	2011
Red grouper	Potts and Brennan (2001)	1999	10/21/05	Yes	Unknown	2009
Vermilion snapper	SEDAR Update #3 (2007)	2006	6/12/07	Yes	Unknown	Not scheduled
Red snapper	SEDAR 15 (2008)	2006	6/11/08	Yes	Yes	2010

[1]Actions were implemented to reduce fishing mortality to a level expected to end overfishing. These stocks will be declared undergoing overfishing until a stock assessment confirms otherwise.

History of Scoping

A Notice of Intent (NOI) to prepare a Draft Environmental Impact Statement (DEIS) for Amendment 17 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region was published January 22, 2008 [73 FR 3701]. Amendment 17 contained actions to establish ACLs and AMs for the 10 South Atlantic snapper grouper species undergoing overfishing. Scoping meetings for Amendment 17, using an associated scoping document, were held February 4-8, and 10-12, 2009. After scoping for ACLs in Amendment 17 was completed, an NOI for Amendment 18 was published (April 7, 2008 [73 FR 18782]) to announce the development of A DEIS to support the establishment of a rebuilding plan for red snapper stock and various management measures to end its overfishing. Amendment 18 was scoped by the Council in April and May 2008. After scoping the issue of red snapper overfishing (Amendment 18), the Council decided it would be more appropriate to address all red snapper issues, i.e., ACLs, AMs, *and* overfishing in Amendment 17 even though they had been scoped individually. After this determination was made, the Council decided to split Amendment 17 into Amendments 17A and 17B in order to deal with all actions relating to red snapper separately from the other nine species undergoing overfishing. Thus, Amendment 17A was created to deal only with overfishing, ACLs, and AMs for red snapper, and Amendment 17B was created to establish ACLs, and AMs for gag, vermilion, red grouper, black grouper, snowy grouper, warsaw grouper, black sea bass, speckled hind, and golden tilefish. Additionally, the Regional Administrator determined the newly created Amendment 17B would be supported by an Environmental Analysis rather than an Environmental Impact Statement (EIS), and Amendment 17A (red snapper) would be supported by an EIS. Because all of the actions contained within, what are now Amendments 17A and 17B, were scoped under the original Amendment 17 and Amendment 18, NOAA Fisheries Service did not publish any additional or separate NOIs. Issues raised during the scoping process regarding any or all 10 snapper grouper species undergoing overfishing are either addressed and/or analyzed in the supporting NEPA documentation for Amendments 17A and 17B.

1.2 Purpose and Need

The purpose of this amendment is to establish an Annual Catch Limits (ACL) and an Accountability Measure (AM) for red snapper, including management measures to reduce the probability that catches will exceed the stocks' ACLs pursuant to reauthorized Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requirements. The SSC recommended at their December 2008 meeting that the acceptable biological catch (ABC) level for red snapper be set consistent with the rebuilding plan until it can be further amended on better scientific information. The SSC met in March and June 2009 to identify protocol for determining ABCs, which will be included in the Comprehensive ACL amendment.

The SSC has recommended an overfishing limit (OFL) equal to Maximum Fishing Mortality Threshold. The Science Center has provided projections of spawning stock biomass, recruitment, landings, discards, and probability of stock recovery, under different fishing mortality rates (Red Snapper Projections V; dated 03.19.09). The likely range of the ABC provided by the SSC will be between 61,000 to 82,000 lbs of total removals. NOTE: THE SEFSC PRODUCED NEW REBUILDING PROJECTIONS THAT INCORPORATE RECENT RECRUITMENT, SEE APPENDIX X

This amendment also would implement new status determination criteria for red snapper, including Maximum Sustainable Yield (MSY) and Optimum Yield (OY), which reflect current scientific information as provided by the assessments and approved by the SSC. The amendment would also include a rebuilding plan for red snapper.

To summarize, actions proposed in Amendment 17A would:

- Specify an ACL and an AM for red snapper with management measures to reduce the probability that catches will exceed the stocks' ACL.
- Specify status determination criteria for red snapper.
- Specify a rebuilding plan for red snapper.
- Specify a monitoring program for red snapper.

ACLs , ACTs, and AMs

Revisions to the Magnuson-Stevens Act in 2006 require that by 2010, Fishery Management Plans (FMPs) for fisheries determined by the Secretary to be subject to overfishing must establish a mechanism for specifying ACLs at a level that prevents overfishing and does not exceed the recommendations of the respective Council's SSC or other established peer review processes. These FMPs also are required to establish within this period measures to ensure accountability. AMs are management controls that ensure that the ACLs are not exceeded; examples include corrective measures if overages occur and implementation of an in-season monitoring program. By 2011, FMPs for all other fisheries, except fisheries for species with annual life cycles, must meet these requirements.

The Council is employing a step-wise decision-making process in setting ACLs, ACTs, and management measures to ensure harvest is at or below the ACL (Figure 1-2). The SSC is expected to specify OFLs and ABC recommendations in the future based on criteria specific to levels of data availability. The ACL is the annual catch limit expressed in pounds or numbers of fish that serves as the basis for invoking accountability measures. Setting the ACL provides an opportunity to divide the total ACL into sector-specific ACLs but is not required. The ACT is the target specified in pounds or numbers of fish. Specifying an ACT is optional and up to the discretion of the Council. Catch includes fish that are retained for any purpose, as well dead discards. For fisheries where bycatch estimates are not available in a timely enough manner to manage annual catch, targets may be specified for landings, so long as an estimate of bycatch is accounted for such that total of landings and bycatch will not exceed the stock's ACL.

The final NS1 guidelines recognizes that existing FMPs may use terms and values that are similar to, associated with, or may be equivalent to OFL, ABC, ACL, ACT, and AM in many fisheries for which annual specifications are set for different stocks or stock complexes. In these situations the guidelines suggest that, as Councils revise their FMPs, they use the same terms as set forth in the NS1 guidelines. Therefore, Amendment 17A will include a discussion of existing harvest level designations that could be used by the Council to specify OFLs, ACLs, ACTs, ABCs, and AMs.

AMs are designed to provoke an action once either the ACL or ACT is reached during the course of a fishing season to reduce the risk overfishing will occur. However, depending on how timely the data are, it might not be realized that either the ACL and/or ACT has been reached until after a season has ended. Such AMs include prohibited retention of species once the sector ACT is met, shortening the length of the subsequent fishing season to account for overages of the ACL, and reducing the ACT in the subsequent fishing season to account for overages of the ACL.

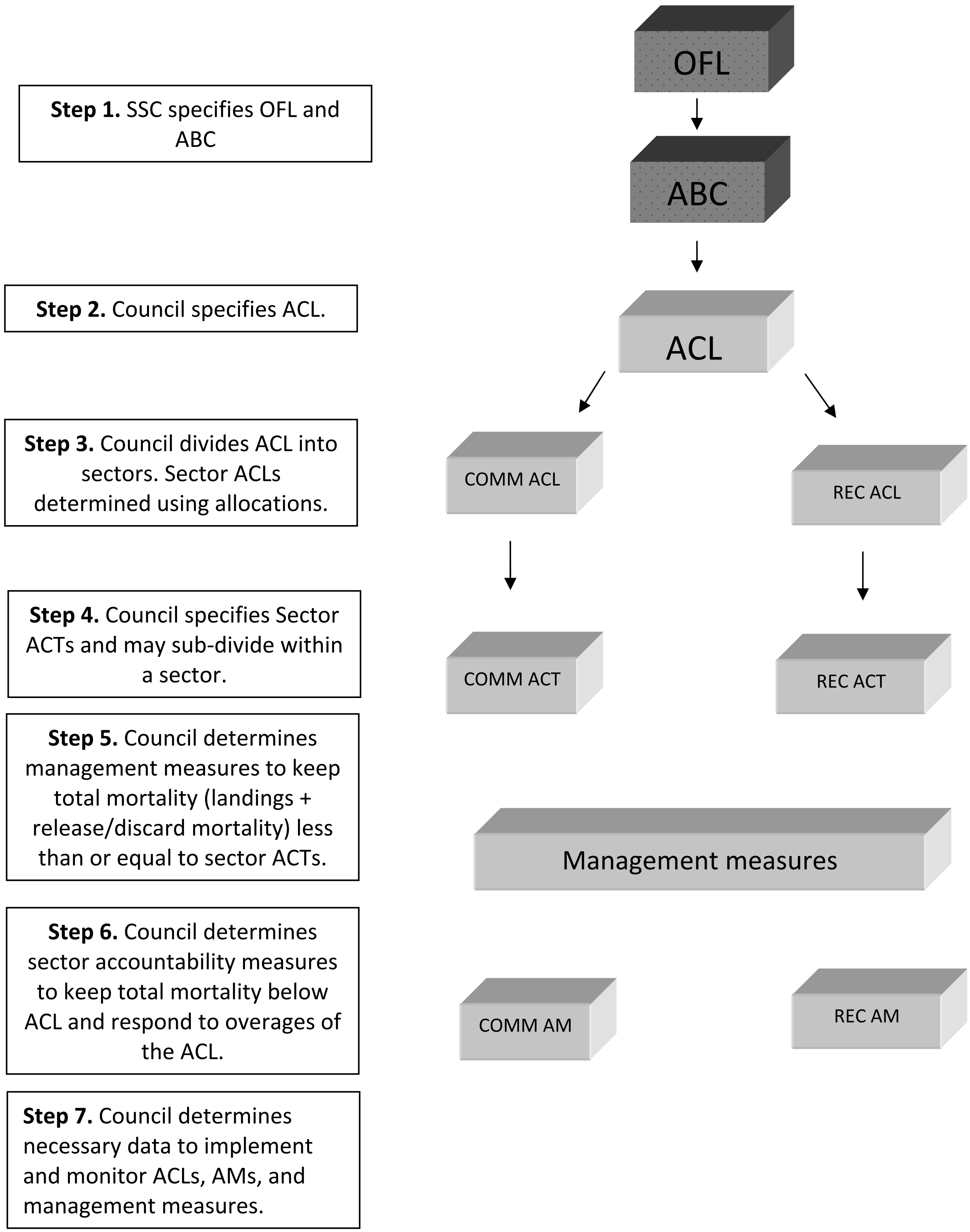

Figure 1-2. The tiering process employed in Snapper Grouper Amendment 17A

Modify management measures as needed to limit harvest to the ACL or ACT

The Council is responsible for implementing regulations that ensure annual catches do not exceed the ACL to ensure overfishing does not occur. The Council will consider alternatives that could adjust management measures for red snapper, which is currently identified as experiencing overfishing.

The Council proposes to implement restrictions to fishing activity in the deepwater fishery due to the management uncertainty (e.g., lack of sufficient information about catch) and low levels of available harvest. The Council's objective is to implement a management plan to ensure that fishing mortality does not exceed the ACLs.

The red snapper stock assessment, completed February 2008, determined that the species was undergoing overfishing and was overfished. Biomass shows a sharp decline during the 1950s and 1960s, continued decline during the 1970s, and stable but low levels since 1980. Estimates of annual biomass have been well below B_{MSY} since the mid-1960s, with possibly some small amount of recovery since implementation of current size limits in 1992 (Figure 1-3).

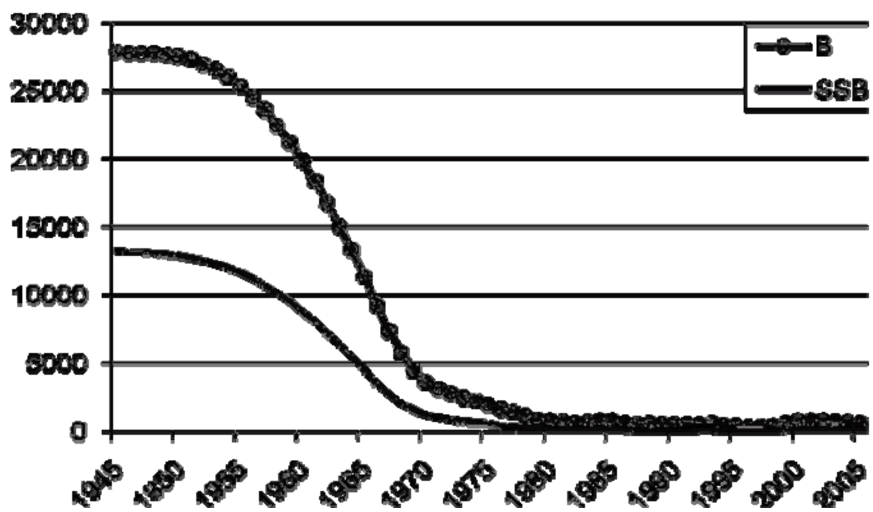

Figure 1-3. Biomass and Spawning Stock Biomass (pounds).

The Council received notification, in a letter dated July 8, 2008, that the South Atlantic red snapper stock is undergoing overfishing and is overfished and that the Magnuson-Stevens Act requires the Council to prepare a plan amendment or proposed regulations to end overfishing within one year. The Council is proposing management measures in this amendment to end overfishing of red snapper and rebuild the stock.

Specify Status Determination Criteria for Red Snapper

> **Definitions**
> *MSST.* The biomass level below which a stock is considered overfished
> *MFMT.* The maximum level of fishing mortality that a stock or complex can withstand, while still producing MSY on a continuing basis.

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires each FMP define four **management reference points.** Reference points are biological signposts against which the status of a stock can be judged and allow managers to measure fishery status and performance. More specifically, by evaluating the current stock biomass (B) and fishing mortality rate (F) in relation to these reference points, fishery managers can determine whether a fishery is overfished or undergoing overfishing, and whether current management measures are sufficient to prevent overfishing and achieve the Optimum Yield (OY).

The four reference points are **MSY, OY, minimum stock size threshold (MSST), maximum fishing mortality threshold (MFMT)**. MSY and OY were described in the previous section. MSST and MFMT are benchmarks used by fishery managers to indicate if a fishery is overfished and if overfishing is occurring, respectively (see box for definitions). When the rate of mortality on a stock caused by fishing activities exceeds MFMT, overfishing is occurring. When the stock biomass is below MSST, the stock is considered overfished.

In the past for snapper grouper species, the Council has specified either numeric values or proxies for, or ways to calculate (when data became available) the four reference points described above. Recent stock assessments have provided numerical values for the benchmarks. The Council is proposing the following changes based on the gag and vermilion snapper assessments.

- Biomass-based management reference points based on the best available scientific information and;
- OY definitions to be more consistent with the National Standard Guidelines related to that parameter.

For more detail on the Council's reference points…
The Secretary approved the numerical MSY, MSST, and MFMT estimates proposed in Snapper Grouper Amendments 11 (SAFMC 1999) and 12 (SAFMC 2000) for black sea bass and red porgy, respectively. Amendment 15A specified MSY, MSST, MFMT, and OY for black sea bass, snowy grouper, and red porgy. Amendment 15B has alternatives that would specify management reference points for golden tilefish. Amendment 16 specifed management reference points for gag and vermilion snapper. The Snapper Grouper FMP currently defines MSY and OY for all other snapper grouper stocks as the yield produced by fishing at fixed exploitation rates (F_{MSY} and F_{OY}, respectively), which are designed to remove a constant fraction of the stocks each year. When F_{MSY} has not been estimated by a stock assessment, it is approximated as the fishing mortality rate that would reduce the long-term average level of spawning per recruit (static SPR) to 30-40% of the long-term average that would be expected in the absence of fishing. Similarly, F_{OY} is estimated as a rate of fishing that would reduce the long-term average level of static SPR to 40-50% of that which would be expected for a virgin stock. The MSST of snapper grouper stocks except snowy grouper and golden tilefish is defined as one-half of the stock biomass at MSY (B_{MSY}), or the product of that biomass and one minus the natural mortality rate, whichever is greater. This definition is designed to specify a higher overfished threshold for less productive stocks relative to those stocks that are highly productive and capable of increasing in biomass more quickly. However, when the estimate of the natural mortality rate is small (i.e., snowy grouper and golden tilefish), the overfished threshold can be very close to the rebuilding goal of B_{MSY}. Amendment 15A defined MSST = $SSB_{MSY}(0.75)$ for snowy grouper. The preferred alternative in Amendment 15B would also define MSST = $SSB_{MSY}(0.75)$ for golden tilefish. The Council currently defines MFMT as F_{MSY} or fishing mortality that will produce the MSY.

<u>Red Snapper Rebuilding Plan</u>

The red snapper stock in the South Atlantic has been assessed through SEDAR. The assessment indicates that the stock is undergoing overfishing and is overfished. The SSC determined the assessment is based upon the best available science at their June 2008 meeting. The Council is required by the Magnuson-Stevens Act to implement rebuilding plans for overfished species. The intent of a rebuilding plan is to increase biomass of overfished stocks to a sustainable level (B_{MSY}) within a specified period. The purpose of specifying rebuilding plans is to achieve conservation goals, while minimizing to the extent practicable adverse socioeconomic impacts.

Four components have been identified as being necessary for a rebuilding plan: (1) An estimate of biomass at the maximum sustainable yield (B_{MSY}) (the rebuilding goal), (2) a rebuilding schedule, (3) a rebuilding strategy, and (4) an estimate of optimum yield (OY) expected when stock recovery has been completed (Powers 1996; Restrepo *et al*. 1998). Rebuilding schedules define the timeframe in which the biomass of the overfished stock will be rebuilt. Rebuilding strategies define catch levels and fishing mortality rates for the overfished stock throughout the rebuilding schedule to prevent overfishing and achieve the rebuilding goal. The rebuilding goal is the stock biomass that is capable of producing MSY (B_{MSY}) and may be specified in terms of overall stock biomass or in spawning stock biomass. Optimum yield (OY) is the target harvest level for a rebuilt stock. Once the stock surpasses the rebuilding target, fishery management plans can transition from rebuilding to optimal yield management.

The absence of a rebuilding plan hinders routine review and accountability and reduces the likelihood of achieving conservation objectives. A rebuilding plan provides annual allowable mortality levels and an ABC during the rebuilding period, which should not be exceeded if the stock is to rebuild to B_{MSY} by the end of the rebuilding schedule. Landings are compared to the ABC each year and adjustments can be made to keep the stock on the rebuilding trajectory. Without a rebuilding plan that specifies annual catch or mortality targets, it would be difficult to ensure that the stock is making progress towards rebuilding and to evaluate the management and regulations.

Red Snapper Monitoring Program

The Council is concerned that restrictions on red snapper harvest through management measures in Amendment 17A will decrease the quantity of fishery-dependent samples. A decrease in the data collected has the potential to increase the uncertainty around the status determination estimates developed through the stock assessment. Therefore, the Council is considering implementing a monitoring program specific to red snapper to promote the sampling of fish.

1.3 History of Management

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 FMP, as well as some events not covered in amendment actions.

Table 1-2. History of management.

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" 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 (1986)	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 (1988)	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 lbs s-g on board. -Established rebuttable assumption that vessel with s-g on board had harvested such fish in EEZ.
Regulatory Amendment #2 (1988)	03/30/89	PR: 53 FR 32412 FR: 54 FR 8342	-Established 2 artificial reefs off Ft. Pierce, FL as SMZs.
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.
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 (1990)	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

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	8/3/90	55 FR 32257	-Added wreckfish to the 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
Emergency Rule Extension	11/1/90	55 FR 40181	-extended the measures implemented via emergency rule on 8/3/90
Amendment #3 (1990)	01/31/91	PR: 55 FR 39023 FR: 56 FR 2443	-Added wreckfish to the FMU; -Defined optimum yield and overfishing -Required permit to fish for, land or sell wreckfish; -Required catch and effort reports from selected, permitted vessels; -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; and -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.

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 #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 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" limit – lane snapper -10" limit – vermilion snapper (recreational only) -12" limit – red porgy, vermilion snapper (commercial only), gray, yellowtail, mutton, schoolmaster, queen, blackfin, cubera, dog, mahogany, and silk snappers -20" limit – red snapper, gag, and red, black, scamp, yellowfin, and yellowmouth groupers. -28" 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 south of Cape Canaveral, FL -spawning season closure – commercial harvest mutton snapper >snapper aggregate prohibited during May and June -charter/headboats and excursion boat possession limits extended

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Amendment #5 (1991)	04/06/92	PR: 56 FR 57302 FR: 57 FR 7886	-Wreckfish: established limited entry system with 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 TAC
Emergency Rule	8/31/92	57 FR 39365	-Black Sea Bass (bsb): modified definition of bsb pot; allowed multi-gear trips for bsb; allowed retention of incidentally-caught fish on bsb trips
Emergency Rule Extension	11/30/92	57 FR 56522	-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 (1992)	07/06/93	FR: 58 FR 36155	-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 (1992)	07/31/93	PR: 58 FR 13732 FR: 58 FR 35895	-Established 8 SMZs off S. 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	-commercial quotas for snowy grouper, golden tilefish -commercial trip limits for snowy grouper, golden tilefish, speckled hind, and warsaw grouper -include 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 IFQ system
Amendment #7 (1994)	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 N. Carolina -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 (1994)	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
Notice of Control Date	04/23/97	62 FR 22995	-Anyone entering federal bsb pot fishery off S. Atlantic states after 04/23/97 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.
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 demonstrate landings of any species in SG FMU in 1993, 1994, 1995 or 1996; and have held valid SG permit between 02/11/96 and 02/11/97. -granted transferable permit with unlimited landings if vessel landed ≥ 1,000 lbs. of snapper grouper spp. 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 Council's habitat responsibility -allowed retention of snapper grouper spp. 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.
Regulatory Amendment #7 (1998)	01/29/99	PR: 63 FR 43656 FR: 63 FR 71793	-Established 10 SMZs at artificial reefs off South Carolina.
Interim Rule Request	1/16/98		-Council requested all Amendment 9 measures except black sea bass pot construction changes be implemented as an interim request under MSA
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
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

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 (1998)	2/24/99	PR: 63 FR 63276 FR: 64 FR 3624	-<u>Red porgy</u>: 14" length (recreational and commercial); 5 fish rec. bag limit; no harvest or possession > bag limit, and no purchase or sale, in March and April. -<u>Black sea bass</u>: 10" length (recreational and commercial); 20 fish rec. bag limit; required escape vents and escape panels with degradable fasteners in bsb pots -<u>Greater amberjack</u>: 1 fish rec. bag limit; no harvest or possession > bag limit, and no purchase or sale, during April; quota = 1,169,931 lbs; began fishing year May 1; prohibited coring. -<u>Vermilion snapper</u>: 11" length (recreational) Gag: 24" length (recreational); no commercial harvest or possession > bag limit, and no purchase or sale, during March and April -<u>Black grouper</u>: 24" length (recreational and commercial); no harvest or possession > bag limit, and no purchase or sale, during March and April. -<u>Gag and Black grouper</u>: within 5 fish aggregate grouper bag limit, no more than 2 fish may be gag or black grouper (individually or in combination) -<u>All SG without a bag limit</u>: aggregate recreational bag limit 20 fish/person/day, excluding tomtate and blue runners -<u>Vessels with longline gear</u> aboard may only possess snowy, warsaw, yellowedge, and misty grouper, and golden, blueline and sand tilefish.
Amendment #9 (1998) resubmitted	10/13/00	PR: 63 FR 63276 FR: 65 FR 55203	-Commercial trip limit for greater amberjack
Regulatory Amendment #8 (2000)	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
Emergency Interim Rule	09/08/99, expired 08/28/00	64 FR 48324 and 65 FR 10040	-Prohibited harvest or possession of red porgy.
Emergency Action	9/3/99	64 FR 48326	-Reopened the Amendment 8 permit application process
Amendment #10 (1998)	07/14/00	PR: 64 FR 37082 and 64 FR 59152 FR: 65 FR 37292	-Identified EFH and established HAPCs for species in the SG FMU.

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Amendment #11 (1998d)	12/02/99	PR: 64 FR 27952 FR: 64 FR 59126	-MSY proxy: goliath and Nassau grouper = 40% static 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 (MSST=3.72 mp, 1995 biomass=1.33 mp); undergoing overfishing (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 (2000)	09/22/00	PR: 65 FR 35877 FR: 65 FR 51248	-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 during Jan-April; 1 fish bag limit; 50 lb. bycatch comm. trip limit May-December; modified management options and list of possible framework actions.
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 spp. within the *Oculina* Experimental Closed Area.
Notice of Control Date	10/14/05	70 FR 60058	-The Council is considering management measures to further limit participation or effort in the commercial fishery for snapper grouper species (excluding Wreckfish).

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 #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. Snowy Grouper Commercial: Quota (gutted weight) = 151,000 lbs gw in year 1, 118,000 lbs gw in year 2, and 84,000 lbs gw in year 3 onwards. Trip limit = 275 lbs gw in year 1, 175 lbs gw in year 2, and 100 lbs gw in year 3 onwards. Recreational: Limit possession to one snowy grouper in 5 grouper per person/day aggregate bag limit. 2. Golden Tilefish Commercial: Quota of 295,000 lbs gw, 4,000 lbs gw trip limit until 75% of the quota is taken when the trip limit is reduced to 300 lbs gw. Do not adjust the trip limit downwards unless 75% is captured on or before September 1. Recreational: Limit possession to 1 golden tilefish in 5 grouper per person/day aggregate bag limit. 3. Vermilion Snapper Commercial: Quota of 1,100,000 lbs gw. Recreational: 12" size limit. 4. Black Sea Bass Commercial: Commercial quota (gutted weight) of 477,000 lbs gw in year 1, 423,000 lbs gw in year 2, and 309,000 lbs gw in year 3 onwards. Require 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. Require black sea bass pots be removed from the water when the quota is met. Change fishing year from calendar year to June 1 – May 31. Recreational: Recreational allocation of 633,000 lbs gw in year 1, 560,000 lbs gw in year 2, and 409,000 lbs gw in year 3 onwards. Increase minimum size limit from 10" to 11" in year 1 and to 12" in year 2. Reduce recreational bag limit from 20 to 15 per person per day. Change fishing year from the calendar year to June 1 through May 31. 5. Red Porgy Commercial and recreational 1. Retain 14" TL size limit and seasonal closure (retention limited to the bag limit); 2. Specify a commercial quota of 127,000 lbs 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; 3. Increase commercial trip limit from 50 lbs ww to 120 red porgy (210 lbs gw) during May through December; 4. Increase recreational bag limit from one to three red porgy per person per day.
Notice of Control Date	3/8/07	72 FR 60794	-The Council may consider measures to limit participation in the snapper grouper for-hire fishery
Amendment	2/12/09	PR: 73 FR 32281	-Establish eight deepwater Type II marine protected

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.
#14 (2007) Sent to NMFS 7/18/07		FR: 74 FR 1621	areas (MPAs) to protect a portion of the population and habitat of long-lived deepwater snapper grouper species.
Amendment #15A (2007)	3/14/08	73 FR 14942	- Establish rebuilding plans and SFA parameters for snowy grouper, black sea bass, and red porgy.
Amendment #15B (2008b)	TBD	PR: 74 FR 30569	- Prohibit the sale of bag-limit caught snapper grouper species. -Reduce the effects of incidental hooking on sea turtles and smalltooth sawfish. - Adjust commercial renewal periods and transferability requirements. - Implement plan to monitor and assess bycatch, - Establish reference points for golden tilefish. - Establish allocations for snowy grouper (95% com & 5% rec) and red porgy (50% com & 50% rec).
Amendment #14 (2007) Sent to NMFS 7/18/07	2/12/09	PR: 73 FR 32281 FR: 74 FR 1621	-Establish 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 (2007)	3/14/08	73 FR 14942	- Establish rebuilding plans and SFA parameters for snowy grouper, black sea bass, and red porgy.
Amendment #15B (2008b)	TBD	PR: 74 FR 30569	- Prohibit the sale of bag-limit caught snapper grouper species. -Reduce the effects of incidental hooking on sea turtles and smalltooth sawfish. - Adjust commercial renewal periods and transferability requirements. - Implement plan to monitor and assess bycatch, - Establish reference points for golden tilefish. - Establish allocations for snowy grouper (95% com & 5% rec) and red porgy (50% com & 50% rec).
Amendment #16 (SAFMC 2008c)	7/29/09	PR: 74 FR 6297 FR: 74 FR 30964	-Specify SFA parameters for gag and vermilion snapper -For gag grouper: Specify interim allocations 51%com & 49%rec; rec & com spawning closure January through April; directed com quota=348,440 pounds gutted weight; reduce 5-grouper aggregate to 3-grouper and 2 gag/black to 1 gag/black and exclude captain & crew from possessing bag limit. -For vermilion snapper: Specify interim allocations 68%com & 32%rec; directed com quota split Jan-June=168,501 pounds gutted weight and 155,501 pounds July-Dec; reduce bag limit from 10 to 4 and a rec closed season October through May 15. In addition, the NMFS RA will set new regulations based on new stock assessment. -Require dehooking tools.

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 #17A (TBD)	TBD	TBD	-Specify an ACL and an AM for red snapper with management measures to reduce the probability that catches will exceed the stocks' ACL -Specify a rebuilding plan for red snapper -Specify status determination criteria for red snapper -Specify a monitoring program for red snapper
Amendment #17B (TBD)	TBD	TBD	-Specify ACLs, ACTs, and AMs, where necessary, for 9 species undergoing overfishing. -Modify management measures as needed to limit harvest to the ACL or ACT. -Update the framework procedure for specification of total allowable catch.
Notice of Control Date	12/4/08	TBD	Establishes a control date for the golden tilefish fishery of the South Atlantic
Notice of Control Date	12/4/08	TBD	Establishes control date for black sea bass pot fishery of the South Atlantic
Amendment 18 (TBD)	TBD	TBD	-Extend the range of the snapper-grouper FMP north -Limit participation and effort in the golden tilefish fishery -Modifications to management of the black sea bass pot fishery -Separate snowy grouper quota into regions/states -Separate the gag recreational allocation into regions/states -Change the golden tilefish fishing year -Improve the accuracy, timing, and quantity of fisheries statistics -Designate EFH in new northern areas

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 19	TBD	TBD	-Establish deepwater coral HAPCs
Amendment 20	TBD	TBD	-Update wreckfish ITQ according to reauthorized MSFCMA -Establish ACLs, AMs, and management reference points for wreckfish fishery
Comprehensive ACL Amendment	TBD	TBD	-Establish ABC control rules, establish ABCs, ACTs, and AMs for species not undergoing overfishing -Remove some species from South Atlantic FMUs -Specify allocations among the commercial, recreational, and for-hire sectors for species not undergoing overfishing -Limit the total mortality for federally managed species in the South Atlantic to the ACTs -Address spiny lobster issues.

1.3 Management Objectives

Objectives of the Snapper Grouper FMP, as modified by Amendment 8 (SAFMC June 1996), are shown below. In addition, two new objectives as proposed in Amendment 17A are also provided.

1. Prevent overfishing.
2. Collect necessary data.
3. Promote orderly utilization of the resource.
4. Provide for a flexible management system.
5. Minimize habitat damage.
6. Promote public compliance and enforcement.
7. Mechanism to vest participants.
8. Promote stability and facilitate long run planning.
9. Create market-driven harvest pace and increase product continuity.
10. Minimize gear and area conflicts among fishermen.
11. Decrease incentives for overcapitalization.
12. Prevent continual dissipation of returns from fishing through open access.
13. Evaluate and minimize localized depletion.

The existing management program does not currently include objectives to end overfishing and rebuild overfished stocks, actions now required by the Reauthorized Magnuson-Stevens Act. Therefore, the Council has recommended adding the following two new management objectives to the FMP: This should be brought to the Council's attention so they know it is in here.

14. End overfishing of snapper grouper stocks undergoing overfishing.
15. Rebuild stocks declared overfished.

2 Actions and Alternatives

Section 2 outlines alternatives considered by the Council in this amendment and compares their environmental consequences (described in detail in **Section 4.0**). These alternatives were identified and developed through multiple processes, including the scoping process, public hearings and/or comments, interdisciplinary plan team meetings, and meetings of the Council, the Council's Snapper Grouper Committee, Snapper Grouper Advisory Panel, and Scientific and Statistical Committee. Species affected by the proposed actions and alternatives below include: Golden tilefish, speckled hind, warsaw grouper, snowy grouper, black grouper, black sea bass, gag, red grouper, vermilion snapper, and red snapper. Alternatives the Council considered but eliminated from detailed study during the development of this amendment are described in **Appendix A**.

2.1. Proxy Maximum Sustainable Yield (MSY) for red snapper

Table 2-1. MSY and MSY proxy alternatives for red snapper.

Alternatives	Equation	F_{MSY}	MSY Values (lbs whole weight)
Alternative 1 (no action)	MSY equals the yield produced by F_{MSY}. $F_{30\%SPR}$ is used as the F_{MSY} proxy for all stocks.	$F_{30\%SPR}$[1]= 0.148[2]	2,431,000[3]
Alternative 2 (preferred)	MSY equals the yield produced by F_{MSY} or the F_{MSY} proxy. MSY and F_{MSY} are defined by the most recent SEDAR/SSC.[4]	$F_{40\%SPR}$= 0.104[2]	2,304,000[5]

[1]Prior to SEDAR 15 (2008), Potts et al. (2001) estimated $F_{30\%SPR}$= 0.40.
[2]Source: Red Snapper Projections V dated March 19, 2009
[3]The value for MSY was not specified in Amendment 11. Based on SEDAR 15 (2008) $F_{30\%SPR}$ = 0.148; yield at $F_{30\%SPR}$ = 2,431,000 lbs whole weight (Table 4.1 from Red Snapper Projections V dated March 19, 2009).
[4]The Review Panel from SEDAR and the SSC recommended a proxy of $F_{40\%SPR}$ for F_{MSY}.
[5]The values for MSY and $F_{40\%\ SPR}$ are defined by Red Snapper Projections V dated March 19, 2009. The range is MSY from sensitivity runs is 559,000 lbs whole weight to 3,927,000 lbs whole weight.

Table 2-2. Criteria used to determine the overfished and overfishing status of red snapper.

Quantity	Units	$F_{40\%}$ Proxy	$F_{30\%}$ Proxy	Status
F_{MSY}	y−1	0.104	0.148	–
SSB_{MSY}	1000 lbs	17,863	13,283	–
D_{MSY}	1000	39	54	–

	fish			
Recruits at F_{MSY}	1000 fish	693	686	–
Y at 65% F_{MSY}	1000 lb	1984	2257	–
Y at 75% F_{MSY}	1000 lb	2104	2338	–
Y at 85% F_{MSY} Y	1000 lb	2199	2391	–
Y at F_{MSY}	1000 lb	2304	2431	–
MSST	1000 lb	16,470	12,247	–
F_{2006}/ F_{MSY}	–	7.67	5.39	Overfishing
SSB_{2006}/SSB_{MSY}	–	0.02	0.03	–
SSB_{2006}/MSST	–	0.03	0.04	Overfished

Source: Table 4.1 in Red Snapper Projections V dated March 19, 2009.

2.1.1 Comparison of Alternatives

MSY in **Alternative 1 (Status Quo)** is defined as the yield produced by F_{MSY} where $F_{30\%SPR}$ is used as the F_{MSY} proxy and represents the overfishing level defined in Amendment 11. In **Alternative 1 (Status Quo)**, MSY was not specified in the SFA Amendment 11; however, Table 4.1 from Red Snapper Projections V dated March 19, 2009 provides an estimate of the yield equal to $F_{30\%SPR}$ proxy as 2,431,000 lbs whole weight based on SEDAR 15 (2008). **Alternative 2 (Preferred)** would redefine the MSY of the red snapper stock to equal the value associated with the $F_{40\%SPR}$ proxy (2,304,000 lbs whole weight).

Alternative 2 (Preferred) is based on the SSC's recommendation and would specify an MSY proxy equal the yield at $F_{40\%SPR}$ with a steepness of 0.95. MSY for other species assessed through the SEDAR process has been based on the yield at F_{MSY} or the Council's status quo proxy for F_{MSY} ($F_{30\%SPR}$). Therefore, **Alternative 2 (Preferred)** would establish a new proxy for F_{MSY} not previously used, which is more conservative than the status quo proxy of $F_{30\%SPR}$. The choice of **Alternative 2 (Preferred)**, which uses $F_{40\%SPR}$ as a proxy for F_{MSY} versus $F_{30\%SPR}$ as proxy for F_{MSY} depends on how much risk the Council is willing to take. If $F_{30\%SPR}$ is not a proper proxy for F_{MSY}, the Council could have to take corrective actions down the road to rebuild the stock to B_{MSY} within the allowable timeframe. **Alternative 2 (Preferred)**, which uses $F_{40\%SPR}$ as a proxy for F_{MSY} is more conservative and provides greater assurance overfishing would be ended and the stock would rebuild within the specified time. Therefore, the biological benefits of **Alternative 2 (Preferred)** for the red snapper stock would be greater than **Alternative 1 (Status Quo)** because **Alternative 2 (Preferred)** would allow for less harvest and there would be a greater probability overfishing would end and the stock would be rebuilt to SSB_{MSY}. However, a choice of a F_{MSY} proxy that is too conservative could have unnecessary negative social and economic effects.

The Council has specified the Minimum Stock Size Threshold (MSST) as the biomass using the formula MSST = (1-M)*SSB_{MSY}. This formula is recommended in the Technical Guidance Document developed by NMFS and represents 1 minus the natural mortality multiplied by the spawning stock biomass at maximum sustainable yield. The value from Red Snapper Projections V dated March 19, 2009 is 16,469,633 lbs whole weight (7470.5 mt).

2.1.2 Council Conclusion

2.2 Red Snapper Rebuilding Plan

2.2.1 Rebuilding Schedule

Alternative 1 (Status Quo). There currently is not a rebuilding plan for red snapper. Snapper Grouper Amendment 4 (regulations effective January 1992) implemented a 15-year rebuilding plan beginning in 1991 which expired in 2006.

Alternative 2. Define a rebuilding schedule as the shortest possible period to rebuild in the absence of fishing mortality (T_{MIN}). This would equal 15 years with the rebuilding time period ending in 2024, 2010 is Year 1.

Alternative 3. Define a rebuilding schedule as the mid-point between shortest possible and maximum recommended period to rebuild. This would equal 25 years with the rebuilding time period ending in 2034, 2010 is Year 1.

Alternative 4 (Preferred). Define a rebuilding schedule as the maximum recommended period to rebuild if T_{MIN} > 10 years. The maximum recommended period equals T_{MIN} + one generation time. This would equal 35 years with the rebuilding time period ending in 2044 (SEDAR 15 2008 was the source of the generation time). 2010 is Year 1.

2.2.1.1 Comparison of Alternatives

The reauthorized Magnuson-Stevens Act requires amendment actions aimed at ending overfishing of species that are overfished and undergoing overfishing be accompanied by a rebuilding plan for the species. One part of a rebuilding plan is the rebuilding schedule; therefore, if no rebuilding schedule is established for red snapper the rebuilding plan would not comply with the previously mentioned requirements. Biologically, under **Alternative 1 (Status Quo)**, it would be unlikely that the stock would rebuild to a sustainable level within a predictable amount of time. However, if fishing related mortality was limited to the OY level, which would be 75%F_{MSY}, the stock would rebuild with or without a plan. This may benefit the socioeconomic environment in the near term; however, not implementing a rebuilding schedule at this time increases the chance that more drastic measures would need to be taken in the future. For this reason the long-term negative socioeconomic impacts under **Alternative 1 (Status Quo)** would likely be higher than those under any of the other rebuilding schedule alternatives.

Alternatives 2-4 (Preferred) would establish rebuilding schedules within the time periods allowed by the reauthorized Magnuson-Stevens Act. These alternatives differ in the length of time prescribed to rebuild the species, ranging from ranging from 15 years (**Alternative 2**) to 35 years (**Alternative 4 (Preferred)**). The shorter the length of time established for a rebuilding schedule the more restrictive harvest limitations need to be to achieve the rebuilding goal. The more restrictive the harvest limitations are, the more negative the socioeconomic impacts can be expected. Therefore, it can be assumed that **Alternative 2**, which would implement the shortest rebuilding schedule, would provide the biological benefit in the shortest amount of time, but would also incur the highest level of negative socioeconomic impacts. Furthermore, **Alternative 2** would require there be no fishing mortality of red snapper and therefore would require a prohibition on all species that co-occur with red snapper. **Alternative 3**, with a 25-year rebuilding schedule would still provide the biological benefits of rebuilding the fishery; however, those benefits may not occur as quickly as they would under **Alternative 2**. **Alternative 3** would incur a level of negative socioeconomic impacts in between that of **Alternatives 2** and **4 (Preferred).** Lastly, **Alternative 4 (Preferred)**, with a rebuilding schedule of 35 years would again be expected to yield the same biological benefits of rebuilding the stock; however, the full impact of those benefits may not be realized until even later than they would be under **Alternative 3**. **Alternative 4 (Preferred)** would also require the least restrictive harvest limitations in order to achieve a rebuilt status within the 35-year period, and therefore, would incur the least negative socioeconomic impacts relative to **Alternatives 2** and **3**.

If no harvest of red snapper was allowed, as specified in management measure **Alternative 2**, it is still expected that red snapper would be caught and released by commercial and recreational fishermen. As release mortality is estimated to be 40% and 90% for the recreational and commercial sectors, respectively (SEDAR 15 2008), the schedule specified in **Alternative 2** is not considered to be realistic and would not be expected to rebuild the stock to B_{MSY}. It is not possible to eliminate incidental mortality on one species in a multi-species complex, without prohibiting fishermen from targeting all associated species wherever the prohibited species occurs. Similarly, due to bycatch mortality, the schedule specified in **Alternative 3** also is not realistic and would not likely allow red snapper to rebuild to B_{MSY} by the end of the rebuilding schedule unless greater restrictions were placed on other species that co-occur with red snapper than are being proposed in this amendment. The high rate of bycatch mortality of red snapper while fishing for co-occurring species in both sectors would require stricter harvest regulations in the form of larger closed areas, relative to **Alternative 4 (Preferred)**, applied to all snapper grouper species in order for the stock to rebuild within the **Alternative 3** rebuilding schedule. Greater restrictions would incur greater negative social and comic impacts, which may not be necessary for the stock to reach a rebuilt condition within the preferred rebuilding schedule. The Council is considering substantial measures to reduce fishing mortality in this amendment including area closures for all snapper grouper species, which could reduce bycatch of red snapper and co-occurring species.

Consequently, the Council has chosen **Alternative 4** as preferred, which would support little or no harvest of red snapper in the initial years of rebuilding but would allow some incidental catch of red snapper when targeting co-occurring species. **Alternative 4 (Preferred)** would fulfill Magnuson-Stevens Act requirements to end overfishing of the species within a designated time span while minimizing adverse social and economic impacts to the extent practicable because using the longest allowable time span would require the implementation of less restrictive set of management measures relative to other alternatives considered.

2.2.1.2 Council Conclusion

2.2.2 Rebuilding Strategy and Optimum Yield

*Note: Rebuilding strategies are based on $F_{40\%SPR}$. Rebuilding strategies provided by the SEFSC for both $F_{40\%SPR}$ and $F_{40\%SPR}$ proxies for F_{MSY}, which incorporate high recruitment that has occurred recently, are included in Appendix X. All alternatives are based upon a **very high recruitment** scenario referenced in the most recent SEFSC projections. Need to request new projections from Science Center for these alternatives. Time to reaching B_{MSY} is estimated from the base run.*

Alternative 1 (Status Quo). Do not define a yield-based rebuilding strategy for red snapper. $F_{OY} = F_{45\%SPR}$. The value for OY at equilibrium is 2,169,000 lbs whole weight.

Alternative 2. Define a rebuilding strategy for red snapper that sets fishing mortality at F_{MSY} ($F_{40\%}$) in year 1. The ACL for 2010 would be 89,000 lbs whole weight. The ACL specified for 2010 would remain in effect beyond 2010 until modified. Under this strategy, the fishery would have a 44% chance of rebuilding to SSB_{MSY} within the allowable 35 year timeframe (Table 2-6). Since this alternatives specifies the fishing mortality rate that produces MSY, OY at equilibrium would not be specified. The Council will review ACL and management measures following the next scheduled assessment for red snapper.

Establish three AMs:

(1) Track catch per unit effort (CPUE) of red snapper via a fishery-independent monitoring program (see Section 4.12) to track changes in biomass.
(2) Track the biomass and CPUE through the research set-aside that would involve data collection by headboat and charterboat operators.
(3) The Council would evaluate the size of the area closures when the discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action being developed in Amendment 17B.

Some members of the IPT are concerned that the AMs listed above are not true AMs.

Alternative 3. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 85% F_{MSY} (85%$F_{40\%}$). The ACL for 2010 would be 69,000 lbs whole weight. The ACL specified for 2010 would remain in effect beyond 2010 until modified. The Council will review ACL and management measures following the next scheduled assessment for red snapper. OY at equilibrium would be 2,199,000 lb ww. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2035 and 69% chance of rebuilding to SSB_{MSY} by 2044 (Table 2-7).

Establish three AMs:

(1) Track CPUE of red snapper via a fishery-independent monitoring program (see Section 4.12) to track changes in biomass.
(2) Track the biomass and CPUE through the research set-aside that would involve data collection by headboat and charterboat operators.

(3) The Council would evaluate the size of the area closures when the discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action being developed in Amendment 17B.

Alternative 4 (Preferred). Define a rebuilding strategy for red snapper that sets F_{OY} equal to 75% F_{MSY} (75%$F_{40\%}$). The ACL for 2010 would be 79,000 lbs whole weight. The ACL specified for 2010 would remain in effect beyond 2010 until modified. The Council will review ACL and management measures following the next scheduled assessment for red snapper. OY at equilibrium would be 2,0104,000 lb ww. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2032 and an 84% chance of rebuilding to SSB_{MSY} by 2044 (Table 2-8).

Establish three AMs:

(1) Track CPUE of red snapper via a fishery-independent monitoring program (see Section 4.12) to track changes in biomass.
(2) Track the biomass and CPUE through the research set-aside that would involve data collection by headboat and charterboat operators.
(3) The Council would evaluate the size of the area closures when the discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action being developed in Amendment 17B.

Alternative 5. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 65%F_{MSY} (65%$F_{40\%}$). The ACL for 2010 would be 70,000 lbs whole weight. The ACL specified for 2010 would remain in effect beyond 2010 until modified. The Council will review ACL and management measures following the next scheduled assessment for red snapper. OY at equilibrium would be 1,984,000 lbs ww. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2030, and a 94% chance of rebuilding to SSB_{MSY} by 2044 (Table 2-9).

Establish three AMs:

(1) Track CPUE of red snapper via a fishery-independent monitoring program (see Section 4.12) to track changes in biomass.
(2) Track the biomass and CPUE through the research set-aside that would involve data collection by headboat and charterboat operators.
(3) The Council would evaluate the size of the area closures when the discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action being developed in Amendment 17B.

Alternative 6. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 96% F_{MSY} (96%$F_{40\%}$) and rebuilds in 35 years. The ACL for 2010 would be 101,000 lbs whole weight. The ACL specified for 2010 would remain in effect beyond 2010 until modified. The Council will review ACL and management measures following the next scheduled assessment for red snapper. OY at equilibrium would be xxxxxx lbs ww. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2044 (Table 2-10).

Establish three AMs:

(1) Track CPUE of red snapper via a fishery-independent monitoring program (see Section 4.12) to track changes in biomass.
(2) Track the biomass and CPUE through the research set-aside that would involve data collection by headboat and charterboat operators.
(3) The Council would evaluate the size of the area closures when the discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action being developed in Amendment 17B.

Alternative 7. Define a rebuilding strategy for red snapper that sets the ACL at 0 (directed landings only). The AM would be to track catch per unit effort (CPUE) of red snapper via a fishery-independent monitoring program (see Section 4.12) to track changes in biomass. CPUE would be evaluated every three years and adjustments would be made by the framework action being developed in Amendment 17B.

Sub-alternative 7a. Rebuilding strategy based on F_{MSY}.
Sub-alternative 7b. Rebuilding strategy based on 85% F_{MSY}.
Sub-alternative 7c. Rebuilding strategy based on 75% F_{MSY}.
Sub-alternative 7d. Rebuilding strategy based on 65% F_{MSY}.
Sub-alternative 7e. Rebuilding strategy based on 96% F_{MSY}.

Table 2-3. Reduction in total removals (landings plus dead discards) needed end overfishing. Non-shaded areas determined by comparing estimated landings in 2009 with allowable removals in 2010. Shaded areas are estimated by interpolation. Council's preferred choice is to use High recruitment with F40%SPR proxy for F_{MSY}. New projections with high recruitment and F40% proxy have been requested from Science Center.

F_{MSY} proxy	F40% proxy				F30% proxy			
Recruitment	Base Estimated	High	Very High	Extremely High	Base Estimated	High	Very High	Extremely High
Alternative 2 (F_{MSY})	85%	86%	83%	81%	80%	80%	78%	76%
Alternative 3 (85% F_{MSY})	88%	88%	86%	83%	83%	83%	81%	79%
Alternative 4 (75% F_{MSY})	89%	89%	87%	85%	85%	85%	83%	81%
Alternative 5 (65% F_{MSY})	90%	90%	88%	86%	87%	87%	85%	82%
Alternative 6 ($F_{rebuild}$)	86%	86%	84%	82%	80%	80%	78%	76%

Table 2-4. Red snapper projections under a fishing mortality at FMSY (F40%). F = fishing mortality rate (per year), LD = landings or new dead discards, DD = dead discards* (Alternative 2; Sub-Alternative 7a).

Year	F	LD (1000lb)	DD (1000lb)	Total Kill. LD+DD (1000 lb)	Probability Recovery	Comments
2007	0.930	454	153	607	0	
2008	1.220	553	190	743	0	
2009	0.974	407	157	564	0	
2010	0.104	59	23	82	0	overfishing prevented if total kill<82,000 lb
2011	0.104	102	29	131	0	overfishing prevented if total kill<131,000 lb
2012	0.104	160	32	192	0	overfishing prevented if total kill<192,000 lb
2013	0.104	230	40	270	0	overfishing prevented if total kill<270,000 lb
2014	0.104	315	50	365	0	overfishing prevented if total kill<365,000 lb
2015	0.104	417	56	473	0	overfishing prevented if total kill<473,000 lb
2016	0.104	532	60	592	0	overfishing prevented if total kill<592,000 lb
2017	0.104	655	63	718	0	overfishing prevented if total kill<718,000 lb
2018	0.104	781	66	847	0	overfishing prevented if total kill<847,000 lb
2019	0.104	908	67	975	0	overfishing prevented if total kill<975,000 lb
2020	0.104	1033	68	1101	0	overfishing prevented if total kill<1,101,000 lb
2021	0.104	1152	69	1221	0	overfishing prevented if total kill<1,221,000 lb
2022	0.104	1265	70	1335	0	overfishing prevented if total kill<1,335,000 lb
2023	0.104	1370	70	1440	0.01	overfishing prevented if total kill<1,440,000 lb
2024	0.104	1468	71	1539	0.02	overfishing prevented if total kill<1,539,000 lb
2025	0.104	1557	71	1628	0.03	overfishing prevented if total kill<1,628,000 lb
2026	0.104	1639	71	1710	0.05	overfishing prevented if total kill<1,710,000 lb
2027	0.104	1713	72	1785	0.07	overfishing prevented if total kill<1,785,000 lb
2028	0.104	1780	72	1852	0.09	overfishing prevented if total kill<1,852,000 lb
2029	0.104	1839	72	1911	0.11	overfishing prevented if total kill<1,911,000 lb
2030	0.104	1893	72	1965	0.14	overfishing prevented if total kill<1,965,000 lb
2031	0.104	1941	72	2013	0.17	overfishing prevented if total kill<2,013,000 lb
2032	0.104	1983	72	2055	0.19	overfishing prevented if total kill<2,055,000 lb
2033	0.104	2021	72	2093	0.21	overfishing prevented if total kill<2,093,000 lb
2034	0.104	2054	72	2126	0.24	overfishing prevented if total kill<2,126,000 lb
2035	0.104	2084	72	2156	0.27	overfishing prevented if total kill<2,156,000 lb
2036	0.104	2110	72	2182	0.3	overfishing prevented if total kill<2,182,000 lb
2037	0.104	2133	72	2205	0.32	overfishing prevented if total kill<2,205,000 lb
						SSB=7506 mt; stock not overfished
2038	0.104	2154	73	2227	0.33	overfishing prevented if total kill<2,055,000 lb
2039	0.104	2172	73	2245	0.35	overfishing prevented if total kill<2,093,000 lb
2040	0.104	2187	73	2260	0.37	overfishing prevented if total kill<2,126,000 lb
2041	0.104	2201	73	2274	0.4	overfishing prevented if total kill<2,156,000 lb
2042	0.104	2214	73	2287	0.42	overfishing prevented if total kill<2,182,000 lb
2034	0.104	2224	73	2297	0.43	overfishing prevented if total kill<2,205,000 lb
2044	0.104	2234	73	2307	0.44	overfishing prevented if total kill<2,055,000 lb
Landings in 2007 & 2008						
Year	Total Com	Headboat	MRFSS	Total Rec	Total C+R	
2007	116,934	38,448	302,156	340,604	457,538	
2008	233,267	115,308	696,755	812,063	1,045,330	

*LD represents either landed catch or red snapper > 20 inches TL that would be discarded if all red snapper harvest was prohibited. DD represents dead discards for red snapper < 20 inches TL. F_{MSY}=F40%=0.104; MSST=7471mt; SSB_{MSY}=8103mt; Y@75%F_{MSY}=2,104,000 lb; Y@F_{MSY}=2,304,000 lb.

Table 2-5. Red snapper projections under a fishing mortality rate of 85% FMSY (85%F40%). F = fishing mortality rate (per year), LD = landings or new dead discards, DD = dead discards* (Alternative 3; Sub-Alternative 7b).

Year	F	LD (1000 lb)	DD (1000 lb)	Total Kill LD+DD (1000 lb)	Probability Recovery	Comments
2007	0.930	454	153	607	0	
2008	1.220	553	190	743	0	
2009	0.974	407	157	564	0	
2010	0.088	50	19	69	0	overfishing prevented if total kill<82,000 lb
2011	0.088	88	25	113	0	overfishing prevented if total kill<131,000 lb
2012	0.088	139	28	167	0	overfishing prevented if total kill<192,000 lb
2013	0.088	201	35	236	0	overfishing prevented if total kill<270,000 lb
2014	0.088	277	43	320	0	overfishing prevented if total kill<365,000 lb
2015	0.088	369	48	417	0	overfishing prevented if total kill<473,000 lb
2016	0.088	474	52	526	0	overfishing prevented if total kill<592,000 lb
2017	0.088	586	55	641	0	overfishing prevented if total kill<718,000 lb
2018	0.088	702	57	759	0	overfishing prevented if total kill<847,000 lb
2019	0.088	819	58	877	0	overfishing prevented if total kill<975,000 lb
2020	0.088	934	59	993	0	overfishing prevented if total kill<1,101,000 lb
2021	0.088	1046	60	1106	0	overfishing prevented if total kill<1,221,000 lb
2022	0.088	1152	60	1212	0.01	overfishing prevented if total kill<1,335,000 lb
2023	0.088	1252	61	1313	0.02	overfishing prevented if total kill<1,440,000 lb
2024	0.088	1345	61	1406	0.04	overfishing prevented if total kill<1,539,000 lb
2025	0.088	1431	61	1492	0.07	overfishing prevented if total kill<1,628,000 lb
2026	0.088	1511	62	1573	0.09	overfishing prevented if total kill<1,710,000 lb
2027	0.088	1583	62	1645	0.13	overfishing prevented if total kill<1,785,000 lb
2028	0.088	1648	62	1710	0.17	overfishing prevented if total kill<1,852,000 lb
2029	0.088	1707	62	1769	0.21	overfishing prevented if total kill<1,911,000 lb
2030	0.088	1761	62	1823	0.27	overfishing prevented if total kill<1,965,000 lb
2031	0.088	1809	62	1871	0.32	overfishing prevented if total kill<2,013,000 lb
						SSB=7486 mt; stock not overfished
2032	0.088	1852	62	1914	0.37	overfishing prevented if total kill<2,055,000 lb
2033	0.088	1890	62	1952	0.41	overfishing prevented if total kill<2,093,000 lb
2034	0.088	1925	62	1987	0.46	overfishing prevented if total kill<2,126,000 lb
2035	0.088	1956	62	2018	0.51	overfishing prevented if total kill<2,156,000 lb
2036	0.088	1983	62	2045	0.53	overfishing prevented if total kill<2,182,000 lb
						SSB=8302 mt; stock rebuild to SSBmsy
2037	0.088	2007	63	2070	0.56	overfishing prevented if total kill<2,055,000 lb
2038	0.088	2029	63	2092	0.59	overfishing prevented if total kill<2,093,000 lb
2039	0.088	2048	63	2111	0.62	overfishing prevented if total kill<2,126,000 lb
2040	0.088	2065	63	2128	0.64	overfishing prevented if total kill<2,156,000 lb
2041	0.088	2080	63	2143	0.66	overfishing prevented if total kill<2,182,000 lb
2042	0.088	2094	63	2157	0.67	overfishing prevented if total kill<2,055,000 lb
2043	0.088	2106	63	2169	0.68	overfishing prevented if total kill<2,093,000 lb
2044	0.088	2116	63	2179	0.69	
Landings in 2007 & 2008						
Year	Total Com	Headboat	MRFSS	Total Rec	Total C+R	
2007	116,934	38,448	302,156	340,604	457,538	
2008	233,267	115,308	696,755	812,063	1,045,330	

*LD represents either landed catch or red snapper > 20 inches TL that would be discarded if all red snapper harvest was prohibited. DD represents dead discards for red snapper < 20 inches TL. F_{MSY}=F40%=0.104; MSST=7471mt; SSB_{MSY}=8103mt; Y@75%F_{MSY}=2,104,000 lb; Y@F_{MSY}=2,304,000 lb.

Table 2-6. Red snapper projections under a fishing mortality rate of 75% FMSY (75%F40%). F = fishing mortality rate (per year), LD = landings or new dead discards, DD = dead discards* (Alternative 4; Sub-Alternative 7c).

				Total Kill	Probability	
Year	F	LD (1000lb)	DD (1000lb)	LD+DD (1000 lb)	Recovery	Comments
2007	0.930	454	153	607	0	
2008	1.220	553	190	743	0	
2009	0.974	407	157	564	0	
2010	0.078	44	17	61	0	overfishing prevented if total kill<82,000 lb
2011	0.078	78	22	100	0	overfishing prevented if total kill<131,000 lb
2012	0.078	124	25	149	0	overfishing prevented if total kill<192,000 lb
2013	0.078	181	31	212	0	overfishing prevented if total kill<270,000 lb
2014	0.078	250	39	289	0	overfishing prevented if total kill<365,000 lb
2015	0.078	335	43	378	0	overfishing prevented if total kill<473,000 lb
2016	0.078	431	46	477	0	overfishing prevented if total kill<592,000 lb
2017	0.078	534	49	583	0	overfishing prevented if total kill<718,000 lb
2018	0.078	642	51	693	0	overfishing prevented if total kill<847,000 lb
2019	0.078	751	52	803	0	overfishing prevented if total kill<975,000 lb
2020	0.078	860	53	913	0	overfishing prevented if total kill<1,101,000 lb
2021	0.078	965	53	1018	0.01	overfishing prevented if total kill<1,221,000 lb
2022	0.078	1065	54	1119	0.02	overfishing prevented if total kill<1,335,000 lb
2023	0.078	1160	54	1214	0.03	overfishing prevented if total kill<1,440,000 lb
2024	0.078	1249	55	1304	0.06	overfishing prevented if total kill<1,539,000 lb
2025	0.078	1331	55	1386	0.1	overfishing prevented if total kill<1,628,000 lb
2026	0.078	1408	55	1463	0.14	overfishing prevented if total kill<1,710,000 lb
2027	0.078	1478	55	1533	0.19	overfishing prevented if total kill<1,785,000 lb
2028	0.078	1541	55	1596	0.25	overfishing prevented if total kill<1,852,000 lb
2029	0.078	1599	55	1654	0.32	overfishing prevented if total kill<1,911,000 lb
						SSB=7499 mt; stock not overfished
2030	0.078	1652	55	1707	0.38	overfishing prevented if total kill<1,965,000 lb
2031	0.078	1699	55	1754	0.44	overfishing prevented if total kill<2,013,000 lb
2032	0.078	1742	56	1798	0.5	overfishing prevented if total kill<2,055,000 lb
						SSB=8302 mt; stock rebuild to SSBmsy
2033	0.078	1780	56	1836	0.56	overfishing prevented if total kill<2,093,000 lb
2034	0.078	1815	56	1871	0.61	overfishing prevented if total kill<2,126,000 lb
2035	0.078	1846	56	1902	0.65	overfishing prevented if total kill<2,156,000 lb
2036	0.078	1874	56	1930	0.69	overfishing prevented if total kill<2,182,000 lb
2037	0.078	1898	56	1954	0.73	overfishing prevented if total kill<2,182,000 lb
2038	0.078	1921	56	1977	0.75	overfishing prevented if total kill<2,182,000 lb
2039	0.078	1940	56	1996	0.78	overfishing prevented if total kill<2,182,000 lb
2040	0.078	1958	56	2014	0.79	overfishing prevented if total kill<2,182,000 lb
2041	0.078	1974	56	2030	0.8	overfishing prevented if total kill<2,182,000 lb
2042	0.078	1988	56	2044	0.82	overfishing prevented if total kill<2,182,000 lb
2043	0.078	2001	56	2057	0.84	overfishing prevented if total kill<2,182,000 lb
2044	0.078	2012	56	2068	0.84	overfishing prevented if total kill<2,182,000 lb
Landings in 2007 & 2008						
Year	Total Com	Headboat	MRFSS	Total Rec	Total C+R	
2007	116,934	38,448	302,156	340,604	457,538	
2008	233,267	115,308	696,755	812,063	1,045,330	

*LD represents either landed catch or red snapper > 20 inches TL that would be discarded if all red snapper harvest was prohibited. DD represents dead discards for red snapper < 20 inches TL. F_{MSY}=F40%=0.104; MSST=7471mt; SSB_{MSY}=8103mt; Y@75%F_{MSY}=2,104,000 lb; Y@F_{MSY}=2,304,000 lb.

Table 2-7. Red snapper projections under a fishing mortality rate of 65% FMSY (65%F40%). F = fishing mortality rate (per year), LD = landings or new dead discards, DD = dead discards* (Alternative 5; Sub-Alternative 7d).

Year	F	LD (1000lb)	DD (1000lb)	Total Kill. = LD+DD (1000 lb)	Probability Recovery	Comments
2007	0.930	454	153	607	0	
2008	1.220	553	190	743	0	
2009	0.974	407	157	564	0	
2010	0.068	39	15	54	0	overfishing prevented if total kill<82,000 lb
2011	0.068	68	19	87	0	overfishing prevented if total kill<131,000 lb
2012	0.068	109	21	130	0	overfishing prevented if total kill<192,000 lb
2013	0.068	160	27	187	0	overfishing prevented if total kill<270,000 lb
2014	0.068	222	34	256	0	overfishing prevented if total kill<365,000 lb
2015	0.068	299	38	337	0	overfishing prevented if total kill<473,000 lb
2016	0.068	385	41	426	0	overfishing prevented if total kill<592,000 lb
2017	0.068	479	43	522	0	overfishing prevented if total kill<718,000 lb
2018	0.068	577	44	621	0	overfishing prevented if total kill<847,000 lb
2019	0.068	677	45	722	0	overfishing prevented if total kill<975,000 lb
2020	0.068	777	46	823	0	overfishing prevented if total kill<1,101,000 lb
2021	0.068	874	47	921	0.01	overfishing prevented if total kill<1,221,000 lb
2022	0.068	967	47	1014	0.02	overfishing prevented if total kill<1,335,000 lb
2023	0.068	1056	47	1103	0.05	overfishing prevented if total kill<1,440,000 lb
2024	0.068	1139	48	1187	0.1	overfishing prevented if total kill<1,539,000 lb
2025	0.068	1217	48	1265	0.14	overfishing prevented if total kill<1,628,000 lb
2026	0.068	1289	48	1337	0.21	overfishing prevented if total kill<1,710,000 lb
2027	0.068	1356	48	1404	0.28	overfishing prevented if total kill<1,785,000 lb
2028	0.068	1417	48	1465	0.37	overfishing prevented if total kill<1,852,000 lb
						SSB=7663 mt; stock not overfished
2029	0.068	1472	48	1520	0.44	overfishing prevented if total kill<1,911,000 lb
2030	0.068	1523	48	1571	0.53	overfishing prevented if total kill<1,965,000 lb
						SSB=8236 mt; stock rebuild to SSBmsy
2031	0.068	1569	49	1618	0.6	overfishing prevented if total kill<1,911,000 lb
2032	0.068	1611	49	1660	0.66	overfishing prevented if total kill<1,965,000 lb
2033	0.068	1649	49	1698	0.72	overfishing prevented if total kill<1,911,000 lb
2034	0.068	1683	49	1732	0.76	overfishing prevented if total kill<1,965,000 lb
2035	0.068	1714	49	1763	0.79	overfishing prevented if total kill<1,911,000 lb
2036	0.068	1741	49	1790	0.83	overfishing prevented if total kill<1,965,000 lb
2037	0.068	1766	49	1815	0.85	overfishing prevented if total kill<1,911,000 lb
2038	0.068	1789	49	1838	0.88	overfishing prevented if total kill<1,965,000 lb
2039	0.068	1809	49	1858	0.9	overfishing prevented if total kill<1,911,000 lb
2040	0.068	1827	49	1876	0.91	overfishing prevented if total kill<1,965,000 lb
2041	0.068	1843	49	1892	0.91	overfishing prevented if total kill<1,911,000 lb
2042	0.068	1858	49	1907	0.92	overfishing prevented if total kill<1,965,000 lb
2043	0.068	1871	49	1920	0.93	overfishing prevented if total kill<1,911,000 lb
2044	0.068	1882	49	1931	0.94	overfishing prevented if total kill<1,965,000 lb
Landings in 2007 & 2008						
Year	Total Com	Headboat	MRFSS	Total Rec	Total C+R	
2007	116,934	38,448	302,156	340,604	457,538	
2008	233,267	115,308	696,755	812,063	1,045,330	

*LD represents either landed catch or red snapper > 20 inches TL that would be discarded if all red snapper harvest was prohibited. DD represents dead discards for red snapper < 20 inches TL. F_{MSY}=F40%=0.104; MSST=7471mt; SSB_{MSY}=8103mt; Y@75%F_{MSY}=2,104,000 lb; Y@F_{MSY}=2,304,000 lb.

Table 2-8. Red snapper projections under a fishing mortality rate of Frebuild = 96% FMSY (96%F40%). F = fishing mortality rate (per year), LD = landings or new dead discards, DD = dead discards* (Alternative 6; Sub-Alternative 7e).

Year	F	LD (1000lb)	DD (1000lb)	Total Kill. = LD+DD (1000 lb)	Probability Recovery	Comments
2007	0.930	454	153	607	0.00	
2008	1.220	553	190	743	0.00	
2009	0.974	407	157	564	0.00	
2010	0.1	56	22	78	0.00	overfishing prevented if total kill<82,000 lb
2011	0.1	98	28	126	0.00	overfishing prevented if total kill<131,000 lb
2012	0.1	155	31	186	0.00	overfishing prevented if total kill<192,000 lb
2013	0.1	223	39	262	0.00	overfishing prevented if total kill<270,000 lb
2014	0.1	305	48	353	0.00	overfishing prevented if total kill<365,000 lb
2015	0.1	405	54	459	0.00	overfishing prevented if total kill<473,000 lb
2016	0.1	518	58	576	0.00	overfishing prevented if total kill<592,000 lb
2017	0.1	638	61	699	0.00	overfishing prevented if total kill<718,000 lb
2018	0.1	762	63	825	0.00	overfishing prevented if total kill<847,000 lb
2019	0.1	886	65	951	0.00	overfishing prevented if total kill<975,000 lb
2020	0.1	1009	66	1075	0.00	overfishing prevented if total kill<1,101,000 lb
2021	0.1	1127	67	1194	0.00	overfishing prevented if total kill<1,221,000 lb
2022	0.1	1238	68	1306	0.01	overfishing prevented if total kill<1,335,000 lb
2023	0.1	1342	68	1410	0.01	overfishing prevented if total kill<1,440,000 lb
2024	0.1	1439	68	1507	0.02	overfishing prevented if total kill<1,539,000 lb
2025	0.1	1528	69	1597	0.04	overfishing prevented if total kill<1,628,000 lb
2026	0.1	1609	69	1678	0.06	overfishing prevented if total kill<1,710,000 lb
2027	0.1	1682	69	1751	0.08	overfishing prevented if total kill<1,785,000 lb
2028	0.1	1749	69	1818	0.10	overfishing prevented if total kill<1,852,000 lb
2029	0.1	1809	69	1878	0.13	overfishing prevented if total kill<1,911,000 lb
2030	0.1	1862	70	1932	0.16	overfishing prevented if total kill<1,965,000 lb
2031	0.1	1910	70	1980	0.20	overfishing prevented if total kill<2,013,000 lb
2032	0.1	1953	70	2023	0.23	overfishing prevented if total kill<2,055,000 lb
2033	0.1	1991	70	2061	0.26	overfishing prevented if total kill<2,093,000 lb
2034	0.1	2025	70	2095	0.29	overfishing prevented if total kill<2,126,000 lb
2035	0.1	2055	70	2125	0.32	overfishing prevented if total kill<2,156,000 lb
						SSB=7519 mt; stock not overfished
2036	0.1	2081	70	2151	0.35	overfishing prevented if total kill<2,182,000 lb
2037	0.1	2105	70	2175	0.37	overfishing prevented if total kill<2,205,000 lb
2038	0.1	2125	70	2195	0.40	overfishing prevented if total kill<2,205,000 lb
2039	0.1	2144	70	2214	0.42	overfishing prevented if total kill<2,205,000 lb
2040	0.1	2160	70	2230	0.44	overfishing prevented if total kill<2,205,000 lb
2041	0.1	2174	70	2244	0.47	overfishing prevented if total kill<2,205,000 lb
2042	0.1	2187	70	2257	0.48	overfishing prevented if total kill<2,205,000 lb
2043	0.1	2198	70	2268	0.50	overfishing prevented if total kill<2,205,000 lb
2044	0.1	2208	70	2278	0.51	overfishing prevented if total kill<2,205,000 lb

Landings in 2007 & 2008					
Year	Total Com	Headboat	MRFSS	Total Rec	Total C+R
2007	116,934	38,448	302,156	340,604	457,538
2008	233,267	115,308	696,755	812,063	1,045,330

*LD represents either landed catch or red snapper > 20 inches TL that would be discarded if all red snapper harvest was prohibited. DD represents dead discards for red snapper < 20 inches TL. F_{MSY}=F40%=0.104; MSST=7471mt; SSB_{MSY}=8103mt; Y@75%F_{MSY}=2,104,000 lb; Y@F_{MSY}=2,304,000 lb.

2.2.2.1 Comparison of Alternatives

Optimum Yield at Equilibrium

Choice of the proxy for F_{MSY} in Section 4.1 has an effect on the magnitude of OY. OY values based on the status quo proxy for F_{MSY} of $F_{30\%\ SPR}$ would be expected to result in higher values for OY than the use of $F_{40\%SPR}$ proxy for F_{MSY}. The Council has selected in Section 4.1, $F_{40\%SPR}$ as the proxy for F_{MSY}.

Under status quo **Alternative 1**, $F_{OY} = F_{45\%SPR}$ and the value for OY when the stock is at SSB_{MSY} is 2,169,000 lbs whole weight. Under the action alternatives, OY when the stock is rebuilt is based upon the rebuilding strategy where OY is some portion of the yield at F_{MSY}. Since **Alternative 2** and **Sub-Alternative 7a** identify a rebuilding strategy based on the yield at F_{MSY}, OY when the stock is rebuilt would be equivalent to MSY. The OY at equilibrium (when stock biomass reached SSB_{MSY}) for **Alternatives 3 through 6** and **Sub-alternatives 7b-7e** would be based on the rebuilding strategy where OY would equal the yield at 85% F_{MSY}, 75% F_{MSY}, 65% F_{MSY}, and 96% F_{MSY}, respectively. OY values at equilibrium in the seven alternatives are distinguished from one another by the level of risk (and associated tradeoffs) each would assume.

The more conservative the estimate of OY, the larger the sustainable biomass when the stock is rebuilt. The greatest biological benefit would be provided by **Alternative 5** and **Sub-alternative 7d**, which would specify an OY at equilibrium equal to 65%F_{MSY}. The least amount of biological benefit would be provided by **Alternative 2** and **Sub-alternative 7a**, which would specify a rebuilding strategy and therefore an OY equal to the yield at F_{MSY}. Therefore, this definition could make it more difficult to sustain red snapper over the long term. Therefore, the biological benefits of this alternative would be intermediate in value and would consider the social and economic effects of the action.

Rebuilding strategies

Alternative 1 (Status Quo) would not establish a yield-based, rebuilding strategy for red snapper. Under **Alternative 1 (Status Quo)** harvest levels expected as a result of management measures for co-occurring shallow water snapper grouper species in Amendment 16 (SAFMC 2008), would continue until modified and the stock would not rebuild within the preferred time frame under the rebuilding schedule. Amendment 16 (SAFMC 2008) is expected to provide a reduction in red snapper total kill of 16.5% (commercial sector), 1.1 to 7.7% (headboat sector), and 2.3% (private/charter sector). Therefore, expected reduction of red snapper from actions imposed through Amendment 16 would not be sufficient to provide the 83% reduction needed to end overfishing.

Under **Alternatives 2-7**, the red snapper stock could rebuild sooner than specified by each rebuilding strategy since the Council's intent is to prohibit all harvest of red snapper during initial rebuilding and actions are being taken to reduce incidental catch of red snapper in **Section 4.3.**

Alternatives 2-6 would prohibit all harvest of red snapper in the commercial and recreational sectors but would set an ACL equal to the total kill specified in the rebuilding strategy for each alternative. This would require the SEFSC to monitor discarded red snapper in the commercial and recreational sectors. At their March 2009 meeting, the SSC indicated their recommendation of ABC = 0 for speckled hind and warsaw grouper was based on landed catch only, due to concern about monitoring discards. The SSC expressed similar concerns when discussing ACLs based on discards for speckled hind and warsaw grouper at their March 2009 meeting. Since monitoring of discards would rely on self-reporting of discards by fishermen, the SSC felt that this could create a disincentive for fishermen to report if they know that once a certain level of discarded fish is reached, AMs would be triggered, which could potentially further restrict their snapper grouper harvest. Because of these concerns with monitoring discards, CPUE of red snapper would be tracked via a fishery-independent monitoring program to identify changes in biomass. Furthermore, the Council is considering a research set-aside that would involve data collection by headboat and charterboat operators to determine if there are changes in CPUE and biomass. If the ACL was exceeded or if acceptable increased in CPUE did not occur, the Council would evaluate the size of the area closures. CPUE would be evaluated every three years and adjustments would be made by a framework action being developed in Amendment 17B.

Alternative 2 would establish an ACL of 82,000 lbs whole weight, and define a rebuilding strategy based a constant F of 0.104 and F_{MSY} ($F_{40\%SPR}$). Of the action alternatives considered, **Alternative 2** would have the smallest probability of rebuilding the stock to SSB_{MSY} by 2044. Under **Alternative 2**, an initial 83% reduction in total kill would be required. At this rate of harvest the stock would likely not be considered overfished (i.e. SSB > MSST) by the year 2037; however, the population would continue to only come infinitely close to a rebuilt condition without actually achieving it. This rebuilding has a 44% probability of rebuilding to SSB_{MSY} by 2044. Under **Alternative 2**, an initial 83% reduction in total kill would be required, at this rate of harvest the stock would be nearing a rebuilt condition by the year 2050. Compared to **Alternatives 3 - 5**, **Alternative 2** would require the longest time to rebuild. It is possible the red snapper stock could rebuild sooner since the Council is considering management measures to prohibit all harvest during the initial years of rebuilding and actions are being considered to reduce incidental catch.

Alternative 3 would define a rebuilding strategy for red snapper that maintains fishing mortality at a constant F of 0.088 and 85% F_{MSY} ($85\%F_{40\%SPR}$). Under **Alternative 3**, the initial reduction in total kill of 86% would be required. The ACL would be 69,000 lbs whole weight until modified. Under this alternative the stock has a 50% chance of being rebuilt by 2036, six years later than **Alternative 5**, and **4 (Preferred)** years later than **Alternative 4 (Preferred)**. Furthermore, there is a 69% chance the stock could rebuild to SSB_{MSY} in the maximum allowable 35 year time frame. However, the stock could rebuild sooner since the Council is considering management actions that would prohibit all harvest of red snapper during initial rebuilding and actions would be taken to reduce incidental catch.
Alternative 4 (Preferred) would establish a rebuilding strategy that maintains fishing mortality at 75% F_{MSY} ($75\%F_{40\%SPR}$) with a constant F of 0.078. The ACL would be set at 79,000 lbs whole weight and would remain in effect until. Under **Alternative 4 (Preferred)**, an 87%

reduction in total kill would be required. At this rate of recovery, the stock would have a 50% probability of reaching a rebuilt condition in 2032, an 84% probability of reaching a rebuild condition by 2045. **Alternative 4 (Preferred)** would rebuild the stock faster than **Alternative 3**, but would rebuild it two years slower than **Alternative 5**.

Alternative 5 would implement the most conservative rebuilding strategy of all the alternatives considered. Under **Alternative 5** the rebuilding strategy would maintain fishing mortality at $65\%F_{MSY}$ ($65\%F_{40\%}$). The ACL would be the lowest of all the alternatives at 35,000 lbs whole weight, and would remain in effect until modified. An 88% reduction in total kill would be required under **Alternative 5**. **Alternative 5** may be viewed as too conservative in light of the fact that **Alternatives 3** and **4 (Preferred)** are also expected to rebuild the stock within the allowable time frame.

Alternative 6 (Figure 4-7) would establish an ACL of 78,000 lbs whole weight, and define a rebuilding strategy based a constant F of 0.088 and $96\%F_{MSY}$ ($96\%F_{40\%SPR}$). Under **Alternative 6**, an initial 84% reduction in total kill would be required. **Alternative 6** specifies a fishing mortality rate that would rebuild the stock to SSB_{MSY} in the maximum allowable time of 35 years (2044). **Alternative 6** is more biologically beneficial than **Alternative 1 (Status Quo)** and **Alternative 2** because it would lead to a substantial increase in SSB in the first 20 years of implementation but would allow for slower recovery of the stock than **Alternatives 3-5** (Figure 4-2).

Alternative 7 would define a rebuilding strategy for red snapper that sets the ACL at 0 (directed landings only). Different rebuilding strategies corresponding to F_{MSY}, $85\%F_{MSY}$, $75\%F_{MSY}$, $65\%F_{MSY}$, and $96\%F_{MSY}$ ($F_{REBUILD}$)are provided by **Sub-Alternatives 7a-7e**. The biological effects of **Sub-alternatives 7a-7e** correspond to **Alternatives 2-6** described above. The primary difference between **Alternative 7** and **Alternatives 2-6** is **Alternative 7** sets the ACL at 0 where a certain level of dead discards is assumed. In contrast, **Alternatives 2-6** would require the SEFSC monitor the level of dead discards with respect to the ACL. The advantage of **Alternatives 2-6** is a concrete value would be specified for an ACL and action could be taken if that value was exceeded. The disadvantage of **Alternatives 2-6** is discard data are more uncertain than landed data and the SSC has concern that the public may under report discards if there is a perception further restrictions could be placed on fisheries when a specified level is achieved.

Under **Alternative 7**, the AM would be to track catch per unit effort (CPUE) of red snapper via a fishery-independent monitoring program (see **Section 4.12**) to track changes in biomass. CPUE would be evaluated every three years and adjustments would be made by the framework action being developed in Amendment 17B. The proposed framework for a fishery-independent red snapper monitoring program would continue the long-term data series from MARMAP surveys and adds a complementary sampling program to expand needed coverage. The improved sampling plan would increase the (1) spatial footprint (central FL to Cape Hatteras, NC), (2) sample size, and (3) number of gear utilized over current survey levels, thereby considerably improving program effectiveness.

2.2.2.2Council Conclusions

2.3 Red Snapper Management Measures

Note: More than one of the alternatives and/or sub-alternatives below may be chosen as preferred alternatives. Additionally, the prohibition of red snapper harvest in **Alternatives 2-6** would remain in effect beyond 2009 until modified.

The prohibition of red snapper harvest in **Alternatives 2-6** would remain in effect beyond 2009 until modified.

Alternative 1 (Status Quo). This would continue the 20-inch size limit (commercial & recreational) and the recreational 2 fish bag limit (included in the 10 snapper per person limit).

Alternative 2. Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ.

Alternative 3. Prohibit commercial and recreational harvest, possession, and retention of species in the snapper grouper FMU year-round in an area that includes commercial logbook grids 2880, 2980, 3080, and 3180 between a depth of 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m), or 8,100 sq miles of the South Atlantic EEZ. Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ.

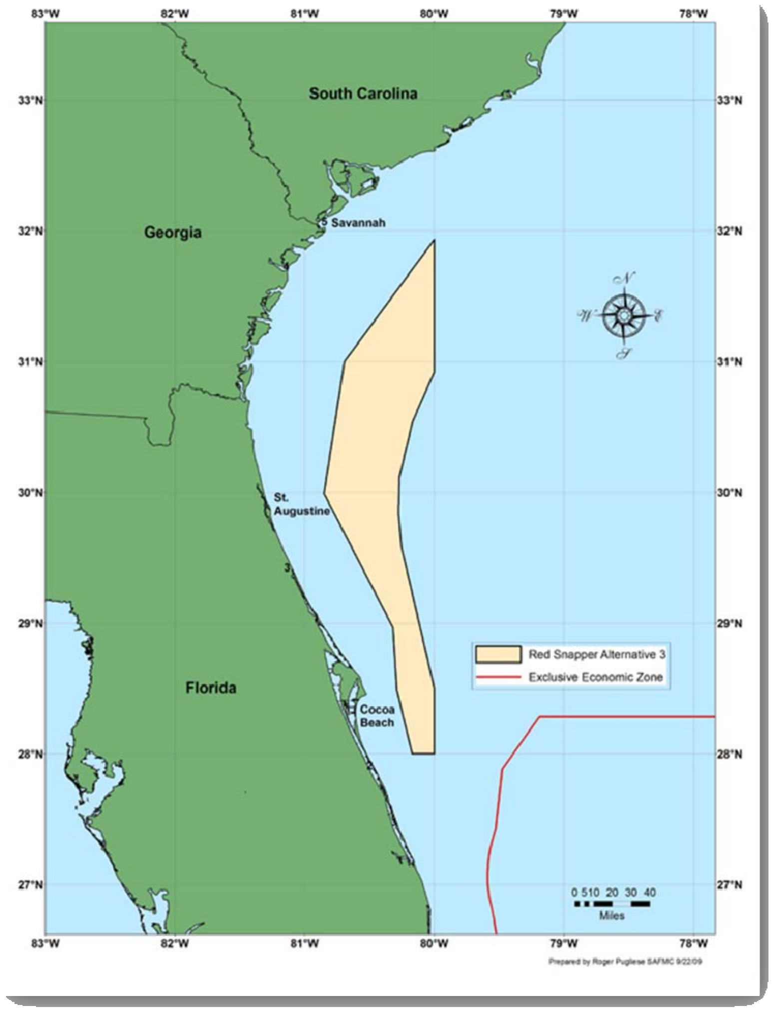

Figure 2-1. Map of proposed closed area under **Alternative 3**.

Alternative 4. Prohibit commercial and recreational harvest, possession, and retention of species in the snapper grouper FMU year-round in an area that includes commercial logbook grids 2880, 2980, 3080, 3179, 3180, 3278, and 3279 between a depth of 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m), or 12,300 sq miles of the South Atlantic EEZ. Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ.

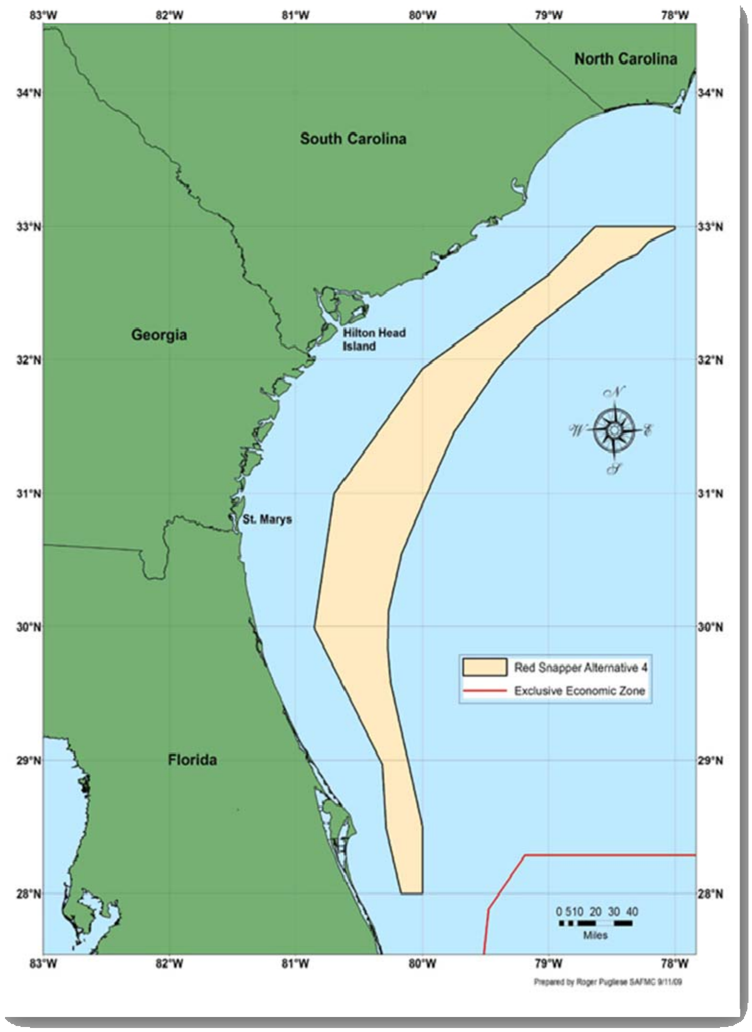

Figure 2-2. Map of proposed closed area under **Alternative 4.**

Alternative 5. Prohibit commercial and recreational harvest, possession, and retention of species in the snapper grouper FMU year-round in an area that includes commercial logbook grids 2880, 2980, 3080, and 3180, or 13,900 sq miles of the South Atlantic EEZ. Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ.

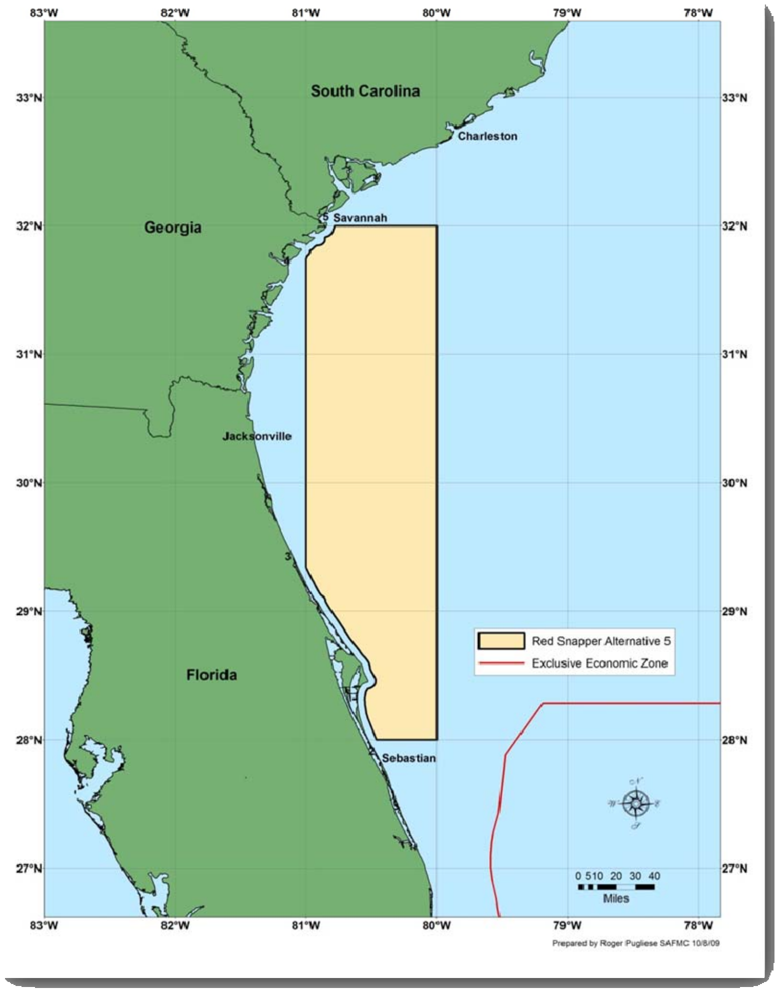

Figure 2-3. Map of proposed closed area under **Alternative 5.**

Alternative 6. Prohibit commercial and recreational harvest, possession, and retention of species in the snapper grouper FMU year-round in an area that includes commercial logbook grids 2880, 2980, 3080, 3179, 3180, 3278, and 3279, or 26,600 sq miles of the South Atlantic EEZ. Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ.

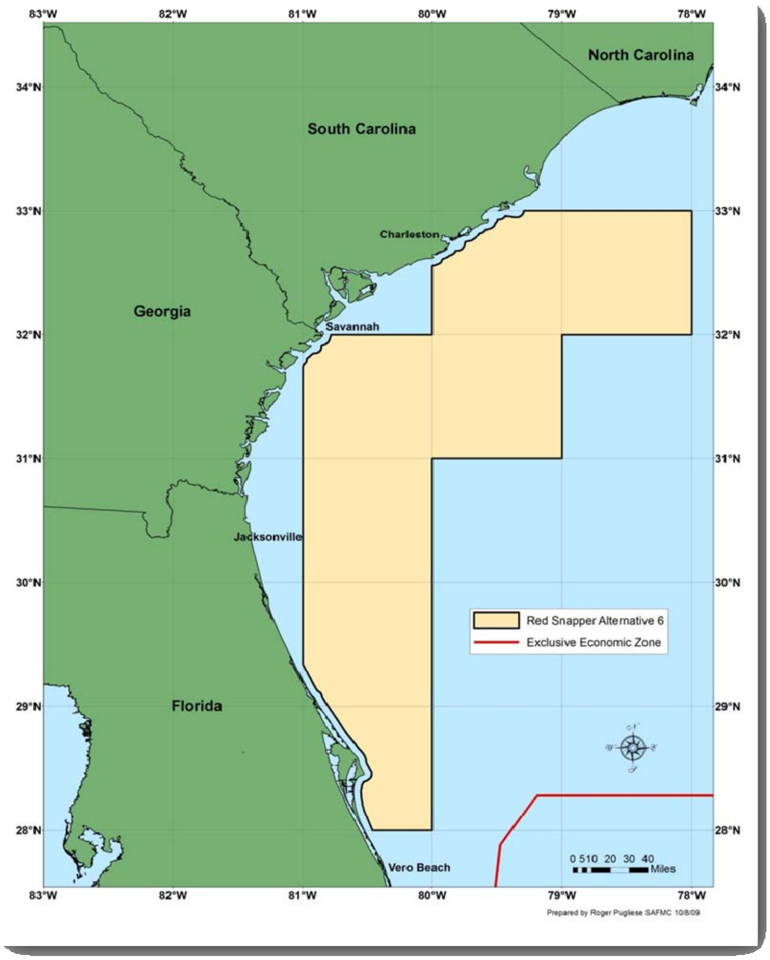

Figure 2-4. Map of proposed closed area under **Alternative 6.**

Alternative 7. Allow harvest, possession, and retention of snapper grouper species (with exception of red snapper) in the closed area if fish were harvested with black sea bass pots with endorsements.

Alternative 8. Allow harvest, possession, and retention of snapper grouper species (with exception of red snapper) with bottom longline gear in the closed area deeper than 50 fathoms as specified in CFR §622.35.

Alternative 9. Allow harvest, possession, and retention of snapper grouper species (with the exception of red snapper) in the closed area if fish were harvested with spearfishing gear.

Alternative 10. Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in South Atlantic EEZ. Establish a limited, designated snapper-grouper bottom fishing zone (or zones) between 28 degrees N (approx. Stuart, FL) and 33 degrees N (Cape Romain, SC) within the South Atlantic EEZ.

Allocate a portion of the 79,000 lb ACL as non-directed removals; i.e., bycatch mortality, between the closure area and outside the closure area.

Outside the closure area: Take the poundage allotment for area south of 28 degrees north and north of 33 degrees north (Cape Romain), off the 79,000 lb.

South of 28 degrees (approx. Stuart FL) – 25,048 pounds
North of 33 degrees (Cape Romain SC) – 24,047 pounds
49,095 lb (non-directed removals) comes off the 79,000 ACL

Closure area: Allocate the remaining poundage (79,000 – 49,095 lbs) as directed removals to the three sectors based on Table 2, Alternative 3; Attachment 30:

28% - commercial 8,373 lbs
29% - for hire 8,672 lbs
43% - recreational 12,859 lbs

(Team to verify numbers and convert to numbers of fish where appropriate)

(Determine number of fish)

Commercial

The red snapper commercial ACL within the zone is 8,373 lbs. Make X number of permits available to those that hold a Federal Snapper Grouper Commercial Permit that would allow the permit holder to fish for species in the Snapper Grouper FMU inside of the limited, designated snapper-grouper bottom fishing zone(s) using circle hooks. Commercial permit holders selected to fish the designated fishing zone would be selected by a lottery system. (Details to be inserted; see GA DNR's rules for administering a lottery system). NMFS-SERO shall issue permits in the initial or any subsequent permit year by lottery devised and operated by the agency. A subset would be selected by the SEFSC to bring in red snapper for biological sampling. If real-time reporting requirements are violated, the permit holder would be subjected to severe sanctions, up to and including permit revocation. Once the real-time monitoring indicates the poundage [i.e., red snapper discards] allocated to the commercial sector has been taken, all permits for that sector are rescinded.

The following tracking and accountability measures would be required for those with a permit to fish in the zone:

- VMS
- Real time electronic catch (directed and non-directed) reporting via electronic logbooks or team   alternative real time reporting technology
- Video monitoring or observers (if selected)
- (The Council discussed requiring observers in at least in the first year to validate the video monitoring.)

For-Hire (Headboat and Charterboat)

The red snapper for-hire ACL within the zone is 8,672 lbs. Make X number of permits available to those that hold a Federal Snapper Grouper For-Hire Permit that would allow the permit holder to fish for species in the Snapper Grouper FMU inside of the limited, designated snapper-grouper bottom fishing zone(s) using circle hooks. For-hire permit holders selected to fish the designated fishing zone would be selected by a lottery system. (Details to be inserted; see GA DNR's rules for administering a lottery system). NMFS-SERO shall issue permits in the initial or any subsequent permit year by lottery devised and operated by the agency. A subset would be selected by the SEFSC to bring in red snapper for biological sampling. If real-time reporting requirements are violated, the permit holder would be subjected to severe sanctions, up to and including permit revocation. Once the real-time monitoring indicates the poundage [i.e., red snapper discards] allocated to the for-hire sector has been taken, all permits for that sector are rescinded.

The following tracking and accountability measures would be required for those with a permit to fish in the zone:

- Mandatory species ID training
- VMS
- Real time catch (directed and non-directed) reporting via logbooks??
- Video monitoring or Observers (if selected)
- (The Council discussed requiring observers in at least in the first year to validate the video monitoring.)

Private Recreational

The red snapper private recreational ACL within the zone is 12,859 lbs. Make X number of permits available that would allow the permit holder to fish for species in the Snapper Grouper FMU inside of the limited, designated snapper-grouper bottom fishing zone using circle hooks. Private recreational permit holders selected to fish the designated fishing zone would be selected by a lottery system. (Details to be inserted; see GA DNR's rules for administering a lottery system). NMFS-SERO shall issue permits in the initial or any subsequent permit year by lottery devised and operated by the agency. A subset would be selected by the SEFSC to bring in red snapper for biological sampling. If real-time reporting requirements are violated, the permit holder would be subjected to severe sanctions, up to and including permit revocation. Once the real-time monitoring indicates the poundage [i.e., red snapper discards] allocated to the private recreational sector has been taken, all permits for that sector are rescinded.

The following tracking and accountability measures would be required for those with a permit top fish in the zone:

- Mandatory species ID training
- VMS
- Real time text message reporting of catch (B1s and B2s)
- Video monitoring

Permit Numbers

At the September 2009 Council meeting, NMFS Law Enforcement personnel indicated that they could adequately monitoring, using VMS, 1000 vessels. Under that scenario, the following number of permits would be distributed each year:

28% - commercial	280 boats
29% - for hire X 10 to obtain boat #	290 boats
43% - recreational	430 boats
	1000 boats

These calculations were brought forward by a Council member. It may not be possible to divvy this small number of fish among this many boats. Perhaps you can, if fishermen can really stay off the snapper, as the commercial guys assert that they can.

There was discussion that attrition in the commercial and for hire sectors would be so substantial as to allow everyone remaining to participate, so that a lottery wouldn't be necessary for that sector.

Costs

Applicant to procure the monitoring technology. VMS can be reimbursed; other technology such as video monitoring, electronic logbooks, etc. would be responsibility of the applicant.

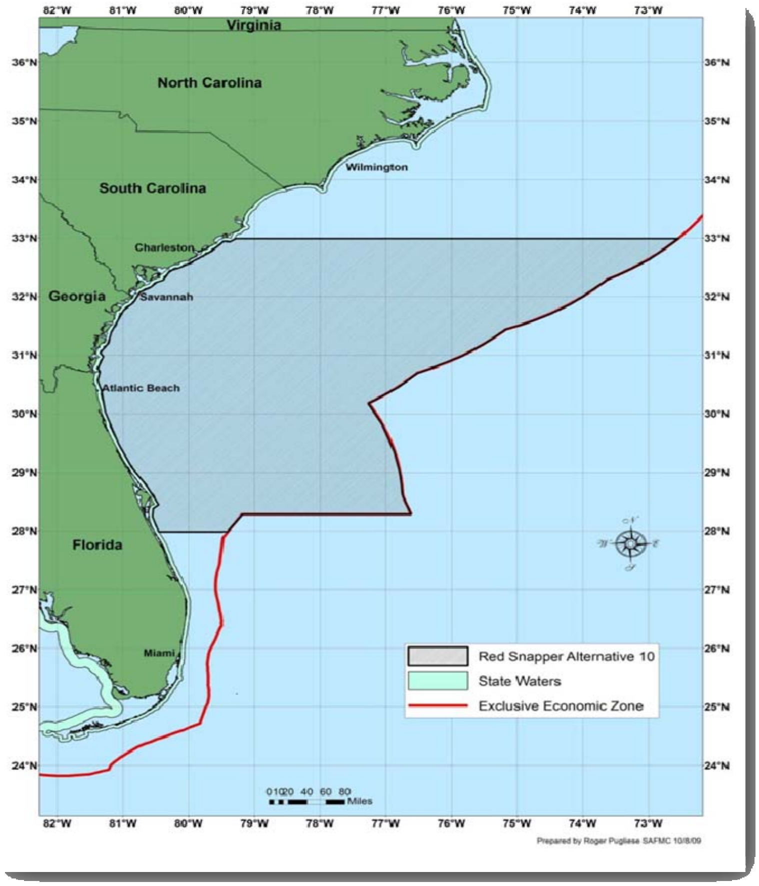

Figure 2-5 Map of proposed lottery program area under **Alternative 10.**

The IPT would like the Council to address the following list of questions regarding Alternative 10 (above).

<u>Lottery related questions:</u>

1) *What will the be the privileges offered to lottery winners in each of the sectors?*
2) *How much would lottery winners be allowed to fish?*
3) *Would lottery permits be issued to vessels or for trips in each of the sectors, would it be the same for each sector?*
4) *What is the duration of the special privileges granted to lottery winners in each sector.*
5) *Would a new lottery be conducted annually? It would seem that commercial and for-hire operations would prefer long-term arrangements for financial stability, whereas shorter arrangements might be possible for private recreational fishermen who fish less often and are not using the fishery as a source of income.*
6) *Could lotteries be conducted more frequently, i.e., quarterly for the private recreational sector as a means of limiting the hard-to-monitor recreational sector?*
7) *Will the lottery winners be able to sell their permits, or will permits be non-transferable?*

8) *It is reasonable to award the same amount of red snapper to every lottery winner? The "Permit Numbers" section above, assumes that each lottery winning boat would be able to catch approximately 30 lbs of red snapper. However, it might be possible to award a larger number of lottery permits to the private recreational sector, which each permit equating to fewer lbs of red snapper.*

Enforcement related questions:

1) *Is the cost of enforcement worth the benefit of the lottery system?*
2) *In the event VMS is required for the lottery winners, (which is strongly endorsed by OLE), how often will the VMS units need to be switched from old lottery winners to new lottery winner's vessels. Additionally, OLE cannot afford to purchase or reimburse up to 1,000 new lottery winners each cycle.*
3) *The methods of video monitoring would not be adequate or effective in capturing retention or catch-n-release activity on varying types of vessels allowed in this plan because it could not be used for fish identification purposes, which is the proof that is needed to prosecute violations.*

General questions:

1) *Do red snapper have to be discarded? Can there be a requirement to land their red snapper and give them up at the dock for biological sampling? This might entail a requirement to call-in catches of red snapper so that some one would know to collect the fish at the dock or marina.*

Alternative 11. Allow transit through areas closed to snapper grouper harvest.

> **Sub-alternative 11a.** The prohibition on possession does not apply to a person aboard a vessel that is in transit with snapper-grouper species on board and with fishing gear appropriately stowed.

Vessels (both commercial and recreational) may transit through any snapper grouper closed area in the South Atlantic EEZ with snapper grouper species on board if prohibited fishing gear is appropriately stowed and not available for immediate use. Use of spearfishing gear is permitted within South Atlantic snapper grouper closed areas and is not subject to this provision.

The term *"transit"* means: Direct, non-stop progression through any snapper grouper closed area in the South Atlantic EEZ on a constant heading, along a continuous straight line course, while making way by means of a source of power at all times.

The term *"Gear appropriately stowed"* includes but is not limited to: **Terminal gear** (i.e., hook, leader, sinker, flasher, or bait) used with an automatic reel, bandit gear, buoy gear, tolling gear, hand-line, or rod and reel must be disconnected and stowed separately from such fishing gear. Rod and reel must be removed from the rod holder and stowed securely on or below deck; **longline gear** may be left on the drum if all gangions and hooks are disconnected and stowed below deck, hooks cannot be baited, all buoys must be disconnected from the gear; however, buoys may remain on deck; **trawl and try net gear** may remain on deck, but trawl doors must be disconnected from such net and must be secured; **gill nets**, stab nets, or trammel nets must be left on the drum, any additional such nets not attached to the drum must be stowed below deck; and **crustacean traps,** golden crab trap, or sea bass pots cannot be baited, all buoys must be disconnected from the gear; however, buoys may remain on deck. Other methods of stowage authorized in writing by the Regional Administrator, and subsequently published in the *Federal Register* may also be utilized under this definition.

The term *"Not available for immediate use"* means: Gear that is shown to not have been in recent use and that is stowed in conformance with the definitions included under "gear appropriately stowed".

> **Sub-alternative 11b.** The prohibition on possession does not apply to a person aboard a vessel that has snapper grouper species onboard if the vessel is in transit.

Vessels (both commercial and recreational) may transit through any snapper grouper closed area in the South Atlantic EEZ with snapper grouper species.

The term *"transit"* means: Direct, non-stop progression through any snapper grouper closed area in the South Atlantic EEZ on a constant heading, along a continuous straight line course, while making way by means of a source of power at all times.

> **Sub-alternative 11c.** The prohibition on possession does not apply to a person aboard a vessel that has wreckfish onboard if the vessel is in transit.

Vessels (both commercial and recreational) may transit through any snapper grouper closed area in the South Atlantic EEZ with snapper grouper species and/or wreckfish on board.
The term *"transit"* means: Direct, non-stop progression through any snapper grouper closed area in the South Atlantic EEZ on a constant heading, along a continuous straight line course, while making way by means of a source of power at all times.

2.3.1 Comparison of Alternatives

Under **Alternative 1 (Status Quo)**, harvest reductions in total kill of 16.5% (commercial sector), 1.1 to 7.7% (headboat sector), and 2.3% (private/charter sector) stemming from Snapper Grouper Amendment 16 (SAFMC 2008), which has recently been implemented. An 85% reduction in total removals of red snapper is needed to end overfishing. Under the preferred rebuilding strategy, a 90% reduction in red snapper total removals would be needed. **Alternative 2** would prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ. Depending on the assumptions, prohibiting all harvest of red snapper under **Alternative 2**, could provide between a 39 to 61% reduction in total removals.

Alternative 3 prescribes, in addition to a closure of the red snapper fishery, a closure of four logbook grids (2880, 2980, 3080, 3180) between depths of 98 feet (16 fathoms; 30 m) and 240 feet (40 fathoms, 73m) to harvest, possession, and retention of all species in the snapper grouper FMU. Under **Alternative 3**, the estimated reduction in total removals is estimated to range from

79%, which assumes the SEDAR 15 (2008) 90% release mortality rate for the commercial fishery to 88% reduction in total removals, which assumes a 40% discard mortality (SERO-LAPP-2009-07). **Alternative 5**, which prescribes a general closure of the red snapper fishery and a complete closure of the four logbook grids partially closed in **Alternative 3** would provide a reduction in total removals from 80% to 88%.

Alternative 4 requires, in addition to a closure of the red snapper fishery, the year-round closure of seven logbook grids (2880, 2980, 3080, 3179, 3180, 3278, 3279) between depths of 98 and 240 feet to the harvest of all members of the snapper/grouper FMU. Under this regulatory option, assuming **Alternative 4** has the same impacts upon recreational and headboat fisheries as **Alternative 6**, the reduction in total kill in the different scenarios examined in SERO-LAPP-2009-07 would range from 84% to 90%. The reduction in total removals from the scenarios examined for **Alternative 6** range from 86% to 90%. This alternative would establish the year-round closure of seven logbook grids (2880, 2980, 3080, 3179, 3180, 3278, 3279) and therefore includes the most extensive closure of harvest areas.

Allowing transit with snapper grouper and or wreckfish on board (**Sub-Alternatives 7a, 7b**, and **7c**) would make enforcement within the closed areas more difficult; however, the enforcement burden may be mitigated by careful drafting of transit and "gear stowed" regulations. Additionally, allowing for transit through the closed area would likely eliminate any safety-at-sea concerns that may arise from having to navigate around a closed area in bad weather.

2.3.2 Council Conclusion

2.4 Require the use of Circle Hooks

Alternative 1 (Status Quo). Do no require the use of circle hooks within any particular area of the South Atlantic EEZ when fishing for snapper grouper species.

Alternative 2. Require the use of circle hooks when fishing for snapper grouper within the area north of 28 degrees.

Alternative 3. Require the use of circle hooks when fishing for snapper grouper species within the South Atlantic EEZ.

2.4.1 Comparison of Alternatives

Alternative 2 would require the use of circle hooks within north of 28^{o}N; whereas **Alternative 3** would require the use of circle hooks within the South Atlantic EEZ . The intended effect is to reduce discard and bycatch mortality of red snapper.

Studies on the effects of circle hooks and J hooks on retention and survival is limited to a handful of snapper grouper species. Some studies indicate beneficial effects can be gained to species such as red snapper while others are inconclusive. Due to limited data, it is not possible to quantify the reduction in red snapper release mortality that could be provided by using circle hooks. Furthermore, not all species in the snapper grouper complex have the same mouth morphology and it is possible that circle hooks could negatively impact survival. Alternatively, use of circle hooks could substantially reduce harvest of some species, would have positive biological benefits but have negative social and economic impacts on fishermen dependent upon the species.

The mandatory use of circle hooks was considered in Amendment 16 but removed after the amendment was reviewed by the Council's SSC. The SSC was concerned that there was not enough published information to quantify the effects of reducing discard mortality for various snapper grouper species, including red snapper. The SSC also expressed concern as did some public comments, that mandatory use of circle hooks could reduce availability of some snapper grouper species such as yellowtail snapper and gray triggerfish, which are not overfishing or overfished. Yellowtail snapper are primarily taken in South Florida; therefore, if **Alternative 3** was not selected as the preferred alternative, fishermen targeting yellowtail snapper with J-hooks would be able to continue this practice.

2.4.2 Council Conclusions

2.5 Establish a Red Snapper Monitoring Program

Alternative 1. (Status Quo) Utilize existing data collection programs to monitor the rebuilding progress of red snapper. Existing programs include the fishery dependent Marine Recreational Information Program (MRIP), logbook, discard logbook, headboat logbook, Trip Interview Program (TIP), and dealer reported landings. Fishery independent methods include Marine Resources Monitoring Assessment and Prediction Program (MARMAP), and the Southern Area Monitoring and Assessment Program (SEAMAP). Over the course of the next three years MARMAP will be looking for red snapper sampling sites along the north FL, and South GA coast.

Alternative 2. Establish fishery independent monitoring program to track progress of red snapper. Sampling would include deployment of chevron traps, cameras, and hook and line at randomly selected stations.

Alternative 3. Establish a red snapper research fishery involving for-hire vessels (charter boat and headboats). Participating vessels may be authorized to harvest and land fish in excess of Federal possession limits and/or during fishery closures. Retention limits for red snapper would be based upon research objectives. The trip limits and number of trips per month will depend on the number of selected vessels, available quota, and objectives of the research fishery (Table 2-9).

Table 2-9. Sub-Alternatives under consideration for the red snapper research fishery.

	Number of vessels to participate		Trip Limit (lbs whole weight)	Trips/month	Fishing Season
	CB	HB			
Alternative 3a					
Alternative 3b					
Alternative 3c					

[In order to determine the number of headboats that could participate while still allowing the stock to rebuild, several variables need to be considered, i.e., number of grids closed, biomass in closed grids, number of vessels located near closed areas able to participate, level of dead discards predicted for commercial and recreational sector inside and outside the closed areas.]

Sub-Alternatives under consideration for the red snapper headboat research fishery.
*If no directed fishing were allowed in the commercial and recreational sectors ACL = 0, and no discards by participating headboats. Note: It is not possible to complete this table until preferred alternative specifying are closure is selected. Table will likely have to be completed by Science Center.

<u>Administrative Details</u>

The National Marine Fisheries Service (NMFS) will annually request applications for participation in the red snapper research fishery through an Exempted Fishing Permit (EFP). The EFP would authorize participation in the red snapper research fishery and the collection of red snapper and other species in the Fishery Management Unit. Participating vessels may be authorized to harvest and land fish in excess of Federal possession limits and/or during fishery closures.

NMFS will review the submitted applications based on the selection criteria as described in a Federal Register notice and information provided on the application form to determine which applicants are qualified to participate in the red snapper research fishery.

Qualified applicants are those that:
- possess a valid commercial snapper grouper Federal permit;
- possess a valid United States Coast Guard (USCG) safety inspection decal when the application is submitted;
- have not been charged criminally or civilly (i.e., issued a Notice of Violation and Assessment (NOVA) or Notice of Permit Sanction) for any snapper grouper-related violation;
- have complied with NMFS observer programs and are able to take a NMFS-approved observer; and,
- submit a completed application by the posted deadline.

2.5.1 Comparison of Alternatives

The no action **Alternative 1 (Status Quo)** would not establish a program to monitor rebuilding of red snapper. However, since some of the alternatives being considered would prohibit fishing for or retention of red snapper as well as area closures for snapper grouper species, traditional fishery-dependent data would be lacking and it would not be possible to track recovery of red snapper in SEDAR updates and future benchmark assessments. Further, existing fishery-independent data collection programs would not be sufficient to monitor red snapper due to limitations associated with the temporal and spatial range of sampling.

Alternative 2 would utilize fishery-independent sampling to collect data to monitor stock status of red snapper. It is possible that with additional funding, the Marine Resources Monitoring Assessment and Prediction Program (MARMAP) or a new program could be established to accomplish the task.

For thirty years, the Marine Resources Research Institute (MRRI) at the South Carolina Department of Natural Resources (SCDNR), through the MARMAP program, has conducted fisheries-independent research on groundfish, reef fish, ichthyoplankton, and coastal pelagic fishes within the region between Cape Lookout, North Carolina, and Cape Canaveral, Florida. The overall mission of the program has been to determine distribution, relative abundance, and critical habitat of economically and ecologically important fishes of the South Atlantic Bight (SAB), and to relate these features to environmental factors and exploitation activities. Research toward fulfilling these goals has included trawl surveys (from 6-350 m depth); ichthyoplankton surveys; location and mapping of reef habitat; sampling of reefs throughout the SAB; life history and population studies of priority species; tagging studies of commercially important species and special studies directed at specific management problems in the region. Survey work has also provided a monitoring program that has allowed the standardized sampling of fish populations over time, and development of a historical database for future comparisons of long-term trends.

The chevron trap has been one of the primary gear types used by MARMAP to monitor reef fish abundance and collect specimens for life history studies. Since 1987, chevron traps baited with clupeids have been deployed at stations randomly selected by computer from a database of approximately 2,500 live bottom and shelf edge locations and buoyed for approximately 90 minutes. This database was compiled from MARMAP visual underwater television studies with additional locations added from catch records from MARMAP and other projects. During the 1990s, additional sites were obtained for the North Carolina and south Florida area from scientific and commercial fisheries sources to facilitate expanding the overall sampling coverage. Sample sites are all located in the central SAB from 27^0 N latitude to 34^0 N latitude. Trapping has occurred to depths as great as 218 m but the majority of trap sampling has occurred at 16 to 91 m. During all years, sampling was conducted during daylight to eliminate light phase as a variable. Conductivity, temperature, and depth profiles were taken after each trap set. Another primary gear type used by MARMAP since 1978 is hook and line. Hook and line stations were fished during dawn and dusk periods, one hour preceding and after actual sunrise and sunset.

Collection of Red Snapper Data

Under **Alternative 2**, chevron traps would be used to collect information on red snapper. Few red snapper have been taken with chevron trap by the MARMAP program. However, use of chevron traps in the Gulf of Mexico indicates red snapper are readily available to this gear type. It may be that few red snapper have been taken with this gear in the South Atlantic because MARMAP began using the gear when biomass was already at very low levels. In addition, the zone of greatest abundance for red snapper is off north Florida in the South Atlantic, which represents the geographic extreme for sampling by the MARMAP program.

Therefore, under **Alternative 2**, it would be necessary for an increase in sampling intensity off the north Florida and southern Georgia region beyond what MARMAP has done historically. In addition, reconnaissance work would be needed to identify additional live bottom locations where red snapper occur. This can be accomplished through underwater television studies as well as through cooperative efforts with fishermen and cooperative research programs.

Similar to MARMAP methodology, chevron traps would be baited with clupeids and soaked for 90 minutes at randomly selected stations to capture specimens for examination. Cameras would be attached to these traps to obtain a video record of what is not captured by the traps. In addition, at the same stations, non-destructive sampling would also be conducted with cameras mounted on traps, which are not baited, to obtain a video record of species composition and abundance.

At these same stations standardized hook and line gear would be used to collect information on red snapper. Following MARMAP design, this sampling will consist of rods utilizing Electromate motors powered 6/0 Penn Senator reels and 36 kg test monofilament line. The terminal tackle will consist of three 4/0 hooks on 23 kg monofilament leaders 0.25 m long and 0.3 m apart, weighted with sinkers 0.5 to 1 kg. The top and bottom hooks will be baited with cut squid and the middle hook baited with cut cigar minnow.

All fish caught with traps and hook and line gear would be identified and measured to the nearest 1 cm. Data would be recorded with a shipboard data acquisition system. Video from traps would be visually examined and fish would be estimated to the lowest taxonomic level. Lengths of red snapper would also be estimated from video. Catch per unit effort for red snapper sampled with trap, hook and line, or video would be expressed as the number/hour for a particular gear type.

For trap and hook and line samples, every effort would be made to minimize handling time and release red snapper and other snapper grouper species alive. Dead specimens would be retained for life history studies. During life history workup, a data acquisition system with 1-mm resolution would be used to measure red snapper and other priority species (standard length, fork length, and total length) with their weights determined by a triple beam balance to the nearest gram. Hard parts and reproductive tissue would be removed and stored for future life history studies. Additional samples could be obtained as needed to conduct stock assessments. Details on number of samples to be collected would be provided by the SEFSC.

To obtain information on movement, growth rates, and release mortality, red snapper would be tagged prior to release. As visible tags could encourage targeting of red snapper by the public due to the possibility of obtaining rewards for tag returns, internal Passive Integrated Transponder (PIT) will be used. A PIT tag is encased in glass to protect the electronic components. It is inserted with a 12-gauge needle or by surgical incision under the animal's skin. PIT tags serve as a permanent coded marker that is a reliable form of identification for an individual. The tag is activated by a handheld reader, which generates a close-range, electromagnetic field and transmits its number to the reader. The process is similar to scanning bar codes in a grocery store (http://www.cof.orst.edu/ofep/Hinkle%20Creek%20DVD/Completed%20Activities/PIT%20Tags.doc). PIT tags have been commonly used to tag many animals including fish species. At the time of tagging, information collected would include PIT tag number, species, total length, fork length, data, location, time, condition of fish, and rate of descent.

Alternative 3 would employ fishery dependent data to monitor abundance of red snapper. The advantage in having fishermen collect information is they would have some knowledge about locations where red snapper can be found that might not be available to researchers. The disadvantage would be fishermen could target red snapper where they are most concentrated and therefore, trends in CPUE and mean length might not reflect true population trends. To eliminate this bias, sampling would need to be coordinated through the SEFSC.

Under **Alternative 3**, Participating vessels may be authorized to harvest and land fish in excess of Federal possession limits and/or during fishery closures. Retention limits for red snapper would be based upon research objectives. The trip limits and number of trips per month will depend on the number of selected vessels, available quota, and objectives of the research fishery.

Fishery dependent data from headboats represents the longest continuous time series for snapper grouper species. This time series has been an important index for many assessments including red snapper. Proposed alternatives for red snapper in Amendment 17A include areas where fishing for or retention of all snapper grouper species would be prohibited. To maintain this continuous database, limited headboat trips would be permitted to enter closed areas and fish for snapper grouper species. Under **Alternative 3**, trips would be selected by the SEFSC and would include an observer who would obtain data on all red snapper caught. Additional information on snapper grouper species would be obtained where possible. Every effort would be made to tag released red snapper with PIT tags as described for **Alternative 3**. Dead red snapper would be retained for life history studies. The SEFSC would indicate if additional samples were needed for stock assessments.

Additional fishery dependent data could be obtained by means of grant-funded research through the Cooperative Research Program. Fishermen, working with researchers, could obtain funding from NOAA Fisheries Service to obtain information on red snapper for studies on life history, release mortality, mapping locations of high abundance, etc.

2.5.2 Council Conclusion

3 Affected Environment

3.1 Habitat

3.1.1 Inshore/Estuarine Habitat

Many deepwater 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 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 diurnal feeding migrations or seasonal shifts in cross-shelf distributions. More detail on these habitat types is found in Sections 3.2.1 and 3.2.2 of the Council's Habitat Plan (SAFMC 1998e).

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 11° to 27° C (52° to 81° F) due to the proximity of the Gulf Stream, with lower shelf habitat temperatures varying from 11° to 14° C (52° to 57° F). Water depths range from 16 to 27 meters (54 to 90 feet) or greater for live-bottom habitats, 55 to 110 meters (180 to 360 feet) for the shelf-edge habitat, and from 110 to 183 meters (360 to 600 feet) for lower-shelf habitat areas.

The exact extent and distribution of productive snapper grouper habitat on the continental shelf north of Cape Canaveral is unknown. Current data suggest from 3 to 30 percent 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 invertebrates, moderate relief reefs from 0.5 to 2 meters (1.6 to 6.6 feet), 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, Florida, but is most abundant offshore from northeastern Florida. South of Cape Canaveral, the continental shelf narrows from 56 to 16 kilometers (35 to 10 miles) wide, thence reducing 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 feet). 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 meters

(89 and 331 feet) isobaths from Cape Hatteras, NC to Cape Canaveral, FL is reef habitat. Although the benthic communities found in water depths between 100 and 300 meters (328 and 984 feet) from Cape Hatteras, NC to Key West, FL 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.

Man-made artificial reef structures are also utilized to attract fish and increase fish harvests; however, research on man-made 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 unvegetated areas of little or no relief.

The distribution of coral and live hard-bottom habitat as presented in the SEAMAP Bottom Mapping Project is a proxy for the distribution of the species within the snapper grouper complex. The method used to determine hard bottom habitat relied on the identification of reef obligate species including members of the snapper grouper complex. The Florida Fish and Wildlife Research Institute (FWRI), using the best available information on the distribution of hard bottom habitat in the south Atlantic region, prepared ArcView maps for the four-state project. These maps, which consolidate known distribution of coral, hard/live bottom, and artificial reefs as hard bottom, are included in Appendix E of the Habitat Plan (SAFMC 1998e). These maps are also available on the Internet at the Council's following Internet Mapping System website: http://ocean.floridamarine.org/efh_coral/ims/viewer.htm.

The South Carolina Department of Natural Resources, NOAA/Biogeographic Characterization Branch, and the South Atlantic Fishery Management Council cooperatively generated additional information on managed species' use of offshore fish habitat. Plots of the spatial distribution of offshore species were generated from the Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP) data (Figures 35-41) in the Habitat Plan (SAFMC 1998e). The plots should be considered 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 presented in Appendix E of the Habitat Plan (SAFMC 1998e), can 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 be generated through the Council's Internet Mapping System at the following web address: http://ocean.floridamarine.org/efh_coral/ims/viewer.htm.

3.1.3 Essential Fish Habitat

Essential fish habitat (EFH) is defined in the Magnuson-Stevens Fishery Conservation and Management 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 feet (but to at least 2,000 feet 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 meters (100-foot) contour, such as attached microalgae; 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-HAPCs) 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 Habitat Area of Particular Concern; all hermatypic coral habitats and reefs; Manganese outcroppings on the Blake Plateau; and Council-designated Artificial Reef Special Management Zones (SMZs). Areas that meet the criteria for designating essential fish habitat-habitat areas of particular concern 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 FMP regulations, the Council, in cooperation with NOAA Fisheries, actively comments on non-fishing projects or policies that may impact essential fish habitat. The Council adopted a habitat policy and procedure document that established a four-state Habitat Advisory Panel and adopted a comment and policy development process. With guidance from the Advisory Panel, the Council has developed and approved habitat 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; and alterations to riverine, estuarine and nearshore flows (Appendix C of Habitat Plan; SAFMC 1998e).

3.2 Biological/Ecological Environment

3.2.1 Species Most Impacted By This FMP Amendment

Amendment 17A includes alternatives for management measures that could prohibit fishing for or retention of all snapper grouper species in areas off of north Florida and Georgia to end overfishing of red snapper by reducing the incidental catch of the species. Snapper grouper species commonly taken with red snapper could be affected by the action. In addition to red snapper, snapper-grouper species most likely to be affected by the proposed actions includes many species that occupy the same habitat at the same time. For example, red snapper co-occur with vermilion snapper, gag, scamp, greater amberjack, gray triggerfish, black sea bass, red grouper, and others (Tables 4-14 to 4-16). Therefore, snapper grouper species are likely to be caught when regulated since they will be incidentally caught when fishermen target other co-occurring species. Furthermore, proposed actions in Amendment 17A include provisions, which would allow fishing with spearfish gear, black sea bass pots, and bottom longline. Therefore, in addition to species that co-occur with red snapper, species such as golden tilefish and snowy grouper that commonly occur in deeper water could be affected by the proposed actions.

3.2.1.1 Gag, Mycteroperca microlepis

Gag occur in the Western Atlantic from North Carolina to the Yucatan Peninsula, and throughout the Gulf of Mexico. Juveniles are sometimes observed as far north as Massachusetts (Heemstra and Randall 1993). Gag commonly occur at depths of 39-152 m (131-498 ft) (Heemstra and Randall 1993) and prefer inshore-reef and shelf-break habitats (Hood and Schlieder 1992). Bullock and Smith (1991) indicated gag probably do not move seasonally between reefs in the Gulf of Mexico, but show a gradual shift toward deeper water with age. McGovern *et al.* (2005) reported extensive movement of gag along the Southeast United States. In a tagging study, 23% of the 435 recaptured gag moved distances greater that 185 km (100 nautical miles). Most of these individuals were tagged off South Carolina and were recaptured off Georgia, Florida, and in the Gulf of Mexico (McGovern *et al.* 2005).

Gag are probably estuarine dependent (Keener *et al.* 1988; Ross and Moser 1995; Koenig and Coleman 1998; Strelcheck *et al.* 2003). Juveniles (age 0) occur in shallow grass beds along Florida's east coast during the late spring and summer (Bullock and Smith 1991). Sea grass is also an important nursery habitat for juvenile gag in North Carolina (Ross and Moser 1995). Post-larval gag enter South Carolina estuaries when they are 13 mm (0.5 inches) TL and 40 days old during April and May each year (Keener *et al.* 1988), and utilize oyster shell rubble as nursery habitat. Juveniles remain in estuarine waters throughout the summer and move offshore as water temperatures cool during September and October. Adults are often seen in shallow water 5-15 m (16-49 ft) above the reef (Bullock and Smith 1991) and as far as 40-70 km (22-38 nautical miles) offshore.

Huntsman *et al.* (1999) indicated gag are vulnerable to overfishing since they are long-lived, late to mature, change sex, and aggregate to spawn. The estimated natural mortality rate is 0.14 (SEDAR 10 2007). Maximum reported size for gag is 145 cm (57.5 inches) TL and 36.5 kg (81 pounds) (Heemstra and Randall 1993), and maximum reported age is 26 years (Harris and Collins 2000). Gag is a sequential hermaphrodite, changing sex from female to male with increased size and age (Coleman *et al.* 1996; McGovern *et al.* 1998; Coleman *et al.* 2000). All individuals less than 87.5 cm (34.7 inches) TL are females. At 105.0 cm (41.6 inches) TL, 50% of fishes are males. Almost all gag are males at sizes greater than 120.0 cm (47.5 inches) TL (McGovern *et al.* 1998).

Along the southeastern United States (1994-1995), size at first maturity is 50.8 cm (20.2 inches) TL, and 50% of gag females are sexually mature at 62.2 cm (24.7 inches) (McGovern *et al.* 1998). According to Harris and Collins (2000), age-at-first-maturity is 2 years, and 50% of gag are mature at 3 years. For data collected during 1978-1982 off the southeastern United States, McGovern *et al.* (1998) reported the smallest mature females were 58.0 cm (22.9 inches) TL and 3 years old. Hood and Schlieder (1992) indicated most females reach sexual maturity at ages 5-7 in the Gulf of Mexico. Off the southeastern United States, gag spawn from December through May, with a peak in March and April (McGovern *et al.* 1998). Duration of planktonic larvae is about 42 days (Keener *et al.* 1988; Koenig and Coleman 1998; Lindeman *et al.* 2000). McGovern *et al.* (1998) reported the percentage of male gag landed by commercial fishermen decreased from 20% during 1979-1981 to 6% during 1995-1996. This coincided with a decrease in the mean length of fish landed. A similar decrease in the percentage of males was reported in the Gulf of Mexico (Hood and Schleider 1992; Coleman *et al.* 1996).

Adults are sometimes solitary, and can occur in groups of 5 to 50 individuals. They feed primarily on fishes, crabs, shrimp, and cephalopods (Heemstra and Randall 1993), and often forage in small groups far from the reef ledge (Bullock and Smith 1991). Juveniles feed primarily on crustaceans, and begin to consume fishes when they reach about 25 mm (1 inch) in length (Bullock and Smith 1991; Mullaney 1994).

3.2.1.2 Scamp, *Mycteroperca phenax*

Scamp occur in the Western Atlantic, from North Carolina to Key West, in the Gulf of Mexico, and in the southern portion of the Caribbean Sea. Juveniles are sometimes encountered as far north as Massachusetts (Heemstra and Randall 1993). Its reported depth range is 30-100 m (98-328 ft) (Heemstra and Randall 1993). Juveniles are found in estuarine and shallow coastal waters (Bullock and Smith 1991; Heemstra and Randall 1993).

Scamp are protogynous, with females dominating sizes less than 70.0 cm (27.8 in) (Harris *et al.* 2002). Scamp live for at least 30 years (Harris *et al.* 2002), and attain sizes as great as 107.0 cm

(42.4 in) TL and 14.2 kg (31.3 lbs) (Heemstra and Randall 1993). Natural mortality rate is estimated to be 0.15 (Potts and Brennan 2001). Harris *et al.* (2002) report that the length and age at first spawning of females off North Carolina to southeast Florida was 30.0-35.0 cm (11.9-13.8 in) TL and age 1. Length and age at 50% maturity was 35.3 cm (13.9 in) TL and 1.28 years, respectively (Harris *et al.* 2002). In a study conducted in the eastern Gulf of Mexico, all fish larger than 35.0 cm TL were sexually mature (M. Godcharles and L. Bullock, unpublished data).

Spawning occurs from February through July in the South Atlantic Bight and in the Gulf of Mexico, with a peak in March to mid-May (Harris *et al.* 2002). Hydration of eggs occurs primarily during the morning and late afternoon, which indicates that scamp spawn during late afternoon and evening. Spawning individuals have been captured off South Carolina and St. Augustine, Florida at depths of 33 to 93 m. Scamp aggregate to spawn. Spawning locations and time of spawning overlaps with gag (Gilmore and Jones 1992). Fish are the primary prey of this species (Matheson *et al.* 1986).

3.2.1.3 Red grouper, *Epinephelus morio*

Red grouper is primarily a continental species, mostly found in broad shelf areas (Jory and Iversen 1989). Red grouper occur in the Western Atlantic, from North Carolina to southeastern Brazil, including the eastern Gulf of Mexico and Bermuda, but can occasionally be found as far north as Massachusetts (Heemstra and Randall 1993).
Red grouper is uncommon around coral reefs; it generally occurs over flat rock perforated with solution holes (Bullock and Smith 1991), and is commonly found in the caverns and crevices of limestone reef in the Gulf of Mexico (Moe 1969). It also occurs over rocky reef bottoms (Moe 1969).

Adult red grouper are sedentary fish that are usually found at depths of 5-300 m (16-984 ft). Fishermen off North Carolina commonly catch red grouper at depths of 27-76 m (88-249 ft) for an average of 34 m (111 ft). Fishermen off southeastern Florida also catch red grouper in depths ranging from 27-76 m (88-249 ft) with an average depth of 45 m (148 ft) (Burgos 2001; McGovern *et al.* 2002). Moe (1969) reported that juveniles live in shallow water nearshore reefs until they are 40.0 cm (16 inches) and 5 years of age, when they become sexually mature and move offshore. Spawning occurs during February-June, with a peak in April (Burgos 2001). In the eastern Gulf of Mexico, ripe females are found December through June, with a peak during April and May (Moe 1969). Based on the presence of ripe adults (Moe 1996) and larval red grouper (Johnson and Keener 1984) spawning probably occurs offshore. Coleman *et al*. (1996) found groups of spawning red grouper at depths between 21-110 m (70-360 feet). Red grouper do not appear to form spawning aggregations or spawn at specific sites (Coleman *et al.* 1996). They are reported to spawn in depths of 30-90 m (98-295 ft) off the Southeast Atlantic coast (Burgos 2001; McGovern *et al.* 2002).

Red grouper are protogynous, changing sex from female to male with increased size and age. Off North Carolina, red grouper first become males at 50.9 cm (20.1 inches) TL and males dominate size classes greater than 70.0 cm (27.8 inches) TL. Most females transform to males between ages 7 and 14. Burgos (2001) reported that 50% of the females caught off North

Carolina are undergoing sexual transition at age 8. Maximum age reported by Heemstra and Randall (1993) was 25 years. Burgos (2001) and McGovern *et al.* (2002) indicated red grouper live for at least 20 years in the Southeast Atlantic and a maximum age of 26 years has been reported for red grouper in the Gulf of Mexico (L. Lombardi, NMFS Panama City, personal communication). Natural mortality rate is estimated to be 0.20 (Potts and Brennan 2001). Maximum reported size is 125.0 cm (49.2 inches) TL (male) and 23.0 kg (51.1 pounds). For fish collected off North Carolina during the late 1990s, age at 50% maturity of females is 2.4 years and size at 50% maturity is 48.7 cm (19.3 inches) TL. Off southeastern Florida, age at 50% maturity was 2.1 years and size at 50% maturity was 52.9 cm (21.0 inches) TL (Burgos 2001; McGovern *et al.* 2002). These fish eat a wide variety of fishes, octopi, and crustaceans, including shrimp, lobsters, and stomatopods (Bullock and Smith 1991, Heemstra and Randall 1993).

3.2.1.4 Black grouper, *Mycteroperca bonaci*

The black grouper occurs in the Western Atlantic, from North Carolina to Florida, Bermuda, the Gulf of Mexico, West Indies, and from Central America to Southern Brazil (Crabtree and Bullock 1998). Adults are found over hard bottom such as coral reefs and rocky ledges. Black grouper occur at depths of 9 to 30 m (30 to 98 ft). Juveniles sometimes occur in estuarine seagrass and oyster rubble habitat in North Carolina and South Carolina (Keener *et al.* 1988; Ross and Moser 1995). In the Florida Keys, juveniles settle on patch reefs (Sluka *et al.* 1994). Commercial landings of black grouper exceed landings of any other grouper in the Florida Keys.

Natural mortality (M) is estimated to be 0.15 (Potts and Brennan 2001). Crabtree and Bullock (1998) found black grouper live for at least 33 years and attain sizes as great as 151.8 cm (60.1 inches) TL. Females range in length from 15.5 to 131.0 cm (6.1-51.9 inches) TL and males range in length from 94.7 to 151.8 cm (38.3-60.1 in) TL. Black grouper are protogynous. Approximately 50% of females are sexually mature by 82.6 cm (32.7 inches) TL and 5.2 years of age. At a length of 121.4 cm (48.1 inches) TL and an age of 15.5 years, approximately 50% of the females have become males. Black grouper probably spawn throughout the year, however, peak spawning of females occurs from January to March.

Off Belize, black grouper are believed to spawn in aggregations at the same sites used by Nassau grouper (Carter and Perrine 1994). Eklund *et al.* (2000) describe a black grouper spawning aggregation discovered during winter 1997-1998, less than 100 m outside a newly designated marine reserve. Adults feed primarily on fishes.

Black sea bass occur in the Western Atlantic, from Maine to southeastern Florida, and in the eastern Gulf of Mexico (McGovern *et al.* 2002). Separate populations were reported to exist to the north and south of Cape Hatteras, North Carolina (Wenner *et al.* 1986). However, genetic similarities suggest this is one stock (McGovern *et al.* 2002). This species is common around rock jetties and on rocky bottoms in shallow water (Robins and Ray 1986) at depths from 2-120 meters (7-394 feet). Most adults occur at depths from 20-60 meters (66-197 feet) (Vaughan *et al.* 1995).

Maximum reported size is 66.0 centimeters (26.1") total length and 3.6 kilograms (7.9 lbs) (McGovern *et al.* 2002). Maximum reported age is 10 years (McGovern *et al.* 2002); however, ages as great as 20 years have been recorded in the Mid Atlantic region (Lavenda 1949; Froese and Pauly 2003). Natural mortality is estimated to be 0.30 (SEDAR 2 2003b). The minimum size and age of maturity for females reported off the southeastern U.S. coast is 10.0 centimeters (3.6") standard length and age 0. All females are mature by 18.0 centimeters (7.1") standard length and age 3 (McGovern *et al.* 2002; Table 3-1). Wenner *et al.* (1986) report peak spawning occurs from March through May in the South Atlantic Bight. McGovern *et al.* (2002) indicate black sea bass females are in spawning condition during March-July, with a peak during March through May (McGovern *et al.* 2002). Some spawning also occurs during September and November. Spawning takes place in the evening. Black sea bass change sex from female to male (protogyny). Females dominate the first 5 year classes and individuals over the age of 5 are more commonly males. The size at maturity and the size at transition of black sea bass was smaller in the 1990s than during the early 1980s off the southeast U.S. Black sea bass appear to compensate for the loss of larger males by changing sex at smaller sizes and younger ages (McGovern *et al.* 2002).

The diet of black sea bass is generally composed of shrimp, crab, and fish (Sedberry 1988). Smaller black sea bass eat small crustaceans and larger individuals feed on decapods and fishes.

3.2.1.5 Vermilion Snapper, *Rhomboplites aurorubens*

Vermilion snapper occur in the Western Atlantic, from North Carolina to Rio de Janeiro. It is most abundant off the southeastern United States and in the Gulf of Campeche (Hood and Johnson 1999). The vermilion snapper is demersal, commonly found over rock, gravel, or sand bottoms near the edge of the continental and island shelves (Froese and Pauly 2003). It occurs at depths from 18 to 122 m (59 to 400 ft), but is most abundant at depths less than 76 m (250 ft). Individuals often form large schools. This fish is not believed to exhibit extensive long range or local movement (SEDAR SAR 2 2003).

The maximum size of a male vermilion snapper, reported by Allen (1985) in Froese and Pauly (2003), was 60.0 cm (23.8 in) TL and 3.2 kg (7.1 lbs). Maximum reported age in the South Atlantic Bight was 14 years (Zhao *et al.* 1997; Potts *et al.* 1998). SEDAR 2-SAR2 (2003) recommends that natural mortality (M) be defined as 0.25/yr, with a range of 0.2-0.3/yr.

This species spawns in aggregations (Lindeman *et al.* 2000) from April through late September in the southeastern United States (Cuellar *et al.* 1996). Zhao *et al.* (1997) indicated that most spawning in the South Atlantic Bight occurs from June through August. Eggs and larvae are pelagic.

Vermilion snapper are gonochorists meaning that all vermilion snapper are mature at 2 years of age and 20.0 cm (7.9 in) (SEDAR SAR2 2003). Cuellar *et al.* (1996) collected vermilion snapper off the southeastern United States and found that all were mature. The smallest female was 16.5 cm (6.5 in) FL and the smallest male was 17.9 cm (7.1 in) FL (Cuellar *et al.* 1996). Zhao and McGovern (1997) reported that 100% of males that were collected after 1982 along the southeastern United States were mature at 14.0 cm (5.6 in) TL and age 1. All females collected after 1988 were mature at 18.0 cm (7.1 in) TL and age 1.

This species preys on fishes, shrimp, crabs, polychaetes, and other benthic invertebrates, as well as cephalopods and planktonic organisms (Allen 1985). Sedberry and Cuellar (1993) reported that small crustaceans (especially copepods), sergestid decapods, barnacle larvae, stomatopods, and decapods dominated the diets of small (< 50 mm (2 in) SL) vermilion snapper off the Southeastern United States. Larger decapods, fishes, and cephalopods are more important in the diet of larger vermilion snapper.

3.2.1.6 Snowy Grouper, *Epinephelus niveatus*

Snowy grouper occur in the Eastern Pacific and the Western Atlantic from Massachusetts to southeastern Brazil, including the northern Gulf of Mexico (Robins and Ray 1986). It is found at depths of 30-525 m (98-1,722 ft). Adults occur offshore over rocky bottom habitat. Juveniles are often observed inshore and occasionally in estuaries (Heemstra and Randall 1993).

The snowy grouper is a protogynous species. The smallest, youngest male examined by Wyanski *et al.* (2000) was 72.7 cm (28.8 in) TL and age 8. The median size and age of snowy grouper was 91.9 cm (34.5 in) and age 16. The largest specimen observed was 122 cm (48 in) TL and 30 kg (66 lbs), and 27 years old (Heemstra and Randall 1993). The maximum age reported by Wyanski *et al.* (2000) is 29 years for fish collected off of North Carolina and South Carolina. Radiocarbon techniques indicate that snow grouper may live for as long as 40 years (Harris, South Carolina Department of Natural Resources, personal communication). Wyanski *et al.* (2000) reported that 50% of the females are mature at 54.1 cm (21.3 in) TL and 5 years of age. The smallest mature female was 46.9 cm (18.5 in) TL, and the largest immature female was 57.5 cm (22.6 in) TL.

Females in spawning condition have been captured off western Florida during May, June, and August (Bullock and Smith 1991). In the Florida Keys, ripe individuals have been observed from April to July (Moore and Labinsky 1984). Spawning seasons reported by other researchers are as follows: South Atlantic (north of Cape Canaveral), April through September (Wyanski *et al.* 2000) and April through July (Parker and Mays 1998); and South Atlantic (south of Cape Canaveral), May through July (Manooch 1984). Wyanski *et al.* (2000) reported that snowy grouper spawn at depths from 176 to 232 m (577 to 761 ft) off South Carolina. Adults feed on fishes, gastropods, cephalopods, and crustaceans (Heemstra and Randall 1993).

3.2.1.7 Golden Tilefish, *Lopholatilus chamaeleonticeps*

Golden tilefish are distributed throughout the Western Atlantic, occurring as far north as Nova Scotia, to southern Florida, and in the eastern Gulf of Mexico (Robins and Ray 1986) (Table 3-1). According to Dooley (1978), golden tilefish occurs at depths of 80-540 meters (263-1,772 feet). Robins and Ray (1986) report a depth range of 82-275 meters (270-900 feet) for golden tilefish. It is most commonly found at about 200 meters (656 feet), usually over mud or sand bottom but, occasionally, over rough bottom (Dooley 1978).

Maximum reported size is 125 centimeters (50”) total length and 30 kilograms (66 lbs) (Dooley 1978; Robins and Ray 1986). Maximum reported age is 40 years (Harris *et al.* 2001). Radiocarbon aging indicate golden tilefish may live for at least 50 years (Harris, South Carolina Department of Natural Resources, personal communication). A recent SEDAR assessment estimate natural mortality (M) at 0.08 (SEDAR 4 2004). Golden tilefish spawn off the southeast coast of the U.S. from March through late July, with a peak in April (Table 3-1; Harris *et al.* 2001). Grimes *et al.* (1988) indicate peak spawning occurs from May through September in waters north of Cape Canaveral. Golden tilefish primarily prey upon shrimp and crabs, but also eat fishes, squid, bivalves, and holothurians (Dooley 1978).

3.2.1.8 Greater amberjack, *Seriola dumerili*

The greater amberjack is a pelagic and epibenthic member of the family Carangidae (Manooch and Potts 1997a). This species occurs in the Indo-West Pacific, and in the Western and Eastern Atlantic Oceans. In the Western Atlantic, it occurs as far north as Nova Scotia, Canada, southward to Brazil, including the Gulf of Mexico (Paxton *et al.* 1989, in Froese and Pauly 2003; Manooch and Potts 1997a; Manooch and Potts 1997b). The greater amberjack is found at depths of 18-360 m (60-1,181 ft). It inhabits deep reefs, rocky outcrops or wrecks and, occasionally, coastal bays. Juveniles and adults occur singly or in schools in association with floating plants or debris in oceanic and offshore waters.

This species is the largest jack (Robins and Ray 1986 in Froese and Pauly 2003). Maximum reported size is 190 cm (75 in) and 80.6 kg (177.7 lbs) (Paxton *et al.* 1989, in Froese and Pauly 2003). Size at maturity and age at first maturity is estimated as 78.8 cm (31.3 in) TL and 2.3 years, respectively. Maximum reported age is 17 years (Manooch and Potts 1997a). The natural mortality rate is estimated to be 0.25 (Legault and Turner 1999).

Greater amberjack are gonochorists (separate sexes). Based on the occurrence of migratory nucleus oocytes and postovulatory follicles (POFs), spawning occurs from January through June, with peak spawning in April and May. Although fish in spawning condition were captured from North Carolina through the Florida Keys, spawning appears to occur primarily off south Florida and the Florida Keys (MARMAP unpublished data). Greater amberjack in spawning condition were sampled from a range of depths, although the bulk of samples were from the shelf break. Tagging data indicated that greater amberjack are capable of extensive movement that might be related to spawning activity. Greater amberjack tagged off South Carolina have been recaptured off Georgia, east Florida, Florida Keys, west Florida, Cancun Mexico, Cuba, and the Bahamas (MARMAP, unpublished data). Primary food items include fishes, such as bigeye scad, and invertebrates (Paxton *et al.* 1989, in Froese and Pauly 2003).

3.2.1.8 Gray triggerfish, *Balistes capriscus*

Gray triggerfish are found in the Eastern Atlantic from the Mediterranean to Moçamedes, Angola and in the Western Atlantic from Nova Scotia to Bermuda, the northern Gulf of Mexico, and to Argentina. The gray triggerfish is associated with live bottom and rocky outcrops from nearshore areas to depths of 100 m (328 ft). It also inhabits bays, harbors, and lagoons, and juveniles drift at the surface with *Sargassum*.

Maximum reported size is 60 cm (23.76 in) TL (male/unsexed) and 6.2 kg (13.8 lbs; Froese and Pauly 2003). Males are significantly larger than females (Moore 2001). The maximum age of gray triggerfish collected from North Carolina to eastern Florida was 10 years (Moore 2001). The maximum age of gray triggerfish collected from the Northeastern Gulf of Mexico was 13 years (Johnson and Saloman 1984). Potts and Brennan (2001) estimated the natural mortality of gray triggerfish to be 0.30.

Gray triggerfish are gonochorists that exhibit nest-building and territorial reproductive behavior. Mature females from fishery-independent samples are found in 0% of age-0, 98 % of age-1 and age-2 fish, and 100% of fish older than age-3. Mature males from fishery-independent samples are present in 63% of age-1, 91% of age-2, 98% of age-3, 99% of age-4 and age-5, and 100% of older age fish. Females reach first maturity at 14.2 cm (5.6 in) FL, with an L_{50} of 15.8 cm (6.3 in) FL. Males first mature at 17.0 cm (6.7 in) FL, with a L_{50} of 18.0 cm (7.1 in) FL (Moore 2001).

Along the southeast United States, Moore (2001) determined that gray triggerfish spawn every 37 days, or 3-4 times per season. In contrast, Ingram (2001) estimated that gray triggerfish spawn every 3.7 days in the Gulf of Mexico. Off the southeast United States, female gray triggerfish are in spawning condition from April-August, with a peak of activity during June-July (Appendix 4). Male gray triggerfish are found in spawning condition throughout the year; however, there was a peak in activity during May-September (Moore 2001).

3.2.1.9 Red Snapper, *Lutjanus campechanus*

The red snapper is found from North Carolina to the Florida Keys, and throughout the Gulf of Mexico to the Yucatan (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).

The maximum size reported for this species is 100 cm (39.7 in) TL (Allen 1985, Robins and Ray 1986) and 22.8 kg (50 lbs) (Allen 1985). Maximum reported age in the Gulf of Mexico is reported as 53 years by Goodyear (1995) and 57 years by Allman *et al.* (2002). For samples collected from North Carolina to eastern Florida, maximum reported age is 45 years (White and Palmer 2004). McInerny (2007) reports a maximum age of 54 years for red snapper in the South Atlantic. Natural mortality (M) is estimated to be 0.078 using the Hoenig (1983) method with a maximum age of 53 years (SEDAR 15 2008). Manooch *et al.* (1998) estimated M at 0.25 but the maximum age in their study was 25 years (Manooch and Potts 1997).

Red snapper are gonochorists. In the U.S. South Atlantic Bight and in the Gulf of Mexico, Grimes (1987) reported that size at first maturity is 23.7 cm (9.3 in) FL. For red snapper collected along the Southeastern United States, White and Palmer (2004) found that the smallest mature male was 20.0 cm (7.9 in) TL, and the largest immature male was 37.8 cm (15 in) TL. 50% of males are mature at 22.3 cm (8.8 in) TL, while 50% of females are mature at 37.8 cm (15 in) TL. Males are present in 86% of age 1, 91% of age 2, 100% of age 3, 98% of age 4, and 100% of older age fish. Mature females are present in 0% of age 1, 53% of age 2, 92% of age 3, 96% of age 4, and 100% of older age individuals. Grimes (1987) found that the spawning season of this species varies with location, but in most cases occurs nearly year round. White and Palmer (2004) reported that the spawning season for female red snapper off the southeastern United States extends from May to October, peaking in July through September. Red snapper eat fishes, shrimps, crabs, worms, cephalopods, and some planktonic items (Szedlemayr and Lee 2004).

3.3 Science Underlying the Management of Snapper Grouper Species Most Impacted By This FMP Amendment

The status of gag, vermilion snapper, black sea bass, golden tilefish, snowy grouper, greater amberjack, red snapper has been recently assessed through the Southeast Data, Assessment, and Review (SEDAR) process. Black grouper and red grouper are currently being assessed in SEDAR 19.

The SEDAR process consists of a series of workshops aimed at ensuring that each assessment is based on the best available scientific information. First, representatives from NOAA Fisheries Service, state agencies, and the South Atlantic Council, as well as experts from non-governmental organizations and academia, participate in a data workshop. The purpose of a data workshop is to assemble and review available fishery-dependent and fishery-independent data and information on a stock, and to develop consensus about what constitutes the best available scientific information on the stock, how that information should be used in an assessment, and what type of stock assessment model should be employed.

Second, assessment biologists from these agencies and organizations participate in a stock assessment workshop, where data from the data workshop are input into one or more stock assessment models (e.g., production, age-structured, length structured, etc.) to generate estimates of stock status and fishery status. Generally, multiple runs of each model are conducted: base runs and a number of additional runs to examine sensitivity of results to various assumptions (e.g., different natural mortality rates, different data sets/catch periods, etc.).

Finally, a stock assessment review workshop is convened to provide representatives from the Center for Independent Experts the opportunity to peer review the results of the stock assessment workshop. Representatives from NOAA Fisheries Service, the South Atlantic Council, and constituent groups may attend and observe the review but the actual review is conducted by the Center for Independent Experts. The Council's Scientific and Statistical Committee (SSC) then reviews the report of the stock assessment review workshop.

The review portion of the SEDAR process has helped improve the acceptance of stock assessments. However, continued lack of basic fishery data has resulted in uncertainty in the assessment results. Each SEDAR Review Panel has identified significant shortcomings in data and research (see **Section 4.5** for a detailed list of research and data needs). In addition, not all of the reviews have been completed with 100% consensus.

3.3.1 Gag assessment and stock status

SEDAR assessment

The stock of gag off the United States South Atlantic was assessed during a SEDAR assessment workshop, held at the Wyndham Grand Bay Hotel, Miami, Florida, on May 1–5, 2006. The workshop's objectives were to complete the SEDAR 10 benchmark assessment of gag and to conduct stock projections. Participants in the benchmark assessment included state, federal, and university scientists, as well as Council members and staff, and various observers. All decisions regarding stock assessment methods and acceptable data were made by consensus (SEDAR 10 2007).

Available data on the stock included abundance indices, recorded landings, and samples of annual size compositions and age compositions from fishery-dependent sources. Three fishery–dependent abundance indices were developed by the data workshop: one from the NOAA Fisheries Service headboat survey, one from the commercial logbook program, and one from the MRFSS survey. There were no usable fishery–independent abundance data for this stock of gag. Landings data were available from all recreational and commercial fisheries. The assessment included data through 2004.

A forward projecting statistical model of catch at age was used as the primary assessment model. In addition, an age-aggregated production model was used to investigate results under a different set of model assumptions. The assessment workshop developed two base runs: one assuming a time-varying catchability and one assuming constant catchability for the fishery dependent indices. Each base run of the catch-at-age model was used for estimation of benchmarks and stock status.

Stock projections were evaluated under five scenarios starting in 2008. Each scenario applied the current fishing mortality rate (F) in years 2005–2007. Starting in 2008, the five projection scenarios included: (1) current F, (2) F_{MSY}, (3) 85% of F_{MSY}, (4) 75% of F_{MSY}, and (5) 65% of F_{MSY}.

Status

The gag stock in the Atlantic is undergoing **overfishing** as of 2004 (last year of data in the stock assessment). This means fish are being removed more quickly than the stock can replace them such that the maximum sustainable yield (MSY) cannot be achieved. The Council compares the current fishing mortality rate (F) to the level of fishing mortality that would result in overfishing (maximum fishing mortality threshold or MFMT) and if the current F is greater than the MFMT, overfishing is occurring. For gag the most recent estimate of the fishing mortality rate (F) is from 2004 and is = 0.310. The Council is using the fishing mortality rate that would produce the maximum sustainable yield (F_{MSY} = 0.237) as the maximum fishing mortality threshold. Comparing these two numbers:

- F_{2004}/MFMT = 0.310/0.237 = 1.309

This comparison is referred to as the **overfishing ratio**. If the ratio is greater than 1, then overfishing is occurring.

The gag stock in the Atlantic was not **overfished** as of the start of 2005. This means that the spawning stock biomass (pounds of spawning fish in the water) has not been reduced below the level that could produce the maximum sustainable yield. The Council compares the current spawning stock biomass (SSB) to the level of spawning stock biomass that could be rebuilt to the level to produce the MSY in 10 years. This is referred to as the minimum spawning stock biomass or MSST. For gag, the estimated level of spawning stock biomass in 2005 was 7,470,000 pounds gutted weight (gw). The Minimum stock size threshold (MSST) = 6,816,000 pounds gw. Comparing these two numbers:

- SSB_{2005}/MSST = 7,470,000/6,816,000 = 1.096

This comparison is referred to as the **overfished ratio**. If the ratio is less than 1, then the stock is overfished.

3.3.2 Vermilion Snapper assessment and stock status

SEDAR assessment

A SEDAR stock assessment workshop was convened at the NOAA Center for Coastal Fisheries and Habitat Research Beaufort, North Carolina, on Monday, April 4, 2007. The workshop's objectives were to conduct an update assessment of the vermilion snapper off the southeastern U.S. and to conduct stock projections based on possible management scenarios. Participants in the update assessment included state and federal scientists, Council AP and SSC members, and various observers. All decisions regarding stock assessment methods and acceptable data were made by consensus (SEDAR Assessment Update #3 2007).

Available data on the species included all those utilized for the benchmark assessment conducted in 2002; no additional data sources were identified during the scoping workshop. These data were abundance indices, recorded landings, and samples of annual size compositions from indices and landings. Four abundance indices were used in the benchmark assessment: one from the NMFS headboat survey and three from the SC MARMAP fishery-independent monitoring program. Landings data were available from all recreational and commercial fisheries. While the MARMAP chevron trap index decreased in recent years, the remaining abundance indices showed neither marked increase nor decline during the assessment period (1976–2006).

The statistical model of catch at length as developed for the benchmark assessment was used as the only assessment model. The assessment workshop provided the base run of the model, identical to that used in the benchmark assessment. This base run was used for the estimation of benchmarks and stock status. The benchmark assessment concluded that the high degree of uncertainty in recruitment and spawning stock biomass estimates meant that reliable biomass based benchmarks could not be developed from the assessment, and this was found to be the case for the update assessment as well.

The ratio of fishing mortality in 2006 to F_{MAX} was 2.05, compared to 1.71 in the benchmark assessment, suggesting that overfishing continues. Projections were used to evaluate the potential of the stock to be rebuilt, but could only be conducted for constant F scenarios. Four projections were considered: $F=F_{MAX}$; $F=85\%F_{MAX}$; $F=75\%F_{MAX}$; and $F=65\%F_{MAX}$. The results of each were very similar.

Stock Status

The vermilion snapper stock in the Atlantic is undergoing **overfishing** as of 2006 (last year of data in the stock assessment update). This means fish are being removed more quickly than the stock can replace them such that the maximum sustainable yield (MSY) cannot be achieved. The Council compares the current fishing mortality rate (F) to the level of fishing mortality that would result in overfishing (maximum fishing mortality threshold or MFMT) and if the current F is greater than the MFMT, overfishing is occurring. For vermilion snapper the most recent estimate of the fishing mortality rate is from 2006 and was = 0.729. The Council is using the fishing mortality rate that produces the greatest yield per fish (F_{MAX} = 0.355) as the maximum fishing mortality threshold. F_{MAX} is being used as a proxy for F_{MSY} (F_{MSY} = Fishing mortality rate that would produce maximum sustainable yield) because the SSC did not have confidence in the calculated biomass reference points. The SSC does have confidence in the fishing mortality rate estimates from the SEDAR assessment. Comparing these two numbers:

- F_{2006}/MFMT = 0.729/0.355 = 2.05

This comparison is referred to as the **overfishing ratio**. If the ratio is greater than 1, then overfishing is occurring.

Whether the vermilion snapper stock in the Atlantic is currently **overfished** is unknown because the SSC does not have confidence in the biomass reference points from the SEDAR assessment. Recognizing the need for a new benchmark assessment, NMFS and the state of South Carolina began sampling available vermilion snapper otoliths to enable an age-based assessment. Further, the SEDAR steering committee replaced white grunt in the SEDAR schedule with vermilion snapper. Results from an age-based assessment for vermilion snapper will be reviewed by the Council's Scientific and Statistical Committee (SSC) during their November 30 – December 2, 2008 meeting.

3.3.3 Black sea bass assessment and stock status

SEDAR assessment

Black sea bass was assessed at the second SEDAR (SEDAR 2 2003b). Data for the SEDAR assessment were assembled and reviewed at a data workshop held during the week of October 7, 2002 in Charleston, South Carolina. The assessment utilized commercial and recreational landings, as well as abundance indices and life history information from fishery-independent and fishery-dependent sources. Six abundance indices were developed by the data workshop. Two CPUE indices were used from the NMFS headboat survey (1978-2001) and the MRFSS recreational survey (1992-1998). Four indices were derived from CPUE observed by the South Carolina MARMAP fishery-independent monitoring program ("Florida" trap index, 1981-1987; blackfish trap index, 1981-1987; hook and line index, 1981-1987; and chevron trap index, 1990-2001) (SEDAR 2 2003b).

Age-structured and age-aggregated production models were applied to available data at the assessment workshop. The age-structured model was considered the primary model, as recommended by participants in the data workshop. The stock assessment indicated black sea bass was overfished and overfishing was occurring.

At the request of the South Atlantic Council, the SEDAR panel convened to update the 2003 black sea bass stock assessment, using data through 2003, and to conduct stock projections based on possible management scenarios (SEDAR Update #1 2005). The update indicated the stock was still overfished and overfishing was still occurring but results showed the stock was much more productive that previously indicated. The stock could be rebuilt to the biomass level capable of producing the maximum sustainable yield in 5 years if all fishing mortality were eliminated; previously this was estimated to take 11 years (SEDAR 2 2003b).

Stock Status
The black sea bass stock in the Atlantic is undergoing **overfishing** and is **overfished** as of 2004 (last year of data in the stock assessment update). For black sea bass the most recent estimate of the fishing mortality rate is from 2003 and was = 2.64 and F_{MSY} = 0.429 as the maximum fishing mortality threshold. Comparing these two numbers:

- F_{2003}/MFMT = 0.729/0.355 = 6.15

This comparison is referred to as the **overfishing ratio**. If the ratio is greater than 1, then overfishing is occurring.

The black sea bass stock in the Atlantic is **overfished**. For black sea bass, the estimated level of spawning stock biomass in 2005 was 4,099,884 pounds whole weight. The Minimum stock size threshold (MSST) = 10,511,633 pounds whole weight. Comparing these two numbers:

- SSB_{2005}/MSST = 4,099,884/10,511,633 = 0.39

If the ratio is less than 1, then the stock is overfished.

3.3.4 Red snapper assessment and stock status

Assessments conducted in 1988 and 1990, indicated red snapper was experiencing overfishing (NMFS 1991; Huntsman *et al.* 1992). In 1990, scientists recommended size limits for red snapper to achieve reductions necessary to end overfishing. In response, the Council developed Amendment 4 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. In January 1992, new regulations for red snapper established a 20” TL minimum size limit and an aggregate bag limit of 10 snapper (excluding vermilion snapper) with no more than 2 red snapper included in the aggregate bag limit. These regulations were determined to be sufficient to end overfishing based on the science available at the time.

In 1997, a new red snapper stock assessment was conducted by the NMFS using landings data from 1986 to 1996. The assessment estimated red snapper reached a maximum age of 25 and noted that few fish over the age of 12 were landed. The assessment concluded that the red snapper stock was in a “transitional” condition. “The status of the stock is less than desirable, but does appear to be responding for the better to something, possibly management, in the most recent years.” The Council did not implement any changes to red snapper management at the time based on the assessment conclusions.

The 2008 SEDAR 15 stock assessment concluded red snapper is overfished and undergoing overfishing. The assessment estimated that red snapper reach a maximum age of 54 years, not 25 years as previously estimated. The Council's SSC approved the assessment and indicated it was based on the best available scientific information.

A statistical catch-at-age model (SCA) and a surplus-projection model (ASPIC) were considered in this assessment. Data used assessment consist of records of commercial catch for the handline (hook-and-line) and dive fisheries, logbook data from the recreational headboat fishery, and MRFSS survey data of the rest of the recreational sector. The bulk of landings of red snapper come from the recreational fishery, which have exceeded the landings of the commercial fishery by 2-3 fold over the assessment period. Total landings were variable, with a downward trend through the 1990s.

The Council is considering two proxies for F_{MSY} in Amendment 17A, $F_{30\%SPR}$ and $F_{40\%SPR}$. The ratio of F to the respective proxies for F_{MSY} suggests a generally increasing trend in fishing mortality from the 1950s through the mid-1980s. This indicates that overfishing has been occurring since the early 1970s, with the 2006 estimate of $F/F_{30\%SPR} = 5.39$ and $F/F_{40\%SPR}$ at 7.67 (March 19, 2009 Projection; SEDAR 15 2008).

Estimated abundance-at-age shows truncation of the oldest ages from the 1950s into the 1980s; the age structure continues to be in a truncated condition. Fish of age 10 and above are practically non-existent in the population. Estimated biomass-at-age follows a similar pattern of truncation as seen in the abundance data. Total biomass and spawning biomass show nearly identical trends with a sharp decline during the 1950s and 1960s, continued decline during the 1970s, and stable but low levels since 1980. Numbers of age-1 fish have declined during the same period, however notably strong year classes occurred in 1983 and 1984, and again in 1998 and 1999. Note: Additional detail is presented in Section 4 and is hereby incorporated by reference.

3.4 Other Affected Council-Managed Species

Red snapper are targeted by commercial and recreational fishermen and are commonly taken on trips with red grouper, scamp, gag, red grouper, black grouper, gray triggerfish, greater amberjack, almaco jack, red porgy, black sea bass, and others. A detailed description of the life history of these species is provided in the snapper grouper SAFE report (NMFS 2005) http://sero.nmfs.noaa.gov/sf/safereports/safe.htm.

3.5 Protected Species

There are 31 different species of marine mammals that may occur in the EEZ of the South Atlantic region. All 31 species are protected under the MMPA and six are also listed as endangered under the ESA (i.e., sperm, sei, fin, blue, humpback, and North Atlantic right whales). There are only three known interactions between the South Atlantic snapper grouper fishery and marine mammals. All three marine mammals were likely dolphins, all were caught in Florida on handline gear, and all three animals were released alive. Other species protected under the ESA occurring in the South Atlantic include five species of sea turtle (green, hawksbill, Kemp's ridley, leatherback, and loggerhead); the smalltooth sawfish; and two *Acropora* coral species (elkhorn [*Acropora palmata*] and staghorn [*A. cervicornis*]). A discussion of these species is included below. Designated critical habitat for the *Acropora* corals also occurs within the South Atlantic region.

The impacts of the South Atlantic snapper grouper fishery on ESA-listed species have been evaluated in a biological opinion on the continued authorization of snapper grouper fishing under the South Atlantic Snapper Grouper Fishery Management Plan and Amendment 13C (NMFS 2006), and during subsequent informal ESA section 7 consultations. The biological opinion stated the fishery was not likely to adversely affect any critical habitat or marine mammals (see NMFS 2006 for discussion on these species). However, the opinion did state that the snapper grouper fishery would adversely affect sea turtles and smalltooth sawfish. A discussion of these species is included below.

NOAA Fisheries Service conducted an informal Section 7 consultation on July 9, 2007, evaluating the impacts of the South Atlantic snapper grouper fishery on ESA-listed *Acropora* species. The consultation concluded that the continued operation of the snapper grouper fishery was not likely to adversely affect newly listed *Acropora* species. On November 26, 2008, a final rule designating *Acropora* critical habitat was published in the *Federal Register*. A memo dated December 2, 2008, evaluated the effects of the continued authorization of the South Atlantic snapper grouper fishery on *Acropora* critical habitat pursuant to section 7 of the ESA. The evaluation concluded the proposed actions are not likely to adversely affect *Acropora* critical habitat.

3.5.1 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. The following sections are 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 (Frick 1976, Hughes 1974). 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 (Bjorndal 1980, 1997; Paredes 1969; 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 50m) 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 a 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 1000 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 are known to eat a wide range of things 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, Limpus and Nichols 1994, Lanyan *et al.* 1989) and they may spend anywhere from 80 to 94% of their time submerged (Limpus and Nichols 1994, Lanyan *et al.* 1989).

3.5.2 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 resources (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).

3.5.3 ESA-Listed Marine Invertebrates

Elkhorn (*Acropora palmata)* and staghorn (*A. cervicornis*) coral were listed as threatened under the ESA on May 9, 2006. The Atlantic *Acropora* Status Review (*Acropora* Biological Review Team 2005) presents a summary of published literature and other currently available scientific information regarding the biology and status of both these species.

Elkhorn and **staghorn** corals are two of the major reef-building corals in the wider Caribbean. In the South Atlantic region, they are found most commonly in the Florida Keys; staghorn coral occurs the furthest north with colonies documented off Palm Beach, Florida (26º3'N latitude). The depth range for these species ranges from <1 m to 60 m. The optimal depth range for elkhorn is considered to be 1 to 5 m depth (Goreau and Wells 1967), while staghorn corals are found slightly deeper, 5 to 15 m (Goreau and Goreau 1973).

All Atlantic *Acropora* species (including elkhorn and staghorn coral) are considered to be environmentally sensitive, requiring relatively clear, well-circulated water (Jaap *et al.* 1989). Optimal water temperatures for elkhorn and staghorn coral range from 25° to 29°C (Ghiold and Smith 1990, Williams and Bunkley-Williams 1990). Both species are almost entirely dependent upon sunlight for nourishment, contrasting the massive, boulder-shaped species in the region (Porter 1976, Lewis 1977) that are more dependent on zooplankton. Thus, Atlantic *Acropora* species are much more susceptible to increases in water turbidity than some other coral species.

Fertilization and development of elkhorn and staghorn corals is exclusively external. Embryonic development culminates with the development of planktonic larvae called planulae (Bak *et al.* 1977, Sammarco 1980, Rylaarsdam 1983). Unlike most other coral larvae, elkhorn and staghorn planulae appear to prefer to settle on upper, exposed surfaces, rather than in dark or cryptic ones (Szmant and Miller 2006), at least in a laboratory setting. Studies of elkhorn and staghorn corals indicated that larger colonies of both species had higher fertility rates than smaller colonies (Soong and Lang 1992).

3.5.4 South Atlantic Snapper Grouper Fishery Interactions with ESA-Listed Species

Sea turtles are vulnerable to capture by bottom longline and vertical hook-and-line gear. The magnitude of the interactions between sea turtles and the South Atlantic snapper grouper fishery was evaluated in NMFS (2006) using data from the Supplementary Discard Data Program (SDDP). Three loggerheads and three unidentified sea turtles were caught on vertical lines; one leatherback and one loggerhead were caught on bottom longlines, all were released alive (Table 3-1). The effort reported program represented between approximately 5% and 14% of all South Atlantic snapper grouper fishing effort. These data were extrapolated in NMFS (2006) to better estimate the number of interactions between the entire snapper grouper fishery and ESA-listed sea turtles. The extrapolated estimate was used to project future interactions (Table 3-2).

The SDDP does not provide data on recreational fishing interactions with ESA-listed sea turtle species. However, anecdotal information indicates that recreational fishermen occasionally take sea turtles with hook-and-line gear. The biological opinion also used the extrapolated data from the SDDP to estimate the magnitude of recreational fishing on sea turtles (Table 3-2).

Smalltooth sawfish are also considered vulnerable to capture by bottom longline and vertical hook-and-line gear based on their capture in other southeast fisheries using such gear (Poulakis and Seitz 2004; Simpfendorfer and Wiley 2004). SDDP data does not include any reports of smalltooth sawfish being caught in the South Atlantic commercial snapper grouper fishery. There are no other documented interactions between smalltooth sawfish and the South Atlantic commercial snapper grouper fishery. However, the potential for interaction, led NOAA Fisheries Service to estimate future interactions between smalltooth sawfish and the snapper grouper fishery in the 2006 biological opinion (Table 3-2).

Regulations proposed under snapper grouper amendment 15B (74 FR 31225; June 30, 2009) would 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 and smalltooth sawfish.

Table 3-1. Sea turtle incidental take data from the supplementary discard data program (SDDP) for the Southeast U.S. Atlantic.

Reporting Period	Month	Logbook Statistical Grid	Species Caught	Number Caught	Discard Condition
Vertical Hook-and-Line Sea Turtle Catch Data					
8/1/01-7/31/02	April	2482	Unidentified	1	Alive
8/1/01-7/31/02	November	3377	Loggerhead	1	Alive
8/1/02-7/31/03	February	2780	Loggerhead	1	Alive
8/1/02-7/31/03	November	3474	Loggerhead	1	Alive
8/1/02-7/31/03	November	3476	Unknown	1	Alive
8/1/02-7/31/03	December	3476	Unknown	1	Alive
Bottom Longline Sea Turtle Catch Data					
8/1/01-7/31/02	August	3674	Leatherback	1	Alive
8/1/03-7/31/04	January	3575	Loggerhead	1	Unknown

Source: SEFSC Supplementary Discard Data Program

Table 3-2. Three year South Atlantic anticipated takes of ESA-Listed species for snapper grouper gear.

Species	Amount of Take	Total
Green	Total Take	39
	Lethal Take	14
Hawksbill	Total Take	4
	Lethal Take	3
Kemp's ridley	Total Take	19
	Lethal Take	8
Leatherback	Total Take	25
	Lethal Take	15
Loggerhead	Total Take	202
	Lethal Take	67
Smalltooth sawfish	Total Take	8
	Lethal Take	0

Source: NMFS 2006

3.6 Administrative Environment

3.6.1 The Fishery Management Process and Applicable Laws

3.6.1.1 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 U.S. Exclusive Economic Zone (EEZ), an area extending 200 nautical miles 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 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 of Commerce (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 M-Magnuson-Stevens Act and with other applicable laws summarized in Section 7.0. In most cases, the Secretary has delegated this authority to NOAA Fisheries Service.

The South Atlantic Fishery Management 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 miles offshore from the seaward boundary of the States of North Carolina, South Carolina, Georgia, and east Florida to Key West. The Council has thirteen voting members: one from NOAA Fisheries Service; 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 South Atlantic 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 South Atlantic 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 of Commerce 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 matters, are open to the public. The Council uses a Scientific and Statistical Committee 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 Procedures Act, in the form of “notice and comment” rulemaking.

3.6.1.2 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 Environment and Natural Resources. 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 South Atlantic 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 also is represented at the Council level, but does not have voting authority at the Council level.

NOAA Fisheries Service' 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.

3.7 Enforcement

Both the National Oceanic and Atmospheric Administration (NOAA) Fisheries Office for Enforcement (NOAA/OLE) and the United States Coast Guard (USCG) have the authority and the responsibility to enforce South Atlantic 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.

NOAA General Counsel issued a revised Southeast Region Magnuson-Stevens Act Penalty Schedule in June 2003, which addresses all Magnuson-Stevens Act violations in the Southeast Region. In general, this Penalty Schedule increases the amount of civil administrative penalties that a violator may be subject to up to the current statutory maximum of $120,000 per violation.

3.8 Human Environment

3.8.1 Economic Description of the Commercial Fishery

Additional information on the commercial snapper grouper fishery is contained in previous amendments [Amendment 13C (SAFMC 2006), Amendment 15A (SAFMC 2007), Amendment 15B (SAFMC 2008), and Amendment 16 (SAFMC 2008)] and is incorporated herein by reference.

3.8.1.1 Gear and Fishing Behavior

The commercial snapper grouper fishery utilizes vertical lines, longlines, black sea bass pots/traps, spears, and powerheads (i.e., spears with spring-loaded firearms). Vertical lines are used from the North Carolina/Virginia border to the Atlantic side of Key West, Florida. The majority of hook and line fishermen use either electric or hydraulic reels (bandit gear) and generally have 2-4 bandit reels per boat. The majority of the bandit fleet fishes year round for snapper grouper with the only seasonal differences in catch associated with the regulatory spawning season closures in March and April for gag. Most fluctuations in fishing effort in this fishery are a result of the weather. Trips can be limited during hurricane season and during the winter months from December through March. Some fishermen stop bandit fishing to target king mackerel when they are running.

The Council allows the use of bottom longlines north of St. Lucie Inlet, Florida, in depths greater than 50 fathoms. Bottom longline gear is used to target snowy grouper and golden tilefish. Longline boats are typically bigger than bandit boats, their trips are longer, and they cost more to operate because they operate farther offshore. A longline spool generally holds about 15 miles of cable. Longlines are fished from daylight to dark because sea lice eat the flesh of hooked fish at night. The fishery is operated year long with little or no seasonal fluctuation barring hurricane disruption.

Spears or powerheads are most commonly used off Florida and are illegal for killing snapper grouper species in South Carolina and in Special Management Zones.

Black sea bass pots are used exclusively to target black sea bass, though bycatch of other snapper grouper species is allowed. The pots have mesh size, material, and construction restrictions to facilitate bycatch reduction. All sea bass pots must have a valid identification tag attached and more than 87% of tags in April 2003 were for vessels with homeports in North Carolina. Fishing practices vary by buoy practices, setting/pulling strategies, number of pots set, and length of set, with seasonal variations. The South Carolina pot fishery is mainly a winter fishery with short soak times (in some cases about an hour) and relatively few pots per boat. Most trips are day trips with pots being retrieved before heading to port. The North Carolina pot fishery also is primarily a winter fishery with some fishermen continuing to pot through the summer. North Carolina fishermen tend to use more pots than those in South Carolina. Although most North Carolina trips with sea bass pots last one day, more pots are left to soak for several days than in South Carolina. Many participants in the black sea bass fishery are active in other fisheries, including the recreational charter fishery during the summer months. Many snapper grouper permit holders maintain pot endorsements but are not active in the pot fishery.

3.8.1.2 Landings, Revenue and Economic Impact

According to the NOAA Fisheries southeast logbook database, which is used to analyze commercial fishing behavior at the boat and trip level, the landings of all species in the snapper grouper management unit averaged 6.4 million pounds in 2003-2007 and had a dockside (ex-vessel) value to fishermen of $13.8 million in 2007 dollars, referring to trips landing at least one pound of snapper grouper (Table 3-7).[1] Adding what was not reported in the logbooks, total commercial landings of snapper grouper were approximately 22% higher, 7.8 million pounds in 2003-2007 (ALS data, see footnote 1). The difference, 1.4 million pounds ($2.4 million), provides an approximation of the potential impact on commercial, logbook-reported landings of precluding the sale of fish under federal and state bag limit regulations (Snapper Grouper FMP Amendment 15B).[2] The difference of 1.4 million pounds is assumed to be for snapper grouper caught mostly in federal waters (*Ibid.*).

Recently published work provides a basis for estimating broader measures of economic activity associated with landing snapper grouper.[3] Compared with the annual ex-vessel value of $13.8 million in 2007 dollars, approximations of the associated impacts are as follows for the harvesting, processor, wholesale, distributor and retail levels combined: sales, $308 million; income, $168 million; and employment, 6,236.

In 2003-2007, logbook-reported landings for snapper grouper averaged 6.4 million pounds and $13.8 million in 2007 dollars. Adding the $2.3 million for other species landed on the same trips, the trip value comes to $16.1 million (2007 dollars, Table 3-7). For the 890 boats that made these snapper grouper trips, the ex-vessel value for logbook-reported landings for all trips/species averaged $22.8 million. During these five years, the comparable annual average

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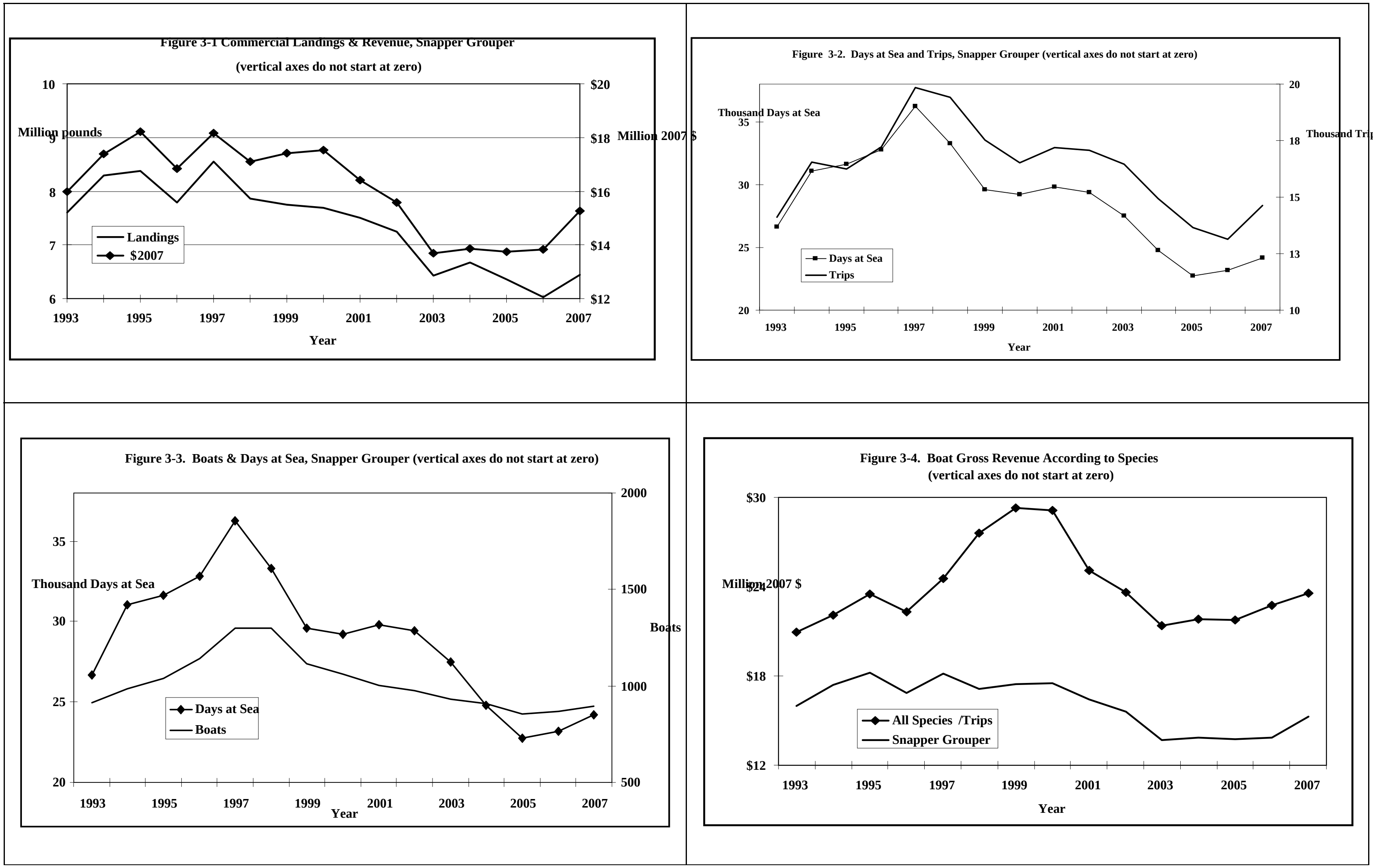
[1] Fishermen are required to report their landings by species and by trip to NOAA Fisheries Service Southeast Fisheries Science Center logbook program. However, they do not report prices or revenue on their logbook sheets. Therefore, trip revenue were approximated as reported landings from individual logbook reports multiplied by average monthly prices for each species as calculated from the NOAA Fisheries Service Accumulated Landings System (ALS). To obtain values in 2007 dollars, the BLS Consumer Price Index for urban dwellers was used to adjust for the effects overall price inflation in the U.S. economy at the consumer level.

[2] The proposed Action and its alternatives, the methods, data and assumptions used in the analysis are described in SAFMC, Snapper Grouper FMP Amendment 15B, final draft of July 2008, especially section 4.4.2, pp. 4-21 to 4-38. Amendment 15B is pending review.

[3] Economics and Sociocultural Analysis Division, U.S. Dept. of Commerce, NOAA, National Marine Fisheries Service, *Fisheries Economics of the United States, 2006*, Economics and Sociocultural Status and Trends Series, January 2009, pp. 93-111. The approximation of economic impacts is based on ratio of the ex-vessel revenue, $13.8 million in 2007 dollars (Table 3-7) and the total landings revenue for the South Atlantic region shown in the report. Income or value added refers to the dollar value of a firm's output minus the dollar value of the inputs it purchased from other firms, essentially the value of labor, capital, and management of the firm. Most of the associated impacts occur at the retail level.

gross revenue was in the range of \$24,000 to \$27,000 per boat (median, \$9,650 to \$10,740 per boat; maximum, \$210,000 to \$360,000 per boat, all data in 2007 dollars).



Figures 3-1 – 3-4. Commercial landings and revenue, days at sea and trips, days at sea and boats, boat gross revenue.

3.8.1.3 Landings, Ex-vessel Value, Price, and Effort

The landings of snapper grouper declined 29% from a high of 8.5 million pounds in 1997 to 6.1 million pounds in 2006, while effort declined by a third (Figures 3-1 to 3-4), Table 3-3 & 3-8; data used in the tables and graphs may differ). Boats fell from a high of 1,375 in 1998 to a low of 889 in 2005. Days at sea fell 37% from 36,264 to 22,727 between 1997 and 2006, while trips fell 34% from 19,860 to 13,138.

Counting all of their trips, the boats typically landed a bit more of other species than snapper grouper since 1999. However, the dockside price is lower, about $1.11 a pound compared with $2.15 for snapper grouper in 2003-2007, and it has fallen more over time, from $1.73 in 1993 (all prices in 2007 dollars, where price is represented by the ratio of revenue to landings). The revenue from species other than snapper grouper rose between 1993 and 1999, peaking at $11.8 million (Figure 3-4). Total boat revenue peaked at $29.3 million in 1999 and averaged approximately the same in 2003-2007 as in 1993-1997 (2007 dollars).

The shallow water groupers and mid-shelf snappers are the largest species groups by volume and value within the snapper grouper fishery. Vermilion snapper in the mid-shelf snapper group is the largest volume species in the fishery, and accounted for 15% of total landings and 18% of dockside revenue on average in 2003-2007 (totals, Table 3-3). Gag is the largest volume shallow-water grouper, and accounted for 9% of total landings and 13% of dockside revenue.

Table 3-3. Annual landings and dockside (ex-vessel) revenues for trips with at least one pound of species in the snapper grouper fishery management unit, 2003-2007, landings in whole weight.

Item	2003	2004	2005	2006	2007	Average
Snapper grouper, 1,000 lbs	6,471	6,693	6,365	6,112	6,528	6,434
Snapper grouper, 1,000 2007 $	$13,762	$13,340	$13,078	$13,431	$15,426	$13,807
Price/lb (whole wt), current $	$1.89	$1.82	$1.93	$2.14	$2.36	$2.03
Price index for #2 diesel fuel	43	54	80	92	100	67
Other sp, same trips, 1,000 lbs	2,092	1,651	1,751	2,116	2,122	1,946
Other sp, same trips, 1,000 2007 $	$2,149	$2,001	$2,225	$2,394	$2,738	$2,301
Boat rev, all sp/trips, 1,000 2007 $	$21,967	$22,120	$22,377	$23,338	$24,232	$22,807

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of September 22, 2008, and Accumulated Landings System database as of September 17, 2008. NOAA Fisheries Service, Southeast Regional Office permits database. The BLS Consumer Price Index for all Urban Consumers was used to adjust dockside revenues and average annual prices for inflation. Data in last row computed separately, and results may differ if computed as for the previous rows. BLS Producer price index for #2 diesel fuel, index=100 for 2007.

The number of boats with snapper grouper permits exhibited a downward trend from 1,251 in 1999 to 874 in 2005, averaging 944 in 2003-2007 (Table 3-4). Two types of permits were created with the limited access program for the snapper grouper fishery that was implemented in 1998. The number of transferable permits that allow an unlimited harvest per trip was 938 in

1999 and 697 in 2006. The number of vessels with non-transferable permits with a 225-pound trip limit declined year-by-year from 313 in 1999 to 159 in 2007. The number of transferable permits declined, in part, because new entrants into the fishery must buy two permits and retire one as the condition for entry into the fishery. Furthermore, it is likely that the number of vessels in the snapper grouper fishery declined for economic reasons. For example, fuel prices doubled between 2003 and 2005 and continued to increase through mid-2008. By contrast, average annual prices for species in the snapper grouper management unit were relatively flat.

Table 3-4. Fishing effort and distribution of landings for trips with at least one pound of species in the snapper grouper fishery management unit in the South Atlantic, 2003-2007.

Item	2003	2004	2005	2006	2007	Average
Number of trips	16,545	15,045	13,756	13,224	14,753	14,665
Days away from port	27,556	24,820	22,794	23,160	24,216	26,296
Boats landing snapper grouper	931	905	857	868	889	890
Number of permitted boats	1059	1001	909	874	877	944
Boats with transferable permits	828	782	721	697	718	749
Boats with non-transferable permits	231	219	188	177	159	195
	Number of boats according to landings of snapper grouper					
1-100 lbs per boat per year	140	156	138	164	155	151
101-1,000 lbs per boat per year	245	225	242	258	261	246
1,001-5,000 lbs per boat per year	270	263	239	228	225	245
5,001-10,000 lbs per boat per year	104	96	86	64	86	87
10,001-50,000 lbs per boat per year	152	133	123	127	134	134
More than 50,000 lbs per boat per year	20	32	29	27	28	27

Source: Same as first table, this section.

From 2003 through 2007, there were on average 890 boats and 14,665 trips per year on which at least one pound of snapper grouper species was landed (Table 3-4).[4] On average, 493 of the 890 boats landed at least 1000 pounds of snapper grouper species annually; 248 boats landed at least 5,000 pounds; 161 boats landed at least 10,000 pounds; and 27 boats landed at least 50,000 pounds of snapper grouper species.

3.8.1.4 The South Atlantic Snapper Grouper Fishery by State

The following discussion provides annual averages for 2003-2007. To maintain the confidentiality of individual reporting units, summaries are provided for regions defined as North Carolina, South Carolina, Georgia and northeast Florida, and central-southeast Florida. Northeast Florida consists of trips landed in Nassau, Duval, and St. Johns Counties; the central-southeast Florida region consists of trips landed in Flagler through Miami-Dade Counties; and the Florida Keys region consists of trips from Atlantic waters landed in Monroe County.

[4] Fishermen with a permit to fish in Federal waters are required to submit a logbook report to the NMFS with information about landings, gear type, approximate location of trip and date of landing. Trip revenue was calculated as landings multiplied by average prices from the NMFS Accumulated Landings System. The logbook database does not include landings from trips in state waters by fishermen who do not have Federal permits.

Among the specified regions, snapper grouper landings and trips were not proportional (Table 3-5). For example, boats in central-southeast Florida made 32% of the trips and accounted for 12% of the total snapper grouper harvest. However, the disparity was less for trip revenue and days fished in this and other instances; that is, boats in central-southeast Florida had 19% of the trip revenue and 22% of the days fished. The differences have to do with the greater importance of coastal pelagic species on trips in central-southeast Florida and other factors.

Table 3-5. Average annual landings & dockside revenues for trips with at least one pound of species in the snapper grouper fishery, averages for 2003-2007 by state, quantity in whole weight.

Item	North Carolina	South Carolina	Georgia-northeast Florida	Central-southeast Florida	Florida Keys	South Atlantic
Snapper grouper, 1,000 lbs	1,816	1,591	734	790	1,504	6,434
Percent of landings	28%	25%	11%	12%	23%	100%
Snapper grouper, 1,000 2007 $	$3,738	$3,795	$1,651	$1,615	$3,008	$13,807
Other sp, same trips, 1,000 lbs	286	125	54	1,293	188	1,946
Trip revenue, 1,000 2007 $	$4,127	$3,977	$1,774	$3,021	$3,210	$16,108
Percent of trip revenue	26%	25%	11%	19%	20%	100%
Number of boats*	175	64	46	342	294	921
Number of trips	2,607	916	486	4,691	5,964	14,665
Percent of trips	18%	6%	3%	32%	41%	100%
Number of days	4,727	4,702	1,946	5,473	7,661	24,509
Percent of days fished	19%	19%	8%	22%	31%	100%
Trips per boat	14.9	14.2	10.6	13.7	20.3	15.9
Days per trip	1.8	5.1	4.0	1.2	1.3	1.7

Source: Same as first table, this section. *Some boats land in more than one area.

Table 3-6. Average annual landings (in thousands of pounds, whole weight) on trips that landed at least one pound of snapper grouper species: averages for 2003-2007, by state & species group.

Species	North Carolina		South Carolina		Georgia-northeast Florida		Central-southeast Florida		Florida Keys		South Atlantic	
	lbs	%	lbs	%	lbs	%	lbs	%	lbs	%	lbs	%
Shallow-water groupers	504	24%	555	32%	152	19%	107	5%	100	6%	1418	17%
Deep-water groupers	84	4%	78	5%	5	1%	28	1%	59	3%	254	3%
Tilefish	78	4%	112	6%	1	0%	227	11%	12	1%	430	5%
Shallow-water snappers	10	0%	20	1%	21	3%	128	6%	887	52%	1065	13%
Mid-shelf snappers	375	18%	366	21%	347	44%	33	2%	15	1%	1136	14%
Triggerfish / Spadefish	131	6%	77	4%	56	7%	5	0%	2	0%	271	3%
Jacks	111	5%	159	9%	132	17%	240	12%	406	24%	1047	12%
Grunts / porgies	127	6%	92	5%	14	2%	16	1%	24	1%	274	3%
Sea basses	395	19%	133	8%	6	1%	6	0%	0	0%	540	6%
Snapper grouper	1816	86%	1591	93%	734	93%	790	38%	1504	89%	6434	77%
Coastal pelagic sp	216	10%	52	3%	34	4%	1016	49%	81	5%	1399	17%
Sharks	9	0%	19	1%	6	1%	195	9%	77	5%	306	4%
Tunas	22	1%	2	0%	1	0%	1	0%	0	0%	25	0%
Other species	39	2%	54	3%	13	2%	81	4%	30	2%	217	3%

All species	2102	100%	1717	100%	787	100%	2083	100%	1692	100%	8380	100%
Source: Same as first table, this section.												

Reading the percentages down in Table 3-6, coastal pelagic species account for more than 10% of the landings only in central-southeast Florida. Shallow-water groupers and mid-shelf snappers account for more than 10% of the landings in the Carolinas and through Georgia and northeast Florida. Sea bass accounted for more than 10% of the landings in North Carolina only. Jacks account for more than 10% in Georgia and northeast Florida through the Keys.

3.8.1.5 The Snapper Grouper Fishery by Gear

The following discussion provides annual averages from 2003 to 2007. To maintain the confidentiality of individual reporting units, summaries are provided for vertical lines, longlines, black sea bass pots, and all other gears combined. The all-other-gear category includes trolling lines, nets, and other gears. Most of the snapper grouper harvest, including vermilion snapper and gag, is taken by some type of vertical hook-and-line gear. There are exceptions. Black sea bass are harvested primarily with black sea bass pots, while golden tilefish and yellowedge grouper are harvested primarily with bottom longlines. Some species, such as snowy grouper, are harvested by both vertical lines and longlines. Surface longlines used in the shark fishery may catch snapper grouper as secondary species.

The average quantities of snapper grouper species harvested from 2003-2007 included 5.2 million pounds worth $11.3 million (in 2007 dollars) per year with vertical lines, 0.41 million pounds with longlines, 0.12 million pounds with black sea bass pots, and 0.51 million pounds with other gear (Table 3-7). Vertical lines accounted for 78% of all trips that landed at least one pound of snapper grouper, 81% of the snapper grouper landed, 81% of days fished, and 76% of the trip revenue. Trips with longlines tend to be longer than trips with other gear.

Table 3-7. Annual landings and dockside revenues for trips with at least one pound of species in the snapper grouper fishery by primary gear, 2003-2007, landings in whole weight.

Item	Diving	Hook & Line	Longline	Traps	Other gear	Total
Snapper grouper, 1,000 lbs	219	5,185	408	116	506	6,434
Percentage of landings	3%	81%	6%	2%	8%	100%
Snapper grouper, 1,000 2007$	$571	$11,314	$895	$168	$861	$13,807
Other sp, same trips, 1,000 lbs	49	674	265	941	17	1,946
Percentage of landings, other	3%	35%	14%	48%	1%	100%
Trip revenue, thousand 2007 $	$762	$12,272	$1,048	$1,148	$880	$16,108
Percentage of trip revenue	5%	76%	7%	7%	5%	100%
Number of boats*	65	723	27	50	245	1,110
Number of trips	648	11,405	246	690	1,676	14,665
Percent of trips	4%	78%	2%	5%	11%	100%
Number of days fished	920	19,910	924	944	1,811	24,509
Percent of days fished	4%	81%	4%	4%	7%	100%
Trips per boat	10.0	15.8	9.0	13.8	6.8	13.2
Days per trip	1.4	1.7	3.8	1.4	1.1	1.7

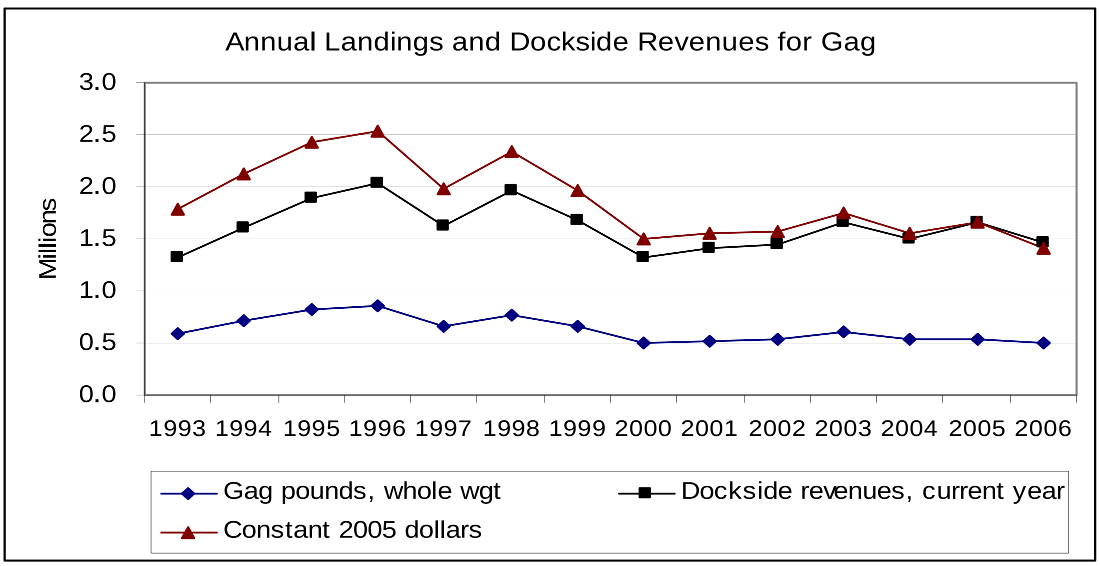
Source: Same as first table, this section.

3.8.1.6 The Commercial Fishery for Gag

According to logbook data, commercial landings of gag ranged from a high of 0.85 million pounds (whole weight) worth approximately $2.03 million in 1996 to a low of 0.50 million pounds worth $1.6 million in 2006 (Figure 3-5). Dockside revenue and pounds landed fluctuate in the same direction, which suggests that ex-vessel demand is price elastic. The policy implication is that regulations that reduce industry landings in the short-term are expected to reduce dockside revenue in the short-term. Conversely, dockside revenue is expected to increase over time if regulation successfully increases biomass and landings.

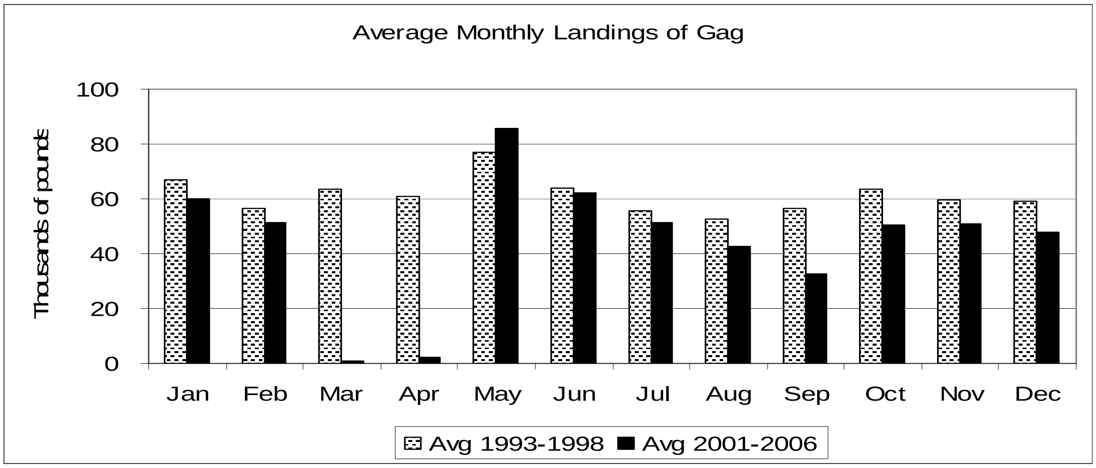
The time series for gag is defined by regulatory periods, with landings between 1993 and 1998 usually exceeding landings between 2001 and 2006. Between 1992 and 1998, the fishery for gag was regulated with a 20-inch minimum size limit. Beginning in 1999, the size limit was increased to 24 inches and the fishery was closed in March and April to protect the spawning stock. Prior to 1999, average monthly landings were highest in May and lowest in August (Figure 3-6). After the closure and larger size limit were implemented, average monthly landings increased in May, but otherwise declined in the remaining open months when compared to the 1993-1998 period, especially in September.

Figure 3-5. Annual landings and dockside revenue for gag, 1993-2006



Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.
NOAA Fisheries Service, Southeast Fisheries Science Center Accumulated Landings System as of October 5, 2007.

Figure 3-6. Monthly average landings of gag, 1993-1998 and 2001-2006.



Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

On average in 2003-2007, 2,286 trips per year landed at least one pound of gag, and the landing came to 554,000 pounds with a value of $1.8 million in 2007 dollars (Table 3-8). On the same trips, the landings for all species came to 2.6 million pounds and the trip revenue came to $6.0 million. The ex-vessel value for all species and trips by the 292 boats that landed gag came to $10.2 million. The boats were not uniformly productive in the fishery for gag. Ninety-six of the 292 boats landed 100 pounds or less per year on average during 2003-2007, 160 landed 101 to 5,000 pounds, and 36 landed more than 5000 pounds.

Table 3-8. Annual landings, dockside revenue and fishing effort, trips and boats with landings of at least one pound of gag, 2003-2007, landings in whole weight.

Item	2003	2004	2005	2006	2007	Average
Trips with at least one pound of gag	2,481	2,182	2,200	2,082	2,487	2,286
Gag, thousand pounds	598	532	541	496	605	554
Gag, thousand current $	$1,636	$1,521	$1,651	$1,617	$2,140	$1,713
Gag, thousand 2007 $	$1,844	$1,668	$1,751	$1,661	$2,136	$1,812
Dockside price, current $ / pound	$2.73	$2.86	$3.05	$3.26	$3.53	$3.09
All sp, same trips, thousand lbs	2,576	2,509	2,584	2,363	2,819	2,570
All sp, same trips, 1,000 2007 $	$5,898	$5,482	$5,845	$5,629	$7,154	$6,001
Boat rev, all sp/trips, 1,000 2007$	$9,923	$9,538	$10,357	$9,238	$12,137	$10,239
Number of boats that landed gag	302	292	302	259	305	292
	Number of boats according to landings of gag grouper					
1-100 lbs per boat per year	99	100	100	90	92	96
101-1,000 lbs per boat per year	89	92	103	74	100	92
1,001-5,000 lbs per boat per year	76	68	64	61	72	68
5,001-10,000 lbs per boat per year	25	19	22	21	30	23
More than 10,000 lbs per boat / year	13	13	13	13	11	13

Source: Same as first table, this section.

Gag was the primary source of revenue on an average of 1,042 trips per year in 2003-2007, and a lesser source of revenue on 1,244 trips (Table 3-9 and Table 3-10). However, on the trips for which gag was the primary source of revenue, it accounted for approximately 71% (391,000 pounds) of the commercial harvest, and 470,000 pounds of other species (other groupers, snappers, jacks, grunts, porgies and non-snapper grouper species). On the 1,244 trips for which it was a lesser source of revenue, landings of gag came to 164,000 pounds with an ex-vessel value of $527,000, compared with 1.5 million pounds for other species and an ex-vessel value of $3.2 million (Table 3-10). Along the Atlantic coast, more of the landings of gag occur in the Carolinas than farther south (Table 3-11). Approximately 81% of the gag is landed with vertical lines, and most of the remainder is landed with dive gear.

Table 3-9. Annual landings and Dockside revenue on trips with gag as the top source of trip revenue, 2003-2007, landings in whole weight.

Item	2003	2004	2005	2006	2007	Average
Trips with at least one pound of gag	1,183	1,011	1,044	904	1,070	1,042
Boats	184	193	188	169	206	188
Gag, thousand pounds	415	385	372	341	440	391
Gag, thousand 2007 $	$1,282	$1,212	$1,213	$1,149	$1,567	$1,284
Other sp, same trips, 1,000 lbs	505	482	432	418	512	470
Other sp, same trips, 1,000 2007 $	$1,015	$935	$877	$861	$1,142	$966

Source: Same as first table, this section.

Table 3-10. Annual landings and dockside revenue on trips with gag as a lesser source of trip revenue, 2003-2007, landings in whole weight.

Item	2003	2004	2005	2006	2007	Average
Trips with at least one pound of gag	1,298	1,171	1,156	1,178	1,417	1,244
Boats	263	247	253	225	262	250
Gag, thousand pounds	184	147	169	155	166	164
Gag, thousand 2007 $	$562	$456	$538	$512	$569	$527
Other sp, same trips, 1,000 lbs	1,472	1,496	1,611	1,449	1,701	1,546
Other sp, same trips, 1,000 2007 $	$3,039	$2,878	$3,217	$3,107	$3,876	$3,224

Source: Same as first table, this section.

Table 3-11. Annual landings of gag for trips with at least one pound of gag, by region and primary gear, 2003-2007, landings in thousand pounds, whole weight.

Landing region or primary gear	2003	2004	2005	2006	2007	Average
North Carolina	141	143	175	154	141	151
South Carolina	234	233	216	204	241	226
Georgia and northeast Florida	100	88	90	71	117	93
Central and southeast Florida	120	66	58	66	101	82
Florida Keys	3	2	1	1	4	2
Vertical lines	455	450	467	410	462	447
Diving gear	131	76	67	81	133	98
Other gear	13	7	6	5	11	8

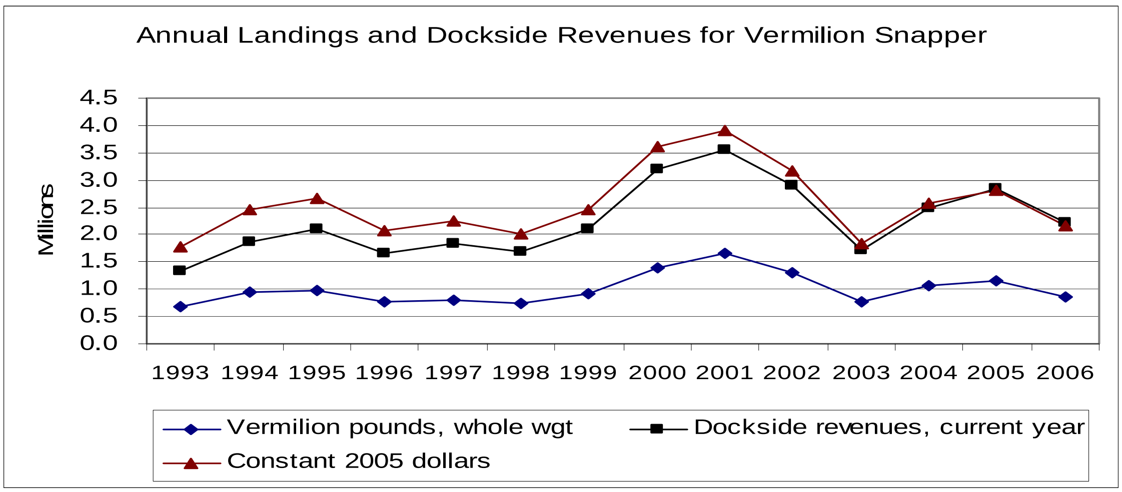
Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of September 22, 2008.

3.8.1.7 The Commercial Fishery for Vermilion Snapper

Logbook-reported commercial landings of vermilion snapper in 1993-2006 ranged from 0.68 million pounds ($1.33 million) in 1993 to 1.65 million pounds ($3.54 million) in 2001 (Figure 3-

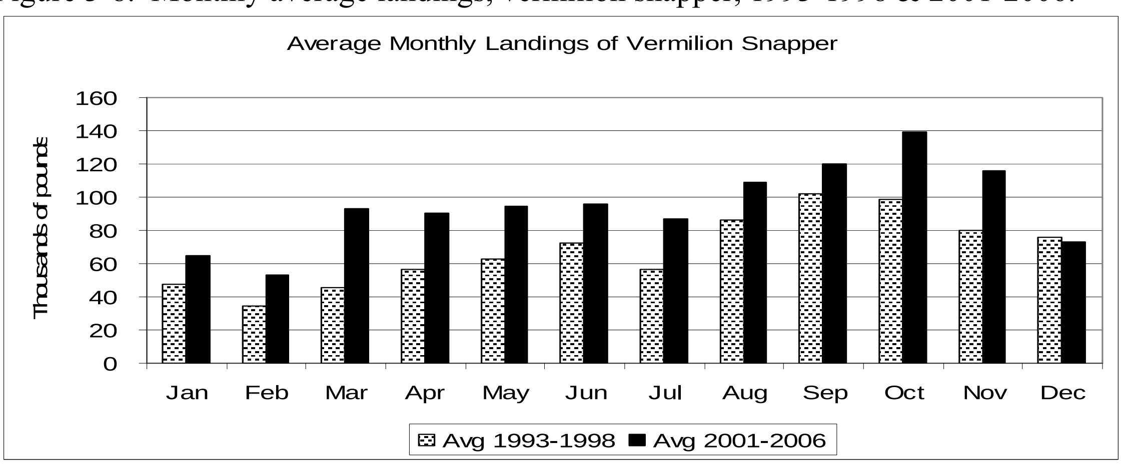
7). Landings of vermilion snapper began to increase in 1999 coincident with the implementation of more restrictive regulations for gag, peaked in 2001, and then declined through 2003 when unusually cold-water temperatures reduced the availability of fish in the summer and fall of 2003. Landings of vermilion snapper recovered in 2004 and 2005, but not to the levels of 2001 and 2002. Dockside revenue generally displayed the same trend over time as commercial landings, which suggests that ex-vessel demand for vermilion snapper is price elastic. Hence, regulations that reduce industry landings in the short-term are expected to reduce dockside revenue in the short-term. Conversely, dockside revenue is expected to increase over time if regulation successfully increases biomass and landings. Vermilion snapper are landed throughout the year, with peak months from August through November (Figure 3-8). Average monthly landings were higher for all months except December during 2001-2006 compared with 1993-1998. The greatest relative monthly increases in average landings between the two periods occurred during March and April, apparently as fishermen shifted their fishing effort from gag to vermilion in response to the closed season that was implemented in 1999.

Figure 3-7. Annual landings and dockside revenue for vermilion snapper, 1993-2006.



Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database (as of October 10, 2007), and Accumulated Landings System (as of October 5, 2007).

Figure 3-8. Monthly average landings, vermilion snapper, 1993-1998 & 2001-2006.



Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

Logbook-reported landings of vermilion snapper averaged 993,000 pounds in 2003-2007 and had an ex-vessel value of $2.5 million, and counting all species landed on the 2,230 trips, trip revenue was $7.2 million (2007 dollars; trips with one or more pounds of vermilion snapper; Table 3-12).

Table 3-12. Annual landings, dockside revenues and fishing effort, trips and boats with landings of at least one pound of vermilion snapper, 2003-2007, landings in whole weight.

Item	2003	2004	2005	2006	2007	Average
Trips with at least 1 lb vermilion snapper	2,171	2,147	2,170	2,107	2,554	2,230
Vermilion snapper, thousand pounds	769	1,071	1,152	865	1,108	993
Vermilion snapper, thousand current $	$1,866	$2,274	$2,552	$2,083	$3,078	$2,370
Vermilion snapper, thousand 2007 $	$2,100	$2,490	$2,704	$2,140	$3,070	$2,501
Dockside price, current $ / pound	$2.43	$2.12	$2.21	$2.41	$2.78	$2.39
All species, same trips, 1000 lbs	2,796	3,131	3,210	3,026	3,777	3,188
All species, same trips, 1,000 2007 $	$6,377	$6,629	$7,012	$6,889	$9,086	$7,199
Boat rev, all sp/trips, 1,000 2007 $	$9,517	$9,383	$9,550	$10,124	$12,741	$10,263
Boats that landed vermilion snapper	248	255	252	233	275	253
	Number of boats according to landings of vermilion snapper					
1-100 lbs per boat per year	91	95	99	89	111	97
101-1,000 lbs per boat per year	66	75	59	63	70	67
1,001-5,000 lbs per boat per year	38	28	38	35	37	35
5,001-10,000 lbs per boat per year	26	13	18	12	18	17
More than 10,000 lbs per boat / year	27	44	38	34	39	36

Source: Same as first table, this section.

Revenue for the 253 boats came to $10.2 million for all species/trips landed. The boats were not uniformly productive in the fishery for vermilion snapper. Ninety-seven of the 253 boats landed 100 pounds or less, 164 boats landed 1,000 pounds or less, 52 landed 1,001 to 10,000 pounds, and 36 boats landed more than 10,000 pounds (Table 3-12).

Table 3-13. Annual landings and dockside revenues on trips with vermilion snapper as the top source of trip revenue, 2003-2007, landings in whole weight.

Item	2003	2004	2005	2006	2007	Average
Trips with at least 1 lb vermilion snapper	956	1024	1059	809	1063	982
Boats	152	159	156	135	147	150
Vermilion snapper, thousand pounds	630	911	992	687	901	824
Vermilion snapper, thousand 2007 $	1716	2126	2329	1717	2496	2077
Other species, same trips, thousand pounds	722	834	963	733	997	850
Other species, same trips, thousand 2007 $	1323	1391	1754	1348	1842	1532

Source: Same as first table, this section.

Vermilion snapper was the primary source of revenue on 982 trips per year on average in 2003-2007 (Table 3-13). These trips accounted 83% of the landings and ex-vessel value, 824,000 pounds at $2.1 million (Table 3-13). On these trips, other species accounted for 855,000 pounds and $1.5 million in revenue (groupers, jacks, grunts, porgies, and non-snapper grouper species).

Vermilion snapper were caught as a lesser source of revenue on 1,248 trips for gag, scamp, and red grouper in the shallow-water grouper fishery and snowy grouper in the deep-water grouper fishery (Table 3-14). These trips accounted for an annual average of 169,000 pounds of vermilion snapper ($424,000 in 2007 dollars) and 1.3 million pounds ($3.2 million) of other species. Vermilion snapper is landed mostly in the Carolinas through Georgia and northeast Florida and vertical lines are the leading gear (Table 3-15).

Table 3-14. Annual landings and dockside revenues on trips with vermilion snapper as a lesser source of trip revenue, 2003-2007, landings in whole weight

Item	2003	2004	2005	2006	2007	Average
Trips with at least 1 lb vermilion snapper	1,215	1,123	1,111	1,298	1,491	1,248
Boats	220	221	213	203	255	222
Vermilion snapper, thousand pounds	140	160	160	178	207	169
Vermilion snapper, thousand 2007 $	$385	$364	$376	$423	$574	$424
Other species, same trips, 1,000 lbs	1,304	1,225	1,095	1,428	1,672	1,345
Other sp, same trips, 1,000 2007 $	$2,955	$2,748	$2,554	$3,401	$4,175	$3,166

Source: Same as first table, this section.

Table 3-15. Annual landings of vermilion snapper for trips with at least one pound of vermilion snapper, by region and primary gear, 2003-2007, landings in whole weight.

Landing region or primary gear	2003	2004	2005	2006	2007	Average
North Carolina	238	311	422	320	522	363
South Carolina	286	414	424	259	264	329
Georgia and northeast Florida	225	331	291	277	312	287
Central and southeast Florida	11	7	10	4	8	8
Florida Keys	9	8	5	5	1	6
Vertical lines	764	1,066	1,145	859	1,098	986
Diving gear	2	2	4	4	5	3
Other gear	4	3	3	2	4	3

Source: Same as first table, this section.

3.8.1.8 The Commercial Fishery for Red Snapper

A small commercial fishery for red snapper along the Atlantic coast has existed at least since 1902 when 155,000 pounds were landed, primarily in Georgia.[5] The fishery continued at relatively low levels until after World War 2. Landings jumped to approximately 250,000 pounds in 1945 and 363,000 pounds in 1950. Landings fluctuated along a generally increasing trend through 1968 when they peaked at 974,000 pounds, declined to less than 100,000 pounds in 2006, and then increased in 2007 and 2008 (Figure 3-9). Landings in 2008 of 236,000 pounds were the highest since 1989 but remain far below historical catches prior to 1975. Commercial landings of red snapper averaged 540,000 pounds per year from 1950-1959, 678,000 pounds per year from 1960-1969, 524,000 pounds per year from 1970-1979, 259,000 pounds per year from

[5] NOAA. 1990. Historical catch statistics: Atlantic and Gulf coast states, 1879-1989. Current Fishery Statistics 9010, NMFS Fishery Statistics Division, 107p.

1980-1989, 147,000 pounds per year from 1990-2000, and 152,000 pounds per year from 2001-2008.

Fishermen along the east coast of Florida dominated the commercial fishery for red snapper until the mid-1970s, and accounted for more than 90% of landings from 1950-1975 (Figures 3-9 and 3-10). Geographic expansion of the fishery occurred during the late 1970s. Landings increased in Georgia, South Carolina and North Carolina and declined in Florida where landings averaged less than 60% of the total commercial fishery from 1978-2008 (Figure 3-10). Recently, however, the proportion of landings from Florida has increased from about 50% in 2002 to 80% in 2008 as landings increased in Florida and the combined landings from North Carolina, South Carolina and Georgia declined.

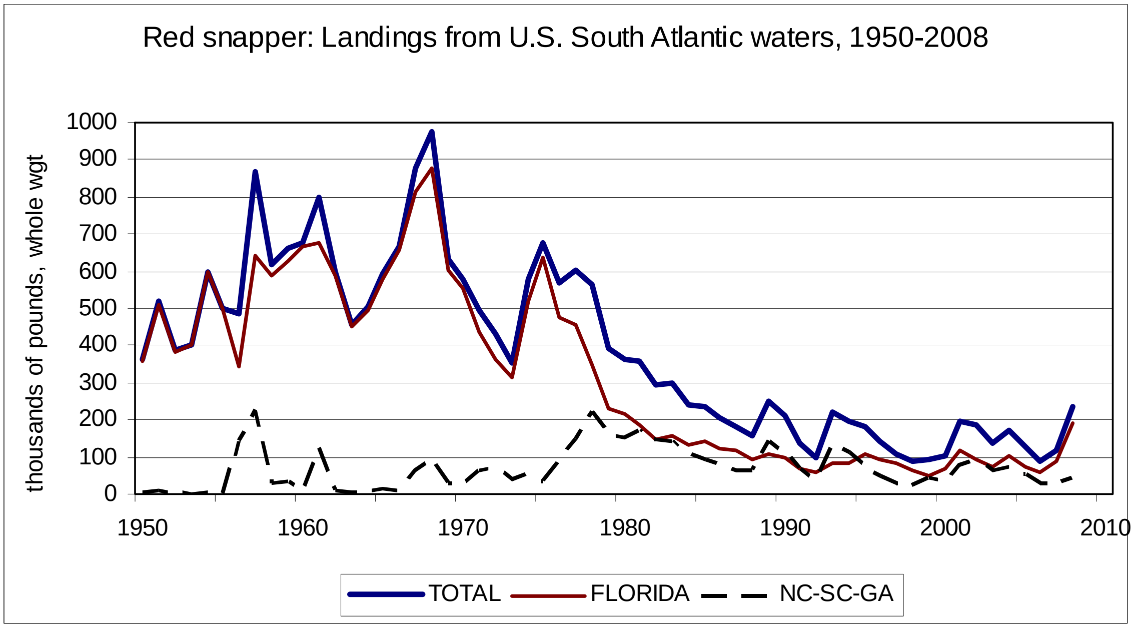


Figure 3-9. Commercial landings of red snapper from U.S. south Atlantic waters, 1950-2008.
Sources: SEDAR 15 for 1950-2006, and NOAA Fisheries Southeast Fisheries Science Center Accumulated Landings System for 2007-2008.

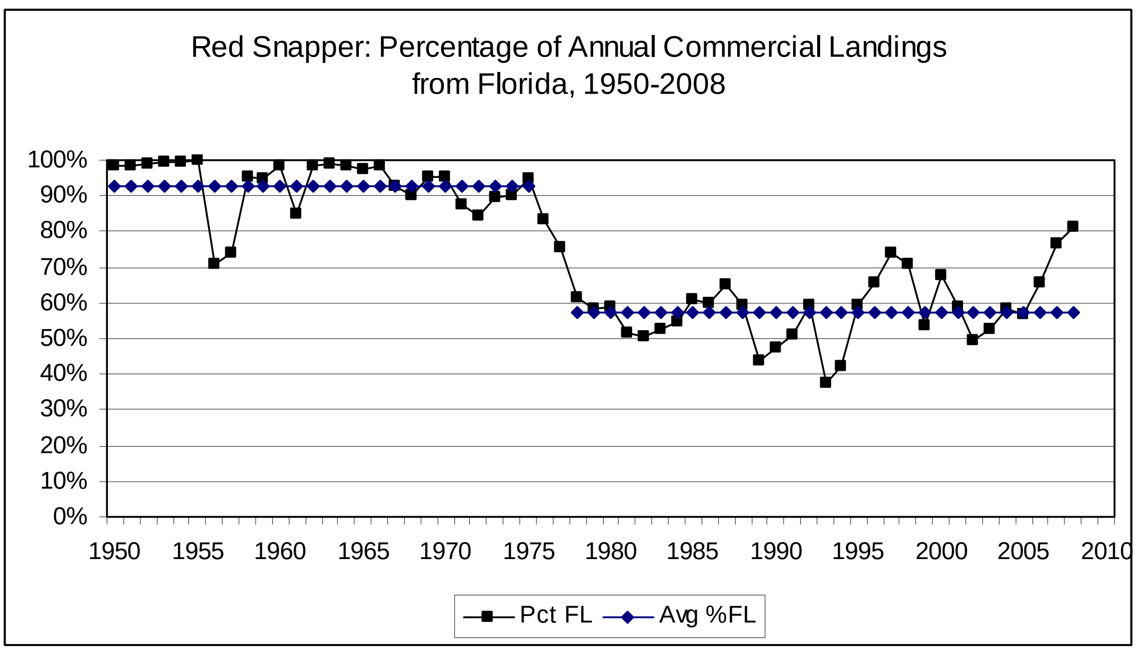


Figure 3-10. Percentage of commercial red snapper landings from Florida, 1950-2008.
Sources: SEDAR 15 for 1950-2006, and NOAA Fisheries Southeast Fisheries Science Center Accumulated Landings System for 2007-2008.

Figure 3-11 displays landings and dockside revenues during the latter portion of the time series. Between 1981 and 2008, commercial landings of red snapper ranged from a high of 391,000 pounds (whole weight) worth $863,000 in current year dollars in 1981 to a low of 88,000 pounds worth approximately $292,000 in 2006. Dockside revenues increased to nearly $866,000 in 2008. In current year dollars, 2008 produced the highest revenues for red snapper since 1978. In constant 2008 dollars, dockside revenues in 2008 were the highest since 1993 after accounting for inflation with the consumer price index for all urban consumers.

Dockside revenues and pounds landed fluctuate in the same direction (Figure 3-11), which suggests that ex-vessel demand is price elastic. The policy implication is that regulations that reduce industry landings in the short-term are expected to reduce dockside revenues in the short-term. Conversely, dockside revenues are expected to increase over time if regulation successfully increases biomass and landings.

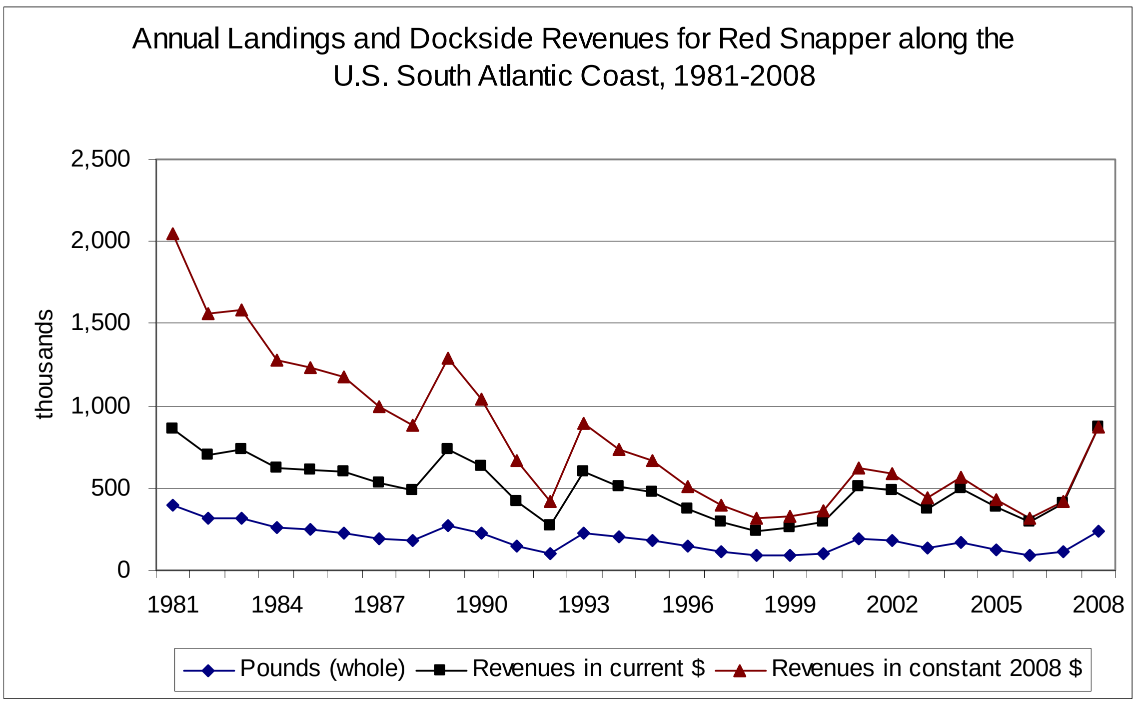


Figure 3-11. Annual dockside revenues from commercial red snapper landings, 1981-2008.
Source: NOAA Fisheries Service, Southeast Fisheries Science Center Accumulated Landings System as of July 8, 2009.

Logbook trip reports provide additional details about the commercial fishery for red snapper.[6] The number of vessels and trips that landed red snapper declined from 1995-2008, with a brief

[6] Since 1993, snapper-grouper fishermen with a permit to fish in Federal waters have been required to submit logbook trip reports to the NMFS with information about landings by species and gear type, approximate location of trip and date of landing. Unlike the ALS database, the logbook database does not include landings from trips in state waters by fishermen who do not have Federal permits. A comparison of red snapper landings from the logbook and ALS databases suggests that landings may have been underreported in the logbook database during 1993 and

exception in 2001 and 2002 (Figure 3-12). Between 2005 and 2008 (which represent the subset of data that will be used to analyze the proposed management alternatives in Amendment 17A), an average of 220 vessels reported an average of 1,357 trips that landed at least one pound of red snapper (Table 1). These trips totaled an annual average of 135,000 pounds of red snapper worth $467,000 in current year dollars, and produced an average of 1.93 million pounds of other species worth $4.58 million.

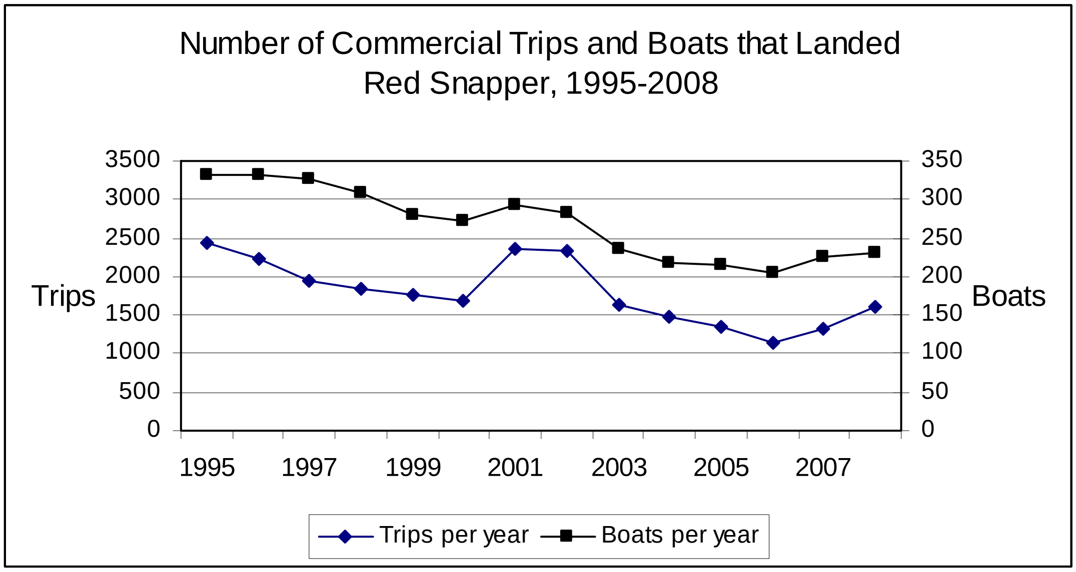


Figure 3-12. Number of commercial trips and boats that landed red snapper in federal waters, 1995-2008.
Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of June 29, 2009.

Clearly, red snapper was not the primary revenue species on most of these trips. Red snapper was the primary source of trip revenue on an average of 190 trips per year and a lesser source of revenue on 1,167 trips per year (Table 3-16). On average from 2005-2008, red snapper was the primary source of trip revenue on less than 15% of the total number of trips on which they were landed. These trips accounted for approximately 40% of the total commercial harvest of red snapper, with an annual average for the entire fishery of 54,000 pounds of red snapper worth $189,000 in current dollars and 57,000 pounds of other species worth $124,000. Approximately 60% of the total commercial harvest of red snapper occurred on trips when red snapper was a secondary source of trip revenue. Trips with red snapper as a lesser source of revenue accounted for an annual average of 81,000 pounds of red snapper worth $279,000 in current dollars and 1.87 million pounds of other species worth $4.46 million.

1994, the first two years for mandatory logbook reporting. By 1995 landings in the two databases were relatively close, which conforms with expectations that red snapper are landed primarily in federal waters. Between 2005 and 2008, landings reported to the logbook database were about 95% of total red snapper landings as defined by the ALS database.

	Trips with at least one pound of red snapper	Trips with red snapper as primary source of trip revenue	Trips with red snapper as secondary source of trip revenue
	Annual averages for 2005-2008		
Number of vessels	220	67	205
Number of trips	1,357	190	1,167
Red snapper landings (thousand pounds, whole weight)	135	54	81
Dockside revenue from red snapper in current year dollars (thousands)	$467	$189	$279
Landings of other species (thousand pounds, whole weight)	1,928	57	1,871
Dockside revenue from other species in current year dollars (thousands)	$4,584	$124	$4,460

Table 3-16. Average annual landings and dockside revenues on trips that landed at least one pound of red snapper, 2005-2008.[7]
Sources: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of June 29, 2009, and NOAA Fisheries Service, Southeast Fisheries Science Center Accumulated Landings System as of July 8, 2009.

Red snapper were most commonly caught as a secondary revenue species on trips with vermilion snapper, gag or scamp as the primary revenue species on the trip (Figure 3-13). On average for 2005-2008, vermilion snapper was the primary source of trip revenue for approximately 31% of the trips that landed red snapper, and accounted for 28% of total red snapper landings. Gag was the primary source of trip revenue for 23% of trips that landed red snapper and accounted for nearly 18% of total red snapper landings. Scamp was the primary source of trip revenue for 9% of trips that landed red snapper and accounted for 5% of total red snapper landings. The top revenue species was not part of the snapper-grouper management unit for 8% of the trips with red snapper. These trips accounted for less than 2.5% of total red snapper landings.

[7] The logbook database does not collect prices or revenues for landed fish. Trip revenues were approximated as reported landings multiplied by average prices, by species, from the NMFS Accumulated Landings System.

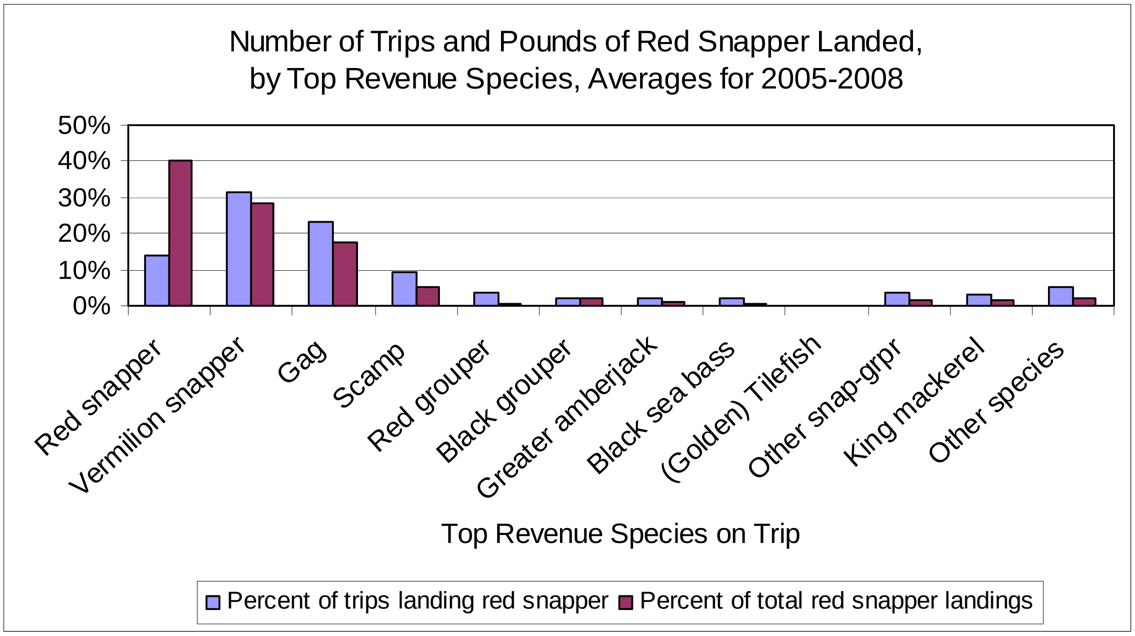


Figure 3-13. Number of trips and pounds of red snapper landed, classified according to the top revenue species on each trip, averages for 2005-2008.
Sources: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of June 29, 2009, and NOAA Fisheries Service, Southeast Fisheries Science Center Accumulated Landings System as of July 8, 2009.

3.8.1.9 The Commercial Fishery for Black Grouper

Black grouper were landed on an average 1,622 trips per year in 2003-2007, with landings amounting to 182,000 pounds ($528,000 in 2007 dollars; trips with landings of at least one pound of black grouper, Table 3-17). Landings of other species on these trips came to 873,000 pounds, and brought trip revenue to $2.3 million. For the 323 boats, the landings of black grouper accounted for 6.5% of the $8.2 million of the ex-vessel value for all logbook-reported landings of species/trips (Table 3-17). Black grouper was landed by an average of 323 boats in 2003-2007, with 288 of them landing 1,000 pounds or less per year and 8 of them landing more than 5,000 pounds.

Table 3-17. Annual landings, dockside revenue and fishing effort, trips and boats with landings of at least one pound of black grouper, 2003-2007, landings in whole weight.

Item	2003	2004	2005	2006	2007	Average
Trips with at least 1 lb black grouper	1,743	1,905	1,726	1,331	1,405	1,622
Black grouper, thousand pounds	158	205	196	170	180	182
Black grouper, thousand current $	$386	$518	$521	$495	$575	$499
Black grouper, thousand 2007 $	$436	$569	$552	$510	$575	$528
Dockside price, current $ / pound	$2.45	$2.52	$2.66	$2.92	$3.19	$2.75
All sp, same trips, 1,000 lbs	921	1,150	1,145	981	1,079	1,055
All sp, same trips, 1,000 2007 $	$1,934	$2,379	$2,445	$2,241	$2,607	$2,321
Boat rev, all sp/trips, 1,000 2007 $	$8,779	$8,604	$7,339	$7,396	$8,693	$8,162
Boats landing landed black grouper	372	363	309	289	281	323
	Number of boats according to landings of black grouper					

1-100 lbs per boat per year	171	152	139	157	138	151
101-1,000 lbs per boat per year	164	172	138	101	110	137
1,001-5,000 lbs per boat per year	34	28	23	23	25	27
More than 5,000 lbs per boat per year	3	11	9	8	8	8
Source: Same as first table, this section.						

Black grouper was the top source of revenue for 649 trips on average in 2003-2007, and a lesser source on 973 trips (Table 3-18 and Table 3-19). On the 649 trips for which it was the top source of revenue, black grouper accounted for 115,000 pounds of landings ($334,000 in 2007 dollars), and other species accounted for 122,000 pounds. These 649 trips accounted for 67% of the total ex-vessel value. For the 973 trips for which it was a lesser source of revenue, landings of black grouper came to 67,000 pounds, compared with 751,000 pounds for other species. During 2003-2007, black grouper was landed for the most part in the Carolinas and the Florida Keys (Table 3-20). Vertical lines were the leading gear.

Table 3-18. Annual landings and dockside revenues on trips with black grouper as the top source of trip revenue, 2003-2007, landings in whole weight.

Item	2003	2004	2005	2006	2007	Ave
Trips with at least 1 lb black grouper	691	802	686	510	554	649
Boats	206	203	169	149	151	176
Black grouper, 1,000 pounds	106	137	113	108	111	115
Black grouper, 1,000 2007 $	$292	$380	$319	$325	$356	$334
Other sp, same trips, 1,000 lbs	107	149	86	123	147	122
Other sp, same trips, 1,000 2007 $	$188	$262	$154	$243	$315	$232
Source: Same as first table, this section.						

Table 3-19. Annual landings and dockside revenues on trips with black grouper as a lesser source of trip revenue, 2003-2007, landings in whole weight.

Item	2003	2004	2005	2006	2007	Ave
Trips with at least 1 lb black grouper	1,052	1,103	1,040	821	851	973
Boats	309	294	263	242	232	268
Black grouper, 1,000 pounds	52	69	83	62	69	67
Black grouper, 1,000 2007 $	$144	$189	$233	$185	$219	$194
Other sp, same trips, 1,000 lbs	656	795	864	688	752	751
Other sp, same trips, 1,000 2007$	$1,310	$1,548	$1,740	$1,488	$1,717	$1,561
Source: Same as first table, this section.						

Table 3-20. Annual landings of black grouper for trips with at least one pound of black grouper, by region and primary gear, 2003-2007, landings in thousand pounds, whole weight.

Landing region or primary gear	2003	2004	2005	2006	2007	Average
North Carolina	41	50	58	61	30	48
South Carolina	24	32	31	49	65	40
Georgia and northeast Florida	3	19	12	8	19	12
Central and southeast Florida	14	16	11	10	12	13
Florida Keys	76	89	83	42	54	69
Vertical lines	121	172	168	156	159	155

Diving gear	24	21	24	12	18	20
Other gear	12	11	4	1	3	6
Source: Same as first table, this section.						

3.8.1.10 The Commercial Fishery for Black Sea Bass

Black sea bass were landed on an average 2,157 trips per year in 2003-2007, with landings of 540,000 pounds ($937,000 in 2007 dollars; trips with landings of at least one pound of black sea bass, Table 3-21). Landings of other species on the same trips, 4.0 million pounds, brought trip revenue to $4.5 million in 2007 dollars. The landings of black sea bass accounted for 9.8% of the $9.6 million of the ex-vessel value for all logbook-reported landings of all species/trips by 237 boats. Of the 237 boats, 181 of them landed 1,000 pounds or less of black sea bass per year and 23 of them landed more than 5,000 pounds.

Table 3-21. Annual landings, dockside revenues and fishing effort, trips and boats with landings of at least one pound of black sea bass, 2003-2007, landings in whole weight.

Item	2003	2004	2005	2006	2007	Average
Trips with at least 1 lb black sea bass	2,238	2,372	2,056	2,172	1,949	2,157
Black sea bass, thousand pounds	597	707	460	527	409	540
Black sea bass, thousand current $	$916	$842	$571	$988	$1,089	$881
Black sea bass, thousand 2007 $	$1,033	$927	$611	$1,020	$1,097	$937
Dockside price, current $ / pound	$1.53	$1.19	$1.24	$1.87	$2.66	$1.63
All species, same trips, 1,000 lbs	4,189	4,616	4,441	4,508	4,805	4,512
All species, same trips, 1,000 2007 $	$4,411	$4,643	$4,358	$4,549	$4,594	$4,511
Boat rev, all sp/trips, 1,0000 2007 $	$8,835	$8,961	$9,116	$9,569	$11,441	$9,584
Boats that landed black sea bass	225	243	240	220	256	237
	Number of boats according to landings of black sea bass					
1-100 lbs per boat per year	84	86	104	87	134	99
101-1,000 lbs per boat per year	85	93	81	81	72	82
1,001-5,000 lbs per boat per year	35	34	36	31	27	33
5,001-10,000 lbs per boat per year	7	12	7	6	11	9
More than 10,000 lbs per boat / year	14	18	12	15	12	14
Source: Same as first table, this section.						

Black sea bass was the top source of revenue for 765 trips on average in 2003-2007, and a lesser source on 1,392 trips (Table 3-22 and Table 3-23). On the 765 trips for which it was the top source of revenue, black sea bass accounted for 489,000 pounds of landings ($855,000 in 2007 dollars), and other species accounted for 54,000 pounds ($68,000 in 2007 dollars). These 765 trips accounted for 35% of the total, 91% of the landings, and 97% ex-vessel value.

Table 3-22. Annual landings and dockside revenues on trips with black sea bass as the top source of trip revenue, 2003-2007, landings in whole weight.

Item	2003	2004	2005	2006	2007	Average
Trips with at least 1 lb black sea bass	858	889	620	811	649	765
Boats	86	94	83	85	88	87
Black sea bass, thousand pounds	546	637	403	482	378	489
Black sea bass, thousand 2007 $	$948	$827	$539	$936	$1,023	$855

Other species, same trips, 1,000 lbs	51	57	38	69	57	54
Other sp, same trips, 1,000 2007 $	$62	$66	$43	$94	$76	$68
Source: Same as first table, this section.						

Table 3-23. Annual landings and dockside revenues on trips with black sea bass as a lesser source of trip revenue, 2003-2007, landings in whole weight.

Item	2003	2004	2005	2006	2007	Average
Trips with at least 1 lb black sea bass	1,380	1,483	1,436	1,361	1,300	1,392
Boats	195	217	216	194	233	211
Black sea bass, thousand pounds	51	70	57	45	31	51
Black sea bass, thousand 2007 $	$85	$99	$73	$84	$74	$83
Other species, same trips, 1,000 lbs	1,446	1,721	1,674	1,498	1,408	1,549
Other sp, same trips, 1,000 2007 $	$3,316	$3,651	$3,704	$3,436	$3,422	$3,506
Source: Same as first table, this section.						

For the 1,392 trips for which it was a lesser source of revenue, landings of black sea bass came to 51,000 pounds ($83,000 in 2007 dollars), compared with 1.5 million pounds for other species ($3.5 million). Among South Atlantic states, black sea bass is landed primarily in North Carolina and South Carolina (Table 3-24). The species is landed mostly with black sea bass pots and vertical lines are a distant second.

Table 3-24. Annual landings of black sea bass for trips with at least one pound of black sea bass, by region and primary gear, 2003-2007, landings in thousand pounds whole weight.

Landing region or primary gear	2003	2004	2005	2006	2007	Average
North Carolina	476	485	324	421	271	395
South Carolina	112	210	120	94	128	133
Georgia and northeast Florida	4	7	8	6	5	6
Central and southeast Florida	4	5	9	7	4	6
Florida Keys			0		0	0
Vertical lines	70	85	63	58	44	64
Traps	521	617	390	466	362	471
Diving gear	0	1	0	0	0	0
Other gear	6	5	6	3	2	4
Source: Same as first table, this section.						

3.8.1.11The Commercial Fishery for Red Grouper

Red grouper were landed on an average of 2,725 trips per year in 2003-2007, with landings amounting to 319,000 pounds and an ex-value of $787,000 in 2007 dollars (data for trips with landings of at least one pound of red grouper, Table 3-25). Landings of other species on these trips came to 2.7 million pounds, and brought trip revenue to $6.9 million. The landings of red grouper accounted for 6.4% of the $12.3 million of the ex-vessel value for all logbook-reported

Table 3-25. Annual landings, dockside revenue and fishing effort, trips and boats with landings of at least one pound of red grouper, 2003-2007, landings in whole weight.

Item	2003	2004	2005	2006	2007	Average
Trips with at least 1 lb red grouper	2,840	2,670	2,558	2,522	3,035	2,725

Red grouper, thousand pounds	282	245	202	316	551	319
Red grouper, thousand current $	$614	$493	$444	$773	$1,440	$753
Red grouper, thousand 2007 $	$692	$542	$471	$793	$1,436	$787
Dockside price, current $ / pound	$2.18	$2.01	$2.20	$2.45	$2.62	$2.36
All species, same trips, 1,000 lbs	2,806	2,810	2,862	3,012	3,707	3,039
All sp, same trips, 1,000 2007 $	$6,132	$5,994	$6,333	$6,922	$9,121	$6,900
Boat rev, all sp/trips, 1,000 2007$	$12,307	$11,646	$11,709	$11,351	$14,284	$12,259
Boats that landed red grouper	461	420	389	347	391	402
	Number of boats according to landings of red grouper					
1-100 lbs per boat per year	232	217	197	183	182	202
101-1,000 lbs per boat per year	158	137	134	94	114	127
1,001-5,000 lbs per boat per year	59	56	53	51	56	55
5,001-10,000 lbs per boat per year	9	9	5	16	23	12
More than 10,000 lbs per boat / year	3	1	0	3	16	5
Source: Same as first table, this section.						

landings of species/trips by 402 boats. Of the 402 boats, 329 landed 1,000 pounds or less per year and 17 of them landed more than 5,000 pounds.

Red grouper was the top source of revenue for 486 trips on average in 2003-2007, and a lesser source on 2,239 trips (Table 3-26 and Table 3-27). On the 486 trips for which it was the top source of revenue, red grouper accounted for 136,000 pounds of landings (ex-vessel value of $337,000 in 2007 dollars), and other species accounted for 142,000 pounds. These 486 trips accounted for 43% of the totals for the landings and ex-vessel value for red grouper (Table 3-25). For the 2,239 trips for which it was a lesser source of revenue, landings of red grouper came to 183,000 pounds, compared with 2.6 million pounds for other species.

Table 3-26. Annual landings and dockside revenues on trips with red grouper as the top source of trip revenue, 2003-2007.

Item	2003	2004	2005	2006	2007	Average
Trips with at least 1 lb red grouper	476	388	304	430	830	486
Boats	175	143	117	119	157	142
Red grouper, thousand pounds	105	88	49	128	308	136
Red grouper, thousand 2007 $	$256	$191	$115	$322	$803	$337
Other species, same trips, 1,000 lbs	110	109	55	162	275	142
Other sp, same trips, 1,000 2007 $	$247	$221	$109	$343	$637	$311
Source: Same as first table, this section.						

Table 3-27. Annual landings and dockside revenues on trips with red grouper as a lesser source of trip revenue, 2003-2007.

Item	2003	2004	2005	2006	2007	Average
Trips with at least 1 lb of red grouper	2,364	2,282	2,254	2,092	2,205	2,239
Boats	431	399	368	326	365	378
Red grouper, thousand pounds	176	158	153	188	243	183
Red grouper, thousand 2007 $	$436	$350	$356	$471	$633	$449
Other species, same trips, 1,000 lbs	2,415	2,455	2,605	2,534	2,881	2,578
Other sp, same trips, 1,000 2007 $	$5,193	$5,232	$5,753	$5,786	$7,048	$5,803
Source: Same as first table, this section.						

Table 3-28. Annual landings of red grouper for trips with at least one pound of red grouper, by region and primary gear, 2003-2007, landings in thousand pounds, whole weight.						
Landing region or primary gear	2003	2004	2005	2006	2007	Average
North Carolina	171	139	120	202	374	201
South Carolina	52	49	41	85	142	74
Georgia and northeast Florida	11	9	9	7	9	9
Central and southeast Florida	10	8	7	7	9	8
Florida Keys	38	41	26	15	16	27
Vertical lines	268	223	191	309	540	306
Diving gear	7	7	7	4	8	7
Other gear	6	15	3	3	3	6
Source: Same as first table, this section.						

3.8.1.12 Imports

Imports have been a major source of seafood supply in the United States, and the domestic snapper grouper market is not an exception. During 2003-2007, imports of fresh and frozen snappers and groupers remained at relatively high levels, averaging 48 million pounds, product weight, a year (Table 3-29). By way of comparison, the average logbook-reported landings of snapper grouper caught in South Atlantic waters were 7.8 million pounds, whole weight. The dominance of imports in the snapper grouper market may be expected to exert limits on the movement of domestic ex-vessel prices resulting from changes in domestic landings of snappers and groupers.

Table 3-29. U.S. imports of snapper and grouper (product weight)						
	Fresh snapper & grouper		Frozen snapper & grouper		Total	
Year	Million pounds	Million 2007$	Million pounds	Million 2007$	Million pounds	Million 2007$
2003	34	66	10	16	44	82
2004	33	68	10	15	43	83
2005	36	76	14	22	50	99
2006	35	81	13	24	49	104
2007	38	87	14	26	52	113
Ave	35	76	12	21	48	96
Source: NOAA Fisheries, Foreign trade data base; see footnote, first table in this section.						

3.8.2 Economic Description of the Recreational Fishery

Additional information on the recreational snapper grouper fishery is contained in previous amendments [Amendment 13C (SAFMC 2006), Amendment 15A (SAFMC 2007), Amendment 15B (SAFMC 2008), and Amendment 16 (SAFMC 2008)] and is incorporated herein by reference.

The South Atlantic recreational fishery is comprised of the private sector and for-hire sector. The private sector includes anglers fishing from shore (all land-based structures) and private/rental boats. The for-hire sector is composed of the charterboat and headboat (also called partyboat) sectors. Charterboats 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.

3.8.2.1 Harvest

Recreational snapper grouper harvest in the South Atlantic has been variable during the period 2003-2007, averaging slightly below 11 million pounds (Table 3-30). On average, the private/shore mode of fishing accounted for the largest harvests at around 7.23 million pounds (MP). Well below this harvest level are those of the charter mode at 1.97 MP and headboat at 1.69 MP. Harvests in each state also fluctuated during the same period (Table 3-31). On average, Florida accounted for most of the snapper grouper harvest in the South Atlantic at around 6.83 MP, followed by North Carolina at 2.07 MP, South Carolina at 1.41 MP, and lastly by Georgia at 0.64 MP.

Table 3-30. Harvest of snapper grouper species by mode in the South Atlantic, 2003-2007.

Year	Charterboat[1]	Headboat[2]	Shore and Private/Rental Boat[1]	Total
2003	2,301,303	1,375,688	7,265,886	10,942,877
2004	1,517,384	1,889,010	6,688,596	10,094,990
2005	2,313,468	1,649,210	6,123,049	10,085,727
2006	1,998,902	1,648,405	7,282,328	10,929,635
2007	1,697,350	1,893,031	8,777,570	12,367,950
Average	1,965,681	1,691,068	7,227,485	10,884,235

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab and MRFSS database, NOAA Fisheries, NMFS, SERO.
[1] Pounds of A and B1 fish estimated from the MRFSS Survey.
[2] The total annual estimate of headboat catch derived from data collected through the NMFS headboat survey.

Table 3-31. Harvest of snapper grouper species by state in the South Atlantic, 2003-2007.

Year	Florida	Georgia	South Carolina	North Carolina
2003	7,848,011	770,993	1,042,157	1,281,714
2004	5,970,816	763,609	1,625,212	1,735,353
2005	6,696,212	622,302	852,105	1,915,107
2006	6,474,221	746,982	1,466,944	2,241,489
2007	7,173,255	320,927	2,079,880	3,199,767
Average	6,832,503	644,962	1,413,259	2,074,686

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab and MRFSS database, NOAA Fisheries, NMFS, SERO.

There are six snapper grouper species most affected by this amendment. The distribution by mode of these species in the South Atlantic is presented in Table 3-32. With the exception of black grouper, all species show relatively large harvests over the 2003-2007 period. Black sea bass accounted for the largest harvest at an average of 0.84 MP, followed somewhat closely by vermilion snapper at an average of 0.601 MP and gag at an average of 0.597 MP. Except for vermilion snapper, the shore and private mode of fishing dominated the harvest of the six major species. Headboats dominated in the harvest of vermilion snapper.

Table 3-33 presents the geographic distribution of the six major species. Florida registered harvests of all six species while South Carolina and North Carolina did not show harvests of black grouper. Georgia registered very low landings of black grouper and red grouper, whereas North Carolina registered relatively low landings of red grouper.

Seasonal distribution of the six major species is presented in Table 3-34, with the monthly headboat data aggregated to match the MRFSS two-month wave. Except for black grouper, the peak harvest period for the subject species is May-June. November-December and July-August are the peak months for black grouper.

Table 3-32. South Atlantic average harvest (lbs) of 6 major species in this amendment, by mode, 2003-2007.

Species	Charterboat	Headboat	Shore and Private/Rental Boat	Total
Gag	108,909	49,061	439,510	597,480
Vermilion Snapper	118,490	386,936	96,071	601,497
Red Snapper	101,457	51,355	168,511	321,323
Black Sea Bass	102,610	177,477	555,316	835,403
Black Grouper	2,502	1,689	32,761	36,952
Red Grouper	48,215	23,166	280,044	351,425

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab and MRFSS database, NOAA Fisheries, NMFS, SERO.

Table 3-33. South Atlantic average harvest (lbs) of 6 major species in this amendment, by state, 2003-2007.

Species	Florida	Georgia	South Carolina	North Carolina
Gag	345,322	12,332	45,582	204,332
Vermilion Snapper	173,928	49,938	273,711	167,988
Red Snapper	263,256	25,923	23,050	10,716
Black Sea Bass	268,816	79,753	75,722	244,377
Black Grouper	36,842	19		
Red Grouper	112,730	54	9,800	235,723

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab and MRFSS database, NOAA Fisheries, NMFS, SERO.

Table 3-34. South Atlantic average harvest (lbs) of 6 major species in this amendment, by two-month wave, 2003-2007.

Species	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sept-Oct	Nov-Dec
Gag	80,034	77,148	148,653	123,023	90,568	108,654
Vermilion Snapper	27,846	94,800	202,830	192,067	110,755	45,748
Red Snapper	29,635	60,695	84,515	45,343	51,385	51,873
Black Sea Bass	46,955	164,408	252,861	214,016	67,534	129,723
Black Grouper	9,100	3,381	3,411	15,621	3,699	15,685
Red Grouper	17,387	38,396	144,045	87,539	53,716	44,697

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab and MRFSS database, NOAA Fisheries, NMFS, SERO.

For the period 2003-2007, the six major species in this amendment accounted for about 26 percent of all recreational harvests of snapper grouper in the South Atlantic.

3.8.2.2 Effort

Recreational effort derived from the MRFSS database can be characterized in terms of the number of trips as follows:

1. 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.

2. 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.
3. Total recreational trips - The total estimated number of recreational trips in the South Atlantic, regardless of target intent or catch success.

Estimates of recreational effort for the entire snapper grouper fishery in the South Atlantic are provided in Table 3-35 for trips by mode and Table 3-36 for trips by state. The total column refers to the total number of trips taken by anglers in the South Atlantic snapper grouper fishery and not to the sum of catch and target trips.

In the South Atlantic, total angler trips were highest for the shore mode, followed by the private mode, and then by the charter mode (Table 3-35). However, average catch trips were highest on those taken through the private mode and lowest on those through the charter mode. The same is true with target trips: they were highest for private mode and lowest for charter mode. For the charter mode, both catch and target trips peaked in 2005 and decreased thereafter. Shore mode catch trips dropped from 2003 to 2004 but steadily increased thereafter; shore mode target trips fell from 2003 to 2005 and increased thereafter. Catch trips for the private mode fell in 2004 but increased thereafter, with relatively high levels in the last two years; target trips declined through 2005 and picked up in the last two years. Florida registered the highest total angler trips, followed in order by North Carolina, South Carolina, and Georgia (Table 3-36). The same pattern holds for catch trips but not for target trips. South Carolina registered slightly higher target trips than North Carolina.

Table 3-35. Recreational effort for the snapper grouper fishery in the South Atlantic, in thousand trips, by mode, 2003-2007.

	Charter Mode Trips			Shore Mode Trips			Private Mode Trips		
	Catch	**Target**	**Total**	**Catch**	**Target**	**Total**	**Catch**	**Target**	**Total**
2003	118	23	412	1,103	263	10,872	2,105	648	9,963
2004	129	28	418	987	209	11,186	1,985	477	9,488
2005	373	69	971	1,095	195	11,240	2,096	473	9,886
2006	285	68	834	1,276	272	12,511	2,603	530	10,749
2007	129	40	501	1,400	321	11,938	2,851	668	13,137
Avg.	207	45.6	627	1,172	252	11,549	2,328	559	10,644

Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

Table 3-36. Recreational effort for the snapper grouper fishery in the South Atlantic, in thousand trips, by state, 2003-2007.

	Florida			Georgia			South Carolina			North Carolina		
	Catch	**Target**	**Total**	**Catch**	**Target**	**Total**	**Catch**	**Target**	**Total**	**Catch**	**Target**	**Total**
2003	2,860	723	11,444	92	46	971	143	86	2,098	231	80	6,733
2004	2,530	532	10,800	90	26	960	191	84	2,224	289	71	7,107
2005	2,835	579	12,200	96	28	859	178	60	2,188	454	70	6,849
2006	3,325	633	13,349	71	28	799	248	133	2,670	520	76	7,276
2007	3,807	784	15,169	104	20	926	137	109	2,529	332	116	6,951
Avg.	3,071	650	12,592	90	29	903	179	94	2,341	365	82	6,983

Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

Estimates of recreational effort for the six species most affected by this amendment are provided in Table 3-37 for trips by mode and Table 3-38 for trips by state. The total column refers to the total number of trips taken by anglers for all six species and not to the sum of catch trips and target trips.

In terms of total angler trips, the shore mode dominated all other modes for trips catching and/or targeting any of the six major species in this amendment (Table 3-37). However, in terms of catch and target trips, the private mode dominated the other two fishing modes in all six species. There are also observable regional variations in catch and target trips for the six major species (Table 3-38). In both catch and target trips, Florida dominated all other states for most species. Notable exceptions are black sea bass where North Carolina had a slight edge over Florida in catch but not in target trips. It is also worth noting that South Carolina showed higher target trips for black sea bass than either Florida or North Carolina.

The seasonal distribution of recreational effort for the six major species in this amendment is presented in Table 3-38 (catch trips) and Table 3-39 (target trips). Except for black grouper, the peak period for catch trips did not match with the peak period for harvests. Catch trips for black sea bass, vermilion snapper, and red snapper peaked in July-August, whereas harvests of these species peaked in May-June. A similar statement may be made of the matching between peak target trips and peak harvests, although peak target trips for three species (black sea bass, red grouper, and vermilion snapper) matched perfectly with their corresponding peak harvests.

Table 3-37. South Atlantic average recreational effort for 6 major species in this amendment, in thousand trips, by mode, 2003-2007.

	Charter Mode Trips			Shore Mode Trips			Private Mode Trips		
Species	**Catch**	**Target**	**Total**	**Catch**	**Target**	**Total**	**Catch**	**Target**	**Total**
Gag Grouper	8.1	1.8	463	10.5	2.2	11,514	93.0	33.5	10,658
Vermilion Snapper	25.6	0.6	463	1.0	0.0	11,514	53.5	2.4	10,658
Red Snapper	14.8	2.8	463	1.6	4.2	11,514	63.0	36.3	10,658
Black Sea Bass	37.1	3.5	463	73.8	0.8	11,514	489.3	46.6	10,658
Black Grouper	0.8	0.0	463	0.7	0.2	11,514	12.7	3.7	10,658
Red Grouper	9.6	0.0	463	1.8	0.5	11,514	59.9	3.1	10,658

Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

Table 3-38. South Atlantic average recreational effort for 6 major species in this amendment, in thousand trips, by state, 2003-2007.

	Florida			Georgia			South Carolina			North Carolina		
Species	**Catch**	**Target**	**Total**	**Catch**	**Target**	**Total**	**Catch**	**Target**	**Total**	**Catch**	**Target**	**Total**
Gag	88.5	35.5	12,487.4	2.0	0.0	895.0	5.0	0.9	2,315.6	16.1	1.0	6,936.4

Grouper												
Vermilion Snapper	53.0	1.6	12,487.4	6.9	0.0	895.0	9.9	1.0	2,315.6	10.3	0.4	6,936.4
Red Snapper	71.6	39.1	12,487.4	5.0	1.4	895.0	2.0	2.8	2,315.6	0.9	0.0	6,936.4
Black Sea Bass	200.3	12.0	12,487.4	30.7	4.7	895.0	140.0	23.2	2,315.6	229.2	11.0	6,936.4
Black Grouper	14.0	3.9	12,487.4	0.0	0.0	895.0	0.3	0.0	2,315.6	0.0	0.0	6,936.4
Red Grouper	56.1	3.0	12,487.4	0.0	0.0	895.0	1.0	0.0	2,315.6	14.3	0.5	6,936.4

Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

Table 3-39. South Atlantic average catch trips (all modes) for the 6 major species in this amendment, by two-month wave, 2003-2007.

Species	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sept-Oct	Nov-Dec
Gag	15,877	14,401	18,174	16,565	21,794	24,721
Vermilion Snapper	6,655	15,255	18,103	21,136	11,287	7,685
Red Snapper	6,769	14,959	14,647	17,674	13,024	12,404
Black Sea Bass	25,433	72,493	145,060	164,675	111,767	80,716
Black Grouper	2,168	1,764	2,726	3,062	1,245	3,289
Red Grouper	11,282	10,720	17,439	11,245	8,438	12,185

Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

Table 3-40. South Atlantic average target trips (all modes) for the 6 major species in this amendment, by two-month wave, 2003-2007.

Species	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sept-Oct	Nov-Dec
Gag	5,746	8,624	7,275	7,829	2,351	5,624
Vermilion Snapper	494	680	860	0	477	513
Red Snapper	2,680	11,200	8,139	10,672	5,298	5,380
Black Sea Bass	2,996	10,646	13,791	9,706	5,635	8,115
Black Grouper	586	623	948	809	0	958
Red Grouper	630	523	980	690	139	571

Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

Similar analysis of recreational effort is not possible for the headboat sector since data are not collected at the angler level. Estimates of effort in the headboat sector are provided in terms of angler days, or the number of standardized 12-hour fishing days that account for the different half-, three-quarter-, and full-day fishing trips by headboats. Despite the inability to associate headboat effort with specific species, the stationary bottom nature of headboat fishing, as opposed to trolling, suggests that most headboat trips and, hence, angler days, are snapper grouper trips by intent, though not necessarily successful.

The state-by-state distribution of headboat angler days is presented in Table 3-41. Due to very low headboat angler days for Georgia, entries for Georgia are combined with those of Florida. For the period 2003-2007, total headboat angler days fluctuated around the mean of 240,980 days. On average, Florida accounted for the largest number of angler days (164,492), or about 68 percent of all headboat angler days. Nevertheless, the numbers for South Carolina (47,571 days) and North Carolina (27,312 days) are far from being negligible.

The seasonal distribution of headboat angler days is presented in Table 3-42. The peak for angler days consistently occurred in July-August each year. The troughs occurred in the last two months of the year, except for 2004 and 2005 when troughs occurred in September-October.

Table 3-41. South Atlantic headboat angler days, 2003-2007.

	Florida	South Carolina	North Carolina	Total
2003	145,011	36,556	22,998	206,568
2004	173,701	50,461	27,255	253,421
2005	171,078	34,036	31,573	238,692
2006	175,522	56,074	25,736	259,338
2007	157,150	60,729	29,002	246,881
Average	164,492	47,571	27,312	240,980

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab.

Table 3-42. South Atlantic headboat angler days, by two-month wave, 2003-2007.

	Jan-Feb	**Mar-Apr**	**May-Jun**	**Jul-Aug**	**Sept-Oct**	**Nov-Dec**
2003	21,799	33,513	35,815	42,621	19,030	15,231
2004	27,539	39,674	43,456	49,878	16,486	23,923
2005	27,526	38,666	43,531	54,585	18,371	19,972
2006	27,377	44,151	43,268	47,058	22,860	16,544
2007	24,073	35,042	39,697	48,643	19,363	19,334
Average	25,663	38,209	41,153	48,557	19,222	19,001

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab.

3.8.2.3 Permits

For-hire vessels in the South Atlantic are required to have a snapper grouper for-hire permit to fish for or possess snapper grouper species in the EEZ. The number of permitted vessels for the period 2003-2005 is provided in Table 3-43. This sector operates as an open access fishery and not all permitted vessels are necessarily active in the fishery. Some vessel owners have been known to purchase open access permits as insurance for uncertainties in the fisheries in which they currently operate.

The number of for-hire permits issued in the South Atlantic snapper grouper fishery increased over the period 2003-2007, from 1,477 permits in 2003 to 1,754 permits in 2007. Most of the increases would likely be for strictly for-hire business, since permits issued for vessels operating as for-hire and commercial entities remained about flat from 2005 to 2006 and fell in 2007. The majority of snapper grouper for-hire permitted vessels were home-ported in Florida; a good number of vessels were also home-ported in North Carolina and South Carolina. Interestingly, there were several vessels with homeports in states other than those within the South Atlantic Council's area of jurisdiction. Most of the vessels with both for-hire and commercial permits were home-ported in the South Atlantic Council's area of jurisdiction.

The for-hire permit does not distinguish between whether the vessel operates as a charterboat or headboat. Based on a 1997 survey, Holland *et al.* (1999) estimated that a total of 1,080 charter vessels and 96 headboats supplied for-hire services in all South Atlantic fisheries during 1997.

Table 3-43. South Atlantic snapper grouper for-hire permit holders by home port state, 2003-2007.

	Number of vessels issued for-hire vessel permits						**Number of vessels with both a for-hire permit and a commercial snapper grouper permit**					
Home Port State	**2003**	**2004**	**2005**	**2006**	**2007**	**Avg.**	**2003**	**2004**	**2005**	**2006**	**2007**	**Avg.**
Florida	957	1,084	1,119	1,108	1,140	**1,082**	148	151	148	151	122	**144**
North Carolina	206	232	254	284	315	**258**	45	42	43	46	40	**43**
South Carolina	122	108	121	119	129	**120**	34	33	33	34	24	**32**
Georgia	36	27	33	33	30	**32**	4	2	2	2	3	**3**
Virginia	5	13	10	10	8	**9**		4	3	2		**3**
Other States	69	48	51	62	69	**60**	8	3	5	3	2	**4**
Gulf States	82	82	79	65	63	**74**						
Total	**1,477**	**1,594**	**1,667**	**1,681**	**1,754**	**1,635**	**239**	**235**	**234**	**238**	**191**	**227**

Source: Southeast Permits Database, NOAA Fisheries, SERO.

3.8.2.4 Economic Value, Expenditures, and Economic Impacts

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. 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.

Estimates of the economic value of a day of saltwater recreational fishing in the South Atlantic indicate that the mean value of access per marine recreational fishing trip is $109.31 for the South Atlantic (Haab *et al.* 2001). While this estimate is not specific to snapper grouper fishing trips, it may shed light on the magnitude of an angler's willingness to pay for this type of recreational experience.

Willingness to pay for an incremental increase in catch and keep rates per trip was also estimated to be $3.01 for bottom fish species by Haab *et al.* (2001). Whitehead *et al.* (2001) estimated the marginal willingness to pay to avoid a one fish red snapper bag limit decrease to be $1.06 to $2.20. Finally, Haab *et al.* (2001) provided a compensating variation (the amount of money a person would have to receive to be no worse off after a reduction of the bag limit) estimate of $2.49 per fish when calculated across all private boat anglers that targeted snapper grouper species in the South Atlantic.

In their study of the North Carolina for-hire fishery, Dumas et al. (2009) estimated several measures of consumer surplus for anglers fishing through the for-hire mode. Anglers were distinguished as to whether fishing was their primary or secondary purpose for taking the trip to the coasts. An additional snapper-grouper caught and kept would generate consumer surplus of $93.51 per trip for primary purpose anglers and $60.79 per trip for secondary purpose anglers. Consumer surplus per site per trip for primary purpose anglers ranged from $4.88 to $27.03 in charter trips taken in Federal waters, or from $0.35 to $9.55 in charter trips taken in state waters. The corresponding range of values for secondary purpose anglers were $0.24 to $16.62 for charter trips in Federal waters, or $0.12 to $16.54 for charter trips in state waters. On headboat trips in both state and federal waters, consumer surplus per site per trip ranged from $0.59 to $4.12 for primary purpose anglers and from $0.48 to $4.76 for secondary purpose anglers. Consumer surplus trip for the opportunity to take a for-hire fishing trip was estimated at $624.02 per angler per trip on charterboats and $101.64 per anger per trip on headboats.

In addition to the above economic values, there are estimates of the economic value of a red snapper and a red snapper trip provided in (NMFS 2008). Although these values are derived for the Gulf of Mexico recreational fishery, they can be used as proxy values for the South Atlantic fishery. It is noted, however, that red snapper is a significantly more important recreational target fishery in the Gulf of Mexico than in the South Atlantic. As a result, the estimates of economic value may overstate the true values for the South Atlantic. The estimated CS to a recreational angler of one red snapper is $6.04, while the estimated CS of a red snapper fishing trip is $53.53. These values were used to estimate the impacts of the red snapper interim rule in the South Atlantic.

Most recently, the NMFS Southeast Science Center (NMFS 2009) developed estimates of consumer surplus per angler trip based on various studies and data in the last ten years (see Appendix XXX). These estimates were culled from various studies – Haab et al. (2009), Dumas et al. (2009), and NOAA SEFSC SSRG (2009). The values/ranges of consumer surplus estimates are (in 2009 dollars) $112 to $128 for red snapper, $123 to $128 for grouper, $11 for other snappers, and $80 for snapper grouper. These values are deemed directly applicable in assessing the changes in consumer surplus due to management measures in Amendment 17A.

While anglers receive economic value as measured by the consumer surplus associated with fishing, for-hire businesses receive value from the services they provide. Producer surplus (PS) is the measure of the economic value these operations receive. PS is the difference between the revenue a business receives for a good or service, such as a charter or headboat trip, and the cost the business incurs to provide that good or service. Estimates of the PS associated with for-hire trips are not available. However, proxy values in the form of net operating revenues are also provided in NMFS (2008). These values are not PS estimates because they are not net of crew costs and returns to the owner. The estimated net operating revenues per angler trip for the for-hire sector are $162 for a charterboat trip and $78 for a headboat trip.

The NMFS Southeast Science Center recently provided estimates of charterboat and headboat net operating revenues for various areas in the Southeast (NMFS 2009). These estimates were culled from several studies – Liese et al. (2009), Dumas et al. (2009), Holland et al. (1999), and Sutton et al. (1999). Estimates of net operating revenue per angler trip (2009 dollars) on representative charter trips are $135 for east Florida, $146 for Louisiana through east Florida, $156 for northeast Florida, and $128 for North Carolina. For charter trips into the EEZ only, net operating revenues are $141 in east Florida and $148 in northeast Florida. For full day and overnight trips only, net operating revenues are $160 in North Carolina and $155 in central and south North Carolina. Net operating revenues per angler trip are lower for headboats than for charterboats. Net operating revenue estimates for a representative headboat trip are $48 in the Gulf of Mexico, $63 in North Carolina, and $68 in central and south North Carolina. For full day and overnight headboat trips, net operating revenues are $74 in North Carolina and $77 in central and south North Carolina.

These value estimates should not be confused with angler expenditures or economic activity. While 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.

However, angler expenditures benefit a number of sectors that provide goods and services for salt-water sport fishing. Gentner and Steinback (2008) provide more recent estimates of saltwater recreational fishing trip expenditures (Table 3-44) and total economic impacts from these expenditures (Table 3-45). In addition to expenditures directly related to trips as shown in the two tables, the recreational sector also expended for fishing related equipment, such as license fees, boat insurance, boat storage, etc. Considering both trip and equipment expenditures, total economic impacts generated by the recreational sector in 2006 amounted to $2.515 billion of output and 24 thousand jobs in North Carolina, $534 million of output and 6 thousand jobs in South Carolina, $192 million of output and 2 thousand jobs in Georgia, and $6.383 billion of output and 56 thousand jobs in East Florida.

Dumas et al. (2009) also estimated the economic impacts of the recreational sector in North Carolina, with more focus on the for-hire sector. They found that for-hire fishing passengers spent about $380 million per year, including both on- and off-vessel spending, in coastal North Carolina. Inclusive of multiplier effects, this spending would support about $667.4 million in economic output along the coast, about 10,200 jobs, $261.4 million in wages and salaries, and $49.3 million in local/state sales and excise (such as fuel and cigarette) taxes.

Table 3-44. Summary of expenditures per saltwater trip.

	North Carolina		South Carolina		Georgia		Florida-East	
Item	**Resident**	**Non Resident**	**Resident**	**Non Resident**	**Resident**	**Non Resident**	**Resident**	**Non Resident**
Shore mode trip expenses	$53.99	$177.89	$38.26	$120.12	$12.96	$24.22	$15.43	$21.13
Private/rental boat trip expenses	$38.54	$84.09	$31.36	$82.03	$15.35	$11.40	$29.86	$23.25
Charter mode trip expenses	$197.09	$262.49	$146.74	$245.60	$48.03	$25.80	$160.56	$65.07
Charter fee-average-per day	$121.41	$132.47	$70.92	$57.90	$36.33	$7.95	$123.75	$19.40

Source: Gentner and Steinback (2008).

Table 3-45. Summary of economic impacts of saltwater trips in 2006 (thousand dollars, except employment is total jobs).

	North Carolina		South Carolina		Georgia		Florida-East	
Item	**Resident**	**Non Resident**	**Resident**	**Non Resident**	**Resident**	**Non Resident**	**Resident**	**Non Resident**
Shore Mode Trips								
Expenditures	112,213	395,315	30,657	81,698	3,381	723	151,072	347,356
Output	137,127	551,590	33,009	102,974	3,496	786	165,175	499,420
Value-added	75,860	307,655	18,640	57,078	2,088	479	97,053	288,973
Income	43,760	176,121	10,730	32,873	1,179	263	57,695	169,077
Employment	1,591	6,719	390	1,274	33	7	1,766	5,282
Private/Rental Mode Trips								
Expenditures	82,020	44,412	30,445	12,102	7,002	175	397,051	216,040
Output	85,838	57,463	28,495	15,021	6,791	166	408,948	263,996
Value-added	48,792	32,011	16,854	85,737	4,117	103	244,789	156,081
Income	27,726	18,266	9,505	4,848	2,304	57	141,903	91,423
Employment	878	663	314	181	59	1	4,060	2,789
Charter Mode Trips								
Expenditures	20,123	57,092	2,507	12,986	1,112	343	35,185	103,694
Output	29,749	85,330	3,520	18,010	1,741	459	57,011	168,219
Value-added	16,689	47,893	1,997	10,165	1,012	272	34,308	98,977
Income	9,453	27,192	1,127	5,798	568	151	19,606	57,282
Employment	379	1,086	45	231	21	5	575	1,740

Source: Gentner and Steinback (2008).

3.8.2.5 Financial Operations of the Charter and Headboat Sectors

Holland *et al.* (1999) estimated that the charterboat fee in the South Atlantic ranged from $292 to $2,000. The actual cost depended on state, trip length, and the variety of services offered by the charter operation. Depending on the state, the average fee for a half-day trip ranged from $296 to $360, for a full day trip the range was $575 to $710, and for an overnight trip the range was $1,000 to $2,000. Most (>90 percent) Florida charter operators offered half-day and full-day trips and about 15 percent of the fleet offered overnight trips. In comparison, only about 3 percent of operations in the other South Atlantic states offered overnight trips.

For headboats, the average fee in Florida was $29 for a half-day trip and $45 for a full day trip. For North and South Carolina, the average base fee was $34 per person for a half-day trip and $61 per person for a full day trip. Most of these headboat trips operated in Federal waters in the South Atlantic (Holland *et al.* 1999).

Capital investment in charter vessels averaged $109,301 in Florida, $79,868 for North Carolina, $38,150 for South Carolina and $51,554 for Georgia (Holland *et al.* 1999). Charterboat owners incur expenses for inputs such as fuel, ice, and tackle in order to offer the services required by their passengers. Most expenses incurred in 1997 by charter vessel owners were on crew wages and salaries and fuel. The average annual charterboat business expenditures incurred was $68,816 for Florida vessels, $46,888 for North Carolina vessels, $23,235 for South Carolina vessels, and $41,688 for vessels in Georgia in 1997. The average capital investment for headboats in the South Atlantic was approximately $220,000 in 1997. Total annual business expenditures averaged $135,737 for headboats in Florida and $105,045 for headboats in other states in the South Atlantic.

The 1999 study on the for-hire sector in the Southeastern U.S. presented two sets of average gross revenue estimates for the charter and headboat sectors in the South Atlantic (Holland *et al*., 1999). The first set of estimates were those reported by survey respondents and were as follows: $51,000 for charterboats on the Atlantic coast of Florida; $60,135 for charterboats in North Carolina; $26,304 for charterboats in South Carolina; $56,551 for charterboats in Georgia; $140,714 for headboats in Florida; and $123,000 for headboats in the other South Atlantic states (Holland *et al*., 1999). The authors generated a second set of estimates using the reported average trip fee, average number of trips per year, and average number of passengers per trip (for the headboat sector) for each vessel category for Florida vessels. Using this method, the resultant average gross revenue figures were $69,268 for charterboats and $299,551 for headboats. Since the calculated estimates were considerably higher than the reported estimates (22 percent higher for charterboats and 113 percent higher for headboats), the authors surmised that this was due to sensitivity associated with reporting gross receipts, and subsequent under reporting. Alternatively, the respondents could have overestimated individual components of the calculated estimates. Although the authors only applied this methodology to Florida vessels, assuming the same degree of under reporting in the other states results in the following estimates in average gross revenues: $73,365 for charterboats in North Carolina, $32,091 for charterboats in South Carolina; $68,992 for charterboats in Georgia; and $261,990 for headboats in the other South Atlantic states.

It should be noted that the study's authors were concerned that while the reported gross revenue figures may be underestimates of true vessel income, the calculated values could overestimate gross income per vessel from for-hire activity (Holland *et al.*, 1999). Some of these vessels are also used in commercial fishing activities and that income is not reflected in these estimates.

A more recent study of the North Carolina for-hire fishery provides some updated information on the financial status of the for-hire fishery in the state (Dumas et al., 2009). Depending on vessel length, regional location, and season, charter fees per passenger per trip ranged from $168.14 to $251.59 for a full-day trip and from $93.63 to $123.95 for a half-day trip; headboat fees ranged from $72.50 to $81.78 for a full-day trip and from $38.08 to $45 for a half-day trip. Charterboats generated a total of $55.7 million in passenger fees, $3.2 million in other vessel income (e.g., food and beverages), and $4.8 million in tips. The corresponding figures for headboats were $9.8 million in passenger fees, $0.2 million in other vessel income, and $0.9 million in tips. Non-labor expenditures (e.g., boat insurance, dockage fees, bait, ice, fuel) amounted to $43.6 million for charterboats and $5.3 million for headboats. Summing across vessel lengths and regions, charter vessels had an aggregate value (depreciated) of $120.4 million and headboats had an aggregate value (depreciated) of $10.2 million.

3.8.3 Social and Cultural Environment

A more detailed description of the social and cultural environment of the snapper grouper fishery is contained in Amendment 13C (SAFMC 2006) and is incorporated herein by reference. The following sections summarize key information relevant to this action. Key communities were identified primarily based on permit and employment activity. These data were obtained from the U.S. Bureau of the Census and from state and federal permitting agencies.

Permit trends are hard to determine, since several factors may affect how many vessels are homeported in certain communities, including vessel mobility, shifting stock locations, and resettlement of fishermen due to coastal development. Nevertheless, although vessel location shifts occur, static geographical representations help determine where impacts may be felt.

Data from the US Census Bureau must be used with some caution. Census data is collected every ten years and may not reflect shifting community demographics. Businesses routinely start up and fail or move and the census data collection cycle may fail to capture key changes. Further, census estimates do not include seasonal visitors and tourists, or those that live less than half the year in a surveyed area. Many of the latter group may work as seasonal employees and not be counted. Census data also misses some types of labor, such as day laborers, undocumented crew members, or family members that help with bookkeeping responsibilities.

Permit requirements for the commercial Snapper Grouper fishery were established in 1998 by Amendment 8 (SAFMC 1997). This amendment created a limited entry system for the fishery and established two types of permits based on the historic landings associated with a particular permit. Those who could demonstrate a certain amount of landings over a certain time period received permits that did not limit the number of pounds of Snapper Grouper that could be landed from federal waters (hereafter referred to as "unlimited commercial permits"). These permits were transferable. Vessels with verified landings, but did not meet the threshold were issued permits that allowed them to land 225 pounds of Snapper Grouper species from federal waters each trip (hereafter referred to as "limited commercial permits"). These permits were not transferable. New entry into the fishery required the purchase of two unlimited permits from existing permit holders for exchange for a new permit. This "two for one" system was intended to gradually decrease the number of permits in the fishery. These restrictions only applied to the commercial Snapper Grouper permit.

Impacts on fishing communities from coastal development, rising property taxes, decreasing access to waterfront due to increasing privatization of public resources, rising cost of dockage and fuel, lack of maintenance of waterways and ocean passages, competition with imported fish, and other less tangible (often political) factors have combined to put all these communities and their associated fishing sectors under great stress.

While studies on the general identification of fishing communities have been undertaken in the past few years, little social or cultural investigation into the nature of the Snapper Grouper fishery itself has occurred. A socioeconomic study by Waters *et al.* (1997) covered the general characteristics of the fishery in the South Atlantic, but those data are now almost 10 years old and do not capture important changes in the fishery. Cheuvront and Neal (2004) conducted survey work of the North Carolina commercial Snapper Grouper fishery south of Cape Hatteras, but did not include ethnographic examination of communities dependent upon fishing.

To help fill information gaps, members of the South Atlantic Council's Snapper Grouper Advisory Panel, Council members, Advisory Panel members, and representatives from the angling public identified communities they believed would be most impacted by the management measures proposed in Amendment 13C on the species addressed by this amendment. Details of their designation of particular communities, and the factors considered in this designation, can be found in Amendment 13C (SAFMC 2006).

Because so many communities in the South Atlantic benefit from Snapper Grouper fishing, the following discussion focuses on "indicator communities," defined as communities thought to be most heavily impacted by Snapper Grouper regulations.

3.8.3.1 North Carolina

Figure 3-14. North Carolina communities with substantial fishing activity, as identified by South Atlantic Advisory Panels.

3.8.3.1.1 Statewide

Overview

Of the four states in the South Atlantic region, North Carolina (Figure 3-14) is often recognized as possessing the most "intact" commercial fishing industry; that is, it is more robust in terms of viable fishing communities and fishing industry activity than the other three states. The state offers a wide variety of fishing opportunities, including sound fishing, trolling for tuna, bottom fishing, and shrimping. Perhaps because of the wide variety of fishing opportunities, fishermen have been better able to weather regulations and coastal development pressures, adjusting their annual fishing patterns as times have changed.

Commercial Fishing

There has been a steady decline in the number of federal commercial snapper grouper permits North Carolina since 1999, with 194 unlimited commercial permits in 1999, but only 139 in 2004. Limited permits similarly declined from 36 to16.

State license sale and use statistics for all types of licenses also indicate an overall decrease since 1994. While the overall number of state licenses to sell any species of fish or shellfish increased from 6,781 in 1994 to 9,712 in 2001/2002, the number of license holders actually reporting sales decreased from 6,710 in 1994/1995 to 5,509 in 2001/2002 (SAFMC 2006).

North Carolina fishermen demographics are detailed in Cheuvront and Neal (2004). Ninety eight percent of surveyed fishermen were white and 58 percent had completed some college or had graduated from college. Of those who chose to answer the question, 27 percent of respondents reported a household income of less than $30,000 per year, and 21 percent made at least $75,000 per year. On average, respondents had been fishing for 18 years, and had lived in their communities for 27 years.

Cheuvront and Neal (2004) also provided an overview of how North Carolina commercial Snapper Grouper fishermen carry out their fishery. Approximately 65 percent of surveyed fishermen indicated year-round fishing. Gag is the fish most frequently targeted by these fishermen, with 61 percent of fishermen targeting gag at some point in the year, despite the prohibition of commercial sales and limit to the recreational bag limit in March and April. Vermilion snapper (36.3 percent) and black sea bass (46 percent) are the next most frequently targeted species. A significant number of fishermen land king mackerel during each month, with over 20 percent of fishermen targeting king mackerel between October and May. During the gag closed season, king mackerel are targeted by about 35 percent of the fishermen. Other snapper/grouper complex species landed by at least 5 percent of the fishermen in any given month were red grouper (39.5 percent), scamp (27.4 percent), snowy grouper (9.7 percent), grunts (14.5 percent), triggerfish (13.7 percent), and golden tilefish (5.6 percent). Non-snapper/grouper complex species landed by at least 5 percent of the fishermen in any given month included Atlantic croaker, yellowfin tuna, bluefin tuna, dolphin, and shrimp.

By looking at the commercial landings data on the snapper grouper complex it is possible to see which communities are involved with the commercial fisheries for these species (Table 3-46). Although rankings can fluctuate from year to year, this can give us a starting point for understanding some of the communities that would be impacted by more restrictive regulations.

Table 3-46. Top commercial cumulative landings for North Carolina for 2003-2007, listed by species, impacted by this amendment. Logbook data, SEFSC 2009.

	Location	Pounds	Location	Pounds	Location	Pounds
Gag	New Hanover County	675,714	Carteret County	640,750	Brunswick County	390,242
Vermillion Snapper	Brunswick County	2,317,534	Carteret County	1,483,802		

Black Sea Bass	Onslow County	2,100,034	Dare County	1,552,624	New Hanover County	1,165,877
Snowy Grouper	Dare County	439,301	Carteret County	387,333	New Hanover County	211,988
Golden tilefish	Brunswick County	117,658	Dare County	13,526		
Red snapper	Carteret County	60,491	Brunswick County	31,007		
Black grouper	Brunswick County	518	Hyde County	406		
Red grouper	Brunswick County	636,262	New Hanover County	602,521	Carteret County	589,856
Warsaw grouper	Onslow County	15				
Speckled hind	Dare County	428	Hyde County	174		

Recreational Fishing

Recreational fishing is well developed in North Carolina and, due to natural geography, is not limited to areas along the coast. Data show that North Carolina is almost on par with east Florida for total recreational fishing participation effort (data not shown; see SAFMC 2006). A brief discussion of public boat ramps and local recreational fishing clubs, as well as sources of information used by these anglers, can be found in SAFMC (2006).

The North Carolina state legislature approved the creation of a state recreational saltwater fishing license in 2004. The license created controversy for both the recreational and commercial sectors, each believing that it will hurt or help their access to marine resources. Possession of the license, subject to exemptions, has been required as of January 1, 2007 (http://www.ncdmf.net/recreational/NCCRFLfaq.htm).

3.8.3.1.2 Hatteras Village, Dare County

A detailed history of this community, from its discovery by Italian explorers in the 16th century to establishment of a National Seashore in 1953, can be found in SAFMC (2006).

Overview

Census data indicate there was not a significant increase in population size in Hatteras Village from 1990 to 2000 (SAFMC 2006). The demographics of the island have shifted, as is evidenced in the decreasing percentage of the population that is actively in the workforce, perhaps reflecting a larger number of retirees in the community, and the increasing proportion of residents with higher education, also reflecting a retired, professional segment of the population. Hatteras Village has also experienced a significant increase in the percent of the population in the farming, fishing, and forestry occupations, from 5.6 percent to 10.8 percent. This may be reflective of the increasing number of persons employed in businesses related to recreational fishing, such as charter boat captains and crew, boat repair and sales, marinas, etc. See SAFMC (2006) for the raw data describing community demographics. Figure 3-15 includes two maps detailing the area.

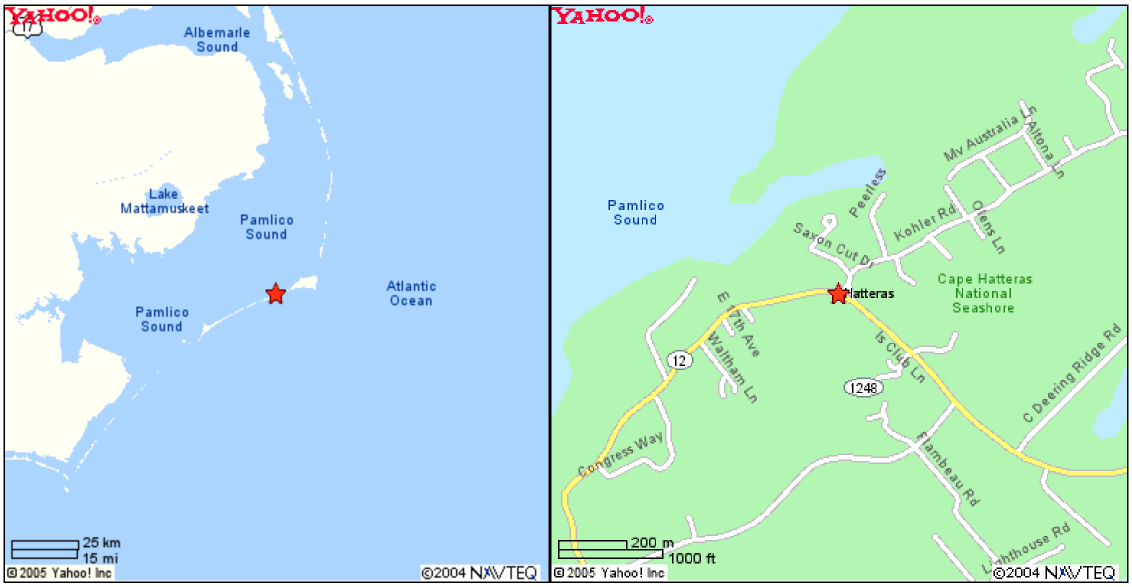


Figure 3-15. Hatteras Island and Village, Outer Banks, North Carolina.
Source: Yahoo Maps, http://www.yahoo.com.

Commercial Fishing

Anecdotal information from Hatteras residents indicates the number of fish houses has decreased as tourism has increased (SAFMC 2006). Residents, however, still promote the fisherman's way of life through festivals and special community designations (SAFMC 2006).

Mirroring the statewide trend, the number of unlimited commercial permits held by residents of Hatteras decreased from 1999 (9 permits) to 2004 (5 permits). The number of limited commercial permits has remained at 3 (SAFMC 2006). Twenty people stated they were employed in fishing related industry in the 1998 census, with 18 of these employed by marinas. A listing of the six marinas and eight bait and tackle stores in Hatteras Village can be found in SAFMC (2006).

Recreational Fishing

Hatteras is host to several prestigious fishing tournaments and is homeport for the island's famous charter fishing fleet. The number of charter/headboat permits held by Hatteras residents has dramatically increased, from one permit in 1999 to 28 in 2004.

3.8.3.1.3 Wanchese, Dare County

A history of this community, and neighboring Manteo, describing its persistence as a small, close-knit community focused on making its living from the sea, can be found in SAFMC (2006).

Figure 3-16. Map of Roanoke Island, North Carolina, showing Wanchese and Manteo. Source: Kitner 2005.

Overview

Figure 3-16 provides a map of Roanoke Island, including Wanchese and Manteo. While Wanchese has maintained its identity as a commercial fishing community, it faces continuing pressure from developers in nearby Manteo and other Outer Banks communities. However, the town has recently approved a zoning document that would prevent unplanned growth and would help preserve working waterfronts and residential areas (Kozak 2005). A partial community profile detailing local traffic patterns, businesses, and prominent families can be found in SAFMC (2006).

The largest industrial area in Wanchese is centered on the Wanchese Seafood Industrial Park, built to enhance business opportunities in the seafood and marine trades. Tenants of the park are able to ship products overnight to major domestic and international markets through the airport in Norfolk, Virginia. The park is utilized by fishermen and seafood dealers, as well as boatbuilding and boat maintenance businesses. The park is full of activity and it is common to find large numbers of people, especially Hispanics, working in the marine trade industries.

Census statistics from 2000 show the population of Wanchese is aging and very homogenous, with little ethnic diversity. There has been a slight increase in the Hispanic population since 1990, mirroring most other communities in North Carolina. Education levels have also increased, and the poverty rate has decreased. A higher percentage of people are employed in fishing-related professions in Wanchese than in almost any other community – 10 percent – although even that number has decreased nearly 50 percent since 1990.

Commercial Fishing

Commercial landings and value for Wanchese/Stumpy Point declined from 31.9 million pounds valued at $26.1 million in 2001 to 28.7 million pounds valued at $23.2 million in 2002. In 2001, Wanchese/Stumpy Point was listed as the 28th most prominent United States port based on the value of the product landed, declining to 30th in 2002. While landings increased in 2003, to 33 million pounds, value further declined to $21 million (31st place), with further declines in both poundage (31 million pounds) and value ($20.5 million) in 2004.

Amendment 8, which limited entry into the commercial Snapper Grouper fishery, does not appear to have caused a decrease in the number of commercial permits held by residents of Wanchese (SAFMC 2006). In 1999, seven unlimited commercial permits were held, with eight in 2004. Three limited commercial licenses were held in both 1999 and in 2004.

One hundred twenty residents of Wanchese stated they were employed in fishing related industries in the 1998 census (SAFMC 2006). Sixteen of these were listed as employed in fishing, 56 in fish and seafood, and 40 in boatbuilding.

There were 228 commercial vessels registered and 201 state standard commercial fishing licenses issued in the community in 2002 (SAFMC 2006). Wanchese residents also held 12 dealer licenses. The town is an important unloading port for many vessels transiting to and from the Mid-Atlantic and South Atlantic.

Recreational Fishing

As of 2005, nine boatbuilding businesses were located in Wanchese, building either pleasure yachts, recreational fishing vessels or, less often, commercial fishing vessels. There were two bait and tackle businesses and two marinas in town. All these businesses rely on the fishing industry. Manteo also maintains an active private and for-hire recreational fishing community. From 1999 to 2004, there was an increase in the number of charter/headboat licenses held, from two permits to nine permits. As most of the recreational sector for the region operates out of Manteo and Nags Head, these communities would be more affected by recreational fishing restrictions than would Wanchese.

Figure 3-17. Area of Carteret County, North Carolina, showing Morehead City, Atlantic Beach (at the red star), and Beaufort. Source: Yahoo Maps, http://www.yahoo.com.

3.8.3.1.4 Morehead City, Carteret County

In Carteret County, Morehead City, Beaufort, and Atlantic Beach form a triad of different but complementary communities in close geographic proximity (Figure 3-17). A detailed history of Morehead City, from its founding in the 1840s-1850s to its development as a center for sport and tournament fishing in recent years, can be found in SAFMC (2006).

Overview

Morehead City's economy is currently based on tourism, fishing (commercial and recreational), light industry, government, and other service and professional industries. The town has regained its commercial viability as a modern port terminal, and benefits from its location on the "sound-side" of the Atlantic Beach resort trade. Diving has become an important tourist activity; Rodale's Scuba Diving magazine recently named North Carolina as the best wreck diving destination in North America, and Morehead City as the best overall dive destination. Recreational fishing effort is growing quickly, as new marinas, boat storage areas, boat builders, and marine supply stores open in the city.

Detailed statistics detailing community demographics of Morehead City in 1990 and 2000 can be found in SAFMC (2006). The population of Morehead City increased from 1990 to 2000, with sizable increases in the number of people declaring non-white ethnicities. Median income increased from approximately $20,000 to nearly $29,000 from 1990 to 2000. Median home value nearly doubled, and median rent increased 35 percent. The percentage of those completing high school increased by 10 percent, and there was a seven percent increase in those receiving a bachelor's degree or higher. The poverty level decreased. However, the unemployment rate increased. The occupations of farming, fishing, and forestry employ more than one percent of the population of Morehead City.

Commercial Fishing

In 1998, 100 people were employed in fishing related businesses according to census figures, with 40 employed in marinas and 36 employed in fish and seafood businesses (SAFMC 2006). Over 200 state commercial vessel licenses, 150 state standard commercial fishing licenses, and 14 dealer licenses were issued by the state to residents of Morehead City in 2002. The number of unlimited commercial permits held by Morehead City residents was 15 in 1999 and 14 in 2004, while the three limited commercial permits held in 1999 were no longer held by 2004 (SAFMC 2006). As of 2002, the state had issued 211 commercial vessel registrations, 150 standard commercial licenses, and 14 dealer licenses to Morehead City residents. Residents of Morehead City were primarily employed by marinas (40 percent) and fish and seafood (36 percent), with 16 percent employed in boatbuilding businesses.

A narrative detailing the fishing methods, habits, and observations of a bandit-rig fisherman in Morehead City can be found in SAFMC (2006).

Recreational Fishing

The number of charter/headboat permits held by Morehead City residents nearly doubled, from seven in 1999 to 13 in 2004.

3.8.3.1.5 Beaufort, Carteret County

Beaufort is located on the coast near Cape Lookout, and borders the southern portion of the Outer Banks. Its deep harbor is home to vessels of all sizes, and its marinas are a favorite stop-over for transient boaters. A detailed history of Beaufort, from its establishment to its importance as a trade center during the 18th and 19th centuries, to its later involvement in the menhaden fishing industry, can be found in SAFMC (2006).

Overview

Tourism, service industries, retail businesses, and construction are important mainstays of the Beaufort area, with many shops and restaurants catering to people from outside the area. Census data show a slight decrease in population size from 1990 to 2000, from 3,808 inhabitants to 3,771, perhaps due to the aging population. Educational attainment rose over the last decade, and the percentage of individuals below the poverty line fell slightly. The percentage of those in the labor force decreased, another possible indication of an aging population. However, the percentage unemployed also decreased. The number of people working in farming, fishing, and forestry remained about the same from 1990 to 2000. According to census business pattern data from 1998, most of the fishing-related employment in Beaufort (total 300 persons) occurs in the boat building industry, which employs 184 residents (SAFMC 2006). Forty-eight people reported working in marinas, while others are employed in fish processing, fish harvesting, and seafood marketing.

Commercial Fishing

There has been a slight decrease in the number of unlimited commercial permits held by residents of Beaufort, from 5 permits in1999 to 4 permits in 2004. In the last two years, the one limited commercial permit held by a Beaufort resident was no longer reported. As of 2002, the state had issued 430 commercial vessel registrations, 294 standard commercial licenses, and 32 dealer licenses to Beaufort residents.

Recreational Fishing

There has been virtually no change in the number of charter/headboat permits, 1 permit in 2003 and 2004, held by residents.

3.8.3.1.6 Atlantic Beach, Carteret County

Atlantic Beach has been a popular resort town since the 1870s. The first bathing pavilion was built on Bogue Banks in 1887. Tourists flocked to the resorts, and ferry service to Atlantic Beach increased. Other resorts and tourism related development occurred over the next century, and the area remains a popular vacation destination (www.atlanticbeach-nc.com/history_part-1.html).

Overview

Atlantic Beach demographic data from 1990 and 2000 show a slight population decline since 1990, as well as decreases in the percent of the population involved in farming, fishing, and forestry (SAFMC 2006). The median age of the population has increased, perhaps a reflection of the growing number of retirees moving to this area of the coast.

Commercial Fishing

As observed in other areas of North Carolina, since limited access was put into place, the number of commercial permits has decreased from eight unlimited commercial permits in 1999 to four in 2004, and four limited commercial permits to zero (SAFMC 2006). In 1998, 60 residents of Atlantic Beach were employed in fishing related industry, with 93 percent of those employed by the marine sector. In 2002, 56 vessels were registered with the state as commercial fishing vessels, 42 standard commercial fishing licenses were held by Atlantic Beach residents, and there were ten valid dealer licenses issued to community members (SAFMC 2006).

Recreational Fishery

Since 1999, the number of federal charter/headboat permits held by Atlantic City residents has increased from six to 19, though only one permit was recorded in 2002. Of the 60 individuals reporting working in a fishing related industry in 1998, 46 worked in marinas. Two state permits were issued to recreational fishing tournaments to sell licenses in 2002 (SAFMC 2006).

Figure 3-18. General area of Sneads Ferry, North Carolina.
Source: Yahoo Maps, http://www.yahoo.com.

3.8.3.1.7 Sneads Ferry, Onslow County

Sneads Ferry is a historical fishing village located on the New River near the northern tip of Topsail Island (Figure 3-18). The river joins the Intracoastal Waterway at Sneads Ferry, with easy access to the Atlantic Ocean. A very active commercial fishing community, Sneads Ferry takes in more fish than any other Onslow County port (http://www.cbcoastline.com/areainfo.htm). It also includes Camp Lejeune, a U.S. Marine base. The Sneads Ferry Shrimp Festival has been held annually since 1971. Now grown to a two-day event, the annual shrimp festival is the town's major fund-raiser. From its proceeds, the town established a 14-acre community park and built a 7200-sq. ft. Shrimp Festival Community Building (www.sneadsferry.com/areahistory/his_sf.htm).

Overview

Census data indicate the population of Sneads Ferry increased by about 10 percent from 1990 to 2000, from 2,031 inhabitants to 2,248. Most new residents were white, and the number of black or African American residents decreased from 159 to 115. Median income increased from about $20,000 to nearly $35,000. Median home value increased from $65,000 to $110,000, but median rent remained about the same. The percentage of those completing high school increased by 10 percent and the percent of residents with at least a Bachelor's degree doubled, from six percent to 12.8 percent. The poverty level decreased from 20.9 percent to 13.5 percent, and the percentage of the population unemployed decreased from 8.3 percent to 2.2 percent. The percentage of residents employed in farming, fishing, and forestry decreased by half from 18.2 percent to 9 percent, while employment in sales and office occupations increased by over 17 percent. It is unclear who may be buying home sites on newly developed land in the town, but the town's current demographics may point to an increase in retirees in Sneads Ferry, as they are better educated, have higher incomes, and are older. The dramatic decline by approximately 50 percent of persons employed in extractive natural resource occupations may be due to increasing job opportunities outside of the community, the changing impacts of regulations, or status of the resources

Commercial Fishing

Sneads Ferry is a small town with little of the large-scale development seen elsewhere on the North Carolina coast. Many houses in the community have fishing vessels docked in front of the house or on the lawn. The white rubber boots worn by commercial fishermen in this community and many other parts of North Carolina are commonly referred to as "Sneads Ferry Sneakers", suggesting the importance of commercial fishing to the area. Most of the fishermen in town are shrimpers and net fishermen who go out daily. There is also a strong contingent of black sea bass pot fishermen resident in the town. The species with the highest consistent landings in the town are black sea bass, button clams, blue crab, flounders, mullet, shrimp, spot, and whiting.

The number of federal charter/headboat permits held by residents increased from six in 1999 to 13 in 2004, while the number of unlimited commercial permits decreased from 22 to 17, and the number of limited commercial permits remained at one (SAFMC 2006). Over 347 commercial fishing vessels were registered with the state in 2002, and 228 residents held state-issued standard commercial fishing licenses. There were also 18 dealer licenses in the community and 169 shellfish licenses. In 1998, 16 persons were employed in fishing related industry, with 75 percent working in fish and seafood.

Recreational Fishing

Recreational fishing in Sneads Ferry is not as prominent an activity as in Morehead City. However, there are a large number of vessels with charter permits for Snapper Grouper homeported there. Little is currently known about recreational fishing out of Sneads Ferry, aside for its advertisement as an important tourist attraction in many websites that discuss the community. At least five marinas cater to recreational fishermen. There are two other marinas at Camp LeJeune Marine Base, just across the Neuse River. Some smaller river and sound fishing charters operating out of the area and one headboat runs from Sneads Ferry. Other than black sea bass, it does not appear that many Snapper Grouper species are frequently caught recreationally from Sneads Ferry.

3.8.3.2 South Carolina

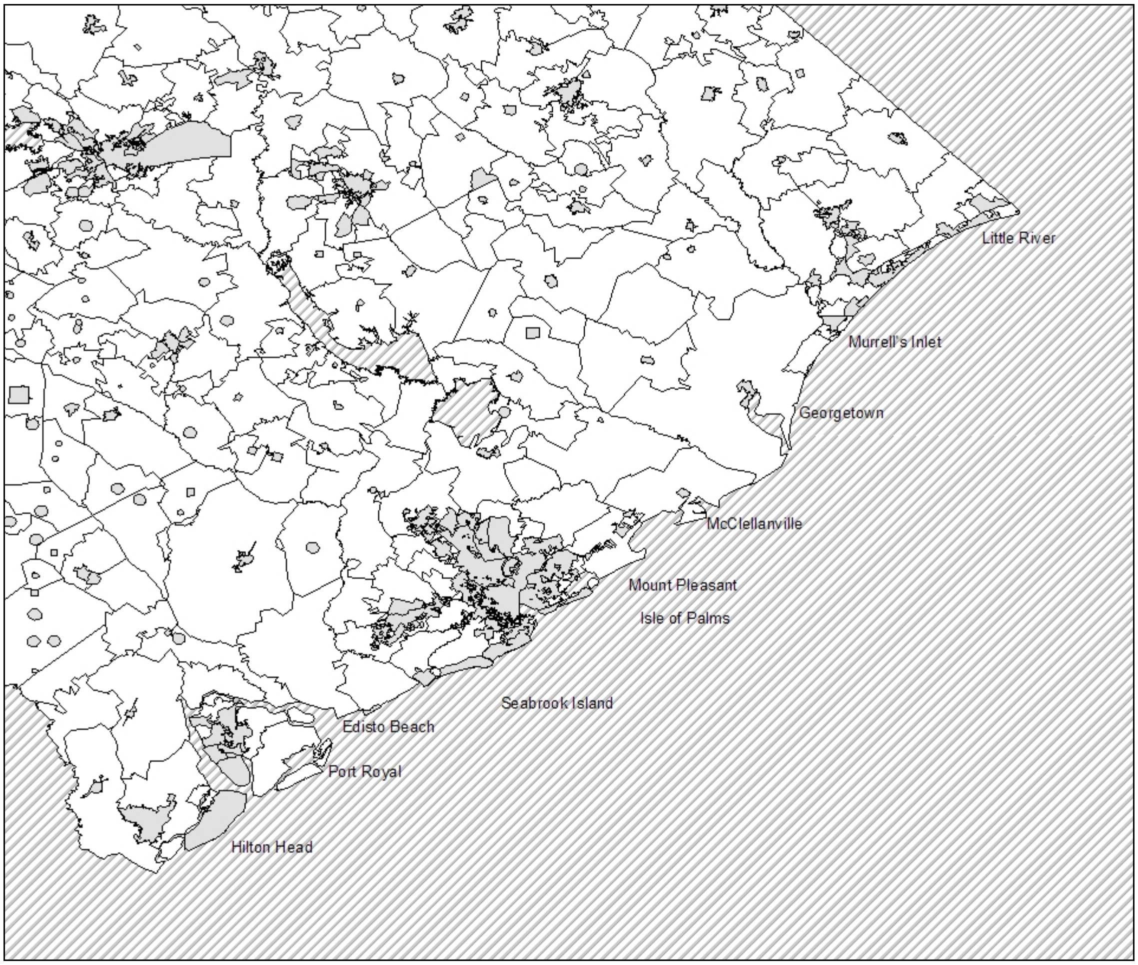


Figure 3-19. South Carolina communities with substantial fishing activity, as identified by South Atlantic Advisory Panels.

3.8.3.2.1 Statewide

Overview

South Carolina communities with substantial fishing activity are less developed than those in North Carolina and, over the past 20 to 30 years, the state has seen much more tourist-oriented development along its coasts than Georgia or North Carolina. In Horry County, the urban area of Myrtle Beach has expanded greatly in the past few decades, and much of the coastal area has been developed as vacation homes, condominiums, and golf courses. The communities most impacted by this development are Little River, Murrells Inlet, Pawleys Island, and Georgetown, although the latter three are located in Georgetown County (Figure 3-19). The same is true of rapid developing Charleston County, and the cities and communities of McClellanville, Mt. Pleasant, Sullivans Island, Wadmalaw and Edisto Islands feel the impact of urban sprawl from the city of Charleston. Further south along the coast, the Hilton Head Island resort development has been the impetus for changing coastal landscapes in the small towns of Port Royal, Beaufort, St. Helena Island, and Bluffton.

For the purpose of this document, only Little River will be singled out as a community with a high concentration of both commercial and recreational fishing, along with other types of coastal oriented leisure pursuits. Other analyses will consider South Carolina as a whole.

Commercial Fishing

While pockets of commercial fishing activities remain in the state, most are being displaced by the development forces and associated changes in demographics. The number of unlimited commercial permits, however, increased from 74 in 1999 to 87 in 2004, while the number of limited commercial permits decreased by 75 percent from 12 to 4 (SAFMC 2006).

Recreational Fishing

Many areas that used to be dedicated to commercial fishing endeavors are now geared towards the private recreational angler and for hire sector. The number of federal charter/headboat permits held by South Carolina residents increased from 41 in 1999 to 111 in 2004. The majority of saltwater anglers fish for coastal pelagic species such as king mackerel, Spanish mackerel, tunas, dolphins, and billfish. A lesser number focus primarily on bottom fish such as snapper and groupers and often these species are the specialty of the headboats that run out of Little River, Murrells Inlet, and Charleston. There are 35 coastal marinas in the state and 34 sportfishing tournaments (SAFMC 2006).

3.8.3.2.2 Little River, Georgetown County

A history of Little River detailing its settlement in the late 1600s, its popularity as a vacation destination in the 1920s, and the concurrent rise in charter fishing, can be found in SAFMC (2006).

Figure 3-20. Little River, South Carolina, and surrounding area.
Source: Yahoo Maps, http://www.yahoo.com.

Overview

Figure 3-20 shows Little River and the surrounding area. A detailed description of changes in land-use patterns in and near Little River can be found in SAFMC (2006). Nearby Murrells Inlet is gradually transforming into a residential community for Myrtle Beach, and SAFMC (2006) argues this is also true for Little River.

Census data indicate the Little River population more than doubled from 1990 (3,470 persons) to 2000 (7,027 persons) and became more ethnically diverse with more people of American Indian or Alaskan Native, and Hispanic or Latino ethnicities. Median income increased by over 40 percent, from nearly $29,000 to over $40,000. Median home value also increased by over 40 percent, and median rent increased by nearly 35 percent. The percentage of those completing high school and those with a Bachelor's degree remained about the same. The poverty level decreased by nearly two-thirds to 4.7 percent, and the percentage of the population unemployed decreased from 6.6 percent to 3.4 percent. The percentage of residents employed in farming, fishing, and forestry decreased from 3.6 percent to 0.9 percent.

Commercial Fishing

In 1998, 38 residents of Little River were employed in fishing related industry according to the U.S. Census, with 81 percent of those employed by the marina sector. The number of Snapper Grouper unlimited harvest commercial permits held by community residents remained about the same between 1999 and 2004, from 15 permits to 16 permits, and one resident still held a limited harvest commercial license. Twenty-four Little River residents held state permits, with the most being saltwater licenses (8 permits) or trawler licenses (5 permits) (SAFMC 2006).

The table below (Table 3-47) shows the commercial cumulative landings by pounds and ranking in the South Atlantic for Little River for the years 2005-2207 for major species in this amendment. Little River had little or no landings of black grouper, speckled hind, or warsaw grouper.

Species	Pounds	Ranking in South Atlantic
Gag	409,721	4th
Vermillion Snapper	1,035,287	5th
Black Sea Bass	549,944	6th
Snowy Grouper	289,128	3rd
Golden tilefish	615,373	4th
Red snapper	31,777	11th
Red grouper	21,535	20th

Table 3-47 Source: Logbook Data, SEFSC 2009.

Recreational Fishing

As observed in other coastal communities described herein, the number of charter/headboat permits held by community residents increased from 9 in 1999 to 16 in 2004. Three headboats operated out of Little River, and this part of the for-hire industry has a long and storied past in the community. Recreational fishing, primarily as headboat effort, came about as a way for commercial fishermen to continue fishing in the summer months. A detailed account of how recreational fishing developed in Little River can be found in Burrell (2000). Most of the private recreational fishing effort in this area occurs out of marinas in North Myrtle Beach, Myrtle Beach, and Murrells Inlet.

3.8.3.3 Georgia

3.8.3.3.1 Statewide

Overview

Only one community in Georgia (Townsend) lands a substantial amount of the Snapper Grouper species addressed in this amendment. Other parts of the state involved in the commercial harvest of seafood are focused on penaeid shrimp, blue crabs, and other finfish such as flounder, shad, croaker, and mullet.

Brunswick, the other community that has a commercial fishing presence, was once a more thriving commercial fishing community but now tourism and other related activities are competing for waterfront in the town. The most commonly harvested species in Brunswick are blue crab and different species of penaeid shrimp. According to the ACCSP website, there have been no Snapper Grouper species landed in Brunswick in since 2001. Other parts of the state involved in the commercial harvest of seafood are focused on penaeid shrimp, blue crabs, and other finfish such as flounder, shad, croaker, and some mullet.

Commercial Fishing

Unlike the pattern observed in many other areas, the number of unlimited commercial permits and limited commercial permits held by Georgia residents did not decrease from 1999 to 2004, with eight permits and one permit, respectively. In 2002, 947 vessels were registered with the state as commercial fishing vessels, 612 full-time state commercial fishing licenses were held by Georgia residents, and 147 residents held part-time state commercial fishing licenses. Within the commercial fishing fleet, four hundred and eighty two vessels had shrimp gear on board in that year (SAFMC 2006).

The table below (Table 3-48) shows the commercial cumulative landings by pounds and ranking in the South Atlantic for Townsend, Georgia for the years 2003-2207 for major species in this amendment. Townsend had little or no landings of black grouper, speckled hind, golden tilefish, or warsaw grouper.

Species	Pounds	Ranking in South Atlantic
Gag	397,284	5
Vermillion Snapper	1,428,918	4
Black Sea Bass	19,790	14
Snowy grouper	33,619	19
Red snapper	130,553	3
Red grouper	21,797	20

Table 3-48. Source: Logbook Data, SEFSC 2009.

Recreational Fishing

As observed in other areas, the number of charter/headboat permits held by Georgia residents increased markedly from five permits in 1999 to 27 permits in 2004 (SAFMC 2006). Recreational vessels are located at Tybee Island close to Savannah, on the barrier islands off Brunswick, and between Savannah and Brunswick.

3.8.3.3.2 Townsend, McIntosh County

A history of the area, describing its economy before the Civil War, the rise and fall of lumbering, and the building of the railroad, can be found in SAFMC (2006). Townsend is a small, rural community. In 2005, the fish house in this community was relocating inland. It is not known if this relocation was successful and whether that fish house will be handling domestically harvested fish in the future.

Overview

The population of Townsend increased by over 1,000 residents from 2,413 in 1990 to 3,538 in 2000. Although there was a large relative increase in the number of Hispanic or Latino residents, from 2 to 27, most of the new inhabitants were white (1,465 in 1990 and 2,437 in 2000). Median income increased from approximately $23,000 to $35,000. Median home value nearly tripled, from $33,000 in 1990 to $98,100 in 2000, and monthly rent nearly doubled, from $213 to $431. In 1990, 26.9 percent of residents had less than a 9th grade education, but by 2000, that number declined to 11.0 percent. The percentage of those completing high school increased by nearly 15 percent, while the percent receiving a bachelor's degree or higher remained about the same (8.4 percent to 8.9 percent). The percent of the population with an income below the poverty line deceased by four percent, but remained high at 14.6 percent. The percentage of the population unemployed increased from 3.4 percent to 6.5 percent. There has been a sizeable decline in the percentage of the population employed in manufacturing, from 29.0 percent to 16.2 percent, and the proportion of the population employed in farming, fishing, and industry remained unchanged at approximately three percent.

Commercial Fishing

A comprehensive description of the historic and current fish houses of coastal Georgia and how they operate, focusing on Phillips Seafood of Townsend, can be found in SAFMC (2006). For nearly a decade, only one fish house has consistently handled Snapper Grouper species. A fish house in Brunswick may have landed these species in the past, but has not reported landings since 2001.

Recreational Fishing

Offshore recreational anglers do not often target or harvest Snapper Grouper species in Georgia (http://www.st.nmfs.noaa.gov/st1/recreational/overview/overview.html).
Of the Snapper Grouper species harvested, black sea bass, sheepshead, and vermilion snapper are the most commonly harvested fish at five, seven, and two percent, respectively. As of 2004, residents of the Savannah area held 11 charter/headboat permits for Snapper Grouper, and many of these vessels are docked on Tybee Island. Residents of the area around the city of Brunswick,

including Jekyll Island and Sea Island, held four Snapper Grouper charter/headboat permits. Interestingly, unlike the cities profiled in the Carolinas, the number of federally permitted for-hire vessels has declined dramatically. From 2003 to 2004, the number of Snapper Grouper permitted for hire vessels declined from 43 to 27 (NMFS 2004). The cause of this decline is unknown.

3.8.3.4 Florida

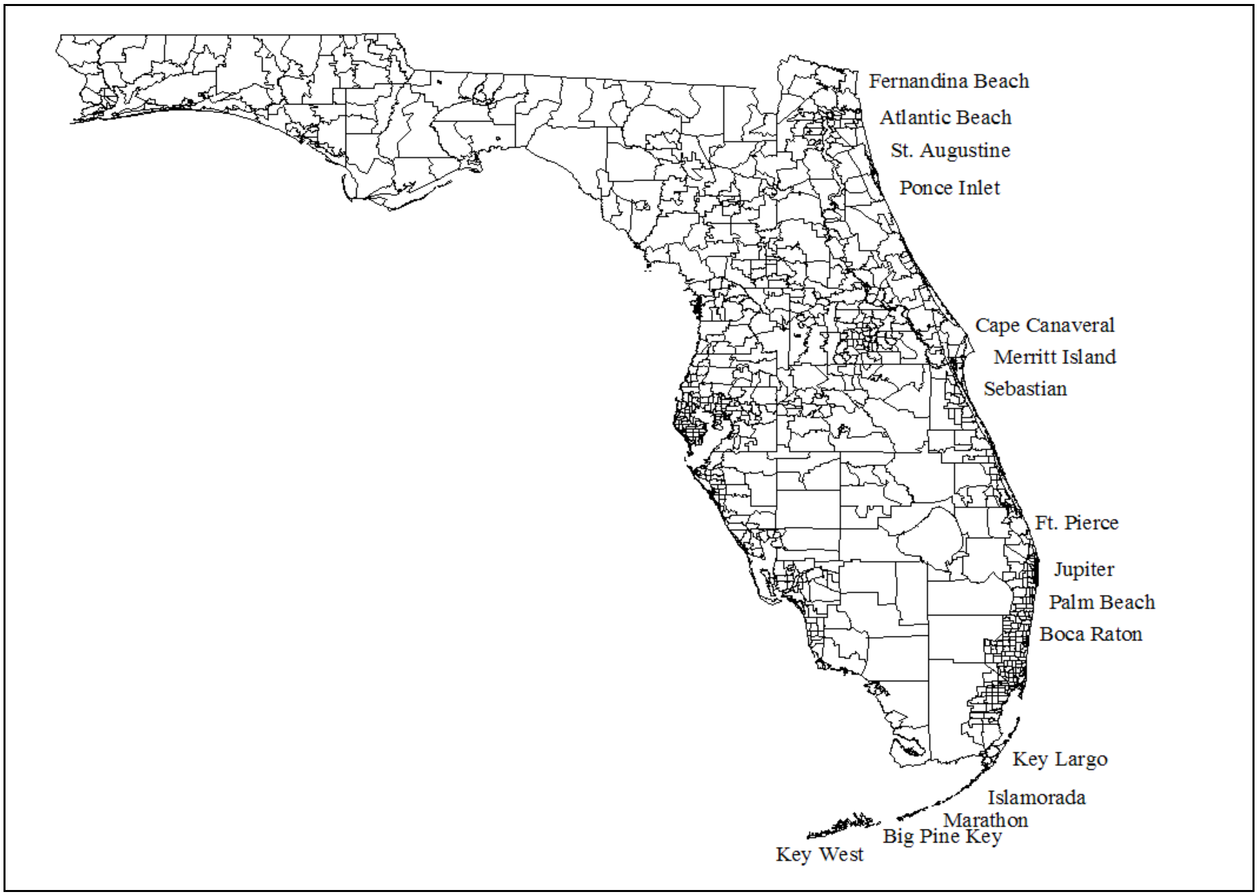


Figure 3-21. Florida communities with substantial fishing activity. Identified by South Atlantic Advisory Panels. Source: Jepson et al. (2005).

3.8.3.4.1 Statewide

Overview

Florida stands apart from other states in the South Atlantic region in fishing behaviors, history, and demographics. Florida has one of the fastest growing populations in the United States, estimated to increase each day by 750 to 1,000 new immigrants. Twenty-five percent of all vacation homes in the United States are located in Florida's coastal counties (Coastal Ocean Resource Economics 2005).

Along with being heavily populated on land, coastal waters off Florida are also heavily used by recreational users of all kinds. This growth of a leisured class occupying coastal areas has led, in part, to conflicts over natural resource access and use-rights. One example of this type of struggle was the conflict over the use of gillnets in state waters. The conflict culminated in a state-wide ban on the use of gillnets, which dealt a resounding blow to many Florida fishermen, ending in the loss of many commercial fishing properties and the displacement of many fishermen. There have also been conflicts between the "environmental community" and commercial fishermen over the closing of the *Oculina* Bank off of Florida's central coast, and the creation of both the Florida Keys National Marine Sanctuary and the Tortugas Sanctuary, both in the Keys.

The natural geography of Florida also sets it apart from other South Atlantic states, particularly in the area from central Florida through the Keys. The weather is amenable to fishing almost year round, though hurricanes in 2004 were particularly devastating and took a toll on all fisheries in the state, both east and west coast. There was also a cold water event that started near West Palm Beach in 2003, which moved up the east coast causing a substantial decline in Snapper Grouper fishing that year. The continental shelf is much narrower in Florida than elsewhere in the region, allowing fishermen to access deep waters quickly and return the same day. Finally, the species of Snapper Grouper available to fishermen in southern Florida are different than further north, with yellowtail snapper, gag and black grouper, and other alternative species such as stone crab, spiny lobster, dolphin, kingfish, and billfish allow a greater variety of both commercial and recreational fishing opportunities. These fisheries are important to many Florida communities identified by the Snapper Grouper Advisory Panel as shown in Figure 3-21.

Commercial Sector

Considering the high population growth rates and emphasis on a tourism economy in Florida, the commercial fishing sector in Florida is still robust in some areas. Although total landings and dollar values of all species landed on the Florida East coast have decreased from 1998 to 2003 (from nearly 30 million pounds worth approximately $44 million to approximately 23 million pounds worth $33 million dollars; SAFMC 2006), there is still a considerable commercial fishing presence in east Florida.

The table below (Table 3-49) shows the cumulative landings for 2005, 2006, 2007 for the top three communities in Florida for each species in this amendment. Although, the rankings can change from year to year, but the cumulative landings over a three year range can suggest which communities are most involved with the commercial harvest of each species.

	Location	Pounds	Location	Pounds	Location	Pounds
Gag	Mayport	319,605	Cocoa	265,628	Jacksonville Beach	220,562
Vermillion Snapper	Mayport	833,254	St. Augustine	294,860	Atlantic Beach	124,688
Black Sea Bass	Jacksonville	6,765	Fernandina Beach	6,541	Mayport	5,524
Snowy	Key West	269,315	Pt. Orange	195,872	Tavernier	114,877

Grouper						
Golden tilefish	Cocoa	1,109,657	Ft. Pierce	933,150	Pt. Orange	678,863
Red snapper	Mayport	173,390	St. Augustine	108,773	Jacksonville Beach	85,461
Black grouper	Key West	951,205	Key Largo	142,787	Summerland Key	142,634
Red grouper	Tavernier	86,261	Summerland Key	75,632	Miami	62,579
Warsaw grouper	Key West	22,781	Cocoa	3,525	Tavernier	2,110
Speckled hind	Key west	77,614	Cocoa	2,528	Tavernier	847

Table 3-49 Cumulative landings for 2005, 2006, 2007 for the top three communities in Florida for each species in this amendment: Source: Logbook data, SEFSC 2009.

Recreational Sector

While the commercial fishing industry, though still strong, may be in decline, the recreational sector appears to be stable. Excluding the headboat sector, although the number of participants declined in 2004 to approximately 1.9 million from 2.2 million in 2003 and from a high of 2.6 million in 2001, the number of trips taken in 2003 and 2004 remained at approximately 21 million. As may be recalled from Table 3-65, the headboat sector has exhibited a steady decline. In 2004, many homeports hosted at least one vessel holding both federal charter/headboat permits and federal unlimited commercial permits. Key West and Miami stand out, with 35 and 15 such vessels, respectively.

3.8.3.4.2 Cape Canaveral, Brevard County

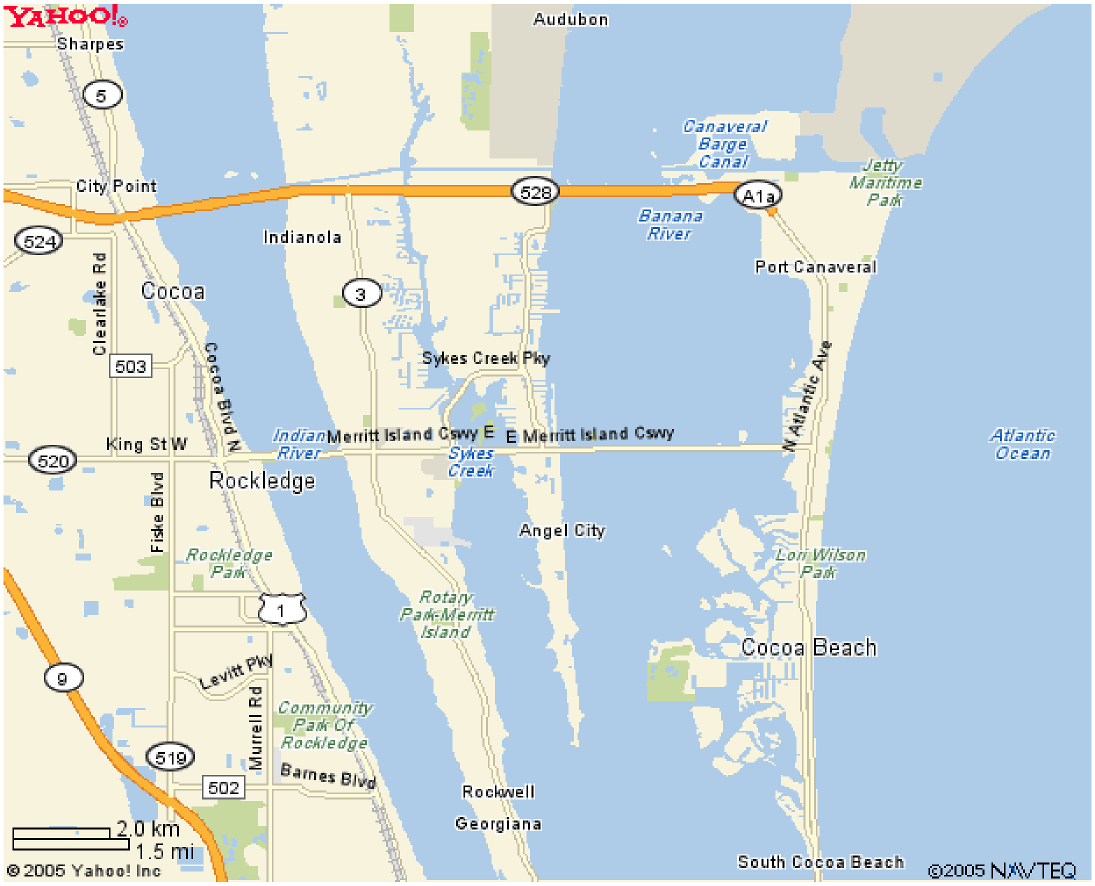


Figure 3-22. Area map of Cape Canaveral, Florida. Source: Yahoo Maps, http://www.yahoo.com.

A detailed history of Cape Canaveral, Florida, from its first habitation 10,000 years ago, its settlement by the United States in the early 1800s, the establishment of the Banana River Naval Air Station in World War II, to NASA's arrival in 1952, can be found in SAFMC (2006). A map of the area is shown in Figure 3-22.

Overview

Cape Canaveral has a fairly homogenous, aging population, with those 65 years and older growing from 16.1 percent of the population to 23.1 percent since 1990. Overall, educational attainment has increased. The number of persons who speak a language other than English at home has increased 2.5 percent, and fewer people have incomes below the poverty line. Unemployment has decreased, but fewer people are in the labor force today than in 1990, perhaps due to an aging population. The percentage of persons in a service occupation has grown from 14.1 percent to 20.4 percent, while there has been a sizeable decline in the percent of residents employed in forestry, mining, and fishing, from 2.7 percent in 1990 to 0.4 percent in 2000.

Fisheries in central Florida generally operate in two different environments, inshore river or inlet fishing with associated lagoons, which primarily attracts recreational fishing, and offshore areas, where commercial fishing primarily occurs. Popular inshore areas include the Indian, St. Johns, and Banana Rivers and associated lagoons. Commercial exploitation of the rivers and lagoons declined after implementation of the Florida net ban of 1994.

Many commercial fish houses have gone out of business or have shifted to selling imported products to supplement their local supplies. At the same time, the number of businesses possessing federal dealer permits has increased from about 180 in 1999 to a little over 200 in 2001. There is some industry speculation that the increasing number of dealer permits reflects increased decentralization in the domestic fishing markets and the need to increase profits by self-marketing.

Commercial Fishing

Cape Canaveral draws fishermen from Cocoa/Cocoa Beach, Merritt Island, Melbourne, and Titusville. These fishermen target many Snapper Grouper species, as well as coastal migratory pelagics such as mackerel, highly migratory species such as sharks and swordfish, and shellfish such as oysters, quahogs, and shrimp. Snowy grouper and tilefish (particularly golden or sand tilefish) landings exceed 10,000 pounds per year. Total commercial landings decreased, however, from 8.9 million pounds to 6.0 million pounds from 1998 to 2004 (SAFMC 2006).

The number of unlimited commercial permits in this area increased from nine in 1999 to 16 in 2004. The number of limited commercial permits fluctuated over this period, but ultimately declined from four permits in 1999 to one in 2004 (SAFMC 2006).

The number of Florida Saltwater Products Licenses issued to residents of Brevard County (where Cape Canaveral is located) decreased from 872 in 1998/99 to 492 in 2004/05 (SAFMC 2006). This license is needed to sell marine species in the state. There have also been declines in license sales for various crustacean fisheries.

Recreational Fishing

In 2004, Brevard county supported 36 bait and tackle stores, with five in Cape Canaveral, and 70 marinas with over 3,000 wet slips, indicating the importance of recreational fishing to the area. Fourteen fishing tournaments consistently occur in the area. Additional details about these businesses and tournaments can be found in SAFMC (2006).

As in other coastal areas of Florida, there is a fairly heavy presence in Brevard County of charter boat businesses, private marinas, and other associated businesses catering to the recreational fishing sector. The number of federally permitted charter/headboat vessels in Cape Canaveral increased from zero to seven from 1999 to 2004. According to Holland *et al.* (1999), there were approximately 32 charter boats and 2 headboats in the Canaveral/Melbourne area. Current estimates from permit files show at least 38 for-hire vessels with Snapper Grouper permits homeported in Cape Canaveral or Port Canaveral, which includes approximate four headboats.

That is likely a low estimate for total the total number of for-hire vessels in the area since it does not include vessels in the nearby Merritt Island and in the Cocoa/Cocoa Beach areas.

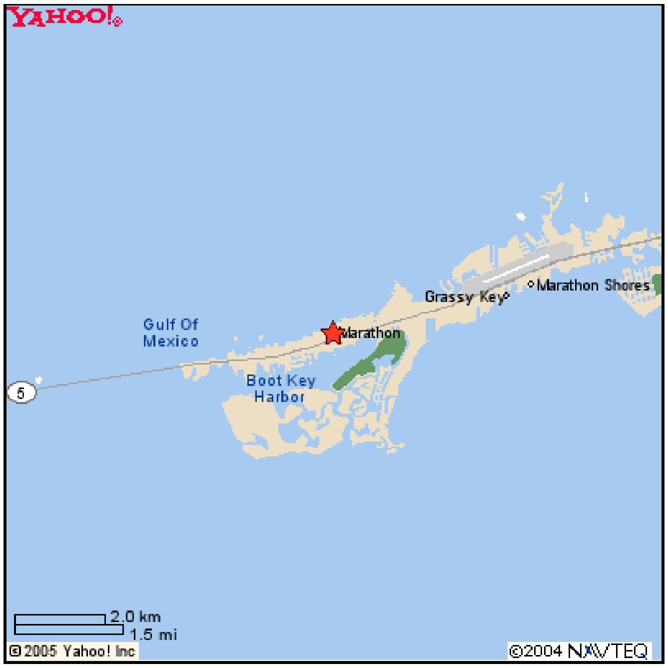


Figure 3-23. Marathon, Florida.
Source: Yahoo Maps, http://www.yahoo.com.

3.8.3.4.3 Marathon, Monroe County

A history of Marathon, detailing its settlement in the 1800s, the rise of industry, the effects of the Great Hurricane of 1935, the rise of tourism, and the importance of commercial fishing, can be found in SAFMC (2005). Figure 3-23 shows a map of Marathon, which lies in Monroe County.

Overview

Census data from 1990 and 2000 show there was an increase in overall population in Marathon from 8,857 in 1990 to 10,255 in 2000. During this period, the Hispanic population more than doubled, increasing from 1,040 to 2,095. This increase accounts for more than two thirds of the total population increase for the area. During this period of time, the median household income increased from approximately $25,000 to over $36,000.

Marathon has maintained a relatively high percentage of the total population, 4.1 percent in 2000, involved in farming, fishing, and forestry, though the percentage has declined from 8.7 percent in 1990. Since there is little commercial farming and forestry occurring in the area, the majority of percentage can be assumed to relate to fishing activities. The percentage of people that live below the poverty line decreased slightly from 15.1 percent in 1990 to 14.2 percent in 2000.

Commercial Fishing

In 1998, 184 Marathon residents were employed in fishing related industry according to the Census data, with 39 of those in the "fishing" category, 92 employed in "fish and seafood," and 47 employed by marinas (SAFMC 2006). The number of unlimited commercial permits held by community residents decreased from 65 permits to 44 permits between 1999 and 2004. Similarly, the number of limited commercial permits decreased from 43 permits to 31 permits.

Recreational Fishing

While most of the waters around Marathon are open to fishing, some areas have been set aside for eco-tourism and fish-viewing by divers and snorkelers. Sombrero Reef, said to be one of the most beautiful sections of North America's only living coral barrier reef, lies several miles offshore and is protected by the Florida Keys National Marine Sanctuary (http://www.fla-keys.com/marathon).

The importance of recreational boating and fishing to the economy of Marathon is shown by the businesses reliant upon it. As of 2004, there were at least 25 charter boat businesses, two party boat businesses, eight bait and tackle shops, and 27 marinas in the area. The number of vessels holding the federal charter/headboat permit increased from 16 in 1999 to 30 in 2004. In addition, there were seven fishing tournaments in Marathon. Most tournaments are centered on tarpon fishing. However, there are inshore and offshore fishing tournaments as well. These tournaments begin in February and run through June. Hotels and restaurants fill with participants and charters, guides and bait shops reap the economic benefits of these people coming to the area. These tournaments are positive economic pulses in the local economy, one that thrives on the existence of tourism and recreational fishing.

4 Environmental Impacts

Red Snapper Regulatory Background

The Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (1983) (FMP) imposed minimum size limits on six species to control growth overfishing, one of the species affected was red snapper. Information about growth, age, and mortality was used to form the basis for yield per recruit (YPR) models used in the FMP. According the 1983 Source Document for the FMP, the YPR analysis indicated red snapper were undergoing growth overfishing. At the time, minimum sizes were the preferred method of ending growth overfishing and preventing recruitment overfishing. Implementing a 12" size limit was expected to yield an eight percent increase in the yield if recruitment were held constant. It should be noted that at the time, the expected discard survival rate was estimated to be between 60 and 80 percent. Even at the lower end of the discard survivorship range yield was still expected to increase by six percent. Larger size limits were rejected because of potential decreases to inshore availability, and public testimony indicated that all user groups unanimously favored at least a 12" in minim size for red snapper.

Amendment 4 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (SAFMC 1991) implemented management measures to address overfishing of several snapper grouper species including red snapper. Prior the implementation of Amendment 4, NOAA Fisheries Service held an overfishing workshop (February 12-14, 1990) where Dr. Phil Goodyear, a NOAA Fisheries Service population dynamist, presented his work on Gulf of Mexico red snapper. Dr. Goodyear noted an SPR of 3% in the Gulf, and the workshop concluded that an SPR of 20% was sufficient for that red snapper population. Later, the workshop concluded growth parameters and habitat were approximately the same for South Atlantic red snapper as Gulf red snapper, and it would be sufficient to apply the same SPR level of 20% to the South Atlantic stock. Based on proceedings of this workshop, which included SPR recommendations for other snapper grouper species in addition to red snapper, the Council specified 30% SPR as the overfishing level for all species in the snapper grouper management unit except goliath grouper.

During development of Amendment 4, which implemented a 20" total length size limit and a 2 red snapper within a 10-fish snapper aggregate bag limit (excluding vermilion snapper), the Plan Development Team (PDT) felt the most appropriate goal for management of red snapper was 40% SPR rather than the 30% specified by the Council, and the PDT recommended a 21" total length size limit for red snapper. However, the Council felt implementing a 20" total length size limit would be adequate to reach the goal of 30% SPR. The size limit was expected to produce SPRs of 33% and 40% for the recreational and commercial fisheries, respectively. A provision to closely monitor the red snapper population (for size limit effectiveness) was included in the discussion, as was an allowance to implement larger size limits or additional regulations in the future if needed. At the time, the Council and NOAA Fisheries Service felt a bag limit of 10 snapper, where no more than 2 can be red snapper, would provide additional protection from overfishing, assist in achieving the target level of 30% SPR and spread out harvest within the recreational sector. However, it is important to note that at the time these red snapper management measures were implemented, there was no analysis projecting the expected reductions from the combination of size limit and bag limit. Therefore, it was impossible to predict whether or not the combination of size limit and bag limit would achieve the 30% SPR goal. Because of this uncertainty, Amendment 4 specified that the bag limit could be modified as necessary through future framework action.

In 1998, the Comprehensive Amendment Addressing Sustainable Fisheries Act Definitions and Other Required Provisions in Fishery Management Plans of the South Atlantic Region, Amendment 11 (SAFMC 1998), was implemented. In this amendment, the issue of MSY proxies was addressed. Amendment 11 states that during a meeting of the Snapper Grouper Assessment Group there was a consensus for 30-40% static SPR as a proxy for MSY. Where, longer lived species would have an SPR closer to 40% and moderately long-lived species, closer to 30%. It also stated that for data poor species with a known natural mortality rate, such as red snapper, the Council could use the natural mortality rate (M) as a proxy for F_{MSY}, and as soon as data are available, an F_{MSY} proxy would be specified. Taking this into account, Amendment 11 specified $F_{30\%SPR}$ as the proxy for F_{MSY}. At the time, the Council felt management measures being proposed in Amendments 7, 8, and 9 could result in an SPR of 35%, and they concluded those measures were sufficient to rebuild red snapper above the overfished level. Unfortunately the implementation of a limited access fishery, size limit, and bag limit were not enough to end overfishing of the species, and red snapper in the South Atlantic continue to be overfished to this day.

ACL Guidelines

Revisions to the Magnuson-Stevens Act in 2006 require that by 2010, Fishery Management Plans (FMPs) for fisheries determined by the Secretary to be subject to overfishing must establish a mechanism for specifying Annual Catch Limits (ACLs) at a level that prevents overfishing and does not exceed the recommendations of the respective Council's Scientific and Statistical Committee (SSC) or other established peer review processes. These FMPs also are required to establish within this time frame measures to ensure accountability. By 2011, FMPs for all other fisheries, except fisheries for species with annual life cycles, must meet these requirements.

The role of the SSC is very clear. According to the SSC Job Description dated March 2008, the SSC is the Council's primary technical advisory body. The SSC is expected to provide a broad suite of technical recommendation related to all aspects of the Council's management program. Section 101-627(g) of the Magnuson-Stevens Act states: *Each Council shall establish, maintain, and appoint the members of a SSC to assist in the development, collection, evaluation, and peer review of such statistical, biological, economic, social, and other scientific information as is relevant to such Council's development and amendment of any fishery management plan. Each SSC shall provide its Council ongoing scientific advice for fishery management decisions, including recommendations for ABC, preventing overfishing, MSY, and achieving rebuilding targets...*and other scientific advice. Furthermore, the reauthorized Magnuson-Stevens Act indicates the Council cannot exceed the fishing level recommendations of its SSC. Although the SSC specifies a level of catch that cannot be exceeded by the Council, it is also tasked with providing the Council with advice on fishery management components, MSY, and other issues.

Therefore, while recommendations on MSY, OY, proxies for F_{MSY}, etc. from the SSC are advisory in nature, fishing level recommendations from the Council cannot be exceeded.

NMFS guidelines define the following terms:

- Overfishing limit (OFL) means "the annual amount of catch that corresponds to the estimate of MFMT applied to a stock or stock complex's abundance and is expressed in terms of numbers or weight of fish.

- Acceptable biological catch (ABC) means "a level of a stock or stock complex's annual catch that accounts for the scientific uncertainty in the estimate of OFL and should be specified based on the ABC control rule.

- Annual catch limit (ACL) means "the level of annual catch of a stock or stock complex that serves as the basis for invoking accountability measures." Setting the ACL provides an opportunity to divide the total ACL into sector-specific ACLs.

- Annual catch target (ACT) means "an amount of annual catch of a stock or stock complex that is the management target of the fishery. NMFS guidelines indicate that specifying an ACT is optional and up to the discretion of the Council. A stock or stock complex's ACT should usually be less than its ACL and results from the application of the ACT control rule. If sector-ACLs have been established, each one should have a corresponding sector-ACT."

- Accountability measures (AMs) means "management controls that prevent ACLs or sector-ACLs from being exceeded (in-season AMs), where possible, and correct or mitigate overages if they occur."

The SSC provided OFL and ABC recommendations in terms of pounds of fish at their June 2008 meeting but the SSC did not have an ABC control rule to assist them with estimating ABC and indicated that they considered the values to be "interim" until more robust methods for estimating these parameters could be made available. For stock and stock complexes required to have an ABC, NMFS final guidelines recommends that each Council should establish an ABC control rule based on scientific advice from its SSC. At their December 2008 SSC meeting, the SSC considered advice from the proposed NS1 guidelines and rescinded all estimates of ABC with the exception of an ABC = 0 for speckled hind and warsaw grouper. Furthermore, the SSC recommended at their December 2008 meeting that the ABC levels for snowy grouper, black sea bass, and red snapper be set consistent with the rebuilding plans for those species until they can be further amended on better scientific information. The SSC met in March and June 2009 to identify protocol for determining ABCs, which will be included in the Comprehensive ACL amendment. Appendix x is a document produced by the SSC titled "Proposed South Atlantic Council ABC Control Rule Report of the SAFMC SSC September 2009", which outlines the proposed protocol recommended by the SSC for establishing ABCs.

Magnuson-Stevens Act National Standard 1 guidelines includes a section entitled "Exceptions to requirements to prevent overfishing" (§ 600.310(j)(2)(ii)(B)), which is also known as the mixed-stock exception. The Council discussed this provision at its September 2009 meeting. The mixed stock exception allows for limited overfishing of a stock within a species complex if certain criteria are met. In order for the mixed stock exception to be granted the Council must justify through analysis that permitting limited overfishing a particular stock within a species complex will result in long-term net benefits to the nation, and that mitigating measures have been considered, and it has been demonstrated that a similar level of long-term net benefits cannot be achieved by modifying fleet behavior, gear selection/configuration, or other technical characteristic in a manner such that no overfishing would occur. Under the exception, fishing-related mortality must be limited to a level that will not lead the stock to fall below its MSST more than 50 percent of the time in the long-term, recognizing that persistent overfishing is expected to cause the affected stock to fall below its B_{MSY} more than 50 percent of the time in the long-term. Furthermore, any stock that drops below its MSST would be subject to the rebuilding requirements of the Magnuson-Stevens Act, which requires that overfishing be ended immediately and that the stock be rebuild to B_{MSY}. The mixed stock exception provides Councils with needed flexibility in terms of the specific mechanisms and measures used to prevent overfishing. However, the final rule implementing the National Standard 1 guidelines (74 FR 3178) are very clear in stating the mixed stock exception may *not* be applied to a species that is overfished. Therefore, the mixed stock exception is not applicable in the case of South Atlantic red snapper, which are overfished and undergoing overfishing.

4.1 Proxy for Maximum Sustainable Yield (MSY) for red snapper

Table 4-1. MSY and MSY proxy alternatives for red snapper.

Alternatives	**Equation**	**F_{MSY}**	**MSY Values (lbs whole weight)**
Alternative 1 (no action)	MSY proxy equals the yield produced by F_{MSY}. $F_{30\%SPR}$ is used as the F_{MSY} proxy for all stocks.	$F_{30\%SPR}$[1]= 0.148[2]	2,431,000[3]
Alternative 2 (preferred)	MSY proxy equals the yield produced by F_{MSY} or the F_{MSY} proxy. MSY and F_{MSY} are defined by the most recent SEDAR/SSC.[4]	$F_{40\%SPR}$= 0.104[2]	2,304,000[5]

[1]Prior to SEDAR 15 (2008), Potts et al. (2001) estimated $F_{30\%SPR}$= 0.40.
[2]Source: Red Snapper Projections V dated March 19, 2009
[3]The value for MSY was not specified in Amendment 11. Based on SEDAR 15 (2008) $F_{30\%SPR}$ = 0.148; yield at $F_{30\%SPR}$ = 2,431,000 lbs whole weight (Table 4.1 from Red Snapper Projections V dated March 19, 2009).
[4]The Review Panel from SEDAR and the SSC recommended a proxy of $F_{40\%SPR}$ for F_{MSY}.
[5]The values for MSY and $F_{40\% SPR}$ are defined by Red Snapper Projections V dated March 19, 2009. The range is MSY from sensitivity runs is 559,000 lbs whole weight to 3,927,000 lbs whole weight.

4.1.1 Biological Effects

MSY is a reference point used by managers to assess fishery performance over the long term. As a result, redefined management reference points could require regulatory changes in the future as managers monitor the long term performance of the stock with respect to the new reference point. Therefore, these parameter definitions would affect subject stocks and the ecosystem of which they are a part, by influencing decisions about how to maximize and optimize the long-term yield of fisheries under equilibrium conditions and triggering action when stock biomass decreases below a threshold level. Specifying MSY will not directly affect the protected species, because these parameters are not used in determining immediate harvest objectives. The biological effects of the choice of management reference points are described below.

MSY in **Alternative 1 (Status Quo)** is defined as the yield produced by F_{MSY} where $F_{30\%SPR}$ is used as the F_{MSY} proxy and represents the overfishing level defined in Amendment 11. In **Alternative 1 (Status Quo)**, MSY was not specified in the SFA Amendment 11; however, Table 4.1 from Red Snapper Projections V dated March 19, 2009 provides an estimate of the yield equal to $F_{30\%SPR}$ proxy as 2,431,000 lbs whole weight based on SEDAR 15 (2008). **Alternative 2 (Preferred)** would redefine the MSY proxy of the red snapper stock based on the recommendation of the SEDAR 15 Review Panels and SSC to equal the value associated with the $F_{40\%SPR}$ (2,304,000 lbs whole weight). Therefore, MSY associated with the status quo **Alternative 1 (Status Quo)** is 127,000 lbs whole weight greater than the yield associated with $F_{40\%SPR}$ proxy for F_{MSY} specified in **Alternative 2 (Preferred)**. Using the $F_{40\%SPR}$ proxy for F_{MSY}, MSY ranges from 559,000 lbs whole weight to 3,927,000 lbs whole weight suggesting MSY cannot be reliably estimated.

Table 4-2. Criteria used to determine the overfished and overfishing status of red snapper.

Quantity	Units	$F_{40\%}$ Proxy	$F_{30\%}$ Proxy	Status
F_{MSY}	y−1	0.104	0.148	–
SSB_{MSY}	1000 lb	17,863	13,283	–
D_{MSY}	1000 fish	39	54	–
Recruits at F_{MSY}	1000 fish	693	686	–
Y at 65% F_{MSY}	1000 lb	1984	2257	–
Y at 75% F_{MSY}	1000 lb	2104	2338	–
Y at 85% F_{MSY} Y	1000 lb	2199	2391	–
Y at F_{MSY}	1000 lb	2304	2431	–
MSST	1000 lb	16,470	12,247	–
F_{2006}/ F_{MSY}	–	7.67	5.39	Overfishing
SSB_{2006}/SSB_{MSY}	–	0.02	0.03	–
SSB_{2006}/MSST	–	0.03	0.04	Overfished

Source: Table 4.1 in Red Snapper Projections V dated March 19, 2009.

The Council's SSC discussed whether $F_{30\%SPR}$ or $F_{40\%SPR}$ should be used as a proxy for F_{MSY} at their December 2008 meeting. The SSC's rationale for this discussion was based on the review workshop for red snapper where the review panel, consisting of individuals from Center for Independent Experts (CIE), stated *"One of the principal difficulties with the SCA model estimate* *of the stock recruitment parameters is that the steepness estimate appears unrealistically high. In addition, there are no data in the assessment to adequately define the asymptote of the Beverton-Holt function and hence estimates of MSY indicators cannot be considered reliable. It may be preferable, as indicated above, to use the ratio indicators to evaluate stock status or use SPR proxies. The panel suggested that $F_{40\%}$ and $SSB_{40\%}$ proxies may be used as limit indicators"* (SEDAR 15 2008)." Due to the review panel's concern regarding the high steepness = 0.95 in the base run, the assessment group considered using $F_{40\%SPR}$ as a proxy for F_{MSY}, which has an associated steepness equal to 0.68.

However, since the lower steepness value associated with a $F_{40\%SPR}$ proxy differed for F_{MSY} from the base assessment steepness value of 0.95, there was an abrupt change in recruitment estimates between assessment years in the model and recruitment estimates for the projection years. Several alternatives to handle this inconsistency in projections were provided to the SSC by the assessment group at the December 2008 SSC meeting. These included changing all steepness values in the assessment and projections to 0.68, leaving them both at 0.95, and a hybrid where 0.95 was used for the assessment and 0.68 was used for projections. The SSC chose to keep the estimate of steepness consistent between the model and the projections. The SSC discussed two options for the %SPR proxy for F_{MSY}. Some SSC members argued for following the suggestion from the CIE reviewers (using $F_{40\%SPR}$) and cited literature and examples that showed that $F_{40\%SPR}$ is a more appropriate proxy for F_{MSY}. Other SSC members stated $F_{30\%SPR}$ should be considered because it was approved by the Council for other species (approved by the Council in the Comprehensive SFA Amendment 11) and that its corresponding steepness value is approximately 0.90, which was close to the estimated valued in the base estimation model. In December 2008, the SSC made a motion, which was approved, recommending that the proxy for F_{MSY} be $F_{40\%SPR}$ with an associated steepness of 0.95. In the full Council also voted to use $F_{40\%SPR}$ as the F_{MSY} proxy. The assessment team provided the updated base model (steepness =0.95 in assessment and projections) to produce new projections, MSY estimates, and OY estimates.

Alternative 2 (Preferred) is based on the SSC's recommendation and would specify an MSY proxy equal the yield at $F_{40\%SPR}$ with a steepness of 0.95. MSY for other species assessed through the SEDAR process has been based on the yield at F_{MSY} or the Council's status quo proxy for F_{MSY} ($F_{30\%SPR}$). Therefore, **Alternative 2 (Preferred)** would establish a new proxy for F_{MSY} not previously used, which is more conservative than the status quo proxy of $F_{30\%SPR}$. Furthermore, Amendment 17A is using a tiered approach where OY, rebuilding projections, and management measures are based on decisions made for determining the MSY reference point. The choice of **Alternative 2 (Preferred)**, which uses $F_{40\%SPR}$ as a proxy for F_{MSY} versus $F_{30\%SPR}$ as proxy for F_{MSY} depends on how much risk the Council is willing to take. Rebuilding projections associated with **MSY Alternative 1 (Status Quo)** would indicate the stock could rebuild more quickly and with less restrictive management measures than those associated with **Alternative 2 (Preferred)**. If $F_{30\%SPR}$ is not a proper proxy for F_{MSY}, the Council could have to take corrective actions down the road to rebuild the stock to B_{MSY} within the allowable timeframe. **Preferred Alternative 2**, which uses $F_{40\%SPR}$ as a proxy for F_{MSY} is more conservative and provides greater assurance overfishing would be ended and the stock would rebuild within the specified time. Therefore, the biological benefits of **Alternative 2**

(Preferred) for the red snapper stock would be greater than **Alternative 1 (Status Quo)** because **Alternative 2 (Preferred)** would allow for less harvest and there would be a greater probability overfishing would end and the stock would be rebuilt to SSB_{MSY}. However, as explained in **Sections 4.1.1.2** and **4.1.1.3**, a choice of a F_{MSY} proxy that is too conservative could have unnecessary negative social and economic effects.

4.1.2 Economic Effects

Defining MSY would mainly condition the type of management measures to be implemented over time to achieve the rebuilding objectives within a certain timeframe. These management measures, not the chosen MSY, would have direct economic effects on fishing participants. In principle, more (less) stringent measures would logically be required under an MSY alternative that is more (less) conservative from a biological standpoint. As with any fishing regulations, the economic issue involves the balancing of short-term costs and long-term benefits. The economically preferable MSY choice would be one that is expected to result in the highest net economic benefits over time. This choice condition can only be rendered feasible if both MSY and accompanying regulatory measures are simultaneously considered. At this stage, only the MSY choice is considered, and thus only general discussions of issues can be made.

Both MSY definitions would provide for potential red snapper landings way over commercial and recreational landings in the last few years[8]. In 2003-2007, the average combined commercial and recreational landings were approximately 440 thousand pounds. In contrast, MSY would be 2.431 million pounds under **Alternative 1 (Status Quo)** and 2.204 million pounds under **Alternative 2 Preferred**. This wide gap between current landings and potential landings has at least two implications. First, both MSY definitions would require more stringent management measures to rebuild the red snapper stock. Second, there appears a relatively high likelihood that future benefits from the fishery would outweigh the costs of implementing stringent management measures. Although both MSY definitions imply about similar cost/benefit configurations, one alternative can be distinguished from the other on the basis of the associated risk of overfishing the red snapper stock.

Alternative 1 (Status Quo) would allow for relatively more harvest over time and therefore is accompanied by a greater probability of overfishing. It may therefore be characterized with greater short-term economic benefits and less long-term economic benefits than **Alternative 2 (Preferred)**. It likely that **Alternative 2 (Preferred)** would offer a higher net economic benefit over time.

Non-use values, like existence and bequest values, increase with increasing long-term economic benefits. Therefore, **Alternative 2 (Prefered)** would offer a higher level of non-use value.

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[8] Although Optimum Yield, which is lower than MSY, is the appropriate value as a measure of potential harvests, the use of MSY at this point would not invalidate the points raised here.

4.1.3 Social Effects

General Concepts

Defining the MSY for a species or species complex would not be expected to cause direct social impacts because it would not place specific controls on the amount or manner in which the resources are harvested. This parameter simply provides a management target and threshold needed to assess the status and performance of the fishery. All current direct, indirect, consumptive, and non-consumptive uses of the resources will be unaffected. Subsequent evaluation of the resource relative to the benchmark, however, may trigger harvest and/or effort controls, which would be expected to directly impact the individuals, social networks, and associated industries related to the fishery, inducing short-term adverse economic impacts until less restrictive management is implemented.

Designation of this benchmark, therefore, establishes the foundation for subsequent regulatory change. Regulatory change may cause some of the following direct and indirect consequences: increased crew and dockside worker turnover; displacement of social or ethnic groups; increased time at sea (potentially leading to increased risk to the safety of life and boat); decreased access to recreational activities; demographic population shifts (such as the entrance of migrant populations replacing or filling a market niche); displacement and relocation as a result of loss of income and the ability to afford to live in coastal communities; increased efforts from outside the fishery to affect fishing related activities; changes in household income source; business failure; declining health and social welfare; and increased gentrification of coastal communities as fishery participants are unable to generate sufficient revenue to remain in the community. Ultimately, one of the most important measurements of social change is how these social forces, in coordination with the strategies developed and employed by local fishermen to adapt to the regulatory changes, combine to affect the local fishery, fishing activities and methods, and the community as a whole.

A major indirect effect of fisheries management on the fishing community and related sectors is increased confusion and differences between the community and the management sector in levels of understanding and agreement on what is best for both the resource and the community. The fact that "the science" can cause relatively large reductions in harvests is particularly disconcerting to many fishermen and concerned stakeholders. This can induce enforcement problems and compliance with current and future regulations, which can lead to inefficient use of resources, ineffectual regulations, and failure to meet management targets, which may precipitate additional restrictions.

Data deficiencies and the complexity of the task make it difficult to determine biological reference points with certainty. The selection of a particular benchmark has potential implications on resource users depending upon its accuracy relative to the true value. Selection of an unnecessarily conservative alternative, while protecting the resource, may subject the human environment to overly restrictive regulations, foregone social and economic benefits, and increasing the risk to the economic viability of participants in the fishery and associated industries. Alternatively, the erroneous choice of an insufficiently conservative alternative could result in short term increased economic benefits to fishery participants, but lead to reduced stock sustainability, ultimately leading to more severe social and economic disruptions than would occur under more conservative management. In general, however, assuming the "correct" level of conservatism is selected (i.e., is appropriate to the biological and environmental parameters of the resource, including the nature of the fishery that harvests the resource), the higher the MSY, the greater the allowable, long-term sustainable yield for the fishery and, hence, the greater the long-term social benefits of a sustainable and healthy resource.

Comparison of Fishery with Management Reference Point Alternatives

The average annual harvests (all sectors) of red snapper from 2003-2007 were approximately 442,000 pounds (whole weight). Both of the alternative MSY specifications are more than five times the recent average annual harvest. Because both of the alternative MSY specifications exceed average annual harvests, neither specification would imply or necessitate harvest reductions and, as a result, no adverse social impacts would be expected to occur as a result of the selection of either alternative for this action based solely on a comparison of current harvest with the MSY. All status quo harvest and use activities could continue unchanged based solely on this perspective of analysis, which would presume the resource is in a rebuilt equilibrium status. It is noted, however, based on evaluations of the resource relative to MSST and MFMT (see Table 4.2), that red snapper has been determined to be overfished and undergoing overfishing and, as a result, the necessary management measures to address this condition are expected to result in the closure of the red snapper fishery (see **Sections 4.2.2** and **4.3**). The expected social effects of the closure of the fishery and appropriate alternatives are discussed in those sections. However, it should be emphasized that none of these effects are attributable to the specification of MSY. Although **Alternative 2 (Preferred)** would establish a larger recovered resource equilibrium MSY, recorded harvests have never approached either level and the difference in values is less than 130,000 pounds. As a result, little to no differential social effects would be expected under either alternative from this perspective.

It should be noted, however, that while little to no differential social effects would be expected from the perspective of comparing the resultant equilibrium MSYs of the respective alternatives, the underlying rule or equation that determines the resultant MSY for each is materially different and would be expected to result in differential social effects. As discussed in **Section 4.1.1**, rebuilding projections associated with **Alternative 1 (Status Quo)** would indicate the stock could rebuild more quickly and with less restrictive management measures than those associated with **Alternative 2 (Preferred)**. Less restrictive management measures and quicker recovery, if possible, would be expected to result in greater short-term and long-term social benefits. However, selection of the correct rule/equation is a biological consideration and the expected benefits of **Alternative 1 (Status Quo)** relative to **Alternative 2 (Preferred)** would not be expected to be realized if the rule/equation in **Alternative 1 (Status Quo)** is inappropriate for the resource.

4.1.4 Administrative Effects

The potential administrative effects of these alternatives differ in that the scenarios defined by each vary in terms of the implied restrictions required to constrain the fisheries to the respective benchmarks.

4.1.5 Council's Conclusions

The Council has specified the Minimum Stock Size Threshold (MSST) as the biomass using the formula MSST = (1-M)*SSB_{MSY}. This formula is recommended in the Technical Guidance Document developed by NMFS and represents 1 minus the natural mortality multiplied by the spawning stock biomass at maximum sustainable yield. The value from Red Snapper Projections V dated March 19, 2009 is 16,469,633 lbs whole weight (7470.5 mt).

4.2 Red Snapper Rebuilding Plan

4.2.1 Rebuilding Schedule

Alternative 1 (Status Quo). There currently is not a rebuilding plan for red snapper. Snapper Grouper Amendment 4 (regulations effective January 1992) implemented a 15-year rebuilding plan beginning in 1991 which expired in 2006.

Alternative 2. Define a rebuilding schedule as the shortest possible period to rebuild in the absence of fishing mortality (T_{MIN}). This would equal 15 years with the rebuilding time period ending in 2024, 2010 is Year 1.

Alternative 3. Define a rebuilding schedule as the mid-point between shortest possible and maximum recommended period to rebuild. This would equal 25 years with the rebuilding time period ending in 2034, 2010 is Year 1.

Alternative 4 (Preferred). Define a rebuilding schedule as the maximum recommended period to rebuild if T_{MIN} > 10 years. The maximum recommended period equals T_{MIN} + one generation time. This would equal 35 years (SEDAR 15 2008 was the source of the generation time) with the rebuilding time period ending 2044. 2010 is Year 1.

4.2.1.1 Biological Effects

Choice of a rebuilding schedule has a direct effect on the biological, ecological, and physical environment by determining the length of time over which rebuilding efforts can be extended. Shorter schedules generally require overfished stocks be provided a greater amount of (and more immediate) relief from fishing pressure. Conversely, longer schedules generally allow overfished stocks to be harvested at higher rates of fishing mortality as they rebuild. Extending the rebuilding period beyond the shortest possible timeframe increases the risk that environmental or other factors could prevent the stocks from recovering. As a result, the biological/ecological benefits of a shorter schedule are generally greater than those of the intermediate schedule and the benefits of the intermediate schedule are generally greater than those of the maximum recommended schedule. However, the overall effects of all the action alternatives are expected to be beneficial because each defines a plan for rebuilding the overfished stock. Regardless of the approach chosen (shorter versus longer schedules), specifying a re-building schedule for red snapper will have no immediate affect on protected species because these parameters are not used in determining immediate harvest objectives.

Alternative 1 (Status Quo) would not establish a rebuilding schedule for red snapper. The most recent stock assessment indicates red snapper are overfished and undergoing overfishing. Therefore, a rebuilding schedule is a necessary component of the rebuilding plan. Without such a schedule it is unlikely the stock would recover within a predictable amount of time that would ultimately rebuild the stock to a sustainable level. Therefore, this alternative would not meet the objective of achieving SSB_{MSY} within the terms allowed by the Magnuson-Stevens Act. This alternative would also maintain the existing levels of risk to ESA-listed species.

Alternatives 2-4 (Preferred) would establish schedules that would achieve rebuilding within time periods allowed by the MSA, and therefore, **Alternatives 2-4 (Preferred)** would be expected to benefit the ecological environment by restoring a crucial link within the trophic structure of the ecosystem. Results of SEDAR 15 (2007) determined that in the absence of any fishing mortality, the fishery could rebuild to SSB_{MSY} in 15 years (T_{MIN}) **(Alternative 2).** In addition, SEDAR 15 (2007) estimated the mean generation time for red snapper as 20 years (Red Snapper Projections V, March 19, 2009). Therefore, the longest allowable time, (T_{MIN} + one generation time), to rebuild would be 35 years **(Alternative 4 (Preferred)). Alternative 3** represents a midpoint between **Alternatives 2** and **4 (Preferred).** Theoretically, **Alternative 2** would rebuild the stock to SSB_{MSY} more quickly than other alternatives because it would require managers to impose the strictest harvest controls. Shorter rebuilding schedules generally provide the greatest biological benefit by allowing biomass, the age and size structure, sex ratio, and community structure to be restored to healthy levels at the fastest possible rate. However, red snapper is part of a multispecies fishery. Even if retention of red snapper is prohibited, red snapper would still be caught since they have temporal and spatial coincidence with other species fishermen target.

If no harvest of red snapper was allowed, as specified in **Alternative 2**, it is still expected that red snapper would be caught and released by commercial and recreational fishermen. As release mortality is estimated to be 40% and 90% for the recreational and commercial sectors, respectively (SEDAR 15 2008), the schedule specified in **Alternative 2** is not considered to be realistic since it would require a prohibition on all harvest of snapper-grouper species to ensure there was no incidental catch, which would unnecessarily incur greater negative socioeconomic impacts compared to **Alternative 4 (Preferred)**. **Alternative 2** would not be expected to rebuild the stock to B_{MSY} because it is not possible to eliminate incidental mortality on one species in a multi-species complex, without prohibiting fishermen from targeting all associated species wherever the prohibited species occurs. Similarly, due to bycatch mortality, the schedule specified in **Alternative 3** also is not realistic and would not likely allow red snapper to rebuild to B_{MSY} by the end of the rebuilding schedule unless greater restrictions were placed on other species that co-occur with red snapper than are being proposed in this amendment. The Council is considering substantial measures to reduce fishing mortality in this amendment including area closures for all snapper grouper species, which could reduce bycatch of red snapper and co-occurring species.

Consequently, the Council has chosen **Alternative 4** as preferred, which would support little or no harvest of red snapper in the initial years of rebuilding but would allow some incidental catch of red snapper when targeting co-occurring species. In addition, the magnitude of bycatch would be less for **Alternative 4 (Preferred)** than for **Alternatives 2** and **3**, particularly if area closures are implemented for all snapper grouper species.

4.2.1.2 Economic Effects

Like MSY, a rebuilding schedule would condition the type of management measures to be implemented to achieve the rebuilding objectives. The actual management measures implemented during the rebuilding period would have direct economic effects on fishing participants. **Alternative 1 (Status Quo)**, which does not provide a rebuilding schedule, would potentially imply the least restrictive regulations but may be ruled out per MSA requirements.

The major economic issue associated with the choice of a rebuilding schedule relates to the cost/benefit configuration of the various alternatives. This cost/benefit configuration depends on the functional distance between current and target fishery status and the length of the rebuilding schedule. In terms of productive capacity, there exists a wide gap between current and potential production from the fishery, and this gap necessitates the introduction of more stringent measures in order to reach full production capacity. The length of the rebuilding period would determine how stringent should the measures be -- the shorter (longer) the rebuilding period, the more (less) stringent would be the required management measures, but the sooner (later) would the benefits also accrue. Without actual estimates of costs and benefits over time, it cannot be determined whether a shorter rebuilding period would provide larger net economic benefits. However, some general conclusions on costs/benefits can be made based on the respective characteristics of the various rebuilding schedules.

As discussed in the biological effects section, the presence of incidental mortality of red snapper from fishing for other species would render the shorter rebuilding schedules (**Alternatives 2** and **3)** or no rebuilding schedule (**Alternative 1 (Status Quo)**) unrealistic for rebuilding the red snapper stock to B_{msy}. These shorter rebuilding schedules would require regulations more restrictive than the ones considered in this amendment, thereby imposing more costs to the fishing participants in the red snapper and other fisheries. Unless those other fish stocks are also rebuilt as to provide substantially higher future benefits, there is a fairly low level of likelihood that future benefits from a fully recovered red snapper stock would outweigh the short-term costs of more restrictive regulations implied by these shorter rebuilding schedules. While incidental mortality would still occur under **Alternative 4 (Preferred)**, the associated costs of regulations would not be as high as in the other two alternatives. In addition, this alternative would provide a timeframe sufficiently long to rebuild the red snapper stock as well as flexibility in the type of management measures to implement over time. In this sense, **Alternative 4 (Preferred)** may be characterized with a higher likelihood of generating the highest net benefits over time.

Non-use values, like existence and bequest values, would be highest under **Alternative 2** and lowest under **Alternative 1 (Status Quo)**. However, the differences in non-use value between **Alternatives 2, 3,** and **4 (Preferred)** are minimal.

4.2.1.3 Social Effects

Defining a rebuilding schedule is an administrative action and, as such, does not directly affect the social environment because it would not directly alter the current harvest or use of a resource. Direct effects only accrue to actions that alter harvest or other use of the resource. All entities could continue normal and customary behaviors until such time as harvest restrictions are imposed. Participation rates and harvest levels could continue unchanged. Since there would be no direct effect on resource harvest or use, there would be no direct effects on fishery participants, associated industries, or communities.

Defining a rebuilding schedule, however, may result in indirect effects. Restrictive management measures could be necessary to rebuild a resource, and direct effects accrue to these measures. Further, defining the rebuilding schedule determines the length of time over which rebuilding efforts can be extended and affects the severity of the measures, and associated social and economic effects, implemented during the recovery period. Generally, the shorter the rebuilding schedule, the more severe the necessary harvest restrictions. The more severe the harvest restrictions, the greater the short term adverse effects associated with business failure, job or living dislocations, and overall adjustments for the social environment. Commercial and recreational fishermen may be able to adjust to the restrictions by switching to other species or by leaving fishing and seeking other employment or recreational pursuits, thereby mitigating any potential adverse social impacts. If other species are also depleted, regulations may prevent switching to another fishery, or if other forms of employment or recreational activities are unavailable or difficult to find, then mitigation opportunities are reduced and net adverse social impacts are potentially more severe.

With respect to individual user groups, depending on the value of the resource and the yield stream of benefits realized upon recovery, particularly severe restrictions may result in losses to current users that cannot be recovered in the long term, or can be recovered, but are realized by different users, particularly if current users choose or are economically forced to exit the fishery due the measures implemented to achieve any required harvest reductions. The social effects of the alternative red snapper rebuilding strategies and management measures are included in **Sections 4.2.2.3** and **4.2.3.3**, respectively.

Because the red snapper resource has been declared overfished, a rebuilding schedule is required. Therefore, **Alternative 1 (Status Quo),** which would not establish a rebuilding schedule, is not a valid alternative and its selection would require subsequent additional management action to adopt a legally compliant rebuilding schedule. Since this subsequent action would merely accomplish what the Council has the opportunity to accomplish with the current action, adoption of **Alternative 1 (Status Quo)** would likely result in a public conclusion that management is not responsibly fulfilling its duties.

Although **Alternatives 2-4** specify rebuilding schedules of different length, the red snapper fishery will have to be closed for the duration of rebuilding, unless conditions change, under each alternative. While faster recovery conceptually allows faster receipt of the benefits of a recovered resource, because the directed fishery will have to be closed for the duration of even the longest rebuilding schedule, **Alternative 4 (Preferred)**, it is unlikely that the resource could recover under either the shortest schedule, **Alternative 2**, or the intermediate schedule, **Alternative 3**, without additional restrictions on other fisheries, with greater associated adverse social and economic consequences due to the relatively minor significance of the red snapper fishery for the South Atlantic as a whole compared to other snapper grouper fisheries, than those expected to be required in tandem with **Alternative 4 (Preferred)** in order to sufficiently reduce the red snapper mortality associated with bycatch in these other fisheries. As a result, any social gains associated with faster recovery would likely be negated by the losses associated with harsher restrictions on other fisheries. **Alternative 4 (Preferred)** would allow the longest possible rebuilding timeframe and, therefore, be expected to allow the greatest flexibility to both allow for red snapper recovery and minimize the adverse social and economic effects on associated fisheries.

4.2.1.4 Administrative Effects

Under **Alternative 1 (Status Quo)**, no rebuilding timeframe would be established for red snapper. The Magnuson-Stevens Act requires that a rebuilding plan be established for any species that is declared overfished. Part of a rebuilding plan is the timeframe within which the stock would be rebuilt. Therefore, if no rebuilding timeframe was implemented, the rebuilding plan could not be considered complete and the agency would not meet the Magnuson-Stevens Act requirement. The rebuilding timeframe alternatives themselves would not affect the administrative environment regardless of the length of time specified in each alternative. **Alternatives 2-4 (Preferred)** would incur an equal, yet minimal administrative burden in the form of notifying the public of which rebuilding schedule was chosen by the Council.

4.2.1.5 Council's Conclusions

4.2.2 Rebuilding Strategy and Optimum Yield

*Note: Rebuilding strategies are based on $F_{40\%SPR}$. Rebuilding strategies provided by the SEFSC for both $F_{40\%SPR}$ and $F_{40\%SPR}$ proxies for F_{MSY}, which incorporate high recruitment that has occurred recently, are included in Appendix X. All alternatives are based upon a **very high recruitment** scenario referenced in the most recent SEFSC projections. Need to request new projections from Science Center for these alternatives. Time to reaching B_{MSY} is estimated from the base run.*

Alternative 1 (Status Quo). Do not define a yield-based rebuilding strategy for red snapper. $F_{OY} = F_{45\%SPR}$. The value for OY at equilibrium is 2,169,000 lbs whole weight.

Alternative 2. Define a rebuilding strategy for red snapper that sets fishing mortality at F_{MSY} ($F_{40\%}$) in year 1. The ACL for 2010 would be 89,000 lbs whole weight. The ACL specified for 2010 would remain in effect beyond 2010 until modified. Under this strategy, the fishery would have a 44% chance of rebuilding to SSB_{MSY} within the allowable 35 year timeframe (Table 4-4). Since this alternatives specifies the fishing mortality rate that produces MSY, OY at equilibrium would not be specified. The Council will review ACL and management measures following the next scheduled assessment for red snapper.

Establish three AMs:

(1) Track catch per unit effort (CPUE) of red snapper via a fishery-independent monitoring program (see Section 4.12) to track changes in biomass.
(2) Track the biomass and CPUE through the research set-aside that would involve data collection by headboat and charterboat operators.
(3)The Council would evaluate the size of the area closures when the discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action being developed in Amendment 17B.

Some members of the IPT expressed concern that the AMs listed above are not true AMs.

Alternative 3. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 85% F_{MSY} (85%$F_{40\%}$). The ACL for 2010 would be 69,000 lbs whole weight. The ACL specified for 2010 would remain in effect beyond 2010 until modified. The Council will review ACL and management measures following the next scheduled assessment for red snapper. OY at equilibrium would be 2,199,000 lb ww. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2035 and 69% chance of rebuilding to SSB_{MSY} by 2044 (Table 4-5).

Establish three AMs:

(1) Track CPUE of red snapper via a fishery-independent monitoring program (see Section 4.12) to track changes in biomass.
(2) Track the biomass and CPUE through the research set-aside that would involve data collection by headboat and charterboat operators.
(4) (3) The Council would evaluate the size of the area closures when the discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action being developed in Amendment 17B.

Alternative 4 (Preferred). Define a rebuilding strategy for red snapper that sets F_{OY} equal to 75% F_{MSY} (75%$F_{40\%}$). The ACL for 2010 would be 79,000 lbs whole weight. The ACL specified for 2010 would remain in effect beyond 2010 until modified. The Council will review ACL and management measures following the next scheduled assessment for red snapper. OY at equilibrium would be 2,104,000 lb ww. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2032 and an 84% chance of rebuilding to SSB_{MSY} by 2044 (Table 4-6).

Establish three AMs:

(1) Track CPUE of red snapper via a fishery-independent monitoring program (see Section 4.12) to track changes in biomass.
(2) Track the biomass and CPUE through the research set-aside that would involve data collection by headboat and charterboat operators.
(5) (3) The Council would evaluate the size of the area closures when the discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action being developed in Amendment 17B.

Alternative 5. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 65%F_{MSY} (65%$F_{40\%}$). The ACL for 2010 would be 70,000 lbs whole weight. The ACL specified for 2010 would remain in effect beyond 2010 until modified. The Council will review ACL and management measures following the next scheduled assessment for red snapper. OY at equilibrium would be 1,984,000 lbs ww. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2030, and a 94% chance of rebuilding to SSB_{MSY} by 2044 (Table 4-7).

Establish three AMs:

(1) Track CPUE of red snapper via a fishery-independent monitoring program (see Section 4.12) to track changes in biomass.
(2) Track the biomass and CPUE through the research set-aside that would involve data collection by headboat and charterboat operators.
(6) (3) The Council would evaluate the size of the area closures when the discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action being developed in Amendment 17B.

Alternative 6. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 96% F_{MSY} (96%$F_{40\%}$) and rebuilds in 35 years. The ACL for 2010 would be 101,000 lbs whole weight. The ACL specified for 2010 would remain in effect beyond 2010 until modified. The Council will review ACL and management measures following the next scheduled assessment for red snapper. OY at equilibrium would be xxxxxx lbs ww. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2044 (Table 4-8).
Establish three AMs:

(1) Track CPUE of red snapper via a fishery-independent monitoring program (see Section 4.12) to track changes in biomass.
(2) Track the biomass and CPUE through the research set-aside that would involve data collection by headboat and charterboat operators.
(7) (3) The Council would evaluate the size of the area closures when the discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action being developed in Amendment 17B.

Alternative 7. Define a rebuilding strategy for red snapper that sets the ACL at 0 (directed landings only). The AM would be to track catch per unit effort (CPUE) of red snapper via a fishery-independent monitoring program (see Section 4.12) to track changes in biomass. CPUE would be evaluated every three years and adjustments would be made by the framework action being developed in Amendment 17B.

Sub-alternative 7a. Rebuilding strategy based on F_{MSY}.
Sub-alternative 7b. Rebuilding strategy based on 85% F_{MSY}.
Sub-alternative 7c. Rebuilding strategy based on 75% F_{MSY}.
Sub-alternative 7d. Rebuilding strategy based on 65% F_{MSY}.
Sub-alternative 7e. Rebuilding strategy based on 96% F_{MSY}.

Table 4-3. Reduction in total removals (landings plus dead discards) needed end overfishing. Non-shaded areas determined by comparing estimated landings in 2009 with allowable removals in 2010. Shaded areas are estimated by interpolation. Council's preferred choice is to use High recruitment with F40%SPR proxy for F_{MSY}. *New projections with high recruitment and F40% proxy have been requested from Science Center.*

F_{MSY} proxy	F40% proxy				F30% proxy			
Recruitment	Base Estimated	High	Very High	Extremely High	Base Estimated	High	Very High	Extremely High
Alternative 2 (F_{MSY})	85%	86%	83%	81%	80%	80%	78%	76%
Alternative 3 (85% F_{MSY})	88%	88%	86%	83%	83%	83%	81%	79%
Alternative 4 (75% F_{MSY})	89%	89%	87%	85%	85%	85%	83%	81%
Alternative 5 (65% F_{MSY})	90%	90%	88%	86%	87%	87%	85%	82%
Alternative 6 ($F_{rebuild}$)	86%	86%	84%	82%	80%	80%	78%	76%

Table 4-4. Red snapper projections under a fishing mortality at FMSY (F40%). F = fishing mortality rate (per year), LD = landings or new dead discards, DD = dead discards* (Alternative 2; Sub-Alternative 7a).

				Total Kill.	Probability	
Year	F	LD (1000lb)	DD (1000lb)	LD+DD (1000 lb)	Recovery	Comments
2007	0.930	454	153	607	0	
2008	1.220	553	190	743	0	
2009	0.974	407	157	564	0	
2010	0.104	59	23	82	0	overfishing prevented if total kill<82,000 lb
2011	0.104	102	29	131	0	overfishing prevented if total kill<131,000 lb
2012	0.104	160	32	192	0	overfishing prevented if total kill<192,000 lb
2013	0.104	230	40	270	0	overfishing prevented if total kill<270,000 lb
2014	0.104	315	50	365	0	overfishing prevented if total kill<365,000 lb
2015	0.104	417	56	473	0	overfishing prevented if total kill<473,000 lb
2016	0.104	532	60	592	0	overfishing prevented if total kill<592,000 lb
2017	0.104	655	63	718	0	overfishing prevented if total kill<718,000 lb
2018	0.104	781	66	847	0	overfishing prevented if total kill<847,000 lb
2019	0.104	908	67	975	0	overfishing prevented if total kill<975,000 lb
2020	0.104	1033	68	1101	0	overfishing prevented if total kill<1,101,000 lb
2021	0.104	1152	69	1221	0	overfishing prevented if total kill<1,221,000 lb
2022	0.104	1265	70	1335	0	overfishing prevented if total kill<1,335,000 lb
2023	0.104	1370	70	1440	0.01	overfishing prevented if total kill<1,440,000 lb
2024	0.104	1468	71	1539	0.02	overfishing prevented if total kill<1,539,000 lb
2025	0.104	1557	71	1628	0.03	overfishing prevented if total kill<1,628,000 lb
2026	0.104	1639	71	1710	0.05	overfishing prevented if total kill<1,710,000 lb
2027	0.104	1713	72	1785	0.07	overfishing prevented if total kill<1,785,000 lb
2028	0.104	1780	72	1852	0.09	overfishing prevented if total kill<1,852,000 lb
2029	0.104	1839	72	1911	0.11	overfishing prevented if total kill<1,911,000 lb
2030	0.104	1893	72	1965	0.14	overfishing prevented if total kill<1,965,000 lb
2031	0.104	1941	72	2013	0.17	overfishing prevented if total kill<2,013,000 lb
2032	0.104	1983	72	2055	0.19	overfishing prevented if total kill<2,055,000 lb
2033	0.104	2021	72	2093	0.21	overfishing prevented if total kill<2,093,000 lb
2034	0.104	2054	72	2126	0.24	overfishing prevented if total kill<2,126,000 lb
2035	0.104	2084	72	2156	0.27	overfishing prevented if total kill<2,156,000 lb
2036	0.104	2110	72	2182	0.3	overfishing prevented if total kill<2,182,000 lb
2037	0.104	2133	72	2205	0.32	overfishing prevented if total kill<2,205,000 lb
						SSB=7506 mt; stock not overfished
2038	0.104	2154	73	2227	0.33	overfishing prevented if total kill<2,055,000 lb
2039	0.104	2172	73	2245	0.35	overfishing prevented if total kill<2,093,000 lb
2040	0.104	2187	73	2260	0.37	overfishing prevented if total kill<2,126,000 lb
2041	0.104	2201	73	2274	0.4	overfishing prevented if total kill<2,156,000 lb
2042	0.104	2214	73	2287	0.42	overfishing prevented if total kill<2,182,000 lb
2034	0.104	2224	73	2297	0.43	overfishing prevented if total kill<2,205,000 lb
2044	0.104	2234	73	2307	0.44	overfishing prevented if total kill<2,055,000 lb
Landings in 2007 & 2008						
Year	Total Com	Headboat	MRFSS	Total Rec	Total C+R	
2007	116,934	38,448	302,156	340,604	457,538	
2008	233,267	115,308	696,755	812,063	1,045,330	

*LD represents either landed catch or red snapper > 20 inches TL that would be discarded if all red snapper harvest was prohibited. DD represents dead discards for red snapper < 20 inches TL. FMSY=F40%=0.104; MSST=7471mt; SSBMSY=8103mt; Y@75%FMSY=2,104,000 lb; Y@FMSY=2,304,000 lb.

Table 4-5. Red snapper projections under a fishing mortality rate of 85% FMSY (85%F40%). F = fishing mortality rate (per year), LD = landings or new dead discards, DD = dead discards* (Alternative 3; Sub-Alternative 7b).

				Total Kill	Probability	
Year	F	LD (1000 lb)	DD (1000 lb)	LD+DD (1000 lb)	Recovery	Comments
2007	0.930	454	153	607	0	
2008	1.220	553	190	743	0	
2009	0.974	407	157	564	0	
2010	0.088	50	19	69	0	overfishing prevented if total kill<82,000 lb
2011	0.088	88	25	113	0	overfishing prevented if total kill<131,000 lb
2012	0.088	139	28	167	0	overfishing prevented if total kill<192,000 lb
2013	0.088	201	35	236	0	overfishing prevented if total kill<270,000 lb
2014	0.088	277	43	320	0	overfishing prevented if total kill<365,000 lb
2015	0.088	369	48	417	0	overfishing prevented if total kill<473,000 lb
2016	0.088	474	52	526	0	overfishing prevented if total kill<592,000 lb
2017	0.088	586	55	641	0	overfishing prevented if total kill<718,000 lb
2018	0.088	702	57	759	0	overfishing prevented if total kill<847,000 lb
2019	0.088	819	58	877	0	overfishing prevented if total kill<975,000 lb
2020	0.088	934	59	993	0	overfishing prevented if total kill<1,101,000 lb
2021	0.088	1046	60	1106	0	overfishing prevented if total kill<1,221,000 lb
2022	0.088	1152	60	1212	0.01	overfishing prevented if total kill<1,335,000 lb
2023	0.088	1252	61	1313	0.02	overfishing prevented if total kill<1,440,000 lb
2024	0.088	1345	61	1406	0.04	overfishing prevented if total kill<1,539,000 lb
2025	0.088	1431	61	1492	0.07	overfishing prevented if total kill<1,628,000 lb
2026	0.088	1511	62	1573	0.09	overfishing prevented if total kill<1,710,000 lb
2027	0.088	1583	62	1645	0.13	overfishing prevented if total kill<1,785,000 lb
2028	0.088	1648	62	1710	0.17	overfishing prevented if total kill<1,852,000 lb
2029	0.088	1707	62	1769	0.21	overfishing prevented if total kill<1,911,000 lb
2030	0.088	1761	62	1823	0.27	overfishing prevented if total kill<1,965,000 lb
2031	0.088	1809	62	1871	0.32	overfishing prevented if total kill<2,013,000 lb
						SSB=7486 mt; stock not overfished
2032	0.088	1852	62	1914	0.37	overfishing prevented if total kill<2,055,000 lb
2033	0.088	1890	62	1952	0.41	overfishing prevented if total kill<2,093,000 lb
2034	0.088	1925	62	1987	0.46	overfishing prevented if total kill<2,126,000 lb
2035	0.088	1956	62	2018	0.51	overfishing prevented if total kill<2,156,000 lb
2036	0.088	1983	62	2045	0.53	overfishing prevented if total kill<2,182,000 lb
						SSB=8302 mt; stock rebuild to SSBmsy
2037	0.088	2007	63	2070	0.56	overfishing prevented if total kill<2,055,000 lb
2038	0.088	2029	63	2092	0.59	overfishing prevented if total kill<2,093,000 lb
2039	0.088	2048	63	2111	0.62	overfishing prevented if total kill<2,126,000 lb
2040	0.088	2065	63	2128	0.64	overfishing prevented if total kill<2,156,000 lb
2041	0.088	2080	63	2143	0.66	overfishing prevented if total kill<2,182,000 lb
2042	0.088	2094	63	2157	0.67	overfishing prevented if total kill<2,055,000 lb
2043	0.088	2106	63	2169	0.68	overfishing prevented if total kill<2,093,000 lb
2044	0.088	2116	63	2179	0.69	
Landings in 2007 & 2008						
Year	Total Com	Headboat	MRFSS	Total Rec	Total C+R	
2007	116,934	38,448	302,156	340,604	457,538	
2008	233,267	115,308	696,755	812,063	1,045,330	

*LD represents either landed catch or red snapper > 20 inches TL that would be discarded if all red snapper harvest was prohibited. DD represents dead discards for red snapper < 20 inches TL. FMSY=F40%=0.104; MSST=7471mt; SSBMSY=8103mt; Y@75%FMSY=2,104,000 lb; Y@FMSY=2,304,000 lb.

Table 4-6. Red snapper projections under a fishing mortality rate of 75% FMSY (75%F40%). F = fishing mortality rate (per year), LD = landings or new dead discards, DD = dead discards* (Alternative 4; Sub-Alternative 7c).

				Total Kill	Probability	
Year	F	LD (1000lb)	DD (1000lb)	LD+DD (1000 lb)	Recovery	Comments
2007	0.930	454	153	607	0	
2008	1.220	553	190	743	0	
2009	0.974	407	157	564	0	
2010	0.078	44	17	61	0	overfishing prevented if total kill<82,000 lb
2011	0.078	78	22	100	0	overfishing prevented if total kill<131,000 lb
2012	0.078	124	25	149	0	overfishing prevented if total kill<192,000 lb
2013	0.078	181	31	212	0	overfishing prevented if total kill<270,000 lb
2014	0.078	250	39	289	0	overfishing prevented if total kill<365,000 lb
2015	0.078	335	43	378	0	overfishing prevented if total kill<473,000 lb
2016	0.078	431	46	477	0	overfishing prevented if total kill<592,000 lb
2017	0.078	534	49	583	0	overfishing prevented if total kill<718,000 lb
2018	0.078	642	51	693	0	overfishing prevented if total kill<847,000 lb
2019	0.078	751	52	803	0	overfishing prevented if total kill<975,000 lb
2020	0.078	860	53	913	0	overfishing prevented if total kill<1,101,000 lb
2021	0.078	965	53	1018	0.01	overfishing prevented if total kill<1,221,000 lb
2022	0.078	1065	54	1119	0.02	overfishing prevented if total kill<1,335,000 lb
2023	0.078	1160	54	1214	0.03	overfishing prevented if total kill<1,440,000 lb
2024	0.078	1249	55	1304	0.06	overfishing prevented if total kill<1,539,000 lb
2025	0.078	1331	55	1386	0.1	overfishing prevented if total kill<1,628,000 lb
2026	0.078	1408	55	1463	0.14	overfishing prevented if total kill<1,710,000 lb
2027	0.078	1478	55	1533	0.19	overfishing prevented if total kill<1,785,000 lb
2028	0.078	1541	55	1596	0.25	overfishing prevented if total kill<1,852,000 lb
2029	0.078	1599	55	1654	0.32	overfishing prevented if total kill<1,911,000 lb
						SSB=7499 mt; stock not overfished
2030	0.078	1652	55	1707	0.38	overfishing prevented if total kill<1,965,000 lb
2031	0.078	1699	55	1754	0.44	overfishing prevented if total kill<2,013,000 lb
2032	0.078	1742	56	1798	0.5	overfishing prevented if total kill<2,055,000 lb
						SSB=8302 mt; stock rebuild to SSBmsy
2033	0.078	1780	56	1836	0.56	overfishing prevented if total kill<2,093,000 lb
2034	0.078	1815	56	1871	0.61	overfishing prevented if total kill<2,126,000 lb
2035	0.078	1846	56	1902	0.65	overfishing prevented if total kill<2,156,000 lb
2036	0.078	1874	56	1930	0.69	overfishing prevented if total kill<2,182,000 lb
2037	0.078	1898	56	1954	0.73	overfishing prevented if total kill<2,182,000 lb
2038	0.078	1921	56	1977	0.75	overfishing prevented if total kill<2,182,000 lb
2039	0.078	1940	56	1996	0.78	overfishing prevented if total kill<2,182,000 lb
2040	0.078	1958	56	2014	0.79	overfishing prevented if total kill<2,182,000 lb
2041	0.078	1974	56	2030	0.8	overfishing prevented if total kill<2,182,000 lb
2042	0.078	1988	56	2044	0.82	overfishing prevented if total kill<2,182,000 lb
2043	0.078	2001	56	2057	0.84	overfishing prevented if total kill<2,182,000 lb
2044	0.078	2012	56	2068	0.84	overfishing prevented if total kill<2,182,000 lb
Landings in 2007 & 2008						
Year	Total Com	Headboat	MRFSS	Total Rec	Total C+R	
2007	116,934	38,448	302,156	340,604	457,538	
2008	233,267	115,308	696,755	812,063	1,045,330	

*LD represents either landed catch or red snapper > 20 inches TL that would be discarded if all red snapper harvest was prohibited. DD represents dead discards for red snapper < 20 inches TL. FMSY=F40%=0.104; MSST=7471mt; SSBMSY=8103mt; Y@75%FMSY=2,104,000 lb; Y@FMSY=2,304,000 lb.

Table 4-7. Red snapper projections under a fishing mortality rate of 65% FMSY (65%F40%). F = fishing mortality rate (per year), LD = landings or new dead discards, DD = dead discards* (Alternative 5; Sub-Alternative 7d).

Year	F	LD (1000lb)	DD (1000lb)	Total Kill. = LD+DD (1000 lb)	Probability Recovery	Comments
2007	0.930	454	153	607	0	
2008	1.220	553	190	743	0	
2009	0.974	407	157	564	0	
2010	0.068	39	15	54	0	overfishing prevented if total kill<82,000 lb
2011	0.068	68	19	87	0	overfishing prevented if total kill<131,000 lb
2012	0.068	109	21	130	0	overfishing prevented if total kill<192,000 lb
2013	0.068	160	27	187	0	overfishing prevented if total kill<270,000 lb
2014	0.068	222	34	256	0	overfishing prevented if total kill<365,000 lb
2015	0.068	299	38	337	0	overfishing prevented if total kill<473,000 lb
2016	0.068	385	41	426	0	overfishing prevented if total kill<592,000 lb
2017	0.068	479	43	522	0	overfishing prevented if total kill<718,000 lb
2018	0.068	577	44	621	0	overfishing prevented if total kill<847,000 lb
2019	0.068	677	45	722	0	overfishing prevented if total kill<975,000 lb
2020	0.068	777	46	823	0	overfishing prevented if total kill<1,101,000 lb
2021	0.068	874	47	921	0.01	overfishing prevented if total kill<1,221,000 lb
2022	0.068	967	47	1014	0.02	overfishing prevented if total kill<1,335,000 lb
2023	0.068	1056	47	1103	0.05	overfishing prevented if total kill<1,440,000 lb
2024	0.068	1139	48	1187	0.1	overfishing prevented if total kill<1,539,000 lb
2025	0.068	1217	48	1265	0.14	overfishing prevented if total kill<1,628,000 lb
2026	0.068	1289	48	1337	0.21	overfishing prevented if total kill<1,710,000 lb
2027	0.068	1356	48	1404	0.28	overfishing prevented if total kill<1,785,000 lb
2028	0.068	1417	48	1465	0.37	overfishing prevented if total kill<1,852,000 lb
						SSB=7663 mt; stock not overfished
2029	0.068	1472	48	1520	0.44	overfishing prevented if total kill<1,911,000 lb
2030	0.068	1523	48	1571	0.53	overfishing prevented if total kill<1,965,000 lb
						SSB=8236 mt; stock rebuild to SSBmsy
2031	0.068	1569	49	1618	0.6	overfishing prevented if total kill<1,911,000 lb
2032	0.068	1611	49	1660	0.66	overfishing prevented if total kill<1,965,000 lb
2033	0.068	1649	49	1698	0.72	overfishing prevented if total kill<1,911,000 lb
2034	0.068	1683	49	1732	0.76	overfishing prevented if total kill<1,965,000 lb
2035	0.068	1714	49	1763	0.79	overfishing prevented if total kill<1,911,000 lb
2036	0.068	1741	49	1790	0.83	overfishing prevented if total kill<1,965,000 lb
2037	0.068	1766	49	1815	0.85	overfishing prevented if total kill<1,911,000 lb
2038	0.068	1789	49	1838	0.88	overfishing prevented if total kill<1,965,000 lb
2039	0.068	1809	49	1858	0.9	overfishing prevented if total kill<1,911,000 lb
2040	0.068	1827	49	1876	0.91	overfishing prevented if total kill<1,965,000 lb
2041	0.068	1843	49	1892	0.91	overfishing prevented if total kill<1,911,000 lb
2042	0.068	1858	49	1907	0.92	overfishing prevented if total kill<1,965,000 lb
2043	0.068	1871	49	1920	0.93	overfishing prevented if total kill<1,911,000 lb
2044	0.068	1882	49	1931	0.94	overfishing prevented if total kill<1,965,000 lb
Landings in 2007 & 2008						
Year	Total Com	Headboat	MRFSS	Total Rec	Total C+R	
2007	116,934	38,448	302,156	340,604	457,538	
2008	233,267	115,308	696,755	812,063	1,045,330	

*LD represents either landed catch or red snapper > 20 inches TL that would be discarded if all red snapper harvest was prohibited. DD represents dead discards for red snapper < 20 inches TL. FMSY=F40%=0.104; MSST=7471mt; SSBMSY=8103mt; Y@75%FMSY=2,104,000 lb; Y@FMSY=2,304,000 lb.

Table 4-8. Red snapper projections under a fishing mortality rate of Frebuild = 96% FMSY (96%F40%). F = fishing mortality rate (per year), LD = landings or new dead discards, DD = dead discards* (Alternative 6; Sub-Alternative 7e).

Year	F	LD (1000lb)	DD (1000lb)	Total Kill. = LD+DD (1000 lb)	Probability Recovery	Comments
2007	0.930	454	153	607	0.00	
2008	1.220	553	190	743	0.00	
2009	0.974	407	157	564	0.00	
2010	0.1	56	22	78	0.00	overfishing prevented if total kill<82,000 lb
2011	0.1	98	28	126	0.00	overfishing prevented if total kill<131,000 lb
2012	0.1	155	31	186	0.00	overfishing prevented if total kill<192,000 lb
2013	0.1	223	39	262	0.00	overfishing prevented if total kill<270,000 lb
2014	0.1	305	48	353	0.00	overfishing prevented if total kill<365,000 lb
2015	0.1	405	54	459	0.00	overfishing prevented if total kill<473,000 lb
2016	0.1	518	58	576	0.00	overfishing prevented if total kill<592,000 lb
2017	0.1	638	61	699	0.00	overfishing prevented if total kill<718,000 lb
2018	0.1	762	63	825	0.00	overfishing prevented if total kill<847,000 lb
2019	0.1	886	65	951	0.00	overfishing prevented if total kill<975,000 lb
2020	0.1	1009	66	1075	0.00	overfishing prevented if total kill<1,101,000 lb
2021	0.1	1127	67	1194	0.00	overfishing prevented if total kill<1,221,000 lb
2022	0.1	1238	68	1306	0.01	overfishing prevented if total kill<1,335,000 lb
2023	0.1	1342	68	1410	0.01	overfishing prevented if total kill<1,440,000 lb
2024	0.1	1439	68	1507	0.02	overfishing prevented if total kill<1,539,000 lb
2025	0.1	1528	69	1597	0.04	overfishing prevented if total kill<1,628,000 lb
2026	0.1	1609	69	1678	0.06	overfishing prevented if total kill<1,710,000 lb
2027	0.1	1682	69	1751	0.08	overfishing prevented if total kill<1,785,000 lb
2028	0.1	1749	69	1818	0.10	overfishing prevented if total kill<1,852,000 lb
2029	0.1	1809	69	1878	0.13	overfishing prevented if total kill<1,911,000 lb
2030	0.1	1862	70	1932	0.16	overfishing prevented if total kill<1,965,000 lb
2031	0.1	1910	70	1980	0.20	overfishing prevented if total kill<2,013,000 lb
2032	0.1	1953	70	2023	0.23	overfishing prevented if total kill<2,055,000 lb
2033	0.1	1991	70	2061	0.26	overfishing prevented if total kill<2,093,000 lb
2034	0.1	2025	70	2095	0.29	overfishing prevented if total kill<2,126,000 lb
2035	0.1	2055	70	2125	0.32	overfishing prevented if total kill<2,156,000 lb
						SSB=7519 mt; stock not overfished
2036	0.1	2081	70	2151	0.35	overfishing prevented if total kill<2,182,000 lb
2037	0.1	2105	70	2175	0.37	overfishing prevented if total kill<2,205,000 lb
2038	0.1	2125	70	2195	0.40	overfishing prevented if total kill<2,205,000 lb
2039	0.1	2144	70	2214	0.42	overfishing prevented if total kill<2,205,000 lb
2040	0.1	2160	70	2230	0.44	overfishing prevented if total kill<2,205,000 lb
2041	0.1	2174	70	2244	0.47	overfishing prevented if total kill<2,205,000 lb
2042	0.1	2187	70	2257	0.48	overfishing prevented if total kill<2,205,000 lb
2043	0.1	2198	70	2268	0.50	overfishing prevented if total kill<2,205,000 lb
2044	0.1	2208	70	2278	0.51	overfishing prevented if total kill<2,205,000 lb

Landings in 2007 & 2008					
Year	Total Com	Headboat	MRFSS	Total Rec	Total C+R
2007	116,934	38,448	302,156	340,604	457,538
2008	233,267	115,308	696,755	812,063	1,045,330

*LD represents either landed catch or red snapper > 20 inches TL that would be discarded if all red snapper harvest was prohibited. DD represents dead discards for red snapper < 20 inches TL. F_{MSY}=F40%=0.104; MSST=7471mt; SSB_{MSY}=8103mt; Y@75%F_{MSY}=2,104,000 lb; Y@F_{MSY}=2,304,000 lb.

4.2.2.1 Biological Effects

The SEFSC provided two types of projections which (1) allow for some harvest and (2) are based on only discarded red snapper. The Council decided not to use discard-only projections since alternatives are being considered in **Section 4.3** that could potentially allow some level of harvest. At their September 2009 meeting, the Council indicated that projections should consider very high recruitment, which likely occurred in 2006. These projections were requested from the SEFSC in October 2009.

Optimum Yield at Equilibrium

Choice of the proxy for F_{MSY} in **Section 4.1** has an effect on the magnitude of OY. OY values based on the status quo proxy for F_{MSY} of $F_{30\%\ SPR}$ would be expected to result in higher values for OY than the use of $F_{40\%SPR}$ proxy for F_{MSY}. The Council has selected in **Section 4.1**, $F_{40\%SPR}$ as the proxy for F_{MSY}.

Under status quo **Alternative 1**, $F_{OY} = F_{45\%SPR}$ and the value for OY when the stock is at SSB_{MSY} is 2,169,000 lbs whole weight. Under the action alternatives, OY when the stock is rebuilt is based upon the rebuilding strategy where OY is some portion of the yield at F_{MSY}. Since **Alternative 2** and **Sub-Alternative 7a** identify a rebuilding strategy based on the yield at F_{MSY}, OY when the stock is rebuilt would be equivalent to MSY. The OY at equilibrium (when stock biomass reached SSB_{MSY}) for **Alternatives 3 through 6** and **Sub-alternatives 7b-7e** would be based on the rebuilding strategy where OY would equal the yield at 85% F_{MSY}, 75% F_{MSY}, 65% F_{MSY}, and 96% F_{MSY}, respectively. OY values at equilibrium in the seven alternatives are distinguished from one another by the level of risk (and associated tradeoffs) each would assume.

The more conservative the estimate of OY, the larger the sustainable biomass when the stock is rebuilt. The greatest biological benefit would be provided by **Alternative 5** and **Sub-alternative 7d**, which would specify an OY at equilibrium equal to 65%F_{MSY}. Therefore, a larger sustainable biomass associated with a fishing mortality rate at 65 percent of F_{MSY} would be good for the stock, but could have negative social and economic effects, in the short term, because longer and/or more severe short-term reductions in harvest would be needed to achieve larger sustainable biomass. The least amount of biological benefit would be provided by **Alternative 2** and **Sub-alternative 7a**, which would specify a rebuilding strategy and therefore an OY equal to the yield at F_{MSY}. Therefore, this definition could make it more difficult to sustain red snapper over the long term.

The preferred **Alternative 4** as well as **Sub-alternative 7c** would set the rebuilding strategy as well as the OY equal to the yield at 75%F_{MSY}. This definition reduces slightly the safety margin between MSY and OY relative to **Alternative 5** and **Sub-Alternative 7d**. Therefore, the biological benefits of this alternative would be intermediate in value and would consider the social and economic effects of the action. Restrepo *et al.* (1998) state "that fishing at 75 percent of F_{MSY} would result in equilibrium yields at 94 percent of MSY or higher, and equilibrium biomass levels between 125 percent and 131 percent of B_{MSY} – a relatively small sacrifice in yield for a relatively large gain in biomass." A simple deterministic model described in Mace (1994) to evaluate the effects of fishing at 75 percent of F_{MSY} indicates that the ratios are consistent across a broad set of life history characteristics ranging from species such as snowy grouper with low natural mortality rates to more productive species like vermilion snapper and black sea bass. Restrepo *et al.* (1998) determined the ratio between the yield fishing at 75 percent of F_{MSY} relative to fishing at F_{MSY} would range from 0.949 and 0.983. Restrepo *et al.* (1998) also indicate fishing at this rate under equilibrium conditions is expected to reduce the risk of overfishing by 20-30 percent.

Rebuilding strategies

Alternative 1 (Status Quo) would not establish a yield-based, rebuilding strategy for red snapper. Current regulations include a commercial limited access system, a 20" total length (TL) commercial and recreational minimum size limit, and a 2-fish recreational bag limit. Under **Alternative 1 (Status Quo)** harvest levels would continue until modified and the stock would not rebuild within the preferred time frame under the rebuilding schedule. Status quo includes harvest reductions of co-occurring species under recently implemented Amendment 16 (SAFMC 2008), which extends the shallow water grouper spawning season closure to four months and creates a five month seasonal closure for vermilion snapper, which is expected to provide a reduction in total kill of 16.5% (commercial sector), 1.1 to 7.7% (headboat sector), and 2.3% (private/charter sector). Therefore, expected reduction of red snapper from actions imposed through Amendment 16 would not be sufficient to provide the 83% reduction needed to end overfishing. **Alternative 1 (Status Quo)** would also not establish an ACL for red snapper, which would not fulfill the requirements of recently published NS 1 guidelines. Below is a graphical representation of SSB_{MSY} through time if current red snapper harvest levels persist. It illustrates the current rate of removal, if increased slowly overtime, would not achieve the rebuilding goal of an SSB_{MSY} of 8102.5 mt. Compared to **Alternatives 2 – 7**, **Alternative 1 (Status Quo)** is the least biologically beneficial.

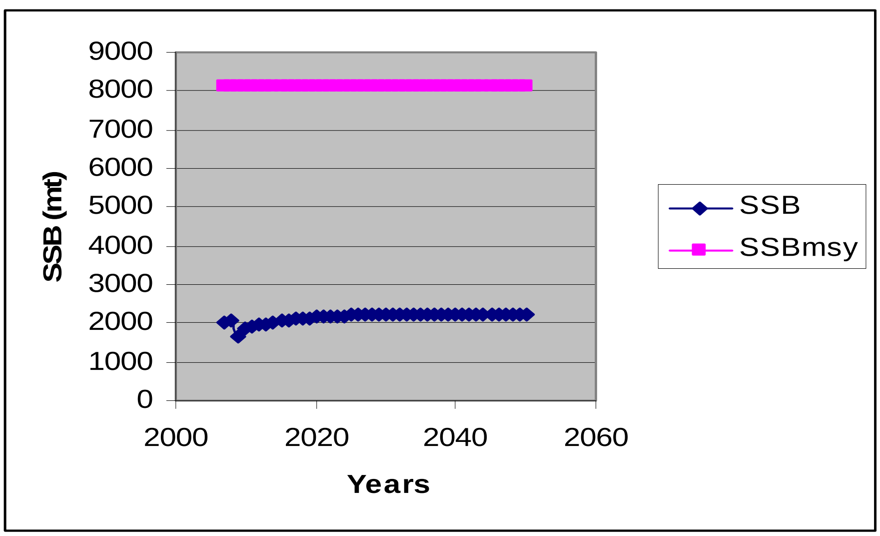

Figure 4-1 Projection results where fishing mortality rate fixed at F = Fcurrent. Expected values represented by dotted solid line. Thick horizontal line represents the 8102.5 (mt) = SSB_{MSY} benchmark. Source: Red Snapper Projections - V and Addendum: April 2009, Figure 5.3.

Alternatives 2-6 would prohibit all harvest of red snapper in the commercial and recreational sectors but would set an ACL equal to the total kill specified in the rebuilding strategy for each alternative. This would require the SEFSC to monitor discarded red snapper in the commercial and recreational sectors. At their March 2009 meeting, the SSC indicated their recommendation of ABC = 0 for speckled hind and warsaw grouper was based on landed catch only due to concern about monitoring discards. The SSC expressed similar concerns when discussing ACLs based on discards for speckled hind and warsaw grouper at their March 2009 meeting. The SSC was not only concerned about the accuracy of discard data from the recreational and commercial sector but also the possibility that some members of the fishing community might under report discarded fish if they thought further restrictions might be imposed if levels of discards became elevated. There could be similar concerns with the need to monitor red snapper discards in **Alternatives 2-6**. Because of these concerns with monitoring discards, CPUE of red snapper would be tracked via a fishery-independent monitoring program to identify changes in biomass. Furthermore, the Council is considering a research set-aside that would involve data collection by headboat and charterboat operators to determine if there are changes in CPUE and biomass. If the ACL was exceeded or if acceptable increased in CPUE did not occur, the Council would evaluate the size of the area closures. CPUE would be evaluated every three years and adjustments would be made by a framework action being developed in Amendment 17B.

Under **Alternatives 2-7**, the red snapper stock could rebuild sooner than specified by each rebuilding strategy since the Council's is to considering alternatives that would prohibit all harvest of red snapper during initial rebuilding and actions are being taken to reduce incidental catch of red snapper in **Section 4.3.** The probability of rebuilding to SSB_{MSY} by 2044 increases with the level of conservativeness of each of the rebuilding strategy alternative.

Alternative 2 would establish an ACL of 82,000 lbs whole weight, and define a rebuilding strategy based a constant F of 0.104 and F_{MSY} ($F_{40\%SPR}$). Of the action alternatives considered, **Alternative 2** would have the smallest probability of rebuilding the stock to SSB_{MSY} by 2044. Under **Alternative 2**, an initial 83% reduction in total kill would be required. At this rate of harvest the stock would likely not be considered overfished (i.e. SSB > MSST) by the year 2037; however, the population would continue to only come infinitely close to a rebuilt condition without actually achieving it. This rebuilding has a 44% probability of rebuilding to SSB_{MSY} by 2044. It is possible the red snapper stock could reach a rebuilt state eventually, but likely not within the allowable rebuilding time period, since the Council's intent is to prohibit all harvest during the initial years of rebuilding and actions are being taken to reduce incidental catch. **Alternative 2** is more biologically beneficial than **Alternative 1 (Status Quo)** because it would lead to a substantial increase in SSB in the first 20 years of implementation; however, by approximately 2030 this increase is projected to slow significantly, and would allow for slower recovery of the stock than **Alternatives 3-6** (Figure 4-2).

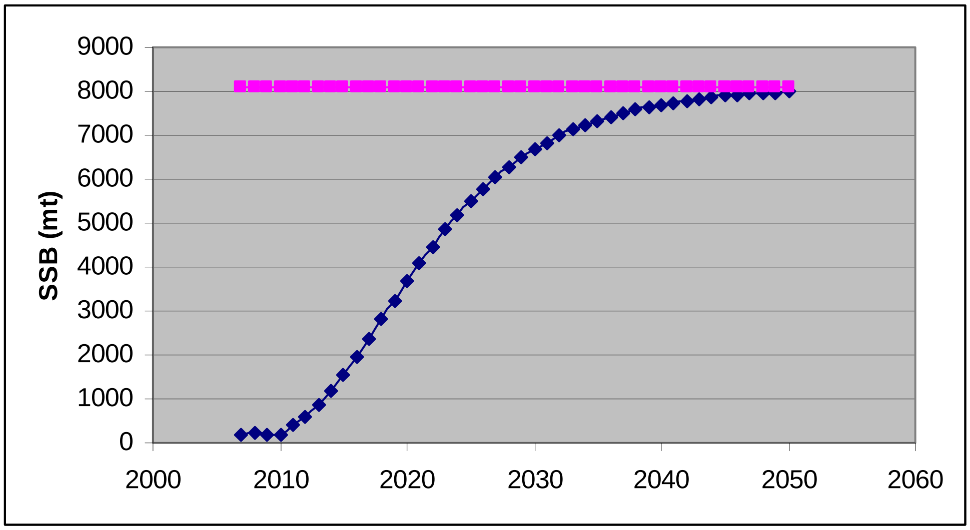

Figure 4-2. Projection results where fishing mortality rate is fixed at F = F40%SPR. Expected values represented by dotted solid lines. Thick horizontal lines represents SSB_{MSY} = 8102.5 (mt) benchmark. Source: Red Snapper Projections - V and Addendum: April 2009, Figure 5.7.

Under **Alternative 3**, an initial reduction in total kill of 86% would be required. Therefore, this definition would provide the least amount of indirect benefits to the biological and ecological environment of all the alternatives, and could make it more difficult to sustain red snapper over the long term. The ACL would be 69,000 lbs whole weight until modified. Under this scenario, SSB increases steadily through time until approximately the year 2030 when those increases begin to level off. Under this alternative the stock has a 50% chance of being rebuilt by 2036, six years later than **Alternative 5**, and **4 (Preferred)** years later than **Alternative 4 (Preferred)**. Furthermore, there is a 69% chance the stock could rebuild to SSB_{MSY} in the maximum allowable 35 year time frame. However, the stock could rebuild sooner since the Council is considering management actions that would prohibit all harvest of red snapper during initial rebuilding and actions would be taken to reduce incidental catch. Although **Alternatives 4 (Preferred)** and **5** would yield higher biological benefits at a faster rate, **Alternative 3** would rebuild the stock within the rebuilding time frame. As Figure 4-3 illustrates, the rebuilding begins to slow just as the stock reaches a rebuilt condition, eliminating the delay in rebuilding caused by the leveling effect under **Alternative 2**.

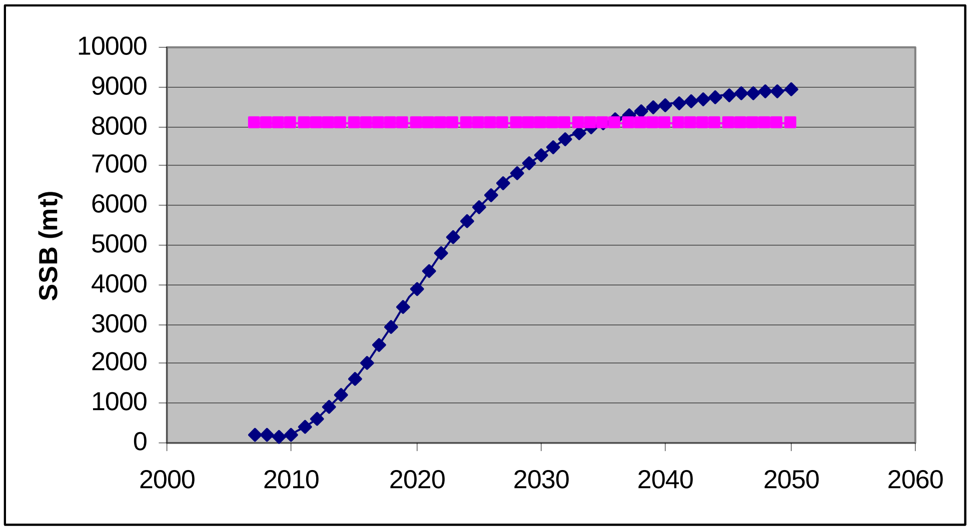

Figure 4-3. Projection results were fishing mortality rate is fixed at F = 85%F40SPR%. Expected values represented by dotted solid lines. Thick horizontal line represents SSB_{MSY} = 8102.5 (mt) benchmark. Source: Red Snapper Projections - V and Addendum: April 2009, Figure 5.6.

Alternative 4 (Preferred) would establish a rebuilding strategy that maintains fishing mortality at 75% F_{MSY} (75%$F_{40\%SPR}$) with a constant F of 0.078. The ACL would be set at 61,000 lbs whole weight and would remain in effect until modified (Figure 4-4). Under **Alternative 4 (Preferred)**, a 87% reduction in total kill would be required. At this rate of recovery, the stock has a 50% chance of rebuilding to SSB_{MSY} by 2032. Furthermore, there is an 84% that the stock could rebuild to SSB_{MSY} by 2044. However, the stock could rebuild sooner since the Council is considering management actions to prohibit all harvest of red snapper during initial rebuilding and actions are being considered to reduce incidental catch in **Section 4.3**. This is an intermediate option for stock recovery in terms of time for recovery and removal rate. **Alternative 4 (Preferred)** would rebuild the stock more quickly than **Alternative 3**, but would rebuild it two years slower than **Alternative 5**. When considering the expanding margin of error for SSB as it approaches SSB_{MSY}, it is likely a two year difference would be biologically negligible regarding benefits to the stock. According the April 2009 projections, the number of recruits during this two year time period would increase by 2,000 which may be viewed as a slight biological benefit; however, given the level of uncertainty this small increase in recruits may also be negligible when considered with other variables.

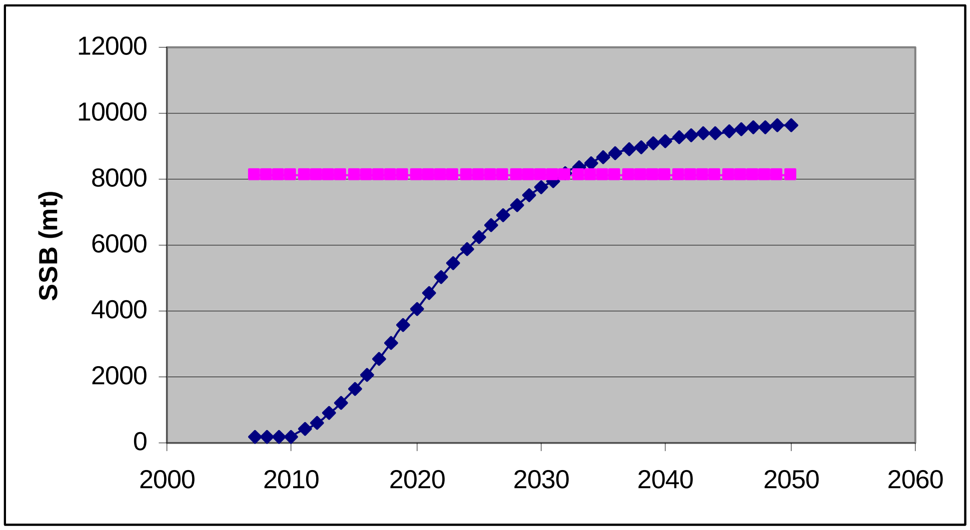

Figure 4-4. Projection results where fishing mortality rate is fixed at F = 75%$_{F40\%SPR}$. Expected values represented by dotted solid lines. Thick horizontal line represent SSB_{MSY} = 8102.5 (mt) benchmark. Source: Red Snapper Projections - V and Addendum: April 2009, Figure 5.5.

Alternative 5 would implement the most conservative rebuilding strategy of all the alternatives considered. Under **Alternative 5** the rebuilding strategy would set F_{OY} equal to 65%F_{MSY} (65%$F_{40\%}$). The ACL would be the lowest of all the alternatives at 35,000 lbs whole weight, and would remain in effect until modified. An 88% reduction in total kill would be required under **Alternative 5**. Because this ACL is the lowest relative to other alternatives, it would be the ACL most likely to be exceeded. According to the April 2009 projections, **Alternative 5** would rebuild the stock the fastest of all the alternatives considered. The stock would have a 50 percent probability of being rebuilt by the year 2027 and a 94% probability of being rebuilt by 2044. However, the stock could rebuild sooner than 2027 since the Council is considering management measures to prohibit all harvest of red snapper during initial rebuilding and actions are being considered to reduce incidental catch in Section 4.3. The estimated time frame of 17 years is the closest to $T_{MIN,}$ and would be the most biologically beneficial for the stock. However, this alternative would also be the most restrictive compared to all the other alternatives under consideration. **Alternative 5** may be viewed as too conservative in light of the fact that **Alternatives 3** and **4 (Preferred)** are also expected to rebuild the stock within the allowable time frame. As Figure 4-5 illustrates, steady progress toward a rebuilt condition is expected under this alternative with no leveling effect before the rebuild condition is reached.

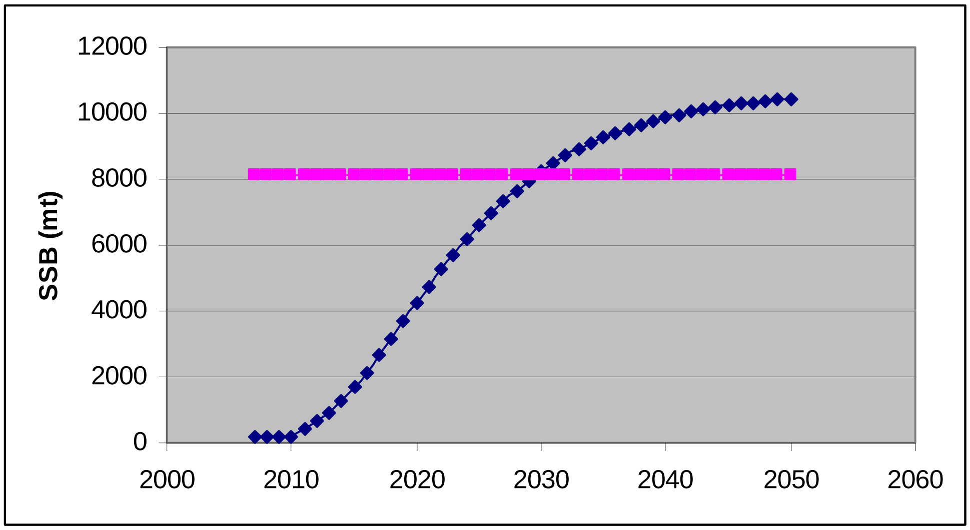

Figure 4-5. Projection where fishing mortality rate is fixed at F = $65\%_{F40\%SPR}$. Expected values presented by dotted solid lines. Thick horizontal line represents SSB_{MSY} = 8102.5 (mt) benchmark. Source: Red Snapper Projections -V and Addendum: April 2009, Figure 5.4.

Alternative 6 (Figure 4-6) would establish an ACL of 78,000 lbs whole weight, and define a rebuilding strategy based a constant $F_{REBUILD}$ of 0.088 and $96\%F_{MSY}$ ($96\%F_{40\%SPR}$). Under **Alternative 6**, an initial 84% reduction in total kill would be required. **Alternative 6** specifies a fishing mortality rate that has a 50% probability of rebuilding the stock to SSB_{MSY} in the maximum allowable time of 35 years (2045). It is possible the red snapper stock could rebuild sooner that specified in 2045 since the Council is considering management measures to prohibit all harvest during the initial years of rebuilding and actions are being considered to reduce incidental catch. **Alternative 6** is more biologically beneficial than **Alternative 1 (Status Quo)** and **Alternative 2** because it would lead to a substantial increase in SSB in the first 20 years of implementation but would allow for slower recovery of the stock than **Alternatives 3-5** (Figure 4-2).

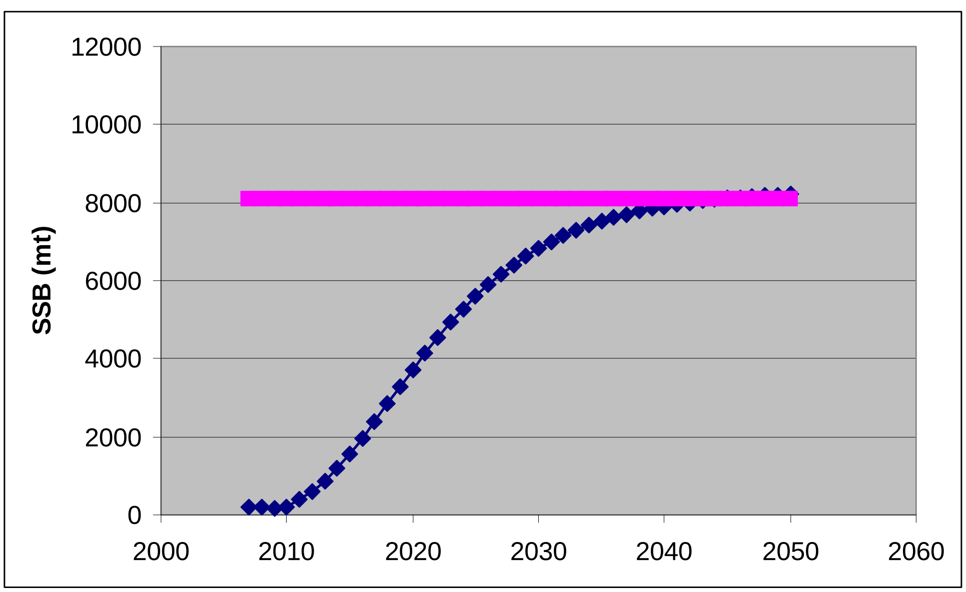

Figure 4-6. Projection where fishing mortality rate is fixed at F = 96%F40%SPR. Expected values presented by dotted solid lines. Thick horizontal line represents SSB_{MSY} = 8102.5 (mt) benchmark. Source: Red Snapper Projections -VII: July 31 2009, Figure 6.1.

Alternative 7 would define a rebuilding strategy for red snapper that sets the ACL at 0 (directed landings only). Different rebuilding strategies corresponding to F_{MSY}, 85%F_{MSY}, 75%F_{MSY}, 65%F_{MSY}, and 96%F_{MSY} ($F_{REBUILD}$) are provided by **Sub-Alternatives 7a-7e**. The biological effects of **Sub-alternatives 7a-7e** correspond to **Alternatives 2-6** described above. The primary difference between **Alternative 7** and **Alternatives 2-6** is **Alternative 7** sets the ACL at 0 where a certain level of dead discards is assumed. In contrast, **Alternatives 2-6** would require the SEFSC monitor the level of dead discards with respect to the ACL. The advantage of **Alternatives 2-6** is a concrete value would be specified for an ACL and action could be taken if that value was exceeded. The disadvantage of **Alternatives 2-6** is discard data are more uncertain than landed data and the SSC has concern that the public may under report discards if there is a perception further restrictions could be placed on fisheries when a specified level is achieved.

Under **Alternative 7**, the AM would be to track catch per unit effort (CPUE) of red snapper via a fishery-independent monitoring program (see Section 4.12) to identify changes in biomass. CPUE would be evaluated every three years and adjustments would be made by the framework action being developed in Amendment 17B. The disadvantage of this strategy is that a monitoring program does not currently exist and baseline data are few. The proposed framework for a fishery-independent red snapper monitoring program would continue the long-term data series from MARMAP surveys and add a complementary sampling program to expand needed coverage. The improved sampling plan would increase the (1) spatial footprint (central FL to Cape Hatteras, NC), (2) sample size, and (3) number of gear utilized over current survey levels; thereby, considerably improving program effectiveness. The spatial and sample size expansions would be made possible by the participation of NOAA-SEFSC (Beaufort Laboratory) staff. The core aspects of the current sampling program (survey design, chevron trap, short bottom long-line and rod and reel sampling) would remain the core of the improved program, enabling comparisons of data collected in the improved program with those collected during previous years by MARMAP. Additional gear would be added and utilized by both NOAA-SEFSC and MARMAP (detailed below), with gear effectiveness research performed by NOAA-SEFSC. NOAA-SEFSC would coordinate with MARMAP to plan annual survey efforts (e.g., spatiotemporal focus of sampling) as guided by SAFMC and NMFS (SERO and SEFSC) data needs. An improved program should include a geographic sampling range from Cape Hatteras, North Carolina to St. Lucie Inlet, Florida with targeting of specific geographical areas (e.g., offshore of northern FL and southern GA where the majority of red snapper landings occur) would be anticipated and would be guided by specific management actions.

Alternative 1 (Status Quo) will perpetuate the existing level of risk for interactions between ESA-listed species and the fishery. **Alternatives 2-7** are unlikely to have adverse effects on ESA-listed species, including *Acropora* species.. Previous ESA consultations determined the snapper grouper fishery was not likely to adversely affect these species (see Section 3.5 of this document). These alternatives are unlikely to alter fishing behavior in a way that would cause new adverse effects to *Acropora* species. The impacts from **Alternatives 2-7** on sea turtles and smalltooth sawfish are unclear. If they perpetuate the existing amount of fishing effort, but cause effort redistribution, any potential effort shift is unlikely to change the level of interaction between sea turtles and smalltooth sawfish and the fishery as a whole. If these alternatives result in an overall reduction of fishing effort in the snapper grouper fishery, the risk of interaction between sea turtles and smalltooth sawfish will likely decrease.

4.2.2.2 Economic Effects

Commercial Fishery

The alternatives above identify various rebuilding schedules and their implied ACLs. In general, the lower the ACL, the greater would be the negative short-term economic effects. However, a lower ACL implies a shorter rebuilding period and therefore greater positive long-term economic effects. In 2007, the commercial fishery for red snapper harvested 108,000 pounds of red snapper with an ex-vessel value of $376,000. If the commercial fishery only harvests the ACL amount under each of the alternatives, the short-term annual loss in revenue from red snapper would amount to approximately $89,800 under **Alternative 2**, $135, 200 under **Alternative 3**, $163,110 under **Alternative 4**, and $187, 540 under **Alternative 5**. However, since the ACL includes discards, these estimates are the maximum amounts. Actual negative impacts would be more. Under the assumption that the ACL is the upper limit of a commercial quota, short-term negative economic effects would be greatest under **Alternative 5**. However, **Alternative 5** has the shortest rebuilding period, and therefore, the largest long-term positive economic effects. **Alternative 6** has impacts between those of **Alternatives 2** and **3**. Impacts from **Alternative 7** depend upon the risk associated with accuracy of predicting dead discards. These estimates only consider the negative impacts from the decrease in the red snapper ACL. If the red snapper limitations on harvest prevent catch of co-occurring species, this will have to be incorporated in order to assess the full impact of these alternatives. Also, these estimates do not incorporate Amendment 16 regulations into the status quo. If these were able to be incorporated into the baseline, the impacts would be less. Therefore, these impacts are overestimates.

Positive impacts to the non-use value of the red snapper resource would be lowest under **Alternative 1 (Status Quo)** and highest under **Alternative 5**.

Recreational fishery

The alternative rebuilding strategies and their implied ACLs provide measurable parameters that would delimit the nature and extent of management measures to be implemented over time. In general, a lower ACL would imply more stringent management measures and consequently larger adverse economic effects in the short-run but potentially larger benefits in the long run.

Abstracting from **Alternative 1 (Status Quo),** which is the status quo, all alternatives would virtually render the red snapper fishery a bycatch fishery for the recreational sector. **Alternatives 2-6** would provide for some positive ACL level for red snapper while **Alternative 7** would set the ACL to zero for directed landings. Whether or not some benefits can be derived from the positive ACLs depends on the actual management measures implemented. Given the management measures specified in the next section where basically the harvest, retention, and possession of red snapper would be prohibited or the structure of fishing activities severely curtailed, the recreational sector of the red snapper fishery would not derive any economic benefit from any of the positive ACLs (**Alternatives 2-6**) or from the zero ACL (**Alternative 7**) during the rebuilding period. Some positive benefits from the positive ACLs would occur only if less restrictive management measures are implemented during the rebuilding period. Naturally, benefits would accrue once the stock is rebuilt and management measures are changed to effectively allow directed harvests.

If the same management measures are maintained throughout the rebuilding period until B_{msy} is reached, the various rebuilding strategies would carry the same economic costs. In that case, the alternatives may be compared on the basis of expected economic benefits over time, and economic benefits would be mainly determined by the probability of achieving the B_{msy} target. In this case, the alternatives may be ranked in the following descending order: A**lternative 5**, **Alternative 4**, **Alternative 3**, and **Alternatives 6** and **2**. The various sub-alternatives under **Alternative 7** may be ranked in a similar manner. Although the various ACLs are calculated on the assumption of very high recruitment, different recruitment levels may affect the probability of successfully achieving the target but not necessarily the relative ranking of alternatives. One major factor that can change the ranking of alternatives pertains to the possibility of changing management regulations during the rebuilding period. For example, if an ACL is exceeded, additional stringent measures may be implemented to constrain red snapper removal to the chosen ACL. This could materially change the costs of regulations during the rebuilding period. Although this could happen with lower ACLs, there is a possibility this could happen as well with higher ACLs. This possible difference in costs among the various alternatives when management measures are changed cannot be evaluated, so the possible change in the ranking of alternatives cannot be determined.

The same three sets of accountability measures accompany **Alternatives 2-6**. The first one would track CPUE/biomass of red snapper via a fishery independent data collection; the second would track CPUE/biomass via a research program involving headboats and charterboats; and, the third would require the Council to evaluate CPUE/biomass every three years and make adjustments to the size of area closures when discards are estimated to exceed the ACL. The costs to fishing participants associated with the tracking of CPUE and biomass are relatively minimal, but the administrative costs for the fishery independent data collection could vary from small to large depending on the size of the program. Any additional closures based on the collected information would add costs especially to the fishing participants of other fisheries. The costs and potential benefits of these AMs to the fishing participants would be proportionally the same across **Alternatives 2-6**. The AM for **Alternative 7** involves tracking of red snapper CPUE via a fishery independent monitoring program, with the CPUE being evaluated every three years to determine if adjustments to the management measures are required. The costs to fishing participants arising out of this particular AM would be about the same as those under the AMs for the other alternatives. Because CPUE/biomass tracking would be done via one instead of two tracking methods, the administrative costs of this particular AM would be slightly less than the AMs for the other alternatives. But with only one source of data, there is a possibility the evaluation would be less accurate. This could potentially result in getting off track of the rebuilding schedule. If more strict adjustments become necessary later, the resulting costs to fishing participants may turn out to be higher than those of the AMs for the other alternatives.

4.2.2.3 Social Effects

General Concepts

Similar to defining the MSY, defining the OY for a species or species complex would not be expected to cause direct social impacts because it would not place specific controls on the amount or manner in which the resources are harvested. This parameter simply provides a management target and threshold needed to assess the status and performance of the fishery. All current direct, indirect, consumptive, and non-consumptive uses of the resources will be unaffected. Evaluation of the resource relative to the benchmark, however, may trigger harvest and/or effort controls, which would directly impact the individuals, social networks, and associated industries related to the fishery, inducing short-term adverse economic impacts until less restrictive management is allowable. For additional discussion of the general concepts associated with defining a benchmark like OY, see **Section 4.1.1.3**.

Social impacts of management accrue incrementally to fishing regulations and conditions that exist each year, and cumulatively as conditions are compounded over multiple years (single year or short-term restrictions may result in minimal social impacts, whereas persistent restrictions would be expected to result in more significant impacts). In general, smaller harvest levels entail greater short-term dislocations and adjustments for the social environment. Commercial and recreational fishermen may be able to adjust to harvest reductions by switching to other species or by leaving fishing and seeking other employment or recreational opportunities elsewhere. If other species are depleted, regulations may prevent fishermen from freely switching to another fishery or, if other forms of employment or recreational activities are unavailable or difficult to find, then the adjustments would be more severe than if alternatives were readily available.

The rebuilding strategies typically considered are either constant catch or constant fishing mortality rate (F) approaches, with different periods of catch adjustment. The basic principle of a constant catch strategy is to maintain the allowable harvest at a constant amount for the entire rebuilding period. This is a conservative strategy that creates the least socio-economic disruption in the short term to the fishing industry and associated businesses, assuming the allowed harvest level is relatively close to current harvests. However, medium- and long-term problems may arise as catch rates increase with the rebuilding resource and ABC is held constant. While the total catch remains constant, harvest occurs more quickly and/or with the expenditure of fewer resources. Although this may allow these resources to be put to other uses, with associated benefits, the increased catch rates could induce the perception among fishermen that regulation is too restrictive, particularly if increased bycatch and bycatch mortality occurs, jeopardizing recovery goals. Pressure to increase allowable catches is likely under such events, although the long-term biological recovery may not be complete.

Constant F strategies recognize the limitations of constant catch strategies by allowing catches to increase as the stock recovers and biomass increases. Starting harvest levels under constant F approaches, however, are typically lower than constant catch levels, resulting in greater initial restrictions and short-term social and economic losses, but higher subsequent harvest levels support larger medium- and long-term benefits.

As discussed in **Section 1.2**, ACLs specify the amount of allowable fishing mortality of a species per year and are the amount of harvest that prevents overfishing. Exceeding the ACL, or ACT if such is also specified, triggers the AMs. In tandem or as part of a rebuilding strategy, the ACL is the specific amount of annual fishing mortality, regardless of whether determined by a constant catch or constant F rebuilding strategy, that is allowed each year of the rebuilding period. In general terms, the higher the ACL, the greater the short-term social and economic benefits that would be expected to accrue, assuming long-term recovery and rebuilding goals are not jeopardized. Adhering to stock recovery and rebuilding goals is assumed to result in net long-term positive social and economic benefits. Thus, it is important that short-term decisions, such as allowable annual harvest levels, be consistent with the long-term objectives. Although the net long-term outcome may be positive, however, as with any short-term and long-term trade-off, short-term consequences may be so severe as to result in the long-term benefits accruing to different entities than those who bear the consequences of the short-term actions.

In addition to the above considerations, the preferred rebuilding strategy from the perspective of the social environment would be expected to be influenced by the industries' perception of stock status. If the industry believes that the resource is overfished, then fishermen and associated businesses would be expected to be willing to accept short-term socio-economic losses in exchange for long-term increases in harvest rates, depending, of course, that they also consider when pay-back occurs as reasonable. Constant F strategies may be preferred because the fishermen would more quickly realize the benefits of resource rebuilding through corresponding increases in allowable harvest. However, if fishermen disagree with the stock assessment, then they would be less willing to incur reductions in current harvest rates. In this event, fishermen may prefer constant catch rebuilding strategies because of the reduced short-term socio-economic losses while additional biological information is collected and assessed. Modified constant F strategies probably would be preferred by fishermen who perceive the stock to be overfished, but who are not certain about the magnitude of potential long-term benefits.

Comparison of Fishery with Management Reference Point Alternatives

As is the case with the alternative specifications of the equations used to determine MSY, all of the alternative rebuilding strategy equations (formulas) result in equilibrium (recovered resource) OY specifications that are considerably greater than the recent average annual harvest. Thus, none of the alternative specifications would imply or necessitate harvest reductions based on an evaluation of current harvests with the OY and, as a result, no adverse social impacts would be expected to occur as a result of such an evaluation. As with the discussion on MSY, however, it is noted that stock conditions and necessary rebuilding requirements require the closure of the red snapper fishery (see **Sections 4.2.2** and **4.3**). The expected social effects of the closure of the fishery and appropriate alternatives are discussed in those sections. It should be emphasized, however, that none of these effects are directly attributable to the specification of equilibrium OY. Although the different alternatives imply the possibility of different equilibrium harvest levels according to higher or lower OY specifications, suggesting the possibility of variable levels of social and economic benefits, assuming all OY specifications afford adequate resource protection, the total variation between the alternative specifications is small, particularly considering the absence of a demonstrated ability by the combined harvest sectors to actually harvest these quantities. Thus, little to no differential social effects would be expected between the different alternatives based simply on an examination of harvests and equilibrium OY.

All of the rebuilding strategies considered are constant catch strategies, so the potential differences in social and economic benefits between constant catch and constant F strategies discussed above is not relevant to the current discussion.

In addition to each alternative employing a constant catch approach, with the exception of **Alternative 1 (Status Quo)**, each of the alternative red snapper rebuilding strategies would impose a directed harvest level of zero pounds and establish a specific ACL that would remain fixed until modified. **Alternative 1 (Status Quo)** would not define a rebuilding strategy, or specify an ACL, but the allowable directed harvest level would still likely be set at zero as a result of the proposed management measures discussed for a subsequent action. Because red snapper has been determined to be overfished, a rebuilding strategy is required. Further, ACLs are now required components of FMPs. As such, **Alternative 1 (Status Quo)** would not be a viable long-term action, meaning its selection would require additional subsequent council action to re-address both requirements. Thus, while the red snapper fishery could continue unaffected, at least as constrained by this action, with unchanged short-term social and economic benefits, such would be temporary and the costs and social impacts of duplicative management action would be incurred. While no direct adverse social effects would accrue to the fishery participants or associated industries and communities, a perception of irresponsible management and waste of public resources might accrue, with associated adverse social outcomes.

Alternatives 2-7 differ in the formula on which the rebuilding strategy would be based. The alternative formulas result in different allowable harvests (ACLs), different OYs, different expected chances of rebuilding, different specifications on whether the ACL refers to release mortality or directed landings), and different AMs. Because the allowable directed harvest for each of **Alternatives 2-7** would be zero pounds, in functional application, no difference in social effects would be expected across all these alternatives based on this perspective. The rebuilding strategy for **Alternative 2** would only be expected to result in a 44% chance of rebuilding within the allowable timeframe and, while the higher resultant ACL would be expected to result in a lower likelihood of triggering AMs, this alternative would be expected to result in reduced long-term social benefits relative to those alternatives with at least 50% as recovery would not be expected and the fishery would not be able to receive the increased social and economic benefits of a recovered resource. **Alternative 3** would be expected to result in a greater likelihood of triggering AMs than **Alternative 2** because of the lower ACL for **Alternative 3**, but would be expected to support recovery within the specified timeframe, thus achieving greater long-term social benefits. **Alternative 4 (Preferred)** would be expected to achieve greater social benefits than **Alternative 3** because it would be expected to result in a greater likelihood of resource recovery sooner than **Alternative 3** and would also allow a higher ACL, thus reducing the likelihood of triggering AMs and their associated loss of short-term social and economic benefits. Because it may result in resource recovery more quickly than **Alternative 4 (Preferred)**, **Alternative 5** may be capable of resulting in greater social benefits than **Alternative 4 (Preferred)**. However, the lower ACL in **Alternative 5** relative to **Alternative 4 (Preferred)** would be expected to increase the likelihood of triggering AMs, thus increasing the likelihood of reduced short-term social benefits relative to **Alternative 4 (Preferred)**. Although

Alternative 6 would be expected to result in the least likelihood of triggering AMs compared to **Alternatives 2-5**, Alternative 6 would not be expected to recover earlier than the maximum allowable recovery time and would be expected to just have a 50% chance of resulting in resource recovery by the required date. Because **Alternative 4 (Preferred)** could result in resource recovery up to 12 years sooner than **Alternative 6**, **Alternative 4 (Preferred)** would be expected to result in greater long-term social and economic benefits despite the greater likelihood of triggering AMs. Each of **Alternatives 2-6** would impose the same AMs, so, other than varying in the likelihood or triggering the AMS, based on the severity of the ACLs, no differential social effects would be expected between these alternatives relative to the AMs themselves. **Alternative 7** would set the ACL equal to allowable directed landings instead of release or bycatch mortality, but would set the amount equal to zero pounds. The actual rebuilding strategy and expected social effects would be expected to parallel the comparable strategies defined by **Alternatives 2-6**. The reliance on CPUE monitoring, instead of hard release or bycatch mortality caps, to trigger the AM in **Alternative 7,** however, may adversely affect achieving the recovery goals, resulting in reduced long-term social benefits relative to the other alternatives. **Alternative 7** would also impose a single AM rather than the three AMs under **Alternatives 2-6**. As a result, while the single AM may result in smaller short-term adverse social effects, the effectiveness of the AM may be reduced relative to the three AMs of the other alternatives, resulting in increased jeopardy to stock protection and reduced long-term benefits relative to the other alternatives.

4.2.2.4 Administrative Effects

Alternative 1 (Status Quo) would incur no additional administrative time or cost burden. However, it would also not fulfill NS 1 final rule requirements for establishing ACLs. In theory, the larger the allowable harvest, the less restrictive and administratively burdensome subsequent management is needed to be. From this perspective, **Alternative 1 (Status Quo)** would allow the largest harvest, and therefore less restriction. However, the more conservative the estimate of OY, the larger the sustainable biomass, which translates into a lower administrative burden. **Alternatives 2** – **5**, would produce similar administrative impacts, which are likely to be minimal to moderate. The impacts would take the form of information dissemination to the fishing public, and tracking the ACL. Tracking discards for the ACL may be a complicated endeavor, and thus may require the development of some specialized means of doing so. A full description of issues associated with tracking the red snapper ACL is provided in **Section 4.18** Monitoring and Mitigation and is hereby incorporated by reference.

Need to add administrative impacts of AMs.

4.2.2.5 Council's Conclusions

4.3 Red Snapper Management Measures

*Note: More than one preferred alternative may be chosen from the list of alternatives and sub-alternatives below. Additionally, The prohibition of red snapper harvest in **Alternatives 2-6** would remain in effect beyond 2009 until modified.*

Alternative 1 (Status Quo). This would continue the 20-inch size limit (commercial & recreational) and the recreational 2 fish bag limit (included in the 10 snapper per person limit).

Alternative 2. Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ.

Alternative 3. Prohibit commercial and recreational harvest, possession, and retention of species in the snapper grouper FMU year-round in an area that includes commercial logbook grids 2880, 2980, 3080, and 3180 between a depth of 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m), or 8,100 sq miles of the South Atlantic EEZ. Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ.

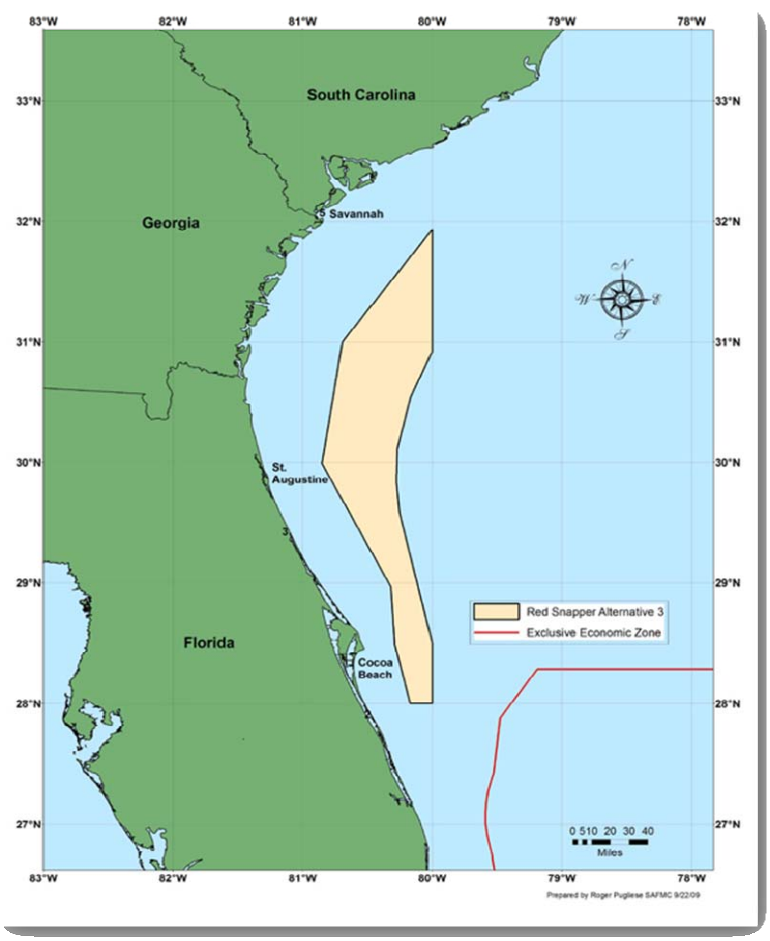

Figure 4-7. Map of proposed closed area under **Alternative 3**.

Alternative 4. Prohibit commercial and recreational harvest, possession, and retention of species in the snapper grouper FMU year-round in an area that includes commercial logbook grids 2880, 2980, 3080, 3179, 3180, 3278, and 3279 between a depth of 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m), or 12,300 sq miles of the South Atlantic EEZ. Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ.

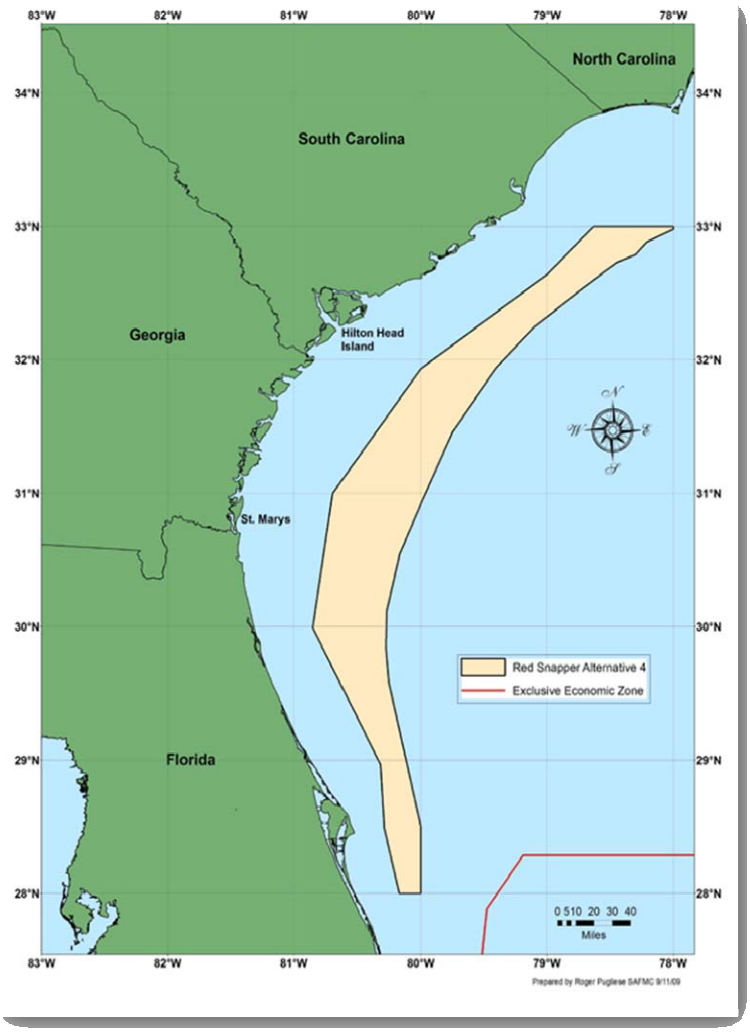

Figure 4-8. Map of proposed closed area under **Alternative 4.**

Alternative 5. Prohibit commercial and recreational harvest, possession, and retention of species in the snapper grouper FMU year-round in an area that includes commercial logbook grids 2880, 2980, 3080, and 3180, or 13,900 sq miles of the South Atlantic EEZ. Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ.

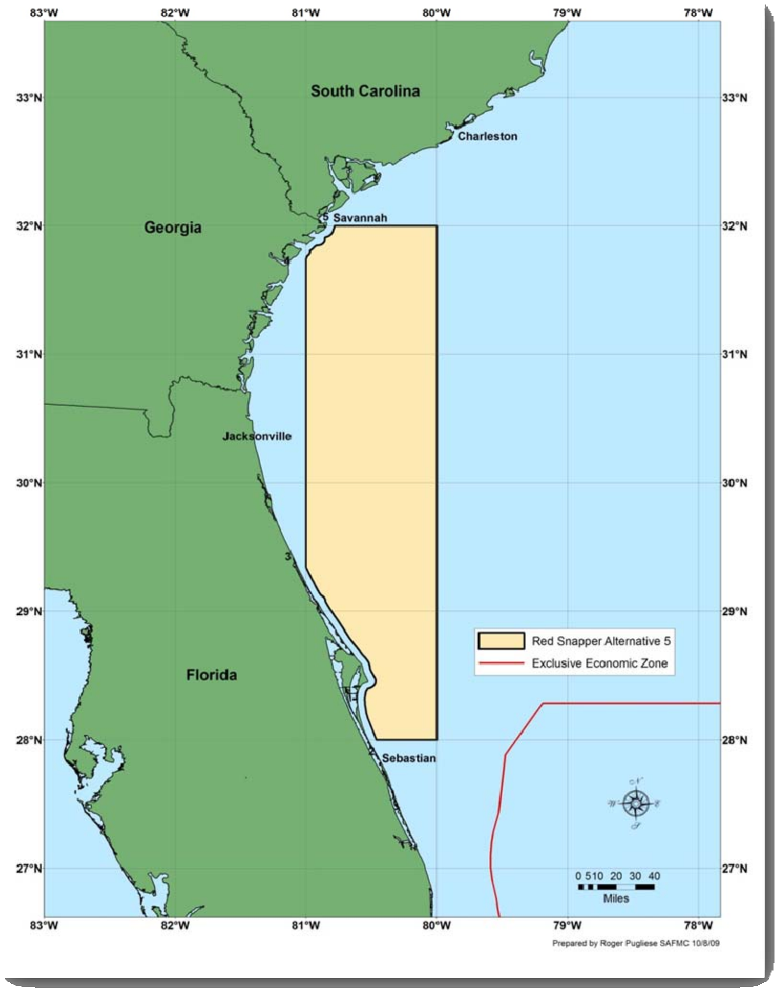

Figure 4-9. Map of proposed closed area under **Alternative 5.**

Alternative 6 . Prohibit commercial and recreational harvest, possession, and retention of species in the snapper grouper FMU year-round in an area that includes commercial logbook grids 2880, 2980, 3080, 3179, 3180, 3278, and 3279, or 26,600 sq miles of the South Atlantic EEZ. Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ.

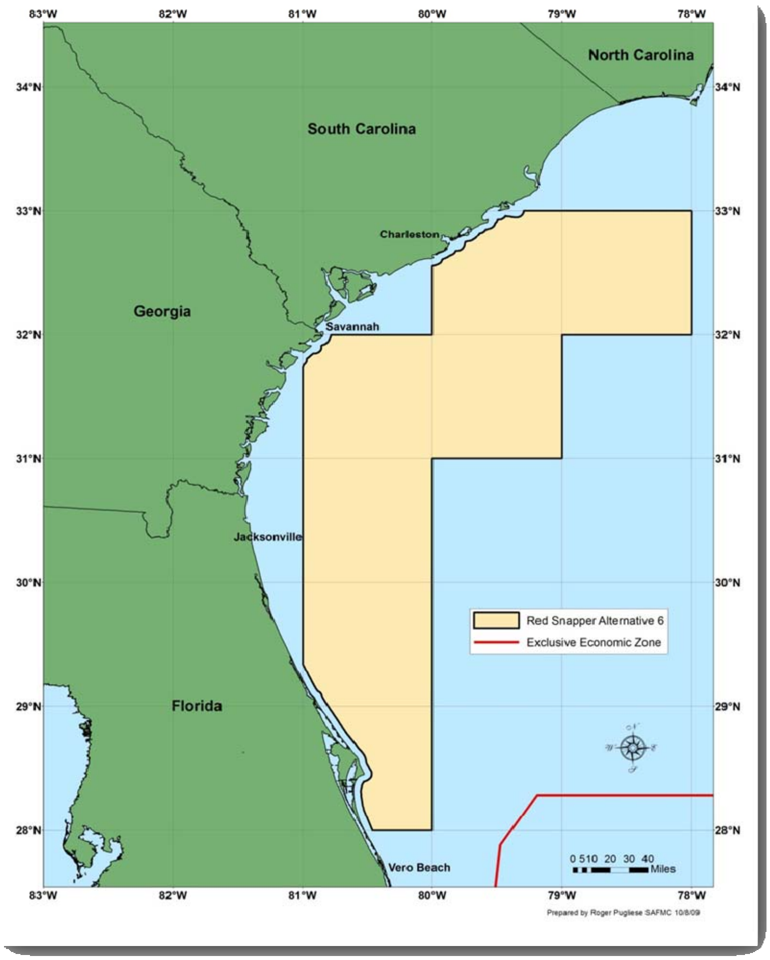

Figure 4-10. Map of proposed closed area under **Alternative 6.**

Note: ***Alternatives 7-11*** *are intended to be considered in conjunction with one or more of* ***Alternatives 2-6***

Alternative 7. Allow harvest, possession, and retention of snapper grouper species (with exception of red snapper) in the closed area if fish were harvested with black sea bass pots with endorsements.

Alternative 8. Allow harvest, possession, and retention of snapper grouper species (with exception of red snapper) with bottom longline gear in the closed area deeper than 50 fathoms as specified in CFR §622.35.

Alternative 9. Allow harvest, possession, and retention of snapper grouper species (with the exception of red snapper) in the closed area if fish were harvested with spearfishing gear.

Allocate a portion of the 79,000 lb ACL as non-directed removals; i.e., bycatch mortality, between the closure area and outside the closure area.

Outside the closure area: Take the poundage allotment for area south of 28 degrees north and north of 33 degrees north (Cape Romain), off the 79,000 lb.

South of 28 degrees (approx. Stuart FL) – 25,048 pounds
North of 33 degrees (Cape Romain SC) – 24,047 pounds
49,095 lb (non-directed removals) comes off the 79,000 ACL.

Closure area: Allocate the remaining poundage (79,000 – 49,095 lbs) as directed removals to the three sectors based on Table 2, Alternative 3; Attachment 30:

28% - commercial 8,373 lbs
29% - for hire 8,672 lbs
43% - recreational 12,859 lbs

(Team to verify numbers and convert to numbers of fish where appropriate)

(Determine number of fish)

<u>Commercial</u>

The red snapper commercial ACL within the zone is 8,373 lbs. Make X number of permits available to those that hold a Federal Snapper Grouper Commercial Permit that would allow the permit holder to fish for species in the Snapper Grouper FMU inside of the limited, designated snapper-grouper bottom fishing zone(s) using circle hooks. Commercial permit holders selected to fish the designated fishing zone would be selected by a lottery system. (Details to be inserted; see GA DNR's rules for administering a lottery system). NMFS-SERO shall issue permits in the initial or any subsequent permit year by lottery devised and operated by the agency. A subset would be selected by the SEFSC to bring in red snapper for biological sampling. If real-time reporting requirements are violated, the permit holder would be subjected to severe sanctions, up to and including permit revocation. Once the real-time monitoring indicates the poundage [i.e., red snapper discards] allocated to the commercial sector has been taken, all permits for that sector are rescinded.

The following tracking and accountability measures would be required for those with a permit to fish in the zone:

- VMS
- Real time electronic catch (directed and non-directed) reporting via electronic logbooks or team alternative real time reporting technology
- Video monitoring <u>or</u> observers (if selected)
- (The Council discussed requiring observers in at least in the first year to validate the video monitoring.)

<u>For-Hire (Headboat and Charterboat)</u>

The red snapper for-hire ACL within the zone is 8,672 lbs. Make X number of permits available to those that hold a Federal Snapper Grouper For-Hire Permit that would allow the permit holder to fish for species in the Snapper Grouper FMU inside of the limited, designated snapper-grouper bottom fishing zone(s) using circle hooks. For-hire permit holders selected to fish the designated fishing zone would be selected by a lottery system. (Details to be inserted; see GA DNR's rules for administering a lottery system). NMFS-SERO shall issue permits in the initial or any subsequent permit year by lottery devised and operated by the agency. A subset would be selected by the SEFSC to bring in red snapper for biological sampling. If real-time reporting requirements are violated, the permit holder would be subjected to severe sanctions, up to and including permit revocation. Once the real-time monitoring indicates the poundage [i.e., red snapper discards] allocated to the for-hire sector has been taken, all permits for that sector are rescinded.

The following tracking and accountability measures would be required for those with a permit to fish in the zone:

- Mandatory species ID training
- VMS
- Real time catch (directed and non-directed) reporting via logbooks??
- Video monitoring or Observers (if selected)
- (The Council discussed requiring observers in at least in the first year to validate the video monitoring.)

<u>Private Recreational</u>

The red snapper private recreational ACL within the zone is 12,859 lbs. Make X number of permits available that would allow the permit holder to fish for species in the Snapper Grouper FMU inside of the limited, designated snapper-grouper bottom fishing zone using circle hooks. Private recreational permit holders selected to fish the designated fishing zone would be selected by a lottery system. (Details to be inserted; see GA DNR's rules for administering a lottery system). NMFS-SERO shall issue permits in the initial or any subsequent permit year by lottery devised and operated by the agency. A subset would be selected by the SEFSC to bring in red snapper for biological sampling. If real-time reporting requirements are violated, the permit holder would be subjected to severe sanctions, up to and including permit revocation. Once the real-time monitoring indicates the poundage [i.e., red snapper discards] allocated to the private recreational sector has been taken, all permits for that sector are rescinded.

The following tracking and accountability measures would be required for those with a permit top fish in the zone:

- Mandatory species ID training
- VMS
- Real time text message reporting of catch (B1s and B2s)
- Video monitoring

Permit Numbers

At the September 2009 Council meeting, NMFS Law Enforcement personnel indicated that they could adequately monitoring, using VMS, 1000 vessels. Under that scenario, the following number of permits would be distributed each year:

28% - commercial	280 boats
29% - for hire X 10 to obtain boat #	290 boats
43% - recreational	430 boats
	1000 boats

These calculations were brought forward by a Council member. It may not be possible to divvy this small number of fish among this many boats. Perhaps you can, if fishermen can really stay off the snapper, as the commercial guys assert that they can.

There was discussion that attrition in the commercial and for hire sectors would be so substantial as to allow everyone remaining to participate, so that a lottery wouldn't be necessary for that sector.

Costs

Applicant to procure the monitoring technology. VMS can be reimbursed; other technology such as video monitoring, electronic logbooks, etc. would be responsibility of the applicant.

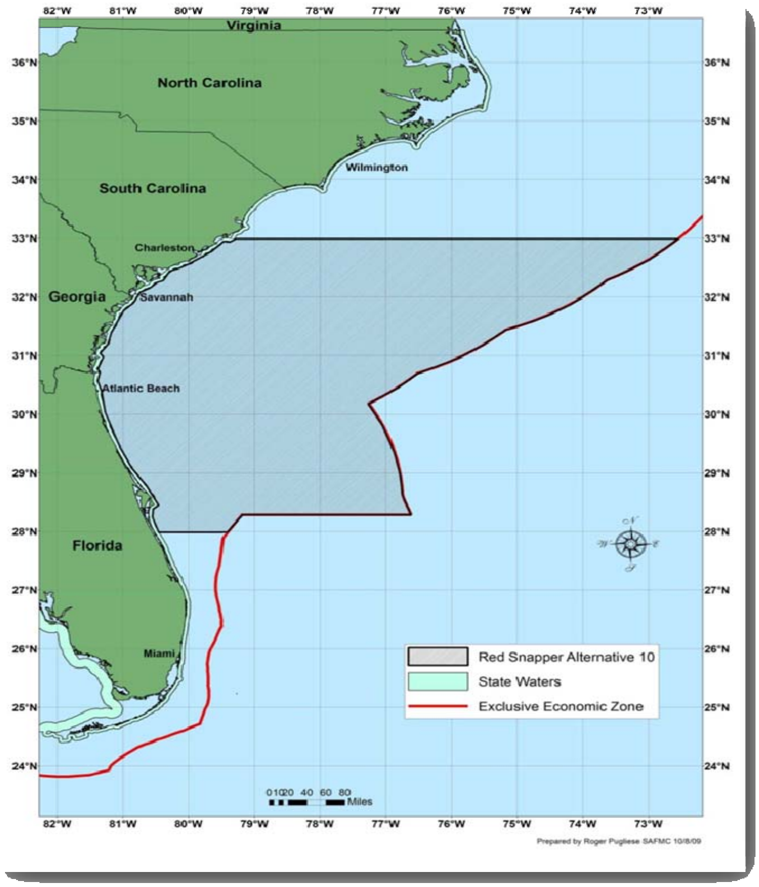

Figure 4-11 Map of proposed lottery program area under **Alternative 10.**

The IPT would like the Council to address the following list of questions regarding Alternative 10 (above).

Lottery related questions:

9) *What will the be the privileges offered to lottery winners in each of the sectors?*
10) *How much would lottery winners be allowed to fish?*
11) *Would lottery permits be issued to vessels or for trips in each of the sectors, would it be the same for each sector?*
12) *What is the duration of the special privileges granted to lottery winners in each sector.*
13) *Would a new lottery be conducted annually? It would seem that commercial and for-hire operations would prefer long-term arrangements for financial stability, whereas shorter*

arrangements might be possible for private recreational fishermen who fish less often and are not using the fishery as a source of income.

14) *Could lotteries be conducted more frequently, i.e., quarterly for the private recreational sector as a means of limiting the hard-to-monitor recreational sector?*
15) *Will the lottery winners be able to sell their permits, or will permits be non-transferable?*
16) *It is reasonable to award the same amount of red snapper to every lottery winner? The "Permit Numbers" section above, assumes that each lottery winning boat would be able to catch approximately 30 lbs of red snapper. However, it might be possible to award a larger number of lottery permits to the private recreational sector, which each permit equating to fewer lbs of red snapper.*

Enforcement related questions:

4) *Is the cost of enforcement worth the benefit of the lottery system?*
5) *In the event VMS is required for the lottery winners, (which is strongly endorsed by OLE), how often will the VMS units need to be switched from old lottery winners to new lottery winner's vessels. Additionally, OLE cannot afford to purchase or reimburse up to 1,000 new lottery winners each cycle.*
6) *The methods of video monitoring would not be adequate or effective in capturing retention or catch-n-release activity on varying types of vessels allowed in this plan because it could not be used for fish identification purposes, which is the proof that is needed to prosecute violations.*

General questions:

1) *Do red snapper have to be discarded? Can there be a requirement to land their red snapper and give them up at the dock for biological sampling? This might entail a requirement to call-in catches of red snapper so that some one would know to collect the fish at the dock or marina.*

Alternative 11. Allow transit through areas closed to snapper grouper harvest.

Sub-alternative 11a. The prohibition on possession does not apply to a person aboard a vessel that is in transit with snapper-grouper species on board and with fishing gear appropriately stowed.

Vessels (both commercial and recreational) may transit through any snapper grouper closed area in the South Atlantic EEZ with snapper grouper species on board if prohibited fishing gear is appropriately stowed and not available for immediate use. Use of spearfishing gear is permitted within South Atlantic snapper grouper closed areas and is not subject to this provision.

The term *"transit"* means: Direct, non-stop progression through any snapper grouper closed area in the South Atlantic EEZ on a constant heading, along a continuous straight line course, while making way by means of a source of power at all times.

The term *"Gear appropriately stowed"* includes but is not limited to: **Terminal gear** (i.e., hook, leader, sinker, flasher, or bait) used with an automatic reel, bandit gear, buoy gear, tolling gear, hand-line, or rod and reel must be disconnected and stowed separately from such fishing gear.

Rod and reel must be removed from the rod holder and stowed securely on or below deck; spearfishing gear must be stowed securely on or below deck; **longline gear** may be left on the drum if all gangions and hooks are disconnected and stowed below deck, hooks cannot be baited, all buoys must be disconnected from the gear; however, buoys may remain on deck; **trawl and try net gear** may remain on deck, but trawl doors must be disconnected from such net and must be secured; **gill nets**, stab nets, or trammel nets must be left on the drum, any additional such nets not attached to the drum must be stowed below deck; and **crustacean traps,** golden crab trap, or sea bass pots cannot be baited, all buoys must be disconnected from the gear; however, buoys may remain on deck. Other methods of stowage authorized in writing by the Regional Administrator, and subsequently published in the *Federal Register* may also be utilized under this definition.

The term *"Not available for immediate use"* means: Gear that is shown to not have been in recent use and that is stowed in conformance with the definitions included under "gear appropriately stowed".

> **Sub-alternative 11b.** The prohibition on possession does not apply to a person aboard a vessel that has snapper grouper species onboard if the vessel is in transit.

Vessels (both commercial and recreational) may transit through any snapper grouper closed area in the South Atlantic EEZ with snapper grouper species.
The term *"transit"* means: Direct, non-stop progression through any snapper grouper closed area in the South Atlantic EEZ on a constant heading, along a continuous straight line course, while making way by means of a source of power at all times.

> **Sub-alternative 11c.** The prohibition on possession does not apply to a person aboard a vessel that has wreckfish onboard if the vessel is in transit.

Vessels (both commercial and recreational) may transit through any snapper grouper closed area in the South Atlantic EEZ with snapper grouper species and/or wreckfish on board.
The term *"transit"* means: Direct, non-stop progression through any snapper grouper closed area in the South Atlantic EEZ on a constant heading, along a continuous straight line course, while making way by means of a source of power at all times.

4.3.1 Biological Effects

To determine the actual environmental effects of the **Alternative 1 (Status Quo)** management alternative on red snapper, one must first examine current trends in harvest levels, stock biomass levels, and life history characteristics, then predict the direction of future trends under status quo management. Expected harvest reductions in total kill of 16.5% (commercial sector), 1.1 to 7.7% (headboat sector), and 2.3% (private/charter sector) stemming from Snapper Grouper Amendment 16 (SAFMC 2008), which among other things, would extend the shallow water grouper spawning season closure as well as create a five month seasonal closure for vermilion snapper, must also be factored into the baseline condition of the fishery in order to obtain the correct percent reduction of removals needed for red snapper. The bulk of landings of red snapper come from the recreational fishery, which have exceeded the landings of the commercial fishery by 2-3 fold in recent years. Total landings were variable, with a downward trend through the 1990s. The recent SEDAR assessment determined the red snapper stock in the South Atlantic is undergoing overfishing and is overfished (SEDAR 15 2008). The Council is considering two proxies for F_{MSY} in Amendment 17A, $F_{30\%SPR}$ and $F_{40\%SPR}$. The ratio of F to the respective proxies for F_{MSY} suggests a generally increasing trend in fishing mortality from the 1950s through the mid-1980s. This indicates that overfishing has been occurring since the early 1970s, with the 2006 estimate of $F/F_{30\%SPR} = 5.39$ and $F/F_{40\%SPR}$ at 7.67 (March 19, 2009 Projection; SEDAR 15 2008).

Recruitment was predicted from spawning biomass using a Beverton–Holt spawner-recruit model. In years when composition data could provide information on year-class strength (1974–2006), estimated recruitment was conditioned on the Beverton–Holt model with autocorrelated residuals. In years prior, recruitment followed the Beverton–Holt model precisely (similar to an age-structured production model). There have been several moderately good year classes in 1983, 1998, 1999, and 2000 (Figure 4-12). Examination of landings data indicate a very large spike in recruitment likely occurred around 2005 or 2006, which resulted in a very large increase in the number of released fish that were presumably less than the 20” TL minimum size limit (Figure 4-12a). The spike in recruitment appears to be responsible for the large increase in recent landings reported by fishermen and recorded in the landings. However, if these fish are caught and killed, then the age/size composition and biomass would not continue to improve over time.

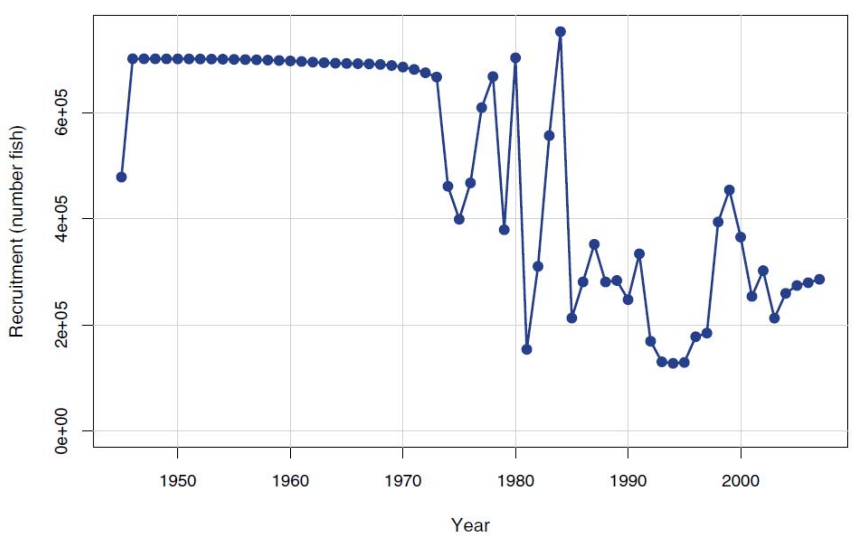

Figure 4-12. Estimated recruitment of age-1 red snapper.
Source: SEDAR 15 2008, Figure 1.23.

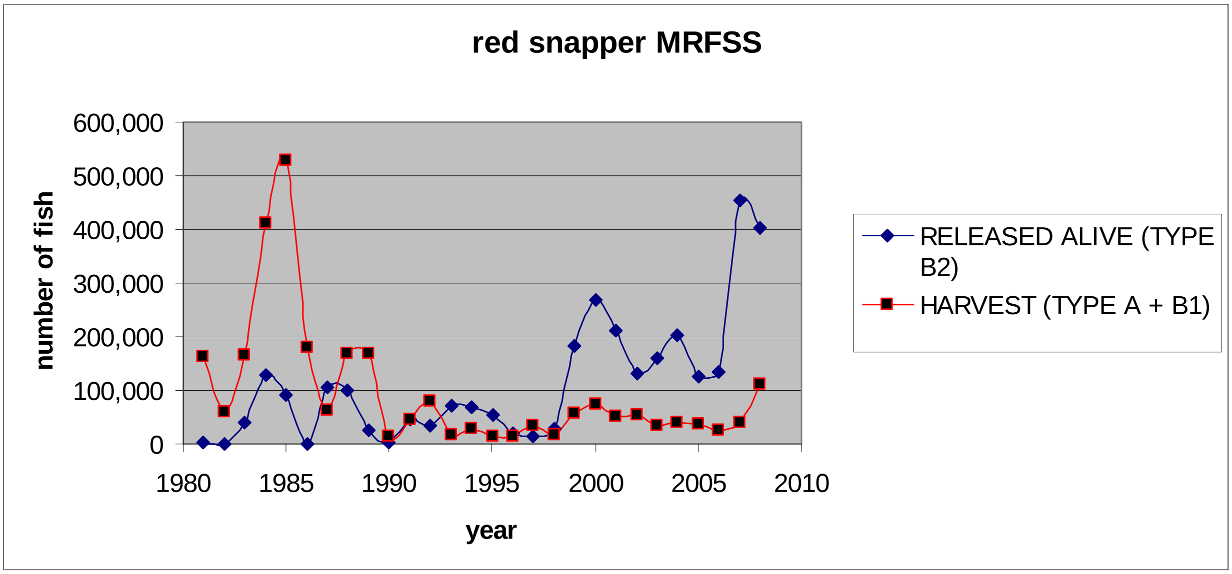

Figure 4-12a. Number of released (B2) and harvested (A+B1) red snapper from MRFSS survey.

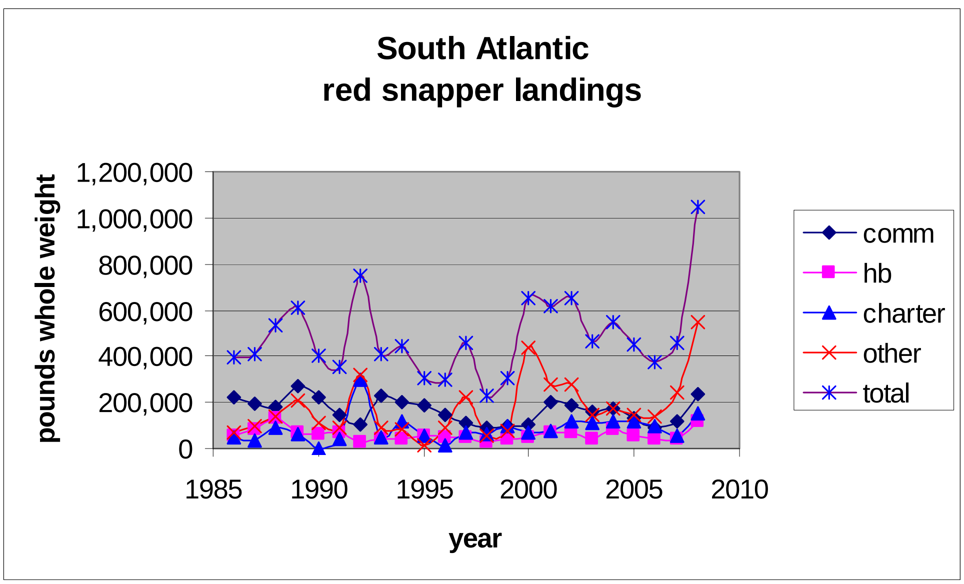

Figure 4-12b. Landed (pounds whole weight) by commercial and recreational sectors.

McInerny (2007) reports a maximum age of 54 years red snapper in the South Atlantic. Natural mortality is estimated to be 0.078 using the Hoenig (1983) method with a maximum age of 53 years (SEDAR 15 2008). Because red snapper are very long-lived and have low natural mortality rates, they are very vulnerable to overfishing. The average age is currently fairly stable between 5 and 8 with an increase in recent years. As shown in Figure 4-13, most of the population is age 10 or younger. This is based on ages from over 7,000 fish. Since red snapper live for at least 54 years, heavy fishing pressure is likely responsible for the truncation in the age structure. Evidence indicates most of the older fish were removed in the 1950s and 1960s and the population has not recovered.

Examination of Table 5.9 from the November 2008 estimation of biomass benchmarks and projections indicates the age structure of the population is truncated as a small percentage of red snapper older than 10 years are being landed. Figure 4-13 demonstrates a larger proportion of red snapper older than age 10 would be expected when the stock is healthy at a $F=F_{40\%}$.

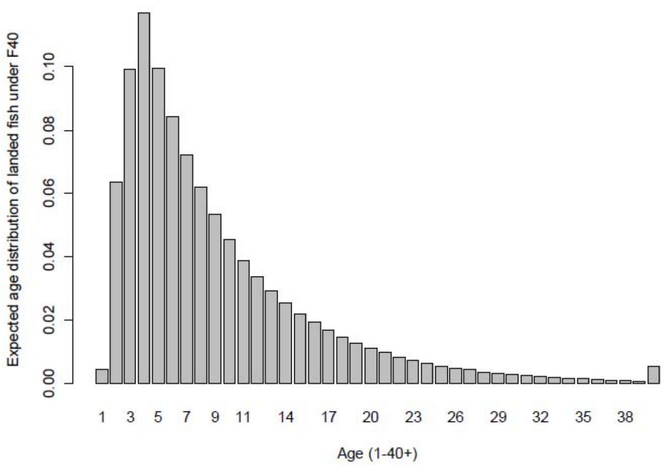

Figure 4-13. equilibrium age distribution of landed red snapper that could be expected when $F=F_{40\%}$. The distribution is conditional on selectivity patterns estimated in the terminal years of the SEDAR 15 (2008)assessment. The oldest age considered in this analysis (age 40) was treated as a plus group (i.e., an accumulator class).
Source: Southeast Fisheries Science Center, September 11, 2009.

Alternative 1 (Status Quo) would retain the current regulations used to manage catches of red snapper. Regulations include a commercial limited access system, a 20" TL commercial and recreational minimum size limit, and a 2 fish recreational bag limit. Minimum size limits are generally used to maximize the yield of each fish recruited to the fishery and to protect a portion of a stock from fishing mortality. The concept behind maximizing yield is to identify the size that best balances the benefits of harvesting fish at larger, more commercially valuable sizes against losses due to natural mortality. Protecting immature and newly mature fish from fishing mortality provides increased opportunities for reproduction and recruitment before becoming vulnerable to fishing gear. If the size limit chosen is larger than the size at first reproduction for the species in question, then a sufficient pool of spawners could be retained even if fishing pressure is heavy.

These types of measures are generally expected to benefit the environment in the short term and long term by limiting the extent to which a stock is targeted. However, the extent to which such benefits are realized depends on the appropriateness of a measure when applied to a specific stock, as well as if, and to what extent, fishing effort changes or shifts in response to the select management measure.

Discard mortality also can limit the amount by which fishing effort and mortality is reduced by limited access systems, trip limits, and minimum size limits, if fishermen catch and discard red snapper when targeting co-occurring species. The snapper grouper ecosystem includes many species, which occupy the same habitat at the same time. For example, red snapper co-occur with vermilion snapper, tomtate, scup, red porgy, white grunt, black sea bass, red grouper, scamp, gag, and others. Therefore, red snapper are likely to be caught and suffer some mortality when regulated since they will be incidentally caught when fishermen target other co-occurring species.

In 1983, the Snapper Grouper Fishery Management Plan established a 12" TL for red snapper to maximize the yield per recruit (SAFMC 1983). Due to concerns of red snapper overfishing, Amendment 4 (SAFMC 1991) increased the size limit of red snapper taken by recreational fishermen from 12" TL to 20" TL. As a result of this increased size limit SEDAR 15 (2008) indicates many more red snapper are being released by the recreational sector than are retained (Tables 4-9 and Figure 4-12a). Since release mortality rates are estimated to be 40% for the recreational sector and 90% for the commercial sector, the increased size limit many not have had the intended effect of enhancing stock status. SEDAR 15 (2008) indicates the large number of discards combined with high release mortality rates is one of the major factors contributing to overfishing of red snapper in the South Atlantic. Furthermore, assessment sensitivity runs indicate overfishing of red snapper would be occurring at lower release mortality rates of 20% for the recreational sector and 70% for the commercial sector.

Table 4-9. MRFFS landings (number A+B1) of red snapper by state, 2005-2008.

Year	FL	GA	SC	NC
2005	30,798	3,059	924	1,158
2006	20,048	3,028	1233	1,766
2007	35,900	1,949	3220	337
2008	98,121	10,750	1212	1,217
total	184,867	18,786	6,589	4,478
percent	86.10%	8.75%	3.07%	2.09%

Table 4-10. MRFSS number of red snapper released alive (B2) among states, 2005-2008.

Year	FL	GA	SC	NC
2005	117,058	3,884	4,797	0
2006	123,175	10,665	333	519
2007	409,593	42,044	1,948	1,820
2008	375,099	18,824	6,383	2,938
total	1,024,925	75,417	13,461	5,277
percent	91.59%	6.74%	1.20%	0.47%

Since the alternatives to status quo management evaluated for red snapper are intended to reduce fishing mortality, they are expected to benefit the biological environment by assisting in restoring stock status and population demographics to more natural conditions. The indirect effects of these alternatives on the ecological environment are less certain. Improving the status of the red snapper stock would likely promote more natural ecological functions. However, competitor, predator, and prey relationships in marine ecosystems are complex and poorly understood.

The snapper grouper ecosystem includes many species that occupy the same habitat at the same time. For example, red snapper co-occur with vermilion snapper, gag, scamp, greater amberjack, gray triggerfish, black sea bass, red grouper, and others (Tables 4-11 to 4-13). Therefore, snapper grouper species are likely to be caught when regulated since they will be incidentally caught when fishermen target other co-occurring species. Management measures implemented through Amendment 16 (SAFMC 2008) are expected to reduce harvest of several of these co-occurring species through seasonal closures, quotas, and bag limit reductions, and will likely reduce, to a small extent, removals of red snapper as an ancillary effect. Although some red snapper harvest reductions may occur as a result of Amendment 16 (SAFMC 2008), those measures would not provide the reductions needed to end overfishing of the stock.

Continued overexploitation of any snapper grouper species may disrupt the natural community structure of the reef ecosystems that support these species. Predator species could be expected to decrease in abundance in response to a decline of an exploited species. Alternatively, predators could target other species as prey items. Conversely, the abundance of those prey and competitor species of the overexploited species that are not targeted in fisheries (e.g., scup and tomtate) could increase in response to a decline in the abundance of a targeted species such as red snapper.

Table 4-11. Species taken on commercial trips when at least 1 pound of red snapper was caught. Based on ALS data from 2003-2007.

COMMON	% by trip	% by wt	cum wt
SNAPPER,VERMILION	66.81%	27.59%	27.59%
GROUPER,GAG	61.11%	13.85%	41.44%
SCAMP	64.70%	8.66%	50.10%
AMBERJACK,GREATER	40.66%	7.21%	57.30%
SNAPPER,RED	100.00%	5.72%	63.02%
TRIGGERFISH,GRAY	54.57%	5.48%	68.50%
GROUPER,RED	53.55%	4.77%	73.28%
JACK,ALMACO	34.73%	4.28%	77.56%
GROUPER,BLACK	10.55%	2.42%	79.98%
GROUPER,SNOWY	17.87%	1.68%	81.66%
SEA BASSE,ATLANTIC,BLACK,UNC	39.57%	1.66%	83.31%
KING MACKEREL	27.76%	1.43%	84.74%
PORGY,RED,UNC	41.53%	1.42%	86.16%

Table 4-12. Species taken on headboat trips when at least 1 red snapper was caught. Based on data from 2003-2007.

Species	% trip	% number	Cum % number
Vermilion Snapper	69.89%	45.02%	45.02%
Black Sea Bass	77.85%	17.23%	62.25%
Tomtate	22.46%	4.82%	67.08%
Gray Triggerfish	65.96%	4.10%	71.18%
Red Porgy	21.67%	3.34%	74.52%
Banded Rudderfish	13.71%	2.77%	77.29%
White Grunt	12.94%	2.75%	80.04%
Red Snapper	100.00%	2.69%	82.73%
Sharpnose Shark	51.91%	2.08%	84.81%
Scamp	29.02%	1.77%	86.58%
Gray Snapper	39.83%	1.53%	88.11%
Bank Sea Bass	11.81%	0.90%	89.01%
Lane Snapper	32.70%	0.79%	89.81%
Whitebone Porgy	25.80%	0.77%	90.58%
Greater Amberjack	25.11%	0.75%	91.32%
Almaco Jack	13.32%	0.73%	92.05%
Spottail Pinfish	5.02%	0.72%	92.77%

Table 4-13. Species taken on MRFSS trips when at least 1 red snapper was caught. Based on data from 2003-2007.

Species	% trip	% number	Cum % number
Vermilion snapper	29.48%	31.28%	31.28%
Black sea bass	43.62%	25.09%	56.36%
Red snapper	100.00%	6.10%	62.46%
Gray triggerfish	20.34%	5.56%	68.02%
Tomtate	21.03%	3.24%	71.27%
White grunt	5.17%	2.25%	73.52%
Gag	16.81%	1.89%	75.42%
Greater amberjack	10.52%	1.74%	77.16%
Atlantic sharpnose shark	19.05%	1.73%	78.88%
Red porgy	8.88%	1.71%	80.59%
King mackerel	8.36%	1.61%	82.20%
Scamp	8.97%	1.36%	83.57%
Round scad	1.90%	1.35%	84.92%
Gray snapper	5.26%	1.29%	86.20%
Spanish sardine	0.69%	1.04%	87.24%
Dolphin	5.26%	0.87%	88.12%
Scaled sardine	0.69%	0.87%	88.99%

Species	% trip	% number	Cum % number
Lane snapper	5.69%	0.76%	89.75%
Spottail pinfish	3.53%	0.72%	90.47%
Almaco jack	3.45%	0.71%	91.18%
Herring family	0.52%	0.67%	91.86%
Banded rudderfish	1.64%	0.63%	92.49%
Gulf flounder	1.29%	0.55%	93.04%
Red grouper	5.52%	0.47%	93.51%

Table 4-14. Percentage of red snapper (commercial) landed by month in FL, GA, SC, and NC during 2003-2007 (lbs gutted weight) by state and month.

Month	Total	FL &GA	SC	NC
1	8.61%	8.13%	11.02%	6.57%
2	8.10%	8.71%	6.71%	5.84%
3	9.39%	9.86%	7.75%	9.29%
4	9.40%	9.30%	9.56%	9.96%
5	10.78%	10.52%	10.46%	14.40%
6	12.59%	13.55%	9.45%	11.78%
7	8.46%	8.05%	9.32%	10.19%
8	6.13%	5.88%	6.20%	8.66%
9	4.49%	4.84%	3.57%	3.58%
10	6.90%	6.03%	9.44%	8.66%
11	8.12%	7.38%	11.29%	6.49%
12	7.02%	7.76%	5.22%	4.58%

Table 4-15. Average red snapper headboat landings 2003-2007 (percentage) by state and month.

Month	Total	South FL	GA - NFL	SC	NC
1	3.64%	4.61%	4.76%	0.00%	1.07%
2	5.59%	37.81%	5.53%	0.00%	0.32%
3	8.59%	23.42%	9.36%	4.46%	2.03%
4	11.07%	3.26%	11.49%	14.52%	2.58%
5	13.73%	9.77%	12.21%	24.05%	4.59%
6	9.60%	3.27%	9.59%	12.84%	5.22%
7	8.93%	4.05%	8.97%	11.83%	3.98%
8	8.02%	2.21%	6.88%	16.03%	2.30%
9	4.54%	2.26%	4.26%	4.77%	8.18%
10	10.86%	3.60%	11.31%	6.01%	23.68%
11	7.42%	1.23%	8.94%	4.82%	2.61%
12	8.02%	4.50%	6.68%	0.68%	43.43%

Table 4-16. Average red snapper MRFSS landings 2003-2007 (A+B1 Number, percent) by state and month.

Wave	Total	FL	GA	SC	NC
1	9.37%	10.84%	0.00%	0.00%	0.00%
2	18.25%	19.37%	8.09%	15.73%	15.73%
3	26.99%	25.22%	38.98%	37.09%	37.09%
4	12.11%	11.94%	14.93%	10.52%	10.52%
5	16.95%	15.25%	28.55%	26.53%	26.53%
6	16.34%	17.38%	9.45%	10.13%	10.13%

A report has been produced that estimates the effect of actions proposed in **Alternatives 2-6** in reducing the total removals of red snapper (SERO-LAPP-2009-07). Ten scenarios in this report consider the effect of management measures established in Amendment 13C and Amendment 16 as well as the effects of modifying release mortality. Methodologies for predicting outcomes from **Alternatives 2-9** are fully described for each of the commercial, recreational private/charter, and headboat sectors in previous reports (SERO 2009a-d). Cumulative impacts are addressed in SERO-LAPP-2009-07. For the alternatives proposed, predicted outcomes are considered either within or without the context of indirect red snapper harvest reductions due to Amendment 13C (commercial sector only) and Amendment 16 (commercial, recreational private/charter, and headboat sectors). It should be noted that reductions in MRFSS and headboat removals for **Alternatives 3** and **4** are assumed equivalent to projections for **Alternatives 5** and **6**, respectively. The depth-specific catch information necessary to evaluate **Alternatives 3** and **4** was largely unavailable in MRFSS and headboat data.

Mortality of discarded red snapper has been estimated at 40% for the recreational fishery and at 90% for the commercial fishery (SEDAR 15 2008). A significant component of this difference in discard mortality rate between recreational and commercial fisheries results from commercial fishermen generally fishing in deeper water, although longer handling time (longer surface interval) in the commercial fishery can also increase discard mortality rate. According to SEDAR 15 2008, commercial fishermen have been observed to hold fish on deck until fishing at a site has ceased. After fishing activity has slackened, fishermen measure and release undersized fish. The prevalence of this practice in the commercial fishery is unknown, but higher mortality due to handling time (Koenig 2001 as cited in SEDAR7-RW) and the effect of hooking may explain the high mortality (94% of 31 red snapper released) observed in a study of the discards of one commercial fisherman from the Atlantic coast (SEDAR15-RD07). During the SEDAR process, the decision was made to recommend the use of slightly higher point estimates of discard mortality in the commercial and recreational sectors (relative to those in SEDAR 7 for Gulf red snapper) because depth data indicate that fishing occurs at greater depths for red snapper in the Atlantic versus Gulf of Mexico. Burns et al. (2004) studied the effect of depth on discard mortality using barometric chambers. Mortality due to barotrauma was not observed at depths of <20, 25, and 30 m. Mortality increased to 40% at 45 m and 45% at 60 m. Burns et al. (2002) determined that release mortality of red snapper was related to depth with a 50% release mortality occurring at 48.6 m (159 feet). These values were similar to those in other studies

(Gitschlag and Renaud 1994; Koenig 2001). Diamond and Campbell (2009) state estimates of release mortality based on the ability of fish to submerge after discarding may underestimate total discard mortality because delayed mortality is overlooked. For red snapper, Diamond and Campbell (2009) indicated delayed mortality of red snapper was greater than 60% at depths ranging from 30 to 50 m (98 to 164 feet).

Given what is known of the distribution of the red snapper stock, it is reasonable to assume that little additional increase in removals would result from commercial fishermen moving into deeper water (thereby potentially increasing discard mortality to levels greater than 90%). However, some closure alternatives may result in commercial and recreational fishermen moving into shallower water to fish, potentially decreasing discard mortality rates. Thus, various scenarios that include a substantial reduction (from 90% to 40%) in commercial discard mortality, a moderate reduction (from 90% to 65%) in commercial discard mortality, and a relatively small reduction (from 40% to 30%) in recreational discard mortality are also modeled in analysis of the alternatives to evaluate the sensitivity of red snapper reductions to changes in discard mortality rates.

Alternative 2 would prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ. The prohibition of red snapper harvest in **Alternatives 2-6** would remain in effect beyond 2009 until modified. Fishing mortality in 2007 (F_{CURR}) is estimated as 0.797. The proxies for F_{MSY} being considered by the Council are estimated as 0.148 and 0.104 for $F_{30\%SPR}$ and $F_{40\%SPR}$, respectively. Comparing the expected total kill in 2009 to the estimated landings in 2010 indicates an 83% reduction in total kill is needed to end overfishing when $F_{40\%SPR}$ with very high recruitment is used as a proxy for F_{MSY}. However, projections from the assessment indicate a total prohibition on harvest, possession, and retention of red snapper would not rebuild the stock because it is most often incidentally caught when targeting co-occurring species, and has a very high release mortality rate. In order to end overfishing of the stock, action must be taken to also restrict harvest of those co-occurring species.

Analyses suggest that without additional regulations, this closure would be inadequate to achieve the level of reduction necessary to end overfishing of red snapper. This is due to the high rate of encounter with red snapper during other snapper grouper fishing operations as well as the high release mortality of red snapper. Depending on the assumptions, prohibiting all harvest of red snapper under **Alternative 2**, could provide between a 39 to 61% reduction in total removals Tables 4-17 and 4-18. To achieve an 83% reduction, the interaction rate of South Atlantic fisheries with red snapper must be reduced through the closure of specific areas to harvest of all members of the snapper grouper fishery management unit (FMU), in addition to a general closure of the red snapper fishery.

Table 4-17. Cumulative effects of Amendment 17A management alternatives on removals of red snapper in the south Atlantic region.

Alternative	Total Removals (lbs)				% reduction
	Commercial	Headboat	MRFSS	All modes	

Status quo	130,810	73,387	398,658	602,855	0%
Alt 2	120,031	45,870	202,129	368,030	39%
Alt 3**	65,294	15,777	44,287	125,359	79%
Alt 4***	44,861	11,500	38,999	95,360	84%
Alt 5	60,453	15,777	44,287	120,518	80%
Alt 6	34,798	11,500	38,999	85,298	86%

* Scenario 1B: Incorporates effects of Amendments 13C and 16 does not eliminate trips; constant 40% recreational release mortality rate and 90% commercial release mortality rate (SERO-LAPP-2009-07).
** MRFSS and headboat data same as Alt 5.
*** MRFSS and headboat data same as Alt 6.

Table 4-18. Cumulative effects of Amendment 13C (commercial only), Amendment 16, and Amendment 17A management alternatives on cumulative removals of red snapper in the south Atlantic region.

Alternative	**Total Removals (lbs)**				**% reduction**
	Commercial	**Headboat**	**MRFSS**	**All modes**	
Status quo	117,997	73,387	398,658	590,042	0%
Alt 2	26,213	19,387	187,063	232,663	61%
Alt 3*	19,864	12,013	41,536	73,413	88%
Alt 4**	15,360	9,286	36,472	61,118	90%
Alt 5	17,853	12,013	41,536	71,402	88%
Alt 6	10,889	9,286	36,472	56,647	90%

*Incorporates effects of Amendments 13C and 16 by eliminating trips; 40% release mortality rate for all sectors (SERO-LAPP-2009-07).
** MRFSS and headboat data same as Alt 5.
*** MRFSS and headboat data same as Alt 6.

Alternative 3 prescribes, in addition to a closure of the red snapper fishery, a closure of four logbook grids (2880, 2980, 3080, 3180), or 8,100 sq miles of the EEZ, between depths of 98 feet (16 fathoms; 30 m) and 240 feet (40 fathoms, 73m) to harvest, possession, and retention of all species in the snapper grouper FMU (Figure 4-7). Due to the lack of depth information in the MRFSS and headboat datasets, **Alternative 3** is assumed to have the same impacts upon recreational and headboat fisheries as **Alternative 5**. Under **Alternative 3**, the estimated reduction in total removals is estimated to range from 79%, which assumes the SEDAR 15 (2008) 90% release mortality rate for the commercial fishery to 88% reduction in total removals, which assumes a 40% discard mortality (SERO-LAPP-2009-07). A pre-implementation discard mortality rate of 40% for the commercial fishery is not consistent with the most recent SEDAR estimate (SEDAR 15, 2008), but a post-implementation decrease in discard mortality may be a reasonable assumption. This is because **Alternative 3** requires the closure of waters between 98 and 240 feet within four logbook grids. It can be reasonably expected that in response to this closure some fishing effort will shift to waters shallower than 98 feet. Furthermore, Amendment 17B proposes a closure for all deepwater species (except golden tilefish), which may reduce fishing effort in deeper water.

Although a variety of factors contribute to discard mortality (e.g., fishing depth, surface interval, hook location, predation, water temperature), depth of capture is an important consideration

(GMFMC 2007). If the recreational and commercial fisheries move shoreward, a decrease in discard mortality can be expected in those areas where effort shifts.

Alternative 5 prescribes a general closure of the red snapper fishery, or 13,900 sq miles of the South Atlantic EEZ, and a complete closure of the four logbook grids partially closed in **Alternative 3** (Figure 4-7). Various analysis scenarios for **Alternative 5** are generally the same as for **Alternative 3**. Under **Alternative 5**, the estimated reduction in total removals is estimated to range from 80%, which assumes the SEDAR 15 (2008) 90% release mortality rate for the commercial fishery to 88% reduction in total removals, which assumes a 40% discard mortality (SERO-LAPP-2009-07).

Alternative 4 requires, in addition to a closure of the red snapper fishery, the year-round closure of seven logbook grids (2880, 2980, 3080, 3179, 3180, 3278, 3279) or 12,300 sq miles of the South Atlantic EEZ, between depths of 98 and 240 feet to the harvest of all members of the snapper/grouper FMU. Under this regulatory option, assuming **Alternative 4** has the same impacts upon recreational and headboat fisheries as **Alternative 6**, the reduction in total kill in the different scenarios examined in SERO-LAPP-2009-07 would range from 84% to 90%.

The reduction in total removals from the scenarios examined for **Alternative 6** range from 86% to 90%. This alternative would establish the year-round closure of seven logbook grids (2880, 2980, 3080, 3179, 3180, 3278, 3279), or 26,600 sq miles of the EEZ, and therefore includes the most extensive closure of harvest areas. As a result, it is the least sensitive to discard mortality rates or to the potential contributions from Amendments 13C and 16. In fact, all but three of the scenarios considered for this alternative achieve a harvest reduction of at least 89%.

The analysis provided in SERO-LAPP-2009-07 considered scenarios with changes in release morality. Some level of effort shifting into shallower water, for both the recreational and commercial fisheries, can be expected following implementation of areal closures. This shift in harvest effort should result in reduced discard mortality. This is because a substantial component of the mortality experienced by red snapper following capture and release is due to barotrauma (Campbell 2008; Diamond and Campbell 2009) and is therefore directly related to depth of capture (Burns et al. 2002; Burns et al. 2004, Rummer 2007). Rummer (2007) estimates that discard mortality may be as low as 20% if the fish is caught in waters < 20 m. If red snapper fishing activity does move closer to shore (particularly into areas 2981, 3081, and 3181) as areas farther offshore are closed (Figure 4-7), then reductions in depth-related discard mortality should be realized.

It is difficult to predict exactly what those reductions will be, both because the level and pattern of effort shifting is unknown and because higher discard mortality rates will continue to be experienced in areas of the south Atlantic where areal closures are not implemented. **Alternatives 3** and **5** include a combination of area and depth defined closures. Depth information was not available for the recreational fishery for this analysis, but some depth information from commercial logbook records was available to evaluate red snapper reductions. For all scenarios considered in SERO-LAPP-2009-07, MRFSS and headboat reductions in removals associated with **Alternatives 3** and **4** were assumed to be the same as MRFSS and headboat reductions associated with **Alternatives 5** and **6**, respectively. However, this likely overestimates the actual reductions that would result from **Alternatives 3** and **4**, since these alternatives would close a smaller area to all snapper-grouper fishing relative to **Alternatives 5** and **6**.

Analyses of fishery independent MARMAP data may provide insight into the spatial distribution of the red snapper stock to help quantify the relative level of difference between **Alternative 3** and **5**, and **Alternative 4** and **6**, in context of the percent of the overall red snapper stock in the closed cells (e.g. **Alternatives 5** and **6**) also contained within the depths closed by **Alternatives 3** and **4**.

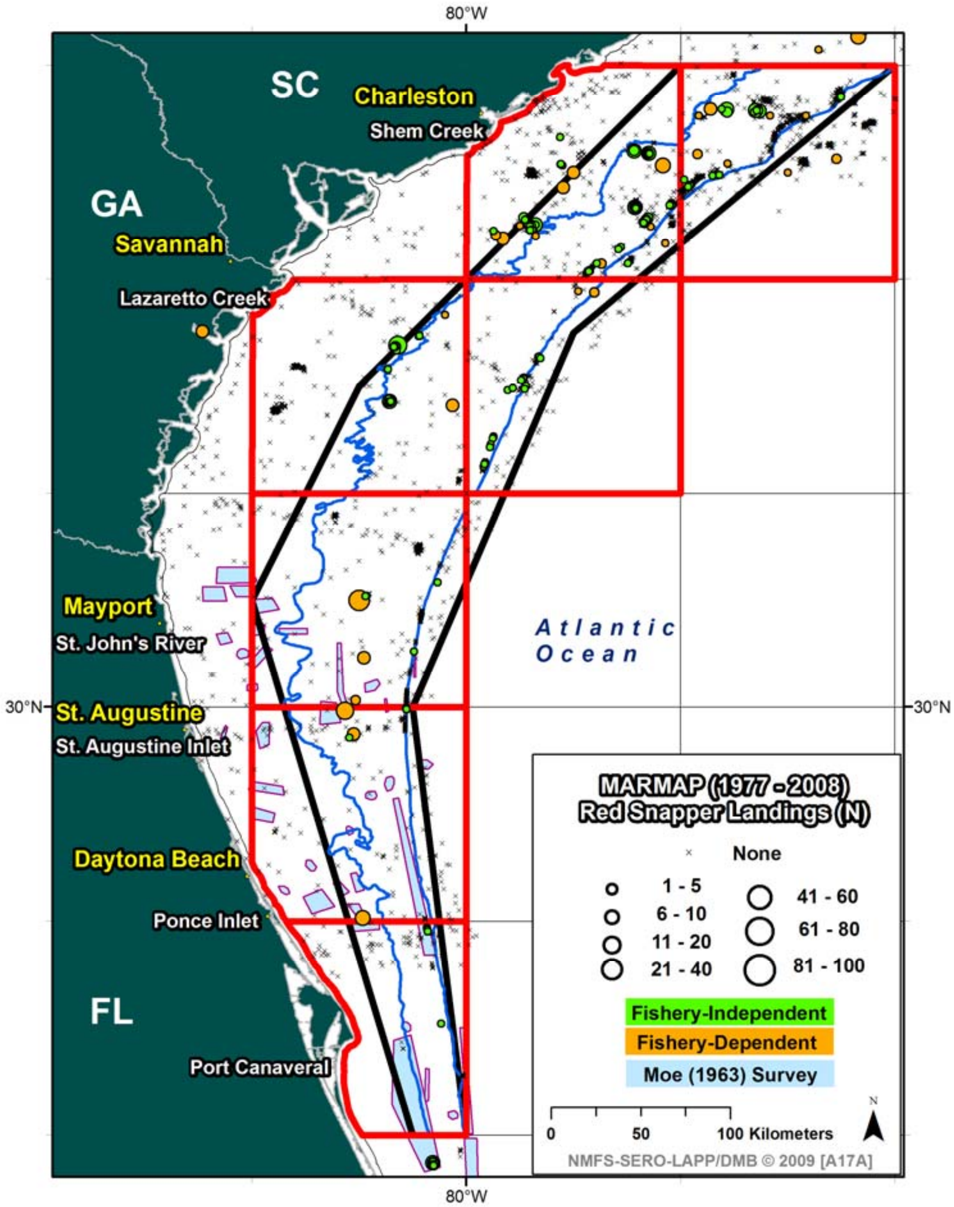

Figure 4-14 Distribution of red snapper taken by MARMAP in fishery-independent and fishery-dependent samples.

As with most statistical analyses, assumptions can limit the applicability of results and conclusions. Assumptions in SERO-LAPP-2009-07 analysis included: 1) discards occur in same proportion as landings; 2) no effort shifting from closed areas occurs; 3) there will be 100% compliance with closed area restrictions; 4) release mortality rate remains unchanged when areas are closed unless otherwise noted; and 5) headboat landings are reasonable spatial proxies for private and charter boat landings. If discards do not occur proportionally to landings, the overall reductions generated by spatial closures in **Alternatives 3-6** would be different than presented herein. If fishermen relocate their effort to open areas rather than eliminating trips, reductions would be less than presented herein. If fishermen go out of business due to the stringency of proposed regulations, overall reductions might be greater than those presented herein. If compliance is less than 100% or effort shifting occurs, then reductions estimated in this report would be less optimistic. Similarly, if release mortality is lower than estimated by SEDAR 15 (2009), then reductions would be greater. Higher release mortality rates would result in lower reductions in overall removals.

Alternative 7 would allow harvest, possession, and retention of snapper-grouper species (with the exception of red snapper), if the fish are caught with black sea bass pots, in any of the proposed closed areas outlined in **Alternatives 2-6**. Table 4-14 illustrates that most red snapper are harvested from waters off Georgia and Florida. Federal waters off of Georgia and northern Florida are also the approximate locations of proposed snapper-grouper area closures in **Alternatives 3-6**. If black sea bass pots are allowed within a proposed closed area, red snapper bycatch would be more probable than if sea bass trap deployment was limited to locations outside of the closed area where red snapper do not occur as frequently. However, commercial trips with black sea bass pots are likely to produce a lower number of red snapper dead discards compared to recreational trips targeting black sea bass because of the difference in selectivity of the gear types used. The recreational fishery for black sea bass is authorized to use hook and line, spear guns, and powerheads, all of which, except for spear guns, are relatively non-selective. The commercial fishery for black sea bass is authorized to use specialized sea bass pots, which must meet certain design standards in order to be legally deployed. Under **Alternative 7**, black sea bass pots would be the only allowable gear that could be used to target snapper-grouper species within the proposed closed areas. Black sea bass pots are considered highly selective for black sea bass, and would be able to be deployed within any one of the proposed closed areas in **Alternatives 2-6** without affecting the harvest reductions needed to end overfishing of red snapper. Table 4-19 reveals that on trips that fished black sea bass pots, black sea bass made up over 90% of the catch by weight. Red snapper are rarely taken in black sea bass pots (0.22% of trips) and represent less than 0.01% of the catch by weight. Allowing commercial harvest of black sea bass using sea bass pots could alleviate, to some degree, negative socioeconomic effects caused by area closure in the black sea bass fishery without impeding efforts to end overfishing of red snapper.

Table 4-19 Snapper grouper species caught on commercial trips during 2003-2008 when at least one pound of black sea bass was caught using black sea bass pots.

COMMON	% Trip	% Wt
SEA BASSE,ATLANTIC,BLACK,UNC	100.00%	91.17%
PINFISH,SPOTTAIL	26.16%	1.42%
OCTOPUS	25.23%	0.78%
GRUNT,WHITE	23.68%	2.39%
TRIGGERFISH,GRAY	22.47%	0.97%
GRUNTS	14.80%	1.32%
EEL,CONGER	6.15%	0.14%
EELS,UNC	5.02%	0.16%
SNAPPER,VERMILION	4.33%	0.17%
PORGY,RED,UNC	3.17%	0.08%

COMMON	% Trip	% Wt
HAKE,ATLANTIC,RED & WHITE	2.93%	0.04%
PIGFISH	2.66%	0.06%
TRIGGERFISH,OCEAN	2.34%	0.07%
TILEFISH,BLUELINE	2.07%	0.55%
PORGY,KNOBBED	1.25%	0.03%
SEA BASS,ROCK	1.25%	0.05%
PORGY,WHITEBONE	1.08%	0.05%
GRUNT,BLUESTRIPED	1.03%	0.04%
GROUPER,RED	0.89%	0.04%
PORGY,JOLTHEAD	0.81%	0.04%
GROUPER,GAG	0.71%	0.02%
48 other species	8.38%	0.39%
SNAPPER,RED	0.22%	<0.01%

The proposed snapper-grouper area closures could potentially lead to some effort shift into the black sea bass fishery. Currently, Amendment 18 to the Fishery Management Plan for the Snapper-Grouper Fishery of the South Atlantic Region contains an action to control fishing effort in the black sea bass fishery in anticipation of effort shifts that may occur as a result of this and other amendments, which will or have already implemented more restrictive management measures. Therefore, any effort shift to the black sea bass fishery that may occur as a result of Amendment 17A may be mitigated by future effort control actions, and thus prevent any long-term negative biological impacts on black sea bass. Furthermore, overfishing of black sea bass due to effort shift is not likely because commercial harvest of black sea bass is controlled by a quota.

Alternative 8 would allow the harvest of golden tilefish and other deepwater snapper-grouper species with bottom longline within the snapper-grouper area closures proposed in **Alternatives 2-6**. Golden tilefish are usually caught over mud habitat in depths of 180 m to 300 m, (Low *et al.* 1983; Able *et al.* 1993), with depths of ~200 m being most common (Dooley 1978). In contrast, red snapper adults usually occur over rocky bottoms, and juveniles inhabit shallow waters and are common over sandy or muddy bottom habitat (Allen 1985). The difference in preferred habitat of golden tilefish and red snapper would allow for the deployment of bottom longline gear without negatively affecting rebuilding efforts for red snapper. As is the case in allowing black sea bass pot deployment within the closed areas, if chosen as a preferred, allowing the use of bottom longline gear may also help to mitigate some of the negative socioecomic impact expected as a result of an area closure. Table 4-20 reveals that on trips that fished bottom longline gear, golden tilefish made up over 64% of the catch by weight. Red snapper are rarely taken bottom longline (0.35% of trips) and represent 0.01% of the catch by weight. Additionally, any effort shift toward the golden tilefish fishery with bottom longline gear may be mitigated by an action currently being proposed in Amendment 18 to limit golden tilefish fishing effort. Furthermore, overfishing of golden tilefish due to effort shift is not likely because commercial harvest of golden tilefish is controlled by a quota.

Table 4-20. Snapper grouper species caught on commercial trips during 2003-2008 when at least one pound of golden tilefish was caught using bottom longline.

COMMON	% Trip	% Wt
TILEFISH	100.00%	64.06%
GROUPER,SNOWY	38.03%	9.54%
BLACK BELLIED ROSEFISH	19.10%	8.12%
SHARK,SANDBAR	8.54%	5.07%
TILEFISH,BLUELINE	25.79%	4.51%
GROUPER,YELLOWEDGE	21.83%	2.40%
SHARK,HAMMERHEAD	4.75%	0.91%
DOLPHINFISH	15.40%	0.86%
HAKE,ATLANTIC,RED & WHITE	14.61%	0.53%
SHARK,BLACKTIP	2.46%	0.49%
GROUPER,RED	1.50%	0.47%
AMBERJACK,GREATER	3.26%	0.33%
SHARK,ATLANTIC SHARPNOSE	2.64%	0.29%
GROUPER,BLACK	1.23%	0.27%
SHARK,SILKY	2.02%	0.23%
HIND,SPECKLED	1.67%	0.21%
EELS,UNC	11.80%	0.18%
SNAPPER,MUTTON	1.23%	0.14%
AMBERJACK,LESSER	4.05%	0.13%
SCORPIONFISH-THORNYHEADS	6.25%	0.12%
SHARK,BULL	0.97%	0.11%
SHARK,TIGER	1.41%	0.11%
SHARK,GREAT HAMMERHEAD	0.35%	0.10%
SCAMP	1.32%	0.09%
FINFISHES,UNC FOR FOOD	3.61%	0.07%
SNAPPER,QUEEN	1.41%	0.06%
COD,ATLANTIC,UNC	0.44%	0.06%
TRIGGERFISH,GRAY	0.53%	0.06%
SNAPPER,SILK	1.23%	0.06%
EEL,CONGER	1.76%	0.06%
SHARK,LEMON	0.26%	0.05%
SHARK,FINETOOTH	0.44%	0.04%
SHARK,UNC,FINS	1.32%	0.03%
SHARK,MAKO UNC	0.70%	0.03%
COBIA	1.06%	0.02%
GROUPER,WARSAW	0.35%	0.02%
GROUPER,YELLOWFIN	0.35%	0.02%
AMBERJACK	0.09%	0.01%
WAHOO	0.88%	0.01%
GROUPER,GAG	0.35%	0.01%
SHARK,BLACKNOSE	0.70%	0.01%
SNAPPER,RED	0.35%	0.01%
31 Other species	8.19%	0.09%

Alternative 9 would allow the harvest of snapper-grouper species, other than red snapper, within a proposed closed area using spearfishing gear. Because of it selectivity as a gear type, spear guns would be the least likely of all fishing gear to produce red snapper bycatch. Allowing the use of spear guns may also help to offset, to a small degree, some of the negative socioeconomic impacts expected from large area closures. Some concern has been raised regarding the potential for a massive effort shift to spearfishing in a proposed closed area, and the possible impacts on other species and socioeconomic environment that shift might cause. From a biological perspective, spear guns are the most selective gear type available if the user is well-versed in species identification. Allowing the use of spear guns within an area closed to snapper grouper fishing would not impede efforts to rebuild the red snapper fishery, and would not be likely to adversely affect other snapper-grouper species in the fishery management unit.

Alternative 10 fill in analysis here:

Alternative 1 (Status Quo) will perpetuate the existing level of risk for interactions between ESA-listed species and the fishery. **Alternatives 2-11** and the associated sub-alternatives are unlikely to have adverse effects on ESA-listed species, including *Acropora* species. Previous ESA consultations determined the snapper grouper fishery was not likely to adversely affect these species (See **Section 3.5**). These alternatives are unlikely to alter fishing behavior in a way that would cause new adverse effects to *Acropora species.* The impacts from **Alternatives 2-11** and the associated sub-alternatives on sea turtles and smalltooth sawfish are unclear. If they perpetuate the existing amount of fishing effort, but cause effort redistribution, any potential effort shift is unlikely to change the level of interaction between sea turtles and smalltooth sawfish and the fishery as a whole. If these alternatives reduce the overall amount of fishing effort in the fishery, the risk of interaction between sea turtles and smalltooth sawfish will likely decrease.

4.3.2 Economic Effects

Commercial Fishery

A simulation model was used to predict the effects of Snapper Grouper Amendments 13C, 15A and 16 on commercial fishing activity for the 2005-2007 study period. **Appendix E** outlines, in detail, the methodology used in the simulation model and is hereby incorporated by reference.

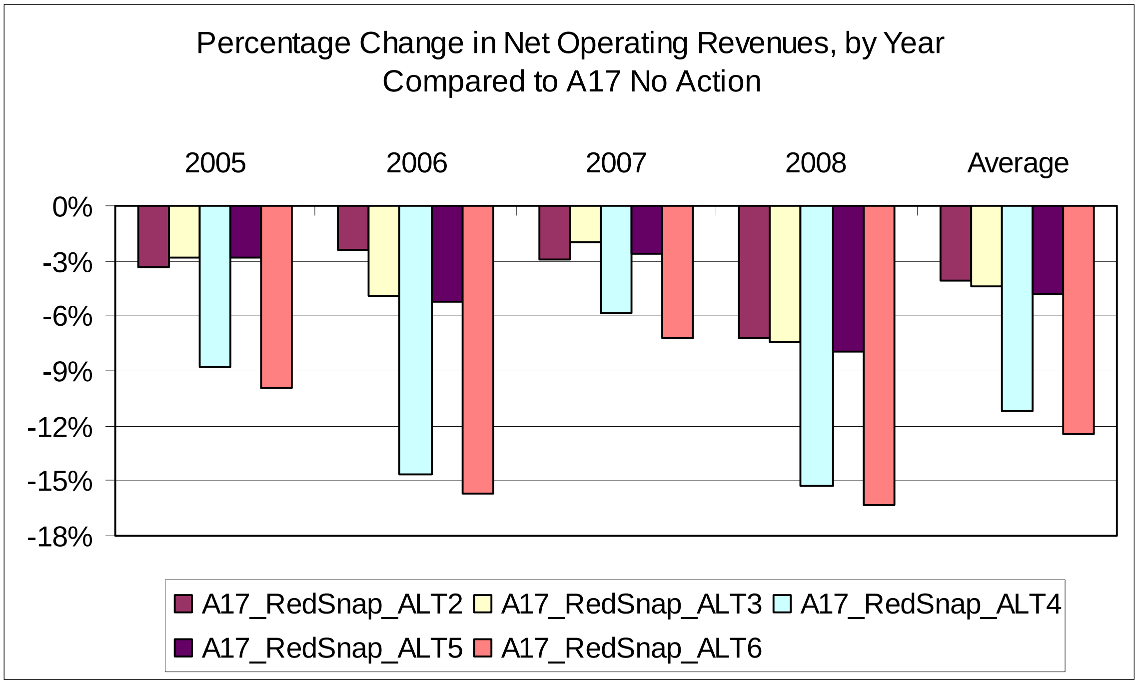

Figure 4-15 Predicted percentage changes in net operating revenues compared to the No Action alternative for Amendment 17A.

Alternative 2 is the least restrictive alternative because it would prohibit the harvest of red snapper only, and is expected to reduce net operating revenues for commercial fishermen by an average of approximately 4 percent per year (Figure 4-15). For individual years of data used in the analysis, the expected losses in net operating revenues associated with **Alternative 2** ranged from 2.4 percent for 2006 to 7.3 percent for 2008. The expected losses are relatively small because red snapper is not a high-volume species in the commercial snapper-grouper fishery.

Alternatives 3 and **4** would prohibit the harvest of all species in the snapper-grouper management unit between 98 and 240 foot water depths in specific geographic locations. **Alternative 3** would prohibit harvests of snapper-grouper species off northeast Florida and Georgia, while **Alternative 4** would prohibit harvests off portions of South Carolina in addition to northeast Florida and Georgia. Therefore, **Alternative 4** is expected to generate greater losses for the commercial fishery than **Alternative 3** because it encompasses a broader range of restricted waters. **Alternative 3** is predicted to reduce net operating revenues for commercial fishermen by an average of approximately 4.4 percent per year, whereas **Alternative 4** is predicted to reduce net operating revenues by 11.2 percent (Figure 4-15). For **Alternative 3**, the expected losses for individual years range from 2.0 percent for 2007 to 7.4 percent for 2008. For **Alternative 4**, the expected losses for individual years range from 5.9 percent for 2007 to 15.3 percent for 2008.

Alternatives 5 and **6** would prohibit the harvest of all species in the snapper-grouper management unit regardless of water depth in specific areas. **Alternative 5** would prohibit fishing for species in the snapper-grouper management unit in the same areas off Georgia and northeast Florida as would **Alternative 3**, and **Alternative 6** would prohibit fishing in the same areas as would **Alternative 4**. Therefore, **Alternative 5** is expected to generate greater losses than **Alternative 3** because **Alternative 3** would prohibit harvests only in water depths between 98 and 240 feet. **Alternative 6** is expected to generate greater losses than **Alternative 4** for the same reason. On average, **Alternative 5** is expected to generate reductions of about 4.8 percent in net operating revenues, and **Alternative 6** is expected to generate reductions of about 12.4 percent (Figure 4-15). For **Alternative 5**, the expected losses for individual years range from 2.6 percent for 2007 to 8.0 percent for 2008. For **Alternative 6**, the expected losses for individual years range from 7.3 percent for 2007 to 16.4 percent for 2008.

Although the average overall expected reductions in net operating revenues range from 4 percent to slightly more than 12 percent for the entire commercial snapper-grouper fishery, the effects of Amendment 17A would be highly focused on fishermen in northeast Florida and Georgia because that region represents the center of the red snapper fishery (Figures 4-15a and 15b). Fishermen there would incur the largest losses in absolute and relative terms The predicted reductions in net operating revenues for fishermen in northeast Florida and Georgia are expected to average approximately 24 percent for **Alternative 2,** 64 percent for **Alternative 3,** 70 percent for **Alternative 4**, 65 percent for **Alternative 5**, and 71 percent for **Alternative 6** (Figure 4-15b).

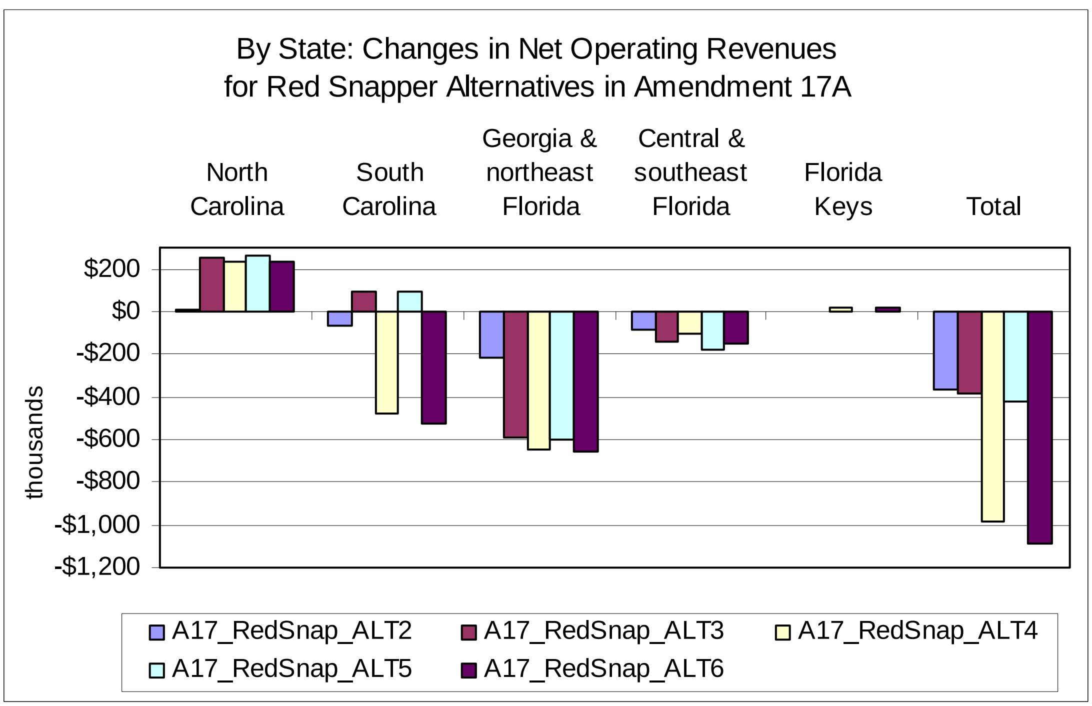

Figure 4-15a. Change in net operating revenues by state of landing for red snapper alternatives compared to the No-Action alternative for Amendment 17A.

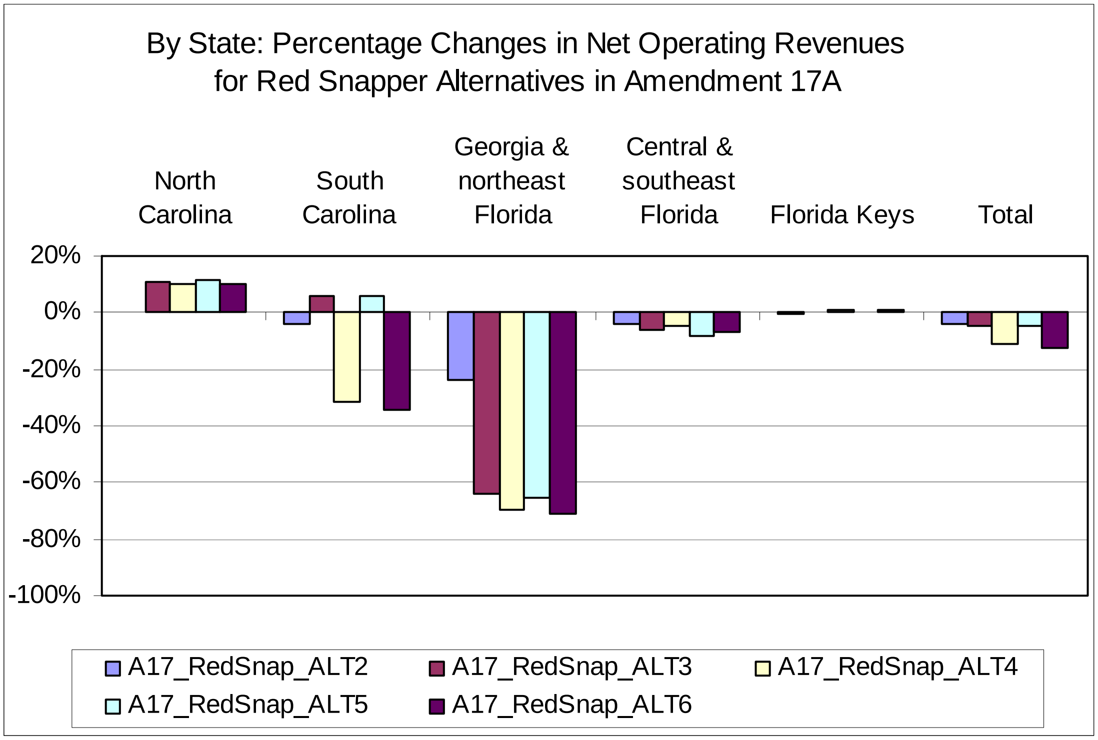

Figure 4-15b. Percentage change in net operating revenues by state of landing for red snapper alternatives compared to the No-Action alternative for Amendment 17A.

Alternatives 3 and **5** would limit the closures to areas off the coast of northeast Florida and Georgia, whereas **Alternatives 4** and **6** also would close areas off the coast of South Carolina. Net operating revenues for fishermen in South Carolina are expected to decline by an average of approximately 31 percent with **Alternative 4** and 34 percent with **Alternative 6** (Figure 4-15b).

An unexpected finding of the simulation analysis was that proposed **Alternatives 3-6** would increase catches of red grouper and various other species during the fourth calendar quarter of the year compared to **Alternative 1 (Status Quo)** (Figure 4-15c). The predicted effects of Amendment 16 are included in **Alternative 1 (Status Quo)** for Amendment 17A. Amendment 16 specifies a commercial quota for gag, with the additional provision that the entire shallow water grouper fishery will be closed when the quota for gag is filled. The simulation analysis for Amendment 17A predicts that the proposed restrictions on the harvest of red snapper and other species in the snapper-grouper unit, including gag, would enable the fishery for shallow water groupers to remain open longer than with Amendment 16 only. Therefore, while the commercial fishery still would land its quota for gag, landings of other shallow water groupers and species commonly caught with shallow water groupers could be greater than with status quo. One implication of this prediction is that a longer open season for shallow water groupers would partially offset the overall losses that normally would be expected from the proposed alternatives for red snapper.

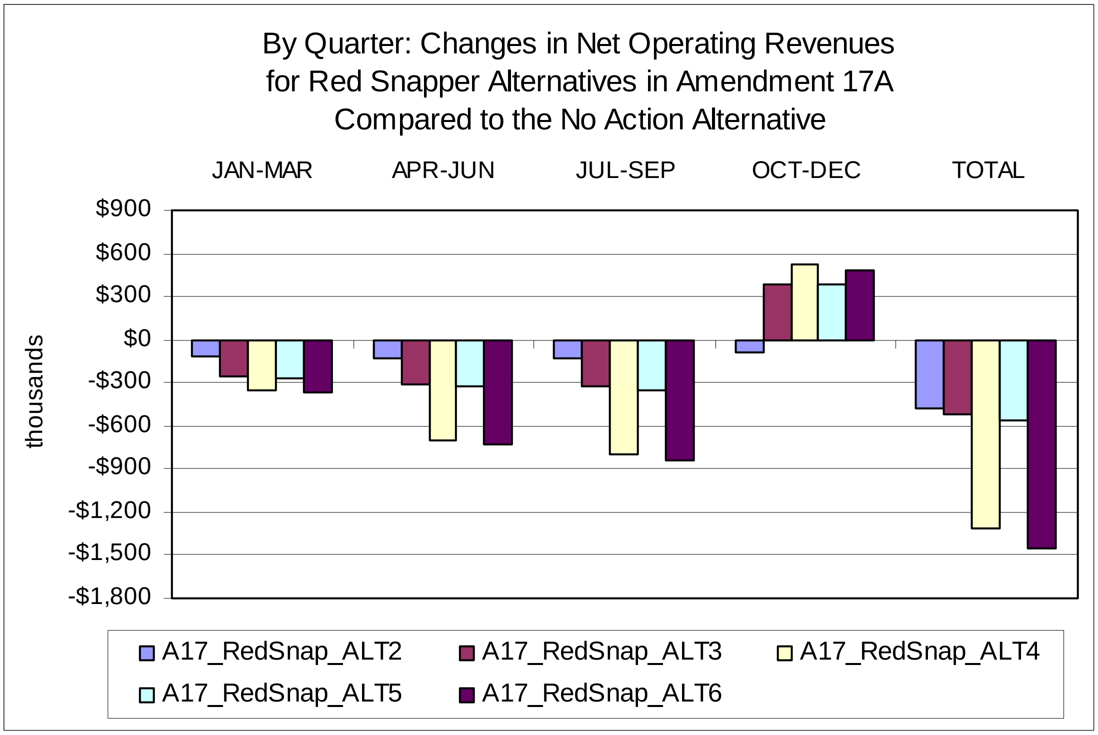

Figure 4-15c. Change in net operating revenues by calendar quarter for red snapper alternatives compared to the No-Action alternative for Amendment 17A.

Fishermen in North Carolina are predicted to gain if the shallow water grouper fishery remains open longer than with **Alternative 1 (Status Quo)** (Figures 4-15a and 4-15b). Fishermen in South Carolina are predicted to gain with **Alternatives 3** and **5** because these alternatives would not close areas off the coast of South Carolina.

Losses would be incurred primarily by fishermen who use vertical lines, although fishermen who dive for groupers could gain with **Alternatives 4** and **6** because dive gear would be exempt from the prohibition on harvesting activities within the restricted areas (Figures 4-16a and 4-16b).

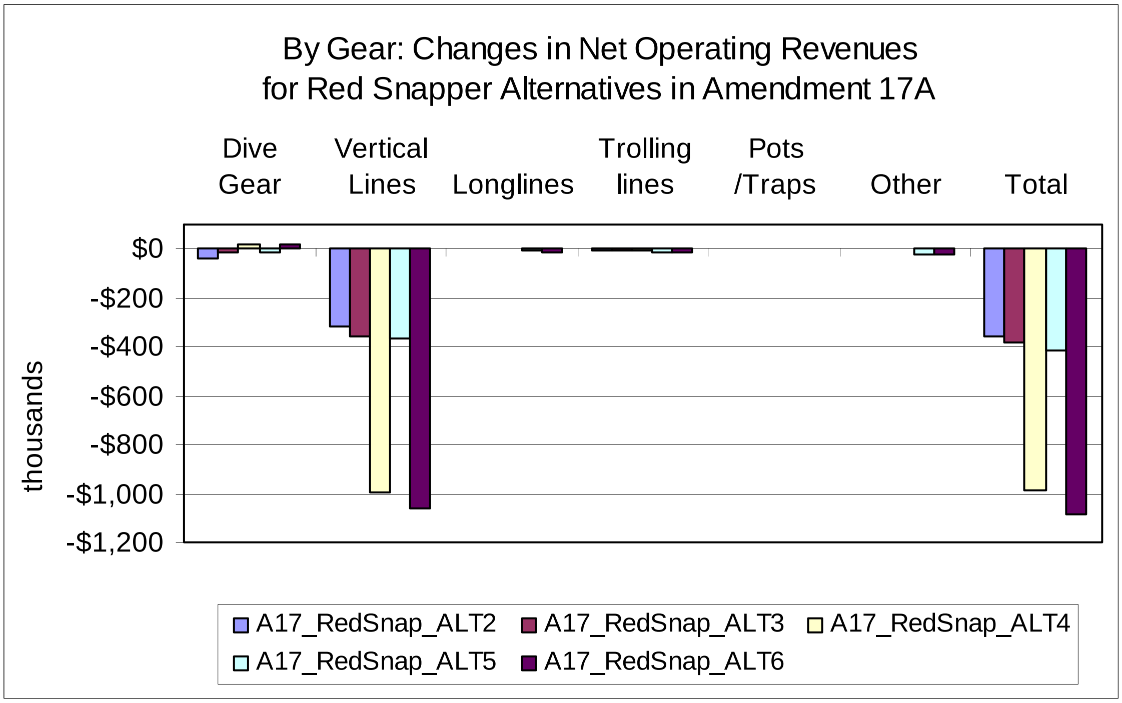

Figure 4-16a. Change in net operating revenues by gear type for red snapper alternatives compared to the No-Action alternative for Amendment 17A.

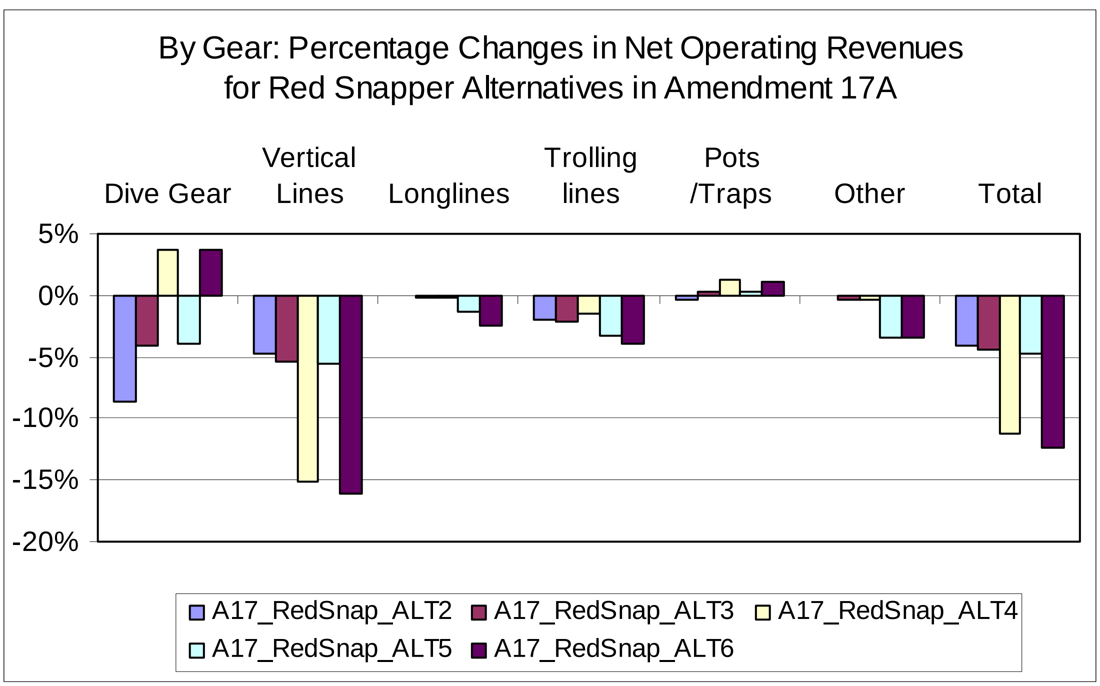

Figure 4-16b. Percentage change in net operating revenues by gear type for red snapper alternatives compared to the No-Action alternative for Amendment 17A

Alternatives for the management of red snapper could interact with additional alternatives proposed in Amendment 17B that are not considered in these analyses. In particular, the proposed alternatives considered in Amendment 17A do not include any commercial quotas for red grouper or black grouper, while Amendment 17B proposes to limit the harvest of both species. Therefore, the prediction of a longer open season for shallow water groupers could be an artifact of the way in which the two amendments were defined, and the simulation analysis of alternatives in Amendment 17A might not have predicted a longer season if commercial quotas for red and black groupers had been proposed in Amendment 17A rather than Amendment 17B. The simulation analysis for Amendment 17A predicted average annual landings for red grouper that were greater than the proposed commercial quota in Amendment 17B, but it also predicted average annual landings for black grouper that were less than its quota proposed in Amendment 17B.

Non-use values would increase under **Alternatives 2-6**. it is possible that non-uses values would be higher under Alternatives that involve a closure versus **Alternatives 1 (Status Quo)** and **2** that do not.

Recreational Sector

The methodology employed in this assessment follows the methodology employed in NMFS (2008a and 2008b). NMFS (2008a) analyzed the expected economic effects of a recreational closure of the red snapper fishery in the Gulf of Mexico in 2008. The methodology for that assessment is thoroughly documented in that report and is incorporated herein by reference. NMFS (2008b) analyzed the expected economic effects of the interim rule to close the red snapper fishery in the South Atlantic, and the methodology described in that document is incorporated herein by reference. A general description of the methodology employed for the current amendment is provided below. Appendix XX provides more details on the method used to estimate the economic effects of this amendment on the recreational sector.

This assessment evaluated the expected change in economic value relative to the status quo to fishers and for-hire vessels in response to the proposed alternatives. The change in economic value is measured in terms of the consumer surplus (CS) to recreational anglers and net operating revenues (NOR) to for-hire vessels. CS in the present case is the net benefit an angler derives from an additional fish kept on a fishing trip and is equivalent to the difference between the monetized benefit an angler receives and the actual cost. This value is the appropriate measure of economic effects on recreational anglers as a result of changes in fishing regulations. NOR is the net operating revenue, expressed on a per angler basis, a charterboat or headboat derives from a fishing trip. NOR is calculated as revenue minus the costs for fuel, ice, bait, and other supplies. The economic effects of the various alternatives whose effects can be quantified are presented in the tables below. These estimates also serve as reference points in determining the approximate magnitude of economic effects of the other alternatives.

Table 4-21a presents the economic effects of **Alternative 2**. The CS values are computed by multiplying the number of red snapper target trips by the CS per trip ($80). The NOR values are computed by multiplying the number of for-hire trips by the NOR per trip. It may be noted that partly due to the overestimation of target trips, as discussed in Appendix XX, the resulting CS and NOR reductions may be considered overestimates. In addition, the CS value used is uniform across all fishing modes, although this may not necessarily be the case. Headboat anglers may value red snapper differently, on average, than private and charterboat anglers. The direction and magnitude of such difference are unknown, though the higher cost of fishing to charterboat anglers suggests the CS to headboat anglers would be less than that to charterboat anglers. Moreover, the NOR values used are uniform across all areas, and thus no account is taken for area variations in charter and headboat operations that could result in varying NOR values.

Table 4-21a. Reductions in consumer surplus (CS) and for-hire net operating revenues (NOR) due to Alternative 2, in 2009 dollars.

	Charterboat	Headboat	Private	Total
Northeast Florida				
CS-Trips	761,429	633,891	2,148,532	3,543,852
NOR	347,588	2,727,731		3,075,319
Total	1,109,017	3,361,622	2,148,532	6,619,170
Southeast Florida				
CS-Trips	148,673	54,578	419,513	622,764
NOR	67,868	487,576		555,444
Total	216,542	542,153	419,513	1,178,207
Georgia				
CS-Trips	126,200	65,035	249,560	440,795
NOR	65,920	92,840		158,760
Total	192,120	157,875	249,560	599,555
South Carolina				
CS-Trips	23,560	126,342	93,840	243,742
NOR	38,560	316,766		355,326
Total	62,120	443,108	93,840	599,068
North Carolina				
CS-Trips	0	6,702	0	6,702
NOR	0	161,989	0	161,989
Total	0	168,691	0	168,691

Table 4-21b presents the economic effects of **Alternative 5**. Due primarily to the difficulty of distinguishing trip activities in each grid by depth, the economic effects of **Alternative 3** cannot be quantified. It may only be remarked that, in principle, **Alternative 3** would result in relatively smaller economic effects than **Alternative 5** as some areas in the designated grids would be left open to fishing for snapper grouper, except red snapper. However, some of these "open" areas under **Alternative 3** may be subject to seasonal closures imposed under previous amendments.

Alternative 5 would close certain fishing areas for recreational fishing of all snapper grouper fishing in addition to prohibiting red snapper fishing in the EEZ year round. The reductions in CS and NOR shown in Table 4-21b incorporate the red snapper closure found in Table 4-21a and additional reductions in CS and NOR due to the closure of snapper grouper fishing in certain areas. Additional CS and NOR reductions are calculated by multiplying the number of target trips in the subject areas by the same CS and NOR values used in analyzing **Alternative 2**. The target trips for headboats in the four designated grids are estimated by applying an adjustment factor to the total headboat angler trips by area. This factor is derived as the ratio of the number of angler trips in the four designated grids to the total number of angler trips that reported fishing locations. The same ratio is applied to the charter and private target trips, by area, to arrive at the number of charter and private target trips for each grid.

Table 4-21b. Reductions in consumer surplus (CS) and for-hire net operating revenues (NOR) due to Alternative 5 (or Alternative 3), in 2009 dollars.

	Charterboat	Headboat	Private	Total
Northeast Florida				
CS-Trips	2,279,495	656,482	8,232,365	11,168,342
NOR	600,474	3,329,048		3,929,523
Total	2,879,969	3,985,531	8,232,365	15,097,865
Southeast Florida				
CS-Trips	148,673	54,578	419,513	622,764
NOR	67,868	487,576		555,444
Total	216,542	542,153	419,513	1,178,207
Georgia				
CS-Trips	179,074	65,085	278,689	522,848
NOR	66,974	94,154		161,128
Total	246,048	159,239	278,689	683,976
South Carolina				
CS-Trips	23,560	126,342	93,840	243,742
NOR	38,560	316,766		355,326
Total	62,120	443,108	93,840	599,068
North Carolina				
CS-Trips	0	6,702	0	6,702
NOR	0	161,989	0	161,989
Total	0	168,691	0	168,691

Table 4-21c presents the economic effects of **Alternative 6**. Due primarily to the difficulty of distinguishing trip activities in each grid by depth, the economic effects of **Alternative 4** cannot be quantified. It may only be remarked that, in principle, **Alternative 4** would result in relatively smaller economic effects than **Alternative 6** as some areas in the designated grids would be left open to fishing for snapper grouper, except red snapper. However, some of these “open” areas under **Alternative 4** may be subject to seasonal closures imposed under previous amendments.

Alternative 6 would close certain fishing areas for recreational fishing of all snapper grouper fishing in addition to prohibiting red snapper fishing in the EEZ year round. This alternative would close three grid areas in addition to the four provided under **Alternative 5**. The reductions in CS and NOR shown in Table 4-21c incorporate those of the red snapper closure found in Table 4-21a, the four grid closures presented in Table 4-21b, and additional reductions in CS and NOR due to the closure of three more grid areas. Additional CS and NOR reductions are calculated in the same way done for **Alternative 5**.

Table 4-21c. Reductions in consumer surplus (CS) and for-hire net operating revenues (NOR) due to Alternative 6 (or Alternative 4), in 2009 dollars.

	Charterboat	Headboat	Private	Total
Northeast Florida				
CS-Trips	2,279,495	656,482	8,232,365	11,168,342
NOR	600,474	3,329,048		3,929,523
Total	2,879,969	3,985,531	8,232,365	15,097,865
Southeast Florida				
CS-Trips	148,673	54,578	419,513	622,764
NOR	67,868	487,576		555,444
Total	216,542	542,153	419,513	1,178,207
Georgia				
CS-Trips	179,074	65,085	278,689	522,848
NOR	66,974	94,154		161,128
Total	246,048	159,239	278,689	683,976
South Carolina				
CS-Trips	537,839	164,762	848,174	1,550,774
NOR	103,231	744,925		848,156
Total	641,069	909,688	848,174	2,398,930
North Carolina				
CS-Trips	0	6,702	0	6,702
NOR	0	161,989	0	161,989
Total	0	168,691	0	168,691

For purposes of the succeeding discussions, Table 4-21d is presented below. This table summarizes the more detailed tables presented above.

Table 4-21d. Summary of economic effects, in 2009 dollars.

		FL-NE	FL-SE	GA	SC	NC	TOTAL
ALT. 2	CS	3,543,852	622,764	440,795	243,742	6,702	4,857,855
	NOR	3,075,319	555,444	158,760	355,326	161,989	4,306,837
	TOTAL	6,619,170	1,178,207	599,555	599,068	168,691	9,164,692
ALT. 3,5	CS	11,168,342	622,764	522,848	243,742	6,702	12,564,398
	NOR	3,929,523	555,444	161,128	355,326	161,989	5,163,410
	TOTAL	15,097,865	1,178,207	683,976	599,068	168,691	17,727,808
ALT. 4,6	CS	11,168,342	622,764	522,848	1,550,774	6,702	13,871,430
	NOR	3,929,523	555,444	161,128	848,156	161,989	5,656,239
	TOTAL	15,097,865	1,178,207	683,976	2,398,930	168,691	19,527,670

Under **Alternative 1 (Status Quo)**, the red snapper recreational fishery could continue to operate as it currently does, with no short-term reductions in the number of harvested fish, trips taken, or changes in economic values from the calculated baseline. Because the resource is overfished, these conditions would not be expected to persist, nor could they legally be allowed to continue. Biological conditions in the resource would be expected to worsen, requiring more stringent harvest restrictions as stipulated in the rest of the alternatives.

Alternative 2 would prohibit all harvest (retention) of red snapper in the South Atlantic EEZ as well as red snapper harvested by federally permitted for-hire vessels that fish in state waters. At present, it is not known how long this prohibition would last. Assuming trip cancellations, this alternative may be expected to result in a total CS reduction of approximately $4.9 million (2009 dollars).

Under the assumption that the prohibitions of **Alternative 2** result in the cancellation of all red snapper target trips, this alternative would be expected to result in a NOR reduction of approximately $520 thousand to charterboats, and a NOR reduction of approximately $3.8 million to headboats, or a total reduction in economic values of approximately $4.3 million. The assumption that all red snapper target trips would be cancelled is expected to result in overestimation of the actual number of trips affected and thus of the economic values lost to the recreational sector. In reality, most red snapper anglers would be expected to continue to fish but shift their effort to other species.

There is little expectation that all red snapper target trips would be cancelled under **Alternative 2**. On average, red snapper is only the third most important species in terms of the number of fish caught on private and charter trips and the fifteenth most important species in terms of the number of pounds of fish harvested on headboat trips (NMFS 2008b). Hence, most of the historic trips that previously targeted red snapper would be expected to continue to be taken but would target other species. Target effort for grouper, dolphin, and king mackerel was projected to increase from 13 percent (grouper) to 31 percent (dolphin) in response to the red snapper closure in the Gulf of Mexico (NMFS 2008a). Absent specific data to suggest the proportion of red snapper target trips expected to be cancelled, this analysis simply assumes the cancellation of all red snapper target trips constitutes an upper bound of the expected change in economic value to the recreational fishery as a result of **Alternative 2**. Overall, **Alternative 2** is expected to reduce short-term economic value by $9.2 million (CS + NOR). If the prohibition is permanent, reductions in economic value could top approximately $131 million under a 7 percent discount rate.

As shown in Table 4.21a, Florida would experience the largest economic effects, followed by South Carolina, then closely by Georgia, and lastly by South Carolina. The reported absence of target trips for red snapper in North Carolina is primarily responsible for the zero effects of red snapper fishing prohibition for this state. North Carolina landed some red snapper, but apparently, there has been very low demand for red snapper trips in this state. The headboat sector appears to be the largest target mode, but this is very likely due to the assessment assumptions and, as noted above, the estimates of headboat effort are believed to exceed actual totals. Private and charterboat modes are a relatively large component of the red snapper recreational sector.

Alternatives 3, 4, 5 and 6 would prohibit recreational harvest, possession, and retention of species in the Snapper Grouper FMU year-round in certain areas in the South Atlantic, in addition to the red snapper fishery closure. As noted earlier, each of these alternatives would result in economic losses in addition to the losses estimated for **Alternative 2**. These losses would mainly come from reductions in economic values derived from Snapper Grouper species other than red snapper. In addition, the assumption on trip cancellations mentioned with respect to **Alternative 2** would become more valid under any of these four alternatives. The issue of trip cancellation that would affect other Snapper Grouper species would also arise under any of these four alternatives. It is likely that fishing effort would shift to the open areas or to species whose harvest is allowed in areas considered in any of these four alternatives, but effort shifting would carry certain costs that could be relatively high for some fishing participants.

The economic effects of **Alternative 3** cannot be quantitatively distinguished from those of **Alternative 5**. Table 4-21b presents the economic effects of **Alternative 5**, and from there one can infer that the economic effects of **Alternative 3** would be smaller than, but close to, those of **Alternative 5**. Given the location of the grids for closure, the areas with additional effects from the closures under **Alternative 5** would be Northeast Florida and Georgia. All other areas are estimated to remain unaffected by area closures under **Alternative 5**. This explains why the economic effects presented in Table 4-21b differ from those presented in Table 4-21a only in the cases of Northeast Florida and Georgia.

Alternative 5 may be expected to result in a total CS reduction of approximately $12.6 million (2009 dollars), in charter NOR of $774 thousand, and in headboat NOR of $4.4 million. Overall, **Alternative 5** is expected to reduce short-term economic value by $17.7 million (CS + NOR). If the prohibition is permanent, reductions in economic value could top approximately $253 million under a 7 percent discount rate. Again, one has to pay attention to the possible overestimation of these economic values partly due to the overestimation of angler trips. In terms of areas and fishing modes, the distribution of economic effects of **Alternative 5** follows closely that of **Alternative 2**.

As with the previous pair of alternatives, the economic effects of **Alternative 4** cannot be quantitatively distinguished from those of **Alternative 6**. Table 4-21c presents the economic effects of **Alternative 6**, so the economic effects of **Alternative 4** may be inferred to be smaller than, but close to, those values in the table. Given the location of the grids for closure, the areas affected by closures under **Alternative 6** would be Northeast Florida, Georgia, and South Carolina. All other areas are estimated to remain unaffected by the closures under **Alternative 6**.

Alternative 6 may be expected to result in a total CS reduction of approximately $13.9 million (2009 dollars), in charter NOR of $1.0 million, and in headboat NOR of $5.5 million. Overall, **Alternative 6** is expected to reduce short-term economic value by $19.5 million (CS + NOR). If the prohibition is permanent, reductions in economic value could top approximately $279 million under a 7 percent discount rate. Again, one has to pay attention to the possible overestimation of these economic values partly due to the overestimation of angler trips. The distribution of economic effects of **Alternative 6**, in terms of areas and modes, follows closely that of **Alternative 2**.

In addition to the direct economic effects described above, the various alternatives would entail consequent effects on the industries supporting the fishing industry and on the regional economies. Gentner and Steinback (2008) estimated the economic impacts of the recreational sector's expenditures on the regional economies of the South Atlantic states, showing the level of employment, among others, generated by angler expenditures. They estimated that in 2006, angler expenditure on saltwater trips supported 16,212 jobs in Florida (east coast), 2,435 jobs in Georgia, 2,435 in South Carolina, and 11,316 jobs in North Carolina. Dumas et al. (2009) estimated the economic impacts of the for-hire industry in North Carolina, showing that for-hire fishing expenditures supported about 10,200 jobs in North Carolina. Thus, any reductions in angler trips and expenditures would have repercussions on the region's employment and other socioeconomic environment.

Alternative 7, which would allow fishing for black sea bass in the closed area using black sea bass pots with endorsements, would affect only the commercial sector and thus would not introduce any change to the economic effects on the recreational presented in the tables above.

Alternative 8, which would allow fishing for golden tilefish in the closed areas, would mitigate the negative economic effects of the closed areas on the recreational sector. However, the expected adjustments to the economic effects presented the tables above would be relatively small. Headboats have no reported landings of golden tilefish and charterboats anglers reported no targeting of golden tilefish. Only the private mode anglers reported some low level of targeting for the species. Hence, **Alternative 8** would only mitigate the CS reductions to private mode anglers from the area closures.

The economic effects of **Alternative 9**, which would allow fishing for snapper grouper in the closed areas using spearfishing gear, cannot be ascertained due to the absence of information regarding recreational spearfishing in the closed areas. The general tone of this alternative is that of mitigating the negative economic effects of the closure, if spearfishing is practiced by some recreational anglers.

Alternative 10 would allocate the 79,000 lb ACL between the closed area (49,095 lbs) and exempted area (29,905 lbs), consider the exempted area allocation as non-directed removal and closed area allocation as directed removal, allocate the closed area directed removal among the commercial (8,373 lbs), for-hire (8,672 lbs), and private recreational (12,859 lbs) sectors, establish a limited snapper grouper bottom fishing zone in the closed area with (lottery-issued) permits to fish in the zone, and accountability measures for the commercial, for-hire, and private recreational sectors. This alternative would allow very limited recreational fishing under relatively restrictive conditions, although **Alternatives 2-6** may still be considered more restrictive. With the allocation in the exempted area considered non-directed removal, the CS and NOR losses to this area would approximate the losses to Southeast Florida and North Carolina under **Alternative 2**. For the closed area (approximately Northeast Florida through

South Carolina) where the allocation is considered directed removal, **Alternative 10** would result in slightly lower negative economic effects than those estimated for **Alternative 2**.

The AMs for the for-hire sector and private recreational sector would introduce costs that could be substantial relative to their general size of operations and the allowable red snapper harvests. Specifically, the VMS requirement would generally favor bigger for-hire operations or financially well off private recreational anglers, unless NMFS shoulders a good part of the VMS cost. These AMs could potentially whittle down the number of applicants for the permit lottery, and thereby simplify to an extent the lottery process. One major downside of these AMs is that the real-time reporting component is highly dependent on fishers who have less incentive to submit accurate reports. Permit revocation if fishers violate the reporting requirement may compel some to submit accurate reports and some to develop subtle means of less accurate reporting. Another downside of these AMs is the lack of provision regarding the agency's actions when the various allocations are exceeded, especially that allocations to the for-hire and private recreational sectors are very low and would likely be reached over a short period.

Alternative 11 is mainly an enforcement measure that would provide anglers some cushion from being unduly penalized. This would also allow anglers to cut fishing costs by not being compelled to possibly take a longer route to and from a fishing area. The mitigating effects of this alternative would be minimal relative to the economic effects of any of the restrictive management measures discussed above. **Alternatives 11a** and **11b** would affect recreational anglers more than **Alternative 11c** given the relative absence of recreational fishing for wreckfish.

4.3.3 Social Effects

Alternative 1 (Status Quo) would not be expected to result in any direct short-term adverse social effects because no new restrictions on the fishery would occur. As a result, all entities could continue normal and customary behaviors in the fishery. Participation rates and harvest levels could continue unchanged. Since there would be no direct effect on resource harvest or use, there would be no direct effects on fishery participants, associated industries, or communities. However, the long-term adverse social effects would be expected to be increased because status quo regulations would result in the continued overfishing of red snapper, which would be expected to require stricter future regulations than those currently under consideration.

In general, the other alternatives vary by species, area coverage, and exemptions, and the expected social effects of these alternatives would be expected to be proportional to the magnitude of expected prohibitions and associated economic effects (see Section **4.3.2** for a discussion of the expected magnitude and regional or sector distribution of economic effects). In general, the greater the expected harvest restrictions, in terms of either or both species and area covered, the greater the resultant short-term adverse social effects. Persistence of these effects may be sector/entity specific, with some entities having greater flexibility to adjust to conditions and find alternate sources or income, product, recreation, etc. The varying severity of the short-term effects at the different entity level may also create variable levels of urgency to adapt or adjust behavior. While the long-term effects of resource recovery are expected to be positive, with net overall increased social benefits relative to the status quo, it should again be emphasized that those who bear the short-term losses in social or economic benefits may not, and likely won't be due to the expected duration of recovery time, the same entities that receive the benefits of the recovered resource.

Because **Alternatives 2-6** would prohibit all commercial and recreational harvest of red snapper in the South Atlantic EEZ, none of these alternatives would be expected to have any differential social effects from the perspective of the red snapper fishery. Instead, these alternatives vary in the severity of restrictions on the harvest of other snapper grouper species. A general description of social effects expected to accrue to regulatory change is provided in **Section 4.1.1.3**. As the severity of each alternative increases, the likelihood and severity of these social effects would be expected to increase.

Among **Alternatives 2-6**, **Alternative 2** would be expected to have the least negative social effect on the commercial and recreational snapper grouper fisheries because it would not extend harvest prohibitions beyond the red snapper fishery. Cumulative effects on other fisheries would depend on the relative significance of red snapper activity to the overall activity or production profile of an entity, business, or community. These effects would be concentrated in the north Florida and Georgia communities due to the concentration of red snapper harvest off these coasts. Because red snapper is a relatively minor species in the commercial fishery, adverse social effects on this sector and associated industries and communities, as well as cumulative effects on other fisheries, may be minor, particularly compared to possible effects on the recreational industry. While data does not suggest that red snapper is a significant target species for the recreational sector as a whole, including the charterboat sector, the red snapper is possibly more important to the headboat sector, particularly in Georgia and north Florida. However, even within the charterboat sector, especially where red snapper harvests are concentrated, individual businesses may have developed client bases that more heavily target red snapper than overall data would indicate, increasing the potential adverse effects to these businesses and associated communities.

The prohibitions on the harvest of other snapper grouper species in **Alternatives 3-6** would be expected to increase both the magnitude and scope of short-term adverse social effects relative to **Alternative 2.** Specifically, while **Alternatives 3** and **5** and **Alternatives 4** and **6** are variants of each other in that within each pair the difference in scope of prohibition is the extent to which water depth determines the allowable harvest area, **Alternatives 4** and **6** would extend the affected area of the additional snapper grouper prohibitions and resultant adverse effects to South Carolina, rather than just Georgia and north Florida. While North Carolina commercial fishermen overall could benefit due to potential lengthening of the shallow water grouper fishery under **Alternatives 3-6**, South Carolina commercial fishermen could similarly benefit under **Alternatives 3** and **5**, which would not extend the snapper grouper prohibitions to waters off South Carolina, but lose benefits under **Alternatives 4** and **6**. Effectively, and logically, any extension of the shallow water grouper fishery as a result of the snapper grouper prohibitions would not benefit fishermen whose waters are already closed. Although continued harvest opportunities may exist for some fishermen off North Carolina or areas off Florida unaffected by the snapper grouper prohibitions, relocated effort would not be without increased costs, increased stock pressures at these locations, and likely disrupted landings patterns, as landing locations shift in tandem with changes in the fishing area. Additionally, potential cumulative effects could be greater as these other snapper grouper species would be expected to be more important proportionally to affected fishermen and associated businesses and communities. As a result, the likelihood of business failure, with associated adverse social effects, would be expected to increase. Further, while vessels may have the flexibility to follow the fish, shore side businesses may be unable to follow any changing fishing, unloading, and docking patterns.

For the recreational sector, while effects on angler satisfaction are not dismissed, anglers, as with any recreational group, have greater opportunities or flexibility to choose an alternative recreational pursuit than businesses have to start a new business or attract a new type of clientele. Further, while other opportunities may exist, the ability to rapidly transform a business and maintain profitability is usually limited; changes take time, yet financial obligations cannot usually be delayed. As a result, the adverse social effects on the commercial side of the recreational sector – for-hire operations, bait and tackle shops, etc. – may mirror those of the commercial harvest sector, if angler demand substantially declines as a result of the harvest prohibitions. The effects on recreational businesses could also be worse than those of the commercial sector due to more limited flexibility. While commercial vessels, to some extent, have the ability to go to the fish, e.g., a vessel could sail from a South Carolina port, fish off North Carolina, land its harvest in North Carolina, and return to port in South Carolina, recreational businesses start with the anglers coming to them, then find the fish. If the prohibitions decrease angler traffic, convincing historic clientele they will be just as happy purchasing a different service (new species, more catch and release, etc.) may be difficult, and finding new anglers may require complete relocation of the business, which is a substantially different action than fishing farther down the coast a few days or weeks at a time before returning home. From a ranking perspective, **Alternative 6** would be expected to result in the greatest adverse social effects, followed by **Alternative 4**, **Alternative 5**, and **Alternative 3**.

From a long-term perspective, given the severity of the prohibitions likely required to rebuild red snapper, it is unlikely that restrictions more severe than currently necessary would be imposed to recover the resource faster. Thus, a comparison of the effects of the alternatives considered is more a question of which alternative will actually achieve the necessary reduction in red snapper mortality than it is a question of which alternative will achieve the necessary reduction at the lowest social and economic cost. Therefore, consideration of the trade-offs of the long-term benefits of a recovered resource with the short-term costs of the harvest prohibitions is not that relevant in this case. The primary long-term consideration is, as stated with respect to the rebuilding strategy, that given the severity of necessary restrictions and the length of time necessary to rebuild the resource, the future beneficiaries of the recovery are unlikely to be those who bear the social and economic costs of recovery.

Alternatives 7-9 would be expected to mitigate some of the adverse social and economic effects of **Alternatives 3-6** by allowing exemptions to the harvest prohibitions of these alternatives. The exemptions of **Alternatives 7-9** would not be relevant under **Alternative 2**. Because each addresses either a different species or gear, **Alternatives 7-9** should be viewed independently as each being capable of individually reducing the adverse effects of the harvest prohibitions. As a result of the exemptions, each of **Alternatives 7-9** would be expected to result in increased social and economic benefits relative to **Alternatives 3-6**. **Alternatives 7-9** would also be expected to result in the increased social benefits of the perception of more rational management decision by allowing the continued fishing for and harvest of species, or harvest of species with a particular gear, that would not be expected to adversely affect the red snapper resource or recovery goals.

The expected social effects of **Alternative 10** will be completed when the details of the alternative are clarified at the next Council meeting. In general, however, this alternative will be would also be expected to reduce the short-term reduction in social benefits by allowing some directed red snapper harvest to occur. However, some equity issues would be expected to arise. Current language in the alternative specifies that the allowable non-directed removals allotted to the northern (approximately north of Charleston, South Carolina) and southern (approximately south of Cape Canaveral, Florida) portions of the South Atlantic would be allocated to fishermen in the prohibited zone (approximately south of Charleston, South Carolina through Cape Canaveral, Florida) as allowable directed harvests. While this would be expected to be viewed by those in the prohibited zone as favorable, increasing their social and economic benefits relative to no allowable directed harvest, fishermen in the northern and southern zones might be expected to feel such allocation is unfair. Further, it is unclear how recovery goals could be expected to be met under such an arrangement as release mortality would be expected to continue in the northern and southern zones, resulting in total mortality exceeding the ACL. The ACL could be exceeded even further as the allowed directed harvest in the prohibited zone could result in more directed pressure than would occur in the absence of allowable directed harvest, causing the allowable release mortality to exceed the target.

The transit allowances of **Alternative 11** would allow fishermen, both commercial and recreational, to reduce the costs associated with allowable harvest outside the proposed restricted areas, by not requiring extensive rerouting of their trip to avoid the closed areas. Also, absent transit provisions, considerably larger areas may be effectively removed from allowable fishing than encompassed by the strict area prohibitions themselves, resulting in potentially greater associated adverse social and economic effects. Thus, allowing transit, would avoid both the additional travel costs and the additional costs of a functionally expanded prohibition zone. In general, it is assumed that the greater the ability to increase harvests of other species, reduce costs, and reduce the likelihood of functionally expanded areas where harvest is prohibited, the greater the social benefits. **Alternative 7a** would allow any legal species (species with non-zero allowable harvest levels) to be possessed, but all gear would have to be stowed, effectively eliminating the ability to troll for non-snapper grouper species when transiting the restricted areas. **Alternative 7b** is less encompassing from a species perspective than **Alternative 7a**, but would allow trolling to continue while transiting, thus increasing the allowable fishing area for trolling species. **Alternative 7c** would be the least accommodating of the sub-alternatives, allowing only wreckfish on board (except for the species and gear harvest allowances of **Alternatives 3-6**) while in transit. It is not possible with available data to determine whether the benefits of the trolling allowance of **Alternative 7b** would result in a better social outcome than the broader species allowance of **Alternative 7a**, nor is a strong qualitative argument obvious. However, both would be expected to be better than the more narrow allowance of **Alternative 7c**.

4.3.4 Administrative Effects

Under **Alternative 1 (Status Quo)**, no rebuilding strategy would be established for red snapper. The Magnuson-Stevens Act requires that a rebuilding plan be established for any species undergoing overfishing and is declared overfished. Part of a rebuilding plan is the strategy according to which the stock would be rebuilt. Therefore, if no rebuilding strategy were implemented, the rebuilding plan could not be considered complete and the agency would not meet the Magnuson-Stevens Act requirement. If this situation were to occur, NOAA Fisheries Service would incur a substantial litigation risk. Administratively, the impacts of a lawsuit brought against the agency would be moderate and take the form of compiling the administrative record, and drafting case related documents.

Alternatives 2-7 would involve extensive coordination amongst various divisions within NOAA Fisheries Service as well as Coast Guard and State law enforcement officials. Enforcement of **Alternative 2** is expected to be somewhat less burdensome since there are no area boundaries to monitor other than that of the EEZ.

Alternative 3 would prohibit the harvest of all species in the snapper grouper FMU within the proposed area. **Alternatives 4** and **5** would require more enforcement coordination since the harvest of several species would be allowed within the proposed closed area. **Alternative 6** would not increase the current administrative burden since there is already a bag limit in place. **Alternative 6** would only require the development of outreach materials informing the public of the new requirements.

Analysis needs to be added for separate and new alternatives.

4.3.5 Council's Conclusion

4.4 Require the use of Circle Hooks

Alternative 1 (Status Quo). Do no require the use of circle hooks within any particular area of the South Atlantic EEZ when fishing for snapper grouper species.

Alternative 2. Require the use of circle hooks when fishing for snapper grouper within the area north of 28 degrees.

Alternative 3. Require the use of circle hooks when fishing for snapper grouper species within the South Atlantic EEZ.

4.4.1 Biological Effects

Alternative 2 would require the use of circle hooks within north of 28^{o}N; whereas **Alternative 3** would require the use of circle hooks within the South Atlantic EEZ . The intended effect is to reduce discard and bycatch mortality of red snapper. Burns *et al.* (2004) reported use of J hooks was the leading cause of red snapper mortality when the effects of hook versus depth related trauma. However, a tagging study conducted by Burns *et al.* (2004) resulted in slightly more red snapper captures from fish initially caught on circle hooks suggesting circle hooks might not provide increased survival over J hooks. Cooke and Suski (2004) found mortality rates were lower for circle hooks than J-style hooks. Hooking depth, anatomical hooking location, amount of bleeding, and ease of hook removal were identified as major contributors to mortality. In many cases, circle hooks were found capture the maxilla and were less likely to be swallowed. Additionally, circle hooks were found less likely to result in bleeding than J-hooks, which tend to deep hook fish at a higher frequency (Cooke and Suski 2004). Removal of deeply ingested hooks often results in mortality (Warner 1979; Muoneke and Childress 1994), with vital organs being damaged from penetration into the pericardium or body cavity (Diggles and Ernst 1997). Kaimmer and Trumble (1997) found circle hooks caught the jaw of Pacific halibut in more than 95 percent of the observations, while J-hooks caught the jaw about 80 percent of the time.

Bacheler and Buckel (2004) determined the proportion of grouper and smaller grunt and porgy species that bled varied across hooking locations, with more fish bleeding from gut and gill hooking than jaw hooking. Circle hooks were more likely to hook the species they studied in the jaw, and jaw hooked fish were much less likely to bleed (Bacheler and Buckel (2004). Burns *et al.* (2002) found more red snapper caught with rod-and-reel gear died from hook mortality than all other causes combined, including depth, stress, and handling. Acute J-hook mortalities occurred when the hook penetrated or slit the esophagus, heart, or liver.

Bacheler and Buckel (2004) evaluated the ability of various hook types and sizes to reduce catches of sublegal grouper and non-target species in Onslow Bay, North Carolina. Catch rates for undersized grouper, non-target individuals, and sharks varied across hook treatments, while catch rates for large grouper did not. Bacheler and Buckel (2004) concluded that changes made to hook sizes or type within the ranges used in their study would have very little effect on the catch and size of grouper.

While hook type and size did not affect catches of grouper species, Bacheler and Buckel (2004) found catch rates of other species such as white grunt and red porgy were much higher for the small J hooks than for the large J hook or the circle hook. These results suggest there are limitations to gape size for smaller grunt and porgy species. In the Portugal longline fishery, Erzini *et al.* (1998) found the smallest J hooks sparids than larger hooks (size 13 and 11).

Bacheler and Buckel (2004) found circle hooks significantly reduced gut hooking in all grouper species (gag, red grouper, and scamp) as well as smaller grunt and porgy species. Large J hooks were also determine to reduce gut hooking in smaller grunt and porgy species. Circle hooks have been found to reduce gut hooking in bluegill, rainbow trout, and striped marlin, juvenile bluefin tuna, striped bass sailfish, yellowfin tuna, and Pacific halibut (Domeier *et al.* 2003; Falterman and Graves 2002; Lukacovic and Uphoff 2002; Jenkins 2003; Prince et al. 2002; Skomal et al. 2002; Trumble *et al.* 2002).

If circle hooks increase catch rates as suggested by Henwood *et al.* (2006), a negative effect on the biological environment is possible. Because the recreational sector is managed with size limits, bag limits, and closed seasons, it is more susceptible to increased catch rates. If recreational anglers catch the bag limit more frequently and land larger fish, landings could increase beyond current levels. However, if catch rates increase the number of legal size fish landed and reduce discard mortality, a net benefit would be expected. Therefore, exclusion of smaller individuals or an increase in survival of regulatory discards would be considered to be a positive biological effect.

Similarly, if circle hooks decrease CPUE, then a net benefit to the stock could occur. In addition, circle hooks could reduce regulatory discards, thereby providing additional benefits. Modifying gear to reduce bycatch and bycatch mortality could also have beneficial effects on the biological and ecological environment of non-targeted species. Some incidentally caught species in the directed gag and vermilion snapper fishery include red grouper, scamp, red snapper, and greater amberjack have similar mouth morphology, which is an important factor in the effectiveness of circle hook use (Cooke and Suski 2004). As a result, hooking mortality on these species could be reduced. Discard mortality rates of snapper grouper stocks that are either overfished or are undergoing overfishing could decrease with the use of circle hooks. Therefore, the mandatory use of circle hooks specified in **Alternatives 2** and **3** has the potential to reduce red snapper fishing mortality and help stock return to a healthy sustainable level.

Nevertheless, studies on the effects of circle hooks and J hooks on retention and survival is limited to a handful of snapper grouper species. Due to limited data, it is not possible to quantify the reduction in mortality that could be provided by using circle hooks. Not all species in the snapper grouper complex have the same mouth morphology and it is possible that circle hooks could negatively impact survival. Alternatively, use of circle hooks could substantially reduce harvest of some species, would have positive biological benefits but have negative social and economic impacts on fishermen dependent upon the species.

The mandatory use of circle hooks was considered in Amendment 16 but removed after the amendment was reviewed by the Council's SSC. The SSC was concerned that there was not enough published information to quantify the effects of reducing discard mortality for various snapper grouper species, including red snapper. The SSC also expressed concern as did some public comments, that mandatory use of circle hooks could reduce availability of some snapper grouper species such as yellowtail snapper and gray triggerfish, which are not overfishing or overfished. Yellowtail snapper are primarily taken in South Florida; therefore, if **Alternative 3** was not selected as the preferred alternative, fishermen targeting yellowtail snapper with J-hooks would be able to continue this practice.

4.4.2 Economic Impacts

Alternative 1 (Status Quo) would not introduce any changes in the fishing gear employed by fishermen, and thus would not introduce any additional cost to fishing operations.

Alternative 2 would introduce some fishing gear change to fishing participants operating essentially in the major area for red snapper fishing while Alternative 3 would introduce such changes to all fishing within the South Atlantic EEZ.

The general benefits from **Alternatives 2** and **3** would come in the form of enhancing the various measures in place for the recreational and/or commercial sectors by lowering incidental take of managed species. The general short-term effects, however, of requiring circle hooks if these devices were not used at all by any vessels would be to increase fishing costs. Those vessels that already use these devices would not experience any increase in fishing costs. By reducing bycatch, the use of circle hooks would possibly free up some crew effort that otherwise would be spent culling the vessel's catch of unwanted fish. Freed up labor hours could be devoted to other activities that could generate more catch/revenues. On the other hand, it is possible that intended harvest could be reduced by using circle hooks. Depending on the physical structure of a fish's mouth, and the way that they take bait, circle hooks may make it difficult to harvest desired species, reducing revenues to commercial fishermen and consumer surplus to recreational anglers, as well as potential losses in net operating revenues to for-hire businesses if angler demand for for-hire trips is adversely affected.

In the Gulf, many fishermen using vertical lines used circle hooks, and if the same were to hold true for the South Atlantic, then the economic effect of requiring circle hooks on commercial fishermen (**Alternatives 2** and **3)** would be relatively low. In addition, the use of circle hooks has gained popularity among Gulf for-hire operators and private anglers, and if this were also true among for-hire operators and private anglers in the South Atlantic, then the economic effects of requiring circle hooks on the recreational sector (**Alternatives 2** and **3)** would also be relatively low. Moreover, fishing equipment suppliers and large-scale retailers currently offer a wide variety of comparably priced hooks, including circle hooks.

In general then, requiring the use of circle hooks may not substantially increase the cost of fishing to either the commercial or the recreational sectors, though the potential reduction in the harvest of some important species is noted.

4.4.3 Social Impacts

Because the assumption behind the imposition of circle hook restrictions is that they would be expected to support a healthier snapper grouper resource (reduced hook-related mortality of fish not retained, quicker rebuilding, larger biomass, etc.), as well as possible higher allowable harvest levels, such restrictions would be expected to result in greater social benefits. These higher benefits could be received in the short term (to the extent that harvests limits are a function of total fishing mortality, including both landings and the mortality of fish not retained, reduced hook-related mortality of fish not retained could support higher landing levels) and long term (the increased social benefits of a recovered stock supporting higher harvest levels). Some anglers may object to the loss of personal choice in hook types, especially if they feel they will experience a reduction in catch rates. Social benefits would be reduced if catch success in general or for individual species is adversely affected. Specific species of note are gray triggerfish and yellowtail snapper. Because **Alternative 1 (Status Quo)** would not require the use of circle hooks, no change in social benefits would be expected. As a result, the benefits of current harvests of species for which circle hook may be a problem would not be reduced, while the social benefits of reduced hook-related mortality of fish not retained, quicker rebuilding, and potential larger biomass and harvest levels would be forgone. Because of the limited geographic application of **Alternative 2,** the harvest problems and associated loss of social benefits associated with yellowtail snapper could be substantially reduced if not eliminated, while some problems with gray triggerfish and other species that might experience reductions in catch rates, should such occur, would continue. However, some increased social benefits associated with reduced hook-related mortality of fish not retained would be expected. **Alternative 3** would be expected to result in the full increased social benefits associated with decreased hook-related mortality of fish not retained, while generating the full lost benefits associated with the reduced harvests of species where circle hooks may not be appropriate. Because of the resource benefits of circle hooks, both **Alternatives 2** and **3** would be expected to result in increased social benefits relative to **Alternative 1 (Status Quo).** It is speculative, however, which of **Alternatives 2** and **3** would be expected to result in the better social outcome, though the implicit recognition in **Alternative 2** that variance for some species is appropriate should not be overlooked.

4.4.4 Administrative Impacts

Alternatives 2 and **3** would incur a significant administrative burden on NOAA Fisheries Service as well as enforcement personnel. These alternative would require the preparation of fishery notices or other publications outlining specific hook, dehooking and venting gear requirements, and would require outreach and ongoing enforcement of gear compliance standards.

4.4.5 Council Conclusions

4.5 Establish a Red Snapper Monitoring Program

Alternative 1. (Status Quo) Utilize existing data collection programs to monitor the rebuilding progress of red snapper. Existing programs include the fishery dependent Marine Recreational Information Program (MRIP), logbook, discard logbook, headboat logbook, Trip Interview Program (TIP), and dealer reported landings. Fishery independent methods include Marine Resources Monitoring Assessment and Prediction Program (MARMAP), and the Southern Area Monitoring and Assessment Program (SEAMAP). Over the course of the next three years MARMAP will be looking for red snapper sampling sites along the north FL, and South GA coast.

Alternative 2. Establish fishery independent monitoring program to track progress of red snapper. Sampling would include deployment of chevron traps, cameras, and hook and line at randomly selected stations. NOTE: DOES THIS NEED TO BE AN ALTERNATIVE? THIS IS SOMETHING THE SCIENCE CENTER WOULD DO AND IS ADDRESSED IN SECTION 4.12.

Alternative 3. Establish a red snapper research fishery involving for-hire vessels (charter boat and headboats). Participating vessels may be authorized to harvest and land fish in excess of Federal possession limits and/or during fishery closures. Retention limits for red snapper would be based upon research objectives. The trip limits and number of trips per month will depend on the number of selected vessels, available quota, and objectives of the research fishery (Table 4-22).

Table 4-22. Sub-Alternatives under consideration for the red snapper research fishery.

	Number of vessels to participate		Trip Limit (lbs whole weight)	Trips/month	Fishing Season
	CB	HB			
Alternative 3a					
Alternative 3b					
Alternative 3c					

For the Council's Consideration:
[In order to determine the number of headboats that could participate while still allowing the stock to rebuild, several variables need to be considered, i.e., number of grids closed, biomass in closed grids, number of vessels located near closed areas able to participate, level of dead discards predicted for commercial and recreational sector inside and outside the closed areas. Table below would need to be completed by Science Center.]

Administrative Details

NOAA Fisheries Service will annually request applications for participation in the red snapper research fishery through an Exempted Fishing Permit (EFP). The EFP would authorize participation in the red snapper research fishery and the collection of red snapper and other species in the Fishery Management Unit. Participating vessels may be authorized to harvest and land fish in excess of Federal possession limits and/or during fishery closures.

NMFS will review the submitted applications based on the selection criteria as described in a Federal Register notice and information provided on the application form to determine which applicants are qualified to participate in the red snapper research fishery.

Qualified applicants are those that:
- possess a valid commercial snapper grouper Federal permit;
- possess a valid United States Coast Guard (USCG) safety inspection decal when the application is submitted;
- have not been charged criminally or civilly (i.e., issued a Notice of Violation and Assessment (NOVA) or Notice of Permit Sanction) for any snapper grouper-related violation;
- have complied with NMFS observer programs and are able to take a NMFS-approved observer; and,
- submit a completed application by the posted deadline.

4.5.1 Biological Effects

If the red snapper fishery is closed, as would be the case under several of the red snapper management alternatives, a dedicated data collection program would need to be implemented to monitor the status of red snapper in the South Atlantic throughout the rebuilding time frame. Under **Alternative 1 (Status Quo),** existing fishery dependant and fishery independent data collection programs would be utilized to gather abundance and life history data on red snapper in the South Atlantic. Fishery independent programs include the SEAMAP and the MARMAP. Fishery dependant data collection programs include the MRIP, logbook, discard logbook, headboat logbook, TIP, and dealer reported landings. Sampling methods of these programs are described in detail below. Additionally, the Southeast Fisheries Science Center has developed a detailed proposed framework for fishery dependant and fishery independent monitoring programs. This document entitled Red Snapper Monitoring Plan, May 8, 2009 is included in this document as **Appendix H**, and is hereby incorporated by reference. The selection of a monitoring program will have no immediate affect on protected species because it will not immediately affect fishing effort. However, any additional information regarding protected species interactions with the fishery, collected during one of these monitoring programs, may improve NOAA Fisheries' capacity to evaluate the frequency and severity of those interactions.

The following text also appears in the Monitoring and Mitigation section of this document in case the Council does chose to limit fishery independent monitoring to that section and keep only fishery dependant monitoring as an action in this section.

MARMAP reef fish sampling program includes a sample domain ranging from Cape Lookout, North Carolina to St. Lucie Inlet, Florida. Habitats sampled include; natural hardbottom areas along the continental shelf and shelf break ranging from ~ 15 to 230 m depth, with depth ranges differing by gear type. Sampling is conducted from May–September each year with supplemental sampling in other months. Three types of gear are used to collect CPUE and length frequency data and/or biological samples (e.g. otoliths and gonads) to assess relative densities, age, and sex structure of population: 1) Chevron traps used in depths of 13-100 m; 2) short bottom long-line (used to survey sloping hardbottom areas where it is difficult to use chevron traps; depths = 25 – 223 m); and 3) rod and reel (depths = 15 – 230 m). Several methodologies of rod and reel sampling (including the use of commercial snapper reels) are utilized to collect species-specific CPUE data and biological samples.

Chevron traps are used to sample between 600 and 700 randomly chosen sites from a total of 2,500 known hard-bottom sites. About 330 to 500 of the selected sites are sampled annually. Short bottom long-lines are used to sample between 100-200 randomly selected sites are sampled from a total of 1,000 sampling sites. Rod and reel sampling occurs opportunistically over natural hardbottom habitat. MARMAP has used traps to sample and monitor hardbottom-associated reef fish populations (including red snapper) in the US South Atlantic since 1978, and chevron traps since 1990. Short bottom long-lining and rod and reel sampling has occurred since 1978. Thus, an extended time series exists on which to build an improved sampling program.

Some limitations to current fishery independent sampling efforts do exist. While the MARMAP sampling domain covers a large area of the southeast US continental shelf, logistical, weather, and funding constraints result in relatively low levels of sampling effort in the northern and southern regions of the survey area. Additionally, and regardless of spatial focus of sampling, greater sample sizes are required to develop robust indices of abundance for many federally managed species. Finally, multiple species of management interest require the use of multiple gears for effective sampling, and some are not effectively sampled with traps and longline gear. While MARMAP historically has utilized a variety of gear types, currently only chevron traps and short bottom long line gear are used consistently to develop abundance trends. Thus, as a likely combined result of (1) insufficient realized spatial coverage, (2) insufficient survey sample size, and (3) lack of appropriate gears to effectively sample some species, MARMAP surveys alone cannot generate effective abundance indices for stock assessments for all species of management interest. *An improved fishery independent survey program is needed to support stock assessments and management actions.*

Proposed framework for an improved sampling program focusing on red snapper

This proposed framework continues the long-term data series from MARMAP surveys and adds a complementary sampling program to expand needed coverage. The improved sampling plan would increase the (1) spatial footprint (central FL to Cape Hatteras, NC), (2) sample size, and (3) number of gears utilized over current survey levels, thereby considerably improving program effectiveness. The spatial and sample size expansions would be made possible by the participation of NOAA-SEFSC (Beaufort Laboratory) staff. The core aspects of the current sampling program (survey design, chevron trap, short bottom long-line and rod and reel sampling) would remain the core of the improved program, enabling comparisons of data collected in the improved program with those collected during previous years by MARMAP. Additional gears would be added and utilized by both NOAA-SEFSC and MARMAP (detailed below), with gear effectiveness research performed by NOAA-SEFSC. NOAA-SEFSC would coordinate with MARMAP to plan annual survey efforts (e.g., spatiotemporal focus of sampling) as guided by SAFMC and NMFS (SERO and SEFSC) data needs.

An improved program should include a geographic sampling range from Cape Hatteras, North Carolina to St. Lucie Inlet, Florida with targeting of specific geographical areas (e.g., offshore of northern FL and southern GA where the majority of red snapper landings occur) would be anticipated and would be guided by specific management actions. Four gear types would be utilized, each resulting in a CPUE estimate or proxy for abundance that could be compared across time and space to assess responses of red snapper and other reef fish populations to management actions. Chevron traps and short bottom long-lines would continue to be utilized following current MARMAP protocols. These gears are effective for sampling many reef fish species. Combined trap-camera studies in the Gulf of Mexico suggest chevron traps efficiently sample red snapper (D. DeVries, personal communication).

A trap-deployed camera sampling program would be initiated, building on preliminary gear investigations by MARMAP and utilizing protocols developed and utilized by SEFSC Panama City and Pascagoula laboratories for reef fish surveys in the Gulf of Mexico. The camera sampling program would involve still- or video cameras mounted on traps that would enable quantification of species in the vicinity of the trap. Adding a camera component to the chevron survey would facilitate determination of the relationship between trap CPUE and actual abundance for specific species (e.g., red snapper). The camera component would also improve data collection for species that, unlike red snapper, are not prone to collection in traps (e.g., gag grouper *Mycteroperca microlepis*). Rod and reel sampling would be utilized for both CPUE data and the collection of biological samples. Standard methodologies would be applied and variability-inducing factors (e.g., degree of angling experience) would be controlled for and/or considered when generating CPUE estimates. Additionally, NMFS-SEFSC would begin to explore the efficiency and utility of visual (scuba-based) surveys as a sampling and gear-assessment method at survey sites < ~ 40m depth, and of split-beam hydro acoustic surveys at all depths.

Sample sizes and spatial focus of the improved sampling program would be dependent on and determined by specific management actions under Amendment 17A, and by funding and resource availability. Any level of participation in the improved program by NMFS-Beaufort staff would require additional funding for staff, equipment, and potentially vessel support, depending on whether planned ship time on the NOAA ship Pisces materializes beginning in FY10. Additional biological sampling (processing and analysis of otoliths and gonads) would also require additional funding for staff and equipment.

Fishery Dependant Data Collection

Fishery dependent data could be employed to monitor abundance of red snapper. The advantage of having fishermen collect information is they would have some knowledge about locations where red snapper can be found that might not be available to researchers. The disadvantage would be fishermen could target red snapper where they are most concentrated and therefore, trends in CPUE and mean length might not reflect true population trends. To eliminate this bias, sampling would need to be coordinated through the SEFSC.

Fishery dependent data from headboats represents the longest continuous time series for snapper grouper species. This time series has been an important index for many assessments including red snapper. Proposed alternatives for red snapper in Amendment 17A include areas where fishing for or retention of all snapper grouper species would be prohibited. To maintain this continuous data base, limited headboat trips would be permitted to enter closed areas and fish for snapper grouper species. Trips could be selected by the SEFSC and would include an observer who would obtain data on all red snapper caught. Additional information on snapper grouper species would be obtained where possible. Every effort would be made to tag released red snapper with PIT tags. Dead red snapper would be retained for life history studies. The SEFSC would indicate if additional samples were needed for stock assessments.

Additional fishery dependent data could be obtained by means of grant funded research through the Cooperative Research Program. Fishermen, working with researchers, could obtain funding from NOAA Fisheries Service to obtain information on red snapper for studies on life history, release mortality, mapping locations of high abundance, etc.

Alternative 2 would establish a fishery independent monitoring program to track progress of red snapper. Sampling would include deployment of chevron traps, cameras, and hook and line at randomly selected stations. This alternative is similar in the sampling methodologies discussed under **Alternative 1 (Status Quo)**; however, **Alternative 2** would not implement a dedicated fishery dependant data collection program to monitor red snapper.

Alternative 3 would establish a red snapper research fishery involving for-hire vessels (charter boat and headboats). Participating vessels may be authorized to harvest and land fish in excess of Federal possession limits and/or during fishery closures. Retention limits for red snapper would be based upon research objectives. The trip limits and number of trips per month will depend on the number of selected vessels, available quota, and objectives of the research fishery.

The Southeast Region Headboat Survey (SRHS) is a relatively reliable fishery dependent data source for abundance indices primarily because of the manner in which the fishing activity occurs. Often fishery dependent abundance indices are biased because of the targeting nature of fishing for profit. Headboats tend to target habitat areas and types, often attempting to maximize the fishing experience for their patrons, rather than targeting individual species. This property lends itself to producing nearly unbiased measures of abundance. An ideal fishery independent survey would most likely be based on a stratified random sampling design, in which the habitat was stratified and random samples collected within each strata proportional to the fish abundance in each strata. Headboats do not operate randomly, but the most productive habitat areas do get fished (sampled) and most importantly they cover these habitats based on overall fish catches, not necessarily focusing on one particular species. This is not to say that headboats will always produce a reliable abundance index. Catch-per-unit effort from headboats is a 'relative' measure of abundance and can be affected by management regulations and economics. For example, if bag limits are low enough so that anglers are reaching the limit on almost every trip, then the CPUE tells us nothing about relative abundance of that species. An example of economics affecting CPUE may have been realized in 2008 when fuel prices reached all time highs. Some headboat captains reported traveling shorter distances relative to past years for some of their trips in 2008. If headboats are not fishing the more productive areas or fishing in shallower waters, then this can impact the relative CPUE for some species.

In the case of red snapper, the headboat survey produced an index of relative abundance used in the SEDAR 15 stock assessment. Ideally, we would keep this index intact by eliminating any forces that might alter the behavior of the fleet, which in turn could affect the relationship between CPUE and abundance. Some of these forces are out of our control. Ideally, it would be best to allow headboats to operate in the same manner year after year. Therefore, if headboats are to be used as a monitoring tool, it would be best to leave the fishery unencumbered by any regulations, other than those already in existence.

If the relationship between CPUE from the headboats and fish abundance is altered too much, then it will not be useful from a monitoring stand point. An important feature of the usefulness of the headboat CPUE index for monitoring is that we have estimates from the past to compare with future values. Without this relative comparison, we would be starting a brand new index, which may be of little utility with only a few years of data. If there are significant changes in headboat effort or behavior it may be better to start a new fishery-independent index.

As was mentioned above, the ideal situation would be to allow the headboat fishery to continue as is. However, an important question is: Can the headboat fishery operate at full capacity and still allow red snapper recovery? To answer this question the SEFSC ran several projection scenarios. The results of this analysis are shown in Report 2 of the Red Snapper Monitoring Plan, May 8, 2009 drafted by Southeast Fisheries Science Center staff, and is hereby incorporated by reference (**Appendix H**). The results suggest that the headboat fishery cannot operate at full capacity. Without other sectors operating (coast wide shutdown for non-headboats), the headboat fishery could operate at 70% of capacity and still allow for recovery of red snapper. This does not seem like a realistic management scenario, so we analyzed trade-offs between the percent capacity in other sectors and headboats (see Table 1 in Report 2 **Appendix H**). There is a steep trade-off between the fishing mortality rate (*F*) allowed for headboats and the other sectors. For example, the headboats would have to be scaled back to 30 percent in order to allow just 10 percent of the remaining sectors to operate. At this point it is not known what size area might need to be closed to reduce the other sectors to 10 percent. It is important to keep in mind that this 10 percent is mortality directed toward red snapper. So, areas where red snapper are infrequently encountered may only account for a small percentage, thereby allowing larger areas to remain open.

An important question is: Can a usable abundance index be obtained with a reduced headboat fishery? To answer this question we analyzed the delta-GLM model for estimating the red snapper index from the SEDAR 15 stock assessment in Report 3 of the Red Snapper Monitoring Plan **(Appendix H)**. The results of this analysis suggest the obvious; there is a trade-off between the amount of potential error and the amount of trips which are allowed to run. Figures 2-5 from Report 3 **(Appendix H)** suggest the main trends of the index remain intact with low numbers of trips. However, the ratio of the index in the terminal year to that in the initial year (which could be viewed as a good proxy for stock status), indicates a steeply increasing amount of error with decreasing trips in the headboat fishery. In the case of computing an index with 30% of the trips, the error on the ratio mentioned above goes to CV = 0.18, which would suggest an error in stock status of +/- 36 percent. Furthermore, this analysis assumes trips are randomly selected coast wide and follow the area, month, and trip type distributions shown in Tables 1-3 (Report 3 of **Appendix H**). Implementing this type of trip allocation may be difficult. [The report did not take into account the number of grids closed or the number of vessels that would available in nearby areas to participate, or the location/biomass of RS in each of the proposed grids. Once the Council selects the area to close, it may be necessary to have the Science Center repeat their analysis since only vessels that operate in the closed area would be affected.]

Critical Issues Associated With Fishery Dependant Monitoring

As has been shown above, it is technically possible to maintain a reliable, but noisy CPUE abundance index from a greatly reduced headboat fishery; but can it be put into practice? A few critical issues that arise when dealing with a reduced headboat fishery are: (1) Allocating trips following a statistical design, and (2) forces that may affect the relationship between CPUE and true abundance.

Allocating trips following a statistical design that follows past patterns may prove difficult. On average, headboats tend to operate at about 50-60 percent of passenger capacity. If trips were reduced by 70 percent or more, it is likely these trips will be run at near full capacity, or we would have to consider capping the number of passengers on any trip. How would trips be allocated? To follow the statistical design, which matches patterns observed in the past, we would have to allocate trips by area, month, and trip type. It is very unclear how this would operate, and there are many economic and social considerations involved in this. It seems highly likely headboat captains might change the way they run trips based on the allocation mechanism. Assuming the allocation could be worked out, there are still issues with avoiding forces mentioned in (2) above. Most notable is Amendment 16, which added more regulations for shallow water grouper and vermilion snapper. This may affect fishing behavior enough to change the current relationship between headboat CPUE and true abundance.

The current method for collecting data from headboats in the SRHS is through self-reported catch records (logbooks) and dockside intercepts. The total catch and discards in numbers are entirely self reported. The dockside samples provide average weights, length measurements, and otolith samples from landed fish for selected trips. This current sampling design would be woefully inadequate under a 30% or less capacity fishery. It is probably not a good idea to have a species recovery monitoring be based entirely on self reported data. The catch and discard numbers would have to be recorded independently, at-sea. One advantage of using headboats for monitoring, as opposed to private, charter, or even commercial boats, is they constitute some of the largest vessels fishing for snapper grouper. The large size makes it easier for putting observers on board and efficiently collecting large amounts of data. If headboats were used as the sole source for monitoring red snapper, then sampling would likely have to be at a high rate (i.e. observer coverage would need to be near 100% of trips). There are many details that would need to be worked out if observers were to be used for collecting data aboard headboats. Some decisions would have to be made about the following: (1) The type of data to be collected (e.g. numbers, lengths, weights, and discards), (2) the percentage of trips to be covered, and (3) the degree of sub-sampling of fish on a given trip, just to name a few. Those details have not been worked out here because the amount of sampling and total costs would have to considered first. It should be noted that any reduction in the headboat fishery will affect data collection for all other snapper grouper species. Forcing a statistical design of headboat trips based on red snapper by definition will be insufficient or inadequate for other species in the snapper grouper complex.

The most biologically beneficial data collection scenario would be to designate both **Alternatives 2** and **3** as preferred alternatives to ensure a balanced data collection approach. However, funding for both a fishery independent program and a fishery dependant program may not be available on a continuing basis. Both of these alternatives differ from **Alternative 1 (Status Quo)** in that they establish a monitoring program dedicated solely to gathering data on red snapper throughout a specific time period during which all harvest of the species could be prohibited. It is true that the programs under **Alternative 1 (Status Quo)** may conduct research related to red snapper and co-occurring species; however, these programs are not focused only on red snapper for the purposes of this amendment. Furthermore, the possibility that those programs listed under **Alternative 1 (Status Quo)** would be required to shift their focus to other more critical species in the future would always exist. **Alternatives 2** and **3**, would establish dedicated, long-term programs, designed to fulfill the need to accurately track red snapper abundance throughout the rebuilding process.

Alternative 1 (Status Quo) would perpetuate the existing level of risk for interactions between ESA-listed species and the fishery. **Alternatives 2** and **3** are unlikely to have adverse affects on ESA-listed *Acropora* species. Previous ESA consultations determined the snapper grouper fishery was not likely to adversely affect these species (See **Section 3.5**). The effects of **Alternative 2** and **3** on sea turtles and smalltooth sawfish are unclear. If monitoring is conducted by commercial or research vessels, using fishing methods similar or identical to those of the snapper grouper fishery, the types and rates of interactions with ESA-listed species would be expected to be similar to those already occurring in the fishery; no increase in the likelihood of adverse affects occurring would be anticipated.

4.5.2 Economic Effects

Commercial Sector

While the short-term economic effects associated with the monitoring programs outlined under **Alternatives 2** and **3** cannot be estimated at this time due to a lack of sufficient detail about these programs, it is likely that the positive long-term economic benefits from **Alternatives 2** and **3** will exceed those provided under **Alternative 1 (Status Quo)**.
Non-use values are expected to rise with the accumulation of additional biological and economic information. Therefore, **Alternatives 2** and **3** would provide an increase in non-use values over **Alternative 1 (Status Quo)**.

Recreational Sector

Alternatives 1 and 2 would not have any short-term economic effects on the recreational sector, as they would not necessarily require any changes to the current data collection program for the recreational sector. Considering that some vital information on red snapper will no longer be available under the proposed total closure of the red snapper fishery, data collection involving the recreational sector through some other means would be necessary. The data collection approach under **Alternative 2** may be considered an improvement over that of the status quo. Such data collection, however, would not be able to gather information on the actual operations of the anglers and for-hire sectors with respect to red snapper fishing and thus, on the possible valuation of red snapper fishing activities. **Alternative 3** would partly supply such information about anglers and for-hire operations even though at very limited level. In addition, selected for-hire vessels could derive some benefits from the data collection program.

4.5.3 Social Effects

Alternatives 1 (Status Quo) and **2** are administrative actions and would not be expected to have any direct short-term effects on fishermen or associated businesses and communities. Under these alternatives, although some minimal directed harvest may continue, monitoring should entail the least mortality, resulting in the quickest red snapper recovery and receipt of the long-term benefits of a recovered resource.

Alternative 3 would allow continued red snapper directed harvest for research. Any directed harvest would be expected to result in direct short-term social and economic benefits for those entities allowed to participate in the program and harvest red snapper. Participation, however, would be limited and those not able to participate in the program may raise issues of fairness and equity, particularly given that participants would be able to profit (carry paying customers) from a research endeavor. Details of the qualification and selection process that would be utilized are not available. From the long-term perspective, continued directed harvest, even minimal quantities for research purposes, could delay red snapper recovery and the receipt of the long-term social benefits of a recovered resource. Additional discussion of expected social effects will be completed when/if details of the research fishery program are provided.

4.5.4 Administrative Effects

Alternative 1 (Status Quo) would incur no additional administrative impacts. However, under **Alternatives 2** and **3**, most activities related to monitoring programs would require the issuance of some form of authorization or acknowledgement such as an exempted fishing permit, letter of acknowledgement, or a scientific research permit. The administrative burden for processing these authorizations can range from moderate to minor. The most time consuming of the three is an exempted fishing permit, and the least time consuming is a letter of acknowledgement.

4.5.5 Council's Conclusion

4.6 Research Needs

Vermilion snapper, gag, snowy grouper, golden tilefish, black sea bass, and red snapper have been assessed through the SEDAR process. After completion of these assessments, research needs have been identified by the SEDAR workgroup and made available. These needs have been identified and prioritized in the MARFIN request for proposals. Furthermore, a summary of current research will be provided in the snapper grouper SAFE Report (NMFS 2005), which is considered to be a "living" document that will be updated as new data become available.

Biological research needs that have been identified through the SEDAR process are as follows:

4.5.1 Red snapper

- Use new technology such as recent advances in genetics techniques to reinvestigate the stock structure and estimate the effective population size of red snapper in the Gulf of Mexico and along the Atlantic coast.
- Obtain better estimates of red snapper natural mortality and release mortality in commercial and recreational fisheries.
- Investigate life history of larval/juvenile (age 0 and 1) red snapper.
- Include assessment of otolith edge type in all future assessments. Classification schemes for edge type and quality of the otolith/section have been developed by the MARMAP program and are currently used by MARMAP and NMFS Beaufort.

- Continue to conduct inter-lab comparison of age readings from test sets of otoliths in preparation for any future stock assessments.
- Obtain adequate data for gutted to whole weight conversions a priori (before stock assessment data workshop).
- Ensure small specimens from fishery-independent data collections are available to produce good estimates of von Bertalanffy parameters.

4.5.2 Socio-cultural Research Needs

Socio-cultural research needs that have been identified by the Council's Scientific and Statistical Committee are as follows:

1. Identification, definition and standardization of existing datasets to meet short-term social analysis needs (e.g. behavioral networks based on annual rounds). Centrally locate these datasets so they are accessible to researchers and managers (realizing the constraints imposed by confidentiality);

2. Development of new variables to meet long-term social analytical needs (e.g., community health, individual health, decision-making patterns, cumulative impacts of endogenous, exogenous, and regulatory factors);

3. Longitudinal Data – monitoring needs, including historical, ethnographic, and quantitative data over time;

4. Traditional ecological knowledge/local fisheries knowledge (TEK/LFK) constructions along with scientific ecological knowledge (SEK);

5. State data (license/permit data; social survey type data) and coordination between agencies/levels;

6. Better integration of social, biological and economic variables in modeling efforts; and

7. Better efforts to include humans and human behavior in the ecosystem-based framework (e.g., representation of humans as keystone predators in the system);

Economic research needs that have been identified by the Council's Scientific and Statistical Committee are as follows:

The following issues were identified as being impediments to conducting economic research:

- Confidentiality of state data and data collected through federal research projects.
- Data collected through certain agency grants cannot be distributed without dealing with confidentiality issues.
- The inability to display confidential data.

Commercial

1. Explore the feasibility of developing computable general equilibrium models, which can incorporate the entire economy and important ecosystem components (medium priority, high cost).
2. Develop an input output model for the South Atlantic commercial fisheries. This model should be similar to the NOAA Fisheries Service model for other regions on shore-based communities (medium priority, high cost).
3. Consider alternative ways to collect data on both a social and economic basis e.g. partnerships to develop projects (high priority, medium cost).
4. Ensure availability, improve upon and collect basic data: catch, employment, effort, price, cost/earnings (very high priority, high cost).
5. Opportunity costs - rely on the studies completed in the past on the next best jobs. Include collection of data to estimate worker satisfaction bonus.
6. Integrated biological, social and economic models including dynamic optimization models.
7. Demand analysis – include the effects of imports. Studies of value added product e.g. branding and marketing strategies.
8. Include data collection and analysis on the processing sector, retail sector.
9. Research on the economic and social effects of capacity reduction.
10. Employment in the primary and secondary sectors of the fishing industry that also includes research on household budgets.
11. Cumulative impacts – economic and social.
12. Models to predict fishing behavior in the face of fishing regulations. This would include description of fishing rounds on a seasonal basis and fishing behavioral networks.
13. Non-consumptive and non-use benefits of marine protected species and essential fish habitat/habitat areas of particular concern. Also, measure the socio-cultural benefits of these species.
14. Research on live product/whole weight conversion factors on a seasonal basis possibly through the TIP program or through other biological sampling programs.

Recreational

1. Assess the feasibility of developing benefits transfer models from existing data and the MRFSS. Complete recreational demand models that are more relevant for fisheries management. These models should focus on policy relevant variables (bag, size limits, individual species and species groups). (high priority, low/medium cost)
2. Develop random utility models for predicting participation changes, economic value and behavior of recreational fishermen. (high priority, high cost for data collection).
3. Develop targeted input-output model to estimate the effects of policy changes on the economic impacts of recreational fishing. Will provide information on jobs, wages, income on affected sectors such as lodging, restaurants, bait and tackle shops, marinas, boats (medium priority, high cost).
4. Include categories/motivations of recreational anglers in models outlined in items 1 and 2 (medium priority, high cost).
5. Collect data on motivations/behavioral patterns of recreational fishermen. (medium priority, high cost).
6. Characterize participants in subsistence fisheries. (low priority, high cost).

7. Develop Valuation models and I/O models for tournament fishing. (medium priority, high cost).
8. Develop cost-earnings model for the for-hire sector (charter and headboat). (high priority, high cost). NOAA Fisheries Service is currently conducting a study.

Ecosystem based management

1. Conduct analyses to facilitate the economic valuation of ecosystem services (very high priority, high cost).
2. Explore the use of ecopath and ecosim (very high priority, high cost).

4.6 Cumulative Effects

As directed by NEPA, federal agencies are mandated to assess not only the indirect and direct impacts, but the cumulative impacts of proposed actions as well. NEPA defines a cumulative impact as *"the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time"* (40 C.F.R. 1508.7). Cumulative effects can either be additive or synergistic. A synergistic effect is when the combined effects are greater than the sum of the individual effects.

Various approaches for assessing cumulative effects have been identified, including checklists, matrices, indices, and detailed models (MacDonald 2000). The Council on Environmental Quality (CEQ) offers guidance on conducting a Cumulative Effects Analysis (CEA) in a report titled "Considering Cumulative Effects under the National Environmental Policy Act". The report outlines 11 items for consideration in drafting a CEA for a proposed action.

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.
2. Establish the geographic scope of the analysis.
3. Establish the timeframe for the analysis.
4. Identify the other actions affecting the resources, ecosystems, and human communities of concern.
5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stress.
6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.
7. Define a baseline condition for the resources, ecosystems, and human communities.
8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.
9. Determine the magnitude and significance of cumulative effects.
10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.
11. Monitor the cumulative effects of the selected alternative and adapt management.

This CEA for the biophysical environment will follow a modified version of the 11 steps. Cumulative effects for the socio-economic environment will be analyzed separately.

4.6.1 Biological

SCOPING FOR CUMULATIVE EFFECTS

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.

The CEQ cumulative effects guidance states that this step is done through three activities. The three activities and the location in the document are as follows:

I. The direct and indirect effects of the proposed actions **(Section 4.0)**;
II. Which resources, ecosystems, and human communities are affected **(Section 3.0)**; and
III. Which effects are important from a cumulative effects perspective **(information revealed in this cumulative Effects Analysis (CEA)**?

2. Establish the geographic scope of the analysis.

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. 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. Therefore, the proper geographical boundary to consider effects on the biophysical environment is larger than the entire South Atlantic EEZ. The ranges of affected species are described in **Section 3.2.1**, which is hereby incorporated by reference. The most measurable and substantial effects would be limited to the South Atlantic region.

3. Establish the timeframe for the analysis.

Establishing a timeframe for the CEA is important when the past, present, and reasonably foreseeable future actions are discussed. It would be advantageous to go back to a time when there was a natural, or some modified (but ecologically sustainable) condition. However, data collection for many fisheries began when species were already fully exploited. Therefore, the timeframe for analyses should be initiated when data collection began for the various fisheries. In determining how far into the future to analyze cumulative effects, the length of the effects will depend on the species and the alternatives chosen. Long-term evaluation is needed to determine if management measures have the intended effect of improving stock status. Therefore, analyses of effects should extend beyond the time when these overfished stocks are rebuilt. Monitoring should continue indefinitely for all species to ensure that management measures are adequate for preventing overfishing in the future. A complete description of monitoring methods that would be employed under this amendment appears in **Section 4.18** of this document, and is incorporated herein by reference.

4. Identify the other actions affecting the resources, ecosystems, and human communities of concern (the cumulative effects to the human communities are discussed in Section 4).

Listed 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 environment.

I. Fishery-related actions affecting speckled hind, warsaw grouper, golden tilefish, snowy grouper, and red snapper.

A. Past

The reader is referred to **Section 1.3 History of Management** for past regulatory activity for the fish species. These include bag and size limits, spawning season closures, commercial quotas, gear prohibitions and limitations, area closures, and a commercial limited access system.

Amendment 13C to the FMP for the Snapper Grouper Fishery of the South Atlantic Region became effective October 23, 2006. The amendment addresses overfishing for snowy grouper, golden tilefish, black sea bass and vermilion snapper. The amendment also allows for a moderate increase in the harvest of red porgy as stocks continue to rebuild. Amendment 13C 2006 is hereby incorporated by reference. Analysis found in Appendix x show minimal reductions (< 2%) in commercial red snapper removals resulting from Amendment 13C. Therefore, ancillary effort reductions in the red snapper fishery due to management measures in Amendment 13C would not result in any significant reduction in harvest of red snapper that could be counted toward the overall harvest reductions needed to end overfishing of the specie.

Amendment 14 to the FMP for the Snapper Grouper Fishery of the South Atlantic Region was implemented on February 12, 2009. Implementing regulations for Amendment 14 established eight Type 2 Marine Protected Areas (MPAs) in federal waters ranging from North Carolina to Florida (see Figure 4-17). A Type 2 MPA is an area within which fishing for or retention of snapper grouper species is prohibited but other types of legal fishing, such as trolling, are allowed. The prohibition on possession does not apply to a person aboard a vessel that is in transit with fishing gear appropriately stowed. MPAs are being used as a management tool to promote the optimum size, age, and genetic structure of slow growing, long-lived deepwater snapper grouper species (speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, blueline tilefish, and sand tilefish. Because of the small sizes of the MPAs, it is unlikely that any significant reductions in overall mortality of species also affected by Amendment 17A would occur. Therefore, biological effects of the MPAs would not significantly add to or reduce the anticipated biological benefits of management actions in Amendment 17A.

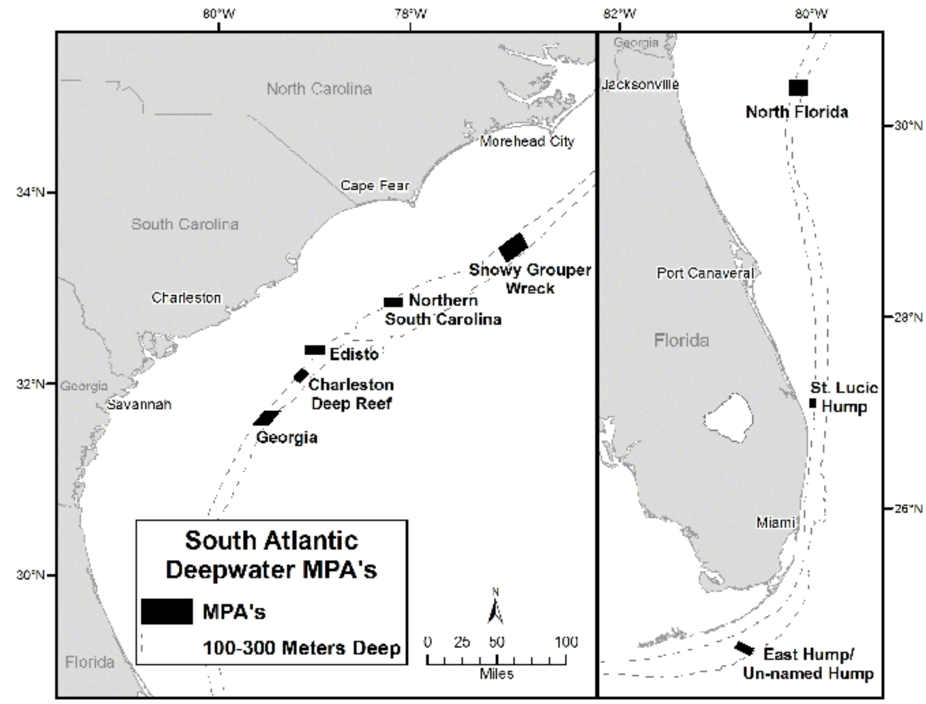

Figure 4-17 Marine protected areas implemented under Snapper Grouper Amendment 14 (SAFMC 2007).

B. Present

In addition to snapper grouper fishery management issues being addressed in this amendment, several other snapper grouper amendments have been developed concurrently and are in the process of approval and implementation.

Most recently, Amendment 16 to the FMP for the Snapper Grouper Fishery of the South Atlantic Region (SAFMC 2008c) was partially approved by the Secretary of Commerce. Amendment 16 includes provisions to extend the shallow water grouper spawning season closure, create a five month seasonal closure for vermilion snapper, require the use of dehooking gear if needed, reduce the aggregate bag limit from five to three grouper, and reduce the bag limit for black grouper and gag to one gag or black grouper combined within the aggregate bag limit. The expected effects of these measures include significant reductions in landings and overall mortality of several shallow water snapper grouper species including, gag, black grouper, red grouper, and vermilion snapper. Specifically, the use of dehooking tools may reduce the release mortality of red snapper that are incidentally caught while fishing for other snapper grouper species. Model output in Appendix x shows that Amendment 16 could contribute up to a 16% reduction in commercial red snapper harvest, which has been included in the baseline conditions upon which the needed red snapper reductions have been derived.

On July 30, 2008, Amendment 15B to the FMP for the Snapper Grouper Fishery of the South Atlantic Region was submitted for Secretarial review. Management measures in Amendment 15B, if approved, that would affect red snapper in Amendment 17A include prohibition of the sale of bag limit caught snapper grouper species for fishermen not holding a federal commercial permit for South Atlantic snapper grouper, an action to adopt, when implemented, the Atlantic Coastal Cooperative Statistics Program (ACCSP) release, discard and protected species module to assess and monitor bycatch, allocations for snowy grouper, and management reference points for golden tilefish.

Since some recreational fishermen may intentionally catch more fish than they can consume with the intent to sell, prohibiting the sale of those fish by recreational fishermen could decrease fishing effort; and therefore, may have small biological benefits. Adopting a bycatch monitoring method would not yield immediate biological benefits, but may help to inform future fishery management decisions with increased certainty using data collected from the (ACCSP). Biological benefits from Amendment 15B are not expected to result in a significant cumulative biological effect when added to anticipated biological impacts under Amendment 17A.

C. Reasonably Foreseeable Future

Amendment 18 to the FMP for the Snapper Grouper Fishery of the South Atlantic Region is currently under development. Measures in Amendment 18 would extend the snapper grouper FMP northward, limit effort in the black sea bass and golden tilefish fisheries, separate snowy grouper quota into regions/states, separate gag recreational allocation in to regions/states, change the golden tilefish fishing year, improve the accuracy and timing of fisheries statistics, review and update the wreckfish ITQ program, and designate EFH in the proposed snapper grouper northern area. The actions currently contained in Amendment 18, which affect red snapper, are intended to prevent overcapitalization while allowing fishery participants to achieve optimum yield benefits for those species.

The Comprehensive Annual Catch Limit (ACL) Amendment would establish Annual Catch Limits (ACLs) and Annual Catch Targets (ACTs) for all other federally managed South Atlantic species not experiencing overfishing. Other actions contained within the ACL Amendment may include: (1) choosing ecosystem component species; (2) allocations; (3) management measures to limit recreational and commercial sectors to their ACTs; (4) accountability measures; and (5) any necessary modifications to the range of regulations. It is unlikely any of the management measures for the species being addressed in the Comprehensive ACL Amendment would directly affect red snapper in Amendment 17A. However, several species are co-occurring, and are included in species groupings e.g., the shallow water snapper grouper complex and the deepwater snapper grouper complex. Therefore, if regulations are implemented in the future that may biologically benefit one species in a species complex, it is likely others in the same complex may also realize biological benefits.

II. Non-Council and other non-fishery related actions, including natural events affecting speckled hind, warsaw grouper, golden tilefish, snowy grouper, and red snapper.

A. Past
B. Present
C. Reasonably foreseeable future

In terms of natural disturbances, it is difficult to determine the effect of non-Council and non-fishery related actions on stocks of snapper grouper species. Annual variability in natural conditions such as water temperature, currents, food availability, predator abundance, etc. can affect the abundance of young fish, which survive the egg and larval stages each year to become juveniles (i.e., recruitment). This natural variability in year class strength is difficult to predict as it is a function of many interactive and synergistic factors that cannot all be measured (Rothschild 1986). Furthermore, natural factors such as storms, red tide, cold water upwelling, etc. can affect the survival of juvenile and adult fishes; however, it is very difficult to quantify the magnitude of mortality these factors may have on a stock. Alteration of preferred habitats for snapper grouper species could affect survival of fish at any stage in their life cycles. However, estimates of the abundance of fish, which utilize any number of preferred habitats, as well as, determining the impact habitat alteration may have on snapper grouper species, is problematic.

The snapper grouper ecosystem includes many species, which occupy the same habitat at the same time. For example, red snapper co-occur with vermilion snapper, tomtate, scup, red porgy, white grunt, black sea bass, red grouper, scamp, gag, and others. Therefore, red snapper are likely to be caught and suffer some mortality when regulated since they will be incidentally caught when fishermen target other co-occurring species. Red snapper recruitment has been measured from the 1950’s to the present time and shows a decline from the earliest years to a low in the mid-1900s. Since then there have been several moderately good year classes in 1998, 1999, and 2000, and then another decline through 2003, with a slight increase through 2007. These moderately good year classes have grown and entered the fishery over the past couple years and are likely responsible for the higher catches being reported by recreational and commercial fishermen. Other natural events such as spawning seasons, and aggregations of fish in spawning condition can make some species especially vulnerable to targeted fishing pressure. Such natural behaviors are discussed in further detail in **Section 3.2** of this document, and is hereby incorporated by reference.

AFFECTED ENVIRONMENT

5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stress.

In terms of the biophysical environment, the resources/ecosystems identified in earlier steps of the CEA are the fish populations directly or indirectly affected by the regulations. This step should identify the trends, existing conditions, and the ability to withstand stresses of the environmental components.

The trends in condition of gag, vermilion snapper, black sea bass, snowy grouper, golden tilefish, and red snapper are documented through the Southeast Data, Assessment and Review (SEDAR) process. Red grouper, black grouper, warsaw grouper, and speckled hind have not been recently assessed. However, given the best available science, each of these stocks has been determined to be undergoing overfishing, meaning that fishing related mortality is greater than the maximum fishing mortality threshold. The status of each of these stocks is described in detail in **Section 3.3** of this document, and is hereby incorporated by reference.

6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.

This step is important in outlining the current and probable stress factors on snapper grouper species identified in the previous steps. The goal is to determine whether these species are approaching conditions where additional stresses could have an important cumulative effect beyond any current plan, regulatory, or sustainability threshold (CEQ 1997). Sustainability thresholds can be identified for some resources, which are levels of impact beyond which the resources cannot be sustained in a stable state. Other thresholds are established through numerical standards, qualitative standards, or management goals. The CEA should address whether thresholds could be exceeded because of the contribution of the proposed action to other cumulative activities affecting resources.

<u>Fish populations</u>

Numeric values of overfishing and overfished thresholds are being updated in this amendment for red snapper. These values includes maximum sustainable yield (MSY), the fishing mortality rate that produces MSY (F_{MSY}), the biomass or biomass proxy that supports MSY (B_{MSY}), the minimum stock size threshold below which a stock is considered to be overfished (MSST), the maximum fishing mortality threshold above which a stock is considered to be undergoing overfishing (MFMT), and optimum yield (OY).

Definitions of overfishing and overfished for species addressed in this amendment can be found in the most recent stock assessment sources included in **Table 1-2** of this document. Applicable stock assessment sources include SEDAR 4 (2004) for golden tilefish and snowy grouper; Potts and Brennan (2001) for speckled hind, black grouper, and red grouper; Huntsman *et al.* (1993) for warsaw grouper; SEDAR Update 1 (2005) for black sea bass; SEDAR 10 (2006) for gag;

SEDAR Update #3 (2007) for vermilion snapper; and SEDAR 15 (2008) for red snapper. Of these species, snowy grouper, black sea bass, and red snapper have been declared overfished. All others have been determined to be undergoing overfishing according to their respective overfishing and overfished definitions. Detailed discussions of the science and processes used to determine the stock status of these species is contained in the previously mentioned information sources and are hereby incorporated by reference.

7. Define a baseline condition for the resources, ecosystems, and human communities. The purpose of defining a baseline condition for the resource and ecosystems in the area of the proposed action is to establish a point of reference for evaluating the extent and significance of expected cumulative effects. The SEDAR assessments show trends in biomass, fishing mortality, fish weight, and fish length going back to the earliest periods of data collection. For some species such as gag and snowy grouper, assessments reflect initial periods when the stocks were above B_{MSY} and fishing mortality was fairly low. However, some species such as vermilion snapper and black sea bass were heavily exploited or possibly overfished when data were first collected. As a result, the assessment must make an assumption of the biomass at the start of the assessment period thus modeling the baseline reference points for the species. For a detailed discussion of the baseline conditions of each of the species addressed in this amendment the reader is referred to those stock assessment and stock information sources referenced in **Item Number 6** of this CEA.

DETERMINING THE ENVIRONMENTAL CONSEQUENCES OF CUMULATIVE EFFECTS

8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.

Table 4-23. The cause and effect relationship of fishing and regulatory actions within the time period of the Cumulative Effects Analysis (CEA).

Time period/dates	Cause	Observed and/or Expected Effects
1960s-1983	Growth overfishing of many reef fish species.	Declines in mean size and weight of many species including black sea bass.
August 1983	4" trawl mesh size to achieve a 12" TL commercial vermilion snapper minimum size limit (SAFMC 1983).	Protected youngest spawning age classes.
Pre-January 12, 1989	Habitat destruction, growth overfishing of vermilion snapper.	Damage to snapper grouper habitat, decreased yield per recruit of vermilion snapper.
January 1989	Trawl prohibition to harvest fish (SAFMC 1988).	Increase yield per recruit of vermilion snapper; eliminate trawl damage to live bottom habitat.
Pre-January 1, 1992	Overfishing of many reef species including vermilion snapper, and gag.	Spawning stock ratio of these species is estimated to be less than 30% indicating that they are overfished.
January 1992	Prohibited gear: fish traps south of Cape Canaveral, FL; entanglement nets; longline gear inside of 50 fathoms; powerheads and bangsticks in designated SMZs off SC. Size/Bag limits: 10" TL vermilion snapper (recreational only); 12" TL vermilion snapper (commercial only); 10 vermilion snapper/person/day; aggregate grouper bag limit of 5/person/day; and 20" TL gag, red, black, scamp, yellowfin, and yellowmouth grouper size limit (SAFMC 1991).	Protected smaller spawning age classes of vermilion snapper.
Pre-June 27, 1994	Damage to *Oculina* habitat.	Noticeable decrease in numbers and species diversity in areas of *Oculina* off FL
July 1994	Prohibition of fishing for and retention of snapper grouper species (HAPC renamed OECA; SAFMC 1993)	Initiated the recovery of snapper grouper species in OECA.
1992-1999	Declining trends in biomass and overfishing continue for a number of	Spawning potential ratio for vermilion snapper and gag is less than 30% indicating that they are overfished.

Time period/dates	Cause	Observed and/or Expected Effects
	snapper grouper species including vermilion snapper and gag.	
February 24, 1999	Gag and black: 24" total length (recreational and commercial); 2 gag or black grouper bag limit within 5 grouper aggregate; March-April commercial closure. Vermilion snapper: 11" total length (recreational). Aggregate bag limit of no more than 20 fish/person/day for all snapper grouper species without a bag limit (1998c).	F for gag vermilion snapper remains declines but is still above F_{MSY}.
October 23, 2006	Snapper grouper FMP Amendment 13C (SAFMC 2006)	Commercial vermilion snapper quota set at 1.1 million lbs gutted weight; recreational vermilion snapper size limit increased to 12" TL to prevent vermilion snapper overfishing
Effective February 12, 2009	Snapper grouper FMP Amendment 14 (SAFMC 2007)	Use marine protected areas (MPAs) as a management tool to promote the optimum size, age, and genetic structure of slow growing, long-lived deepwater snapper grouper species (e.g., speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, blueline tilefish, and sand tilefish). Gag and vermilion snapper occur in some of these areas.
Effective March 20, 2008	Snapper grouper FMP Amendment 15A (SAFMC 2008a)	Establish rebuilding plans and SFA parameters for snowy grouper, black sea bass, and red porgy.
Target September 2009	Snapper grouper FMP Amendment 15B (SAFMC 2008b)	End double counting in the commercial and recreational reporting systems by prohibiting the sale of bag-limit caught snapper grouper, and minimize impacts on sea turtles and smalltooth sawfish.
Target Effective Date July 2009	Snapper grouper FMP Amendment 16 (SAFMC 2008c)	Protect spawning aggregations and snapper grouper in spawning condition by increasing the length of the spawning season closure, decrease discard mortality by requiring the use of dehooking tools, reduce overall harvest of gag and vermilion snapper to end overfishing.
Target 2010	Snapper grouper FMP Amendment 17A.	SFA parameters for red snapper; ACLs and ACTs; management measures to limit

Time period/dates	Cause	Observed and/or Expected Effects
		recreational and commercial sectors to their ACTs; accountability measures. Establish rebuilding plan for red snapper.
Target 2010	Snapper Grouper Amendment 17B	ACLs and ACTs; management measures to limit recreational and commercial sectors to their ACTs; accountability measures, for species undergoing overfishing.
Target 2010	Snapper Grouper FMP Amendment 18	Extend the snapper grouper FMU northward, review and update wreckfish ITQ system, prevent overexploitation in the black sea bass and golden tilefish fisheries, improve data collection timeliness and data quality.
Target 2010	Snapper Grouper FMP Amendment 19	Review and updated wreckfish ITQ program.
Target January 1, 2011	Comprehensive ACL Amendment.	ACLs, ACTs, and accountability measures for species not experiencing overfishing; accountability measures; an action to remove species from the fishery management unit as appropriate; and management measures to limit recreational and commercial sectors to their ACTs.
Target 2011	Amendment 20 (Wreckfish)	Review the current ITQ program and update the ITQ program as necessary to comply with MSA LAPP requirements.

9. Determine the magnitude and significance of cumulative effects.

Proposed management actions, as summarized in **Section 2** of this document, would establish ACLs and AMs for those species undergoing overfishing and are expected to have a beneficial, cumulative effect on the biophysical environment. These management actions are expected to protect and increase stock biomass, which may affect other stocks. Detailed discussions of the magnitude and significance of the preferred alternatives appear in **Section 4** of this integrated document and is hereby incorporated by reference. Below is a short summary of the biological significance and magnitude of each of the preferred alternatives chosen, and a brief discussion of their combined effect on the snapper grouper FMU and the ecosystem.

The red snapper rebuilding plan and management measures in this amendment would result in a slow rebuilding of the stock over the course of many years. One ancillary benefit of restricting red snapper harvest are reductions in fishing related mortality of other species associated with red snapper. It is not possible to eliminate incidental mortality of red snapper, since it is part of a multi-species complex, without prohibiting fishermen from targeting all associated species wherever red snapper occur. Therefore, biological benefits are expected for all species associated with red snapper, especially in the specific areas of regulatory implementation.

When viewed in totality, the actions in this amendment would benefit shallow water species currently undergoing overfishing as well as the ecosystem in which they reside. Since the snapper grouper FMU and species complexes therein include a host of co-occurring species, proposed management measures may also benefit those associated species in addition to the ten addressed here. Predator prey relationships would likely approach balanced conditions over time, and the protections put in place under this amendment may enhance the natural sex ratio and protect easily targeted fish that may aggregate to spawn. Although it is difficult to quantify the cumulative effects of the proposed actions, it is expected that the effects will be positive and synergistic.

10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.
The cumulative effects on the biophysical environment are expected to be positive. Avoidance, minimization, and mitigation are not applicable.

11. Monitor the cumulative effects of the selected alternative and adopt management.
The effects of the proposed action are, and will continue to be, monitored through collection of data by NOAA Fisheries Service, states, stock assessments and stock assessment updates, life history studies, and other scientific observations.

4.6.2 Socioeconomic

A description of the human environment, including a description of commercial and recreational snapper grouper fisheries and associated key fishing communities is contained in **Section 3.0** and incorporated herein by reference. A description of the history of management of the snapper grouper fishery is contained in **Section 1.3** and is incorporated herein by reference. Participation in and the economic performance of the fishery have been effected by a combination of regulatory, biological, social, and external economic factors. Regulatory measures have obviously affected the quantity and composition of harvests, through the various size limits, seasonal restrictions, trip or bag limits, and quotas. Gear restrictions, notably fish trap and longline restrictions, have also affected harvests and economic performance. The limited access program implemented in 1998/1999 substantially affected the number of participants in the fishery. Biological forces that either motivate certain regulations or simply influence the natural variability in fish stocks have played a role in determining the changing composition of the fishery. Additional factors, such as changing career or lifestyle preferences, stagnant to declining ex-vessel fish prices due to imports, increased operating costs (e.g., gas, ice, insurance, dockage fees, etc.), and increased waterfront/coastal value leading to development pressure for non-fishery uses have impacted both the commercial and recreational fishing sectors.

Given the variety of factors that affect fisheries, persistent data issues, and the complexity of trying to identify cause-and-effect relationships, it is not possible to differentiate actual or cumulative regulatory effects from external cause-induced effects. For each regulatory action, expected effects are projected. However, these projections typically only minimally, if at all, are capable of incorporating the variety of external factors, and evaluation in hindsight is similarly incapable of isolating regulatory effects from other factors, as in, what portion of a change was due to the regulation versus due to input cost changes, random variability of species availability, the sale of a fish house or docking space for condominium development, or even simply fishermen behavioral changes unrelated to the regulation.

In general, it can be stated, however, that the regulatory environment for all fisheries has become progressively more complex and burdensome, increasing, in tandem with other adverse influences, the likelihood of economic losses, business failure, occupational changes, and associated adverse pressures on associated families, communities, and industries. Some reverse of this trend is possible and expected. The establishment of ACLs and AMs for species undergoing overfishing is expected to help protect and sustain harvest at the OY level. However, certain pressures would remain, such as total effort and total harvest considerations, increasing input costs, import induced price pressure, and competition for coastal access.

A detailed description of the expected social and economic impacts of the actions in this amendment are contained elsewhere in **Section 4**, and in **Sections 5** and **6**, which are incorporated herein by reference. Current and future amendments are expected to add to this cumulative effect. Snapper Grouper Amendment 15B proposes to prohibit the sale of bag-limit caught snapper grouper species for those who do not hold a federal commercial permit for snapper grouper. This would eliminate the ability of the recreational angler to subsidize the cost of a fishing trip through the sales of snapper grouper, and may therefore, decrease recreational demand. This action would have more pronounced effects on the for-hire sector which often uses the sale of bag-limit caught fish to pay crew members. The cumulative impacts of eliminating the ability to sell bag limit caught snapper grouper and the restrictions on red snapper specifically in this amendment could be perceived as being significant to this sector.

Snapper Grouper Amendment 16 will address overfishing in the gag and vermilion snapper fisheries. The corrective action in response to overfishing always requires harvest reductions and more restrictive regulation. Thus, additional short-term adverse social and economic effects would be expected. These restrictions will hopefully prevent; however, the stocks from becoming overfished, which would require recovery plans, further harvest restrictions, and additional social and economic losses.

Snapper Grouper Amendment 17B will establish ACLs, AMs, and ACTs for a number of snapper grouper species, and specify golden tilefish allocations. Some of these actions are expected to result in additional harvest restrictions on the snapper grouper fishery, and additional short-term adverse social and economic effects.

Snapper Grouper Amendment 18 will examine limiting participation and effort in the golden tilefish and black sea bass pot fisheries, consider extending the range of the FMP north through the Mid-Atlantic and New England Council areas, and consider separating the allowable harvests for some species in regional or state totals, among other actions. While restrictions of this nature would in theory allow status quo total harvests for the respective species to continue, these restrictions may result in the redistribution of harvests among traditional users, resulting in those who are able to increase their harvests, and associated social and economic benefits, and those who suffer reduced harvests, with associated losses in benefits. For those who would be expected to experience a possible reduction in harvests, these reductions may occur on top of declining benefits as a result of other recent or developing management action.

4.7 Bycatch Practicability

NEEDS TO BE UPDATED; REWRITE TO FOCUS ON RED SNAPPER AND CHANGE YEARS TO 2005-2008.

4.7.1 Population Effects for the Bycatch Species

4.7.1.1 Background

The directed commercial fishery for gag, black grouper, red grouper, snowy grouper, red snapper, vermilion snapper, and speckled hind is prosecuted primarily with hook and line gear (Table 4-24). Black sea bass are predominantly taken with pots; whereas, longline gear has been the predominant gear type used to capture golden tilefish and warsaw grouper. Commercial landings information for speckled hind and warsaw grouper are probably not reliable since sale is prohibited.

Table 4-24. Percentage of commercial catch by gear based on data from 2004-2007.

Species	H&L	Diving	LL	Pot	Other
Gag	82.33%	16.74%	0.23%	0.02%	0.67%
Black sea bass	11.31%	0.01%	0.00%	88.67%	0.00%
Vermilion snapper	99.84%	0.01%	0.00%	0.08%	0.06%
Red grouper	96.51%	1.82%	0.71%	0.08%	0.87%
Black grouper	87.25%	10.28%	1.19%	0.01%	1.27%
Golden tilefish	10.98%	0.00%	88.70%	0.00%	0.33%
Snowy grouper	64.10%	0.00%	17.95%	0.00%	17.95%
Red Snapper	90.67%	8.60%	0.11%	0.02%	0.60%
Speckled Hind	75.11%	0.00%	23.52%	1.37%	0.00%
Warsaw grouper	33.16%	0.00%	66.84%	0.00%	0.00%

Source: NMFS SEFSC Logbook Program.

Landings in 2007 were split fairly evenly between commercial and recreational sources for gag, vermilion snapper, red grouper, and speckled hind (Table 4-25). In previous years, the catch of vermilion snapper was dominated by commercial landings (~68%). The commercial sector dominated landings of golden tilefish and black grouper; whereas, red snapper and black sea bass landings were most abundant in the recreational sector.

Table 4-25. Landings (lbs whole weight) during 2007 for commercial (ALS), headboat (HB), MRFSS, and HB MRFSS combined.

Species	commercial	HB	MRFSS	HB/MRFSS
Gag	712,970	78,859	526,428	605,287
Black sea bass	564,615	162,067	669,089	831,156
Vermilion snapper	1,074,761	613,792	347,840	961,632
Red grouper	506,020	44,569	610,368	654,937
Black grouper	106,697	17,404	47,037	64,441
Golden tilefish	332,473	0	4,782	4,782
Snowy grouper	132,620	308	26,973	27,281

Red Snapper	115,653	38,448	302,156	340,604
Speckled Hind	1,917	1,220	430	1,650
Warsaw grouper	608	791	20,254	21,045

Management measures proposed in Amendment 17A would establish ACLs and AMs for some species undergoing overfishing, modify management measures to reduce harvest to achieve ACLs and ACTs, and establish a rebuilding plan for red snapper. These alternatives are described in detail in **Sections 2.0** and **4.0**. The final NS1 guidelines recognize that existing FMPs may use terms and values that are similar to, associated with, or may be equivalent to ABC, ACL, ACT, and AM in many fisheries for which annual specifications are set for different stocks or stock complexes. In these situations the guidelines suggest that, as Councils revise their FMPs, they use the same terms as set forth in the NS1 guidelines.

Management measures specified in Snapper Grouper Amendment 16, which has been approved, include actions that could serve as ABCs, ACLs, ACTs, and AMs for species addressed in Amendment 17A. Amendment 16 would: establish sector allocations for gag and vermilion snapper, establish a commercial quota for gag and reduce the commercial quota for vermilion snapper; prohibit harvest and retention of gag and shallow water groupers (gag, black grouper, red grouper, scamp, red hind, rock hind, coney, graysby, yellowfin grouper, yellowmouth grouper and tiger grouper) after the commercial gag quota is met; establish a January through April recreational and commercial spawning season closure for gag and other shallow water groupers including red grouper and black grouper; modify bag limits for vermilion snapper, gag, and shallow water groupers; establish a recreational closed season for vermilion snapper; and exclude captain and crew on for-hire vessels from retaining vermilion snapper or species in the grouper aggregate.

4.7.1.2 Commercial Fishery

During 2004 to 2007, approximately 20% of snapper grouper permitted vessels from the Gulf of Mexico and South Atlantic were randomly selected to fill out supplementary logbooks. The average number of trips per year during 2003 to 2007 was 14,704 (Table 4-26). Fishermen spent an average of 1.68 days at sea per trip.

Table 4-26. Snapper grouper fishery effort for South Atlantic.

YEAR	Trips	Days	Days per Trip
2003	16,568	27,621	1.67
2004	15,062	24,896	1.65
2005	13,783	22,876	1.66
2006	13,273	23,335	1.76
2007	14,835	24,445	1.65
Mean	14,704	24,635	1.68

Source: NMFS SEFSC Logbook Program.

For species in Snapper Grouper Amendment 17A, the number of trips that reported discards was greatest for red grouper and vermilion snapper, followed by gag, black grouper, and black sea bass (Table 4-29). The average percentage of trips that reported discards was 4.00% for red grouper, 3.73% for vermilion snapper, 2.79% for gag, 2.75% for black grouper, and 2.72% for black sea bass (Table 4-30). During 2003-2007, the average number of individuals discarded per trip was greatest for vermilion snapper (70), followed by black sea bass (60) (Table 4-43).

Since the discard logbook database represents a sample, data were expanded to estimate the number of discard fish in the whole fishery. The method for expansion was to: (1) estimate the probability of discarding a species; (2) estimate the number of fish discarded per trip; and (3) estimate the number discarded in the whole fishery (total discarded = total trips * % trips discarding * discard number). For example in 2004, the total discards of red grouper 3,538 = 15,062 total trips (Table 4-28) * 0.042 trips discarding (Table 4-29) * 5.64 discards/trip (Table (Table 4-31). During 2003-2007, an average of 26,184 black sea bass and 37,441 vermilion snapper were discarded per year (Table 4-32).

Table 4-27. Annual number of trips reporting discard of Amendments 17A and B species.
Source: NMFS SEFSC Logbook Program.

YEAR	red grouper	black grouper	vermilion snapper	gag	red snapper	golden tilefish	speckled hind	warsaw grouper	snowy grouper	black sea bass
2003	123	106	106	137	48	0	49	17	2	108
2004	121	63	62	111	42	0	12	1	0	65
2005	134	115	102	76	57	0	41	2	8	75
2006	75	44	116	25	53	0	14	0	1	78
2007	145	82	162	86	84	1	9	1	12	68
Mean	119.6	82.0	109.6	87.0	56.8	0.2	25.0	4.2	4.6	78.8

Table 4-28. Percentage of trips that discarded Amendments 17A and B species.
Source: NMFS SEFSC Logbook Program.

YEAR	red grouper	black grouper	vermilion snapper	gag	red snapper	golden tilefish	speckled hind	warsaw grouper	snowy grouper	black sea bass
2003	3.41	2.94	2.94	3.80	1.33	0.00	1.36	0.47	0.06	3.00
2004	4.16	2.17	2.13	3.82	1.44	0.00	0.41	0.03	0.00	2.24
2005	5.28	4.53	4.02	2.99	2.24	0.00	1.61	0.08	0.31	2.95
2006	3.60	2.11	5.57	1.20	2.55	0.00	0.67	0.00	0.05	3.75
2007	3.57	2.02	3.99	2.12	2.07	0.02	0.22	0.02	0.30	1.67
Mean	4.00	2.75	3.73	2.79	1.93	0.00	0.86	0.12	0.14	2.72

Table 4-29. Average number (unexpanded) of Amendments 17A and B species.

YEAR	red grouper	black grouper	vermilion Snapper	gag	red snapper	golden tilefish	speckled hind	warsaw grouper	snowy grouper	black sea bass
2003	4.0	2.4	63.9	4.6	20.5	0.0	14.9	2.2	1.5	169.7
2004	5.6	2.3	63.3	8.4	98.8	0.0	3.8	1.0	0.0	30.1
2005	4.9	6.6	100.9	6.6	16.2	0.0	5.2	2.5	3.8	31.1
2006	7.0	4.6	60.0	3.0	10.2	0.0	8.2	0.0	1.0	27.6
2007	5.9	3.1	60.0	4.6	26.4	2.0	3.9	1.0	2.1	40.9
Mean	5.5	3.8	69.6	5.4	34.4	0.4	7.2	1.3	1.7	59.9

Source: NMFS SEFSC Logbook Program.

Table 4-30. Expanded number of discarded Amendments 17A and B species.

YEAR	red grouper	black grouper	vermilion Snapper	gag	red snapper	golden tilefish	speckled hind	warsaw grouper	snowy grouper	black sea bass
2003	2,276	1,186	31,145	2,887	4,533	0	3,365	175	14	84,233
2004	3,538	767	20,335	4,822	21,490	0	238	5	0	10,147
2005	3,571	4,140	55,837	2,740	4,998	0	1,156	27	163	12,671
2006	3,334	1,294	44,358	472	3,449	0	733	0	6	13,700
2007	3,106	917	35,527	1,458	8,115	7	128	4	91	10,169
Mean	3,165	1,661	37,441	2,476	8,517	1	1,124	42	55	26,184

Table 4-31. The 50 most commonly discarded species during 2003-2007 for the South Atlantic.

Species	Number trips reported discarding the species	Number discarded
PORGY, RED, UNC	755	57,742
SNAPPER, VERMILION	575	39,285
SEA BASS, ATLANTIC, BLACK, UNC	405	30,876
SHARK, DOGFISH, SPINY	112	19,072
SNAPPER, YELLOWTAIL	1646	14,937
SNAPPER, RED	284	8,818
MENHADEN	89	6,699
SCAMP	574	6,594
SNAPPER, MANGROVE	221	4,112
SHARK, ATLANTIC, SHARPNOSE	145	3,445
SEA BASS, ROCK	72	3,259
GROUPER, RED	599	3,179
MACKEREL, KING and CERO	324	3,103
SHARK, UNC	392	3,069
GRUNTS	160	2,991
GROUPER, GAG	446	2,630
SHARK, DOGFISH, UNC	30	2,600
FINFISHES, UNC, BAIT, ANIMAL FOOD	25	2,490
GRUNT, TOMTATE	18	2,477
MACKEREL, KING	416	2,393
BLUEFISH	51	2,276
SHARK, BLACKTIP	134	2,068
BLUE RUNNER	248	1,991
GROUPER, BLACK	413	1,628
AMBERJACK, GREATER	228	1,584
SHARK, DOGFISH, SMOOTH	16	1,499
SHARK, SANDBAR	77	1,357
BONITO, ATLANTIC	291	1,321
HIND, SPECKLED	132	1,248
TRIGGERFISHES	126	1,158
SKATES	40	1,014
TUNA, LITTLE (TUNNY)	189	968
SHARK, TIGER	66	929
FINFISHES, UNC FOR FOOD	114	927
DOLPHINFISH	180	917
TRIGGERFISH, GRAY	90	851
AMBERJACK	180	836

Species	Number trips reported discarding the species	Number discarded
BALLYHOO	26	794
BARRACUDA	133	747
SNAPPER, MANGROVE (Duplicate of 3760)	113	669
SNAPPER, MUTTON	174	662
GRUNT, WHITE	47	642
MACKEREL, SPANISH	62	593
REMORA	218	555
SCUPS OR PORGIES, UNC	77	509
SNAPPERS, UNC	16	487
PINFISH, SPOTTAIL	30	483
CHUBS	8	393
SHARK, CARIBBEAN, SHARPNOSE	11	361
STINGRAYS	30	336

4.7.1.3 Recreational Fishery

For the recreational fishery, estimates of the number of recreational discards are available from MRFSS and the NMFS headboat survey. The MRFSS 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, or disposed of in some way other than Types A or B2.
    - Type B2 - Fishes that were caught and released alive.

For species in Snapper Grouper Amendment 17A, the number of released fish was greatest for black sea bass (13,298,399), followed by red snapper (1,079,338), vermilion snapper (853,191), gag (701,139), and red grouper (451,876) (Table 4-45). During 2003-2007, 86% of red snapper, 83% of speckled hind, 79% each of black sea bass and black grouper, 77% of gag, and 70% of red grouper were released by recreational fishermen (Table 4-34).

Table 4-32. Estimated number total catch (A+B1+B2), harvests (A+B1), and released (B2) fish in numbers for the South Atlantic during 2003-2007.

Species	**Total**	**A+B1**	**B2**	**% B2**
Vermilion Snapper	2,060,724	1,207,533	853,191	41%
Gag	909,616	208,477	701,139	77%
Red Grouper	641,537	189,661	451,876	70%
Black Grouper	97,560	20,202	77,358	79%
Red snapper	1,255,345	176,007	1,079,338	86%
Golden Tilefish	107,391	104,267	3,124	3%
Speckled Hind	9,005	1,544	7,461	83%
Warsaw Grouper	7,783	5,989	1,794	23%
Snowy Grouper	49,976	44,362	5,614	11%
Black Sea Bass	16,820,380	3,521,981	13,298,399	79%

Source: MRFSS Web Site.

For species in Snapper Grouper Amendments 17A and B, black sea bass (360,937), followed by vermilion snapper (259,627) and red snapper (106,060) were most often discarded by headboat fishermen during 2004-2007 (Table 4-35). Among the grouper species, the species most commonly discarded were gag (12,363), red grouper (13,845), black grouper (1,699), and speckled hind (904) (Table 4-35). To estimate the number of dead discards, it was assumed the release mortality rates were 15% black sea bass; 38% vermilion snapper, 25% gag, black grouper, red grouper; 40% red snapper; and 100% snowy grouper. Golden tilefish were not harvested or discarded by headboat fishermen during 2004-2007.

Table 4-33. Total fish released alive or dead on sampled headboat trips during 2004-2007. Release mortality rates used to estimate dead discards are: 15% black sea bass; 38% vermilion snapper; 25% gag, black grouper, red grouper; 40% red snapper; and 100% snowy grouper and golden tilefish. Dead discards = (no. released alive * % release mortality rate) + no. released dead.

Species	released alive	mean#/trip	released dead	mean#/trip	#trips alive	# trips dead	dead discards
Vermilion Snapper	259,627	30.81	11,780	1.40	8,428	8,423	110,438
Gag	12,363	1.81	199	0.03	6,838	6,833	3,290
Black grouper	1,699	1.10	30	0.02	1,539	1,539	455
Red grouper	13,845	2.60	164	0.03	5,324	5,330	3,625
Red snapper	106,060	16.76	2,168	0.34	6,328	6,325	44,592
Golden tilefish	0	0	0	0	0	0	0
Speckled hind	904	2.15	180	0.43	420	420	unknown
Warsaw grouper	90	0.60	5	0.03	149	149	unknown
Snowy grouper	99	0.61	6	0.04	161	161	105
Black sea bass	360,937	28.02	10,328	0.80	12,881	12,881	64,469

Source: NMFS Headboat survey.

4.7.1.4 Finfish Bycatch Mortality

SEDAR 17 (2008) recommended a release mortality rate for vermilion snapper of 38% for both the commercial and recreational fisheries. This was based on a recent mortality study conducted by Ruderhshausen *et al*. (2007). 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 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. Higher 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, which 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 deepwater.

SEDAR 10 (2006) 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 a 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.

A recent study conducted by Rudershausen *et al.* (2007) estimated release mortality rates of 15% for undersized vermilion snapper and 33% for undersized gag taken with J- hooks in depths of 25 – 50 m off North Carolina. 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. For 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) also concluded minimum size limits were moderately effective for vermilion snapper and gag over the shallower portions of their depth range.

SEDAR 15 (2008) estimates acute release mortality rates of red snapper to be 90% and 40% for the commercial and recreational fisheries, respectively, in the South Atlantic. 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 (2008) indicated red snapper were most often caught at depths of 141 to 190 feet by the recreational sector and 141 to 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.

Release mortality rates are unknown for black grouper and red grouper but could be similar to gag as they occupy a similar depth range. Estimates of release mortality rates for these species will be provided by the SEDAR 19 assessment, which will begin in June, 2009. 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. Overton et al. (2008) reported a release mortality rate of 13% for gag held in enclosures.

Snowy grouper are primarily caught in water deeper than 300 feet and golden tilefish are taken at depths greater than 540 feet; therefore, release mortality of the species are probably near 100% (SEDAR 4 2004).. Tables 4-32 and 4-34 indicate there were fewer golden tilefish and snowy grouper discarded by commercial and recreational fishermen during 2003-2007, when compared with the other species considered in Amendments 17A and B. Release mortality rates are probably at or near 100% for adult speckled hind and warsaw grouper in deep water. However, juvenile speckled hind and warsaw grouper are also taken in water at the shelf-edge (~165 feet) where some survival of released species could occur. If release mortality rates of juvenile speckled hind and warsaw grouper are similar to gag, some survival (~50%) would be expected at depths of 165 feet (McGovern *et al.* 2005). Therefore, the overall release mortality for these species could be less than 100%. Estimates of release mortality for speckled hind and warsaw grouper will be provided by SEDAR 27, which is scheduled to take place in 2012. Several recent studies point to the prevalence and severity of deleterious effects of barotrauma encountered by fishes removed from deepwater (Rummer and Bennett 2005; St. John and Syers 2005; Parker et al. 2006; Hannah et al. 2008).

Release mortality of black sea bass is considered to be low (15%) (SEDAR 2-SAR 3 2005) 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.

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

Vermilion snapper, gag, black sea bass, red grouper, black grouper, and red snapper
Vermilion snapper and black sea bass were among the most commonly discarded species in the commercial fishery in recent years (2003-2007, Tables 4-32 and 4-33). In the recreational fishery, 86% of red snapper, 79% each of black sea bass and black grouper, 77% of gag, and 70% of red grouper were discarded by private and charter boats (Table 4-34). Discard rate was highest in vermilion snapper, followed by black sea bass and red snapper in the headboat fishery (Table 4-35).

Section 2.1.4 considers management reference point alternatives for red snapper including maximum sustainable yield (MSY), optimum yield (OY) and minimum stock size threshold (MSST). A rebuilding schedule for red snapper stocks, using 2010 as year 1 and with different periods of 15, 25 and 35 years to rebuild, is reported in **Section 2.1.5.1**. **Section 2.1.6** includes alternatives intended to end overfishing and rebuild the red snapper stock. Alternatives for red snapper include area closures for all snapper grouper species as well as prohibition for retention and possession of red snapper. Red snapper co-occur with vermilion snapper, as well as black sea bass, red grouper, and scamp. Therefore, alternatives, which would prohibit all fishing for or retention of snapper grouper species within certain areas would eliminate all bycatch of red snapper and co-occurring species. However, effort could increase outside of the closed areas.

Seasonal and/or longer closures of both commercial and recreational fisheries specified in Amendment 16, which has been approved, could also reduce bycatch mortality of species included in Amendments 17A and B. A longer spawning seasonal closure could enhance the reproductive potential of the stock. For example Amendment 16 will establish 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 would be 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. Increased bycatch mortality is accounted for in analyses and overall mortality is expected to decrease over time. Other actions in Amendment 16, which could reduce bycatch of snapper grouper species, include a reduction in the recreational bag limit to 1 gag or black grouper (combined) per day within a grouper aggregate bag limit of 3 fish and the establishment of a commercial quota for gag. When the commercial quota is met, all fishing for or possession of shallow water grouper species will be prohibited.

Unobserved mortality due to predation or trauma associated with capture could be substantial (; Burns *et al.* 1992; Rummer and Bennett 2005; St. John and Syers 2005; Parker *et al*. 2006; Rudershausen *et al.* 2007; Hannah *et al.* 2008). Amendment 16 includes actions that require the use of dehooking devices, which could help reduce bycatch 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).

4.7.2 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 decrease in the commercial and recreational sectors in response to more restrictive management measures; thereby, reducing the potential for bycatch. Alternatives for red snapper include a prohibition on retention of the species as well as area closures, which would prohibit retention of snapper grouper species. These actions for red snapper could result in substantial reductions in discards and co-occurring species. Thus ecological changes could occur in the community structure of reef ecosystems through actions that would end overfishing. These ecological changes could affect the nature and magnitude of bycatch of species in Amendments 17A and B as well as other species. However, many of the species in the snapper-grouper FMU have spatial and temporal coincidence and the benefits could be shared among them.

Data from North Carolina presented to the Council indicated fishermen with snapper grouper permits also fish in the nearshore gillnet fisheries. Fishermen with snapper grouper permits in other areas also participate in various state fisheries. It is expected that if efforts shift to these fisheries, there could be impacts to protected species. Current monitoring programs will allow NOAA Fisheries Service to track and evaluate any increased risk to protected species. If necessary, an ESA consultation can be re-initiated to address any increased levels of risk to ESA-listed species.

A Limited Access Privilege (LAP) program was under consideration for the snapper grouper fishery that could substantially reduce bycatch by providing fishery participants an incentive to fish efficiently and to better handle their catch to maximize profits. An IFQ program could stabilize markets and prices by allowing catches to be delivered on demand. This would help fishermen target when they wanted to fish, where they wanted to fish, and which species they wanted to catch thereby reducing bycatch. At the March 2008 meeting, the Council determined this was not the appropriate time to move forward with consideration of a Limited Access Privilege Program for the snapper grouper fishery in the South Atlantic.

The Comprehensive ACL Amendment for species in FMPs not experiencing overfishing could propose additional measures to reduce bycatch in the snapper grouper fishery with the possible establishment of species units. Species grouping would be based on biological, geographic, economic, taxonomic, technical, social, and ecological factors. Each group would be represented by an indicator species that has been recently assessed or is scheduled for a SEDAR assessment in the future. Amendment 14 is currently in place, which establishes Marine Protected Areas, and could also reduce bycatch of red snapper.

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

Management measures proposed in Snapper Grouper Amendment 17A are intended to end overfishing of red snapper. Amendment 17A includes area closure alternatives to end overfishing and rebuild red snapper. Since fishing for or possession of all snapper grouper species with hook and line gear would be prohibited, there would be no bycatch and fishing mortality of species that co-occur with red snapper.

More restrictive management measures proposed in Amendment 17A could result in an effort shift to other species and fisheries causing a change in the magnitude of harvest and number of discards in those fisheries. Reduced fishing pressure on species in this amendment would be expected to result in an increase in the mean size and age. In addition, biomass and the percentage of males for grouper species would be expected to increase. The relative abundance, size structure, and age structure of other species in reef communities could be expected to change in response to reduced fishing pressure on species in Amendment 17A as well as potential shifts in effort. Thus, ecological changes could occur in the community structure of reef ecosystems through the proposed actions. These ecological changes could affect the nature and magnitude of bycatch over time.

4.7.4 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. Of the gear utilized within the snapper grouper fishery, only the black sea bass pot is considered to pose an entanglement risk to marine mammals. The southeast U.S. Atlantic black sea bass pot fishery is included in the grouping of the Atlantic mixed species trap/pot fisheries, which the 2010 proposed List of Fisheries classifies as a Category II (74 FR 27739; June 11, 2009). Gear types used in these fisheries are determined to have occasional incidental mortality and serious injury of marine mammals. For the snapper grouper fishery, the best available data on protected species interactions are from the Southeast Fisheries Science Center (SEFSC) Supplementary Discard Data Program (SDDP) initiated in July of 2001 and 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 bottom longline/hook-and-line component of the South Atlantic snapper grouper fishery remains a Category III under the LOF.

Although the black sea bass pot fishery 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 in waters ranging from 70-120 feet deep (21.3-36.6 meters). There are no known interactions between the black sea bass pot fishery and large whales. NOAA Fisheries Service's biological opinion on the continued operation of the South Atlantic snapper grouper fishery determined the possible adverse effects resulting from the fishery are extremely unlikely. Thus, the continued operation of the snapper grouper fishery in the southeast U.S. Atlantic EEZ is not likely to adversely affect sperm, fin, sei, and blue whales (NMFS 2006).

North Atlantic right and humpback whales may overlap both spatially and temporally with the black sea bass pot fishery. Recent revisions to the Atlantic Large Whale Take Reduction Plan have folded the Atlantic mixed species trap/pot fisheries into the plan (72 FR 193; October 5, 2007). The new requirements will help further reduce the likelihood of North Atlantic right and humpback whale entanglement in black sea bass pot gear.

The Bermuda petrel and roseate tern occur within the action area. 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 USFWS data). Interaction with fisheries has not been reported as a concern for either of these species.

Fishing effort reductions have the potential to reduce the amount of interactions between the fishery and marine mammals and birds. Although, the Bermuda petrel and roseate tern occur within the action area, 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 is not likely to negatively affect the Bermuda petrel and the roseate tern.

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

Management alternatives in Snapper Grouper Amendment 17A would be expected to affect the cost of fishing operations. It is likely that all four states (NC, SC, GA & FL) would be affected by the regulations (closures, ACLs, etc.) and the variety/number of species included in this Amendment.

Additionally, factors such as waterfront property values, availability of less expensive imports, etc. may affect economic decisions made by recreational and commercial fishermen.

Amendment 18 (under development) proposes to enhance current data collection programs. This might provide more insight in calculating the changes in fishing, processing, disposal and marketing costs.

4.7.6 Changes in Fishing Practices and Behavior of Fishermen

Management regulations proposed in Snapper Grouper Amendment 17A could result in a modification of fishing practices by commercial and recreational fishermen, thereby affecting the magnitude of discards. Furthermore, closed seasons, new or reduced quotas could cause some commercial and recreational fishermen to reduce effort. However, it is difficult to quantify any of the measures in terms of reducing discards until the magnitude of bycatch has been monitored over several years.

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

Research and monitoring is needed to understand the effectiveness of proposed management measure in reducing bycatch. If all fishing for red snapper is prohibited, a monitoring program will be essential to track changes in stock structure and will be a component of Snapper Grouper Amendment 17A. Additional work is needed to determine the effectiveness of measures in Amendment 16 and by future actions being proposed by the Council to reduce bycatch. Amendment 18 is being developed, which proposes to enhance current data collection programs. Some observer information has recently been provided by MARFIN and Cooperative Research Programs but more is needed. Approximately 20% of commercial fishermen are asked to fill out discard information in logbooks; however, a greater percentage of fishermen could be selected with emphasis on individuals that dominate landings. Furthermore, the use of electronic logbooks could be enhanced to enable fishery managers to obtain information on species composition, size distribution, geographic range, disposition, and depth of fishes that are released. Additional administrative and enforcement efforts will be needed to implement and enforce these regulations.

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

Preferred management measures, including those that are likely to increase or decrease discards could result in social and/or economic impacts as discussed in Section 4.

4.7.9 Changes in the Distribution of Benefits and Costs

Attempts were made to ensure reductions provided by preferred management measures are equal in the commercial and recreational sectors. The extent to which these management measures will increase or decrease the magnitudes of discards is unknown. Proposed closures for deepwater species as well as area closures for red snapper are likely to provide substantial decreases in bycatch. Some measures specified in Amendment 16, such as the requirement for dehooking devices, a recreational/commercial seasonal closure for gag, reduction of recreational bag limits, and closing all shallow water groupers when a gag quota is met or during a gag seasonal closure could help to reduce bycatch. It is likely that some proposed management measures such as bag limits for snowy grouper and golden tilefish could increase the number of discards. However, this depends on if fishermen shift effort to other species, seasons, or fisheries and if effort decreases in response to more restrictive management measures as well as changes in community structure and age/size structures that could result from ending overfishing.

4.7.10 Social Effects

The social effects of all the management measure, including those most likely to reduce bycatch, are described in **Section 4**.

4.7.11 Conclusion

This section evaluates the practicability of taking additional action to minimize bycatch and bycatch mortality in the South Atlantic snapper grouper fishery using the ten factors provided at 50 CFR 600.350(d)(3)(i). In summary, proposed closures for deepwater species in Amendment 17B as well as area closures for red snapper in Amendment 17A could provide substantial decreases in bycatch of Snapper Grouper Amendments 17A and B species and also co-occurring species. The requirement of dehooking devices, a recreational/commercial seasonal closure for gag, reduction of recreational bag limits, and closing all shallow water groupers when a gag quota is met or during a gag seasonal closure specified in Amendment 16 could also help to reduce bycatch. It is likely that some management measures such as bag limits for snowy grouper and golden tilefish could increase the number of discards. However, this depends on if fishermen shift effort to other species, seasons, or fisheries and if effort decreases in response to more restrictive management measures as well as changes in community structure and age/size structures that could result from ending overfishing. Furthermore, overall fishing effort could decrease in the commercial and recreational sectors in response to more restrictive management measures, thereby reducing the potential for bycatch.

There is likely to be an interactive effect of the preferred management measures in Snapper Grouper Amendment 17A on bycatch of species addressed in the amendment with associated species in reef ecosystems. The area prohibitions to protect red snapper would eliminate bycatch of red snapper and co-occurring species. Reduced fishing pressure on species in Amendment 17A would be expected to result in an increase in the mean size/age of affected species. In addition, an increase would be expected in the percentage of male groupers and population biomass. Overlapping seasonal closures for red porgy, greater amberjack, mutton snapper, gag, shallow water groupers and vermilion snapper with proposed actions in this amendment could be expected to reduce bycatch and fishing mortality of many co-occurring species. The relative abundance, size structure, and age structure of other species in reef communities could be expected to change in response to reduced fishing pressure as well as potential shifts in effort. Thus, ecological changes could occur in the community structure of reef ecosystems through actions that would end overfishing. These ecological changes could affect the nature and magnitude of bycatch over time.

Additional measures to reduce bycatch in the snapper grouper fishery are being developed. The Comprehensive ACL Amendment could propose measures to reduce bycatch in the snapper grouper fishery including species grouping based on biological, geographic, economic, taxonomic, technical, social, and ecological factors. Each group could be represented by an indicator species, which has been recently assessed or is scheduled for a SEDAR assessment in the future.

4.8 Unavoidable Adverse Effects

Will be added prior to public hearings.

4.9 Effects of the Fishery on the Environment

The biological impacts of the proposed actions are described in Section 4.0, including impacts on habitat. No actions proposed in this amendment are anticipated to have any adverse impact on EFH or EFH-HAPCs for managed species including species in the snapper grouper complex. Any additional impacts of fishing on EFH identified during the public hearing process will be considered, therefore the Council has determined no new measures to address impacts on EFH are necessary at this time. The Councils adopted habitat policies, which may directly affect the area of concern, are available for download through the Habitat/Ecosystem section of the Council's website: http://map.mapwise.com/safmc/Default.aspx?tabid=56.

NOTE: The Final EFH Rule, published on January 17, 2002, (67 FR 2343) replaced the interim Final Rule of December 19, 1997 on which the original EFH and EFH-HAPC designations were made. The Final Rule directs the Councils to periodically update EFH and EFH-HAPC information and designations within fishery management plans. As was done with the original Habitat Plan, a series of technical workshops were conducted by Council habitat staff and a draft plan that includes new information has been completed pursuant to the Final EFH Rule.

4.9 Damage to Ocean and Coastal Habitats

The alternatives and proposed actions are not expected to have any adverse effect on the ocean and coastal habitat.

Management measures implemented in the original Snapper Grouper Fishery Management Plan through Amendment 7 combined have significantly reduced the impact of the snapper grouper fishery on EFH. The Council has reduced the impact of the fishery and protected EFH by prohibiting the use of poisons and explosives; prohibiting use of fish traps and entanglement nets in the EEZ; banning use of bottom trawls on live/hard bottom habitat north of Cape Canaveral, Florida; restricting use of bottom longline to depths greater than 50 fathoms north of St. Lucie Inlet; and prohibiting use of black sea bass pots south of Cape Canaveral, Florida. These gear restrictions have significantly reduced the impact of the fishery on coral and live/hard bottom habitat in the South Atlantic Region.

Additional management measures in Amendment 8 (SAFMC 1997), including specifying allowable bait nets and capping effort, have protected habitat by making existing regulations more enforceable. Establishing a controlled effort program limited overall fishing effort and to the extent there is damage to the habitat from the fishery (e.g. black sea bass pots, anchors from fishing vessels, impacts of weights used on fishing lines and bottom longlines), limited such impacts.

In addition, measures in Amendment 9 (SAFMC 1998b), that include further restricting longlines to retention of only deepwater species and requiring that black sea bass pot have escape panels with degradable fasteners, reduce the catch of undersized fish and bycatch and ensure that the pot, if lost, will not continues to "ghost" fish. Amendment 13C (SAFMC 2006) increased mesh size in the back panel of pots, which has reduced bycatch and retention of undersized fish. Amendment 15B (SAFMC 2008b), which has been submitted for review by the Secretary of Commerce includes an action that would implement sea turtle bycatch release equipment requirements, and sea turtle and smalltooth sawfish handling protocols and/or guidelines in the permitted commercial and for-hire snapper grouper fishery.

Amendment 16 (SAFMC 2008c), includes an action, which is intended to reduce bycatch by requiring fishermen use venting tools and dehooking devices. Limiting the overall fishing mortality reduces the likelihood of over-harvesting of species with the resulting loss in genetic diversity, ecosystem diversity, and sustainability.

Measures adopted in the Coral and Shrimp FMPs have further restricted access by fishermen that had potential adverse impacts on essential snapper grouper habitat. These measures include the designation of the *Oculina* Bank HAPC and the Rock Shrimp closed area (see the Shrimp and Coral FMP/Amendment documents for additional information).

The Council's Comprehensive Habitat Amendment (SAFMC 1998b) contains measures that expanded the *Oculina* Bank HAPC and added two additional satellite HAPCs. Amendment 14 (SAFMC 2007), established marine protected areas where fishing for or retention of snapper grouper species would be prohibited.

4.10 Relationship of Short-Term Uses and Long-Term Productivity

The relationship between short-term uses and long-term productivity will be affected by this amendment. The proposed actions could significantly restrict the harvest of red snapper, gag, vermilion snapper, black sea bass, snowy grouper, golden tilefish, black grouper, red grouper, speckled hind, and warsaw grouper in the short-term for both the commercial and recreational sectors of the fishery. However, reductions in harvest are expected to benefit the long-term productivity of these species.

4.11 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments are defined as commitments that cannot be reversed, except perhaps in the extreme long-term, whereas irretrievable commitments are lost for a period of time. There are no irreversible commitments for this amendment. While the proposed actions would result in irretrievable losses in consumer surplus and angler expenditures, failing to take action would compromise the long-term sustainability of the stocks.

Since the Snapper Grouper FMP and its implementing regulations are always subject to future changes, proceeding with the development of Amendment 17 does not represent an irreversible or irretrievable commitment of resources. NOAA Fisheries Service always has discretion to amend its regulations and may do so at any time, subject to the Administrative Procedures Act.

4.12 Monitoring and Mitigation Measures

The proposed actions would adversely affect immediate, short-term net revenues of some commercial and for-hire fishermen in the South Atlantic. The proposed actions would also adversely affect short-term consumer surplus of some recreational anglers in the South Atlantic and may result in cancelled trips and reduced expenditures to the fishery and associated industries. However, it is anticipated reductions in fishing pressure, which will reduce the likelihood that these stocks will be declared overfished, will assist in restoring the size and age structure to more natural conditions and allow stock biomass to increase to more sustainable and productive levels. As a result, the amount of fish that can be harvested should increase as the stocks rebuild. The short-term, adverse effects of ending overfishing can be mitigated to some degree by the type of regulations the Council selects to manage reduced catch levels. The Council's preferred alternatives contain those measures that are believed to best mitigate the unavoidable, short-term, adverse effects of ending overfishing.

The following was removed from the monitoring action and inserted here per the IPT. The IPT felt that fishery dependant monitoring should remain an action while fishery independent monitoring programs could be addressed in this section.

Fishery Independent Collection of Red Snapper Data

MARMAP reef fish sampling program includes a sample domain ranging from Cape Lookout, North Carolina to St. Lucie Inlet, Florida. Habitats sampled include; natural hardbottom areas along the continental shelf and shelf break ranging from ~ 15 to 230 meters depth, with depth ranges differing by gear type. Sampling is conducted from May–September each year with supplemental sampling in other months. Three types of gear are used to collect CPUE and length frequency data and/or biological samples (e.g. otoliths and gonads) to assess relative densities, age, and sex structure of population: 1) Chevron traps used in depths of 13-100 m; 2) short bottom long-line (used to survey sloping hardbottom areas where it is difficult to use chevron traps; depths = 25–223 m); and 3) rod and reel (depths = 15-230 m). Several methodologies of rod and reel sampling (including the use of commercial snapper reels) are utilized to collect species-specific CPUE data and biological samples.

Chevron traps are used to sample between 600 and 700 randomly chosen sites from a total of 2,500 known hard-bottom sites. About 330 to 500 of the selected sites are sampled annually. Short bottom long-lines are used to sample between 100-200 randomly selected sites are sampled from a total of 1,000 sampling sites. Rod and reel sampling occurs opportunistically over natural hardbottom habitat. MARMAP has used traps to sample and monitor hardbottom-associated reef fish populations (including red snapper) in the US South Atlantic since 1978, and chevron traps since 1990. Short bottom long-lining and rod and reel sampling has occurred since 1978. Thus, an extended time series exists on which to build an improved sampling program.

Some limitations to current fishery independent sampling efforts do exist. While the MARMAP sampling domain covers a large area of the southeast US continental shelf, logistical, weather, and funding constraints result in relatively low levels of sampling effort in the northern and southern regions of the survey area. Additionally, and regardless of spatial focus of sampling, greater sample sizes are required to develop robust indices of abundance for many federally managed species. Finally, multiple species of management interest require the use of multiple gears for effective sampling, and some are not effectively sampled with traps and longline gear. While MARMAP historically has utilized a variety of gear types, currently only chevron traps and short bottom long line gear are used consistently to develop abundance trends. Thus, as a likely combined result of: 1) Insufficient realized spatial coverage; 2) insufficient survey sample size; and 3) lack of appropriate gears to effectively sample some species, MARMAP surveys alone cannot generate effective abundance indices for stock assessments for all species of management interest. *An improved fishery independent survey program is needed to support stock assessments and management actions.*

Proposed framework for an improved sampling program focusing on red snapper

This proposed framework continues the long-term data series from MARMAP surveys and adds a complementary sampling program to expand needed coverage. The improved sampling plan would increase the (1) spatial footprint (central FL to Cape Hatteras, NC), (2) sample size, and (3) number of gears utilized over current survey levels, thereby considerably improving program effectiveness. The spatial and sample size expansions would be made possible by the participation of NOAA-SEFSC (Beaufort Laboratory) staff. The core aspects of the current sampling program (survey design, chevron trap, short bottom long-line and rod and reel sampling) would remain the core of the improved program, enabling comparisons of data collected in the improved program with those collected during previous years by MARMAP. Additional gears would be added and utilized by both NOAA-SEFSC and MARMAP (detailed below), with gear effectiveness research performed by NOAA-SEFSC. NOAA-SEFSC would coordinate with MARMAP to plan annual survey efforts (e.g., spatiotemporal focus of sampling) as guided by SAFMC and NMFS (SERO and SEFSC) data needs.

An improved program should include a geographic sampling range from Cape Hatteras, North Carolina to St. Lucie Inlet, Florida with targeting of specific geographical areas (e.g., offshore of northern FL and southern GA where the majority of red snapper landings occur) would be anticipated and would be guided by specific management actions. Four gear types would be utilized, each resulting in a CPUE estimate or proxy for abundance that could be compared across time and space to assess responses of red snapper and other reef fish populations to management actions. Chevron traps and short bottom long-lines would continue to be utilized following current MARMAP protocols. These gears are effective for sampling many reef fish species. Combined trap-camera studies in the Gulf of Mexico suggests chevron traps efficiently sample red snapper (D. DeVries, personal communication).

A trap-deployed camera sampling program would be initiated, building on preliminary gear investigations by MARMAP and utilizing protocols developed and utilized by SEFSC Panama City and Pascagoula laboratories for reef fish surveys in the Gulf of Mexico). The camera sampling program would involve still- or video cameras mounted on traps that would enable quantification of species in the vicinity of the trap. Adding a camera component to the chevron survey would facilitate determination of the relationship between trap CPUE and actual abundance for specific species (e.g., red snapper). The camera component would also improve data collection for species that, unlike red snapper, are not prone to collection in traps (e.g., gag). Rod and reel sampling would be utilized for both CPUE data and the collection of biological samples. Standard methodologies would be applied and variability-inducing factors (e.g., degree of angling experience) would be controlled for and/or considered when generating CPUE estimates. Additionally, NMFS-SEFSC would begin to explore the efficiency and utility of visual (scuba-based) surveys as a sampling and gear-assessment method at survey sites < ~ 40 m depth, and of split-beam hydro acoustic surveys at all depths.

Sample sizes and spatial focus of the improved sampling program would be dependent on and determined by specific management actions under Amendment 17 and by funding and resource availability. Any level of participation in the improved program by NMFS-Beaufort staff would require additional funding for staff, equipment, and potentially vessel support, depending on whether planned ship time on the NOAA ship Pisces materializes beginning in FY 2010. Additional biological sampling (processing and analysis of otoliths and gonads) would also require additional funding for staff and equipment.

4.13 Unavailable or Incomplete Information

The Council on Environmental Quality, in its implementing regulations for the National Environmental Policy Act, addressed incomplete or unavailable information at 40 CFR 1502.22 (a) and (b). That direction has been considered. There are two tests to be applied: 1) Does the incomplete or unavailable information involve “reasonable foreseeable adverse effects…;” and 2) is the information about these effects “essential to a reasoned choice among alternatives…”.

Stock assessments have been conducted on vermilion snapper, gag, black sea bass, snowy grouper, golden tilefish, and red snapper using the best available data available. Status determinations for these species were derived from the SEDAR process, which involves a series of three workshops designed to ensure each stock assessment reflects the best available scientific information. The findings and conclusions of each SEDAR workshop are documented in a series of reports, which are ultimately reviewed and discussed by the Council and their SSC. SEDAR participants, the Council advisory committees, the Council, and NMFS staff reviewed and considered any concerns about the adequacy of the data. **Section 4.10** lists data needs that resulted from these assessments. The Council’s SSC determined that the assessments were based on the best available data.

The Council’s Snapper Grouper Committee acknowledged, while stock assessment findings are uncertain, there is no reason to assume such uncertainty leads to unrealistically optimistic conclusions about stock status. Rather, the stocks could be in worse shape than indicated by the stock assessment. Uncertainty due to unavailable or incomplete information should not be used as a reason to avoid taking action. Therefore, there are reasonable foreseeable significant adverse effects of not taking action to end overfishing. Failure to take action could result in a worsening of stock status, persistent foregone economic benefits, and more severe corrective actions to end overfishing in the future.

Where information is unavailable or incomplete, such as is the case with estimates of dead discards that could occur when a species is incidentally caught during a seasonal closure or after a quota is met, management measures have been designed to adopt a conservative approach to increase the probability overfishing does not occur.

5 Regulatory Impact Review

This section will be added after the Council picks preferred alternatives and prior to public hearings.

6 Initial Regulatory Flexibility Analysis

6.1 Introduction

The purpose of the Regulatory Flexibility Act (RFA) is to establish a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration. The RFA does not contain any decision criteria; instead, the purpose of the RFA is to inform the agency, as well as the public, of the expected economic impacts of various alternatives contained in the FMP or amendment (including framework management measures and other regulatory actions). The RFA is also intended to ensure that the agency considers alternatives that minimize the expected impacts while meeting the goals and objectives of the FMP and applicable statutes.

With certain exceptions, the RFA requires agencies to conduct a regulatory flexibility analysis for each proposed rule. The regulatory flexibility analysis is designed to assess the impacts various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those impacts. In addition to analyses conducted for the RIR, the regulatory flexibility analysis provides: 1) A statement of the reasons why action by the agency is being considered; 2) a succinct statement of the objectives of, and legal basis for the proposed rule; 3) a description and, where feasible, an estimate of the number of small entities to which the proposed rule will apply; 4) a description of the projected reporting, record-keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; 5) an identification, to the extent practical, of all relevant Federal rules which may duplicate, overlap, or conflict with the proposed rule; and 6) a description of any significant alternatives to the proposed rule which accomplish the stated objectives of applicable statutes and which minimize any significant economic impact of the proposed rule on small entities.

In addition to the information provided in this section, additional information on the expected economic impacts of the proposed action was presented in **Sections 4.0** and **5.0** and is included herein by reference.

6.2 Statement of Need for, Objectives of, and Legal Basis for the Rule

The purpose and need, issues, problems, and objectives of the proposed rule are presented in **Section 1.0** and are incorporated herein by reference. The general purpose of this amendment is to establish a rebuilding plan and implement new management for the overfished red snapper stock in the South Atlantic. In particular, this amendment would: 1) specify ACL and an AM for red snapper with management measures to reduce the probability that catches will exceed the stocks' ACL; 2) specify a rebuilding plan for red snapper; 3) specify status determination criteria for red snapper; and, 4) specify a monitoring program for red snapper. The Magnuson-Stevens Fishery Conservation and Management Act provides the statutory basis for the proposed rule.

6.3 Identification of All Relevant Federal Rules Which May Duplicate, Overlap or Conflict with the Proposed Rule

No duplicative, overlapping, or conflicting Federal rules have been identified. Previous amendments, whether already implemented or in the process of being implemented, have been considered in designing the various actions in this amendment.

6.4 Description and Estimate of the Number of Small Entities to Which the Proposed Rule will Apply

This proposed action is expected to directly affect commercial fishers and for-hire operators. The SBA has established size criteria for all major industry sectors in the U.S. including fish harvesters and for-hire operations. A business involved in fish harvesting is classified as a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates), and has combined annual receipts not in excess of $4.0 million (NAICS code 114111, finfish fishing) for all its affiliated operations worldwide. For for-hire vessels, the other qualifiers apply and the annual receipts threshold is $7.0 million (NAICS code 713990, recreational industries).

From 2003-2007, which is the period of data used in the analysis of the expected impacts of this action, an average of 944 vessels per year were permitted to operate in the commercial snapper grouper fishery. Of these vessels, 749 held transferable permits and 195 held non-transferable permits. On average, 890 vessels landed 6.43 million pounds of snapper grouper and 1.95 million pounds of other species on snapper grouper trips. Total dockside revenues from snapper grouper species stood at $13.81 million (2007 dollars) and from other species, at $2.30 million (2007 dollars). Considering revenues from both snapper grouper and other species, the revenues per vessel would be $18,101. An average of 27 vessels per year harvested more than 50,000 pounds of snapper grouper species per year, generating at least, at an average price of $2.15 (2007 dollars) per pound, dockside revenues of $107,500. Vessels that operate in the snapper grouper fishery may also operate in other fisheries, the revenues of which cannot be determined with available data and are not reflected in these totals.

Although a vessel that possesses a commercial snapper grouper permit can harvest any snapper grouper species, not all permitted vessels or vessels that landed snapper grouper landed all of the six major species in this amendment. The following average number of vessels landed the subject species in 2003-2007: 292 for gag, 253 for vermilion snapper, 220 for red snapper, 237 for black sea bass, 323 for black grouper, and 402 for red grouper. Combining revenues from snapper grouper and other species on the same trip, the average revenue (2007 dollars) per vessel for vessels landing the subject species would be $20,551 for gag, $28,454 for vermilion snapper, $22,168 for red snapper, $19,034 for black sea bass, $7,186 for black grouper, and $17,164 for red grouper.

Based on revenue information, all commercial vessels affected by measures in this amendment can be considered as small entities.

For the period 2003-2007, an average of 1,635 vessels were permitted to operate in the snapper grouper for-hire fishery, of which 82 are estimated to have operated as headboats. Within the total number of vessels, 227 also possessed a commercial snapper grouper permit and would be included in the summary information provided on the commercial sector. The for-hire fleet is comprised of charterboats, which charge a fee on a vessel basis, and headboats, which charge a fee on an individual angler (head) basis. The charterboat annual average gross revenue is estimated to range from approximately \$62,000-\$84,000 for Florida vessels, \$73,000-\$89,000 for North Carolina vessels, \$68,000-\$83,000 for Georgia vessels, and \$32,000-\$39,000 for South Carolina vessels. For headboats, the appropriate estimates are \$170,000-\$362,000 for Florida vessels, and \$149,000-\$317,000 for vessels in the other states. Based on these average revenue figures, it is determined, for the purpose of this assessment, that all for-hire operations that would be affected by this action are small entities.

Some fleet activity may exist in both the commercial and for-hire snapper grouper sectors, but the extent of such is unknown and all vessels are treated as independent entities in this analysis.

6.5 Description of the projected reporting, record-keeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for the preparation of the report or records

The proposed action may require additional reporting, record-keeping, and other compliance requirements. The cost of these requirements cannot be estimated at this time.

6.6 Substantial Number of Small Entities Criterion

The proposed action is expected to directly affect all Federally permitted commercial and for-hire vessels that operate in the South Atlantic snapper grouper fishery. All affected entities have been determined, for the purpose of this analysis, to be small entities. Therefore, it is determined that the proposed action will affect a substantial number of small entities.

6.7 Significant Economic Impact Criterion

The outcome of 'significant economic impact' can be ascertained by examining two issues: disproportionally and profitability.

<u>Disproportionality</u>: Do the regulations place a substantial number of small entities at a significant competitive disadvantage to large entities?

All entities that are expected to be affected by the proposed rule are considered small entities, so the issue of disproportionality does not arise in the present case.

Profitability: Do the regulations significantly reduce profit for a substantial number of small entities?

The red snapper closure in the EEZ, coupled with area closures for most snapper grouper species, is determined to significantly reduce the profits of a substantial number of commercial and for-hire vessels operating in the snapper grouper fisheries in the South Atlantic.

6.8 Description of Significant Alternatives

This section will be completed once the Council has finalized its selection of all preferred alternatives.

7 Fishery Impact Statement and Social Impact Assessment

7.1 Fishery Impact Statement

7.2 Social Impact Assessment

7.2.1 Introduction

Mandates to conduct Social Impact Assessments (SIA) come from both the National Environmental Policy Act (NEPA) and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). NEPA requires Federal agencies to consider the interactions of natural and human environments by using a "...systematic, interdisciplinary approach which will ensure the integrated use of the natural and social sciences...in planning and decision-making@ [NEPA section 102 (2) (a)]. Under the Council on Environmental Quality=s (CEQ, 1986) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act, a clarification of the terms Ahuman environment@ expanded the interpretation to include the relationship of people with their natural and physical environment (40 CFR 1508.14). Moreover, agencies need to address the aesthetic, historic, cultural, economic, social, or health effects which may be direct, indirect or cumulative (Interorganizational Committee on Guidelines and Principles for Social Impact Assessment, 1994).

Under the Magnuson-Stevens Act, fishery management plans (FMPs) must A...achieve and maintain, on a continuing basis, the optimum yield from each fishery@ [Magnuson-Stevens Act section 2 (b) (4)]. When considering "…a system for limiting access to the fishery in order to achieve optimum yield…@ the Secretary of Commerce and Regional Fishery Management Councils are to consider both the social and economic impacts of the system [Magnuson-Stevens Act section 303 (b) (6)]. Recent amendments to the Magnuson-Stevens Act require that FMPs address the impacts of any management measures on the participants in the affected fishery and those participants in other fisheries that may be affected directly or indirectly through the inclusion of a fishery impact statement [Magnuson-Stevens Act section 303 (a) (9)]. National Standard 8, requires that FMPs must consider the impacts upon fishing communities to assure their sustained participation and minimize adverse economic impacts upon those communities [Magnuson-Stevens Act section 301 (a) (8)].

7.2.2 Problems and Methods

Social impacts are generally the consequences to human populations that follow from some type of public or private action. Those consequences may include alterations to A...the ways in which people live, work or play, relate to one another, organize to meet their needs and generally cope as members of a society...@ (Interorganizational Committee on Guidelines and Principles for Social Impact Assessment, 1994:1). Social impact analyses can be used to determine possible consequences management actions may have on fishing dependent communities. In order to do a full social impact analysis it is necessary to identify community participants who depend upon the fisheries in that area and to identify the amount of dependency they have upon a given fishery. Further it is necessary to understand the other opportunities for employment that exist within the community should fishery management measures become so restrictive that participants must switch their focus to other fisheries or other jobs outside of the fishing industry. Public hearings and scoping meetings may provide input from those concerned with a particular action, but they do not constitute a full overview of those that depend on the fishing industry.

In attempting to assess the social impacts of the proposed amendment it must be noted that there is not enough data on all participants who are involved with the snapper grouper fishery at the community level to do a complete overview of the fishery; therefore, analyses cannot predict all social impacts. However, secondary data such as landings data, license data, permits data, and information on communities such as Census data, can help to describe the communities involved in the snapper grouper fishery in the South Atlantic.

Today, more fisheries are managed by quotas and/or have restrictions on the number of participants. This limits the other opportunities fishermen who fish for species in the snapper-grouper complex to target other species to make up for reduced harvests of the snapper-grouper species.

Based on an analysis of secondary data, there are not any communities in the South Atlantic region that are completely dependent on the snapper-grouper fisheries, although several are heavily involved with the commercial or recreational snapper-grouper fishery. Any reduction in harvest has the potential to put fishermen and fishing dependent businesses out of business. Some recreational and commercial fishermen may decide it is not worth fishing for very limited bag limits, reduced TACs or for only a few species. Decisions on whether to stay in the fishery or to leave for another type of employment often depends on the circumstances of the individual such as whether or not they own their fishing boat, how much longer they intended to fish before retirement, if there is other family income, etc. At this time, there is insufficient information on fishermen to be able to fully describe what they may do with reduced catches, shorter fishing seasons, and/or closed areas.

In the future, fishermen, fishing dependent businesses, and communities involved in the snapper-grouper fisheries will benefit when overfishing is stopped and the fishery is rebuilt. However, for the short-term, the closing of specified areas, seasonal closures, reduced catch limits, and other measures that are necessary to stop overfishing and rebuild stocks, will all have negative impacts on those involved in the fishery. The average age of commercial fishermen is increasing, and fewer young people are becoming commercial fishermen. A fishery that is rebuilt in 15, 20, or even 25 years may be of no help to fishermen who will be impacted now by new regulations because they may be too old to fish when the fishery is rebuilt. Because fewer young people are choosing to fish, there may be the possibility that there may not be many commercial fishermen to harvest quotas once the fishery is rebuilt.

Communities that depend on the fishing industry throughout the South Atlantic are facing increasing challenges due to increased regulations that reduce catch for both the recreational and commercial fishing sector. If commercial catches are reduced, there can be a reduction in fish houses and processors, or a loss of jobs in the processing sector. Some fishermen may decide they can no longer make a living in the fishing industry and leave the industry for other jobs. Overall, fewer young people are becoming fishermen due to the difficulty of making a living fishing. If the harvest levels are reduced for recreational sector, this will have a negative impact on charter and party boat operators, private boat owners, and businesses such as bait shops, marinas, hotels, and restaurants that cater to recreational fishermen.

Communities are also facing increasing challenges due to development and gentrification. As more water front property is developed for non-fishing uses such as locations for condominiums, hotels, restaurants, etc., fishing related businesses are in competition over land. Development often increases taxes which make it difficult for fishing docks, processors, and other businesses to stay near the water. In the last few decades more fishermen have had to move inland due to the rising cost of housing and taxes for water front property. This has changed the dynamics of some areas that were once built around the fishing industry.

Profiles of the communities expected to be affected by the actions in this proposed amendment are provided in Section 3.8.3, while a discussion of the expected social effects of each alternative considered is provided in Section 4.

7.2.3 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. This executive order is generally referred to as environmental justice (EJ).

Persons employed in the snapper-grouper fishery and associated businesses and communities along the South Atlantic coast would be expected to be affected by this proposed action. Information on the race and income status for groups at the different participation levels (vessel owners, crew, dealers, processors, employees, employees of associated support industries, etc.) is not available. County level data, however, for the communities profiled in Section 3.8.3 have been assessed to examine potential EJ concerns. Because this proposed action would be expected to affect fishermen and associated industries in numerous communities along the South Atlantic coast and not just those profiled, it is possible that other counties or communities have poverty or minority rates that exceed the EJ thresholds.

In order to identify the potential for EJ concern, the rates of minority populations (non-white, including Hispanic) and the percentage of the population that was below the poverty line were examined. The threshold for comparison that was used was 1.2 times the state average such that, if the value for the community or county was greater than or equal to 1.2 times the state average, then the community or county was considered an area of potential EJ concern. Census data for the year 2000 was used Estimates of the state minority and poverty rates, associated thresholds, and community rates are provided in Table 7-1.

Based on available demographic information, only the poverty rate for Beaufort, North Carolina suggests potential EJ concern, with a poverty rate of 16.6 percent, which exceeds the state threshold of 14.76 percent. This single instance might suggest potential EJ concerns are minimal. As noted above, however, additional communities beyond those profiled would be expected to be affected by the actions in this proposed amendment. Because these communities have not been profiled, the absence of additional potential EJ concerns cannot be assumed and the total number of communities that exceed the thresholds in unknown.

However, while some communities expected to be affected by this proposed amendment may have minority or economic profiles that exceed the EJ thresholds and, therefore, may constitute areas of concern, no EJ issues have been identified or are expected to arise as a result of this proposed amendment. No negative environmental consequences are expected to accrue to this proposed amendment. While adverse social and economic consequences are expected to accrue to fishermen in the snapper-grouper fishery and associated industries and communities due to the reduction of expenditures and revenues associated with changes in fishing behavior and harvest levels, the environmental consequences of this proposed amendment are expected to be positive. This proposed amendment is expected to reduce the take and mortality of an overfished species, red snapper, and also result in the possible reduction in the mortality of other species. Protection of red snapper would be expected to assist in the rebuilding of this resource and the reduced mortality of additional species would be expected to increase the environmental benefits these species contribute to the marine environment and the general health and condition of this environment. These measures are also not expected to result in increased risk or exposure of affected individuals to adverse health hazards.

Table 7-1. Environmental Justice Thresholds (2000 U.S. Census data).

State	Community	Minority Rate	Minority Threshold*	Poverty Rate	Poverty Threshold*
Florida		34.60	41.52	12.50	15.00
	Cape Canaveral	8.10		11.60	

	Marathon	26.70		14.20	
Georgia		37.40	44.88	13.00	15.60
	Townsend**	39.10		14.60	
South Carolina		33.90	40.68	14.10	16.92
	Little River	9.10		7.50	
North Carolina		29.80	35.76	12.30	14.76
	Atlantic City	2.60		7.30	
	Beaufort	25.40		16.60	
	Hatteras Village	6.60		10.00	
	Morehead City	19.20		14.60	
	Sneads Ferry	9.70		13.50	
	Wanchese	3.30		8.10	

*Calculated as 1.2 times the state rate.

**Values are for entire McIntosh County.

8 Other Applicable Law

8.1 Administrative Procedure Act

All federal rulemaking is governed under the provisions of the Administrative Procedure Act (APA) (5 U.S.C. Subchapter II), which establishes a "notice and comment" procedure to enable public participation in the rulemaking process. Under the APA, NOAA Fisheries Service is required to publish notification of proposed rules in the *Federal Register* and to solicit, consider, and respond to public comment on those rules before they are finalized. The APA also establishes a 30-day waiting period from the time a final rule is published until it takes effect.

8.2 Coastal Zone Management Act

Section 307(c)(1) of the federal Coastal Zone Management Act (CZMA) of 1972 requires that all federal activities that directly affect the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable. While it is the goal of the Council to have management measures that complement those of the states, federal and state administrative procedures vary and regulatory changes are unlikely to be fully instituted at the same time. Based on the analysis of the environmental consequences of the proposed action in **Section 4.0**, the Council has concluded this amendment would improve federal management of snapper grouper species.

8.3 Endangered Species Act

The Endangered Species Act (ESA) of 1973 (16 U.S.C. Section 1531 et seq.) requires that federal agencies ensure actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of threatened or endangered species or the habitat designated as critical to their survival and recovery. The ESA requires NOAA Fisheries Service to consult with the appropriate administrative agency (itself for most marine species and the U.S. Fish and Wildlife Service for all remaining species) when proposing an action that may affect threatened or endangered species or adversely modify critical habitat. Consultations are necessary to determine the potential impacts of the proposed action. They are concluded informally when proposed actions may affect but are "not likely to adversely affect" threatened or endangered species or designated critical habitat. Formal consultations, resulting in a biological opinion, are required when proposed actions may affect and are "likely to adversely affect" threatened or endangered species or adversely modify designated critical habitat.

NOAA Fisheries Service completed a biological opinion in 2006 evaluating the impacts of the continued authorization of the South Atlantic snapper grouper fishery under the snapper grouper FMP and Amendment 13C (NMFS 2006) on ESA-listed species (see **Section 3.5**). The opinion stated the fishery was not likely to adversely affect northern right whale critical habitat, seabirds, or marine mammals (see NMFS 2006 for discussion on these species). However, the opinion did state that the snapper grouper fishery would adversely affect sea turtles and smalltooth sawfish, but would not jeopardize their continued existence. An incidental take statement was issued for green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles, as well as smalltooth sawfish. Reasonable and prudent measures to minimize the impact of these incidental takes were specified, along with terms and conditions to implement them.

NOAA Fisheries Service conducted an informal Section 7 consultation on July 9, 2007, evaluating the impacts of the South Atlantic snapper grouper fishery on ESA-listed *Acropora* species. The consultation concluded that the continued operation of the snapper grouper fishery was not likely to adversely affect newly listed *Acropora* species. On November 26, 2008, a final rule designating *Acropora* critical habitat was published in the *Federal Register*. A memo dated December 2, 2008, evaluated the effects of the continued authorization of the South Atlantic snapper grouper fishery on *Acropora* critical habitat pursuant to Section 7. The evaluation concluded the proposed actions are not likely to adversely affect *Acropora* critical habitat.

8.4 Executive Order 12612: Federalism

E.O. 12612 requires agencies to be guided by the fundamental federalism principles when formulating and implementing policies that have federalism implications. The purpose of the Order is to guarantee the division of governmental responsibilities between the federal government and the states, as intended by the framers of the Constitution. No federalism issues have been identified relative to the actions proposed in this amendment and associated regulations. The affected states have been closely involved in developing the proposed management measures and the principal state officials responsible for fisheries management in their respective states have not expressed federalism related opposition to the proposed action.

8.5 Executive Order 12866: Regulatory Planning and Review

E.O. 12866, signed in 1993, requires federal agencies to assess the costs and benefits of their proposed regulations, including distributional impacts, and to select alternatives that maximize net benefits to society. To comply with E.O. 12866, NMFS prepares a Regulatory Impact Review (RIR) for all fishery regulatory actions that implement a new FMP or that significantly amend an existing plan. RIRs provide a comprehensive analysis of the costs and benefits to society associated with proposed regulatory actions, the problems and policy objectives prompting the regulatory proposals, and the major alternatives that could be used to solve the problems. The reviews also serve as the basis for the agency's determinations as to whether proposed regulations are a "significant regulatory action" under the criteria provided in E.O. 12866 and whether proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the RFA. A regulation is significant if it is likely to result in an annual effect on the economy of at least $100,000,000 or if it has other major economic effects.

8.6 Executive Order 12898: Environmental Justice

This Executive Order mandates that each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, 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 and possessions. Federal agency responsibilities under this Executive Order include conducting their programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons from participation in, denying persons the benefit of, or subjecting persons to discrimination under, such programs policies, and activities, because of their race, color, or national origin. Furthermore, each federal agency responsibility set forth under this Executive Order shall apply equally to Native American programs.

Specifically, federal agencies shall, to the maximum extent practicable; conduct human health and environmental research and analysis; collect human health and environmental data; collect, maintain and analyze information on the consumption patterns of those who principally rely on fish and/or wildlife for subsistence; allow for public participation and access to information relating to the incorporation of environmental justice principals in federal agency programs or policies; and share information and eliminate unnecessary duplication of efforts through the use of existing data systems and cooperative agreements among Federal agencies and with State, local, and tribal governments.

The Council conducted a series of scoping meetings for this amendment in which the public was invited to provide input on actions contained therein. A summary of the scoping meetings can be found in **Appendix x** of this document. Comments received were considered during the development of Amendment 17A, and no environmental justice issues were raised during the scoping process. No Native American programs would be affected by actions contained within this amendment; therefore, no tribal consultation has been initiated.

Section 3.11 describes several areas in North Carolina, South Carolina, Georgia, and Florida where South Atlantic snapper grouper fisheries have a local presence. These communities were identified as key communities involved in the South Atlantic snapper grouper fishery based on fishing permit and employment data. The demographic information reported for these communities were derived from census data. Although the Census Bureau does not supply race or income data at the community level, such data are available for each county in which the fishing communities exist. Based on 2005 Census data, none of the counties within which any of the subject fishing communities is located has a disproportionately high poverty rate[9], or minority population[10]. The proposed actions would be applied to all participants in the fishery,

[9] Following the Office of Management and Budget's (OMB) Statistical Policy Directive 14 if a family's total income is less than the family's threshold, then that family and every individual in it is considered in poverty. The official poverty definition uses money income before taxes and does not include capital gains or noncash benefits (such as public housing, Medicaid, and food stamps) (U.S. Census, 2008).

[10] A minority population is one either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis (U.S. Census, 2008).

regardless of their race, color, national origin, or income level, and as a result are not expected to result in adverse or disproportionate environmental or public health impacts. Comments received during scoping did not indicate proposed actions are expected to affect any existing subsistence consumption patterns. Therefore, no environmental justice issues are anticipated and no modifications to any proposed actions have been made to address environmental justice issues.

8.7 Executive Order 12962: Recreational Fisheries

E.O. 12962 requires federal agencies, in cooperation with states and tribes, to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities through a variety of methods including, but not limited to, developing joint partnerships; promoting the restoration of recreational fishing areas that are limited by water quality and habitat degradation; fostering sound aquatic conservation and restoration endeavors; and evaluating the effects of federally-funded, permitted, or authorized actions on aquatic systems and recreational fisheries, and documenting those effects. Additionally, the order establishes a seven member National Recreational Fisheries Coordination Council responsible for, among other things, ensuring that social and economic values of healthy aquatic systems that support recreational fisheries are considered by federal agencies in the course of their actions, sharing the latest resource information and management technologies, and reducing duplicative and cost-inefficient programs among Federal agencies involved in conserving or managing recreational fisheries. The Council also is responsible for developing, in cooperation with federal agencies, states and tribes, a Recreational Fishery Resource Conservation Plan - to include a five-year agenda.

8.8 Executive Order 13089: Coral Reef Protection

E.O. 13089, signed by President William Clinton on June 11, 1998, recognizes the ecological, social, and economic values provided by the Nation’s coral reefs and ensures that federal agencies are protecting these ecosystems. More specifically, the Order requires federal agencies to identify actions that may harm U.S. coral reef ecosystems, to utilize their program and authorities to protect and enhance the conditions of such ecosystems, and to ensure that their actions do not degrade the condition of the coral reef ecosystem.

Previous snapper grouper amendments, including Amendment 13A (2003), eliminated all potential adverse impacts to *Oculina* coral in the *Oculina* Banks HAPC and Experimental Closed Area that are associated with bottom fishing gear and fulfills the intentions of E.O. 13089. The use of bottom trawls, bottom longlines, dredges, fish traps, and fish pots is currently prohibited within the *Oculina* Banks HAPC and Experimental Closed Area and that prohibition would not be affected by the proposed actions.

The Comprehensive Ecosystem Based Amendment 1 (CE-BA 1, under development) will have alternatives for boundaries and management measures for proposed deepwater coral habitat areas of particular concern (HAPCs). A series of public hearings for the amendment were held

January and February 2009. The Council submitted the draft Environmental Impact Statement (DEIS) for CE-BA 1 to NOAA Fisheries Service in January 2009. CE-BA 1 is currently undergoing review for publication of a notice of availability of the DEIS.

8.9 Executive Order 13158: Marine Protected Areas

E.O. 13158 was signed on May 26, 2000 to strengthen protection of U.S. ocean and coastal resources through the use of Marine Protected Areas (MPAs). The E.O. defined MPAs as "any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." It directs federal agencies to work closely with state, local, and non-governmental partners to create a comprehensive network of MPAs "representing diverse U.S. marine ecosystems, and the nation's natural and cultural resources". The South Atlantic Council developed Amendment 14 to the FMP for the Snapper Grouper Fishery if the South Atlantic Region to establish a series of deepwater marine protected areas in the South Atlantic EEZ. The amendment was approved by the Council during its June 2007 meeting and submitted to NOAA Fisheries Service for approval by the Secretary of Commerce on July 18, 2007. Amendment 14 was implemented on February 12, 2009.

8.10 Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) established a moratorium, with certain exceptions, on the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas. It also prohibits the importing of marine mammals and marine mammal products into the United States. Under the MMPA, the Secretary of Commerce (authority delegated to NOAA Fisheries Service) is responsible for the conservation and management of cetaceans and pinnipeds (other than walruses). The Secretary of the Interior is responsible for walruses, sea otters, polar bears, manatees, and dugongs.

In 1994, Congress amended the MMPA, to govern the taking of marine mammals incidental to commercial fishing operations. This amendment required the preparation of stock assessments for all marine mammal stocks in waters under U.S. jurisdiction; development and implementation of take-reduction plans for stocks that may be reduced or are being maintained below their optimum sustainable population levels due to interactions with commercial fisheries; and studies of pinniped-fishery interactions. The MMPA requires a commercial fishery to be placed in one of three categories, based on the relative frequency of incidental serious injuries and mortalities of marine mammals. Category I designates fisheries with frequent serious injuries and mortalities incidental to commercial fishing; Category II designates fisheries with occasional serious injuries and mortalities; and Category III designates fisheries with a remote likelihood or no known serious injuries or mortalities. To legally fish in a Category I and/or II fishery, a fisherman must obtain a marine mammal authorization certificate by registering with the Marine Mammal Authorization Program (50 CFR 229.4), the must accommodate an observer if requested (50 CFR 229.7(c)) and comply with any applicable take reduction plans.

The commercial hook-and-line components of the South Atlantic snapper grouper fishery (i.e., bottom longline, bandit gear, and handline) are listed as part of a Category III fishery (74 FR 27739; June 11, 2009) because there have been no documented interactions between these gears and marine mammals. The black sea bass pot component of the South Atlantic snapper grouper fishery is part of the Atlantic mixed species trap/pot fishery, a Category II fishery, in the 2010 proposed LOF (74 FR 27739; June 11, 2009). The Atlantic mixed species trap/pot fishery designation was created in 2003 (68 FR 41725, July 15, 2003), by combining several separately listed trap/pot fisheries into a single group. This group was designated Category II as a precaution because of known interactions between marine mammals and gears similar to those included in this group. Prior to this consolidation, the black sea bass pot fishery in the South Atlantic was a part of the "U.S. Mid-Atlantic and Southeast U.S. Atlantic Black Sea Bass Trap/Pot" fishery (Category III). There has never been a documented interaction between marine mammals and black sea bass trap/pot gear in the South Atlantic. The actions in Amendment 17A are not expected to negatively impact the provisions of the MMPA.

8.11 Migratory Bird Treaty Act and Executive Order 13186

The Migratory Bird Treaty Act (MBTA) implemented several bilateral treaties for bird conservation between the United States and Great Britain, the United States and Mexico, the United States and Japan, and the United States and the former Union of Soviet Socialists Republics. Under the MBTA, it is unlawful to pursue, hunt, take, capture, kill, possess, trade, or transport any migratory bird, or any part, nest, or egg of a migratory bird, included in treaties between the signatories, except as permitted by regulations issued by the Department of the Interior (16 U.S.C. 703-712). Violations of the MBTA carry criminal penalties. Any equipment and means of transportation used in activities in violation of the MBTA may be seized by the United States government and, upon conviction, must be forfeited to the U.S. government.

Executive Order 13186 directs each federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement a memorandum of understanding (MOU) with the U.S. Fish and Wildlife Service (USFWS) to conserve those bird populations. In the instance of unintentional take of migratory birds, NOAA Fisheries Service would develop and use principles, standards, and practices that will lessen the amount of unintentional take in cooperation with the USFWS. Additionally, the MOU would ensure that National Environmental Policy Act (NEPA) analyses evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern.

A MOU is currently being developed, which will address the incidental take of migratory birds in commercial fisheries under the jurisdiction of NOAA Fisheries Service. NOAA Fisheries Service must monitor, report, and take steps to reduce the incidental take of seabirds that occurs in fishing operations. The United States has already developed the U.S. National Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries. Under that plan many potential MOU components are already being implemented.

8.12 National Environmental Policy Act

Concerned with the degree of damages incurred by human activity on the sensitive ecological environment in the United States, Congress passed, and Richard Nixon signed into law, the National Environmental Policy Act (NEPA) of 1969, 42 U.S.C. §§ 4321 *et seq.* NEPA sets the national environmental policy by providing a mandate and framework for federal agencies to consider all reasonably foreseeable environmental effects of their actions. In addition, it requires disclosure of information regarding the environmental impacts of any federal or federally funded action to public officials and citizens before decisions are made and actions taken. The analyses and results are presented to the public and other agencies through the development of NEPA documentation. The Final Environmental Impact Statement (FEIS) integrated into Amendment 17 to the FMP serves as the documentation to satisfy the requirements of NEPA.

8.13 National Marine Sanctuaries Act

Under the National Marine Sanctuaries Act (NMSA) (also known as Title III of the Marine Protection, Research, and Sanctuaries Act of 1972), as amended, the U.S. Secretary of Commerce is authorized to designate National Marine Sanctuaries to protect distinctive natural and cultural resources whose protection and beneficial use requires comprehensive planning and management. The National Marine Sanctuary Program is administered by the Sanctuaries and Reserves Division of NOAA. The Act provides authority for comprehensive and coordinated conservation and management of these marine areas. The National Marine Sanctuary Program currently comprises 13 sanctuaries around the country, including sites in American Samoa and Hawaii. These sites include significant coral reef and kelp forest habitats, and breeding and feeding grounds of whales, sea lions, sharks, and sea turtles. The two main sanctuaries in the South Atlantic EEZ are Gray's Reef and Florida Keys National Marine Sanctuaries. The Florida Keys National Marine Sanctuary represents the bulk of the ESA-listed *Acropora* species' range in the South Atlantic region.

8.14 Paperwork Reduction Act

The purpose of the Paperwork Reduction Act is to control paperwork requirements imposed on the public by the federal government. The authority to manage information collection and record keeping requirements is vested with the Director of the Office of Management and Budget. This authority encompasses establishment of guidelines and policies, approval of information collection requests, and reduction of paperwork burdens and duplications.

The Council is not proposing, in this amendment, measures that would involve increased paperwork and consideration under this Act.

8.15 Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) of 1980 (5 U.S.C. 601 et seq.) requires federal agencies to assess the impacts of regulatory actions implemented through notice and comment rulemaking procedures on small businesses, small organizations, and small governmental entities, with the goal of minimizing adverse impacts of burdensome regulations and record-keeping requirements on those entities. Under the RFA, NOAA Fisheries Service must determine whether a proposed fishery regulation would have a significant economic impact on a substantial number of small entities. If not, a certification to this effect must be prepared and submitted to the Chief Counsel for Advocacy of the Small Business Administration. Alternatively, if a regulation is determined to significantly impact a substantial number of small entities, the Act requires the agency to prepare an initial and final Regulatory Flexibility Analysis to accompany the proposed and final rule, respectively. These analyses, which describe the type and number of small businesses affected, the nature and size of the impacts, and alternatives that minimize these impacts while accomplishing stated objectives, must be published in the *Federal Register* in full or in summary for public comment and submitted to the chief counsel for advocacy of the Small Business Administration. Changes to the RFA in June 1996 enable small entities to seek court review of an agency's compliance with the Act's provisions.

8.16 Small Business Act

Enacted in 1953, the Small Business Act (SBA) requires that agencies assist and protect small-business interests to the extent possible to preserve free competitive enterprise. The IRFA discussed in Section 6 of this document shows that Amendment 17 is in compliance with the SBA.

8.17 Public Law 99-659: Vessel Safety

Public Law 99-659 amended the Magnuson-Stevens Act to require that a FMP or FMP amendment must consider, and may provide for, temporary adjustments (after consultation with the U.S. Coast Guard and persons utilizing the fishery) regarding access to a fishery for vessels that would be otherwise prevented from participating in the fishery because of safety concerns related to weather or to other ocean conditions.

No vessel would be forced to participate in the snapper grouper fishery under adverse weather or ocean conditions as a result of the imposition of management regulations proposed in this amendment. No concerns have been raised by people participating neither in the fishery nor by the U.S. Coast Guard that the proposed management measures directly or indirectly pose a hazard to crew or vessel safety under adverse weather or ocean conditions. Therefore, this amendment proposes neither procedures for making management adjustments due to vessel safety problems nor procedures to monitor, evaluate, or report on the effects of management measures on vessel or crew safety under adverse weather or ocean conditions.

9 List of Preparers

Name	Title	Agency	Division	Location
Myra Brouwer	Fishery Scientist	SAFMC	N/A	SAFMC
David Dale	EFH Specialist	NMFS	HC	SERO
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Tracy Dunn	Enforcement Specialist	NMFS	LE	SERO
Otha Easly	Enforcement Specialist	NMFS	LE	SERO
Karla Gore	Natural Resource Management Specialist	NMFS	SF	SERO
Andy Herndon	Biologist	NMFS	PR	SERO
Stephen Holliman	Economist	NMFS	SF	SERO
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Tony Lamberte	Economist	NMFS	SF	SERO
Palma Ingles	Anthropologist	NMFS	SF	SERO
Jennifer Lee	Council Liaison	NMFS	PR	SERO
Jack McGovern	Fishery Biologist	NMFS	SF	SERO
Nikhil Mehta	Fishery Biologist	NMFS	SF	SERO
Janet Miller	Permits	NMFS	SF	SERO
Roger Pugliese	Senior Fishery Biologist	SAFMC	N/A	SAFMC
Kate Quigley	Economist	SAFMC	N/A	SAFMC
Monica Smit-Brunello	Attorney Advisor	NOAA	GC	SERO
Jim Waters	Economist	NMFS	Economics	SEFSC
Kate Michie	Fishery Management Plan Coordinator	NMFS	SF	SERO
Gregg Waugh	Deputy Director	SAFMC	N/A	SAFMC
Erik Williams	Stock Assessment Biologist	NMFS	SF	SEFSC

10 List of Agencies, Organizations, and Persons To Whom Copies of the Statement Are Sent

Responsible Agency

Amendment 17:
South Atlantic Fishery Management Council
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Toll Free: 866-SAFMC-10
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Environmental Impact Statement:
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 Marine Protected Areas Advisory Panel
SAFMC Coral Advisory Panel
SAFMC Habitat and Environmental Protection 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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Will be added prior to public hearings.