Amendment 17A to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region

SAFMC

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Amendment 17A to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region with Final Environmental Impact Statement, Initial Regulatory Flexibility Act Analysis, Regulatory Impact Review, and Social Impact Assessment/Fishery 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}
$F_{REBUILD}$	The rate of fishing mortality expected to have a 50% chance of stock recovery in T_{MAX}.
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
MRIP	Marine Recreational Information Program
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	Minimum Stock Size Threshold
MSY	Maximum Sustainable Yield
NEPA	National Environmental Policy Act 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
SPR	Spawning Potential Ratio
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 FINAL ENVIRONMENTAL IMPACT STATEMENT, INITIAL REGULATORY FLEXIBILITY ANALYSIS, FINAL REGULATORY IMPACT REVIEW AND SOCIAL IMPACT ASSESSMENT/FISHERY IMPACT STATEMENT

Proposed actions:	For red snapper, specify the following: MSY proxy; rebuilding plan (including ACLs, AMs, and OY); measures to end overfishing, and monitoring program. Require use of circle hooks.
Lead agency:	FMP Amendment – South Atlantic Fishery Management Council EIS - NOAA Fisheries Service
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ABSTRACT

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires the Regional Fishery Management Councils and NOAA Fisheries Service to prevent overfishing while achieving optimum yield (OY) from each fishery. When it is determined a stock is undergoing overfishing, measures must be implemented to end overfishing. In cases where stocks are overfished, the Councils and NOAA Fisheries Service must implement rebuilding plans. **The most recent assessment for the red snapper stock in the South Atlantic indicates that the stock is experiencing overfishing and is overfished (SEDAR 15 2008). A new benchmark assessment for red snapper is scheduled to be completed in December 2010.**

The Council received notification, in a letter dated July 8, 2008, that the South Atlantic red snapper stock is undergoing overfishing and is overfished. The Magnuson-Stevens Act requires the Council to prepare a plan amendment or proposed regulations to end overfishing within one year of notification that a stock is overfished. While the Council developed an amendment, they requested NOAA Fisheries Service, in March 2009, to establish interim measures to reduce overfishing and fishing pressure on the red snapper stock. Interim measures became effective on January 4, 2010. The interim rule was effective until June 2, 2010, but was extended for an additional 186 days since the Council is proposing long-term management measures in Snapper Grouper Fishery Management Plan (FMP) Amendment 17A to end overfishing of red snapper and rebuild the stock. Regulations implemented by the interim rule will expire on December 5th, 2010.

The *purpose* of Snapper Grouper FMP Amendment 17A is threefold: (1) to implement management measures to end overfishing of the red snapper stock in the South Atlantic immediately upon implementation; (2) to rebuild the stock so it may ultimately produce optimum yield (OY); and (3) to minimize to the extent practicable adverse social and economic effects expected from the first two items. The *need* for the action is to bring the red snapper stock back to a level that will produce optimum yield (OY). OY, the ultimate goal of any fishery management plan, is the level of harvest that provides the greatest economic, social, and ecological benefit to the nation. By allowing the red snapper stock to increase in biomass and maximize its reproductive potential, the population will again produce the OY.

Current regulations for red snapper allow for a recreational bag limit of 2 fish per person per day and require a 20 inch total length minimum size limit for both commercial and recreational fishermen. Through Amendment 17A, the Council is proposing a *total prohibition of harvest and possession of red snapper*. However, a total prohibition alone will not end overfishing because red snapper will still experience bycatch mortality as fishermen pursue other co-occurring species in the snapper grouper complex. The red snapper stock is part of the multi-species fishery; many species 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, and others. This is a

significant issue as release mortality rates for red snapper are estimated at 40% for the recreational fishery and 90% for the commercial fishery (due to deeper waters fished and handling practices).

Due to the nature of the fishery and the high release mortality rates, Amendment 17A also includes alternatives that would prohibit the harvest of *all snapper grouper species* in certain areas in addition to a prohibition of red snapper harvest/possession throughout the exclusive economic zone (EEZ). The alternatives for the closed areas focus on locations where concentrated landings of red snapper are reported, primarily off the coasts of Georgia and the north and central east coasts of Florida.

The Council and NOAA Fisheries Service are considering a range of options in Amendment 17A. In general, the positive effects to the stock and ecosystem are greatest with the largest closures and lowest annual catch limits. In turn, negative socio-economic effects increase with such options. However, there are positive, long-term socio-economic effects from a rebuilt stock. As with many fishing regulations, the economic issue involves the balancing of short-term costs and long-term benefits. There is a wide gap between the current landings (approximately 440 thousand pounds) and potential landings for a rebuilt stock (approximately 2.2 million pounds). This has at least two implications: first, more stringent management measures are needed to rebuild the red snapper stock; second, there is a relatively high likelihood that future benefits from the fishery would outweigh the costs of implementing stringent management measures.

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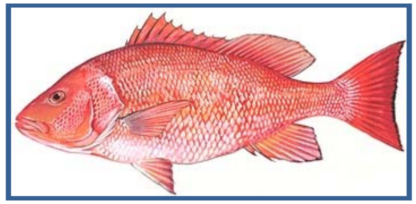


The South Atlantic Fishery Management Council (Council) is developing regulations for red snapper to end overfishing and rebuild the stock. The regulations are expected to be implemented in late 2010 or early in 2011. The stock status is based upon a red snapper stock assessment that was completed in 2008. A new red snapper stock assessment is currently underway; results will be presented to the Council at their December 2010 Council meeting. Regulations could change based upon that assessment.

This document is intended to serve as a SUMMARY for all the actions and alternatives in Amendment 17A. It also includes a summary of the expected biological and socio-economic effects from the management measures.

Table of Contents for Actions in Amendment 17A

Background

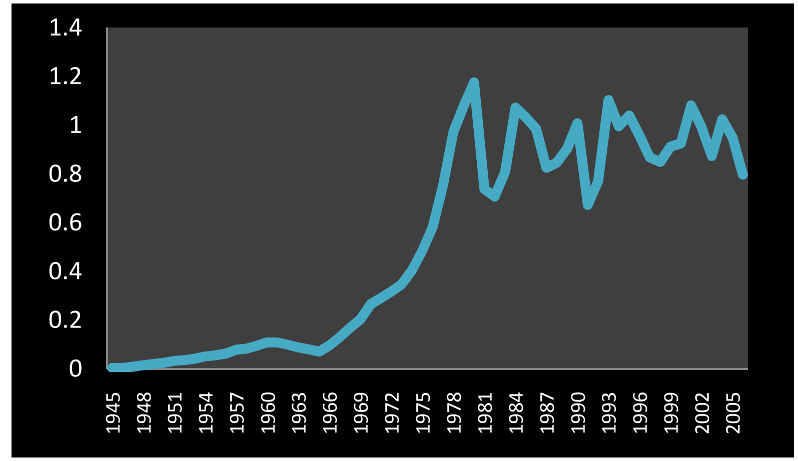
The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires the Regional Fishery Management Councils and NOAA Fisheries Service to prevent overfishing while achieving optimum yield (OY) from each fishery. When a stock is undergoing overfishing, measures must be put in place to end overfishing immediately upon implementation. In cases where stocks are overfished, the Councils and NOAA Fisheries Service must implement rebuilding plans.

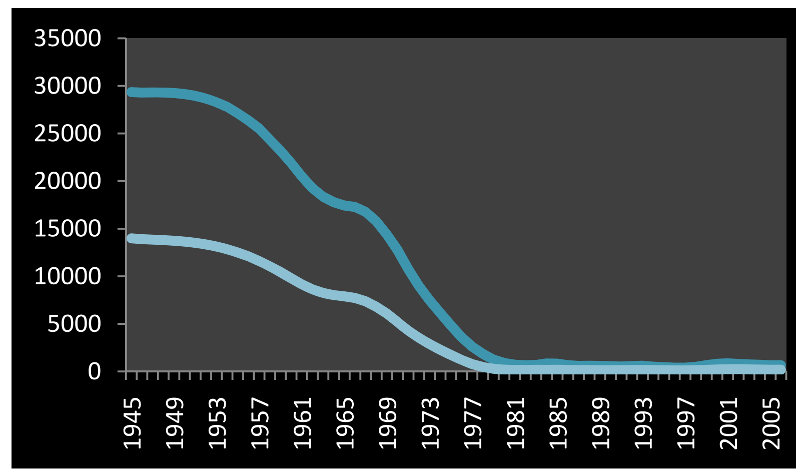
The most recent assessment for the red snapper stock in the South Atlantic shows that the stock is experiencing overfishing and is overfished (SEDAR 15 2008). A new benchmark assessment for red snapper is expected to be completed by the end of 2010.

Overfishing
A rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield (MSY) on a continuing basis.

Overfished
When a fish stock is sufficiently small that a change in management practices is required to achieve an appropriate level and rate of rebuilding.

OVERFISHING is occurring at a high degree
(This is a graph of red snapper mortality rate from fishing activities over time)





The stock is severely OVERFISHED.
(This is a graph of biomass in pounds (top line) and spawning stock biomass over time)

Purpose and need of the proposed action

The *purpose* of Amendment 17A is threefold: (1) to implement management measures to end overfishing of the red snapper stock in the South Atlantic immediately upon implementation; (2) to rebuild the stock so it may ultimately produce optimum yield (OY); and (3) to minimize to the extent practicable adverse social and economic effects expected from the first two items.

The *need* for the action is to bring the red snapper stock back to a level that will produce optimum yield (OY). By allowing the red snapper stock to increase in biomass and maximize its reproductive potential, the population will again produce the optimum yield. Optimum yield, the ultimate goal of any fishery management plan, is the level of harvest that provides the greatest economic, social, and ecological benefit to the nation.

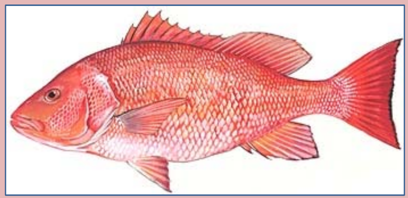
List of Management Actions

There are five *actions* in Amendment 17A that will accomplish the purpose and need.

- **(1)** Establish a maximum sustainable yield proxy for red snapper
- **(2)** Establish a red snapper rebuilding plan
    - a. Rebuilding schedule (timeline)
    - b. Rebuilding strategy, optimum yield, annual catch limit and accountability measures
- **(3)** Establish red snapper management measures
- **(4)** Require the use of circle hooks
- **(5)** Establish a red snapper monitoring program

Each action has a range of *alternatives* in order to accomplish the purpose and need. Alternatives are developed for Council members and the public to weigh biological, economic and social impacts. The public is given the opportunity to comment on the alternatives as well. The range must include at least the no action (to do nothing) and preferred (the Council's choice) alternatives.

Red Snapper Life History – *An Overview*



The red snapper is found from North Carolina to the Florida Keys, and throughout the Gulf of Mexico to the Yucatan Peninsula in waters ranging from 33-623 feet. Adults are usually found over rocky bottoms. Juveniles inhabit shallow waters and are common over sandy or muddy bottoms. Red snapper do not migrate but can move long distances. They live in both pelagic (open ocean) and benthic (ocean bottom) habitats during their life cycles.

The spawning season for red snapper varies with location, but in most cases occurs nearly year round. The spawning season off the southeastern United States extends from May to October, peaking in July through September. Females are mature at 11 to 13 inches total length. Red snapper eat fishes, shrimps, crabs, worms, other invertebrates, and some plankton.

Red snapper can attain sizes as great as 40 inches total length and 50 lbs. The 2008 stock assessment for South Atlantic red snapper indicated that red snapper can live to a maximum of 54 years, far longer than the previous (1997) estimate of 25 years. Red snapper in the Gulf of Mexico have been reported up to 57 years old.

Among red snapper, larger fish aren't always older fish. There is a great deal of variability in the age of red snapper at larger sizes. For example, the average size of a 10 year old red snapper is around 32 inches, but 10 year old fish range in size from 27 to 40 inches in length. Fish are currently being caught before they become old enough to reach their peak reproductive levels. Increasing the abundance of older, mature fish is important to long-term sustainability.

The red snapper stock is part of the snapper grouper multi-species fishery with many species 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, and others. Because red snapper are part of a multi-species fishery, they can be incidentally caught and killed when fishermen target co-occurring species.

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

❖ Action 1. Establish a Maximum Sustainable Yield (MSY) proxy for red snapper

The MSY alternatives are in Table S-1. Under the Magnuson-Stevens Act, the Council is required to set MSY. If there is not enough data to establish MSY, a proxy must be used. A proxy is a place-holder until sufficient data becomes available to estimate MSY.

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

Alternatives	Equation	F_{MSY}	MSY Proxy Values (lbs whole weight)
Alternative 1 (No Action) (Preferred)	**MSY equals the yield produced by F_{MSY}. $F_{30\%SPR}$ is used as the F_{MSY} proxy.**	**$F_{30\%SPR}$[1]= 0.148[2]**	**2,431,000[3]**
Alternative 2	MSY equals the yield produced by F_{MSY} or the F_{MSY} Proxy. MSY and F_{MSY} are recommended by the most recent SEDAR/SSC[4] . F_{MSY} proxies will be specified by the Council.	$F_{40\%SPR}$=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 SEDAR15 (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 of MSY from sensitivity runs is 559,000 lbs whole weight to 3,927,000 lbs whole weight.

- MSY = Maximum Sustainable Yield
- The Council must set MSY.
- There currently is not enough information to calculate MSY for red snapper. Therefore, a proxy must be used.
- A proxy is a placeholder until sufficient data become available to estimate MSY.

Impacts from Action 1 (Establish MSY Proxy)

Biological

Alternative 2 is based on the Council's Scientific and Statistical Committee's (SSC) recommendation and would specify an MSY proxy equal to the yield at $F_{40\%SPR}$. **Alternative 2** would establish a new proxy for F_{MSY} not previously used for red snapper, which is more conservative than the No Action proxy of $F_{30\%SPR}$. **Alternative 2**, provides greater assurance overfishing would be ended and the stock would rebuild within the specified time as the rebuilding goal (SSB_{MSY}) is higher (Table S-2). Therefore, the biological benefits of **Alternative 2** for the red snapper stock would be greater than **Alternative 1 (No Action) (Preferred),** because Alternative 2 would allow for less harvest and there would be a greater probability overfishing would end and the stock would be rebuilt to SSB_{MSY}.

Table S-2. A comparison of the rebuilding attributes when using two different F_{MSY} proxies.

	F_{MSY} Proxy	
	$F_{30\%SPR}$	$F_{40\%SPR}$
Rebuilding goal (SSB_{MSY})	Lower (13,283,000 lbs)	Higher (17,863,000 lbs)
ACL in Year One (2010)	Higher	Lower
OY at Equilibrium	Higher	Lower
Years to rebuild to SSB_{MSY}	Less time	More time
Probability of rebuilding to SSB_{MSY}	Higher	Lower

Socio-economic

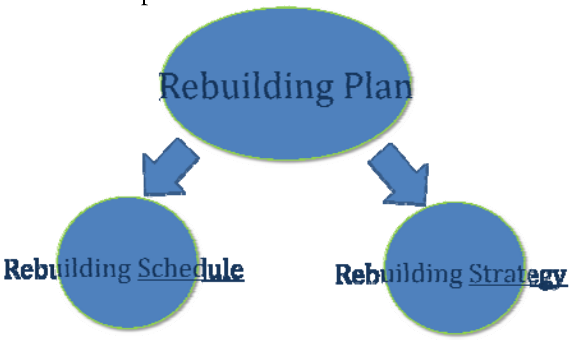
As the yield at $F_{30\%SPR}$ is greater than the yield at $F_{40\%SPR}$, a F_{MSY} proxy that is too conservative could have unnecessary negative social and economic effects in terms of more restrictive management measures including larger area closures. In principle, more stringent measures would logically be required under an MSY alternative that is more conservative from a biological standpoint; conversely, less stringent measures would be required under an MSY alternative that is less conservative. As with any fishing regulation, the economic issue involves the balancing of short-term costs and long-term benefits. The economically preferable MSY proxy choice would be one that results in the highest net economic benefits over time. In 2003-2007, the average combined commercial and recreational red snapper landings were approximately 551,000 pounds. In contrast, the MSY proxy could yield 2.431 million pounds (MP) under **Alternative 1 (No Action) (Preferred)** and 2.304 MP under **Alternative 2**once the stock is rebuilt. This wide gap between current landings and potential landings has at least two implications. First, both MSY proxy options would require stringent management measures to rebuild the red snapper stock. Second, there is a relatively high likelihood that future benefits from the fishery would outweigh the costs of implementing stringent management measures.

What does this table mean?

In **Action 1** (MSY Proxy), the Council is deciding on what proxy to use to determine MSY. A proxy must be used as there is not enough information to specify MSY for red snapper. The two options under consideration are to use either $F_{30\%SPR}$ or $F_{40\%SPR}$. This table compares the two options. Basically, the use of $F_{40\%SPR}$ 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 as the rebuilding goal (SSB_{MSY}) is higher.

❖ Action 2. Establish a rebuilding plan for red snapper

A **rebuilding plan** is a plan to recover overfished stocks to a sustainable level (B_{MSY}) within a specific period of time. Rebuilding **schedules** and **strategies** are two components of a plan.



Rebuilding Plan
A plan to recover overfished stocks to a sustainable level within a specific period of time.

B_{MSY}
Biomass when fishing at the maximum sustainable yield. B_{MSY} is often used as a biological reference point in fisheries management.

- ### Rebuilding schedule

Alternatives for the **rebuilding schedule** are in Table S-3. The Council must choose the time period during which to rebuild the overfished red snapper stock. The Magnuson-Stevens Act and subsequent guidance sets a minimum and maximum amount of time the Councils have to rebuild overfished stocks. This range depends on several factors including the life history of the stock and the level of depletion of the stock.

Table S-3. Rebuilding schedule alternatives for red snapper.

Alternative	Year One	Time Period Allowed by Law	Years to Rebuild to Goal (SSB_{MSY})
Alternative 1 (No Action)	Do not implement a rebuilding plan		
Alternative 2	2010	Shortest (15 years)	2024
Alternative 3	2010	Mid-point (25 years)	2034
Alternative 4 (Preferred)	**2010**	**Longest (35 years)**	**2044**

- The Council must establish a **rebuilding schedule**.
- A **rebuilding schedule** specifies the number of years to recover the stock; this choice will affect the rebuilding strategies and management measures chosen.
- **The Council's preferred option is to take the maximum amount of time allowed by law (35 years) to rebuild the stock.** The Council believes this minimizes the expected adverse social and economic impacts to the fishing industry.

- **Rebuilding strategy (includes optimum yield, annual catch limit, and accountability measures)**

The **rebuilding strategy** specifies the maximum rate of fishing mortality allowed during rebuilding. **Each strategy alternative has a corresponding Optimum Yield (OY) and Annual Catch Limit (ACL) (Table S-4).** The *OY* at equilibrium is the amount of catch that will provide the greatest overall benefit to the nation when the red snapper stock is rebuilt. Think of this as the long-term goal in terms of the poundage of red snapper in the ocean. The *ACL* is the level of annual catch (pounds or numbers) that triggers accountability measures to ensure that overfishing is not occurring. Accountability measures are discussed in the next section. The Council establishes the ACL and this number cannot exceed the Acceptable Biological Catch recommendations from the scientists. ACLs can be established for each sector (e.g., commercial, recreational) and would be called "sector-ACLs".

Table S-4. Rebuilding strategy, OY, and ACL alternatives for red snapper.

Alternatives	Rebuilding strategy (F_{OY} Equal To)	ACL in Year 1 of Rebuilding (2010)[1, 2]		OY Proxy Values at Equilibrium (lbs whole weight)
		Sub-Alt. A (Preferred)	Sub-Alt. B	
Alternative 1 (No Action)	$F_{45\%SPR}$	Not specified		2,196,000
Alternative 2	$85\%F_{40\%SPR}$	0	89,000	2,199,000
Alternative 3	$75\%F_{40\%SPR}$	0	79,000	2,104,000
Alternative 4	$65\%F_{40\%SPR}$	0	68,000	1,984,000
Alternative 5	$97\%F_{40\%SPR}$	0	101,000	2,287,000
Alternative 6	$85\%F_{30\%SPR}$	0	125,000	2,392,000
Alternative 7	$75\%F_{30\%SPR}$	0	111,000	2,338,000
Alternative 8	$65\%F_{30\%SPR}$	0	97,000	2,257,000
Alternative 9 (Preferred)	**$98\%F_{30\%SPR}$**	**0**	**144,000**	**2,425,000**

[1]For alternative 2-9, the ACL specified for 2010 would remain in effect beyond 2010 until modified.
[2]In Amendment 17A, the ACL and AM options are tied together. See the next section for the AM alternatives.

Rebuilding Strategy
The fishing rate that will result in a rebuilt stock within the designated rebuilding schedule.

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

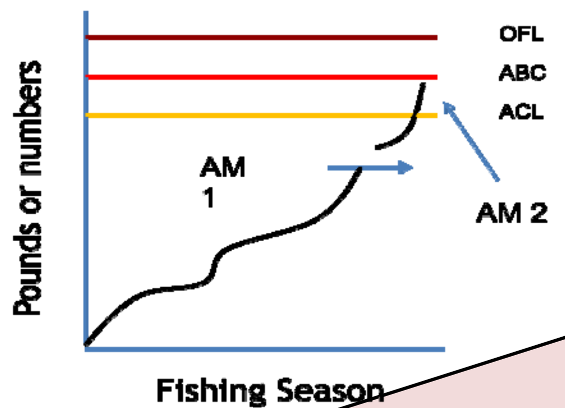
Annual Catch Limits (ACL)
The level of annual catch (pounds or numbers) that triggers accountability measures to ensure that overfishing is not occurring.

Based on the Council's preferred alternative (highlighted in table):

- The rebuilding strategy sets the maximum fishing mortality allowed during rebuilding at "**$98\%F_{30\%SPR}$**". The ACL would be 0 and the OY (yield when rebuilt) would be 2,291,000 lbs. Why the ACL would be 0 is explained later.

- **Accountability measures**

*Accountability measures (*AMs) are management controls to prevent ACLs, including sector specific ACLs, from being exceeded, and to correct or mitigate overages of the ACL if they occur. There are two categories of AMs: (1) in-season AMs and (2) AMs for when the ACL is exceeded. In the theoretical graphic of annual harvest below, **AM 1** represents a form of in-season regulation that prevents the ACL from being exceeded. An example is to close a fishery when a percentage of an ACL is reached. If catch exceeds the ACL, **AM 2** would implement actions after the fishing year. Examples include decreasing the ACL in the following year or shortening the subsequent year's fishing season.



What does this table mean?

This table specifies the ACL and accountability measures (AM). The AM describes (1) how the Council will track rebuilding and (2) what would trigger a change in management measures. The Council intends to track the rebuilding of red snapper through monitoring what is called catch per unit effort or CPUE. Amendment 17A contains options to implement fishery-dependent and independent programs (with and without the fishermen) to provide CPUE estimates. The Council intends to make adjustments to regulations (principally the size of the area closure) depending on CPUE. The Council also intends to set ACL = 0 and not change the closure size if discards exceed the ACL. The Council believes that *self-reported* discard information should not be the sole determinant of closure size. Therefore, "B" Sub-Alternatives are not the preferred options.

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

The accountability measures alternatives are in Table S-5. In Amendment 17A, the ACL and AM options are tied together.

Table S-5. AM and ACL alternatives.

Sub-Alternative	ACLs (lbs)	Accountability Measures
Alternative 1 (No Action)	Do not implement AMs or ACLs	
Alternative 2A	0	1. Track the CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if the assessment indicates progress is not being made. 2. Track the biomass and CPUE through fishery-dependent sampling. 3. CPUE would be evaluated every three years and adjustments would be made using the framework action.
Alternative 3A	0	
Alternative 4A	0	
Alternative 5A	0	
Alternative 6A	0	
Alternative 7A	0	
Alternative 8A	0	
Alternative 9A (Preferred)	0	
Alternative 2B	89,000	Same as above but the following is added to number three: "The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL."
Alternative 3B	79,000	
Alternative 4B	68,000	
Alternative 5B	101,000	
Alternative 6B	125,000	
Alternative 7B	111,000	
Alternative 8B	97,000	
Alternative 9B	144,000	

Impacts from Action 2 (Rebuilding Plan)

a) Rebuilding Schedule

Alternative 1	-	no action
Alternative 2	-	15 years
Alternative 3	-	25 years
Alternative 4	-	35 years

Biological

Alternatives 2-4 would establish rebuilding schedules that would rebuild red snapper 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 15 years (**Alternative 2**) to 35 years (**Alternative 4 (Preferred)**). Generally, the shorter rebuilding timeframes translate into higher biological benefits. **Alternative 2**, which would implement the shortest rebuilding schedule, would require more stringent regulations to achieve the goal of rebuilding in the shortest amount of time. However, **Alternative 2** may not be realistic as it 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 co-occurring species. The Council is considering substantial measures to reduce fishing mortality in this amendment including an area closure for all snapper grouper species. This would reduce bycatch of red snapper but it is uncertain to what extent. **Consequently, the Council has chosen the longest rebuilding schedule alternative (Alternative 4; 35 years) as the preferred.**

Socio-economic

Alternative 3 would incur a level of negative short-term socioeconomic impacts between that of **Alternatives 2 and 4. Alternative 4** would 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**. In addition, **Alternative 4** 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** may have a higher likelihood of generating the highest net benefits over time.

b) Rebuilding strategy (includes optimum yield, annual catch limit and accountability measures)

Biological

OY values at equilibrium in the nine 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 4**, which would specify an OY at equilibrium equal to 65%$F_{40\%SPR}$ and would require a 91% reduction in total kill relative to 2005-2007 landings. The least amount of biological benefit would be provided by **Alternative 9 (Preferred)**, which would specify a rebuilding strategy of 98%$F_{30\%SPR.}$

In general, the greater the percent reduction in red snapper mortality, the greater the positive impact to the stock and associated ecosystem (Table S-6).

Table S-6. The annual limit in red snapper kill, the percent reduction needed in total removals to end overfishing, and the probability of rebuilding for Alternatives 1-9.

Alternative	Total Kill	Percent Reduction	Year Rebuilt (50% Prob)	Prob rebuilt 2044
Alternative 1 (No Action) ($F_{45\%SPR}$)	89,000	85%	2035*; 2025**	70%*; 99%**
Alternative 2 (85%$F_{40\%SPR}$)	89,000	85%	2035	70%
Alternative 3 (75%$F_{40\%SPR}$)	79,000	87%	2032	84%
Alternative 4 (65%$F_{40\%SPR}$)	68,000	91%	2029	94%
Alternative 5 (97%$F_{40\%SPR}$)	101,000	83%	2044	50%
Alternative 6 (85%$F_{30\%SPR}$)	125,000	79%	2031	78%
Alternative 7 (75%$F_{30\%SPR}$)	111,000	82%	2028	92%
Alternative 8 (65%$F_{30\%SPR}$)	97,000	84%	2026	98%
Alternative 9 (Preferred) (98%$F_{30\%SPR}$)	**144,000**	**76%**	**2040**	**53%**

*Compared to SSB_{MSY} = 17,863,000 lbs whole weight for $F_{40\%SPR}$ F_{MSY} proxy.
**Compared to SSB_{MSY} = 13,283 000 lbs whole weight for $F_{30\%SPR}$ proxy for F_{MSY}..
Total kill = landings and discards

Based on the Council's preferred alternative (highlighted in table):

- The annual red snapper kill through fishing activities (including as bycatch) **cannot exceed 144,000 lbs**. If it does, **overfishing** is occurring.
- An **76% reduction** in red snapper fishing mortality is required to **end overfishing**. (This will affect the size of the area closure discussed in the next section.)
- There is a **53% chance** that the red snapper stock will be rebuilt within the chosen time frame (35 years, as discussed earlier).

Socio-economic

Alternative 4 and **Sub-alternative 4A**, expected to result in the largest biological benefit, are also expected to offer the largest long-term economic benefits but would require the most severe short-term reductions and therefore largest short-term negative economic impacts. **Alternative 9 (Preferred)** with **Sub-alternative 9B** is expected to yield the smallest biological benefit. This would likely result in less stringent management measures and therefore the smallest short-term negative economic impacts but also the smallest long-term economic benefits to the fishermen.

Alternative 5 identifies an OY level based on the proxy proxy for F_{MSY} ($F_{40\%SPR}$) recommended by the Council's SSC. This alternative has the longest rebuilding period and a higher reduction in total removals (83%) than **Alternatives 6, 7,** and **9** but lower than **Alternatives 1, 2, 3, 4**, and **8**. **Alternative 5** could be expected to result in smaller long-term benefits than those alternatives with shorter rebuilding periods but might result in less stringent management measures and smaller short-term negative impacts than some alternatives.

Setting ACL to a Poundage Level Versus Setting ACL to Zero

If the Council chooses to set an ACL based on total mortality, the Southeast Fisheries Science Center (SEFSC) would be required to monitor discarded red snapper in the commercial and recreational sectors. There are concerns that the monitoring of discards would rely on self-reporting by fishermen. This could create a disincentive for fishermen to report discards if they know that once a certain level of discarded fish is reached, accountability measures (AMs) would be triggered, which could potentially further restrict their snapper grouper harvest. Because of these concerns with monitoring discards, catch per unit effort (CPUE) of red snapper would be tracked via a fishery-independent monitoring program to identify changes in biomass. Furthermore, the Council is considering the use of fishery-dependent data collection by headboat and charterboat operators to determine if there are changes in CPUE and biomass.

❖ Action 3. Establish red snapper management measures

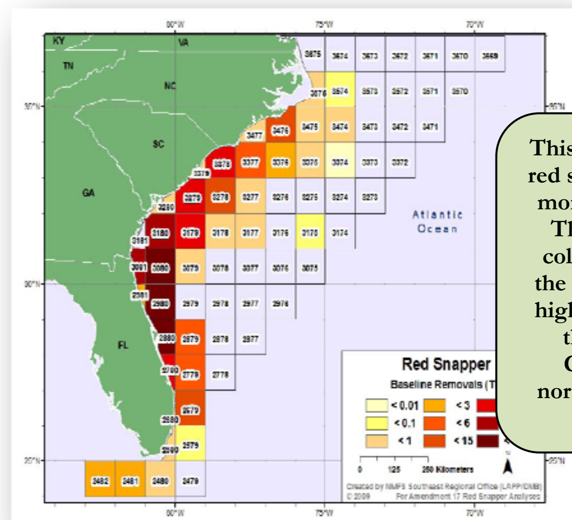
Alternative	Action
Alternative 1 (No Action)	Do not change current management measures.
Alternative 2	Prohibit red snapper.
Alternative 3A-4D	Prohibit red snapper and close bottom fishing in certain areas.
Alternatives 5-7	Fishing exceptions within closed area
Alternatives 8A-8C	Transit allowance within closed area.

Red Snapper Prohibition (Alternative 2)

Current regulations for red snapper include a recreational bag limit of 2 fish per person per day and a 20 inch total length minimum size limit for both commercial and recreational fishermen. **Through Amendment 17A, the Council is proposing to implement of a *total prohibition of harvest/retention of red snapper*.** However, a closure of the fishery will not end overfishing because of red snapper bycatch mortality that occurs whenfishermen pursue other species in the snapper grouper complex. The red snapper stock is part of the multi-species fishery; many species 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, and others. This is a significant issue as release mortality rates for red snapper are estimated at 40% for the recreational fishery and 90% for the commercial fishery (due to deeper waters fished and handling practices).

Area Closures for All Snapper Grouper Species (Alternatives 3A through 4D)

Due to the nature of the fishery and release mortality rates, Amendment 17A also includes alternatives **(Alternatives 3A through 4D)** that would prohibit the harvest/retention of *all snapper grouper species* in certain areas ***in addition*** to a prohibition of red snapper throughout the South Atlantic. The alternatives for the closed areas focus on locations where concentrated landings of red snapper are reported, primarily off the coasts of Georgia and the north and central east coasts of Florida (figure below). **Alternatives 5 through 7** evaluate the allowance of specific fishing activities within the closure. **Alternatives 8A through 8C** investigate transit provisions within the closed area.

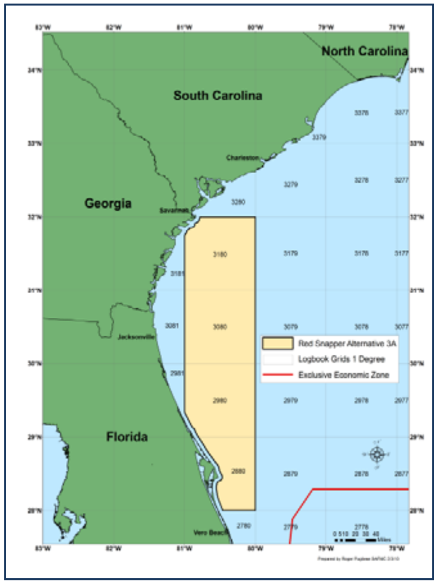


This picture shows red snapper fishing mortality by area. The darker the color, the higher the mortality. The highest level is off the coasts of Georgia and northeast/central Florida.

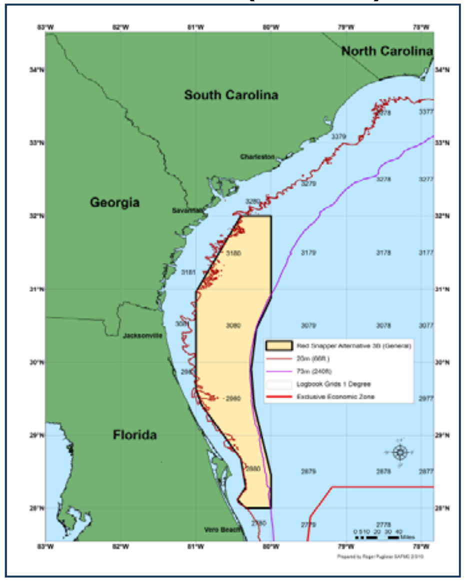
NOTE: The following two pages contain maps of the area closure alternatives and details for Alternative 3E (the Council's preferred).

Eight Non-Preferred Area Closure Alternatives

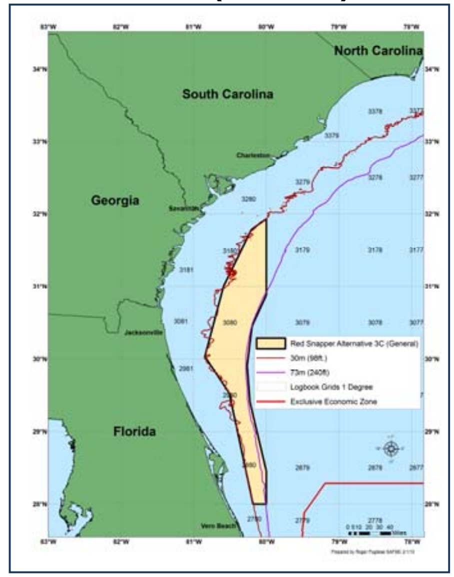
Alternative 3A



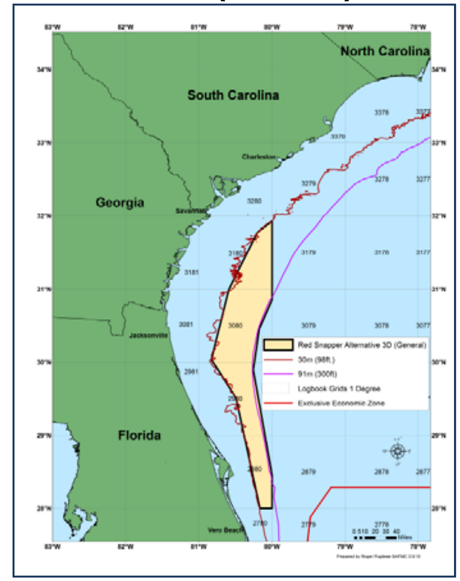
Alternative 3B (66-240 ft)



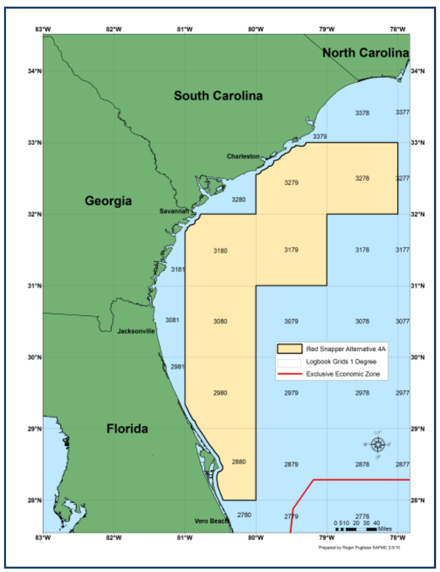
Alternative 3C (98-240 ft)



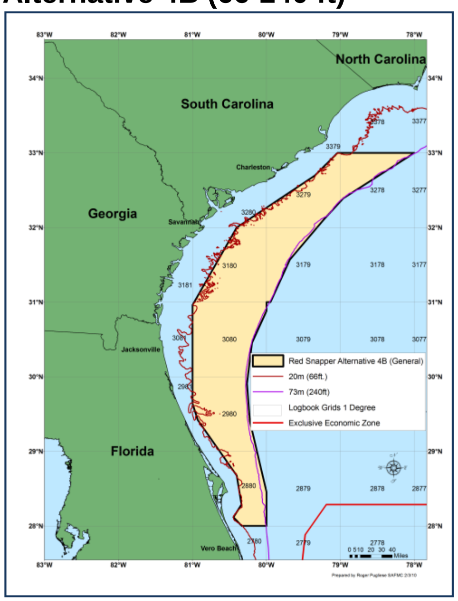
Alternative 3D (98-300 ft)



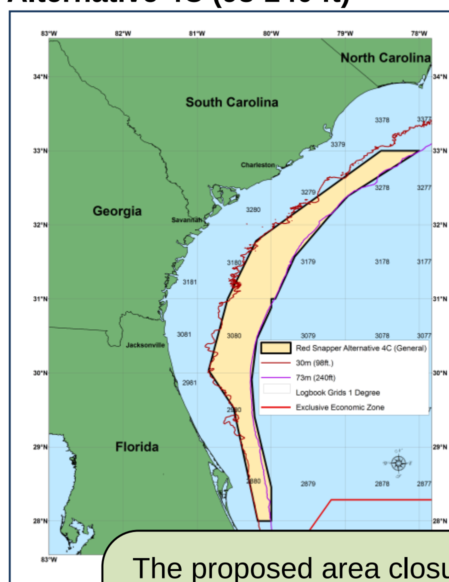
Alternative 4A



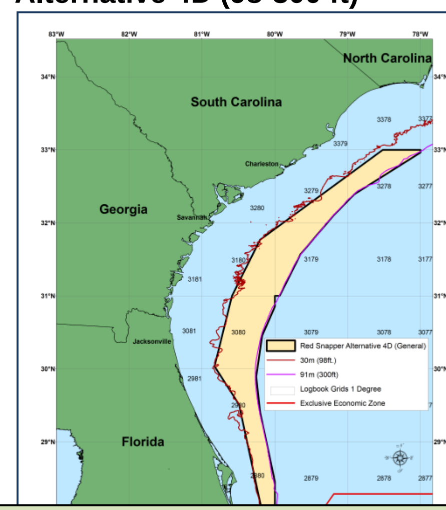
Alternative 4B (66-240 ft)



Alternative 4C (98-240 ft)

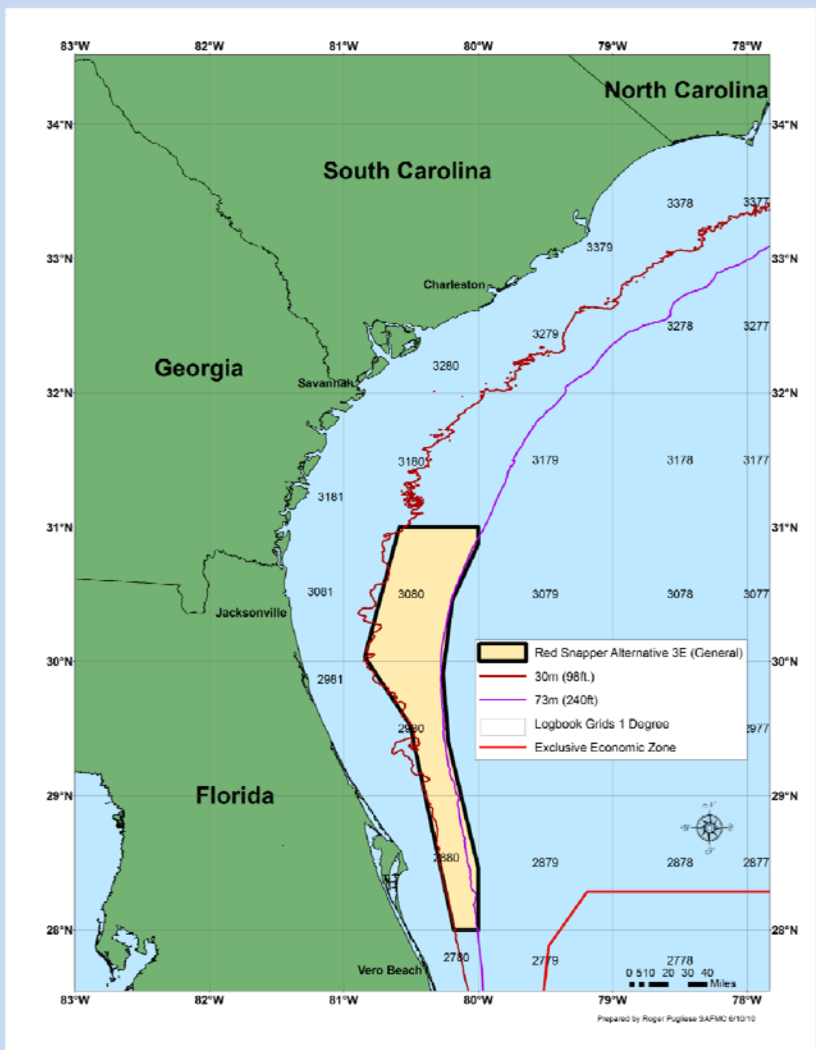


Alternative 4D (98-300 ft)



The proposed area closures (Alternatives 3A – 4D) would prohibit fishing for or the possession of all Snapper Grouper species year-round. ***In addition***, harvest of red snapper would be prohibited in federal waters (3 to 200 miles) in the South Atlantic region.

Area Closure Alternative 3E - Preferred



Alternative 3E (the Council's preferred) would prohibit fishing for or possession of Snapper Grouper species within the defined area between 98 and 240 feet. *In addition*, red snapper harvest/retention would be prohibited throughout federal waters in the South Atlantic

Point	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 10' 57"
3	29° 31' 40"	80° 30' 34"
4	30° 02' 03"	80° 50' 45"
5	31° 00' 00"	80° 35' 19"
6	31° 00' 00"	80° 00' 00"
7	30° 52' 54"	80° 00' 00"
8	30° 27' 19"	80° 11' 41"
9	29° 54' 31"	80° 15' 51"
10	29° 24' 24"	80° 13' 32"
11	28° 27' 20"	80° 00' 00"

Table S-7. Waypoints for Alternative 3E (Preferred).

Species in the Snapper Grouper Fishery Management Unit.

Snappers	Groupers	Grunts	Jacks
Blackfin	Black	Black margate	Almaco
Black	Coney	Blue-striped	B. rudderfish
Cubera	Gag	Cottonwick	Bar jack
Dog	Goliath	French	Blue runner
Gray	Graysby	Margate	Crevalle
Lane	Misty	Porkfish	G. amberjack
Mahogany	Nassau	Sailors choice	L. amberjack
Mutton	Red	Smallmouth	Yellow
Queen	Red hind	Spanish	**Porgys**
Red	Rock hind	Tomtate	Grass
Schoolmaster	Scamp	White	Jolthead
Silk	Snowy	**Triggerfish**	Knobbed
Vermilion	Speckled hind	Gray	Longspine
Yellowtail	Tiger	Ocean	Red
Tilefishes	Warsaw	Queen	Saucereye
Blueline	Yellowedge	**Sea basses**	Scup
Sand	Yellowfin	Bank sea	Sheepshead
Tilefish	Yellowmouth	Black sea	Whitebone
Spadefishes	**Wreckfish**	Rock	**Wrasses**
A. spadefish	Wreckfish		Hogfish
			Puddingwife

Other Provisions for Area Closures

Harvest Exceptions Within the Closed Area

The Council is considering allowing harvest of snapper grouper species (not red snapper) in the closed areas with the use of certain gear. These gears are known to have low interaction with red snapper. Alternatives under consideration are shown in Table S-8.

Table S-8. Summary of harvest exception alternatives.

Alternative	Harvest Exception
Alternative 5 (Preferred)	**Allow fishing for, harvest and possession of snapper grouper species (with exception of red snapper) in the closed area if fish were harvested with black sea bass pots.**
Alternative 6	Allow fishing for, harvest and possession 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 7 (Preferred)	**Allow fishing for, harvest and possession of snapper grouper species (with the exception of red snapper) in the closed area if fish were harvested with spearfishing gear.**

Based on the Council's preferred alternative:

- Spearfishing for snapper grouper species would be allowed in the proposed closure area (98 to 240 feet), as would fishing with black sea bass pots. **Note:** Harvest of red snapper would be prohibited in the closed area.

Transit Allowance Within Closed Area

The Council is considering allowing transit through the proposed closed area. Alternatives under consideration are shown in Table S-9.

Table S-9. Summary of transit allowance alternatives.

Alternative	Transit Allowance
Alternative 8A (Preferred)	**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.**
Alternative 8B	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.
Alternative 8C	The prohibition on possession does not apply to a person aboard a vessel that has wreckfish onboard if the vessel is in transit.

Based on the Council's preferred alternative:

- Transit is allowed with snapper grouper species onboard if gear is stowed.
- The term "transit" means: Underway, making way, not anchored, and a 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.

Impacts from Action 3 (Area Closures)

Biological

The proposed regulations are expected to benefit the stocks of not only red snapper, but also the stocks of other species managed by the Council. As shown in Table S-6 earlier, a **76% reduction** in red snapper removals is required to end overfishing. The reduction expected from each alternative is shown in Table S-10. The reduction varies with the differing assumptions in terms of the following: (1) expected effects of recent management actions, (2) change in release mortality stemming from management actions, and (3) compliance rate of proposed regulations.

Table S-10. The reduction in red snapper mortality from each management measure alternative and scenario type.

Alternative	Closed Depths	Scenario 1	2	3	4	5	6	7
2	None	29%	39%	52%	55%	60%	60%	60%
3A	n/a	72%	72%	83%	83%	87%	89%	90%
3B	66-240 ft	69%	70%	81%	81%	85%	87%	88%
3C	98-240 ft	63%	65%	76%	77%	81%	83%	84%
3D	98-300 ft	63%	66%	76%	77%	81%	83%	84%
3E	**98-240 ft**	**60%**	**63%**	**74%**	**75%**	**79%**	**80%**	**81%**
4A	n/a	76%	77%	86%	86%	89%	91%	93%
4B	66-240 ft	73%	74%	83%	84%	87%	89%	91%
4C	98-240 ft	66%	69%	78%	80%	83%	85%	86%
4D	98-300 ft	67%	69%	79%	80%	83%	85%	86%

Scenario 1: No impacts A13C, A16; A17A eliminates targeted trips only; 80% compliance; 60%/60%offshore release mortality; 20%/20% inshore release mortality.
Scenario 2: No impacts A13C, A16; A17A eliminates targeted trips only; 80% compliance; 40%/90% offshore release mortality, 40%/90% inshore release mortality.
Scenario 3: No impacts A13C, A16; A17A eliminates targeted trips only; 85% compliance; 40%/40% offshore release mortality, 20%/20% inshore release mortality.
Scenario 4: Directed and targeted trips eliminated by A13C, A16, A17A; 85% compliance; 40%/90% offshore release mortality; 20%/20% inshore release mortality.
Scenario 5: Directed and targeted trips eliminated by A13C, A16, A17A; 87% compliance; 40%/40% offshore release mortality; 20%/20% inshore release mortality.
Scenario 6: Directed and targeted trips eliminated by A13C, A16, A17A; 95% compliance; 40%/40% offshore release mortality; 20%/20% inshore release mortality.
Scenario 7: Directed and targeted trips eliminated by A13C, A16, A17A; 100% compliance; 40%/40% offshore release mortality; 20%/20% inshore release mortality.

See More.....See **Appendix E** for more information on the biological model and the description of the scenarios.

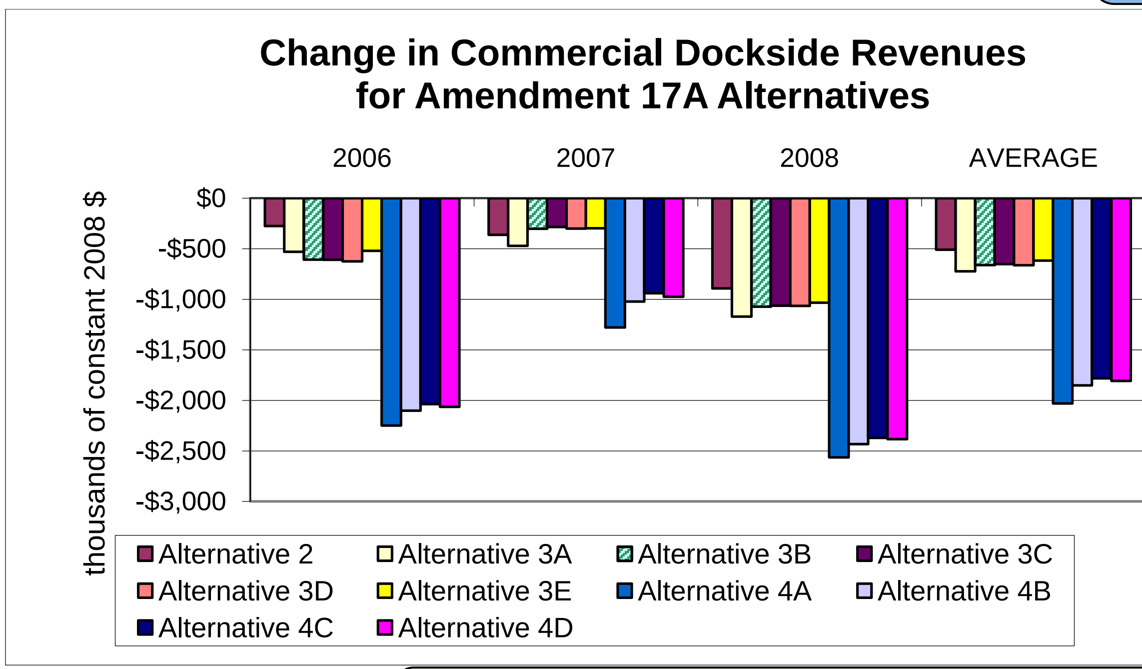
Impacts from Action 3 *(continued)*

Socio-economic

Commercial Industry

A commercial vessel will typically have between 2 and 4 of these electronic reels or "bandit reels" attached to the vessel.

The proposed regulations are expected to adversely affect certain commercial fishermen, especially those that fish off Georgia and Northeast Florida. However, there are long-term benefits from having a rebuilt stock. The graph below displays the predicted changes in net operating revenues compared to the no action alternative for Amendment 17A. *For reference, the colors in the graph and around the maps match.*



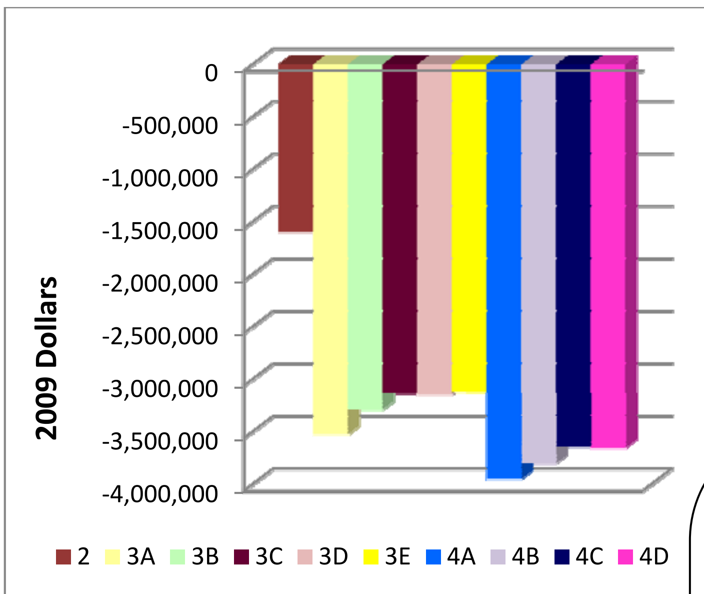
See More…..See **Appendix O** for more information on the economic model (commercial industry) and results.

Impacts from Action 3 *(continued)*

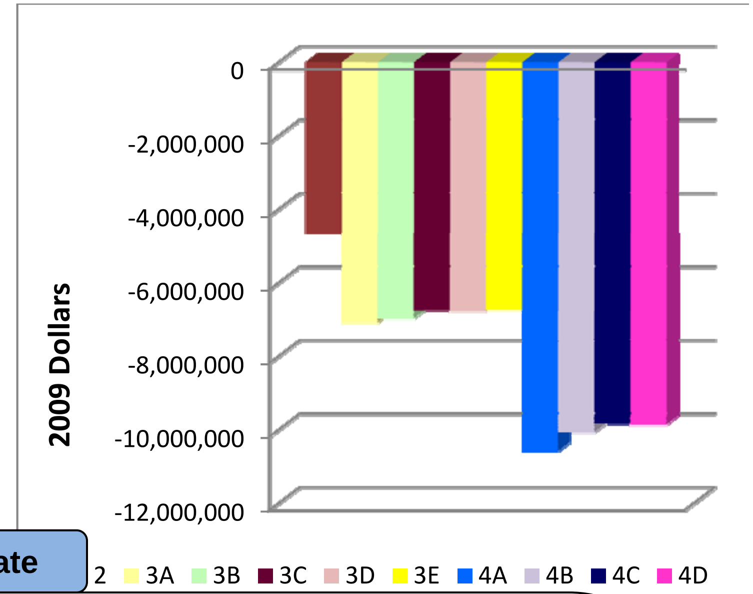
Recreational Industry

Socio-economic

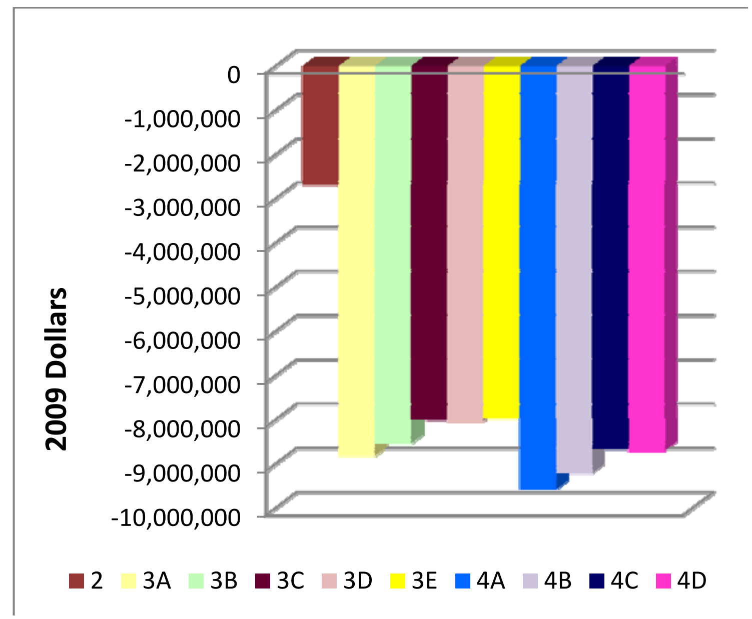
Charterboat



Headboat



Private



See More…..See **Appendix N** for more information on the economic impacts to the recreational sector.

❖ Action 4. Require the Use of Circle Hooks

The Council is considering requiring the use of circle hooks for all snapper grouper species to help reduce discard mortality of red snapper. Alternatives under consideration are shown in Table S-11.

Table S-11. Summary of harvest exception alternatives.

Alternative	Circle Hook Requirement
Alternative 1 (No Action)	Do not require the use of circle hooks when using hook and line gear for snapper grouper species within any particular area of the South Atlantic EEZ when fishing for snapper grouper species.
Alternative 2 (Preferred)	**Require the use of non-stainless steel circle hooks when fishing for snapper grouper species with hook and line gear north of 28 degrees. It is unlawful to possess snapper grouper species without possessing non-stainless steel circle hooks. Apply to the use of natural baits only.**
Alternative 3	Require the use of non-stainless steel circle hooks when fishing for snapper grouper species with hook and line gear within the South Atlantic EEZ. It is unlawful to possess snapper grouper species without possessing non-stainless steel circle hooks. Apply to the use of natural baits only.

Impacts from Circle Hook Requirement (Action 4)

Studies on the effects of circle hooks and J hooks on retention and survival are limited to a handful of snapper grouper species. Some studies indicate beneficial effects while others are inconclusive. Due to limited data, it may not be possible to quantify the reduction in red snapper release mortality that would result from 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. In general, 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.

A picture of J-hooks and a circle hook (lower right) from Bacheler and Buckel (2004)

Based on the Council's preferred alternative:

- The use of circle hooks would be required when fishing north of 28 degrees (southern boundary of the area closures) for species in the snapper grouper fishery management unit as listed on page S-13.
- The Council felt it was important to limit the circle hook requirement to South Atlantic areas north of 28 degrees to not affect fishing for species such as yellowtail and mangrove snapper. Fishermen report that these species are not caught easily with circle hooks.

What are the existing data programs?

Fishery-dependent methods include the 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 Southeast Area Monitoring and Assessment Program (SEAMAP).

❖ Action 5. Establish a Red Snapper Monitoring Program

The Council is implementing a plan to monitor red snapper recovery. The Council recognizes **the effectiveness of traditional fishery-dependent data would diminish with the implementation of an area closure.** Further, existing fishery-independent data collection programs would not be sufficient to monitor red snapper due to limitations associated with the range of sampling. Monitoring program alternatives under consideration are shown in Table S-12.

Table S-12. Summary of red snapper monitoring program alternatives.

Alternative	Red Snapper Monitoring Program
Alternative 1 (No Action)	Utilize existing data collection programs to monitor the rebuilding progress of red snapper.
Alternative 2 (Preferred)	**Establish a fishery-independent monitoring program to track progress of red snapper rebuilding. Sampling would include deployment of gear such as chevron traps, cameras, and hook and line at randomly selected stations in a manner determined by the Southeast Fisheries Science Center in consultation with the South Atlantic Fishery Management Council.**
Alternative 3	Establish a red snapper fishery-dependent monitoring program 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..

- A fishery-independent program will be used to track the recovery of red snapper.
- Fishery-dependent data becomes limited if red snapper harvest is prohibited and area closures are used.

Impacts from Establishing a Monitoring Program (Action 5)

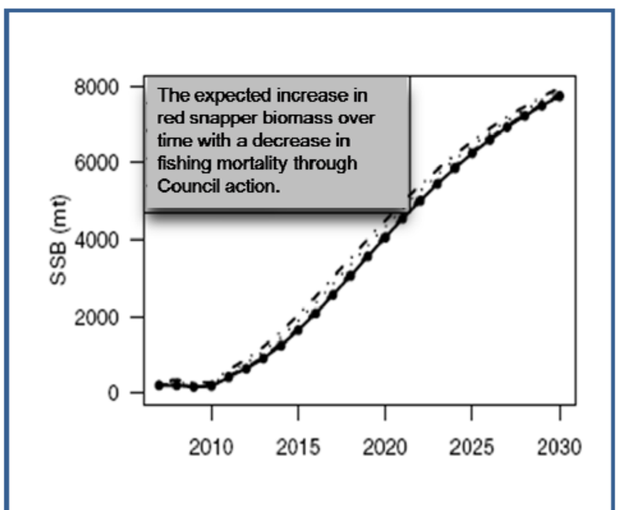
Alternatives 2 and 3 would benefit the stock as it would track rebuilding progress of red snapper through the rebuilding period. Those alternatives may benefit fishery participants in the long-term when data shows harvest may be increased.

Conclusion

The most recent assessment for the red snapper stock in the South Atlantic indicates that the stock is experiencing overfishing and is overfished. The purpose of Amendment 17A to the Snapper Grouper Fishery Management Plan (FMP) is to implement long-term management measures to end overfishing of the red snapper stock in the South Atlantic immediately upon implementation and to rebuild the stock ultimately achieving optimum yield (OY) while minimizing, to the extent practicable, adverse social and economic effects.

Current regulations for red snapper allow for a recreational bag limit of two fish per person per day and require a 20 inch total length minimum size limit for both commercial and recreational fishermen. Through Amendment 17A, the Council is proposing the implementation of a *total prohibition of red snapper harvest*. Due to the nature of the red snapper fishery and the high release mortality rates, Amendment 17A also includes alternatives that would prohibit the harvest of *all snapper grouper species* in certain area to reduce mortality of red snapper, including those incidentally caught when fishermen target co-occurring species. The alternatives for the closed area focus on locations where concentrated landings of red snapper are reported, primarily off Georgia and the north and central east coasts of Florida.

The Council and NOAA Fisheries Service are considering a range of options in Amendment 17A. In general, the positive effects to the stock and ecosystem are greatest with the largest closure and lowest annual catch limits. In turn, negative socio-economic effects increase with such options. However, there are long-term socio-economic effects from a rebuilt stock. As with many fishing regulations, the economic issue involves the balancing of short-term costs and long-term benefits. There is a wide gap between the current landings (approximately 440 thousand pounds) and potential landings for a rebuilt stock (approximately 2.2 million pounds). This has at least two implications: first, more stringent management measures are needed to rebuild the red snapper stock; second, there is a relatively high likelihood that future benefits from the fishery would outweigh the costs of implementing stringent management measures.



A Healthy Red Snapper Stock

- A healthy stock will allow biomass, age and size structure, sex ratio, and genetic and community structure to be restored to more natural levels.

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 (FMP) for the Snapper Grouper Fishery of the South Atlantic Region (SAFMC 1983) (Figure 1-1). The 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) **(Appendix S: Other Applicable Law)** and affect the management of 73 species listed in Table 1.1.

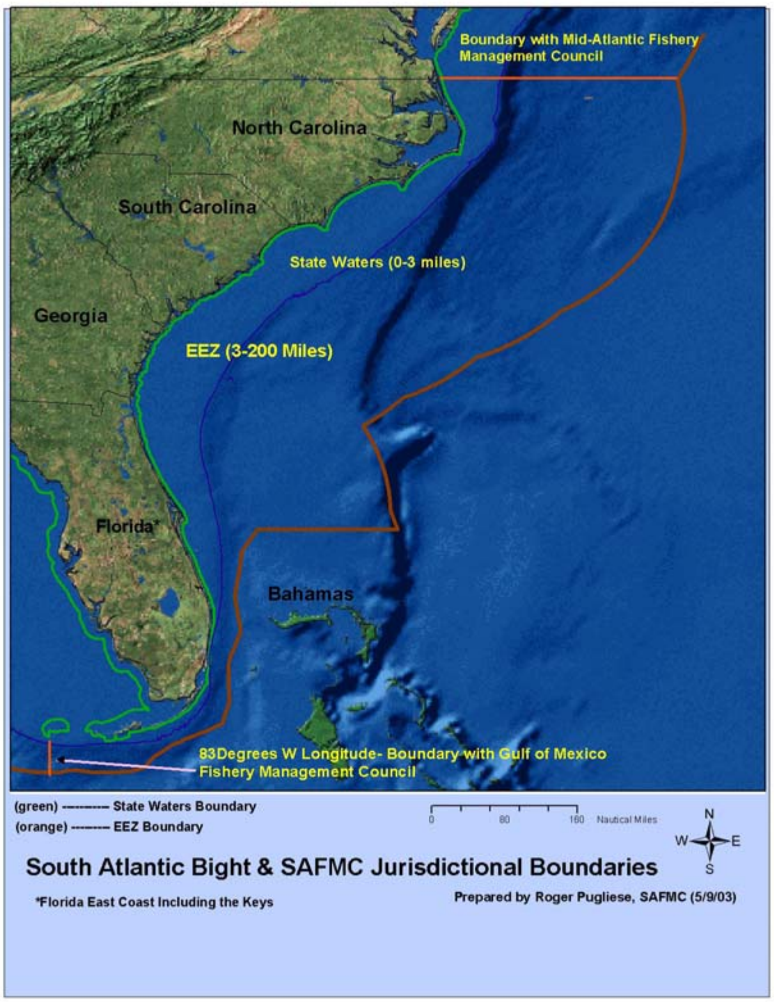


Figure 1-1. Jurisdictional boundaries of the South Atlantic Fishery Management Council.

Table 1-1. Species in the snapper grouper fishery management unit.

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 under the current management regime and other potential future harvest conditions. More specifically, the assessments provide an estimation of maximum sustainable yield (MSY) and a determination of 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.

The Magnuson-Stevens Act instructs the Regional Fishery Management Councils and NOAA Fisheries Service to prevent overfishing while achieving optimum yield (OY) from each fishery. When it is determined a stock is undergoing overfishing, measures must be implemented to end overfishing. In cases where stocks are overfished, the Councils and NOAA Fisheries Service must implement rebuilding plans.

The most recent assessment for the red snapper stock in the South Atlantic indicates that the stock is experiencing overfishing and is overfished (SEDAR 15 2008).

Overfishing means that fish are being removed more quickly than the stock can replace them such that the MSY cannot be achieved. Biomass shows a sharp decline during the 1950s and 1960s, a continued decline during the 1970s, and is stable but at low levels since 1980. Estimates of annual biomass have been well below the biomass at maximum sustainable yield (B_{MSY}) since the mid-1960s, with possibly some small amount of recovery since implementation of current size limits in 1992 (Figure 1-2).

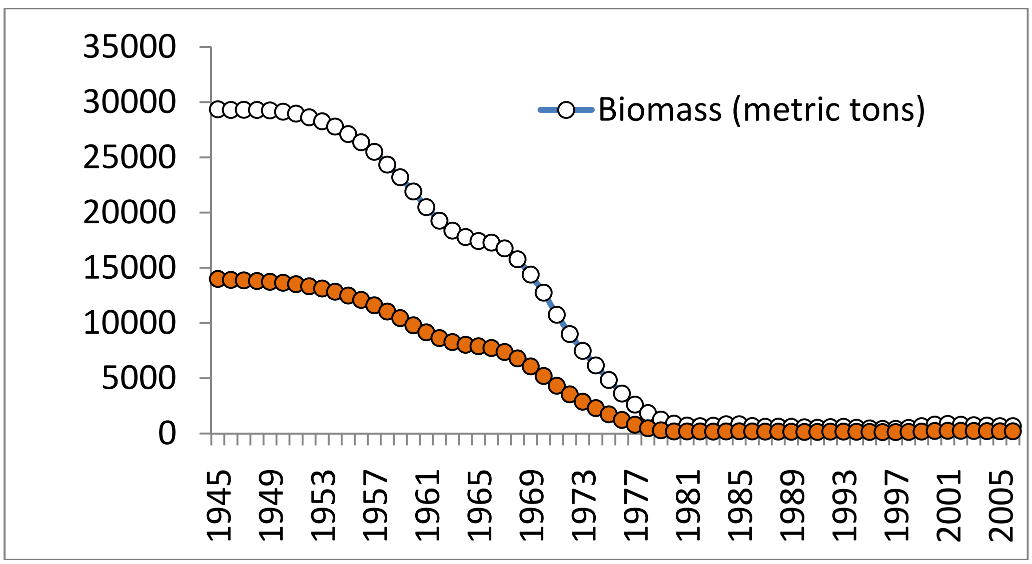


Figure 1-2. Biomass and Spawning Stock Biomass (pounds).

The assessment indicates that in order to rebuild the red snapper stock, the total catch (landings and discards) will need to be reduced **76%** from current levels in order to end overfishing.

1.2 Purpose of the Proposed Action

The *purpose* of Snapper Grouper Amendment 17A is threefold: (1) to implement management measures to end overfishing of the red snapper stock in the South Atlantic immediately upon implementation; (2) to rebuild the stock so it may ultimately produce optimum yield (OY); and (3) to minimize to the extent practicable adverse social and economic effects expected from the first two items.

1.3 Need for the Proposed Action

The *need* of the action is to allow the red snapper stock to increase in biomass in order to maximize its reproductive potential so that the population may produce the optimum yield (OY). OY, the ultimate goal of any FMP, is the portion of the fish stock that provides the greatest economic, social, and ecological benefit to the nation.

The effects of fishing pressure have been well-documented (e.g., PDT 1990). As fishing pressure intensifies, individuals with a genetic makeup for achieving large sizes may be selectively removed from the population because of gear selectivity or economic value, leaving behind fishes with a genetic disposition for smaller size and slower growth. The overall effect of this heavy, sustained fishing pressure on a fish population includes: (1) a change in the growth rate; (2) a reduction in size at age; (3) a change in the percentage of males for species that change sex or are sexually dimorphic; (4) a decline in the size and age at maturity and first reproduction; (5) a decrease in the size and age structure of the population; (6) a decrease in population fecundity; and (7) a decline in the number of spawning events. Continued overfishing may ultimately disrupt the natural community structure of the reef ecosystems that support red snapper and co-occurring species.

In a fishery where OY is not being achieved on a consistent basis, the full extent of social and economic benefits is not realized. For example, in the red snapperfishery, low stock levels translate into a loss of catch possibilities for commercial and recreational fishermen. Revenues are reduced when fishermen have to fish longer and harder, which may eventually cause participants to exit the fishery. Ending overfishing and rebuilding overfished stocks would allow fishermen to catch more fish with less effort, resulting in higher economic returns in the long-term, as long as effort in the fishery is limited.

1.4 Background

1.4.1 Process for Defining Limits and Targets

The Council is utilizing several tools to end overfishing and rebuild the red snapper stock (Table 1-2). These include utilizing two determinations from the Council's Scientific and Statistical Committee (SSC). These determinations are the overfishing limit (OFL) and acceptable biological catch (ABC). The OFL is an estimate of the catch level above which overfishing is occurring and comes from a stock assessment. The ABC is defined as the level of a stock or stock complex's annual catch that accounts for the scientific uncertainty in the estimate of OFL and any other scientific uncertainty, and should be specified based on the ABC control rule. Using the ABC as a start, the Council is proposing an annual catch limit (ACL) for the red snapper stock in the South Atlantic. The ACL is catch limit, expressed in pounds or numbers of fish, that ends or prevents overfishing and serves as the basis for invoking accountability measures (AMs). AMs are designed to initiate an action once the ACL is reached during the course of a fishing season to reduce the risk overfishing will occur. The Council is proposing the implementation of AMs in Amendment 17A. While AMs act to *prevent overfishing* in a fishery, the Council must specify regulations in order to *end overfishing* (through the implementation of management measures).The generalized process to end overfishing and rebuild the stock is summarized in Figure 1-3.

Table 1-2. A summary of the tools being used to prevent overfishing and rebuild the red snapper stock.

Tool	Acronym	Who sets?	Definition
Overfishing Limit	OFL	SSC	An estimate of the catch level above which overfishing is occurring and is expressed in terms of numbers or weight of fish.
Acceptable Biological Catch	ABC	Council, with advice of SSC	A level of a stock or stock complex's annual catch that accounts for the scientific uncertainty in the estimate of OFL and any other scientific uncertainty and should be specified based on the ABC control rule.
Annual Catch Limit	ACL	Council	The level of annual catch of a stock or stock complex that ends or prevents overfishing and serves as the basis for invoking AMs. ACL cannot exceed the ABC, but may be divided into sector-ACLs.
Annual Catch Target	ACT	Council	The amount of annual catch of a stock or stock complex that is the management target of the fishery and accounts for management uncertainty in controlling the actual catch at or below the ACL.
Accountability Measures	AM	Council	Management controls to prevent ACLs, including sector-ACLs, from being exceeded and to correct or mitigate overages of the ACL if they occur.
Allocations	n/a	Council	Distribution of the catch among user groups or individuals.
Management measures	n/a	Council	Actions that affect a resource and its exploitation with a view to achieve certain objectives such as maximizing the production of that resource. Examples include catch quotas, bag limits, size limits, seasonal closures, and area closures.

Source: National Standard 1 Guidelines (Appendix K) and NMFS Glossary (Appendix B).

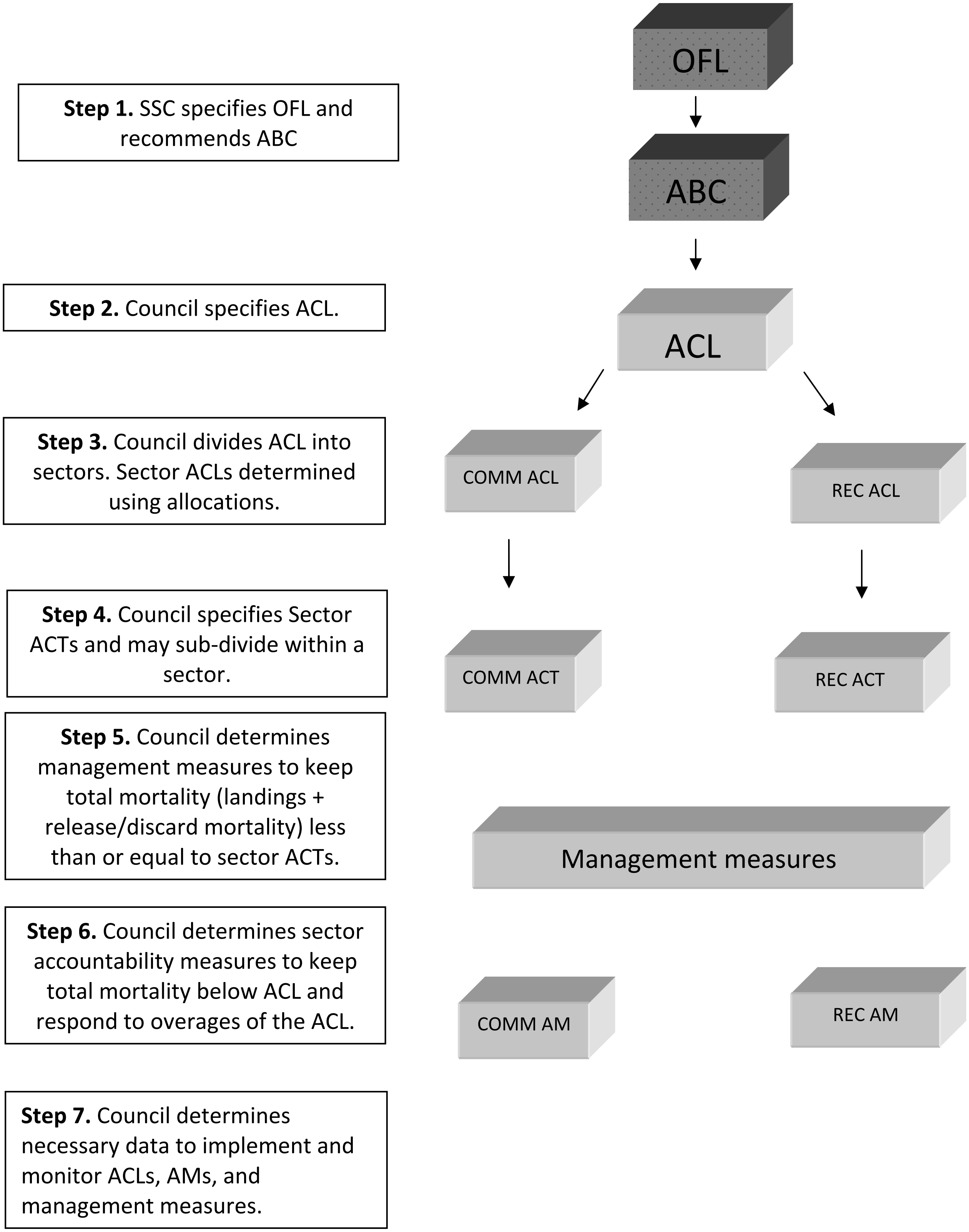


Figure 1-3. The process employed in Snapper Grouper Amendment 17A to specify tools to end overfishing.

1.4.2 SSC Recommendation of OFL and ABC

At their June 2008 meeting, the Scientific and Statistical Committee (SSC) developed an interim approach where they recommended an overfishing limit (OFL) equal to the yield at maximum fishing mortality threshold and the acceptable biological catch (ABC) equal to the yield at 75% F_{MSY} (the current proxy for F_{OY}). At their December 2008 meeting, the SSC withdrew the OFL and ABC levels for red snapper developed at their June 2008 meeting. The SSC instead recommended that the ABC levels for red snapper be set consistent with the rebuilding plans until they can be further amended with better scientific information (Table 1-2).

Table 1-3. Overfishing Level (OFL) and Acceptable Biological Catch (ABC) recommendations from the SSC for red snapper.

Species	OFL	ABC
Red Snapper	Not specified	ABC = rebuilding plan

Through Amendment 17A, the Council is proposing a rebuilding plan that sets F_{OY} equal to 98% F_{MSY} (98%$F_{30\%SPR}$) and rebuilds in 35 years. This would allow a maximum total red snapper kill of 144,000 lbs whole weight in year one of rebuilding. The total kill comes from rebuilding projections of spawning stock biomass, recruitment, landings, discards, and probability of stock recovery, under different fishing mortality rates developed by the Southeast Fisheries Science Center (**Appendix F**).

In addition, the Council plans to implement an ABC Control Rule in the Comprehensive ACL Amendment. The Council is considering a range of ABC Control Rule Options, including one recommended for use by the SSC.

1.4.3 Development of Alternatives

The Council received notification, in a letter dated July 8, 2008, that the South Atlantic red snapper stock is undergoing overfishing and is overfished. While the Council developed an amendment, they requested NOAA Fisheries Service, in March 2009, to establish interim measures to reduce overfishing and fishing pressure on the red snapper stock. Interim measures became effective on January 4, 2010. The interim rule was effective until June 2, 2010, but was extended for an additional 186 days since the Council is proposing long-term management measures in Snapper Grouper FMP Amendment 17A to end overfishing of red snapper and rebuild the stock. Regulations implemented by the interim rule will expire on December 5, 2010.

Current regulations for red snapper allow for a recreational bag limit of 2 fish per person per day and require a 20 inch total length minimum size limit for both commercial and recreational fishermen. Through Snapper Grouper FMP Amendment 17A, the Council is proposing a *total prohibition of red snapper harvest and retention*. However, a harvest prohibition by itself will not end overfishing because of bycatch mortality as fishermen pursue other co-occurring species in the snapper grouper complex. The red snapper stock is part of the multi-species fishery; many species 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, and others. This is a significant issue as release mortality rates for red snapper are estimated at 40% for the recreational fishery and 90% for the commercial fishery (due to deeper waters fished and handling practices) (SEDAR 15 2008).

Due to the nature of the fishery and high release mortality rates, the Council is also proposing alternatives that would prohibit the harvest of *all snapper grouper species* in certain areas. The alternatives for the closed areas focus on locations where concentrated landings of red snapper are reported, primarily off the coasts of Georgia and the north and central east coasts of Florida (Figure 1-4).

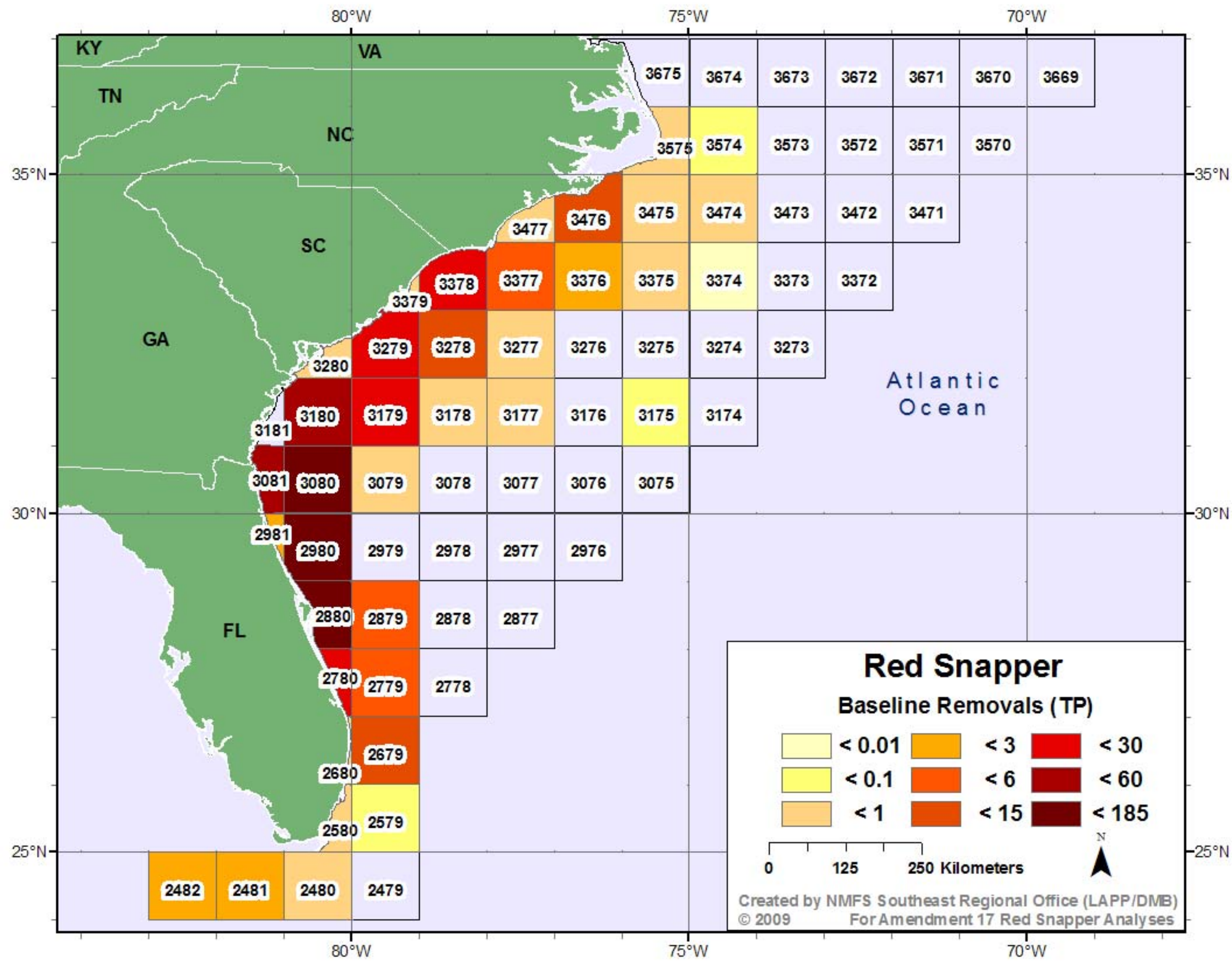


Figure 1-4. Baseline removals of South Atlantic red snapper by logbook grid, 2005-2007. Removals include landings and dead discards in thousands of pounds from the commercial, headboat and private/charterboat sectors.

1.4.3.1 History of Scoping

The following discussion outlines the evolution of Snapper Grouper FMP Amendment 17A which was created by taking red snapper actions from two other amendments and creating one amendment that addresses red snapper issues only. First, 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]. In addition to actions addressing red snapper issues, Snapper Grouper FMP Amendment 17 contained actions to establish annual catch limits (ACLs) and accountability measures (AMs) for the other nine South Atlantic snapper grouper species undergoing overfishing. Scoping meetings for Amendment 17, were held February 4-8, and February 10-12, 2009. After scoping for Amendment 17 was completed, a NOI for Amendment 18 (also containing red snapper actions) was published (April 7, 2008 [73 FR 18782]) to announce the development of a DEIS to analyze the establishment of a rebuilding plan for the red snapper stock and various management measures to end overfishing. Scoping meetings were held by the Council for Amendment 18 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, rebuilding, ACLs and AMs for red snapper, and Amendment 17B was created to establish ACLs, and AMs for gag, vermilion snapper, red grouper, black grouper, snowy grouper, warsaw grouper, black sea bass, speckled hind, and golden tilefish.

To summarize, actions proposed in Snapper Grouper FMP Amendment 17A would:

- Specify an annual catch limit (ACL) and accountability measures for red snapper with management measures to end overfishing and reduce the probability that catches will exceed the stock's ACL.
- Specify status determination criteria for red snapper.
- Establish a rebuilding plan for red snapper.
- Require the use of circle hooks in the snapper grouper fishery.
- Establish a monitoring program for red snapper.

The Regional Administrator determined the newly created Amendment 17B would be analyzed under the National Environmental Policy Act through an Environmental Assessment rather than an Environmental Impact Statement (EIS), and Amendment 17A (red snapper) would be analyzed through an EIS. Because all of the actions contained within, what are now Snapper Grouper FMPs Amendments 17A and 17B, were scoped under the original Amendments 17 and 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 or 17B **(Appendix B)**.

1.4.4 Deadlines

Three statutory requirements are driving timelines for Snapper Grouper FMP Amendment 17A. First, the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires the Council prepare a plan amendment or proposed regulations to end overfishing within one year of being notified that a stock is experiencing overfishing.

Reauthorized Magnuson-Stevens Act
Beginning July 12, 2009, the Reauthorized Magnuson-Stevens Act indicates fishery management councils have two years from the date of an identification or notification to prepare and implement an FMP, FMP amendment, or proposed regulations to end overfishing immediately in the fishery and to rebuild affected stocks. Because the Council received the notification of overfishing on July 8, 2008, the Council is working under the previous version of the Act. The previous version required the Council to prepare a plan amendment or proposed regulations to end overfishing within one year of notification that a stock is overfished.

The Council received notification, in a letter dated July 8, 2008, that the South Atlantic red snapper stock is undergoing overfishing and is overfished. A plan could not be prepared before the deadline due to the significance of the actions and the extensive analyses required. As a result, the Council requested NOAA Fisheries Service, in March 2009, to establish interim measures to reduce overfishing and fishing pressure on the red snapper stock. Interim measures became effective on January 4, 2010. The interim rule was effective until June 2, 2010, but was extended for an additional 186 days since the Council is proposing long-term management measures in Snapper Grouper FMP Amendment 17A to end overfishing of red snapper and rebuild the stock. Regulations in implemented by the interim rule will expire on December 5, 2010.

Second, the Magnuson-Stevens Act requires the Council implement a rebuilding plan for overfished stocks and identify a time period for rebuilding the stock or stock complex based on factors specified in Magnuson-Stevens Act section 304(e)(4). The time period for rebuilding the fishery, as outlined in the Act, must be as short as possible and shall not exceed 10 years except in specific cases. The Act further clarifies that the needs of fishing communities must be considered when designating the time period. More specific guidance on the rebuilding time is provided by the Magnuson-Steven Act's National Standard 1 Guidelines at 50 CFR § 600.310(j)(3)(i)(D) (see text box and **Appendix K**).

Guidance for Rebuilding Timeframes

The "minimum time for rebuilding a stock" (T_{MIN}) means the amount of time the stock or stock complex is expected to take to rebuild to its maximum sustainable yield biomass level (B_{MSY}) in the absence of any fishing mortality. If T_{MIN} for the stock or stock complex is 10 years or less, then the maximum time allowable for rebuilding (T_{MAX}) that stock to its B_{MSY} is 10 years. If T_{MIN} for the stock or stock complex exceeds 10 years, then the maximum time allowable for rebuilding a stock or stock complex to its B_{MSY} is T_{MIN} plus the length of time associated with one generation time for that stock or stock complex. "Generation time" is the average length of time between when an individual is born and the birth of its offspring. The generation time for red snapper is 25 years.

Finally, 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 Scientifical and Statistical Committee SSC or other established peer review processes.

1.5 History of Management

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

<u>Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region 1983</u>

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

<u>Amendment 4 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region 1991</u>

Amendment 4 prohibited the use of various gear, including fish traps, the use of bottom longlines for wreckfish, and powerheads in special management zones (SMZs) off South Carolina; established bag limits and minimum size limits for several species (20 inch total length minimum size limit and 2 fish bag limit for red snapper); established income requirements to qualify for permits; and required that all snapper grouper species possessed in South Atlantic Federal waters must have heads and fins intact through landing.

<u>Amendment 11 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region 1998</u>

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

<u>Interim Rule for Red Snapper</u>

The Council received notification, in a letter dated July 8, 2008, that the South Atlantic red snapper stock is undergoing overfishing and is overfished. A plan could not be prepared before the deadline due to the significance of the actions and the extensive analyses required. As a result, the Council requested NOAA Fisheries Service, in March 2009, to establish interim measures to reduce overfishing and fishing pressure on the red snapper stock. Interim measures became effective on January 4, 2010. The interim rule was effective until June 2, 2010, but was extended for an additional 186 days since the Council is proposing long-term management measures in Snapper Grouper FMP Amendment 17A to end overfishing of red snapper and rebuild the stock. Regulations in implemented by the interim rule will expire on December 5, 2010.

1.6 Management Objectives

Objectives of the Snapper Grouper FMP, as modified by Amendment 8 (SAFMC 1997), 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.
14. End overfishing of snapper grouper stocks undergoing overfishing.
15. Rebuild stocks declared overfished.

2 Actions and Alternatives

Alternatives considered by the Council in this amendment and a comparison of their environmental consequences is outlined in **Section 2**. The alternatives are analyzed in detail in **Section 4**. 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 red snapper and co-occurring species. Alternatives the Council considered but eliminated from detailed study during the development of this amendment are described in **Appendix A**.

All alternatives analyzed in this environmental impact statement (EIS) would achieve the requirements of National Environmental Policy Act (NEPA) outlined in Section 101 and 102 of the Act. Alternatives for the specification of management reference points, the red snapper rebuilding plan, management measures intended to end overfishing of red snapper, and alternatives for a red snapper monitoring program were developed to ensure the long-term sustainability of the red snapper stock for future generations. Actions to end overfishing of red snapper would require fishery participants to significantly reduce harvest of red snapper, thereby, giving the fishermen ownership in contributing to the preservation and enhancement of the environment. Alternatives for actions affecting red snapper were developed by the Council and are analyzed by an interdisciplinary planning team tasked with drafting the subject EIS. The Amendment 17A EIS provides relevant background information and in-depth analyses of each action alternative considered by the Council. Thus, the subject EIS complies with Section 102 of NEPA by providing the Secretary of Commerce all the information needed to make a prudent decision regarding approval of the amendment and subsequent implementation through the rulemaking process.

2.1 Maximum Sustainable Yield (MSY) proxy for red snapper

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

Alternatives	Equation	F_{MSY}	MSY Proxy Values (lbs whole weight)
Alternative 1 (No Action) (Preferred)	MSY equals the yield produced by F_{MSY}. $F_{30\%SPR}$ is used as the F_{MSY} proxy.	$F_{30\%SPR}$[1]= 0.148[2]	2,431,000[3]
Alternative 2	MSY equals the yield produced by F_{MSY} or the F_{MSY} Proxy, MSY and F_{MSY} are recommended by the most recent SEDAR/SSC[4]. F_{MSY} proxies will be specified by the Council.	$F_{40\%SPR}$= 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 of MSY from sensitivity runs is 559,000 lbs whole weight to 3,927,000 lbs whole weight.

Table 2-2a. 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 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}	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

Table 2-2b. Summary of effects of MSY Proxy alternatives for red snapper.

Alternatives	Biological Effects	Socioeconomic/Administrative Effects
Alternative 1 (No Action/Preferred) MSY proxy = $F_{30\%SPR}$	(-/+) Requires less of a reduction in red snapper total kill (76%) to meet the management goal.	(+) Short-term (-) Long-term In the short-term there would be no economic impacts; however, if overfishing is not ended there may be long-term socioeconomic consequences in the form of reduced harvest and reduced revenue.
Alternative 2. MSY proxy = $F_{40\%SPR}$	(+) Requires a greater reduction in red snapper total kill (83%) to meet the management goal.	(-) Short-term (+) Long-term Short-term harvest restrictions needed to end overfishing and manage the stock to this MSY proxy level would incur negative socioeconomic impacts. In the long-term, ending overfishing will benefit the socioeconomic environment by ensuring a steady and sustainable level of harvest.

(-) overall negative impacts, (+) overall positive impacts, (- +) neutral impacts

The maximum sustainable yield (MSY) in **Alternative 1 (No Action/Preferred)** 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 (No Action/Preferred)**, MSY was not specified in 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** 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 is based on the Scientifical and Statistical'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 recently assessed through the SEDAR process has been based on the yield at F_{MSY} or the Council's No Action proxy for F_{MSY} ($F_{30\%SPR}$). Therefore, **Alternative 2** would establish a new proxy for F_{MSY} not previously used for red snapper, which is more conservative than the No Action proxy of $F_{30\%SPR}$. The choice of **Alternative 2,** 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 and NOAA Fisheries Service is willing to take. If the No Action $F_{30\%SPR}$ **(Alternative 1 (No Action/Preferred)** is chosen but is not a proper proxy for F_{MSY}, the Council could have to take corrective actions in the future to rebuild the stock to B_{MSY} within the allowable timeframe. **Alternative 2**, which uses $F_{40\%SPR}$ as a proxy for F_{MSY} is more conservative and would require a greater harvest reduction in order to meet the rebuilding goal. Therefore, the biological benefits of **Alternative 2** for the red snapper stock would be greater than **Alternative 1 (No Action/Preferred)** because **Alternative 2)** would allow for less harvest increasing the likelihood that overfishing would end and the stock would be rebuilt to SSB_{MSY}.

As the yield at $F_{30\%SPR}$ is greater than the yield at $F_{40\%SPR}$, an F_{MSY} proxy that is too conservative could have unnecessary negative social and economic effects in terms of more restrictive management measures including larger area closures (See **Section 2.3**). In principle, more stringent measures would logically be required under a MSY alternative that is more conservative from a biological standpoint; conversely, less stringent measures would be required under a MSY alternative that is less conservative. As with any fishing regulations, the economic issue involves the balancing of short-term costs and long-term benefits. The economically preferable MSY proxy choice would be one that is expected to result in the highest net economic benefits over time. In 2003-2007, the average combined commercial and recreational red snapper landings were approximately 440 thousand pounds. In contrast, the MSY proxy would be 2.431 million pounds under **Alternative 1 (No Action/Preferred)** and 2.304 million pounds under **Alternative 2**. This wide gap between current landings and potential landings has at least two implications. First, both MSY proxy 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.

Initially, the Council determined **Alternative 2** should be the preferred alternative for the red snapper F_{MSY} proxy because it is more conservative than the current F_{MSY} proxy, and would require a more significant harvest reduction to end overfishing. However, at their June 2010 meeting, the Council changed their preferred alternative from **Alternative 2** to **Alternative 1 (No Action)**. The Council recommended that the status quo F_{MSY} proxy be maintained until the Southeast Fisheries Science Center can conduct a comprehensive review of how F_{MSY} proxies should be applied across all southeastern fisheries. It was also suggested that the decision to apply a specific F_{MSY} proxy should be made at the regional level rather than on a species-by-species basis. Therefore, the Council determined it would be advantageous to first determine what methodology would be most appropriate for assigning F_{MSY} proxies to species/stocks on the regional level before proceeding with a change to the current F_{MSY} proxy for red snapper.

The Council has specified the Minimum Stock Size Threshold (MSST), which if approved by NOAA Fisheries Service would define the biomass using the formula MSST = $(1\text{-}M)*SSB_{MSY}$. This formula is recommended in the Technical Guidance Document (Restrepo et al. 1998) developed by NOAA Fisheries Service 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 12,247,000 lbs whole weight (5,555 mt). An in-depth analysis of the impacts of MSY alternatives may be found in **Section 4.1** of this document.

2.2 Red Snapper Rebuilding Plan

2.2.1 Rebuilding Schedule

Alternative 1 (No Action). 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 the 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

Table 2-3. Summary of effects of rebuilding schedule alternatives for red snapper.

Alternatives	Biological Effects	Socioeconomic/Administrative Effects
Alternative 1 (No Action). Do not implement a rebuilding plan.	(- +) 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.	(-) The rebuilding plan would not comply with the requirements of the Magnuson-Stevens Act.
Alternative 2. 15 year rebuilding period	(+) Would achieve the goal of rebuilding in the shortest amount of time	(-) Would incur the highest level of short-term negative socioeconomic impacts.
Alternative 3. 25 year rebuilding period	(+) Would achieve the goal of rebuilding in a moderate amount of time.	(-) Would incur a level of socioeconomic impact in between that of Alternative 2 and Alternative 4 (Preferred).
Alternative 4 (Preferred). 35 year rebuilding period	(+) Would rebuild the stock over the longest period of time.	(-) Would incur the lowest level of socioeconomic impact because it would require the least restrictive harvest provisions. (+) Highest net benefits over time.

(-) overall negative impacts, (+) overall positive impacts, (- +) neutral impacts

The reauthorized Magnuson-Stevens Fishery and Conservation Act (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 as specified under **Alternative 1 (No Action)**, the rebuilding plan would not comply with the previously mentioned requirements of the Magnuson-Stevens Act. However, if fishing related mortality was limited to the optimum yield level, which would be 75%F_{MSY}, the stock would rebuild with or without a plan.

Alternatives 2-4 (Preferred) would establish rebuilding schedules that would rebuild red snapper 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 15 years (**Alternative 2**) to 35 years (**Alternative 4 (Preferred)**). Generally, the shorter rebuilding timeframes translate into higher biological benefits. **Alternative 2**, which would implement the shortest rebuilding schedule, would achieve the goal of rebuilding in the shortest amount of time. However, **Alternative 2** may not be realistic as it 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. 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 but it is uncertain to what extent bycatch of red snapper would be reduced. Consequently, the Council has chosen **Alternative 4** as the preferred rebuilding strategy alternative.

Alternative 3 would incur a level of negative short-term socioeconomic impacts between that of **Alternatives 2** and **4 (Preferred). Alternative 4 (Preferred)** would 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**. In addition, **Alternative 4 (Preferred)** 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 as having a higher likelihood of generating the highest net benefits over time.

2.2.2 Rebuilding Strategy, Annual Catch Limit, Optimum Yield, and Accountability Measures

Note: Projections may be based upon various levels of recruitment in a fishery, ranging from very low to very high recruitment. All alternatives in this analysis are based upon a ***very high recruitment*** *scenario referenced in the most recent SEFSC projections (January 2010,* ***Appendix F****) .*

Table 2-4. Summary of the total kill allowed, reduction needed in total removals, and probability of rebuilding for Alternatives 1-9.

F_{OY} Alternative	Total Kill	% Reduction	Year Rebuilt (50% Prob)	Prob rebuilt 2044
Alternative 1 (No Action) ($F_{45\%SPR}$)	Not specified	85%	2035*; 2025**	70%*; 99%**
Alternative 2 (85%$F_{40\%SPR}$)	89,000	85%	2035	70%
Alternative 3 (75%$F_{40\%SPR}$)	79,000	87%	2032	84%
Alternative 4 (65%$F_{40\%SPR}$)	68,000	91%	2029	94%
Alternative 5 (97%$F_{40\%SPR}$)	101,000	83%	2044	50%
Alternative 6 (85%$F_{30\%SPR}$)	125,000	79%	2031	78%
Alternative 7 (75%$F_{30\%SPR}$)	111,000	82%	2028	92%
Alternative 8 (65%$F_{30\%SPR}$)	97,000	84%	2026	98%
Alternative 9 (Preferred) (98%$F_{30\%SPR}$)	**144,000**	**76%**	**2040**	**53%**

*Compared to SSB_{MSY} = 17,863,000 lbs whole weight for $F_{40\%SPR}$ F_{MSY} proxy.
**Compared to SSB_{MSY} = 13,283 000 lbs whole weight for $F_{30\%SPR}$ F_{MSY} proxy.

Alternative 1 (No Action). Maintain a yield-based rebuilding strategy for red snapper where F_{OY} = $F_{45\%SPR}$ (equivalent to 85% $F_{40\%SPR}$ and 59%$F_{30\%SPR}$). The value for OY at equilibrium is 2,196,000 lbs whole weight. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2035 and a 70% chance of rebuilding to SSB_{MSY} by 2044 based on a $F_{40\%SPR}$ proxy for F_{MSY}. ACL is not specified.

Alternative 2. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 85% F_{MSY} (85%$F_{40\%SPR}$). 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 lbs whole weight. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2035 and 70% chance of rebuilding to SSB_{MSY} by 2044.

Sub-alternative 2A. Establish an ACL based on landings. The ACL in 2010 would equal 0.

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Sub-alternative 2B. Establish an ACL based on total removals. The ACL in 2010 would equal 89,000 lbs (40,370 kg).

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Alternative 3. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 75% F_{MSY} (75%$F_{40\%SPR}$). 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 lbs whole weight. 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.

Sub-alternative 3A. Establish an ACL based on landings. The ACL in 2010 would equal 0.

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Sub-alternative 3B. Establish an ACL based on total removals. The ACL in 2010 would equal 79,000 lbs (35,834 kg).

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Alternative 4. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 65%F_{MSY} (65%$F_{40\%SPR}$). 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 whole weight. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2029, and a 94% chance of rebuilding to SSB_{MSY} by 2044.

Sub-alternative 4A. Establish an ACL based on landings. The ACL in 2010 would equal 0.

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Sub-alternative 4B. Establish an ACL based on total removals. The ACL in 2010 would equal 68,000 lbs (30,844 kg).

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Alternative 5. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 97% F_{MSY} (97%$F_{40\%SPR}$) and rebuilds in 35 years. 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 2,287,000 lbs whole weight. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2044.

Sub-alternative 5A. Establish an ACL based on landings. The ACL in 2010 would equal 0.

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Sub-alternative 5B. Establish an ACL based on total removals. The ACL in 2010 would equal 101,000 lbs (945,813 kg).

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Alternative 6. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 85% F_{MSY} (85%$F_{30\%SPR}$). 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 2,392,000 lbs whole weight. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2031 and 78% chance of rebuilding to SSB_{MSY} by 2044.

Sub-alternative 6A. Establish an ACL based on landings. The ACL in 2010 would equal 0.

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Sub-alternative 6B. Establish an ACL based on total removals. The ACL in 2010 would equal 125,000 (56,699 kg).

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Alternative 7. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 75% F_{MSY} (75%$F_{30\%SPR}$). 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 2,338,000 whole weight. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2028 and an 92% chance of rebuilding to SSB_{MSY} by 2044.

Sub-alternative 7A. Establish an ACL based on landings. The ACL in 2010 would equal 0.

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Sub-alternative 7B. Establish an ACL based on total removals. The ACL in 2010 would equal 111,000 lbs (50,349 kg).

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Alternative 8. Define a rebuilding strategy for red snapper that sets F_{OY} equal to $65\%F_{MSY}$ ($65\%F_{30\%SPR}$). 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 2,257,000 whole weight. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2026, and a 98% chance of rebuilding to SSB_{MSY} by 2044.

Sub-alternative 8A. Establish an ACL based on landings. The ACL in 2010 would equal 0.

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Sub-alternative 8B. Establish an ACL based on total removals. The ACL in 2010 would equal 97,000 lbs (43,998 kg).

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Alternative 9 (Preferred). Define a rebuilding strategy for red snapper that sets F_{OY} equal to 98% F_{MSY} (98%$F_{30\%SPR}$) and rebuilds in 35 years. 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 2,425,000 lbs whole weight. Under this strategy, the fishery would have a 53% chance of rebuilding to SSB_{MSY} by 2044.

Sub-alternative 9A (Preferred). Establish an ACL based on landings. The ACL in 2010 would equal 0.

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Sub-alternative 9B. Establish an ACL based on total removals. The ACL in 2010 would equal 144,000 lbs (65,317 kg).

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Table 2-5. Reduction in total removals (landings plus dead discards) needed to end overfishing.

Fmsy proxy	F40% proxy				F30% proxy			
	Base Estimated Recruitment	High Recruitment	Very High Recruitment	Extremely High Recruitment	Base Estimated Recruitment	High Recruitment	Very High Recruitment	Extremely High Recruitment
Alternative 2 and 6 (85% F_{MSY})	89%	88%	85%	81%	84%	83%	79%	79%
Alternative 3 and 7 (75% F_{MSY})	90%	89%	87%	85%	86%	85%	82%	81%
Alternative 4 and 8 (65% F_{MSY})	91%	90%	89%	87%	88%	87%	84%	83%
Alternative 5 and 9 ($F_{REBUILD}$)	87%	86%	83%	81%	82%	81%	76%	73%

Note: The above is determined by comparing expected landings in 2010 to average landings during 2006-2007. Non-shaded areas determined by comparing estimated landings in 2009 with allowable removals in 2010. Shaded areas are estimated by interpolation. Alternatives 2-5 use $F_{40\%SPR}$ as F_{MSY} proxy; Alternatives 6-9 use $F_{30\%SPR}$ as F_{MSY} proxy. Council's preferred choice is to use very high recruitment with $F_{30\%SPR}$ proxy for F_{MSY}.

2.2.2.1 Comparison of Alternatives

Table 2-6. Comparison of effects of rebuilding strategy alternatives for red snapper.

Alternatives	Biological Effects	Socioeconomic/Administrative Effects
Alternative 1 (No Action)	(+) The stock would have a 70% chance of rebuilding by 2044	(-) Would require the third highest reduction in harvest and would increase risk of litigation for not implementing a rebuilding strategy in compliance with the Magnuson-Stevens Act.
Alternative 2. (85%$F_{40\%SPR}$), 50% chance stock rebuilds by 2035	(+) The stock would have a 70% chance of rebuilding by 2044	(-)Would require the third highest reduction in harvest, and result in third highest level of socioeconomic impacts.
Alternative 3. (75%$F_{40\%SPR}$), 50% chance stock rebuilds by 2032	(+) The stock would have a 84% chance of rebuilding by 2044	(-) Would require the second largest harvest reduction, and result in second highest level of socioeconomic impacts.
Alternative 4. (65%$F_{40\%SPR}$), 50% chance stock rebuilds by 2029	(+) The stock would have a 94% chance of rebuilding by 2044, with the greatest biological benefit.	(-) Would require the greatest harvest reductions and would create the largest short-term socioeconomic impact.
Alternative 5 (97%$F_{40\%SPR}$), 50% chance stock rebuilds by 2044	(+) The stock would have a 50% chance of rebuilding by 2044	(-) Represents the midpoint in socioeconomic impacts that could result from the suite alternatives.
Alternative 6. (85%$F_{30\%SPR}$), 50% chance stock rebuilds by 2031	(+) The stock would have a 78% chance of rebuilding by 2044	(-) Would result in the second lowest level of short-term socioeconomic impacts.
Alternative 7. (75%$F_{30\%SPR}$), 50% chance stock rebuilds by 2028	(+) The stock would have a 92% chance of rebuilding by 2044	(-) Represents a mid point in socioeconomic impacts that could result from the suite alternatives
Alternative 8. (65%$F_{30\%SPR}$), 50% chance stock rebuilds by 2026	(+) The stock would have a 98% chance of rebuilding by 2044	(-)Represents a mid point in socioeconomic impacts that could result from the suite alternatives
Alternative 9 (Preferred). (98%$F_{30\%SPR}$), 50% chance stock rebuilds by 2040	(+) The stock would have a 53% chance of rebuilding by 2044, would provide the least amount of biological benefit.	(-) Would require the least harvest reductions and would create the least short-term socioeconomic impact.
Sub-Alternatives 2A-9A (Preferred) ACL = 0	(+) No directed harvest of red snapper would be allowed	(-) No directed harvest would be allowed any of the alternatives.
Sub-Alternatives 2B-9B ACLs specified in table 2-3.	(+) No directed harvest would be allowed and the ACL would = allowable discards.	(-) SEFSC would be required to monitor discarded red snapper in the commercial and recreational sectors.

(-) overall negative impacts, (+) overall positive impacts, (- +) neutral impacts

Optimum Yield at Equilibrium

Choice of the proxy for F_{MSY} in **Section 4.1** has an effect on the magnitude of the optimum yield (OY). OY values based on the No Action proxy for F_{MSY} of $F_{30\%\ SPR}$ would be expected to result in higher values for OY (**Alternatives 6-9**) than the use of $F_{40\%SPR}$ proxy for F_{MSY} (**Alternatives 2-5**). For example, the estimated yield at 75%F_{MSY} when the stock is at B_{MSY} is 2,338,000 lbs whole weight and 2,104,000 lbs whole weight for $F_{30\%SPR}$ and $F_{40\%SPR}$, respectively. The Council has selected $F_{30\%SPR}$ as the proxy for F_{MSY}.

Under **Alternative 1 (No Action)**, $F_{OY} = F_{45\%SPR}$ (equivalent to 85% $F_{40\%SPR}$) and the value for OY when the stock is at SSB_{MSY} is 2,196,000 lbs whole weight and is extremely similar to **Alternative 2**, which specifies a rebuilding strategy at 85%$F_{40\%SPR}$ with an OY = 2,180,000 lbs whole weight when the stock is at SSB_{MSY} ($SSB_{F40\%SPR}$). OY values at equilibrium in the nine alternatives are distinguished from one another by the level of risk (and associated tradeoffs) each would assume. The more conservative the specification of OY, the larger the sustainable biomass when the stock is rebuilt. The greatest biological benefit would be provided by **Alternative 4**, which would specify an OY at equilibrium equal to 65%$F_{40\%SPR}$ and would require a 91% reduction in total kill relative to 2005-2007. The least amount of short-term biological benefit would be provided by **Alternative 9 (Preferred)**, which would specify a rebuilding strategy of 98%$F_{30\%SPR}$ and a reduction in total kill of 76%. **Alternative 9 (Preferred)** would specify an OY level that is not based on the Scientific and Statistical Committee's (SSC) recommended F_{MSY} proxy. However, once a comprehensive review of how maximum sustainable yield proxies should be applied across the region is completed, a new F_{MSY} proxy for red snapper could be phased in over time to, reduce to the extent practicable, negative impacts.

Rebuilding Strategies

Alternative 1 (No Action) would maintain the yield-based, rebuilding strategy for red snapper specified in Amendment 11, which is similar to the rebuilding strategy specified in **Alternative 2**. The difference between **Alternative 1 (No Action)** and **Alternative 2** is that **Alternative 1 (No Action)** would not specify an annual catch limit (ACL) or a method to monitor recovery of red snapper.

Under **Alternatives 2-9**, 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 2-9 would prohibit all harvest of red snapper in the commercial and recreational sectors but would set an ACL based either on landings or total removals, which is specified in each of the sub-alternatives for each alternative. If the Council chooses to set an ACL based on total removals the Southeast Fisheries Science Center (SEFSC) would be required to monitor discarded red snapper in the commercial and recreational sectors. At their March 2009 meeting, the SSC indicated their recommendation of acceptable biological catch (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, catch per unit effort (CPUE) of red snapper would be tracked via a fishery-independent monitoring program to identify changes in biomass. Furthermore, the Council is considering the use of fishery-dependent data collection by headboat and charterboat operators to determine if there are changes in CPUE and biomass. If the ACL was exceeded or if CPUE indicated the stock was not rebuilding, the Council could re-evaluate management measures to ensure overfishing did not occur. CPUE would be evaluated every year using a three year running average, and adjustments would be made by a framework action being developed in Amendment 17B.

Under **Alternative 2**, an initial reduction in total kill of 85% would be required. Therefore, this definition would provide fewer indirect benefits to the biological and ecological environment than **Alternatives 3** and **4**, and could make it more difficult to sustain red snapper over the long term. The ACL would be 89,000 lbs whole weight total kill or 0 landed catch until modified. Under this alternative the stock has a 50% chance of being rebuilt by 2035, five years later than **Alternative 4**, and three years later than **Alternative 3.** There is a 70% chance the stock could rebuild to SSB_{MSY} in the maximum allowable 35 year time frame.

Alternative 3 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 total kill or 0 lbs landed catch and would remain in effect until modified. Under **Alternative 3**, an 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. There is an 84% that the stock could rebuild to SSB_{MSY} by 2044. Under **Alternative 4** the rebuilding strategy would be more conservative than **Alternatives 2** and **3** and would set F_{OY} equal to 65%F_{MSY} (65%$F_{40\%SPR}$). The ACL would be the lowest of all the alternatives at 68,000 lbs whole weight total kill or 0 lbs landed catch, and would remain in effect until modified. A 91% reduction in total kill would be required under **Alternative 4**.

Alternative 5 would establish an ACL of 101,000 lbs whole weight total kill or 0 lbs landed catch, and define a rebuilding strategy based a constant $F_{REBUILD}$ of 0.088 and 97%F_{MSY} (97%$F_{40\%SPR}$). Under **Alternative 5**, an initial 83% reduction in total kill would be required. **Alternative 5** 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 (2044).

Alternative 6 would establish a rebuilding strategy that maintains fishing mortality at 85% F_{MSY} (85%$F_{30\%SPR}$) with a constant F of 0.126. The ACL would be set at 125,000 lbs whole weight total kill or 0 lbs landed catch and would remain in effect until modified. Under this alternative, the stock would have a 50% chance of being rebuilt by 2031 and a 78% chance of reaching SSB_{MSY} by 2044. Under **Alternative 7**, an 82% reduction in total kill would be required. At this rate of recovery, the stock has a 50% chance of rebuilding to SSB_{MSY} by 2028. There is an 92% that the stock could rebuild to SSB_{MSY} by 2044. Under **Alternative 8** the rebuilding strategy would be more conservative than **Alternatives 5** and **6** and would set F_{OY} equal to 65%F_{MSY}

($65\%F_{30\%SPR}$). The ACL would be 97,000 lbs whole weight total kill or 0 landed catch, and would remain in effect until modified. An 84% reduction in total kill would be required under **Alternative 8**. **Alternative 9 (Preferred)** would establish an ACL of 144,000 lbs whole weight total kill or 0 lbs landed catch, and define a rebuilding strategy based a constant $F_{REBUILD}$ of 0.145 and $98\%F_{MSY}$ ($98\%F_{30\%SPR}$). Under **Alternative 9 (Preferred)**, an initial 76% reduction in total kill would be required. **Alternative 9 (Preferred)** specifies a fishing mortality rate that has a 53% probability of rebuilding the stock to SSB_{MSY} ($SSB_{30\%SPR}$) in the maximum allowable time of 35 years (2044).

The "**A**" **Sub-Alternatives** e.g., **2A, 3A, 4A**… would establish ACLs based on landings, which would be zero in 2010 and would continue until modified. These sub-alternatives would also include three AMs, all related to tracking CPUE. The CPUE would be monitored via fishery-independent and fishery-dependent sampling methods, and those results would be analyzed every three years after which adjustments to management measures and/or the ACL may be made through a framework action. Establishing an ACL of zero would not require monitoring of dead discards, which the SSC has opposed on several occasions since discard data are self-reported and there is greater uncertainty with discard data than with estimates of landings.

The "**B**" **Sub-Alternatives** e.g.**, 2B, 3B, 4B**… 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, which subsequently die 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 concerns when discussing ACLs based on dead 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.

Alternative 4 and **Sub-alternative 4A**, expected to result in the largest biological benefit, is also expected to offer the largest long-term economic benefits but would require the most severe short-term reductions and therefore largest short-term negative economic impacts. **Alternative 9** with **Sub-alternative 9B** is expected to yield the smallest biological benefit. This would likely result in less stringent management measures and therefore the smallest short-term negative economic impacts but also the smallest long-term economic benefits to the fishermen.

An in-depth analysis of the impacts of rebuilding plan alternatives may be found in **Section 4.2** of this document.

2.3 Red Snapper Management Measures

Alternative 1 (No Action). This would continue the 20-inch minimum 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 fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters.

Alternative 3A. Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, 3080, and 3180, using coordinates shown in Table 2-7 to define the area, (14,496 mi^2 of the South Atlantic EEZ)

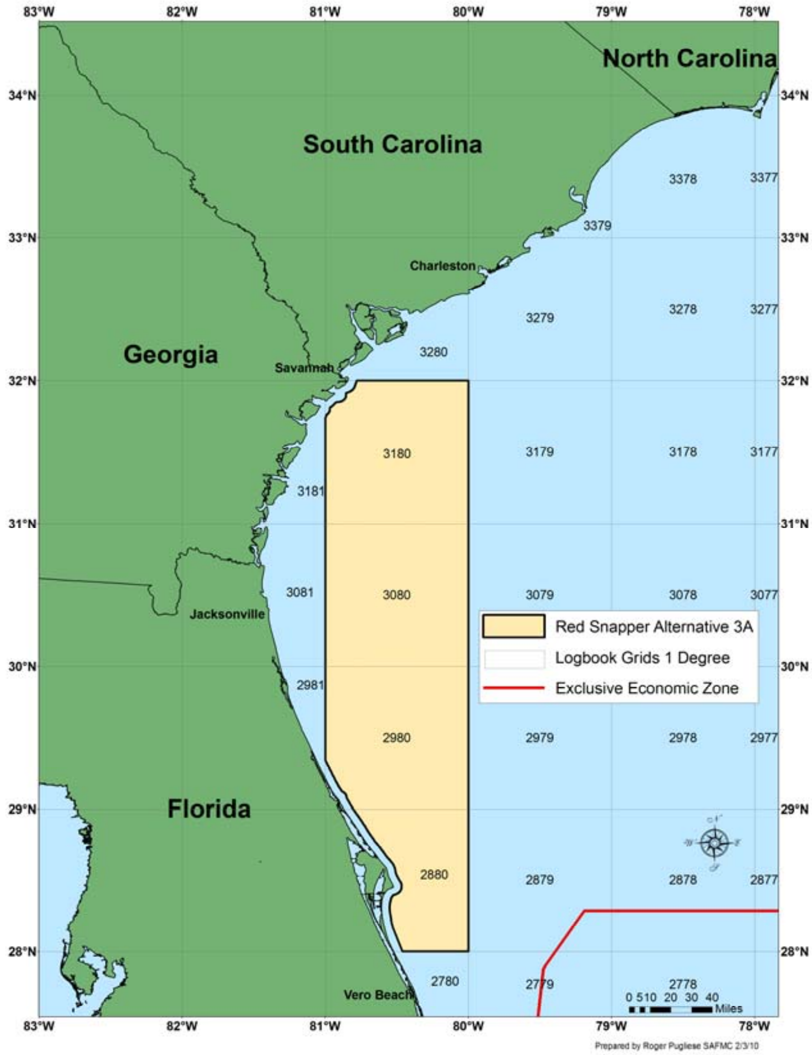


Figure 2-1. Map of proposed closed area under Alternative 3A.

Table 2-7. Waypoints used to delineate Alternative 3A.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 27' 42"
3	29° 20' 33"	81° 00' 00"
4	31° 44' 32"	81° 00' 00"
5	32° 00' 00"	80° 46' 56"
6	32° 00' 00"	80° 00' 00"

Between point 2 and point 3, line follows inner boundary of U.S. EEZ.
Between point 4 and point 5, line follows inner boundary of U.S. EEZ.

Alternative 3B. Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, 3080, and 3180 from 66 feet (11 fathoms; 20 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in Table 2-8 to define the area (10,794 mi² of the South Atlantic EEZ).

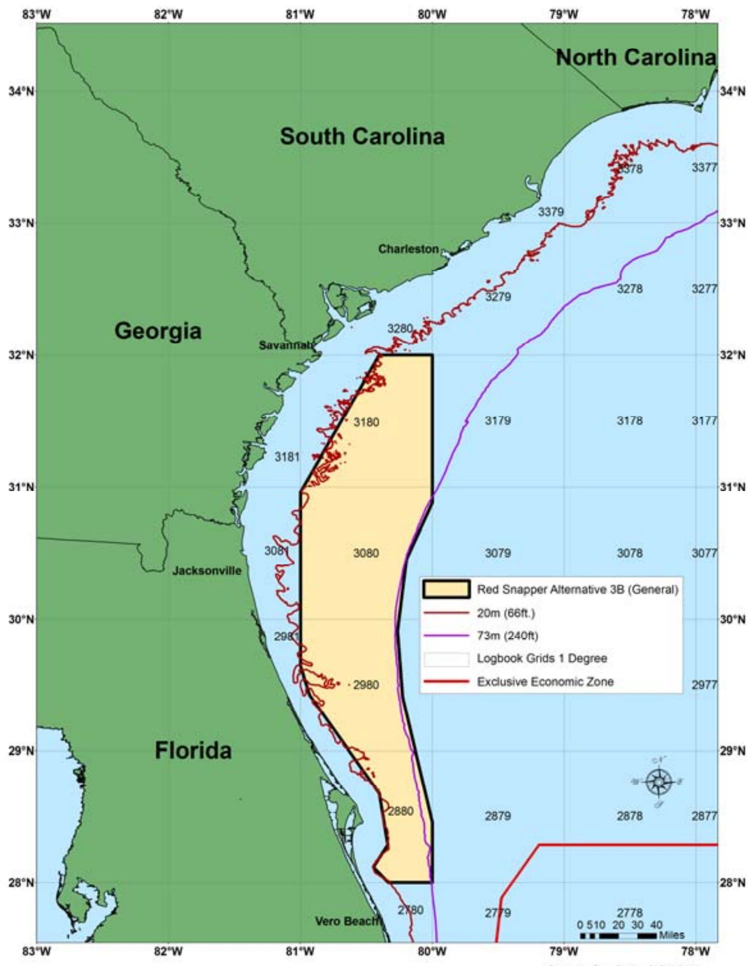


Figure 2-2. Map of proposed closed area under Alternative 3B.

Table 2-8. Waypoints used to delineate Alternative 3B

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 20' 01"
3	28° 06' 58"	80° 26' 49"
4	28° 17' 14"	80° 20' 19"
5	28° 40' 32"	80° 24' 09"
6	29° 25' 09"	80° 55' 44"
7	29° 38' 20"	81° 00' 00"
8	30° 57' 40"	81° 00' 00"
9	32° 00' 00"	80° 24' 12"
10	32° 00' 00"	80° 00' 00"
11	30° 52' 54"	80° 00' 00"
12	30° 27' 19"	80° 11' 41"
13	29° 54' 31"	80° 15' 51"
14	29° 24' 24"	80° 13' 32"
15	28° 27' 20"	80° 00' 00"

Alternative 3C. Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, 3080, and 3180 from 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in Table 2-9 to define the area (6,161 mi² of the South Atlantic EEZ).

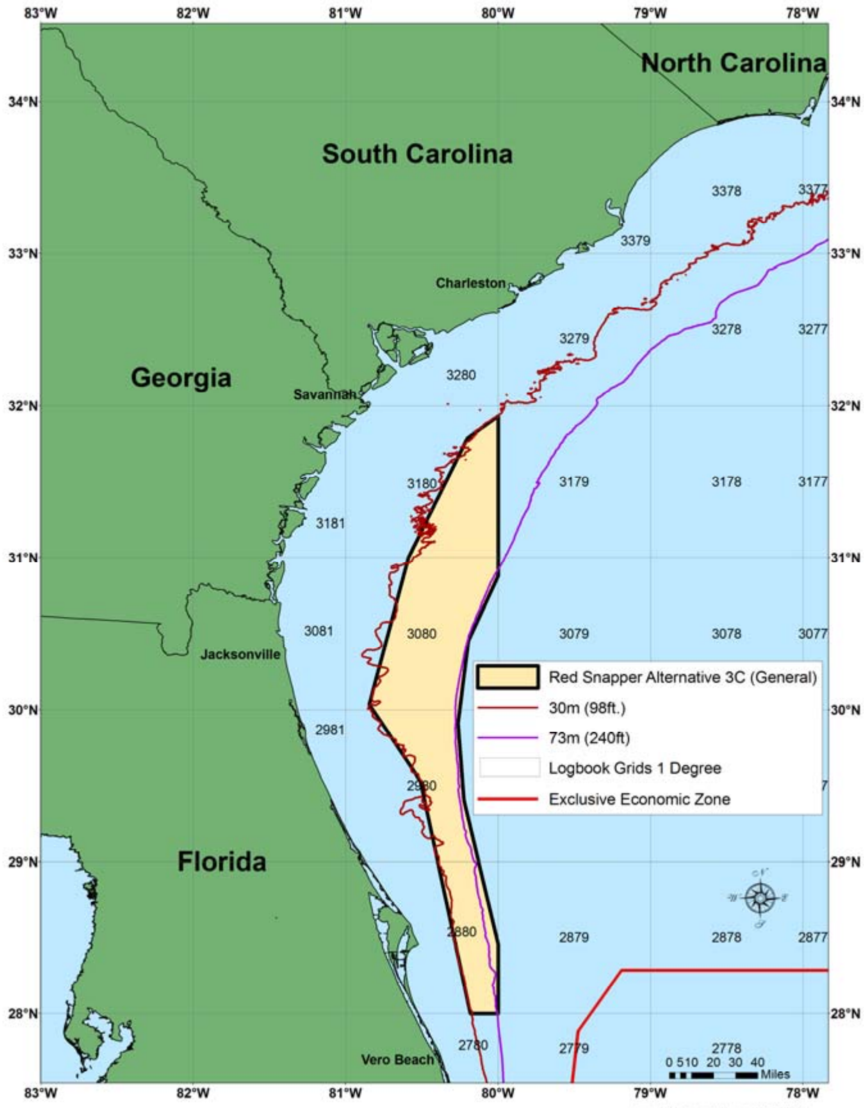


Figure 2-3. Map of proposed closed area under Alternative 3C.

Table 2-9. Waypoints used to delineate Alternative 3C.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 10' 57"
3	29° 31' 40"	80° 30' 34"
4	30° 02' 03"	80° 50' 45"
5	31° 00' 00"	80° 35' 19"
6	31° 47' 00"	80° 12' 15"
7	31° 55' 55"	80° 00' 00"
8	30° 52' 54"	80° 00' 00"
9	30° 27' 19"	80° 11' 41"
10	29° 54' 31"	80° 15' 51"
11	29° 24' 24"	80° 13' 32"
12	28° 27' 20"	80° 00' 00"

Alternative 3D. Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, 3080, and 3180 from 98 feet (16 fathoms; 30 m) to 300 feet (50 fathoms; 91 m), using coordinates shown in Table 2-10 to define the area (6,222 mi² of the South Atlantic EEZ).

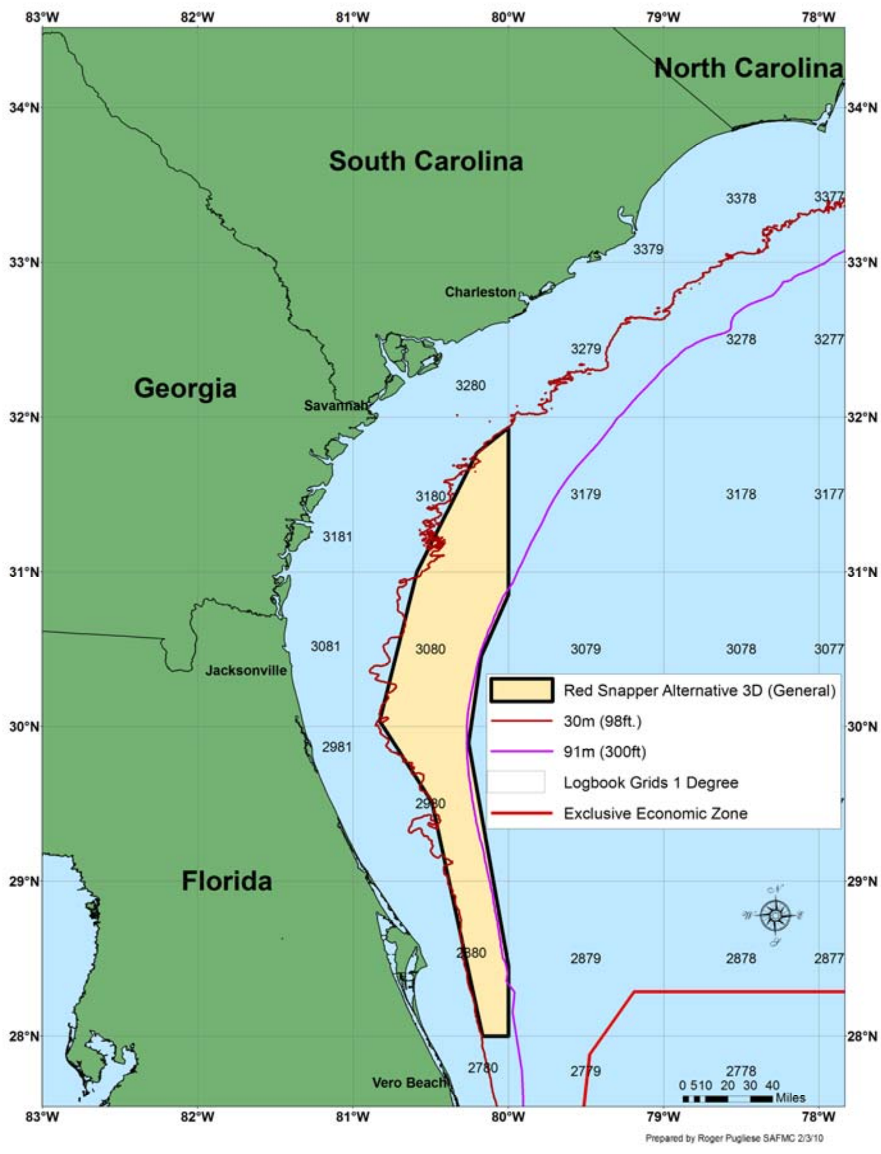


Figure 2-4. Map of proposed closed area under Alternative 3D.

Table 2-10 Waypoints used to delineate Alternative 3D.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 09' 57"
3	29° 30' 40"	80° 29' 34"
4	30° 02' 03"	80° 49' 45"
5	31° 00′ 00"	80° 35' 19"
6	31° 46' 00"	80° 12' 15"
7	31° 55' 55"	80° 00' 00"
8	30° 51' 13"	80° 00' 00"
9	30° 27' 19"	80° 10' 34"
10	29° 53' 31"	80° 15' 25"
11	28° 27' 20"	80° 00' 00"

Alternative 3E (Preferred). Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, and 3080 from 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in Table 2-11 to define the area (4,827 mi² of the South Atlantic EEZ).

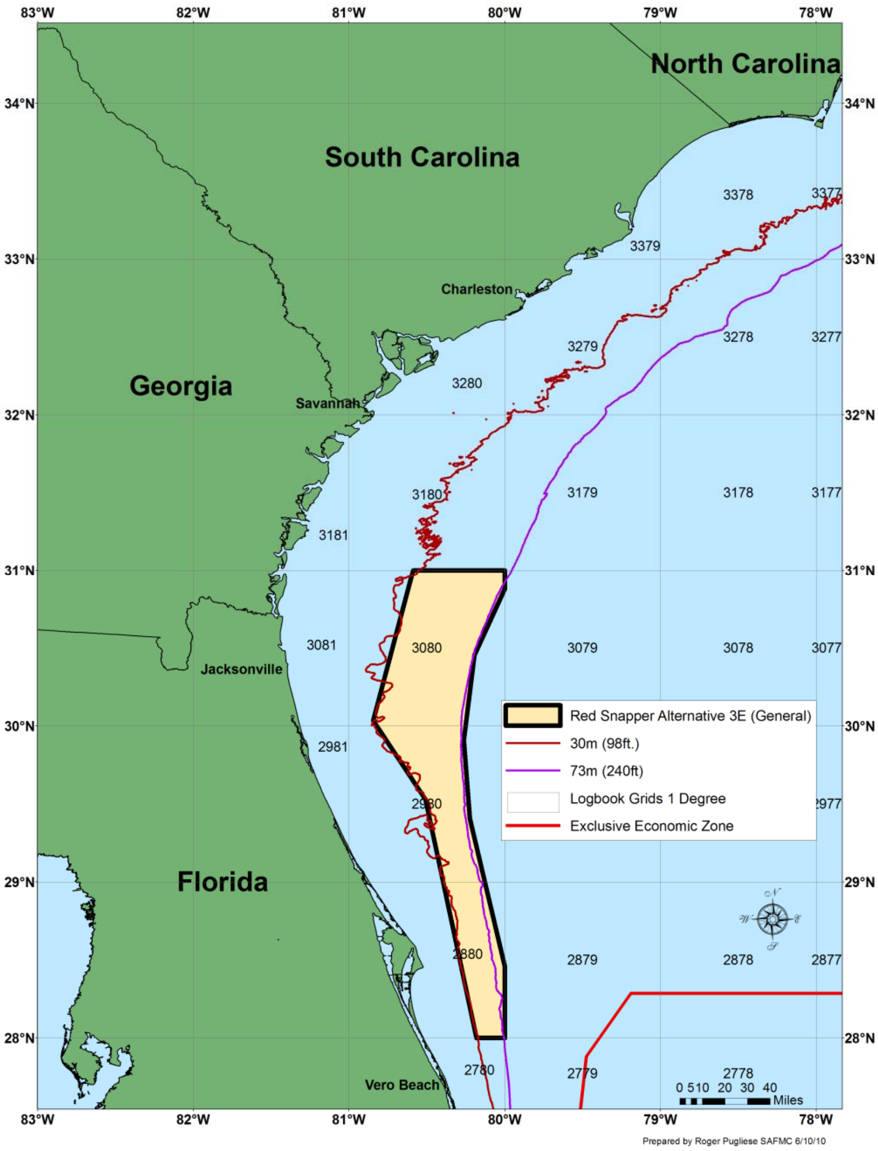


Figure 2-5. Map of proposed closed area under Alternative 3E **(Preferred)**.

Table 2-11. Waypoints used to delineate Alternative 3E.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 10' 57"
3	29° 31' 40"	80° 30' 34"
4	30° 02' 03"	80° 50' 45"
5	31° 00' 00"	80° 35' 19"
6	31° 00' 00"	80° 00' 00"
7	30° 52' 54"	80° 00' 00"
8	30° 27' 19"	80° 11' 41"
9	29° 54' 31"	80° 15' 51"
10	29° 24' 24"	80° 13' 32"
11	28° 27' 20"	80° 00' 00"

Alternative 4A. Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, 3080, 3179, 3180, 3278, and 3279, using coordinates shown in Table 2-12 to define the area ~~for a total of~~ (26,001 mi²) of the South Atlantic EEZ.

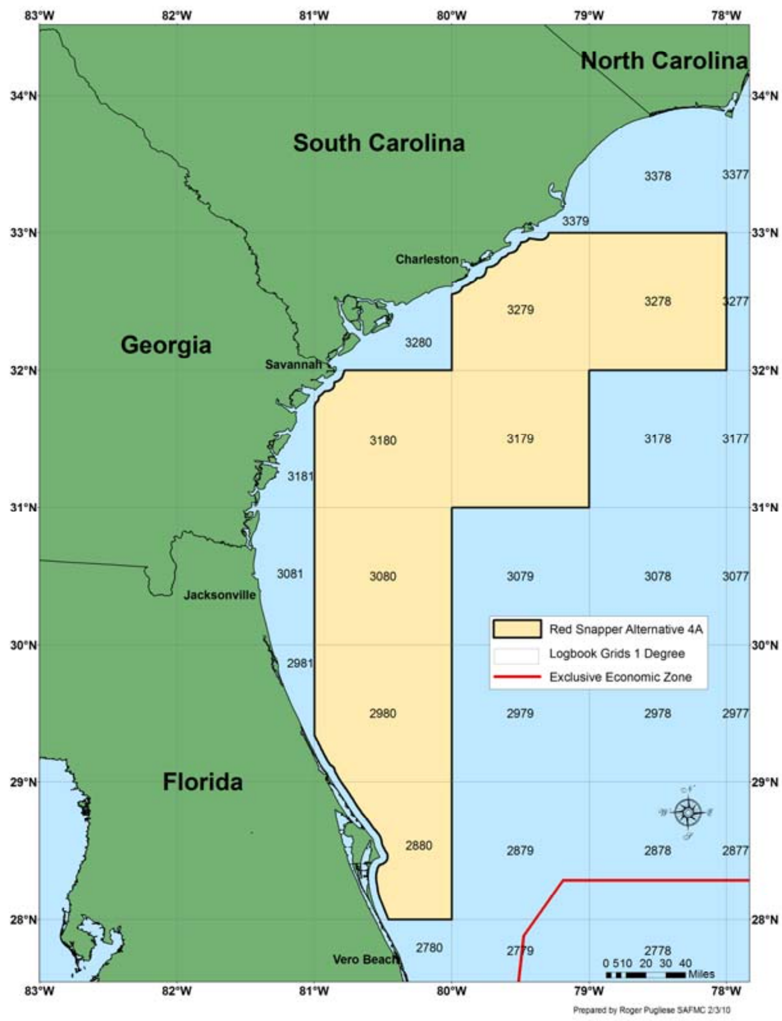


Figure 2-6. Map of proposed closed area under Alternative 4A.

Table 2-12. Waypoints used to delineate Alternative 4A.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 27' 42"
3	29° 20' 33"	81° 00' 00"
4	31° 44' 32"	81° 00' 00"
5	32° 00' 00"	80° 46' 56"
6	32° 00' 00"	80° 00' 00"
7	32° 33' 08"	80° 00' 00"
8	33° 00' 00"	79° 17' 45"
9	33° 00' 00"	78° 00' 00"
10	32° 00' 00"	78° 00' 00"
11	32° 00' 00"	79° 00' 00"
12	31° 00' 00"	79° 00' 00"
13	31° 00' 00"	80° 00' 00"

Between point 2 and point 3, line follows inner boundary of U.S. EEZ.
Between point 4 and point 5, line follows inner boundary of U.S. EEZ.
Between point 7 and point 8, line follows inner boundary of U.S. EEZ.

Alternative 4B. Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, 3080, 3179, 3180, 3278, and 3279 from 66 feet (11 fathoms; 20 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in Table 2-13 to define the area (15,384 mi² of the South Atlantic EEZ).

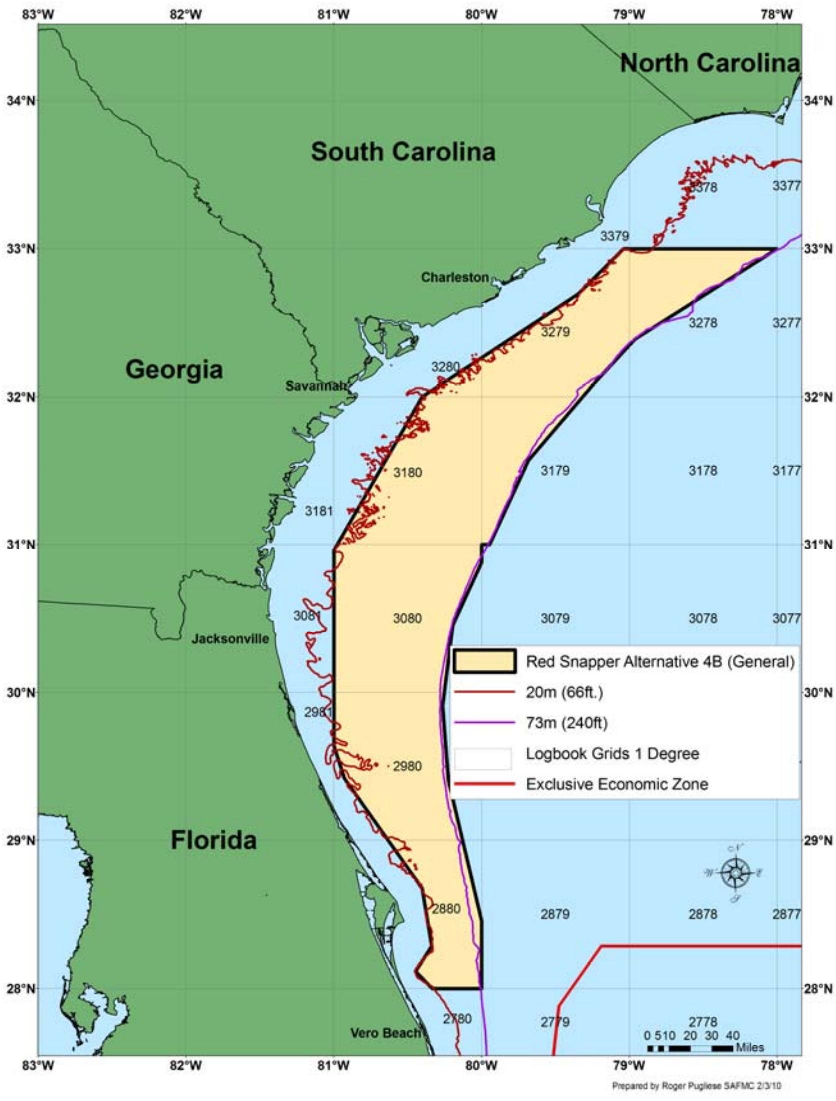


Figure 2-7. Map of proposed closed area under Alternative 4B.

Table 2-13. Waypoints used to delineate Alternative 4B.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 20' 01"
3	28° 06' 58"	80° 26' 49"
4	28° 17' 14"	80° 20' 19"
5	28° 40' 32"	80° 24' 09"
6	29° 25' 09"	80° 55' 44"
7	29° 38' 20"	81° 00' 00"
8	30° 57' 40"	81° 00' 00"
9	32° 00' 00"	80° 24' 12"
10	32° 41' 38"	79° 20' 50"
11	33° 00' 00"	79° 02' 22"
12	33° 00' 00"	78° 00' 00"
13	32° 23' 28"	78° 57' 38"
14	32° 06' 03"	79° 13' 46"
15	31° 34' 08"	79° 41' 03"
16	31° 00' 00"	79° 56' 43"
17	31° 00' 00"	80° 00' 00"
18	30° 52' 54"	80° 00' 00"
19	30° 27' 19"	80° 11' 41"
20	29° 54' 31"	80° 15' 51"
21	29° 24' 24"	80° 13' 32"
22	28° 27' 20"	80° 00' 00"

Alternative 4C. Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, 3080, 3179, 3180, 3278, and 3279 from 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in Table 2-14 to define the area (9,372 mi² of the South Atlantic EEZ).

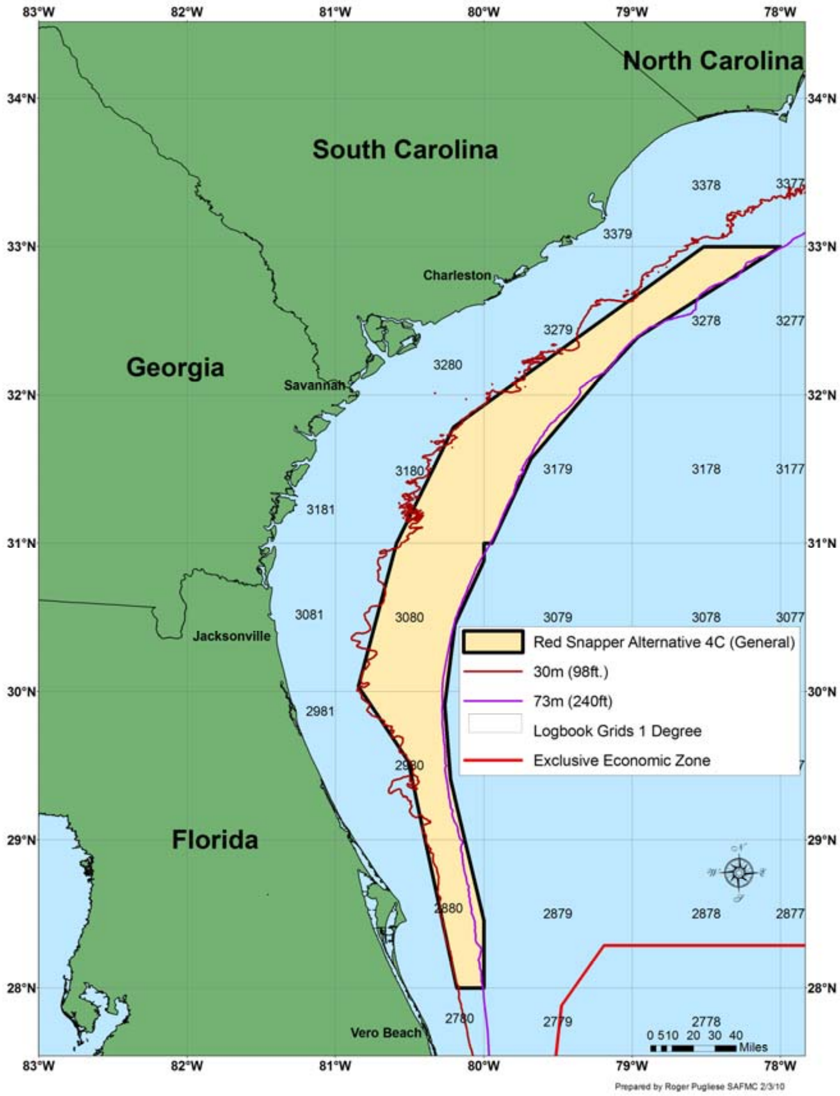


Figure 2-8. Map of proposed closed area under Alternative 4C.

Table 2-14. Waypoints used to delineate Alternative 4C.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 10' 57"
3	29° 31' 40"	80° 30' 34"
4	30° 02' 03"	80° 50' 45"
5	31° 00' 00"	80° 35' 19"
6	31° 47' 00"	80° 12' 15"
7	33° 00' 00"	78° 31' 05"
8	33° 00' 00"	78° 00' 00"
9	32° 23' 28"	78° 57' 38"
10	32° 06' 03"	79° 13' 46"
11	31° 34' 08"	79° 41' 03"
12	31° 00' 00"	79° 56' 43"
13	31° 00' 00"	80° 00' 00"
14	30° 52' 54"	80° 00' 00"
15	30° 27' 19"	80° 11' 41"
16	29° 54' 31"	80° 15' 51"
17	29° 24' 24"	80° 13' 32"
18	28° 27' 20"	80° 00' 00"

Alternative 4D. Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, 3080, 3179, 3180, 3278, and 3279 from 98 feet (16 fathoms; 30 m) to 300 feet (50 fathoms; 91 m), using coordinates shown in Table 2-15 to define the area (9,591 mi² of the South Atlantic EEZ).

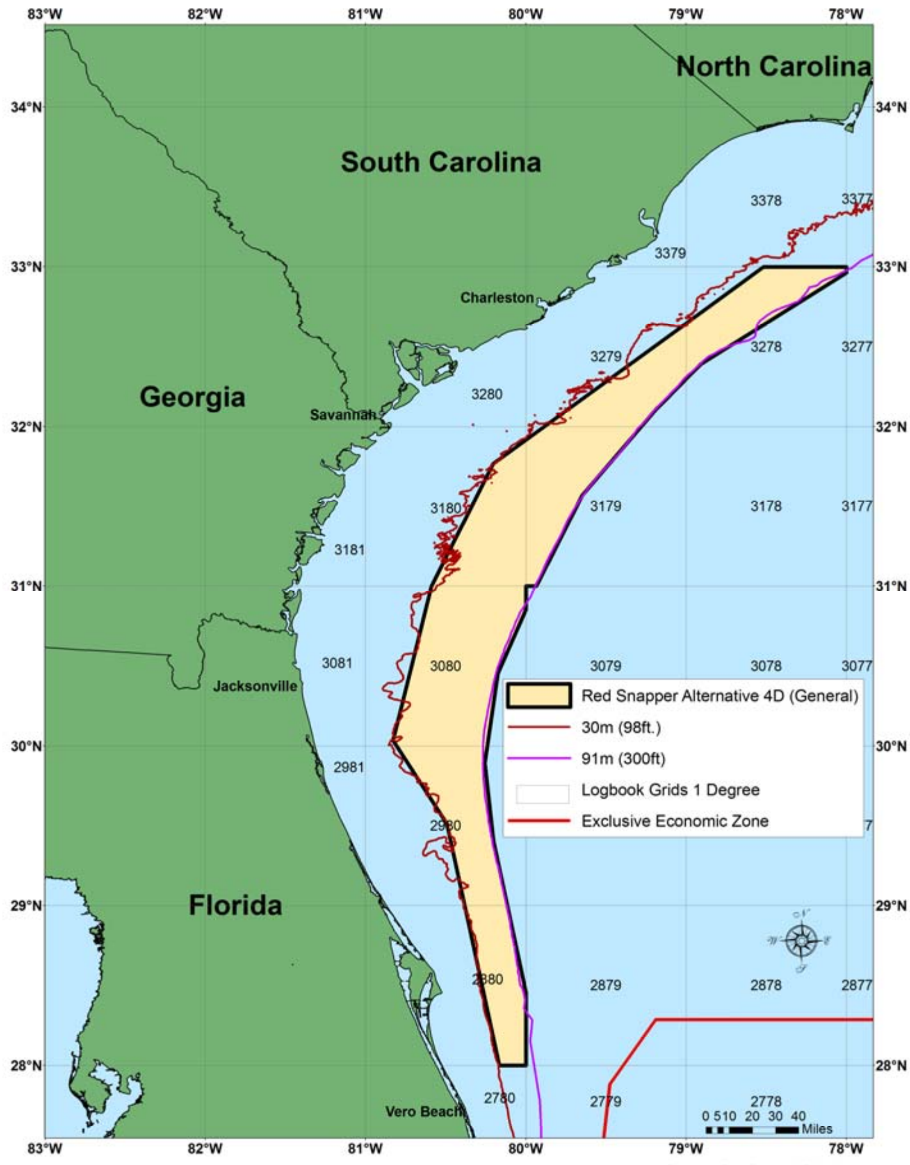


Figure 2-9. Map of proposed closed area under Alternative 4D.

Table 2-15. Waypoints used to delineate Alternative 4D.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 09' 57"
3	29° 30' 40"	80° 29' 34"
4	30° 02' 03"	80° 49' 45"
5	31° 00' 00"	80° 35' 19"
6	31° 46' 00"	80° 12' 15"
7	33° 00' 00"	78° 31' 05"
8	33° 00' 00"	78° 00' 00"
9	32° 57' 44"	78° 00' 00"
10	32° 23' 28"	78° 54' 32"
11	32° 06' 03"	79° 11' 41"
12	31° 34' 08"	79° 38' 57"
13	31° 00' 00"	79° 56' 05"
14	31° 00' 00"	80° 00' 00"
15	30° 51' 13"	80° 00' 00"
16	30° 27' 19"	80° 10' 34"
17	29° 53' 31"	80° 15' 25"
18	29° 24' 24"	80° 12' 13"
19	28° 27' 20"	80° 00' 00"

Alternative 5 (Preferred). Allow fishing for, harvest, and possession of snapper grouper species (with the exception of red snapper) in the closed area if fish were harvested with black sea bass pots.

Alternative 6. Allow fishing for, harvest, and possession of snapper grouper species (with the exception of red snapper) with bottom longline gear in the closed area deeper than 50 fathoms as specified in CFR §622.35.

Alternative 7 (Preferred). Allow fishing for, harvest, and possession of snapper grouper species (with the exception of red snapper) in the closed area if fish were harvested with spearfishing gear.

Alternative 8. Allow transit through areas closed to snapper grouper harvest.

> **Sub-alternative 8a (Preferred).** 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. The Council is considering alternatives that could allow fishing for snapper grouper species with spearfishing gear, black sea bass pots, and/or bottom longline within the proposed closed areas.

The term *"transit"* means: Underway, making way, not anchored, and a 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, trolling 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, and 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** or **golden crab trap** cannot be baited and 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 8b.** 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 certain snapper grouper species.

The term *"transit"* means: Underway, making way, not anchored, and a 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 8c. 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 wreckfish on board.

The term *"transit"* means: Underway, making way, not anchored, and a 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

Table 2-16. Comparison of effects of area closure alternatives for red snapper.

Alternatives	Biological Effects	Socioeconomic/Administrative Effects
Alternative 1 (No Action)	(-) Not prohibiting harvest of red snapper would not end overfishing of red snapper within the allowable timeframe.	(+) short-term (-) long-term If overfishing is allowed to continue future socioeconomic stability in the fishery may be compromised.
Alternative 2 Prohibit all harvest, and possession of red snapper.	(+) Though prohibiting harvest of red snapper will help to reduce overall mortality it would not end overfishing..	(-) Reduction in commercial net operating revenue = 4.3% (-) Reduction in recreational net operating revenue = $8,910,728 This alternative would have the least immediate socioeconomic impact of Alternatives 2-4D.
Alternative 3A grid closures 2880, 2980, 3080, 3180	(+) Reduction in total removals = 72%-90%	(-) Reduction in commercial net operating revenue = 5.4% (-) Reduction in recreational net operating revenue = $19,278,957
Alternative 3B grid closures 2880, 2980, 3080, 3180 from 66-240 ft	(+) Reduction in total removals = 69%-88%	(-) Reduction in commercial net operating revenue = 4.9% (-) Reduction in recreational net operating revenue = $18,803,179
Alternative 3C grid closures 2880, 2980, 3080, 3180 from 98-240 ft	(+) Reduction in total removals = 72%-90%	(-) Reduction in commercial net operating revenue = 4.9% (-) Reduction in recreational net operating revenue = $17,878,731
Alternative 3D grid closures 2880, 2980, 3080, 3180 from 98-300 ft	(+) Reduction in total removals = 63%-84%	(-) Reduction in commercial net operating revenue = 4.9% (-) Reduction in recreational net operating revenue = $17,942,817
Alternative 3E (Preferred) grid closures 2880, 2980, and 3080, from 98-240 ft	(+) Reduction in total removals = 60%-81%	(-) Reduction in commercial net operating revenue = 4.8% (-) Reduction in recreational net operating revenue = $17,833,819 Least negative socioeconomic impacts of all the alternatives considered.
Alternative 4A grid closures 2880, 2980, 3080, 3180, 3179, 3278, 3279	(+) Reduction in total removals = 86%-90%	(-) Reduction in net commercial operating revenue = 13.7%. (-) Reduction in recreational net operating revenue = $24,114,009 The largest socioeconomic impact of all the alternatives.
Alternative 4B grid closures 2880, 2980, 3080, 3180, 3179, 3278, 3279 from 66-240 ft	(+) Reduction in total removals = 73%-91%. alternatives.	(-) Reduction in commercial net operating revenue = 12.5%. (-) Reduction in recreational net operating revenue = $23,082,044
Alternative 4C grid closures 2880, 2980, 3080, 3180, 3179, 3278, 3279 from 98-240 ft	(+) Reduction in total removals = 66%-86%	(-) Reduction in commercial net operating revenue = 12% (-) Reduction in recreational net operating revenue = $22,131,480

Alternatives	Biological Effects	Socioeconomic/Administrative Effects
Alternative 4D grid closures 2880, 2980, 3080, 3180, 3179, 3278, 3279 from 98-300 ft	(+) Reduction in total removals = 67%-86%.	(-) Reduction in commercial net operating revenue = 12% (-) Reduction in recreational net operating revenue = $22,208,457
Alternative 5 (Preferred) Allows black sea bass pots in closed area	(+-) Black sea bass pots are highly selective for black sea bass, and would be able to be deployed within any one of the proposed closed areas in **Alternatives 2-4** without negatively affecting the harvest reductions needed to end overfishing of red snapper	(+) Allowing the use of black sea bass pots may help mitigate some of the short term socioeconomic impacts associated with an area closure.
Alternative 6 Allows bottom longline gear in closed area	(+-) Golden tilefish are found in different habitats than other snapper grouper species. Allowing this gear type would not be likely to impact recovery of red snapper.	(+) Allowing the use of black sea bass pots may help mitigate some of the short term socioeconomic impacts associated with an area closure
Alternative 7 (Preferred) Allows spearfishing in closed area	(+-) Due to the selectivity of the gear type, spearguns could be allowed within a proposed closed area with little or no impact on recovery of red snapper.	(+) Allowing the use of black sea bass pots may help mitigate some of the short term socioeconomic impacts associated with an area closure
Alternative 8 (sub-alternatives 8A (Preferred), 8B, and 8C) Allows transit.	(+-) Allowing transit through a proposed closed area with snapper grouper onboard would not impact the recovery of red snapper.	(+-) Allowing transit through a proposed closed area with legally harvested snapper grouper onboard would address any safety concerns raised by a closed area; however, the provision may be difficult to enforce.

(-) overall negative impacts, (+) overall positive impacts, (- +) neutral impacts

Under **Alternative 1 (No Action)**, between a 40% and 58% reduction in total kill could be expected. Based on the preferred rebuilding strategy **Alternative 9 (Preferred)** that considers very high recruitment and a $F_{30\%SPR}$ proxy for F_{MSY}, a 76% reduction in total removals of red snapper is needed to achieve the yield at 98%F_{MSY} and end overfishing.

Alternative 2 would prohibit all commercial and recreational harvest, and possession of red snapper year-round in the South Atlantic economic exclusive zone (EEZ). The prohibition of red snapper harvest in **Alternatives 2** would remain in effect beyond 2010 until modified. It is anticipated that as the stock rebuilds, the size of the closed area would be decreased and harvest of red snapper would gradually be increased. This determination would be based on results from stock assessment updates conducted by SEDAR. Fishing mortality in 2007 (F_{CURR}) is estimated at 0.797. The proxies for F_{MSY} being considered by the Council are estimated at 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 76% reduction in total kill is needed to end overfishing and rebuild the fishery within 35 years when $F_{30\%SPR}$ with very high recruitment.

Table 2-16a. Projected reductions in red snapper landings following implementation of various alternatives proposed in Amendment 17A.
Various scenarios illustrate sensitivity of projection model to input parameters (Appendix E: Table 3 from SERO-LAPP-2009-07 Rev).

Alternative	Closed Cells	Closed Depths	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
2	None	None	29%	39%	52%	55%	60%	60%	60%
3A	2880, 2980, 3080, 3180	All	72%	72%	83%	83%	87%	89%	90%
3B	2880, 2980, 3080, 3180	66-240 ft	69%	70%	81%	81%	85%	87%	88%
3C	2880, 2980, 3080, 3180	98-240 ft	63%	65%	76%	77%	81%	83%	84%
3D	2880, 2980, 3080, 3180	98-300 ft	63%	66%	76%	77%	81%	83%	84%
3E	2880,2980,3080	98-240 ft	60%	63%	74%	75%	79%	80%	81%
4A	2880, 2980, 3080, 3180, 3179, 3278, 3279	All	76%	77%	86%	86%	89%	91%	93%
4B	2880, 2980, 3080, 3180, 3179, 3278, 3279	66-240 ft	73%	74%	83%	84%	87%	89%	91%
4C	2880, 2980, 3080, 3180, 3179, 3278, 3279	98-240 ft	66%	69%	78%	80%	83%	85%	86%
4D	2880, 2980, 3080, 3180, 3179, 3278, 3279	98-300 ft	67%	69%	79%	80%	83%	85%	86%

Scenario 1: No impacts A13C, A16; A17A eliminates targeted trips only; 80% compliance; 60%/60% offshore release mortality; 20%/20% inshore release mortality.

Scenario 2: No impacts A13C, A16; A17A eliminates targeted trips only; 80% compliance; 40%/90% offshore release mortality, 40%/90% inshore release mortality.

Scenario 3: No impacts A13C, A16; A17A eliminates targeted trips only; 85% compliance; 40%/40% offshore release mortality, 20%/20% inshore release mortality.

Scenario 4: Directed and targeted trips eliminated by A13C, A16, A17A; 85% compliance; 40%/90% offshore release mortality; 20%/20% inshore release mortality.

Scenario 5: Directed and targeted trips eliminated by A13C, A16, A17A; 87% compliance; 40%/40% offshore release mortality; 20%/20% inshore release mortality.

Scenario 6: Directed and targeted trips eliminated by A13C, A16, A17A; 95% compliance; 40%/40% offshore release mortality; 20%/20% inshore release mortality.

Scenario 7: Directed and targeted trips eliminated by A13C, A16, A17A; 100% compliance; 40%/40% offshore release mortality; 20%/20% inshore release mortality.

Alternative 3A prescribes a general closure of the red snapper fishery, or approximately 14,496 mi^2 of the South Atlantic EEZ, and a complete closure of the four logbook grids partially closed in **Alternative 3C** (Figure 4-12). Various analysis scenarios for **Alternative 3A** are generally the same as for **Alternative 3C** and **3E (Preferred).** Under **Alternative 3A**, the estimated reduction in total removals is estimated to range from 72% to 90% depending on assumptions such as effects of previous management measures and release mortality (**Appendix E**).

Alternative 3B would close approximately 10,794 mi^2 to fishing for, harvest, and possession of snapper grouper species. Snapper grouper fishing would be prohibited in four consecutive logbook grids between the depths of 66 feet (20 m) and 240 feet (73 m). **Alternative 3B** includes a slightly larger closed area than **Alternative 3C**, **3D,** and **3E (Preferred)**, and included more inshore area when compared to **Alternatives 3C**, **3D, and 3E (Preferred)**. Under **Alternative 3B**, estimated reductions in red snapper removals ranges from 69% to 88%. The area closure included in **Alternative 3B** would be more biologically beneficial than **Alternatives 3C, 3D,** or **3E,** which would be expected to reduce red snapper removals by 60% to 81%. Under **Alternative 3B** the stock could potentially rebuild faster than **Alternatives 3C**, **3D**, and **3E**, but not as quickly as it would under **Alternatives 3A**, **4A**, or **4B**.

Alternative 3C would close the red snapper fishery and four logbook grids (2880, 2980, 3080, 3180), or 6,161 mi^2 (15,022 km^2) of the EEZ, between depths of 98 feet (16 fathoms; 30 m) and 240 feet (40 fathoms, 73 m) to harvest, possession, and retention of all species in the snapper grouper fisher management unit (Figure 4-12). **Alternative 3D** is very similar to **Alternative 3C** in that it closes logbook grids 2880, 2980, 3080, and 3180 beginning at a depth of 98 feet (30 m). The area closure in **Alternative 3D**, however, extends to a depth of 300 feet (91 m), whereas, the area closure in **Alternatives 3C,** and **3E (Preferred)** extend to 240 feet (73 m). Since **Alternatives 3C,** and **3E (Preferred)** do not extend as far east as **Alternative 3D**, there may some socioeconomic benefits of **Alternatives 3C,** and **3E (Preferred)** over **Alternative 3D**. Additionally, Amendment 17B contains an action that would close federal waters to harvest of deepwater snapper grouper species beyond a depth of 240 feet (73 m), creating regulatory redundancy in the deepest part of the **Alternative 3D** closure.

The reduction in total removals from the scenarios examined for **Alternative 4A** range from 76% to 93%. This alternative would establish the year-round closure of seven logbook grids (2880, 2980, 3080, 3179, 3180, 3278, 3279), or 25,900 mi^2 (67,081 km^2) of the EEZ, and therefore includes the most extensive closure of harvest areas. As a result, it is the least sensitive to variations in assumptions. In fact, all but two of the scenarios considered for this alternative achieve a harvest reduction of at least 86%.

Alternative 4B would close a 15,100 mi^2 (39,109 km^2) area to all snapper grouper fishing in the logbook grids 2880, 2980, 3080, 3791, 3180, 3278, and 3279 between 66 feet (20 m) and 240 feet (73 m). This area is smaller than that under **Alternative 4A**, but larger than the closures included in Alternatives **3A**, **3B**, **3C, 3D**, **3E**, **4C**, and **4D**. Red snapper harvest reductions under **Alternative 4B** could be expected to range from 73% to 91%. The only alternatives that could realistically result in a greater reductions in total removals are **Alternatives 3A** and **Alternative 4A**, which close four and seven total logbook grids respectively.

Alternative 4C 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 9,300 mi^2 (24,087 km^2) 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, the reduction in total kill in the different scenarios examined in **Appendix E** would range from 66% to 86%.

Alternative 4D is similar to **Alternative 4C** except that in addition to a closure of the red snapper fishery and the year□round closure of seven logbook grids (2880, 2980, 3080, 3179, 3180, 3278, 3279), the closure would be between depths of 98 and 300 feet rather than 98 to 240 feet. Under this regulatory option, the reduction in total kill in the different scenarios examined in **Appendix E** would range from 67% to 86%. There is little difference between the magnitude in total removals under **Alternatives 4C** and **4D**, primarily because there is minimal additional area closed by extending the eastern boundary of the closure from 240 feet out to 300 feet.

Under **Alternative 5 (Preferred)**, sea bass pots could be used to target snapper-grouper species within the proposed closed areas. 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 2-4** without negatively affecting the harvest reductions needed to end overfishing of red snapper. Table 4-23 reveals that on trips that fished sea bass pots, black sea bass made up over 90% of the catch by weight. Red snapper are rarely taken in 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 an area closure without impeding efforts to end overfishing of red snapper. Among **Alternatives 2-4**, **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.

Alternative 6 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 2-4**. 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 are common over sandy or muddy bottom habitat (Allen 1985) in much shallower water (generally less than 240 ft (73 m)). The difference in preferred habitat and depth 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 socioeconomic impact expected as a result of an area closure. Although the Council felt that there would little chance that fishermen targeting golden tilefish would impact red snapper stocks, the Council did not select **Alternative 6** as a preferred alternative because the preferred closure **Alternative 4D** would extend to a depth of 300 feet and bottom longline gear is already restricted to depths greater than 300 feet.

Alternative 7 (Preferred) 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.

Allowing transit with snapper grouper and or wreckfish on board (**Sub-Alternatives 8a (Preferred), 8b**, and **8c**)) 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.

Alternatives 4A, 4B, 4C, and **Alternative 4D** would prohibit the harvest of all species in the snapper grouper management unit off portions of South Carolina in addition to Georgia and northeast Florida. Therefore, these alternatives are expected to generate greater commercial losses than **Alternatives 3A-3E**. Simulation results suggest that the commercial losses are 2.5 larger for **Alternatives 4A-4D** than **Alternatives 3A-3E** (assuming all are combined with **Alternatives 5 (Preferred)** and **7 (Preferred)**). **Alternative 4A** in combination with **Alternatives 5 (Preferred)** and **7 (Preferred)** would prohibit harvests in all depths (except for the use of black sea bass pots and spearfishing) and is expected to reduce net operating revenues by approximately $1,235,000 (13.7%). The commercial impacts from the combination of **Alternatives 4B** (which prohibits fishing in 66-240 feet), **Alternatives 5 (Preferred),** and **7 (Preferred)** would be slightly lower with losses of $1,125,000 or 12.5%. The combination of **Alternative 4C** (prohibits harvest between 90-240 feet), **5 (Preferred)**, and **7 (Preferred)** result in even lower at losses of $1,081,000 (12%). **Alternative 4D** (prohibits fishing between 98 and 300 feet), in combination with **Alternative 5 (Preferred)**, and **7 (Preferred)** produces losses slightly higher at $1,095,000 (12.1%).

Including the exemptions for black sea bass and spearfishing gear, the predicted reductions in net operating revenues for commercial fishermen in northeast Florida and Georgia are expected to average approximately $693,000 (70.3%) for **Alternatives 4A** and **4B** and $690,000 (70%) for **Alternatives 4C** and **4D.** Losses to South Carolina fishermen from **Alternatives 4A-4D** including mitigating effects of exemptions for black sea bass pots and spearfishing gear, range from $531,000 (34.5%) for **Alternative 4A** to $456,000 (29.6%) for **Alternative 4C**. **Alternative 4D** resulting losses of $463,000 (30%) in combination with **Alternatives 5 (Preferred)** and **7 (Preferred)**.

The magnitude of economic effects on the recreational sector of the various alternatives directly correlates with the size of area closures. **Alternative 4A** would close all depths within each of the seven statistical grids; hence, it would result in the largest economic effects among the four alternatives. The second largest economic effects would result from **Alternative 4B**, which would close depths from 66 feet to 240 feet. **Alternative 4C**, which would close depths from 98 feet to 240 feet, would result in the lowest economic effects; and, **Alternative 4D**, which would close depths from 98 feet to 300 feet, would have the third largest economic effects on the recreational sector. An in-depth analysis of the impacts of red snapper management measures alternatives may be found in **Section 4.3** of this document.

2.4 Require the use of Circle Hooks

Alternative 1 (No Action). Do not require the use of circle hooks when using hook and line gear for snapper grouper species within any particular area of the South Atlantic EEZ when fishing for snapper grouper species.

Alternative 2 (Preferred). Require the use of non-stainless steel circle hooks when fishing for snapper grouper species with hook and line gear north of 28 degrees. It is unlawful to possess snapper grouper species without possessing non-stainless steel circle hooks. Apply to the use of natural baits only.

Alternative 3. Require the use of non-stainless steel circle hooks when fishing for snapper grouper species with hook and line gear within the South Atlantic EEZ. It is unlawful to possess snapper grouper species without possessing non-stainless steel circle hooks. Apply to the use of natural baits only.

2.4.1 Comparison of Alternatives

Table 2-17. Summary of effects of requiring the use of circle hooks alternatives.

Alternatives	Biological Effects	Socioeconomic/Administrative Effects
Alternative 1 (No Action)	(-) There would be no reduction in bycatch mortality from a required use of circle hooks.	(+) Fishery participants would not be required to purchase new hooks.
Alternative 2 (Preferred). Circle hooks required north of 28 degrees latitude.	(+) May reduce bycatch mortality of incidentally caught red snapper and other non-target species.	(+-) Would not be as likely to reduce harvest of species south of 28 degrees lat. while still reducing bycatch mortality north of 28 degrees. Some cost would be associated with the purchase of the specified hooks.
Alternative 3. Circle hooks required in the entire EEZ.	(+) May reduce bycatch mortality of incidentally caught red snapper and other non-target species. May also reduce harvest of some target species south of 28 degrees latitude.	(-) May reduce harvest of other target species, and some cost would be associated with the purchase of the specified hooks.

(-) overall negative impacts, (+) overall positive impacts, (- +) neutral impacts

Alternative 2 (Preferred) would require the use of non-stainless steel circle hooks within the area north of 28^{o}N; whereas, **Alternative 3** would require the use of non-stainless steel circle hooks within the South Atlantic exclusive economic zone. 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 are limited to a handful of snapper grouper species. Some studies indicate beneficial effects can be gained to species while others are inconclusive. Due to limited data, it may not be 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. In general, 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.

The mandatory use of circle hooks was considered in Amendment 16 (SAFMC 2008) but removed after the amendment was reviewed by the Council's Scientific and Statistical Committee (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 undergoing 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. An in-depth analysis of the impacts of the circle hook alternatives may be found in **Section 4.4** of this document.

2.5 Red Snapper Monitoring Program

Alternative 1 (No Action). 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 (MARMAP), and the Southeast 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 (Preferred). Establish a fishery-independent monitoring program to track progress of red snapper rebuilding. Sampling would include deployment of gear such as chevron traps, cameras, and hook and line at randomly selected stations in a manner determined by the Southeast Fisheries Science Center in consultation with the South Atlantic Fishery Management Council.

Alternative 3. Establish a red snapper fishery-dependent monitoring program 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 would depend on the number of selected vessels, available quota, and objectives of the research fishery.

2.5.1 Comparison of Alternatives

Table 2-18. Summary of effects of red snapper monitoring plan alternatives.

Alternatives	Biological Effects	Socioeconomic/Administrative Effects
Alternative 1 (No Action)	(-) Traditional fishery dependent data would not be collected for red snapper in the EEZ or other snapper grouper species within a proposed closed area.	(-) It would be more difficult to know when it is appropriate to re-open the red snapper fishery and/or remove or reduce a proposed closed area. This could lead to negative socioeconomic impacts in the long-term.
Alternative 2 (Preferred). Fishery independent sampling program	(+) A fishery independent monitoring program would track rebuilding progress of red snapper through the rebuilding period.	(+-) Would require increased funding and program planning, but may benefit fishery participants in the long-term when data shows harvest may be increased.
Alternative 3. Fishery dependent monitoring program	(+) A fishery dependent monitoring program would track rebuilding progress of red snapper through the rebuilding period. 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.	(+-) Would require increased funding and program planning, but may benefit fishery participants in the long-term when data shows harvest may be increased.

(-) overall negative impacts, (+) overall positive impacts, (- +) neutral impacts

Alternative 1 (No Action) 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 Southeast Data Assessment and Review (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 (Preferred) would utilize fishery-independent sampling to collect data to monitor stock status of red snapper. It is possible that with additional funding, Marine Resources Monitoring Assessment and Prediction (MARMAP) program or a new program could be established to accomplish the task.

For over thirty years, the Marine Resources Research Institute 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 (Preferred)**, 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 (Preferred)**, 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 could 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 could be used to collect information on red snapper. Following MARMAP design, this sampling could consist of rods utilizing Electromate motors powered 6/0 Penn Senator reels and 36 kg test monofilament line. Every effort would be made to minimize handling time and release red snapper and other snapper grouper species alive. Dead specimens could be retained for life history studies. 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 sampling design including type of gear used, location of sampling, and number of samples to be collected would be determined by the Southeast Fisheries Science Center (SEFSC). Additional details on potential design of a fishery-independent program are provided in **Appendix V**. **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 catch per unit effort 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 and charterboat trips could 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. 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. An in-depth analysis of the impacts of red snapper monitoring program alternatives may be found in **Section 4.5** of this document.

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 Southeast Marine Assessment and Prediction 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, 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 Council cooperatively generated additional information on managed species' use of offshore fish habitat. Plots of the spatial distribution of offshore species were generated from Marine Resources Monitoring Assessment and Prediction (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 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 Service, 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, Georgia, and South Carolina 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. 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. Section 3.2.1 provides descriptions of red snapper and the seven species that most commonly occur with red snapper, as well as golden tilefish and snowy grouper.

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 feet) (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.

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) Total Length (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 feet) 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 hermaphrodites, 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 Schleider (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) total length (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 (Godcharles and Bullock 1984).

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 feet). Fishermen off North Carolina commonly catch red grouper at depths of 27-76 m (88-249 feet) for an average of 34 m (111 feet). Fishermen off southeastern Florida also catch red grouper in depths ranging from 27-76 m (88-249 feet) 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 feet) 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) total length (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 27 years has been reported for red grouper in the Gulf of Mexico (Lombardi-Carlson et al. 2008). 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 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, ledges, live-bottom, 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 feet). 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), was 60.0 cm (23.8 inches) TL and 3.2 kg (7.1 pounds). 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/year, with a range of 0.2-0.3/year.

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 inches) (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 inches) fork length (FL) and the smallest male was 17.9 cm (7.1 inches) 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 inches) total length (TL) and age 1. All females collected after 1988 were mature at 18.0 cm (7.1 inches) 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 inches) SL) vermilion snapper off the

Southeastern United States. Larger decapods, fishes, and cephalopods are more important in the diet of larger vermilion snapper.

3.2.1.5 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 feet). 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 inches) total length (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 inches) TL and 30 kg (66 lbs), and 27 years old (Heemstra and Randall 1993). The maximum age reported by Wyanski et al. (2000) was 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 inches) TL and 5 years of age. The smallest mature female was 46.9 cm (18.5 inches) TL, and the largest immature female was 57.5 cm (22.6 inches) 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 feet) off South Carolina. Adults feed on fishes, gastropods, cephalopods, and crustaceans (Heemstra and Randall 1993).

3.2.1.6 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 m (263-1,772 feet). Robins and Ray (1986) report a depth range of 82-275 m (270-900 feet) for golden tilefish. It is most commonly found at about 200 m (656 feet), usually over mud or sand bottom but, occasionally, over rough bottom (Dooley 1978).

Maximum reported size is 125 cm (50 inches) total length and 30 kilograms (66 pounds) (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). The 2004 Southeast Data

Assessment and Review estimate of natural mortality is 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).

3.2.1.7 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 feet). 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). Maximum reported size is 190 cm (75 inches) and 80.6 kg (178 pounds) (Paxton et al. 1989). Size at maturity and age at first maturity is estimated as 79 cm (31 inches) 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, 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).

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 feet). It also inhabits bays, harbors, and lagoons, and juveniles drift at the surface with *Sargassum*.

Maximum reported size is 60 cm (23.76 inches) total length (TL) (male/unsexed) and 6.2 kg (14 pounds; 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. 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 feet). 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 (40 inches) total length (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 natural mortality (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 inches) fork length. 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 inches) 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, black grouper, and red grouper has been recently assessed through the Southeast Data, Assessment, and Review (SEDAR) process.
The Southeast Data Assessment and Review (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, 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 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 **Appendix Q** 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 Southeast Data Assessment and Review (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 2006).

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 Marine Recreational Fisheries Statistic 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. The Council took measures to end overfishing in Amendment 16, which was implemented in July 2009.

3.3.2 Vermilion Snapper assessment and stock status

SEDAR assessment

A Southeast Data Assessment and Review (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, the Council's Snapper Grouper Advisory Panel and Scientific and Statistical Committee 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 Marine Resources Monitoring Assessment and Prediction (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 FMAX 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=FMAX; F=85%FMAX; F=75%FMAX; and F=65%FMAX. The results of each were very similar.

Recognizing the need for a new benchmark assessment, NOAA Fisheries Service 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. A new age based assessment for vermilion snapper was completed in 2008 (SEDAR 17 2008). Three different model structures were applied: a statistical catch-at-age model; stock reduction analysis; and a surplus production model. In addition, catch curve analysis was used to examine mortality. The primary model was a statistical catch-at-age model implemented with the AD Model Builder software.

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 did not have confidence in the fishing mortality rate estimates from the 2006 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.

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 was reviewed by the Council's Scientific and Statistical Committee (SSC) during their November 30 – December 2, 2008 meeting.

SEDAR 17 (2008) confirmed that the stock is experiencing overfishing but indicated the stock is not overfished. The base run of the catch-at-age model estimated the current stock status to be: SSB_{2007}/SSB_{MSY} = 0.86 and SSB_{2007}/MSST = 1.10, both indicating the stock is not overfished. It estimated the current fishery status in 2007 to be: F_{2007}/F_{MSY} = 1.27, indicating the stock was subject to overfishing in 2007.

3.3.3 Black sea bass assessment and stock status

SEDAR assessment

Black sea bass was assessed at the second Southeast Data Assessment and Review (SEDAR) assessment (SEDAR 2 2003). 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 2003).

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. An update assessment is scheduled for 2010.

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 inch total length 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 NOAA Fisheries Service 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 Scientific and Statistical Committee 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 Marine Recreational Stastical 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 **Appendix L** and **Section 4** and is hereby incorporated by reference. A new benchmark assessment is being conducted for red snapper via SEDAR 24 and will be completed in late 2010.

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. Assessments were recently completed for red grouper and black grouper in SEDAR 19 (2010). Red grouper were determined to be overfished and experiencing overfishing while black grouper was determined to be not overfished and not experiencing overfishing. 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 exclusive economic zone of the South Atlantic region. All 31 species are protected under the Marine Mammal Protection Act and six are also listed as endangered under the Endangered Species Act (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 contained ctenophores and pelagic snails (Frick 1976, Hughes 1974). At approximately 20 to 25 cm carapace length, juvenile green sea turtles 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 feet) (Walker 1994). The time of these dives also varies by life stage. The maximum dive length is estimated at 66 minutes with most dives lasting from 9 to 23 minutes (Walker 1994).

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

Kemp's ridley hatchlings are also pelagic during the early stages of life and feed in surface waters (Carr 1987, Ogren 1989). Once the juveniles reach approximately 20 cm carapace length they move to relatively shallow (less than 50 m) benthic foraging habitat over unconsolidated substrates (Márquez-M. 1994). They have also been observed transiting long distances between foraging habitats (Ogren 1989). Kemp's ridleys feeding in these nearshore areas primarily prey on crabs, though they are also known to ingest mollusks, fish, marine vegetation, and shrimp

(Shaver 1991). The fish and shrimp Kemp's ridleys ingest are not thought to be a primary prey item but instead may be scavenged opportunistically from bycatch discards or from discarded bait (Shaver 1991). Given their predilection for shallower water, Kemp's ridleys most routinely make dives of 50 m or less (Soma 1985, Byles 1988). Their maximum diving range is unknown. Depending on the life stage 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 Endangered Species Act-listed sea turtles and spend most of their time in the open ocean. Although they will enter coastal waters and are seen over the continental shelf on a seasonal basis to feed in areas where jellyfish are concentrated. Leatherbacks feed primarily on cnidarians (medusae, siphonophores) and tunicates. Unlike other sea turtles, leatherbacks' diets do not shift during their life cycles. Because leatherbacks' ability to capture and eat jellyfish is not constrained by size or age, they continue to feed on these species regardless of life stage (Bjorndal 1997). Leatherbacks are the deepest diving of all sea turtles. It is estimated that these species can dive in excess of 1,000 m (Eckert et al. 1989) but more frequently dive to depths of 50 m to 84 m (Eckert et al. 1986). Dive times range from a maximum of 37 minutes to more routines dives of 4 to 14.5 minutes (Standora et al. 1984, Eckert et al. 1986, Eckert et al. 1989, Keinath and Musick 1993). Leatherbacks may spend 74% to 91% of their time submerged (Standora et al. 1984).

Loggerhead hatchlings forage in the open ocean and are often associated with *Sargassum* rafts (Hughes 1974, Carr 1987, Walker 1994, Bolten and Balazs 1995). The pelagic stage of these sea turtles are known to eat a wide range of organisms including salps, jellyfish, amphipods, crabs, syngnathid fish, squid, and pelagic snails (Brongersma 1972). Stranding records indicate that when pelagic immature loggerheads reach 40-60 cm straight-line carapace length they begin to live in coastal inshore and nearshore waters of the continental shelf throughout the U.S. Atlantic (Witzell 2002). Here they forage over hard- and soft-bottom habitats (Carr 1986). Benthic foraging loggerheads eat a variety of invertebrates with crabs and mollusks being an important prey source (Burke et al. 1993). Estimates of the maximum diving depths of loggerheads range from 211 m to 233 m (692-764ft.) (Thayer et al. 1984, Limpus and Nichols 1988). The lengths of loggerhead dives are frequently between 17 and 30 minutes (Thayer et al. 1984, Limpus and Nichols 1988, 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 less than1 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 through snapper grouper amendment 15B (74 FR 58902; November 16, 2009) 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 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 (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. 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 an 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 ASMFC 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 Fishery and Conservation 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. Historically, the majority of the bandit fleet fished 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. Recently, Snapper Grouper FMP Amendment 16 implemented a closed season from January through April for shallow water groupers and a commercial quota for vermilion snapper that could result in closures if the spring and/or fall sub-quotas are filled. Most fluctuations in fishing effort during the open seasons 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

The NOAA Fisheries southeast logbook database is used to analyze commercial fishing behavior at the boat and trip level (Table 3-3). 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 3-3). 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. Based on logbook data during these five years, the comparable annual average 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). Note that adding what was not reported in the logbooks (ALS data, see footnote 1), landings may have been 861,000 pounds and $569,000 higher in 2003-2007.

Estimates of the economic impacts of the commercial snapper grouper fishery are derived using the model developed for and applied in NMFS (2009c). Based on the average annual ex-vessel revenues for all snapper grouper species over the period 2003-2007 of $13.8 million (2007 dollars), the commercial snapper grouper fishery is estimated to support 2,679 full time equivalent (FTE) jobs and generate approximately $182 million in output (sales) impacts and approximately $77 million in income impacts per year to the U.S. economy. Among the jobs supported, 350 FTE jobs are estimated to be in the harvesting sector and 213 FTE jobs are in the dealer/processor sector. Approximately two-thirds of the jobs supported by the commercial snapper grouper fishery are estimated to accrue to the restaurant sector. The estimates of economic activity include the direct effects (effects in the sector where an expenditure is actually made), indirect effects (effects in sectors providing goods and services to directly affected sectors), and induced effects (effects induced by the personal consumption expenditures of employees in the direct and indirectly affected sectors).

Vessels that harvested snapper grouper species also harvested other species, on the trips where snapper grouper were harvested as well as on other trips on which no snapper grouper were harvested. All revenues from all species on all these trips contributed towards making these vessels economically viable and contributed to the economic activity associated with these vessels. The average annual total ex-vessel revenues from all species (including snapper grouper) harvested during this period (2003-2007) by vessels that harvested snapper grouper species was approximately $22.8 million (2007 dollars). The economic activity associated with these revenues is estimated to support 4,426 FTE jobs (578 in the harvesting sector and 352 in the dealer/processor sector) and generate approximately $300 million in output (sales) impacts and approximately $128 million in income impacts.

For the individual species addressed by this amendment, vermilion snapper generated the largest average annual ex-vessel revenues, approximately $2.5 million (2007 dollars) per year from 2003-2007, followed by gag at approximately $1.8 million (2007 dollars). The economic activity associated with these two species is estimated to support 485 FTE jobs (63 in the harvest sector and 39 in the dealer/processor sector) and 352 FTE jobs (46 in the harvest sector and 28 in the dealer/processor sector), respectively. The vermilion snapper revenues are estimated to generate approximately $33 million in output (sales) impacts and $14 million in income impacts, while the gag revenues are estimated to generate approximately $24 million and $10 million in economic output (sales) and income impacts, respectively. All harvests by the respective vessels that harvest these species support approximately 2,000 FTE jobs (260 in the harvest sector and 158 in the dealer/processor sector), and approximately $135 million in output (sales) impacts and approximately $58 million in income impacts, each. It should be noted, however, that the estimates for the economic activity associated with the harvest of all species by vessels that harvest either vermilion snapper or gag are not additive because some, if not many, of these individual vessels likely harvest both species.

Figure 3-1. Commercial landings & revenue, snapper -grouper

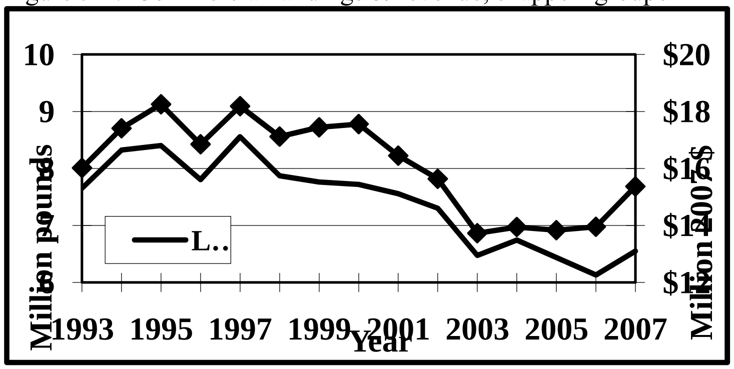


Figure 3-2. Days at sea and trips, snapper grouper

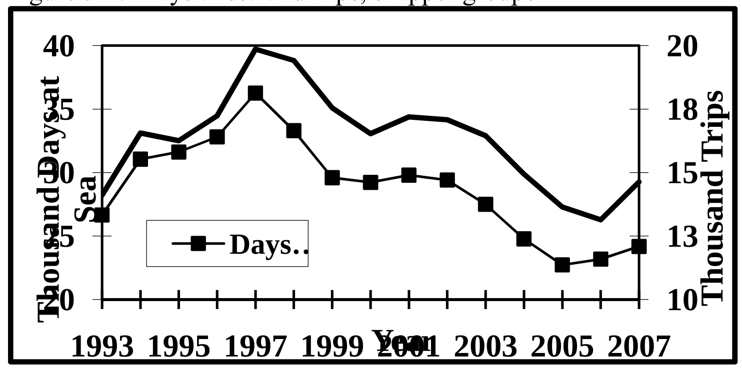


Figure 3-3. Boats and trips, snapper grouper

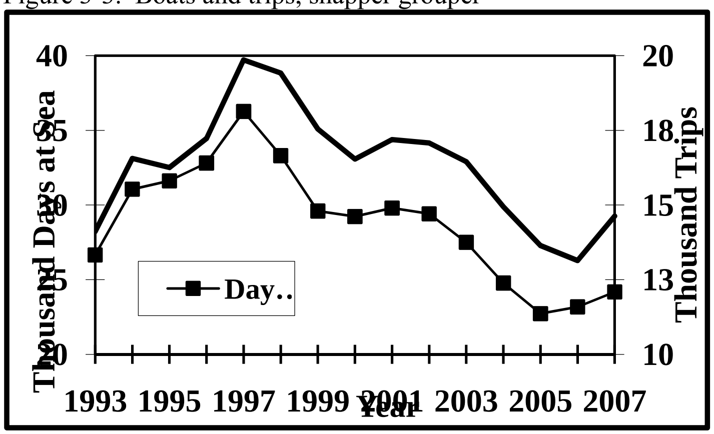
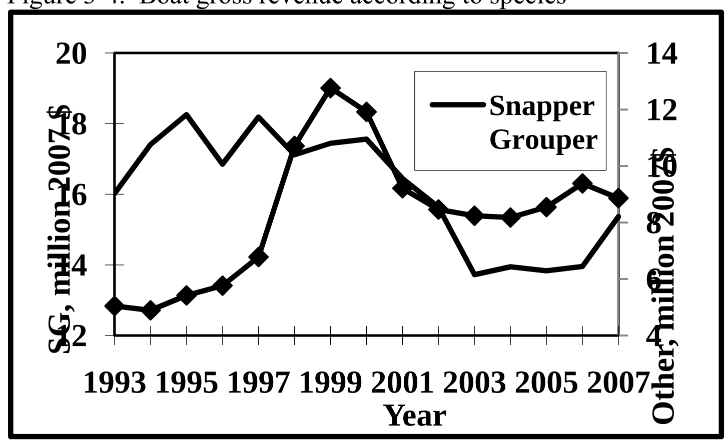


Figure 3-4. Boat gross revenue according to species



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 28% from a high of 8.6 million pounds in 1997 to 6.1 million pounds in 2006, while effort declined by a third (Figures 3-1 to 3-3). The number of boats fell from a high of 1,301 in 1998 to 857 in 2005. Days at sea fell 37% from 36,264 to 22,794 between 1997 and 2005, while trips fell 34% from 19,860 to 13,138 (in 2006).

Counting all of their trips, the boats typically landed more snapper grouper than other species in terms of dollar value. The revenue from species other than snapper grouper rose between 1993 and 1999, peaking at $12.8 million (Figure 3-4). Total boat revenue peaked at $30.2 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 spp, same trips, 1,000 lbs	2,092	1,651	1,751	2,116	2,122	1,946
Other spp, same trips, 1,000 2007 $	$2,149	$2,001	$2,225	$2,394	$2,738	$2,301
Boat rev, all spp/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 877 in 2007, 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 718 in 2007. 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 more than doubled between 2003 and 2007 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).[1] On average, 493 of the 890 boats landed at least 1,000 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.

[1] 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 quantities of lower valued 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 (quantities 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 spp, 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 spp	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. Black 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 gear combined. The all-other-gear category includes trolling lines, nets, and other gear. 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. 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, 0.22 million pounds with dive gear, 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 spp, 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

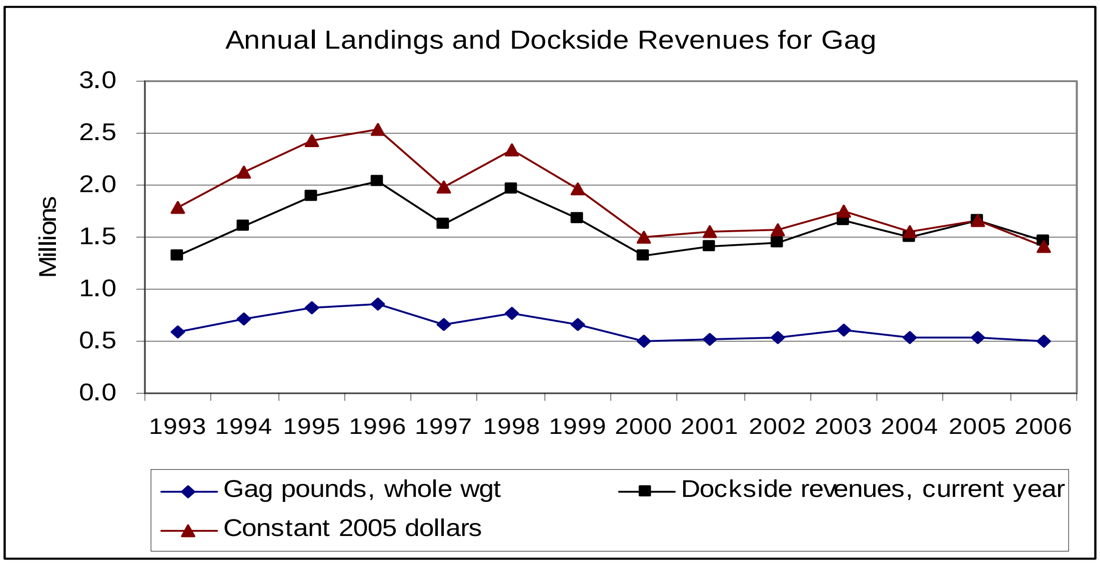
Source: Same as first table, this section.

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.

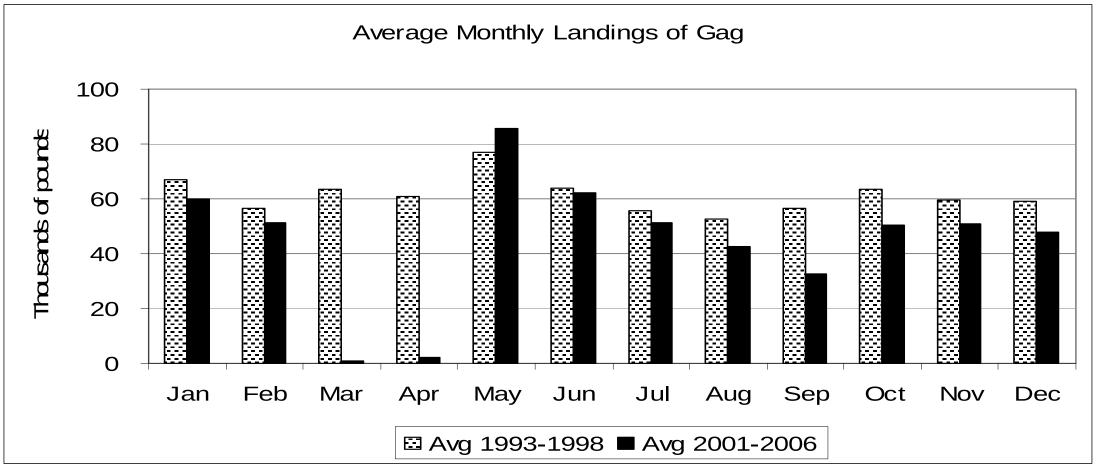
The time series for gag is defined by regulatory periods, with landings between 1993 and 1998 usually exceeding landings between 2001 and 2006. Between 1992 and 1998, the fishery for gag was regulated with a 20-inch total length (TL) minimum size limit. Beginning in 1999, the size limit was increased to 24 inches TL 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 landings 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 boats landed 101 to 5,000 pounds, and 36 boats 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 spp, same trips, thousand lbs	2,576	2,509	2,584	2,363	2,819	2,570
All spp, same trips, 1,000 2007 $	$5,898	$5,482	$5,845	$5,629	$7,154	$6,001
Boat rev, all spp/trips, 1,000 2007$	$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). The trips on which gag was the primary source of revenue accounted for approximately 71% (391,000 pounds) of the total commercial harvest of gag 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 gag 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 spp, same trips, 1,000 lbs	505	482	432	418	512	470
Other spp, 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 spp, same trips, 1,000 lbs	1,472	1,496	1,611	1,449	1,701	1,546
Other spp, 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

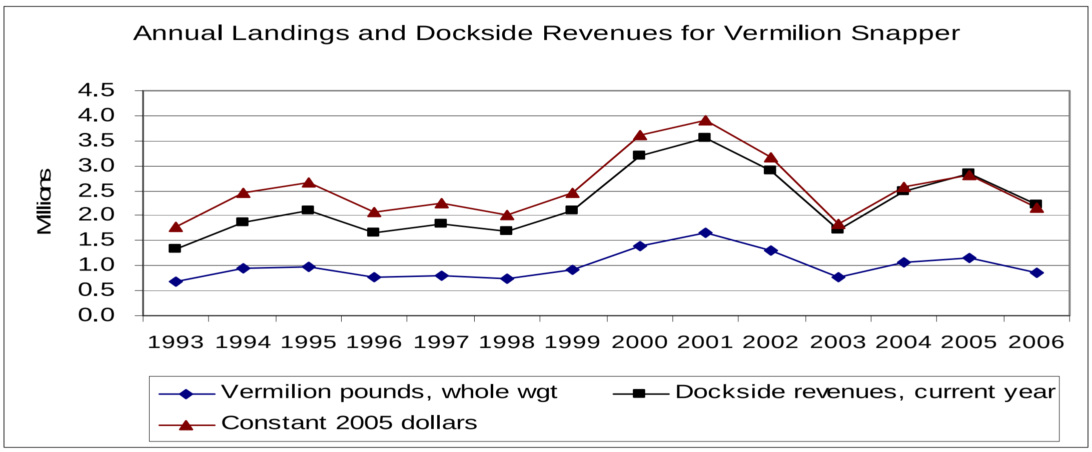
Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of September 22, 2008.

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.

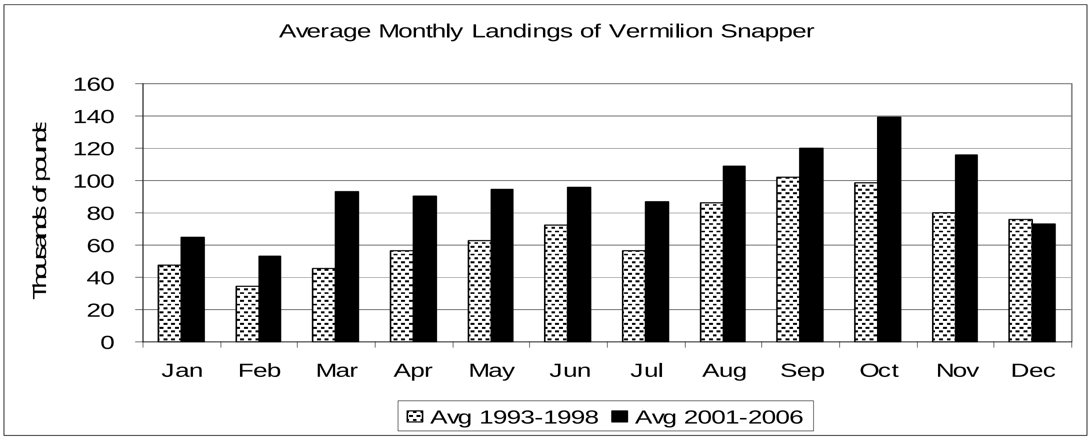
Vermilion snapper are landed throughout the year, with peak months from August through November (Figure 3-8). Average monthly landings were higher for all months except December during 2001-2006 compared with 1993-1998. The greatest relative monthly increases in average landings between the two periods occurred during March and April, which could reflect a shift in fishing effort from gag to vermilion in response to the closed season for gag 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 in 2007 dollars (Table 3-12). An average of 2,230 trips landed one or more pounds of vermilion snapper and landed 3.2 million pounds of all species worth $7.2 million (2007 dollars; 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 spp/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 that landed at least one pound of vermilion snapper came to $10.2 million for all species and all trips, including trips by these boats that did not land vermilion snapper. 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 for vermilion snapper: 824,000 pounds at $2.1 million (Table 3-13). On these trips, other species accounted for 850,000 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 spp, 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.[2] The fishery continued at relatively low levels until after World War II. Landings jumped to approximately 250,000 pounds in 1945. By 1950, they had reached 363,000 pounds. Then, they fluctuated along a generally increasing trend through 1968, peaking at 974,000 pounds and declining to less than 100,000 pounds in 2006 (Figure 3-9). Fishermen along the east coast of Florida dominated the commercial fishery until the mid-1970s (Figure 3-9). By the late 1970s, the fishery had expanded into Georgia, South Carolina and North Carolina, and it declined in Florida. In 1993-2007, logbook-reported commercial landings of red snapper ranged from 202,000 pounds (whole

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

Figure 3-9. Commercial landings of red snapper

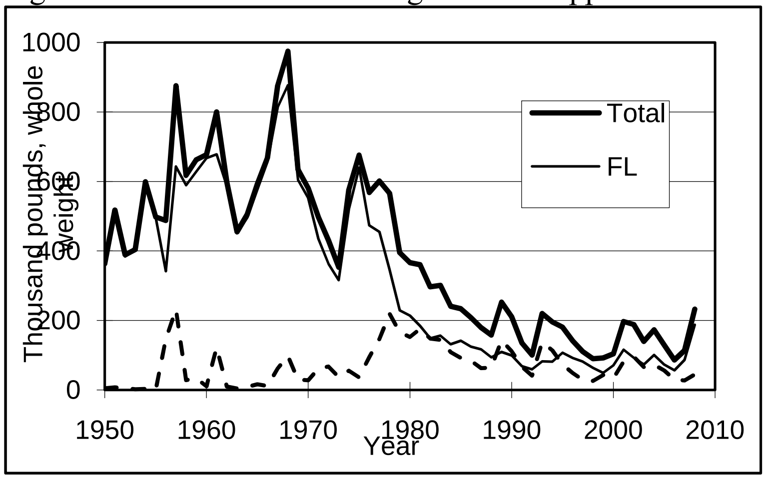


Figure 3-10. Annual landings & revenue, red snapper, 1993-2007

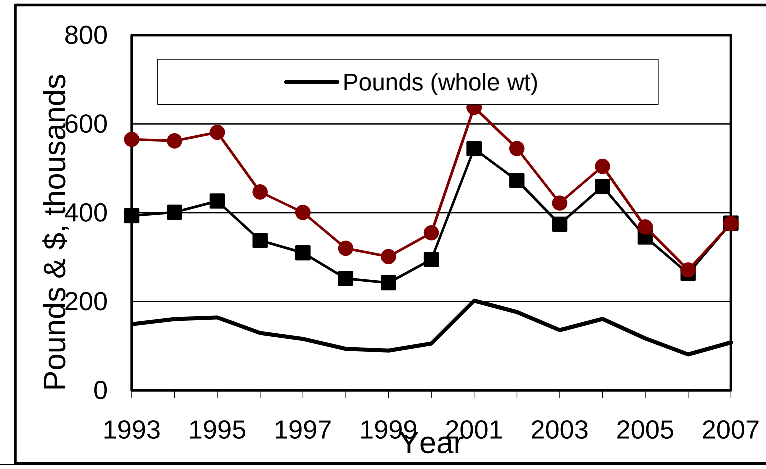


Figure 3-11. Average annual dockside prices, red snapper

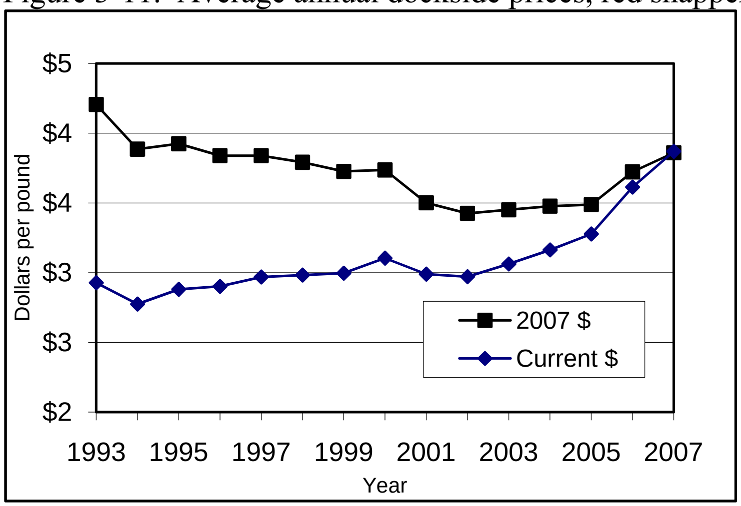
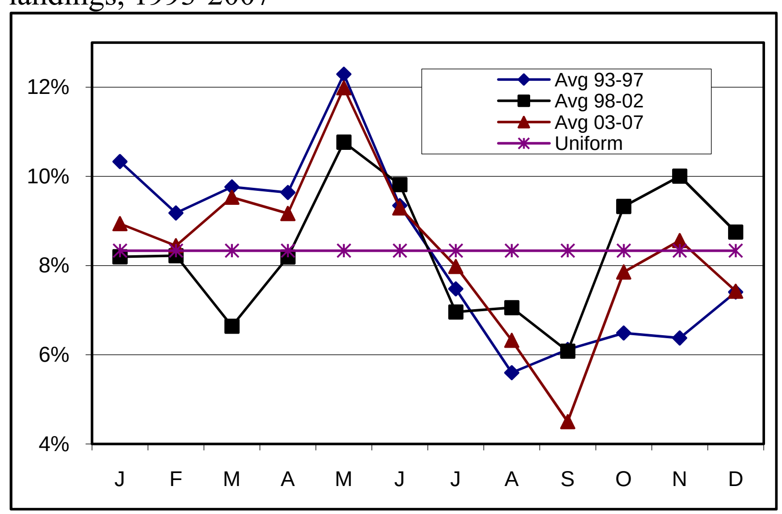


Figure 3-12. Monthly distribution of annual red snapper landings, 1993-2007



weight) worth approximately $544,000 in current year dollars in 2001 to 81,000 pounds worth $263,000 in 2006 (Figure 3-10). 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 regulations successfully increase biomass and landings. Average annual dockside prices for red snapper increased steadily in current year dollars (Figure 3-11). However, prices in 2007 dollars declined through 2002 before increasing in 2006 and 2007.

Although the seasonal distribution of landings varied during 1993-2007, landings tend to be highest in May and lowest in September (Figure 3-12). During the 5-year period from 2003-2007, landings were above average from March through June, below average in August and September, and about average between October and February when compared to a uniform distribution of landings throughout the year.

According to the NMFS logbook database, on average in 2003-2007, 1,385 trips a year landed 121,000 pounds of red snapper worth $388,000 in 2007 dollars, and 2.0 million pounds of other species worth $4.5 on trips with at least one pound of red snapper (Table 3-16). Clearly, red snapper was not the primary revenue species on most of these trips. Boat revenue for all species and trips came to $9.8 million, with 4% for red snapper. Among the 220 boats that landed at least one pound of red snapper, 102 boats landed less than 100 pounds of red snapper per year, 84 boats landed 101-1000 pounds, and 34 boats landed more than 1000 pounds.

Table 3-16. Annual landings, dockside revenues and fishing effort, trips and boats with landings of at least one pound of red snapper, 2003-2007 (landings in whole weight).

Item	2003	2004	2005	2006	2007	Average
Trips with at least 1 lb of red snapper	1,639	1,476	1,341	1,153	1,315	1,385
Red snapper, thousand pounds	136	161	117	81	108	121
Red snapper, thousand current $	$374	$459	$346	$263	$377	$364
Red snapper, thousand 2007 $	$422	$505	$368	$271	$376	$388
Dockside price, current $ / pound	$2.76	$2.85	$2.95	$3.25	$3.49	$3.02
All species, same trips, 1,000 lbs	2,252	2,292	2,199	1,679	2,059	2,096
All species, same trips, 1,000 2007 $	$5,190	$5,105	$4,969	$3,990	$5,131	$4,877
Boat rev, all spp/trips, 1,000 2007 $	$9,448	$8,886	$8,992	$9,286	$12,286	$9,780
Boats that landed red snapper	236	217	216	206	225	220
	Number of boats according to landings of red snapper					
1-100 lbs per boat per year	106	87	97	106	114	102
101-1,000 lbs per boat per year	91	86	86	74	81	84
More than 1,000 lbs per boat per year	39	44	33	26	30	34
Source: Same as first table, this section.						

Red snapper was the primary source of trip revenue on an average of 163 trips per year, 12% of the trips on which it was landed (Table 3-17). These trips accounted for approximately 31% of the total commercial harvest, with an annual average of 38,000 pounds of red snapper worth $125,000 in 2007 dollars and 49,000 pounds of other species worth $103,000 (Table 3-17). On the 1,222 trips wherein red snapper was a lesser source of trip revenue, it accounted for an annual average of 82,000 pounds of red snapper ($263,000 in 2007 dollars) and 1.9 million pounds of other species ($4.4 in 2007 dollars) (Table 3-18). Red snapper is part of the mid-shelf snapper grouper complex that includes scamp, gag, vermilion snapper, red porgy, gray triggerfish and red grouper, among other species. Red snapper is most commonly caught on trips with vermilion snapper, gag or scamp as the primary revenue species on the trip. Red snapper is landed mostly in South Carolina, Georgia and northeast Florida, and central-southeast Florida and it is caught mostly with vertical lines (Table 3-19).

Table 3-17. Annual landings and dockside revenues on trips with red 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 of red snapper	172	198	157	140	149	163
Boats	80	76	66	58	61	68
Red snapper, thousand pounds	43	58	29	27	35	38
Red snapper, thousand 2007 $	$134	$183	$91	$93	$125	$125
Other spp, same trips, 1,000 lbs	63	75	38	29	41	49
Other spp, same trips, 1,000 2007$	$133	$153	$78	$66	$86	$103

Source: Same as first table, this section.

Table 3-18. Annual landings and dockside revenues on trips with red 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 of red snapper	1,467	1,278	1,184	1,013	1,166	1,222
Boats	224	204	199	191	213	206
Red snapper, thousand pounds	93	103	89	54	73	82
Red snapper, thousand 2007 $	$288	$321	$277	$178	$251	$263
Other spp, same trips, 1,000 lbs	2,053	2,057	2,044	1,569	1,910	1,927
Other spp, same trips, 1,000 2007 $	$4,635	$4,447	$4,524	$3,653	$4,669	$4,386

Source: Same as first table, this section.

Table 3-19. Annual landings of red snapper for trips with at least one pound of red snapper, by region and primary gear, 2003-2007 (landings in thousand pounds, whole weight).

Region of landing / primary gear	2003	2004	2005	2006	2007	Average
North Carolina	15	10	7	6	5	9
South Carolina	37	43	38	20	25	33
Georgia and northeast Florida	65	90	46	34	52	58
Central and southeast Florida	16	16	23	17	25	19
Florida Keys	3	1	2	4	1	2
Vertical lines	122	147	103	72	90	107
Diving gear	11	13	11	7	16	12
Other gear	3	1	2	2	1	2

Source: Same as first table, this section.

3.8.1.9 The Commercial Fishery for Black Sea Bass

According to logbook data, black sea bass were landed on an average 2,157 trips per year in 2003-2007, with landings of 540,000 pounds worth $937,000 in 2007 dollars (Table 3-20). Landings of other species on the same trips, 4.0 million pounds, brought trip revenue to $4.5 million in 2007 dollars. Black sea bass were landed by an average of 237 boats in 2003-2007, with 181 of them landing 1,000 pounds or less per year and 23 of them landing more than 5,000 pounds. For these boats, 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 on all trips, including trips by these boats that did not land black sea bass.

Table 3-20. 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 spp/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 3-21 and Table 3-22). On the 765 trips for which it was the top source of revenue, black sea bass accounted for 489,000 pounds of landings worth $855,000 in 2007 dollars, and other species accounted for 54,000 pounds worth $68,000 in 2007 dollars. These 765 trips accounted for 35% of all trips that landed at least one pound of black sea bass, 91% of total landings of black sea bass, and 97% of total ex-vessel value for black sea bass.

Table 3-21. 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 species, same trips, 1,000 2007 $	$62	$66	$43	$94	$76	$68
Source: Same as first table, this section.						

Table 3-22. 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 species, 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 worth $83,000 in 2007 dollars, compared with 1.5 million pounds for other species worth $3.5 million. Among South Atlantic states, black sea bass is landed primarily in North Carolina and South Carolina (Table 3-23). The species is landed mostly with black sea bass pots and vertical lines are a distant second.

Table 3-23. 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.						

3.8.1.10 The Commercial Fishery for Red Grouper

According to the logbook database, 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 (Table 3-24). Landings of other species on these trips came to 2.7 million pounds, 4

Table 3-24. 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 species, same trips, 1,000 2007 $	$6,132	$5,994	$6,333	$6,922	$9,121	$6,900
Boat rev, all spp/trips, 1,000 2007$	$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.

and brought trip revenue to $6.9 million. Red grouper were landed by an average of 402 boats per year; 329 of them landed 1,000 pounds or less per year and 17 of them landed more than 5,000 pounds. The landings of red grouper accounted for 6.4% of the $12.3 million of the ex-vessel value for all logbook-reported landings of all species on all trips by these 402 boats, including trips that did not land red grouper. 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 3-25 and Table 3-26). 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 3-24). 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 3-25. 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 3-26. 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 3-27. 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.						

3.8.1.11 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 3-28). 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 3-28. 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 2003-2008, averaging slightly above 11 million pounds (Table 3-29). On average, the private/shore mode of fishing accounted for the largest harvests at around 7.62 million pounds (MP). Well below this harvest level are those of the charter mode at 1.92 MP and headboat at 1.63 MP. Harvests in each state also fluctuated during the same period (Table 3-30). On average, Florida accounted for most of the snapper grouper harvest in the South Atlantic at around 6.90 MP, followed by North Carolina at 2.21 MP, South Carolina at 1.51 MP, and lastly by Georgia at 0.62 MP.

Table 3-29. Harvest (lbs) of snapper grouper species by mode in the South Atlantic, 2003-2008.

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
2008	1,720,683	1,306,996	9,572,258	12,601,945
Average	1,924,848	1,627,057	7,618,281	11,170,521

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 3-30. Harvest (lbs) of snapper grouper species by state in the South Atlantic, 2003-2008.

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
2008	7,262,726	490,209	1,980,075	2,866,928
Average	6,904,207	619,170	1,507,729	2,206,726

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 3-31. With the exception of black grouper, all species showed relatively large harvests over the 2003-2008 period. Black sea bass accounted for the largest harvest at an average of 0.78 MP, followed somewhat closely by gag at an average of 0.62 MP and vermilion snapper at an average of 0.60 MP. Except for vermilion snapper, the shore and private mode of fishing dominated in the harvest of the six major species. Headboats dominated in the harvest of vermilion snapper.

Table 3-32 presents the geographic distribution of the six major species. Florida registered harvests of all six species while Georgia and North Carolina did not show any harvests of black grouper. Georgia registered very low landings of red grouper, whereas South Carolina registered relatively low landings of black grouper. In addition, North Carolina showed relatively low landings of red snapper.

Seasonal distribution of the six major species is presented in Table 3-33, 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 was May-June. November-December and July-August were the peak months for black grouper. Troughs occurred in January-February for all species, except black grouper whose trough occurred in March-April.

Table 3-31. South Atlantic average harvest (lbs) of 6 major species in this amendment, by mode, 2003-2008.

Species	Charterboat	Headboat	Shore and Private/Rental Boat	Total
Gag	101,539	64,547	456,471	622,558
Vermilion Snapper	111,521	379,710	105,005	596,237
Red Snapper	109,882	62,432	230,733	403,048
Black Sea Bass	93,691	164,465	525,001	783,157
Black Grouper	2,568	13,556	33,051	49,174
Red Grouper	51,741	45,662	401,412	498,815

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

Table 3-32. South Atlantic average harvest (lbs) of 6 major species in this amendment, by state, 2003-2008.

Species	Florida	Georgia	South Carolina	North Carolina
Gag	385,393	14,042	39,089	184,034
Vermilion Snapper	183,484	45,941	231,503	135,308
Red Snapper	339,374	33,621	20,553	9,499
Black Sea Bass	244,222	87,574	245,727	205,635
Black Grouper	49,082	0	93	0
Red Grouper	128,496	50	8,143	362,127

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 two-month wave, 2003-2008.

Species	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sept-Oct	Nov-Dec
Gag	83,007	84,466	153,795	116,837	88,176	96,278
Vermilion Snapper	28,129	84,106	190,469	159,457	85,613	48,463
Red Snapper	38,262	65,142	115,309	64,838	57,314	62,183
Black Sea Bass	45,768	144,853	220,940	178,973	62,636	129,988
Black Grouper	9,616	3,080	6,800	13,069	3,176	13,433
Red Grouper	17,380	77,091	199,260	105,223	62,412	37,449

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

For the period 2003-2008, the six major species affected by 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 Marine Recreational Statistics Survey (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 3-34 for trips by mode and Table 3-35 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 private mode, followed by the shore mode, and then by the charter mode (Table 3-34). In addition, 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, target trips rose steadily through the years while catch trips peaked in 2007. Shore mode catch trips dropped from 2003 to 2004 but steadily increased thereafter to a peak in 2007; shore mode target trips fell from 2003 to 2005 and increased thereafter to a peak in 2007. For the private mode, both catch and target trips fell in 2004 but increased thereafter, reaching a peak in 2007.

By far, Florida registered the highest total angler trips, followed in order by North Carolina, South Carolina, and Georgia (Table 3-35). The same pattern holds for catch trips but not quite for target trips, with South Carolina registering slightly higher target trips than North Carolina. For Florida, both catch and target trips fell in 2004, subsequently rose in the following years, and peaked in 2007. Georgia catch trips fluctuated between 2003 and 2006 and remained at relatively high levels in the last two years; target trips fell substantially in 2004, remained at low levels until 2007, and rose in 2008 to a level close to that in 2003. South Carolina catch trips fluctuated at relatively low levels between 2003 and 2005 but at higher levels in subsequent years; target trips fell in 2004 but subsequently rose to a peak in 2007. Catch trips in North Carolina steadily rose over the years and peaked in 2007; target trips, on the other hand, fluctuated throughout the period.

Table 3-34. Recreational effort for the snapper grouper fishery in the South Atlantic, in thousand trips, by mode, 2003-2008.

	Charter Mode Trips			Shore Mode Trips			Private Mode Trips		
	Catch	**Target**	**Total**	**Catch**	**Target**	**Total**	**Catch**	**Target**	**Total**
2003	117	24	412	982	247	6,493	2,026	687	9,963
2004	135	33	434	851	199	6,754	1,867	496	9,369
2005	127	32	508	924	192	7,009	2,055	517	10,073
2006	109	31	459	1,151	257	8,211	2,520	556	10,749
2007	136	47	501	1,308	297	7,983	3,163	783	13,137
2008	124	48	439	1,002	270	6,317	2,629	772	11,009
Avg.	125	36	459	1,036	244	7,128	2,377	635	10,717

Man-made and beach/bank trips are excluded.
Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

Table 3-35. Recreational effort for the snapper grouper fishery in the South Atlantic, in thousand trips, by state, 2003-2008.

	Florida			Georgia			South Carolina			North Carolina		
	Catch	**Target**	**Total**	**Catch**	**Target**	**Total**	**Catch**	**Target**	**Total**	**Catch**	**Target**	**Total**
2003	2,716	761	11,444	92	46	971	141	95	2,098	175	56	2,354
2004	2,342	558	10,660	87	26	936	184	85	2,239	239	59	2,721
2005	2,595	607	12,049	96	26	851	143	58	2,083	272	48	2,607
2006	3,126	627	13,115	66	28	790	214	133	2,629	374	56	2,885
2007	3,780	876	15,169	117	26	926	295	140	2,529	416	86	2,996
2008	2,947	841	11,215	226	42	1,282	246	134	2,528	336	73	2,740
Avg.	2,918	712	12,275	114	32	959	204	108	2,351	302	63	2,717

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

Estimates of the average (2003-2008) recreational effort for the six species most affected by this amendment are provided in Table 3-36 for trips by mode and Table 3-37 for trips by state. The total column refers to the total number of angler trips by mode or by state and not to the sum of catch trips and target trips.

In terms of catch and target trips, the private mode dominated the other two fishing modes in all six species (Table 3-36). Catch trips were highest for black sea bass across all modes. Target trips, on the other hand, varied by mode: black sea bass was highest for charter and private modes while red snapper was highest for the shore mode. The charter mode showed no target trips for black grouper and red grouper and the shore mode registered no target trips for vermilion snapper.

There are also observable regional variations in catch and target trips for the six major species (Table 3-37). In both catch and target trips, Florida dominated all other states for most species. An exception is black seas bass in which South Carolina registered higher target trips than any other states, although Florida still registered the highest catch trips for this species. Georgia showed no catch and target trips for black grouper and red grouper. South Carolina showed no target trips for both black and red grouper. North Carolina registered no catch and target trips for black grouper and no target trips for red snapper.

The seasonal distribution of recreational effort for the six major species affected by this amendment is presented in Table 3-38 for catch trips and Table 3-39 for target trips. The peak period for catch trips matched with peak harvests for red snapper, black grouper, and red grouper. Catch trips for vermilion snapper and black sea bass peaked in July-August, whereas harvests of these species peaked in May-June. Catch trips for gag peaked in November-December, whereas harvests peaked in May-June. For target trips, the match between peak trips and peak harvests occurred with vermilion snapper, black sea bass, black grouper, and red grouper. Peak target trips for gag and red snapper occurred in July-August, whereas peak harvests for these two species occurred in May-June.

Table 3-36. South Atlantic average recreational effort for 6 major species in this amendment, in thousand trips, by mode, 2003-2008.

	Charter Mode Trips			**Shore Mode Trips**			**Private Mode Trips**		
Species	**Catch**	**Target**	**Total**	**Catch**	**Target**	**Total**	**Catch**	**Target**	**Total**
Gag	7.6	1.8	458.8	9.8	1.7	7,127.8	99.7	37.4	10,716.6
Vermilion Snapper	27.6	0.8	458.8	0.9	0.0	7,127.8	58.6	2.2	10,716.6
Red Snapper	14.7	3.1	458.8	1.5	3.5	7,127.8	72.3	43.7	10,716.6
Black Sea Bass	35.0	3.7	458.8	40.6	0.9	7,127.8	490.8	45.7	10,716.6
Black Grouper	0.8	0.0	458.8	0.8	0.1	7,127.8	14.3	3.4	10,716.6
Red Grouper	9.3	0.0	458.8	1.5	0.4	7,127.8	59.1	3.6	10,716.6

Man-made and beach/bank trips are excluded.
Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

Table 3-37. South Atlantic average recreational effort for 6 major species in this amendment, in thousand trips, by state, 2003-2008.

	Florida			Georgia			South Carolina			North Carolina		
Species	**Catch**	**Target**	**Total**	**Catch**	**Target**	**Total**	**Catch**	**Target**	**Total**	**Catch**	**Target**	**Total**
Gag	93.1	38.6	12,275.4	3.0	0.0	959.5	5.1	1.3	2,351.0	15.8	1.0	2,717.2
Vermilion Snapper	59.2	1.7	12,275.4	6.0	0.0	959.5	10.5	1.1	2,351.0	11.4	0.3	2,717.2
Red Snapper	78.6	46.2	12,275.4	6.2	1.7	959.5	2.7	2.3	2,351.0	1.0	0.0	2,717.2
Black Sea Bass	197.7	12.0	12,275.4	43.4	5.7	959.5	143.9	23.1	2,351.0	181.4	9.6	2,717.2
Black Grouper	15.7	3.6	12,275.4	0.0	0.0	959.5	0.2	0.0	2,351.0	0.0	0.0	2,717.2
Red Grouper	52.6	3.5	12,275.4	0.0	0.0	959.5	0.8	0.0	2,351.0	16.4	0.4	2,717.2

Man-made and beach/bank trips are excluded.
Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

Table 3-38. South Atlantic average catch trips (all modes) for the 6 major species in this amendment, by two-month wave, 2003-2008.

Species	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sept-Oct	Nov-Dec
Gag	15.3	15.8	19.5	17.6	24.1	24.9
Vermilion Snapper	8.7	15.1	19.5	22.6	12.5	8.7
Red Snapper	9.5	15.7	18.8	17.9	13.1	13.6
Black Sea Bass	27.2	70.4	138.1	148.1	103.0	79.7
Black Grouper	2.5	2.0	3.0	2.9	1.9	3.6
Red Grouper	10.3	10.7	17.3	11.1	8.3	12.3

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

Table 3-39. South Atlantic average target trips (all modes) for the 6 major species in this amendment, by two-month wave, 2003-2008.

Species	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sept-Oct	Nov-Dec
Gag	6.5	8.4	7.3	8.9	3.4	6.3
Vermilion Snapper	0.7	0.6	0.9	0	0.4	0.4
Red Snapper	4.0	10.3	10.2	12.0	6.7	7.1
Black Sea Bass	3.0	11.8	12.5	8.6	6.0	8.3
Black Grouper	0.5	0.5	0.8	0.7	0.3	0.8
Red Grouper	0.5	0.4	1.1	0.6	0.4	0.9

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.

The state-by-state distribution of headboat angler days is presented in Table 3-40. Due to very low headboat angler days for Georgia, entries for Georgia are combined with those of Florida. For the period 2003-2008, total headboat angler days fluctuated around the mean of 230,878 days. On average, Florida accounted for the largest number of angler days (157,764), or about 68 percent of all headboat angler days. Nevertheless, the numbers for South Carolina (47,524 days) and North Carolina (25,591 days) are far from being negligible.

The seasonal distribution of headboat angler days is presented in Table 3-41. 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 2008 when troughs occurred in September-October.

Table 3-40. South Atlantic headboat angler days, 2003-2008.

	Florida	South Carolina	North Carolina	Total
2003	145,011	36,556	22,998	204,565
2004	173,701	50,461	27,255	251,417
2005	171,078	34,036	31,573	236,687
2006	175,522	56,074	25,736	257,332
2007	157,150	60,729	29,002	246,881
2008	124,119	47,287	16,982	188,388
Average	157,764	47,524	25,591	230,878

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

Table 3-41. South Atlantic headboat angler days, by two-month wave, 2003-2008.

	Jan-Feb	**Mar-Apr**	**May-Jun**	**Jul-Aug**	**Sept-Oct**	**Nov-Dec**
2003	21,805	36,363	48,210	59,982	22,431	15,774
2004	27,593	45,468	59,144	70,141	22,811	26,260
2005	27,672	41,799	54,892	70,369	21,390	20,565
2006	27,432	48,572	60,525	73,413	29,344	18,046
2007	24,285	41,464	57,268	75,900	27,029	20,935
2008	21,587	36,634	49,223	51,635	13,768	15,541
Average	25,062	41,717	54,877	66,907	22,796	19,520

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 economic exclusive zone (EEZ). The number of permitted vessels for the period 2003-2008 is provided in Table 3-44. 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 steadily increased over the years, from 1,477 permits in 2003 to 1,811 permits in 2008. 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, fell in 2007, and increased in 2008. 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 3-42. South Atlantic snapper grouper for-hire permit holders by home port state, 2003-2008.

	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**	**2008**	**Avg.**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**Avg.**
Florida	957	1,084	1,119	1,108	1,140	1,125	**1,115**	148	151	148	151	122	128	**141**
North Carolina	206	232	254	284	315	342	**272**	45	42	43	46	40	43	**43**
South Carolina	122	108	121	119	129	140	**123**	34	33	33	34	24	25	**31**
Georgia	36	27	33	33	30	27	**31**	4	2	2	2	3	4	**3**
Virginia	5	13	10	10	8	18	**11**		4	3	2		0	**2**
Other States	69	48	51	62	69	85	**64**	8	3	5	3	2	3	**4**
Gulf States	82	82	79	65	63	74	**74**							
Total	**1,477**	**1,594**	**1,667**	**1,681**	**1,754**	**1,811**	**1,690**	**239**	**235**	**234**	**238**	**191**	**203**	**224**

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 (NOAA 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, NOAA Fisheries Service Southeast Science Center (SEFSC) (NMFS 2009) developed estimates of consumer surplus per angler trip based on various studies and data in the last ten years (see **Appendix N**). 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 SEFSC 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 exclusive economic zone 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 valuation estimates should not be confused with angler expenditures or economic activity (impacts) associated with these expenditures. 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.

Estimates of the economic impacts of the recreational snapper grouper fishery were derived using average output (sales) and job (FTE) impact coefficients for recreational angling across all fisheries (species), as derived by an economic add-on to the Marine Recreational Fisheries Statistical Survey (MRFSS), and described and utilized in USDOC (2009). Estimates of the average expenditures by recreational anglers are provided in USDOC (2009) and are incorporated herein by reference. Estimates of the average snapper grouper effort (2003-2007) and associated economic impacts (2007 dollars) are provided in Table 3-43. Snapper grouper target trips were selected as the measure of snapper grouper effort. More trips catch snapper grouper than target snapper grouper, however, as described in Tables 3-34 and 3-35. Estimates of the economic impacts associated with snapper grouper catch trips can be calculated based on the ratio of catch trips to target trips because the average output impact and jobs per trip cannot be differentiated by trip intent. For example, if the number of catch trips were three times the number of target trips for a particular state and mode, the estimate of the associated output or jobs impacts would equal three times the estimate associated with target trips. The total 2007 output (sales) impacts across all modes and states for trips which targeted snapper grouper was approximately $43.3 million, the value added impact was approximately $25.3 million, and the economic activity associated with these trips supported an estimated 467 FTE jobs. The contributions by private/rental mode anglers were the greatest, accounting for approximately half of the total impacts. It should be noted that output impacts and value added impacts are not additive.

Table 3-43. Summary of snapper grouper target trips (2003-2007 average) and associated economic impacts (2007 dollars).
Output and value added impacts are not additive.

	North Carolina	South Carolina	Georgia	East Florida	Total
			Shore Mode		
Target Trips	22,713	12,046	6,650	210,735	252,144
Output Impact	$3,620,977	$1,093,668	$100,261	$5,810,261	$10,625,167
Value Added Impact	$2,016,356	$608,981	$60,119	$3,373,175	$6,058,631
Jobs	44	13	1	62	120
			Private/Rental Mode		
Target Trips	58,883	85,387	22,275	402,804	569,349
Output Impact	$3,209,442	$3,726,440	$337,692	$14,698,955	$21,972,529
Value Added Impact	$1,809,705	$2,174,328	$204,838	$8,783,407	$12,972,278
Jobs	35	42	3	155	234
			Charter Mode		
Target Trips	1,493	3,068	1,543	24,665	30,769
Output Impact	$556,467	$966,706	$91,719	$9,041,651	$10,656,542
Value Added Impact	$312,290	$546,149	$53,530	$5,323,074	$6,235,044
Jobs	7	12	1	93	113
			All Modes		
Target Trips	83,089	100,501	30,468	638,204	852,262
Output Impact	$7,386,885	$5,786,815	$529,671	$29,550,867	$43,254,238
Value Added Impact	$4,138,351	$3,329,458	$318,488	$17,479,656	$25,265,953
Jobs	85	68	5	309	467

Source: effort data from the MRFSS, economic impact results calculated by NMFS SERO using the model developed for USDOC (2009).

As noted in the previous paragraph, the values provided in Table 3-47 reflect only effort derived from the MRFSS. Because the headboat sector in the Southeast is not covered in the MRFSS, the results in Table 3-43 do not include estimates of the economic impacts by headboat anglers. Estimates of headboat effort are available, however, from the NMFS Headboat Survey and are provided in Tables 3-42 and 3-41. Species target information, however, is not collected in the Headboat Survey, which prevents the generation of estimates of the number of headboat target trips for individual species. It is assumed for the purpose of this assessment, though, that while some headboat anglers may not care what species they catch, all headboat anglers expect to catch snapper grouper due to the bottom fishing-nature of headboat angling. As a result, using total headboat effort as a proxy for snapper grouper target effort is not expected to be a significant issue for estimating the economic impacts associated with snapper grouper trips in the headboat sector.

Estimates of the economic impacts associated with headboat snapper grouper effort are provided in Table 3-44. Aside from the issue of possibly using too high a measure of target effort, it should be noted that the estimates of economic impacts are expected to be substantially higher than actual impacts because they were generated using the average impact values associated with charter trips. Because the headboat sector is not included in the MRFSS in the South Atlantic, appropriate estimates of the economic impacts per headboat trip in South Atlantic states were not generated in the development of USDOC (2009) and are not available. Estimates of the impacts of charter trips are expected to be substantially greater than those of headboat trips. The difference in fee scale for charter trips compared to headboat trips, where charter trip is rented on a boat basis whereas anglers pay per person for headboat trips, may be the primary determinant in the difference, but other factors, such as different rates of tourist versus local clientele, may also contribute. The headboat (party boat) sector is included in the MRFSS in the mid-Atlantic (and New England) states and the estimated output (sales) impact per trip for charter and party boats combined in the mid-Atlantic states ranges from approximately $140 to $180 (2007 dollars), whereas the output (sales) impact per charter trip across all South Atlantic states is estimated to exceed $300. Further, the mid-Atlantic values may exceed actual values for just headboat (partyboat) trips because they incorporate charter trips as well in their total. Rather than use an alternative value from outside the region, this analysis simply uses the higher South Atlantic charter value and notes that actual impacts could be substantially less than the estimated value.

Table 3-44. Summary of snapper grouper headboat trips (2003-2007 average) and associated economic impacts (2007 dollars).
Note: these estimated economic impact values may substantially exceed actual values because they are based on average trip values from charter trips. Output and value added impacts are not additive.

	North Carolina	**South Carolina**	**Georgia+Florida**	**Total**
Trips	27,312	47,571	164,492	239,375
Output Impact	$10,179,650	$14,989,306	$60,299,176	$85,468,133
Value Added Impact	$5,712,840	$8,468,342	$35,499,819	$49,681,001
Jobs	130	191	620	941

Source: effort data from the NMFS Headboat Survey, economic impact results calculated by NMFS SERO using the model developed for USDOC (2009).

As seen in Table 3-36, among the major snapper grouper species, black sea bass, red snapper, and gag have been subject to the most recreational target effort, on average, from 2003-2007. The economic impact contributions of these species are included in the information in Table 3-44. Individually, the economic impacts associated with target trips for black sea bass are estimated to be approximately $3 million (2007 dollars) in output (sales) impacts, approximately $1.7 million in value added impacts, and the economic activity associated with trips for these species is estimated to support 35 FTE jobs (based on the average annual number of black sea bass target trips, 2003-2007; tabular results not shown). It should be noted that because these results are embedded in the results for the entire snapper grouper fishery, they are not additive to the totals in Table 3-43. Across all states, private/rental mode target trips for black sea bass accounted for the largest portion of these impacts, approximately $1.9 million in output (sales) impacts, approximately $1.1 million in value added impacts, and 21 FTE jobs, and across all modes South Carolina led with approximately $1.8 million in output (sales) impacts, approximately $1.0 million in valued added impacts, and 22 FTE jobs. The comparable values for red snapper target trips are approximately $2.3 million (output/sales impacts), $1.3 million (value added), and 24 FTE trips total, led by the private/rental mode sector contributing approximately $1.3 million and $800,000 in output (sales) and value added impacts, respectively, and 14 FTE jobs; and Florida, accounting for approximately $2 million and $1.2 million in output (sales) and value added impacts, respectively, and 21 of the total 24 FTE jobs. Finally, the comparable numbers for gag target trips are approximately $2 million in output (sales) impacts, approximately $1.2 million in value added impacts, and the economic activity associated with this species supports 20 FTE jobs. The private/rental boat mode again contributed the largest portion of these impacts, approximately $1.2 million and $700,000 in output (sales) and value added impacts, respectively, and 13 FTE jobs, and most of the activity occurred in Florida, accounting for approximately $1.9 million and $1.1 million in output (sales) and value added impacts, respectively, and accounted for 19 of the total 20 FTE jobs associated with this species.

For the reasons discussed above on the economic impacts of snapper grouper trips, estimates of the economic impacts of headboat target trips for individual snapper grouper species cannot be produced with available data.

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 (greater than 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 are 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.

3.8.3.1North Carolina

Figure 3-13. 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 3-13) 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, which was extended to January through April in December 2009. 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 examining 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 3-45). 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 3-45. 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 3-14 includes two maps detailing the area.

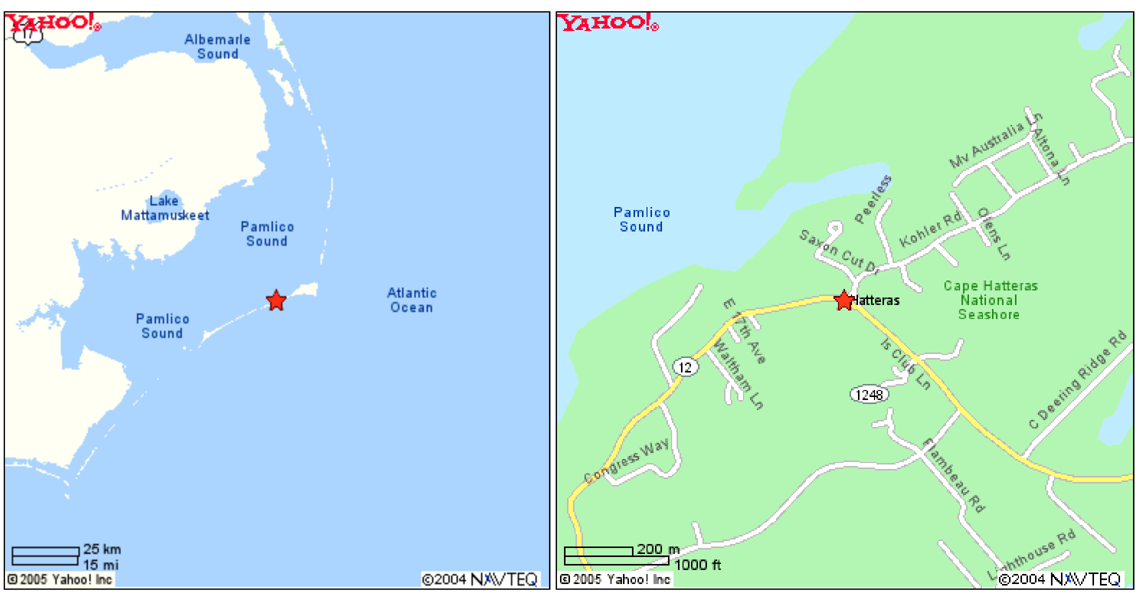


Figure 3-14. Hatteras Island and Village, Outer Banks, North Carolina.
Source: Yahoo Maps, http://www.yahoo.com.

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 (SAFMC2006). 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 3-15. Map of Roanoke Island, North Carolina, showing Wanchese and Manteo. Source: Kitner 2005.

Overview

Figure 3-15 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.

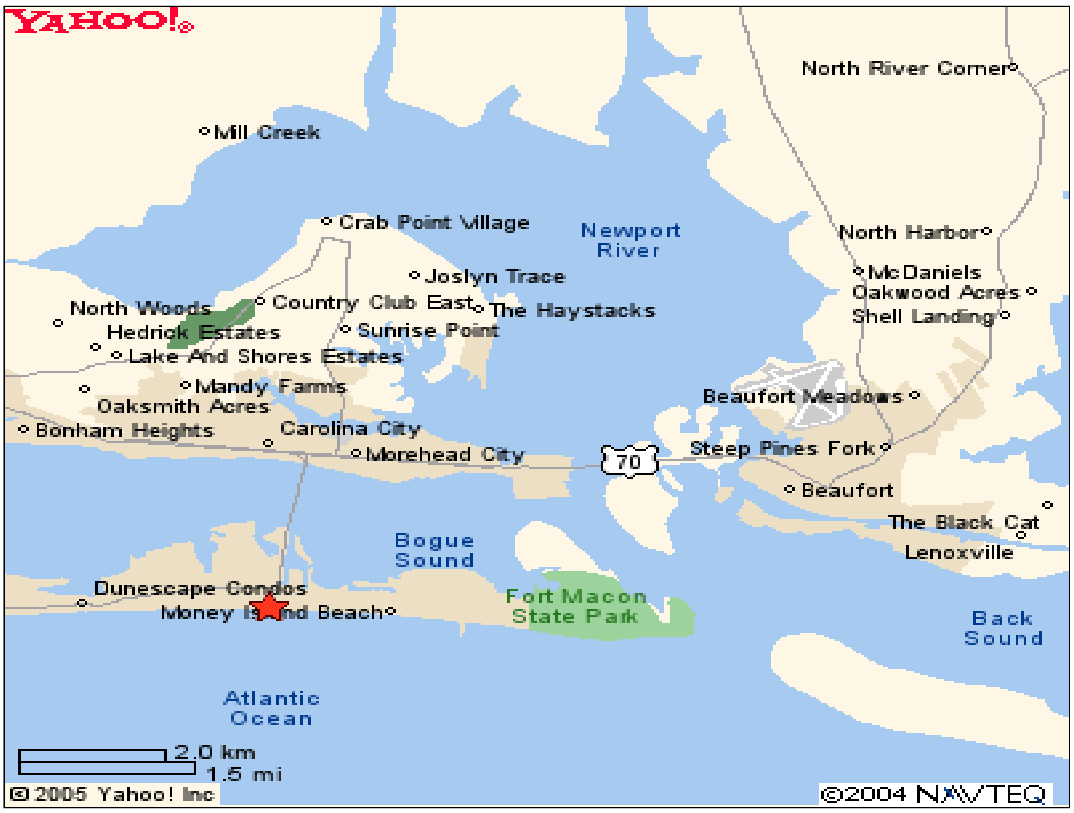


Figure 3-16. Area of Carteret County, North Carolina, showing Morehead City, Atlantic Beach (at the red star), and Beaufort.
Source: Yahoo Maps, http://www.yahoo.com.

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 3-16). 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 3-17. 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 3-17). 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 7,200-square foot 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

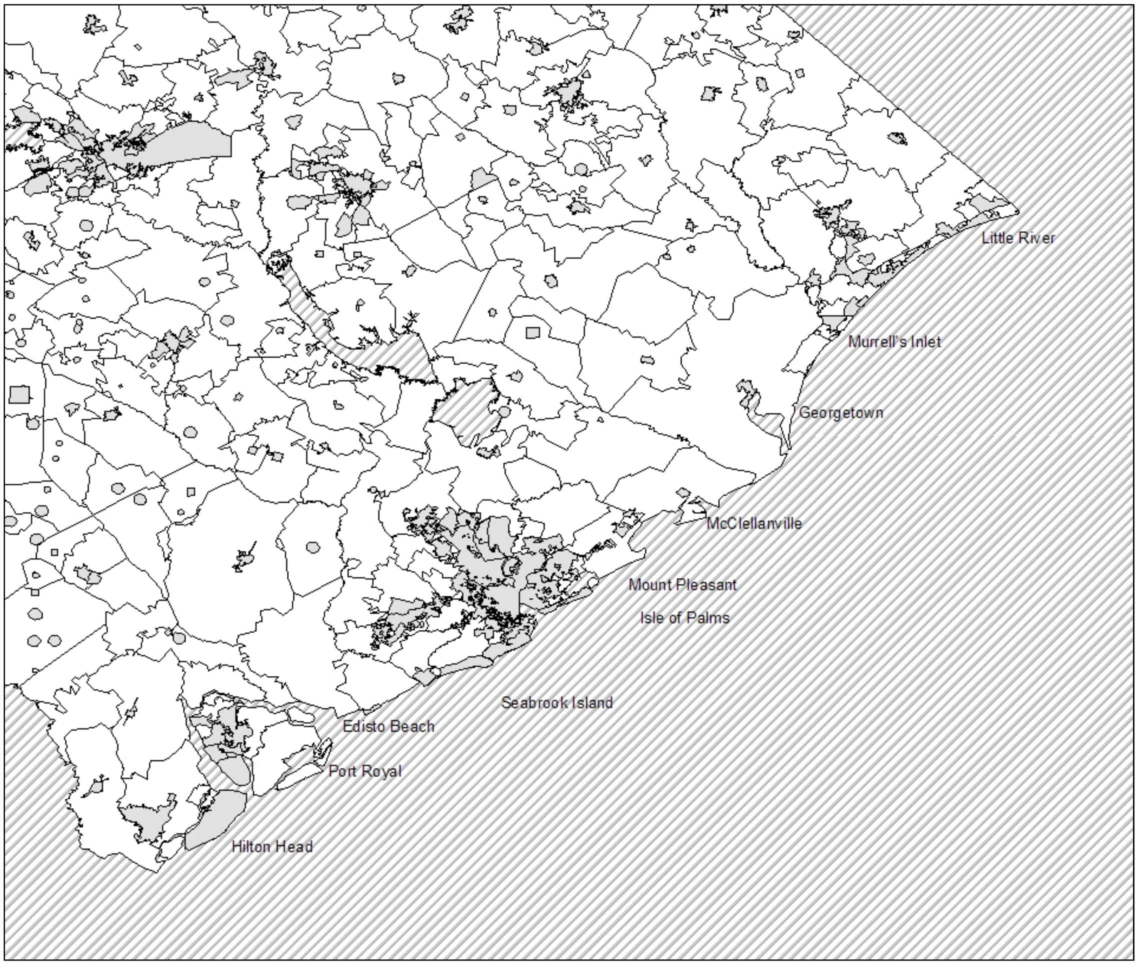


Figure 3-18. South Carolina communities with substantial fishing activity, as identified by South Atlantic Advisory Panels.

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 3-18). 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 3-19. Little River, South Carolina, and surrounding area.
Source: Yahoo Maps, http://www.yahoo.com.

Overview

Figure 3-19 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 3-46) 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.

Table 3-46. Commercial landings for Little River, South Carolina.
Source: Logbook Data, SEFSC 2009.

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

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 Atlantic Coastal Cooperative Statistics Program 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.

Table 3-47. Commercial landings for Townsend, Georgia.
Source: Logbook Data, SEFSC 2009.

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

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/Coastal Georgia

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 common 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

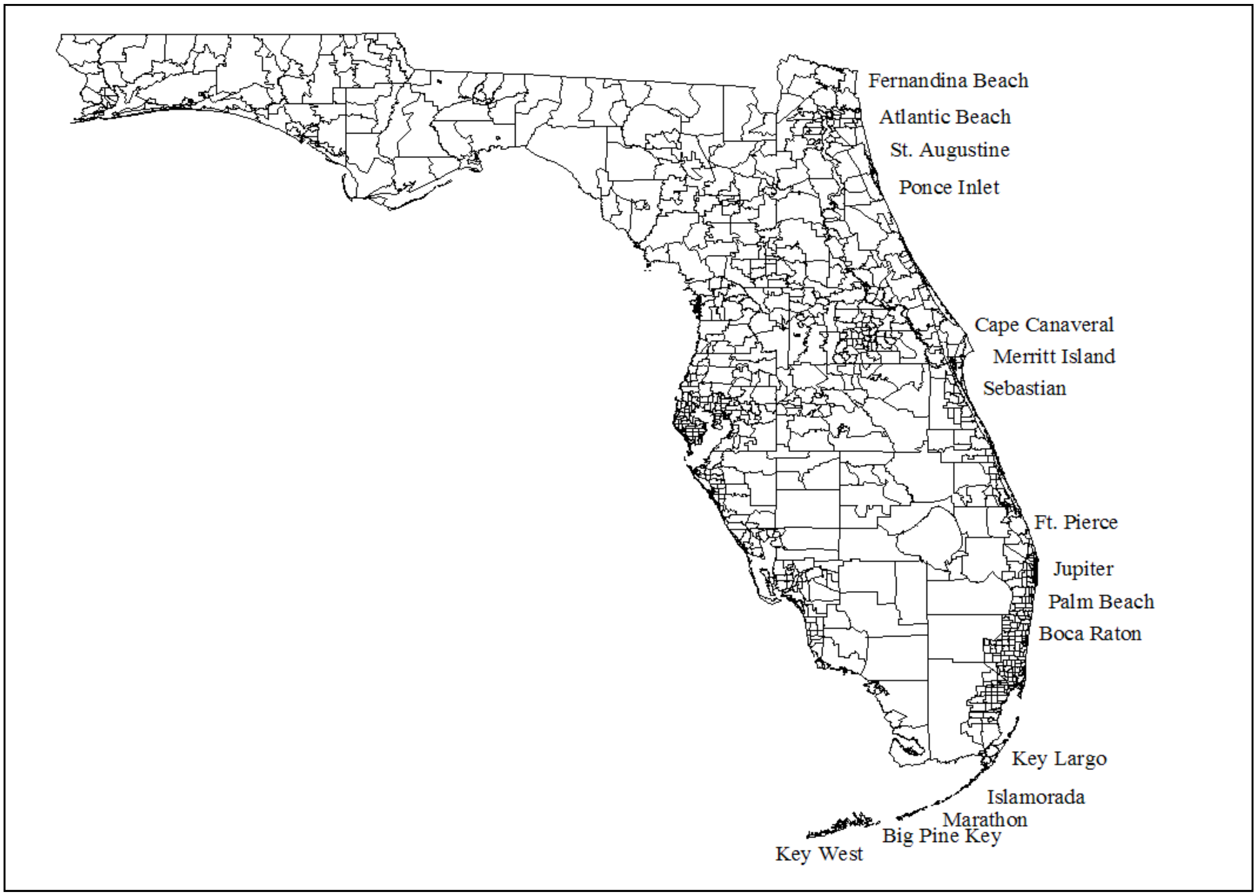


Figure 3-20. Florida communities with substantial fishing activity. Identified by South Atlantic Advisory Panels.
Source: Jepson et al. (2005).

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 available to fishermen in southern Florida are somewhat 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 3-48) 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.

Table 3-48. Cumulative landings for 2005, 2006, 2007 for the top three communities in Florida for 10 species in the snapper grouper fishery management unit.
Source: Logbook data, SEFSC 2009.

	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 Grouper	Key West	269,315	Pt. Orange	195,872	Tavernier	114,877
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

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

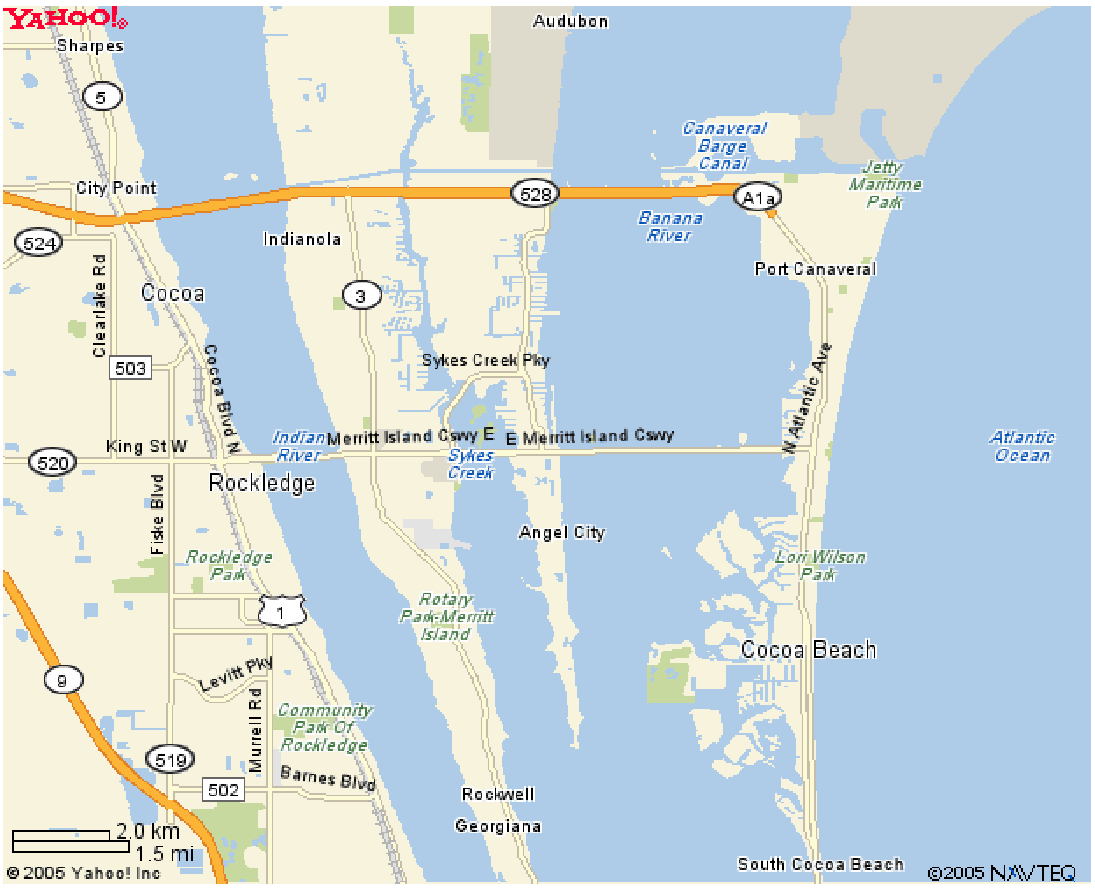


Figure 3-21. Area map of Cape Canaveral, Florida.
Source: Yahoo Maps, http://www.yahoo.com.

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 3-21.

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.

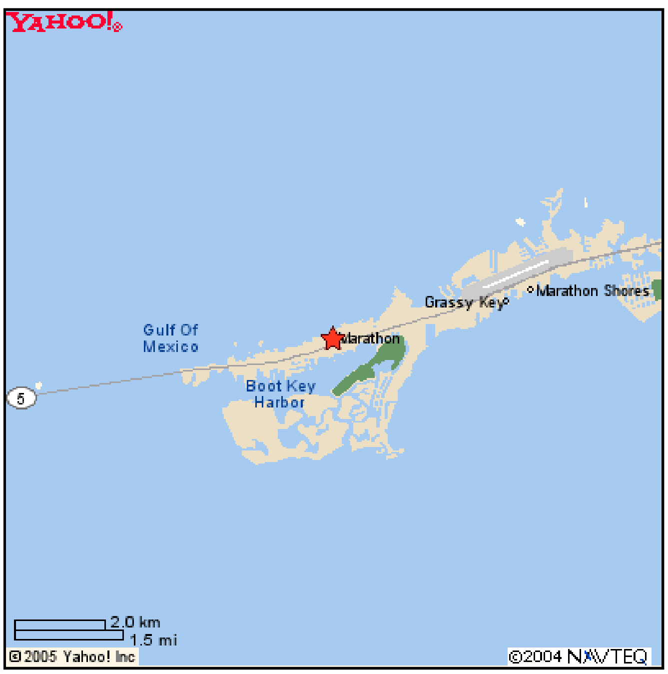


Figure 3-22. Marathon, Florida.
Source: Yahoo Maps, http://www.yahoo.com.

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 3-22 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 Effects

Red Snapper Regulatory Background

The Fishery Management Plan (FMP) for the Snapper Grouper Fishery of the South Atlantic Region (1983) imposed minimum size limits on red snapper and five other species to control growth overfishing. 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 inch total length (TL) minimum size limit was expected to provide an eight percent increase in the yield if recruitment was 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 inch TL minimum size limit for red snapper.

Amendment 4 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (Amendment 4; 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 the spawning potential ratio (SPR) of 3% for red snapper in the Gulf of Mexico, and the workshop concluded that an SPR of 20% was likely a sufficient target for the Gulf of Mexico red snapper population. Later, the workshop concluded growth parameters and habitat were approximately the same for South Atlantic red snapper as Gulf of Mexico red snapper, and it would be appropriate to apply the same SPR level of 20% to the South Atlantic red snapper 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 inch TL minimum 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% SPR value specified by the Council, and the PDT recommended a 21 inch TL size limit for red snapper. However, the Council felt implementing a 20 inch TL minimum 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 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (Amendment 11; SAFMC 1998), was implemented. In this amendment, the issue of maximum sustainable yield (MSY) proxies was addressed. Amendment 11 states that during a meeting of the Snapper Grouper Assessment Group, there was a consensus for the use of 30-40% static SPR as a proxy for F_{MSY} for many snapper grouper species including red snapper where longer lived species would have a F_{MSY} SPR proxy closer to $F_{40\%SPR}$ and moderately long-lived species would have a F_{MSY} proxy closer to $F_{30\%SPR}$. It also stated that for data poor species with a known natural mortality rate (M), such as red snapper, the Council could use 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 red snapper 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.

ACL Guidelines

Revisions to the Magnuson-Stevens Act in 2006 require that by 2010, 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 fishing level 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 timeframe measures to ensure accountability. By 2011, FMPs for all other fisheries, except fisheries for species with annual life cycles, must meet these requirements. Recommended methodologies for specifying ACLs and accountability measures (AMs) are outlined in the final rule implementing National Standard 1 guidelines found in **Appendix K** of this document.

The SSC is expected to provide a broad suite of technical recommendation related to all aspects of the Council's management program. Section 302(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 Fishery Conservation and Management Act (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 SSC cannot be exceeded.

NOAA Fisheries Service National Standard 1 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, NOAA Fisheries Service final National Standard 1 guidelines (**Appendix K**) 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 determine ABC control rules for data rich species and produced a document 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 for data rich species.

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: 1) Justify through analysis that allowing limited overfishing of a particular stock within a species complex will result in long-term net benefits to the nation; 2) show that mitigating measures have been considered; and 3) demonstrate 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 (**Appendix K**) is 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 Proxy Values (lbs whole weight)
Alternative 1 (No Action) (Preferred)	MSY equals the yield produced by F_{MSY}. $F_{30\%SPR}$ is used as the F_{MSY} proxy.	$F_{30\%SPR}$[1]= 0.148[2]	2,431,000[3]
Alternative 2	MSY equals the yield produced by F_{MSY} or the F_{MSY} Proxy, MSY and F_{MSY} are recommended by the most recent SEDAR/SSC[4]. F_{MSY} proxies will be specified by the Council.	$F_{40\%SPR}$= 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 of MSY from sensitivity runs is 559,000 lbs whole weight to 3,927,000 lbs whole weight.

The Council has specified the Minimum Stock Size Threshold (MSST) as the biomass using the formula MSST = $(1\text{-}M)*SSB_{MSY}$. This formula is recommended in the Technical Guidance Document developed by NOAA Fisheries Service 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 12,247,000 lbs whole weight (5,555 mt).

4.1.1 Biological Effects

The maximum sustainable yield (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 impact protected species; however, subsequent regulatory changes implemented to achieve long term performance goals based on MSY could potentially impact protected species. The biological effects of the choice of management reference points are described below.

MSY in **Alternative 1 (No Action/Preferred)** 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 (No Action/Preferred)**, a poundage for MSY was not specified in the Sustainable Fisheries Act (SFA) Amendment 11 due to data limitations; however, Table 4.2 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** 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 yield at $F_{40\%SPR}$ (2,304,000 lbs whole weight). Therefore, MSY associated with the **Alternative 1 (No Action/Preferred)** is 127,000 lbs whole weight greater than the yield associated with the $F_{40\%SPR}$ proxy specified in **Alternative 2**. Using the $F_{40\%SPR}$ proxy for F_{MSY}, sensitivity runs from the SEDAR 15 (2008) assessment indicate MSY ranges from 559,000 lbs whole weight to 3,927,000 lbs whole weight suggesting MSY cannot be reliably estimated based on the data currently available.

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 Scientific and Statistical Committee (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 the 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 F40% and SSB40% proxies may be used as limit indicators"* (SEDAR 15 2008)." Steepness is a measure of a stock's productivity or ability to produce recruits. In unfished conditions, steepness is the fraction of recruits obtained at spawning stock. If steepness approaches 1, then recruitment is nearly constant over a broad range of spawning stock size; however if steepness is slightly larger than 0.2 then recruitment is proportional to size of the spawning stock. 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 (0.68) 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 the 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. The Council also voted to use $F_{40\%SPR}$ as the F_{MSY} proxy at their December 2008 meeting. The assessment team provided the updated base model (steepness =0.95 in assessment and projections) to produce new projections, MSY estimates, and optimum yield (OY) estimates. Discussion continued at subsequent Council meetings regarding whether or not the No Action **Alternative 1** $F_{30\%SPR}$ or $F_{40\%SPR}$ specified in **Alternative 2** should be used as the F_{MSY} proxy. During their discussions, the Council made it clear that the National Standard 1 Guidelines indicate that the choice of a proxy for F_{MSY} is the Council's decision, not the SSC's. Initially, the Council determined **Alternative 2** should be the preferred alternative for the red snapper F_{MSY} proxy because it is more conservative than the current F_{MSY} proxy, and would require a more significant harvest reduction to end overfishing. However, at their June 2010 meeting, the Council changed their preferred alternative from **Alternative 2** to **Alternative 1 (No Action)**. The Council recommended that the status quo F_{MSY} proxy be maintained until the Southeast Fisheries Science Center can conduct a comprehensive review of how F_{MSY} proxies should be applied across all southeastern fisheries. It was also suggested that the decision to apply a specific F_{MSY} proxy should be made at the regional level rather than on a species-by-species basis. Therefore, the Council determined it would be advantageous to first determine what methodology would be most appropriate for assigning F_{MSY} proxies to species/stocks on the regional level before proceeding with a change to the current F_{MSY} proxy for red snapper.

Alternative 2 is based on the SSC's recommendation and would specify a 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 No Action proxy for F_{MSY} ($F_{30\%SPR}$). Therefore, **Alternative 2** would establish a new proxy for F_{MSY} not previously used, which is more conservative than the No Action 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,** 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 (No Action/Preferred)** would indicate the stock could rebuild more quickly and with less restrictive management measures than those associated with **Alternative 2.** 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,** 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** for the red snapper stock would be greater than **Alternative 1 (No Action/Preferred)** because **Alternative 2** would allow for less harvest and there would be a greater probability overfishing would end and the stock would be rebuilt to SSB_{MSY}. Choice of the F_{MSY} proxy sets the overfishing level and determines the harvest objective. The harvest objective dictates the harvest restrictions needed to manage the fishery to that level. Management measures implemented to achieve the harvest objective set by the F_{MSY} proxy will directly impact the biological environment in the form of reduced fishing effort for red snapper and other closely associated species. However, as explained in **Sections 4.1.2** and **4.1.3**, a choice of a F_{MSY} proxy that is too conservative could have unnecessary negative social and economic effects in terms of more restrictive management measures including larger area closures (**See Section 4.3**).

4.1.2 Economic Effects

Establishing MSY, or its proxy, sets off the basic parameters that condition the determination of OY target and accompanying management measures to achieve the target. In principle, the higher the MSY, the higher would be the expected economic benefits from the fishery so that in the present case, **Alternative 1 (No Action/Preferred)** would be more economically preferred than **Alternative 2**. In practice, additional conditions need to be recognized before applying the aforementioned principle. One such condition is the status of the stock. Red snapper is currently considered severely overfished and undergoing overfishing, thus rebuilding the stock has become an overriding concern. Another condition is the probability of successfully rebuilding the stock and ensuring that, once rebuilt, the stock would not slide back to its prior overfished/overfishing status. The first condition necessarily implies imposing restrictive management measures in the short-run, and thus sets the economic issue as one involving the balancing of short-term costs and long-term benefits. The second condition determines the expected economic value derivable from the fishery over the long run. These conditions are further discussed below in connection with comparing alternative MSY proxies.

Alternative 1 (No Action/Preferred) provides for $F_{30\%SPR}$ as the MSY proxy that would produce MSY value of 2.431 MP while **Alternative 2** provides for $F_{40\%SPR}$ as MSY proxy that would produce MSY value of 2.304 MP. In 2003-2008, the average combined commercial and recreational landings were approximately 474 thousand pounds. This wide gap between current landings and potential landings has at least two implications. First, both MSY proxy 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 in the short run.

The economically preferable MSY proxy choice would be one that is expected to result in the highest net economic benefits over time. This choice condition can be rendered more feasible if both the MSY proxy and accompanying regulatory measures are simultaneously considered. At this stage, only the MSY proxy choice is considered, and thus only general discussions of issues can be made. Several scenarios are developed below to aid in the general comparison of MSY proxy alternatives.

Scenario 1: Both MSY proxies have the same rebuilding timeframe, the same stringent management measures during rebuilding period, and the same probability of successfully rebuilding the stock and maintaining it at a sustainable level. Under this scenario, both MSY proxies imply similar costs during the rebuilding period. Since **Alternative 1 (No Action/Preferred)** provides for a higher MSY value, it would allow higher expected future economic benefits, and thus would be the economically preferred alternative.

Scenario 2: Similar to the first scenario, except that the rebuilding timeframe differs between the two MSY proxies. It is likely that **Alternative 1 (No Action/Preferred)** would be associated with shorter rebuilding time frame, so its associated costs would be less than that of **Alternative 2**. With lower costs and higher future benefits, **Alternative 1 (No Action/Preferred)** would be the economically preferred alternative.

Scenario 3: Similar to the first scenario, except that the management measures differ between the two MSY proxies. In all likelihood, the measures under **Alternative 1 (No Action/Preferred)** would be less stringent than those of **Alternative 2**, so its associated costs would be lower. Thus, **Alternative 1 (No Action/Preferred)** would be the economically preferred alternative.

Scenario 4: Similar to the second scenario, except that the management measures differ between the two MSY proxies. Based on conclusions from the first three scenarios, **Alternative 1 (No Action/Preferred)** would be associated with much lower costs and higher future benefits, and thus would the economically preferred alternative.

Scenario 5: Similar to the first scenario, except that the probability of successfully rebuilding the stock and maintaining it at a sustainable level differs between the two MSY proxies. There is good reason to believe that such probability would be higher under **Alternative 2**. If the difference in such probabilities were sufficiently high, **Alternative 2** may turn out to be the economically preferred alternative. A highly simplified example showing **Alternative 2** being economically preferable to **Alternative 1 (No Action/Preferred)**, may aid in clarifying this difference in probabilities. Suppose each MSY level (2.431 MP for **Alternative 1 (No Action/Preferred)** and 2.304 MP for **Alternative 2**) is worth $1 a pound and the associated probabilities of successfully maintaining the stock at a sustainable level are 55% for **Alternative 1 (No Action/Preferred)** (implying 45% failure) and 60% for **Alternative 2** (implying 40% failure). The expected payoff for **Alternative 1 (No Action/Preferred)** would be $0.24 million (55% of $2.431 million minus 45% of $2.431 million). On the other hand, the expected payoff for **Alternative 2** would be $0.46 million (60% of $2.304 million minus 40% of $2.304 million). What is notable in this example is that a relatively small difference in the success rate between the two alternatives may lead to relatively substantial difference in net benefit payoff. In this simplified example, the cost of failure is assumed equal to the forgone benefits. The actual cost may contain other important items than forgone benefits, just as the actual benefit may contain other important items than the value assigned to the potential take from the fishery.

Scenario 6: Similar to the fourth scenario, except that the probability of successfully rebuilding the stock and maintaining it at a sustainable level differs between the two MSY proxies. Based on the conclusions for the fourth scenario, **Alternative 1 (No Action/Preferred)** would be associated with lower costs but based on conclusions for the fifth scenario, **Alternative 2** would likely be associated with higher benefits. Depending on the magnitudes of costs and benefits involved, the economically preferred alternative could be either of the two.

From the various scenarios described above, **Alternative 1 (No Action/Preferred)** may be the economically preferred alternative unless there is a material difference in the success rate of attaining and maintaining MSY between the two alternatives, or the success rate of **Alternative 1 (No Action/Preferred)** is very low. A very low success rate would likely bring about more stringent regulations over time as well as lengthen the actual rebuilding period. This may result in higher costs over time. **Alternative 2** would provide an MSY proxy that is biologically more conservative than **Alternative 1 (No Action/Preferred)**. In general, this would imply that **Alternative 2** would have a high probability of maintaining the stock at a more sustainable level.

Non-use values, like existence and bequest values, increase with increasing long-term economic benefits. **Alternative 2** would offer a higher level of non-use value if the probability of success in reaching MSY and sustaining it at that level were relatively higher than that of **Alternative 1 (No Action/Preferred)**.

4.1.3 Social Effects

General Concepts

Defining the MSY for a species or species complex provides a management target and threshold needed to assess the status and performance of the fishery. Evaluation of the resource relative to the benchmark may trigger harvest and/or effort controls. In the current case of red snapper, the specification of the MSY or MSY proxy directly determines the immediate level of harvest reduction necessary to achieve the biological goals of stock management. This harvest reduction, as well as any other necessary harvest or effort controls, would be expected to directly impact the individual fishermen, social networks, and associated industries related to the fishery, inducing short-term adverse economic and social impacts until less restrictive management is appropriate and implemented.

Designation of MSY, therefore, establishes the foundation for regulatory change, as is the case in this amendment, or in subsequent management actions in response to future developments in the resource and fishery. Regulatory change in general 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.

Additional indirect effect of fisheries management on the fishing community and related sectors includes 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 associated with 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 value (alternative), while protecting the resource, may subject the human environment to overly restrictive regulations, foregone social and economic benefits, and increase 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 social and 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., the level selected 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

Although the average annual harvests (all sectors) of red snapper from 2003-2007, approximately 442,000 pounds (whole weight), were substantially less than the MSY values of both **Alternative 1 (No Action/Preferred)** and **Alternative 2**, 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 complete closure of the red snapper fishery (see Sections 4.2.2 and 4.3), as well as additional prohibitions on the harvest of other species to reduce the bycatch mortality of red snapper caught while these other species are targeted. The expected social effects of these alternative prohibitions are discussed in Sections 4.2.2 and 4.3. Although **Alternative 1 (No Action/Preferred)** would allow larger annual harvests upon red snapper recovery than **Alternative 2,** the larger harvests would result in a smaller standing-stock biomass that would, potentially, be more vulnerable to an unexpected shock and have a greater likelihood of requiring management correction, with attendant adverse social and economic effects. **Alternative 2**, conversely, would be expected to result in a larger recovered biomass, which would be expected to be better capable of withstanding external shocks, but this augmented protection would come at the expense of smaller equilibrium allowable annual harvests. However, recorded harvests have never approached the MSY of either alternative and the difference in amounts is less than 130,000 pounds, or approximately five percent. As a result, little to no differential social effects would be expected between the two alternatives from the simple perspective of allowable harvest. Nevertheless, the long-term trade-off between the two alternatives equate to consideration of whether the social and economic benefits of the reduced likelihood of corrective action under **Alternative 2** exceed the social and economic costs of the reduced harvests that could be allowed relative to **Alternative 1 (No Action/Preferred)**. Further, it should be emphasized that, because of the current status of the resource and necessary closure required under the rebuilding plan, short-term social and economic losses are expected under both alternatives.

It should also be noted that in addition to resulting in different levels of sustained biomass (and different sustainable harvest levels), the underlying rule or equation that determines the resultant MSY for each alternative is materially different and, as a result, would be expected to result in different social and economic effects. As discussed in **Section 4.1.1**, rebuilding projections associated with **Alternative 1 (No Action/Preferred)** indicate the stock could rebuild more quickly and with less restrictive management than under **Alternative 2**. Less restrictive management measures and quicker recovery, where possible, would be expected to result in greater short-term social and economic benefits relative to more restrictive management measures and slower recovery. However, as discussed in the previous paragraph, these short-term benefits must be considered in tandem with the long-term costs of a potentially less stable or sustainable resource, due to the lower standing biomass that would result.

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. Defining a maximum sustainable yield (MSY) proxy establishes a harvest goal for the fishery, for which management measures will be implemented. Those management measures would directly impact the administrative environment according to the level of MSY proxy conservativeness and subsequent restrictions placed on the fishery to constrain harvest levels. If, after a comprehensive review of how MSY proxies should be applied across the region reveals a different MSY proxy is appropriate for red snapper, an increase in administrative time and cost could be expected since a different MSY proxy could require modification of Amendment 17A management measures. Furthermore, if the new benchmark assessment, (due to be completed in October 2010 and reviewed by the Council's Scientific and Statistical Committee in November 2010), indicates management measures implemented for red snapper through Amendment 17A should be changed, additional administrative work in the form of an emergency rule, or regulatory amendment could be expected.

4.1.5 Council's Conclusions

The <u>Snapper Grouper Advisory Panel</u> did not have any recommendations.

The <u>Law Enforcement Advisory Panel</u> did not have any recommendations.

The Scientific and Statistical Committee (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 noted that the SEDAR 15 (2008) Review Panel suggested that $F_{40\%SPR}$ be used as a proxy for F_{MSY} because the estimate of steepness in the base assessment was hitting the upper bound and therefore not estimated with confidence. With this change, it was determined that the steepness associated with projections (h=0.68 when using $F_{40\%SPR}$) differed from the base assessment leading to an abrupt change in recruitment between assessment years and projection years. The SSC discussed multiple ways to handle this inconsistency in steepness and recruitment and approved a motion to use $F_{40\%SPR}$ as the F_{MSY} proxy and retain the steepness of 0.95 for short-term projections.

The Council chose the status quo proxy of $F_{30\%SPR}$ for F_{MSY} proxy (**Alternative 1**) be maintained until the Southeast Fisheries Science Center can conduct a comprehensive review of how F_{MSY} proxies should be applied across all southeastern fisheries. The Council also determined it would be advantageous to first determine what methodology would be most appropriate for assigning F_{MSY} proxies to species/stocks on the regional level before proceeding with a change to the current F_{MSY} proxy for red snapper.

4.2 Red Snapper Rebuilding Plan

4.2.1 Rebuilding Schedule

Alternative 1 (No Action). 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 the 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.

4.2.1.1 Biological Impacts

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 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 actions 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 rebuilding schedule for red snapper will have no immediate effect on species protected under the Endangered Species Act (ESA) and the Marine Mammal Protection Act because these parameters are not used in determining immediate harvest objectives.

Alternative 1 (No Action) would not establish a rebuilding schedule for red snapper. The most recent stock assessment indicates red snapper are overfished and undergoing overfishing. If a stock is overfished, the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires a rebuilding schedule be specified as part of a rebuilding plan. Without a rebuilding schedule, the stock would rebuild to SSB_{MSY} if overfishing was ended; however, there would be no timeframe to specify when the stock would be rebuilt. Therefore, even though this alternative would rebuild the stock, it would not meet the requirements of 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 Magnuson-Stevens Act, 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 (2008) 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 (2008) estimated the mean generation time for red snapper as 20 years (Red Snapper Projections V, March 19, 2009 **Appendix F**). 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 targeting species that co-occur with red snapper. 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 3** or **Alternative 4 (Preferred)**. Therefore, **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. The Council is considering alternatives in **Section 4**.**3** that would rebuild red snapper within the timeframe specified in **Alternative 3**. However, the probability that the stock could rebuild within the 25 year timeframe is less certain than longer timeframes due to uncertainties associated with assessment and effectiveness of proposed management measures. 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 but it is unknown to what extent bycatch of red snapper would be reduced. Consequently, the Council has chosen **Alternative 4** as the preferred rebuilding strategy alternative.

4.2.1.2 Economic Effects

Like the maximum sustainable yield (MSY) proxy, 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 (No Action)**, which does not provide a rebuilding schedule, would potentially imply the least restrictive regulations. While this alternative may rebuild the red snapper stock, it does not comply with Magnuson-Stevens Act requirements on rebuilding schedule, and thus may be ruled out as a viable alternative.

A 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, as noted in the MSY proxy discussions, 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 the management measure should be; the shorter the rebuilding period, the more stringent would be the required management measures, but the sooner would the benefits also accrue. Conversely, longer rebuilding periods would require less management measures, but benefits would accrue later. Without actual estimates of costs and benefits over time, it cannot be determined whether a shorter rebuilding period would provide larger net economic benefits than longer rebuilding period, or vice-versa. However, some general statements on costs/benefits may be made based on the respective characteristics of the various rebuilding schedules.

As discussed in the biological effects section, regardless of the presence of incidental mortality of red snapper from fishing for other species, the shorter rebuilding schedules (**Alternatives 2** and **3)** or no rebuilding schedule (**Alternative 1 (No Action)**) would allow the red snapper stock to rebuild to SSB_{MSY} within the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) allowable timeframe, such as the one specified in **Alternative 3**. These shorter rebuilding schedules, however, may require regulations more restrictive than the ones considered in this amendment. In particular, more areas would be closed to snapper grouper fishing to minimize incidental mortality of red snapper. This would mean that the collateral economic losses to the other fisheries would likely be substantially higher than those estimated for any of the management alternatives considered in this amendment. Not only would more fishing operations, both commercial and recreational, be affected but also the more valuable fisheries would incur losses. 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 to the red snapper fleet and the larger snapper grouper fleet associated with the 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 within the Magnuson-Stevens Act required timeframe. Moreover, this alternative offers fishery managers more flexibility in the type of management measures to implement over time. In this sense, **Alternative 4 (Preferred)** would be accompanied by the least economic costs, among the alternatives, without necessarily sacrificing the long-term benefits from the fishery.

Regardless of the length of the rebuilding period chosen, the long-term benefits from the fishery would depend on, among others, the regulatory regime adopted over time. Regulatory regimes that promote economic efficiency generally have a higher likelihood of generating higher economic values while preserving the sustainability of the fish stock. Other regulatory regimes could very well erode the economic benefits over time, even at higher stock levels. For example, if regulations proposed in this amendment were successful in rebuilding the red snapper stock, higher levels of harvest approaching the chosen optimum yield (OY) would be allowed. But if nothing is done to address overcapacity and other open-access problems in the fishery, the economic status of the fishery could fall back to its current, or possibly worse, condition.

The issue of rebuilding timeframe in fisheries management was explored by Larkin et al. (2006). They constructed a dynamic programming bioeconomic model and applied it to two hypothesized fisheries, one involving moderate-live stock and the other, a long-lived stock. They noted the possibility of generating higher net present values when moving from a 10-year rebuilding timeframe to 20-year and 30-year timeframes, with a higher discounting rate resulting in larger increases than a lower one. One of the additional regulations they simulated was a 10-

year fishery closure within a 40-year rebuilding timeframe. Their results showed minimal changes in net present values and allowable catch under a low discount rate, but an increase in allowable catch with slight reduction in net present value under a higher discount rate.

Non-use values, like existence and bequest values, would be higher under **Alternative 2** and lowest under **Alternative 1 (No Action)**. However, the difference in non-use values between **Alternatives 2**, **3**, and **4** are likely to be minimal.

4.2.1.3 Social Effects

Although defining a rebuilding schedule is an administrative action, the schedule determines the severity of the management measures necessary to rebuild the resource within the allotted timeframe. The severity of these measures, in turn, determines the magnitude of the associated social and economic effects expected to accrue 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 discussed in **Sections 4.2.2.3** and **4.3.3**, respectively.

Because the red snapper resource has been declared overfished, a rebuilding schedule is required. Therefore, **Alternative 1 (No Action),** which would not establish a rebuilding schedule, is not a viable alternative, and its selection would require subsequent additional management action to adopt a legally compliant rebuilding schedule. Because this subsequent action would merely accomplish what the Council has the opportunity to accomplish with the current action, in addition to the additional expense of repetitive management effort, adoption of **Alternative 1 (No Action)** could result in a conclusion by the public that management is not responsibly fulfilling its duties.

Alternatives 2-4 specify rebuilding schedules of different length. Red snapper would be closed during the initial years under each rebuilding schedule and would likely be closed for longer periods for rebuilding schedules of shorter length, which require more restrictive management measures. While faster recovery conceptually allows faster receipt of the benefits of a recovered resource, it is unlikely that the resource could recover under the shortest schedule, **Alternative 2**, without additional restrictions on other fisheries to prevent incidental catch and mortality of red snapper. Because of the relatively minor significance of the red snapper fishery for the South Atlantic as a whole compared to other snapper grouper fisheries (see Sections 3.8.1 and 3.8.2; although some individual commercial fishermen or businesses are likely to be more dependent on red snapper than the fishery as a whole, commercial red snapper average revenues accounted for only approximately $388,000 per year compared to total average annual revenues for all species by the same vessels of approximately $9.78 million, while in the recreational sector, annual red snapper target effort has averaged fewer than 50,000 charter and private angler trips combined compared to over 11 million total charter and private angler trips per year), any social gains associated with faster red snapper recovery under **Alternative 2** would be expected to be negated by the losses associated with harsher restrictions on these other snapper grouper fisheries. For the intermediate rebuilding schedule, **Alternative 3**, recovery of the red snapper stock is realistic under the same additional management restrictions proposed in tandem with **Alternative 4 (Preferred)**. However, the probability that the stock could recover within the 25-year timeframe of Alternative 3 is lower than the probability of recovery under the timeframe specified by **Alternative 4 (Preferred)** (see Section 4.2.1.1). **Alternative 4 (Preferred)** would allow the longest possible rebuilding timeframe, is expected to result in the largest probability (with respect to the alternatives considered) of achieving recovery of the stock within the specified timeframe and, as a result, would be expected to allow the greatest flexibility to recover red snapper and minimize the adverse social and economic effects on associated fisheries.

4.2.1.4 Administrative Effects

Under **Alternative 1 (No Action)**, no rebuilding timeframe would be established for red snapper. The Magnuson Stevens Fishery Conservation and Management Act (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 is specified, 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

The Snapper Grouper Advisory Panel did not have any recommendations.

The Law Enforcement Advisory Panel did not have any recommendations.

The Scientific and Statistical Committee (SSC) did not have any recommendations.

The Council chose **Alternative 4** as their preferred rebuilding schedule alternative. **Alternative 4 (Preferred)** defines 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. The Council acknowledges the cumulative effects of Amendment 17A proposed regulations, recent fisheries regulations, and other circumstances other than regulations (rise in fuel costs, decrease in dock space, national economic recession leading to a decrease in for-hire trips, etc) will have negative economic and social effects. By choosing the longest rebuilding schedule, negative socioeconomic impacts would be mitigated to the greatest extent possible while still ending overfishing.

In addition, more restrictive harvest provisions would be needed to rebuild the stock within a rebuilding schedule shorter than that of **Alternative 4 (Preferred)** and could possibly result in unnecessary socioeconomic impacts. The socioeconomic costs of regulations associated with **Alternative 4 (Preferred)** would be less than **Alternatives 2 and 3**. Since the stock is still likely to rebuild within the longest timeframe using less restrictive harvest prohibitions while incurring the least amount of negative economic impacts, the Council has concluded **Alternative 4 (Preferred)** is the best rebuilding schedule option for red snapper in the South Atlantic.

The Council concluded the preferred alternative is the most appropriate choice in terms of a rebuilding schedule as it minimizes the expected adverse social and economic impacts to the fishing industry; the actions meet the new Magnuson-Stevens Fishery Conservation and Management Act requirements for red snapper; and the preferred alternatives best address the SSC's recommendations. The Council also concluded the preferred alternative best meets the goals and objectives of the Snapper Grouper Fishery Management Plan as amended.

4.2.2 Rebuilding Strategy, Annual Catch Limit, Optimum Yield, and Accountability Measures

Note: Projections may be based upon various levels of recruitment in a fishery, ranging from very low to very high recruitment. All alternatives in this analysis are based upon a ***very high recruitment*** *scenario referenced in the most recent SEFSC projections (January 2010,* ***Appendix F****) .*

Table 4-3. Summary of the total kill allowed, reduction needed in total removals, and probability of rebuilding for Alternatives 1-9.

F_{OY} Alternative	Total Kill	% Reduction	Year Rebuilt (50% Prob)	Prob rebuilt 2044
Alternative 1 (No Action) ($F_{45\%SPR}$)	Not specified	85%	2035*; 2025**	70%*; 99%**
Alternative 2 ($85\%F_{40\%SPR}$)	89,000	85%	2035	70%
Alternative 3 ($75\%F_{40\%SPR}$)	79,000	87%	2032	84%
Alternative 4 ($65\%F_{40\%SPR}$)	68,000	91%	2029	94%
Alternative 5 ($97\%F_{40\%SPR}$)	101,000	83%	2044	50%
Alternative 6 ($85\%F_{30\%SPR}$)	125,000	79%	2031	78%
Alternative 7 ($75\%F_{30\%SPR}$)	111,000	82%	2028	92%
Alternative 8 ($65\%F_{30\%SPR}$)	97,000	84%	2026	98%
Alternative 9 (Preferred) ($98\%F_{30\%SPR}$)	**144,000**	**76%**	**2040**	**53%**

*Compared to SSB_{MSY} = 17,863,000 lbs whole weight for $F_{40\%SPR}$ F_{MSY} proxy.
**Compared to SSB_{MSY} = 13,283 000 lbs whole weight for $F_{30\%SPR}$ F_{MSY} proxy.

Alternative 1 (No Action). Maintain a yield-based rebuilding strategy for red snapper where $F_{OY} = F_{45\%SPR}$ (equivalent to 85% $F_{40\%SPR}$ and $59\%F_{30\%SPR}$). The value for OY at equilibrium is 2,196,000 lbs whole weight. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2035 and a 70% chance of rebuilding to SSB_{MSY} by 2044 based on a $F_{40\%SPR}$ proxy for F_{MSY}. ACL is not specified.

Alternative 2. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 85% F_{MSY} (85%$F_{40\%SPR}$). 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 lbs whole weight. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2035 and 70% chance of rebuilding to SSB_{MSY} by 2044.

Sub-alternative 2A. Establish an ACL based on landings. The ACL in 2010 would equal 0.

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Sub-alternative 2B. Establish an ACL based on total removals. The ACL in 2010 would equal 89,000 lbs (40,370 kg).

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Alternative 3. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 75% F_{MSY} (75%$F_{40\%SPR}$). 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 lbs whole weight. 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.

Sub-alternative 3A. Establish an ACL based on landings. The ACL in 2010 would equal 0.

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Sub-alternative 3B. Establish an ACL based on total removals. The ACL in 2010 would equal 79,000 lbs (35,834 kg).

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Alternative 4. Define a rebuilding strategy for red snapper that sets F_{OY} equal to $65\%F_{MSY}$ ($65\%F_{40\%SPR}$). 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 whole weight. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2029, and a 94% chance of rebuilding to SSB_{MSY} by 2044.

Sub-alternative 4A. Establish an ACL based on landings. The ACL in 2010 would equal 0.

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Sub-alternative 4B. Establish an ACL based on total removals. The ACL in 2010 would equal 68,000 lbs (30,844 kg).

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Alternative 5. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 97% F_{MSY} (97%$F_{40\%SPR}$) and rebuilds in 35 years. 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 2,287,000 lbs whole weight. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2044.

Sub-alternative 5A. Establish an ACL based on landings. The ACL in 2010 would equal 0.

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Sub-alternative 5B. Establish an ACL based on total removals. The ACL in 2010 would equal 101,000 lbs (945,813 kg).

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Alternative 6. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 85% F_{MSY} (85%$F_{30\%SPR}$). 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 2,392,000 lbs whole weight. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2031 and 78% chance of rebuilding to SSB_{MSY} by 2044.

Sub-alternative 6A. Establish an ACL based on landings. The ACL in 2010 would equal 0.

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Sub-alternative 6B. Establish an ACL based on total removals. The ACL in 2010 would equal 125,000 (56,699 kg).

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Alternative 7. Define a rebuilding strategy for red snapper that sets F_{OY} equal to 75% F_{MSY} (75%$F_{30\%SPR}$). 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 2,338,000 whole weight. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2028 and an 92% chance of rebuilding to SSB_{MSY} by 2044.

Sub-alternative 7A. Establish an ACL based on landings. The ACL in 2010 would equal 0.

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Sub-alternative 7B. Establish an ACL based on total removals. The ACL in 2010 would equal 111,000 lbs (50,349 kg).

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Alternative 8. Define a rebuilding strategy for red snapper that sets F_{OY} equal to $65\%F_{MSY}$ ($65\%F_{30\%SPR}$). 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 2,257,000 whole weight. Under this strategy, the fishery would have a 50% chance of rebuilding to SSB_{MSY} by 2026, and a 98% chance of rebuilding to SSB_{MSY} by 2044.

Sub-alternative 8A. Establish an ACL based on landings. The ACL in 2010 would equal 0.

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Sub-alternative 8B. Establish an ACL based on total removals. The ACL in 2010 would equal 97,000 lbs (43,998 kg).

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Alternative 9 (Preferred). Define a rebuilding strategy for red snapper that sets F_{OY} equal to 98% F_{MSY} (98%$F_{30\%SPR}$) and rebuilds in 35 years. 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 2,425,000 lbs whole weight. Under this strategy, the fishery would have a 53% chance of rebuilding to SSB_{MSY} by 2044.

Sub-alternative 9A (Preferred). Establish an ACL based on landings. The ACL in 2010 would equal 0.

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Sub-alternative 9B. Establish an ACL based on total removals. The ACL in 2010 would equal 144,000 lbs (65,317 kg).

Establish three AMs:

1. Track CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if assessment indicates progress is not being made.
2. Track the biomass and CPUE through fishery-dependent sampling.
3. The Council would evaluate the size of the area closures when the dead discards are estimated to exceed the ACL. CPUE would be evaluated every three years and adjustments would be made by the framework action.

Table 4-4. Reduction in total removals (landings plus dead discards) needed end overfishing Determined by comparing expected landings in 2010 to average landings during 2006-2007. Non-shaded areas determined by comparing estimated landings in 2009 with allowable removals in 2010. Shaded areas are estimated by interpolation. Alternatives 2-5 use $F_{40\%SPR}$ as F_{MSY} proxy; Alternatives 6-9 use $F_{30\%SPR}$ as F_{MSY} proxy. Council's preferred choice is to use very high recruitment with $F_{30\%SPR}$ proxy for F_{MSY}.

Fmsy proxy	F40% proxy				F30% proxy			
	Base Estimated Recruitment	High Recruitment	Very High Recruitment	Extremely High Recruitment	Base Estimated Recruitment	High Recruitment	Very High Recruitment	Extremely High Recruitment
Alternative 2 and 6 (85% F_{MSY})	89%	88%	85%	81%	84%	83%	79%	79%
Alternative 3 and 7 (75% F_{MSY})	90%	89%	87%	85%	86%	85%	82%	81%
Alternative 4 and 8 (65% F_{MSY})	91%	90%	89%	87%	88%	87%	84%	83%
Alternative 5 and 9 ($F_{REBUILD}$)	87%	86%	83%	81%	82%	81%	76%	73%

4.2.2.1 Biological Impacts

The Southeast Fisheries Science Center (SEFSC) initially 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 as the stock rebuilds. At their September 2009 meeting, the Council indicated that projections should consider very high recruitment, which likely occurred in 2006. Additional projections were requested from the SEFSC in October 2009 and completed in November 2009 using a $F_{40\%SPR}$ proxy for F_{MSY} (**Alternatives 2-5**). At their December 2009 meeting, the Council requested additional alternatives based on a $F_{30\%SPR}$ proxy for F_{MSY}. New projections based on an $F_{30\%SPR}$ proxy for F_{MSY} were provided in January 2010 and are incorporated in **Alternatives 6-9**.

The SEFSC notes in the Red Snapper Projections - VII and Addendum: November 2009 that projections incorporating very high recruitment should be interpreted in light of the model assumptions and key aspects of the data. A new assessment update for red snapper will be conducted in 2010, which will provide an estimate of the actual magnitude of recent recruitment. The following text is from the November 2009 red snapper addendum.

• *These projections reflect a belief that the 2006 year-class was strong. However, for now, the actual strength can only be guessed, and thus the scientific merit of these projections is questionable. The real value of these projections may be more qualitative than quantitative.*

• *The projections used a spawner-recruit relationship with steepness of h = 0.95, the value estimated in the assessment but with considerable uncertainty. On this topic, the SEDAR-15 Review Workshop Report stated, "One of the principal difficulties with the SCA model estimate of stock recruitment parameters is that the steepness estimate appears unrealistically high."*

Such a high value implies that the stock, at its currently low abundance, spawns nearly as many recruits as it would at high abundance. That is, productivity is nearly independent of spawning biomass. If productivity depends on spawning biomass, stock recovery would take longer than projected.

• The 2008 recreational landings reported by MRFSS indicate very high levels of landings, which could be due to a very strong 2006 year-class, as explored in these projections. The high landings could also be due, at least in part, to increased fishing effort, which is not accounted for here. If effort has actually increased along with the high landings, these projections could be considered overly optimistic in terms of spawning biomass, recruitment, and landing in subsequent years.

• The rebuilding time frame was computed without high 2006 recruitment. If it were recomputed using the high recruitment of these current projections, the rebuilding time frame may be shorter, which would lead to lower estimates of Frebuild. Nonetheless, long-term stock projections, on which Frebuild depends, are highly uncertain.

• Initial abundance at age of the projections, other than 2006 age-1 recruits, were based on estimates from the last year of the assessment. If those estimates are inaccurate, rebuilding will likely be affected.

• Fleets were assumed to continue fishing at their estimated current proportions of total effort, using the estimated current selectivity patterns. New management regulations that alter those proportions or selectivities would likely affect rebuilding.

• The projections assumed no change in the selectivity applied to discards. As recovery generally begins with the smallest size classes, management action may be needed to meet that assumption.

• The projections assumed that the estimated spawner-recruit relationship applies in the future and that past residuals represent future uncertainty in recruitment. If changes in environmental or ecological conditions affect recruitment or life-history characteristics, rebuilding may be affected.

On the topic of uncertainty in projections, the SEDAR-15 Review Workshop Report stated in January of 2008, "The panel discussed the value of projections made beyond 5–10 years. Clearly the uncertainty increases rapidly with time as the currently measured stock is replaced by model values into the future. Realistically, the projections beyond the range of the predominant age groups in the stock are highly uncertain. In this assessment, the best that can be concluded is that rebuilding times will be very long." The assessment team concurs with that statement, and would add that uncertainty is even greater now because of the increased duration between the terminal year of the assessment (2006) and any new implementation of management.

The SEFSC provided "saturated" OY equilibrium values for yield at 85% F_{MSY}, 75% F_{MSY}, and 65% F_{MSY} using $F_{40\%SPR}$ and $F_{30\%SPR}$ as a proxies for F_{MSY}. To determine saturated values, rebuilding projections were run out for 100 years. As the SEFSC did not provide saturated OY values for the yield at $F_{REBUILD}$, saturated equilibrium values were estimated from the 35 year rebuilding projections for $F_{REBUILD}$ provided by the SEFSC. Comparisons were made between the equilibrium values and the terminal year of the 35 year rebuilding projections for the yield at $F_{40\%SPR}$ and $F_{30\%SPR}$ to estimate saturated equilibrium values for $F_{REBUILD}$.

Optimum Yield at Equilibrium

Choice of the proxy for F_{MSY} in **Section 4.1** has an effect on the magnitude of the optimum yield (OY). OY values based on the No Action 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}. For example, the estimated yield at 75%F_{MSY} when the stock is at SSB_{MSY} is 2,338,000 lbs whole weight and 2,104,000 lbs whole weight for $F_{30\%SPR}$ and $F_{40\%SPR}$, respectively. Initially, the Council determined F_{MSY} proxy **Alternative 2** should be the preferred alternative for the red snapper because it is more conservative than the current F_{MSY} proxy, which would require a more significant harvest reduction to end overfishing. However, at their June 2010 meeting, the Council changed their preferred alternative from **Alternative 2** to **Alternative 1 (No Action)**. The Council recommended that the status quo F_{MSY} proxy be maintained until the SEFSC can conduct a comprehensive review of how F_{MSY} proxies should be applied across all southeastern fisheries. It was also suggested that the decision to apply a specific F_{MSY} proxy should be made at the regional level rather than on a species-by-species basis. Therefore, the Council determined it would be advantageous to first determine what methodology would be most appropriate for assigning F_{MSY} proxies to species/stocks on the regional level before proceeding with a change to the current F_{MSY} proxy for red snapper.

Under **Alternative 1 (No Action)**, $F_{OY} = F_{45\%SPR}$ (equivalent to 88%$F_{40\%SPR}$ and 59%$F_{30\%SPR}$). The value for OY when the stock is at the spawning stock biomass at MSY (SSB_{MSY}) is 2,196,000 lbs whole weight and is extremely similar to **Alternative 2**, which specifies a rebuilding strategy at 85%$F_{40\%SPR}$ with an OY = 2,199,000 lbs whole weight when the stock is at SSB_{MSY}. The OY at equilibrium (when stock biomass reaches SSB_{MSY}) for **Alternatives 2** through **5** would be based on the rebuilding strategy where OY would equal the yield at 85% F_{MSY}, 75% F_{MSY}, 65% F_{MSY}, and 97% F_{MSY}, respectively using $F_{40\%SPR}$ as a proxy for F_{MSY}. **Alternatives 6** through **9 (Preferred)** would also be based on the rebuilding strategy where OY would equal the yield at 85% F_{MSY}, 75% F_{MSY}, 65% F_{MSY}, and 98% F_{MSY}, respectively, but would be determined using $F_{30\%SPR}$ rather than $F_{40\% SPR}$, which is a slightly less conservative proxy for F_{MSY}. OY values at equilibrium in the nine 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 4** and **Sub-alternative 4A**, which would specify an OY at equilibrium equal to 65%F_{MSY} based on the F_{MSY} proxy of $F_{40\%SPR}$. Therefore, a larger sustainable biomass associated with a fishing mortality rate at

65%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 9 (Preferred)** with **Sub-alternative 9B**, which would specify a rebuilding strategy based on the yield at OY equal to 98%F_{MSY} (98%$F_{30\%SPR}$). Under this alternative there would be a 53% chance of rebuilding the stock to $SSB_{30\%SPR}$ by 2044.

Alternative 9 (Preferred) would set the rebuilding strategy as well as the OY equal to the yield at 98% F_{MSY} (98%$F_{30\%SPR}$). This alternative is less conservative than **Alternatives 2-8 Alternative 9 (Preferred)** would specify an OY level that is not based on the Scientific and Statistical Committee's (SSC) recommended F_{MSY} proxy. However, once a comprehensive review of how maximum sustainable yield (MSY) proxies should be applied across the region is completed, a new F_{MSY} proxy for red snapper could be phased in over time to , reduce to the extent practicable, negative impacts.

Rebuilding strategies

Alternative 1 (No Action) would establish a yield-based, rebuilding strategy for red snapper that is similar to **Alternative 2** (yield at 85%$F_{40\%SPR}$). The difference between **Alternative 1 (Preferred)** and **Alternative 2** is that **Alternative 1 (No Action)** would not specify an annual catch limit (ACL) or a method to monitor recovery of red snapper. Under **Alternative 1 (No Action)**, the stock would rebuild to $SSB_{30\%SPR}$ sooner than a rebuilding goal of $SSB_{40\%SPR}$ (Figure 4-1).

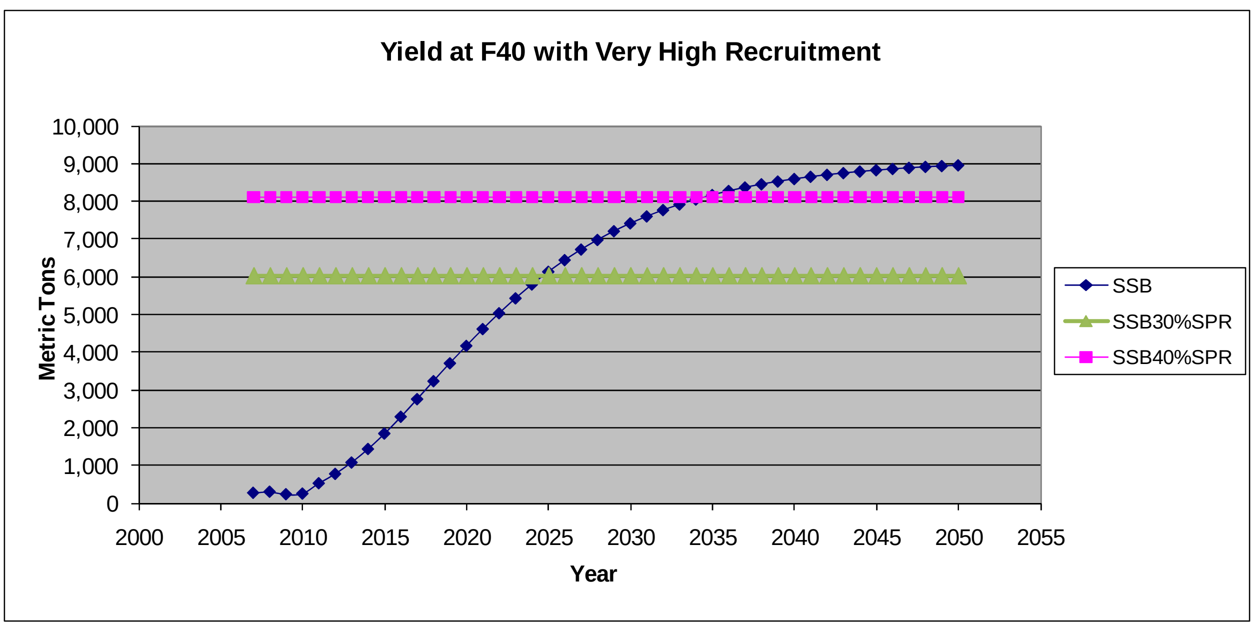


Figure 4-1. Projection results where fishing mortality rate fixed at F = $F_{45\%SPR}$ (**Alternative 1**). Expected values represented by dotted solid line. Thick horizontal line represents the 5555.1 mt and 8102.5 mt SSB_{MSY} benchmark for the yield at $F_{30\%SPR}$ and $F_{40\%SPR}$, respectively.

Under **Alternatives 2-9 (Preferred)**, the red snapper stock could rebuild sooner than specified by each rebuilding strategy since the Council's is 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. The rebuilding strategy under **Alternative 4** would have a 94% chance of rebuilding the stock to $SSB_{40\%SPR}$ by 2044 (Table 4-5c). This is the most conservative rebuilding strategy of all the alternatives considered and would require a 94% reduction in total kill but would achieve the same rebuilding goal ($SSB_{40\%SPR}$) of **Alternatives 2**, **3**, and **5**, but would do so in shortest amount of time. Since **Alternative 4** would also require the most stringent harvest prohibitions in order to manage the fishery to such a conservative level, it would incur the highest level of negative socioeconomic impacts. **Alternatives 6-9 (Preferred)**, which have a rebuilding goal of $SSB_{30\%SPR}$, would be less conservative than **Alternatives 2-5**. **Alternative 9 (Preferred)** would be least conservative of all alternatives considered, requiring a 76% reduction in total kill and would have a 53% chance of rebuilding the stock to $SSB_{30\%SPR}$ by 2044 (Table 4-5h). As a result, **Alternative 9 (Preferred)** would require the least stringent harvest regulations, and would therefore incur the lowest level of negative socioeconomic impacts. All other rebuilding strategy alternatives fall within the range of impacts associated with **Alternative 4** and **Alternative 9 (Preferred)**. The long-term biological impacts of **Alternatives 2-5,** are very similar because they would rebuild the stock to $SSB_{40\%SPR}$; however, **Alternatives 2-5** are more conservative than **Alternatives 6-9 (Preferred)**, which have a rebuilding goal of $SSB_{30\%SPR}$. Therefore, the main difference between **Alternatives 2-5** and **Alternatives 6-9 (Preferred)** are the rates at which red snapper would be rebuilt to the goal of $SSB_{30\%SPR}$ or $SSB_{40\%SPR}$, along with the probability the stock would be rebuilt to the target by end of the rebuilding timeframe of 2044.

The "**A**" **Sub-Alternatives** e.g., **2A, 3A, 4A**… would establish ACLs based on landings, which would be zero in 2010 and would continue until modified. These sub-alternatives would also include three accountability measures , all related to tracking catch per unit effort (CPUE). The CPUE would be monitored via fishery-independent and fishery-dependent sampling methods, and those results would be analyzed every three years after which adjustments to management measures and/or the ACL may be made through a framework action. Establishing an ACL of zero would not require monitoring of dead discards, which the SSC has opposed on several occasions since discard data are self-reported and there is greater uncertainty with discard data than with estimates of landings.

The "**B**" **Sub-Alternatives** e.g.**, 2B, 3B, 4B**… 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, which subsequently die in the commercial and recreational sectors. At their March 2009 meeting, the SSC indicated their recommendation of acceptable biological catch = 0 for speckled hind and warsaw grouper was based on landed catch only due to concern about monitoring discards. The SSC expressed concerns when discussing ACLs based on dead 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 dead discards became elevated. There could be similar concerns with the need to monitor red snapper dead discards in **Alternatives 2B-6B**. Because of these concerns with monitoring discards, CPUE of red snapper could be tracked via a fishery-independent and/or a fishery-dependent monitoring program to identify changes in biomass. The Council is also considering fishery-dependent data collection by headboat and charterboat operators to determine if there are changes in CPUE and biomass. If the ACL was exceeded or if CPUE indicated the stock was not rebuilding, the Council could re-evaluate management measures to ensure overfishing did not occur. CPUE would be evaluated every three years and adjustments would be made by a framework action being developed in Amendment 17B.

Under **Alternative 2**, an initial reduction in total kill of 85% would be required. Therefore, this definition would provide fewer indirect benefits to the biological and ecological environment than **Alternatives 4** and **5**, and could make it more difficult to sustain red snapper over the long term. However, biological benefits under **Alternative 2** would be greater than those under **Alternatives 6, 7**, and **9 (Preferred)** since **Alternative 2** is based on a $F_{40\%\ SPR}$ proxy for F_{MSY}; whereas, **Alternatives 6-9 (Preferred)** are based on a F_{MSY} proxy of $F_{30\%SPR}$. The ACL under **Sub-Alternative 2A** would be zero until modified and under **Sub-Alternative 2B** the ACL would be 89,000 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 (Figure 4-2). Under **Alternative 2** the stock has a 50% chance of being rebuilt by 2035, six years later than **Alternative 4**, and three years later than **Alternative 3.** There is a 70% 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 3** and **4** would yield higher biological benefits at a faster rate, **Alternative 2** would rebuild the stock within the rebuilding time frame (Figures 4-2 through 4-4).

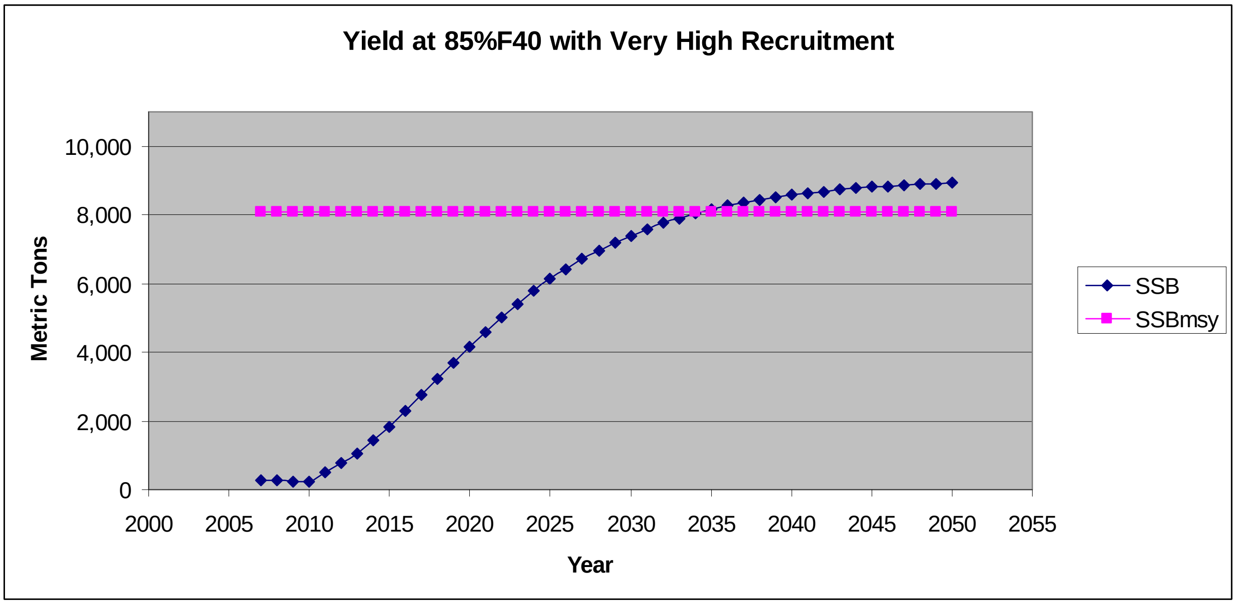


Figure 4-2. Projection results were fishing mortality rate is fixed at F = 85%$F_{40\%SPR}$ (Alternative 2).
Expected values represented by dotted solid lines. Thick horizontal line represents SSB_{MSY} = 8102.5 (mt) benchmark. Source: Red Snapper Projections - VII and Addendum: November 2009, Figure 5.4.

Alternative 3 would establish a rebuilding strategy that maintains fishing mortality at 75% F_{MSY} (75%$F_{40\%SPR}$) with a constant F of 0.078. Under **Sub-Alternative 3A** the ACL would be zero, and under **Sub-Alternative 3B** the ACL would be set at 79,000 lbs whole weight and would remain in effect until modified (Figure 4-3). Under **Alternative 3** an 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. There is an 84% that the stock could rebuild to SSB_{MSY} ($SSB_{40\%SPR}$) 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 among **Alternatives 2-5** for stock recovery in terms of time for recovery and removal rate. **Alternative 3** would rebuild the stock more quickly than **Alternative 2**, but would rebuild it three years slower than **Alternative 4**. When considering the expanding margin of error for SSB as it approaches SSB_{MSY}, it is likely a three year difference would be biologically negligible regarding benefits to the stock.

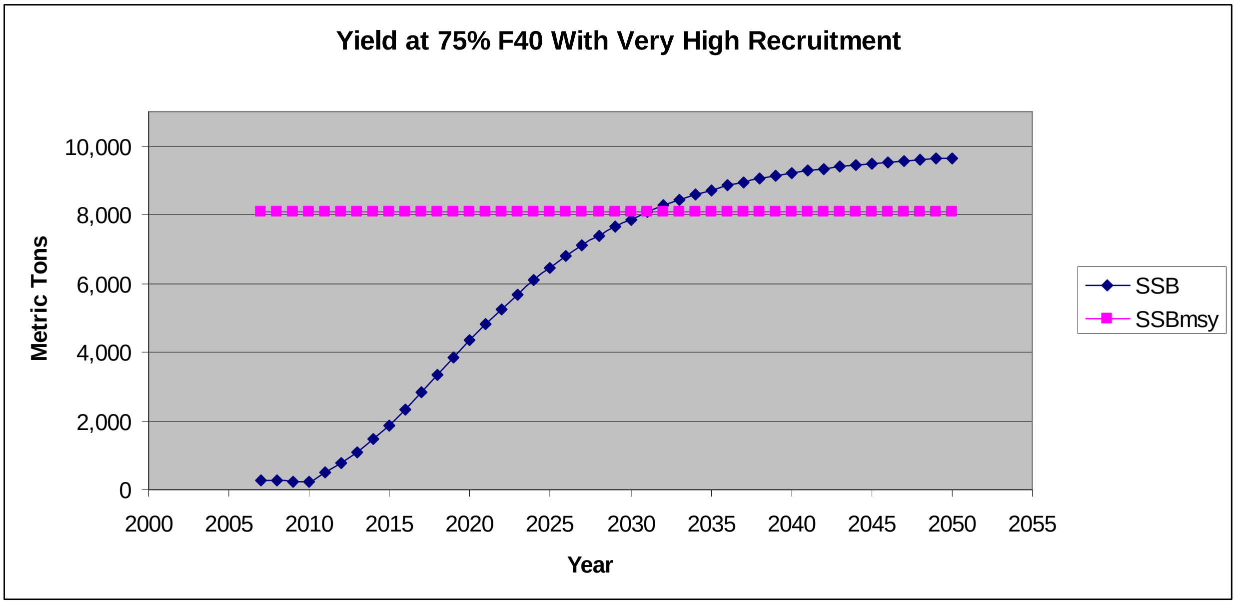


Figure 4-3. Projection results where fishing mortality rate is fixed at F = 75%$F_{40\%SPR}$ (Alternative 3).
Expected values represented by dotted solid lines. Thick horizontal line represent SSB_{MSY} = 8102.5 (mt) benchmark. Source: Red Snapper Projections - VII and Addendum: November 2009, Figure 5.3.

Alternative 4 would implement the most conservative rebuilding strategy of all the alternatives considered that have a rebuilding SSB_{MSY} target of $SSB_{40\%SPR}$. **Alternative 4** would also require a higher reduction in total kill than **Alternatives 6-9 (Preferred)**, which have a rebuilding target of $SSB_{30\%SPR}$. Under **Alternative 4** the rebuilding strategy would set F_{OY} equal to 65%F_{MSY} (65%$F_{40\%SPR}$). Under **Sub-Alternative 4A** the ACL would be zero and under **Sub-Alternative 4B** the ACL would be 68,000 lbs whole weight, and would remain in effect until modified. A 91% reduction in total kill would be required under **Alternative 4**. Because this ACL is the lowest relative to other alternatives, it would be the ACL most likely to be exceeded. According to the November 2009 projections, **Alternative 4** would rebuild the stock the fastest among **Alternatives 2-5**. The stock would have a 50 percent probability of being rebuilt by the year 2029 and a 94% probability of being rebuilt by 2044. However, the stock could rebuild sooner than 2029 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 timeframe of 19 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 4** may be viewed as too conservative in light of the fact that **Alternatives 2, 3**, and **5** are also expected to rebuild the stock within the allowable time frame. As Figure 4-4 illustrates, steady progress toward a rebuilt condition is expected under this alternative with no leveling effect before the rebuilt condition is reached.

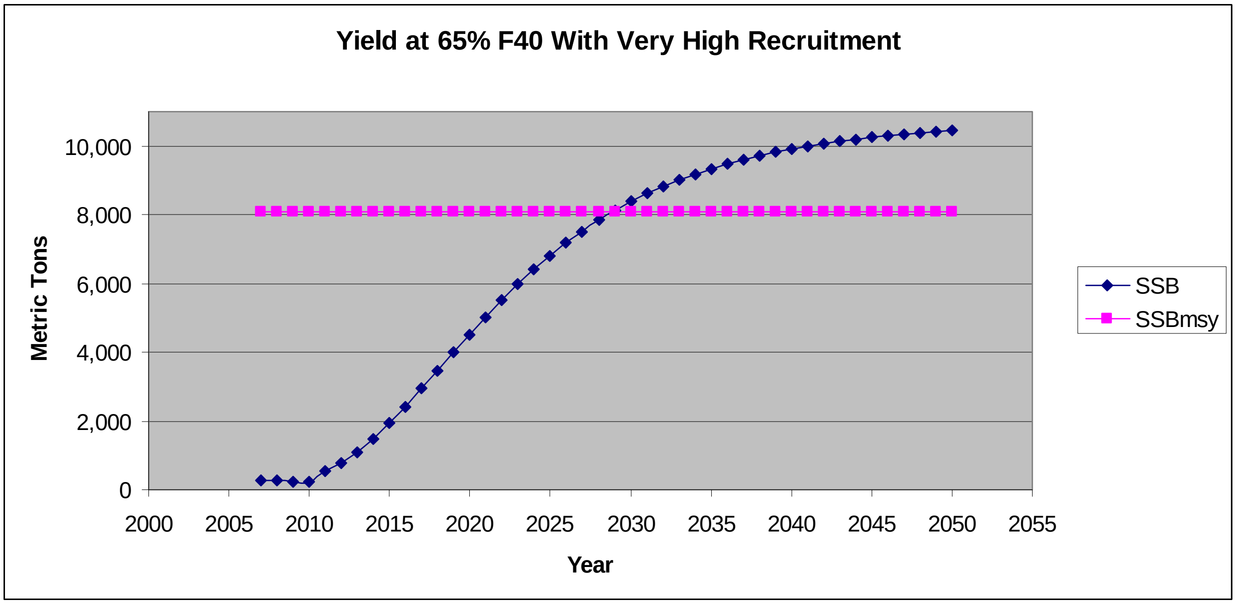


Figure 4-4. Projection where fishing mortality rate is fixed at F = 65%$F_{40\%SPR}$ (Alternative 4). Expected values presented by dotted solid lines. Thick horizontal line represents SSB_{MSY} = 8102.5 (mt) benchmark. Source: Red Snapper Projections -VII and Addendum: November 2009, Figure 5.2.

Alternative 5 (Figure 4-5) would set the rebuilding strategy equal to 97%F_{MSY} (97%$F_{40\%SPR}$) based a constant $F_{REBUILD}$ of 0.088. Under **Sub-Alternative 5A** the ACL would be zero and under **Sub-Alternative 5B** the ACL would be 101,000 lbs whole weight, and would remain in effect until modified. Under **Alternative 5**, an initial 83% reduction in total kill would be required. **Alternative 5** 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 (2044). It is possible the red snapper stock could rebuild sooner than specified in 2044 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. The biological benefits of **Alternative 5** would be intermediate in value and would consider the social and economic effects of the action.

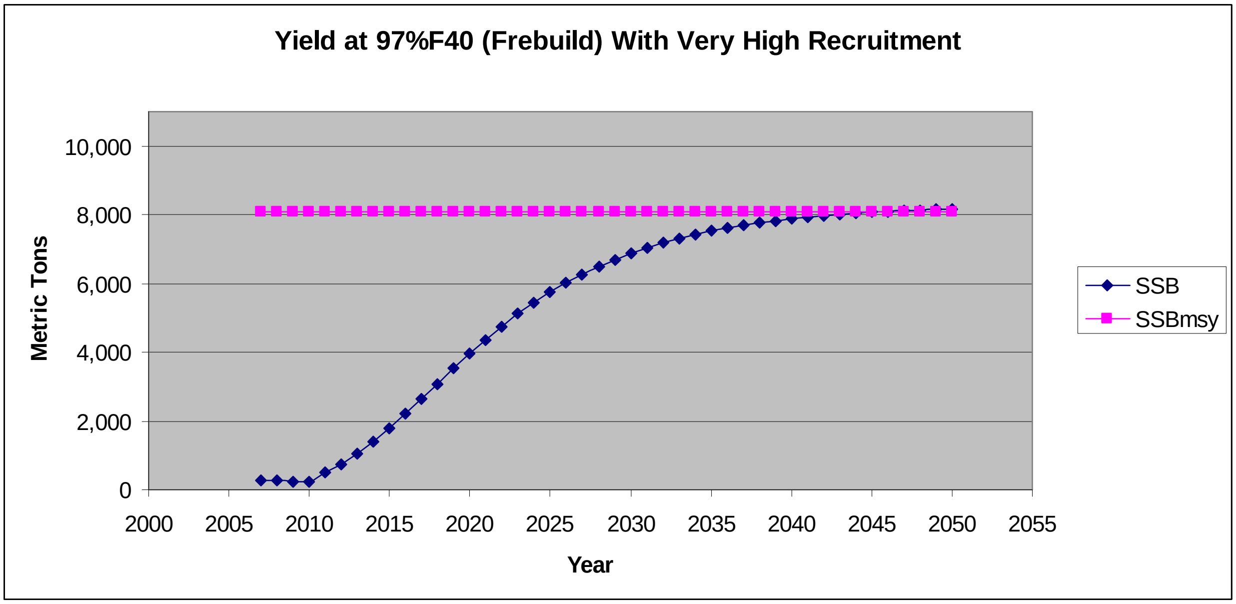


Figure 4-5. Projection where fishing mortality rate is fixed at F = 97%$F_{40\%SPR}$ (**Alternative 5**). Expected values presented by dotted solid lines. Thick horizontal line represents SSB_{MSY} = 8102.5 (mt) benchmark. Source: Red Snapper Projections -VII: November 2009, Figure 5.1.

Under **Alternative 6**, an initial reduction in total kill of 79% would be required. Therefore, this definition would provide fewer indirect benefits to the biological and ecological environment than **Alternatives 7** and **8**, since it would not be expected to rebuild as rapidly to $SSB_{30\%SPR}$. However, biological benefits under **Alternative 6** would be greater than those under **Alternative 9 (Preferred)** since, which would require a smaller reduction in total kill. The ACL under **Sub-Alternative 6A** would be zero until modified and under **Sub-Alternative 6B** the ACL would be 125,000 lbs whole weight until modified. Under this scenario, SSB increases steadily through time until approximately the year 2025 when those increases begin to level off (Figure 4-6). Under this alternative the stock has a 50% chance of being rebuilt by 2031, five years later than **Alternative 8**, and two years later than **Alternative 7.** There is a 78% chance the stock could rebuild to SSB_{MSY} ($SSB_{30\%SPR}$) 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.

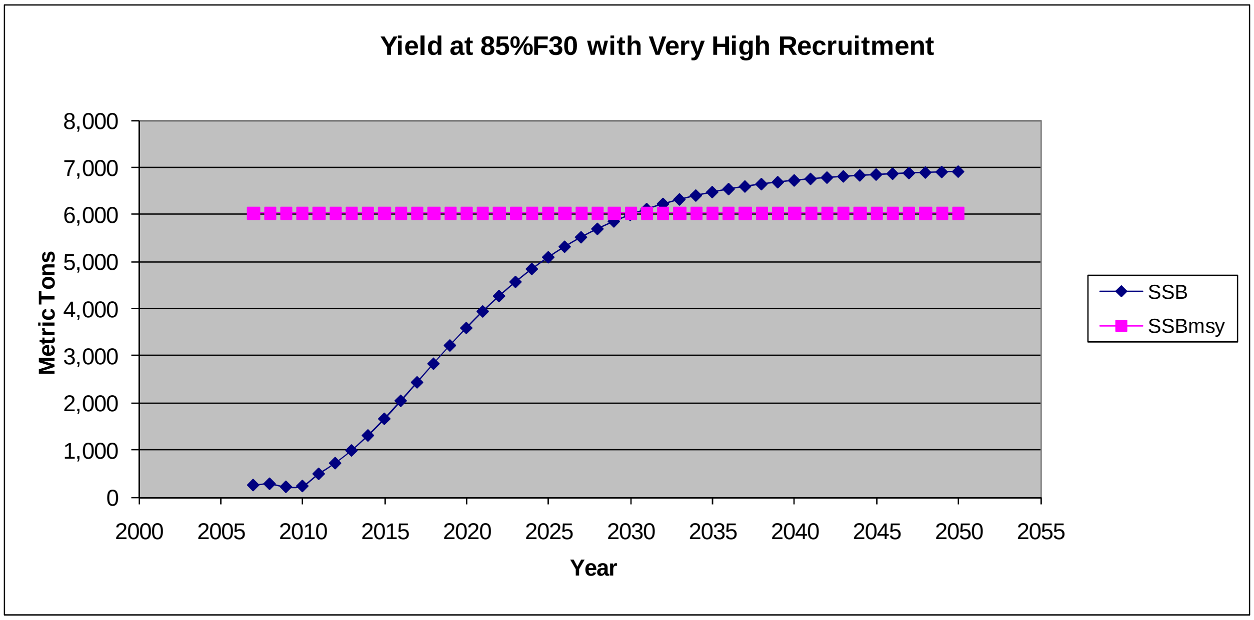


Figure 4-6. Projection where fishing mortality rate is fixed at F = 85%$F_{30\%SPR}$ (**Alternative 6**). Expected values presented by dotted solid lines.
Thick horizontal line represents SSB_{MSY} = 6025.1 (mt) benchmark. Source: Red Snapper Projections -VIII and Addendum: January 2010, Figure 6.5.

Alternative 7 would establish a rebuilding strategy that maintains fishing mortality at 75% F_{MSY} (75%$F_{30\%SPR}$) with a constant F of 0.111. Under **Sub-Alternative 7A** the ACL would be zero, and under **Sub-Alternative 7B** the ACL would be set at 111,000 lbs whole weight and would remain in effect until modified (Figure 4-7). Under **Alternative 7** an 82% reduction in total kill would be required. At this rate of recovery, the stock has a 50% chance of rebuilding to SSB_{MSY} ($SSB_{30\%SPR}$) by 2028. There is a 92% 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 among **Alternatives 6-9** for stock recovery in terms of time for recovery and removal rate. **Alternative 7** would rebuild the stock more quickly than **Alternative 6**, but would rebuild it two years slower than **Alternative 4**.

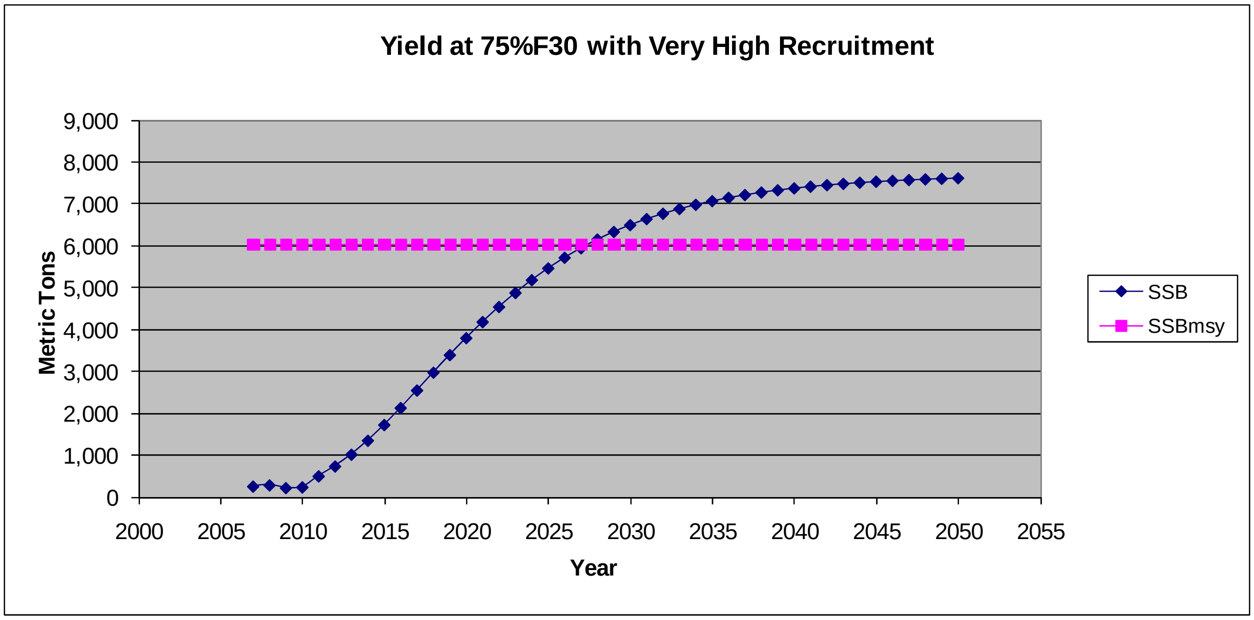


Figure 4-7. Projection where fishing mortality rate is fixed at F = 75%$F_{30\%SPR}$ (**Alternative 7**). Expected values presented by dotted solid lines.
Thick horizontal line represents SSB_{MSY} = 6025.1 (mt) benchmark. Source: Red Snapper Projections -VIII and Addendum: January 2010, Figure 6.4.

Alternative 8 (Figure 4-8) would implement the most conservative rebuilding strategy of all the alternatives considered that have a rebuilding SSB_{MSY} target of $SSB_{30\%SPR}$. Under **Alternative 9 (Preferred)** the rebuilding strategy would set F_{OY} equal to 65%F_{MSY} (65%$F_{30\%SPR}$). Under **Sub-Alternative 8A** the ACL would be zero and under **Sub-Alternative 4B** the ACL would be 97,000 lbs whole weight, and would remain in effect until modified. An 84% reduction in total kill would be required under **Alternative 8**. **Alternative 8** would rebuild the stock the fastest among **Alternatives 6-9 (Preferred)**. The stock would have a 50 percent probability of being rebuilt to $SSB_{30\%SPR}$ by the year 2026 and a 98% probability of being rebuilt by 2044. However, the stock could rebuild sooner than 2026 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**.

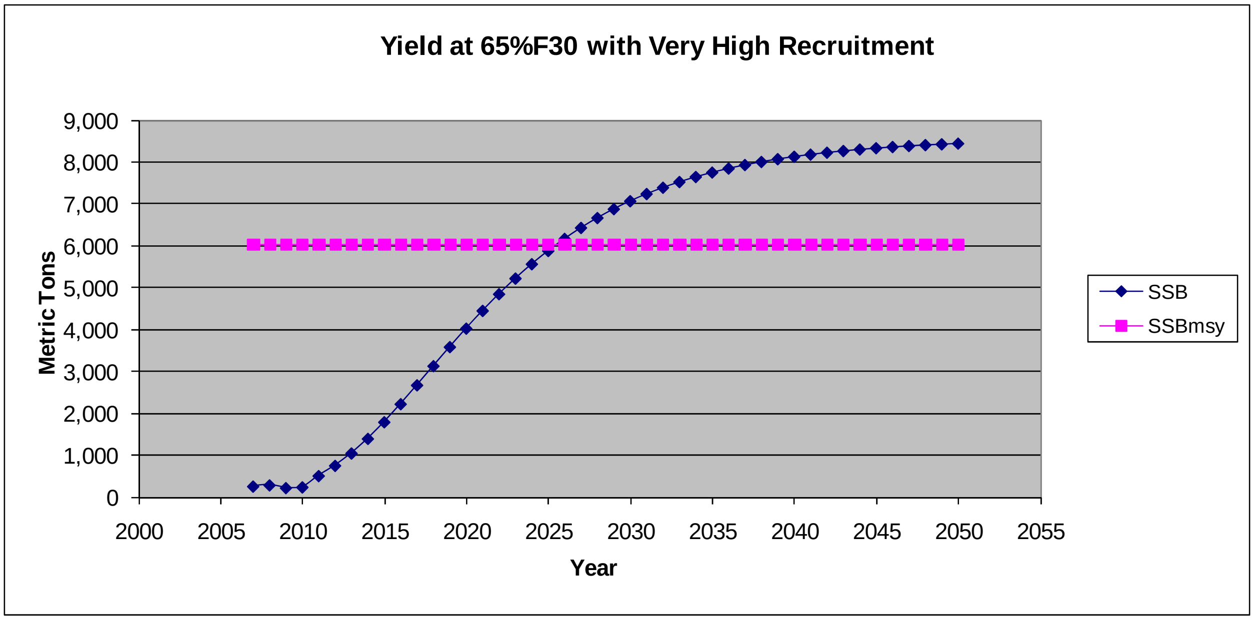


Figure 4-8. Projection where fishing mortality rate is fixed at F = 65%$F_{30\%SPR}$ (**Alternative 8**). Expected values presented by dotted solid lines.
Thick horizontal line represents SSB_{MSY} = 6025.1 (mt) benchmark. Source: Red Snapper Projections -VIII and Addendum: January 2010, Figure 6.3.

Alternative 9 (Preferred) (Figure 4-9) would set the rebuilding strategy equal to 98%F_{MSY} (98%$F_{30\%SPR}$) based a constant $F_{REBUILD}$ of 0.145. Under **Sub-Alternative 9A (Preferred)** the ACL would be zero and under **Sub-Alternative 9B** the ACL would be 144,000 lbs whole weight, and would remain in effect until modified. Under **Alternative 9 (Preferred)**, an initial 76% reduction in total kill would be required. **Alternative 9 (Preferred)** specifies a fishing mortality rate that has a 53% probability of rebuilding the stock to SSB_{MSY} ($SSB_{30\%SPR}$) in the maximum allowable time of 35 years (2044). It is possible the red snapper stock could rebuild sooner than specified in 2044 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. The short-term biological benefits of **Alternative 9 (Preferred)** would be less than all other alternatives considered.

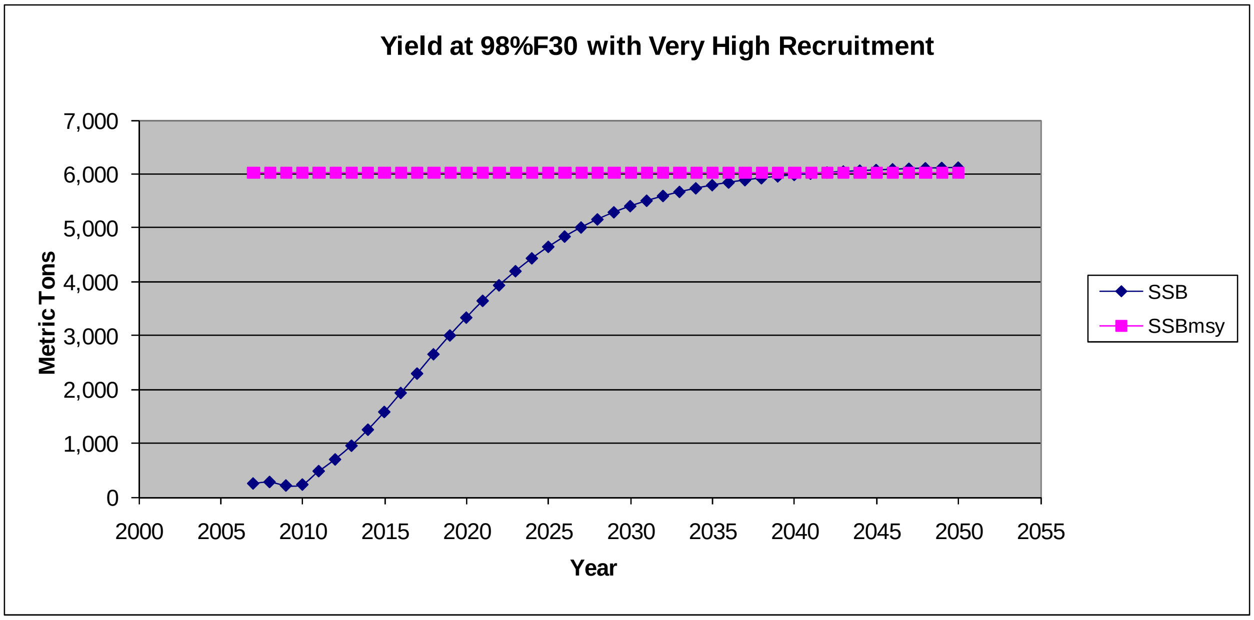


Figure 4-9. Projection where fishing mortality rate is fixed at F = 98%$F_{30\%SPR}$ ($F_{Rebuild}$; **Preferred Alternative 9**).
Expected values presented by dotted solid lines. Thick horizontal line represents SSB_{MSY} = 6025.1 (mt) benchmark. Source: Red Snapper Projections -VIII and Addendum: January 2010, Figure 6.2.

Under each of the sub-alternatives, the accountability measure would be to track 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 there are few baseline data for red snapper and a monitoring program specific to red snapper does not currently exist. The proposed framework for a fishery-independent monitoring program would continue the long-term data series from Marine Resources Monitoring Assessment and Prediction (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. Details of the proposed fishery-independent sampling program are discussed in **Section 4.5**.

Alternatives 1 (No Action)-9 are unlikely to have adverse effects on Endangered Species Act (ESA)-listed species, including *Acropora* species. Previous ESA consultations determined the snapper grouper fishery was not likely to adversely affect *Acropora* 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 these species. The impacts from **Alternatives 1 (No Action)-9** 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

Optimum Yield at Equilibrium

The more conservative the optimum yield (OY), the larger the sustainable biomass when the stock is rebuilt and therefore greater long-term economic benefits. **Alternatives 2-5** are based on the rebuilding strategy where OY would equal the yield at a range of parentages of F_{MSY} using $F_{40\%SPR}$ as a proxy for F_{MSY}. **Alternatives 6-9** are also based on the rebuilding strategy where OY would equal the yield at the same range of percentages of F_{MSY} but use $F_{30\%SPR}$ as a proxy for F_{MSY}. Because $F_{40\%SPR}$ results in a more conservative proxy for F_{MSY}, and therefore higher values of OY at equilibrium, **Alternatives 2-5** would seem to provide greater long-term economic benefits than **Alternatives 6-9**.

Alternative 4 and **Sub-alternative 4A**, are expected to result in the largest biological benefit, is also expected to offer the largest long-term economic benefits but would require the most severe short-term reductions and therefore largest short-term negative economic impacts. **Alternative 9 (Preferred)** with **Sub-alternative 9B** is expected to yield the smallest biological benefit. This would likely result in less stringent management measures and therefore the smallest short-term negative economic impacts but also the smallest long-term economic benefits to the fishermen.

Alternative 5 identifies an OY level based on the Council's Scientific and Statistical's (SSC's) F_{MSY} proxy. This alternative has the longest rebuilding period and a higher reduction in total removals (83%) than **Alternatives 6, 7,** and **9 (Preferred)** but lower than **Alternatives 1, 2, 3, 4,** and **8**. This alternative could be expected to result in smaller long-term economic benefits those alternatives with shorter rebuilding periods but might result in less stringent management measures and smaller short-term negative economic impacts than some of the other alternatives. As stated above, **Alternative 5** would specify an OY level based on the SSC's recommended F_{MSY} proxy while reducing to the extent practicable negative impacts that would result from management measures needed to manage the stock to a more conservative OY level.

Rebuilding Strategies

The rebuilding strategies, annual catch limits (ACLs), and accountability measures (AMs) proposed are the background upon which management measures will be imposed. In general, the faster the rebuilding period, the greater the short-term negative impacts and the greater the long-term positive impacts assuming the management measures would be less stringent after rebuilding has been achieved. A lower ACL implies more stringent management measures than a higher ACL and a sufficient AM ensures proper management of the stock and therefore higher long-term economic benefits.

Alternatives 6-9 would be less conservative than **Alternatives 2-5** in that they are based on a rebuilding goal of $SSB_{30\%SPR}$. Therefore, the negative economic impacts under **Alternatives 2-5** would be less than under **Alternatives 6-9**.

Alternative 4 is the most conservative rebuilding strategy but would also require the most restrictive harvest prohibitions. This is expected to result in the greatest short-term negative economic impacts. **Alternative 9 (Preferred)** is the least conservative of all alternatives considered. This alternative would require the least restrictive harvest prohibitions and therefore the smallest short-term negative economic impacts.

The **"A" Sub-Alternatives (2A, 3A, 4A, etc.)** would establish ACLs based on landings, which would be zero in 2010 and would continue until modified. The **"B" Sub-Alternatives (2B, 3B, 4B, etc.)** would set an ACL equal to the total kill specified in the rebuilding strategy for each alternative. Therefore, **"B" Sub-Alternatives** might provide less stringent management measures on species other than red snapper now or at some future point in time. **Alternative 9B**would offer the highest ACL while **Alternative 4B** would offer the smallest ACL (among the **"B" Sub-alternatives**) and therefore are expected to result in the smallest short-term negative impacts and largest short-term negative impacts, respectively. Under **Alternative 5B** the ACL would be 101,000 lbs. The biological benefits of Preferred Alternative 5 would be intermediate in biological value and would consider the social and economic effects of the actions.

With regards to ACLs, the **"A" Sub-Alternatives** would all have the same short-term economic impacts given that they all have ACLs equal to zero. None of the **"A" Sub-Alternatives** would support a commercial fishery for red snapper. It is likely that none of the **"B" Sub-Alternatives** would support a commercial fishery as well, but they might enable targeting of other species caught in conjunction with red snapper.

Recreational fishery

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

Alternative 1 (No Action) defines OY and rebuilding strategy that is relatively restrictive. It does not, however, provide for an ACL, and thus may be considered a non-viable alternative. It may also be noted that this alternative would require more stringent regulations in the short run than some of the other alternatives, such as **Alternative 2**. All other alternatives would provide for OY, rebuilding strategy, ACL, and AM; however, the ACL level of each alternative would render the red snapper fishery a bycatch fishery for both the commercial and recreational sectors in the short run. That is, these alternatives would not support either a commercial or a recreational fishing industry that would depend on red snapper as a major source of vessel revenues and angler benefits in the short run.

The following shows the various OY levels at equilibrium for **Alternatives 2-9**:

Alternative 2: 2.199 million pounds
Alternative 3: 2.104 million pounds
Alternative 4: 1.984 million pounds
Alternative 5: 2.287 million pounds
Alternative 6: 2.392 million pounds
Alternative 7: 2.338 million pounds
Alternative 8: 2.257 million pounds
Alternative 9: 2.425 million pounds

If everything else were the same, **Alternative 9 (Preferred)** would provide the largest economic benefits in the future and **Alternative 4**, the lowest. One feature that would make a big difference in the comparison of OY alternatives is the F_{MSY} proxy used as the basis for F_{OY}. **Alternatives 2-5** use $F_{40\%SPR}$ as F_{MSY} proxy and **Alternatives 6-8**, $F_{30\%SPR}$. Considering the relatively higher probability that $F_{40\%SPR}$ affords in maintaining a sustainable stock over the long run, the apparent larger economic benefits of **Alternative 9 (Preferred)** than those of some alternatives with relatively close OY level but using $F_{40\%SPR}$ as F_{MSY} proxy, such as **Alternative 5** , may not be realized.

Among alternatives with the same F_{MSY} proxy, larger economic benefits may be associated with alternatives providing F_{OY} closer to F_{MSY}. In this case, **Alternative 5** would be better than **Alternatives 2-4** and **Alternative 9 (Preferred)** would be better than **Alternatives 6-8**. This would be the case if everything else were the same for all alternatives within each set. Some factors that may help validate the potential economic superiority of alternatives with higher OY within each set of F_{MSY} proxy include the probability and speed of attaining SSB_{MSY}. The probability and speed of attaining the minimum stock size threshold (MSST) also plays an important role because regulations could be relaxed much further after reaching this threshold, but for the moment the issue involving MSST can be dispensed with but taken up later in the discussion. For a given timeframe, the higher the probability of reaching SSB_{MSY}, the better would be the alternative; conversely, for a given probability, the faster SSB_{MSY} is reached the better would be the alternative. Based on these criteria, **Alternative 4** would be the best among $F_{30\%SPR}$ alternatives and **Alternative 8** among the other set of alternatives. **Alternative 4** has the highest probability of rebuilding the stock at a given timeframe ending in 2044 and the fastest speed in rebuilding the stock at a given 50% probability.

It may be noted that the comparison of alternatives conducted so far has a long-run outlook. Consideration of short-run regulatory requirements under each alternative would depict an entirely different picture. **Alternative 4**, which appears to provide the best long-run economic condition among the $F_{40\%SPR}$ alternatives, would require the largest short-run cost, with as high as 91% required reduction in total red snapper kill. A similar case happens with **Alternative 8** among the other set of alternatives. **Alternative 4**, in particular, would require much higher reduction in total kill than expected from any of the management alternatives considered in this amendment. If additional management alternatives were developed to achieve such high a required reduction in total red snapper kill, the accompanying cost would most likely be significantly higher as these alternatives would affect a greater number of snapper grouper recreational and commercial fishing activities. Economic costs and benefits over time would have to be examined to give some resolution to this issue. A highly simplified approach is attempted with the main intent of illustrating the issue of economic valuation over time respecting the various rebuilding alternatives.

Table 4-5 presents the economic values of red snapper for the entire 2010-2044 period. Red snapper data are lifted from the relevant tables in the red snapper projections. Some simplifying assumptions used in generating the tabulated results include: (1) red snapper landed or new discards in the source tables are assumed to be red snapper landings/harvests; (2) the assumed red snapper harvests are exactly matched with neither over- nor under-harvest; (3) red snapper is valued by the commercial and recreational sectors at $1 per pound; (4) the regulatory regime over the entire period affects only the red snapper fishery; and, (5) 7% and 3% discount rates.

Table 4-5 presents two sets of economic values, one without harvest adjustments and the other with harvest adjustments. The first set of values refers to the economic values of red snapper harvest for the entire 2010-2044 period. The second set of economic values incorporates adjustments made to the red snapper harvests after the spawning stock biomass exceeded the overfishing threshold (MSST). To make these adjustments, the landing values in the red snapper projection tables were replaced by the corresponding values for total kill that would prevent overfishing less the dead discards. These adjustments were made each year after the SSB exceeded MSST. Also, the discounting rates of 7% and 3% are used to generate the net present values. These are the rates generally used in fisheries when discounting a stream of values over time.

Among the $F_{40\%SPR}$ alternatives, **Alternative 5** would provide the highest net present value regardless of the discounting rates used. This would also be the case even if landings were increased after SSB exceeded MSST, although landings were still restricted to the level that would prevent overfishing. The late landing adjustment introduced into **Alternative 5** did not make a difference in the relative magnitude of results among the alternatives. Landings adjustments were made starting in 2035 for **Alternative 5** , 2032 for **Alternative 2**, 2029 for **Alternative 3**, and 2028 for **Alternative 4**. The larger landings under **Alternative 5** in the early years compensated for the later increase in landings relative to the other alternatives. A similar observation may be made of **Alternative 9 (Preferred)** relative to the other $F_{30\%SPR}$ alternatives.

One other thing worth noting in Table 4-5 is the relatively large difference in values when using different discount rates. In the present case, the use of a 7% rate as against a 3% rate substantially reduced the economic values, although under either discount rate the relative ranking of alternatives did not change.

Table 4-5. Summary of economic values of red snapper under various rebuilding alternatives, in thousand dollars, 2010-2044.

	Year SSB > MSST	Net Present Value without Landing Adjustments		Net Present Value with Landing Adjustments	
		7%	3%	7%	3%
Alternative 2	2031	$12,078	$25,301	$12,334	$26,048
Alternative 3	2028	$11,246	$23,666	$11,906	$25,467
Alternative 4	2027	$10,294	$21,765	$11,422	$24,778
Alternative 5	2034	$12,948	$26,976	$12,977	$27,067
Alternative 6	2028	$14,283	$29,459	$14,501	$30,044
Alternative 7	2024	$13,543	$28,098	$14,230	$29,761
Alternative 8	2036	$12,633	$26,375	$12,878	$27,176
Alternative 9	2036	$15,023	$30,764	$15,031	$30,790

Year SSB > MSST refers to the rebuilding year when the spawning stock biomass exceeds the overfishing threshold (MSST).

The ACL provision under each rebuilding alternative could materially change the economic scenarios presented in the Table 4-5 at least in the first few years of the rebuilding period. Each of **Alternatives 2-9** provides for two ACL sub-alternatives. The first sub-alternative would impose an ACL = 0 based on landings and the second would impose a non-zero ACL based on dead discards. A landings-based ACL of zero would not alter the relative scenarios depicted in Table 4-6 if under each alternative the same ACL level were implemented for the same length of time, e.g., the first 5 years for each alternative. Varying time length for the zero landings-based ACL would lead to economic outcomes different from the ones shown in the table. Without information on how long a zero ACL would be maintained under each alternative, it is not possible to depict each alternative's economic values over time. It may only be remarked that a zero ACL would likely speed up the rebuilding of the red snapper stock under each alternative.

From the standpoint of economic effects, the dead discards-based ACLs would have implications on management measures affecting snapper grouper fisheries other than the red snapper fishery. They would not affect the economic scenarios shown in Table 4-6 because of the assumption that the regulatory regime during the rebuilding period affects only the red snapper fishery. It may only be stated that the lower the dead discards-based ACL, the greater would be the short-term adverse effects on other snapper grouper fisheries.

The same three sets of accountability measures accompany each of the landings-based ACLs. The first one would track CPUE/biomass of red snapper via a fishery-independent monitoring program; the second would track CPUE/biomass through a fishery-dependent sampling program; and, the third would require evaluation of CPUE every three years and making the necessary regulatory adjustments. 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. A fishery-dependent data collection program could have lower associated administrative costs, but could also raise issues regarding the validity of the data. Any adjustment involving more stringent management measures would add costs especially to the fishing participants of other fisheries. On the other hand, more favorable adjustments could benefit the red snapper fishery as well as other snapper grouper fisheries. The costs and potential benefits of these AMs to the fishing participants would be proportionally the same across **Alternatives 2-9**.

The same three sets of accountability measures accompany each of the discards-based ACLs. The first one would track CPUE/biomass of red snapper via a fishery-independent monitoring program; the second would track CPUE/biomass via a fishery-dependent monitoring 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 2-9**.

4.2.2.3 Social Effects

General Concepts

Although an administrative action, defining the optimum yield (OY) for a species or species complex establishes a management target for allowable harvests. If defined as a percentage (less than one) of the maximum sustainable yield, the target would incorporate a protective buffer to help ensure the biological health of the resource is not threatened, thereby helping support stable environmental, economic, and social benefit streams. The larger the buffer, the greater the certainty of biological protection. However, an excessively large buffer (i.e., a buffer that exceeds the biological variability of the resource, environmental challenges, and potential for fishery-induced problems) would result in overly restrictive harvest allowances, leading to foregone social and economic benefits. While none of the relevant biological parameters are ever likely known with certainty, the best OY specification would be expected to balance the risk and costs of being insufficiently conservative against the costs of potentially unnecessarily "leaving fish in the water," all decisions on which incorporate best available knowledge of the biology of the resource, environmental challenges, and the harvest capabilities of the fishing sectors.

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 cumulative impacts). In general, smaller harvests result in 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 employment or recreational opportunities elsewhere. If other species are depleted, regulations may prevent fishermen from freely switching to another fishery. If other employment opportunities or recreational options are unavailable or difficult/costly to find, then 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 amount is relatively close to current harvests. However, medium- and long-term problems may arise as catch rates increase as the resource rebuilds and the allowable catch is held constant. While the total catch remains constant, harvest can occur more quickly and/or with the expenditure of fewer resources. Although this may allow these now non-required (for fishing) 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 issues arise, jeopardizing recovery goals. Pressure to increase allowable catches is likely under such events, although biological recovery may not be complete.

Constant fishing mortality (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**, annual catch limits (ACL) specify the amount of allowable fishing mortality of a species per year and are the amount of harvest expected to prevent overfishing. Exceeding the ACL, or annual catch target (ACT) if an ACT is also specified, triggers the accountability measures (AM). 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, 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 met. 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, as with any short-term and long-term trade-off, short-term consequences may be so severe that the long-term benefits accrue to different entities than those who bear the consequences of the short-term actions. Such “forced” transfer of benefits may raise equity issues.

In addition to the considerations discussed above, the preferred rebuilding strategy from the perspective of the social environment would be expected to be influenced by the fishing industries’ perception of stock status. If the industry believes that the resource is overfished, then fishermen and associated businesses would be expected to generally accept short-term socio-economic losses in exchange for long-term increases in harvest rates if timing and amount of pay-back is 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 expected to 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 may 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

Although 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, because red snapper is overfished, is undergoing overfishing, and the severity of its stock status requires total closure of the red snapper fishery, the alternative OY specifications have no relevance to short-term operation of the fishery. From a long-term perspective, while the different alternatives imply different equilibrium harvest levels, suggesting different social and economic benefits, the total variation between the alternative specifications is small, particularly considering the absence of a demonstrated ability by the combined harvest sectors to harvest these quantities. Thus, little to no differential long-term 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 (No Action)**, each of the alternative rebuilding strategies would impose a directed harvest level of zero pounds and establish a specific ACL that would remain fixed until modified. **Alternative 1 (No Action)** would allow the fishery to continue to be managed under the current yield-based rebuilding strategy and the OY established under Amendment 11, but would not specify an ACL or a method to monitor the recovery of red snapper, though the allowable directed harvest level would still likely be set at zero as a result of the proposed management measures discussed for Action 4. Because ACLs are now required components of fishery management plans, **Alternative 1 (No Action)** would not be a viable long-term action, meaning its selection would require redundant subsequent council action to specify an ACL. Thus, while the red snapper fishery could continue unchanged in the short term, at least as constrained by this individual action, 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 2-9 differ in the formula on which the rebuilding strategy would be based. Further, as discussed in **Section 4.2.2.1**, each of **Alternatives 2-9** have an "**A**" sub-alternative that would establish ACLs based on landings, and "**B**" sub-alternative that would prohibit all harvest of red snapper in the directed commercial and recreational sectors, but would set an ACL equal to the total kill arising from incidental or bycatch harvest or resource monitoring activities. The alternative formulas result in different ACLs (except for **Sub-alternatives A**), different OYs (recovered equilibrium), and different rates of recovery and probabilities of achieving rebuilding by 2044. Additionally, in addition to the two AMs common with **Sub-Alternative A**, **Sub-alternative B** would require modification of the size of the area closures when total kills are estimated to exceed the ACL because the overage would be due (assuming the prohibition on directed harvest is effective) to bycatch mortality of red snapper incidentally caught by fishermen targeting other species. **Sub-Alternative A** would allow increased flexibility in the choice of corrective management action relative to **Sub-Alternative B**, as any management measure allowed under the framework would be available. Because the allowable directed red snapper harvest for each of **Alternatives 2-9** would be zero pounds under both **Sub-alternative A** and **B (**other than potential directed harvest as a research set-aside), in functional application, no difference in social effects would be expected across **Alternatives 2-9** based on this perspective. However, the alternative management measures, as described and discussed in Section 4.3, would establish different area closures for other snapper grouper species in order to limit the mortality of red snapper caught by fishermen who target other snapper grouper species. As a result, for **Sub-alternative B** under **Alternatives 2-9,** the smaller the ACL, the larger the required closure to limit red snapper bycatch and release mortality. The larger the area closure, the greater the short-term loss of social and economic benefits to fishermen and associated businesses and shore-side communities.

The smaller the ACL, the greater the necessary reduction in total kill, the greater the likelihood of triggering AMs, the quicker the expected achievement of at least a 50 percent probability of rebuilding, and the greater the probability that the resource will be recovered by 2044 (the maximum allowable recovery time). Reducing harvest or triggering AMs results in short-term reductions in social and economic benefits. The faster that rebuilding occurs, the sooner the benefits of a rebuilt resource can be obtained, while the higher the probability of being rebuilt, the greater the probability that the benefits of the recovered resource can, in fact, be received. Embedded within comparisons of the alternatives is consideration of the appropriate proxy for F_{MSY}. **Alternatives 2-5** use $F_{40\%SPR}$ as a proxy for F_{MSY}, which is more conservative than using $F_{30\%SPR}$, which is used for **Alternatives 6-9**. Because of the different basis of analysis, the first decision in the selection of the rebuilding strategy is the selection of the appropriate proxy for F_{MSY}, followed by the selection of the rebuilding strategy consistent with that proxy. As such the comparisons of alternatives should tier off the selection of the appropriate proxy for F_{MSY}.

The selection of the best alternative from a social effects perspective involves trade-offs between the considerations discussed in the previous paragraph. However, empirical analysis of these trade-offs is not available and qualitative discussion must suffice. Within **Alternatives 2-5**, **Alternative 4** would require the greatest harvest reduction, have the greatest likelihood of triggering AMs, and result in one of the highest probabilities that the resource would be rebuilt by 2044. Thus, **Alternative 4** would be expected to result in the greatest short-term adverse social and economic effects, but the benefits and likelihood of a rebuilt resource would be expected to be achieved more quickly than under most other alternatives. **Alternative 5,** conversely, would require the smallest harvest reduction, have the smallest likelihood of triggering AMs, and result in one of the smallest probabilities that the resource would be rebuilt by 2044. As such, within the group of $F_{40\%SPR}$ alternatives, **Alternatives 2-5**, **Alternative 5** would be expected to result in the least short-term adverse social and economic disruption, but the benefits of a recovered resource would be substantially delayed relative to **Alternative 4**. Further, **Sub-alternative 5A** would be expected to result in greater social benefits than **Sub-alternative 5B** because of the greater flexibility in corrective action should AMs be triggered.

Within the group of $F_{30\%SPR}$ alternatives, **Alternatives 6-9, Alternative 8** and **Alternative 9 (Preferred)** are the comparable pair of most and least restrictive alternatives, respectively. **Alternative 9 (Preferred)** would be expected to result in the least short-term adverse social and economic disruption, but the benefits of a recovered resource would be expected to be substantially delayed (2040) relative to **Alternative 8** (2026). **Sub-alternative 9A (Preferred)** would be expected to result in greater social benefits than **Sub-alternative 9B** because of the greater flexibility in corrective action should AMs be triggered. **Alternatives 6** and **7** would be expected to have intermediate effects to those described. It should be emphasized that, within either group of alternatives, the value of fishing for the associated species that must be regulated in order to achieve recovery of red snapper is believed to be sufficiently important relative to the value of the red snapper fishery itself that the slowest recovery of red snapper is believed to be the least disruptive of total fishing activity and, as a result, the preferred alternative from a social or economic perspective.

4.2.2.4 Administrative Effects

Under **Alternative 1 (No Action)**, the rebuilding strategy would remain as the yield at $F_{45\%SPR}$, which is similar to **Alternative 3**; however, no annual catch limit (ACL) would be specified for red snapper, which is required by the reauthorized Magnuson-Stevens Fishery Conservation and Management Act. 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 – **9 (Preferred)**, 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. The “B” sub-alternatives would involve tracking dead discards for the ACL, and thus could require the development of some specialized means of monitoring discards. A full description of issues associated with tracking the red snapper ACL is provided in **Section 6.6** Monitoring and Mitigation and is hereby incorporated by reference.

4.2.2.5 Council’s Conclusions

The Snapper Grouper Advisory Panel did not have any recommendations.

The Law Enforcement Advisory Panel did not have any recommendations.

At their December 2009 meeting, the Scientific and Statistical Committee (SSC) stated rebuilding strategy alternatives (including the preferred), which were based on “very high” recruitment in 2006 could produce a high positive bias in the near-term predictions for acceptable biological catch (ABC) and annual catch limits (ACL). However, the Council and SEFSC Director considered projections with very high recruitment to be a reasonable approach as the 2008 recreational landings of red snapper in the U.S. South Atlantic were much higher than have been observed in recent years, and the 2008 commercial landings were on the high end of their recent range. In addition, the SSC indicated that some rebuilding projections were not consistent with the recent SSC-approved ABC control rule, which would require at least a 70% probability of rebuilding success for red snapper. However, the Council has not adopted any ABC control rules for use in Amendment 17A as it is considering options for ABC control rules in the Comprehensive ACL Amendment. The current preferred rebuilding alternative would have a 53% probability of rebuilding to SSB_{MSY} in 35 years.

The Council has chosen **Alternative 9** as their preferred optimum yield rebuilding strategy alternative. **Alternative 9 (Preferred)** would define a rebuilding strategy for red snapper that sets F_{OY} equal to 98% F_{MSY} (98%$F_{30\%}$) and rebuilds in 35 years, assuming very high recruitment. The ACL (total removals) 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. The optimum yield (OY) at equilibrium would be 2,425,000 lbs whole weight. By selecting **Alternative 9**, the Council mitigated, to the extent practicable, socioeconomic impacts that would be associated with proposed management measures intended to manage the stock to the new maximum sustainable yield and OY benchmark levels. Although **Alternative 9 (Preferred)** is not likely to rebuild the stock in the fastest amount of time compared with other alternatives considered, it is expected to rebuild the stock within the specified timeframe, thus having the same overall long-term biological benefits as those alternatives that would have rebuilt the stock sooner.

4.3 Red Snapper Management Measures

Alternative 1 (No Action). This would continue the 20-inch minimum 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 fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters.

Alternative 3A. Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, and possession, of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, 3080, and 3180, using coordinates shown in Table 4-6 to define the area, (14,496 mi^2 of the South Atlantic EEZ).

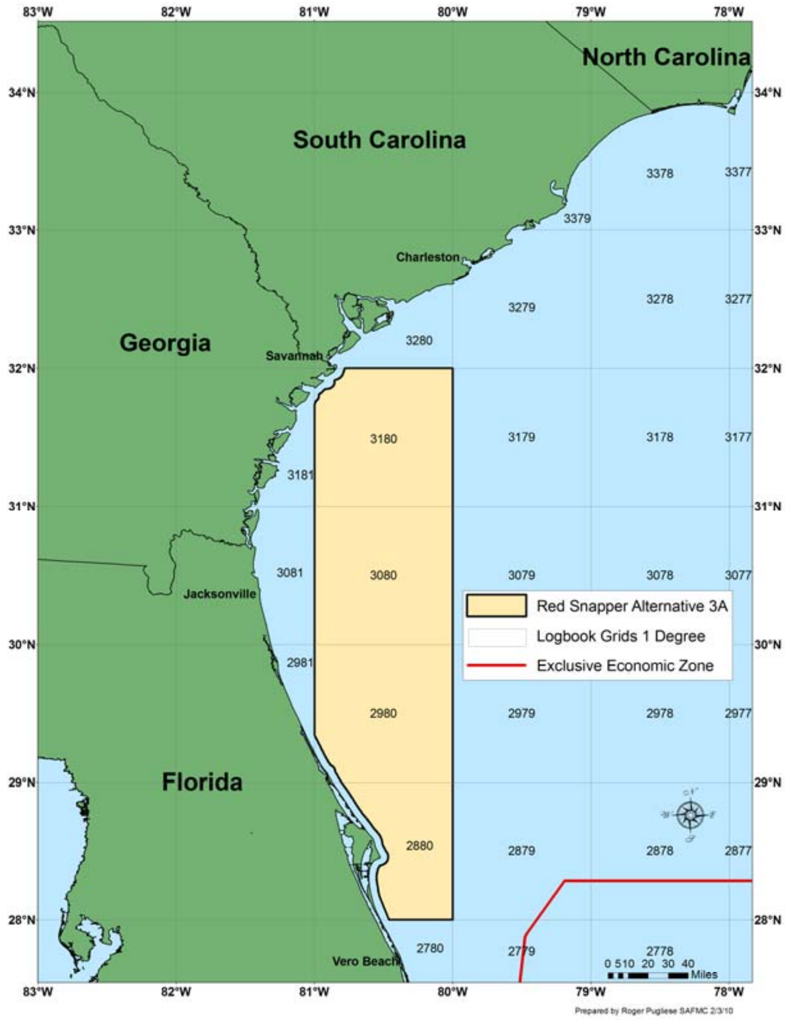


Figure 4-10. Map of proposed closed area under Alternative 3A.

Table 4-6. Waypoints used to delineate Alternative 3A.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 27' 42"
3	29° 20' 33"	81° 00' 00"
4	31° 44' 32"	81° 00' 00"
5	32° 00' 00"	80° 46' 56"
6	32° 00' 00"	80° 00' 00"

Between point 2 and point 3, line follows inner boundary of U.S. EEZ.
Between point 4 and point 5, line follows inner boundary of U.S. EEZ.

Alternative 3B. Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, 3080, and 3180 from 66 feet (11 fathoms; 20 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in Table 4-7 to define the area (10,794 mi² of the South Atlantic EEZ).

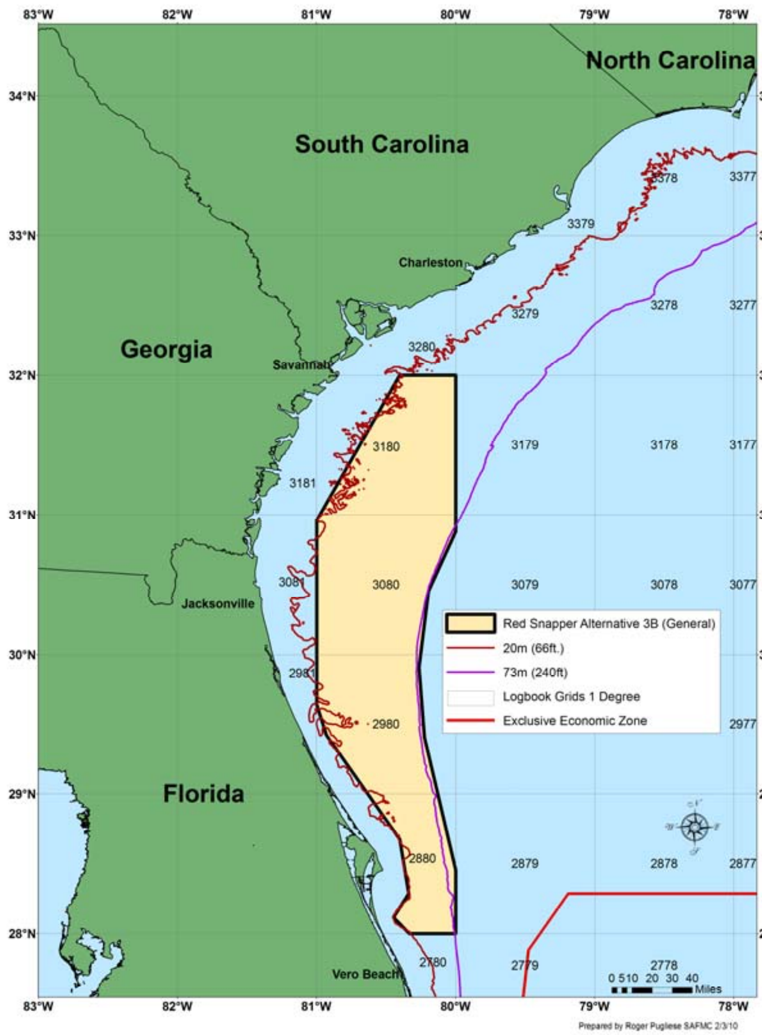


Figure 4-11. Map of proposed closed area under Alternative 3B.

Table 4-7. Waypoints used to delineate Alternative 3B.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 20' 01"
3	28° 06' 58"	80° 26' 49"
4	28° 17' 14"	80° 20' 19"
5	28° 40' 32"	80° 24' 09"
6	29° 25' 09"	80° 55' 44"
7	29° 38' 20"	81° 00' 00"
8	30° 57' 40"	81° 00' 00"
9	32° 00' 00"	80° 24' 12"
10	32° 00' 00"	80° 00' 00"
11	30° 52' 54"	80° 00' 00"
12	30° 27' 19"	80° 11' 41"
13	29° 54' 31"	80° 15' 51"
14	29° 24' 24"	80° 13' 32"
15	28° 27' 20"	80° 00' 00"

Alternative 3C. Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, 3080, and 3180 from 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in Table 4-8 to define the area (6,161 mi² of the South Atlantic EEZ).

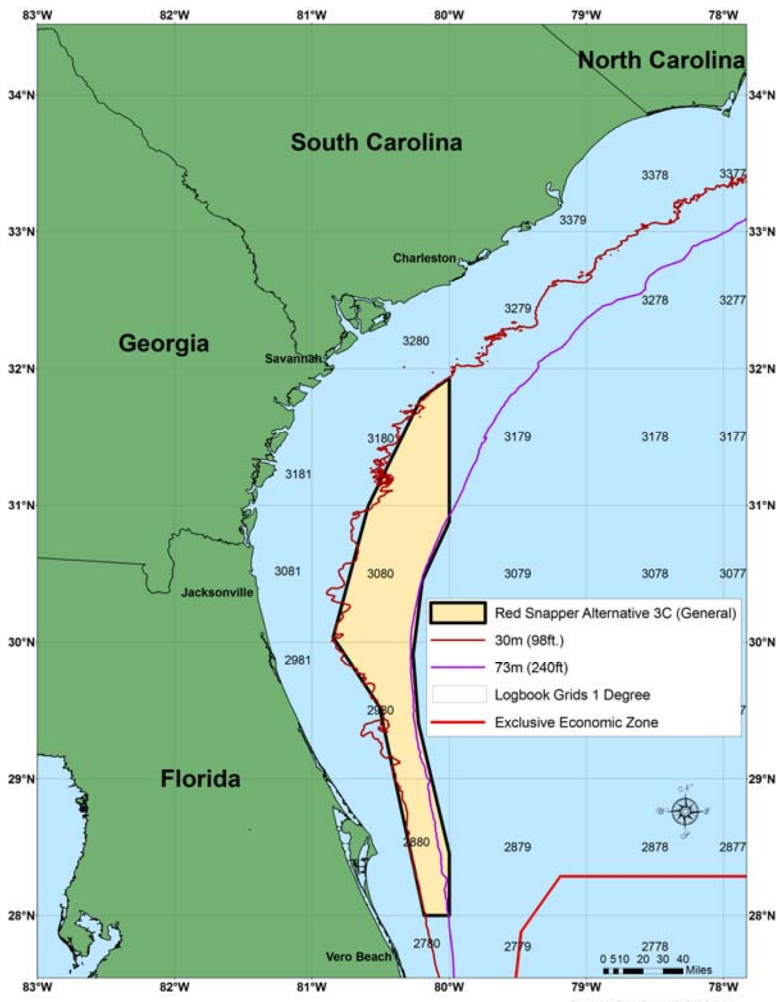


Figure 4-12. Map of proposed closed area under Alternative 3C.

Table 4-8. Waypoints used to delineate Alternative 3C.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 10' 57"
3	29° 31' 40"	80° 30' 34"
4	30° 02' 03"	80° 50' 45"
5	31° 00' 00"	80° 35' 19"
6	31° 47' 00"	80° 12' 15"
7	31° 55' 55"	80° 00' 00"
8	30° 52' 54"	80° 00' 00"
9	30° 27' 19"	80° 11' 41"
10	29° 54' 31"	80° 15' 51"
11	29° 24' 24"	80° 13' 32"
12	28° 27' 20"	80° 00' 00"

Alternative 3D. Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, 3080, and 3180 from 98 feet (16 fathoms; 30 m) to 300 feet (50 fathoms; 91 m), using coordinates shown in Table 4-9 to define the area (6,222 mi² of the South Atlantic EEZ).

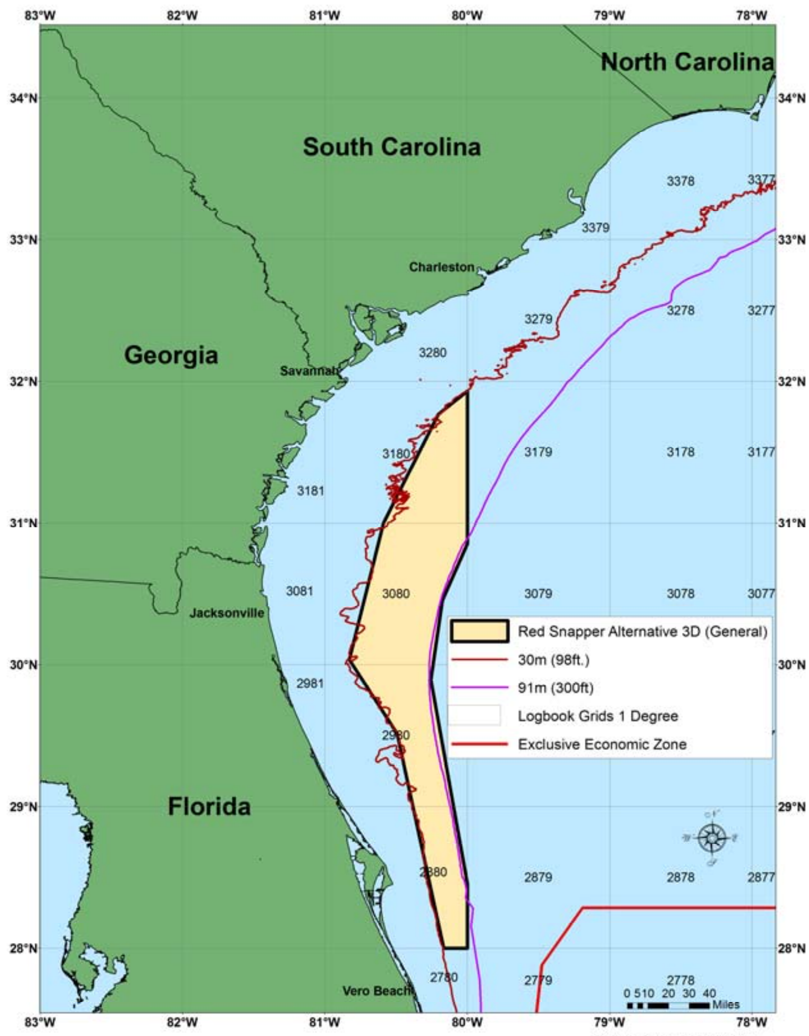


Figure 4-13. Map of proposed closed area under Alternative 3D.

Table 4-9. Waypoints used to delineate Alternative 3D.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 09' 57"
3	29° 30' 40"	80° 29' 34"
4	30° 02' 03"	80° 49' 45"
5	31° 00′ 00"	80° 35' 19"
6	31° 46' 00"	80° 12' 15"
7	31° 55' 55"	80° 00' 00"
8	30° 51' 13"	80° 00' 00"
9	30° 27' 19"	80° 10' 34"
10	29° 53' 31"	80° 15' 25"
11	28° 27' 20"	80° 00' 00"

Alternative 3E (Preferred). Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, and 3080 from 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in Table 4-10 to define the area (4,827 mi² of the South Atlantic EEZ).

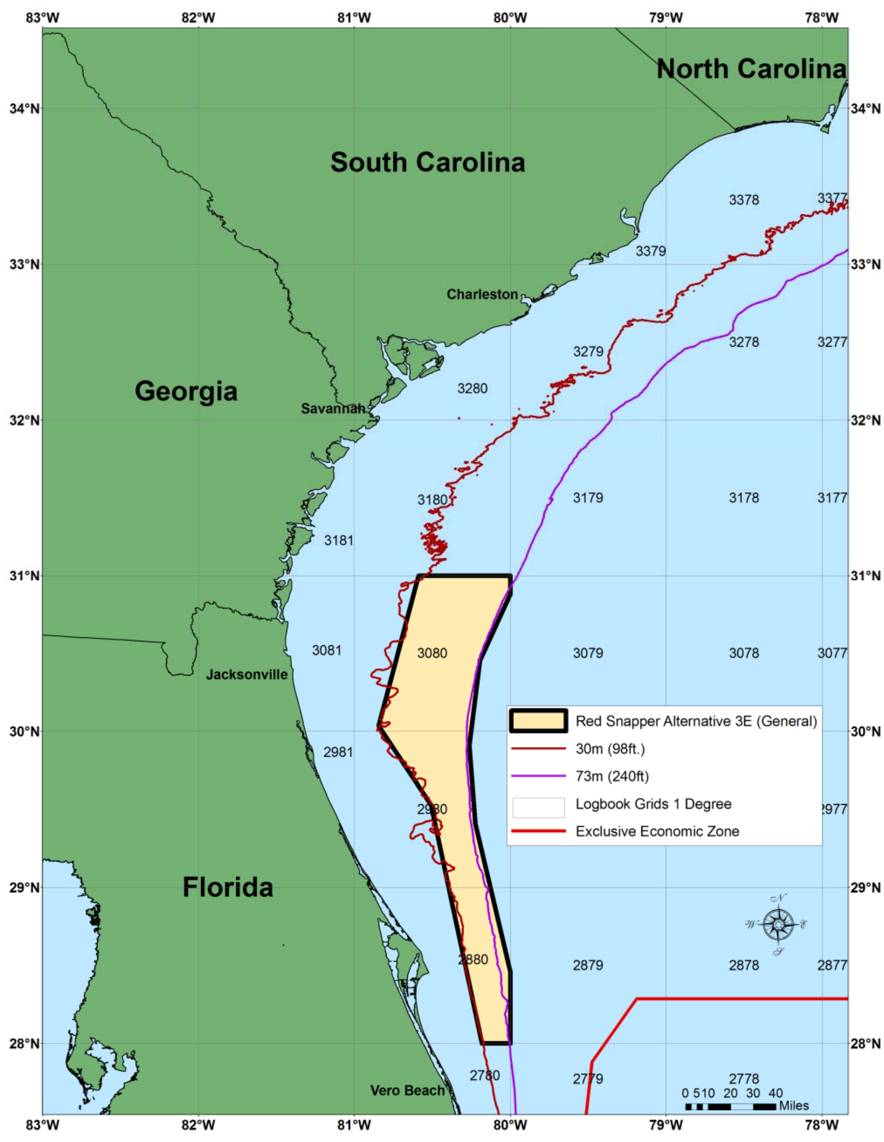


Figure 4-14. Map of proposed closed area under Alternative 3E **(Preferred)**.

Table 4-10. Waypoints used to delineate Alternative 3E **(Preferred)**.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 10' 57"
3	29° 31' 40"	80° 30' 34"
4	30° 02' 03"	80° 50' 45"
5	31° 00' 00"	80° 35' 19"
6	31° 00' 00"	80° 00' 00"
7	30° 52' 54"	80° 00' 00"
8	30° 27' 19"	80° 11' 41"
9	29° 54' 31"	80° 15' 51"
10	29° 24' 24"	80° 13' 32"
11	28° 27' 20"	80° 00' 00"

Alternative 4A. Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, 3080, 3179, 3180, 3278, and 3279, using coordinates shown in Table 4-11 to define the area (26,001 mi²) of the South Atlantic EEZ.

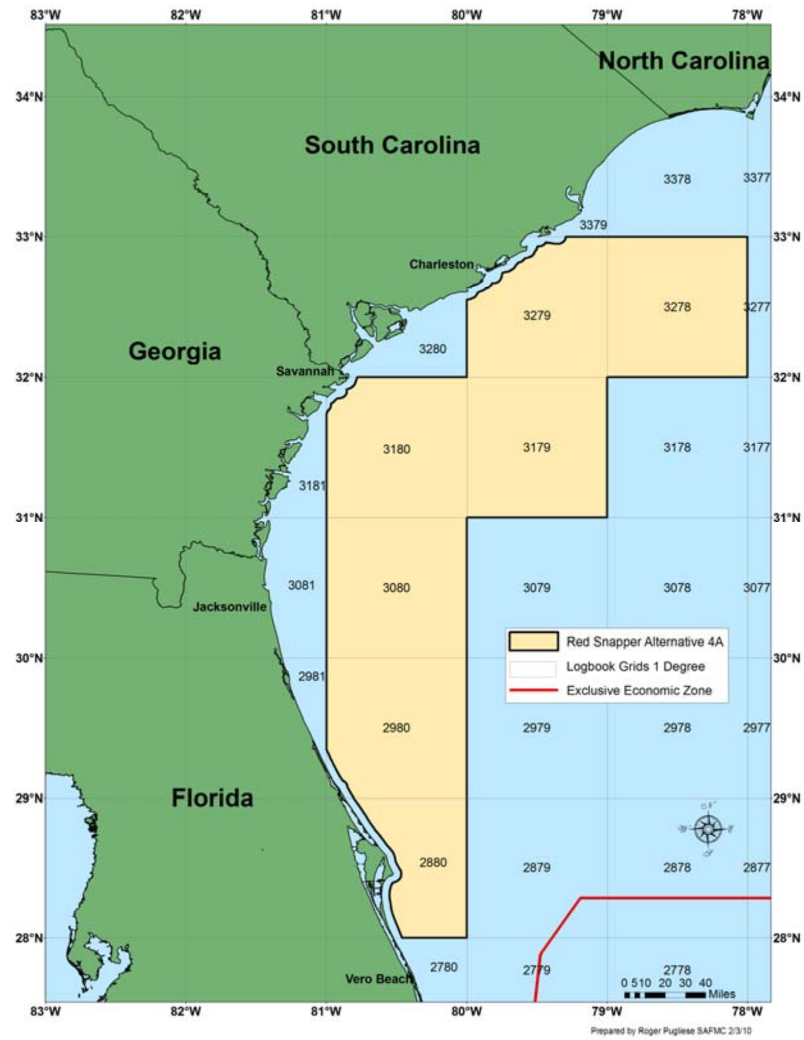


Figure 4-15. Map of proposed closed area under Alternative 4A.

Table 4-11. Waypoints used to delineate Alternative 4A.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 27' 42"
3	29° 20' 33"	81° 00' 00"
4	31° 44' 32"	81° 00' 00"
5	32° 00' 00"	80° 46' 56"
6	32° 00' 00"	80° 00' 00"
7	32° 33' 08"	80° 00' 00"
8	33° 00' 00"	79° 17' 45"
9	33° 00' 00"	78° 00' 00"
10	32° 00' 00"	78° 00' 00"
11	32° 00' 00"	79° 00' 00"
12	31° 00' 00"	79° 00' 00"
13	31° 00' 00"	80° 00' 00"

Between point 2 and point 3, line follows inner boundary of U.S. EEZ.
Between point 4 and point 5, line follows inner boundary of U.S. EEZ.
Between point 7 and point 8, line follows inner boundary of U.S. EEZ.

Alternative 4B. Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, 3080, 3179, 3180, 3278, and 3279 from 66 feet (11 fathoms; 20 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in Table 4-12 to define the area (15,384 mi² of the South Atlantic EEZ).

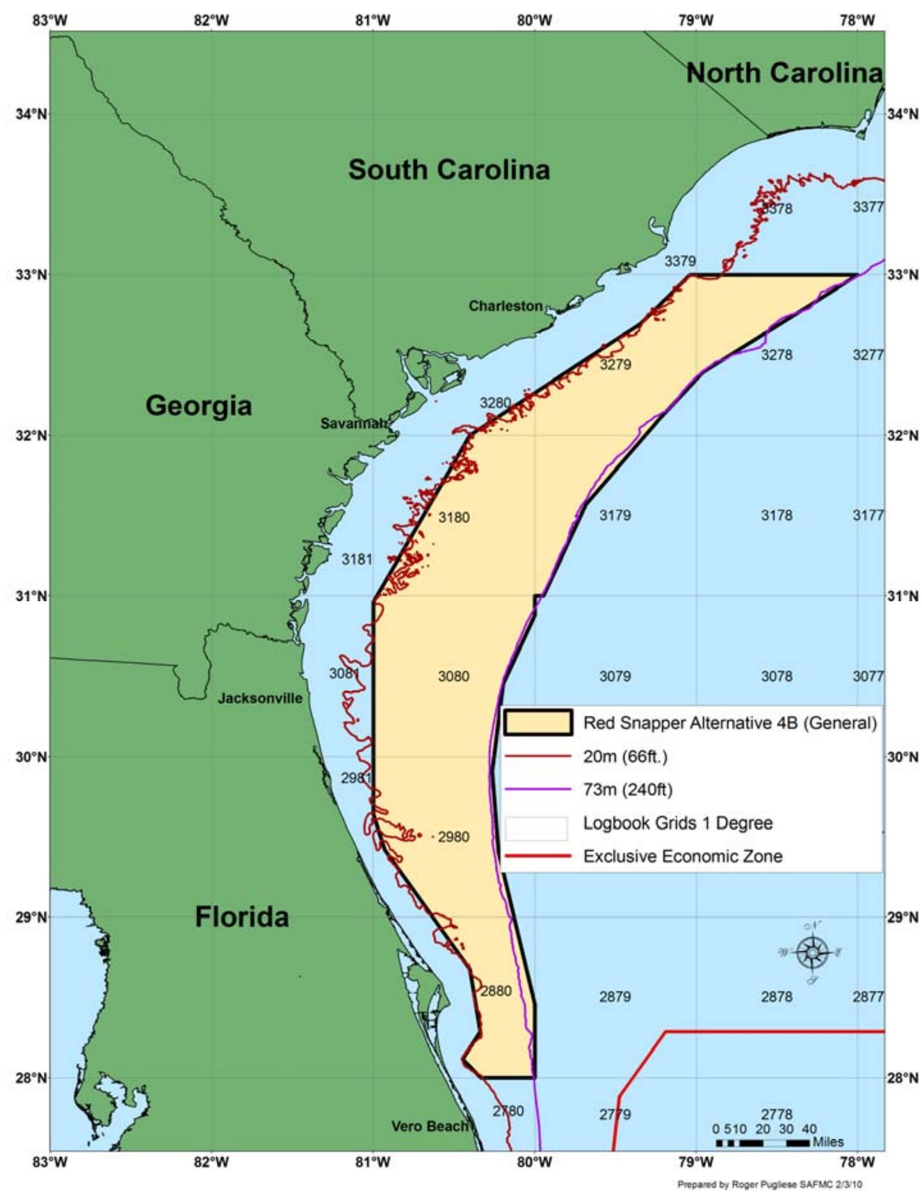


Figure 4-16. Map of proposed closed area under Alternative 4B.

Table 4-12. Waypoints used to delineate Alternative 4B.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 20' 01"
3	28° 06' 58"	80° 26' 49"
4	28° 17' 14"	80° 20' 19"
5	28° 40' 32"	80° 24' 09"
6	29° 25' 09"	80° 55' 44"
7	29° 38' 20"	81° 00' 00"
8	30° 57' 40"	81° 00' 00"
9	32° 00' 00"	80° 24' 12"
10	32° 41' 38"	79° 20' 50"
11	33° 00' 00"	79° 02' 22"
12	33° 00' 00"	78° 00' 00"
13	32° 23' 28"	78° 57' 38"
14	32° 06' 03"	79° 13' 46"
15	31° 34' 08"	79° 41' 03"
16	31° 00' 00"	79° 56' 43"
17	31° 00' 00"	80° 00' 00"
18	30° 52' 54"	80° 00' 00"
19	30° 27' 19"	80° 11' 41"
20	29° 54' 31"	80° 15' 51"
21	29° 24' 24"	80° 13' 32"
22	28° 27' 20"	80° 00' 00"

Alternative 4C. Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, 3080, 3179, 3180, 3278, and 3279 from 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in Table 4-13 to define the area (9,372 mi² of the South Atlantic EEZ).

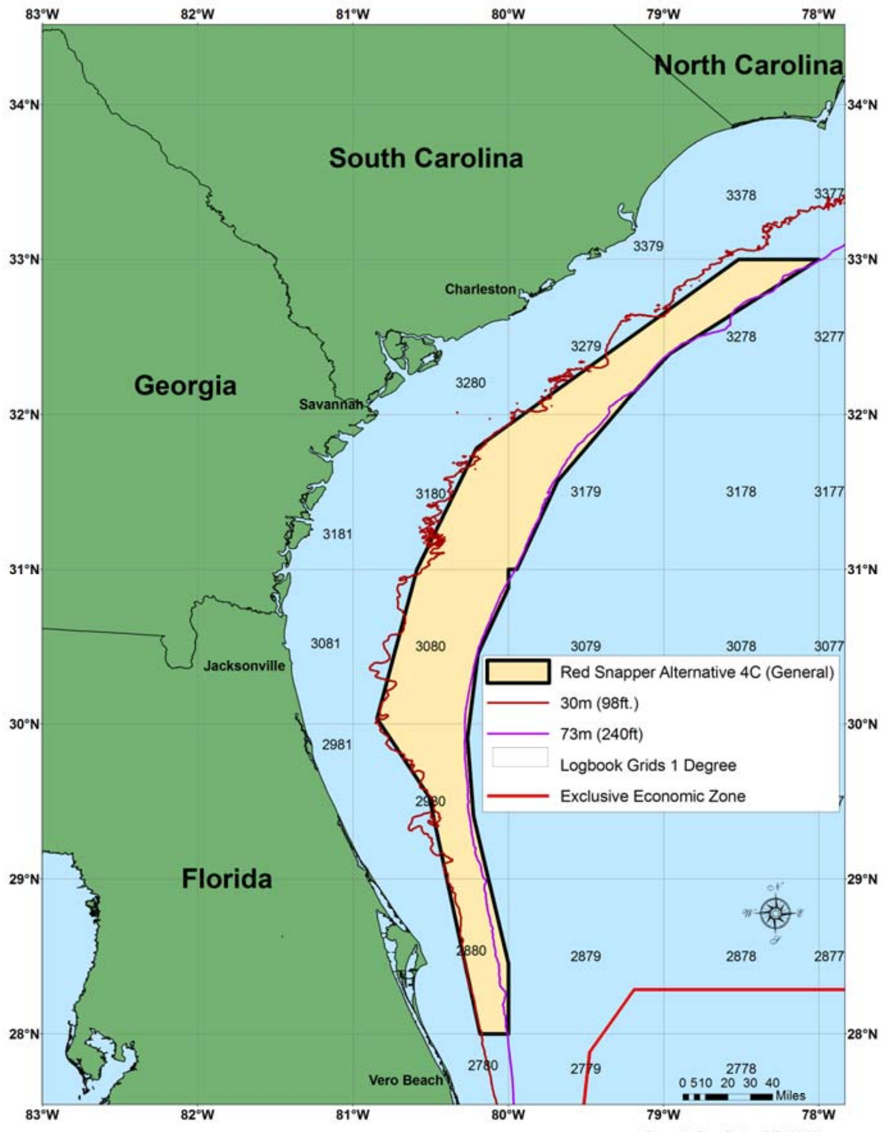


Figure 4-17. Map of proposed closed area under Alternative 4C.

Table 4-13. Waypoints used to delineate Alternative 4C.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 10' 57"
3	29° 31' 40"	80° 30' 34"
4	30° 02' 03"	80° 50' 45"
5	31° 00' 00"	80° 35' 19"
6	31° 47' 00"	80° 12' 15"
7	33° 00' 00"	78° 31' 05"
8	33° 00' 00"	78° 00' 00"
9	32° 23' 28"	78° 57' 38"
10	32° 06' 03"	79° 13' 46"
11	31° 34' 08"	79° 41' 03"
12	31° 00' 00"	79° 56' 43"
13	31° 00' 00"	80° 00' 00"
14	30° 52' 54"	80° 00' 00"
15	30° 27' 19"	80° 11' 41"
16	29° 54' 31"	80° 15' 51"
17	29° 24' 24"	80° 13' 32"
18	28° 27' 20"	80° 00' 00"

Alternative 4D. Prohibit all commercial and recreational fishing for, harvest, and possession of red snapper year-round in the South Atlantic EEZ. Prohibition of red snapper applies in the South Atlantic on board a vessel for which a valid Federal charter vessel/headboat or commercial permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. Prohibit commercial and recreational fishing for, harvest, possession of all species in the snapper grouper fishery management unit (FMU) year-round in an area that includes commercial logbook grids 2880, 2980, 3080, 3179, 3180, 3278, and 3279 from 98 feet (16 fathoms; 30 m) to 300 feet (50 fathoms; 91 m), using coordinates shown in Table 4-14 to define the area (9,591 mi² of the South Atlantic EEZ).

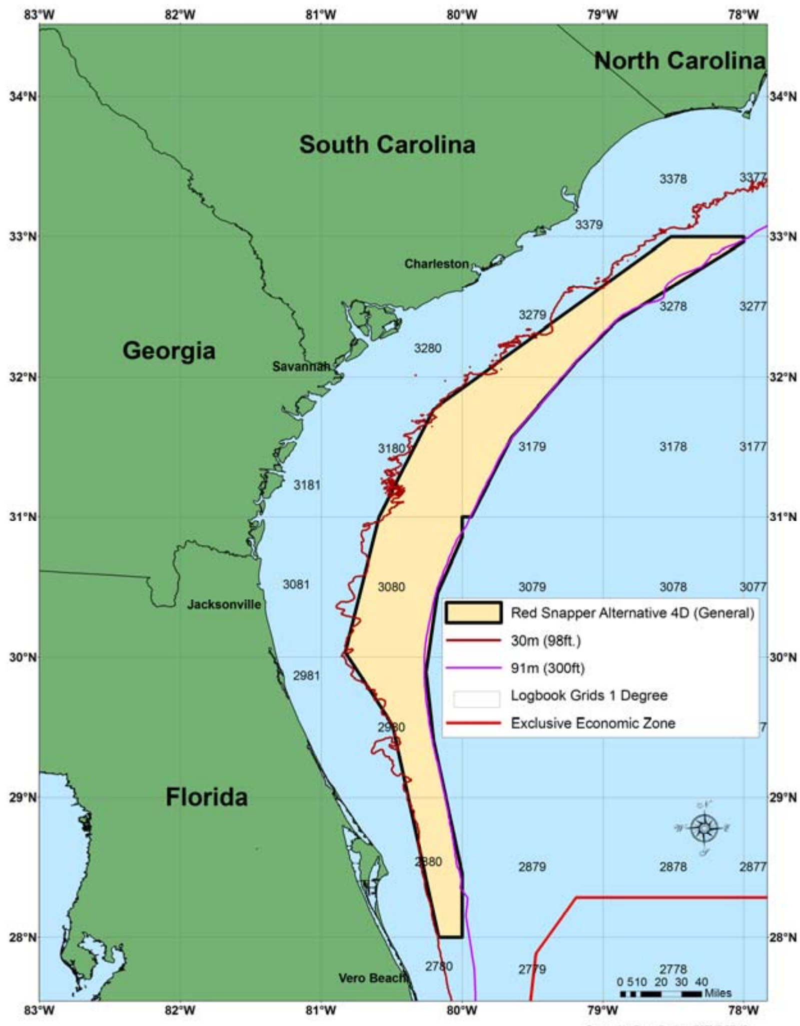


Figure 4-18. Map of proposed closed area under Alternative 4D.

Table 4-14. Waypoints used to delineate Alternative 4D.

Waypoint Number	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 09' 57"
3	29° 30' 40"	80° 29' 34"
4	30° 02' 03"	80° 49' 45"
5	31° 00' 00"	80° 35' 19"
6	31° 46' 00"	80° 12' 15"
7	33° 00' 00"	78° 31' 05"
8	33° 00' 00"	78° 00' 00"
9	32° 57' 44"	78° 00' 00"
10	32° 23' 28"	78° 54' 32"
11	32° 06' 03"	79° 11' 41"
12	31° 34' 08"	79° 38' 57"
13	31° 00' 00"	79° 56' 05"
14	31° 00' 00"	80° 00' 00"
15	30° 51' 13"	80° 00' 00"
16	30° 27' 19"	80° 10' 34"
17	29° 53' 31"	80° 15' 25"
18	29° 24' 24"	80° 12' 13"
19	28° 27' 20"	80° 00' 00"

Alternative 5 (Preferred). Allow fishing for, harvest, and possession of snapper grouper species (with the exception of red snapper) in the closed area if fish were harvested with black sea bass pots.

Alternative 6. Allow fishing for, harvest, and possession of snapper grouper species (with the exception of red snapper) with bottom longline gear in the closed area deeper than 50 fathoms as specified in CFR §622.35.

Alternative 7 (Preferred). Allow fishing for, harvest, and possession of snapper grouper species (with the exception of red snapper) in the closed area if fish were harvested with spearfishing gear.

Alternative 8. Allow transit through areas closed to snapper grouper harvest.

> **Sub-alternative 8a (Preferred).** 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. Under the preferred alternative, the Council would allow fishing for snapper grouper species with spearfishing gear and black sea bass pots within the proposed closed areas.

The term *"transit"* means: Underway, making way, not anchored, and a 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, trolling 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, and 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** or **golden crab trap** cannot be baited and 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 8b. 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 certain snapper grouper species.

The term *"transit"* means: Underway, making way, not anchored, and a 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 8c. 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 wreckfish on board.

The term *"transit"* means: Underway, making way, not anchored, and a 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

Overview

The Scientific and Statistical Committee (SSC) has provided an acceptable biological catch (ABC) recommendation for red snapper (Table 4-15a). The Council is proposing an annual catch limit (ACL) value that is lower than the ABC. Setting the ACL lower than the recommended ABC is recommended in the final National Standard 1 (NS1) guidelines (74 FR 3178; January 16, 2009). National Standard 1 guidelines also state that Councils may establish a process for establishing an ABC control rule, which the South Atlantic Fishery Management Council (Council) is doing. This ABC control rule, and resulting ABC recommendations, will be included in the Comprehensive ACL Amendment for the South Atlantic Region, which is currently in the development stage.

Table 4-15a. Overfishing limit (OFL) and ABC recommendations from the SSC for red snapper. The ACL is based on landed catch.

Species	OFL	ABC	Proposed ACL
Red Snapper	Not specified	ABC = rebuilding plan[1] 144,000 lbs[2]	0

[1]At their June 2008 meeting, the SSC developed an interim approach where they set OFL equal to the yield at the maximum fishing mortality threshold (MFMT) and the ABC equal to the yield at 75% F_{MSY} (the current proxy for F_{OY}). At their December 2008 meeting, the SSC withdrew the OFL and ABC levels for red snapper developed at their June 2008 meeting. The SSC instead recommended that the ABC levels for red snapper be set consistent with the rebuilding plans until they can be further amended with better scientific information. Through Amendment 17A, the Council is proposing a rebuilding plan based on a constant fishing mortality rate, one that would allow a total red snapper kill of 144,000 lbs whole weight in year one of rebuilding.
[2]The maximum red snapper kill in year one of rebuilding under the preferred alternatives.

Recent red snapper landings have exceeded the ABC recommendation of 144,000 lbs. The Council is proposing action in this amendment to reduce red snapper mortality to end overfishing immediately and ensure that future mortality does not exceed the ABC recommendation.

Table 4-15b. Estimates of recent landings (pounds) for red snapper.

Species	Year	Commercial Landings[1] (lbs WW)	Private Recreational & Charter Landings[2] (lbs ww)	Headboat Landings[3] (lbs ww)
Red Snapper	2005	132,006	262,286	58,695
	2006	89,910	240,196	41,431
	2007	116,934	302,156	38,448
	2008	233,267	696,755	115,308
	2009	427,923	870,733	141,085
	Annual average	130,436	474,425	78,993

[1]Source: April 21, 2010 query of NMFS Accumulated Landings System (ALS)
[2]Source: April 21, 2010 query of Marine Resources Improvement Plan (MRIP)
[3]Source: South Atlantic Headboat Survey
Note: Gutted weight = gw and Whole weight = ww

To determine the actual environmental effects of the **Alternative 1 (No Action)** 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 No Action management. Expected harvest reductions in total kill stemming from Snapper Grouper Amendment 16 (SAFMC 2008), which among other things, established a January-April shallow water grouper spawning season closure for the commercial and recreational sectors as well as created a five month recreational seasonal closure for vermilion snapper, was factored into the baseline condition of the fishery in order to obtain the correct percent reduction of removals needed for red snapper (**Appendix E,** SERO-LAPP-2009-07 REV). 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 Southeast Data Assessment and Review (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). A red snapper assessment, which will include data through 2008, will be completed in late 2010.

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 4-18). 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 in 2007 that were presumably less than the 20 inch total length (TL) minimum size limit (Figure 4-18a). The spike in recruitment appears to be responsible for the large increase in recent landings reported by fishermen and recorded in 2008 and 2009. However, if these fish are caught and killed, then the age/size composition and biomass would not continue to improve over time.

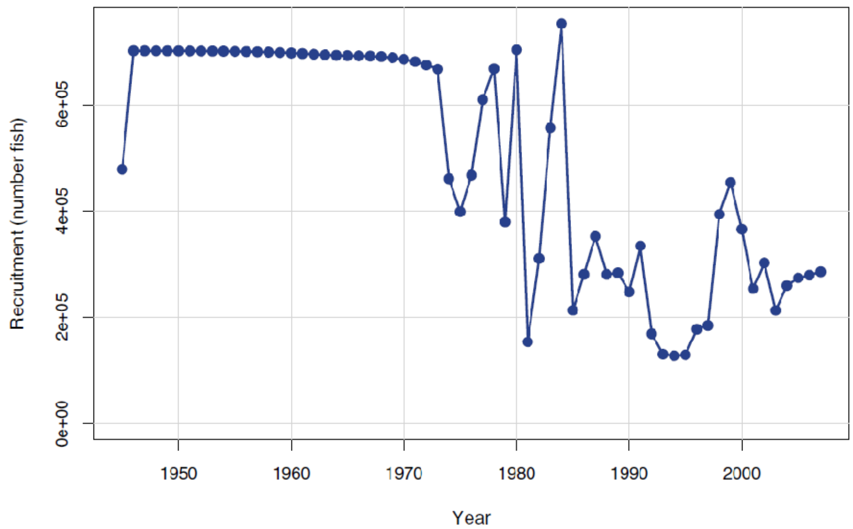


Figure 4-18a. Estimated recruitment of age-1 red snapper.
Source: SEDAR 15 2008, Figure 1.23.

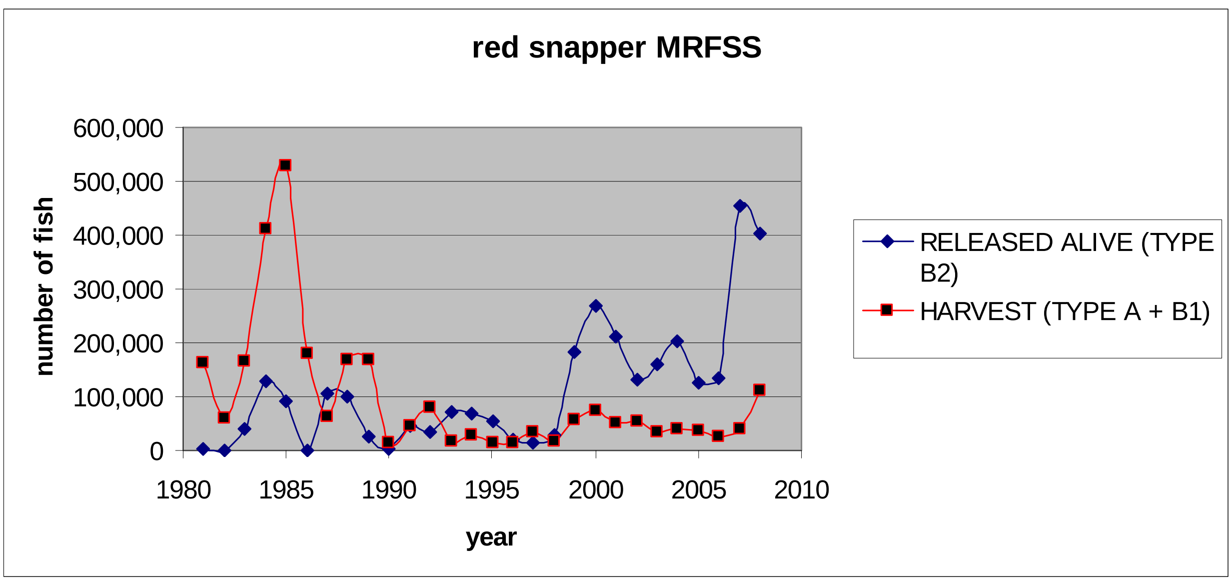


Figure 4-18b. Number of released (B2) and harvested (A+B1) red snapper from MRFSS survey.

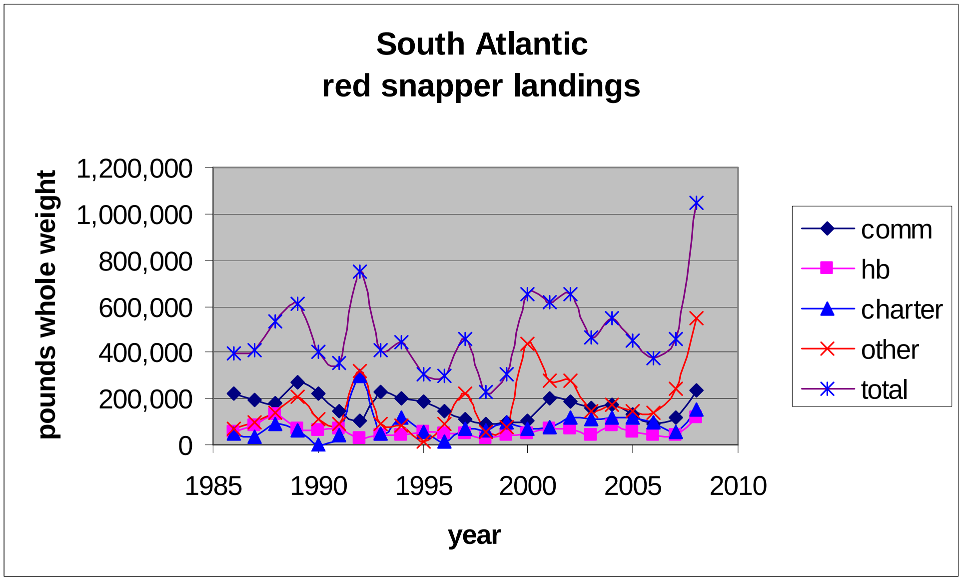


Figure 4-18c. Landed (pounds whole weight) by commercial and recreational sectors.

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 of landed red snapper is currently fairly stable between 5 and 8 with an increase in recent years (SEDAR 15 2008). 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 4-19 demonstrates a larger proportion of red snapper older than age 10 would be expected when the stock is healthy at a $F=F_{40\%SPR}$.

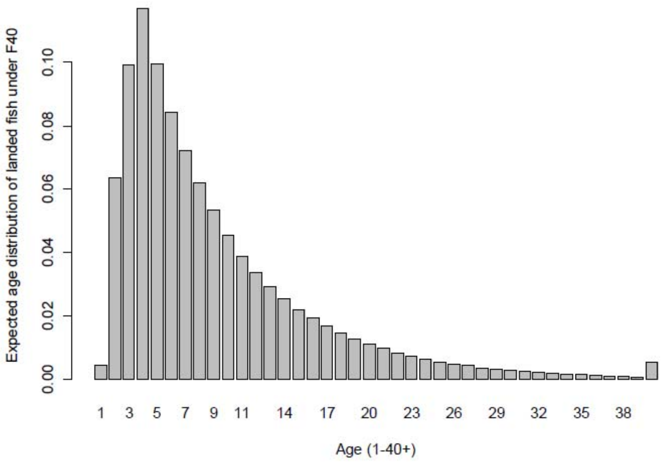


Figure 4-19. Equilibrium age distribution of landed red snapper that could be expected when $F=F_{40\%SPR}$.

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 (No Action) would retain the current regulations used to manage catches of red snapper. Regulations include a commercial limited access system, a 20 inch 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 even when regulated since they will be incidentally caught when fishermen target other co-occurring species. Mortality of discarded red snapper has been estimated at 40% for the recreational fishery and 90% for the commercial fishery (SEDAR 15 2008). **Appendix R** of this document describes the impacts of Amendment 17A on species commonly caught with red snapper.

In 1983, the Snapper Grouper Fishery Management Plan established a 12 inch 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 minimum size limit of red snapper taken by recreational fishermen from 12 inches TL to 20 inches 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 4-15cand Figure 4-15d). Since release mortality rates are estimated to be 40% for the recreational sector and 90% for the commercial sector, the increased size limit may 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 still be occurring at lower release mortality rates of 20% for the recreational sector and 70% for the commercial sector.

Table 4-15c. MRFSS 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 4-15d. 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 No Action 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 healthy 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.

Management measures implemented through Amendment 16 (SAFMC 2008) are expected to reduce harvest of several 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 4-16. Species taken on commercial trips when at least 1 pound of red snapper was caught. Based on Accumulated Landings System (ALS) data from 2003-2008.

COMMON	% by trip	% by wt	cum wt
Snapper, vermilion	67.38%	28.32%	28.32%
Grouper, gag	59.69%	13.23%	41.56%
Scamp	63.24%	8.18%	49.74%
Amberjack, greater	40.77%	7.54%	57.28%
Snapper, red	100.00%	6.44%	63.72%
Triggerfish, red	54.88%	5.50%	69.22%
Grouper, red	52.79%	4.85%	74.07%
Jack, almaco	35.51%	4.30%	78.37%
Grouper, black	10.10%	2.22%	80.59%
Porgy, red, UNC	41.47%	1.67%	82.26%
Sea Bass, Atlantic, black, UNC	39.15%	1.60%	83.86%
King mackerel	27.36%	1.58%	85.43%
Grouper, snowy	17.02%	1.50%	86.93%
137 Other Taxa		13.07%	

Table 4-17. Species taken on headboat trips when at least 1 red snapper was caught. Based on data from 2003-2008.

Species	**% trip**	**% number**	**Cum % number**
Vermilion Snapper	69.21%	44.49%	44.49%
Black Sea Bass	75.54%	16.64%	61.14%
Tomtate	25.65%	5.01%	66.14%
Gray Triggerfish	63.97%	4.04%	70.19%
Red Snapper	100.00%	3.38%	73.57%
Red Porgy	19.74%	3.35%	76.92%
Banded Rudderfish	12.34%	2.76%	79.68%
White Grunt	11.71%	2.73%	82.41%
Sharpnose Shark	51.87%	2.22%	84.63%
Scamp	27.93%	1.57%	86.19%
Gray Snapper	40.21%	1.52%	87.71%
Lane Snapper	34.85%	0.94%	88.65%
Yellowtail Snapper	11.98%	0.88%	89.53%
Bank Sea Bass	11.28%	0.86%	90.39%
Greater Amberjack	25.28%	0.77%	91.16%
Whitebone Porgy	25.94%	0.74%	91.90%
Almaco Jack	12.54%	0.70%	92.61%
Spot tail Pinfish	5.08%	0.65%	93.26%
128 Other Taxa		6.74%	

Table 4-18. Species taken on Marine Recreational Fishery Statistical Survey (MRFSS) trips when at least 1 red snapper was caught. Based on data from 2003-2008.

Common	% trip	% number	Cum % number
vermilion snapper	29.81%	29.55%	29.55%
black sea bass	45.17%	24.27%	53.82%
red snapper	100.00%	6.82%	60.64%
gray triggerfish	19.18%	5.40%	66.04%
Tomtate	20.15%	3.24%	69.29%
white grunt	5.42%	2.69%	71.97%
Gag	16.61%	1.83%	73.80%
red porgy	8.34%	1.82%	75.63%
greater amberjack	10.77%	1.82%	77.44%
atlantic sharpnose shark	18.35%	1.67%	79.11%
round scad	2.02%	1.58%	80.70%
king mackerel	7.85%	1.53%	82.22%
gray snapper	5.00%	1.37%	83.60%
Scamp	8.34%	1.26%	84.86%
atlantic menhaden	0.35%	1.06%	85.92%
Spanish sardine	0.63%	1.05%	86.97%
spot tail pinfish	3.75%	0.84%	87.81%
Dolphin	4.79%	0.79%	88.60%
scaled sardine	0.56%	0.75%	89.35%
lane snapper	5.21%	0.73%	90.08%
almaco jack	3.27%	0.70%	90.77%
banded rudderfish	1.67%	0.61%	91.39%
herring family	0.42%	0.58%	91.97%
red grouper	4.73%	0.57%	92.53%
135 Other Taxa		7.47%	

Table 4-19. Percentage (by weight) of red snapper (commercial) landed by month in FL, GA, SC, and NC during 2003-2008 by month for each state. FL and GA are combined due data confidentiality.

Month	Total	FL &GA	SC	NC
1	7.35%	7.13%	9.02%	5.83%
2	8.18%	8.77%	6.37%	4.50%
3	8.19%	8.74%	6.76%	4.06%
4	8.14%	8.41%	6.52%	8.72%
5	9.64%	9.34%	9.85%	13.58%
6	10.82%	10.99%	9.30%	12.66%
7	9.59%	9.54%	9.83%	9.54%
8	5.71%	4.88%	8.74%	9.60%
9	5.41%	5.30%	6.14%	4.87%
10	6.38%	5.48%	9.11%	12.10%
11	7.81%	7.22%	10.72%	8.34%
12	12.79%	14.20%	7.64%	6.21%

Table 4-20. Percentage (by weight) of red snapper (headboat) landed in FL, GA, SC, and NC during 2003-2008 by month for each state. GA and NFL are combined due to data confidentiality.

Month	Total	South FL	GA - NFL	SC	NC
1	3.10%	5.29%	3.74%	0.00%	1.02%
2	7.19%	36.38%	7.76%	0.04%	0.31%
3	10.02%	23.30%	9.80%	10.94%	1.98%
4	11.44%	3.90%	11.69%	14.57%	3.39%
5	13.45%	9.77%	12.28%	23.06%	5.55%
6	11.00%	3.37%	11.48%	11.79%	6.18%
7	8.79%	4.17%	8.94%	10.63%	3.99%
8	6.49%	2.08%	5.49%	14.05%	2.54%
9	4.15%	2.09%	3.96%	4.22%	8.31%
10	9.25%	3.68%	9.28%	5.67%	22.89%
11	7.57%	1.21%	8.78%	4.41%	2.49%
12	7.54%	4.75%	6.79%	0.64%	41.37%

Table 4-21. Percentage (by weight) of red snapper (MRFSS) landed in FL, GA, SC, and NC during 2003-2008 by month for each state.

Wave	Total	FL	GA	SC	NC
1	9.29%	10.80%	0.00%	0.00%	0.00%
2	15.21%	15.71%	7.03%	22.03%	14.62%
3	29.40%	27.19%	51.98%	25.19%	38.93%
4	16.33%	15.77%	14.40%	34.68%	14.94%
5	14.32%	14.22%	18.51%	2.47%	22.67%
6	15.46%	16.31%	8.09%	15.63%	8.85%

A report has been produced that estimates the effect of actions proposed in **Alternatives 2-4D** in reducing the total removals of red snapper (**Appendix E**). **Appendix E** provides details regarding the analysis as well as limitations associated with assumptions used in determining reductions in total kill provided by the proposed area closures. This report compares projected removal rates under scenarios with or without: (1) elimination of directed and/or targeted trips due to regulations; (2) changes in overall release mortality; (3) distinct inshore release mortality; and (4) varying compliance rates. Projected reductions in total removals were computed from baseline 2005-2007 data compiled from commercial logbook, MRFSS, and headboat logbook data for the U.S. south Atlantic. In various scenarios, baseline removals were reduced as a function of trip elimination, spatial and bathymetric closures, and changes in release mortality.

Recent and currently proposed management regulations may reduce the number of trips taken in the future that would impact the red snapper stock. This may occur due to economic unprofitability on a trip level or a fisherman permanently going out of business. Projections provided in **Appendix E** considers red snapper harvest reductions as a function of directed and/or targeted trips for species regulated by Amendment 13C (commercial sector only), Amendment 16 (all sectors), and Amendment 17A (all sectors) (**Appendix E**).

Mortality of discarded red snapper has been estimated at 40% for the recreational fishery and 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 (SEDAR 15 2009) (**Appendix E**). As discussed in SEDAR 15 (2008), Burns et al. (2004) estimated a red snapper release mortality of 64% following a study on headboats off Florida in the Atlantic and Gulf of Mexico. 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%. Burns et al. (2002) estimated J-hook mortality at 56% in a similar study. Using barometric chambers, Burns et al. (2004) estimated barometric mortality at 0% for depths of less than 20, 25, and 30 m; barotrauma-induced mortality increased to 40% at 45 m and 45% at 60 m. A mark-recapture study by Patterson et al. (2001b) in the Gulf of Mexico estimated a discard mortality of 9% at 21 m, 14% at 27 m, and 18% at 32 m. The mean minimum depth in the recreational (charter boat) fishery was 43 m (range 20 to 183 m). The mean maximum depth was 58 m (24 to 274 m) (**Appendix E**).

Several proposed closure alternatives may result in commercial and recreational fishermen moving into shallower water to fish, potentially decreasing discard mortality rates by reducing barotraumas. Additionally, the complete closure of the red snapper fishery should reduce handling time, as fishermen will no longer need to measure fish to determine if they are of legal size. Finally, several studies (Gitschlag & Renaud 1994, Burns et al. 2002, Burns et al. 2004, Rummer 2007, Diamond and Campbell 2009) have reported release mortalities less than 20% in water depth less than 20 m. Under all currently proposed alternatives in Amendment 17A, four inshore cells (3379, 2981, 3081, and 3181) with no depths less than 20 m would remain open to fishing, and might also be recipients of some effort shifting from closed areas. Consequently, the projection model described in **Appendix E** was designed to account for reduced inshore release mortality in these cells, in addition to changes in release mortality rates across all other cells. It should be noted that the mean depth of fishing is greater than 40 m for both the recreational and commercial fisheries in the South Atlantic, this results in a delayed mortality estimate of around 60% (Diamond and Campbell 2009), representing an increase from the SEDAR 15 (2008) estimated release mortality for the recreational sector.

Most of the benefits associated with spatial closures are dependent on compliance with no-take regulations (Fogarty et al. 2000). Although published data exists to estimate rates of non-compliance (Ward et al. 2001), numerous modeling efforts and case studies have shown that even relatively low levels of poaching can rapidly erode the fisheries benefits of reserves (Tegner 1993, Attwood et al. 1997, Gribble & Robertson 1998, Guzman & Jacome 1998, Murray et al. 1999, Rogers-Bennett et al. 2000; however, see Jennings et al. 1996). As such, the projection model was designed to account for reduced compliance rates (**Appendix E**). At their June 2010, meeting, the Council determined a compliance rate of less than 90% was a realistic estimate of area closure compliance. Therefore, the model scenarios incorporating less than 90% compliance were used to inform their selection of the preferred closed area alternative (**Alternative 3E**).

In order to remain economically viable in the face of substantial spatial closures such as those proposed by Amendment 17A, fishermen may be forced to shift fishing effort from closed areas into areas and fisheries that remain open. This could result in increased fishing pressure on state resources. The directionality and extent of this effort shifting is difficult to predict; however, its impacts upon projected reductions in red snapper landings can be approximated through modification of the compliance rate. Given that the proposed spatial closures render the core of the red snapper stock inaccessible to fishing, any effort shifting from closed areas to open areas would have a lower proportional encounter rate with red snapper (e.g., a lower catch-per-unit-effort). Additionally, regulations imposed by Amendment 17B (approved by the Council in December 2009 for submission to the Secretary of Commerce for final review and approval) would prohibit the harvest of deepwater species (snowy grouper, blueline tilefish, yellowedge grouper, warsaw grouper, speckled hind, misty grouper, queen snapper, and silk snapper) beyond 240 feet (73 m) depth and would implement annual catch limits for gag, red, and black grouper. Therefore, it is possible that effort from Amendment 17A closures would shift inshore. As previously discussed, red snapper landed inshore might be subject to lower release mortality rates than those recommended by SEDAR 15 (2008). As such, it is perhaps safe to assume that noncompliance has a far greater proportional impact on red snapper removals than a similar level of effort shifting (e.g., 10% effort shift ~ ≤5% noncompliance) (**Appendix E**).

Gray's Reef National Marine Sanctuary (GRNMS), which is located 17.5 miles offshore of Sapelo Island, Georgia would likely be affected by **Alternatives 2-4**. Under **Alternatives 3A, 3B, 4A, and 4B** commercial and recreational fishing for, harvest, and possession, of species in the snapper grouper fishery management unit would be prohibited year-round. In contrast, as the closed area would be offshore of GRNMS under **Alternatives 3C3D, 4C, and 4D**, it is possible that there could be increased fishing pressure for snapper grouper species in GRNMS as fishing in deeper offshore areas would be prohibited. Under **Alternative 3E (Preferred)**, the closed area would be south of GRNMS; therefore, some effort shifting from areas off north Florida could occur off Georgia including GRNMS. However the degree of effort shifting into GRNMS would likely be less under **Preferred Alternative 3E** than under **Alternatives 3C, 4C, and 4D**.

Alternative 2 would prohibit all commercial and recreational harvest, and possession, of red snapper year-round in the South Atlantic exclusive economic zone (EEZ). The prohibition of red snapper harvest in **Alternatives 2-4D** would remain in effect beyond 2010 until modified. It is anticipated that as the stock rebuilds, the size of the closed area would be decreased and some harvest of red snapper would gradually be increased. This determination would be based on results from stock assessment updates conducted by the Southeast Data Assessment and Review. Fishing mortality in 2007 (F_{CURR}) is estimated at 0.797. The proxies for F_{MSY} being considered by the Council are estimated at 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 76% reduction in total kill is needed to end overfishing and rebuild the fishery within 35 years when $F_{30\%SPR}$ with very high recruitment, the preferred alternative, is used as a proxy for $F_{MSY;}$ and a 83% in total kill when $F_{40\%SPR}$ with very high recruitment is used as a proxy for F_{MSY}.

Table 4-22. Projected reductions in red snapper landings following implementation of various alternatives proposed in Amendment 17A. Various scenarios illustrate sensitivity of projection model to input parameters (Table 3 from Appendix E).

Alternative	Closed Cells	Closed Depths	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
2	None	None	29%	39%	52%	55%	60%	60%	60%
3A	2880, 2980, 3080, 3180	All	72%	72%	83%	83%	87%	89%	90%
3B	2880, 2980, 3080, 3180	66-240 ft	69%	70%	81%	81%	85%	87%	88%
3C	2880, 2980, 3080, 3180	98-240 ft	63%	65%	76%	77%	81%	83%	84%
3D	2880, 2980, 3080, 3180	98-300 ft	63%	66%	76%	77%	81%	83%	84%
3E	2880,2980,3080	98-240 ft	60%	63%	74%	75%	79%	80%	81%
4A	2880, 2980, 3080, 3180, 3179, 3278, 3279	All	76%	77%	86%	86%	89%	91%	93%
4B	2880, 2980, 3080, 3180, 3179, 3278, 3279	66-240 ft	73%	74%	83%	84%	87%	89%	91%
4C	2880, 2980, 3080, 3180, 3179, 3278, 3279	98-240 ft	66%	69%	78%	80%	83%	85%	86%
4D	2880, 2980, 3080, 3180, 3179, 3278, 3279	98-300 ft	67%	69%	79%	80%	83%	85%	86%

Scenario 1: No impacts A13C, A16; A17A eliminates targeted trips only; 80% compliance; 60%/60% offshore release mortality; 20%/20% inshore release mortality.

Scenario 2: No impacts A13C, A16; A17A eliminates targeted trips only; 80% compliance; 40%/90% offshore release mortality, 40%/90% inshore release mortality.

Scenario 3: No impacts A13C, A16; A17A eliminates targeted trips only; 85% compliance; 40%/40% offshore release mortality, 20%/20% inshore release mortality.

Scenario 4: Directed and targeted trips eliminated by A13C, A16, A17A; 85% compliance; 40%/90% offshore release mortality; 20%/20% inshore release mortality.

Scenario 5: Directed and targeted trips eliminated by A13C, A16, A17A; 87% compliance; 40%/40% offshore release mortality; 20%/20% inshore release mortality.

Scenario 6: Directed and targeted trips eliminated by A13C, A16, A17A; 95% compliance; 40%/40% offshore release mortality; 20%/20% inshore release mortality.

Scenario 7: Directed and targeted trips eliminated by A13C, A16, A17A; 100% compliance; 40%/40% offshore release mortality; 20%/20% inshore release mortality.

Analyses suggest that without additional regulations, **Alternative 2** 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 29 to 60% reduction in total removals Table 4-22. To achieve a 76% 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.

Alternative 3A prescribes a general closure of the red snapper fishery, or approximately 14,496 mi^2 of the South Atlantic EEZ, and a complete closure of the four logbook grids partially closed in **Alternative 3C** (Figure 4-12). Various analysis scenarios for **Alternative 3A** are generally the same as for **Alternative 3C** and **3E (Preferred).** Under **Alternative 3A**, the estimated reduction in total removals is estimated to range from 72% to 90% depending on assumptions such as effects of previous management measures and release mortality (**Appendix E**).

Alternative 3B would close approximately 10,794 mi^2 to fishing for, harvest, and possession of snapper grouper species. Snapper grouper fishing would be prohibited in four consecutive logbook grids between the depths of 66 feet (20 m) and 240 feet (73 m). **Alternative 3B** includes a slightly larger closed area than **Alternative 3C 3D,** and **3E (Preferred)**, and included more inshore area when compared to **Alternatives 3C**, **3D, and 3E (Preferred)**. Under **Alternative 3B**, estimated reductions in red snapper removals ranges from 69% to 88%. The area closure included in **Alternative 3B** would be more biologically beneficial than **Alternatives 3C, 3D,** or **3E,** which would be expected to reduce red snapper removals by 60% to 81%. Under **Alternative 3B** the stock could potentially rebuild faster than **Alternatives 3C**, **3D**, and **3E**, but not as quickly as it would under **Alternatives 3A**, **4A**, or **4B**.

Alternative 3C prescribes, in addition to a closure of the red snapper fishery, a closure of four logbook grids (2880, 2980, 3080, 3180), or 6,161 mi^2 (15,022 km^2) of the EEZ, between depths of 98 feet (16 fathoms; 30 m) and 240 feet (40 fathoms, 73 m) to harvest, possession, and retention of all species in the snapper grouper fisher management unit (Figure 4-12). **Alternative 3D** is very similar to **Alternative 3C** in that it closes logbook grids 2880, 2980, 3080, and 3180 beginning at a depth of 98 feet (30 m). The area closure in **Alternative 3D**; however, extends to a depth of 300 feet (91 m); whereas, the area closure in **Alternatives 3C,** and **3E (Preferred)** extend to 240 feet (73 m). Since **Alternatives 3C,** and **3E (Preferred)** do not extend as far east as **Alternative 3D**, there may some socioeconomic benefits of **Alternatives 3C,** and **3E (Preferred)** over **Alternative 3D**. Additionally, Amendment 17B contains an action that would close federal waters to harvest of deepwater snapper grouper beyond a depth of 240 feet (73 m), creating regulatory redundancy in the deepest part of the **Alternative 3D** closure (assuming Amendment 17B is approved and implemented).

At their June 2010 meeting, the Council changed their F_{MSY} proxy preferred alternative from $F_{40\%\ SPR}$, which requires an 83% reduction in red snapper total removals to end overfishing to $F_{30\%\ SPR,}$which requires a 76% reduction in total removals to end overfishing. Therefore, the Council also reconsidered the area closure alternatives and changed their preferred closure alternative from **Alternative 3C** to **Alternative 3E**. The council determined **Alternative 3E (Preferred)** would end overfishing while mitigating, to the maximum extent practicable, adverse socioeconomic impacts as required by the Magnuson-Stevens Fishery Conservation and Management Act. **Alternative 3E (Preferred)** would close logbook grids 2880, 2980, and 3080 between the depths of 98-240 feet (30 -73m), and encompass an approximate area of 4,827 mi^2, compared to the previous preferred alternative, which encompasses a 6,161 mi^2 area. **Alternative 3E (Preferred)**, might not rebuild the red snapper stock as quickly as **Alternatives 4A-4D**, or **Alternatives 3A-3D**; however, it would reduce the negative socioeconomic impacts during the time that it would take the stock to rebuild. **Alternative 3E (Preferred)** also incorporates the level of non-compliance the Council feels is most realistic (less than 90%). It should be noted that the results of a new benchmark stock assessment for red snapper will be presented to the Council at their December 2010 meeting, at which time they may choose to alter the management measures that would be implemented through Amendment 17A should it be approved by the Secretary.

The reduction in total removals from the scenarios examined for **Alternative 4A** 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 26,001 mi^2 (67,081 km^2) of the EEZ, and therefore includes the most extensive closure of harvest areas. As a result, it is the least sensitive to variations in assumptions. In fact, all but two of the scenarios considered for this alternative achieve a harvest reduction of at least 86%.

Alternative 4B would close a 15,834 mi^2 area to all snapper grouper fishing in the logbook grids 2880, 2980, 3080, 3791, 3180, 3278, and 3279 between 66 feet (20 m) and 240 feet (73 m). This area is smaller than that under **Alternative 4A**, but larger than the closures included in Alternatives **3A**, **3B**, **3C**, **3D**, **4C**, and **4D**. Red snapper harvest reductions under **Alternative 4B** could be expected to range from 73% to 91%. The only alternatives that could realistically result in a greater reductions in total removals are **Alternative 3A**, and **Alternative 4A**, which closes seven total log book grids.

Alternative 4C 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 9,372 mi^2 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, the reduction in total kill in the different scenarios examined in **Appendix E** would range from 66% to 86%.

Alternative 4D is similar to **Alternative 4C** except that in addition to a closure of the red snapper fishery and the year-round closure of seven logbook grids (2880, 2980, 3080, 3179, 3180, 3278, 3279), the closure would be between depths of 98 and 300 feet rather than 98 to 240 feet. Under this regulatory option, the reduction in total kill in the different scenarios examined in **Appendix E** would range from 67% to 86%. There is little difference between the magnitude in total removals under **Alternatives 4C** and **4D**, primarily because there is minimal additional area closed by extending the eastern boundary of the closure from 240 feet out to 300 feet.

Appendix E indicated the projected reductions outlined in the alternatives are extremely sensitive to changes in recreational release mortality rate, as the recreational sectors (private, charter and headboat) account for the majority of removals, but the influence of this parameter is reduced as encounters with red snapper are minimized through spatial closures. For example, with no closed cells assuming 100% compliance, no trip elimination, and 40% recreational and 90% commercial overall release mortality, the anticipated reduction is 39%; whereas, increasing the recreational release mortality to 60% cuts this projected reduction to 18% (a 21% difference). Under the same input assumptions but given closure in **Alternative 4A**, at 40% recreational release mortality, the projected reduction is 86%; given 60% release mortality, the projected reduction is 82% (a 4% difference).

The projected reductions are also extremely sensitive to the estimated compliance rate. For example, under **Alternative 3A** closures assuming no trip elimination, 40% recreational release mortality, 90% commercial release mortality, and 100% compliance, the projected reduction is 81%; given 80% compliance, the projected reduction is cut to 72% (a 9% difference). Under the same suite of assumptions for **Alternative 4A** closures, 100% compliance generates a projected reduction of 86%; 80% compliance generates a projected reduction of 77% (a 9% difference). The projected reductions due to trip elimination range from approximately 4-13%, with the influence of the trip eliminations decreasing as the scale of closures increases, because trips that would be eliminated economically become prohibited by management instead. Reducing inshore mortality to 20% provides an additional 2-3% reduction in projected removals (**Appendix E**).

There is a high level of uncertainty in the projected reductions associated with bathymetric closures due to a relative lack of fishery-independent data concerning the distribution of the red snapper stock. For lack of a better alternative, the percent stock protected was based on commercial logbook data, which introduces several potential biases into the computations (see **Appendix E**). Basing the impacts of the bathymetric closure upon commercial logbook observations of stock distribution may not be appropriate for recreational and headboat fisheries, as commercial fisheries may operate in deeper waters. Recreational vessels tend to fish closer to shore and are more likely to fish in shallower water since most are making day trips. An unpublished examination of confidential headboat fishing effort suggests a substantial number of red snapper occur inshore of 98 feet, an observation supported by the logbook as well. The projected reductions associated with a 66-240 feet closure are 2-7% higher than those associated with a 98-240 feet closure under the scenarios explored in Table 4-22. It should also be noted that the additional area covered by extending the closure inshore to 66 feet provides far more comprehensive coverage of red snapper spawning locations identified by Moe (1963) and MARMAP (1977-2008), as illustrated in Figure 4-11.

Appendix E considered scenarios with changes in release mortality. Some level of effort shifting into shallower water, for both the recreational and commercial fisheries, may be expected following implementation of area closures. 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). This is because a substantial component of the mortality experienced by red snapper following capture and release is due to barotrauma (Campbell 2008) and is therefore directly related to depth of capture (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 less than 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 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 (**Appendix E**).

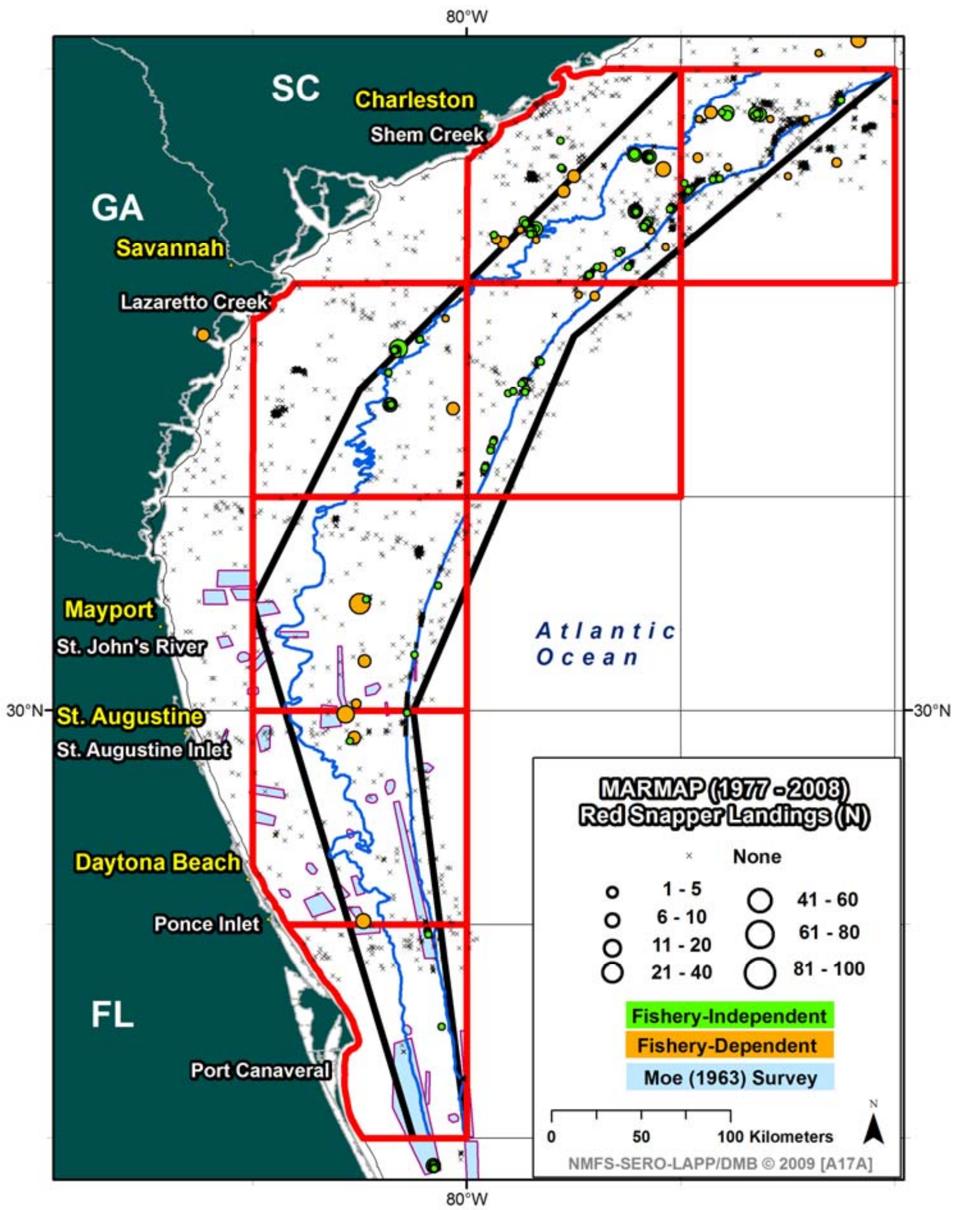


Figure 4-20. Distribution of red snapper taken by MARMAP in fishery-independent and fishery-dependent samples as well as locations where Moe (1963) reported red snapper.

Alternative 5 (Preferred) would allow harvest, and possession, 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 3A-4D**.

Table 4-19 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 3A-4D**. If black sea bass pots are allowed within a proposed closed area, red snapper bycatch would be more probable than if black sea bass pot 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, spearguns, and powerheads, all of which, except for spearguns, are relatively non-selective. Recreational fishing for black sea bass within the proposed closed area could occur under **Alternative 7 (Preferred)**, which would allow the use of spearguns within the closed area.

The commercial fishery for black sea bass is authorized to use specialized black sea bass pots, which must meet certain design standards in order to be legally deployed. Table 4-23 reveals that on trips that fished black sea bass pots, black sea bass constituted 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. However, black sea bass pots are most commonly deployed off of North Carolina where red snapper occur in lower abundance than off Georgia and North Florida. It is possible that the incidental catch of red snapper would be larger if more black sea bass pots were more commonly deployed in the proposed closed areas. The Council indicated that allowing commercial harvest of black sea bass using sea bass pots could alleviate, to some degree, negative socioeconomic effects caused by an area closure without impeding efforts to end overfishing of red snapper. However, the Council is also concerned about increased participation in the black sea bass fishery because the stock is overfished and in a rebuilding plan, and the quota is being met very quickly. At the March 2010 Council meeting, **Alternative 5** was not selected as a preferred alternative due to concern about "ghost fishing" of lost traps and potential interactions with protected species. However, at their June 2010 meeting, the Council changed their decision regarding the exemption for use black sea bass pots within the proposed closed area and voted to select **Alternative 5** as a preferred management measure alternative. Allowing the use of black sea bass pot gear within the proposed closed area could help mitigate negative socioeconomic impacts that may result from proposed snapper grouper area closure and other amendments, which will or have already implemented more restrictive management measures.

The Council's rationale for choosing **Alternative 5** as a preferred alternative is largely based on the fact that Amendment 18 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (Amendment 18), though not yet approved, includes actions to limit effort in the black sea bass fishery. Amendment 18 could potentially limit the number of black sea bass pots allowed per vessel, limit the number of black sea bass pot tags distributed to eligible fishery participants, and/or establish a spawning season closure that would apply to both the commercial and recreational sectors of the fishery. These controls, if implemented, would limit any effort shift into the black sea bass fishery that may result from allowing the use of black sea bass pot gear inside the proposed snapper grouper closed area, while also addressing concerns regarding lost trap interactions with protected species. 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 and Amendment 17B will establish accountability measures for the recreational sector to ensure the annual catch limit is not exceeded. The Council also expressed the need to closely monitor black sea bass harvest and associated discards in the closed area.

Table 4-23. 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 bass, Atlantic, black, UNC	100.00%	91.17%
Pinfish, spot tail	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%
Hake, Atlantic, red and 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%

Alternative 6 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 2-4D**. 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 around 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) in much shallower water (generally less than 240 ft (73 m)). The difference in preferred habitat and depth of golden tilefish and red snapper would allow for the deployment of bottom longline gear without negatively affecting rebuilding efforts for red snapper. Allowing the use of bottom longline gear may help to mitigate some of the negative socioeconomic impact expected as a result of an area closure. Table 4-24 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 by 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. Although the Council felt that there would little chance that fishermen targeting golden tilefish would impact red snapper stocks, the Council did not select **Alternative 6** as a preferred alternative because the preferred closure **Alternative 3E** would extend to a depth of 300 feet and bottom longline gear is already restricted to depths greater than 240 feet.

Table 4-24. 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%
Dolphin fish	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-thorneyheads	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, maco 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 7 (Preferred) would allow the harvest of snapper grouper species, other than red snapper, within a proposed closed area using spearfishing gear. Because of its selectivity as a gear type, spearguns would be the least likely of all fishing gear to produce red snapper bycatch. Allowing the use of spearguns 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, spearguns are the most selective gear type available if the user is well-versed in species identification.

Spearfishing allows fishermen to more effectively select for larger individuals within target species populations (Sadovy et al. 1994; Meyer 2007; Lloret et al. 2008). Spearfishing is an efficient harvesting activity that can significantly alter abundance and size structure of target species toward fewer and smaller fish by selective removal of larger individual fish. The removal of larger individual fish of the target species leaves behind smaller individuals to spawn. Over time this can decrease the size and age at sexual maturity and decrease the average size of the population (Sluka and Sullivan 1998, Chapman and Kramer 1999, Matos-Caraballo et al. 2006; Lloret et al. 2008).

Meyer (2007) reported spearfishing can remove a greater biomass of reef fishes than rod and reel fishing. Frisch et al. (2008) found that free-diving (diving without SCUBA) spear fishermen removed larger fish than rod and reel fishermen. Spearfishing can also impact ecosystem health by altering the composition of the overall natural communities of species (Lloret et al. 2008). Reduction in the larger predatory fishes can have a “top-down” effect on fish assemblages by allowing other fish populations to increase, altering the composition of the overall natural community of species, including invertebrates (Lloret et al. 2008). The largest fish are important as predators in maintaining a balanced and complete ecosystem; their selective removal may cause ecological imbalance (McClanahan and Muthiga 1988; Dulvy et al. 2002).

Spearfishing has been found to alter fish behavior (Schroeder and Parrish 2005) and may cause fish to move to different habitats (Jouvenel and Pollard 2001). These habitats may be less favorable for growth and reproduction. Frisch et al. (2008) and Harper et al. (2000) indicate a small percentage of fish speared are discarded. Frisch et al. (2008) also found that some percentage of fish also escape with spear-induced injuries. There is also little marine debris associated with spearfishing activities compared to rod and reel fishing. Due to the selective nature of spearfishing, allowing the use of spearguns within an area closed to snapper grouper fishing would probably not impede efforts to rebuild the red snapper fishery.

Alternative 8 would allow transit through areas closed to snapper grouper harvest. If the Council chooses to implement one of the proposed area closures for all snapper grouper fishing, snapper grouper that are caught outside a closed area may still need to be transported through a closed area to the vessels’ home port or snapper grouper dealer. In order to reduce safety risks that could result from vessels having to navigate around a closed area in bad weather, the Council is considering allowing such vessels to legally transit through a proposed closed area under specific conditions. **Alternative 8** would apply to vessels that have onboard legally harvested snapper grouper and/or wreckfish who wish to transit through a proposed closed area.

Alternative 8a (Preferred) would require that such a vessel must appropriately stow prohibited fishing gear while transiting through the subject area. The Council is considering alternatives which could allow fishing for snapper grouper species with spearfishing gear, black sea bass pots, and bottom longline gear within the proposed closed areas. **Alternative 8a (Preferred)** is the most comprehensive in defining the conductions under which a vessel may transit through a proposed closed area. **Alternative 8b** would allow travel through a closed an area if the vessel is in transit, defined as direct non-stop progression through any snapper grouper closed area on a constant heading, along a continuous straight line course while making way by means of a source of power at all times, and does not require gear to be appropriately stowed. **Alternative 8c** would only apply to vessels wishing to transit through a proposed closed area with wreckfish onboard and does not include a transit provision for other snapper grouper species that may be onboard. **Alternative 8c** also requires that a vessel be in transit, but does not require that fishing gear be appropriately stowed. Allowing transit through a closed area is likely to have negligible negative direct or indirect effects on the biological environment. The efficacy and control of such a provision is largely the responsibility of law enforcement personnel. As with any fishery management provision, there is the chance that some level of non-compliance may occur at any given time. One hundred percent compliance is not a realistic expectation for proposed snapper grouper closures; however, with a closure in place the biological impacts of illegal snapper grouper harvest would likely be minimal, and the red snapper stock would rebuild within the proposed rebuilding schedule. In addition to changing the preferred F_{MSY} proxy alternative to $F_{30\%SPR}$, at their June 2010 meeting, the Council determined less than 90% would be a realistic estimate of the expected level of compliance for the proposed snapper grouper area closure. Given the scenario incorporating the new preferred F_{MSY} proxy and expected level of compliance, the Council modified their choice of preferred area closure alternative accordingly (**Alternative 3E**).

Alternative 1 (No Action) will perpetuate the existing level of risk for interactions between ESA-listed species and the fishery. **Alternatives 2-8** and the associated sub-alternatives are unlikely to have adverse effects on Endangered Species Act (ESA)-listed species, including *Acropora* species. Previous ESA consultations determined the snapper grouper fishery was not likely to adversely affect *Acropora* species (See **Section 3.5**). These alternatives are unlikely to alter fishing behavior in a way that would cause new adverse effects to these species. The impacts from **Alternatives 2-8** 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 Sector

A simulation model was used to predict the effects of the proposed red snapper management measures on the commercial fishery using average landings and net operating revenues from 2006-2008 as a base for comparison. The simulation model uses logbook trip reports to predict the short-term economic effects of proposed management alternatives on trip revenues and trip costs. Net operating revenues are calculated as trip revenues from all species caught on a trip that catches red snapper minus trip costs, which include fuel, oil, bait, ice, and other supplies, and exclude fixed costs and labor.

The method of analysis used has advantages and disadvantages. The advantages are that logbook data are reported by fishermen, and are available in sufficient detail to analyze and compare the proposed alternatives. The disadvantage is that logbook data reflect fishing patterns and strategies given regulations that will no longer apply. Fishermen will modify their fishing patterns and strategies to minimize the effects of new regulations, but the simulation model does not account for these changes. Therefore, it can only approximate the true, but unknown, outcomes of proposed regulations. Nevertheless, the approach provides useful insights about the relative magnitudes of change due to proposed alternatives and the distribution of effects among subgroups within the fishery. **Appendix O** outlines, in detail, the methodology used in the simulation model and is hereby incorporated by reference.

Overview

Under **Alternative 1 (No Action)**, the fishery is expected to earn approximately $9.0 million per year after deducting trips costs such as fuel, bait, ice, food and other supplies, but before accounting for fixed costs and labor costs. This number represents income to boat owners, captains, and crew members. This estimate is less than the average of what fishermen actually earned from 2006-08 because it accounts for the predicted effects of Amendment 16, which was not implemented until July 2009.

The proposed alternatives all would prohibit the harvest and sale of red snapper, while **Alternatives 3A, 3B, 3C, 3D, 3E, 4A, 4B, 4C, and 4D** also would prohibit the harvest and sale of other species in the snapper-grouper management unit based on conditions defined by water depth and area fished. Alternatives were evaluated given the preferred exemptions for black sea bass pot and spearfishing gear.

The analysis suggests that the proposed alternatives would reduce net operating revenues for the entire commercial snapper-grouper fishery by an overall average of between 4.3 percent ($390,000) for **Alternative 2** and 13.7 percent ($1,235,000) for **Alternative 4A** in combination with **Preferred Alternatives 5** and **7**. However, red snapper are harvested primarily in northeast Florida and Georgia, and fishermen in these areas are expected to incur reductions in net operating revenues that range from 25.7 percent ($254,000) with **Alternative 2** up to 70.4

percent ($694,000) with **Alternative 4A** in combination with **Preferred Alternatives 5** and **7**. Although not discussed elsewhere in this report, losses in northeast Florida and Georgia would range up to 85 percent without the preferred exemptions for sea bass pot and spearfishing gear. The costs associated with these management scenarios would be borne primarily by fishermen who use vertical line gear because it is the most frequently used gear in the fishery.

The simulation results suggest that, on average, the expected losses in net operating revenues for **Alternatives 4A, 4B, 4C, and 4D** in combination with **Preferred Alternative 7** would be approximately 2.5 times larger than the losses with the corresponding **Alternatives 3A, 3B, 3C, and 3D** in combination with **Preferred Alternatives 5** and **7**. The extra three grids off the coast of South Carolina that would be closed by **Alternatives 4A, 4B, 4C and 4D** in combination with **Preferred Alternatives 5** and **7** have higher levels of landings and revenues than the areas off of Georgia and northeast Florida, which results in relatively high extra losses in net operating revenue to comply with the closures. Furthermore, red snapper are less abundant off the coast of South Carolina, which implies that fewer red snapper would be saved. This suggests that the proposed 7-grid closures would have a relatively high extra cost per pound of red snapper saved by the closures.

Within the proposed closures off the coasts of Georgia and northeast Florida, water depths between 98 and 240 feet (**Alternatives 3C** and **Preferred Alternative 3E** in combination with **Preferred Alternatives 5** and **7**) represent the core of the snapper-grouper fishery for mid-shelf species, and deviations to encompass shallower depths from 66-240 feet (**Alternative 3B** in combination with **Preferred Alternatives 5** and **7**) or deeper depths from 98-300 feet (**Alternative 3D** in combination with **Preferred Alternatives** 5 and 7) would generate relatively small additional losses for fishermen, according to the depths recorded on their logbook trip reports.

While **Alternative 2**, the least restrictive proposed management measure, would reduce net operating revenues for the entire commercial snapper grouper fishery by $390,000(4.3 percent), the combination of **Alternative 4A** with **Preferred Alternatives 5** and **7 (Preferred)** would reduce net operating revenues by $1,235,000 (13.7 percent). However, red snapper are harvested primarily in northeast Florida and Georgia, and fishermen in these areas are expected to incur reductions in net operating revenues that range from $254,000 (25.7 percent) under **Alternative 2** up to $693,000 (70.4 percent) under the combination of **Alternative 4A** with **Preferred Alternatives 5** and **7**. The losses in these areas would increase to approximately 85 percent without the black sea bass pot and spearfishing gear exemptions.

The results of the analysis also found that **Alternatives 3A-E and 4A, B, C, and D** increased catches of red grouper and other species during the fourth quarter of the year for reasons explained in detail in **Appendix O**. The implication is that an increase in red grouper catches would partially offset the overall losses that normally would be expected from the proposed alternatives for red snapper. However, the analysis does not incorporate Amendment 17B as part of the baseline. Amendment 17B contains restrictions on the harvest of red grouper and other species. Therefore, the red grouper ACL might be caught earlier in the year than predicted here and less would be caught. In that case, the economic offsets referred to would not occur, making the losses tallied for the above alternatives more severe than reported here.

Results of Alternatives with No Gear Exemptions

Table 4-25 shows the expected losses as a result of **Alternatives 2, 3A-3E,** and **Alternatives 4A-4D** compared to the No Action **Alternative 1**, which is expected to result in approximately $9 million in net operating revenue. Impacts range from losses of $390,000 annually with **Alternative 2**, which prohibits all commercial and recreational harvest, possession, and retention of red snapper year round, to $1,485,000 with **Alternative 4A**, which prohibits harvest of red snapper year round and prohibits harvest of all other species in the snapper grouper FMU in 7 logbook grids. **Preferred Alternative 3E** is expected to result in commercial losses of $430,000.

Table 4-25. Expected Changes in Net Operating Revenues as a Result of Alternatives with No Gear Exemptions.

Alternatives	**Expected Losses in Net Operating Revenue (in $1,000s of 2008 dollars)**
Alternative 1 (No Action)	$9,017
Alternative 2	-$390
Alternative 3A	-$521
Alternative 3B	-$476
Alternative 3C (Preferred)	-$457
Alternative 3D	-$463
Alternative 3E	-$430
Alternative 4A	-$1,485
Alternative 4B	-$1,374
Alternative 4C	-$1,289
Alternative 4D	-$1,304

Results of Alternatives with Gear Exemptions

Table 4-26, below, shows the expected losses in net operating revenue from **Alternatives 3A-3E and 4A-4D** in combination with one or more of the gear exemptions.

Table 4-26. Expected Changes in Net Operating Revenue Assuming Implementation of Gear Exemptions.

Alternatives	**Expected Losses in Net Operating Revenue (in $1,000s of 2008 dollars)**
Alternative 1 (No Action)	$9,017
BSB Pot Exemption Alts	
Alternatives 3A and 5	-$520
Alternatives 3B and 5	-$475
Alternatives 3C and 5	-$457
Alternatives 3D and 5	-$463
Alternatives 3E (Preferred) and 5	-$430
Alternatives 4A and 5	-$1,471
Alternatives 4B and 5	-$1,360
Alternatives 4C and 5	-$1,286
Alternatives 4D and 5	-$1,300
Longline Exemption Alts	
Alternatives 3A and 6	-$507
Alternatives 4A and 6	-$1,422
Diving Exemption Alts	
Alternatives 3A and 7	-$490
Alternatives 3B and 7	-$444
Alternatives 3C and 7	-$438
Alternatives 3D and 7	-$445
Alternatives 3E (Preferred) and 7	-$430
Alternatives 4A and 7	-$1,249
Alternatives 4B and 7	-$1,139
Alternatives 4C and 7	-$1,084
Alternatives 4D and 7	-$1,099
BSB Pot and Diving Exemption Alts	
Alternatives 3A, 5, and 7	-$489
Alternatives 3B, 5, and 7	-$444
Alternatives 3C, 5, and 7	-$438
Alternatives 3D, 5, and 7	-$445
Alternatives 3E (Preferred), 5, and 7	-$430
Alternatives 4A, 5, and 7	-$1,235
Alternatives 4B, 5, and 7	-$1,125
Alternatives 4C, 5, and 7	-$1,081
Alternatives 4D, 5, and 7	-$1,095

Geographical Impacts

Including the black sea bass pot and diving gear exemptions, the predicted reductions in net operating revenues for fishermen in northeast Florida and Georgia are expected to average approximately $254,000 (25.7 percent) for **Alternative 2**, about $673,000 (68.3 percent) for **Alternatives 3A** and **3B** and $669,000 (67.9%) for **Alternative 3C**, $670,000 (68 percent) for **Alternative 3D**, and $603,000 (61.2 percent) for **Preferred Alternative 3E**. Losses to northeast Florida and Georgia fishermen from **Alternatives 4A-4D** including the mitigating effects of exemptions for black sea bass pot and spearfishing gear, range from $690,000 (70 percent) for **Alternatives 4C and 4D** to $693,000 (70.4 percent) for **Alternatives 4A and 4B**.

Table 4-27. Expected Changes in Net Operating Revenues by Geographic Region By Gear Exemption.

	NC	**SC**	**GA-NEFL**	**Central and SE FL**	**KEYS**	**TOTAL**
Alternative 1 (No Action)	$2,498	$1,542	$985	$2,245	$1,746	$9,017
Alternative 2	$17	-$57	-$254	-$93	-$4	-$390
BSB Pot Exemption Alternatives	**NC**	**SC**	**GA-NEFL**	**Central and SE FL**	**KEYS**	**TOTAL**
Alternative 3A and 5	$329	$188	-$793	-$252	$6	-$520
Alternative 3B and 5	$329	$177	-$793	-$196	$6	-$475
Alternative 3C and 5	$317	$172	-$789	-$164	$6	-$457
Alternative 3D and 5	$318	$172	-$789	-$171	$6	-$463
Alternative 3E (Preferred) and 5	$281	$162	-$712	-$168	$6	-$430
Alternative 4A and 5	$179	-$562	-$840	-$258	$8	-$1,471
Alternative 4B and 5	$179	-$517	-$839	-$192	$8	-$1,360
Alternative 4C and 5	$179	-$486	-$834	-$154	$8	-$1,286
Alternative 4D and 5	$179	-$493	-$835	-$161	$8	-$1,300
Longline Exemption Alternatives	**NC**	**SC**	**GA-NEFL**	**Central and SE FL**	**KEYS**	**TOTAL**
Alternative 3A and 6	$329	$178	-$793	-$229	$6	-$507
Alternative 4A and 6	$179	-$547	-$840	-$224	$8	-$1,422
Diving Exemption Alternatives	**NC**	**SC**	**GA-NEFL**	**Central and SE FL**	**KEYS**	**TOTAL**
Alternative 3A and 7	$281	$121	-$673	-$218	-$1	-$490
Alternative 3B and 7	$279	$112	-$673	-$163	-$1	-$444
Alternative 3C (Preferred) and 7	$278	$109	-$669	-$154	-$1	-$438

Alternative 3D and 7	$278	$108	-$670	-$161	-$1	-$445
Alternative 3E (Preferred) and 7	$246	$83	-$603	-$156	-$1	-$430
Alternative 4A and 7	$179	-$545	-$694	-$199	$8	-$1,249
Alternative 4B and 7	$179	-$500	-$693	-$133	$8	-$1,139
Alternative 4C and 7	$179	-$459	-$690	-$124	$8	-$1,084
Alternative 4D and 7	$179	-$466	-$690	-$133	$8	-$1,099
BSB Pot and Diving Exemption Alts	**NC**	**SC**	**GA-NEFL**	**Central and SE FL**	**KEYS**	**TOTAL**
Alternatives 3A, 5, and 7	$281	$121	-$673	-$218	-$1	-$489
Alternatives 3B, 5, and 7	$279	$112	-$672	-$163	-$1	-$444
Alternatives 3C, 5, and 7	$278	$109	-$669	-$154	-$1	-$438
Alternatives 3D, 5, and 7	$278	$108	-$670	-$161	-$1	-$445
Alternatives 3E (Preferred), 5, and 7	$246	$83	-$603	-$156	-$1	-$430
Alternatives 4A, 5, and 7	$179	$531	-$693	-$198	$8	-$1,235
Alternatives 4B, 5, and 7	$179	$487	-$693	-$133	$8	-$1,125
Alternatives 4C, 5, and 7	$179	$456	-$690	-$124	$8	-$1,081
Alternatives 4D, 5, and 7	$179	$463	-$690	-$131	$8	-$1,095
No Gear Exemption Alternatives	**NC**	**SC**	**GA-NEFL**	**Central and SE FL**	**KEYS**	**TOTAL**
Alternative 3A	$329	$188	-$793	-$252	$6	-$521
Alternative 3B	$329	$177	-$793	-$196	$6	-$476
Alternative 3C (Preferred)	$317	$172	-$789	-$164	$6	-$457
Alternative 3D	$318	$172	-$789	-$171	$6	-$463
Alternative 3E (Preferred)	$281	$162	-$712	-$168	$6	-$430
Alternative 4A	$179	-$575	-$840	-$258	$8	-$1,485
Alternative 4B	$179	-$531	-$840	-$192	$8	-$1,374
Alternative 4C	$179	-$489	-$834	-$154	$8	-$1,289
Alternative 4D	$179	-$496	-$835	-$161	$8	-$1,304

Impacts on Different Gear Groups

Net operating revenues are expected to decline or remain unchanged for all gear types under **Alternative 2**, for all gear types except black sea bass pots given **Alternatives 3A-E** combined with **Preferred Alternatives 5** and **7**, and for all gear types except spearfishing and pot gear given **Alternatives 4A-D** combined with **Preferred Alternatives 5** and **7**. Trips with vertical lines would incur almost all of the expected reductions in net operating revenues because this is the primary gear used in the commercial snapper grouper fishery.

Gear exemptions are expected to mitigate the economic effects of the alternatives because some fishing activity would be exempt from the proposed closures. The exemption for black sea bass pots (**Preferred Alternative 5**) is small because most pot fishing occurs in fishing areas that would not be affected by the proposed closures. When compared to the effects of the same alternatives without the gear exemption, the expected benefit of an exemption for pots is approximately $14,000 for **Alternatives 4A** and **4B** in combination with **Preferred Alternatives 5 and 7**, and about $3,000 for the deeper waters associated with **Alternative 4C** and **Alternative 4D** in combination with **Preferred Alternatives 5 and 7**. When compared to the No Action alternative, the net effect of an exemption for pots is a small gain for fishermen with black sea bass pots. There is virtually no benefit for **Alternatives 3A, 3B, 3C, 3D, or 3E (Preferred)** in combination with **Preferred Alternatives 5 and 7**, because the fishery for pots primarily occurs in South Carolina and North Carolina rather than Georgia and northeast Florida.

The exemption for longlines in waters deeper than 300 feet (**Alternative 6**) applies only to **Alternatives 3A** and **4A** because the other alternatives would prohibit fishing only in waters shallower than 300 feet. The simulation analysis found that an exemption for longlines could be either positive or negative for the conditions associated with individual fishing years, with the outcome dependent on whether an exemption would increase landings of tilefish quickly enough to trigger the lower 300 pound trip limit on September 1 of each year.[3] If the 300 pound trip limit is triggered, then total landings of tilefish could be less than without an exemption for longlines and the full trip limit of 4,000 pounds for tilefish. When compared to the same alternatives without the gear exemption, the expected benefit of an exemption for longlines would be approximately $14,000 for **Alternative 3A** and $63,000 for **Alternative 4A**. An exemption for longlines is not one of the Council's preferred alternatives, and trips with longlines are expected to incur reductions in net operating revenues of approximately $63,000 (11.9 percent) with **Alternative 4A** in combination with **Preferred Alternatives 5** and **7**.

The potential benefit of a gear exemption is greatest for spearfishing gear (**Preferred Alternative 7)**. Without an exemption, net operating revenue for divers is expected to decline by an average of approximately $183,000 (38.5 percent) for **Alternatives 3A and 3B**, by $155,000 (32.7 percent) for **Alternatives 3C and 3D**, by $149,000 (31.5 percent), by $213,000 (45 percent) for **Alternatives 4A and 4B**, and by $182,000 (38.3 percent) for **Alternatives 4C and 4D**. With an exemption, net operating revenue for divers is expected to decline by $15,000-

[3] The commercial fishery for golden tilefish is managed with an annual quota and a 4,000 pound trip limit. The trip limit is reduced to 300 pounds after 75% of the quota is taken, but only if this occurs on or before September 1.

$20,000 (3.2-4.1 percent) for **Alternatives 3A-E** and is expected to increase approximately $23,000 (4.9 percent) for **Alternatives 4A-D**. However, the proposed exemption for spearfishing gear is expected to result in an earlier closure for the shallow water grouper fishery than without any gear exemptions, and the indirect result of the exemption would be a reduction in net operating revenue for fishermen with vertical line gear, especially for **Alternatives 3A, 3B, 3C and 3D**. Therefore, the overall benefit for all gears combined of an exemption for spearfishing gear is expected to average approximately $32,000 (0.4 percent) for **Alternatives 3A and 3B**, $19,000 (0.2 percent) for **Alternatives 3C and 3D**, $236,000 (3.1 percent) for **Alternatives 4A and 4B**, and $205,000 (2.7 percent) for **Alternatives 4C and 4D**.

Table 4-28. Expected Losses in Net Operating Revenues by Gear Group By Gear Exemption.

Alternatives	**Dive**	**Vert Lines**	**Longlines**	**Pots/Traps**	**Other**	**TOTAL**
Alternative 1 (No Action)	$474	$7,125	$529	$276	$613	$9,017
Alternative 2	-$40	-$349	$0	-$1	$0	-$390
BSB Pot Exemption Alternatives	**Dive**	**Vert Lines**	**Longlines**	**Pots/Traps**	**Other**	**TOTAL**
Alternative 3A and 5	-$183	-$301	-$16	$1	-$22	-$520
Alternative 3B and 5	-$182	-$292	$0	$1	-$3	-$475
Alternative 3C and 5	-$155	-$302	$0	$1	-$1	-$457
Alternative 3D and 5	-$155	-$307	-$2	$1	-$1	-$463
Alternative 3E (Preferred) and 5	-$149	-$281	$0	$1	-$1	-$430
Alternative 4A and 5	-$213	-$1,174	-$63	$2	-$22	-$1,471
Alternative 4B and 5	-$213	-$1,147	-$1	$2	-$2	-$1,360
Alternative 4C and 5	-$182	-$1,104	$0	$2	-$1	-$1,286
Alternatives 4D and 5	-$182	-$1,117	-$2	$2	-$1	-$1,300
Longline Exemption Alternatives	**Dive**	**Vert Lines**	**Longlines**	**Pots/Traps**	**Other**	**TOTAL**
Alternative 3A and 6	-$183	-$302	-$1	$1	-$22	-$507
Alternative 4A and 6	-$213	-$1,175	$1	-$13	-$22	-$1,422
Diving Exemption Alternatives	**Dive**	**Vert Lines**	**Longlines**	**Pots/Traps**	**Other**	**TOTAL**
Alternative 3A and 7	-$15	-$437	-$16	$1	-$23	-$490
Alternative 3B and 7	-$16	-$426	$0	$1	-$3	-$444
Alternative 3C and 7	-$16	-$421	$0	$1	-$2	-$438
Alternative 3D and 7	-$16	-$427	-$2	$1	-$2	-$445
Alternative 3E (Preferred) and 7	-$20	-$410	$0	$1	-$2	-$430
Alternative 4A and 7	$23	-$1,174	-$63	-$13	-$22	-$1,249
Alternative 4B and 7	$23	-$1,147	-$1	-$12	-$2	-$1,139
Alternative 4C and 7	$23	-$1,104	$0	-$2	-$1	-$1,084

Alternative 4D and 7	$23	-$1,117	-$2	-$2	-$1	-$1,099
BSB Pot and Diving Exemption Alts	**Dive**	**Vert Lines**	**Longlines**	**Pots/Traps**	**Other**	**TOTAL**
Alternative 3A, 5, and 7	-$15	-$437	-$16	$1	-$23	-$489
Alternative 3B, 5, and 7	-$16	-$426	$0	$1	-$3	-$444
Alternative 3C, 5, and 7	-$16	-$421	$0	$1	-$2	-$438
Alternative 3D, 5, and 7	-$16	-$427	-$2	$1	-$2	-$445
Alternative 3E (Preferred), 5, and 7	-$20	-$410	$0	$1	-$2	-$430
Alternative 4A, 5, and 7	$23	-$1,174	-$63	$2	-$22	-$1,235
Alternative 4B, 5, and 7	$23	-$1,147	-$1	$2	-$2	-$1,125
Alternative 4C, 5, and 7	$23	-$1,104	$0	$2	-$1	-$1,081
Alternatives 4D, 5, and 7	$23	-$1,117	-$2	$2	-$1	-$1,095
No Gear Exemption Alternatives	**Dive**	**Vert Lines**	**Longlines**	**Pots/Traps**	**Other**	**TOTAL**
Alternative 3A	-$183	-$301	-$16	$1	-$22	-$521
Alternative 3B	-$182	-$292	$0	$1	-$3	-$476
Alternative 3C	-$155	-$302	$0	$1	-$1	-$457
Alternative 3D	-$155	-$307	-$2	$1	-$1	-$463
Alternative 3E (Preferred)	-$149	-$281	$0	$1	$1	-$430
Alternative 4A	-$213	-$1,174	-$63	-$13	-$22	-$1,485
Alternative 4B	-$213	-$1,147	-$1	-$12	-$2	-$1,374
Alternative 4C	-$182	-$1,104	$0	-$2	-$1	-$1,289
Alternative 4D	-$182	-$1,117	-$2	-$2	-$1	-$1,304

Alternative 8 is mainly an enforcement measure that would provide commercial fishermen some protection from being penalized when transiting through closed areas. This would also allow commercial fishermen to save on 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 8a (Preferred)** and **8b** would affect most commercial fishermen more than **Alternative 8c** given the limited fishing occurring for wreckfish.

Recreational Sector

Several red snapper management measures have been considered to achieve the desired fishing mortality reduction, inclusive of discard mortality. **Alternative 1** is the no action alternative. **Alternative 2** would prohibit harvest, retention, and possession red snapper in the South Atlantic economic exclusive zone (EEZ) year round. **Alternatives 3A, 3B, 3C,** and **3D** would add to **Alternative 2** a year-round prohibition of harvest, retention, and possession of any species in the snapper grouper fishery management unit in an area corresponding to commercial logbook grids 2880, 2980, 3080 and 3180. These four alternatives differ only in the depth restriction -- all depths for **Alternative 3A**, from 66 feet to 240 feet for **Alternative 3B**, from 98 feet to 240 feet for **Alternative 3C**, and from 98 feet to 300 feet for **Alternative 3D**. **Alternative 3E** is similar to **Alternative 3C**, except that it would exclude logbook grid 3180 from among the areas to be closed. **Alternatives 4A, 4B, 4C,** and **4D** would add to **Alternative 2** a year-round prohibition of harvest, retention, and possession of any species in the snapper grouper fishery management unit in an area corresponding to commercial logbook grids 2880, 2980, 3080, 3180, 3179, 3278, and 3279. These four alternatives differ only in the depth restriction -- all depths for **Alternative 4A**, from 66 feet to 240 feet for **Alternative 4B**, from 98 feet to 240 feet for **Alternative 4C**, and from 98 feet to 300 feet for **Alternative 4D**. **Alternative 5** would allow fishing for black sea bass in the closed areas using black sea bass pots with endorsements. **Alternative 6** would allow bottom longline fishing for snapper grouper, except red snapper, in the closed areas beyond 50 fathoms. **Alternative 7** would allow fishing for snapper grouper, except red snapper, in the closed areas using spearfishing gear. **Alternative 8**, and its various sub-alternatives, would address the issue of vessels transiting through the closed areas. Except for **Alternatives 5, 6, 7,** and **8**, the current economic assessment of the red snapper management measures is done in a quantitative manner.

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 N** provides more details on the method used to estimate the economic effects of the red snapper management measures 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. The CS values are computed by multiplying the number of red snapper target trips by the CS per trip and average fish per angler per trip. The NOR values are computed by multiplying the number of affected for-hire angler trips by the NOR per angler, per trip.

Several limitations, discussed in **Appendix N**, characterize the estimated changes in CS and NOR. One such limitation is the possible overestimation of affected target trips and hence also the economic effects. The headboat data collection program does not collect target intent, much less on a species-specific basis, so an alternative estimation approach was used which generated red snapper and snapper angler trips from the estimated total angler days. Moreover, charter and private target trips were assigned by statistical grid using similar information from distribution of headboat trips by statistical grid. In addition, headboat and Marine Recreational Statistical Survey (MRFSS) data do not contain depth information, so the assignment of target trips by depth made use of similar information from the commercial logbook program. Furthermore, the analysis does not take into account possible effort shift due to area or species substitution. Leaving the fishery altogether remains an option for some for-hire owners/operators, but given the relatively low level of local and national economic activities, there's a good chance these persons would remain in the fishing industry. If so, they would have to fish for other snapper grouper species, fish in the open areas, move their operations to other areas in the South Atlantic or nearby locations, or offer other services to make up for their revenue and profit losses. These options may not totally compensate for their profit losses if they incur higher operating cost and/or additional fixed costs or generate lower revenues; nevertheless, these options would imply the economic effects on the for-hire sector would be less than currently estimated. Private anglers may also shift their effort to target other species or the same species (except red snapper) in the open areas rather than stop fishing altogether. Again, this would imply the current estimates of CS reductions to be overestimates.

Another limitation pertains to the use of CS and NOR values. The CS value used is uniform across all fishing modes and areas, and 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. The NOR value used is uniform across all areas, and thus does not account for area variations in charter and headboat operations that could result in varying NOR values.

One other limitation worth noting here is the one-year horizon considered in the analysis. Many of the regulations proposed in this amendment are likely to remain in effect for the next several years, noting that a rebuilding schedule is being proposed in this amendment. It is possible to develop a stream of annual economic effects by extrapolating the one-year estimates to the future after duly accounting for a discount factor. However, future changes in stock status, regulations, and socioeconomic conditions, among others, would have to be taken into account for a more reasonable depiction of annual economic effects. A red snapper stock assessment is forthcoming, and regulations may need to be changed, but the direction and magnitude of changes for purposes of developing a stream of multi-year economic effects cannot be determined at this time. Also, economic conditions could change, but the nature and extent of such a change for purposes of estimating an annual stream of economic effects cannot be determined at this time. To provide some quantitative insights into the long-term economic effects, it is assumed that the regulations proposed in this amendment last forever and all other conditions remain the same throughout.

Table 4-29a presents the economic effects of **Alternative 2**. The bulk of the red snapper fishery is in northeast Florida and Georgia, so it is no surprise anglers and for-hire vessels in this area would experience most of the economic effects from the ban on red snapper fishing. Southeast

Florida and South Carolina are also expected to experience a relatively sizeable amount of economic loss. A good amount of red snapper targeting by charterboat and private anglers in southeast Florida would explain the relatively large losses in CS in this area (see Appendix N). In South Carolina, headboat anglers would account for more than half of the CS losses, and this could be partly due to the possible overestimation of headboat angler trips. The absence of red snapper targeting by charterboat and private anglers in North Carolina would explain the relatively low CS reductions in this area from the red snapper fishing ban. In terms of NOR reductions, the headboat sector would account for most of the effects but this could be partly due to the possible overestimation of affected angler trips on headboats. The distribution, though, of headboat NOR changes follow that of the CS reductions. That is, headboats in northeast Florida and Georgia would experience the largest NOR reductions, followed by those in southeast Florida, South Carolina, and North Carolina.

Table 4-29a. 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/Georgia				
CS	904,548	663,664	2,162,682	3,730,893
NOR	413,508	2,820,571		3,234,078
Total	1,318,056	3,484,235	2,162,682	6,964,972
Southeast Florida				
CS	148,462	54,578	419,513	622,552
NOR	67,868	487,576		555,444
Total	216,330	542,153	419,513	1,177,996
South Carolina				
CS	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	0	6,702	0	6,702
NOR	0	161,989		161,989
Total	0	168,691	0	168,691

The economic effects of closing to snapper grouper fishing logbook grids 2880, 2980, 3080, and 3180, in addition to the red snapper fishing ban, are presented in Tables 4-29b, 4-29c, 4-29d, 4-29e, and 4-29f for **Alternatives 3A, 3B, 3C, 3D**, and **3E** respectively. Note that the area closure under **Alternative 3E** would exclude logbook grid 3180. The tabulated estimates combine the economic effects of the red snapper fishing ban, as shown in Table 4-29a, and the economic effects of the area closures.

As noted earlier, **Alternatives 3A, 3B, 3C,** and **3D** vary only in the depths subject to closure. Closure of the four grids, regardless of depths considered, would affect only the fishing participants in northeast Florida and Georgia. Fishing activities in other areas (southeast Florida, South Carolina, and North Carolina) would not be directly affected by the closure, although these other areas may be indirectly affected if fishers shift to the nearby open areas. The economic effects on these other areas, shown in the tables, would be due only to the fishing ban on red snapper. **Alternative 3E**, which is similar to **Alternative 3C** except that it would exclude logbook grid 3180 from the area closure, would directly affect the fishing participants in northeast Florida and Georgia, but the area closure component of this alternative would not directly affect fishing participants in Georgia.

The magnitude of economic effects of the various alternatives directly correlates with the size of area closures. **Alternative 3A** would close all depths within each of the four grids; hence it would result in the largest economic effects among the four alternatives. The second largest economic effects would result from **Alternative 3B**, which would close depths from 66 feet to 240 feet in each of the four grids. **Alternative 3C**, which would close depths from 98 feet to 240 feet in each of the four grids, would result in the second lowest economic effects; Alternative **3D**, which would close depths from 98 feet to 300 feet in each of the four grids, would have the third largest economic effects; and **Alternative 3E**, which would close depths from 98 feet to 240 feet in each of only three grids, would result in the lowest economic effects. It should be noted here that the assignment of recreational trips by depth was done using the depth distribution of commercial vessel trips. The extent of bias introduced by this technique is unknown, although it may be remarked that in general recreational vessels fish in shallower waters than commercial vessels. This may have particular significance when comparing **Alternative 3C** and **Alternative 3D**.

Table 4-29b. Reductions in consumer surplus (CS) and for-hire net operating revenues (NOR) due to Alternative 3A, in 2009 dollars.

	Charterboat	Headboat	Private	Total
Northeast Florida/Georgia				
CS	2,428,190	2,507,009	8,307,352	13,242,550
NOR	667,448	3,423,203		4,090,651
Total	3,095,638	5,930,212	8,307,352	17,333,201
Southeast Florida				
CS	148,462	54,578	419,513	622,552
NOR	67,868	487,576		555,444
Total	216,330	542,153	419,513	1,177,996
South Carolina				
CS	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	0	6,702	0	6,702
NOR	0	161,989		161,989
Total	0	168,691	0	168,691

Table 4-29c. Reductions in consumer surplus (CS) and for-hire net operating revenues (NOR) due to Alternative 3B, in 2009 dollars.

	Charterboat	Headboat	Private	Total
Northeast Florida/Georgia				
CS	2,358,390	2,422,316	8,025,388	12,806,094
NOR	655,815	3,395,515		4,051,329
Total	3,014,205	5,817,830	8,025,388	16,857,423
Southeast Florida				
CS	148,462	54,578	419,513	622,552
NOR	67,868	487,576		555,444
Total	216,330	542,153	419,513	1,177,996
South Carolina				
CS	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	0	6,702	0	6,702
NOR	0	161,989		161,989
Total	0	168,691	0	168,691

Table 4-29d. Reductions in consumer surplus (CS) and for-hire net operating revenues (NOR) due to Alternative 3C, in 2009 dollars.

	Charterboat	Headboat	Private	Total
Northeast Florida/Georgia				
CS	2,222,476	2,257,712	7,477,923	11,958,111
NOR	633,162	3,341,702		3,974,864
Total	2,855,638	5,599,414	7,477,923	15,932,975
Southeast Florida				
CS	148,462	54,578	419,513	622,552
NOR	67,868	487,576		555,444
Total	216,330	542,153	419,513	1,177,996
South Carolina				
CS	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	0	6,702	0	6,702
NOR	0	161,989		161,989
Total	0	168,691	0	168,691

Table 4-29e. Reductions in consumer surplus (CS) and for-hire net operating revenues (NOR) due to Alternative 3D, in 2009 dollars.

	Charterboat	Headboat	Private	Total
Northeast Florida/Georgia				
CS	2,231,794	2,269,089	7,516,041	12,016,924
NOR	634,715	3,345,421		3,980,137
Total	2,866,509	5,614,511	7,516,041	15,997,061
Southeast Florida				
CS	148,462	54,578	419,513	622,552
NOR	67,868	487,576		555,444
Total	216,330	542,153	419,513	1,177,996
South Carolina				
CS	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	0	6,702	0	6,702
NOR	0	161,989		161,989
Total	0	168,691	0	168,691

Table 4-29f. Reductions in consumer surplus (CS) and for-hire net operating revenues (NOR) due to Alternative 3E, in 2009 dollars.

	Charterboat	Headboat	Private	Total
Northeast Florida/Georgia				
CS	2,215,423	2,252,731	7,447,849	11,916,003
NOR	631,987	3,340,074		3,972,060
Total	2,847,409	5,592,805	7,447,849	15,888,063
Southeast Florida				
CS	148,462	54,578	419,513	622,552
NOR	67,868	487,576		555,444
Total	216,330	542,153	419,513	1,177,996
South Carolina				
CS	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	0	6,702	0	6,702
NOR	0	161,989	0	161,989
Total	0	168,691	0	168,691

The economic effects of closing to snapper grouper fishing logbook grids 2880, 2980, 3080, 3180, 3179, 3278, and 3279, in addition to the red snapper fishing ban, are presented in Tables 4-29g, 4-29h, 4-29i, and 4-29j for **Alternatives 4A, 4B, 4C,** and **4D**, respectively. Estimates in these tables combine the economic effects of the red snapper fishing ban, as shown in Table 4-29a, the economic effects of the closing four logbook grids, as shown in Tables 4-29b, 4-29c, 4-29d, and 4-29e, and the closure of three additional logbook grids.

Alternatives 4A, 4B, 4C, and **4D** vary from one another only in the depths subject to closure. Closure of the seven grids, regardless of depths considered, would affect only the fishing participants in northeast Florida, Georgia, and South Carolina. Fishing activities in southeast Florida and North Carolina would not be directly affected by the closure, although these other areas may be indirectly affected if fishers shift to the nearby open areas. The economic effects in these other areas, shown in the tables, would be due only to the fishing ban on red snapper.

The magnitude of economic effects of the various alternatives directly correlates with the size of area closures. **Alternative 4A** would close all depths within each of the seven logbook grids; hence, it would result in the largest economic effects among the four alternatives. The second largest economic effects would result from **Alternative 4B**, which would close depths from 66 feet to 240 feet. **Alternative 4C**, which would close depths from 98 feet to 240 feet, would result in the lowest economic effects; and, **Alternative 4D**, which would close depths from 98 feet to 300 feet, would have the third largest economic effects. As may be expected, the absolute magnitudes of economic effects of these four alternatives would be greater than those of **Alternatives 3A, 3B, 3C,** and **3D**. However their relative magnitudes of economic effects would closely mimic those of **Alternatives 3A, 3B, 3C,** and **3D**. It should be reiterated here that the assignment of recreational trips by depth was done using the depth distribution of commercial vessel trips. The extent of bias introduced by this technique is unknown, although it may be remarked that in general recreational vessels fish in shallower waters than commercial vessels. This may have particular significance when comparing **Alternative 4C** and **Alternative 4D**.

Table 4-29g. Reductions in consumer surplus (CS) and for-hire net operating revenues (NOR) due to Alternative 4A, in 2009 dollars.

	Charterboat	Headboat	Private	Total
Northeast Florida/Georgia				
CS	2,428,190	2,507,009	8,307,352	13,242,550
NOR	667,448	3,423,203		4,090,651
Total	3,095,638	5,930,212	8,307,352	17,333,201
Southeast Florida				
CS	148,462	54,578	419,513	622,552
NOR	67,868	487,576		555,444
Total	216,330	542,153	419,513	1,177,996
South Carolina				
CS	537,839	3,199,953	848,174	4,585,965
NOR	103,231	744,925		848,156
Total	641,069	3,944,878	848,174	5,434,121
North Carolina				
CS	0	6,702	0	6,702
NOR	0	161,989		161,989
Total	0	168,691	0	168,691

Table 4-29h. Reductions in consumer surplus (CS) and for-hire net operating revenues (NOR) due to Alternative 4B, in 2009 dollars.

	Charterboat	Headboat	Private	Total
Northeast Florida/Georgia				
CS	2,358,390	2,422,316	8,025,388	12,806,094
NOR	655,815	3,395,515		4,051,329
Total	3,014,205	5,817,830	8,025,388	16,857,423
Southeast Florida				
CS	148,462	54,578	419,513	622,552
NOR	67,868	487,576		555,444
Total	216,330	542,153	419,513	1,177,996
South Carolina				
CS	478,680	2,846,388	761,401	4,086,469
NOR	95,791	695,673		791,465
Total	574,471	3,542,061	761,401	4,877,934
North Carolina				
CS	0	6,702	0	6,702
NOR	0	161,989		161,989
Total	0	168,691	0	168,691

Table 4-29i. Reductions in consumer surplus (CS) and for-hire net operating revenues (NOR) due to Alternative 4C, in 2009 dollars.

	Charterboat	Headboat	Private	Total
Northeast Florida/Georgia				
CS	2,222,476	2,257,712	7,477,923	11,958,111
NOR	633,162	3,341,702		3,974,864
Total	2,855,638	5,599,414	7,477,923	15,932,975
Southeast Florida				
CS	148,462	54,578	419,513	622,552
NOR	67,868	487,576		555,444
Total	216,330	542,153	419,513	1,177,996
South Carolina				
CS	475,902	2,829,786	757,326	4,063,014
NOR	95,442	693,361		788,803
Total	571,344	3,523,146	757,326	4,851,817
North Carolina				
CS	0	6,702	0	6,702
NOR	0	161,989		161,989
Total	0	168,691	0	168,691

Table 4-29j. Reductions in consumer surplus (CS) and for-hire net operating revenues (NOR) due to Alternative 4D, in 2009 dollars.

	Charterboat	Headboat	Private	Total
Northeast Florida/Georgia				
CS	2,231,794	2,269,089	7,516,041	12,016,924
NOR	634,715	3,345,421		3,980,137
Total	2,866,509	5,614,511	7,516,041	15,997,061
Southeast Florida				
CS	148,462	54,578	419,513	622,552
NOR	67,868	487,576		555,444
Total	216,330	542,153	419,513	1,177,996
South Carolina				
CS	477,273	2,837,981	759,338	4,074,592
NOR	95,615	694,502		790,117
Total	572,888	3,532,483	759,338	4,864,708
North Carolina				
CS	0	6,702	0	6,702
NOR	0	161,989		161,989
Total	0	168,691	0	168,691

For purposes of the succeeding discussions, Table 4-29k is presented below. This table summarizes the more detailed tables presented above.

Table 4-29k. Summary of CS and NOR reductions, in 2009 dollars.

		FL_NE/GA	FL_SE	SC	NC	TOTAL
ALT. 2	CS	3,730,893	622,552	243,742	6,702	4,603,890
	NOR	3,234,078	555,444	355,326	161,989	4,306,837
	TOTAL	6,964,972	1,177,996	599,068	168,691	8,910,728
ALT. 3A	CS	13,242,550	622,552	243,742	6,702	14,115,547
	NOR	4,090,651	555,444	355,326	161,989	5,163,410
	TOTAL	17,333,201	1,177,996	599,068	168,691	19,278,957
ALT. 3B	CS	12,806,094	622,552	243,742	6,702	13,679,090
	NOR	4,051,329	555,444	355,326	161,989	5,124,088
	TOTAL	16,857,423	1,177,996	599,068	168,691	18,803,179
ALT. 3C	CS	11,958,111	622,552	243,742	6,702	12,831,108
	NOR	3,974,864	555,444	355,326	161,989	5,047,623
	TOTAL	15,932,975	1,177,996	599,068	168,691	17,878,731
ALT. 3D	CS	12,016,924	622,552	243,742	6,702	12,889,921
	NOR	3,980,137	555,444	355,326	161,989	5,052,896
	TOTAL	15,997,061	1,177,996	599,068	168,691	17,942,817
ALT. 3E	CS	11,916,003	622,552	243,742	6,702	12,789,000
	NOR	3,972,060	555,444	355,326	161,989	5,044,819
	TOTAL	15,888,063	1,177,996	599,068	168,691	17,833,819
ALT. 4A	CS	13,242,550	622,552	4,585,965	6,702	18,457,770
	NOR	4,090,651	555,444	848,156	161,989	5,656,239
	TOTAL	17,333,201	1,177,996	5,434,121	168,691	24,114,009
ALT. 4B	CS	12,806,094	622,552	4,086,469	6,702	17,521,817
	NOR	4,051,329	555,444	791,465	161,989	5,560,227
	TOTAL	16,857,423	1,177,996	4,877,934	168,691	23,082,044
ALT. 4C	CS	11,958,111	622,552	4,063,014	6,702	16,650,380
	NOR	3,974,864	555,444	788,803	161,989	5,481,100
	TOTAL	15,932,975	1,177,996	4,851,817	168,691	22,131,480
ALT. 4D	CS	12,016,924	622,552	4,074,592	6,702	16,720,771
	NOR	3,980,137	555,444	790,117	161,989	5,487,686
	TOTAL	15,997,061	1,177,996	4,864,708	168,691	22,208,457

Under **Alternative 1 (No action)**, 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 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 $4.6 million (2009 dollars).

Under the assumption that the prohibitions of **Alternative 2** result in the cancellation of all trips wherein red snapper was targeted, 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 $8.9 million (CS + NOR). If the prohibition is permanent, reductions in economic value could top approximately $127 million under a 7 percent discount rate.

As shown in Table 4-29k, northeast Florida/ Georgia would experience the largest economic effects, followed by southeast Florida, South Carolina, and lastly by North 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 3A, 3B, 3C, 3D, and **3E** would prohibit recreational harvest of species in the Snapper Grouper fishery management unit (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, although more so under **Alternative 3A**, which closes all depths within each of the four grids. 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.

Alternative 3A may be expected to result in a total CS reduction of approximately $14.1 million and a total NOR reduction of $5.2 million ($774 thousand to charterboats and $4.4 million to headboats). Overall, **Alternative 3A** may be expected to reduce short-term economic values by $19.3 million. The overall expected reductions in economic values for the other four alternatives are: $18.8 million for **Alternative 3B**, $17.88 million for **Alternative 3C**, $17.94 million for **Alternative 3D,** and $17.83 for **Alternative 3E**. Among these five alternatives, **Alternative 3E** would result in the lowest reduction in economic values while **Alternative 3A,** the highest. This is probably as expected since **Alternative 3E** would close the smallest areas and **Alternative 3A**, the largest. If the regulations from these alternatives were permanent, economic losses could top $276 million for **Alternative 3A**, $269 million for **Alternative 3B**, $255 million for **Alternative 3C**, $256 million for **Alternative 3D,** and $255 million for **Alternative 3E** at a 7% discount rate.

The pattern of economic effects of **Alternatives 4A through 4D** follows that of **Alternatives 3A through 3D**. Economic losses would be lowest for **Alternative 4C** and highest for **Alternative 4A**. The overall economic losses would be $24.1 million for **Alternative 4A**, $23.1 million for **Alternative 4B**, $22.1 million for **Alternative 4C**, and $22.2 million for **Alternative 4D**. If regulations were permanent, economic losses could reach $344 million, $330 million, $316 million, and $317 million, respectively, for **Alternative 4A**, **Alternative 4B**, **Alternative 4C**, and **Alternative 4D** at a 7% discount rate.

There are at least six additional features worth noting in the tabulated results. First and already noted earlier, northeast Florida/Georgia would experience the largest economic effects of each alternative and North Carolina, the least. This generally reflects the fact that the bulk of the affected fishery is in the northeast Florida/Georgia area. On the other end, North Carolina reported low landings of red snapper and apparent absence of red snapper targeting by the charter and private anglers. In addition, North Carolina is located relatively remote from the proposed closed areas.

Second, each alternative would result in larger reduction in CS than NOR, even more so for alternatives with area closures. To some extent, this is as expected because CS is derived from three modes of fishing, namely, private, charter, and headboat while NOR is generated only by charterboat and headboat operations. In all alternatives, except **Alternative 2**, CS reductions dominate by far the NOR reductions, resulting in big jumps in total economic effects. For example, total economic effects would rise from $8.9 million under **Alternative 2** to $19.3 million under **Alternative 3A**, with an increase in CS from $4.6 million to $14.1 million and NOR from $4.3 million to $5.2 million. Additional losses from these other alternatives would come from losing trips for snapper grouper other than red snapper. These additional lost trips are less than the lost red snapper trips in all fishing modes but the CS valuation of these additional trips would be much higher. In a sense, this would reflect the greater importance of some of the other species, but an examination of the estimating procedure used shows that a large part of the additional CS effects comes from the use of a much higher average number of snapper grouper harvest. Considering the large number of snapper grouper species harvested, it is likely that the average number of these species caught per trip is higher than the average number of red snapper harvested per trip. The sensitivity of the results to the use of average number of snapper grouper species per trip is explored below.

Third, although the magnitude of increase in total economic effects from closing four areas to closing seven areas would not be as large as from no closure to closing four areas, the magnitude of additional effects would still be relatively large. For example, the total economic effects of **Alternative 3A** would be $19.3 million while those of **Alternative 4A** would be $24.1 million, or about a 25% increase. On the other hand, the percent change in reducing red snapper removal between **Alternative 3A** and **Alternative 4A** would be much smaller under any of the six scenarios considered in SERO-LAPP-2009-07. This implies that additional area closures designed to further reduce red snapper removal would be accompanied by more than proportionate increase in economic costs, at least to the recreational sector.

Fourth, as may possibly be expected, the size of area closures would determine the magnitude of economic effects. For example, **Alternative 3A** would result in larger economic effects than any of **Alternative 3B**, **Alternative 3C**, **Alternative 3D,** or **Alternative 3E** because it would cover a larger area. However, an alternative with a larger area closure in absolute value would not necessarily yield larger economic losses than one with smaller area closure. For example, **Alternative 3A** is estimated to close about 38 thousand square kilometers while **Alternative 4C** would close about 24 thousand square kilometers; yet, the expected economic effects of **Alternative 3A** ($19.3 million) would be less than those of **Alternative 4C** ($22.1 million). At least in the present case, the specific location of areas to be closed would also determine the magnitude of economic effects.

Fifth, the economic effects of **Alternative 3C** and **Alternative 4C** may be considered not too different from those of **Alternative 3D** and **Alternative 4D**, respectively. This is but reflective of the small difference in the size of area closure between the respective alternatives. On the other hand, **Alternative 3B** would have relatively larger economic effects than either **Alternative 3C** or **Alternative 3D**. A similar situation holds true for **Alternative 4B** relative to **Alternative 4C** and **Alternative 4D**. What this condition would seem to imply is that closing a smaller but shallower area would result in larger economic effects than closing a larger but deeper area. This may have greater significance for the recreational sector which is thought to fish in shallower waters than commercial vessels.

Sixth, the economic effects of **Alternative 3E** would only be slightly lower than those of **Alternative 3C**. This flows directly from the estimated low target trips for snapper grouper made by recreational anglers in logbook grid 3180.

The next two tables are results of exploring the sensitivity of economic effects to some of the critical assumptions underlying the method used in estimating the economic effects of the various alternatives. One important assumption and noted by the Council's Scientific and Statistical Committee is the 100% cancellation of affected recreational trips.

Table 4-29l shows the results of assuming different levels of trip cancellation. The estimates show relatively substantial differences in the estimates of economic effects under different assumptions of trip cancellation. It is possible the proposed regulations would severely limit the opportunities for recreational fishing, particularly for for-hire vessels, given current economic conditions and recently implemented regulations affecting the snapper grouper fishery. In a sense, this would support a higher level of trip cancellation. Over time, however, as economic conditions improve and anglers as well as for-hire operators adjust to the regulations, fishing activities may return to their higher levels. It is possible then that trip cancellations may be high in the short-term but decrease over time. One other feature in the tabulated estimates is that, for a given level of trip cancellation, the area closures, in addition to the red snapper fishing ban, would still result in relatively larger reductions in economic values when compared with the alternative that would only close the red snapper fishery. This issue is partly addressed in the second set of sensitivity analysis.

Table 4-29m shows the overall economic effects of each alternative when assuming the average number of snapper grouper per angler trip fish harvested for snapper grouper to be the same as that for red snapper. For each mode and area, the estimated average number of snapper grouper harvest per trip far exceeded the corresponding average for red snapper. Largely because of this higher average number of snapper grouper harvest, the area closures were estimated to result in relatively substantial reductions in CS despite affecting fewer trips than the red snapper fishing ban. This analysis was conducted without implying that, in actuality, the average number of red snapper harvest per trip would be equal to or higher than the corresponding average for snapper grouper.

The results in Table 4-29m still show the same pattern as those in Table 4-29l. This time, however, the introduction of area closures would not result in very large reductions in CS and in total economic values under each level of trip cancellation. For example, under the assumption of 100% trip cancellation, total economic effects would increase from $8.9 million under **Alternative 2** to $19.3 million under **Alternative 3A** (Table 4-29l). As shown in Table 4-29m, the corresponding economic effects would increase from $8.9 million to $11.2 million – the increase would still be substantial but not by a very large margin. It appears that the estimated changes in CS and total economic values are quite sensitive to the average number of fish used.

Table 4-29l. Summary of CS and NOR reductions under different levels of trip cancellation, in 2009 dollars.

		Percent of Trips Cancelled			
		100%	75%	50%	25%
ALT. 2	CS	4,603,890	3,452,918	2,301,945	1,150,973
	NOR	4,306,837	3,230,128	2,153,419	1,076,709
	TOTAL	8,910,728	6,683,046	4,455,364	2,227,682
ALT. 3A	CS	14,115,547	10,586,660	7,057,774	3,528,887
	NOR	5,163,410	3,872,557	2,581,705	1,290,852
	TOTAL	19,278,957	14,459,218	9,639,478	4,819,739
ALT. 3B	CS	13,679,090	10,259,318	6,839,545	3,419,773
	NOR	5,124,088	3,843,066	2,562,044	1,281,022
	TOTAL	18,803,179	14,102,384	9,401,589	4,700,795
ALT. 3C	CS	12,831,108	9,623,331	6,415,554	3,207,777
	NOR	5,047,623	3,785,717	2,523,812	1,261,906
	TOTAL	17,878,731	13,409,048	8,939,365	4,469,683
ALT. 3D	CS	12,889,921	9,667,441	6,444,960	3,222,480
	NOR	5,052,896	3,789,672	2,526,448	1,263,224
	TOTAL	17,942,817	13,457,112	8,971,408	4,485,704
ALT. 3E	CS	12,789,000	9,591,750	6,394,500	3,197,250
	NOR	5,044,819	3,783,614	2,522,410	1,261,205
	TOTAL	17,833,819	13,375,364	8,916,910	4,458,455
ALT. 4A	CS	18,457,770	13,843,327	9,228,885	4,614,442
	NOR	5,656,239	4,242,180	2,828,120	1,414,060
	TOTAL	24,114,009	18,085,507	12,057,005	6,028,502
ALT. 4B	CS	17,521,817	13,141,363	8,760,909	4,380,454
	NOR	5,560,227	4,170,170	2,780,113	1,390,057
	TOTAL	23,082,044	17,311,533	11,541,022	5,770,511
ALT. 4C	CS	16,650,380	12,487,785	8,325,190	4,162,595
	NOR	5,481,100	4,110,825	2,740,550	1,370,275
	TOTAL	22,131,480	16,598,610	11,065,740	5,532,870
ALT. 4D	CS	16,720,771	12,540,578	8,360,385	4,180,193
	NOR	5,487,686	4,115,765	2,743,843	1,371,922
	TOTAL	22,208,457	16,656,343	11,104,228	5,552,114

Table 4-29m. Summary of CS and NOR reductions under different levels of trip cancellation and assuming the same average number of fish harvested for red snapper and snapper grouper, in 2009 dollars.

		Percent of Trips Cancelled			
		100%	75%	50%	25%
ALT. 2	CS	4,603,890	3,452,918	2,301,945	1,150,973
	NOR	4,306,837	3,230,128	2,153,419	1,076,709
	TOTAL	8,910,728	6,683,046	4,455,364	2,227,682
ALT. 3A	CS	6,081,456	4,561,092	3,040,728	1,520,364
	NOR	5,163,410	3,872,557	2,581,705	1,290,852
	TOTAL	11,244,866	8,433,649	5,622,433	2,811,216
ALT. 3B	CS	6,013,688	4,510,266	3,006,844	1,503,422
	NOR	5,124,088	3,843,066	2,562,044	1,281,022
	TOTAL	11,137,777	8,353,333	5,568,888	2,784,444
ALT. 3C	CS	5,881,955	4,411,466	2,940,978	1,470,489
	NOR	5,047,623	3,785,717	2,523,812	1,261,906
	TOTAL	10,929,578	8,197,184	5,464,789	2,732,395
ALT. 3D	CS	5,891,068	4,418,301	2,945,534	1,472,767
	NOR	5,052,896	3,789,672	2,526,448	1,263,224
	TOTAL	10,943,964	8,207,973	5,471,982	2,735,991
ALT. 3E	CS	5,875,182	4,406,386	2,937,591	1,468,795
	NOR	5,044,819	3,783,614	2,522,410	1,261,205
	TOTAL	10,920,001	8,190,001	5,460,000	2,730,000
ALT. 4A	CS	6,380,711	4,785,533	3,190,356	1,595,178
	NOR	5,656,239	4,242,180	2,828,120	1,414,060
	TOTAL	12,036,951	9,027,713	6,018,475	3,009,238
ALT. 4B	CS	6,278,520	4,708,890	3,139,260	1,569,630
	NOR	5,560,227	4,170,170	2,780,113	1,390,057
	TOTAL	11,838,746	8,879,060	5,919,373	2,959,687
ALT. 4C	CS	6,145,170	4,608,877	3,072,585	1,536,292
	NOR	5,481,100	4,110,825	2,740,550	1,370,275
	TOTAL	11,626,269	8,719,702	5,813,135	2,906,567
ALT. 4D	CS	6,155,081	4,616,310	3,077,540	1,538,770
	NOR	5,487,686	4,115,765	2,743,843	1,371,922
	TOTAL	11,642,767	8,732,075	5,821,383	2,910,692

Alternative 5, which would allow fishing for snapper grouper other than red snapper 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 sector presented in the tables above.

Alternative 6, which would allow fishing for snapper grouper other than red snapper in the closed areas using bottom longlines, would mitigate the negative economic effects of the closed areas on the commercial sector. It would not introduce any change to the economic effects on the recreational sector presented above.

The economic effects of **Alternative 7**, which would allow fishing for snapper grouper other than red snapper 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 8 is mainly an enforcement measure that would provide anglers some cushion from being unduly penalized. This would also allow anglers to save on 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 8a** and **8b** would affect recreational anglers more than **Alternative 8c** given the general absence of recreational fishing for wreckfish.

4.3.3 Social Effects

4.3.3.1 General Social Effects

Alternative 1 (No Action) 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 snapper grouper 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, long-term adverse social effects would be expected to be increased because **Alternative 1 (No Action)** 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. The expected social effects of these alternatives would be expected to be proportional to the magnitude of expected 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 more extensive the expected harvest restrictions, the greater the resultant short-term adverse social effects. Persistence of these effects may be sector/entity specific, with some sectors/entities having greater flexibility to adjust to the restrictions and find alternate sources of 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 social effects of resource recovery are expected to be positive, with net overall increased social benefits relative to the status quo, fishermen and associated businesses who bear the short-term losses in social or economic benefits may not be the same entities that receive the benefits of the recovered resource.

Because **Alternatives 2-4** would prohibit all commercial and recreational harvest of red snapper in the South Atlantic economic exclusive zone and in state waters by vessels with federal snapper grouper permits, none of these alternatives would be expected to have any differential social effects from the perspective of red snapper harvest or fishing. Instead, these alternatives vary in the severity of restrictions on the harvest of other snapper grouper species. A general description of the social effects of regulatory change is provided in **Section 4.1.1.3**. As the severity of restrictions imposed by each alternative increases, the likelihood of occurrence and severity of these social effects would be expected to increase.

Among **Alternatives 2-4**, **Alternative 2** would be expected to have the least negative social effects on the commercial and recreational snapper grouper fisheries because **Alternative 2** would not extend harvest or fishing prohibitions on any species other than red snapper. Cumulative effects of the red snapper prohibitions on entities that harvest other species would depend on the significance of red snapper activity (harvest of or fishing for) to the overall activity or production of the entity, business, or community. Overall, the effects of the red snapper prohibition 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, under **Alternative 2** 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, red snapper appears to be more important to the headboat sector, particularly in Georgia and north Florida, based on public testimony. 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 available data would indicate, increasing potential adverse effects on these businesses and associated communities.

The prohibitions on the harvest of other snapper grouper species in **Alternative 3** and **Alternative 4** would be expected to result in increased adverse social effects relative to **Alternative 2.** As discussed in the Section 4.3.2 (economic effects), in addition to the waters off North Carolina not being subject to any of the proposed prohibitions in **Alternative 3** and **Alternative 4**, North Carolina commercial fishermen could benefit under these alternatives due to potential lengthening of the shallow water grouper season**.** South Carolina commercial fishermen could similarly benefit under **Alternative 3**, but would be expected to suffer adverse social and economic effects under **Alternative 4**. Although harvest opportunities would continue off North Carolina or areas off Florida not included in the alternative prohibitions, effort shift by vessels to these waters would be expected to result in increased fishing costs, increased stock pressure at these locations, and changes in landings patterns (product flow through ports or dealers) if landing locations shift in tandem with changes in the area fished. As a result, while some harvest mitigation may be possible at the vessel level, adverse shore-side effects may still occur in former ports. Additionally, cumulative effects could increase because the harvest of other snapper grouper species included in the prohibition may be proportionally more important to affected fishermen and associated businesses and communities than the harvest of red snapper. As a result, the likelihood of business failure, with associated adverse social effects, would be expected to increase under **Alternative 3** and **Alternative 4** relative to **Alternative 2**.

Similar to the general social effects of **Alternative 3** and **Alternative 4**, the social effects of the alternative depth specifications would be expected to be proportional to their geographic scope; the larger the area of prohibition, the greater the expected adverse affect on harvests and associated social benefits. However, actual effects would be determined by where fishing activity occurs; a smaller area may traditionally be subject to more fishing effort than a larger area such that the closure of a smaller area may result in greater harvest reduction than a larger area. The "**B**" and "**D**" variations of **Alternative 3** and **Alternative 4** allow this possibility as the "**D**" variation would remove the more extensive shallower waters from the prohibition while adding less extensive deeper waters. As seen by the results of the economic effects analysis of the commercial sector, this phenomena – a geographically smaller prohibition resulting in a larger adverse effect than a geographically larger prohibition – appears in the comparison of the expected effects of **Alternative 3D** with **Alternative 3B**. The adverse social effects of these two alternatives would be expected to mirror the order of the economic effects, though additional social effects could accrue if the results are not believed by the public or industry. Other than this exception, the adverse social effects of the depth variations of **Alternative 3** and **Alternative 4** would be expected to increase or decrease consistent with changes in the size of geographic application.

The "**A**" variations of **Alternative 3** and **Alternative 4** would not impose depth limitations on the area prohibitions and would, therefore, be expected to adversely affect the greatest amount of fishing, harvest, and associated social benefits. Additionally, by not incorporating any consideration of differential depth-associated release mortality, the "**A**" variations may be viewed by some as an overly restrictive, unjustified, and unnecessary reduction in the harvests and associated benefits of other snapper grouper species and, as a result, induce increased dissatisfaction with the management process. The depth considerations of the "**B**"-"**E**" variations would be expected to mitigate, though not necessarily eliminate, some portion of these adverse social effects.

For the recreational sector, while the effects of management measures on angler satisfaction are not inconsequential, particularly because decreased satisfaction can lead to reduced fishing, anglers, as with any recreational group, have greater opportunities or flexibility to choose alternative recreational pursuits than businesses have to start a new business or attract a new type of clientele. Further, even where alternative business opportunities exist, the ability to rapidly transform a business and maintain profitability is usually limited; changes take time, yet financial obligations must be met. As a result, the adverse social effects on the commercial component 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 proposed harvest prohibitions. The effects on recreational businesses could also be worse than those in the commercial sector due to more limited flexibility. Commercial vessels, to some extent, have the ability to go to the fish. A commercial vessel may be able to travel from a north Florida, Georgia, or South Carolina port, fish off North Carolina or south Florida, land its catch in North Carolina or south Florida, and eventually return to its original port. Recreational for-hire businesses, however, start with anglers coming to them and then attempt to find fish. If the proposed prohibitions decrease angler traffic, convincing traditional customers they could be just as happy purchasing a new service (fishing for or harvesting new species, engaging in more catch and release than retention, etc.) may be difficult, and finding new anglers may require business relocation to another port, which is a substantially greater burden, both economically and socially, than fishing elsewhere up or down the coast a few days or weeks at a time before returning to one's home port.

Based on the general conclusions in the discussion above, and mirroring the estimates of the economic effects, from a ranking perspective, all variations of **Alternative 4** would be expected to result in greater adverse social effects than all variations of **Alternative 3**, with the greatest expected adverse social effects within each nested set of alternatives (variations of **Alternative 3** and **Alternative 4**) accruing to the "**A**" alternatives. Within each nested set of alternatives**,** with the exception of the comparison of **Alternative 3B** with **Alternative 3D** discussed above for the commercial effects, the larger the affected area in the proposed prohibition, the greater the expected adverse social effects. As a result, **Alternative 3E (Preferred)** would be expected to result in less adverse social effects than the other **Alternative 3** variations and, as previously stated, all **Alternative 3** variations would be expected to result in less adverse effects than all **Alternative 4** variations.

Alternatives 5-7 would be expected to mitigate some of the adverse social and economic effects of **Alternatives 3** and **4** by allowing exemptions to the harvest prohibitions of these alternatives. The exemptions of **Alternatives 5-7** would not be relevant under **Alternative 2** because **Alternative 2** would only restrict red snapper harvests. **Alternative 5 (Preferred), Alternative 6,** and **Alternative 7 (Preferred)** would be expected to result in increased social and economic benefits relative to **Alternatives 3** and **4** because they would reduce the harvest restrictions encompassed by the other alternatives. **Alternative 6**, however, would only be relevant in combination with the "**A**" variations of **Alternatives 3** and **4**. **Alternative 5 (Preferred)** and **Alternative 7 (Preferred)** would also be expected to result in increased social benefits accruing to the perception of more rational management decision by allowing the continued 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 transit allowances of **Alternative 8** would allow fishermen, both commercial and recreational, to reduce the costs associated with 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 that proscribed by the individual alternatives may be effectively removed from allowable fishing as, absent a transit allowance, it may not be economically feasible to travel around the prohibited areas to reach the open areas. As a result, greater adverse social and economic effects would occur. Allowing transit would eliminate both the additional travel costs and the additional adverse social and economic effects of a functionally expanded prohibition zone. In general, it is assumed that the greater the ability to maintain or increase harvests of other species (assuming any increased harvest does not result in resource issues for these other species), reduce costs, and reduce the likelihood of functionally expanded areas where harvest is prohibited, the greater the social benefits. While increased labor would be required to satisfy the transit conditions, this is presumed preferable than reduced harvests. **Alternative 8A (Preferred)** would allow any legal species (species with non-zero allowable harvest levels) to be possessed, but all gear would have to be appropriately stowed, effectively eliminating the ability to troll for non-snapper grouper species when transiting the restricted areas. **Alternative 8B** is less encompassing from a species perspective than **Alternative 8A (Preferred)**, but would allow trolling to continue while under transit, thus increasing the allowable fishing area for trolling species. **Alternative 8C** would be the least accommodating of the sub-alternatives, allowing only wreckfish on board (except for the species and gear harvest allowances of **Alternatives 3-7**) while in transit. Available data does not support a determination of whether the benefits of the trolling allowance of **Alternative 8B** would result in a better social outcome than the broader species allowance of **Alternative 8A (Preferred)**, nor is a strong qualitative argument obvious. However, both would be expected to be better than the more narrow allowance of **Alternative 8C**.

4.3.3.2 Business Activity Associated with Estimated Economic Effects on the Commercial and Recreational Sectors

This section provides estimates of the business activity associated with the potential changes in commercial ex-vessel revenues and recreational angler trips that may occur as a result of the proposed management changes. Business activity is characterized in the form of full time equivalent (FTE) jobs, income impacts (wages, salaries, and self-employed income), output (sales) impacts (gross business sales), and value-added impacts (difference between the value of goods and the cost of materials or supplies). Job and output (sales) impacts are equivalent metrics across both the commercial and recreational sectors. Income and value-added impacts are not equivalent, though similarity in the magnitude of multipliers may result in roughly equivalent values. Neither income nor value-added impacts should be added to output (sales) impacts because this would result in double counting. Job and output (sales) impacts, however, may be added across sectors.

These estimates of business activity are provided to inform the decision process of the potential consequences of the proposed management changes. However, it should be emphasized that these estimates should not be confused with the estimated changes in economic value (consumer surplus or producer surplus/net operating revenue) provided above as business activity and economic value are not equivalent concepts.

While business activity and economic value are not equivalent concepts, the calculation of the change in business activity utilizes variables that were used in the calculation of the expected change in economic value, specifically ex-vessel revenues in the commercial sector and angler trips in the recreational sector. Because both assessments (change in economic value and change in business activity) use these common variables, the ranking of alternatives based on the magnitude of these effects is unaffected by the metric examined; the greater the estimated change in economic value, the greater the estimated change in business activity. While this outcome may not be true for all proposed management changes, it is true for the proposed management changes in this amendment.

The estimates of the change in business activity should be interpreted and used with caution. While some change (loss or gain) of business activity would be expected to result from any change in commercial revenues or recreational trips, the full loss or gain of the estimates provided below should not be expected to occur as a result of the proposed management changes. The primary reason for this is the calculation of these results does not account for behavioral changes that would be expected to occur in response to the proposed management changes. The nature of these behavioral changes varies by sector. In the commercial sector, an estimated loss in ex-vessel revenues may be overstated if fishermen are able to re-direct their fishing effort to substitute species, while an estimated gain in ex-vessel revenues may come at the expense of reduced harvests of, and revenues from, other species. Parallels exist in the recreational sector: an estimated reduction in angler trips may be overstated if fishermen re-direct their effort to substitute species, while an estimated gain in angler trips for one species may come at the expense of reduced trips for other species.

For the commercial sector, fishing revenues generate business activity in multiple sectors of the economy. These sectors are combined and summarized in the business activity model as harvester, dealer/processor, wholesaler/distributor, grocer, and restaurant sectors. While the loss of jobs and business activity in the harvester and dealer/processor sectors may be likely due to potentially limited substitution opportunities, losses in other sectors are less likely. Although not shown in the tables below, the business activity associated with commercial seafood ex-vessel revenues is dominated by activity in the restaurant sector. For example, $1 million in commercial reef fish (snapper grouper) ex-vessel revenues in Florida is estimated to support 79 total FTE jobs, of which 52 are estimated to occur in the restaurant sector. Given dining substitution alternatives, which include both imported and domestic seafood, as well as non-seafood fare, there should be little expectation that the reduction in the supply of a single species or even multiple species of seafood would result in the loss of either the full amount or a substantial portion of the associated business activity in the restaurant sector (exceptions may occur for specialty or niche markets). The same logic applies to activity in the grocers sector and, to lesser degrees, for secondary wholesalers/distributors and primary dealers/processors. Each sector would be expected to attempt to locate and promote the sales of similar products from alternative sources or other products when similar products are unavailable. Even if diners chose to eat out less, a portion of the food/nutritional component of their affected restaurant expenditures probably would be re-directed to grocery expenditures, while a portion of the recreational/entertainment component of their affected restaurant expenditures probably would be re-directed towards other recreational activities. Any remaining portion of their affected restaurant expenditures probably would be re-directed to other budget expenses. As a result, while the resulting business activity associated with these behavioral changes would no longer be associated with the domestic fishery for the regulated species, alteration of spending patterns may result in transfer of business activity to other sectors rather than loss of business activity.

If harvests and ex-vessel revenues increase as a result of management, then improved employment conditions through greater job stability and improved incomes for current workers may occur instead of increased employment in the harvester and dealer/processor sectors. In the grocer and restaurant sectors, increased purchases of the subject species may occur at the expense of other products. In this event, these increased purchases would represent transferred business activity and not new business activity.

For the recreational sector, the primary behavioral change not captured in the analysis is the potential to shift fishing trips and associated expenditures to alternative target species or recreational activities. In the event of more restrictive management, effort response may entail platform or location switching (fishing from a different mode or port), resulting in new expenditure patterns; anglers may spend less money and/or make their purchases from different vendors and/or in different communities. As a result, expenditure patterns may change and businesses with reduced activity would suffer losses in business activity while businesses with increased activity would experience gains. All the business activity, however, would not be removed from the fishing industry or associated businesses as a whole. Alternatively, substitution of new recreational activities in lieu of fishing, either in the same or different communities, while economically harmful to the fishing industry, would represent gains in business activity to these alternative sectors. As a result, while the extent to which a community retains its character as a fishing destination may change, all of the business activity associated with any reduced fishing would not necessarily be lost to the community or region as a whole.

In summary, the following results capture neither the behavioral possibilities within the fishing industry itself nor the substitution possibilities in associated sectors. Some loss of business activity in the fishing industry is unavoidable in response to reduced commercial ex-vessel revenues and recreational trips. However, loss of the total business activity associated with these revenues or angler trips should not be expected. Similarly, some gain in business activity will likely occur in the event of increased commercial revenues or recreational trips. However, gain of the total potential business activity associated with these revenues or angler trips should not be expected.

The following discussion focuses on the potential change in business activity associated with the estimated changes in commercial ex-vessel revenues for management measure **Alternatives 2, 3A-E** and **4A-D** relative to **Alternative 1 (No Action)** (Tables 4-31a-c). For each of **Alternatives 3A-E** and **4A-D**, the following results also combine the alternative area/depth restrictions with the proposed spearfishing gear exemption. If this exemption is not adopted, the magnitude of the estimated changes in business activity will increase, but the ranking of the alternatives should not be affected.

It should be noted that the estimated changes in business activity for Georgia-NE Florida may underestimate actual effects. The model used for this analysis is organized by state, whereas the estimated changes in ex-vessel revenues must combine Georgia with portions of Florida for confidentiality considerations. Fish revenues flow through each state's economy differently. As an example, repeating the example discussed above, while $1 million in reef fish (snapper grouper) ex-vessel revenues is estimated to support 79 FTE jobs in Florida (18 in the harvester sector), $1 million in reef fish (snapper grouper) ex-vessel revenues is estimated to support 173 FTE jobs in Georgia (61 in the harvester sector). Total output (sales) impacts associated with these revenues are approximately $4 million (2008 dollars) for Florida and $7.7 million for

Georgia. As a result, based on current model estimates, each dollar in ex-vessel reef fish (snapper grouper) revenues is estimated to support more business activity in Georgia than in Florida. The estimated potential change in business activity for Georgia-NE Florida in this analysis is calculated using the Florida model. Because the Georgia portion of ex-vessel revenues in the combined Georgia-NE Florida total are subjected to the lower Florida model parameters instead of the higher Georgia parameters, the estimates of business activity for the combined area will be lower than actual.

It is also noted that, consistent with the analysis of the expected change in economic value for the commercial sector, changes in business activity were forecast for the Florida Keys. However, the changes in ex-vessel revenues, and associated business activity, for the Florida Keys are minor compared to the expected changes in the other portions of the South Atlantic. As a result, the associated changes in business activity for the Florida Keys are not included in the following discussion or tables. Also, while the expected changes in ex-vessel revenues in the commercial sector and expected changes in trips in the recreational sector are additive (to produce estimates of the total expected effects across all four states), the estimated changes in business activity should not be similarly added. The reason for this is that in a state model, the sale of a product in one state that is manufactured in another state produces less business activity in the state of sale due to leakage to the state where manufacture occurred. In a regional model that includes both states, however, both points of sale would remain in the region, resulting in reduced leakage and a higher estimate of business activity. The model used for this assessment only supports analysis for an individual state and for the entire U.S. (all states combined). Only the state results are provided in this assessment.

The estimated potential change in ex-vessel revenues in North Carolina ranges from gains of approximately \$20,000 (**Alternative 2**) to \$390,000 (**Alternatives 3A**, **B**, and **D**), while the associated change in FTE jobs for these alternatives are 0 harvester/3 total and 7 harvester/53 total, respectively (Table 4-31a). The estimated potential change in ex-vessel revenues in South Carolina ranges from a loss of approximately \$920,000 (**Alternative 4A**) to a gain of approximately \$200,000 (**Alternative 3A**), with associated changes in FTE jobs for these alternatives of 37 harvester/98 total and 8 harvester/21 total, respectively. For Georgia-NE Florida, the estimated potential change in ex-vessel revenues ranges from a loss of approximately \$330,000 (**Alternative 2**) to a loss of approximately \$1.07 million (**Alternatives 4A and 4B**), with associated losses in FTE jobs for these alternatives of 6 harvester/26 total and 19 harvester/85 total, respectively. Finally, the estimated potential change in ex-vessel revenues in Central-SE Florida ranges from a loss of approximately \$120,000 (**Alternative 2**) to a loss of approximately \$290,000 (**Alternative 3A**), with associated losses in FTE jobs for these alternatives of 2 harvester/10 total and 5 harvester/23 total, respectively.

Table 4-31a. Potential change in jobs (FTE) associated with the estimated change in the commercial sector ex-vessel revenues relative to management measures **Alternative 1 (No Action)**. All dollar values are in 2008 dollars.

Alternative	Sector	North Carolina	South Carolina	Georgia + NE Florida	Central-SE Florida
2	Ex-vessel $	$20,000	-$80,000	-$330,000	-$120,000
	Harvester	0	-3	-6	-2
	Total Industry	3	-9	-26	-10
3A+EX*	Ex-vessel $	$390,000	$200,000	-$1,020,000	-$280,000
	Harvester	7	8	-19	-5
	Total Industry	53	21	-81	-22
3B+EX	Ex-vessel $	$390,000	$180,000	-$1,020,000	-$200,000
	Harvester	7	7	-19	-4
	Total Industry	53	19	-81	-16
3C+EX	Ex-vessel $	$380,000	$170,000	-$1,020,000	-$190,000
	Harvester	6	7	-19	-3
	Total Industry	52	18	-81	-15
3D+EX	Ex-vessel $	$390,000	$170,000	-$1,020,000	-$200,000
	Harvester	7	7	-19	-4
	Total Industry	53	18	-81	-16
Preferred 3E+EX	Ex-vessel $	$340,000	$140,000	-$900,000	-$190,000
	Harvester	6	6	-16	-3
	Total Industry	46	15	-71	-15
4A+EX	Ex-vessel $	$160,000	-$880,000	-$1,070,000	-$260,000
	Harvester	2	-36	-19	-5
	Total Industry	22	-94	-85	-21
4B+EX	Ex-vessel $	$160,000	-$840,000	-$1,060,000	-$170,000
	Harvester	2	-32	-19	-3

	Total Industry	22	-85	-84	-13
4C+EX	Ex-vessel $	$160,000	-$750,000	-$1,060,000	-$160,000
	Harvester	2	-31	-19	-3
	Total Industry	22	-81	-84	-13
4D+EX	Ex-vessel $	$160,000	-$760,000	-$1,060,000	-$160,000
	Harvester	2	-31	-19	-3
	Total Industry	22	-81	-84	-13

*EX = dive and black sea bass pot exemptions (**Alternative 5 (Preferred)** and **Alternative 7 (Preferred))**.

Table 4-31b contains estimates of the potential change in output (sales) impacts of the proposed alternatives. The estimated potential change in output (sales) impacts in North Carolina ranges from gains of approximately $118,000 (**Alternative 2**) to $2.30 million (**Alternatives 3A**, **B**, and **D**). The estimated potential change in output (sales) impacts in South Carolina ranges from a loss of approximately $4.277 million (**Alternative 4A**) to a gain of approximately $930,000 (**Alternative 3A**). For Georgia-NE Florida, the estimated potential change in output (sales) impacts ranges from a loss of approximately $1.322 million (**Alternative 2**) to a loss of approximately $4.288 million (**Alternative 4A and 4B**). Finally, the estimated potential change in output (sales) impacts in Central-SE Florida ranges from a loss of approximately $481,000 (**Alternative 2**) to a loss of approximately $1.162 million (**Alternative 3A**).

Table 4-31b. Potential change in output (sales) impacts associated with the estimated change in the commercial sector ex-vessel revenues relative to management measures **Alternative 1 (No Action)**. All dollar values are in thousand 2008 dollars.

Alternative	North Carolina	South Carolina	Georgia + NE Florida	Central-SE Florida
2	$118	-$372	-$1,322	-$481
3A+EX*	$2,300	$930	-$4,087	-$1,122
3B+EX	$2,300	$837	-$4,087	-$801
3C+EX	$2,241	$790	-$4,087	-$761
3D+EX	$2,300	$790	-$4,087	-$801
Preferred 3E+EX	$2,005	$651	-$3,607	-$761
4A+EX	$944	-$4,091	-$4,288	-$1,042
4B+EX	$944	-$3,719	-$4,248	-$681
4C+EX	$944	-$3,487	-$4,248	-$641
4D+EX	$944	-$3,533	-$4,248	-$641

*EX = dive and black sea bass pot exemptions (**Alternative 5 (Preferred)** and **Alternative 7 (Preferred))**.

Table 4-31c contains estimates of the potential change in income impacts of the proposed alternatives. The estimated potential change in income impacts in North Carolina ranges from gains of approximately $63,000 (**Alternative 2**) to $1.238 million (**Alternatives 3A**, **B**, and **D**). The estimated potential change in income impacts in South Carolina ranges from a loss of approximately $2.064 million (**Alternative 4A**) to a gain of approximately $449,000 (**Alternative 3A**). For Georgia-NE Florida, the estimated potential change in income impacts ranges from a loss of approximately $703,000 (**Alternative 2**) to a loss of approximately $2.279 million (**Alternative 4A and 4B**). Finally, the estimated potential change in income impacts in Central-SE Florida ranges from a loss of approximately $256,000 (**Alternative 2**) to a loss of approximately $618,000 (**Alternative 3A**).

Table 4-31c. Potential change in income impacts associated with the estimated change in the commercial sector ex-vessel revenues relative to management measures **Alternative 1 (No Action)**. All dollar values are in thousand 2008 dollars.

Alternative	North Carolina	South Carolina	Georgia + NE Florida	Central -SE Florida
2	$63	-$180	-$703	-$256
3A+EX*	$1,238	$449	-$2,172	-$596
3B+EX	$1,238	$404	-$2,172	-$426
3C+EX	$1,206	$381	-$2,172	-$405
3D+EX	$1,238	$381	-$2,172	-$426
Preferred 3E+EX	$1,079	$314	-$1,916	-$405
4A+EX	$508	-$1,975	-$2,279	-$554
4B+EX	$508	-$1,795	-$2,257	-$362
4C+EX	$508	-$1,683	-$2,257	-$341
4D+EX	$508	-$1,705	-$2,257	-$341

*EX = dive and black sea bass pot exemptions (**Alternative 5 (Preferred)** and **Alternative 7 (Preferred))**.

Tables 4-31d-f contain estimates of the potential change in business activity associated with the estimated change in recreational trips for management measure **Alternatives 2, 3A-E** and **4A-D** relative to **Alternative 1 (No Action)**. The exemptions encompassed by **Alternatives 5** and **7** are not relevant to the recreational sector, so the naming of the alternatives varies from that provided in the previous tables (i.e., the names do not include "+EX"). Although estimates of the economic impacts of the headboat sector are provided in Section 3.8.2.4, as discussed in that section, these estimates are based on average values of job, output (sales), and value-added impacts that are derived from charter anglers, which are expected to be substantially higher than appropriate values for the headboat sector. Therefore, estimates of the business activity associated with the potential changes in headboat target effort were not generated for this analysis and, as a result, only estimates for private and charter anglers are provided.

None of the proposed management measure alternatives are expected to affect recreational angler trip demand by North Carolina anglers. As a result, no changes in job, output (sales), or value-added impacts are expected to occur.

The estimated potential change in angler trips and FTE jobs in South Carolina ranges from a loss of approximately 2,970 private trips and 300 charter trips (**Alternatives 2-3E**) to approximately 5,790 private trips and 800 charter trips (**Alternative 4A**), with associated losses in FTE jobs for these alternatives of 2 (total, both sectors) and 6 (total, both sectors) jobs, respectively (Table 4-31d). For Georgia-NE Florida, the estimated potential change in angler trips and FTE jobs ranges from a loss of approximately 33,700 private trips and 3,230 charter trips (**Alternative 2**) to approximately 45,980 private trips and 5,210 charter trips (**Alternatives 3A** and **4A**), with associated losses in FTE jobs for these alternatives of 24 (total, both sectors) and 37 (total, both sectors) jobs, respectively. Finally, the estimated potential change in angler trips and FTE jobs in Central-SE Florida is expected to be the same across all proposed management measure alternatives because only restrictions on the harvest of red snapper would apply. As a result, the expected potential change in angler trips and FTE jobs is approximately 6,240 private trips and 530 charter trips, with associated losses in FTE jobs of 4 (total, both sectors) jobs.

Table 4-31d. Potential change in jobs (FTE) associated with the estimated change in recreational trips relative to management measures **Alternative 1 (No Action)**.

		Private Mode				Charter Mode			
Alternative		North Carolina	South Carolina	Georgia + NE Florida	Central-SE Florida	North Carolina	South Carolina	Georgia + NE Florida	Central-SE Florida
2	Trips	0	-2,971	-33,792	-6,242	0	-301	-3,231	-530
	Jobs	0	-1	-13	-2	0	-1	-11	-2
3A	Trips	0	-2,971	-45,984	-6,242	0	-301	-5,214	-530
	Jobs	0	-1	-18	-2	0	-1	-19	-2
3B	Trips	0	-2,971	-45,424	-6,242	0	-301	-5,123	-530
	Jobs	0	-1	-18	-2	0	-1	-19	-2
3C	Trips	0	-2,971	-44,338	-6,242	0	-301	-4,947	-530
	Jobs	0	-1	-17	-2	0	-1	-18	-2
3D	Trips	0	-2,971	-44,414	-6,242	0	-301	-4,959	-530
	Jobs	0	-1	-17	-2	0	-1	-18	-2
Preferred 3E	Trips	0	-2,971	-44,278	-6,242	0	-301	-4,937	-530
	Jobs	0	-1	-17	-2	0	-1	-18	-2
4A	Trips	0	-5,787	-45,984	-6,242	0	-806	-5,214	-530
	Jobs	0	-3	-18	-2	0	-3	-19	-2
4B	Trips	0	-5,463	-45,424	-6,242	0	-748	-5,123	-530
	Jobs	0	-3	-18	-2	0	-3	-19	-2
4C	Trips	0	-5,448	-44,338	-6,242	0	-746	-4,947	-530
	Jobs	0	-3	-17	-2	0	-3	-18	-2
4D	Trips	0	-5,456	-44,414	-6,242	0	-747	-4,959	-530
	Jobs	0	-3	-17	-2	0	-3	-18	-2

Table 4-31e contains estimates of the potential change in output (sales) impacts of the proposed alternatives. The estimated potential change in output (sales) impacts in South Carolina ranges from a loss of approximately $131,000 (private sector) and $102,000 (charter sector) (**Alternatives 2-3E**) to approximately $255,000 (private sector) and $272,000 (charter sector) (**Alternative 4A**). For Georgia-NE Florida, the estimated potential change in output (sales) impacts ranges from a loss of approximately $1.237 million (private sector) and $1.097 million (charter sector) (**Alternative 2**) to approximately $1.697 million (private sector) and $1.871 million (charter sector) (**Alternatives 3A** and **4A**). Finally, the estimated potential change in output (sales) impacts in Central-SE Florida is expected to be approximately $236,000 (private sector) and $208,000 (charter sector) for all proposed alternatives.

Table 4-31e. Potential change in output (sales) impacts associated with the estimated change in recreational trips relative to management measures **Alternative 1 (No Action)**. All dollar values are in thousand 2008 dollars.

Alternative	Mode	North Carolina	South Carolina	Georgia + NE Florida	Central-SE Florida
2	Private	$0	-$131	-$1,237	-$236
	Charter	$0	-$102	-$1,097	-$208
3A	Private	$0	-$131	-$1,697	-$236
	Charter	$0	-$102	-$1,871	-$208
3B	Private	$0	-$131	-$1,676	-$236
	Charter	$0	-$102	-$1,836	-$208
3C	Private	$0	-$131	-$1,635	-$236
	Charter	$0	-$102	-$1,767	-$208
3D	Private	$0	-$131	-$1,638	-$236
	Charter	$0	-$102	-$1,771	-$208
Preferred 3E	Private	$0	-$131	-$1,634	-$236
	Charter	$0	-$102	-$1,766	-$208
4A	Private	$0	-$255	-$1,697	-$236
	Charter	$0	-$272	-$1,871	-$208
4B	Private	$0	-$240	-$1,676	-$236
	Charter	$0	-$252	-$1,836	-$208
4C	Private	$0	-$240	-$1,635	-$236
	Charter	$0	-$252	-$1,767	-$208
4D	Private	$0	-$240	-$1,638	-$236
	Charter	$0	-$252	-$1,771	-$208

Table 4-31f contains estimates of the potential change in value-added impacts of the proposed alternatives. The estimated potential change in value-added impacts in South Carolina ranges from a loss of approximately $76,000 (private sector) and $57,000 (charter sector) (**Alternatives 2-3E**) to approximately $149,000 (private sector) and $154,000 (charter sector) (**Alternative 4A**). For Georgia-NE Florida, the estimated potential change in value-added impacts ranges from a loss of approximately $740,000 (private sector) and $646,000 (charter sector) (**Alternative 2**) to approximately $1.014 million (private sector) and $1.102 million (charter sector) (**Alternatives 3A** and **4A**). Finally, the estimated potential change in value-added impacts in Central-SE Florida is expected to be approximately $141,000 (private sector) and $122,000 (charter sector) for all proposed alternatives.

Table 4-31f. Potential change in value-added impacts associated with the estimated change in recreational trips relative to management measures **Alternative 1 (No Action)**. All dollar values are in thousand 2008 dollars.

Alternative	Mode	North Carolina	South Carolina	Georgia + NE Florida	Central-SE Florida
2	Private	$0	-$76	-$740	-$141
	Charter	$0	-$57	-$646	-$122
3A	Private	$0	-$76	-$1,014	-$141
	Charter	$0	-$57	-$1,102	-$122
3B	Private	$0	-$76	-$1,002	-$141
	Charter	$0	-$57	-$1,081	-$122
3C	Private	$0	-$76	-$977	-$141
	Charter	$0	-$57	-$1,040	-$122
3D	Private	$0	-$76	-$979	-$141
	Charter	$0	-$57	-$1,043	-$122
Preferred 3E	Private	$0	-$76	-$977	-$141
	Charter	$0	-$57	-$1,039	-$122
4A	Private	$0	-$149	-$1,014	-$141
	Charter	$0	-$154	-$1,102	-$122
4B	Private	$0	-$140	-$1,002	-$141
	Charter	$0	-$143	-$1,081	-$122
4C	Private	$0	-$140	-$977	-$141
	Charter	$0	-$142	-$1,040	-$122
4D	Private	$0	-$140	-$979	-$141
	Charter	$0	-$142	-$1,043	-$122

4.3.4 Administrative Effects

Alternative 1 (No Action) would retain the current regulations used to manage catches of red snapper and therefore would not implement additional measures to end overfishing and rebuild the stock faster than it would under current harvest restrictions. 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 2-4D would involve extensive coordination among 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 the exclusive economic zone. Though each closure alternative would limit harvest in different areas and in different amounts, their potential impact on the administrative environment is largely the same. For any one of the closure alternatives outreach materials would need to be developed including waypoint coordinates outlining the closed area boundaries. An indirect impact on the administrative environment may be the long-term effort shifts into different fisheries, which may require processing permit transfers, and new permit applications.

Alternatives 5 (Preferred) through **7 (Preferred)** are intended to be implemented along with one or more the closure alternatives and therefore their impacts on the administrative environment should be added to those of **Alternatives 2-4D**. **Alternatives 5 (Preferred), 6,** and **7 (Preferred)** would allow fishing for snapper grouper using black sea bass pots, bottom longline gear, and spearfishing, respectively. The administrative impacts of each of these alternatives is very similar in that they would each require enforcement of specific permitted activities within a closed area, which is considered a significant burden. Allowing these activities to occur within a proposed closed area would double or triple the burden on law enforcement personnel compared to a scenario where only one activity were permitted within a closed area. The allowance for the use of black sea bass pot gear (**Alternative 5 (Preferred)**) within the proposed closed area was approved by the Council on the condition that discards in the black sea bass fishery within the proposed closed area be closely monitored. The suggested monitoring activities would require additional administrative cost and effort in terms of organization and operational support.

Additionally, it is anticipated, that with every activity allowed within a proposed closed area the incidence of non-compliance by those illegally harvesting snapper grouper would increase. The same enforcement concerns extend to **Alternative 8**, which would allow transit of vessels with snapper grouper and/or wreckfish onboard, through a proposed closed area. This alternative would serve to further impact the administrative environment via increased or re-allocated enforcement efforts.

4.3.5 Council's Conclusion

The Snapper Grouper Advisory Panel suggested the Council investigate a number of different management measures for red snapper including vessel limits, modifications to the minimum size limit, various area closures, limiting the number of days at sea, and methods to monitor catch at sea. Alternatives the Council considered but rejected are in Appendix A.

The Law Enforcement Advisory Panel (AP) recommended area closures include the fewest number of waypoints with straightened lines along the eastern and western edges. The AP reported ease of enforcement and prosecution would increase if the *Oculina* Habitat of Particular Concern and proposed closure area boundaries aligned, and if the Snapper Grouper 17A eastern boundary was the same as the western boundary of the closure proposed for deepwater species in Snapper Grouper Amendment 17B. In terms of transit, the AP's preferred was **Alternative 8C**, which only allows golden tilefish, black sea bass (caught with pots), and wreckfish onboard. The AP preferred an allowable golden tilefish fishing area where harvest would be restricted to golden tilefish. The AP recommended a prohibition on spearfishing for snapper grouper in the closed areas.

At their December 2009 meeting, the Scientific and Statistical Committee (SSC) expressed concern that the model used to estimate the expected percent reductions in red snapper removal from the spatial closures was based on an analysis that had not been thoroughly reviewed. Adjustments were made to the model according to recommendations from the SSC and the Southeast Fisheries Science Center subsequently determined the model was adequate for use in Snapper Grouper Amendment 17A.

The Council has concluded the closed area under **Alternative 3E (Preferred)**, along with exemptions for spearfishing (**Alternative 7**) and black sea bass pot gear (**Alternative 5**) for species other than red snapper, are likely to end overfishing of red snapper within the Council's rebuilding period, and minimize to the extent practicable socioeconomic impacts. Spearfishing gear is highly selective and species such as red snapper can be easily avoided. Therefore, **Alternative 7** was also chosen as a preferred alternative. The majority of black sea bass fishery is north of the closure, and red snapper accounts for a small percentage of the catch taken with black sea bass in sea bass pots. Therefore, **Alternative 5** was chosen as a preferred alternative. Because the closed area extends over a large portion of the South Atlantic exclusive economic zone, the Council felt it was important to allow transit through the area with snapper grouper species onboard that were caught legally outside of the closed area. Allowing transit under very specific provisions included in **Alternative 8A (Preferred)** would mitigate any safety at sea issues that could arise in poor weather conditions without impacting the rebuilding efforts for red snapper.

The Council will receive a new benchmark Southeast Data Assessment and Review assessment for red snapper in December 2010 and will adjust the management measures, including the closed areas, as needed. Any changes could be implemented through the framework procedure.

4.4 Require the Use of Circle Hooks

Alternative 1 (No Action). Do not require the use of circle hooks when using hook and line gear for snapper grouper species within any particular area of the South Atlantic EEZ when fishing for snapper grouper species.

Alternative 2 (Preferred). Require the use of non-stainless steel circle hooks when fishing for snapper grouper species with hook and line gear north of 28 degrees. It is unlawful to possess snapper grouper species without possessing non-stainless steel circle hooks. Apply to the use of natural baits only.

Alternative 3. Require the use of non-stainless steel circle hooks when fishing for snapper grouper species with hook and line gear within the South Atlantic EEZ. It is unlawful to possess snapper grouper species without possessing non-stainless steel circle hooks. Apply to the use of natural baits only.

4.4.1 Biological Effects

Alternative 2 (Preferred) would require the use of circle hooks when using hook and line gear north of 28°N; whereas **Alternative 3** would require the use of circle hooks for hook and line gear within the entire South Atlantic exclusive economic zone (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 were examined; however, no comparison was made with circle-hooks. A comparison of red snapper recaptures from fish caught on circle and J hooks tagged and released at various depths showed no difference in the percentage of recaptures for a particular depth category (Burns et al. 2004). Among depth zones, Burns et al. (2004) indicated hook trauma accounted for the largest source of mortality in 91 to 140 feet, which is where the largest number of red snapper were caught. Barotrauma was likely the major source of mortality in deeper water.

Burns (2009) reported red snapper were very susceptible to hooking injury; however, circle hooks were not more effective than J hooks in reducing hooking mortality. Between November 1, 2001 and September 30, 2007, 5,317 red snapper were tagged and released with the majority of individuals tagged at 21.7-42.7 m. Table 2.1 from Burns (2009) revealed red snapper originally caught on J-hooks had a slightly better recapture rate that those initially caught on circle hooks (12.5% vs. 8.1%). In contrast, work done by Burns (2009) indicated red grouper benefited from the use of circle hooks.

Table 4-30. Number of red grouper and red snapper tagged and recaptured by hook type from Burns (2009).

Table 2-1. Number of red grouper and red snapper tagged and recaptured by hook type.

Species	J hook tagged	J hook recaps	% J hook recaps	Circle hook tagged	Circle hook recaps	% Circle hook recaps	G test *p* values
Red Grouper	3935	287	7.3	863	121	14.0	4.49×10^{-8}
Red Snapper	2145	269	12.5	3172	258	8.1	2.3×10^{-6}

Cooke and Suski (2004) examined hooking mortality rates in a number of studies and found mortality rates were generally lower for circle hooks than for J-style hooks (Table 4-30). 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). Cooke and Suski (2004) determined hooking mortality ranged between 0 and 33.8% of fish caught for circle hooks, and 0 and 46% for J-style hooks. A statistical comparison indicated the use of circle hooks resulted in significantly lower hooking mortality than with other hook types. Cooke and Suski (2004) reported consistently higher mortality for J-hook-caught fish in the majority of the studies examined.

Table 4-31. Mortality (percentage dead) of fish caught on circle hooks and J-hooks. From Cooke and Suski (2004). Shaded areas represent studies with higher mortality associated with J hooks.

Species	C-Hook	J-Hook	Reference
White Seabass	9.70%	10.20%	Aalbers et al (2003)
Red drum	9%	3%	Aguliar et al. (2002)
Smallmouth bass	3%	6%	Barthel and Cooke (unpublished)
Striped bass	3%	15.50%	Carusso (2000)
Pumpkinseed	0%	0%	Cooke et al. (2003c)
Rock bass	0%	0%	Cooke et al. (2003a)
Bluegill	0.20%	1.20%	Cooke et al. (2003c)
Largemouth bass	5.10%	6.60%	Cooke et al. (2003b)
Coho salmon	14%	14%	Grover (unpublished data)
Chinook salmon	31%	46%	Grover et al. (2002)
Rainbow trout	0%	0%	Jenkins (2003)
Striped bass	0.80%	9.10%	Lukacovic (1999)
Striped bass	1.90%	8.70%	Lukacovic (2001)
Summer flounder	14%	14%	Malchoff et al. (2002)
Coho salmon	3%	24%	McNair (1997)
Rainbow trout	10.4%	19.0%	Parmenter (2001)
Rainbow trout	10.1%	15.9%	Pecora (unpublished data)
Brown trout	6.1%	10.0%	Pecora (unpublished data)
Brook char	25.0%	23.8%	Pecora (unpublished data)
Atlantic bluefin tuna	4%	28%	Skomal et al. (2002)
Bluegill	0%	0%	Suski and Cooke (unpublished data)
Red drum	3%	7%	Thomas et al. (1997)
Silver perch	33.8%	35.3%	Van der Walt and Faragher (2005)

For studies on red drum in Louisiana, hooking mortality rates were 3% for circle hooks and 7% for conventional hooks (Thomas et al. 1997). Striped bass have also consistently shown reduced mortality rates when captured on circle hooks relative to other hook types in studies from Massachusetts (Caruso, 2000: 3% circle, 15.5% J), Maryland (Lukacovic, 1999: 0.8% circle,9.1% J; Lukacovic, 2000: 1.9% circle, 8.7% J), and North Carolina (Hand, 2001: 5.9% circle, 18.2% J). Salmonids exhibited similar patterns, with coho salmon (McNair, 1997: 3% circle, 24% J) and Chinook salmon (McNair, 1997: 0% circle, 15% J; Grover et al. 2002: 31% circle, 46% J) having reduced hooking mortality rates when captured on circle hooks. Atlantic bluefin tuna also had reduced mortality rates when circle hooks (4%) were used instead of conventional J-hooks (28%; Skomal et al. 2002).

Cooke et al. (2003a) noted no mortality for rock bass captured using circle hooks or any of three other conventional hook designs. Cooke et al. (2003c) also assessed mortality in bluegill and pumpkinseed and found that mortality was negligible for all hook types tested. Mortality rates were also similar for a study of largemouth bass in Illinois between fish captured on circle (5.1%) and conventional hooks (6.6%; Cooke et al. 2003b). In a study of summer flounder, Malchoff et al. (2002) reported mortality was similar between circle and conventional hooks.

Barnes et al. (unpublished) compared circle hooks and J-hooks with and without wire appendages and their effects on reducing the catch of small and gut hooked snapper *(Pagrus auratus)* by recreational fishers in the Hauraki Gulf of New Zealand. In a comparison between J and circle hooks without wire appendages Barnes et al. (unpublished) demonstrated larger hook sizes appeared to slightly reduce the overall incidence of gut hooking. The 4/0 circle with no appendages gut hooked 13% of the catch while the 4/0 J hook with no appendages gut hooked 26% of the catch. The 5/0 circle hook with no appendages gut hooked 11% of the fish and the 5/0 J hook with no appendages gut hooked 21% of the snapper. Circle hooks fitted with appendages had the best overall anti-gut hooking performance from 12% to 0.2% of the total catch. The J-hooks with appendages also performed well with gut hooking being reduced from 21% to around 2% of the total catch.

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 four hook types and sizes to reduce catches of sublegal grouper and non-target species in Onslow Bay, North Carolina (Figure 4-21). 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.

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 (Table 4-32). Large J-hooks were also determined to reduce gut hooking in smaller grunt and porgy species.

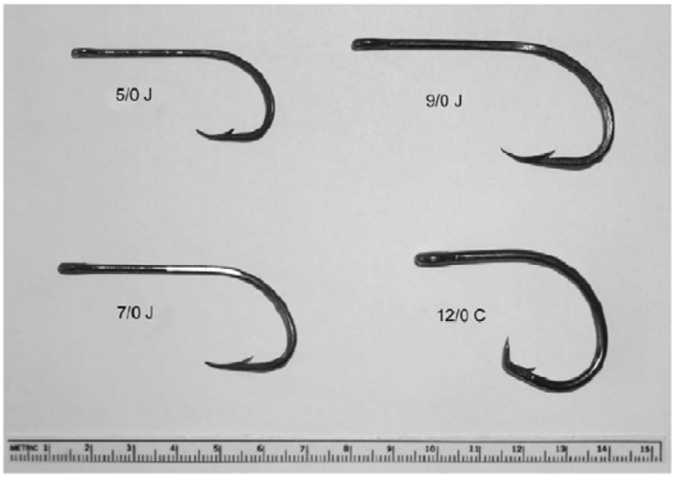


Figure 4-21. Figure 1 from Bacheler and Buckell (2004) showing hook types used in experimental fishing trips.

Table 4-32. Proportions of various hooking locations across hook treatments in grouper and non-target species caught between 14 May 2003 and 20 August 2003 in Onslow Bay, North Carolina, USA. Table 2 from Bacheler and Buckel (2004).

Species	Hook Treatment	Jaw	Gut	Gills	Body	Eye
Grouper	5/0J	0.833	0.167	0	0	0
Grouper	7/0 J	0.829	0.145	0.026	0	0
Grouper	9/0 J	0.818	0.159	0.011	0.006	0.006
Grouper	12/0 C	0.985	0.008	0	0.008	0
Non-target	5/0 J	0.855	0.097	0.005	0.043	0
Non-target	7/0 J	0.925	0.034	0.023	0.017	0
Non-target	9/0 J	0.937	0.013	0	0.051	0
Non-target	12/0 C	0.905	0.018	0	0.018	0

Circle hooks have also 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). In the Portugal longline fishery, Erzini et al. (1998) found the smallest J-hooks sparids than larger hooks (size 13 and 11).

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 catch per unit effort (CPUE) and/or reduce the incidence of fatal hooking events, 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 (Preferred)** 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 may not possible to quantify the reduction in red snapper mortality that could be provided by using circle hooks. Further, circle hooks are currently used by some commercial and recreational fishermen but the proportion of the fishing population using fishing hooks cannot be determined. 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.

Ostrand et al. (2005) studied the effects of non-offset circle hook design and offset-circle hook design on performance and ease of dehooking in the largemouth bass. They reported that non-offset circle hooks were harder to remove and caused slightly more bleeding than non-offset circle hooks, but overall, little difference was found between the two types of circle hooks relative to injury that could lead to mortality (Ostrand et al. 2005). The same study showed non-offset circle hooks to be more effective at hooking largemouth bass than non-offset circle hooks, while hooking location did not differ substantially (Ostrand et al. 2005). A similar study conducted with seven commonly harvested reef fish in the Great Barrier Reef (GBR) line fishery (a mixed species reef fish fishery) illustrated that "offset circle hooks and J hooks were more often associated with injuries than non-offset circle hooks" (Mapleston et al. 2007). However, there was great variation in hook location across target and non-target species, and the GBR line fishery study showed no clear trend in the rate of deep hooking among the reef species harvested with the three types of hooks used. This result contrasts with the findings of Bacheler and Buckel (2004), which found that circle hooks reduced the rate of gut hooking in grouper when compared to the observed incidences of gut hooking using J hooks (Mapleston et al. 2007). Overall, the GBR hook type research indicated there would "be little benefit in promoting the use of offset circle hooks with no evidence of any beneficial effects for the sustainability of the fishery over and above those of non-offset circle hooks" (Mapleston et al. 2007).

The mandatory use of circle hooks was considered in Amendment 16 but removed after the amendment was reviewed by the Council's Scientific and Statistical Committee (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.

Alternative 2 (Preferred) would implement compatible regulations with Gulf of Mexico reef fish fishery circle hook requirements; however, the requirement would not apply to immediately adjacent waters of the Atlantic since it specifies the use of circle hooks north of 28 degrees latitude. Currently, Gulf of Mexico reef fish regulations at 50 CFR 622.41 state:

> *Required gear in the Gulf reef fish fishery. For a person on board a vessel to fish for Gulf reef fish in the Gulf EEZ, the vessel must possess on board and such person must use the gear as specified in paragraphs (m)(1) through (m)(3) of this section.(1) Non-stainless steel circle hooks. Non-stainless steel circle hooks are required when fishing with natural baits.*

Alterative 3 would implement the same compatible regulations in adjacent waters of the Gulf of Mexico, and thus simplify enforcement efforts. However, **Alternative 2 (Preferred)** accounts for the fact that circle hooks could substantially reduce harvest of some species south of 28 degrees latitude, which could have negative social and economic impacts on fishermen dependent upon the species being targeted. Initially, the preferred circle hook alternative limited the use of circle hooks to only non-offset circle hooks northward of 28 degrees latitude. However, at their June 2010 meeting, the Council modified the preferred alternative to include the use of both types of circle hooks, non-offset and offset, in order to implement regulations consistent with circle hook regulations currently in place in the Gulf of Mexico.

Alternative 1 (No Action) will perpetuate the existing level of risk for interactions between ESA-listed species and the fishery. **Alternatives 2 (Preferred)** and **3** are likely to reduce the severity of injuries associated with the incidental hooking of ESA-listed species. The use of large circle hooks has been shown to significantly reduce the rate of hook ingestion in loggerhead sea turtles, reducing post-hooking mortality. Circle hook design typically result in hooking of a sea turtle's lower jaw when bitten, and even smaller circle hooks that are swallowed are shaped such that they hook the esophageal or digestive tract with much lower frequency than J-hooks (Watson et al. 2003). Because hooking location is one of the primary factors influencing post-release mortality in all species of sea turtles, circle hooks are generally believed to increase post-release survival. **Alternatives 2 (Preferred)** and **3** would likely reduce the severity of interactions between the fishery and ESA-listed species.

4.4.2 Economic Impacts

Alternative 1 (No Action) 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 (Preferred) 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 (Preferred)** 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 (Preferred)** 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 (Preferred)** 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 it is assumed that the imposition of circle hook restrictions is expected to support a healthier snapper grouper resource (as a result of reduced hook-related mortality of fish not retained, quicker rebuilding, larger biomass, etc.), as well as possible higher allowable harvest levels, circle hook restrictions would be expected to result in greater social benefits. These increased benefits could be received in the short term (to the extent that harvest 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 higher sustainable harvest levels resulting from a recovered stock). Some anglers may object to the loss of personal choice in the selection of 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 that have been suggested by fishermen that may experience reduced catch rates are gray triggerfish and yellowtail snapper. Because **Alternative 1 (No Action)** 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, or potential larger biomass and harvest levels would be forgone. Because of the limited geographic application of **Alternative 2 (Preferred),** the potential 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, 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 for which circle hooks may not be appropriate. Because of the expected resource benefits of circle hooks, both **Alternatives 2 (Preferred)** and **3** would be expected to result in increased social benefits relative to **Alternative 1 (No Action).** It is speculative, however, which of **Alternatives 2 (Preferred)** and **3** would be expected to result in the better social outcome, though the implicit recognition in **Alternative 2 (Preferred)** that circle hooks may be inappropriate for some species may result in **Alternative 2 (Preferred)** having the better social and economic outcome.

4.4.4 Administrative Impacts

Alternatives 2 (Preferred) and **3** would incur a significant administrative burden on NOAA Fisheries Service as well as enforcement personnel. These alternatives would require the preparation of fishery bulletins or other publications outlining specific hook, requirements, and would require outreach and ongoing enforcement of gear compliance standards. **Alternative 2 (Preferred)** would be slightly more burdensome in terms of law enforcement since it would require circle hooks be used north of 28 degrees, which would create a gear type boundary that would need to be enforced. Requiring the use of circle hooks in the entire South Atlantic exclusive economic zone would be less burdensome on law enforcement personnel since there would be no special boundary to monitor within the Council's area of jurisdiction, and it would implement compatible regulations in an area contiguous with the Gulf of Mexico Fishery Management Council's jurisdiction.

4.4.5 Council Conclusion

The Snapper Grouper Advisory Panel did not have any recommendations.

The Law Enforcement Advisory Panel did not have any recommendations.

The Scientific and Statistical Committee (SSC), at their June 2008 meeting when discussing the circle hook action in Snapper Grouper Amendment 16, felt that there needed to be better documentation of the effects to the resource from fishing with circle hooks. More specifically, the SSC wanted a discussion in the document concerning the percent reduction in mortality that might occur due to the implementation of the circle hooks.

The Council has chosen **Alternative 2** as their preferred circle hook alternative. **Alternative 2(Preferred)** would require the use of non-stainless steel circle hooks when fishing for snapper grouper species with hook and line gear north of 28 degrees (the southern boundary of the proposed closure), where red snapper is most abundant. It would also make it unlawful to possess snapper grouper species without possessing non-stainless steel circle hooks. Few studies on the effects of using circle hooks with snapper grouper species have been completed, though some do support the use of circle hooks as means of decreasing bycatch mortality. One study found circle hooks significantly reduced gut hooking in all grouper species (e.g., gag, red grouper, and scamp) as well as smaller grunt and porgy species. Another study determined circle hooks did not appear to enhance survival of red snapper. Overall, circle hooks could reduce regulatory discards, thereby providing additional benefits to snapper grouper species including red snapper. Based on the little data that do exist, the Council felt taking advantage of any method to reduce red snapper bycatch mortality is warranted considering its overfished condition. The Council is also aware that use of circle hooks could substantially reduce harvest of some species, which would have positive biological benefits but have negative social and economic impacts on fishermen dependent upon the species. A couple of the species that fishermen are concerned about not being able to catch with circle hooks (yellowtail snapper and mangrove snapper) occur south of 28 degrees latitude. Therefore, the Council felt it was important to limit the circle hook requirement to South Atlantic areas north of 28 degrees, and felt that **Alternatives 2 and 3** would be expected to have similar beneficial effects to the red snapper stock.

The Council concluded the preferred alternative is the most appropriate choice in terms of circle hooks as reduce discard mortality of red snapper; minimizes the expected adverse social and economic impacts to the fishing industry to the extent possible as it limits the requirement to north of 28 degrees; the actions meet the new Magnuson-Stevens Fishery Conservation and Management Act requirements for red snapper; and the preferred alternatives best address the SSC's recommendations. The Council also concluded the preferred alternative best meets the goals and objectives of the Snapper Grouper Fishery Management Plan as amended.

4.5 Red Snapper Monitoring Program

Alternative 1 (No Action). 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 (MARMAP), and the Southeast 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 (Preferred). Establish a fishery-independent monitoring program to track progress of red snapper rebuilding. Sampling would include deployment of gear such as chevron traps, cameras, and hook and line at randomly selected stations in a manner determined by the Southeast Fisheries Science Center in consultation with the South Atlantic Fishery Management Council.

Alternative 3. Establish a red snapper fishery-dependent monitoring program 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 would depend on the number of selected vessels, available quota, and objectives of the research fishery.

4.5.1 Biological Effects

If the red snapper fishery is closed, as would be the case under several of the proposed red snapper management alternatives, a dedicated data collection program would needed to monitor the status of red snapper in the South Atlantic throughout the rebuilding time-frame. Under **Alternative 1 (No Action),** existing fishery-dependent 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 Southeast Monitoring Assessment and Prediction (SEAMAP) and the Marine Resources Monitoring Assessment and Prediction MARMAP Programs. Fishery-dependent data collection programs include the Marine Recreational Statistical Survey (MRFSS), commercial logbook, commercial discard logbook, headboat logbook, Trip Interview Program (TIP), and dealer reported landings. Sampling methods of these programs are described in detail below. Additionally, the Southeast Fisheries Science Center (SEFSC) has developed a detailed proposed framework for fishery-dependent and fishery-independent monitoring programs. This document entitled Red Snapper Monitoring Plan, May 8, 2009 is included in this document as **Appendix P**, and is hereby incorporated by reference. An independent monitoring workshop was held in November 2009. A report on the workshop proceedings has been completed **(Appendix V)**. The selection of a monitoring program will have no immediate effect 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 Service capacity to evaluate the frequency and severity of those interactions.

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 approximately 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 catch per unit effort (CPUE) and length frequency data and/or biological samples (e.g. hard parts and reproductive tissue) 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-line 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 U.S. 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 gear types 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

Alternative 2 (Preferred) would establish a fishery-independent monitoring program to track progress of red snapper. Sampling would likely include deployment of chevron traps, cameras, and hook and line at randomly selected stations. Details of the sampling program would be determined by the Southeast Fisheries Science Center (SEFSC). This alternative is similar in the sampling methodologies discussed under **Alternative 1 (No Action)**; however, **Alternative 2**

(Preferred) would not implement a dedicated fishery-dependent data collection program to monitor 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 gear types utilized over current survey levels, thereby considerably improving program effectiveness. The spatial and sample size expansions would be made possible by the participation of the 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 could be added and utilized by both SEFSC and MARMAP (detailed below), with gear effectiveness research performed by SEFSC. SEFSC could coordinate with MARMAP to plan annual survey efforts (e.g., spatiotemporal focus of sampling) as guided by SAFMC and NOAA Fisheries Service data needs.

An improved program could 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 could 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 could continue to be utilized following current MARMAP protocols. These gear 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). The SEFSC is in the process of designing a fishery-independent program to enhance those already in place **(Appendix V)**.

Fishery-Dependent Data Collection

Alternative 3 would establish a fishery-dependent monitoring program, involving for-hire vessels (charter boat and headboats). Participating vessels could 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 would depend on the number of selected vessels, available quota, and objectives of the program.

Fishery-dependent data could be employed to monitor abundance of red snapper and other snapper grouper species. 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 could 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. Dead red snapper could be retained for life history studies. The SEFSC would indicate if additional samples were needed for stock assessments.

The SEFSC previously provided information in the utility of including headboats in some sort of program to monitor CPUE, a summary of which follows (in italics) and is provided in **Appendix P**.

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 P**). The results suggest that the headboat fishery cannot operate at full capacity. Without other sectors operating (coast wide shut down 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 P**). 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 P)**. 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 P)** 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 P**). Implementing this type of trip allocation may be difficult. Note: 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 Dependent 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 (Preferred)** and **3** as preferred alternatives to ensure a balanced data collection approach. However, funding for both a fishery-independent program and a fishery-dependent program may not be available on a continuing basis. Both of these alternatives differ from **Alternative 1 (No Action)** 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. Further, **Alternative 2** would be designed to enhance information collected on other snapper grouper species. It is true that the programs under **Alternative 1 (No**

Action) 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 (No Action)** would be required to shift their focus to other more critical species in the future would always exist. **Alternatives 2 (Preferred)** 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 (No Action) would perpetuate the existing level of risk for interactions between Endangered Species Act (ESA)-listed species and the fishery. **Alternatives 2 (Preferred)** 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 (Preferred)** 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

Alternatives 1, 2 (Preferred) and 3 would not have any expected short-term economic impacts on the commercial fishery since they would not involve the commercial sector in additional data gathering activities. However, the long-term economic impacts of **Alternatives 1, 2 (Preferred), and 3** are expected to be positive since they would contribute to better management of the fishery in general and aid in actions taken by the Council with regard to rebuilding and allowing for future participation in the red snapper and related fisheries.

Non-use values are expected to rise with the accumulation of additional biological and economic information. Therefore, **Alternatives 2 (Preferred)** and **3** would provide an increase in non-use values over **Alternative 1 (No Action)**.

Recreational Sector

Alternatives 1 and **2 (Preferred)** 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 (Preferred)** may be considered an improvement over that of the No Action. 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 (No Action) and **2 (Preferred)** are administrative actions and would not be expected to have any direct short-term effects on fishermen or associated businesses and communities. Under both of these alternatives, although some minimal directed harvest (from regulatory non-compliance) 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. Whether the benefits of potentially more accurate stock assessments exceed any losses associated with potentially delayed recovery is speculative and cannot be determined with available data.

4.5.4 Administrative Effects

Alternative 1 (No Action) would incur no additional administrative impacts. **Alternative 2 (Preferred)** would likely build upon the existing Marine Resources Monitoring Assessment and Prediction (MARMAP) sampling program. **Alternative 2 (Preferred)** would require additional funding that may be more or less than the cost burden asscicated with ., **Alternative 3,** depending upong the level of sampling required. If the fishery-independent program utilizes the framework already in place under MARMAP, **Alternative 2 (Preferred)** would require administrative resources equal to or less than **Alternative 3** since **Alternative 3** would create an entirely new research fishery program. Under **Alternative 3** qualifying criteria for participation would need to be developed and cleared through appropriate channels **Alternative 2 (Preferred)** would require coordination with the SEFSC to create an expanded sample design that would include additional sample locations, and commensurate funding, needed to supplement current MARMAP sampling activities to obtain information on red snapper abundance within any of the proposed closed areas. **Alternatives 2 (Preferred)** and **3**, 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 depending upon what type of National Environmental Policy Act (NEPA) documentation is required. The most time intensive of the three is an exempted fishing permit, and the least time consuming is a letter of acknowledgement. **Alternative 3** would also require coordination with the SEFSC to create an appropriate sample design that would minimize bias associated with fishery-dependent sampling as well as locating funding needed to support such as program.

4.5.5 Council's Conclusion

The Snapper Grouper Advisory Panel recommended: inclusion of guideboats with charter and headboats in a research set-aside program; a research set-aside program for management; support of data research needs identified in the SEDAR report for red snapper; investigation of the interaction with snapper grouper species within the proposed management areas in Amendment 17A; development of a census reporting data systems for all commercial and for-hire participants; establishment of a real-time reporting systems for all sectors to track landings and discards for daily monitoring and quota management; evaluation of the appropriateness of all size limits in the snapper grouper complex; implementation of a saltwater vessel permit with a monitoring system; and establishment of an ad-hoc group to discuss recreational monitoring and data collection.

The Law Enforcement Advisory Panel did not have any recommendations.

The Scientific and Statistical Committee (SSC) was concerned with lack of red snapper catch data for upcoming assessments given the proposed regulations. The SSC believed that a monitoring program was necessary in order to assess red snapper in the future. The SSC considered (1) an expansion of the fishery-independent program (a combination of Marine Resources Monitoring Assessment and Prediction (MARMAP) and new sampling by the Southeast Fisheries Science Center (SEFSC) Beaufort lab) and (2) a headboat sampling program. The SSC discussed issues with the headboat sampling program (mortality too high, change in behavior of fishers). The SSC favored an expanded fishery-independent sampling program.

The Council has chosen **Alternative 2** as their preferred red snapper monitoring alternative. **Alternative 2 (Preferred)** would establish an enhanced fishery-independent monitoring program to track progress of red snapper and other snapper grouper species. Sampling would likely include deployment of chevron traps, cameras, and hook and line at randomly selected stations but specifics of such a program are currently being developed by the SEFSC. This option would build upon the existing MARMAP sampling program. The program would be expanded and sampling made more specific for monitoring red snapper and better monitoring of other snapper grouper species. The disadvantage to using a fishery-independent monitoring program alone is that there is a potential for fishermen to perceive they are being excluded from participating in data collection efforts. However, this amendment does not preclude the use of fishery-dependent data for monitoring red snapper in the future, as NOAA Fisheries Service and SEFSC are constantly working toward improved data gathering and methods of analysis. 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.

5 Cumulative Effects

As directed by the National Environmental Policy Act (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.

5.1 Biological

SCOPING FOR CUMULATIVE EFFECTS

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.

The Council on Environmental Quality (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, which is also the South Atlantic Fishery Management Council's area of jurisdiction. In light of the available information, the extent of the boundaries would depend upon the degree of fish immigration/emigration and larval transport, whichever has the greatest geographical range. Therefore, the proper geographical boundary to consider effects on the biophysical environment is larger than the entire South Atlantic exclusive economic zone. The ranges of affected species are described in **Section 3.2.1**. 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. The Council has chosen a 35-year rebuilding schedule with management measures that would reduce harvest of red snapper in order to rebuild the stock within the preferred timeframe. 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 **Sections 4.5** of this document.

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 Fishery Management Plan (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 E** show minimal reductions (less than 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) (see Figure 5-1) within which, all fishing for snapper grouper species is prohibited as is the use of shark bottom longline gear. Within the MPAs trolling for pelagic species is permitted. The MPAs range in area from 50 to 506 square nautical miles and are located off of North Carolina, South Carolina, Georgia, and Florida. The MPAs are expected to enhance the optimum size, age, and genetic structure of slow-growing, long-lived, deepwater snapper grouper species. 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.

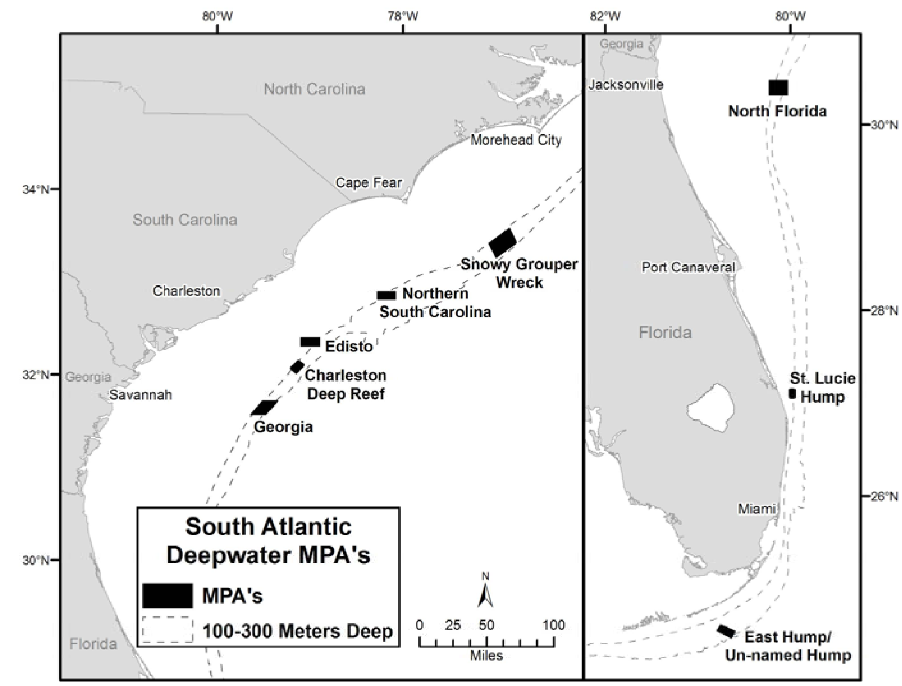


Figure 5-1. Marine protected areas implemented under Snapper Grouper Amendment 14 (SAFMC 2007).

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. Current closures, including quota closures, seasonal closures, and area closures are outlined in **Appendix I.** of this document.

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 E** 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 September 1, 2009, Amendment 15B to the FMP for the Snapper Grouper Fishery of the South Atlantic Region was approved by the Secretary. Management measures in Amendment 15B that 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.

The Comprehensive Ecosystem-Based Amendment 1 (CE-BA 1) was implemented on July 22, 2010. CE-BA 1 consists of regulatory actions that focus on deepwater coral ecosystem conservation and non-regulatory actions that update existing essential fish habitat information. Management actions proposed in the CE-BA 1 include the establishment of deepwater Coral Habitat of Particular Concern(CHAPCs) to protect what is currently thought to be the largest distribution (greater than 23,000 square miles) of pristine deepwater coral ecosystems in the world. Actions in the amendment would prohibit the use of bottom damaging fishing gear and allow for the creation of allowable fishing zones within the CHAPCs in the historical fishing grounds of the golden crab and deepwater shrimp fisheries. The CE-BA 1 would also provide spatial information on designated essential fish habitat (EFH) in the Council's Habitat Plan (SAFMC 1998a). Actions in CE-BA 1 would: 1) Amend the Fishery Management Plan (FMP) for Coral, Coral Reefs, Live/Hard Bottom Habitats of the South Atlantic Region (Coral FMP) to establish Deepwater Coral Habitat Areas of Particular Concern (CHAPCs) and prohibit the use of bottom damaging fishing gear; 2) create a ―Shrimp Fishery Access Area within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries; 3) create allowable Golden Crab Fishing Areas within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC and Pourtales Terrace CHAPC boundaries; 4) amend the Golden Crab FMP to require vessel monitoring; and 5) amend the following FMPs to present spatial information of

Council-designated Essential Fish Habitat and Essential Fish Habitat-Habitat Areas of Particular Concern: Coral FMP; FMP for the Golden Crab Fishery of the South Atlantic Region (Golden Crab FMP), FMP for the Shrimp Fishery of the South Atlantic Region (Shrimp FMP), FMP Coastal Migratory Pelagics Resources in the Atlantic and Gulf of Mexico (Coastal Migratory Pelagics FMP), FMP for Spiny Lobster in the Gulf of Mexico and South Atlantic (Spiny Lobster FMP), FMP for the Dolphin Wahoo Fishery of the Atlantic (Dolphin Wahoo FMP), and FMP for the Snapper Grouper Fishery of the South Atlantic Region (Snapper Grouper FMP).

Amendment 17B to the FMP for the Snapper Grouper Fishery of the South Atlantic Region has been approved by the Council and has been submitted for Secretarial review. It includes a deepwater snapper grouper closure seaward of 240 ft in addition to establishing annual catch limits (ACLs) and accountability measures (AMs) for species experiencing overfishing. The closures proposed in Amendment 17A, if implemented through rulemaking, would enhance the expected biological benefits of the spawning season closure for shallow water grouper in Amendment 16, and the proposed deepwater snapper grouper closure in Amendment 17B.

The Council received notification, in a letter dated July 8, 2008, that the South Atlantic red snapper stock is undergoing overfishing and is overfished. While the Council developed an amendment, they requested NOAA Fisheries Service, in March 2009, to establish interim measures to reduce overfishing and fishing pressure on the red snapper stock. Interim measures became effective on January 4, 2010. The interim rule was effective until June 2, 2010, but was extended for an additional 186 days since the Council is proposing long-term management measures in Snapper Grouper FMP Amendment 17A to end overfishing of red snapper and rebuild the stock. Regulations implemented by the interim rule will expire on December 5, 2010.

The map below represents the closed areas, MPAs, and CHAPCs, established and proposed in various amendments already implemented or currently under development.

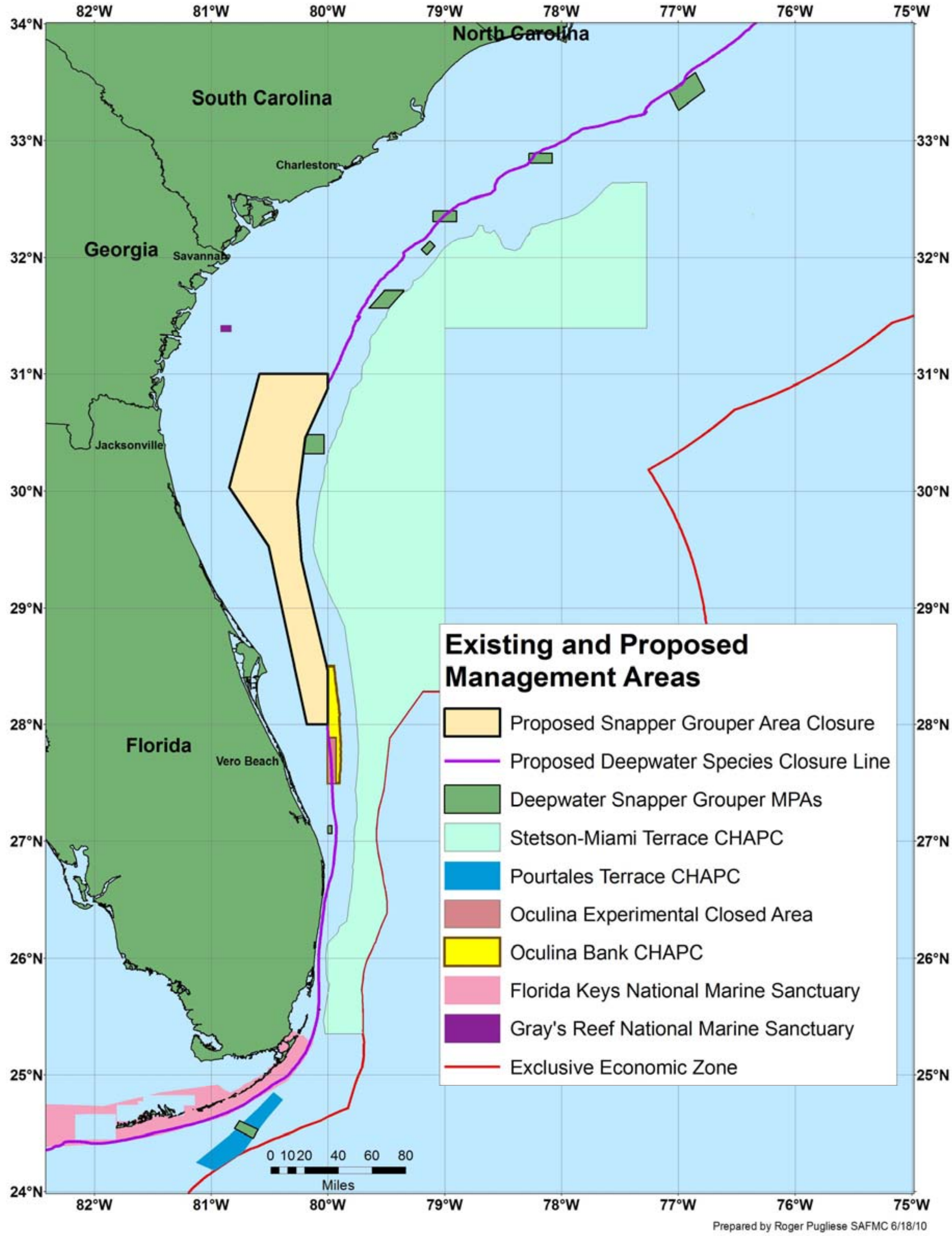


Figure 5-2. South Atlantic closed areas, CHAPCs, National Marine Sanctuaries, and MPAs currently in effect and proposed.

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, change the golden tilefish fishing year, improve the accuracy and timing of fisheries statistics, and designate essential fish habitat 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 actions to limit participation in the black sea bass and golden tilefish fisheries in Amendment 18 could hedge against any foreseeable effort shifts to those fisheries that might result from an area closure in Amendment 17A.

The Comprehensive Annual Catch Limit (ACL) Amendment would consider ACLs and Annual Catch Targets (ACTs) for other Federally managed South Atlantic species not experiencing overfishing in other FMPs including Snapper Grouper. 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 ACLs and ACTs; (4) AMs; 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.

At their March 2010 meeting, the Council requested the development of an FMP amendment to establish a catch share program for several snapper grouper species (Amendment 21 to the FMP for the Snapper Grouper Fishery of the South Atlantic Region). The establishment of a catch share program may eliminate derby-style fisheries that have formed for some snapper grouper species, but could also eliminate some small vessel operators from the fishery depending upon the initial share allocation criteria chosen by the Council. Additionally, the Council has requested an amendment to explore alternate management methods specifically for red snapper for long-term implementation (Amendment 22 to the FMP for the Snapper Grouper Fishery of the South Atlantic Region), which could include management options such as a tagging program or some form of a catch share program.

Finally, the space industry in Florida centered on Cape Canaveral is experiencing severe difficulties due to the ramping down and cancellation of the Space Shuttle Program. This program's loss coupled with additional fishery closures will negatively impact this region. However, declining economic conditions due to decline in the space industry may lessen the pace of waterfront development and associated adverse social and economic pressures on fishery infrastructure.

II. Non-Council and other non-fishery related actions, including natural events affecting 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 an apparent strong year class occurring in 2006. 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.

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. Warsaw grouper, and speckled hind have not been recently assessed. Assessments for red grouper and black grouper were completed in 2010. However, given the best available science, each of these stocks, with the exception of black grouper, 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.

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).

The definitions of overfishing and overfished for red snapper can be found in the most recent stock assessment (SEDAR 15 2008). Detailed discussions of the science and processes used to determine the stock status is contained in the previously mentioned information sources and are hereby incorporated by reference.

Climate change
Global climate changes could have significant effects on South Atlantic fisheries. However, the extent of these effects is not known at this time. Possible impacts include temperature changes in coastal and marine ecosystems that can influence organism metabolism and alter ecological processes such as productivity and species interactions; changes in precipitation patterns and a rise in sea level which could change the water balance of coastal ecosystems; altering patterns of wind and water circulation in the ocean environment; and influencing the productivity of critical coastal ecosystems such as wetlands, estuaries, and coral reefs (Kennedy et al. 2002).

Actions from this amendment could decrease the carbon footprint from fishing if some fishermen stop or reduce their number and duration of trips due to the proposed area closure. It is unclear how climate change would affect snapper grouper species in the South Atlantic. Climate change can affect factors such as migration, range, larval and juvenile survival, prey availability, and susceptibility to predators. In addition, the distribution of native and exotic species may change with increased water temperature, as may the prevalence of disease in keystone animals such as corals and the occurrence and intensity of toxic algae blooms. Climate change may significantly impact snapper grouper species in the future, but the level of impacts cannot be quantified at this time, nor is the time frame known in which these impacts will occur. Actions in this amendment are expected to reduce harvest of red snapper and may also decrease fishing mortality of other co-occurring species; thus these actions may partially mitigate the negative impacts of global climate change on snapper grouper species.

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 red snapper. 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 red snapper, estimates of annual biomass have been well below the biomass at maximum sustainable yield (B_{MSY}) since the mid-1960s, with possibly some small amount of recovery since implementation of current size limits in 1992 (Figure 5-2).

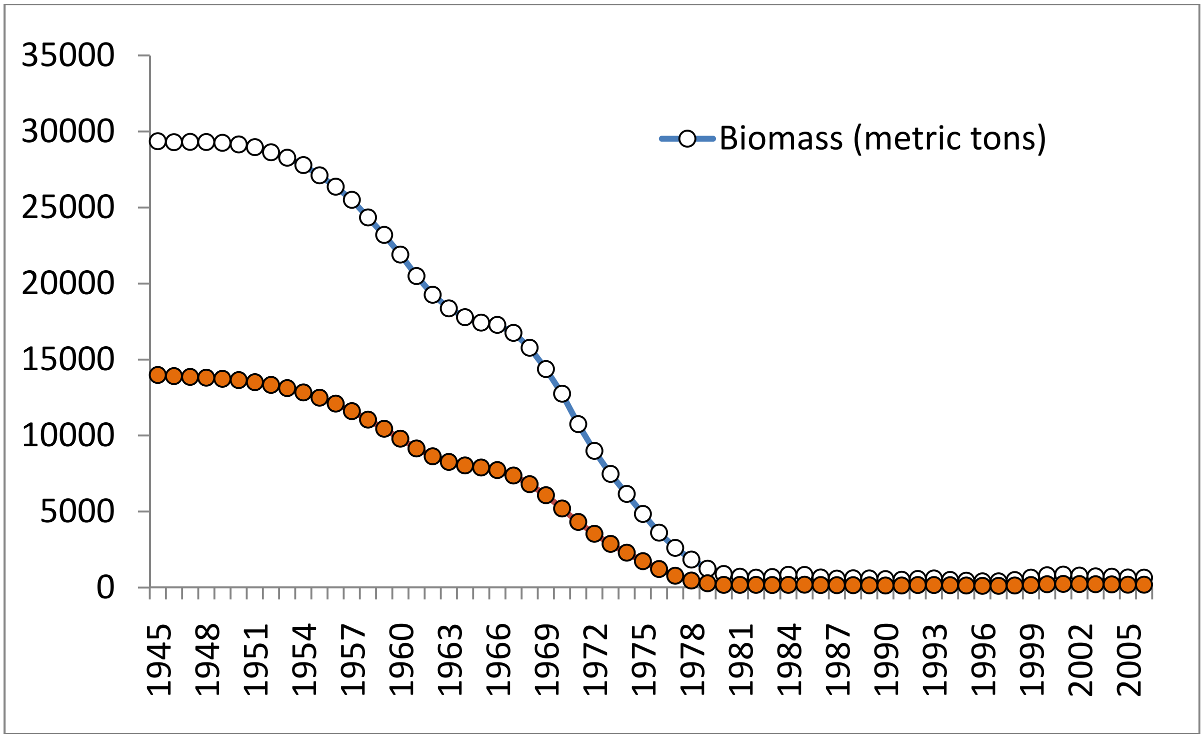


Figure 5-2. Biomass and Spawning Stock Biomass (pounds).

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 5-1. 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.
Effective Dates Dec 16, 2009, to Feb 16, 2010.	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.
Effective Date July 29, 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.
Effective Date January 4, 2010	Red Snapper Interim Rule	Prohibit commercial and recreational harvest of red snapper from January 4, 2010, to June

Time period/dates	Cause	Observed and/or Expected Effects
		2, 2010 with a possible 186-day extension. Regulations were extended until December 5, 2010. Reduce overfishing of red snapper while long-term measures to end overfishing are addressed in Amendment 17A.
Target 2010	Snapper Grouper FMP Amendment 17A	SFA parameters for red snapper; ACLs and ACTs; management measures to limit 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; AMs, 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.
Effective July 22, 2010	Snapper Grouper FMP Amendment 19 (Comprehensive Ecosystem-Based Amendment 1)	Amend the FMP to present spatial information of Council-designated Essential Fish Habitat and Essential Fish Habitat-Habitat Areas of Particular Concern.
Target 2011	Comprehensive ACL Amendment.	ACLs, ACTs, and AMs 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 annual catch limits (ACLs) and accountability measures (AMs) and establish management measures to end red snapper 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 consolidated document. 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 fishery management unit (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 red snapper. 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. **Section 4.5** of this document contains a full discussion and analysis of monitoring program alternatives for red snapper.

5.2 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**. A description of the history of management of the snapper grouper fishery is contained in **Section 1.3**. 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.

The establishment of annual catch limits (ACL) and accountability measures (AM) for species undergoing overfishing is expected to help protect and sustain harvest at the optimum yield 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**. Current and future amendments are expected to add to this cumulative effect. Snapper Grouper Amendment 15B prohibited 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 addressed 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. A red snapper interim rule was put in place from January 4, 2010, to June 2, 2010, to reduce overfishing of red snapper while Amendment 17A is developed, and was extended for an additional 186 days through December 5, 2010.

Snapper Grouper Amendment 17B would establish ACLs, AMs, and annual catch targets 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. Alternatives for the management of red snapper could interact with additional alternatives proposed in Amendment 17B that are not considered in the present analyses (above). 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 aggregate harvest of gag, red grouper, and black grouper. To account for these inconsistencies, **Appendix O contains** a complete description of the economic analysis methodology used to evaluate the simultaneous effects of the preferred alternatives in Amendment 17B and the proposed alternatives in Amendment 17A. The following text and Table 5.2 shows a summary of these results.

If Amendment 17B is implemented, annual catch limits will be set to zero for speckled hind and warsaw grouper. In addition, the harvest, possession and sale of snowy grouper, yellowedge grouper, misty grouper, blueline tilefish, queen snapper, and silk snapper will be prohibited in waters deeper than 240 feet as a means of minimizing the incidental catch and discard of speckled hind and warsaw grouper.

If implemented, the total allowable catch for golden tilefish will be redefined in terms of F_{OY} rather than F_{MSY}. Furthermore, the commercial allocation will be formally established as 97 percent of total allowable catch. The result will be a reduction in the commercial ACL from 295,000 pounds to 282,819 pounds. In addition, an aggregate catch limit of 662,403 pounds will be established for gag, red grouper, and black grouper. The commercial fishery for shallow water groupers will be closed when either the individual ACL for gag (353,940 pounds) or the aggregate ACL for gag, red grouper, and black grouper is reached.

Table 5-2. Predicted economic effects of proposed management measures for red snapper in Amendment 17A given Preferred Alternatives for Amendment 17B.
Economic effects are measured in terms of net operating revenues for commercial trips reported to the SEFSC fishery logbook system.

	Amendment 17A and Preferred Alternatives for Amendment 17B (thousands of constant 2008 $)		Additional Reductions in Net Operating Revenues due to the Preferred Alternatives for Amendment 17B	
BASELINE (simulated conditions with Amendment 16)	$9,017	100%	$9,017	100%
Proposed alternative in Amendment 17A	Change from baseline	Percentage change from baseline	Change from baseline	Percentage change from baseline
Alternative 2	-$859	-9.5%	-$469	-5.2%
Alternatives 3A, 5, and 7	-$978	-10.9%	-$489	-5.4%
Alternatives 3B, 5, and 7	-$947	-10.5%	-$503	-5.6%
Alternatives 3C, 5, and 7	-$943	-10.5%	-$505	-5.6%
Alternatives 3D, 5, and 7	-$947	-10.5%	-$502	-5.6%
Alternatives 3E (Preferred), 5, and 7	-$931	-10.3%	-$501	-5.6%
Alternatives 4A, 5, and 7	-$1,626	-18.0%	-$391	-4.3%
Alternatives 4B, 5, and 7	-$1,547	-17.2%	-$422	-4.7%
Alternatives 4C, 5, and 7	-$1,511	-16.8%	-$430	-4.8%
Alternatives 4D, 5, and 7	-$1,521	-16.9%	-$426	-4.7%

Columns 1 and 2 in Table 5-4 show the cumulative changes to commercial net operating revenues as a result of the alternatives in Amendment 17A and the preferred alternatives for Amendment 17B. Columns 3 and 4 show the dollar and percentage reductions in net operating revenues compared to the impacts form Amendment 17A alone. These are the *additional* reductions in net operating revenues due to the preferred alternatives for Amendment 17B. They range from approximately $391,000 (an extra 4.3 percent) for **Alternative 4A** in combination with **Preferred Alternatives 5** and **7** to $501,000 (an extra 5.6 percent) for **Preferred Alternative 3E** in combination with **Preferred Alternatives** 5 and 7 **(Preferred)**. The baseline was defined by average conditions from 2006-2008, given the expected effects of Amendment 16.

Amendment 17B is not expected to have a large effect on commercial landings of red snapper. If Amendment 17A were never implemented, Amendment 17B would be expected to reduce landings of red snapper by an extra 1 percent compared to regulatory conditions with Amendment 16. However, the preferred alternatives in Amendment 17B would affect landings of other species in the snapper-grouper management unit, especially the shallow water groupers.

The aggregate ACL on the harvest of gag, red grouper and black grouper in Amendment 17B would dampen the prediction in the analysis of Amendment 17A of a longer season for shallow water groupers, and would limit the ability of fishermen to benefit from a longer open season by harvesting larger quantities of red grouper, black grouper and other shallow water groupers given the alternatives proposed in Amendment 17A. When Amendments 17A and 17B are considered jointly, the open season for shallow water groupers still is predicted to last longer than with Amendment 16, but would close sooner than if the ACL had not been specified in Amendment 17B. Therefore, the expected increase in net operating revenues during the fourth quarter will not be as large as was predicted in the analysis of Amendment 17A given the no-action alternative for Amendment 17B, and the overall losses due to the alternatives in Amendment 17A will be larger than originally predicted.

The consideration of preferred alternatives in Amendment 17B was predicted to have the greatest extra economic effects on fishermen in regions that were predicted to benefit from a longer open season for shallow water groupers and/or where significant numbers of trips occur with bottom longlines for species other than golden tilefish. These regions include North Carolina and the Florida Keys for all proposed alternatives in Amendment 17A, and South Carolina for proposed **Alternatives 2, 3A, 3B, 3C, 3D,** and **Preferred Alternative 3E** in combination with **Preferred Alternatives 5** and **7**. Trips in regions that were predicted to be the most adversely affected by the proposed alternatives in Amendment 17A were predicted to be the least affected by the simultaneous consideration of preferred alternatives in Amendment 17B. These regions include South Carolina for proposed **Alternatives 4A, 4B, 4C,** and **4D,** in combination with **Preferred Alternatives 5** and **7**, and Georgia and along the east coast of Florida from Nassau through Miami-Dade Counties for all proposed alternatives in Amendment 17A.

Based on the prediction of a longer open season for shallow water groupers, net operating revenues for fishermen in North Carolina were predicted to increase by approximately 11.2 percent for **Alternatives 3A, 3B, 3C, and 3D** in combination with **Preferred Alternatives 5** and **7**, by 9.9 percent for **Preferred Alternative 3E** in combination with **Preferred Alternatives 5** and **7**, and by 7.2 percent for **Alternatives 4A, 4B, 4C and 4D** in combination with **Preferred Alternatives 5** and **7** given no action for Amendment 17B. However, after accounting for the effects of preferred alternatives for Amendment 17B, net operating revenues for fishermen in North Carolina are expected to increase by approximately 1.5 percent for **Alternatives 3A, 3B, 3C,** and **3D** in combination with **Preferred Alternatives 5** and **7**, and are expected to decline by slightly more than 2 percent with **Alternatives 4A, 4B, 4C** and **4D** in combination with **Preferred Alternatives 5** and **7**. Net operating revenues for North Carolina are not expected to change with P**referred Alternative 3E** in combination with **Preferred Alternatives 5** and **7** because the losses from the preferred alternatives in Amendment 17B are expected to be about equal to the potential gains from Amendment 17A that could accrue from a longer open season for shallow water groupers.

The snapper-grouper fishery would not be closed off the coast of South Carolina with **Alternatives 3A, 3B, 3C, 3D,** and **3E** in combination with **Preferred Alternatives 5** and **7,** but would be closed with **Alternatives 4A, 4B, 4C,** and **4D** in combination with **Preferred Alternatives 5** and **7**. Consequently, net operating revenues for fishermen in South Carolina were expected to increase by between 7.0 and 7.9 percent with **Alternatives 3A, 3B, 3C,** and **3D** in combination with **Preferred Alternatives 5** and **7** given no action for Amendment 17B, and were expected to decline by between 29.6 and 34.5 percent with **Alternatives 4A, 4B, 4C** in combination with **Preferred Alternatives 5** and **7,** and **4D**. After accounting for the effects of the preferred alternatives for Amendment 17B, the predicted increases in net operating revenues for **Alternatives 3A, 3B, 3C,** and **3D** in combination with **Preferred Alternatives 5** and **7** are no longer expected. Net operating revenues are expected to decline by between 32.5 and 36.4 percent with **Alternatives 4A, 4B, 4C,** and **4D** in combination with **Preferred Alternatives 5** and **7**. Net operating revenues for **Preferred Alternative 3E** were expected to increase by approximately 5.4 percent without Amendment 17B, but are expected to decline by approximately 1.3 percent after accounting for the effects of Amendment 17B.

Fishermen in the Florida Keys were predicted to be relatively unaffected by proposed regulations in Amendment 17A. However, the proposed restrictions on the use of bottom longlines and the aggregate ACL for shallow water groupers in Amendment 17B would result in a reduction in net operating revenues of slightly less than 5 percent for **Alternatives 3A, 3B, 3C,** and **3D** in combination with **Preferred Alternatives 5** and **7** and approximately 4.1 percent for **Alternatives 4A, 4B, 4C,** and **4D** in combination with **Preferred Alternatives 5** and **7**. Net operating revenues for **Preferred Alternative 3E** in combination with **Preferred Alternatives 5** and **7** are expected to decline in the Florida Keys by approximately 4.9 percent after accounting for the preferred alternatives in Amendment 17B.

Without accounting for the effects of Amendment 17B, net operating revenues for fishermen in Georgia and northeast Florida were predicted to decline by approximately 68 percent due to **Alternatives 3A, 3B, 3C,** and **3D** in combination with **Preferred Alternatives 5** and **7**, by 61 percent for **Preferred Alternative 3E** in combination with **Preferred Alternatives 5** and **7**, and by approximately 70 percent with **Alternatives 4A, 4B, 4C,** and **4D** in combination with **Preferred Alternatives 5** and **7**. The preferred alternatives in Amendment 17B are expected to add approximately 2 percent to these losses. After accounting for the effects of Amendment 17B, net operating revenues are expected to decline by approximately 70 percent for **Alternatives 3A, 3B, 3C,** and **3D** in combination with **Preferred Alternatives 5** and **7**, by 63 percent for **Preferred Alternative 3E** in combination with **Preferred Alternatives 5** and **7**, and by approximately 72 percent with **Alternatives 4A, 4B, 4C,** and **4D** in combination with **Preferred Alternatives 5** and **7**. Similarly, the preferred alternatives in Amendment 17B are expected to add approximately 2 percent to the losses that were predicted for Amendment 17A.

Amendment 17B would prohibit the harvest of snowy grouper, other deep water groupers and blueline tilefish in waters deeper than 240 feet, and would have overridden the effects of an exemption for longlines in waters deeper than 300 feet (except for golden tilefish) had it been a preferred alternative for Amendment 17A. The preponderance of economic losses due to Amendments 17A and 17B still would be incurred by fishermen that use vertical line gear because that is the most widely used gear in the fishery. However, the losses expected for fishermen with bottom longline gear are greater both in dollar and percentage terms than when the expected effects of Amendment 17B are not considered.
Further detail on the analysis of simultaneous effects of Amendments 17A and 17B can be found in **Appendix O**. The appendix contains some detailed analyses not discussed here.

6 Other Things to Consider

6.1 Unavoidable Adverse Effects

Actions in Amendment 17A that may have unavoidable and adverse effects include updating management reference points, establishing a rebuilding plan for red snapper, closing an area to all snapper grouper fishing, and requiring the use of circle hooks north of 28 degrees latitude. These unavoidable and adverse effects are socioeconomic in nature.

According to the National Environmental Policy Act definitions of direct and indirect effects, defining a maximum sustainable yield (MSY) proxy for red snapper would not directly affect the biological or ecological environment, including Endangered Species Act-listed species, because these parameters are not used in determining immediate harvest objectives. The MSY proxy is a reference point used by fishery 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 long-term performance of the stock with respect to the MSY proxy. Therefore, this parameter definitions will indirectly affect red snapper and its 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 the threshold level.

Since red snapper are overfished and undergoing overfishing, Amendment 17A specifies a rebuilding plan according to which the stock will be returned to a rebuilt condition. The rebuilding schedule portion of the rebuilding plan defines the time within which the stock should be rebuilt. The Council has chosen the longest timeframe for rebuilding red snapper in order to mitigate, to maximum extent practicable, adverse socioeconomic impacts that would result from more restrictive management measures that would be required to rebuild the stock within a shorter time frame. Though immediate unavoidable adverse impacts on the socioeconomic environment will still accrue under the chosen rebuilding schedule, those impacts would not be as great as they would have been if the Council had chosen a shorter rebuilding schedule.

The rebuilding strategy portion of the rebuilding plan would set the rebuilding strategy as well as the optimum yield (OY) equal to the yield at 98%F_{MSY} (98%$F_{30\%}$). The annual catch limit (ACL) under **Sub-Alternative 9A** would be zero and under **Sub-Alternative 9B** the ACL would equal 144,000 lbs whole weight and would remain in effect until modified (Figure 4-5d). OY at equilibrium would be 2,425,000 lbs whole weight. Under the proposed rebuilding strategy, a 76% reduction in total kill would be required. At this rate of recovery, the stock has a 53% chance of rebuilding 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, and is not likely to produce an unavoidable adverse effects on the biological environment.

Proposed management measures for red snapper would adversely affect the commercial and recreational sectors of the snapper grouper fishery. Although the average overall expected reductions in net operating revenues are expected to be 4.8 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. 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 be 30% with the spearfishing and black sea bass pot exemptions.

For the recreational sector, the various alternatives would entail consequent effects on the industries supporting the fishing industry and on the regional economies, in addition to overall short-term headboat/charter boat revenue losses (17.8 million dollars) (**Section 4.3.2**). 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.

Requiring circle hooks for vessels associated with South Atlantic Unlimited Snapper Grouper Permits or South Atlantic 225 lb Trip Limit Permits for snapper grouper would not be expected to yield any unavoidable adverse effects on the biological environment; in fact the action is intended to positively affect the biological environment. In general, 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 in **Section 4.4.1**.

Unavoidable adverse affects of implementing a monitoring program for red snapper would be associated with the use of administrative resources to implement and maintain the subject monitoring program. Under both alternatives being considered by the Council, a substantial amount of funding, time, and personnel would be required to either supplement the existing Marine Resources Monitoring Assessment and Prediction program, or establish a new fishery-dependent monitoring program. Furthermore, these costs would be recurring (likely annually) for the duration of the red snapper rebuilding schedule. Each year funding would need to be secured and personnel would need to be dedicated to collecting and analyzing the data gathered.

6.2 Effects of the Fishery on the Essential Fish Habitat

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 essential fish habitat (EFH) or EFH-Habitat of Particular Concern (EFH-HAPC) 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 Council's 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.

6.3 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 essential fish habitat (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 exclusive economic zone; 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) implemented 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), implemented an action to reduce bycatch by requiring fishermen use 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 Habitat of Particular Concern (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.

6.4 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, and co-occurring snapper grouper species 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.

6.5 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 South Atlantic red snapper stock.

Since the Snapper Grouper Fishery Management Plan and its implementing regulations are always subject to future changes, proceeding with the development of Amendment 17A 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.

6.6 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 regulations 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…".

A stock assessment has been conducted for red snapper using the best available data available. Status determinations for red snapper were derived from the Southeast Data Assessment and Review (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 Scientific and Statistical Committee (SSC). SEDAR participants, the Council advisory committees, the Council, and NOAA Fisheries Service staff reviewed and considered any concerns about the adequacy of the data. **Appendix Q** lists data needs that resulted from the most recent snapper grouper assessments. The Council's SSC determined that the red snapper assessment is based on the best available data, and additional data are not available at this time because the SEDAR assessment scheduled for 2010 will not be completed until December 2010. This assessment will include the effect of a recent wave of recruits entering the fishery on overall abundance and subsequent harvest reductions needed to rebuild the stock.

The Council's Snapper Grouper Committee acknowledged, while stock assessment findings can be associated with different degrees of uncertainty, 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. None of the impacts of decisions made despite the above mentioned unavailable and incomplete information would be catastrophic in nature as described in Section 1502.22(4) of implementing regulations for the National

Environmental Policy Act (NEPA). It should also be noted that a benchmark assessment for red snapper is scheduled to be completed in December 2010. This assessment may provide some analysis that was not available during the development of Amendment 17A. Any changes to red snapper management that may result from the outcome of the 2010 assessment would be analyzed in a separate NEPA document.

7 List of Preparers

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

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8 List of Agencies, Organizations, and Persons To Whom Copies of the Statement are Sent

Responsible Agency

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SAFMC Law Enforcement Advisory Panel
SAFMC Snapper Grouper Advisory Panel
SAFMC Marine Protected Areas Advisory Panel
SAFMC Scientific and Statistical Committee
SAFMC Education and Outreach Advisory Panel
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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