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APR 06 2011 F/SER25:RD

MEMORANDUM FOR: Paul N. Doremus, Ph.D.
NOAA NEPA Coordinator

FROM: for Roy E. Crabtree, Ph.D. James E. Weaver
Regional Administrator

SUBJECT: Regulatory Amendment 10 to the Fishery Management Plan for the Snapper-Grouper Fishery of the South Atlantic Region with Environmental Assessment, Final Regulatory Flexibility Analysis, Regulatory Impact Review, and Fishery Impact Statement/Social Impact Assessment (Regulatory Amendment 10) (RIN 0648-BA51)

The attached subject environmental assessment (EA) and Finding of No Significant Impact (FONSI) are forwarded for your review. The EA and FONSI have been prepared in accordance with the provisions of: (1) NOAA Administrative Order 216-6, Environmental Review Procedures For Implementing The National Environmental Policy Act; and (2) the Council on Environmental Quality's Regulations For Implementing The Procedural Provisions of The National Environmental Policy Act (40 CFR Parts 1500-1508).

Based on the environmental impact analysis within the attached EA, I have determined that no significant environmental impacts will result from the proposed action. I therefore have approved the FONSI for this proposed action. I request your concurrence with the EA and its FONSI. I also recommend, subject to a request from the public, that you release the documents for public review.

1. I concur. 7 APR 11
NOAA NEPA Coordinator Date

2. I do not concur. _____
NOAA NEPA Coordinator Date

Attachments

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
PROGRAM PLANNING AND INTEGRATION
Silver Spring, Maryland 20910

APR 7 2011

To All Interested Government Agencies and Public Groups:

Under the National Environmental Policy Act, an environmental review has been performed on the following action.

TITLE: Regulatory Amendment 10 to the Snapper-Grouper Fishery Management Plan of the South Atlantic Region (Regulatory Amendment 10) (RIN 0648-BA51)

LOCATION: Economic exclusive zone off the Southeast coast

SUMMARY: At their December 2010 meeting, the South Atlantic Fishery Management Council (Council) approved Regulatory Amendment 10 for review by the Secretary of Commerce by a unanimous vote. The proposed action in Regulatory Amendment 10 is an elimination of a snapper-grouper area closure approved in Amendment 17A to the Fishery Management Plan for the Snapper-Grouper Fishery of the South Atlantic Region (Amendment 17A). The actions in Amendment 17A, which include a harvest prohibition for red snapper and a snapper-grouper area closure, were based upon the results of a stock assessment conducted through the Southeast Data Assessment and Review (SEDAR) process completed in 2008 (SEDAR 15). The closure is 4,827 square miles and extends from southern Georgia to northern Florida where harvest and possession of all snapper-grouper species would be prohibited (except when fishing with black sea bass pots or spearfishing gear for species other than red snapper). The closure was scheduled to be implemented on January 3, 2011, but the effective date has been delayed until June 1, 2011, via an emergency rule.

The action in Regulatory Amendment 10 is based upon the results of a stock assessment completed in 2010 (SEDAR 24). The Council's Scientific and Statistical Committee reviewed SEDAR 24 at their November 2010 meeting and approved it as the best available science and usable for management purposes. In a memo dated January 18, 2011, the Southeast Fisheries Science Center certified that Regulatory Amendment 10 is based upon the best available scientific information.

RESPONSIBLE
OFFICIAL:

Roy E. Crabtree, Ph.D.
Regional Administrator
National Marine Fisheries Service, National Oceanic and Atmospheric Administration (NOAA)
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
(727) 824-5305

The environmental review process led us to conclude that this action will not have a significant impact on the environment. Therefore, an environmental impact statement was not prepared. A copy of the finding of no significant impact (FONSI), including the environmental assessment, is enclosed for your information.

Although NOAA is not soliciting comments on this completed EA/FONSI we will consider any comments submitted that would assist us in preparing future NEPA documents. Please submit any written comments to the Responsible Official named above.

Sincerely,

Paul N. Doremus, Ph.D.
NOAA NEPA Coordinator

Enclosure

Regulatory Amendment 10

to the Snapper Grouper Fishery Management Plan
of the South Atlantic Region

Red Snapper Management

Environmental Assessment | **Regulatory Flexibility Act Analysis** | **Regulatory Impact Review**

Social Impact Assessment

JANUARY 2011

Abbreviations and Acronyms Used in the FMP

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

Regulatory Amendment 10

to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region with Environmental Assessment, Initial Regulatory Flexibility Act Analysis, Regulatory Impact Review, and Social Impact Assessment

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Proposed actions: Modify management measures for limiting mortality of South Atlantic red snapper

Lead agency: FMP Regulatory Amendment – South Atlantic Fishery Management Council
EA - NOAA Fisheries Service

For Further Information Contact:

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What is a Regulatory Amendment?

Amendment 4 (SAFMC 1991) to the Snapper Grouper Fishery Management Plan (FMP; SAFMC 1983) established a framework procedure to provide for timely adjustments to the management program for the snapper grouper complex to prevent overfishing and/or rebuild a stock. This regulatory amendment applies to the established framework, which allows for modification to the regulations for area closures. Since the outcome of the new red snapper assessment (SEDAR 24) was unknown at the time amendment 17A was being developed and finalized, it was appropriate for the Council to consider changes to the regulations implemented through amendment 17A via a regulatory amendment that would take into consideration the outcome of SEDAR 24.

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Chapter 1. Introduction

1.1 What Actions Are Being Proposed?

Fishery managers are proposing changes to or elimination of a snapper grouper area closure through Regulatory Amendment 10 to the Snapper Grouper Fishery Management Plan. Changes are being proposed in response to the availability of more recent scientific information concerning red snapper in South Atlantic waters.

1.2 Who is Proposing Action?

The South Atlantic Fishery Management Council (Council) is proposing the actions. The Council develops the regulations and submits them to the National Marine Fisheries Service (NMFS) who ultimately approves, disapproves, or partially approves the actions in the amendment on behalf of the Secretary of Commerce. NMFS is an agency in the National Oceanic and Atmospheric Administration.

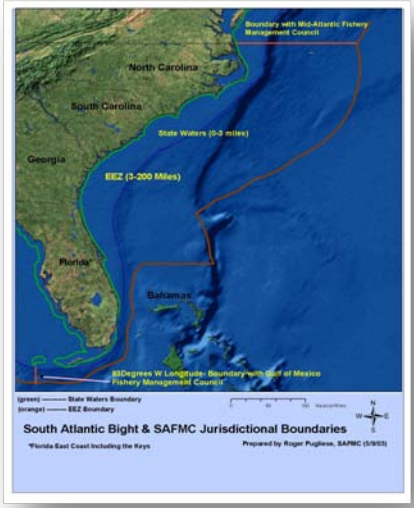
South Atlantic Fishery Management Council

- Responsible for conservation and management of fish stocks
- Consists of 13 voting members who are appointed by the Secretary of Commerce
- Management area is from 3 to 200 miles off the coasts of North Carolina, South Carolina, Georgia, and Florida
- Develops management plans and recommends regulations to NMFS and NOAA for implementation

1.3 Where is the Project Located?

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**).

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



1.4 Why is the Council Considering Action?

A stock assessment completed in February 2008 shows that the red snapper stock in the South Atlantic is experiencing overfishing and is overfished (SEDAR 15 2008). As a result of the assessment, red snapper was closed temporarily through an interim rule from January 4th, 2010 to December 5, 2010, to enable the Council to develop measures to end overfishing in Amendment 17A to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (Amendment 17A). Prior regulations included 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. Management measures in Amendment 17A were submitted to the Secretary of Commerce on July 20th, 2010 and approved on October 27th, 2010. Measures in Amendment 17A included the continuation of the red snapper harvest prohibition (moratorium) established through the interim rule in addition to a prohibition on the harvest and retention of most snapper grouper species in a 4,827 mi^2 area **(Figure 1-2; Table 1-1).** See **Appendix J** for a list of species in the Snapper Grouper management unit.

Figure 1-2. The closure approved in Amendment 17A.

Table 1-1. Waypoints for the closure approved in Amendment 17A

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"

A new stock assessment for red snapper was completed in October 2010 through the Southeast, Data, Assessment, and Review (SEDAR) process. See **section 3.2.1.2** for a detailed description of SEDAR. The more recent assessment was prepared to evaluate a potential strong year class that occurred since the SEDAR 15 assessment was completed and to incorporate the results of extensive age sampling conducted in 2009. The new assessment also evaluated some of the key uncertainties from the prior effort, such as the historic landings levels, fishery selectivity, and discard mortality rates.

Results between the two assessments are not greatly different. Both assessments indicate the red snapper stock is overfished and undergoing overfishing **(Figures 1-3 and 1-4)**. The most recent assessment (SEDAR 24 2010) indicates that the stock biomass has benefited from two recent strong recruitment years and that the stock, while still overfished, is in better condition that what was estimated in SEDAR 15. In addition, the magnitude of overfishing is less than indicated in the previous assessment.

Purpose for Action

To reduce the spatial and temporal coverage of the snapper grouper closure approved in Amendment 17A, or eliminate it, based on the most recent scientific information concerning the red snapper stock in the South Atlantic.

Need for Action

To end overfishing and rebuild the stock while minimizing, to the extent practicable, adverse social and economic effects.

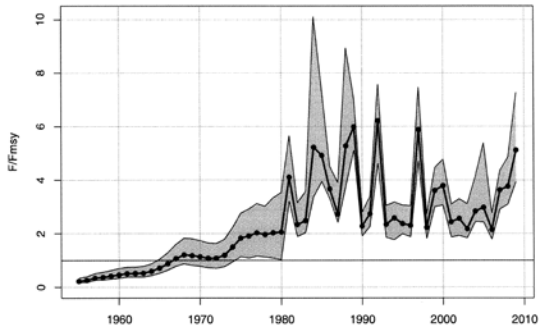


Figure 1-3. The overfishing ratio for red snapper over time. The stock is undergoing overfishing when the F/F_{MSY} is greater than one.

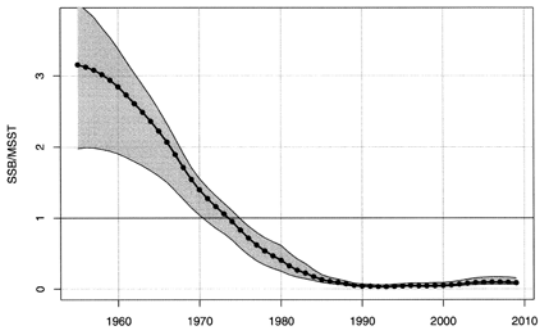


Figure 1-4. The overfished ratio for red snapper over time. The stock is overfished when the SSB/MSST is less than one.

While both assessments indicate the stock is undergoing overfishing and is overfished, the results of SEDAR 24 suggest that the closure to snapper grouper species in Amendment 17A could be reduced in space and time or eliminated. Regulatory Amendment 10 will consider alternatives to reduce the size/shorten the time length of the snapper grouper area closure or to eliminate it, but will not change the red snapper moratorium. The Council could revise the red snapper moratorium through subsequent management action.

1.5 How Much Can the Council Reduce the Size and Shorten the Length of the Area Closure or Can It Be Eliminated?

In order to determine the reduction necessary to end overfishing of the red snapper stock, fishery biologists compare *recent red snapper removals* to a *target level*. The following equation is used:

$$\text{REDUCTION REQUIRED} = \frac{\text{(Estimated Removals - Target Removals)}}{\text{Estimated Removals}}$$

The estimated removals and target removals will change with *model runs*. The mathematical model used to conduct the stock assessment for red snapper performed many runs, each run varying a source of data or an assumption. The SEDAR Review Panel identified what is referred to as a *base run* but also acknowledged the following:

The Review Panel suggested using the AW (Assessment Workshop) base-case model to provide an assessment of the red snapper stock, but cautions that this was one realization of a number of plausible runs.

The Council's Scientific and Statistical Committee (SSC) reviewed the assessment at their November 2010 meeting and approved it as the best available science and usable for management purposes. The SSC discussed how to use the model results to provide fishing level recommendations to the Council (SSC Report 2010). The SSC decided to base their recommendations on three runs of the model using different "weights" for the headboat index since the latter was considered the most reliable. A weight function is used to give some elements more "weight" or influence on the results than other elements in the same model. The base run used a headboat (hb) weight of 0.11. The SSC chose to provide a range for fishing level recommendations based on headboat survey weighting alternatives explored by the SEDAR 24 Review Panel (hb = 0.2, hb = 0.25, and hb = 0.3). The SSC recommended using these 3 values to derive a range of $F_{REBUILD}$ projections and to provide values for Acceptable Biological Catch (ABC). **Table 1-2** shows the percent reductions in fishing mortality required to end overfishing. The reductions are from the average mortality estimate from 2007-2009.

Table 1-2. Reduction required by model run.

SSC Scenario	Reduction Required	
	2011	2012
Headboat weight=0.2	75%	69%
Headboat weight=0.25	72%	65%
Headboat weight=0.3	70%	62%

1.6 History of Management

The red snapper stock in the South Atlantic has been regulated since 1983 (**Table 1-3**). See **Appendix C** for a detailed history of management. Recent actions since the first SEDAR assessment in 2008 are presented in **Figure 1-5**. The delayed effective date of the snapper-grouper area closure enacted by the emergency rule provided the Council time to respond to the new scientific information from the SEDAR 24 benchmark stock assessment.

Table 1-3. Overview of Red Snapper Regulations.

	Commercial Fishery Regulations	Recreational Fishery Regulations	
Effective Date	***Size Limit***	***Size Limit***	***Possession Limit***
8/31/1983	12" TL	12" TL	
1/1/1992	20" TL	20" TL	
1/1/1992			10 snapper/person/day bag limit, excluding vermilion snapper, and allowing no more than 2 red snappers.
1/4/2010	Commercial and recreational harvest and possession prohibited from 1/4/10 to 6/2/10, and can be extended for 186 days.		
7/20/2010	Council submits regulations to close red snapper fishery and the snapper grouper fishery in a 4,827 mi^2 area.		

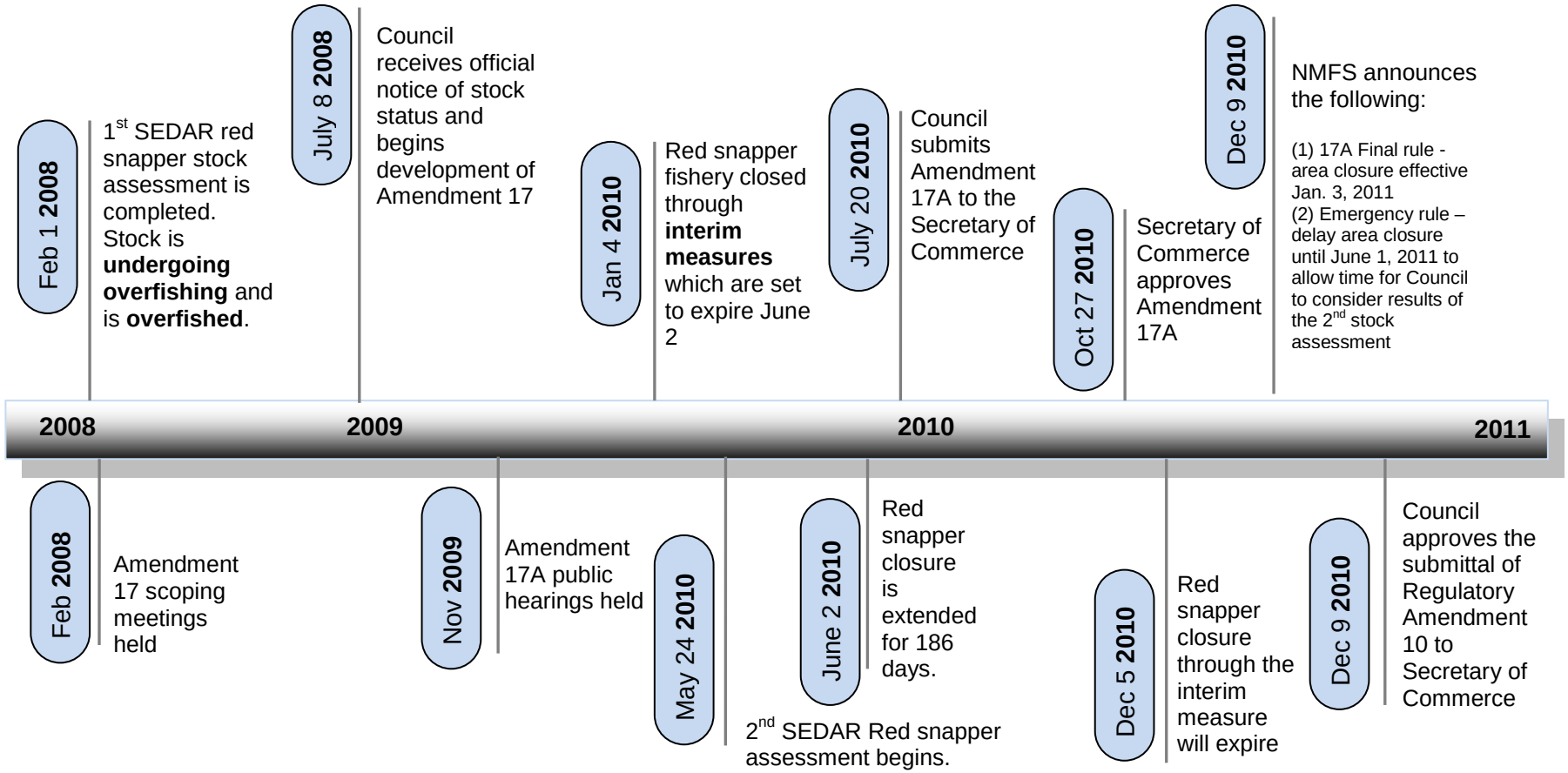


Figure 1-5. Timeline of recent red snapper management measures.

Chapter 2. Proposed Actions

2.1 What are the Proposed Actions?

There are 11 alternatives analyzed in this amendment **(Tables 2-1). Alternative 1**, the no action alternative, is the management measure approved in Amendment 17A to the Snapper Grouper Fishery Management Plan (Amendment 17A) and would implement the snapper grouper area closure. The *snapper grouper area closure* refers to prohibition of fishing for, possession, and retention of snapper grouper species in a specific area. **Alternatives 2 through 10** all would implement a smaller area closure and/or for a portion of the year. **Alternatives 2 through 5** would implement a closure for 2011. **Alternatives 6 through 10** would implement a closure for 2011 and then another for the year 2012. **Alternative 11 (Preferred)** would not implement the snapper grouper closure approved in Amendment 17A.

Required Reduction
2011: 70-75%
2012: 62-69%

Table 2-1. Characteristics of alternatives 1 through 11 in Action 1 and reductions in red snapper removals with varying degrees of projected effort shift.

Alt.	Snapper Grouper Spatial Closure			Percent Reduction (includes reduction from moratorium)		
	Commercial Logbook Grids	Depth (ft)	Length of Closure	Effort shift= 100%	Effort shift= 50%	Effort shift= 0%
1 (no action)	2880, 2980, 3080	98-240	Year-round	2011: 70 2012: 79	2011: 71 2012: 80	2011: 73 2012: 81
2	2880, 2980	98-240	May through October	68	69	70
3	2880, 2980, 3080	98-240	May through August	68	70	71
4	2880, 2980, 3080	98-240	July through December	69	70	72
5	2880, 2980, 3080	98-240	May through December	70	71	73
6	2011: 2880, 2980, 3080 2012: 2880, 2980	2011: 66-240 2012: 98-240	2011: May through December 2012: May through October	2011: 71 2012: 68	2011: 73 2012: 69	2011: 75 2012: 70
7	2011: 2880, 2980 2012: 2980	2011: 98-240 2012: 98-240	2011: May through October 2012: June through July	2011: 68 2012: 66	2011: 69 2012: 67	2011: 70 2012: 67
8	2011: 2880, 2980 2012: 2880, 2980	2011: 98-240 2012: 98-240	2011: May through October 2012: July	2011: 68 2012: 65	2011: 69 2012: 66	2011: 70 2012: 67
9	2011: 2880, 2980, 3080 2012: 2880, 2980	2011: 98-240 2012: 98-240	2011: July through December 2012: January through April	2011: 69 2012: 68	2011: 70 2012: 69	2011: 72 2012: 71
10	2011: 2880, 2980, 3080 2012: 2880, 2980	2011: 98-240 2012: 98-240	2011: May through December 2012: January through April	2011: 70 2012: 68	2011: 71 2012: 69	2011: 73 2012: 71
11 (preferred)	Do not implement the snapper grouper area closure approved in Amendment 17A to the Snapper Grouper Fishery Management Plan.			77%[1]		

[1]An evaluation of predicted moratorium effectiveness using 2007-2009 baseline data indicates that the moratorium will provide a 66% reduction in removals of red snapper based on an Interactive Combined Effects (ICE) Model for South Atlantic Red Snapper (SERO 2010). However, analyses contained in **Appendix I** suggest that the red snapper fishing moratorium has been more effective in reducing mortality of red snapper. The analysis incorporates fishing effort reduction, in addition to the reduction in red snapper removals in 2010 in the South Atlantic. Evidence provided by the Marine Recreational Fisheries Statistics Survey (MRFSS) suggests effort in the South Atlantic is down 33% and total removals in pounds are down 81% when 2010 is compared to the 2007-2009 baseline. Including MRFSS Wave 1-4 data for 2010 as a percentage reduction from the 2007-2009 baseline period, along with the projected trip elimination reductions for the commercial and headboat sector, suggests that an overall reduction in red snapper removals of 77% may have been achieved by the moratorium in 2010. Note: **Alternative 11** was the only alternative evaluated using the analysis detailed in **Appendix I**. As such, the reduction in red snapper fishing mortality for **Alternative 11** is higher than most of the other alternatives as reported in the table above. Also, the required reduction to end overfishing was computed from the SSC-recommended model runs and not the base run identified by the SEDAR Review Panel (see **Section 1.5** for more information).

2.2 List of Alternatives

2.2.1 Changes to the Snapper Grouper Closure

Alternative 1 (No Action) was approved in Amendment 17A. This action was developed to end overfishing of red snapper and rebuild the stock to sustainable levels based on SEDAR 15.

Alternative 1 (No Action)

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 2-2** to define the area (4,827 mi² of the South Atlantic EEZ) **(Figure 2-1)**.

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. 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. The prohibition on possession does not apply to a person aboard a vessel that is in transit with legally harvested snapper grouper species on board and with fishing gear appropriately stowed.

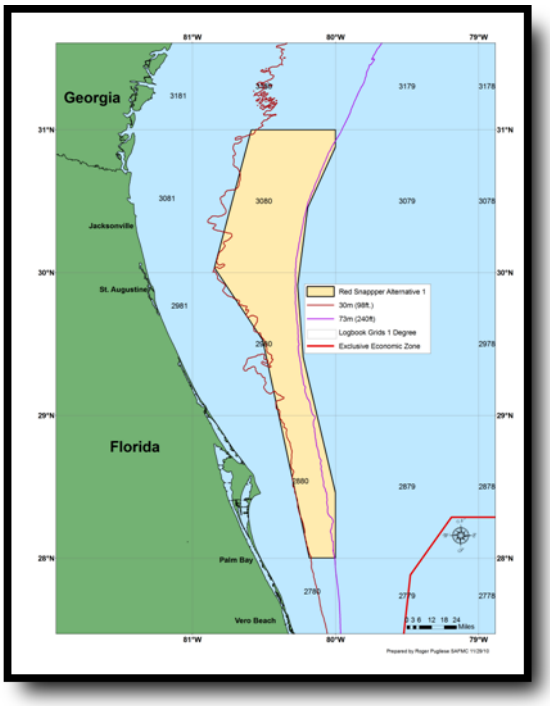


Figure 2-1. The snapper grouper area closure under Alternative 1 (No Action)

Table 2-2. Coordinates for the closure approved in Amendment 17A

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"

Definitions for Alternative 1

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."

Alternative 2

Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) from May 1 through October 31 in an area that includes commercial logbook grids 2880 and 2980 from 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in **Table 2-3** to define the area (3,765 mi² of the South Atlantic EEZ) **(Figure 2-2)**.

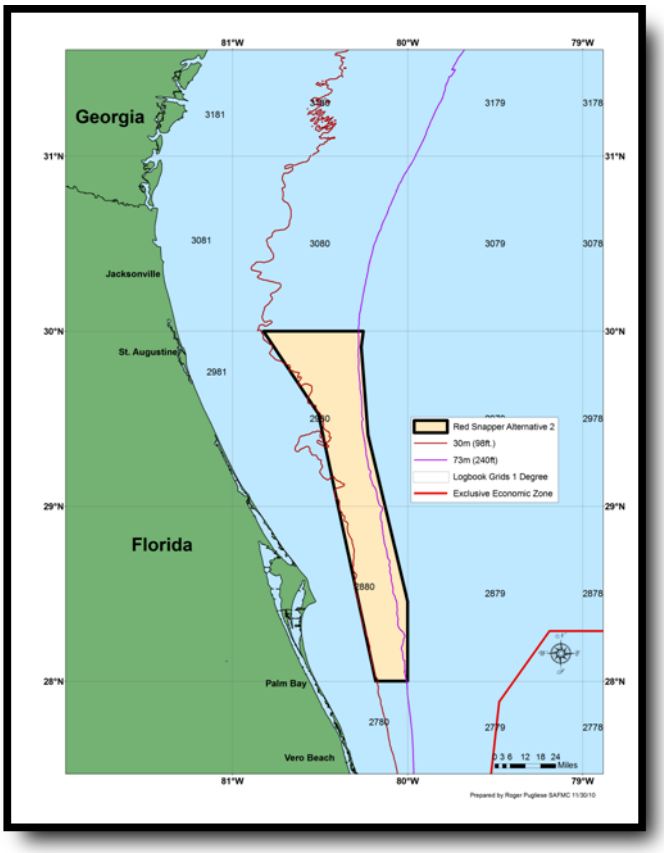


Figure 2-2. The snapper grouper area closure under Alternative 2

Table 2-3. Coordinates for Alternative 2

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° 00' 00"	80° 49' 23"
5	30° 00' 00"	80° 15' 09"
6	29° 54' 31"	80° 15' 51"
7	29° 24' 24"	80° 13' 32"
8	28° 27' 20"	80° 00' 00"

Alternative 3

Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) from May 1 through August 31 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 2-4** to define the area (4,827 mi² of the South Atlantic EEZ) **(Figure 2-3)**.

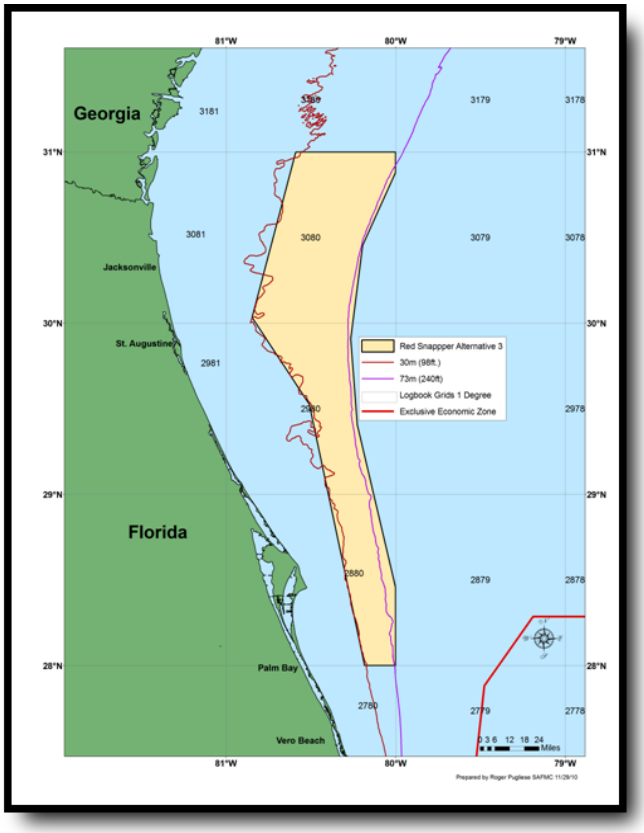


Figure 2-3. The snapper grouper area closure under Alternative 3

Table 2-4. Coordinates for Alternative 3

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 4

Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) from July 1 through December 31 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 2-5** to define the area (4,827 mi² of the South Atlantic EEZ) **(Figure 2-4)**.

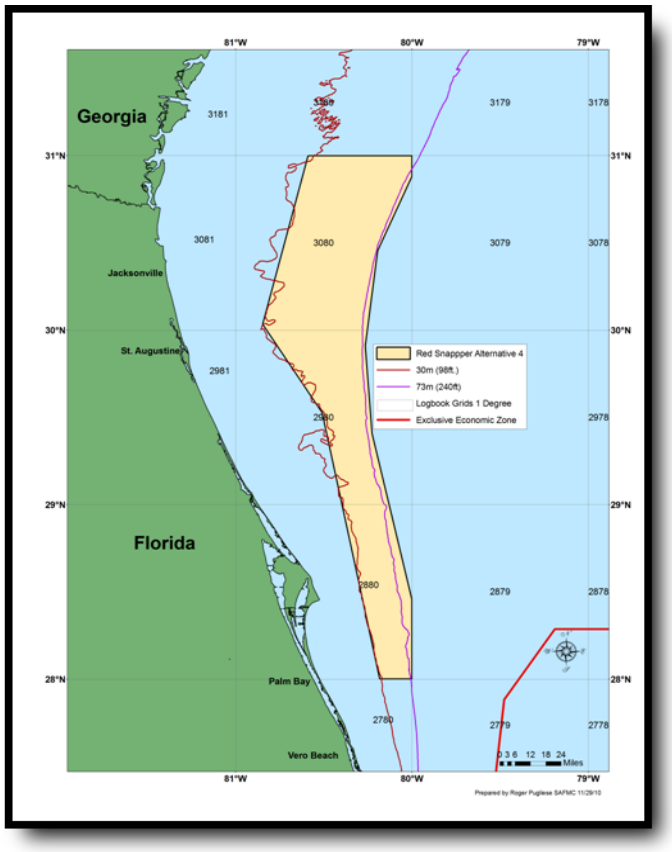


Figure 2-4. The snapper grouper area closure under Alternative 4

Table 2-5. Coordinates for Alternative 4

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 5

Prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) from May1 through December 31 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 2-6** to define the area (4,827 mi² of the South Atlantic EEZ) **(Figure 2-5)**.

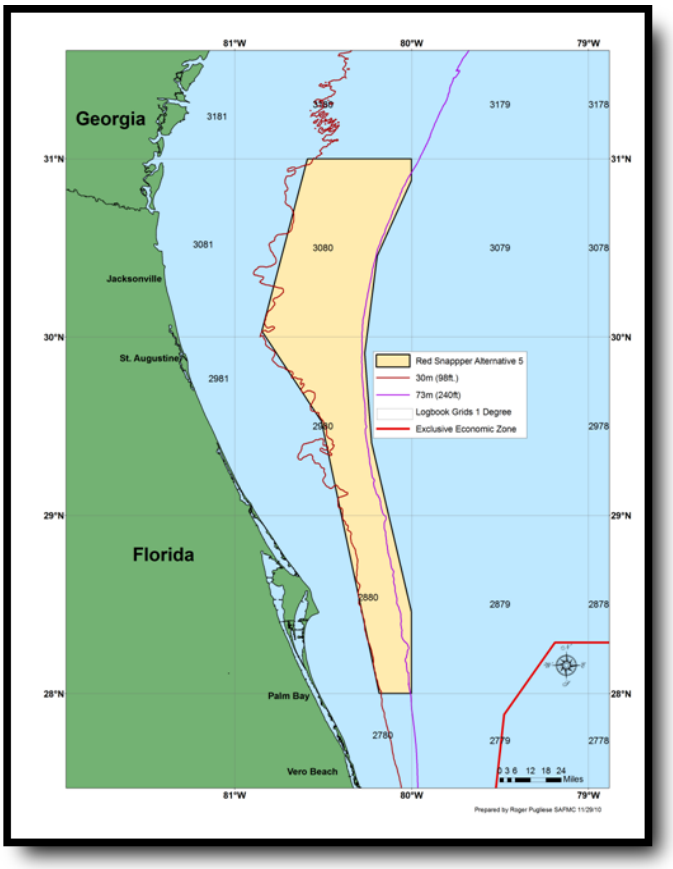


Figure 2-5. The snapper grouper area closure under Alternative 5

Table 2-6. Coordinates for Alternative 5

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 6

In 2011, prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) from May 1 through December 31 in an area that includes commercial logbook grids 2880, 2980, and 3080 from 66 feet (11 fathoms; 20 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in **Table 2-7** to define the area (10,788 mi² of the South Atlantic EEZ) **(Figure 2-6)**.

In 2012 and until modified by the Council, prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) from May 1 through October 31 in an area that includes commercial logbook grids 2880 and 2980 from 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in **Table 2-8** to define the area (3,765 mi² of the South Atlantic EEZ) **(Figure 2-6)**.

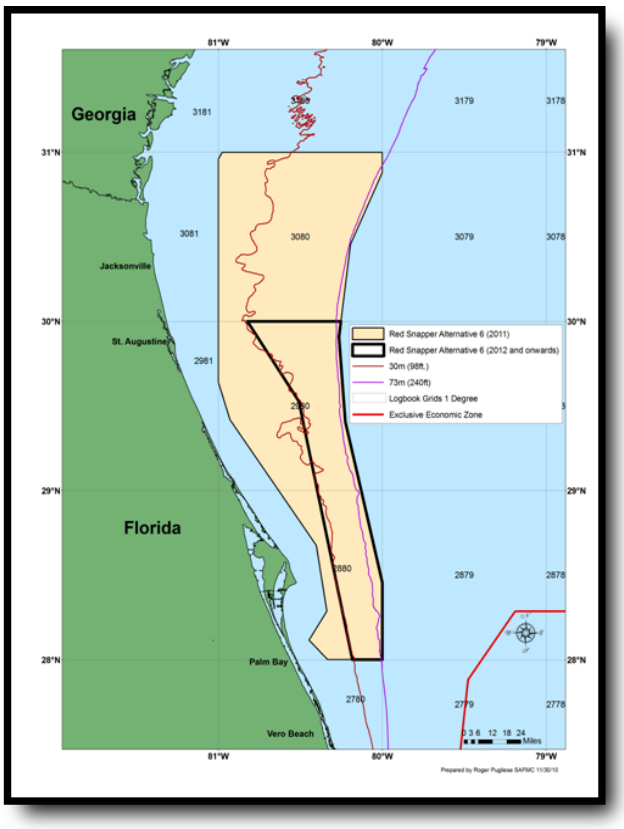


Figure 2-6. The snapper grouper area closure under Alternative 6 in 2011 and 2012

Table 2-7. Coordinates for Alternative 6 in 2011

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° 00' 00"	80° 37' 56"
7	29° 25' 09"	80° 55' 44"
8	29° 38' 20"	81° 00' 00"
9	30° 57' 40"	81° 00' 00"
10	31° 00' 00"	80° 58' 40"
11	31° 00' 00"	80° 00' 00"
12	30° 52' 54"	80° 00' 00"
13	30° 27' 19"	80° 11' 41"
14	29° 54' 31"	80° 15' 51"
15	29° 24' 24"	80° 13' 32"
16	29° 00' 00"	80° 07' 45"
17	28° 27' 20"	80° 00' 00"

Table 2-8. Coordinates for Alternative 6 in 2012

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° 00' 00"	80° 49' 23"
5	30° 00' 00"	80° 15' 09"
6	29° 54' 31"	80° 15' 51"
7	29° 24' 24"	80° 13' 32"
8	28° 27' 20"	80° 00' 00"

Alternative 7

In 2011, prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) from May 1 through October 31 in an area that includes commercial logbook grids 2880 and 2980 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 (3,765 mi² of the South Atlantic EEZ) **(Figure 2-7)**.

In 2012 and until modified by the Council, prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) from June 1 through July 31 in an area that includes commercial logbook grid 2980 from 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in **Table 2-12** to define the area (1,389 mi² of the South Atlantic EEZ) **(Figure 2-8)**.

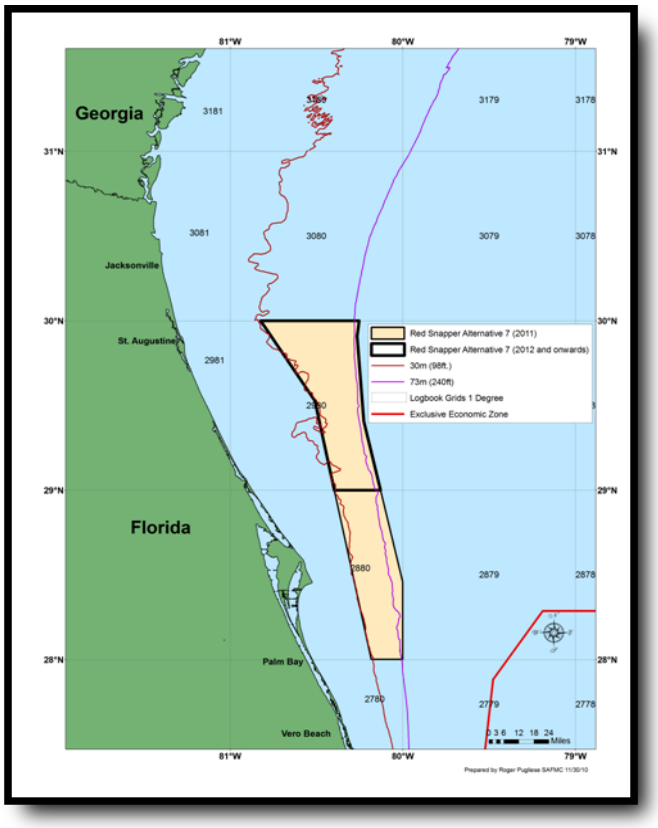


Figure 2-7. The snapper grouper area closure under Alternative 7 in 2011 and 2012

Table 2-9. Coordinates for Alternative 7 in 2011

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° 00' 00"	80° 49' 23"
5	30° 00' 00"	80° 15' 09"
6	29° 54' 31"	80° 15' 51"
7	29° 24' 24"	80° 13' 32"
8	28° 27' 20"	80° 00' 00"

Table 2-10. Coordinates for Alternative 7 in 2012

Waypoint Number	Latitude	Longitude
1	29° 00' 00"	80° 07' 45"
2	29° 00' 00"	80° 23' 47"
3	29° 31' 40"	80° 30' 34"
4	30° 00' 00"	80° 49' 23"
5	30° 00' 00"	80° 15' 09"
6	29° 54' 31"	80° 15' 51"
7	29° 24' 24"	80° 13' 32"

Alternative 8

In 2011, prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) from May 1 through October 31 in an area that includes commercial logbook grids 2880 and 2980 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 (3,765 mi² of the South Atlantic EEZ) **(Figure 2-8)**.

In 2012 and until modified by the Council, prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) from July 1 through July 31 in an area that includes commercial logbook grids 2880 and 2980 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 (3,765 mi² of the South Atlantic EEZ) **(Figure 2-8)**.

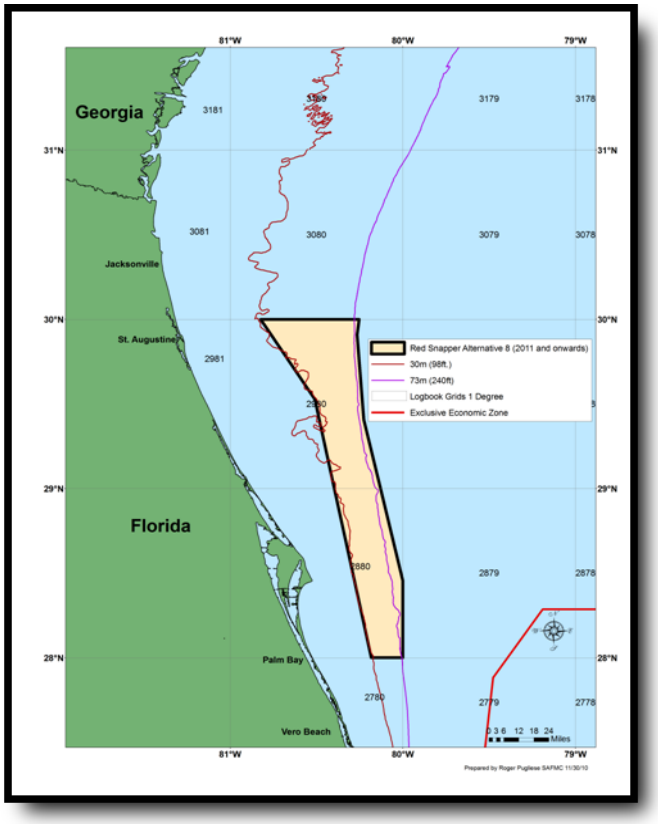


Figure 2-8. The snapper grouper area closure under Alternative 8

Table 2-11. Coordinates for Alternative 8 in 2011 and 2012

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° 00' 00"	80° 49' 23"
5	30° 00' 00"	80° 15' 09"
6	29° 54' 31"	80° 15' 51"
7	29° 24' 24"	80° 13' 32"
8	28° 27' 20"	80° 00' 00"

Alternative 9

In 2011, prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) from July 1 through December 31 in an area that includes commercial logbook grids 2880, 2980, 3080 from 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in **Table 2-12** to define the area (4,827 mi² of the South Atlantic EEZ) **(Figure 2-9)**.

In 2012 and until modified by the Council, prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) from January 1 through April 30 in an area that includes commercial logbook grids 2880 and 2980 from 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in **Table 2-13** to define the area (3,765 mi² of the South Atlantic EEZ) **(Figure 2-9)**.

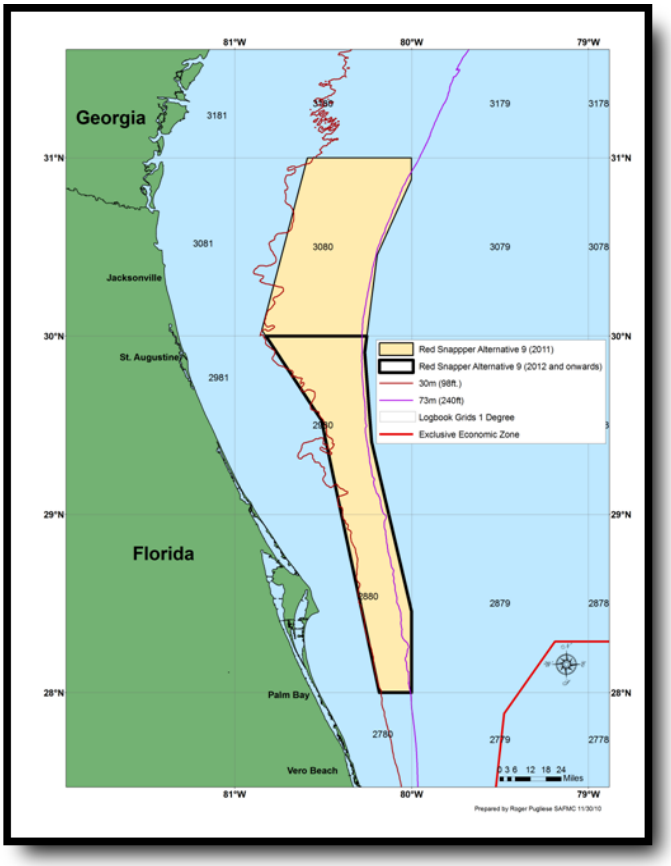


Figure 2-9. The snapper grouper area closure under Alternative 9 in 2011 and 2012

Table 2-12. Coordinates for Alternative 9 in 2011

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"

Table 2-13. Coordinates for Alternative 9 in 2012

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° 00' 00"	80° 49' 23"
5	30° 00' 00"	80° 15' 09"
6	29° 54' 31"	80° 15' 51"
7	29° 24' 24"	80° 13' 32"
8	28° 27' 20"	80° 00' 00"

Alternative 10

In 2011, prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) from May 1 through December 31 in an area that includes commercial logbook grids 2880, 2980, 3080 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 (4,827 mi² of the South Atlantic EEZ) **(Figure 2-10)**.

In 2012 and until modified by the Council, prohibit commercial and recreational fishing for, harvest, and possession of all species in the snapper grouper fishery management unit (FMU) from January 1 through April 30 in an area that includes commercial logbook grids 2880 and 2980 from 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m), using coordinates shown in **Table 2-15** to define the area (3,765 mi² of the South Atlantic EEZ) **(Figure 2-10)**.

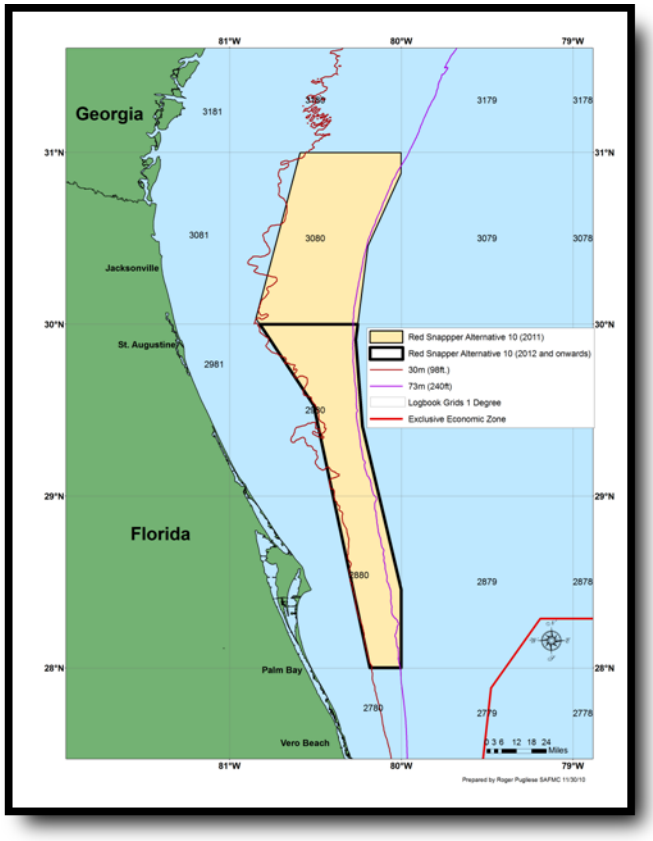


Figure 2-10. The snapper grouper area closure under Alternative 10 in 2011 and 2012

Table 2-14. Coordinates for Alternative 10 in 2011

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"

Table 2-15. Coordinates for Alternative 10 in 2012

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"

Alternative 11 (Preferred)

Do not implement the snapper grouper area closure approved in Amendment 17A to the Snapper Grouper Fishery Management Plan.[1]

[1]The red snapper moratorium would remain in effect under all the alternatives until modified by the Council.

Chapter 3. Affected Environment

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

- **Habitat environment** (Section 3.1)

  Examples include coral reefs and sea grass beds

- **Biological environment** (Section 3.2)

  Examples include populations of red snapper, corals, turtles

- **Human environment** (Section 3.3)

  Examples include fishing communities and economic descriptions of the fisheries

- **Administrative environment** (Section 3.4)

  Examples include the fishery management process and enforcement activities

3.1 Habitat Environment

Many deepwater snapper grouper species utilize both open-water and bottom habitats during several life-history stages; larval stages of these species live in the water column and feed on plankton. Most juveniles and adults are bottom-dwellers and associate with hard structures on the continental shelf that have moderate to high relief (e.g., coral reef systems and artificial reef structures, rocky hard-bottom substrates, ledges and caves, sloping soft-bottom areas, and limestone outcroppings). Juvenile stages of some snapper grouper species also utilize inshore seagrass beds, mangrove estuaries, lagoons, oyster reefs, and embayment systems. In many species, various combinations of these habitats may be utilized during daily feeding migrations or seasonal shifts in cross-shelf distribution.

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.

Artificial reef structures are also utilized to attract fish and increase fish harvests; however, research on artificial reefs is limited and opinions differ as to whether or not these structures promote an increase of ecological biomass or merely concentrate fishes by attracting them from nearby, natural unvegetated areas of little or no relief.

More detail on these habitat types is found in Volume II of the Council's Fishery Ecosystem Plan (SAFMC 2009) available at: http://www.safmc.net/ecosystem/Home/EcosystemHome/tabid/435/Default.aspx

3.1.1 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.

EFH utilized by snapper grouper species in the South Atlantic 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.

3.1.2 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).

3.2 Biological Environment

The reef environment in the South Atlantic management area affected by actions in this amendment is defined by two components (**Figure 3-1**). Each component will be described in detail in the following sections.

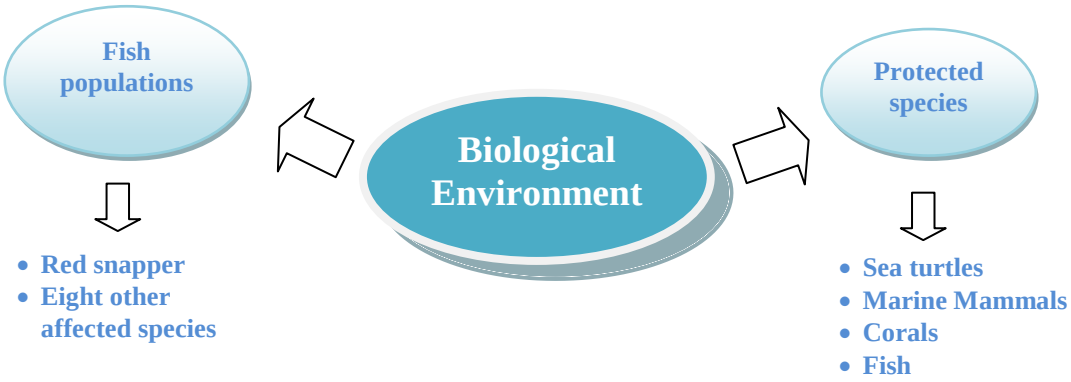


Figure 3-1. Two components of the biological environment described in this amendment.

3.2.1 Fish Populations

The waters off the south Atlantic coast are home to a diverse population of fish. The snapper grouper fishery management unit contains 73 species of fish **(Appendix J)**, many of them neither "snappers" or "groupers". These species live in depths from a few feet (typically as juveniles) to hundreds of feet. As far as north/south distribution, the more temperate species tend to live in the upper reaches of the South Atlantic management area (black sea bass, red porgy) while the tropical variety's core residence is in the waters off south Florida, Caribbean Islands, and northern South America (black grouper, mutton snapper).

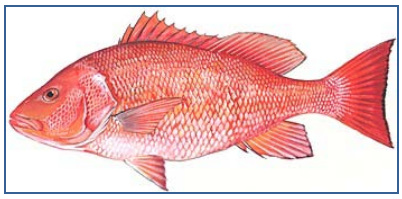
These are reef-dwelling species that live amongst each other. These species rely on the reef environment for protection and food. There are several reef tracts that follow the southeastern coast. The fact that these fish populations congregate together dictates the nature of the fishery (multi-species) and further forms the type of management regulations proposed in this amendment.

Regulatory Amendment 10 includes alternatives for management measures that could prohibit fishing for or retention of all snapper grouper species in areas off of north Florida and south Georgia, to end overfishing of red snapper by reducing the incidental catch of the species. Snapper grouper species commonly taken with red snapper could be affected by the action. In addition to red snapper, snapper grouper species most likely to be affected by the proposed actions includes many species that occupy the same habitat at the same time. Therefore, snapper grouper species are likely to be caught when regulated since they will be incidentally caught when fishermen target other co-occurring species.

3.2.1.1 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) **(Figure 3-2).**

Red Snapper Life History
An Overview



- Extend from North Carolina to the Florida Keys, and throughout the Gulf of Mexico to the Yucatan Peninsula
- Waters ranging from 33-623 feet
- Red snapper do not migrate but can move long distances
- The spawning season extends from May to October, peaking in July through September.
- Can live for at least 54 years

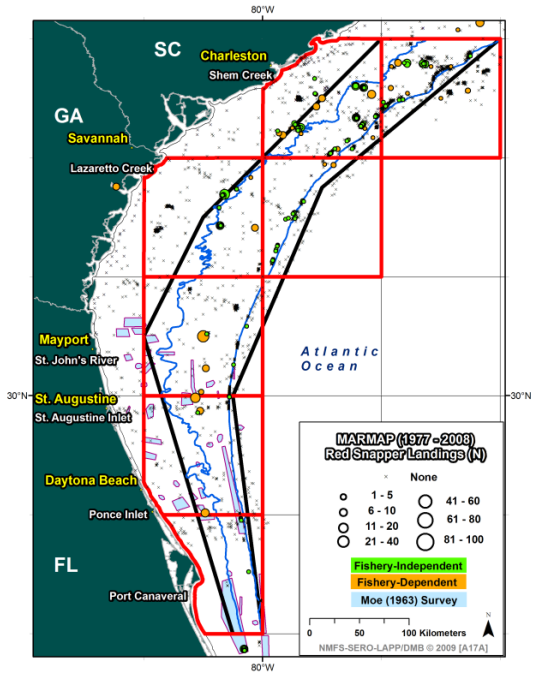


Figure 3-2. Distribution of red snapper taken by MARMAP in fishery-independent and fishery-dependent samples as well as locations where Moe (1963) reported red snapper.

The maximum size reported for this species is 100 cm (40 inches) TL (Allen 1985, Robins and Ray 1986) and 22.8 kg (50 lbs) (Allen 1985). Maximum reported age in the Gulf of Mexico is reported as 53 years by Goodyear (1995) and 57 years by Allman *et al.* (2002). For samples collected from North Carolina to eastern Florida, maximum reported age is 45 years (White and Palmer 2004). McInerny (2007) reports a maximum age of 54 years for red snapper in the South Atlantic. Natural mortality (M) is estimated to be 0.078 using the Hoenig (1983) method with a maximum age of 53 years (SEDAR 15 2008). Manooch *et al.* (1998) estimated M at 0.25 but the maximum age in their study was 25 years (Manooch and Potts 1997).

In the U.S. South Atlantic and in the Gulf of Mexico, Grimes (1987) reported that size of red snapper 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).

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.

3.2.1.2 Stock Status of Red Snapper

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*).

The Southeast Data, Assessment, and Review (SEDAR) process, initiated in 2002, is a cooperative Fishery Management Council process intended to improve the quality, timeliness and reliability of fishery stock assessments in the South Atlantic, Gulf of Mexico, and US Caribbean. SEDAR is managed by the Caribbean, Gulf of Mexico, and South Atlantic Regional Fishery Management Councils in coordination with NOAA Fisheries Service and the Atlantic and Gulf States Marine Fisheries Commissions. SEDAR emphasizes constituent and stakeholder participation in assessment development, transparency in the assessment process, and a rigorous and independent scientific review of completed stock assessments.

Following an 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 following sections describe the results of the two most recent stock assessments for red snapper in the South Atlantic, in addition to the recommendations from the SSC.

SEDAR 15 (completed in 2008)

The 2008 SEDAR 15 stock assessment concluded red snapper is overfished and undergoing overfishing. The South Atlantic Council's SSC approved the assessment and indicated it utilized 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 in the assessment consist of commercial catch/logbook records for the handline (hook-and-line) and dive fisheries, logbook data from the recreational headboat fishery, and MRFSS survey data of the rest of the recreational sector. The bulk of landings of red snapper come from the recreational

fishery and have exceeded the landings of the commercial fishery by 2-3 fold over the time series of data used in the assessment. Total landings exhibit a downward trend through the 1990s and remain relatively low thereafter.

Estimated abundance-at-age shows truncation of the oldest ages occurred from the 1950s into the 1980s; the age structure continues to be truncated. Fish of age 10 and above are rare in the population. Total biomass and spawning biomass show nearly identical trends with a sharp decline during the 1950s and 1960s, continued decline during the 1970s, and low levels without appreciable trend since 1980. Recruitment (numbers of age 1 fish) declined along with biomass, although notably strong year classes occurred in 1983 and 1984, and again in 1998 and 1999. Due to high fishing mortality rates, these occasional positive recruitment events were unable to contribute to population growth.

	SEDAR 15	SEDAR 24
Overfishing (F_{CURR}/MFMT value)	Yes (7.5)	Yes (4.1)
Overfished (B_{CURR}/MSST value)	Yes (0.03)	Yes (0.09)

- If F_{CURR}>MFMT, then undergoing overfishing. The higher the number, the greater degree of overfishing.
- If B_{CURR}<MSST, then overfished. The lower the number, the greater degree of overfished.
- Note: This is a comparison of the base runs. Changing the base run changes the level of overfishing/overfished.

Table 3-1. A comparison of the overfishing and overfished benchmarks between the two most recent SEDAR assessments for red snapper.

SEDAR 24 (completed in October 2010)

The results of the second assessment (SEDAR 24) are not greatly different from SEDAR 15 **(Table 3-1).** The most recent stock assessment indicates that stock biomass has benefited from two recent strong recruitment years and that the stock, while still overfished, is in slightly better shape that what was predicted in SEDAR 15.

It is important to note that the SEDAR Review Panel stated the following in the Review Workshop Report (SEDAR 24 2010):

"The panel suggests using the AW (Assessment Workshop) base case model to provide historical and current estimates of stock abundance, biomass, and exploitation, but cautions that this is one realization of a number of plausible runs and is conditioned on particular assumptions made about the data and population dynamics model that may change in future assessments."

SSC Recommendations

The SSC reviewed the assessment at their November 2010 meeting and approved it as the best available science and usable for management purposes. The SSC discussed how to use the model results to provide fishing level recommendations to the Council (SSC Report 2010). The SSC decided to base their recommendations on three runs of the model using different "weights" for the headboat index since the latter was considered the most reliable. A weight function is used to give some elements more "weight" or influence on the results than other elements in the same model. The base run used a headboat (hb) weight of 0.11. The SSC chose to use three

weights for the headboat index (hb = 0.2, hb = 0.25, and hb = 0.3) and base their catch level advice on the projections from each of these three model configurations. Table 3-2 shows the percent reductions that are required in 2011 and 2012 under each of the three scenarios.

Table 3-2. Reduction required by model run.

SSC Scenario	Reduction Required	
	2011	2012
Headboat weight=0.2	75%	69%
Headboat weight=0.25	72%	65%
Headboat weight=0.3	70%	62%

3.2.1.3 Other Fish Species Affected

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 incidentally caught when fishermen target other co-occurring species. The following species are ones that are most likely to be affected. Amendment 17A (SAFMC 2010a) Section 3.2.1, describes their life history characteristics in detail.

gag
(*Mycteroperca microlepis*)

golden tilefish
(*Lopholatilus chamaeleonticeps*)

gray triggerfish
(*Balistes capriscus*)

greater amberjack
(*Seriola dumerili*)

red grouper
(*Epinephelus morio*)

scamp
(*Mycteroperca phenax*)

snowy grouper
(*Epinephelus niveatus*)

vermilion snapper
(*Rhomboplites aurorubens*)

3.2.2 Protected Species

There are 31 different species of marine mammals that may occur in the EEZ of the South Atlantic region. All 31 species are protected under the Marine Mammal Protection Act (MMPA) 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). In addition to those six marine mammals, 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*]) are protected under the ESA. Amendment 17A, Section 3.5, describes their life history characteristics in detail and discusses the previous ESA section 7 determinations of impacts from the snapper grouper fishery on these species.

3.3 Human Environment

3.3.1 Economic Description of the Commercial Fishery

A description of the commercial component of the snapper grouper fishery is contained in Amendment 17A (SAFMC 2010a) and is incorporated herein by reference. The following is a brief summary and updated information, where available. Dollar values have been converted to 2008 dollars to be consistent with the available economic impact (business activity) model.

Amendment 17A (SAFMC 2010a) reported average annual commercial landings of all snapper grouper species in the South Atlantic from 2003-2007 of approximately 6.4 million pounds with an ex-vessel value of approximately $14.4 million (originally reported as $13.8 million, 2007 dollars). For 2008 and 2009, the comparable estimates are 6.2 million pounds, valued at $14.5 million, and 6.3 million pounds, valued at $13.5 million. The resulting most recent five-year average (2005-2009) harvest totals are approximately 6.3 million pounds valued at $14.4 million.

All harvests (all trips and all species) by all vessels harvesting snapper grouper averaged approximately $23.7 million over 2003-2007 (SAFMC 2010a; reported as $22.8 million in 2007 dollars). Comparable figures for 2008, 2009, or the 2005-2009 average are not available. However, assuming a proportionate ratio, the 2005-2009 average annual revenues would be approximately $23.9 million.

Estimates of the economic impacts (business activity) associated with the commercial snapper grouper fishery are derived using the model developed for and applied in USDOC (2009). Based on the average annual ex-vessel revenues for all snapper grouper species over the period 2005-2009 of $14.4 million, the commercial snapper grouper fishery is estimated to support 2,716 full time equivalent (FTE) jobs and generate approximately $190 million in output (sales) impacts and approximately $81 million in income impacts per year to the U.S. economy. Among the jobs supported, 354 FTE jobs are estimated to be in the harvesting sector and 216 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). Based on the estimated average annual total ex-vessel revenues from all species (including snapper grouper) harvested during this period (2005-2009) by vessels that harvested snapper grouper species, approximately $23.9 million, the economic activity associated with these revenues is estimated to support 4,504 FTE jobs (588 in the harvesting sector and 358 in the dealer/processor sector) and generate approximately $315 million in output (sales) impacts and approximately $134 million in income impacts.

The harvest of red snapper has been prohibited during 2010. During 2005-2009, commercial harvest of red snapper averaged approximately 171,000 pounds valued at approximately $612,000 per year. The business activity associated with these revenues is 115 full time equivalent (FTE) jobs, approximately $8 million in output (sales) impacts and approximately $3 million in income impacts per year to the U.S. economy. As a result of the prohibition on the harvest of red snapper, the persistence of the average annual snapper grouper revenues and associated business activity would not be expected to occur but would, instead, be expected to be reduced by some portion of the losses attributable to the reduction in red snapper harvests. The full loss, however, may not occur if harvests of other species were able to be increased to compensate for the red snapper losses.

Amendment 17A (SAFMC 2010a) contains numerous average annual (2003-2007) commercial sector performance statistics. Updates of these statistics through 2009 are not available. Select highlighted statistics are provided in the following paragraph. An average of 890 commercial vessels per year harvested snapper grouper species during 2003-2007. Among these vessels, 642 harvested 5,000 pounds or less of snapper grouper species per year. The largest portion of snapper grouper harvests was landed in Georgia and Florida (Georgia landings combined with Florida for confidentiality considerations), or approximately 46%, followed by North Carolina (28%), and South Carolina (25%). Snapper grouper species accounted for 89% or more of all landings (pounds) by vessels harvesting snapper grouper species in all states or areas except for Central-southeast Florida, where coastal migratory pelagic species accounted for 49% of total harvests and snapper groupers accounted for 38%. Shallow-water grouper were the largest component snapper grouper group for North Carolina and South Carolina harvests (24% and 32%), mid-shelf snapper were the dominant species group for Georgia-northeast Florida (44%), jacks accounted for the highest snapper grouper landings in central-southeast-Florida, and shallow-water snapper were the dominant species group in the Florida Keys. As might be expected, hook and line was the dominant fishing gear, accounting for 81% of total snapper grouper landings.

On December 17, 2010, there were 604 valid (non-expired) or renewable commercial snapper grouper unlimited permits (for vessels subject to trip limits for individual snapper grouper species, as appropriate, but not a trip limit on the total snapper grouper harvest), of which 589 were valid (non-expired), and 138 valid or renewable commercial snapper grouper limited permits (for vessels limited to the harvest of 225 lbs of snapper grouper per trip), of which 132 were valid. Expired permits may not be fished, but may be renewed within one year of the date of expiration.

Imports continue to be a major source of seafood supply in the United States. During 2005-2009, imports of fresh and frozen snappers and groupers averaged 36.2 million lbs (product weight), valued at $104 million. Although fresh local product may benefit from some higher prices in some markets, the dominance of imports in the total snapper grouper market would be expected to exert limits on the movement of domestic ex-vessel prices resulting from changes in domestic landings.

3.3.2 Economic Description of the Recreational Fishery

A description of the recreational component of the snapper grouper fishery is contained in Amendment 17A (SAFMC 2010a) and is incorporated herein by reference. The following is a brief summary and updated information, where available.

Recreational snapper grouper harvest in the South Atlantic averaged approximately 10.8 million lbs per year during 2005-2009. Private boat anglers accounted for the largest harvests, accounting for approximately 6.1 million lbs, followed by shore anglers (1.7 million lbs), charter anglers (1.6 million lbs), and headboat anglers (1.4 million lbs).

Recreational effort derived from the Marine Recreational Fisheries 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.

Over the years 2005-2009, an average of approximately 945,000 individual angler trips per year targeted snapper grouper species across all modes and states in the South Atlantic, or approximately 4% of all recreational shore, charter, and private angler trips. Snapper grouper target effort was highest in Florida, approximately 694,000 trips per year, and in the private mode, approximately 626,000 trips per year.

Similar to the discussion for the commercial sector, the harvest of red snapper was prohibited in the recreational sector in 2010. While the prohibition of harvest need not result in the cancellation of a target trip, the popularity of red snapper as a food fish, as opposed to being primarily a sport fish suggests that target effort would be expected to decline in response to the harvest prohibition. Red snapper target effort averaged approximately 57,300 trips per year in the South Atlantic during 2005-2009, though target effort increased significantly in 2008 and 2009 compared to previous years, averaging approximately 85,700 trips per year over these two years. Although all of these trips would not be expected to be cancelled in response to the prohibition on the harvest of red snapper, the expected snapper grouper target effort in 2010 and beyond would be expected to be reduced, by

some unknown quantity, from the historical levels.

Similar analysis of recreational effort is not possible for the headboat sector because headboat 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. Over the years 2005-2009, an average of approximately 225,000 angler trips were taken each year in the South Atlantic. The majority of these trips, approximately 153,000 trips per year, were taken in Georgia-Florida (Georgia is combined with Florida because of confidentiality considerations).

Substantially more recreational trips catch snapper grouper species than target these species. Although estimates of the average number of snapper grouper catch trips are not available for the most recent five-year period (2005-2009), Amendment 17A (SAFMC 2010a) reported that during 2003-2008 an average of approximately 3.5 million individual angler trips in just the shore, private boat, and charter modes caught snapper grouper each year. Over 80% of these trips occurred off Florida.

On December 17, 2010, there were 1,474 valid (non-expired) for-hire (charter or headboat) snapper grouper permits. The number of expired but renewable permits on that date is unknown. Expired permits may not be fished, but may be renewed within one year of the date of expiration.

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.

Amendment 17A (SAFMC 2010a) contains discussion on estimates of the consumer surplus associated with fishing for snapper grouper derived from different studies, including Haab *et al.* (2009), Dumas *et al.* (2009), and NMFS (2009). The estimated consumer surplus per snapper grouper (individual fish) used in the analysis of the expected effects of the management changes proposed in SAFMC (2010a) was $80 (2009 dollars).

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 is the measure of the economic value these operations receive. Producer surplus 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 producer surplus associated with for-hire trips are not available. However, proxy values in the form of net operating revenues are available (David Carter, NMFS SEFSC, personal communication, August 2010). 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 (average charter trip regardless of area fished) are $146 for Louisiana through east Florida, $135 for east Florida, $156 for northeast Florida, and $128 for North Carolina. For charter trips into the EEZ only, net operating revenues are $141 in east Florida and $148 in northeast Florida. For full-day and overnight trips only, net operating revenues are estimated to be $155-$160 in North Carolina. Comparable estimates are not available for Georgia, South Carolina, or Texas. Amendment 17A (SAFMC 2010a) utilized a value of $128 (2009 dollars) per charter angler trip to assess the expected change in net operating revenues of the proposed management changes on charter vessels.

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 (all states and all of Florida), and $63-$68 in North Carolina. For full-day and overnight headboat trips, net operating revenues are estimated to be $74-$77 in North Carolina. Comparable estimates are not available for Georgia and South Carolina. Amendment 17A (SAFMC 2010a) utilized a value of $68 (2009 dollars) per headboat angler trip to assess the expected change in net operating revenues of the proposed management changes on headboat vessels.

These value estimates should not be confused with angler expenditures or the 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 (business activity) associated with 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 (2005-2009) and associated business activity (2008 dollars) are provided in **Table 3-3**. Snapper grouper target trips were selected as the measure of snapper grouper effort. Consistent with the distribution of snapper grouper target effort, the largest amount of business activity associated with snapper grouper fishing occurs in Florida (across all modes), and the contributions by private/rental mode anglers were the greatest. It should be noted that output impacts and value added impacts are not additive. Also, the impacts cannot be added across states to generate a regional total because impacts for individual states reflect (are reduced by) leakage of business activity into neighboring states. In a regional model (all four states combined), expenditures flowing from, for example Georgia to Florida, would remain in the region and continue to be counted. Regional estimates of business activity are not available.

Table 3-3. Summary of snapper grouper target trips (2005-2009 average) and associated economic impacts (2008 dollars). Output and value added impacts are not additive.

	North Carolina	South Carolina	Georgia	Florida
	Shore Mode			
Target Trips	25,429	10,837	7,361	217,427
Output Impact	$6,369,109	$1,103,510	$118,570	$6,211,366
Value Added Impact	$3,546,665	$614,461	$71,098	$3,606,039
Jobs	77	14	1	66
	Private/Rental Mode			
Target Trips	63,452	93,769	21,990	446,889
Output Impact	$3,463,430	$4,125,655	$343,566	$16,899,174
Value Added Impact	$1,952,921	$2,407,264	$208,401	$10,098,154
Jobs	37	47	3	178
	Charter Mode			
Target Trips	1,554	4,377	22,517	29,471
Output Impact	$604,947	$1,476,045	$1,415,510	$11,549,733
Value Added Impact	$339,497	$833,905	$826,143	$6,799,652
Jobs	8	19	17	119
	All Modes			
Target Trips	90,435	108,983	51,868	693,787
Output Impact	$10,437,486	$6,705,210	$1,877,645	$34,660,273
Value Added Impact	$5,839,084	$3,855,629	$1,105,642	$20,503,846
Jobs	122	79	21	362

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 3-3** reflect only effort derived from the MRFSS. Because the headboat sector in the Southeast is not covered in the MRFSS, the results in **Table 3-3** do not include estimates of the business activity associated with headboat anglers. Although estimates of the business activity associated with the headboat sector were provided in Amendment 17A (SAFMC 2010a), these estimates were based on the model parameters appropriate for the charterboat sector, which are higher than would be expected for the headboat sector because of higher fees charged by charter vessels and other factors discussed in Amendment 17A (SAFMC 2010a). As a result, these estimates are not repeated here and updated, more appropriate estimates of the business activity associated with the headboat component of the snapper grouper fishery are not available.

3.3.3 Social and Cultural Environment

Descriptions of the social and cultural environment of the snapper grouper fishery are contained in Jepson *et al.* (2005), Amendment 17A (SAFMC 2010a), and the draft Comprehensive Annual Catch Limit Amendment (SAFMC in development) and are incorporated herein by reference. The description contained in Amendment 17A (SAFMC 2010a) covered all South Atlantic states because of the proposed region-wide closure of the red snapper component of the

snapper grouper fishery. The areas expected to be directly affected by the current proposed action are located in southern Georgia and northern Florida. Communities in South Carolina and North Carolina would not be expected to be substantially affected other than from the perspective that the proposed relaxation of the snapper grouper harvest prohibitions contained in Amendment 17A (SAFMC 2010a) would increase total regional access to snapper grouper commercial harvests and opportunities for recreational target trips. It should be noted that the harvest restrictions in Amendment 17A (SAFMC 2010a) for snapper grouper species other than red snapper did not reduce the available harvest quantities of these species but, instead, only restricted the areas in which these species could be harvested. As a result, the total harvest quantities of these species would only be indirectly affected (total landings would only decline if snapper grouper harvest from closed areas could not be compensated by increased harvests in areas that remain open) and need not, as a result of regulation, decline. Because the area expected to be directly affected by this proposed action are located just in southern Georgia and northern Florida, the following summary covers just communities in these areas.

Impacts on fishing communities in general from coastal development, rising property taxes, decreasing access to waterfront due to increasing privatization of public resources, rising costs of dockage and fuel, lack of waterway and ocean passage maintenance, product competition from imports, and other (often political) factors have combined to put coastal communities and their associated fishing sectors under great stress.

The following discussion utilizes information from the documents referenced above as well as Census data (available at www.census.gov). Not all data estimates are available for the same year and the appropriate year is listed. Finally, while unemployment statistics are reported, these estimates are likely lower than current unemployment rates as a result of the depressed economic conditions in recent years.

Georgia

A substantial amount of snapper grouper are landed in only one community in Georgia, Townsend, which is located in McIntosh County. Other areas of the state involved in the commercial harvest of seafood, such as Brunswick, are focused on penaeid shrimp, blue crabs, and other finfish such as flounder, shad, croaker, and mullet.

McIntosh County and Townsend

McIntosh County had an estimated population of 11,378 in 2009, the majority of residents were identified as White (65.5%; 2009; statewide rate of 65.0%), and over 70% of McIntosh County residents over the age of 25 were estimated to have a high school education (2000; statewide rate of 78.6%). In 2007, the unemployment rate in McIntosh County was estimated to be 4.0%, (statewide rate of 4.4% in 2007 and 9.5% in 2009), while the median household income in 2008 was approximately $36,000 (statewide median of approximately $51,000) and 18.8% of the population was estimated to live below the poverty level (2008; statewide rate of 14.7%).

Townsend is a small, rural community, and had a population of 3,538 in 2000. In 2000, Townsend's population was primarily White, had a median household income of approximately $35,000, 11.0% had less than a 9th grade education, 14.6% lived in a

household with an income below the poverty line, and 6.5% were unemployed. Only 3.0% of the population were employed in farming, fishing, and industry. More recent statistics are not available.

Amendment 13C (SAFMC 2006) contains a comprehensive description of the historic and current fish houses of coastal Georgia and how they operate, focusing on Phillips Seafood of Townsend. The description reported that, for nearly a decade, only one fish house consistently handled snapper grouper species. A fish house in Brunswick may have landed these species in the past, but had not reported snapper grouper landings since 2001.

Snapper grouper species are not a commonly targeted species by Georgia recreational anglers (see **Table 3-3**). For 2005-2009, only an average of approximately 52,000 shore, private boat, or charter individual angler trips per year reported targeting snapper grouper species. Over this same period, an average of approximately 940,000 total recreational trips were taken each year in these modes (the headboat mode is excluded).

Florida

Despite the pressures of population increases and an emphasis on a tourism economy, there remains a substantial commercial fishing industry in Florida. Cumulative landings for 2005-2007 for the top three communities in Florida for select snapper grouper species in this amendment are shown in **Table 3-4**. More recent data at this level of disaggregation are not available. Although the rankings can change from year to year, the cumulative landings over a three-year range are useful to suggest which communities are most involved with the commercial harvest of each species, as well as snapper grouper harvest in general. As is evident from the table, communities in north Florida are well represented as locations of substantive snapper grouper landings.

Table 3-4. 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
	2005		2006		2007	
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

Four counties comprise the portion of northern Florida expected to be most affected by this proposed action. These counties are Nassau, Duval, St. John, and Volusia. County profiles are contained in the draft Comprehensive Annual Catch Limit Amendment (SAFMC in development) and are incorporated herein by reference. Jepson et al. (2005) contains profiles of the following representative communities from these counties: Fernandina Beach (Nassau County), Atlantic Beach (Duval County), St. Augustine (St. John County), and Ponce Inlet (Volusia County). These profiles are incorporated herein by reference. The information provided on the fishing communities in Jepson *et al.* (2005) only included fishing demographics and fishing industry employment data for 2000 or 2001 and updated information for these communities has not been assembled. The following is a summary of the county and community information contained in these reports and more recent Census data searches (www.census.gov).

Nassau County and Fernandina Beach

Nassau County had an estimated population of 70,576 in 2009, the majority of residents were identified as White (89.3%; 2009; statewide rate of 79.4%), and approximately 85% of Nassau County residents over the age of 25 were estimated to have a high school education (2006-2008; statewide rate of approximately 85%). In 2007, the unemployment rate in Nassau County was

estimated to be 3.4%, (statewide rate of 4.0% in 2007 and 10.4% in 2009), while the median household income in 2008 was approximately $59,500 (statewide median of approximately $47,800) and 8.9% of the population was estimated to live below the poverty level (2008; statewide rate of 13.3%).

In 2001, a total of 13 Fernandina Beach vessels had some type of Federal permit, including no vessels with commercial snapper grouper permits and three vessels with for-hire snapper grouper permits. Total employment in fishing related businesses in Fernandina Beach, based on 1998 Census data, was 30 persons, and included employment at marinas (10 persons), fish and seafood markets (10 persons), boat building (7 persons), and fishing (3 persons) (SAFMC 2010b). Not included in these totals would be additional businesses associated with the fishing industry, most notably bait and tackle shops. While the years of comparison are not the same for the permit and employment totals, the difference between the number of permits and number of persons listing fishing as a profession may be due to part-time employment and the listing of another profession as the primary employment, or fishermen docking their vessels in Fernandina Beach and living in another community rather than actual changes in employment or fishery participation. In 2008, over 80% of the landings (lbs) and value of seafood landed in Fernandina Beach were from shrimp species, of which over 60% was derived from white shrimp (SAFMC 2010b). King whiting was the most significant non-shrimp species, but accounted for less than 5% of either lbs or value. From a marine infrastructure perspective, while not all businesses would necessarily be located in or fishing from Fernandina Beach, marine related employment in 2007 in Nassau County was estimated to include 59 seafood harvesters (identified as "proprietors" in the Census data; this would include businesses that operate in state or federal waters; number of employees not listed, though a business/proprietor could represent a single person), and 14 employees at seafood dealers (number of proprietors not listed), 4 employees at retail seafood businesses, and 18 employees at marinas (SAFMC 2010b).

Duval County and Atlantic Beach

Duval County had an estimated population of 857,040 in 2009, the majority of residents were identified as White (64%; 2009; statewide rate of 79.4%), and approximately 87% of Duval County residents over the age of 25 were estimated to have a high school education (2006-2008; statewide rate of approximately 85%). In 2008, the unemployment rate in Duval County was estimated to be 7.0%, (statewide rate of 10.4% in 2009), while the median household income in 2008 was approximately $50,700 (statewide median of approximately $47,800) and 12.1% of the population was estimated to live below the poverty level (2008; statewide rate of 13.3%).

Only one Atlantic Beach vessel was identified in 2001 as having some type of Federal permit and this vessel had for-hire permits for both snapper grouper and king mackerel. Total employment in fishing related businesses in Atlantic Beach, based on 1998 Census data, was estimated to be 62 persons, and included employment at marinas (3 persons), fish and seafood businesses (56 persons; this is a distinct business category from fish and seafood markets listed above for Fernandina Beach), and fishing (3 persons) (SAFMC 2010b). Not included in these totals would be additional businesses associated with the fishing industry, most notably bait and

tackle shops. In 2008, seafood landings were dominated by shrimp, with blue crab the next highest value species, while accounting for less than 5% of either lbs or value (SAFMC 2010b). From a marine infrastructure perspective, while not all businesses would necessarily be located in or fishing from Atlantic Beach, marine related employment in 2007 in Duval County was estimated to include 199 seafood harvesters (identified as "proprietors" in the Census data; this would include businesses that operate in state or federal waters; number of employees not listed, though a business/proprietor could represent a single person), and 92 employees at seafood dealers (number of proprietors not listed), 60 employees at retail seafood businesses (20 proprietors), 210 employees at processors (12 proprietors), and 216 employees at marinas (SAFMC 2010b).

St. John's County and St. Augustine

St. John's County had an estimated population of 187,436 in 2009, the majority of residents were identified as White (89.9%; 2009; statewide rate of 79.4%), and approximately 92% of St. John's County residents over the age of 25 were estimated to have a high school education (2006-2008; statewide rate of approximately 85%). In 2009, the unemployment rate in St. John's County was estimated to be 5.4%, (statewide rate of 10.4% in 2009), while the median household income in 2008 was approximately $67,200 (statewide median of approximately $47,800) and 7.9% of the population was estimated to live below the poverty level (2008; statewide rate of 13.3%).

In 2001, a total of 28 St. Augustine vessels had some type of Federal permit, including 11 vessels with commercial snapper grouper permits (9 Class 1 permits and 2 Class 2 permits) and 18 vessels with for-hire snapper grouper permits. Total employment in fishing related businesses in St. Augustine, based on 1998 Census data, was 453 persons, of which 375 were identified as employed in boat building, 75 persons were employed in seafood processing, and 3 persons were employed in fish and seafoods (SAFMC 2010b). Not included in these totals would be additional businesses associated with the fishing industry, most notably bait and tackle shops. Similar to the situation in Fernandina Beach, there appears to be a discrepancy between the number of permitted vessels (28) and the number of persons listing fishing as a profession (0 persons). From a marine infrastructure perspective, while not all businesses would necessarily be located in or fishing from St. Augustine, marine related employment in 2007 in St. John's County was estimated to include 103 seafood harvesters (identified as "proprietors" in the Census data; this would include businesses that operate in state or federal waters; number of employees not listed, though a business/proprietor could represent a single person), and 6 employees at seafood dealers (number of proprietors not listed), 5 employees at retail seafood businesses, and 19 employees at marinas (SAFMC 2010b).

Volusia County and Ponce Inlet

Volusia County had an estimated population of 495,890 in 2009, the majority of residents were identified as White (86.1%; 2009; statewide rate of 79.4%), and approximately 88% of Volusia County residents over the age of 25 were estimated to have a high school education (2006-2008; statewide rate of approximately 85%). For 2006-2008, the unemployment rate in Volusia County was estimated to be 5.5%, (statewide rate of 4% in 2007 and 10.4% in 2009), while the median household income in 2008 was

approximately $45,800 (statewide median of approximately $47,800) and 12.9% of the population was estimated to live below the poverty level (2008; statewide rate of 13.3%).

In 2001, a total of 29 Ponce Inlet vessels had some type of Federal permit, including 12 vessels with commercial snapper grouper permits (all Class 1 permits) and 22 vessels with for-hire snapper grouper permits. Total employment in fishing related businesses in Ponce Inlet, based on 1998 Census data, was 190 persons, of which 181 were identified as employed at marinas, 6 persons were employed in boat building, and 3 persons were employed in fish and seafoods (SAFMC 2010b). Not included in these totals would be additional businesses associated with the fishing industry, most notably bait and tackle shops. Similar to the situation in the other communities discussed, there appears to be a discrepancy between the number of permitted vessels (29) and the number of persons listing fishing as a profession (0 persons). From a marine infrastructure perspective, while not all businesses would necessarily be located in or fishing from Ponce Inlet, marine related employment in 2007 in Volusia County was estimated to include 183 seafood harvesters (identified as "proprietors" in the Census data; this would include businesses that operate in state or federal waters; number of employees not listed, though a business/proprietor could represent a single person), and 16 employees at seafood dealers (number of proprietors not listed), and 137employees at marinas (SAFMC 2010b).

3.4 Administrative Environment

3.4.1 The Fishery Management Process and Applicable Laws

3.4.1.1 Federal Fishery Management

Federal fishery management is conducted under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. 1801 et seq.), originally enacted in 1976 as the Fishery Conservation and Management Act. The Magnuson-Stevens Act claims sovereign rights and exclusive fishery management authority over most fishery resources within the 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. In most cases, the Secretary has delegated this authority to NOAA Fisheries Service.

The South Atlantic Fishery Management Council is responsible for conservation and management of fishery resources in Federal waters of the U.S. South Atlantic. These waters extend from 3 to 200 miles offshore from the seaward boundary of the States of North Carolina, South Carolina, Georgia, and east Florida to Key West. The Council has thirteen voting members: one from NOAA Fisheries Service; one each from the state fishery agencies of North Carolina, South Carolina, Georgia, and Florida; and eight public members appointed by the Secretary. On the South Atlantic Council, there are two public members from each of the four South Atlantic States. Non-voting members include representatives of the U.S. Fish and Wildlife Service, U.S. Coast Guard, State Department, and Atlantic States Marine Fisheries Commission (ASMFC). The South Atlantic Council has adopted procedures whereby the non-voting members serving on the Council Committees have full voting rights at the Committee level but not at the full Council level. Council members serve three-year terms and are recommended by State Governors and appointed by the Secretary of Commerce from lists of nominees submitted by State governors. Appointed members may serve a maximum of three consecutive terms. Public interests also are involved in the fishery management process through participation on Advisory Panels and through council meetings, which, with few exceptions for discussing personnel matters, are open to the public. The Council uses a Scientific and Statistical Committee (SSC) to review the data and science being used in assessments and fishery management plans/amendments. In addition, the regulatory process is in accordance with the Administrative Procedures Act, in the form of "notice and comment" rulemaking.

3.4.1.2 State Fishery Management

The state governments of North Carolina, South Carolina, Georgia, and Florida have the authority to manage fisheries that occur in waters extending three nautical miles from their respective shorelines. North Carolina's marine fisheries are managed by the Marine Fisheries Division of the North Carolina Department of 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's State-Federal Fisheries Division is responsible for building cooperative partnerships to strengthen marine fisheries management and conservation at the state, inter-regional, and national levels. This division implements and oversees the distribution of grants for two national (Inter-jurisdictional Fisheries Act and Anadromous Fish Conservation Act) and two regional (Atlantic Coastal Fisheries Cooperative Management Act and Atlantic Striped Bass Conservation Act) programs. Additionally, it works with the ASMFC to develop and implement cooperative State-Federal fisheries regulations.

3.4.1.3 Enforcement

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

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

NOAA General Counsel issued a revised Southeast Region Magnuson-Stevens Act Penalty Schedule in June 2003, which addresses all Magnuson-Stevens Act violations in the Southeast Region. In general, this Penalty Schedule increases the amount of civil administrative penalties that a violator may be subject to up to the current statutory maximum of $120,000 per violation. NOAA General Counsel requested public comment through December 20 2010, on a new draft policy.

Chapter 4. Environmental Effects

Required Reduction
2011: 70-75%
2012: 62-69%

Chapter 4 describes the effects to the biological, economic, social, and administrative environment from the alternatives in Action 1 **(Table 4-1).**

Table 4-1. Characteristics of alternatives 1 through 11 in Action 1 and reductions in red snapper removals with varying degrees of projected effort shift.

Alt.	Snapper Grouper Spatial Closure			Reduction (includes reduction from moratorium)		
	Commercial Logbook Grids	Depth (ft)	Length of Closure	Effort shift= 100%	Effort shift= 50%	Effort shift= 0%
1 (no action)	2880, 2980, 3080	98-240	Year-round	2011: 70 2012: 79	2011: 71 2012: 80	2011: 73 2012: 81
2	2880, 2980	98-240	May through October	68	69	70
3	2880, 2980, 3080	98-240	May through August	68	70	71
4	2880, 2980, 3080	98-240	July through December	69	70	72
5	2880, 2980, 3080	98-240	May through December	70	71	73
6	2011: 2880, 2980, 3080 2012: 2880, 2980	2011: 66-240 2012: 98-240	2011: May through December 2012: May through October	2011: 71 2012: 68	2011: 73 2012: 69	2011: 75 2012: 70
7	2011: 2880, 2980 2012: 2980	2011: 98-240 2012: 98-240	2011: May through October 2012: June through July	2011: 68 2012: 66	2011: 69 2012: 67	2011: 70 2012: 67
8	2011: 2880, 2980 2012: 2880, 2980	2011: 98-240 2012: 98-240	2011: May through October 2012: July	2011: 68 2012: 65	2011: 69 2012: 66	2011: 70 2012: 67
9	2011: 2880, 2980, 3080 2012: 2880, 2980	2011: 98-240 2012: 98-240	2011: July through December 2012: January through April	2011: 69 2012: 68	2011: 70 2012: 69	2011: 72 2012: 71
10	2011: 2880, 2980, 3080 2012: 2880, 2980	2011: 98-240 2012: 98-240	2011: May through December 2012: January through April	2011: 70 2012: 68	2011: 71 2012: 69	2011: 73 2012: 71
11 (preferred)	Do not implement the snapper grouper area closure approved in Amendment 17A to the Snapper Grouper Fishery Management Plan.			77%[1]		

[1]An evaluation of predicted moratorium effectiveness using 2007-2009 baseline data indicates that the moratorium will provide a 66% reduction in removals of red snapper based on an Interactive Combined Effects (ICE) Model for South Atlantic Red Snapper (SERO 2010). However, analyses contained in **Appendix I** suggest that the red snapper fishing moratorium has been more effective in reducing mortality of red snapper. The analyses incorporate fishing effort reduction, in addition to the reduction in red snapper removals in 2010 in the South Atlantic. Evidence provided by the Marine Recreational Fisheries Statistics Survey (MRFSS) suggests effort in the South Atlantic is down 33% and total removals in pounds are down 81% when 2010 is compared to the 2007-2009 baseline. Including MRFSS Wave 1-4 data for 2010 as a percentage reduction from the 2007-2009 baseline period, along with the projected trip elimination reductions for the commercial and headboat sector, suggests that an overall reduction in red snapper removals of 77% may have been achieved by the moratorium in 2010. Note: **Alternative 11** was the only alternative evaluated using the analysis detailed in **Appendix I**. As such, the reduction in red snapper fishing mortality for **Alternative 11** is higher than most of the other alternatives as reported in the table above. Also, the required reduction to end overfishing was computed from the SSC-recommended model runs and not the base run identified by the SEDAR Review Panel (see **Section 1.5** for more information).

4.1 Biological Effects

The Council is proposing restrictions to fishing mortality through fishing prohibitions. An increase in biomass and a decrease in fishing mortality from current levels of the red snapper and other stocks of fish is expected. Therefore, all 11 alternatives in Action 1 offer *beneficial effects* to fish stocks, including the red snapper stock, in the South Atlantic.

- **Beneficial effects from all ten closure alternatives are expected**

The beneficial biological effects of **Alternative 1 (No Action)** for red snapper have been described in Amendment 17A to the Snapper Grouper Fishery Management Plan (FMP) (SAFMC 2010a). The effects include a return to population characteristics of a more natural state, including age and size structure, sex ratio, genetic structure, and biomass. Components of the ecosystem (e.g., predator/prey relationship, community structure) are expected to more closely resemble those of an unfished population.

- **The red snapper population and associated ecosystem are expected to return to a more natural state**

Alternatives 2 through 10 each propose a decrease in the size and length of the closure proposed in Amendment 17A **(Table 4-1)**. These alternatives would have a lower level of beneficial effects to red snapper than **Alternative 1 (No Action)**. **Alternative 11 (preferred)** offers less beneficial effects as it would not implement a snapper grouper area closure but does provide the necessary reduction in red snapper mortality to end overfishing immediately.

- **Alternative 1 has the greatest positive biological effects; alternatives are ranked**

The alternatives each differ in their level of beneficial effects as each differs in the following:

- **reductions in red snapper removals estimated by the Interactive Combined Effects Model (ICE)**
- **size of closure**
- **length of closure**
- **duration of closure during the spawning season and peak spawning season**

The following section summarizes the effects of each of the above items and presents a ranking of the alternatives in terms of anticipated biological effects. Regardless of the alternatives selected, the fishery's operation under Regulatory Amendment 10 is not anticipated to cause new effects to protected species that were not previously considered. In the unlikely event the fishery is affecting protected species in a way not previously considered, an ESA section 7 consultation can be reinitiated to evaluate and address those effects.

ICE Model Reductions

A model, called the **Interactive Combined Effects Model (ICE**), is used to project red snapper removal rates under a variety of spatial closure sizes, configurations, and input assumptions. See **Appendix F** for a detailed description of the model and results. ICE uses input assumptions and data from the new 2010 benchmark assessment (SEDAR 24 2010) to *project reductions* in red snapper removals across all three fishing sectors (i.e., commercial, recreational private, and for-hire charter and headboat) **(Table 4-2).**

- **A model was used to project the reduction in red snapper removals**
- **Effort shifts of 100%, 50%, and 0% (or no effort shift) were modeled**
- **Alternatives 1 and 6 have the highest reductions**

Table 4-2. Projected reductions in red snapper removals as projected through the ICE Model.

Alt.	Reduction By Effort Shifts of 100%, 50% and 0%		
	100%	50%	0%
1 (no action)	2011: 70 2012: 79	2011: 71 2012: 80	2011: 73 2012: 81
2	68	69	70
3	68	70	71
4	69	70	72
5	70	71	73
6	2011: 71 2012: 68	2011: 73 2012: 69	2011: 75 2012: 70
7	2011: 68 2012: 66	2011: 69 2012: 67	2011: 70 2012: 67
8	2011: 68 2012: 65	2011: 69 2012: 66	2011: 70 2012: 67
9	2011: 69 2012: 68	2011: 70 2012: 69	2011: 72 2012: 71
10	2011: 70 2012: 68	2011: 71 2012: 69	2011: 73 2012: 71
11	77		

Effort shift commonly occurs following the implementation of a closure. Effort shift may be *spatial* (a shift into surrounding areas during the closure) or *temporal* (a shift before and after a closed season). The ICE Model allows the user to specify where effort might shift, what sectors might shift effort, and the percent of effort shifting that may occur. Effort shifting within a commercial statistical grid (also called "grid cell") with a time-area closure was modeled as occurring in the month prior to the closure and the month following the closure.

Effort Shift Example

If grid cell 3080 were closed in June-August and the effort shifting was 50%, removals in May and September would be 125% (e.g., 100% + 50%/2 months = 125%) of the modified baseline output from Equations 3 and 4 (see **Appendix I**). Effort shifting to adjacent statistical areas during time-area closures was assumed to occur during the time-area closure, and the percent effort shifting was apportioned equally amongst the specified effort shifting cells. For example, if cell 2980 were closed in June and effort shifting was specified into cells 3081, 3080, 2981, and 2880 at 50%, then removals in each of these adjacent cells would be 112.5% (e.g., 100% + 50%/4 cells = 112.5%) of the modified baseline output by Equations 3 and 4 (see **Appendix I**).

Size of closure

Alternatives 1 through 10 vary in area size **(Table 4-3).** All the alternatives are bounded by 98 to 240 foot depth with the exception of **Alternative 6** in 2011, which has a border at 66 foot depth on the western side. In terms of the northern and southern sides, all the boundaries include commercial logbook grid 2880, some 2980, and others 3080 **(Figure 4-1).**

- **Largest closure = greatest biological benefits**

Table 4-3. The area of the alternatives

Alt.	Area (mi^2)
1	4,827
2	3,765
3	4,827
4	4,827
5	4,827
6	2011: 10,788 2012: 3,765
7	2011: 3,765 2012: 1,389
8	2011: 3,765 2012: 3,765
9	2011:4,827 2012: 3,765
10	2011: 4,827 2012:3,765

The larger the closure, the greater the beneficial biological effects to the red snapper stock and associated ecosystem. A larger closed area is beneficial for a number of reasons. A larger closed area will offer the greatest reduction in fishing mortality. In addition, effort shift to surrounding areas may reduce the biological benefits of a closed area. As closures increase in size, the level of effort shift often decreases as the effort shift is distributed over a greater area.

- **Greatest amount of spawning location in southernmost grid (2880) as identified by Moe (1963)**

The alternatives are different in terms of their degree of protection to identified red snapper spawning sites. Without the protection of spawning sites, fishermen can remove significant numbers of adult fish from a spawning site before they have a chance to spawn. Grid cell 2880 contains the greatest concentration of identified red snapper spawning sites as identified by Moe 1963; however, the MARMAP survey identified spawning locations in grid cells to the north **(Figure 4-2).** In 2011, **Alternative 6** is the only alternative to offer protection shoreward to a 66 foot depth.

- **Alternative 6 has the greatest beneficial effects in terms of size as it includes all three grids and goes to a depth of 66 feet**

Figure 4-1. The three commercial logbook grids that serve as the northern and southern boundaries for the closure alternatives.

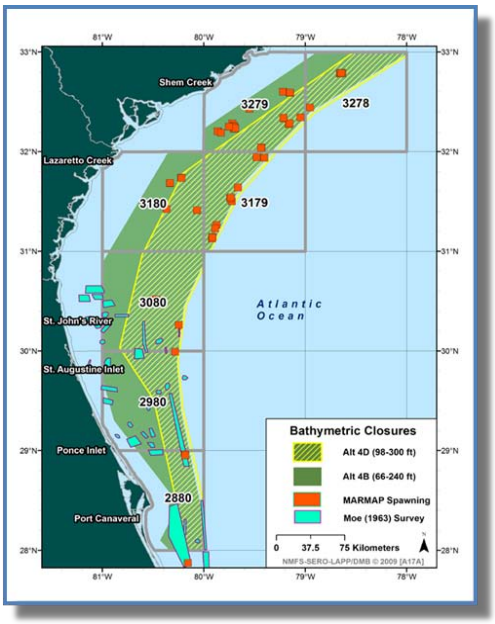


Figure 4-2. Red snapper spawning areas as identified by Moe 1963 and MARMAP surveys.

Alternatives 1 and 6 have the greatest beneficial biological effects for red snapper in terms of size as both include all three grids and Alternative 6 extends shoreward to a depth of 66 feet. Alternative 2 and Alternative 7 both offer less biological benefits for red snapper as they would implement the smallest area closure. Alternative 11 (Preferred) offers the least beneficial biological effects as it would not implement a snapper grouper area closure but does provide the necessary reduction in mortality to end overfishing of red snapper immediately.

Length of Closure

The alternatives differ in the length of the closures during the fishing season. In general, the longest closures have the greatest beneficial biological effects to the red snapper stock and associated ecosystem. Temporal effort shifts may be less for longer area closures.

Spawning Season Protection

The alternatives differ in terms of which months are closed **(Table 4-4)**. The alternatives with the greatest biological benefits are those that offer the greatest level of protection during the red snapper spawning season and peak spawning season. 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.

- **Spawn primarily May through October. Peak is July through September**

Fishing activities often remove the largest fish from the population. This often has negative effects to the population as larger females usually have an exponentially greater quantity of eggs than smaller females. The condition of larvae also improves with the size and age of fish and, in turn, affects survivorship.

- **Protection of spawning fish important for sustainable harvest**

Red snapper often reproduce in spawning aggregations. Spawning aggregations leave fish vulnerable to heavy exploitation.

Alternatives 1, 2, 5, and 6 offer the greatest level of protection to spawning red snapper followed by Alternatives 7, 8, and 10 (2011 only; Table 4-4). Alternative 11 (Preferred) offers less positive beneficial effects as it would not implement a snapper grouper area closure but does provide the necessary reduction in mortality to end red snapper overfishing immediately.

Table 4-4. Closure time periods during female red snapper spawning (orange) and peak spawning (red) time periods. The blue bars indicate the closed months.

alt	Space: Reduction in removals	Space: Area (mi²)	Time
1	79-81%	4,827	2011
2	68-70%	3,765	2011
3	68-71%	4,827	2011
4	69-72%	4,827	2011
5	70-73%	4,827	2011
6	2011: 71-75% 2012: 66-67%	10,788 3,765	2011 2012
7	2011: 68-70% 2012: 66-67%	3,765 1,389	2011 2012
8	2011: 68-70% 2012: 65-67%	3,765 3,765	2011 2012
9	2011: 70-73% 2012: 68-71%	4,827 3,765	2011 2012
10	2011: 70-73% 2012: 68-71%	4,827 4,827	2011 2012

Each of the alternatives have been ranked according to their anticipated biological benefits **(Figure 4-3).** Generally, the alternatives that offer the greatest biological protection are the largest closures that cover the spawning season with the greatest reductions to red snapper removals as determined by the ICE Model.

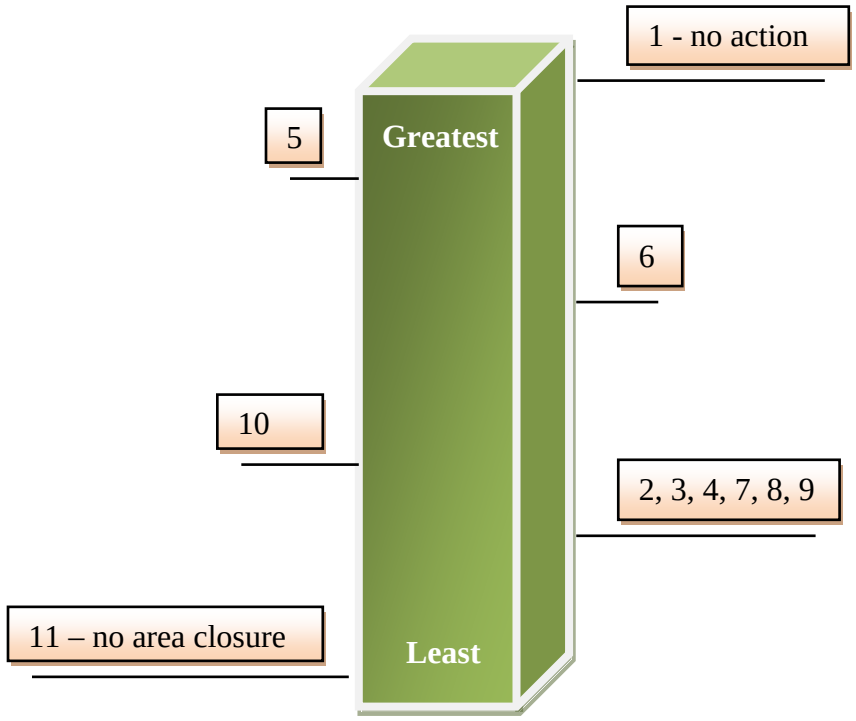


Figure 4-3. Ranking of the alternatives in terms of biological effects.

4.2 Economic Effects

4.2.1 Effects to the Commercial Sector

4.2.1.1 Background and Methodology of Analysis

In this analysis, economic effects results are calculated to illustrate that Regulatory Amendment 10 is expected to benefit the commercial fishery, but that the benefits would accrue as smaller reductions in net operating revenues rather than actual increases in net operating revenues. Recall that the snapper grouper area closure in Amendment 17A has not been implemented, so that net operating revenues are expected to decline for commercial fishermen regardless of whether the closures associated with Amendment 17A or one of the alternatives from Regulatory Amendment 10 is implemented.

A simulation model was employed to calculate the expected economic outcomes for **Alternative 1 (No Action)** and each of the preliminary alternatives. The model hypothetically imposes the proposed restrictions on commercial fishing activities as defined by logbook trip reports that were submitted to the NMFS during 2007-2009. This is the same model and procedure that were used to examine the expected economic effects of management alternatives that were proposed for Amendment 17A. However, the analysis for Amendment 17A used data for 2006-2008 because data for 2009 were unavailable at that time. Therefore, the results presented here for the expected outcome of Amendment 17A, which is **Alternative 1 (No Action)** alternative for Regulatory Amendment 10, are based on updated logbook data from 2007-2009 and will differ from the results that appear in Amendment 17A.

The advantages and disadvantages of the simulation model were discussed in Amendment 17A. Briefly, the advantages are:

- The analysis uses data about actual fishing activities as reported by fishermen;
- The analysis considers the effects of the preliminary management alternatives on trip revenues and trip costs, and allows for the possibility that the restrictions may make some individual trips unprofitable; and
- The analysis considers the interaction of preliminary management alternatives with existing regulations.

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.

The simulation model uses information from the recent past (in this analysis, 2007-2009) as a predictor of the near future. Because the future is unknown and because economic and environmental conditions vary over time, we do not know which year is the best predictor of the near future. Therefore, the 3-year average of simulated results from 2007-2009 is used as the expected predictor of the effects for each preliminary management alternative. The model is most appropriately applied to short-term evaluations because information from the recent past is a more reliable predictor of the near-future than of the distant future.

4.2.1.2 Economic Effects Results

Results are presented in terms of net operating revenues, defined as commercial dockside revenues minus trip costs which include fuel, oil, bait, ice, and other supplies, and exclude fixed costs and labor costs. Therefore, net operating revenues represent the incomes for labor (including crew) plus the gross income for boat owners who must pay fixed costs and other non-trip costs related to owning and operating the vessel.[1] Net operating revenues were adjusted to constant 2008 dollars with the consumer price index for all items and all urban consumers.

Amendment 17A, **Alternative 1 (No Action)**, is expected to result in a decrease of $794,000 (7.8%) annually in net operating revenues for the snapper grouper commercial fishery. The analyses below show the effects of **Alternatives 2-11** assuming that the Amendment 17A closure is implemented January 1, 2011. It is, however, acknowledged that the Amendment 17A closure will not be implemented until June 1, 2011. The effects of the alternatives show increases in net operating revenues compared to implementation of the Amendment 17A closure on January 1st, 2011 because, at the time of the analysis, the delayed implementation of Amendment 10 was not yet in place. Therefore, the results presented here are likely overestimates of benefits of what will actually accrue due to the fact that implementation of the Amendment 17A closure will now be delayed until June 1, 2011 (five months).

Under **Alternative 1 (No Action)**, both black sea bass pots and spearfishing gear are exempted from the closure approved in Amendment 17A. The exemptions are intrinsic in **Alternatives 2-10** as well, and irrelevant in **Alternative 11 (Preferred)** since there is no closure proposed. Under **Alternatives 2-11**, changes in net operating revenues range from an increase of $48,000 (**Alternative 6**) to an increase of $91,000 (**Alternative 3**) annually based on the two year average from 2011-12. The change in net operating revenues annually compared to **Alternative 1 (No Action)** as a result of **Alternatives 2-11** is shown in **Table 4-5. Alternative 11 (Preferred)** (no Amendment 17A closure but maintain the ban on retention of red snapper) results in an increase of $88,000 which is slightly lower than the benefits occurring under **Alternative 3**. This result occurs because while Georgia and Florida gain under **Alternative 11 (Preferred)**, North and South Carolina lose because of the benefits that accrue to North and South Carolina under Amendment 17A (see **Table 4-6** below for state by state/region breakouts).

[1] The logbook database does not collect prices or revenues for landed fish. Trip revenues were calculated as reported landings multiplied by average prices, by species, from the NMFS Accumulated Landings System. Trip costs were calculated from sample data as a function of trip characteristics such as type of gear and amount of gear used, crew size, duration of trip, and pounds landed.

Table 4-5. Average annual changes in net operating revenues from Alternatives 2-11 compared to Alternative 1 (No Action) for 2011 and 2012.

Alternatives	Change in net operating revenues in 1000s of dollars ($)	Percentage change in net operating revenues
2	$53	0.3%
3	$91	0.7%
4	$71	0.2%
5	$50	0.1%
6	$48	0.0%
7	$68	0.6%
8	$69	0.6%
9	$72	0.5%
10	$62	0.4%
11 (Preferred)	$88	0.9%

Note: This analysis assumes a January 1, 2011 start date for Amendment 17A.

The economic effects of the proposed alternatives by state is shown in **Table 4-6**. **Alternative 11 (Preferred)** has the greatest benefit to Georgia/Northeast Florida and southeast Florida as well as the greatest losses for North Carolina and South Carolina due to the gains the latter two states are expected to experience under Amendment 17A.

Table 4-6. Average annual changes in net operating revenues in 1000s of dollars ($) to various regions from Alternatives 2-11 compared to Alternative 1 (No Action) for 2011 and 2012.

Alternatives	NC	SC	GA-NEFL	SEFL	KEYS
2	-$216	-$103	$337	$35	-$1
3	-$118	-$55	$215	$49	$0
4	-$124	-$71	$213	$55	-$1
5	-$70	-$31	$135	$17	$0
6	-$143	-$66	$235	$22	-$1
7	-$225	-$114	$344	$64	-$1
8	-$227	-$114	$346	$65	-$1
9	-$178	-$99	$280	$70	-$1
10	-$151	-$79	$241	$51	-$1
11 (Preferred)	-$241	-$129	$358	$103	-$2

Note: This analysis assumes a January 1, 2011 start date for Amendment 17A.

4.2.2 Effects to the Recreational Sector

Several red snapper management measures have been considered to achieve the desired fishing mortality reduction, inclusive of discard mortality based on the most recent stock assessment. These measures specifically address the prohibition on the harvest, retention, and possession of red snapper throughout the South Atlantic EEZ implemented through Amendment 17A.

The methodology employed in this assessment follows the methodology used in assessing the economic effects of Amendment 17A (SAFMC 2010a) on the recreational sector. A summary description of this methodology is provided below. Appendix N of Amendment 17A 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 no action alternative to fishers and for-hire vessels in response to the proposed alternatives. The change in economic value is measured in terms of 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 an 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 **Alternatives 2 through 11** relative to **Alternative 1 (No Action)** are presented in the tables below. The CS values were computed by multiplying the number of affected angler target trips by the CS per trip and average fish per angler per trip. The NOR values were computed by multiplying the number of affected for-hire angler trips by the NOR per angler, per trip. In contrast to the economic analysis of Amendment 17A, the present economic analysis considers only the effects of the various alternatives on fishing operations for snapper grouper species other than red snapper. Because **Alternatives 2 through 11** are less restrictive than **Alternative 1 (No Action)**, all CS and NOR changes are positive.

Several limitations 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 snapper grouper angler trips from the estimated total angler days. Moreover, charter and private target trips were assigned by statistical grid using similar information from the distribution of headboat trips by statistical grid. In addition, headboat and 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, season, 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, fish in the same area during the open season, 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/seasons 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 some snapper grouper species 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 essentially the one-year horizon considered in the analysis. Spatial and temporal changes to the area closure proposed in this amendment are likely to remain in effect for the next several years, given the existing rebuilding schedule for red snapper. The long-term economic effects of these changes are not explicitly estimated in this assessment due to limited and uncertain information regarding the stock status of red snapper and other snapper grouper species, regulations, and socioeconomic conditions, among others. It is only noted here that the estimated one-year effects may be considered as annual effects of the area closure changes. On this note, some alternatives explicitly include area closure changes for the first year and second year.

Table 4-7a presents the economic effects of the various alternatives relative to **Alternative 1 (No Action)**. These economic effects are positive, i.e., increases in angler CS and for-hire vessel NOR, because all alternatives shown in the table are less restrictive than the no action alternative. Due to the location of the area closure, the various alternatives would mainly affect fishing activities and operations in northeast Florida and Georgia. The economic effects of **Alternatives 2 through 5** and **Alternative 11 (Preferred)** are annual effects; those of **Alternatives 6 through 10** are separated into effects in the first year (e.g. **Alternative 6a**) and those of the second year and beyond (e.g., **Alternative 6b**). It is worth reiterating here that these effects were estimated under the assumption that affected trips are cancelled and not shifted to the open season or area. If effort shifting occurs the actual increases in CS and NOR relative to **Alternative 1 (No Action)** would be higher than those presented in the table.

Table 4-7a. One-year increases in consumer surplus (CS) and for-hire net operating revenues (NOR) under the various alternatives relative to the no action alternative, in 2009 dollars.

	Charterboat	Headboat	Private	Total
Alternative 2				
CS	398,483	2,447,762	1,288,336	4,134,581
NOR	215,983	766,008		981,991
Total	614,466	3,213,770	1,288,336	5,116,572
Alternative 3				
CS	322,802	2,104,524	1,099,797	3,527,123
NOR	174,963	658,594		833,557
Total	497,765	2,763,118	1,099,797	4,360,680
Alternative 4				
CS	373,083	2,065,022	1,082,406	3,520,511
NOR	202,216	646,232		848,448
Total	575,298	2,711,254	1,082,406	4,368,959
Alternative 5				
CS	263,655	1,376,448	657,982	2,298,085
NOR	142,905	430,748		573,653
Total	406,560	1,807,196	657,982	2,871,738
Alternative 6a				
CS	246,408	1,253,413	582,714	2,082,536
NOR	133,557	392,246		525,802
Total	379,965	1,645,659	582,714	2,608,338
Alternative 6b				
CS	398,483	2,447,762	1,288,336	4,134,581
NOR	215,983	766,008		981,991
Total	614,466	3,213,770	1,288,336	5,116,572
Alternative 7a				
CS	398,483	2,447,762	1,288,336	4,134,581
NOR	215,983	766,008		981,991
Total	614,466	3,213,770	1,288,336	5,116,572
Alternative 7b				
CS	526,321	3,132,324	1,758,789	5,417,434
NOR	285,273	980,236		1,265,509
Total	811,594	4,112,560	1,758,789	6,682,943
Alternative 8a				
CS	398,483	2,447,762	1,288,336	4,134,581
NOR	215,983	766,008		981,991
Total	614,466	3,213,770	1,288,336	5,116,572
Alternative 8b				
CS	523,724	3,162,457	1,774,302	5,460,484
NOR	283,865	989,666		1,273,531
Total	807,589	4,152,123	1,774,302	6,734,015

Table 4-7a. Continued. One-year increases in consumer surplus (CS) and for-hire net operating revenues (NOR) under the various alternatives relative to the no action alternative, in 2009 dollars.

Alternative 9a				
CS	373,083	2,065,022	1,082,406	3,520,511
NOR	202,216	646,232		848,448
Total	575,298	2,711,254	1,082,406	4,368,959
Alternative 9b				
CS	353,944	2,249,485	1,352,729	3,956,157
NOR	191,842	703,958		895,800
Total	545,786	2,953,443	1,352,729	4,851,957
Alternative 10a				
CS	263,655	1,376,448	657,982	2,298,085
NOR	142,905	430,748		573,653
Total	406,560	1,807,196	657,982	2,871,738
Alternative 10b				
CS	353,944	2,249,485	1,352,729	3,956,157
NOR	191,842	703,958		895,800
Total	545,786	2,953,443	1,352,729	4,851,957
Alternative 11				
CS	572,005	3,400,754	1,906,229	3,293,887
NOR	310,034	1,064,239		1,818,444
Total	882,038	4,464,993	1,906,229	5,112,330

As mentioned above, some alternatives include closure changes in the second year that differ from those in the first year. For direct comparison of alternatives, two-year effects were summed, and results are presented in **Table 4-7b**. Applying discount rates changed the magnitudes but not the ranking of alternatives. Discounted results are not reported in this document. On a two-year basis, the overall effects of the various alternatives would range approximately from $1.1 million to $2.7 million in NOR and from $4.6 million to $11.8 million in CS. The low numbers are associated with **Alternative 5** whereas the high numbers, with **Alternative 11 (Preferred)**. For charterboats, the CS effects would range approximately from $527,000 to $1.1 million and the NOR effects would be from $286,000 to $620,000. The low ends of the ranges are associated with **Alternative 5** and the high ends, with **Alternative 11(Preferred)**. For headboats, the CS effects would range from $2.8 million to $6.8 million and NOR effects, from $861,000 to $2.1 million. The low ends are associated with **Alternative 5** and the high ends, with **Alternative 11 (Preferred)**. For anglers fishing through the private mode, the CS effects would range approximately from $1.3 million (**Alternative 5**) to $3.8 million (**Alternative 11**). Hence, **Alternative 11 (Preferred)** is best and **Alternative 5** worst for all sectors. Annual economic effects may be approximated by a simple averaging of two-year effects. For example, the annual economic effects of **Alternative 5** would be approximately $2.298 million in CS and $0.574 million in NOR; those of **Alternative 10** would be approximately $3.127 million in CS and $0.735 in NOR.

Table 4-7b. Two-year increases in consumer surplus (CS) and for-hire net operating revenues (NOR) under the various alternatives relative to the no action alternative, in 2009 dollars.

	Charterboat	Headboat	Private	Total
Alternative 2				
CS	796,966	4,895,524	2,576,672	8,269,162
NOR	431,966	1,532,015		1,963,981
Total	1,228,932	6,427,539	2,576,672	10,233,143
Alternative 3				
CS	645,604	4,209,048	2,199,593	7,054,246
NOR	349,926	1,317,188		1,667,114
Total	995,530	5,526,236	2,199,593	8,721,360
Alternative 4				
CS	746,165	4,130,044	2,164,813	7,041,023
NOR	404,431	1,292,464		1,696,896
Total	1,150,597	5,422,509	2,164,813	8,737,919
Alternative 5				
CS	527,311	2,752,895	1,315,964	4,596,170
NOR	285,809	861,497		1,147,306
Total	813,120	3,614,392	1,315,964	5,743,476
Alternative 6				
CS	644,891	3,701,175	1,871,050	6,217,117
NOR	349,540	1,158,253		1,507,793
Total	994,431	4,859,428	1,871,050	7,724,910
Alternative 7				
CS	924,804	5,580,086	3,047,125	9,552,015
NOR	501,256	1,746,243		2,247,499
Total	1,426,060	7,326,330	3,047,125	11,799,515
Alternative 8				
CS	922,207	5,610,220	3,062,638	9,595,065
NOR	499,848	1,755,673		2,255,522
Total	1,422,055	7,365,893	3,062,638	11,850,586
Alternative 9				
CS	727,027	4,314,507	2,435,135	7,476,668
NOR	394,058	1,350,190		1,744,248
Total	1,121,085	5,664,697	2,435,135	9,220,917
Alternative 10				
CS	617,599	3,625,932	2,010,711	6,254,242
NOR	334,747	1,134,707		1,469,453
Total	952,346	4,760,639	2,010,711	7,723,696
Alternative 11				
CS	1,144,009	6,801,509	3,812,457	11,757,975
NOR	620,068	2,128,478		2,748,546
Total	1,764,077	8,929,987	3,812,457	14,506,521

Based on two-year effects, the next three tables present the ranking of alternatives for each sector and for all sectors combined. As a basis for comparison, **Table 4-7c** uses the sum of CS and NOR effects; **Table 4-7d** uses CS effects only; and, **Table 4-7e** uses NOR effects only.

As shown in **Table 4-7c**, each sector individually and all sectors combined have the same top three alternatives (**Alternatives 11, 8, and 7**) and lowest three alternatives (**Alternatives 5, 10, and 6**). It is rather obvious that **Alternative 11 (Preferred)** is the best alternative, since it would not impose any area closure at all. On the other end of the scale is **Alternative 5,** which is the worst alternative for all sectors. It may be recalled that **Alternative 5** would close all three statistical areas from May through December while some of the top alternatives, like **Alternative 7** or **Alternative 8,** would close only two statistical areas at a shorter duration, especially in the second year. The water depths subject to closure are the same for these alternatives. Thus, it is almost expected that **Alternative 5** would be ranked much lower than either **Alternative 7** or **Alternative 8**.

Only slight changes in the ranking of alternatives occur when considering the CS effects only **(Table 4-7d)**. **Alternative 3** is now ranked higher than **Alternative 4** and **Alternative 10** is ranked higher than **Alternative 6**. These rank switches occur only for all sectors combined. The ranking of alternatives for each sector individually remain the same.

The ranking of alternatives using NOR effects only is the same as that using the sum of CS and NOR effects **(Table 4-7e).** This holds true for each sector individually and for all sectors combined.

Table 4-7c. Rank of alternatives based on two-year increases in consumer surplus (CS) plus for-hire net operating revenues (NOR).

Rank	Charterboat	Headboat	Private	All Sectors
1	Alternative 11	Alternative 11	Alternative 11	Alternative 11
2	Alternative 7	Alternative 8	Alternative 8	Alternative 8
3	Alternative 8	Alternative 7	Alternative 7	Alternative 7
4	Alternative 2	Alternative 2	Alternative 2	Alternative 2
5	Alternative 4	Alternative 9	Alternative 9	Alternative 9
6	Alternative 9	Alternative 3	Alternative 3	Alternative 4
7	Alternative 3	Alternative 4	Alternative 4	Alternative 3
8	Alternative 6	Alternative 6	Alternative 10	Alternative 6
9	Alternative 10	Alternative 10	Alternative 6	Alternative 10
10	Alternative 5	Alternative 5	Alternative 5	Alternative 5

Table 4-7d. Rank of alternatives based on two-year increases in consumer surplus (CS).

Rank	Charterboat	Headboat	Private	All Sectors
1	Alternative 11	Alternative 11	Alternative 11	Alternative 11
2	Alternative 7	Alternative 8	Alternative 8	Alternative 8
3	Alternative 8	Alternative 7	Alternative 7	Alternative 7
4	Alternative 2	Alternative 2	Alternative 2	Alternative 2
5	Alternative 4	Alternative 9	Alternative 9	Alternative 9
6	Alternative 9	Alternative 3	Alternative 3	Alternative 3
7	Alternative 3	Alternative 4	Alternative 4	Alternative 4
8	Alternative 6	Alternative 6	Alternative 10	Alternative 10
9	Alternative 10	Alternative 10	Alternative 6	Alternative 6
10	Alternative 5	Alternative 5	Alternative 5	Alternative 5

Table 4-7e. Rank of alternatives based on two-year increases in net operating revenue (NOR).

Rank	Charterboat	Headboat	Private	All Sectors
1	Alternative 11	Alternative 11		Alternative 11
2	Alternative 7	Alternative 8		Alternative 8
3	Alternative 8	Alternative 7		Alternative 7
4	Alternative 2	Alternative 2		Alternative 2
5	Alternative 4	Alternative 9		Alternative 9
6	Alternative 9	Alternative 3		Alternative 4
7	Alternative 3	Alternative 4		Alternative 3
8	Alternative 6	Alternative 6		Alternative 6
9	Alternative 10	Alternative 10		Alternative 10
10	Alternative 5	Alternative 5		Alternative 5

The magnitude of economic effects of the various alternatives directly correlates with the size and duration of the area closure. The ranking of alternatives based on the magnitude of economic effects underscores this point. However, there are certain features of the estimated effects that need to be recognized.

First, some alternatives are very close to each other in terms of economic effects, although a discrete ranking of these alternatives was achieved as shown in the tables above. Take the case of **Alternatives 7 and 8**, which are both ranked either as second or third. Both alternatives are the same with respect to the size and length of area closure for the first year. They differ only in the second year, with **Alternative 7** closing one area in June and July and **Alternative 8** closing two areas in July. Their overall effects differ only somewhat marginally. **Alternative 7** has slightly higher economic effects than **Alternative 8** for charterboats and slightly lower economic effects for the other sectors, including all sectors combined. It appears then that, for all intent and purposes, the two alternatives have the same economic effects.

Second, some alternatives appear to have about the same overall economic effects, but they differ in structure and in their economic effects on certain segments of the recreational sector. **Alternatives 3 and 4**, which are ranked somewhere in the middle, belong to this mold. Both alternatives would close the same three areas and water depths. They differ only in the duration of the closure – **Alternative 3** has a four-month closure (May-August) whereas **Alternative 4** has a six-month closure (July-December). Their overall effects for all sectors combined are close to each other ($8.721 million vs. $8.737 million). Their effects on the private mode do not differ much ($2.199 million vs. $2.164 million). On the other hand, their effects on headboats or charterboats are quite different: $5.526 vs. $5.422 for headboats and $0.995 million vs. $1.15 for charterboats. What is even a little surprising here is that **Alternative 3** (4-month closure) has lower economic effects on charterboats than **Alternative 4** (6-month closure). The reverse is true for headboats and private mode. This signifies the different seasonal distribution of charterboat and headboat/private mode effort. Based on 2007-2009 activities, charterboats took more trips in May and June than in September through December, thus **Alternative 3** has higher economic effects than **Alternative 4**. In a sense, the economic effects on charterboats would tone down the economic effects on the other sectors, resulting in **Alternatives 3 and 4** to have relatively similar total economic effects.

Another pair of alternatives worth comparing consists of **Alternatives 6 and 10**, both of which are ranked at the bottom. In the first year, both alternatives would close the same three statistical areas from May through December, but **Alternative 6** would close water depths from 66 feet to 240 feet and **Alternative 10**, from 98 feet to 240 feet. In the second year, both alternatives would limit the closure to the same two statistical areas and have the same water depths (98 feet to 240 feet) but differ in the length and timing of the closure. **Alternative 6** would close May through October whereas Alternative 10, January through April. As expected, the first year economic effects of **Alternative 10** would be higher than those of **Alternative 6** ($2.872 million vs. $2.608 million, **Alternative 6a** and **Alternative 10a** in **Table 4-7a**). The second year effects, however, did not turn out to be as generally expected – **Alternative 6** would result in higher economic effects than **Alternative 10** despite its longer closure ($5.116 million vs. $4.852 million, **Alternative 6b** and **Alternative 10b** in **Table 4-7a**). This implies that a shorter closure in the early months would affect more recreational trips, particularly the charterboat and headboat sectors, than a longer closure toward the middle and end months. On a two-year basis, **Alternative 6** would favor the charterboat and headboat sectors while **Alternative 10** would favor the private mode anglers. At any rate, the overall economic effects of both alternatives would be about the same: $7.725 million for **Alternative 6** and $7.724 million for **Alternative 10**.

Another issue worth noting here is that economic effects of the various alternatives would filter through the recreational fishing support industries and local communities where recreational fishing activities are concentrated. The economic impacts on these industries and communities would generally be proportionate to the estimated economic effects on anglers and for-hire fleet.

One other important point to consider with the estimated results is the manner the no action alternative was defined in the present economic assessment. The closed area under Amendment 17A was assumed to commence on January 1, 2011, although as noted elsewhere in this document, implementation of the area closure has been delayed until June 1, 2011. Explicit

consideration of this delayed implementation of the area closure would change the magnitudes of economic effects of the various alternatives and potentially also the ranking of these alternatives. What is certain, however, is that **Alternative 11 (Preferred)** would still come out as the best alternative for all segments of the recreational sector in the short term.

The long-term scenario for the various alternatives depends, to a great extent, on the biological condition of the red snapper stock over time. If the current ban on harvest, retention, and possession of red snapper is sufficient to end overfishing and keep the pace of rebuilding along the desired trajectory, then the short-term benefits of the various alternatives will be sustained over time. In particular, **Alternative 11 (Preferred)** will provide the largest long-term economic benefits. If some form of area closure is needed, it could happen that some of the lesser alternatives (e.g., **Alternative 7 or Alternative 8**) would be better than **Alternative 11 (Preferred)** in the long term.

4.3 Social Effects

4.3.1 General Social Effects

Regulatory change in general may cause some of the following direct and indirect social 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.

An additional indirect effect of fisheries management on the fishing community and related sectors may include 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 fishermen and associated businesses and communities. The fact that "the science" can cause relatively large changes in harvests, particularly reductions, may be disconcerting to fishermen and concerned stakeholders. This can induce compliance issues 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. Essentially, the effectiveness of management, from biological, economic, and social perspectives, requires buy-in by affected entities.

A description of the communities expected to be affected by the actions in this amendment is provided in **Section 3.3.3**.

Alternative 1 (No Action) would not be expected to result in any change in any direct short or long-term social effects associated with new restrictions because no new restrictions on the fishery would occur. Under **Alternative 1 (No Action)**, the actions approved under Amendment 17A would go into effect, with the exception of the delayed application of the harvest prohibition of snapper grouper species other than red snapper until June 2011, and all entities associated with the red snapper component of the snapper grouper fishery would be expected to experience the effects of these actions. The expected social effects of these actions are discussed in Amendment 17A and are incorporated herein by reference.

Although **Alternative 1 (No Action)** would not be expected to result in any change in social effects associated with management change, reduction in social benefits may accrue to a possible perception of inappropriate management. As discussed in **Section 1.4**, the most recent assessment of the red snapper resource indicates that the stock is in better shape than the conditions that precipitated the adoption of the actions approved under Amendment 17A, and this improved condition supports a lessening of the restrictions proposed by Amendment 17A. From the perspective that less restrictive measures can achieve the biological goals for the red snapper resource, failure to lessen the planned restrictions and reduce the expected adverse social and economic benefits associated with these planned restrictions would not be expected to be well received by affected entities and may be perceived as inappropriate exercise of management authority.

Alternatives 2-11 are less restrictive than the prohibitions approved under Amendment 17A. As a result, the expected social effects of all of the alternative harvest prohibitions and exemptions would be expected to be positive relative to **Alternative 1 (No Action)**. However, because **Alternative 1 (No Action)** equates to the implementation of the actions approved under Amendment 17A, and these actions are expected to result in reductions in short-term social benefits relative to historical performance in the snapper grouper fishery, the less restrictive measures considered in the current amendment would be expected to result in net increased short-term social benefits relative to **Alternative 1 (No Action)**, but reduced short-term social benefits relative to the historic fishery.

Because **Alternatives 2-11** would equally prohibit all commercial and recreational harvest of red snapper in the South Atlantic EEZ 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 extent to which they lessen the restrictions on the harvest of other snapper grouper species expected to go into effect as a result of Amendment 17A. As the severity of restrictions expected to be implemented as a result of Amendment 17A is reduced, assuming the biological goals are not compromised, the greater the expected increase in social benefits.

It should be emphasized that this assessment assumes that all of the alternatives considered would be successful in achieving the biological goals of red snapper management. A discussion of the expected biological effects of the proposed alternatives is provided in **Section 4.1**. As detailed in **Table 2-1**, the alternatives are expected to result in different percentage reductions in red snapper mortality. Although changing future conditions could result in a need for greater red

snapper harvest reductions in subsequent years than currently projected, such that higher short-term reductions than currently projected may be beneficial, assessment of such considerations are beyond the scope of this analysis. As a result, this assessment assumes that the social benefits are maximized with the minimum reduction in red snapper harvest necessary to meet the biological goals for the resource. Specifically, if a certain percentage reduction is expected to meet recovery goals, it is assumed that social benefits would not be increased by a higher percentage reduction.

The expected social effects of the alternative harvest prohibitions and exemptions would be expected to be generally proportional to the magnitude of expected economic effects. The expected economic effects of these alternatives are provided in **Section 4.2**. In general, the less extensive the proposed harvest restriction, in terms of geographic coverage, duration, and more liberal exemptions, the greater the resultant short-term increase in social effects relative to **Action 1 (No Action)**. The expected economic effects have been used to generate estimates of the expected changes in business activity, which have an inarguable social content, and are provided in **Section 4.3.2**. As explained in **Section 4.3.2**, the estimates of the changes in business activity are proportional and unidirectional to the expected economic effects of the alternatives.

The estimates of the expected change in business activity can be used as a guide to ranking the expected changes in social benefits. However, four caveats should be noted. The first caveat is, as discussed above, all results assume that the biological goals would be met under each alternative; specifically, harvest reductions that are greater than those currently expected to be sufficient to achieve rebuilding goals would not be expected to result in greater social or economic benefits. The second caveat is that all calculations are based on a two-year calendar basis encompassing both 2011 and 2012, but the calculations do not include the effects of the expected delay of the implementation of the area closure until June in 2011. As a result, the expected changes in business activity, and associated social effects, would be expected to exceed the actual changes by an unknown amount (losses would not be as severe, nor gains as great) because the calculations artificially return or take away changes that are not expected to occur as a result of the delayed implementation of the area closure in 2011. This caveat affects the magnitude but not the expected ranking of the effects. The third caveat is, as discussed in **Section 4.3.2**, the calculations do not allow for behavioral changes, so any estimates are likely inflated by an unknown amount. The final caveat is that the results provided in **Section 4.3.2** assume both the pot and dive gear exemptions apply in tandem with each alternative prohibition. It is appropriate to apply these exemptions because of their approval and implementation through Amendment 17A.

With these considerations in mind and the assumption that the ranking based on economic and business activity effects is a sufficient indicator of ranking from a social perspective, it can be seen in **Section 4.3.2** that overall, across all states and from the perspective of national effects, for the commercial sector, **Alternative 11 (Preferred)** would be expected to result in the greatest average annual increase in total social benefits (across all states) while **Alternative 5** would be expected to result in the smallest average annual increase in total social benefits (**Table 4-8**). However, as seen in the results in the subsequent tables (**Tables 4-9 through 4-12**), not all states, and associated communities, would be expected to receive increased social or economic

benefits from any of the alternatives. As discussed in Amendment 17A, the prohibition of harvest of snapper grouper species off Georgia and Florida would be expected to benefit fishermen, and associated communities and businesses, in North Carolina and South Carolina as a result of expected lengthening of the season for these species and an increased opportunity of harvest and sale of these species by fishermen in these two states at the expense of fishermen and associated shoreside entities that operate in closer geographic proximity to the closed areas**.** Therefore, based on this expectation, it is logical that reducing the severity of these prohibitions would reverse these effects; entities in North Carolina and South Carolina would be expected to lose the benefits that they were previously expected to gain, while entities in Georgia and Florida would be expected to gain back the benefits that they were previously expected to lose. Overall, however, across all states, a net increase in social benefits would be expected because the gains in social benefits in Georgia and Florida would be expected to exceed the losses in social benefits in North Carolina and South Carolina. These results and the rankings of **Alternatives 2-11** can be seen in **Tables 4-8 through 4-12**.

For the recreational sector, the ranking of alternatives would similarly be expected to follow the expected changes in recreational effort (rather than changes in ex-vessel revenues) and resultant potential effects on business activity. Projections of these changes are provided in **Table 4-13**. Overall, while all of **Alternatives 2-11** would be expected to result in increased short term social benefits relative to **Alternative 1 (No Action)** because each would result in a reduction in snapper grouper harvest prohibitions, **Alternative 5** would be expected to result in the smallest total increase in social benefits because it would be expected to result in the smallest increase in recreational angler trips, while **Alternative 11 (Preferred)** would be expected to result in the largest total increase in social benefits. Unlike the expected effects on the commercial sector, these alternatives are not expected to have any substantial effects on anglers or associated businesses or communities in North Carolina or South Carolina. As a result, all the expected social effects of these alternatives would be expected to occur in Georgia and Florida, specifically northeast Florida due to the proximity to the affected waters.

4.3.2 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 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 (CS or PS/NOR) 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. As stated in **Section 4.3.1**, the proposed measures in this amendment are expected to result in increases in commercial revenues and recreational trips relative to the status quo because they reduce the management restrictions adopted in Amendment 17A. While some change of business activity would be expected to result from any change in commercial revenues or recreational trips, the full 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. If harvests and ex-vessel revenues increase as a result of management change, 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 less restrictive management, taking advantage of new fishing opportunities 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 lost by the fishing industry or associated businesses as a whole in the event of more restrictive management, nor would all business activity be expected to be new activity in the event of less restrictive management. 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.

The previous two paragraphs may seem confusing with respect to the current amendment because they are general summaries of things to consider with respect to management change. In the current situation, confusion may arise due to the fact that the proposed actions are expected to lessen the restrictions of an amendment yet to be fully implemented. As such, the benefits (increased revenues in the commercial sector and increased trips in the recreational sector) are not new per se, i.e., the benefits are not expected additions/increases to the historic fishery, but represent, instead, historic average annual revenues and trips that would not be expected to be lost. Thus, they represent continuations of historic performance. Stated an alternative way, the changes in business activity provided below are less gains than they are expectations of avoided losses. As such, the discussion of "uncaptured" behavioral change provided above reduces, for this amendment, to caution that the benefits (avoided losses) of the proposed actions are likely overstated because their original tabulation as expected losses as a result of Amendment 17A was likely overstated. Or, stated a different way, the full amount of these business activity effects should not be expected to be "retained" as a result of the proposed alternatives because they were unlikely to be lost as a result of Amendment 17A.

The following discussion focuses on the potential change in business activity associated with the estimated changes in commercial ex-vessel revenues for Action 1 **Alternatives 2-11,** as provided in **Tables 4-8 through 4-12**. As stated in **Section 4.3.1**, the effects of **Alternatives 2-10** were assessed in tandem with the black sea bass pot and spearfish gear exemptions implemented as a result of Amendment 17A. The results represent the expected potential effect of the alternative area prohibitions for 2011 and 2012. However, as discussed in **Section 4.3.1**, the assessment does not include the effects of the delayed implementation of the area prohibition on the harvest of other snapper grouper species in 2011.

Finally, although the assessment covered a two-year period, 2011 and 2012, the results provided in the tables represent the average annual effects for the two years, meaning, on average these changes, with respect to **Alternative 1 (No Action)**, would be expected to occur each year in 2011 and 2012. For **Alternatives 2-5**, the average annual effect over the two-year period would be expected to be equal to the single-year effect because the prohibitions would not change in 2012 from those in 2011. For **Alternatives 6-10**, however, the effects in 2011 would be expected to be different in 2011 than in 2012 because of the reduced scope of the prohibition in 2012. As a fictional example, if a prohibition was projected to result in an increase of 20 harvester jobs in 2011 (relative to **Alternative 1 (No Action)**) and 30 harvester jobs in 2012, the

30 jobs in 2012 would not be expected to be all new jobs relative to 2011 but rather, continuation of the 20 jobs from 2011 and 10 new jobs in 2012. Therefore, from an average annual perspective, the expected change in business activity would be 25 harvester jobs per year for the two years (20 + 30 = 50, divided by 2). The average annual effects over the entire period beginning in 2013 and continuing into subsequent years would be equivalent to the average annual estimate for the first two years under **Alternatives 2-5**, because the prohibitions would remain fixed each year until changed, but would increase under **Alternatives 6-10** because of the persistence of a less restrictive prohibition (relative to 2011) in the subsequent years (20+30 equals an annual average of 25, whereas 20+30+30 equals an annual average of approximately 27, 20+30+30+30 equals an annual average of approximately 28, etc.).

It should be noted that the estimated changes in business activity for Georgia-northeast 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 due to 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-northeast Florida in this analysis is calculated using the Florida model because the majority of the changes occur in Florida. Because the Georgia portion of ex-vessel revenues in the combined Georgia-northeast 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 changes in business activity were also forecast for the Florida Keys. However, the expected changes in ex-vessel revenues, and associated business activity, for the Florida Keys are minor, amounting to, at most, a few thousand dollars over the two years, 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 discussed below) are additive across states 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). This assessment provides the expected potential change in business activity for the entire U.S. and for each state individually. A simple examination of the results will confirm that the sum of the effects of the individual states is less than the U.S. total.

For the combined effects, the estimated potential change in average annual ex-vessel revenues to the U.S. ranges from a gain of approximately $105,000 (**Alternative 5**) to a gain of approximately $183,000 (**Alternative 11**), with associated increases in FTE jobs for these alternatives of 3 harvester/20 total and 5 harvester/34 total, respectively (**Table 4-8**). The estimated potential change in average annual ex-vessel revenues in North Carolina ranges from a loss of approximately $99,000 (**Alternative 5**) to a loss of approximately $324,000 (**Alternative 11)**, with associated reductions in FTE jobs for these alternatives of 2 harvester/14 total and 5 harvester/44 total, respectively (**Table 4-9**). The estimated potential change in average annual ex-vessel revenues in South Carolina ranges from a loss of approximately $47,000 (**Alternative 5**) to a loss of approximately $197,000 (**Alternative 11**), with associated reductions in FTE jobs for these alternatives of 2 harvester/5 total and 8 harvester/21 total, respectively (**Table 4-10**). For Georgia-northeast Florida, the estimated potential change in average annual ex-vessel revenues ranges from a gain of approximately $229,000 (**Alternative 5**) to a gain of approximately $575,000 (**Alternative 11**), with associated gains in FTE jobs for these alternatives of 4 harvester/18 total and 10 harvester/45 total, respectively (**Table 4-11**). Finally, the estimated potential change in average annual ex-vessel revenues in Central-southeast Florida ranges from a gain of approximately $22,000 (**Alternative 5**) to a gain of approximately $131,000 (**Alternative 11**), with associated losses in FTE jobs for these alternatives of 0 harvester/2 total and 2 harvester/10 total, respectively (**Table 4-12**).

Table 4-8. Potential change in U.S. business activity associated with the estimated change in the commercial sector ex-vessel revenues relative to **Alternative 1 (No Action)**. All dollar values are in 2008 dollars.

		US Business Activity Effects			
Alternative*	**Revenue Change**	**Harvester Jobs**	**Total Jobs**	**Output Impacts**	**Income impacts**
2	$143,285	4	27	$1,886,490	$803,972
3	$164,290	4	31	$2,163,042	$921,831
4	$136,970	3	26	$1,803,347	$768,539
5	$104,800	3	20	$1,379,797	$588,033
6	$118,980	3	22	$1,566,491	$667,597
7	$158,535	4	30	$2,087,272	$889,540
8	$160,410	4	30	$2,111,958	$900,061
9	$147,500	4	28	$1,941,985	$827,623
10	$131,410	3	25	$1,730,144	$737,342
11	$183,025	5	34	$2,409,707	$1,026,953

*all alternatives, except **Alternative 11**, include the pot and dive gear exemptions. The gear exemptions are not relevant to **Alternative 11**.

Table 4-9. Potential change in North Carolina business activity associated with the estimated change in the commercial sector ex-vessel revenues relative to **Alternative 1 (No Action)**. All dollar values are in 2008 dollars.

		North Carolina Business Activity Effects			
Alternative*	**Revenue Change**	**Harvester Jobs**	**Total Jobs**	**Output Impacts**	**Income impacts**
2	-$289,720	-5	-39	-$1,708,769	-$919,861
3	-$163,850	-3	-22	-$966,387	-$520,224
4	-$168,400	-3	-23	-$993,223	-$534,670
5	-$99,450	-2	-14	-$586,556	-$315,754
6	-$194,585	-3	-26	-$1,147,662	-$617,807
7	-$302,840	-5	-41	-$1,786,150	-$961,517
8	-$304,495	-5	-41	-$1,795,912	-$966,772
9	-$239,710	-4	-33	-$1,413,810	-$761,079
10	-$205,235	-3	-28	-$1,210,476	-$651,621
11	-$323,515	-5	-44	-$1,908,091	-$1,027,160

*all alternatives, except **Alternative 11**, include the pot and dive gear exemptions. The gear exemptions are not relevant to **Alternative 11**.

Table 4-10. Potential change in South Carolina business activity associated with the estimated change in the commercial sector ex-vessel revenues relative to **Alternative 1 (No Action)**. All dollar values are in 2008 dollars.

		South Carolina Business Activity Effects			
Alternative*	**Revenue Change**	**Harvester Jobs**	**Total Jobs**	**Output Impacts**	**Income impacts**
2	-$156,860	-6	-17	-$729,242	-$351,994
3	-$84,815	-3	-9	-$394,305	-$190,325
4	-$112,525	-5	-12	-$523,129	-$252,506
5	-$47,470	-2	-5	-$220,688	-$106,523
6	-$99,425	-4	-11	-$462,227	-$223,110
7	-$173,520	-7	-18	-$806,694	-$389,379
8	-$173,985	-7	-18	-$808,856	-$390,422
9	-$151,960	-6	-16	-$706,462	-$340,998
10	-$119,435	-5	-13	-$555,253	-$268,012
11	-$197,515	-8	-21	-$918,247	-$443,224

*all alternatives, except **Alternative 11**, include the pot and dive gear exemptions. The gear exemptions are not relevant to **Alternative 11**.

Table 4-11. Potential change in Georgia-northeast Florida business activity associated with the estimated change in the commercial sector ex-vessel revenues relative to **Alternative 1 (No Action)**. All dollar values are in 2008 dollars.

		Georgia-northeast Florida Business Activity Effects			
Alternative*	**Revenue Change**	**Harvester Jobs**	**Total Jobs**	**Output Impacts**	**Income impacts**
2	$544,330	10	43	$2,181,130	$1,158,879
3	$350,395	6	28	$1,404,033	$745,991
4	$349,315	6	28	$1,399,705	$743,692
5	$229,290	4	18	$918,765	$488,158
6	$384,805	7	30	$1,541,914	$819,250
7	$555,050	10	44	$2,224,085	$1,181,701
8	$557,090	10	44	$2,232,260	$1,186,045
9	$452,870	8	36	$1,814,650	$964,160
10	$392,855	7	31	$1,574,170	$836,388
11	$575,435	10	45	$2,305,768	$1,225,101

*all alternatives, except **Alternative 11**, include the pot and dive gear exemptions. The gear exemptions are not relevant to **Alternative 11**.

Table 4-12. Potential change in central-southeast Florida business activity associated with the estimated change in the commercial sector ex-vessel revenues relative to **Alternative 1 (No Action)**. All dollar values are in 2008 dollars.

		Central-southeast Florida Business Activity Effects			
Alternative*	**Revenue Change**	**Harvester Jobs**	**Total Jobs**	**Output Impacts**	**Income impacts**
2	$46,345	1	4	$185,704	$98,669
3	$62,750	1	5	$251,439	$133,595
4	$69,420	1	5	$278,166	$147,795
5	$22,425	0	2	$89,857	$47,743
6	$28,580	1	2	$114,520	$60,847
7	$81,445	1	6	$326,350	$173,396
8	$83,395	2	7	$334,164	$177,548
9	$87,880	2	7	$352,135	$187,097
10	$64,385	1	5	$257,991	$137,076
11	$131,000	2	10	$524,917	$278,899

*all alternatives, except **Alternative 11**, include the pot and dive gear exemptions. The gear exemptions are not relevant to **Alternative 11**.

Table 4-13 contains estimates of the potential change in business activity associated with the estimated change in recreational trips under **Alternatives 2-11** relative to **Alternative 1 (No Action)**. The gear exemptions implemented as a result of Amendment 17A are not relevant to the recreational sector. Because coefficients of the estimated change in business activity are not available for the headboat sector, 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 in **Table 4-13**. None of the proposed prohibitions would be expected to affect recreational angler trip demand by North Carolina or South Carolina anglers. As a result, no changes in job, output (sales), or value-added impacts are expected to occur. Because of confidentiality considerations, this assessment combines the expected effects for Georgia and Florida.

As seen in **Table 4-13**, overall, **Alternative 5** would be expected to result in the least gain in business activity associated with the recreational sector, while **Alternative 11** would be expected to result in the greatest gain. **Alternative 5** would be expected to result in an increase of 7,950 angler trips and 7 FTE jobs, while **Alternative 11** would be expected to result in an increase of 22,219 angler trips and 18 FTE jobs. These alternatives also would be expected to result in the fewest and most gains in business activity if evaluated by sector, private versus charter.

Table 4-13. Two-year potential change in Georgia-northeast Florida business activity associated with the estimated change in the recreational target trips relative to **Alternative 1 (No Action)**. All dollar values are in 2008 dollars.

Alternative	Fishing Mode	Target Trip Change	Total Jobs	Output Impacts	Value-added Impacts
2	Private	13,380	6	$505,967	$302,342
	Charter	1,688	7	$661,334	$389,346
	Total	15,068	12	$1,167,301	$691,688
3	Private	11,422	5	$431,925	$258,098
	Charter	1,367	6	$535,730	$315,399
	Total	12,789	10	$967,654	$573,497
4	Private	11,241	5	$425,080	$254,008
	Charter	1,580	7	$619,205	$364,543
	Total	12,821	11	$1,044,285	$618,551
5	Private	6,834	3	$258,410	$154,414
	Charter	1,117	5	$437,558	$257,603
	Total	7,950	7	$695,968	$412,017
6	Private	9,716	4	$367,412	$219,548
	Charter	1,366	6	$535,142	$315,053
	Total	11,082	10	$902,554	$534,601
7	Private	15,823	7	$598,330	$357,534
	Charter	1,958	8	$767,344	$451,757
	Total	17,781	14	$1,365,674	$809,291
8	Private	15,904	7	$601,393	$359,365
	Charter	1,953	8	$765,188	$450,488
	Total	17,856	14	$1,366,581	$809,852
9	Private	12,645	5	$478,173	$285,734
	Charter	1,540	6	$603,333	$355,199
	Total	14,185	11	$1,081,505	$640,933
10	Private	10,441	4	$394,828	$235,931
	Charter	1,308	6	$512,412	$301,671
	Total	11,749	10	$907,240	$537,602
11	Private	19,797	8	$748,627	$447,344
	Charter	2,422	10	$949,186	$558,813
	Total	22,219	18	$1,697,812	$1,006,157

4.3.3 Environmental Justice Considerations

Executive Order 12898 requires federal agencies conduct their programs, policies, and activities in a manner to ensure individuals or populations are not excluded from participation in, or denied the benefits of, or subjected to discrimination because of their race, color, or national origin. In addition, and specifically with respect to subsistence consumption of fish and wildlife, federal agencies are required to collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence. This executive order is generally referred to as environmental justice (EJ).

Persons employed in the snapper grouper fishery and associated businesses and communities along the South Atlantic coast, particularly those in Georgia and northeast Florida, would be expected to be affected by this proposed action. Information on the race and income status for groups at the different participation levels (vessel owners, crew, dealers, processors, employees, employees of associated support industries, etc.) is not available. County level data, however, for certain communities have been assessed to examine potential EJ concerns. Because this proposed action would be expected to affect fishermen and associated industries in numerous communities along the South Atlantic coast and not just those profiled, it is possible that other counties or communities have poverty or minority rates that exceed the EJ thresholds.

In order to identify the potential for EJ concern, the rates of minority populations (non-white, including Hispanic) and the percentage of the population that was below the poverty line were examined. The threshold for comparison that was used was 1.2 times the state average such that, if the value for the community or county was greater than or equal to 1.2 times the state average, then the community or county was considered an area of potential EJ concern. Census data for the year 2000 was used Estimates of the state minority and poverty rates, associated thresholds, and community rates are provided in **Table 4-14**.

Among the communities examined, based on available demographic information, only the poverty rates for Daytona Beach and St. Augustine, Florida suggest potential EJ concern. As noted above, however, additional communities beyond those profiled would be expected to be affected by the actions in this proposed amendment. Because these communities have not been profiled, the absence of additional potential EJ concerns cannot be assumed and the total number of communities that exceed the thresholds is unknown.

However, while some communities expected to be affected by this proposed amendment may have minority or economic profiles that exceed the EJ thresholds and, therefore, may constitute areas of concern, no EJ issues have been identified or are expected to arise as a result of this proposed amendment. No adverse human health or environmental impacts are expected to accrue to this proposed amendment. The measures in this proposed amendment are expected to result in increased social and economic benefits and the environmental consequences of this proposed amendment are expected to be positive. While this proposed amendment is expected to reduce the mortality of an overfished species, red snapper, and result in the possible reduction in the mortality of other species, the reduction in mortality of these species would be expected to be

less than would occur as a result of other management measures that have yet to be fully implemented, thereby reducing adverse consequences to the human environment while preserving necessary protection of red snapper. Protection of red snapper would be expected to assist in the rebuilding of this resource and the reduced mortality of additional species would be expected to increase the environmental benefits these species contribute to the marine environment and the general health and condition of this environment. These measures are also not expected to result in increased risk of exposure of affected individuals to adverse health hazards. Thus, the proposed actions are not expected to result in any negative environmental consequences.

Because the proposed actions are not expected to result in any negative environmental consequences, the EJ issues of fair treatment and meaningful involvement regardless of race, color, national origin, or income are not relevant.

Table 4-14. Environmental Justice Thresholds (2000 U.S. Census data).

State	Community	Minority Rate	Minority Threshold*	Poverty Rate	Poverty Threshold*
Florida		34.60	41.52	12.50	15.00
	Cape Canaveral	8.10		11.60	
	Daytona Beach	39.7		23.6	
	Fernandina Beach	20.0		10.2	
	Jacksonville Beach	11.0		7.2	
	St. Augustine	20.7		15.8	
Georgia		37.40	44.88	13.00	15.60
	Townsend**	39.10		14.60	
South Carolina		33.90	40.68	14.10	16.92
	Little River	9.10		7.50	
North Carolina		29.80	35.76	12.30	14.76
	Atlantic City	2.60		7.30	
	Beaufort	25.40		16.60	
	Hatteras Village	6.60		10.00	
	Morehead City	19.20		14.60	
	Sneads Ferry	9.70		13.50	
	Wanchese	3.30		8.10	

*Calculated as 1.2 times the state rate.
**Values are for all of McIntosh County.

4.4 Administrative Effects

4.4.1 Snapper Grouper Area Closure

Alternative 1 (No Action) would maintain the administrative burden associated with implementing and enforcing the area closure provisions promulgated through Amendment 17A. Under **Alternative 1 (No Action)** , extensive coordination between the enforcement divisions of NOAA Fisheries Service and the U.S. Coast Guard is required to enforce the 4,827 mi^2 closure. However, under **Alternative 1 (No Action)**, there would be no need to continually issue notices to remind fishermen when the area is closed since it would be closed year-round. Complexities associated with enforcement of the black sea bass pot, spearfishing gear, and transit exemptions would persist. An indirect effect of all the area closure alternatives being considered is possible effort shifting into different fisheries, which may increase processing volume for permit transfers, new permit applications, and could require subsequent long-term effort-limiting actions. The red snapper monitoring program, and all associated administrative elements, would continue to develop and operate as outlined in Amendment 17A regardless of whether or not the Council decides to modify the current snapper grouper area closure. Therefore, no new administrative impacts are expected to affect monitoring efforts already in place.

Alternatives 2-5 are all variations on the same basic area closure concept and would therefore, result in comparable impacts relative to administrative time, cost, and enforcement burdens. Because each of the snapper grouper area closure options under consideration have a seasonal and temporal component, public outreach materials would need to be developed to inform constituents of the revised area boundaries and time period. Regulations will also need to be modified to reflect new waypoints and closure time period(s) for the updated provision to be enforceable. Though the enforcement burden may not increase as a result of changing the size and or seasonality of the snapper grouper area closure, it could potentially make enforcement more complex since the closure would not be a year-round prohibition. Law enforcement officers would not only be responsible for enforcing the boundary component of the area closure but also the temporal component, which may be difficult if some fishermen claim they did not receive prior notice the area was closed at a certain time.

Alternatives 6-10 would be likely to be more difficult to enforce and may require more extensive outreach to the fishing community because they include a built-in step-down mechanism for the size and duration of the area closure. **Alternatives 6-10** are designed to account for the expected increase in red snapper biomass in the first year of rebuilding by stepping down the size and/or duration of the snapper grouper area closure in the following year. Therefore, constituents would need to be made aware of the next year's updated waypoints and the time during which the closure would be effective. Because snapper grouper fishery participants are not required to use vessel monitoring systems in the South Atlantic, there is no way to enforce or prosecute area closure violators through dockside methods. Most if not all enforcement would depend on at-sea intercepts.

Alternative 11 (Preferred) would permanently suspend implementation of the snapper grouper area closure approved in Amendment 17A. Therefore, only the red snapper prohibitions would remain in effect. The administrative impacts associated with this alternative are directly related to the duration of its implementation; however, when compared to all the other alternatives considered under this action, **Alternative 11 (Preferred)** would incur the least administrative impacts over the status quo. Under **Alternative 11 (Preferred)**, no monitoring and enforcement of a closed area would be required. Therefore, no additional impact on enforcement efforts would be expected beyond the resources allocated to the enforcement of the red snapper prohibitions already in place.

4.5 Council Conclusions

The Acceptable Biological Catch (ABC) for red snapper is determined by the Council's rebuilding strategy of $F_{REBUILD}$ equal to 98% of $F_{30\% SPR}$. At their November 2010 meeting, the SSC recommended evaluating the rebuilding strategy for the short term (10 years) using a range of alternative headboat weights explored by the SEDAR 24 Review Panel as described in **Section 1.5**. Updated projections and $F_{REBUILD}$ values based on SSC recommendations, presented to the Council at the December 2010 meeting, suggested that a 70-75% reduction in red snapper mortality is required to end overfishing and meet the rebuilding strategy of 98% of $F_{30\%SPR}$. According to initial ICE model evaluations of the moratorium and area closure alternatives, reflecting estimated reductions in effort due to regulations in Amendments 16, 17A, and 17B, the moratorium alone provides a 66% reduction in mortality, which falls short of the 70 to 75% reduction required to meet the rebuilding strategy.

Examination of recreational data available from the Marine Recreational Fisheries Statistics Survey (MRFSS) program for January - August 2010 was used to evaluate predicted moratorium effectiveness. The data show a 33% decline in total trips in 2010 when compared to the 2007-2009 baseline period, which is consistent with fishermen's reports that effort has decreased significantly. In fact, reports from fishermen indicate a decline in trips targeting red snapper in the core north Florida area of up to 50%. Further examination of MRFSS data indicates that red snapper encounters also declined substantially, by as much as 80% in some sectors. Given the strong indications of large reductions in both effort and red snapper encounters for the first 8 months of 2010, the area evaluation model (ICE) was updated to incorporate the observed reductions in the private and charter recreational segments. These new results suggest that the moratorium may provide as much as a 77% reduction in total mortality, which is adequate to meet the Council's rebuilding strategy and to end overfishing. It is important to note that this conclusion is predicated upon substantial effort reductions, some of which are not induced by regulations but are instead widely attributed to other factor such as economic conditions, and therefore may not remain adequate if the downward trend in effort reverses.

The Snapper Grouper Advisory Panel (AP) did not discuss Regulatory Amendment 10 at their November 2010 meeting because the document became available on December 5, 2010. However, the AP received a presentation from Council staff on results of SEDAR 24 and had the

opportunity to ask questions regarding the assessment. An AP representative was present at the December 2010 Council meeting when the Council discussed Regulatory Amendment 10. The AP representative supported the Council's preferred alternative to remove the area closure established through Snapper Grouper Amendment 17A.

During the December 2010 Council meeting, the Southeast Fisheries Science Center (SEFSC) director stated that the analyses conducted for Regulatory Amendment 10 were fair and the Council's choice of management measures depended on their level of risk tolerance. The SEFSC stated that effort on red snapper appeared to be down at least 10% and declines are observed in reported takes of red snapper.

Despite the decline in effort, both the Council and the SEFSC received substantial anecdotal information from fishermen that would indicate there has not been a decline in catch per unit effort during the moratorium. This information would indicate that catches of red snapper are also on the decline since effort has decreased. While anecdotal information is not scientifically verified, the Council does consider it in their management decisions. Moreover, the SEFSC agreed that anecdotal information has been consistent throughout the moratorium.

In deciding how to proceed with this action, the Council considered the most recent evaluations on the effectiveness of the moratorium and the reductions in mortality required to end overfishing and meet the rebuilding strategy based upon the findings of the new benchmark assessment conducted through SEDAR 24. Furthermore, the Council acknowledged the significant economic downturn of recent years and the economic impacts resulting from fishery management actions. In choosing not to impose a snapper grouper fishing area closure, the Council acted to minimize economic and social impacts while meeting the mandate to end overfishing immediately. The Council also acknowledged the high level of uncertainty in both the assessment of current stock status and the evaluations of regulatory effectiveness, as well as the difficulty in predicting how participants will modify behavior in response to regulatory changes. While uncertainty is unavoidable and any action carries a level of risk, the Council concluded that the options were carefully analyzed and evaluated and that the Council could reasonably expect the red snapper moratorium to end overfishing of red snapper. In taking this action, the Council is responding to the mandate to end overfishing while also relying on adaptive management approaches since information on this and other fisheries will continue to be obtained and evaluated in the future, and management may need to be adjusted accordingly.

In addition, the Council reasoned that eliminating the closed area would help to restore faith and goodwill among fishermen in the Council process. The Council's goal is to try to build the red snapper fishery back up to a high level of sustainable harvest and not to put fishermen out of business. Goodwill will enhance voluntary compliance and enhance support for future management of this fishery. The latter will likely continue to be restrictive, however, so it will be important to get buy-in from the fishing community.

The SEFSC will monitor the effectiveness of the regulations in reducing fishing mortality prior to the next red snapper assessment scheduled for 2013. Based on preliminary data, the SEFSC's Fishery-Independent Survey (FIS) strongly corroborates the age distribution estimated in the SEDAR 24 assessment and observed in intensive age sampling conducted in 2009. All sources

indicate two strong year classes currently moving through the fishery. The FIS proposes to focus sampling on those two year classes so that changes in their abundance over time can be used to measure population mortality. This will provide a means to estimate mortality in the absence of directed harvest and enable evaluation of the management strategy and rebuilding progress. The Council requested that the SEFSC deliver an interim progress report on their FIS in early 2012 to be reviewed by the SSC and be available to the Council at their March 2012 meeting.

The Council concluded the proposed action best meets the objectives of the Snapper Grouper FMP, as amended, and ends overfishing of red snapper immediately.

Chapter 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.

5.1 Effects to Biological Environment

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 the South Atlantic Fishery Management Council area of jurisdiction. In light of the available information, the extent of the boundaries would depend upon the degree of fish immigration/emigration and larval transport, whichever has the greatest geographical range. 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 3.1.** 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.

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 1.6 History of Management** and **Appendix C** 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.

B. Present

In addition to snapper grouper fishery management issues being addressed in this amendment, several other snapper grouper amendments have been developed concurrently and are in the process of approval and implementation.

Most recently, Amendment 17A implemented a prohibition on harvest/retention of red snapper and proposed a 4,827 mi^2 snapper grouper area closure within which harvest and possession of all snapper grouper species is prohibited except when using black sea bass pot gear or spearfishing gear to fish for species other than red snapper. Based on results from a recent assessment (SEDAR 24), it is estimated that this area closure would achieve a greater reduction in red snapper removals than is needed to end overfishing. Amendment 17A also includes a requirement to use non-stainless steel circle hooks north of 28˚ N. latitude with natural bait. Additionally, Amendment 17A specifies an annual catch limit (ACL) of zero landings for red snapper and accountability measures (AMs) that include tracking catch per unit effort using fishery-dependent and fishery-independent data sources, as well as a separate fishery-independent red snapper monitoring program. The area closure was delayed through an emergency rule until June 1st, 2011.

Amendment 17B to the FMP for the Snapper Grouper Fishery of the South Atlantic Region was approved by the Secretary of Commerce on December 22, 2010, and includes a deepwater snapper grouper closure seaward of 240 ft for six species that co-occur with speckled hind and warsaw grouper, in addition to establishing ACLs and AMs for eight species experiencing overfishing, as well as black grouper. The ACLs and AMs being implemented through Amendment

17B may help to prevent potential increased harvest of those nine species due to effort shifts that may result from actions in Amendment 17A. Amendment 18A to the FMP, currently under development, contains actions that could limit effort in the black sea bass pot fishery, which may prevent a large effort shift into the fishery that could occur as a result of the provisions to allow the use of black sea bass pot gear within the snapper grouper closed area in Amendment 17A.

C. Reasonably Foreseeable Future

The Comprehensive ACL Amendment would implement ACLs, AMs, and Annual Catch Targets (ACTs) for federally-managed South Atlantic species not experiencing overfishing in other FMPs including Snapper Grouper. 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 proposed species groupings. 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.

Regulatory Amendment 9 to the FMP, would implement trip limits and/or split season quotas for black sea bass, greater amberjack, vermilion snapper, and gag, to prevent derby style fisheries from forming. Fishing for these species may also be impacted by effort shifting due to regulations imposed on co-occurring species such as red snapper. Since several of the species addressed in Regulatory Amendment 9 co-occur with red snapper, imposing trip limits could have the ancillary effect of reducing red snapper bycatch after the trip limits are met. Amendment 22 to the FMP is currently under development and will explore the applicability of long-term red snapper management programs such as fish tags and catch shares. This amendment is in the earliest stages of development and will not impact red snapper in the very near future.

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.

AFFECTED ENVIRONMENT

5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stress.

In terms of the biophysical environment, the resources/ecosystems identified in earlier steps of the CEA are the fish populations directly or indirectly affected by the regulations. This step should identify the trends, existing conditions, and the ability to withstand stresses of the environmental components.

The trends in condition of red snapper are documented through the Southeast Data, Assessment and Review (SEDAR) process. SEDAR 24 indicates the red snapper stock in the South Atlantic is overfished and undergoing overfishing, however, to a lesser degree than shown in the previous 2008 stock assessment (SEDAR 15). Therefore, the Council is considering, through this Regulatory Amendment 10, modifying the size and need for the snapper grouper area closure because it is currently larger than needed to end overfishing of red snapper. Reducing the size of or elimination of the snapper grouper area closure is expected to alleviate, to some degree, the negative socioeconomic impacts that would have otherwise been realized under the Amendment 17A closure. Additionally, projections based on SEDAR 24 indicate the area closure may be reduced or eliminated without impacting the ending of overfishing of red snapper in the South Atlantic.

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 red snapper is approaching conditions where additional stresses could have an important cumulative effect beyond any current plan, regulatory, or sustainability threshold (CEQ 1997). Sustainability thresholds can be identified for some resources, which are levels of impact beyond which the resources cannot be sustained in a stable state. Other thresholds are established through numerical standards, qualitative standards, or management goals. The CEA should address whether thresholds could be exceeded because of the contribution of the proposed action to other cumulative activities affecting resources.

<u>Fish populations</u>

Numeric values of overfishing and overfished thresholds are being updated in this amendment for red snapper. These values includes maximum sustainable yield (MSY), the fishing mortality rate that produces MSY (F_{MSY}), the biomass or biomass proxy that supports MSY (B_{MSY}), the minimum stock size threshold below which a stock is considered to be overfished (MSST), the maximum fishing mortality threshold above which a stock is considered to be undergoing overfishing (MFMT), and optimum yield (OY).

Definitions of overfishing and overfished for red snapper can be found in the most recent stock assessment SEDAR 24 (2010) and SEDAR 15 (2008) for red snapper. In both of these stock assessments red snapper are shown to be overfished and undergoing overfishing. Detailed discussions of the science and processes used to determine the stock status of red snapper is contained in the previously mentioned benchmark stock assessments 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 the 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.

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 a detailed discussion of the baseline conditions of each of the species addressed in this amendment the reader is referred to the stock assessments 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 for the snapper grouper fishery in the South Atlantic 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.
Effective 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
Effective 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 snapper grouper species including vermilion snapper and gag.	Spawning potential ratio for vermilion snapper and gag is less than 30% indicating that they are overfished.

Table 5-1. Continued. The cause and effect relationship of fishing and regulatory actions for the snapper grouper fishery in the South Atlantic within the time period of the Cumulative Effects Analysis (CEA).

Time period/dates	Cause	Observed and/or Expected Effects
Effective 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:" 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}.
Effective 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 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.

Table 5-1. Continued. The cause and effect relationship of fishing and regulatory actions for the snapper grouper fishery in the South Atlantic within the time period of the Cumulative Effects Analysis (CEA).

Time period/dates	Cause	Observed and/or Expected Effects
Effective Date January 4, 2010	Red Snapper Interim Rule	Prohibit commercial and recreational harvest of red snapper from January 4, 2010, to June 2, 2010 with a possible 186-day extension. Reduce overfishing of red snapper while long-term measures to end overfishing are addressed in Amendment 17A.
Effective dates are as follows: Prohibition on the harvest and possession of red snapper (December 3, 2010); area closure for South Atlantic snapper grouper (January 3, 2011); and circle hook requirement (March 3, 2011).	Snapper Grouper FMP Amendment 17A (SAFMC 2010a)	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.
Effective January 3, 2011	Emergency Rule	Delayed the implementation of the snapper grouper area closure until June 1st, 2011
Effective Date January 28, 2011	Snapper Grouper Amendment 17B (SAFMC 2010b)	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 18A	Prevent overexploitation in the black sea bass and golden tilefish fisheries, improve data collection timeliness and data quality.
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 2012	Amendment 20 (Wreckfish)	Review the current ITQ program and update the ITQ program as necessary to comply with MSA LAPP requirements.

Table 5-1. Continued. The cause and effect relationship of fishing and regulatory actions for the snapper grouper fishery in the South Atlantic within the time period of the Cumulative Effects Analysis (CEA).

Time period/dates	Cause	Observed and/or Expected Effects
Target 2011	Regulatory Amendment 9	Control derby fisheries for black sea bass, vermilion snapper, gag, and greater amberjack.
Target 2013	Amendment 21	Establish a catch share program for gag, black sea bass, vermilion snapper, and golden tilefish.
Target 2013	Amendment 22	Establish a sustainable long-term management program for red snapper.

9. Determine the magnitude and significance of cumulative effects.

Proposed management actions, as summarized in **Section 2** of this document, would reduce the size and duration of the snapper grouper area closure promulgated through Amendment 17A or eliminate the closure altogether, based on a new stock assessment that indicates the current area closure is larger than needed to end overfishing of the red snapper stock. 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.

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 adapt 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 Amendment 17A contains a full discussion and analysis of the preferred monitoring program for red snapper, and is hereby incorporated by reference.

5.2 Effects to Socioeconomic Environment

Participation in and the economic performance of the fishery have been affected 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 prices due to imports, increased operating costs (gas, ice, insurance, dockage fees, etc.), and increased waterfront/coastal value leading to development pressure for other than 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 species availability variability, the

sale of a fish house for condominium development, or even simply fishermen behavioral changes unrelated to the regulation.

In general, it can be stated, however, that the regulatory environment for all fisheries has become progressively more complex and burdensome, increasing, in tandem with other adverse influences, the pressure on economic losses, business failure, occupational changes, and associated adverse pressures on associated families, communities, and industries. Some reverse of this trend is possible and expected. The adoption of limited access privilege programs would allow a simplified regulatory environment since trip or seasonal restrictions may no longer be needed and effort issues should be addressed by internal access-rights transfer, while rebuilding plans and the recovery of stocks would allow harvest increases. 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 description of the human environment, including a description of commercial and recreational snapper grouper fisheries and associated key fishing communities is contained in **Section 3.3** and incorporated herein by reference. A description of the history of management of the snapper grouper fishery is contained in **Section 1.6** and **Appendix C** and is incorporated herein by reference. A description of the cumulative effects of actions in Amendment 17A is contained in Amendment 17A and incorporated herein by reference (SAFMC 2010a). In addition, a description of the cumulative effects of actions in Amendment 17B is contained in Amendment 17B and incorporated herein by reference (SAFMC 2010b).

A detailed description of the expected social and economic impacts of the actions in this amendment is contained elsewhere in Section 4 and 5 and is incorporated herein by reference. In general, the actions in this amendment are expected to reduce the negative effects of Amendment 17A (SAFMC 2010a) on both the commercial and recreational sectors, with particular reference to the closed area component of that amendment. This amendment, however, is expected to have differential effects on commercial vessel operations across the South Atlantic geographic areas. Commercial vessel operations in northeast Florida, southeast Florida and Georgia are expected to benefit from this amendment. On the other hand, commercial vessel operations in North Carolina, South Carolina, and the Florida Keys are expected to experience revenue and profit losses. At any rate, the actions contained in this amendment are expected to support the achievement of OY in the respective fisheries over time, resulting in social and economic gains.

Current and future amendments are expected to add to this cumulative effect. Snapper Grouper Amendment 14 (SAFMC 2007) restricted fishing at a series of Marine Protected Area (MPA) sites. The expected economic impacts of these MPAs are unknown since available data cannot identify the incidence or magnitude of harvests from these areas, not is it possible to forecast how fishing behavior or harvests may change to compensate for these restrictions. In the short term, some additional economic losses may occur as a result of this amendment, but in the long term, the stocks are expected to benefit from this increased protection, with spill-over benefits to the fishery.

Snapper Grouper Amendment 15A (SAFMC 2008a)specified management reference points and status determination criteria for snowy grouper, red porgy, and black sea bass; rebuilding schedules for snowy grouper and black sea bass; and rebuilding strategies for snowy grouper, red porgy, and black sea bass. The management reference points, status determination criteria, and rebuilding schedules are not expected to have direct economic or social impacts. The reference point and status determination criteria actions, however, may precipitate future impacts if the resources are evaluated and it is determined that further restrictions on the fisheries are required. The rebuilding schedules also induce indirect impacts by determining the pace of recovery and the overall restrictiveness of measures required to recover the resource, since the faster the recovery period the greater harvest must be restricted. The rebuilding strategies define the annual yield during the recovery period. Although in general yield increases over the course of the recovery period and net cumulative benefits increase across the fisheries, initial yield reductions at the beginning of the recovery periods are likely to have short term adverse impacts on some participants or sectors of the fisheries, thereby increasing the general cumulative burden.

Snapper Grouper Amendment 16 (SAFMC 2008c) addressed overfishing in the gag and vermilion snapper fisheries. The expected impacts of this action have not been determined at this time. However, the corrective action in response to overfishing always requires harvest reductions and more restrictive regulation. Thus, additional short term social and economic impacts would be expected. These restrictions will hopefully prevent, however, the stocks from becoming overfished, which would require recovery plans, further harvest restrictions, and additional social and economic losses.

Snapper Grouper Amendment 17A (SAFMC 2010a) will continue the prohibition on the harvest, retention, and possession of red snapper in the South Atlantic EEZ established through interim rule. This prohibition is expected to result in substantial adverse social and economic impacts on both the commercial and recreational sectors, including their support industries and communities in the South Atlantic. The implementation of the closed area component of this amendment will be delayed until June 1, 2011, and is proposed to be eliminated entirely in the current regulatory amendment.

Snapper Grouper Amendment 17B (SAFMC 2010b), which will be implemented in early 2011, will establish ACLs, AMs, and annual catch targets for eight snapper grouper species undergoing overfishing, and specify golden tilefish allocations. Specifically, ACLs will be set at zero for speckled hind and warsaw grouper, and will prohibit the harvest, possession and sale of snowy grouper, yellowedge grouper, misty grouper, blueline tilefish, queen snapper, and silk snapper in waters deeper than 240 feet. In addition, this amendment will establish an aggregate ACL (quota) for gag, black grouper, and red grouper, retain the commercial ACL for gag, and prohibit the commercial possession of shallow-water groupers (gag, black grouper, red grouper, scamp, red hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney) when the gag ACL or the aggregate gag, black grouper, and red grouper ACL is met or projected to be met. These measures are expected to result in additional harvest restrictions on the snapper grouper fishery and additional short-term adverse social and economic effects on both the commercial and recreational sectors, including their support industries and communities.

There are several amendments currently under development that will affect the same or additional fishery participants in the South Atlantic. As the development of these amendment progresses, their social and economic effects will be investigated in greater detail. At this stage, only the general nature of their potential social and economic implications can be described.

Snapper Grouper Amendment 18A will examine limiting participation and effort in the golden tilefish and black sea bass pot fisheries. While restrictions of this nature would in theory allow status quo total harvests for the respective species to continue, these restrictions may result in the redistribution of harvests among traditional users, resulting in some participants who are able to increase their harvests, and associated social and economic benefits, and some participants who suffer reduced harvests, with associated losses in benefits. For those who would be expected to experience a possible reduction in harvests, these reductions may occur on top of declining benefits as a result of other recent or developing management action.

Snapper Grouper Amendment 20 will include a formal review of the current wreckfish individual transferable quota (ITQ) program and will update/modify that program according to recommendations from the review. Depending on the actual management measures adopted, this amendment could provide increased or decreased opportunities for those whose fishing operations have been restricted by the present and past snapper grouper amendments.

Snapper Grouper Amendment 21 will examine trip limits; effort and participation reduction and endorsements; catch shares for vermilion snapper, golden tilefish, black sea bass, gag, greater amberjack, red grouper, and black grouper; individual transferable quotas (ITQs); cooperatives; regional fishery allocations (RFAs); community development quota (CDQ) components; regional or state by state quotas; and changes in the black sea bass fishing year. Some possible measures in this amendment have the potential to further restrict fishing opportunities for some participants in the snapper grouper fishery. Other measures may potentially affect the level and nature of effort and investments expended by fishing participants in the affected components of the snapper grouper fishery.

Snapper Grouper Amendment 22 will address the long-term management for red snapper and thus offers the potential for creating a more stable regulatory environment conducive to long-term planning of fishing operations in the red snapper segment of the snapper grouper fishery.

The Comprehensive Annual Catch Limit (ACL) Amendment will establish ACLs, AMs, and ACTs for all federally managed South Atlantic species that do not currently have ACLs and AMs and are not overfished or experiencing overfishing. It is likely that many fishing participants affected by past and current fishing regulations also exploit some of the species addressed by the Comprehensive ACL Amendment. As a result, this amendment could further restrict the fishing opportunities for these fishermen for these species in the short-term should any of the adopted measures become economically binding.

Mackerel Amendment 18 will establish ACLs, AMs, and ACTs for king mackerel, Spanish mackerel, and cobia, and Spiny Lobster Amendment 10 will establish ACLs, AMs, and ACTs for lobsters. Snapper grouper fishermen, and associated businesses and communities, who also

participate in these fisheries could potentially face limited prospects for continued participation in multiple fisheries, at least in the short-term, as a result of these amendments.

The cumulative social and economic effects of past, present, and future amendments may be described as limiting fishing opportunities in the short-term. However, these amendments are expected to improve prospects for sustained participation in the snapper grouper fishery over time.

Chapter 6. List of Preparers

Table 6-1. List of Regulatory Amendment 10 preparers.

Name	Agency/Division	Area of Amendment Responsibility
Myra Brouwer	SAFMC	IPT Lead/Fishery Biologist
Rick DeVictor	NMFS/SF	IPT Lead/Fishery Biologist
John Carmichael	SAFMC/SEDAR	Science & Statistics Program Manager
David Dale	NMFS/HC	EFH Specialist
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Amanda Frick	NMFS/PR	Geographer
Andy Herndon	NMFS/PR	Biologist
Stephen Holiman	NMFS/SF	Economist
Tony Lamberte	NMFS/SF	Economist
Jack McGovern	NMFS/SF	Fishery Scientist
Kate Michie	NMFS/SF	Fishery Management Plan Coordinator
Roger Pugliese	SAFMC	Senior Fishery Biologist
Kate Quigley	SAFMC	Economist
Monica Smit-Brunello	NOAA/GC	Attorney Advisor
Jim Waters	NMFS/EC	Economist
Gregg Waugh	SAFMC	Deputy Director

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, Eco=Economics

Table 6-2. List of Interdisciplinary Plan Team Members.

Name	SAFMC	Title
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John Carmichael	SAFMC	SAFMC Data Program Managers
Anik Clemens	NMFS/SF	Technical Writer Editor
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Gregg Waugh	SAFMC	Deputy Director

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, Eco=Economics

Chapter 7. List of Agencies and Persons Consulted

Responsible Agency

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Environmental Assessment:
NMFS, Southeast Region
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List of Agencies, Organizations, and Persons Consulted
SAFMC Law Enforcement Advisory Panel
SAFMC Snapper Grouper Advisory Panel
SAFMC Scientific and Statistical Committee
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

Chapter 8. References

Allen, G.R. 1985. FAO species catalogue. Vol. 6. Snappers of the world. An annotated and illustrated catalogue of lutjanid species known to date. FAO Fish. Synop. 6(125): 208 pp.

Allman, R. J., G. R. Fitzhugh, and W. A. Fable. 2002. Report of Red Snapper Otolith Ageing; 2000 Data Summary. NMFS, SEFSC, Panama City Laboratory Contribution Series: 02-02. 18 p.

CEQ. 1997. Council on Environmental Quality. Considering Cumulative Effects Under the National Environmental Policy Act. U.S. Council on Environmental Quality, Washington, DC. 64 pp.

Dumas, C.F., J.C. Whitehead, C.E. Landry, and J.H. Herstine. 2009. Economic Impacts and Recreation Value of the North Carolina For-Hire Fishing Fleet. North Carolina Sea Grant FRG Grant Report 07-FEG-05.

Goodyear, C.P., 1995. Red snapper in U.S. waters of the Gulf of Mexico. NOAA Contribution: MIA-95/96-05.

Grimes, C.B. 1987. Reproductive biology of the Lutjanidae: a review. Pages 239-294 In J.J. Polovina and S. Ralston (eds.). Tropical snappers and groupers: biology and fisheries management. Westview Press. Boulder, Colorado.

Haab, T.C., R. Hicks, K. Schnier, and J.C. Whitehead. 2009. Angler Heterogeneity and the Species-Specific Demand for Recreational Fishing in the Southeastern United States. Draft Final Report Submitted for MARFIN Grant #NA06NMF4330055.

Hoenig, J. M. 1983. Empirical use of longevity data to estimate mortality rates. Fish. Bull. 82: 898-903.

Holland, S. M., A. J. Fedler, and J. W. Milon. 1999. The Operation and Economics of the Charter and Headboat Fleets of the Eastern Gulf of Mexico and South Atlantic Coasts. University of Florida Office of Research, Technology, and Graduate Education. Report prepared for the National Marine Fisheries Service. Grant Number NA77FF0553.

Jepson, M., K. Kitner, A. Pitchon, W.W. Perry, and B. Stoffle. 2005. Potential fishing communities in the Carolinas, Georgia, and Florida: An effort in baseline profiling and mapping. 319 pp. Available at http://sero.nmfs.noaa.gov/sf/socialsci/socialsci.htm.

Kennedy, V. S., R. R. Twilley, J. A. Kleypas, J. H. Cowan, Jr., S. R. Hare. 2002. Coastal and Marine Ecosystems & Global Climate Change: Potential Effects on U.S. Resources. Pew Center on Global Climate Change. 52 p.

Liese, C. D.,W. Carter, and R. Curtis. 2009. Surveying the For-Hire Sector: Economic Heterogeneity in the Southeast Charter Boat Industry. Submitted to the Proceedings of the 5th World Recreational Fishing Conference.

Manooch, C.M., III and J. C. Potts. 1997. Age, growth and mortality of greater amberjack from the southeastern United States. Fish. Res. 30: 229-240.

Manooch, C. S., III, J. C. Potts, M. L. Burton, and D. S. Vaughan. 1998. Population assessment of the vermilion snapper, *Rhomboplites aurorubens*, from the southeastern United States. NOAA Technical Memorandum NMFS–SEFSC–411. 59pp.

McInerny, S. A. 2007. Age and Growth of Red Snapper *Lutjanus campechanus*, From the Southeastern United States. A thesis submitted to the University of North Carolina Wilmington.

Moe, M. A. 1963. A survey of offshore fishing in Florida. Florida State Board of Conservation, Marine Laboratory, Maritime Base (St. Petersburg, FL). Professional Papers Series, No. 4. 117 pp.

NMFS (National Marine Fisheries Service). 2009. Economic Value of Angler Catch and Keep in the Southeast United States: Evidence from a Choice Experiment. NOAA SEFSC SSRG.

Robins, C. R. and G. C. Ray. 1986. A field guide to Atlantic coast fishes of North America. Houghton Mifflin Company, Boston, U.S.A. 354 p.

Rothschild, B.J. 1986. Dynamics of Marine Fish Populations. Harvard University Press. Cambridge, Massachusetts. 277pp.

SAFMC (South Atlantic Fishery Management Council). 1983. Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407.

SAFMC (South Atlantic Fishery Management Council). 1991. Amendment 4 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407.

SAFMC (South Atlantic Fishery Management Council). 1993. Amendment 6 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407.

SAFMC (South Atlantic Fishery Management Council). 1997. Amendment 9 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South

Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407.

SAFMC (South Atlantic Fishery Management Council). 2006. Amendment 13C, Final Environmental Assessment, Initial Regulatory Flexibility Analysis/Regulatory Impact Review, and Social Impact Assessment/Fishery Impact Statement for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407, 631 pp.

SAFMC (South Atlantic Fishery Management Council). 2007. Amendment 14 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2008a. Amendment 15A to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2008b. Amendment 15B to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2008c. Amendment 16 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2009. Fishery Ecosystem Plan of the South Atlantic Region: Volume II. South Atlantic Habitats and Species. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2010a. Amendment 17A to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region with Final Environmental Assessment, Initial Regulatory Flexibility Analysis, Regulatory Impact Review, and Social Impact Assessment/Fishery Impact Statement. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405. 385 pp. with appendices.

SAFMC (South Atlantic Fishery Management Council). 2010b. Amendment 17B to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region with Final Environmental Assessment, Initial Regulatory Flexibility Analysis, Regulatory Impact Review, and Social Impact Assessment/Fishery Impact Statement. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

Scientific and Statistical Committee Meeting Report. November 8-10, 2010. Holiday Inn, North Charleston, SC 29405.

SEDAR (Southeast Data, Assessment and Review). 2008. SEDAR 15 Stock Assessment Report 1, South Atlantic Red Snapper. SEDAR15-SAR1. Southeast Data, Assessment, and Review, South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SEDAR (Southeast Data, Assessment and Review). 2010. SEDAR 24 Stock Assessment Report, South Atlantic Red Snapper. SEDAR24-SAR1. Southeast Data, Assessment, and Review, South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

Southeast Regional Office. 2010. An Interactive Combined Effects (ICE) Model for South Atlantic Red Snapper. National Marine Fisheries Service, St. Petersburg, FL. 17 pp.

Sutton, S.G., R.B. Ditton, J.R. Stoll, and J.W. Milon. 1999. A Cross sectional study and longitudinal perspective on the social and economic characteristics of the charter and party boat fishing industry of Alabama, Mississippi, Louisiana and Texas. Report by the Human Dimensions of Recreational Fisheries Research Laboratory, Texas A&M for NMFS, MARFIN program grant number NA 77FF0551.

Szedlmayer, S. T. and J. D. Lee. 2004. Diet shifts of juvenile red snapper (*Lutjanus campechanus*) with changes in habitat and fish size. Fish. Bull. 102:366–375.

USDOC (U.S. Department of Commerce). 2009. Fisheries Economics of the United States 2006. Economic and Sociocultural Status and Trend Series. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 158 pp.

White, D. B., and S. M. Palmer. 2004. Age, growth and reproduction of the red snapper, *Lutjanus campechanus*, from the Atlantic waters of the southeastern United States. Bull. Mar. Sci. 75: 335-360.

APPENDIX A. ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Action 1.

Alternative 12

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.

Discussion: This alternative was removed from consideration because the Council chose Alternative 11 (No Area Closure) as their preferred. If the area closure is not implemented, then Alternative 12 is unnecessary.

Alternative 13

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.

Discussion: This alternative was removed from consideration because the Council chose Alternative 11 (No Area Closure) as their preferred. If the area closure is not implemented, then Alternative 13 is unnecessary.

Alternative 14

The prohibition on possession does not apply to a person aboard a vessel that is in transit with legally harvested snapper grouper species on board and with fishing gear appropriately stowed.

Discussion: This alternative was removed from consideration because the Council chose Alternative 11 (No Area Closure) as their preferred. If the area closure is not implemented, then Alternative 14 is unnecessary.

Action 2: Sunset Provision

Alternative 1

Do not specify a date that the snapper grouper spatial closure would expire.

Alternative 2

The snapper grouper spatial closure would expire on January 1, 2012.

Alternative 3

The snapper grouper spatial closure would expire on January 1, 2013.

Alternative 4

The snapper grouper spatial closure would expire on July 1, 2014.

Discussion: Since the Council chose Alternative 11 (No Area Closure) as their preferred, then an action to specify the length of that closure was no longer necessary.

Appendix B. Glossary

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

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

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

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

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

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

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

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

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

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

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

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

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

Discards: Fish captured, but released at sea.

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

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

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

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

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

F: Fishing mortality.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Head Boat: A fishing boat that charges individual fees per recreational angler onboard.

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

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

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

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

Marine Recreational Fisheries Statistics Survey (MRFSS): Survey operated by NMFS in cooperation with states that collects marine recreational data.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX C. HISTORY OF MANAGEMENT FOR THE SNAPPER GROUPER FISHERY

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
FMP (1983)	08/31/83	PR: 48 FR 26843 FR: 48 FR 39463	-12" limit – red snapper, yellowtail snapper, red grouper, Nassau grouper -8" limit – black sea bass -4" trawl mesh size -Gear limitations – poisons, explosives, fish traps, trawls -Designated modified habitats or artificial reefs as Special Management Zones (SMZs)
Regulatory Amendment #1 (1986)	03/27/87	PR: 51 FR 43937 FR: 52 FR 9864	-Prohibited fishing in SMZs except with hand-held hook-and-line and spearfishing gear. -Prohibited harvest of goliath grouper in SMZs.
Amendment #1 (1988)	01/12/89	PR: 53 FR 42985 FR: 54 FR 1720	-Prohibited trawl gear to harvest fish south of Cape Hatteras, NC and north of Cape Canaveral, FL. -Directed fishery defined as vessel with trawl gear and ≥200 lbs s-g on board. -Established rebuttable assumption that vessel with s-g on board had harvested such fish in EEZ.
Regulatory Amendment #2 (1988)	03/30/89	PR: 53 FR 32412 FR: 54 FR 8342	-Established 2 artificial reefs off Ft. Pierce, FL as SMZs.
Notice of Control Date	09/24/90	55 FR 39039	-Anyone entering federal wreckfish fishery in the EEZ off S. Atlantic states after 09/24/90 was not assured of future access if limited entry program developed.
Regulatory Amendment #3 (1989)	11/02/90	PR: 55 FR 28066 FR: 55 FR 40394	-Established artificial reef at Key Biscayne, FL as SMZ. Fish trapping, bottom longlining, spear fishing, and harvesting of Goliath grouper prohibited in SMZ.
Amendment #2 (1990)	10/30/90	PR: 55 FR 31406 FR: 55 FR 46213	-Prohibited harvest/possession of goliath grouper in or from the EEZ -Defined overfishing for goliath grouper and other species

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Emergency Rule	8/3/90	55 FR 32257	-Added wreckfish to the FMU -Fishing year beginning 4/16/90 -Commercial quota of 2 million pounds -Commercial trip limit of 10,000 pounds per trip
Fishery Closure Notice	8/8/90	55 FR 32635	- Fishery closed because the commercial quota of 2 million pounds was reached
Emergency Rule Extension	11/1/90	55 FR 40181	-extended the measures implemented via emergency rule on 8/3/90
Amendment #3 (1990)	01/31/91	PR: 55 FR 39023 FR: 56 FR 2443	-Added wreckfish to the FMU; -Defined optimum yield and overfishing -Required permit to fish for, land or sell wreckfish; -Required catch and effort reports from selected, permitted vessels; -Established control date of 03/28/90; -Established a fishing year for wreckfish starting April 16; -Established a process to set annual quota, with initial quota of 2 million pounds; provisions for closure; -Established 10,000 pound trip limit; -Established a spawning season closure for wreckfish from January 15 to April 15; and -Provided for annual adjustments of wreckfish management measures;
Notice of Control Date	07/30/91	56 FR 36052	-Anyone entering federal snapper grouper fishery (other than for wreckfish) in the EEZ off S. Atlantic states after 07/30/91 was not assured of future access if limited entry program developed.

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #4 (1991)	01/01/92	PR: 56 FR 29922 FR: 56 FR 56016	-Prohibited gear: fish traps except black sea bass traps north of Cape Canaveral, FL; entanglement nets; longline gear inside 50 fathoms; bottom longlines to harvest wreckfish**; powerheads and bangsticks in designated SMZs off S. Carolina. -defined overfishing/overfished and established rebuilding timeframe: red snapper and groupers ≤ 15 years (year 1 = 1991); other snappers, greater amberjack, black sea bass, red porgy ≤ 10 years (year 1 = 1991) -Required permits (commercial & for-hire) and specified data collection regulations -Established an assessment group and annual adjustment procedure (framework) -Permit, gear, and vessel id requirements specified for black sea bass traps. -No retention of snapper grouper spp. caught in other fisheries with gear prohibited in snapper grouper fishery if captured snapper grouper had no bag limit or harvest was prohibited. If had a bag limit, could retain only the bag limit. -8" limit – lane snapper -10" limit – vermilion snapper (recreational only) -12" limit – red porgy, vermilion snapper (commercial only), gray, yellowtail, mutton, schoolmaster, queen, blackfin, cubera, dog, mahogany, and silk snappers -20" limit – red snapper, gag, and red, black, scamp, yellowfin, and yellowmouth groupers. -28" FL limit – greater amberjack (recreational only) -36" FL or 28" core length – greater amberjack (commercial only) -bag limits – 10 vermilion snapper, 3 greater amberjack -aggregate snapper bag limit – 10/person/day, excluding vermilion snapper and allowing no more than 2 red snappers -aggregate grouper bag limit – 5/person/day, excluding Nassau and goliath grouper, for which no retention (recreational & commercial) is allowed -spawning season closure – commercial harvest greater amberjack > 3 fish bag prohibited in April south of Cape Canaveral, FL -spawning season closure – commercial harvest mutton snapper >snapper aggregate prohibited during May and June -charter/headboats and excursion boat possession limits extended

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #5 (1991)	04/06/92	PR: 56 FR 57302 FR: 57 FR 7886	-Wreckfish: established limited entry system with ITQs; required dealer to have permit; rescinded 10,000 lb. trip limit; required off-loading between 8 am and 5 pm; reduced occasions when 24-hour advance notice of offloading required for off-loading; established procedure for initial distribution of percentage shares of TAC
Emergency Rule	8/31/92	57 FR 39365	-Black Sea Bass (bsb): modified definition of bsb pot; allowed multi-gear trips for bsb; allowed retention of incidentally-caught fish on bsb trips
Emergency Rule Extension	11/30/92	57 FR 56522	-Black Sea Bass: modified definition of bsb pot; allowed multi-gear trips for bsb; allowed retention of incidentally-caught fish on bsb trips
Regulatory Amendment #4 (1992)	07/06/93	FR: 58 FR 36155	-Black Sea Bass: modified definition of bsb pot; allowed multi-gear trips for bsb; allowed retention of incidentally-caught fish on bsb trips
Regulatory Amendment #5 (1992)	07/31/93	PR: 58 FR 13732 FR: 58 FR 35895	-Established 8 SMZs off S. Carolina, where only hand-held, hook-and-line gear and spearfishing (excluding powerheads) was allowed.
Amendment #6 (1993)	07/27/94	PR: 59 FR 9721 FR: 59 FR 27242	-commercial quotas for snowy grouper, golden tilefish -commercial trip limits for snowy grouper, golden tilefish, speckled hind, and warsaw grouper -include golden tilefish in grouper recreational aggregate bag limits -prohibited sale of warsaw grouper and speckled hind -100% logbook coverage upon renewal of permit -creation of the *Oculina* Experimental Closed Area -data collection needs specified for evaluation of possible future IFQ system
Amendment #7 (1994)	01/23/95	PR: 59 FR 47833 FR: 59 FR 66270	-12” FL – hogfish -16” TL – mutton snapper -required dealer, charter and headboat federal permits -allowed sale under specified conditions -specified allowable gear and made allowance for experimental gear -allowed multi-gear trips in N. Carolina -added localized overfishing to list of problems and objectives -adjusted bag limit and crew specs. for charter and head boats -modified management unit for scup to apply south of Cape Hatteras, NC -modified framework procedure
Regulatory Amendment #6 (1994)	05/22/95	PR: 60 FR 8620 FR: 60 FR 19683	Established actions which applied only to EEZ off Atlantic coast of FL: Bag limits – 5 hogfish/person/day (recreational only), 2 cubera snapper/person/day > 30” TL; 12” TL – gray triggerfish
Notice of Control Date	04/23/97	62 FR 22995	-Anyone entering federal bsb pot fishery off S. Atlantic states after 04/23/97 was not assured of future access if limited entry program developed.

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

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #9 (1998)	2/24/99	PR: 63 FR 63276 FR: 64 FR 3624	-Red porgy: 14" length (recreational and commercial); 5 fish rec. bag limit; no harvest or possession > bag limit, and no purchase or sale, in March and April. -Black sea bass: 10" length (recreational and commercial); 20 fish rec. bag limit; required escape vents and escape panels with degradable fasteners in bsb pots -Greater amberjack: 1 fish rec. bag limit; no harvest or possession > bag limit, and no purchase or sale, during April; quota = 1,169,931 lbs; began fishing year May 1; prohibited coring. -Vermilion snapper: 11" length (recreational) Gag: 24" length (recreational); no commercial harvest or possession > bag limit, and no purchase or sale, during March and April -Black grouper: 24" length (recreational and commercial); no harvest or possession > bag limit, and no purchase or sale, during March and April. -Gag and Black grouper: within 5 fish aggregate grouper bag limit, no more than 2 fish may be gag or black grouper (individually or in combination) -All SG without a bag limit: aggregate recreational bag limit 20 fish/person/day, excluding tomtate and blue runners -Vessels with longline gear aboard may only possess snowy, warsaw, yellowedge, and misty grouper, and golden, blueline and sand tilefish.
Amendment #9 (1998) resubmitted	10/13/00	PR: 63 FR 63276 FR: 65 FR 55203	-Commercial trip limit for greater amberjack
Regulatory Amendment #8 (2000)	11/15/00	PR: 65 FR 41041 FR: 65 FR 61114	-Established 12 SMZs at artificial reefs off Georgia; revised boundaries of 7 existing SMZs off Georgia to meet CG permit specs; restricted fishing in new and revised SMZs
Emergency Interim Rule	09/08/99, expired 08/28/00	64 FR 48324 and 65 FR 10040	-Prohibited harvest or possession of red porgy.
Emergency Action	9/3/99	64 FR 48326	-Reopened the Amendment 8 permit application process
Amendment #10 (1998)	07/14/00	PR: 64 FR 37082 and 64 FR 59152 FR: 65 FR 37292	-Identified EFH and established HAPCs for species in the SG FMU.

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #11 (1998d)	12/02/99	PR: 64 FR 27952 FR: 64 FR 59126	-MSY proxy: goliath and Nassau grouper = 40% static SPR; all other species = 30% static SPR -OY: hermaphroditic groupers = 45% static SPR; goliath and Nassau grouper = 50% static SPR; all other species = 40% static SPR -Overfished/overfishing evaluations: BSB: overfished (MSST=3.72 mp, 1995 biomass=1.33 mp); undergoing overfishing (MFMT=0.72, F1991-1995=0.95) Vermilion snapper: overfished (static SPR = 21-27%). Red porgy: overfished (static SPR = 14-19%). Red snapper: overfished (static SPR = 24-32%) Gag: overfished (static SPR = 27%) Scamp: no longer overfished (static SPR = 35%) Speckled hind: overfished (static SPR = 8-13%) Warsaw grouper: overfished (static SPR = 6-14%) Snowy grouper: overfished (static SPR = 5=15%) White grunt: no longer overfished (static SPR = 29-39%) Golden tilefish: overfished (couldn't estimate static SPR) Nassau grouper: overfished (couldn't estimate static SPR) Goliath grouper: overfished (couldn't estimate static SPR) -overfishing level: goliath and Nassau grouper = F>F40% static SPR; all other species: = F>F30% static SPR Approved definitions for overfished and overfishing. MSST = [(1-M) or 0.5 whichever is greater]*B_{MSY}. MFMT = F_{MSY}
Amendment #12 (2000)	09/22/00	PR: 65 FR 35877 FR: 65 FR 51248	-Red porgy: MSY=4.38 mp; OY=45% static SPR; MFMT=0.43; MSST=7.34 mp; rebuilding timeframe=18 years (1999=year 1); no sale during Jan-April; 1 fish bag limit; 50 lb. bycatch comm. trip limit May-December; modified management options and list of possible framework actions.
Amendment #13A (2003)	04/26/04	PR: 68 FR 66069 FR: 69 FR 15731	-Extended for an indefinite period the regulation prohibiting fishing for and possessing snapper grouper spp. within the *Oculina* Experimental Closed Area.
Notice of Control Date	10/14/05	70 FR 60058	-The Council is considering management measures to further limit participation or effort in the commercial fishery for snapper grouper species (excluding Wreckfish).

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #13C (2006)	10/23/06	PR: 71 FR 28841 FR: 71 FR 55096	- End overfishing of snowy grouper, vermilion snapper, black sea bass, and golden tilefish. Increase allowable catch of red porgy. Year 1 = 2006. 1. Snowy Grouper Commercial: Quota (gutted weight) = 151,000 lbs gw in year 1, 118,000 lbs gw in year 2, and 84,000 lbs gw in year 3 onwards. Trip limit = 275 lbs gw in year 1, 175 lbs gw in year 2, and 100 lbs gw in year 3 onwards. Recreational: Limit possession to one snowy grouper in 5 grouper per person/day aggregate bag limit. 2. Golden Tilefish Commercial: Quota of 295,000 lbs gw, 4,000 lbs gw trip limit until 75% of the quota is taken when the trip limit is reduced to 300 lbs gw. Do not adjust the trip limit downwards unless 75% is captured on or before September 1. Recreational: Limit possession to 1 golden tilefish in 5 grouper per person/day aggregate bag limit. 3. Vermilion Snapper Commercial: Quota of 1,100,000 lbs gw. Recreational: 12" size limit. 4. Black Sea Bass Commercial: Commercial quota (gutted weight) of 477,000 lbs gw in year 1, 423,000 lbs gw in year 2, and 309,000 lbs gw in year 3 onwards. Require use of at least 2" mesh for the entire back panel of black sea bass pots effective 6 months after publication of the final rule. Require black sea bass pots be removed from the water when the quota is met. Change fishing year from calendar year to June 1 – May 31. Recreational: Recreational allocation of 633,000 lbs gw in year 1, 560,000 lbs gw in year 2, and 409,000 lbs gw in year 3 onwards. Increase minimum size limit from 10" to 11" in year 1 and to 12" in year 2. Reduce recreational bag limit from 20 to 15 per person per day. Change fishing year from the calendar year to June 1 through May 31. 5. Red Porgy Commercial and recreational 1. Retain 14" TL size limit and seasonal closure (retention limited to the bag limit); 2. Specify a commercial quota of 127,000 lbs gw and prohibit sale/purchase and prohibit harvest and/or possession beyond the bag limit when quota is taken and/or during January through April; 3. Increase commercial trip limit from 50 lbs ww to 120 red porgy (210 lbs gw) during May through December; 4. Increase recreational bag limit from one to three red porgy per person per day.
Notice of Control Date	3/8/07	72 FR 60794	-The Council may consider measures to limit participation in the snapper grouper for-hire fishery
Amendment	2/12/09	PR: 73 FR 32281	-Establish eight deepwater Type II marine protected

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
#14 (2007) Sent to NMFS 7/18/07		FR: 74 FR 1621	areas (MPAs) to protect a portion of the population and habitat of long-lived deepwater snapper grouper species.
Amendment #15A (2007)	3/14/08	73 FR 14942	- Establish rebuilding plans and SFA parameters for snowy grouper, black sea bass, and red porgy.
Amendment #15B (2008b)	2/15/10	PR: 74 FR 30569 FR: 74 FR 58902	- Prohibit the sale of bag-limit caught snapper grouper species. -Reduce the effects of incidental hooking on sea turtles and smalltooth sawfish. - Adjust commercial renewal periods and transferability requirements. - Implement plan to monitor and assess bycatch, - Establish reference points for golden tilefish. - Establish allocations for snowy grouper (95% com & 5% rec) and red porgy (50% com & 50% rec).
Amendment #16 (SAFMC 2008c)	7/29/09	PR: 74 FR 6297 FR: 74 FR 30964	-Specify SFA parameters for gag and vermilion snapper -For gag grouper: Specify interim allocations 51%com & 49%rec; rec & com spawning closure January through April; directed com quota=348,440 pounds gutted weight; reduce 5-grouper aggregate to 3-grouper and 2 gag/black to 1 gag/black and exclude captain & crew from possessing bag limit. -For vermilion snapper: Specify interim allocations 68%com & 32%rec; directed com quota split Jan-June=168,501 pounds gutted weight and 155,501 pounds July-Dec; reduce bag limit from 10 to 4 and a rec closed season October through May 15. In addition, the NMFS RA will set new regulations based on new stock assessment. -Require dehooking tools.
Amendment #17A (TBD)	TBD	TBD	-Specify an ACL and an AM for red snapper with management measures to reduce the probability that catches will exceed the stocks' ACL -Specify a rebuilding plan for red snapper -Specify status determination criteria for red snapper -Specify a monitoring program for red snapper
Amendment #17B (TBD)	TBD	TBD	-Specify ACLs, ACTs, and AMs, where necessary, for 9 species undergoing overfishing. -Modify management measures as needed to limit harvest to the ACL or ACT. -Update the framework procedure for specification of total allowable catch.

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Notice of Control Date	12/4/08	TBD	Establishes a control date for the golden tilefish fishery of the South Atlantic
Notice of Control Date	12/4/08	TBD	Establishes control date for black sea bass pot fishery of the South Atlantic
Amendment 18 (TBD)	TBD	TBD	-Extend the range of the snapper-grouper FMP north -Limit participation and effort in the golden tilefish fishery -Modifications to management of the black sea bass pot fishery -Separate snowy grouper quota into regions/states -Separate the gag recreational allocation into regions/states -Change the golden tilefish fishing year -Improve the accuracy, timing, and quantity of fisheries statistics -Designate EFH in new northern areas
Red Snapper Interim Rule	1/4/10	PR: 74 FR 31906 FR: 74 FR 63673 Extension: 75 FR 27658	-Prohibit commercial and recreational harvest of red snapper from January 4, 2010, to June 2, 2010. -Regulations were extended until December 5, 2010. -Reduce overfishing of red snapper while long-term measures to end overfishing are addressed in Amendment 17A.
Amendment 19	TBD	TBD	-Establish deepwater coral HAPCs

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment 20	TBD	TBD	-Update wreckfish ITQ according to reauthorized MSFCMA -Establish ACLs, AMs, and management reference points for wreckfish fishery
Comprehensive ACL Amendment	TBD	TBD	-Establish ABC control rules, establish ABCs, ACTs, and AMs for species not undergoing overfishing -Remove some species from South Atlantic FMUs -Specify allocations among the commercial, recreational, and for-hire sectors for species not undergoing overfishing -Limit the total mortality for federally managed species in the South Atlantic to the ACTs -Address spiny lobster issues.

Appendix D. Initial Regulatory Flexibility Analysis

1. Introduction

The purpose of the Regulatory Flexibility Act (RFA) is to establish a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration. The RFA does not contain any decision criteria; instead, the purpose of the RFA is to inform the agency, as well as the public, of the expected economic impacts of various alternatives contained in the FMP or amendment (including framework management measures and other regulatory actions). The RFA is also intended to ensure that the agency considers alternatives that minimize the expected impacts while meeting the goals and objectives of the FMP and applicable statutes.

With certain exceptions, the RFA requires agencies to conduct a regulatory flexibility analysis for each proposed rule. The regulatory flexibility analysis is designed to assess the impacts various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those impacts. In addition to analyses conducted for the RIR, the regulatory flexibility analysis provides: 1) A statement of the reasons why action by the agency is being considered; 2) a succinct statement of the objectives of, and legal basis for the proposed rule; 3) a description and, where feasible, an estimate of the number of small entities to which the proposed rule will apply; 4) a description of the projected reporting, record-keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; 5) an identification, to the extent practical, of all relevant Federal rules which may duplicate, overlap, or conflict with the proposed rule; and 6) a description of any significant alternatives to the proposed rule which accomplish the stated objectives of applicable statutes and which minimize any significant economic impact of the proposed rule on small entities.

Additional information on the description of affected entities was presented in **Chapter 3.3,** and additional information on the expected economic impacts of the proposed action was presented in **Chapter 4.2** and **Chapter 5.2**.

2. Statement of Need for, Objectives of, and Legal Basis for the Rule

The purpose and need, issues, problems, and objectives of the proposed rule are presented in **Chapter 1.0**. The purpose of this amendment is to reduce the spatial and temporal coverage of the regulations proposed in Amendment 17A based on the most recent scientific information concerning the red snapper stock in the South Atlantic. This amendment addresses the need to end overfishing and rebuild the red snapper stock while minimizing, to the extent practicable,

adverse social and economic effects. The Magnuson-Stevens Fishery Conservation and Management Act, as amended, provides the statutory basis for the proposed rule.

3. Identification of All Relevant Federal Rules Which May Duplicate, Overlap or Conflict with the Proposed Rule

No duplicative, overlapping, or conflicting Federal rules have been identified. Previous amendments, whether already implemented or in the process of being implemented, have been considered in designing the various actions in this amendment.

4. Description and Estimate of the Number of Small Entities to Which the Proposed Rule will Apply

This proposed action is expected to directly affect commercial fishers and for-hire operators. The SBA has established size criteria for all major industry sectors in the U.S. including fish harvesters and for-hire operations. A business involved in fish harvesting is classified as a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates), and has combined annual receipts not in excess of $4.0 million (NAICS code 114111, finfish fishing) for all its affiliated operations worldwide. For for-hire vessels, the other qualifiers apply and the annual receipts threshold is $7.0 million (NAICS code 713990, recreational industries).

From 2007-2009, an average of 895 vessels per year had valid permits to operate in the commercial snapper grouper fishery. Of these vessels, 751 held transferable permits and 144 held non-transferable permits. On average, 797 vessels landed snapper grouper species, generating dockside revenues of approximately $14.514 million (2008 dollars). Each vessel, therefore, generated an average of approximately $18,000 in gross revenues from snapper grouper. Gross dockside revenues by area are distributed as follows: $4.054 million in North Carolina, $2.563 million in South Carolina, $1.738 million in Georgia/Northeast Florida, $3.461 million in central and southeast Florida, and $2.695 million in the Florida Keys. Vessels that operate in the snapper grouper fishery may also operate in other fisheries, the revenues of which cannot be determined with available data and are not reflected in these totals.

Based on revenue information, all commercial vessels affected by the proposed action can be considered small entities.

From 2007-2009, an average of 1,797 vessels had valid permits to operate in the snapper grouper for-hire fishery, of which 82 are estimated to have operated as headboats. The for-hire fleet is comprised of charterboats, which charge a fee on a vessel basis, and headboats, which charge a fee on an individual angler (head) basis. The charterboat annual average gross revenue is estimated to range from approximately $62,000-$84,000 for Florida vessels, $73,000-$89,000 for North Carolina vessels, $68,000-$83,000 for Georgia vessels, and $32,000-$39,000 for South

Carolina vessels. For headboats, the corresponding estimates are $170,000-$362,000 for Florida vessels, and $149,000-$317,000 for vessels in the other states.

Based on these average revenue figures, all for-hire operations that would be affected by the proposed action can be considered small entities.

Some fleet activity, i.e., multiple vessels owned by a single entity, may exist in both the commercial and for-hire snapper grouper sectors but its extent is unknown, and all vessels are treated as independent entities in this analysis.

5. Description of the projected reporting, record-keeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for the preparation of the report or records

The proposed action would not introduce any changes to reporting, record-keeping, and other compliance requirements which are currently required, particularly under Amendment 17A.

6. Substantial Number of Small Entities Criterion

The proposed action is expected to directly affect all Federally permitted commercial and for-hire vessels that operate in the South Atlantic snapper grouper fishery. All directly affected entities have been determined, for the purpose of this analysis, to be small entities. Therefore, it is determined that the proposed action will affect a substantial number of small entities.

7. Significant Economic Impact Criterion

The outcome of 'significant economic impact' can be ascertained by examining two issues: disproportionally and profitability.

Disproportionally: Do the regulations place a substantial number of small entities at a significant competitive disadvantage to large entities?

All entities that are expected to be affected by the proposed rule are considered small entities, so the issue of disproportional effects on small versus large entities does not arise in the present case.

Profitability: Do the regulations significantly reduce profit for a substantial number of small entities?

The economic analysis done for the proposed action estimated the changes in net operating revenues to commercial and for-hire vessels. For the current purpose, net operating revenue is equated to profit.

The proposed action to eliminate the area closure which was adopted in Amendment 17A is estimated to have a non-uniform change in the short-term profits of commercial vessels operating in the South Atlantic snapper-grouper fishery. Annual profits would increase approximately by $358,000 for vessels in northeast Florida and Georgia and by $103,000 for vessels in southeast Florida. On the other hand, annual profits would decrease approximately by $241,000 for vessels in North Carolina, by $129,000 in South Carolina, and by $2,000 for vessels in the Florida Keys. The net effect of the proposed action on commercial vessels as a whole would be an average increase in annual profits of approximately $88,000. Vessels fishing with vertical line gear are the ones most affected by the proposed action.

The differential effects of the proposed action on commercial vessels in various geographic areas in the South Atlantic are mainly conditioned by the manner quotas for certain snapper-grouper species are met. Although the proposed action would open up very specific areas off the coasts of Georgia and northeast Florida, commercial vessels operating in other areas would also be affected via the possible quota closures of some snapper-grouper species. Opening the areas closed under Amendment 17A would allow commercial vessels from southeast Florida, northeast Florida, and Georgia to harvest more snapper-grouper species, such as vermilion snapper, gag, and red grouper, and this would tend to increase their profits. Such an increase in harvest, however, would lead to reaching certain snapper-grouper quotas sooner, resulting in lower harvest by vessels in North Carolina, South Carolina, and the Florida Keys. These vessels would then experience reductions in their profits. The more constraining quotas are those for vermilion snapper and gag. The quota for gag is especially important, since it would trigger closure for all shallow-water groupers.

For-hire vessels operating in northeast Florida and Georgia are expected to be the only for-hire vessels affected by the proposed action. This is based on the extent of for-hire vessel fishing activities in the subject three statistical areas considered for closure under Amendment 17A. As a result of the proposed action, annual profits are expected to increase by $300,000 for charterboats and $1,000,000 for headboats.

8. Description of Significant Alternatives

One of the management measures adopted in Amendment 17A is a year-round closure, i.e., prohibition of harvest, retention, and possession of any species in the snapper-grouper fishery management unit, of an area corresponding to commercial logbook grids (cells) 2880, 2980, and 3080 for depths from 98 ft to 240 ft. The proposed action would eliminate this closure.

Eleven alternatives, including the proposed action, were considered for the area closure. The first alternative to the proposed action is the no action alternative. Among the alternatives, this would result in the largest negative economic effects on small entities. The second alternative to the proposed action is a May-October closure of cells 2880 and 2980 in depths from 98 ft to 240 ft. This alternative would result in lower profit increases for both the commercial and for-hire vessels than the proposed action. The third alternative to the proposed action is a May-August closure of cells 2880, 2980, and 3080 in depths from 98 ft to 240 ft. This alternative would result in a lower profit increases to the for-hire vessels and a slightly higher profit increase to commercial vessels. The fourth alternative to the proposed action is a July-December closure of cells 2880, 2980, and 3080 in depths from 98 ft to 240 ft. This alternative would result in lower

profit increases to the for-hire and commercial vessels than the proposed action. The fifth alternative to the proposed action is a May-December closure of cells 2880, 2980, and 3080 in depths from 98 ft to 240 ft. This alternative would result in lower profit increases to the for-hire and commercial vessels than the proposed action. The sixth alternative to the proposed action is a May-December closure of cells 2880, 2980, and 3080 in depths from 66 ft to 240 ft for the first year and a May-October closure of cells 2880 and 2980 in depths from 98 ft to 240 ft for the second year and onwards. This alternative would result in lower profit increases to the for-hire and commercial vessels than the proposed action. The seventh alternative to the proposed action is a May-October closure of cells 2880 and 2980 in depths from 98 ft to 240 ft for the first year and a June-July closure of cell 2980 in depths from 98 ft to 240 ft for the second year and onwards. This alternative would result in lower profit increases to the for-hire and commercial vessels than the proposed action. The eighth alternative to the proposed action is a May-October closure of cells 2880 and 2980 in depths from 98 ft to 240 ft for the first year and a July closure of cells 2880 and 2980 in depths from 98 ft to 240 ft for the second year and onwards. This alternative would result in lower profit increases to the for-hire and commercial vessels than the proposed action. The ninth alternative to the proposed action is a July-December closure of cells 2880, 2980, and 3080 in depths from 98 ft to 240 ft for the first year and a January-April closure of cells 2880 and 2980 in depths from 98 ft to 240 ft for the second year and onwards. This alternative would result in lower profit increases to the for-hire and commercial vessels than the proposed action. The tenth alternative to the proposed action is a May-December closure of cells 2880, 2980, and 3080 in depths from 98 ft to 240 ft for the first year and a January-April closure of cells 2880 and 2980 in depths from 98 ft to 240 ft for the second year and onwards. This alternative would result in lower profit increases to the for-hire and commercial vessels than the proposed action.

The various alternatives have an important feature that applies to commercial vessels but not to for-hire vessels. With the exception of the no action alternative, all alternatives would result in profit increases to commercial vessels in northeast Florida and Georgia and southeast Florida but profit decreases to commercial vessels in North Carolina, South Carolina, and the Florida Keys. For-hire vessels would experience profit increases under all the alternatives, except the no action alternative.

APPENDIX E Regulatory Impact Review

5.1 Introduction

The NOAA Fisheries Service requires a Regulatory Impact Review (RIR) for all regulatory actions that are of public interest. The RIR does three things: (1) it provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action; (2) it provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problem; and, (3) it ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost-effective way. The RIR also serves as the basis for determining whether the proposed regulations are a "significant regulatory action" under the criteria provided in Executive Order (E.O.) 12866 and provides information that may be used in conducting an analysis of impacts on small business entities pursuant to the Regulatory Flexibility Act (RFA). This RIR analyzes the expected impacts that this action would be expected to have on the commercial and recreational snapper grouper fisheries. Additional details on the expected economic effects of the various alternatives in this action are included in **Section 4.0** and are incorporated herein by reference.

5.2 Problems and Objectives

The purpose and need, issues, problems, and objectives of the proposed amendment are presented in **Section 1.4** and are incorporated herein by reference. In summary, the purpose of Regulatory Amendment 10 to the Fishery Management Plan (FMP) for the Snapper Grouper Fishery of the South Atlantic Region is to implement management measures in response to the availability of more recent scientific information concerning red snapper in South Atlantic waters.

5.3 Methodology and Framework for Analysis

This RIR assesses management measures from the standpoint of determining the resulting changes in costs and benefits to society. To the extent practicable, the net effects of the proposed measures are stated in terms of producer and consumer surplus, changes in profits, employment in the direct and support industries, and participation by charter boat fishermen and private anglers. In addition, the public and private costs associated with the process of developing and enforcing regulations on fishing for snapper grouper in waters of the U.S. South Atlantic are provided.

5.4 Description of the Fishery

A description of the South Atlantic snapper grouper fishery is contained in **Section 3.3** and is incorporated herein by reference.

5.5 Impacts of Management Measures

Details on the economic impacts of all alternatives are included in Section 4 and are included herein by reference. The following discussion includes only the expected impacts of the preferred alternative.

5.5.1 Changes to the Snapper Grouper Closure

The overall impacts of this action are discussed in **Section 4.1.2** of this document, and are hereby incorporated by reference.

The Council chose one of the eleven alternatives proposed as preferred (**Alternative 11**) which proposes to not implement the snapper grouper area closure approved in Amendment 17A to the Snapper Grouper Fishery Management Plan but to maintain the ban on retention of red snapper. The other alternatives (**Alternatives 2-10**) propose area closures that are considered to achieve the desired fishing mortality reduction, inclusive of discard mortality based on the most recent stock assessment. Economic effects to the commercial fishery were analyzed using a simulation model based on historical logbook landings. A brief model description is provided in **Section 4.2.1**. A more detailed model description and description of results is contained in **Appendix H**. The commercial model indicates that **Alternative 11 (Preferred)** results in an average increase in net operating revenues of $88,000 annually for the commercial fishery for 2011 and 2012 compared to **Alternative 1 (No Action)**. This analysis assumes an Amendment 17A start date of January 1, 2010 as part of **Alternative 1 (No Action)**. A state by state breakout of economic effects indicates that Georgia and Northeast Florida will benefit most under **Alternative 11 (Preferred)** to the amount of average annual net operating revenues for 2011 and 2012 of $358,000. However, while estimates of positive benefits are calculated for Georgia and Northeast Florida, North Carolina is estimated to see average annual decreases of $241,000 in net operating revenues for 2011 and 2012. South Carolina is also estimated to experience losses, in the amount of $129,000 annually while the Florida Keys is estimated to experience a $2,000 annual decline in net operating revenues. Southeast Florida is expected to experience increases in net operating revenues of about $103,000 annually on average for 2011 and 2012 under **Alternative 11 (Preferred)**.

The expected economic effects to the recreational fishery are explained in **Section 4.2.2** and estimated with the use of a methodology described in Appendix N of Amendment 17A. Therefore, both the commercial and recreational economic effects are analyzed using the same methodologies as used in Amendment 17A. The recreational economic effects are evaluated in the form of expected change in economic value relative to the no action alternative to fishers and for-hire vessels in response to the proposed alternatives. The change in economic value is measured in terms of consumer surplus (CS) to recreational anglers and net operating revenues (NOR) to for-hire vessels.

In contrast to the commercial effects, above, the economic effects to the recreational sector of **Alternatives 2-5 and 11** are presented in **Section 4.2.2** as average annual effects while economic effects of **Alternatives 6-10** are presented in the form of separate effects for 2011 and 2012. For all sectors, **Alternative 11 (Preferred)** yields the highest estimated consumer surplus and net operating revenues compared to all other alternatives. **Alternative 11 (Preferred)** is expected to result in an estimated average annual increase in consumer surplus of about $572,000, $3.4

million, and $1.9 million for charterboat, headboat and private recreational sectors, respectively. Net operating average annual revenues for charterboat and headboat sectors are expected to increase by about $310,000 and $1.1 million, respectively. Total aggregated average annual benefits (consumer surplus and net operating revenues) are estimated to total about $5.1 million in benefits for the recreational sector. Total two year increases for **Alternative 11 (Preferred)** total an estimated $14.5 million.

5.6 Public and Private Costs of Regulations

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

Council costs of document preparation, meetings, public hearings, and information dissemination……..…….. $400,000

NOAA Fisheries administrative costs of document preparation, meetings and review $360,000

Annual law enforcement costs ..... unknown

TOTAL $760,000

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

5.7 Summary of Economic Impacts

In summary, **Alternative 11** provides the highest the economic benefits to the commercial and recreational sectors compared to all other alternatives. The commercial model indicates that **Alternative 11 (Preferred)** results in an average increase in net operating revenues of $88,000 annually for the commercial fishery for 2011 and 2012 compared to **Alternative 1 (No Action)**. For all sectors, **Alternative 11 (Preferred)** yields the highest estimated consumer surplus and net operating revenues compared to all other alternatives. Total aggregated average annual benefits (consumer surplus and net operating revenues) are estimated to total about $5.1 million in benefits for the recreational sector. Total two year increases for **Alternative 11 (Preferred)** total an estimated $14.5 million.

5.8 Determination of Significant Regulatory Action

Pursuant to E.O. 12866, a regulation is considered a “significant regulatory action” if it is expected to result in: (1) an annual effect of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities; (2)

create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; (3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; or (4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this executive order. Based on the information provided above, this regulatory action was determined to not be economically significant for the purposes of E.O. 12866.

APPENDIX F. An Interactive Combined Effects (ICE) Model for South Atlantic Red Snapper

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Introduction

The SEDAR-24 (2010) benchmark stock assessment of U.S. South Atlantic red snapper indicates the stock is undergoing overfishing and is severely overfished (SEDAR 24 2010). The South Atlantic Fishery Management Council (SAFMC) is currently developing Regulatory Amendment 10 (Reg10) to the Snapper-Grouper Fishery Management Plan (FMP) to address overfishing of red snapper and rebuild this stock (SAFMC 2010). Three 'plausible' stock assessment model outcomes were identified by the SAFMC's Scientific and Statistical Committee (SSC) as being the most useful for red snapper management purposes. These runs improved model fits to the headboat catch-per-unit-effort index, and were presented to the SEDAR-24 (2010) Review Workshop as 'hb=0.2', 'hb=0.25', and 'hb=0.3'. Given $F_{rebuild} = 98\%F_{30\%SPR}$, a 70-75% percent reduction in total removals of red snapper from 2007-2009 baseline levels is projected to end overfishing and rebuild the red snapper stock under these various scenarios.

Amendment 16 to the Snapper-Grouper FMP was implemented in July 2009, closing the vermilion snapper (VS) recreational fishery in the U.S. South Atlantic during November through March of each year. Amendment 16 also closed shallow-water grouper (SWG) to commercial and recreational harvest during January through April of each year. Amendment 17B, if implemented, would include a prohibition on harvest of several deepwater snapper-grouper species beyond 240 feet (73 m). These regulatory actions may indirectly affect red snapper removals (e.g. landings and dead discards) if trips targeting other regulated species no longer occur due to closed seasons or areas. Additionally, red snapper removals will be directly impacted by the implementation of Amendment 17A, which includes a year-round prohibition on red snapper harvest, possession, and retention in the U.S. South Atlantic exclusive economic zone (EEZ).

Five reports were completed by Southeast Regional Office personnel analyzing the effects of SAFMC FMP amendments on red snapper removals (SERO 2009a-e). Input assumptions and data for these previous reports were based upon an earlier red snapper stock assessment (SEDAR-15 2009). This report uses input assumptions and data from the new 2010 benchmark assessment (SEDAR-24 2010; Table A1) to project reductions in red snapper removals across all three fishing sectors (i.e., commercial, recreational private, and for-hire charter and headboat) based upon an interactive combined effects (ICE) model. The ICE model was developed to project red snapper removal rates under a variety of spatial closure sizes, configurations, and input assumptions.

Methods

Trip Elimination: Overview

Trip elimination models were developed for the commercial, headboat, and recreational private and charter sectors to simulate the impacts of previously approved amendments to the Snapper-Grouper FMP. The impacts of Amendments 16, 17A, and 17B were not captured by 2007-2009 baseline data, as regulations associated with these amendments became effective either in late 2009 or later. Impacts were expressed as changes in total catch (landings and discards, in lbs) by month and statistical area, by sector.

Trip elimination methods for the commercial sector were performed by the Southeast Fisheries Science Center (SEFSC) and followed procedures described in SERO (2009a), as updated for SEDAR-24 (2010) assumptions and input years. Fishermen with permits to fish in federal waters for species in the snapper-grouper fishery have been required since 1993 to submit logbook reports of their landings by species. These logbook trip reports from 2007-2009 constitute the source of data used in this analysis. Amendment 13C was not modeled, as it was implemented in 2006 and its effects should have been captured by the 2007-2009 baseline.

The simulation model uses logbook trip reports to predict the short-term economic effects of proposed management alternatives (Waters 2008). The general method of analysis is to hypothetically impose proposed regulations on individual fishing trips as reported to the logbook database, and then calculate their effects on trip catches, revenues and costs. Trips were eliminated and landings re-estimated according to the scenarios described in Table 1.

Table 1. Trip elimination scenarios explored by the commercial trip elimination model. An 'X' denotes elimination of trips. Amendments 16 ('A16') closes shallow-water grouper during January through April, Amendment 17B ('A17B') includes a deepwater closure (240 feet seaward) to protect Warsaw grouper and speckled hind, Amendment 17A ('A17A') closes red snapper throughout the EEZ, and Regulatory Amendment 10 ('Reg10') closes fishing for managed Snapper-Grouper throughout the EEZ with a specified depth range.

Scenario	A16	A17B	A17A	Reg10
Baseline	n/a	n/a	n/a	n/a
1			X	No Closure
2	X	X	X	No Closure
3			X	All Depths
4	X	X	X	All Depths
5			X	66-240 ft
6	X	X	X	66-240 ft
7			X	98-240 ft
8	X	X	X	98-240 ft

The simulation model examines the effects of proposed management alternatives on trip revenues and trip costs. If trip revenues remain greater than trip costs plus the opportunity cost of labor after accounting for the likely effects of proposed restrictions, then the trip is recorded as taken in the simulation model, and reported catches of species that would be prohibited or restricted by law are considered to be caught anyway and released. If the proposed management alternatives would cause trip revenues to fall below the sum of trip costs and the opportunity cost for labor after accounting for the likely effects of proposed restrictions on trip-level harvests, then the trip is recorded as not taken in the simulation model, and reported catches are assumed to no longer occur given the new regulatory restrictions. As a result, red snapper would not be caught, would not be released, and would not incur release mortality.

This method of analysis 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 scenarios. 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 management scenarios and the distribution of effects among commercial gear sectors .

Because the commercial logbook does not account for all commercial landings (e.g. sales made on state permits), landings and new management discard (e.g., post-Amendment 17A) estimates generated by the trip elimination model were scaled up to account for this missing data. Expansion factors for under-reporting were computed by year based upon differences between the baseline logbook data and commercial landings inputs to the Beaufort Assessment Model used in SEDAR-24. Expansion factors for under-reporting were 8.9%, 7.3%, and 3.1% for 2007-2009, respectively. Additionally, the commercial logbook dataset does not contain information on discards, which are estimated for the commercial fishery from a supplemental discard logbook and are presented in SEDAR-24 (2010) as discards in numbers. Discard logbook estimated dead discards were converted from numbers to pounds assuming an average weight of 2.88 lbs from SEDAR-24 (2010). For the baseline commercial scenario, red snapper removals were expressed as landings plus dead discards. Dead discards accounted for 18.2%, 8.7%, and 8.1% of the total removals during 2007-2009, respectively.

All non-baseline trip elimination scenarios contained an Amendment 17A moratorium on the harvest of red snapper. Output from Scenarios 1-8 (Table 1) was expressed as new management dead discards. Catch that would have been landed on trips not eliminated by A16, A17A, and A17B regulations were converted to dead discards using the discard mortality rate (*D*) in Equation 1 (SEDAR -24 2010):

$$D = \frac{1}{(1 + e^{-(-2.3915+0.0592*0.304801*d)})} \quad (1)$$

where *d* represents water depth (in feet) of fishing for red snapper as reported in the SEFSC commercial logbook database. This equation applies to red snapper that would be landed by all commercial gear types except dive gear. Fishermen with dive gear are assumed to not take red snapper if prohibited or restricted. Hence, there would be no release mortality associated with dive gear.

Moratorium simulated dead discards were then expanded to account for discard logbook estimated dead discards. To create expansion factors, baseline landings were converted to dead discards using the average commercial release mortality rate (48%; SEDAR-24 2010), and the ratio of these converted landings to discard logbook estimated dead discards (in lbs) was computed by year (37.8%, 18.1%, and 16.8% for 2007-2009, respectively). Expanded outputs for all commercial trip elimination scenarios were expressed as total removals (in lbs) by statistical area and month.

Trip Elimination: Recreational Headboat

Trip elimination methods for the headboat sector followed procedures described in SERO (2009b) and SERO (2009d), as updated for SEDAR-24 (2010) assumptions, data, and input years. The recreational headboat sector of the snapper-grouper fishery was evaluated using headboat survey (HBS) logbook data (Southeast Region Headboat Survey data, accessed 19 April 2010) reported by headboat operators. Headboats are large, for-hire vessels that typically accommodate 20 or more anglers on half- or full-day trips. The three-year average of trips and landings (in pounds whole weight) derived from HBS catch-effort data files from 2007-2009 was assumed to be representative of future behavior and effort in the fishery. Impacts of Amendment 17B were not modeled for the headboat sector as SEDAR-24 (2010) suggested minimal headboat catch beyond 240 ft depth.

Directed trips were eliminated from catch-effort data files (2007-2009) using criterion determined from catch-frequency distributions derived from the catch-effort data files (see SERO 2009b). Similar to the approaches used for the commercial trip elimination model, headboat trip records with catches exceeding a pre-determined criterion for vermilion snapper (November-March), shallow-water grouper (January-April), or red snapper (all months) were eliminated under various management scenarios and landings were subsequently re-estimated from the modified catch-effort files. The time periods evaluated correspond to proposed closed seasons for vermilion snapper and shallow-water grouper in Amendment 16, and red snapper in Amendment 17A. All trips landing at least 25 vermilion snapper, SWG, or vermilion snapper/SWG combined during closed months with the aggregate catch of these species exceeding 25% of the Snapper-Grouper FMP (all 73 regulated species) landings on the trip were defined as 'directed' trips that would be impacted by Amendment 16. Similarly, all trips landing at least 25 red snapper with red snapper landings exceeding 25% of the Snapper-Grouper FMP landings on the trip were defined as 'directed' trips that would be impacted by Amendment 17A. By defining 'directed' trips in terms of both quantity and percentage of landings, trips

landing small quantities but high percentages of fish or trips landing large quantities representing a small percentage of the trip's landings were excluded from elimination. Modified catch-effort headboat files were used to calculate headboat catch by month and statistical area based on SEFSC methods for management scenarios described in Table 2.

Table 2. Trip elimination scenarios explored by headboat sector trip elimination models, considering the effects ('X' denotes elimination of trips) of Amendments 16 ('A16') and Amendment 17A ('A17A') closing red snapper throughout the EEZ.

Scenario	A16	A17A
Baseline	n/a	n/a
1	X	
2		X
3	X	X

Headboat landings computed from the modified catch-effort files for the scenarios listed in Table 2 were subsequently expanded to include dead discards from SEDAR-24 (2010). Dead discards were converted from numbers to weight using the average SEDAR-24 dead discard weights of 1.77, 1.87, and 2.17 for 2007-2009, respectively. Headboat dead discards were computed for trip elimination scenarios using the ratio of trip elimination landings (later converted to dead discards) to baseline landings times the baseline mean dead discards (17.2 TP). Removals were assigned spatially using headboat four-digit statistical grids, with blanks filled in following methods described in SERO (2009d). Headboat reporting of statistical areas for 2007-2009 was significantly improved over 2005-2007.

Trip Elimination: Recreational Private and Charter

Trip elimination methods for the recreational private and charter sectors followed procedures described in SERO (2009c), as updated for SEDAR-24 (2010) assumptions, data, and input years. The private, rental, and for-hire charter sectors were evaluated using data from the Marine Recreational Fisheries Statistics Survey (MRFSS) dockside intercept records. MRFSS intercepts collect data on port agent observed landings ('A' catch), angler reported landings that were not observed ('B1' catch) and discards ('B2' catch). Data are reported in numbers by species, two-month wave (e.g., Wave 1 = Jan/Feb, … Wave 6 = Nov/Dec), area fished (inland, state, and federal waters), mode of fishing (charter, private/rental, shore), and state (east Florida, Georgia, South Carolina, and North Carolina).

MRFSS data were post-stratified for the state of Florida into two regions: Southeast Florida and Northeast Florida. Landings and discard data were additionally post-stratified by mode of fishing (e.g. 'Charter' and 'Private/Rental'). Mean annual landings and discards in numbers and weight were computed for 2007-2009. Landings and discards reported as occurring in inshore waters were eliminated following rationale of the SEDAR-24 Data Workshop (DW). Discard estimates in numbers were converted to discard estimates in weight following the previously

described protocol for the headboat discards. Discard estimates in weight for each year (2007-2009) were converted to dead discards by multiplying by the recreational release mortality for red snapper, estimated at 38.9% for the 'Private/Rental' mode and 41.3% for the 'Charter' mode (SEDAR-24 2010). Total baseline removals were computed by adding landings and dead discards.

Similar to the approaches used for the headboat trip elimination model, MRFSS intercept records with catches exceeding a pre-determined criterion (see SERO 2009c) for vermilion snapper (November-March), shallow-water grouper (January-April), or red snapper (all months) were eliminated under various management alternatives scenarios and landings were subsequently re-estimated from the modified intercept files. These time periods evaluated correspond to proposed closed seasons for vermilion snapper and shallow-water grouper in Amendment 16, and red snapper in Amendment 17A. Impacts of Amendment 17B were not modeled for the private or charter recreational sectors as SEDAR-24 (2010) suggested minimal private or charter red snapper catch beyond 240 ft depth. All trips landing at least 5 vermilion snapper per angler or 1 SWG per angler during closed months with the 'closed season species' landings per angler exceeding 50% of the Snapper-Grouper FMP (all 73 regulated species) landings per angler were defined as 'directed' trips that would be impacted by Amendment 16. Similarly, all trips landing at least 1 red snapper per angler with red snapper landings per angler exceeding 50% of the Snapper-Grouper FMP landings per angler were defined as 'directed' trips that would be impacted by Amendment 17A. Similarly, primary and secondary target species identified in the MRFSS intercept records were also used to identify 'targeted' trips. If anglers reported targeting red snapper, vermilion snapper, or SWG, then the trip was identified as a 'target' trip for these species during the closure months.

Table 3. Trip elimination scenarios explored by recreational sector trip elimination models, considering the effects ('T' denotes elimination of 'targeted' trips; 'DT' denotes elimination of 'directed' and 'targeted' trips) of Amendments 16 ('A16') and Amendment 17A ('A17A').

Scenario	A16	A17A
Baseline	n/a	n/a
1	n/a	T
2	DT	T
3	n/a	DT
4	DT	DT

Once 'targeted' and 'directed' trips were defined, these trips were removed from the MRFSS intercept records dependent upon the model scenario (Table 3) and assumed to no longer occur. Landings and discards were then re-estimated using the MRFSS post-stratification program and modified intercept records. Re-estimated catch (in lbs) was apportioned by wave using the sector and scenario-specific 2007-2009 distribution of catch by wave, and then apportioned by month within waves using the ratios of days per month, assuming a uniform distribution of catch across days.

To evaluate the impacts of Amendment 17A spatial area closures, MRFSS landings had to be partitioned into statistical grids. MRFSS red snapper landings in the south Atlantic are reported primarily by state (FL, GA, SC, and NC), mode (charter, private), and area fished (federal waters, state waters, and inland waters), providing little spatial resolution to where red snapper landings occur. In order to partition MRFSS removals (landings + discards) into logbook grids, headboat removals by logbook grid were used as a proxy (see SERO 2009b-d). MRFSS removals were assigned to logbook grids using equation 2:

$$R_a = \frac{\%L_a}{\sum_{a=1}^{\Omega} \%L_a} * R_\Omega \qquad (2)$$

where, *R* is MRFSS removals, *a* is logbook grid, *%L* is the percentage of headboat landings, and *Ω* is MRFSS post-stratified region. In some instances, logbook grids overlapped state boundaries. If the majority of a logbook grid occurred in the MRFSS post-stratified region, then MRFSS post-stratified landings were assigned to that logbook grid.

Changes to Post-Release Mortality

Mortality of discarded red snapper has been estimated at 38.9% for the private recreational sector, 41.3% for the recreational for-hire (i.e., headboat and charter) sector, and 48% for the commercial sector (SEDAR-24 2010). Release mortality rates were based upon barometric mortality curves from a meta-analysis of laboratory and field studies combined with the average depth of fishing from observer data (see Equation 1). Differences in discard mortality rates between sectors result from differences in average depth fished, although it should be noted that longer handling time (longer surface interval) in the commercial fishery and hook trauma (all sectors) are also important sources of post-release mortality (SEDAR-24 2010).

Some closure alternatives may result in commercial and recreational fishermen moving into shallower water to fish, potentially decreasing barometric trauma and associated post-release mortality rates. The ICE Model allows the user to input post-Reg10 changes in release mortality by sector across all statistical areas. In addition, statistical areas 3379, 2981, 3081, and 3181 do not contain any depths greater than 66 ft. If effort shifts into shallower water due to annual spatial closures then a decrease in 'inshore' release mortality could be specified to account for this effort shift. The release mortality rate at 66 feet is estimated to be 20% (SEDAR-24 2010). The removals associated with changes in release mortality were computed by multiplying the sector-specific, statistical area-specific catch (in lbs) by the sector-specific, statistical area-specific release mortality rate.

Impacts of Bathymetric Closures

Reg10 contains alternatives for two bathymetric closures: (1) 66-240 ft and (2) 98-240 ft. The SEDAR-24 (2010) Data Workshop generated an Excel workbook entitled 'Rec-Discard-Mort-Dept-Analysis.xlsx.' The depth distributions of red snapper targeted by the recreational charter, headboat, and private fleets were computed in this workbook based upon available observer and port sampler data. To compute the impacts of the bathymetric closure, the red snapper stock was assumed to be heterogeneously distributed. Coastal relief mapping was used to determine if any depths between the specified depths (66-240 ft or 98-240 ft) were present within a closed statistical area. The percentage of the red snapper stock protected was estimated using the SEDAR-24 (2010) proportions of red snapper caught by depth. At 100% compliance, the percentage of the red snapper protected within various depth closures is presented in Table 4. Red snapper caught in statistical areas without these depths present would receive no protection from a bathymetric closure. The impacts of the bathymetric closure for the commercial sector were computed explicitly within the commercial trip elimination model as described previously.

Table 4. Proportion of red snapper removals originating within bathymetric contours, by sector.

Sector	66-240	98-240
Headboat	88.5%	40.6%
Charter	92.2%	74.2%
Private	81.0%	62.1%

Note: Computed from 'Rec-Discard-Mort-Dept-Analysis.xlsx' (SEDAR-24-DW 2010).

Compliance Rate

Most of the fisheries benefits of 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 spatial closures (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. Compliance rate was treated as a scalar multiplier, uniformly distributed across closed cells. For example, if a cell with 1,000 lbs of removals in June were 100% closed during the month of June with 90% compliance, 100 lbs of removals would still occur in that cell (see Equations 3 and 4).

Temporal Closures

All baseline and trip elimination scenarios expressed catch (in lbs) by month and by sector. The ICE Model allows the user to specify the statistical areas that will be closed, the months during

which they will be closed, and the percentage of the month that will be closed. For example, a scenario might be modeled in which cell 3080 were 100% closed during the months of June – August, and open for the remainder of the year. The associated removals would be computed using the month- and sector-specific catch within that cell (see Equations 3 and 4).

Effort Intensification

Partial monthly openings of closed areas may lead to an intensification of effort relative to historical levels. The ICE Model allows the user to enter a scalar multiplier for effort intensification for partial openings of closed cells. This adjusts the 'baseline' removal rate to account for increased effort that may occur (see Equations 3 and 4).

Effort Shifting

Effort may shift from closed statistical areas to nearby adjacent statistical areas, or shift from closed months to open months within a statistical area. The ICE Model allows the user to specify where effort might shift, what sectors might shift effort, and the percent scalar of effort shifting that may occur. Effort shifting within a cell with a time-area closure was modeled as occurring in the month prior to the closure and the month following the closure. For example, if cell 3080 were closed in June-August and the effort shifting scalar were 50%, removals in May and September would be 125% (e.g., 100% + 50%/2 months = 125%) of the modified baseline output from Equations 3 and 4. Effort shifting to adjacent statistical areas during time-area closures was assumed to occur during the time-area closure, and the percent effort shifting scalar was apportioned equally amongst the specified effort shifting cells. For example, if cell 2980 were closed in June and effort shifting was specified into cells 3081, 3080, 2981, and 2880 at 50%, then removals in each of these adjacent cells would be 112.5% (e.g., 100% + 50%/4 cells = 112.5%) of the modified baseline output by Equations 3 and 4.

Combined Effects

The approach taken for computing combined effects was somewhat different between the commercial and recreational sectors. The projected impacts of Reg10 upon removals (R) during a given month (m) in a cell (c) were computed for the commercial sector as follows:

$$R_{m,c}^{new} = R_{m,c}^{adj} + \left(\delta_{m,c} * \left(1 - \Phi_{m,c}\right) * \left(R_{m,c}^{old} - R_{m,c}^{adj}\right) + \left(\Phi_{m,c} * (1 - \xi) * \left(R_{m,c}^{old} - R_{m,c}^{adj}\right)\right)\right) \quad (3)$$

where R^{adj} denotes removals derived from the pertinent trip elimination scenario inclusive of explicitly-computed impacts of spatial closure and changes in release mortality (Table 1), R^{old} denotes baseline removals, δ denotes effort shifting or effort intensification (for partial closure) scalar, Φ denotes percent of month cell is subject to time-area closure, and ξ denotes percent compliance. This equation takes the adjusted commercial removals expected under the given management scenario by statistical area and by sector and scales it accordingly for effort shifting, effort intensification, closures, and non-compliance.

The projected impacts of Reg10 upon removals in the recreational sector were computed as follows:

$$R_{m,c}^{new} = \begin{cases} \Phi \neq (0,100), & \rho_c * \left[C_{m,c}^{adj} * \delta_{m,c} * (1 - \Phi_{m,c}) - \left(\Phi_{m,c} * \gamma * C_{m,c}^{adj}\right)\right] \\ \Phi = 100, & \rho_c * \left[C_{m,c}^{adj} - \left(\Phi_{m,c} * \gamma * C_{m,c}^{adj}\right)\right] \\ \Phi = 0, & \rho_c * \left[C_{m,c}^{adj} * \delta_{m,c}\right] \end{cases} \quad (4)$$

where C^{adj} denotes catch derived from the pertinent trip elimination scenario exclusive of impacts of spatial closure and changes in release mortality (Table 1), C^{old} denotes baseline catch, ρ denotes post-Reg10 release mortality rate for the recreational sector for the given statistical area, and *γ* denotes percent of stock protected (computed as percent of stock within bathymetric closure times compliance rate). This equation takes the adjusted catch expected under the given management scenario by statistical area and by sector and scales it accordingly for spatial closures, bathymetric closures, effort shifting, effort intensification, and non-compliance; then converts this adjusted catch to removals using the statistical area- and sector-specific post-Reg10 release mortality rate.

To compute the percent reduction achieved by a given set of combined management measures and input assumptions, the ICE Model sums across months, statistical areas, and sectors, then compares the total removals under the new management regime to the baseline (2007-2009) removals. Reduction targets were handled as percentages to compensate for deviations between SEDAR-24 (2010) input data and Beaufort Assessment Model (BAM) output estimates of removals. BAM outputs deviate from SEDAR-24 DW data because BAM accepts input for the recreational sector in numbers of fish landed, rather than pounds. BAM then estimates the weights of the catch using a von Bertalanffy growth curve coupled with the sector-specific selectivity curves. The proportional differences between mean BAM output removals (2007-2009) and projected total allowable removals under three model runs (i.e., 'hb=0.2', 'hb=0.25', and 'hb=0.3') at F = $F_{rebuild}$ = 98%$F_{30\%SPR}$ were used to compute the reduction targets for 2011, which ranged between 70-75%.

Results

Mean (2007-2009) baseline removals for the commercial sector were 259 thousand pounds (TP). Baseline headboat removals (landings + dead discards, in lbs) were computed as 105 TP. Baseline 'Private/Rental' removals were computed as 690 TP; 'Charter' removals were computed as 196 TP. Total baseline removals across sectors were 1,253 TP. These totals are consistent with SEDAR-24 (2010). Total removals varied by statistical area (Figure 1), with statistical areas 2980 (Ponce and St. Augustine Inlets), 2880 (Port Canaveral Inlet), and 3080 (St. Augustine and St. John's River Inlets) comprising the top three sources of removals.

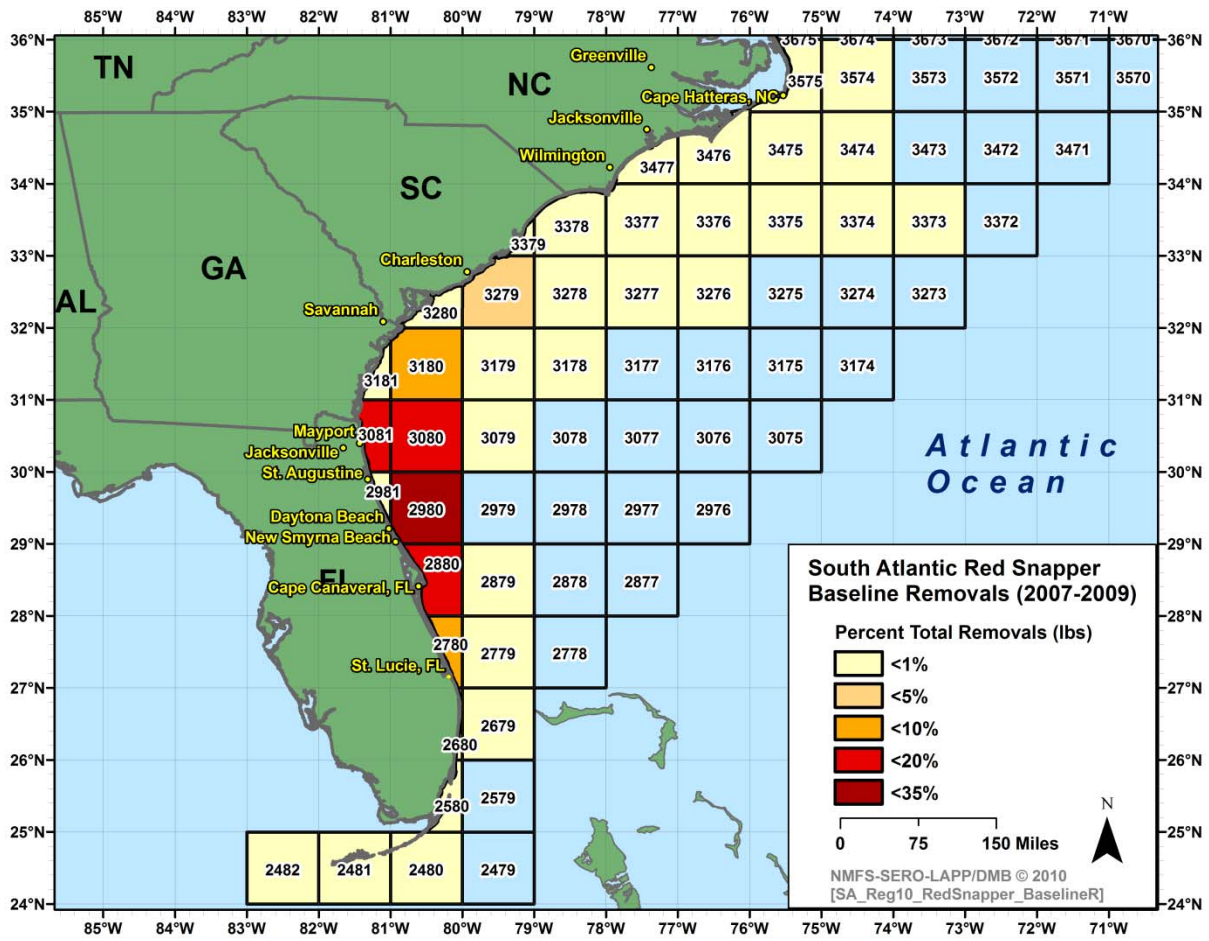

Figure 1. Percent of U.S. South Atlantic red snapper baseline removals (2007-2009), by statistical area.

The ICE Model suggests a moratorium on red snapper with no spatial closures to snapper-grouper fishing might provide a 45-66% reduction in removals (Table 5). Elimination of targeted trips for red snapper by Amendment 17A has a substantial effect (19%) upon projected reductions, with minimal additional reductions associated with the projected effects of other amendments (2-3%).

To achieve a 70-75% reduction in removals, a spatial area closure during at least part of the year would be needed in 2011. The ICE model indicates that the Amendment 17A closure might provide a 79-81% reduction. The ICE Model also indicates reductions in removals associated with short-term (one- or two-month) closures may be partially or completely offset by effort-shifting and effort intensification (Table 6).

A variety of input parameter assumptions and scenarios were investigated to explore the sensitivity of the model to the combined effects of the broad suite of potential input parameters. Table 6 presents the projected reductions associated with management

alternatives under consideration in Reg10. The input parameter stream has been reduced in this presentation to reflect input parameters selected by the SAFMC and their SSC during the development of Amendment 17A (e.g., elimination of directed and targeted trips for all sectors, reduction of inshore release mortality rate to 20% all sectors for annual closures, 90% compliance rate).

Table 5. Projected reductions across sectors associated with trip elimination scenarios under a red snapper harvest moratorium. A 'T' denotes elimination of 'targeted' trips; 'DT' denotes elimination of 'targeted' and 'directed' trips.

A16	A17B	A17A	Reduction
			45%
		T	64%
		DT	64%
DT	DT	T	66%
DT	DT	DT	66%

Note: Amendments 16 ('A16') closes shallow-water grouper during January through April, Amendment 17B ('A17B') includes a deepwater closure (240 feet seaward) to protect Warsaw grouper and speckled hind, Amendment 17A ('A17A') closes red snapper throughout the EEZ, and Regulatory Amendment 10 ('Reg10') closes fishing for managed Snapper-Grouper throughout the EEZ with a specified depth range.

Table 6. Projected reductions in red snapper removals associated with different levels of effort shifting and various spatial and bathymetric closures.

			Reductions by Pct. Effort Shift		
Closed Statistical Areas	**Depth (ft)**	**Closed Months**	**0%**	**50%**	**100%**
No Closure	n/a	n/a	66%	n/a	n/a
2980	98-240	Annual[1]	72	70	69
2980	98-240	June-July	67	67	66
2880, 2980	98-240	Annual[1]	75	74	72
2880, 2980	98-240	May-Oct	70	69	68
2880, 2980	98-240	July	67	66	66
2880, 2980	98-240	Jan-Apr	71	69	68
2880, 2980, 3080	98-240	Annual[1]	81	80	79
2880, 2980, 3080	98-240	May-Aug	71	70	68
2880, 2980, 3080	98-240	July-Dec	71	69	67
2880, 2980, 3080	98-240	May-Dec	73	71	70
2880, 2980, 3080	66-240	May-Dec	75	73	71
2880, 2980, 3080	98-240	July-Dec	72	70	69

Note: Assumes elimination of directed and targeted trips for all sectors and 90% compliance rate for all scenarios (SAFMC Amendment 17A 2009).
[1]Inshore release mortality rate reduced to 20%.

Discussion

SEDAR-24 projections indicate between a 70-75% reduction in red snapper removals (based on a $F_{rebuild} = 98\%*F_{30\%SPR}$) is needed to end overfishing and rebuild the red snapper stock in the south Atlantic region (SEDAR-24 2010). Amendment 17A implements a closure of the red snapper fishery in the south Atlantic. Our analyses suggest that without additional regulations, this closure will be inadequate to achieve the reductions in red snapper removals 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 moderately-high release mortality of red snapper. To achieve a 70-75% reduction, the interaction rate 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. A variety of scenarios were identified that would provide reductions in the 70-75% range while allowing for a reasonable rate of effort shifting. To achieve the higher end of this range of targeted reductions, longer (>6 months) and larger (three statistical areas, 66-240 ft) closures may be required. However; the time-area closures necessary to achieve the targeted reductions from SEDAR-24 (2010) are significantly smaller than the three statistical area annual closure selected as the preferred alternative in Amendment 17A.

As with most statistical analyses, assumptions can limit the applicability of results and conclusions. Assumptions in this analysis included: 1) discards occur in the same proportion as landings, 2) headboat landings are reasonable spatial proxies for private and charter boat landings, 3) no movement of fish across closed area boundaries, and 4) historical trends are reasonable proxies for future trends.

If discards do not occur proportionally to landings, the overall reductions generated by spatial closures would be different than presented herein. If fishermen relocate their effort to open areas rather than eliminating trips, reductions would be less than presented herein. If fishermen go out of business due to the stringency of proposed regulations, overall reductions might be greater than those presented herein.

If historical trends are not reasonable proxies for future trends, then the predictive utility of the ICE Model, which is based upon 2007-2009 trends in red snapper catch, is reduced. The ability of the 2007-2009 baseline data to predict fishery trends in 2011 is adversely impacted by fluctuations in the environment, rebuilding of the red snapper stock, and changes in the economy that effect fishing effort. If economic hardship creates a disincentive to fish, especially for the recreational sector, effort and associated removals in 2011 may be lower than projected.

The ability of the ICE Model to predict reductions beyond 2011 is further constrained as the trends in the fishery move further from the 2007-2009 baseline. A major concern in predicting future trends is that the ICE Model is predicated upon an equilibrium (average 2007-2009) stock; whereas the red snapper stock is in a rebuilding plan. As the stock rebuilds, the proportional representation of various age classes will shift, as will their absolute abundance.

The various sector-specific selectivities may then generate different levels of removals that would not be captured by historical data.

Most of the positive benefits of spatial area closures, including projected reductions in red snapper, are dependent on compliance with no-take regulations (Fogarty *et al.* 2000). Numerous modeling efforts and case studies have shown that even relatively low levels of poaching can rapidly erode the fisheries benefits of spatial area closures (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). Little published data exists to estimate rates of non-compliance (Ward et al. 2001), but a multi-year study in the Great Barrier Reef reported high levels of intrusion into a no-take zone of the Great Barrier Reef Marine Park (Gribble & Robertson 1998). For results summarized in Table 6, compliance was fixed at 90% based on Council recommended compliance rates during A17A deliberations. If compliance is less than 90%, reductions in red snapper removals might be substantially less than those estimated in this report. Reg10 differs from A17A in that the time-area closures are smaller and of limited duration. A smaller closure is more easily enforced when enforcement resources are limited, and may also receive more public support or buy-in. Both of these factors may increase compliance rate. If compliance is greater than 90%, reductions in red snapper removals might be higher than those estimated in this report.

The use of headboat landings locations as spatial proxies for private and charter boat landings is discussed in SERO (2009c). A comparison of post-stratified aggregated landings showed similar patterns in red snapper removals, although MRFSS reports higher relative landings off Northeast Florida and lower relative landings off South Carolina (SERO 2009c). Given the large size of the statistical areas involved in the spatial portioning of landings and the locations of major population centers, it seems reasonable to assume that broad-scale landings patterns between these sectors might be similar. If charter boat and private recreational landings patterns are not reasonably approximated by the headboat fishery, then overall reductions might be greater or lower than those projected by these analyses.

Movements of exploited fish species across closed area boundaries can help maintain fisheries yields but also reduce the ability of the closed area to protect spawning stock biomass (Farmer 2009). Fishermen may take advantage of these movements by redistributing fishing effort along closed area boundaries (review in Gell & Roberts 2003), further reducing the closed area's ability to control fishing pressure on the stock. Modeling efforts suggest larger closed areas provide a buffer, reducing the impacts of 'fishing-the-line' upon the core population (Fogarty 1999, Bohnsack 2000, Crowder et al. 2000, Walters 2000, Farmer 2009). Regardless, a combination of fish movement across closed area boundaries and a redistribution of fishing effort along boundaries might substantially reduce the protections afforded by the closures proposed in Reg10 for the red snapper stock.

In summary, model results suggest a moratorium on red snapper with no spatial closures to snapper-grouper fishing will not be sufficient to achieve the necessary SEDAR-24 (2010) reductions. Similarly, model results indicate the A17A closure achieves a greater reduction in

removals (79-81%) than may be needed. To achieve the SEDAR-24 (2010) necessary reductions in removals, a spatial area closure during at least part of the year would be needed in 2011 to achieve a 70-75% reduction in removals. Larger spatial area closures effective for longer durations are more likely to achieve necessary reductions in removals, as removals associated with short-term (one- or two-month) closures may be offset by effort-shifting and effort intensification (Table 6). Similarly, closure of 66-240 ft would greatly increase protection of red snapper spawning grounds, especially in statistical areas 2980 and 3080, as compared to a 98-240 ft closure (Figure 2), but would result in a significantly larger area closed to fishing.

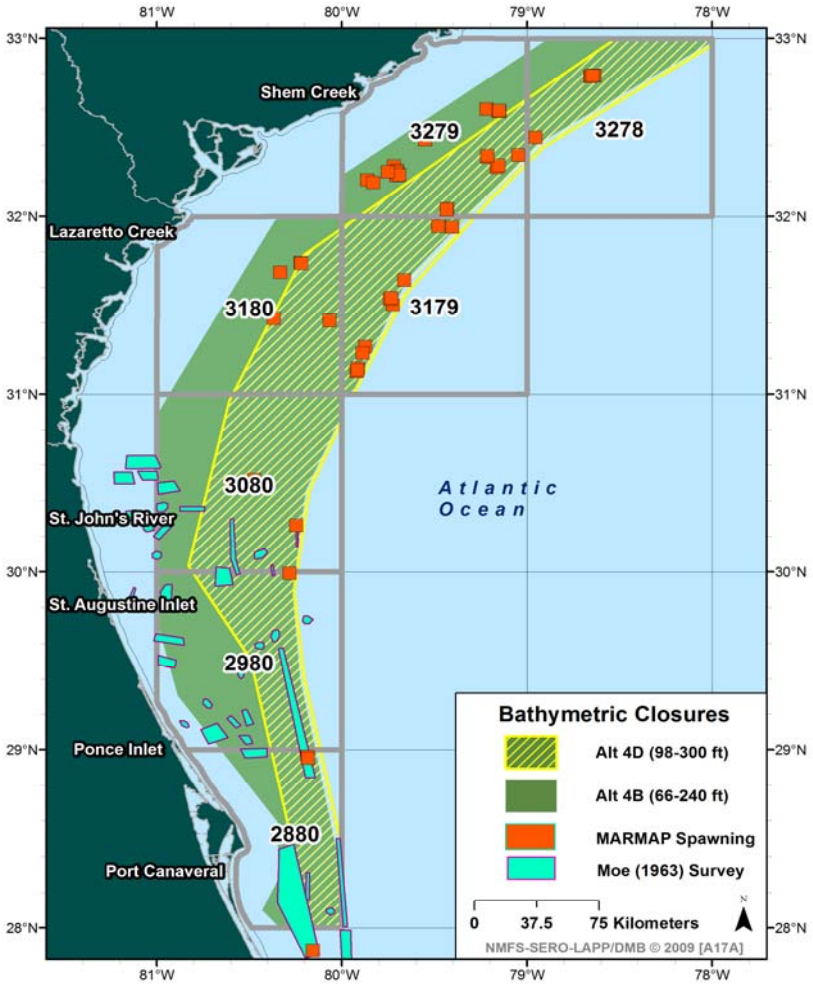

Figure 2. Generalized bathymetric closure areas from SAFMC Snapper-Grouper Amendment 17A, illustrating 66-240 ft and 98-300 ft closures relative to Moe (1963) survey-reported spawning grounds for red snapper and MARMAP sampling locations (1977-2009) where red snapper were captured in spawning condition.

Literature Cited

Attwood, C.G., J.M. Harris and A.J. Williams. 1997. International experience of marine protected areas and their relevance to South Africa. *South African Journal of Marine Science* 18: 311–332.

Bohnsack, J.A. 2000. A comparison of the short-term impacts of no-take marine reserves and minimum size limits. Bulletin of Marine Science, 66(3): 635-650.

Crowder, L.B., Lyman, S.J., Figueira, W.F., and J. Priddy. 2000. Source-sink population dynamics and the problem of siting marine reserves. Bulletin of Marine Science, 66(3): 799-820.

Farmer, N.A. 2009. Reef fish movements and marine reserve designs. Ph.D. Dissertation, University of Miami, Miami, FL. 216 pp.

Fogarty, M.J. 1999. Essential habitat, marine reserves and fishery management. Trends in Ecology & Evolution, 14(4): 133-134.

Fogarty, M.J., J.A. Bohnsack and P.K. Dayton. 2000. Marine reserves and resource management. In: *Seas at the Millenium: An Environmental Evaluation. Volume III Global Issues and Processes*. C.R.C. Sheppard (Editor). Pergamon, Elsevier Science, New York. p. 375–392.

Gell, F. R. and C.M. Roberts. 2003. The fishery effects of marine reserves and fishery closures Washington, DC: WWF-US.

Gribble, N.A. and J.W.A. Robertson. 1998. Fishing effort in the far northern section cross shelf closure area of the Great Barrier Reef Marine Park: the effectiveness of area-closures. *Journal of Environmental Management* 52: 53–67.

Guzman, H.M. and G. Jacome. 1998. Artisan fishery of Cayos Cochinos Biological Reserve, Honduras. *Revista de Biologia Tropical* 46: 151–163.

Jennings, S., S.S. Marshall and N.V.C. Polunin. 1996. Seychelles' marine protected areas: comparative structure and status of reef fish communities. *Biological Conservation* 75: 201–209.

Murray, S.N., T. Gibson Denis, J.S. Kido and J.R. Smith. 1999. Human visitation and the frequency and potential effects of collecting on rocky intertidal populations in Southern California marine reserves. *California Cooperative Oceanic Fisheries Investigation Report* 40: 100–106.

Rogers-Bennett, L., Bennett, W. A., Fastenau, H. C. and C. M. Dewees. 1995. Spatial variation in red sea urchin reproduction and morphology: implications for harvest refugia. *Ecological Applications* 5: 1171–1180.

SAFMC 2010. Amendment 17A to the Snapper-Grouper Fishery Management Plan. SAFMC, Charleston, SC. 417 pp.

SEDAR 15. 2009. Stock Assessment Report 1 (SAR 1) South Atlantic red snapper. Southeast Data, Assessment, and Review, Charleston, SC. 511 pp.

SEDAR 24. 2010. Stock Assessment Report: South Atlantic red snapper. Southeast Data, Assessment, and Review, Charleston, SC. 524 pp.

SERO. 2009a. Evaluating the Effects of Amendment 13C, Amendment 16, and Amendment 17A Regulations on Red Snapper Removals by South Atlantic Commercial Fisheries. SERO-LAPP-2009-03, NMFS, SERO, St. Petersburg, FL. 41 pp.

SERO. 2009b. Evaluating the Effects of Amendment 16 Regulations on 2005-2007 South Atlantic Red Snapper Headboat Removals. SERO-LAPP-2009-04, NMFS, SERO, St. Petersburg, FL. 10 pp.

SERO. 2009c. Evaluating the Effects of Amendment 16 Regulations on 2005-2007 South Atlantic Red Snapper Private and Charterboat Removals. SERO-LAPP-2009-05, NMFS, SERO, St. Petersburg, FL. 22 pp.

SERO. 2009d. Evaluating the Effects of Amendment 17A Regulations on 2005-2007 South Atlantic Red Snapper Headboat Removals. SERO-LAPP-2009-06, NMFS, SERO, St. Petersburg, FL. 13 pp.

SERO. 2009e. Projected Combined Effects of Amendments 13C, 16, and 17A Regulations on south Atlantic Red Snapper Removals. SERO-LAPP-2009-07, NMFS, SERO, St. Petersburg, FL. 17 pp.

Tegner, M.J. 1993. Southern California abalones: can stocks be rebuilt using marine harvest refugia? Canadian Journal of Fisheries and Aquatic Sciences, 50: 2010–2018.

Walters, C.J. 2000. Impacts of dispersal, ecological interactions, and fishing effort dynamics on efficacy of marine protected areas: How large should protected areas be? *Bulletin of Marine Science*, 66(3): 745-757.

Ward, T.J., Heinemann, D., and N. Evans. 2001. The role of marine reserves as fisheries management tools: A review of concepts, evidence, and international experience. *Australia Bureau of Rural Sciences: Agriculture, Fisheries, and Forestry*, 105 pp.

Waters, J.R. 2008. An Economic Model to Analyze Management Alternatives Proposed for the Commercial Fishery in Amendment 16 to the Snapper-Grouper Fishery Management Plan. NOAA National Marine Fisheries Service, Southeast Fisheries Science Center, 14p.

Table A1. Changes to SAFMC red snapper ICE model resulting from differences between SEDAR-15 (2009) and SEDAR-24 (2010).

Parameter	Old Value	New Value	Why?
Baseline	Arithmetic mean 2005-2007	Arithmetic mean 2007-2009	To match 'final year' computation in SEDAR 24, which used geometric mean 2007-2009 – discussions with SEFSC led to choice of arithmetic mean when dealing with removals due to issues with zeroes when using geometric means.
Impacts of previous amendments	Computed from 2005-2007 data	Re-computed from 2007-2009 data	To match 'final year' computation in SEDAR 24
Sector partitioning	Headboat, MRFSS, and Commercial	For-Hire, Private, and Commercial	To be consistent with SEDAR 24 projections
Commercial discard weight	1.49 lb (Dlb/Dnum 2007-2009 from SEDAR 15)	2.88 lb (Average 1992-2008 from SEDAR 24)	To be consistent with SEDAR 24 projections
Commercial discard mortality	90% all gears (from SEDAR 15)	48% 'line' gears, 0% dive gears [SEDAR 24] (95% CI: 34-62%)	To be consistent with SEDAR 24 projections; note combined effects model explicitly accounts for changes in commercial release mortality using depth of fishing reported to logbook
Recreational baseline landings	Includes shore landings and discards	Excludes shore landings and discards	SEDAR 24 assumes shore landings and discards are misidentified
Recreational discard weight	1.49 lb (Dlb/Dnum 2007-2009 from SEDAR 15)	Recreational discard weights were 2007: 1.77; 2008: 1.87; 2009: 2.17	To be consistent with SEDAR 24 projections

Parameter	Old Value	New Value	Why?
Recreational discard mortality	40% all gears/modes (SEDAR 15)	41.3% for the for-hire sector and 38.9% for the private sector (95% CI: 0.29-0.54 for-hire, 0.27-0.52 private)	To be consistent with SEDAR 24 projections
Bathymetric closure impacts on recreational removals	Recreational removals occur spatially following commercial logbook	SEDAR 24 provides bathymetric distribution of removals for recreational sector	Better representation of recreational fleet (more inshore than commercial)
Spatial distribution of headboat landings	Time-consuming manual gap-filling and proxy vessel process due to holes in data	Some improvements in dataset may reduce burden and provide better accuracy	Improved spatial distribution of recreational fleet
Spatial distribution of private/charter landings	Assumed proportional to headboat spatial distribution	Same as previous	No improved MRFSS spatial data available; headboat reporting improved in recent years.
Compliance	Explored 80%-100%	SAFMC LEAP indicates <100%	Little improved data available; any range (0-100%) can be modeled.
Effort shifting	Shifting not explicitly modeled; scalar effort intensification for partial openings allowed	User-specified cells for effort shifting and intensification, with scalars by month and cell	Allows greater flexibility for analysis of impacts effort shifting

Appendix G. SEDAR-24 South Atlantic Red Snapper: Management quantities and projections requested by the SSC and SERO

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November 2010

Introduction
In the SEDAR-24 CIE report, the Review Panel concluded "The Review Panel suggested using the AW base-case model to provide an assessment of the red snapper stock, but cautions that this was one realization of a number of plausible runs." The SSC followed up on this conclusion to identify three additional plausible runs; all of these runs increased the weighting of the headboat index relative to other data components.

Methods
The weighting given to the headboat index is controlled by the annual CV_t. In the model, the CV applied was,

$$CV_t = CV_t^d/\omega$$

where CV_t^d was the annual CV estimated by the data workshop and ω was a user-supplied weight. Larger values of ω result in smaller CV_t and, consequently, more emphasis on the index.

In the base-case configuration, as reviewed by the SEDAR-24 RW, weighting of data components was accomplished through an iterative re-weighting strategy. That strategy provided a headboat index weight of $\omega = 0.11$. The RW panel requested additional runs using $\omega = 0.20$, $\omega = 0.25$, $\omega = 0.30$, and the SSC selected those runs as plausible alternatives.

In this report, the alternative model runs are labeled wgt11, wgt20, wgt25, and wgt30, with labels indicating the value of ω applied to the headboat index. In addition to management quantities from those runs, this report provides results from 10-year, deterministic projections using four different fishing mortality rates: Fmsy, F30, 98% of F30, and Fcurrent but with a moratorium applied. Projection methods and caveats about results are described in the SEDAR-24 AW report. One caveat worth reiterating is that projections of population and fishery dynamics are highly uncertain. In the deterministic projections of this report, the uncertainty surrounding expected values is not quantified.

Results
Benchmarks and other management quantities from the various runs are presented in Table 1. Predicted landings and discards from the various runs are shown in Tables 2–5. Deterministic projection results from wgt11 are shown in Tables 6a,b,c,d; results from wgt20 in Tables 7a,b,c,d; results from wgt25 in Tables 8a,b,c,d; and results from wgt30 in Tables 9a,b,c,d.

Discussion
The benchmarks are conditional on selectivities estimated at the end of the assessment period. Changes in relative contributions toward mortality from the various fleets would alter the aggregate selectivity and thus benchmarks. Such changes have likely occurred as a result of the current moratorium, and as a result, moratorium fishing mortality rates are not directly comparable to Fmsy or its proxies.

Table 1. Estimated status indicators, benchmarks, and related quantities from the Beaufort Assessment Model. Values are from runs with component weights as in the base-case model of the AW report (wgt11), and from runs with increased weight on the headboat index (wgt20, wgt25, and wgt30). Estimates of yield do not include discards; Dmsy represents discard mortalities expected when fishing at Fmsy. Spawning stock biomass (SSB) is measured by total gonad weight of mature females.

Quantity	Units	wgt11	wgt20	wgt25	wgt30
Fmsy	y^{-1}	0.178	0.188	0.196	0.206
85%Fmsy	y^{-1}	0.151	0.160	0.166	0.175
75%Fmsy	y^{-1}	0.133	0.141	0.147	0.155
65%Fmsy	y^{-1}	0.115	0.122	0.127	0.134
F30%	y^{-1}	0.170	0.183	0.192	0.204
F40%	y^{-1}	0.125	0.134	0.140	0.149
F50%	y^{-1}	0.092	0.098	0.103	0.109
Bmsy	mt	13632	14180	14429	14634
SSBmsy	mt	156	162	165	168
MSST	mt	144	149	152	154
MSY	1000 lb	1842	1891	1908	1926
Dmsy	1000 fish	67	71	73	75
Rmsy	1000 age-1 fish	584	599	604	608
Y at 85%Fmsy	1000 lb	1821	1870	1887	1905
Y at 75%Fmsy	1000 lb	1780	1829	1846	1863
Y at 65%Fmsy	1000 lb	1712	1760	1777	1794
F(2007-2009)/Fmsy	–	4.12	3.27	2.98	2.76
SSB(2009)/SSBmsy	–	0.09	0.11	0.12	0.14

Table 2a. Estimated recent landings in whole weight (1000 lb) for commercial lines (L.cl), commercial dive (L.cd), for hire (L.hb), and private recreational (L.pvt) from run with headboat index weight of $\omega = 0.11$.

Year	L.cl	L.cd	L.hb	L.pvt	Total
2000	92.13	10.38	146.29	441.08	689.87
2001	175.32	18.24	151.48	280.75	625.78
2002	163.11	22.10	219.31	247.60	652.12
2003	118.79	17.45	202.00	136.94	475.19
2004	149.73	19.65	236.07	244.04	649.48
2005	117.99	9.34	224.78	206.96	559.07
2006	80.29	4.16	183.87	156.50	424.82
2007	104.72	7.51	187.91	366.92	667.06
2008	240.48	6.30	301.94	616.19	1164.92
2009	340.89	8.01	382.32	708.17	1439.40

Table 2b. Estimated recent dead discards in whole weight (1000 lb) for commercial lines (D.cl), for hire (D.hb), and private recreational (D.pvt) from run with headboat index weight of $\omega = 0.11$.

Year	D.cl	D.hb	D.pvt	Total
2000	22.52	24.02	156.32	202.87
2001	25.81	29.15	150.80	205.76
2002	61.00	23.25	90.28	174.53
2003	18.51	15.79	96.22	130.53
2004	6.58	30.99	128.66	166.23
2005	7.12	44.70	68.56	120.38
2006	7.34	9.14	43.31	59.80
2007	15.24	85.09	231.43	331.76
2008	21.44	55.76	310.78	387.97
2009	30.33	34.88	173.44	238.65

Table 3a. Estimated recent landings in whole weight (1000 lb) for commercial lines (L.cl), commercial dive (L.cd), for hire (L.hb), and private recreational (L.pvt) from run with headboat index weight of $\omega = 0.20$.

Year	L.cl	L.cd	L.hb	L.pvt	Total
2000	92.09	10.37	145.95	435.65	684.06
2001	175.23	18.24	148.67	274.31	616.45
2002	163.07	22.10	214.40	241.58	641.14
2003	118.77	17.45	200.25	135.59	472.06
2004	149.70	19.65	227.16	233.93	630.43
2005	117.99	9.34	216.68	199.01	543.03
2006	80.30	4.16	185.58	157.14	427.18
2007	104.72	7.51	195.48	371.14	678.85
2008	240.53	6.30	296.43	601.97	1145.22
2009	340.96	8.01	374.62	692.68	1416.28

Table 3b. Estimated recent dead discards in whole weight (1000 lb) for commercial lines (D.cl), for hire (D.hb), and private recreational (D.pvt) from run with headboat index weight of $\omega = 0.20$.

Year	D.cl	D.hb	D.pvt	Total
2000	22.24	23.65	153.86	199.75
2001	25.54	29.14	150.71	205.39
2002	60.56	22.35	86.77	169.68
2003	17.88	15.69	95.59	129.16
2004	6.67	31.67	131.48	169.82
2005	7.15	45.06	69.10	121.31
2006	7.09	8.93	42.30	58.32
2007	15.08	83.76	227.86	326.70
2008	21.32	56.51	315.08	392.91
2009	30.75	36.51	181.51	248.76

Table 4a. Estimated recent landings in whole weight (1000 lb) for commercial lines (L.cl), commercial dive (L.cd), for hire (L.hb), and private recreational (L.pvt) from run with headboat index weight of $\omega = 0.25$.

Year	L.cl	L.cd	L.hb	L.pvt	Total
2000	92.07	10.37	145.41	432.55	680.40
2001	175.20	18.24	147.28	271.36	612.07
2002	163.06	22.10	211.63	238.31	635.10
2003	118.77	17.45	199.79	135.26	471.26
2004	149.70	19.65	218.49	224.66	612.49
2005	118.00	9.34	210.96	193.59	531.90
2006	80.30	4.16	186.24	157.43	428.14
2007	104.73	7.51	198.55	372.95	683.74
2008	240.55	6.30	296.01	600.35	1143.21
2009	340.99	8.01	372.62	688.71	1410.34

Table 4b. Estimated recent dead discards in whole weight (1000 lb) for commercial lines (D.cl), for hire (D.hb), and private recreational (D.pvt) from run with headboat index weight of $\omega = 0.25$.

Year	D.cl	D.hb	D.pvt	Total
2000	22.05	23.41	152.30	197.75
2001	25.33	29.19	151.00	205.52
2002	60.19	21.55	83.68	165.43
2003	17.36	15.74	95.87	128.98
2004	6.75	32.27	133.94	172.96
2005	7.15	45.18	69.29	121.63
2006	6.98	8.91	42.19	58.07
2007	14.99	82.71	225.03	322.73
2008	21.13	56.51	315.13	392.77
2009	30.77	37.05	184.23	252.05

Table 5a. Estimated recent landings in whole weight (1000 lb) for commercial lines (L.cl), commercial dive (L.cd), for hire (L.hb), and private recreational (L.pvt) from run with headboat index weight of $\omega = 0.30$.

Year	L.cl	L.cd	L.hb	L.pvt	Total
2000	92.06	10.37	145.64	432.42	680.49
2001	175.19	18.24	146.41	269.52	609.35
2002	163.06	22.09	208.88	235.12	629.15
2003	118.77	17.45	200.15	135.50	471.87
2004	149.71	19.65	210.87	216.60	596.82
2005	118.01	9.34	207.56	190.38	525.29
2006	80.30	4.16	190.37	160.75	435.58
2007	104.73	7.51	203.75	379.58	695.58
2008	240.58	6.30	299.58	607.15	1153.61
2009	341.01	8.01	372.86	688.99	1410.88

Table 5b. Estimated recent dead discards in whole weight (1000 lb) for commercial lines (D.cl), for hire (D.hb), and private recreational (D.pvt) from run with headboat index weight of $\omega = 0.30$.

Year	D.cl	D.hb	D.pvt	Total
2000	21.79	23.06	150.00	194.85
2001	25.01	29.11	150.57	204.69
2002	59.68	20.88	81.08	161.64
2003	16.92	15.75	95.92	128.58
2004	6.77	32.71	135.77	175.25
2005	7.14	45.15	69.25	121.54
2006	6.94	8.98	42.54	58.45
2007	14.85	80.95	220.28	316.08
2008	20.78	56.10	312.89	389.76
2009	30.64	37.34	185.67	253.66

Table 6a. Projection results (expected values) with F=Fmsy, extended from assessment model configuration with component weights as in the AW report, including headboat index weight of $\omega = 0.11$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.416	11.49	235	62	306	0	0	0
2011	0.178	13.76	223	22	39	22	235	235
2012	0.178	15.53	251	26	52	29	278	513
2013	0.178	17.62	270	29	56	35	321	834
2014	0.178	20.11	290	31	62	41	378	1212
2015	0.178	22.98	312	34	66	47	436	1648
2016	0.178	26.17	335	36	71	52	491	2139
2017	0.178	29.71	356	39	76	57	546	2685
2018	0.178	33.56	377	41	81	62	602	3287
2019	0.178	37.68	397	44	86	67	660	3947

Table 6b. Projection results (expected values) with F=F30, extended from assessment model configuration with component weights as in the AW report, including headboat index weight of $\omega = 0.11$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.416	11.49	235	62	306	0	0	0
2011	0.170	13.76	223	21	37	21	226	226
2012	0.170	15.61	251	25	50	28	268	494
2013	0.170	17.76	271	28	54	34	311	805
2014	0.170	20.35	292	30	59	40	367	1172
2015	0.170	23.33	314	33	64	45	425	1597
2016	0.170	26.66	337	35	69	51	480	2077
2017	0.170	30.35	359	38	74	56	535	2611
2018	0.170	34.39	381	40	79	61	591	3202
2019	0.170	38.72	401	42	84	66	649	3851

Table 6c. Projection results (expected values) with F=0.98×F30, extended from assessment model configuration with component weights as in the AW report, including headboat index weight of $\omega = 0.11$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.416	11.49	235	62	306	0	0	0
2011	0.167	13.76	223	20	36	20	222	222
2012	0.167	15.65	251	25	49	27	263	485
2013	0.167	17.83	271	27	53	33	306	791
2014	0.167	20.46	292	30	58	39	362	1153
2015	0.167	23.49	315	32	63	45	420	1573
2016	0.167	26.89	338	34	68	50	474	2047
2017	0.167	30.66	361	37	73	55	529	2576
2018	0.167	34.79	383	39	78	60	585	3162
2019	0.167	39.21	403	42	83	65	643	3805

Table 6d. Projection results (expected values) under continued moratorium, extended from assessment model configuration with component weights as in the AW report, including headboat index weight of $\omega = 0.11$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings. In these projections, the F applied corresponds to F=0.9×Fcurrent (Fcurrent = 0.73) but decreased to reflect potential landings that are discarded and survive.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.416	11.49	235	62	306	0	0	0
2011	0.416	13.76	223	78	344	0	0	0
2012	0.416	15.21	251	91	395	0	0	0
2013	0.416	16.81	267	99	427	0	0	0
2014	0.416	18.59	283	108	473	0	0	0
2015	0.416	20.52	299	116	519	0	0	0
2016	0.416	22.57	316	124	563	0	0	0
2017	0.416	24.77	332	131	606	0	0	0
2018	0.416	27.12	347	139	650	0	0	0
2019	0.416	29.57	362	146	693	0	0	0

Table 7a. Projection results (expected values) with F=Fmsy, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.20$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.35	16.88	282	65	345	0	0	0
2011	0.188	20.64	286	28	48	29	326	326
2012	0.188	23.27	320	35	67	38	386	711
2013	0.188	26.25	341	38	74	45	438	1149
2014	0.188	29.59	361	41	80	52	501	1650
2015	0.188	33.29	382	43	85	58	563	2213
2016	0.188	37.32	401	46	90	63	624	2837
2017	0.188	41.67	420	48	94	69	685	3522
2018	0.188	46.34	438	50	99	74	747	4269
2019	0.188	51.21	454	52	103	78	808	5077

Table 7b. Projection results (expected values) with F=F30, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.20$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.35	16.88	282	65	345	0	0	0
2011	0.183	20.64	286	27	47	28	317	317
2012	0.183	23.34	320	34	65	37	376	693
2013	0.183	26.39	341	37	72	44	428	1121
2014	0.183	29.82	362	40	78	51	490	1612
2015	0.183	33.62	383	42	83	57	553	2164
2016	0.183	37.76	403	45	88	62	614	2778
2017	0.183	42.26	422	47	92	67	675	3454
2018	0.183	47.08	440	49	97	73	737	4190
2019	0.183	52.12	457	51	101	77	798	4988

Table 7c. Projection results (expected values) with F=0.98×F30, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.20$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.35	16.88	282	65	345	0	0	0
2011	0.179	20.64	286	27	46	28	311	311
2012	0.179	23.4	320	33	64	37	370	680
2013	0.179	26.49	342	36	71	43	422	1102
2014	0.179	29.98	363	39	77	50	483	1585
2015	0.179	33.85	384	41	81	56	545	2131
2016	0.179	38.08	404	44	86	62	607	2737
2017	0.179	42.67	424	46	91	67	668	3405
2018	0.179	47.6	442	48	95	72	729	4135
2019	0.179	52.76	459	50	100	77	791	4926

Table 7d. Projection results (expected values) under continued moratorium, extended from assessment model configuration with component weights as in the AW report, including headboat index weight of $\omega = 0.20$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings. In these projections, the F applied corresponds to F=0.9×Fcurrent (Fcurrent = 0.61) but decreased to reflect potential landings that are discarded and survive.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.35	16.88	282	65	345	0	0	0
2011	0.35	20.64	286	84	384	0	0	0
2012	0.35	23.4	320	101	458	0	0	0
2013	0.35	26.26	342	112	504	0	0	0
2014	0.35	29.3	361	121	557	0	0	0
2015	0.35	32.53	380	130	610	0	0	0
2016	0.35	35.95	398	138	661	0	0	0
2017	0.35	39.58	414	146	712	0	0	0
2018	0.35	43.43	430	153	762	0	0	0
2019	0.35	47.42	444	160	812	0	0	0

Table 8a. Projection results (expected values) with F=Fmsy, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.25$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.331	19.77	305	66	351	0	0	0
2011	0.196	24.23	314	31	53	31	358	358
2012	0.196	27.28	349	38	73	43	432	790
2013	0.196	30.68	370	42	82	50	490	1280
2014	0.196	34.4	390	45	88	57	555	1836
2015	0.196	38.45	409	47	92	62	618	2454
2016	0.196	42.81	427	50	97	68	680	3133
2017	0.196	47.48	445	52	102	73	741	3875
2018	0.196	52.46	461	54	106	78	803	4678
2019	0.196	57.61	476	56	110	83	865	5544

Table 8b. Projection results (expected values) with F=F30, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.25$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.331	19.77	305	66	351	0	0	0
2011	0.192	24.23	314	30	52	31	351	351
2012	0.192	27.34	349	38	72	42	425	775
2013	0.192	30.8	370	41	80	49	482	1258
2014	0.192	34.59	390	44	86	56	547	1805
2015	0.192	38.72	410	47	91	62	610	2415
2016	0.192	43.17	428	49	96	67	671	3086
2017	0.192	47.95	446	51	100	72	733	3819
2018	0.192	53.05	462	53	104	77	795	4615
2019	0.192	58.33	477	55	108	82	857	5472

Table 8c. Projection results (expected values) with F=0.98×F30, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.25$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.331	19.77	305	66	351	0	0	0
2011	0.188	24.23	314	30	51	30	344	344
2012	0.188	27.4	349	37	71	41	417	761
2013	0.188	30.91	370	41	79	48	475	1236
2014	0.188	34.77	391	43	85	55	539	1775
2015	0.188	38.98	411	46	90	61	602	2377
2016	0.188	43.52	430	48	94	66	663	3040
2017	0.188	48.41	447	50	99	71	725	3765
2018	0.188	53.62	464	52	103	76	787	4552
2019	0.188	59.03	479	54	107	81	849	5402

Table 8d. Projection results (expected values) under continued moratorium, extended from assessment model configuration with component weights as in the AW report, including headboat index weight of $\omega = 0.25$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings. In these projections, the F applied corresponds to F=0.9×Fcurrent (Fcurrent = 0.58) but decreased to reflect potential landings that are discarded and survive.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.331	19.77	305	66	351	0	0	0
2011	0.331	24.23	314	85	393	0	0	0
2012	0.331	27.64	349	105	479	0	0	0
2013	0.331	31.11	372	116	531	0	0	0
2014	0.331	34.76	392	126	586	0	0	0
2015	0.331	38.6	411	134	640	0	0	0
2016	0.331	42.64	428	142	692	0	0	0
2017	0.331	46.91	444	149	743	0	0	0
2018	0.331	51.43	459	156	794	0	0	0
2019	0.331	56.09	473	163	845	0	0	0

Table 9a. Projection results (expected values) with F=Fmsy, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.30$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.32	22.67	325	65	346	0	0	0
2011	0.206	27.74	338	34	57	32	377	377
2012	0.206	31.18	373	42	79	47	477	854
2013	0.206	34.94	393	46	88	53	539	1393
2014	0.206	38.98	413	49	94	60	603	1996
2015	0.206	43.32	431	51	99	66	664	2660
2016	0.206	47.96	448	53	103	71	725	3385
2017	0.206	52.91	464	55	108	76	787	4171
2018	0.206	58.14	478	57	112	80	849	5020
2019	0.206	63.53	492	59	115	85	912	5932

Table 9b. Projection results (expected values) with F=F30, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.30$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.32	22.67	325	65	346	0	0	0
2011	0.204	27.74	338	33	57	32	372	372
2012	0.204	31.22	373	41	79	46	472	844
2013	0.204	35.02	394	45	87	53	534	1378
2014	0.204	39.1	413	48	93	60	597	1975
2015	0.204	43.5	431	50	98	65	658	2633
2016	0.204	48.2	448	53	102	70	719	3353
2017	0.204	53.22	464	55	107	75	781	4134
2018	0.204	58.53	479	57	110	80	844	4977
2019	0.204	64	493	58	114	85	907	5884

Table 9c. Projection results (expected values) with F=0.98×F30, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.30$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.32	22.67	325	65	346	0	0	0
2011	0.199	27.74	338	33	56	31	365	365
2012	0.199	31.29	373	41	77	45	464	829
2013	0.199	35.14	394	44	86	52	525	1354
2014	0.199	39.3	414	47	92	59	589	1942
2015	0.199	43.79	432	50	96	64	649	2592
2016	0.199	48.58	449	52	101	69	710	3302
2017	0.199	53.72	466	54	105	74	772	4074
2018	0.199	59.15	481	56	109	79	835	4909
2019	0.199	64.76	495	58	112	84	898	5807

Table 9d. Projection results (expected values) under continued moratorium, extended from assessment model configuration with component weights as in the AW report, including headboat index weight of $\omega = 0.30$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings. In these projections, the F applied corresponds to F=0.9×Fcurrent (Fcurrent = 0.57) but decreased to reflect potential landings that are discarded and survive.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.32	22.67	325	65	346	0	0	0
2011	0.32	27.74	338	87	395	0	0	0
2012	0.32	31.72	373	109	500	0	0	0
2013	0.32	35.72	396	120	555	0	0	0
2014	0.32	39.88	416	129	611	0	0	0
2015	0.32	44.24	434	137	663	0	0	0
2016	0.32	48.8	451	145	715	0	0	0
2017	0.32	53.61	466	152	766	0	0	0
2018	0.32	58.67	480	158	817	0	0	0
2019	0.32	63.87	494	164	868	0	0	0

Appendix H. Notes about the Economic Effects of Preliminary Management Alternatives In Snapper-Grouper Regulatory Amendment 10 On the Commercial Snapper-Grouper Fishery

National Marine Fisheries Service
Southeast Fisheries Science Center

November 29, 2010

Notes about the Economic Effects of Preliminary Management Alternatives
In Snapper-Grouper Regulatory Amendment 10
On the Commercial Snapper-Grouper Fishery

Deliverables

Deliverables include this Word file plus four Excel spreadsheets with results from the simulation analysis of preliminary management alternatives for Regulatory Amendment 10. Spreadsheets are named:

- **RegA10 base17A comm econ 3yr NOR tables 112310** includes tabulations of simulated net operating revenues given the closures to be implemented by Snapper-Grouper Amendment 17A as the No Action alternative;
- **RegA10 base17A comm econ 3yr REV tables 112310** includes tabulations of simulated gross dockside revenues given the closures to be implemented by Snapper-Grouper Amendment 17A as the No Action alternative;
- **RegA10 base17AB comm econ 3yr NOR tables 112110** includes tabulations of simulated net operating revenues given the closures to be implemented by Snapper-Grouper Amendments 17A and 17B as the No Action alternative;
- **RegA10 base17AB comm econ 3yr REV tables 112110** includes tabulations of simulated gross dockside revenues given the closures to be implemented by Snapper-Grouper Amendments 17A and 17B as the No Action alternatives.

Each spreadsheet includes five basic worksheets.

- **LogYear** presents results for the three years (2007-2009) of logbook data used in the analysis.
- **State** presents results organized by region within the jurisdiction of the South Atlantic Fishery Management Council. Regions are defined as North Carolina, South Carolina, Georgia and northeast Florida, central and southeast Florida, and the Florida Keys. Northeast Florida is defined as the three northeastern counties of Nassau, Duval and St Johns. Central and southeast Florida is defined as the remaining east coast counties from Flagler County through Miami-Dade County. The Florida Keys region is defined by water body code to include waters to the south and east of the Keys.
- **Gear** presents results organized by the primary gear used on each trip as reported to the logbook program. If more than one gear was used on a trip, the primary gear was defined as the gear that accounted for a plurality of trip revenues. Gears include vertical lines (gear codes H, E, and TR), longlines (L), pots/traps (T), dive gear (S, P), and all other gears.
- **Month** presents results organized by month and calendar quarter.
- **Alternatives** defines the preliminary alternatives to be examined for Regulatory Amendment 10 and the set of existing regulations from Amendments 13C, 15A, 16, 17A and 17B that define the No Action alternative.

The preliminary alternatives for Regulatory Amendment 10 were examined with:

- Gear exemptions for black sea bass pots and dive gear;
- Gear exemption for dive gear only;
- Gear exemption for black sea bass pots only;

- No gear exemptions.

The spreadsheets with results in terms of net operating revenues include worksheets named **Exempt_Spears** and **Exempt_Pots** that compare the simulated results with and without exemptions for spearfishing and black sea bass pots. An exemption for spearfishing is evaluated by subtracting simulated results for scenarios with

- (a) both gear exemptions minus (b) an exemption for pots only, and
- (a) an exemption for spears only minus (b) no gear exemptions.

Both comparisons yield identical results.

Similarly, the exemption for black sea bass pots is evaluated by subtracting simulated results for scenarios with

- (a) both gear exemptions minus (b) an exemption for spears only, and
- (a) an exemption for pots only minus (b) no gear exemptions.

Both comparisons yield identical results.

Additional worksheets in spreadsheet **RegA10 base17A comm econ 3yr NOR tables 112310** include the figures and underlying data that appear later in this set of notes.

- **LogYearFigures**
- **StateFigures**
- **GearFigures**
- **MonthFigures**

The discussion about the information in each figure compares the expected outcome of closures to be implemented by Amendment 17A with the expected outcomes for the preliminary alternatives for Regulatory Amendment 10. However, although Amendment 17A represents the No Action alternative for Regulatory Amendment 10, the figures are organized to display expected deviations from a baseline defined by Amendment 16, which is the No Action alternative for Amendment 17A and is identified as alternative 0 in the accompanying Excel spreadsheets. Figures are displayed in this way to illustrate that Regulatory Amendment 10 is expected to benefit the commercial fishery, but that the benefits would accrue as smaller reductions in net operating revenues rather than actual increases in net operating revenues. In other words, the benefits are depicted in the figures as smaller (in absolute value) negative numbers rather than as positive numbers. Recall that Amendment 17A has not been implemented, so that net operating revenues are expected to decline for commercial fishermen regardless of whether the closures associated with Amendment 17A or one of the alternatives from Regulatory Amendment 10 is implemented.

Background

Amendment 17A was developed to reduce overfishing on red snapper, and will prohibit the landing and sale of red snapper throughout the jurisdiction of the SAFMC. Other management actions in Amendment 17A are designed to reduce the incidental bycatch and discard of red snapper by vessels when fishing for other species in the snapper-grouper management unit. These management actions include a prohibition on the landing and sale of any species in the

snapper-grouper management unit within 98-240 water depths in areas defined by latitude-longitude grids 2880, 2980 and 3080. Fishing with black sea bass pots or spearfishing gear is exempt from this closure, although red snapper may not be landed or sold if caught with the exempted gears. Amendment 17A has been approved by the Secretary of Commerce and awaits implementation.

A new biological stock assessment was slightly more optimistic about the status of the red snapper stock, although it still found the stock to be overfished and that overfishing still is occurring. As a result, Regulatory Amendment 10 will consider management actions for red snapper that are less restrictive. Most of the preliminary alternatives for Regulatory Amendment 10 would maintain the prohibition on fishing within 98-240 foot depths for all snapper-grouper species, but specify smaller geographic limits for the closed areas and shorter seasonal closures rather than a year-round closure.

Table 1. Preliminary management alternatives for Regulatory Amendment 10.

Preliminary Alternatives for Regulatory Amendment 10	Alternative Label	Areas Closed	Depth (ft) Closed	Months Closed
1-no action (regulations to be implemented by Amendment 17A)	1	2880, 2980, 3080	98-240	year-round
2 (2011 and onwards)	2	2880, 2980	98-240	May-October
3 (2011 and onwards)	3	2880, 2980, 3080	98-240	May-August
4 (2011 and onwards)	4	2880, 2980, 3080	98-240	July-December
5 (2011 and onwards)	5	2880, 2980, 3080	98-240	May-December
6 (2011)	6a	2880, 2980, 3080	66-240	May-December
6 (2012 and onwards)	6b	2880, 2980	98-240	May-October
7 (2011)	7a	2880, 2980	98-240	May-October
7 (2012 and onwards)	7b	2980	98-240	June-July
8 (2011)	8a	2880, 2980	98-240	May-October
8 (2012 and onwards)	8b	2880, 2980	98-240	July
9 (2011)	9a	2880, 2980, 3080	98-240	July-December
9 (2012 and onwards)	9b	2880, 2980	98-240	Jan-April
10 (2011)	10a	2880, 2980, 3080	98-240	May-December
10 (2012 and onwards)	10b	2880, 2980	98-240	Jan-April

Method of Analysis

The economic analysis of the preliminary management alternatives for Regulatory Amendment 10 consists of a comparison of their expected economic outcomes with the expected outcome for the closures that have been approved but not yet implemented for Amendment 17A.

A simulation model was employed to calculate the expected economic outcomes for the No Action management scenario and each of the preliminary alternatives. The model hypothetically

imposes the proposed restrictions on commercial fishing activities as defined by logbook trip reports that were submitted to the NMFS during 2007-2009. This is the same model and procedure that were used to examine the expected economic effects of management alternatives that were proposed for Amendment 17A. However, the analysis for Amendment 17A used data for 2006-2008 because data for 2009 were unavailable at that time. Therefore, the results presented here for the expected outcome of Amendment 17A, which is the No Action alternative for Regulatory Amendment 10, are based on updated logbook data from 2007-2009 and will differ from the results that appear in Amendment 17A.

The advantages and disadvantages of the simulation model were discussed in Amendment 17A. Briefly, the advantages are:

- The analysis uses data about actual fishing activities as reported by fishermen;
- The analysis considers the effects of the preliminary management alternatives on trip revenues and trip costs, and allows for the possibility that the restrictions may make some individual trips unprofitable;
- The analysis considers the interaction of preliminary management alternatives with existing regulations.

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.

The simulation model uses information from the recent past (in this analysis, 2007-2009) as a predictor of the near future. Because the future is unknown and because economic and environmental conditions vary over time, we do not know which year is the best predictor of the near future. Therefore, the 3-year average of simulated results from 2007-2009 is used as the expected predictor of the effects for each preliminary management alternative. The model is most appropriately applied to short-term evaluations because information from the recent past is a more reliable predictor of the near-future than of the distant future.

Results are presented in terms of net operating revenues, defined as commercial dockside revenues minus trip costs which include fuel, oil, bait, ice, and other supplies, and exclude fixed costs and labor costs. Therefore, net operating revenues represent the incomes for labor (including crew) plus the gross income for boat owners who must pay fixed costs and other non-trip costs related to owning and operating the vessel.[1] Net operating revenues were adjusted to constant 2008 dollars with the consumer price index for all items and all urban consumers.

All alternatives are evaluated from January through December each year.

[1] The logbook database does not collect prices or revenues for landed fish. Trip revenues were calculated as reported landings multiplied by average prices, by species, from the NMFS Accumulated Landings System. Trip costs were calculated from sample data as a function of trip characteristics such as type of gear and amount of gear used, crew size, duration of trip, and pounds landed.

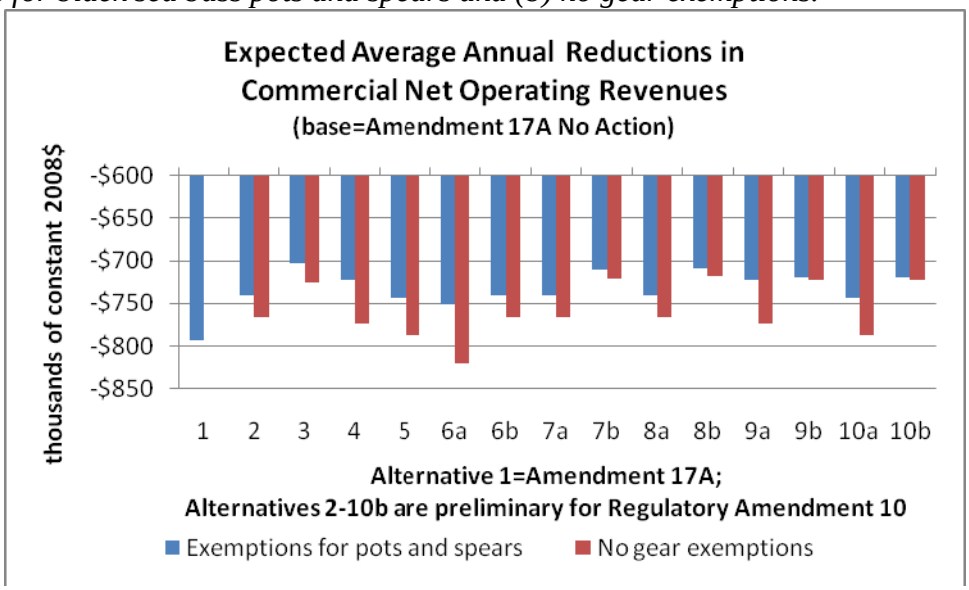
Results

There are five primary conclusions from the economic analysis of preliminary management alternatives for Regulatory Amendment 10.

1. The potential economic benefit of Regulatory Amendment 10 occurs in the form of smaller losses in net operating revenues due to regulation rather than an actual increase in net operating revenues.
2. In aggregate, the potential benefit of Regulatory Amendment 10 is small compared to total net operating revenues for the entire snapper-grouper fishery.
3. However, the potential benefit is large for fishermen in Georgia and northeast Florida, where the management alternatives associated with Amendment 17A would be most restrictive.
4. The smaller and shorter closures associated with Regulatory Amendment 10 would allow the snapper-grouper fleet to fill the existing commercial quotas for gag and vermilion snapper more quickly, which sometimes yielded counterintuitive, but plausible, results.
5. The gear exemption for spearfishing matters.

(1)Potential benefits equate to smaller reductions in net operating revenues.
The closures to be implemented by Amendment 17A are defined as the No Action alternative for Regulatory Amendment 10 because they represent the restrictions that will be implemented if not superseded by any of the alternatives in Regulatory Amendment 10. In most of the preliminary management scenarios, Regulatory Amendment 10 would be less restrictive than Amendment 17A, and hence there usually would be a benefit to commercial fishermen. However, the benefit takes the form of smaller losses in net operating revenues due to regulation rather than an actual increase in net operating revenues. Smaller losses are depicted in Figure 1 and all subsequent figures by vertical bars that are shorter than the bar for Alternative 1 (Amendment 17A).

Figure 1. Expected average annual reductions in commercial net operating revenues, given (a) exemptions for black sea bass pots and spears and (b) no gear exemptions.



Amendment 17A is expected to reduce net operating revenues by approximately $794,000 (Figure 1) based on average simulated outcomes with data for 2007-2009. The least costly preliminary alternative in Regulatory Amendment 10 (alternative 3 with an exemption for spearfishing gear) is expected to reduce net operating revenues by an average of approximately $703,000 (see the left bar for alternative 3 in Figure 1) compared to No Action for Amendment 17A. In this scenario, alternative 3 with an exemption for spearfishing gear would yield an expected benefit of approximately $91,000 per year in the form of smaller losses in net operating revenues due to regulation.

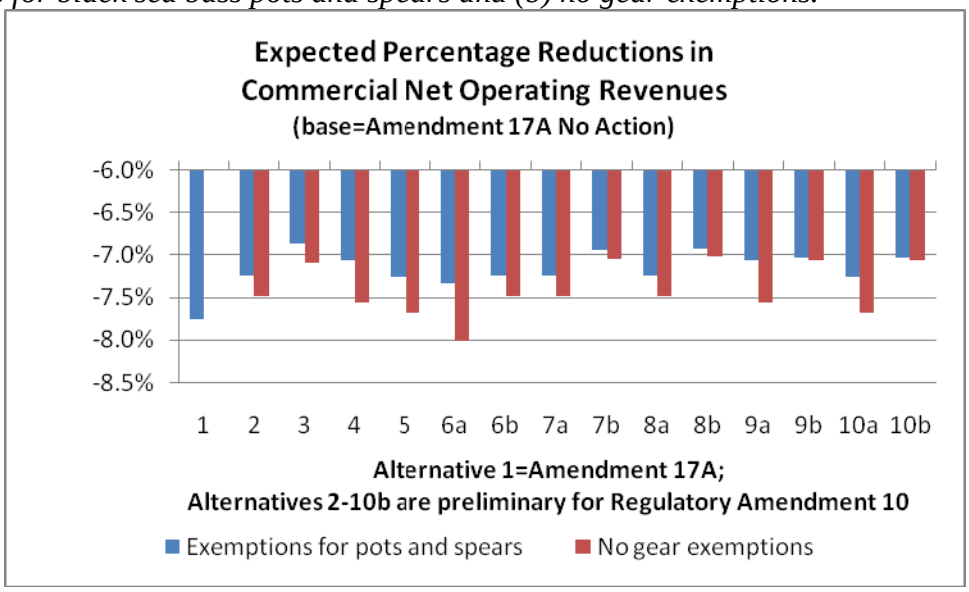
Two preliminary management scenarios in Regulatory Amendment 10 are expected to make fishermen worse off than with Amendment 17A. Both outcomes occurred with preliminary management alternative 6a without a gear exemption for spearfishing. Alternative 6a is the only alternative that would close the snapper-grouper fishery in the shallower water depths from 66-240 feet where spearfishing is more likely to occur, whereas Amendment 17A and all other preliminary alternatives for Regulatory Amendment 10 would close the snapper-grouper fishery in water depths from 98-240 feet. Hence, an elimination of the exemption for spearfishing would generate extra losses for commercial fishermen. The most costly preliminary alternative in Regulatory Amendment 10 (alternative 6a without any gear exemptions) is expected to reduce net operating revenues by an average of approximately $820,000 (see the right bar for alternative 6a in Figure 1) compared to No Action for Amendment 17A. Thus, alternative 6a without any gear exemptions is expected to be approximately $27,000 more costly than the closures that would be implemented by Amendment 17A. Preliminary alternative 6a with an exemption for black sea bass pots and without an exemption for spearfishing is expected to reduce net operating revenues by an average of approximately $818,000 compared to No Action for Amendment 17A.

(2)Potential benefits are small relative to the entire snapper-grouper fishery.
In the simulation model, the average annual net operating revenues are approximately $10.2 million (in constant 2008 dollars) for all trips that landed at least one pound of any species in the snapper-grouper management unit. This includes trips that targeted species in the snapper-grouper management unit as well as trips that landed snapper-grouper species as secondary sources of revenue while fishing primarily for non-snapper-grouper species. The closures to be implemented by Amendment 17A are expected to reduce net operating revenues to approximately $9.4 million, or by approximately $794,000 per year (7.8 percent) (see Figures 1 and 2).

The closures for Amendment 17A include gear exemptions from the closed areas for fishing activities with spears and black sea bass pots. Given the same gear exemptions, the preliminary management alternatives in Regulatory Amendment 10 are expected to reduce net operating revenues in a range from $703,000 (6.9 percent) per year for alternative 3 to $751,000 (7.3 percent) for alternative 6a (Figures 1 and 2). The resulting potential benefits from the less restrictive alternatives in Regulatory Amendment 10 are relatively small in aggregate, and range from 1.0 percent ($91,000) per year for alternative 3 to 0.4 percent ($42,000) for alternative 6a. The potential benefits associated with Regulatory Amendment 10 are smaller without any gear

exemptions, and range from approximately $72,000 (0.8 percent) per year for alternative 7b to an additional loss of $27,000 (-0.3 percent) for alternative 6a (Figures 1 and 2).

Figure 2. Expected percentage reductions in commercial net operating revenues given (a) exemptions for black sea bass pots and spears and (b) no gear exemptions.



(3)Potential benefits are large for fishermen in Georgia and northeast Florida. Amendment 17A would close the snapper-grouper fishery where red snapper are most abundant; i.e., in water depths from 98-240 feet in areas from southeast Georgia through east-central Florida defined by latitude-longitude grids 3080, 2980 and 2880. As a result, net operating revenues for fishermen in Georgia and northeast Florida are expected to decline by an average of approximately $770,000 per year (64 percent) with Amendment 17A (Figures 3 and 4).

With Regulatory Amendment 10, however, net operating revenues for fishermen in Georgia and northeast Florida are expected to decline by approximately $416,000-$433,000 per year (35-36 percent) by removing grid 3080 from the list of closed areas for preliminary alternatives 2, 6b, 7a, 7b, 8a, 8b, 9b and 10b (Figures 3 and 4). Although a 35 percent decline in net operating revenues would be substantial, fishermen in Georgia and northeast Florida would benefit by approximately $354,000-$337,000 (29-28 percent) compared to Amendment 17A.

Among the preliminary alternatives in Regulatory Amendment 10, alternatives 5, 6a and 10a include closures that are most similar to those of Amendment 17A, and hence have the smallest potential benefit for commercial fishermen. Net operating revenues for fishermen in Georgia and northeast Florida would decline by approximately $635,000 per year (53 percent) (Figures 3 and 4) for a potential benefit of approximately $135,000 per year (11 percent) compared to Amendment 17A.

Figure 3. Expected average annual reductions in commercial net operating revenues, by region, given exemptions for black sea bass pots and spears.

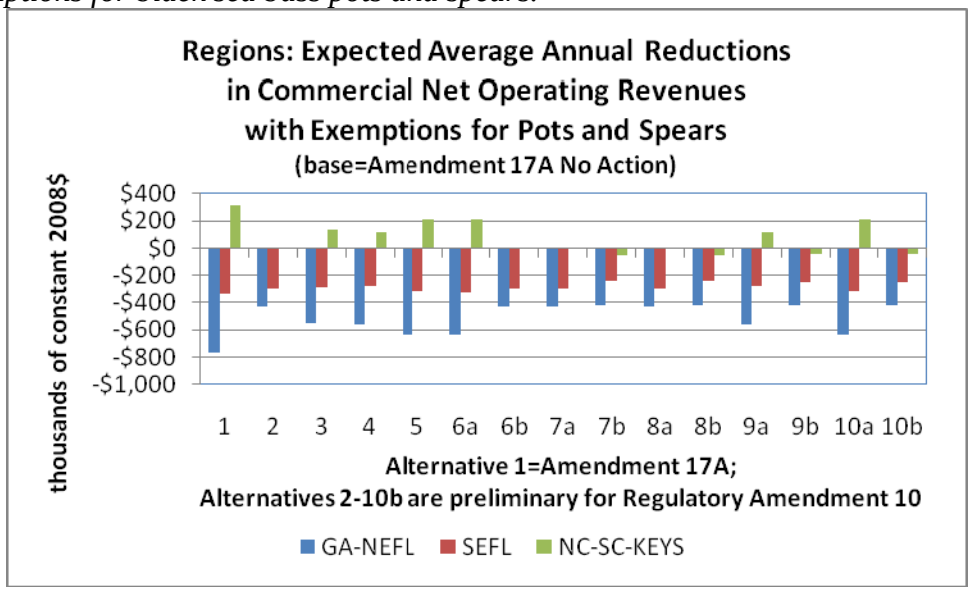
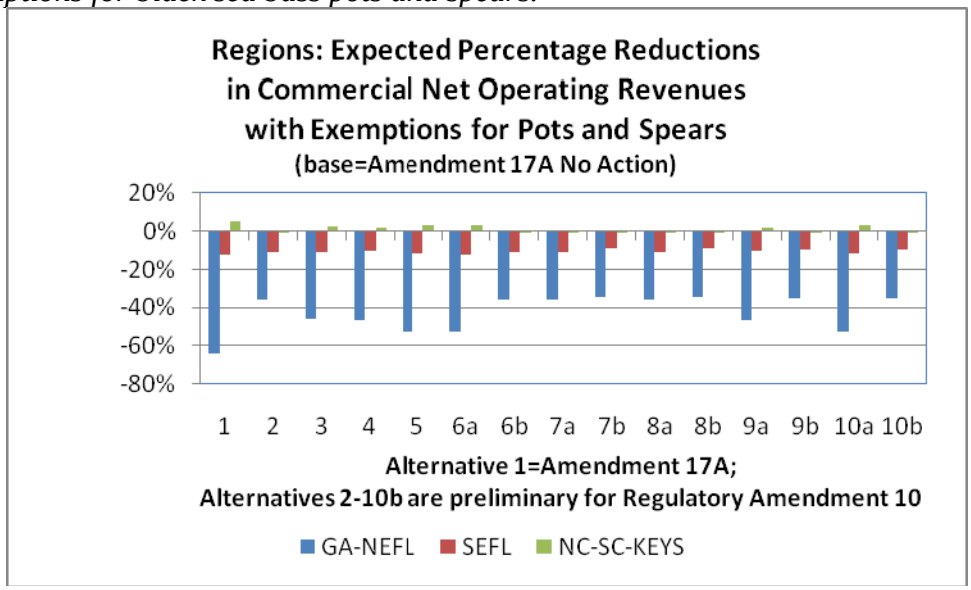


Figure 4. Expected percentage reductions in commercial net operating revenues, by region, given exemptions for black sea bass pots and spears.



The preliminary alternatives for Regulatory Amendment 10 are expected to generate minimal benefits for commercial fishermen in southeast Florida. From the perspective of fishermen in southeast Florida, the most favorable preliminary alternatives (7b, 8b, 9b and 10b) in Regulatory Amendment 10 are expected to reduce net operating revenues by approximately $250,000 per year, or 9 percent (Figures 3 and 4). With Amendment 17A, net operating revenues are expected to decline by approximately $334,000 per year, or 13 percent (Figures 3 and 4). The resulting difference between the two outcomes represents a potential benefit of approximately $84,000 per year, or 4 percent, with Regulatory Amendment 10 rather than Amendment 17A.

(4)Smaller and shorter closures increase the rate of filling quotas for other species.
Other areas within the jurisdiction of the South Atlantic Council would not be closed under Amendment 17A, and net operating revenues for fishermen in these areas (including North Carolina, South Carolina and the Florida Keys) are expected to increase by approximately 5 percent (Figures 3 and 4). The closures off the coasts of Georgia and Florida associated with Amendment 17A are expected to slow the rate at which the quota for gag is filled, which would establish a longer open season for shallow water groupers and enable fishermen in North Carolina and South Carolina to land greater quantities of red grouper and other shallow water groupers. The preliminary alternatives in Regulatory Amendment 10 would reverse this redistribution of fishery benefits, with smaller and shorter closed areas off the coasts of Georgia and Florida resulting in shorter open seasons for shallow water groupers and less opportunity for fishermen in North Carolina and South Carolina to land greater quantities of red grouper and other shallow water groupers.

Figures 5 and 6 illustrate that the preliminary management alternatives in Regulatory Amendment 10 would shift harvests and net operating revenues from later in the calendar year with Amendment 17A to earlier in the year with Regulatory Amendment 10. The closures associated with Amendment 17A are expected to reduce net operating revenues by approximately 16 percent during the first quarter, by 8 percent during the second quarter, and by 10 percent during the third quarter (Figure 6). Net operating revenues are expected to increase by approximately 4 percent during the fourth quarter due to the slower rate of filling the commercial quota for gag and the resulting longer open season for shallow water groupers. By virtue of the smaller and shorter closures associated with the preliminary alternatives for Regulatory Amendment 10, fishermen would land larger quantities of gag and vermilion snapper during the first half of the year and incur smaller reductions in net operating revenues, which equates to a benefit for commercial fishermen (Figures 5 and 6). The quotas for gag and vermilion snapper are expected to be filled earlier than with Amendment 17A, and hence net operating revenues would decline during the fourth quarter compared to the expected outcome for Amendment 17A. The comparison of net operating revenues for the preliminary alternatives with Amendment 17A is mixed during the third quarter. Net operating revenues during the third quarter for preliminary alternatives 4, 5, 6a, 9a and 10a are expected to be approximately the same as with Amendment 17A. Commercial fishermen are expected to incur smaller reductions in net operating revenues with the other preliminary alternatives when compared to the expected outcome for Amendment 17A.

Figure 5. Expected average annual reductions in commercial net operating revenues, by quarter, given exemptions for black sea bass pots and spears.

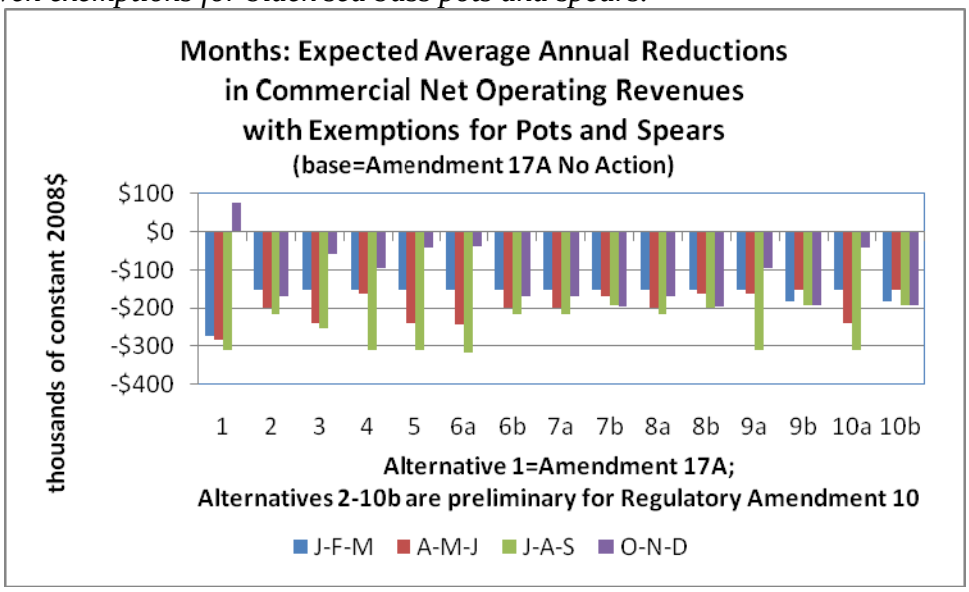
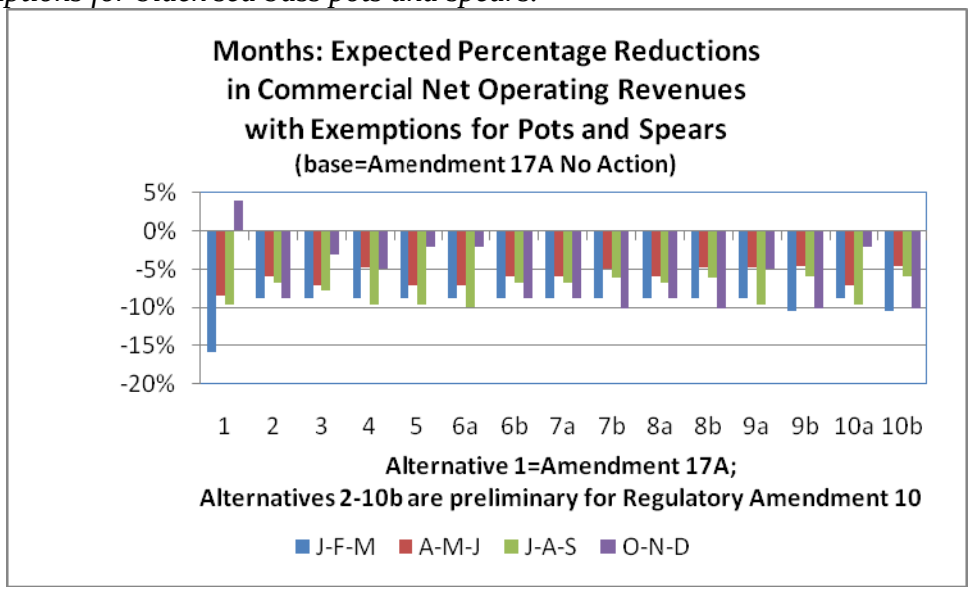


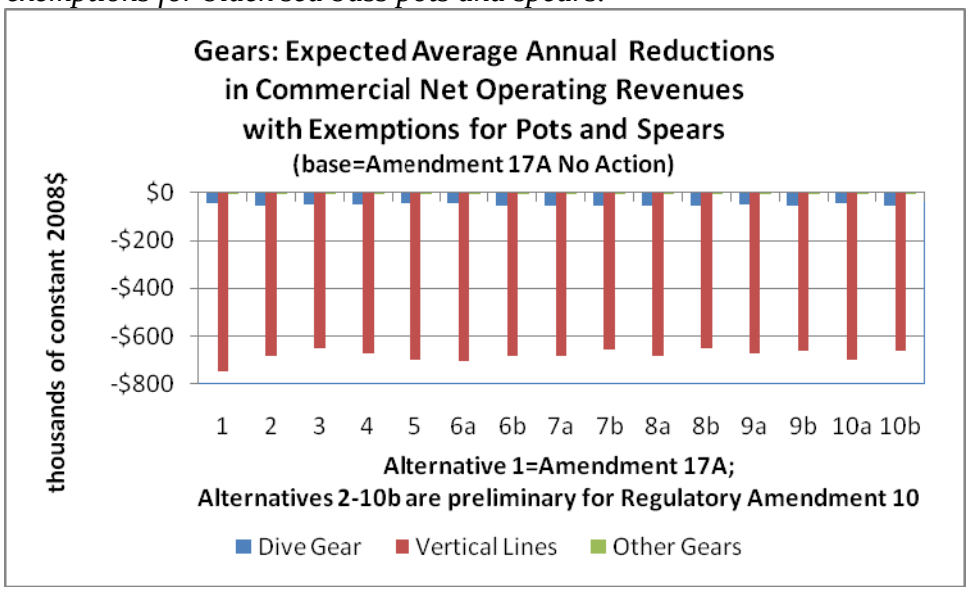
Figure 6. Expected percentage reductions in commercial net operating revenues, by quarter, given exemptions for black sea bass pots and spears.



(5)The gear exemption for spearfishing matters.
Vertical lines are the dominant gear used in the commercial snapper-grouper fishery and account for approximately 79 percent of net operating revenues. Trips with diving gear account for slightly more than 5 percent of the total net operating revenues generated by the commercial fishery. Other sources of net operating revenues include trips with longlines (7 percent), trips with black sea bass pots (3 percent) and trips with other gears (6 percent).

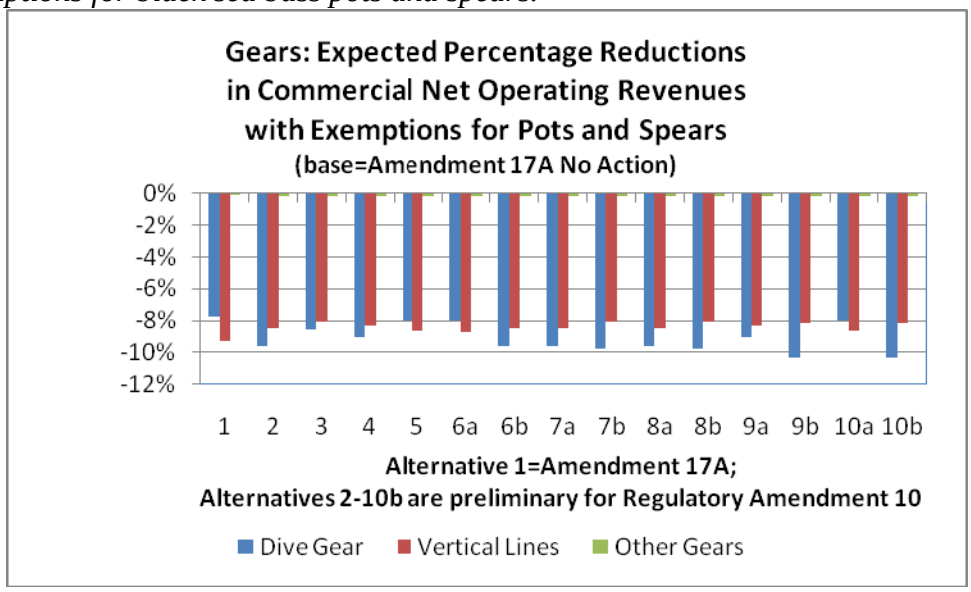
Because trips with vertical lines generate such a large share of net operating revenues, the closures associated with Amendment 17A and Regulatory Amendment 10 are expected to reduce net operating revenues by a correspondingly large amount in constant 2008 dollars (Figure 7).

Figure 7. Expected average annual reductions in commercial net operating revenues, by gear type, given exemptions for black sea bass pots and spears.



However, the relative effect of the closures on net operating revenues is similar for trips with diving gear and trips with vertical lines (Figure 8). The smaller and shorter closures associated with Regulatory Amendment 10 are expected to enable trips with vertical lines to account for slightly larger shares of overall landings and net operating revenues in the fishery. As a result, net operating revenues for trips with vertical lines are expected to decline by approximately 1 percent less than with Amendment 17A (Figure 8). If spearfishing gear is exempt from the closures, then the additional landings by trips with vertical lines are expected to result in slightly larger reductions in net operating revenues of 1-2 percent for trips with spears (Figure 8).

Figure 8. Expected percentage reductions in commercial net operating revenues, by gear type, given exemptions for black sea bass pots and spears.



On the other hand, if spearfishing gear is not exempt from the closures, then the preliminary alternatives for Regulatory Amendment 10 are expected to create additional losses for trips with spears in terms of both constant 2008 dollars (Figure 9) and as a percent of baseline net operating revenues (Figure 10). Amendment 17A is expected to reduce net operating revenues for spearfishing trips by approximately $43,000 per year, or 7.8 percent (Figures 9 and 10). Without gear exemptions, the worst preliminary alternative (6a) for trips with spears is expected to reduce net operating revenues by approximately $200,000 per year, or by 36 percent.

Figure 9. Expected average annual reductions in commercial net operating revenues without any gear exemptions, by gear type.

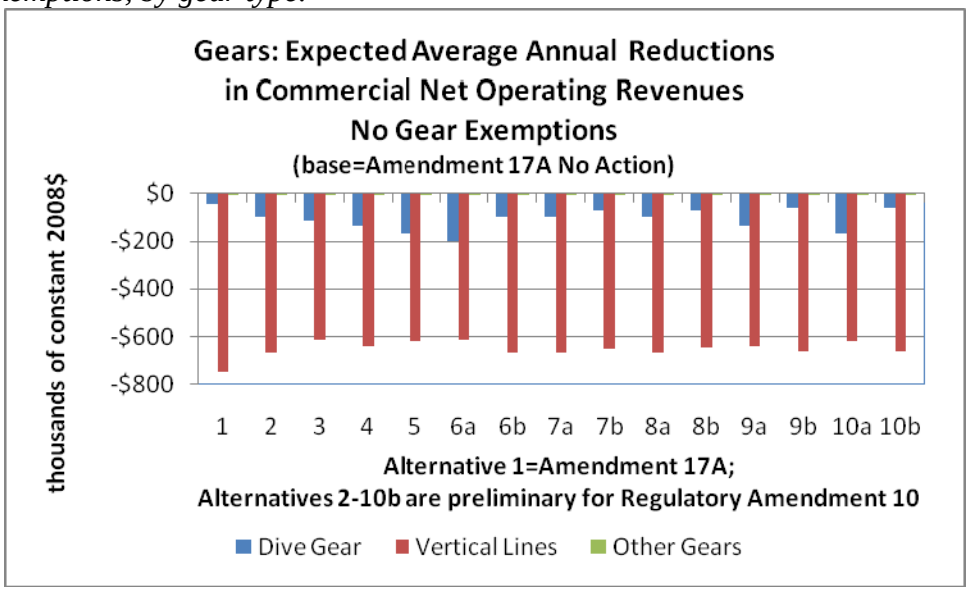
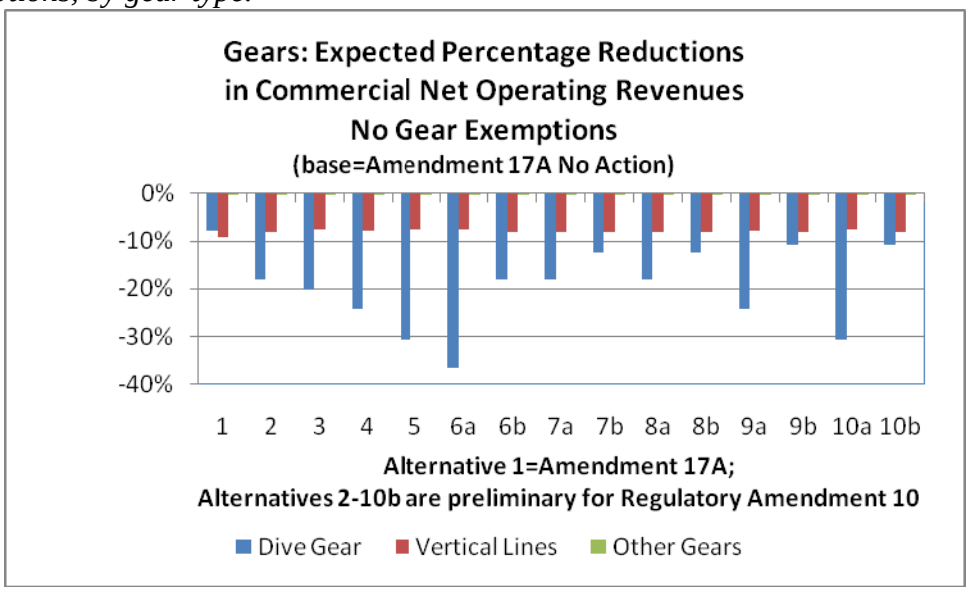


Figure 10. Expected percentage reductions in commercial net operating revenues without any gear exemptions, by gear type.



The exemption for spearfishing would benefit fishermen when they can fish in closed areas or during closed seasons when trips with other gears are prohibited. The potential benefit in extra net operating revenues generated by the exemption for spearfishing is expected to be greatest (with an average of approximately $66,000 per year) with preliminary alternative 6a because it would close the snapper-grouper fishery in water depths from 66-240 feet from May through December in grid areas 2880, 2980 and 3080, which is the longest and most comprehensive closure from among the preliminary alternatives for Regulatory Amendment 10. The potential benefit in extra net operating revenues due to an exemption for spearfishing is expected to be smallest (with an average of approximately $3000) with preliminary alternatives 9b and 10b because they would close the snapper-grouper fishery from January through April. Fishermen with spearfishing gear would hardly be able to take advantage of their exemption because the shallow water grouper fishery already is closed during these months.

An exemption for spearfishing is expected to benefit fishermen with dive gear in Georgia and northeast Florida because that is where the closures to protect red snapper would occur. Fishermen in North Carolina and South Carolina are expected to lose net operating revenues because the exemption for spearfishing is expected to result in a shorter open season for shallow water groupers. As a reflection of the shorter open season for shallow water groupers, net operating revenues are expected to increase during the second and third quarters, and decline during the fourth quarter compared to the same preliminary management alternatives without the gear exemption. The exemption is not expected to change net operating revenues during the first quarter because the shallow water grouper fishery already is closed from January through April.

The exemption for black sea bass pots did not suggest similar benefits. Almost no commercial fishing with pots was reported in the proposed closed areas during 2007 or 2008. Some pot fishing occurred in the proposed closed areas during 2009.

APPENDIX I. Report on the Analysis of a Continued Red Snapper Moratorium presented to the South Atlantic Fishery Management Council at their December 2010 Meeting

Prepared by South Atlantic Fishery Management and NMFS Southeast Regional Office

The following appendices are included within this document:

Appendix I-A. SEDAR-24 South Atlantic Red Snapper: Management quantities and projections requested by the SSC and SERO

Appendix I-B. Addendum to Appendix I-A (December 3, 2010)

Appendix I-C. Red snapper estimated reductions

Appendix I-D. Red Snapper Removals in 2010, Reported to MRFSS

ABC Recommendations

The Acceptable Biological Catch (ABC) recommendation from the Council's Scientific and Statistical Committee (SSC) for red snapper in the South Atlantic is the catch level that corresponds to the rebuilding projections based on the rebuilding goal identified by the Council. The rebuilding goal is based on achieving a rate of fishing mortality equal to 98%$F_{30\%SPR}$, which equates to an ABC range of 374,000 to 421,000 pounds in 2011. This ABC range was determined through projections provided by Southeast Fisheries Science Center (SEFSC) and is included in Appendix I-A. ABCs of 374,000, 395,000, and 421,000 correspond to a headboat index weight of 0.20, 0.25, and 0.30, respectively.

The SSC recommended basing ABC values on headboat index catch per unit effort (CPUE) weights of 0.20, 0.25, and 0.30. The headboat index is considered a highly reliable source of information on stock abundance, and the inability of the base run used in SEDAR 24 to match a pronounced increase in headboat CPUE was considered a key point in the assessment. Increasing the weight in the headboat index (ie, 0.30 versus 0.20) implies greater confidence in the observed CPUE value.

Moratorium Evaluations

Additional information was provided by the SEFSC as an addendum to the original projections and is included in Appendix I-B. These projections were completed because moratorium projections may not be directly comparable to harvest projections due to the differences in selectivities. Selectivity is the relationship between retention and size (or age) of fish. Selectivity directly influences reference point values, estimated fishing mortality, and the estimated yield in future years. Changes in selectivity between past years, 2010, and probable future conditions add considerable complexity to the evaluation of this management action. Therefore, the ABC under a red snapper moratorium may differ from the ABC under harvest scenarios.

Future fishing mortality, landings, and discards are predicted through stock assessment models. If mortality is expected to be below the ABC, then it is likely that overfishing is not occurring. As outlined in the original projections (See Appendix I-A), the discard mortalities under a continued red snapper moratorium in 2011 are 384,000, 393,000, and 395,000 pounds. These values correspond to a headboat index weight of 0.20, 0.25, and 0.30, respectively. The discard mortalities under the headboat index weights of 0.25 and 0.30 are lower than the ABCs at corresponding headboat weights (Table 1). However, the ABCs and discard levels under the moratorium may not be directly comparable due to shifts in selectivity that would result from the moratorium as described above.

Table 1. A comparison of the ABCs and discard mortalities (in pounds whole weight) under the red snapper moratorium.

Headboat Index Weight	ABC	Discard Mortalities Under Moratorium
0.20	374,000	384,000
0.25	395,000	393,000
0.30	421,000	395,000

Model projections in Appendix I-A also estimate the red snapper spawning stock biomass expected through various fishing mortality estimates. Despite the changes in selectivity noted above, and the resultant difficulties in comparing findings under the harvest and moratorium scenarios, the red snapper spawning stock biomass is projected to be similar when comparing the rebuilding goal projections and moratorium projections under a headboat index weight of 0.30 (Table 2). This suggests that the moratorium action may meet the rebuilding strategy.

Table 2. The spawning stock biomass (mt) in two projections from the original projections where the headboat weight is 0.30.

	Rebuilding Goal Projection (F=0.98XF30)	**Continued Moratorium Projection**
2010	22.67	22.67
2011	27.74	27.74
2012	31.29	31.72
2013	35.14	35.72
2014	39.3	39.88
2015	43.79	44.24
2016	48.58	48.8
2017	53.72	53.61
2018	59.15	58.67
2019	64.76	63.87

As outlined in Appendix I-B, the SEFSC estimated the rebuilding goal ($98\%F_{30\%SPR}$) under a continued moratorium. According to the projection addendum, the moratorium combined with a 10% decrease in effort towards red snapper may still result in overfishing (does not end overfishing). However, should the decrease in effort be greater, then the moratorium alone may achieve a fishing mortality rate that is below the overfishing level. However, as noted above, the evaluation of moratorium projections are problematic as they attempt to compare poundage values from different selectivity scenarios. To address this issue, the NMFS Southeast Regional Office (SERO) estimated the needed reductions in removals (Appendix I-C). This was achieved by comparing the baseline removals estimated by the SEDAR 24 stock assessment (2007-2009) to target removals in 2011 as estimated by the $98\%F_{30\%SPR}$ projections. This analysis suggested that a 70%-75% reduction in red snapper removals is needed, based upon the plausible range of assessment runs identified by the SSC.

An evaluation of predicted moratorium effectiveness using 2007-2009 baseline data indicates that the moratorium will provide a 66% reduction in removals of red snapper based on an Interactive Combined Effects (ICE) Model for South Atlantic Red Snapper (SERO 2010; Table 3). This analysis accounts for reduction in effort in the commercial sector using an economic trip elimination model developed by the SEFSC. It also accounts for reductions in effort in the recreational sector using models that eliminate targeted and directed trips from the MRFSS and headboat baseline (2007-2009) survey data (SERO 2010). These trip elimination models explicitly account for management regulations but do not account for other factors that might reduce effort such as an economic downturn. These trip elimination models are predicated upon the ability of historical data to predict future angler behavior; if angler behavior in 2011 is significantly different from behavior in 2007-2009 in ways

not predicted by the models, then associated reductions in red snapper removals might be different from those indicated in Table 3.

Table 3. ICE Model Results based on predicted effort reductions

FISHERY	R(1000)	PCT REDUCTION
Comm	74.9	71%
Private	216.5	69%
HB	40.5	61%
Charter	88.5	55%
TOTAL	420.4	66%

Effort and Mortality Reduction, Private and Charter Recreational Fishery in 2010

Overall fishing effort in the South Atlantic EEZ (> 3 mi) has declined by 44% since 2007 and by 33% compared to average 2007-2009 South Atlantic EEZ effort (Figure 1). Off the east coast of Florida, effort in the EEZ has declined by 42% since 2007 and by 31% compared to average 2007-2009 east Florida EEZ effort (Figure 2).

Figure 1. MRFSS estimates of the number of trips in the South Atlantic for 2010 through Wave 4 (January through August).

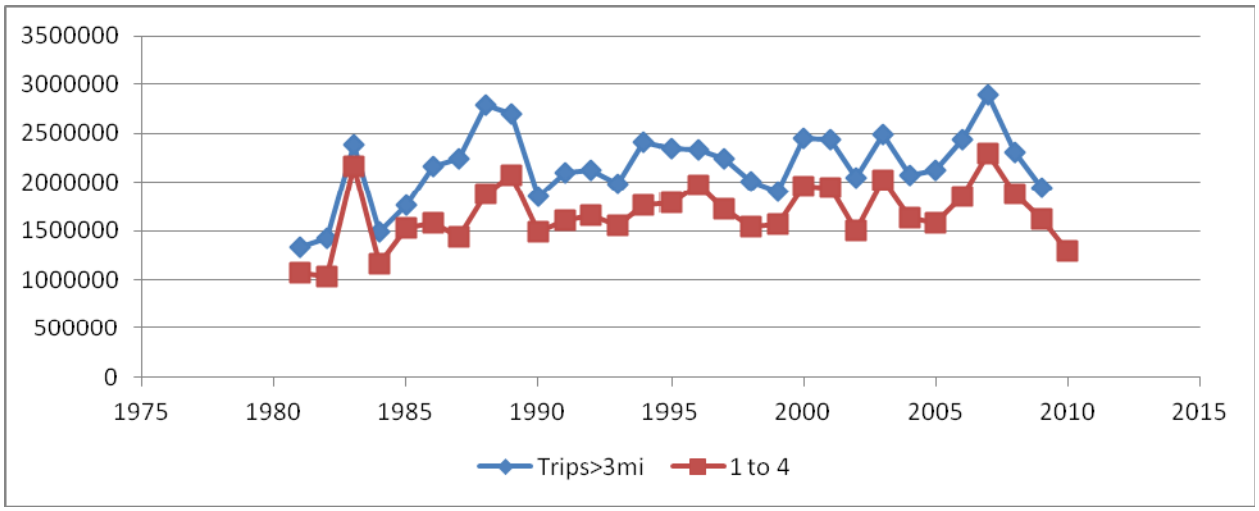
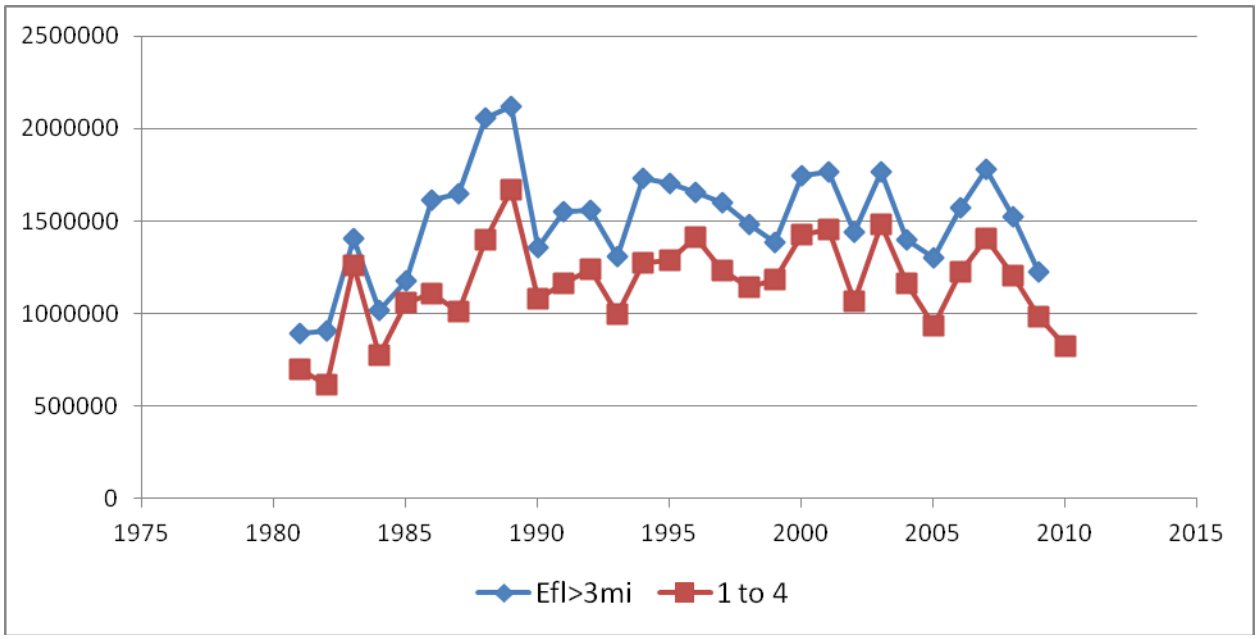


Figure 2. MRFSS estimates of the number of trips off the coast of East Florida for 2010 through Wave 4 (January through August).



MRFSS estimates for waves 1-4 (January - August) were compared between 2010 and earlier years. These waves were used because this is the most recent information available for 2010, and the Marine Recreational Fishing Statistics Survey (MRFSS) was chosen because no 2010 estimates of red snapper encounters are currently available from either the commercial fishery observer program or from the Southeast Fisheries Science Center Headboat Logbook survey. MRFSS estimates provide evidence that fishermen are encountering fewer red snapper, likely due to lower effort and avoidance of red snapper fishing locations (Table 4).

Table 4. The percent reduction in red snapper encounters in 2010, based on MRFSS estimates for waves 1-4.

YEAR	1	2	3	4	total
2007	42,775	42,773	102,377	217,176	405,101
2008	107,601	72,414	130,713	78,881	389,609
2009	80,650	124,421	43,929	37,336	286,336
2010	11,437	9,952	31,469	14,911	67,769
% Reduction (07-09)	0.85	0.88	0.66	0.87	0.81

These data support fishermen reports indicating reduced effort in the snapper grouper fishery, in particular in the North Florida area, where red snapper are most prevalent, as a result of the moratorium during 2010. They support the continued and widely reported decline in overall

recreational effort along the South Atlantic Coast. They also indicate a slightly greater decrease in effort than is estimated by the initial runs of the ICE model and a greater decrease in red snapper encounters, at least in the private and charter fisheries.

Modified ICE Model

The ICE Model (SERO 2010) estimates reductions in the private and charter sectors through moratorium and trip elimination of 69% and 55%, respectively. Preliminary catch estimates from MRFSS in 2010 (Waves 1-4) indicate significantly larger reductions than those predicted by the ICE Model. Based on trip elimination from 2007-2009 data, the red snapper moratorium is projected to achieve a 66% reduction in red snapper removals in 2011. This reduction is based on both simulation of a moratorium and elimination of target and/or directed fishing trips due to new management regulations, including the moratorium (i.e., Amendment 16, 17A, and 17B). Evidence provided by MRFSS suggests effort in the South Atlantic is down 33% and total removals in pounds are down 81% when 2010 is compared to the 2007-2009 baseline (Appendix I-D, Table 6A). The differences between the 66% reduction in red snapper removals predicted by the ICE Model and the observed 81% decrease in removals reported to MRFSS may be in part due to several factors, including: 1) inclusion of all sectors for modeling the effects of the moratorium versus use of MRFSS alone, 2) simulation of historical data which may not accurately represent current fishery dynamics, and 3) elimination of recreational fishing effort (trip elimination) based on responses to management regulations exclusive of economic considerations. Given the significant economic downturn, reductions in removals estimated by the SERO decision model may underestimate the total reduction in removals achieved under the moratorium.

To address this, the ICES model was modified to integrate direct observations of the reduction in encounters for the private and charter recreational fisheries with the estimated reductions in the commercial and headboat fisheries. This approach allows the model to incorporate observed data on moratorium impacts where such information is currently available. The 81% overall reduction in red snapper removals was split into mode specific values, indicating that Charter removals of red snapper are down 88% and Private removals are down 79% (Appendix I-D, Tables 6B and 6C). MRFSS discards (N) in 2010 were converted to pounds using the average weight of a discarded fish under a moratorium from the HB=0.3 SEFSC moratorium projection (Appendix I-A, Table 9D). Other aspects of the model are consistent with Council recommendations for Amendment 17A. No adjustments are made for effort shifts as these results do not include any closed area. This approach implicitly incorporates the recruitment signals observed by SEDAR-24 (2010), as it uses the projections to compute the average weight of a discarded fish in 2010.

Including MRFSS Wave 1-4 data for 2010 as a percentage reduction from the 2007-2009 baseline period as noted above, along with the projected trip elimination reductions for the commercial and headboat sector, suggests that an overall reduction in red snapper removals of 77% may have been achieved by the moratorium in 2010 (Table 5).

Table 5. Modified ICES model results, based on including observed 2010 reductions in the Private and Charter sectors (highlighted).

FISHERY	R(1000)	PCT REDUCTION
Comm	74.9	71%
Private	145.0	79%
HB	40.5	61%
Charter	23.7	88%
TOTAL	284.1	77%

Conclusion

Despite differences in selectivities, there is very little difference in the rate that the red snapper biomass rebuilds over the short term when comparing harvest projections and moratorium projections. Nonetheless, initial estimates of moratorium effectiveness indicate that some additional savings are required. The ICE model projections based upon 2007-2009 data indicated the moratorium provides 66% of the 70%-75% required, and the moratorium projections incorporating a 10% decrease in fishing mortality rate suggest overfishing may continue.

The challenge lies in inferring the effectiveness of a moratorium that likely changes fishing behavior significantly and definitely changes fishery selectivity to the extent that direct comparisons between pre- and post-moratorium conditions are not applicable. To address the analytical issues, the needed action was calculated as a percentage reduction in fishing mortality and the ICE model developed as a tool for evaluating the reduction provided by the moratorium and area closures. However, the model does not directly account for the full effort reduction observed in a significant fishery sector and initial results may underestimate the actual effectiveness of the moratorium.

Examination of information available from the private and charter recreational fisheries through June 2010 allows evaluation of assumptions regarding reductions in effort and red snapper for at least a portion of the time when the moratorium has been in place. As this suggests that both effort and encounter reductions are greater than initially estimated, the ICE model was modified to directly include these 2010 observations. These results indicate that the moratorium may provide a 77% reduction in mortality, which exceeds the 70%-75% needed to end overfishing.

References

Southeast Fisheries Science Center. SEDAR-24 South Atlantic Red Snapper: Management quantities and projections requested by the SSC and SERO. November 2010.

Southeast Regional Office. 2010. An Interactive Combined Effects (ICE) Model for South Atlantic Red Snapper. National Marine Fisheries Service, St. Petersburg, FL. 17 pp.

Appendix I-A: SEDAR-24 South Atlantic Red Snapper: Management quantities and projections requested by the SSC and SERO

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November 2010

Introduction
In the SEDAR-24 CIE report, the Review Panel concluded "The Review Panel suggested using the AW base-case model to provide an assessment of the red snapper stock, but cautions that this was one realization of a number of plausible runs." The SSC followed up on this conclusion to identify three additional plausible runs; all of these runs increased the weighting of the headboat index relative to other data components.

Methods
The weighting given to the headboat index is controlled by the annual CV_t. In the model, the CV applied was,

$$CV_t = CV_t^d/\omega$$

where CV_t^d was the annual CV estimated by the data workshop and ω was a user-supplied weight. Larger values of ω result in smaller CV_t and, consequently, more emphasis on the index.

In the base-case configuration, as reviewed by the SEDAR-24 RW, weighting of data components was accomplished through an iterative re-weighting strategy. That strategy provided a headboat index weight of $\omega = 0.11$. The RW panel requested additional runs using $\omega = 0.20$, $\omega = 0.25$, $\omega = 0.30$, and the SSC selected those runs as plausible alternatives.

In this report, the alternative model runs are labeled wgt11, wgt20, wgt25, and wgt30, with labels indicating the value of ω applied to the headboat index. In addition to management quantities from those runs, this report provides results from 10-year, deterministic projections using four different fishing mortality rates: Fmsy, F30, 98% of F30, and Fcurrent but with a moratorium applied. Projection methods and caveats about results are described in the SEDAR-24 AW report. One caveat worth reiterating is that projections of population and fishery dynamics are highly uncertain. In the deterministic projections of this report, the uncertainty surrounding expected values is not quantified.

Results
Benchmarks and other management quantities from the various runs are presented in Table 1. Predicted landings and discards from the various runs are shown in Tables 2–5. Deterministic projection results from wgt11 are shown in Tables 6a,b,c,d; results from wgt20 in Tables 7a,b,c,d; results from wgt25 in Tables 8a,b,c,d; and results from wgt30 in Tables 9a,b,c,d.

Discussion
The benchmarks are conditional on selectivities estimated at the end of the assessment period. Changes in relative contributions toward mortality from the various fleets would alter the aggregate selectivity and thus benchmarks. Such changes have likely occurred as a result of the current moratorium, and as a result, moratorium fishing mortality rates are not directly comparable to Fmsy or its proxies.

Table 1. Estimated status indicators, benchmarks, and related quantities from the Beaufort Assessment Model. Values are from runs with component weights as in the base-case model of the AW report (wgt11), and from runs with increased weight on the headboat index (wgt20, wgt25, and wgt30). Estimates of yield do not include discards; Dmsy represents discard mortalities expected when fishing at Fmsy. Spawning stock biomass (SSB) is measured by total gonad weight of mature females.

Quantity	Units	wgt11	wgt20	wgt25	wgt30
Fmsy	y^{-1}	0.178	0.188	0.196	0.206
85%Fmsy	y^{-1}	0.151	0.160	0.166	0.175
75%Fmsy	y^{-1}	0.133	0.141	0.147	0.155
65%Fmsy	y^{-1}	0.115	0.122	0.127	0.134
F30%	y^{-1}	0.170	0.183	0.192	0.204
F40%	y^{-1}	0.125	0.134	0.140	0.149
F50%	y^{-1}	0.092	0.098	0.103	0.109
Bmsy	mt	13632	14180	14429	14634
SSBmsy	mt	156	162	165	168
MSST	mt	144	149	152	154
MSY	1000 lb	1842	1891	1908	1926
Dmsy	1000 fish	67	71	73	75
Rmsy	1000 age-1 fish	584	599	604	608
Y at 85%Fmsy	1000 lb	1821	1870	1887	1905
Y at 75%Fmsy	1000 lb	1780	1829	1846	1863
Y at 65%Fmsy	1000 lb	1712	1760	1777	1794
F(2007-2009)/Fmsy	–	4.12	3.27	2.98	2.76
SSB(2009)/SSBmsy	–	0.09	0.11	0.12	0.14

Table 2a. Estimated recent landings in whole weight (1000 lb) for commercial lines (L.cl), commercial dive (L.cd), for hire (L.hb), and private recreational (L.pvt) from run with headboat index weight of $\omega = 0.11$.

Year	L.cl	L.cd	L.hb	L.pvt	Total
2000	92.13	10.38	146.29	441.08	689.87
2001	175.32	18.24	151.48	280.75	625.78
2002	163.11	22.10	219.31	247.60	652.12
2003	118.79	17.45	202.00	136.94	475.19
2004	149.73	19.65	236.07	244.04	649.48
2005	117.99	9.34	224.78	206.96	559.07
2006	80.29	4.16	183.87	156.50	424.82
2007	104.72	7.51	187.91	366.92	667.06
2008	240.48	6.30	301.94	616.19	1164.92
2009	340.89	8.01	382.32	708.17	1439.40

Table 2b. Estimated recent dead discards in whole weight (1000 lb) for commercial lines (D.cl), for hire (D.hb), and private recreational (D.pvt) from run with headboat index weight of $\omega = 0.11$.

Year	D.cl	D.hb	D.pvt	Total
2000	22.52	24.02	156.32	202.87
2001	25.81	29.15	150.80	205.76
2002	61.00	23.25	90.28	174.53
2003	18.51	15.79	96.22	130.53
2004	6.58	30.99	128.66	166.23
2005	7.12	44.70	68.56	120.38
2006	7.34	9.14	43.31	59.80
2007	15.24	85.09	231.43	331.76
2008	21.44	55.76	310.78	387.97
2009	30.33	34.88	173.44	238.65

Table 3a. Estimated recent landings in whole weight (1000 lb) for commercial lines (L.cl), commercial dive (L.cd), for hire (L.hb), and private recreational (L.pvt) from run with headboat index weight of $\omega = 0.20$.

Year	L.cl	L.cd	L.hb	L.pvt	Total
2000	92.09	10.37	145.95	435.65	684.06
2001	175.23	18.24	148.67	274.31	616.45
2002	163.07	22.10	214.40	241.58	641.14
2003	118.77	17.45	200.25	135.59	472.06
2004	149.70	19.65	227.16	233.93	630.43
2005	117.99	9.34	216.68	199.01	543.03
2006	80.30	4.16	185.58	157.14	427.18
2007	104.72	7.51	195.48	371.14	678.85
2008	240.53	6.30	296.43	601.97	1145.22
2009	340.96	8.01	374.62	692.68	1416.28

Table 3b. Estimated recent dead discards in whole weight (1000 lb) for commercial lines (D.cl), for hire (D.hb), and private recreational (D.pvt) from run with headboat index weight of $\omega = 0.20$.

Year	D.cl	D.hb	D.pvt	Total
2000	22.24	23.65	153.86	199.75
2001	25.54	29.14	150.71	205.39
2002	60.56	22.35	86.77	169.68
2003	17.88	15.69	95.59	129.16
2004	6.67	31.67	131.48	169.82
2005	7.15	45.06	69.10	121.31
2006	7.09	8.93	42.30	58.32
2007	15.08	83.76	227.86	326.70
2008	21.32	56.51	315.08	392.91
2009	30.75	36.51	181.51	248.76

Table 4a. Estimated recent landings in whole weight (1000 lb) for commercial lines (L.cl), commercial dive (L.cd), for hire (L.hb), and private recreational (L.pvt) from run with headboat index weight of $\omega = 0.25$.

Year	L.cl	L.cd	L.hb	L.pvt	Total
2000	92.07	10.37	145.41	432.55	680.40
2001	175.20	18.24	147.28	271.36	612.07
2002	163.06	22.10	211.63	238.31	635.10
2003	118.77	17.45	199.79	135.26	471.26
2004	149.70	19.65	218.49	224.66	612.49
2005	118.00	9.34	210.96	193.59	531.90
2006	80.30	4.16	186.24	157.43	428.14
2007	104.73	7.51	198.55	372.95	683.74
2008	240.55	6.30	296.01	600.35	1143.21
2009	340.99	8.01	372.62	688.71	1410.34

Table 4b. Estimated recent dead discards in whole weight (1000 lb) for commercial lines (D.cl), for hire (D.hb), and private recreational (D.pvt) from run with headboat index weight of $\omega = 0.25$.

Year	D.cl	D.hb	D.pvt	Total
2000	22.05	23.41	152.30	197.75
2001	25.33	29.19	151.00	205.52
2002	60.19	21.55	83.68	165.43
2003	17.36	15.74	95.87	128.98
2004	6.75	32.27	133.94	172.96
2005	7.15	45.18	69.29	121.63
2006	6.98	8.91	42.19	58.07
2007	14.99	82.71	225.03	322.73
2008	21.13	56.51	315.13	392.77
2009	30.77	37.05	184.23	252.05

Table 5a. Estimated recent landings in whole weight (1000 lb) for commercial lines (L.cl), commercial dive (L.cd), for hire (L.hb), and private recreational (L.pvt) from run with headboat index weight of $\omega = 0.30$.

Year	L.cl	L.cd	L.hb	L.pvt	Total
2000	92.06	10.37	145.64	432.42	680.49
2001	175.19	18.24	146.41	269.52	609.35
2002	163.06	22.09	208.88	235.12	629.15
2003	118.77	17.45	200.15	135.50	471.87
2004	149.71	19.65	210.87	216.60	596.82
2005	118.01	9.34	207.56	190.38	525.29
2006	80.30	4.16	190.37	160.75	435.58
2007	104.73	7.51	203.75	379.58	695.58
2008	240.58	6.30	299.58	607.15	1153.61
2009	341.01	8.01	372.86	688.99	1410.88

Table 5b. Estimated recent dead discards in whole weight (1000 lb) for commercial lines (D.cl), for hire (D.hb), and private recreational (D.pvt) from run with headboat index weight of $\omega = 0.30$.

Year	D.cl	D.hb	D.pvt	Total
2000	21.79	23.06	150.00	194.85
2001	25.01	29.11	150.57	204.69
2002	59.68	20.88	81.08	161.64
2003	16.92	15.75	95.92	128.58
2004	6.77	32.71	135.77	175.25
2005	7.14	45.15	69.25	121.54
2006	6.94	8.98	42.54	58.45
2007	14.85	80.95	220.28	316.08
2008	20.78	56.10	312.89	389.76
2009	30.64	37.34	185.67	253.66

Table 6a. Projection results (expected values) with F=Fmsy, extended from assessment model configuration with component weights as in the AW report, including headboat index weight of $\omega = 0.11$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.416	11.49	235	62	306	0	0	0
2011	0.178	13.76	223	22	39	22	235	235
2012	0.178	15.53	251	26	52	29	278	513
2013	0.178	17.62	270	29	56	35	321	834
2014	0.178	20.11	290	31	62	41	378	1212
2015	0.178	22.98	312	34	66	47	436	1648
2016	0.178	26.17	335	36	71	52	491	2139
2017	0.178	29.71	356	39	76	57	546	2685
2018	0.178	33.56	377	41	81	62	602	3287
2019	0.178	37.68	397	44	86	67	660	3947

Table 6b. Projection results (expected values) with F=F30, extended from assessment model configuration with component weights as in the AW report, including headboat index weight of $\omega = 0.11$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.416	11.49	235	62	306	0	0	0
2011	0.170	13.76	223	21	37	21	226	226
2012	0.170	15.61	251	25	50	28	268	494
2013	0.170	17.76	271	28	54	34	311	805
2014	0.170	20.35	292	30	59	40	367	1172
2015	0.170	23.33	314	33	64	45	425	1597
2016	0.170	26.66	337	35	69	51	480	2077
2017	0.170	30.35	359	38	74	56	535	2611
2018	0.170	34.39	381	40	79	61	591	3202
2019	0.170	38.72	401	42	84	66	649	3851

Table 6c. Projection results (expected values) with F=0.98×F30, extended from assessment model configuration with component weights as in the AW report, including headboat index weight of $\omega = 0.11$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.416	11.49	235	62	306	0	0	0
2011	0.167	13.76	223	20	36	20	222	222
2012	0.167	15.65	251	25	49	27	263	485
2013	0.167	17.83	271	27	53	33	306	791
2014	0.167	20.46	292	30	58	39	362	1153
2015	0.167	23.49	315	32	63	45	420	1573
2016	0.167	26.89	338	34	68	50	474	2047
2017	0.167	30.66	361	37	73	55	529	2576
2018	0.167	34.79	383	39	78	60	585	3162
2019	0.167	39.21	403	42	83	65	643	3805

Table 6d. Projection results (expected values) under continued moratorium, extended from assessment model configuration with component weights as in the AW report, including headboat index weight of $\omega = 0.11$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings. In these projections, the F applied corresponds to F=0.9×Fcurrent (Fcurrent = 0.73) but decreased to reflect potential landings that are discarded and survive.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.416	11.49	235	62	306	0	0	0
2011	0.416	13.76	223	78	344	0	0	0
2012	0.416	15.21	251	91	395	0	0	0
2013	0.416	16.81	267	99	427	0	0	0
2014	0.416	18.59	283	108	473	0	0	0
2015	0.416	20.52	299	116	519	0	0	0
2016	0.416	22.57	316	124	563	0	0	0
2017	0.416	24.77	332	131	606	0	0	0
2018	0.416	27.12	347	139	650	0	0	0
2019	0.416	29.57	362	146	693	0	0	0

Table 7a. Projection results (expected values) with F=Fmsy, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.20$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.35	16.88	282	65	345	0	0	0
2011	0.188	20.64	286	28	48	29	326	326
2012	0.188	23.27	320	35	67	38	386	711
2013	0.188	26.25	341	38	74	45	438	1149
2014	0.188	29.59	361	41	80	52	501	1650
2015	0.188	33.29	382	43	85	58	563	2213
2016	0.188	37.32	401	46	90	63	624	2837
2017	0.188	41.67	420	48	94	69	685	3522
2018	0.188	46.34	438	50	99	74	747	4269
2019	0.188	51.21	454	52	103	78	808	5077

Table 7b. Projection results (expected values) with F=F30, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.20$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.35	16.88	282	65	345	0	0	0
2011	0.183	20.64	286	27	47	28	317	317
2012	0.183	23.34	320	34	65	37	376	693
2013	0.183	26.39	341	37	72	44	428	1121
2014	0.183	29.82	362	40	78	51	490	1612
2015	0.183	33.62	383	42	83	57	553	2164
2016	0.183	37.76	403	45	88	62	614	2778
2017	0.183	42.26	422	47	92	67	675	3454
2018	0.183	47.08	440	49	97	73	737	4190
2019	0.183	52.12	457	51	101	77	798	4988

Table 7c. Projection results (expected values) with F=0.98×F30, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.20$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.35	16.88	282	65	345	0	0	0
2011	0.179	20.64	286	27	46	28	311	311
2012	0.179	23.4	320	33	64	37	370	680
2013	0.179	26.49	342	36	71	43	422	1102
2014	0.179	29.98	363	39	77	50	483	1585
2015	0.179	33.85	384	41	81	56	545	2131
2016	0.179	38.08	404	44	86	62	607	2737
2017	0.179	42.67	424	46	91	67	668	3405
2018	0.179	47.6	442	48	95	72	729	4135
2019	0.179	52.76	459	50	100	77	791	4926

Table 7d. Projection results (expected values) under continued moratorium, extended from assessment model configuration with component weights as in the AW report, including headboat index weight of $\omega = 0.20$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings. In these projections, the F applied corresponds to F=0.9×Fcurrent (Fcurrent = 0.61) but decreased to reflect potential landings that are discarded and survive.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.35	16.88	282	65	345	0	0	0
2011	0.35	20.64	286	84	384	0	0	0
2012	0.35	23.4	320	101	458	0	0	0
2013	0.35	26.26	342	112	504	0	0	0
2014	0.35	29.3	361	121	557	0	0	0
2015	0.35	32.53	380	130	610	0	0	0
2016	0.35	35.95	398	138	661	0	0	0
2017	0.35	39.58	414	146	712	0	0	0
2018	0.35	43.43	430	153	762	0	0	0
2019	0.35	47.42	444	160	812	0	0	0

Table 8a. Projection results (expected values) with F=Fmsy, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.25$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.331	19.77	305	66	351	0	0	0
2011	0.196	24.23	314	31	53	31	358	358
2012	0.196	27.28	349	38	73	43	432	790
2013	0.196	30.68	370	42	82	50	490	1280
2014	0.196	34.4	390	45	88	57	555	1836
2015	0.196	38.45	409	47	92	62	618	2454
2016	0.196	42.81	427	50	97	68	680	3133
2017	0.196	47.48	445	52	102	73	741	3875
2018	0.196	52.46	461	54	106	78	803	4678
2019	0.196	57.61	476	56	110	83	865	5544

Table 8b. Projection results (expected values) with F=F30, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.25$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.331	19.77	305	66	351	0	0	0
2011	0.192	24.23	314	30	52	31	351	351
2012	0.192	27.34	349	38	72	42	425	775
2013	0.192	30.8	370	41	80	49	482	1258
2014	0.192	34.59	390	44	86	56	547	1805
2015	0.192	38.72	410	47	91	62	610	2415
2016	0.192	43.17	428	49	96	67	671	3086
2017	0.192	47.95	446	51	100	72	733	3819
2018	0.192	53.05	462	53	104	77	795	4615
2019	0.192	58.33	477	55	108	82	857	5472

Table 8c. Projection results (expected values) with F=0.98×F30, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.25$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.331	19.77	305	66	351	0	0	0
2011	0.188	24.23	314	30	51	30	344	344
2012	0.188	27.4	349	37	71	41	417	761
2013	0.188	30.91	370	41	79	48	475	1236
2014	0.188	34.77	391	43	85	55	539	1775
2015	0.188	38.98	411	46	90	61	602	2377
2016	0.188	43.52	430	48	94	66	663	3040
2017	0.188	48.41	447	50	99	71	725	3765
2018	0.188	53.62	464	52	103	76	787	4552
2019	0.188	59.03	479	54	107	81	849	5402

Table 8d. Projection results (expected values) under continued moratorium, extended from assessment model configuration with component weights as in the AW report, including headboat index weight of $\omega = 0.25$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings. In these projections, the F applied corresponds to F=0.9×Fcurrent (Fcurrent = 0.58) but decreased to reflect potential landings that are discarded and survive.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.331	19.77	305	66	351	0	0	0
2011	0.331	24.23	314	85	393	0	0	0
2012	0.331	27.64	349	105	479	0	0	0
2013	0.331	31.11	372	116	531	0	0	0
2014	0.331	34.76	392	126	586	0	0	0
2015	0.331	38.6	411	134	640	0	0	0
2016	0.331	42.64	428	142	692	0	0	0
2017	0.331	46.91	444	149	743	0	0	0
2018	0.331	51.43	459	156	794	0	0	0
2019	0.331	56.09	473	163	845	0	0	0

Table 9a. Projection results (expected values) with F=Fmsy, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.30$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.32	22.67	325	65	346	0	0	0
2011	0.206	27.74	338	34	57	32	377	377
2012	0.206	31.18	373	42	79	47	477	854
2013	0.206	34.94	393	46	88	53	539	1393
2014	0.206	38.98	413	49	94	60	603	1996
2015	0.206	43.32	431	51	99	66	664	2660
2016	0.206	47.96	448	53	103	71	725	3385
2017	0.206	52.91	464	55	108	76	787	4171
2018	0.206	58.14	478	57	112	80	849	5020
2019	0.206	63.53	492	59	115	85	912	5932

Table 9b. Projection results (expected values) with F=F30, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.30$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.32	22.67	325	65	346	0	0	0
2011	0.204	27.74	338	33	57	32	372	372
2012	0.204	31.22	373	41	79	46	472	844
2013	0.204	35.02	394	45	87	53	534	1378
2014	0.204	39.1	413	48	93	60	597	1975
2015	0.204	43.5	431	50	98	65	658	2633
2016	0.204	48.2	448	53	102	70	719	3353
2017	0.204	53.22	464	55	107	75	781	4134
2018	0.204	58.53	479	57	110	80	844	4977
2019	0.204	64	493	58	114	85	907	5884

Table 9c. Projection results (expected values) with F=0.98×F30, extended from assessment model configuration with component weights as in the AW report, but headboat index weight increased to $\omega = 0.30$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.32	22.67	325	65	346	0	0	0
2011	0.199	27.74	338	33	56	31	365	365
2012	0.199	31.29	373	41	77	45	464	829
2013	0.199	35.14	394	44	86	52	525	1354
2014	0.199	39.3	414	47	92	59	589	1942
2015	0.199	43.79	432	50	96	64	649	2592
2016	0.199	48.58	449	52	101	69	710	3302
2017	0.199	53.72	466	54	105	74	772	4074
2018	0.199	59.15	481	56	109	79	835	4909
2019	0.199	64.76	495	58	112	84	898	5807

Table 9d. Projection results (expected values) under continued moratorium, extended from assessment model configuration with component weights as in the AW report, including headboat index weight of $\omega = 0.30$. F is fishing mortality rate (per yr), SSB is mid-year spawning stock (mt), R is recruits (1000 age-1 fish), D is discard mortalities (1000 fish or 1000 lb whole weight), L is landings (1000 fish or 1000 lb whole weight), and sum L is cumulative landings. In these projections, the F applied corresponds to F=0.9×Fcurrent (Fcurrent = 0.57) but decreased to reflect potential landings that are discarded and survive.

Year	F	SSB(mt)	R(1000)	D(1000)	D(klb)	L(1000)	L(klb)	Sum L(klb)
2010	0.32	22.67	325	65	346	0	0	0
2011	0.32	27.74	338	87	395	0	0	0
2012	0.32	31.72	373	109	500	0	0	0
2013	0.32	35.72	396	120	555	0	0	0
2014	0.32	39.88	416	129	611	0	0	0
2015	0.32	44.24	434	137	663	0	0	0
2016	0.32	48.8	451	145	715	0	0	0
2017	0.32	53.61	466	152	766	0	0	0
2018	0.32	58.67	480	158	817	0	0	0
2019	0.32	63.87	494	164	868	0	0	0

APPENDIX I-B

December 3, 2010

Addendum to:
SEDAR-24 South Atlantic Red Snapper:
Management quantities and projections requested by the SSC and SERO

In 2010, a moratorium on red snapper was implemented. This was modeled in a three-step process. First, the current fishing rates by fleet, discounted by expected reductions in fishing effort, were applied to estimate landings by fleet. Second, all caught fish were assumed released, and fleet-specific discard mortality probabilities were applied to convert the potential landings to dead discards. Third, an optimization procedure was used to estimate the fishing mortality rates that produce those dead discards, as well as the mortality rates associated with undersized fish. That is, six mortality rates were estimated: the Fs of legal sized discards and undersized discards from commercial lines, for-hire, and private recreational fleets. These rates were then applied to compute the total dead discards and total mortality rates used to project the population forward in time. For most projection scenarios (described in the projection document), these mortality rates applied only in 2010, but one projection scenario (Scenario 7 in the projection document) applied the moratorium mortality rates throughout.

For computing the F30 discard equivalents, the same procedure was applied, except that F=F30 (rather than 90% Fcurrent) and the abundance at age was assumed equal to that expected under F=F30. For the four model runs with different headboat weights, the F30 discard equivalents are the following:

wgt11: F30 discard equivalent is 0.112
wgt20: F30 discard equivalent is 0.119
wgt25: F30 discard equivalent is 0.124
wgt30: F30 discard equivalent is 0.130

These F30 discard equivalent rates can be directly compared to the 2010 discard only estimates of F shown in the projection report Tables 6-9. These F rates suggest that a moratorium management action alone does not reduce the F rate below the overfishing levels (the F30 discard equivalents). An important assumption made in the projection document was that the moratorium management action resulted in a 10% reduction in F. This percent reduction is highly uncertain because no data existed at the time of this analysis to ground truth this assumption. Should this percent reduction be significantly higher, then the moratorium alone may achieve an F rate that is below the overfishing level.

FISHING MORTALITY RATES

APPENDIX I-C

SEDAR 24 RW BASE CASE (ω = 0.11)	
Fcurrent	0.733
Fmsy	0.178
Frebuild	0.167

SSC SCENARIO 1 (ω = 0.2)	
Fcurrent	0.615
Fmsy	0.188
Frebuild	0.179

SSC SCENARIO 1 (ω = 0.25)	
Fcurrent	0.584
Fmsy	0.196
Frebuild	0.188

SSC SCENARIO 1 (ω = 0.3)	
Fcurrent	0.569
Fmsy	0.206
Frebuild	0.199

BASELINE ESTIMATED REMOVALS FROM BAM OUTPUT

SEDAR 24 RW BASE CASE (ω = 0.11)

	Landings	Ddiscards	Total
2007	667	332	999
2008	1165	388	1553
2009	1439	239	1678
Average	1090	319	1410

SSC SCENARIO 1 (ω = 0.2)

	Landings	Ddiscards	Total
2007	679	327	1006
2008	1145	393	1538
2009	1416	249	1665
Average	1080	323	1403

SSC SCENARIO 1 (ω = 0.25)

	Landings	Ddiscards	Total
2007	684	323	1006
2008	1143	393	1536
2009	1410	252	1662
Average	1079	323	1402

SSC SCENARIO 1 (ω = 0.3)

	Landings	Ddiscards	Total
2007	696	316	1012
2008	1154	390	1543
2009	1411	254	1665
Average	1087	320	1407

TARGET REMOVALS IN 2011 BASED ON F = 98%F30% REBUILDING PROJECTIONS

SEDAR 24 RW BASE CASE (ω = 0.11)

	Landings	Ddiscards	Total
2011	222	36	258
2012	263	49	312

SSC SCENARIO 1 (ω = 0.2)

	Landings	Ddiscards	Total
2011	311	46	357
2012	370	64	434

SSC SCENARIO 1 (ω = 0.25)

	Landings	Ddiscards	Total
2011	344	51	395
2012	417	71	488

SSC SCENARIO 1 (ω = 0.3)

	Landings	Ddiscards	Total
2011	365	56	421
2012	464	77	541

PERCENT REDUCTION NEEDED TO END OVERFISHING AND ACHIEVE REBUILDING TARGET

	Percent Redux from Base	
Model Run	2011	2012
SEDAR 24 RW BASE CASE (ω = 0.11)	82%	78%
SSC SCENARIO 1 (ω = 0.2)	75%	69%
SSC SCENARIO 2 (ω = 0.25)	72%	65%
SSC SCENARIO 3 (ω = 0.3)	70%	62%

APPENDIX I-D: Red Snapper Removals in 2010, Reported to MRFSS

Table 1. Average release mortalities of discarded red snapper.

Mode	Release Mortality	Source
For-Hire (Charter)	41.3%	SEDAR-24-DW (2010)
Private	38.9%	SEDAR-24-DW (2010)

Table 2. Average weights (lbs) of discarded red snapper.

Year	Weight (lbs)	Source
2007	1.77	SEDAR-24-DW (2010)
2008	1.87	SEDAR-24-DW (2010)
2009	2.17	SEDAR-24-DW (2010)
2010	5.32	SEFSC Moratorium Projections (hb=0.3)

Table 3A. Red snapper landings reported to MRFSS Waves 1-4, 2007-2010 (Private and Charter Modes, SAFMC waters, in lbs).

	Wave				
LANDINGS(LBS)	1	2	3	4	Grand Total
2007	22,990	8,770	150,977	50,559	233,296
2008	66,740	59,061	241,617	151,048	518,466
2009	316,060	266,078	178,225	60,492	820,855
Avg. 2007-2009	**135,263**	**111,303**	**190,273**	**87,366**	**524,206**
2010	0	0	0	205	205

Table 4A. Red snapper dead discards (N) reported to MRFSS Waves 1-4, 2007-2010 (Private and Charter Modes, SAFMC waters, in lbs), expanded to lbs using average weights from Table 1.

	Wave				
DISCARDS(LBS)	1	2	3	4	Grand Total
2007	28,171	27,767	62,757	141,744	260,439
2008	69,442	44,721	68,695	40,569	223,427
2009	32,931	71,033	20,338	22,082	146,385
Avg. 2007-2009	**43,515**	**47,840**	**50,597**	**68,132**	**210,084**
2010	23,682	20,475	65,899	30,019	140,076

Table 5A. Red snapper removals (lbs) reported to MRFSS Waves 1-4, 2007-2010 (Private and Charter Modes, SAFMC waters, in lbs), with discards expanded to lbs using average weights from Table 1.

	Wave				
REMOVALS(LBS)	**1**	**2**	**3**	**4**	**Grand Total**
2007	51,161	36,537	213,734	192,303	493,735
2008	136,182	103,782	310,312	191,617	741,893
2009	348,991	337,111	198,563	82,574	967,240
Avg. 2007-2009	**178,778**	**159,143**	**240,870**	**155,498**	**734,289**
2010	23,682	20,475	65,899	30,224	140,281

Table 6A. Difference in red snapper removals (lbs) between 2007-2009 baseline (Waves 1-4) and 2010 Waves 1-4 during moratorium.

	Wave				
REMOVALS(LBS)	**1**	**2**	**3**	**4**	**Grand Total**
Avg. 2007-2009	178,778	159,143	240,870	155,498	734,289
2010	23,682	20,475	65,899	30,224	140,281
2010	87%	87%	73%	81%	81%

Table 3B. Red snapper landings reported to MRFSS Waves 1-4, 2007-2010 (Private mode, SAFMC waters, in lbs).

	Wave				
LANDINGS(LBS)	**1**	**2**	**3**	**4**	**Grand Total**
2007	12,388	5,948	131,202	44,528	194,066
2008	42,227	53,695	201,825	72,688	370,435
2009	171,597	229,814	170,435	37,394	609,240
Avg. 2007-2009	**75,404**	**96,486**	**167,821**	**51,537**	**391,247**
2010	0	0	0	0	0

Table 4B. Red snapper dead discards (N) reported to MRFSS Waves 1-4, 2007-2010 (Private mode, SAFMC waters, in lbs), expanded to lbs using average weights from Table 1.

	Wave				
DISCARDS(LBS)	**1**	**2**	**3**	**4**	**Grand Total**
2007	24,769	19,638	35,837	100,335	180,579
2008	52,437	39,924	62,365	31,621	186,346
2009	29,659	60,117	19,322	19,131	128,229
Avg. 2007-2009	**35,621**	**39,893**	**39,175**	**50,363**	**165,051**
2010	23,682	20,081	46,762	28,693	119,219

Table 5B. Red snapper removals (lbs) reported to MRFSS Waves 1-4, 2007-2010 (Private mode, SAFMC waters, in lbs), with discards expanded to lbs using average weights from Table 1.

	Wave				
REMOVALS(LBS)	**1**	**2**	**3**	**4**	**Grand Total**
2007	37,157	25,586	167,039	144,863	374,645
2008	94,664	93,619	264,190	104,309	556,781
2009	201,256	289,931	189,757	56,525	737,469
Avg. 2007-2009	**111,025**	**136,378**	**206,995**	**101,899**	**556,298**
2010	23,682	20,081	46,762	28,693	119,219

Table 6B. Difference in private mode red snapper removals (lbs) between 2007-2009 baseline (Waves 1-4) and 2010 Waves 1-4 during moratorium.

	Wave				
REMOVALS(LBS)	**1**	**2**	**3**	**4**	**Grand Total**
Avg. 2007-2009	111,025	136,378	206,995	101,899	556,298
2010	23,682	20,081	46,762	28,693	119,219
2010	79%	85%	77%	72%	79%

Table 3C. Red snapper landings reported to MRFSS Waves 1-4, 2007-2010 (charter mode, SAFMC waters, in lbs).

	Wave				
LANDINGS(LBS)	**1**	**2**	**3**	**4**	**Grand Total**
2007	10,602	2,822	19,775	6,031	39,230
2008	24,513	5,366	39,792	78,360	148,031
2009	144,463	36,264	7,790	23,098	211,615
Avg. 2007-2009	**59,859**	**14,817**	**22,452**	**35,830**	**132,959**
2010	0	0	0	205	205

Table 4C. Red snapper dead discards (N) reported to MRFSS Waves 1-4, 2007-2010 (charter mode, SAFMC waters, in lbs), expanded to lbs using average weights from Table 1.

	Wave				
DISCARDS(LBS)	**1**	**2**	**3**	**4**	**Grand Total**
2007	3,402	8,130	26,920	41,409	79,861
2008	17,005	4,798	6,330	8,948	37,081
2009	3,273	10,916	1,016	2,950	18,155
Avg. 2007-2009	**7,894**	**7,948**	**11,422**	**17,769**	**45,032**
2010	0	394	19,137	1,326	20,857

Table 5C. Red snapper removals (lbs) reported to MRFSS Waves 1-4, 2007-2010 (charter mode, SAFMC waters, in lbs), with discards expanded to lbs using average weights from Table 1.

REMOVALS (LBS)	Wave 1	2	3	4	Grand Total
2007	14,004	10,952	46,695	47,440	119,091
2008	41,518	10,164	46,122	87,308	185,112
2009	147,736	47,180	8,806	26,048	229,770
Avg. 2007-2009	**67,753**	**22,765**	**33,874**	**53,599**	**177,991**
2010	0	394	19,137	1,531	21,062

Table 6C. Difference in charter mode red snapper removals (lbs) between 2007-2009 baseline (Waves 1-4) and 2010 Waves 1-4 during moratorium.

REMOVALS(LBS)	Wave 1	2	3	4	Grand Total
Avg. 2007-2009	67,753	22,765	33,874	53,599	177,991
2010	0	394	19,137	1,531	21,062
2010	100%	98%	44%	97%	88%

Appendix J. 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*

Finding of No Significant Impact (FONSI) for Measures in Regulatory Amendment 10 to the Fishery Management Plan for the Snapper-Grouper Fishery of the South Atlantic Region (Regulatory Amendment 10)

National Marine Fisheries Service

April 2011

Introduction

This Finding of No Significant Impact (FONSI) was prepared in accordance with National Oceanic and Atmospheric Administration Administrative Order 212-6 (NAO 216-6; May 20, 1999) and NMFS Instruction 30-12-4-1, July 22, 2005, Guidelines for Preparation of Finding of No Significant Impact, for determining the significance of impacts of a proposed management action. This introduction provides a brief description of the proposed management action and alternatives and summarizes why the **Preferred Alternative 11** will not have a significant effect on the human environment. Attached is the environmental assessment, entitled *Regulatory Amendment 10 to the Snapper Grouper Fishery Management Plan of the South Atlantic Region, dated January 2011.*

The environmental assessment contains 11 alternatives. **Alternative 1**, the No Action alternative, is the snapper-grouper area closure approved in Amendment 17A to the Fishery Management Plan for the Snapper-Grouper Fishery of the South Atlantic Region (Amendment 17A). The snapper-grouper area closure is 4,827 square miles (7,7637,768 square km) off the coasts of southern Georgia and northeast Florida where the harvest and possession of snapper-grouper species would be prohibited, except when fishing with black sea bass pot gear or spearfishing gear for species other than red snapper. **Alternatives 2-10** would reduce the snapper-grouper area closure approved in Amendment 17A in space and/or time. **Alternative 11**, the Preferred Alternative, would not implement the snapper-grouper area closure approved in Amendment 17A.

Alternative 1 is the No Action Alternative, whereby, the underlying purpose and need (as described in Section 1.4 in the attached environmental assessment for Regulatory Amendment 10) would not be addressed. The purpose and need is to reduce the spatial and temporal coverage of the snapper-grouper closure approved in Amendment 17A, or eliminate it, based upon new scientific information in order to minimize adverse social and economic effects. **Alternatives 2-11** would meet the purpose and need by reducing the closure approved in Amendment 17A in space and/or time or eliminate the area closure. **Alternative 11**, the Preferred Alternative, seeks to prevent significant direct economic loss to snapper-grouper fishermen, while immediately ending overfishing and rebuilding the red snapper stock.

It is important to note that the snapper-grouper area closure approved in Amendment 17A has not been implemented. As described in Section 1.6 of Regulatory Amendment 10, an emergency rule published on December 9, 2010 (75 FR 76890), delayed the effective date of the snapper-grouper area closure from January 3, 2011, to June 1, 2011, with a possible 186-day extension, unless superseded by subsequent rulemaking. The delayed effective date of the snapper-grouper area closure provided the South Atlantic Fishery Management Council (Council) time to respond to the new scientific information from the SEDAR 24 benchmark stock assessment. The Council identified Regulatory Amendment 10 as the management tool to modify the area closure implemented through Amendment 17A, based upon new stock assessment information.

Finding of No Significant Impact

National Oceanic and Atmospheric Administration Administrative Order 216-6 (NAO 216-6) (May 20, 1999) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality regulations at 40 CFR 1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." Each criterion listed below is relevant in making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ's context and intensity criteria. These include:

1) Can the proposed action reasonably be expected to jeopardize the sustainability of any target species that may be affected by the action?

Response: No. The proposed action would not be expected to jeopardize the sustainability of any target species. The snapper-grouper area closure was determined to be necessary to end overfishing and rebuild the red snapper stock based upon the information in a 2008 Southeast Data Assessment and Review (SEDAR) assessment (SEDAR 15). However, the most recent assessment (SEDAR 24) indicates that the stock, though still overfished and experiencing overfishing, is in slightly better condition than what was previously estimated in SEDAR 15. As a result of SEDAR 24, evidence of decreased effort in the recreational fishery, and the Council's Scientific and Statistical Committee's (SSC) endorsement of several scenarios from SEDAR 24 that require a smaller reduction in mortality to end overfishing, the snapper-grouper area closure is not necessary as the red snapper harvest prohibition approved in Amendment 17A is sufficient to end overfishing.

2) Can the proposed action reasonably be expected to jeopardize the sustainability of any non-target species?

Response: No. Although fishery management actions can adversely impact non-target species by increasing bycatch, reducing habitat availability, or altering predator-prey relationships, the South Atlantic Fishery Management Council's (Council) proposed action is not anticipated to have such effects on non-target species. The proposed action will not jeopardize the sustainability of red snapper as the harvest prohibition approved in Amendment 17A does provide the necessary reduction in mortality to end overfishing.

Section 3.2.1.3 identifies the species that would be most affected by the action as the following: red snapper; gag; golden tilefish; gray triggerfish; greater amberjack; red grouper; scamp; snowy grouper; and vermilion snapper. All but three species (gray triggerfish, greater amberjack, and scamp) have annual catch limits (ACL) and accountability measures (AM) that are expected to provide the necessary biological protection. The implementation of ACLs and AMs for gray triggerfish, greater amberjack, and scamp will be implemented in 2011 through the Comprehensive ACL Amendment.

3) Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential habitat as defined under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and defined in the Fishery Management Plan for the Snapper-Grouper Fishery of the South Atlantic Region (FMP)?

Response: No. Although fishery management actions can adversely affect habitat by increasing fishing gear interactions with the seafloor and/or redistributing fishing effort over more vulnerable habitat, the proposed action is not anticipated to have such an effect. The snapper-grouper area closure approved in Amendment 17A has not been implemented; thus, the amount of interaction between fishing gear and the physical environments should decrease or stay the same. The proposed action would not be expected to cause any damage to ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in the Council's FMPs. Additionally, the Council has implemented a number of gear restrictions designed to minimize adverse effects of the snapper-grouper fishery on particularly vulnerable or valuable habitat.

4) Can the proposed action reasonably be expected to have a substantial adverse impact on public health or safety?

Response: No. Although fishery management actions can sometimes affect public safety by eliminating or minimizing fishermen's flexibility to decide when, where, and how to fish, the proposed actions is not expected to have such an effect. The action is not expected to change fishing techniques or operations in a way that would impact the safety of commercial or recreational fishermen.

5) Can the proposed action reasonably be expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species?

Response: No. Fishery management actions can adversely affect species and/or habitat protected by the Endangered Species Act and/or Marine Mammal Protection Act by increasing bycatch and/or fishing gear interactions with the seafloor, and/or by redistributing fishing effort to areas where protected species and/or critical habitat occurs. However, as the proposed area closure has not been implemented, any changes in fishing effort or distribution that may have affected protected species are unlikely to have occurred.

6) Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g. benthic productivity, predator-prey relationships, etc.)

Response: No. Although fishery management actions can impact biodiversity and ecosystem function by altering predator-prey relationships and damaging habitat, the proposed actions would not be expected to have such an effect. The snapper-grouper area closure approved in Amendment 17A has not been implemented, thus, the amount of interaction between fishing gear and the physical environments should stay the same. The proposed action would not be expected to cause any damage to ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in the Council's Fishery Management Plans. Additionally, the Council has implemented a number of gear restrictions designed to minimize adverse effects of the snapper-grouper fishery on particularly vulnerable or valuable habitat.

7) Are significant social or economic impacts interrelated with natural or physical environmental effects?

Response: No. In the context of the entire fishery as a whole, the social and economic impacts of the Preferred Alternative are not expected to be significant as the net effects of the proposed action are expected to be positive and their magnitude comprises a relatively small portion of the entire economic and social activities associated with the snapper-grouper fishery in the South Atlantic. In terms of net operating revenues, the economic effects on the commercial sector would be positive for vessels in Northeast Florida, Southeast Florida, and Georgia as the vessels in those areas will be able to harvest more fish without the closure. Conversely, the economic effects on the commercial sector would be negative for vessels in North Carolina, South Carolina, and the Florida Keys. The negative effects in those areas will arise from relatively early quota closures, particularly on vermilion snapper and gag, that may result from areas off Georgia and Florida being open to harvest of snapper-grouper species. The overall net effects for all commercial vessels in the South Atlantic snapper-grouper fishery are expected to be positive, resulting in an increase in net operating revenues of approximately $57,000 annually. Overall, the net operating revenues for all commercial vessels in the South Atlantic snapper-grouper fishery are estimated at $10 million

annually, so the increase is relatively minor compared to total revenues in the fishery. In terms of business activity, the effects on the commercial sector will be an expected increase of approximately $1.6 million in output (sales) impacts and an increase of approximately $683,000 in income impacts. Total average annual business activity associated with the South Atlantic snapper-grouper commercial sector is estimated to be approximately $190 million in output impacts and approximately $81 million in income impacts.

The effects on the recreational sector are expected to be positive in all affected areas and mostly confined to fishing activities off of Northeast Florida and Georgia based on the proximity of these areas to the closed area. In terms of net operating revenues, the annual economic effects on the for-hire segment of the recreational sector (vessel businesses) are expected to be an increase of approximately $227,000 for charterboats and $815,000 for headboats. The annual consumer surplus effects on anglers are expected to be an increase of approximately $419,000 for charterboat anglers, $2,604,000 for headboat anglers, and $1,494,000 for private mode anglers. Considering that these effects will accrue only to fishing activities in Northeast Florida and Georgia, they can be considered relatively small when compared to net operating revenues of all for-hire vessels and consumer surplus of all anglers in the South Atlantic. In terms of business activity, the effects on the recreational sector are expected to be an increase of approximately $1.2 million in output impacts and $760,000 in value added (income) impacts. Based only on target effort for the charter and private modes, the economic activity in the total South Atlantic recreational sector is estimated to be approximately $35 million in output impacts and $21 million in value added impacts. Estimates of business activity associated with the headboat sector are not available because of a lack of sufficient data.

8) Are the effects on the quality of the human environment likely to be highly controversial?

Response: No. The effects on the quality of the human environment are not likely to be highly controversial in terms of public and scientific controversy.

Public Controversy

The effects of the snapper-grouper area closure approved in Amendment 17A on the quality of the human environment were highly controversial as many fishermen questioned the accuracy of the data used to make determinations of red snapper overfishing and felt the action would have unnecessary negative economic effects. As the proposed action in Regulatory Amendment 10 is to not implement the snapper-grouper area closure approved in Amendment 17A, public controversy is likely to be minimal. A total of 21 comment letters were received on Regulatory Amendment 10 and the proposed rule, including comments from individuals and fishing associations. NOAA Fisheries Service received 17 comments that expressed general support of the action in Regulatory Amendment 10. NOAA Fisheries Service also received four comments that addressed issues outside the scope of the action.

Scientific Controversy

The basis for the action is scientifically sound. The actions in Regulatory Amendment 10 are based upon the results of SEDAR Assessment 24 and a subsequent Council's SSC review of the assessment. The results of the assessment, the description of the SEDAR process, and the SSC recommendations are described in Section 3.2.1.2 of Regulatory Amendment 10.

In addition, during the December 2010 Council meeting, the Southeast Fisheries Science Center (SEFSC) director stated that the analyses conducted for Regulatory Amendment 10 were appropriate and the Council's choice of management measures depended on their level of risk tolerance. The Council also acknowledged the high level of uncertainty in both the assessment of current stock status and the evaluations of regulatory effectiveness, as well as the difficulty in predicting how participants would modify behavior in response to regulatory changes. While uncertainty is unavoidable and any action carries a level of risk, the Council concluded that the options were carefully analyzed, and evaluated and the Council could reasonably expect the red snapper harvest prohibition to end overfishing. In taking this action, the Council is responding to the Magnuson-Stevens Act mandate to end overfishing, while also relying on adaptive management approaches since information on this and other fisheries will continue to be obtained and evaluated in the future, and management may need to be adjusted accordingly.

The SEFSC will monitor the effectiveness of the regulations in reducing fishing mortality prior to the next red snapper assessment scheduled for 2013. Based on preliminary data, the SEFSC's Fishery-Independent Survey (FIS) strongly corroborates the age distribution estimated in the SEDAR 24 assessment and observed in intensive age sampling conducted in 2009. All sources indicate two strong year classes currently moving through the fishery. The FIS proposes to focus sampling on those two year classes so that changes in their abundance over time can be used to measure population mortality. This will provide a means to estimate mortality in the absence of directed harvest and enable evaluation of the management strategy and rebuilding progress. The Council requested that the SEFSC deliver an interim progress report on their FIS in early 2012 to be reviewed by the SSC and be available to the Council at their March 2012 meeting.

9) Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas?

Response: No. No special areas, including historic and cultural areas, park land, prime farmlands, wetlands, wild and scenic rivers, ecologically critical areas, or marine sanctuary areas would be impacted by the proposed action because none of these areas are in the directly affected environment of the South Atlantic snapper-grouper fishery, which is conducted in the federal waters off of North Carolina, South Carolina, Georgia, and Florida.

10) Are the effects of the human environment likely to be highly uncertain or involve unique and unknown risks?

Response: No. The need for this action is based on the results of a new SEDAR stock assessment. The results of the assessment, the description of the SEDAR process, and the SSC recommendations are described in Section 3.2.1.2 of Regulatory Amendment 10. All stock assessments have some level of uncertainty. However, these assessments are peer reviewed by the Center for Independent Experts and the Council's SSC, and considered the best available scientific information. SEDAR 24 was approved by the Council's SSC for use in management of South Atlantic red snapper.

11) Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

Response: No. The proposed interim federal action is not expected to compound the cumulative effects on the physical, social and economic environments, habitat, protected species or the fishery resource. Therefore, there are no foreseeable significant additive or interactive effects as a result of the proposed interim federal action.

12) Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

Response: No. The proposed action affected environment does not concern districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places. Consequently, it is unlikely that the proposed action would adversely affect the aforementioned, and this action is not likely to cause destruction of significant scientific, cultural, or historical resources.

13) Can the proposed action reasonably be expected to result in the introduction or spread of a non-indigenous species?

Response: No. The proposed action will not introduce or spread any non-indigenous species because it does not change existing fishing operations.

14) Is the proposed action likely to establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration?

Response: No. The proposed action does not establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration. Long-term management of red snapper is being considered in Amendment 22 to the Fishery Management Plan for the Snapper-Grouper Fishery of the South Atlantic Region (Amendment 22). Through Amendment 22, NOAA Fisheries Service and the Council will consider alternatives to the current red snapper harvest restrictions as the stock

increases in biomass. Examples of measures under consideration include the implementation of red snapper trip limits, bag limits, a catch share program, tag program, temporal and spatial closures including those to protect spawning stocks, and gear prohibitions. These preliminary measures may not represent the full range of alternatives that eventually will be evaluated in the Amendment 22 Environmental Impact Statement. Amendment 22 scoping meetings were held in January and February 2011.

15) Can the proposed action reasonably be expected to threaten a violation of Federal, State or local law requirements imposed for the protection of the environment?

Response: No. The proposed action is not likely to impose or cause a violation of federal, state, or local law or requirements imposed for the protection of the environment. The proposed actions are consistent with applicable state and federal regulations.

16) Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target or non-target species?

Response: No. The proposed actions are not expected to result in any cumulative adverse effects that could have a substantial effect on the target species or non-target species. A cumulative effects analysis was conducted for Regulatory Amendment 10 and revealed no cumulative adverse effects on the biological environment.

Determination

In view of the information presented in this document and the analysis contained in the supporting Environmental Assessment, I have determined that the Preferred Alternative will not significantly impact the quality of the human environment as described above and in the supporting Environmental Assessment. In addition, all beneficial and adverse impacts of the proposed action have been identified and analyzed to reach the conclusion of no significant impacts. Accordingly, preparation of an Environmental Impact Statement for this action is not necessary.

James E. Weaver APR 06 2011

for Roy E. Crabtree, Ph.D. Date
Regional Administrator
National Marine Fisheries Service
Southeast Regional Office