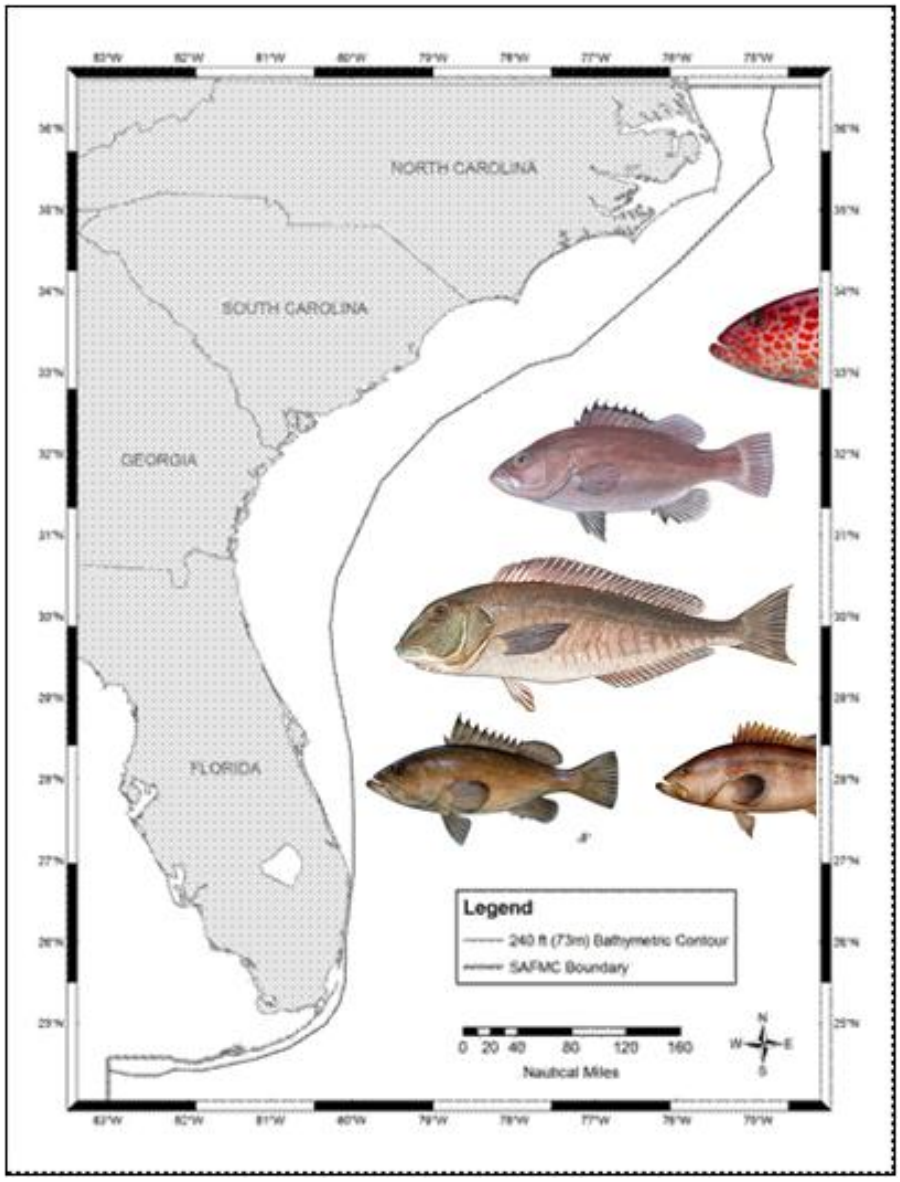

Regulatory Amendment 11

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

240-ft (40-Fathom) Closure

Environmental Assessment Regulatory Flexibility Act Analysis Regulatory Impact Review Social Impact Assessment

A publication of the South Atlantic Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Award Number FNA10NMF4410012

August 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
M	natural mortality rate
MARMAP	Marine Resources Monitoring Assessment and Prediction Program
MFMT	maximum fishing mortality threshold
MMPA	Marine Mammal Protection Act
MRFSS	Marine Recreational Fisheries Statistics Survey
MRIP	Marine Recreational Information Program
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	minimum stock size threshold
MSY	maximum sustainable yield
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OFL	overfishing limit
OY	optimum yield
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

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Chapter 1.
Introduction

1.1 What Actions Are Being Proposed?

Fishery managers are considering modifications to the 240-ft (40-fathom) closure off the coast of the South Atlantic states. These modifications include a reduction in the number of deepwater species* currently prohibited from retention, changes to the boundaries of the 240-ft (40-fathom) closure, removal of the entire closure, and vessel transit provisions.

1.2 What is the 240-ft (40-fathom) Closure?

Amendment 17B to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (Amendment 17B) implemented what is referred to as the *240-ft (40-fathom) closure*. Beginning January 31, 2011, possession of six deepwater snapper grouper species (snowy grouper, blueline tilefish, yellowedge grouper, misty grouper, queen snapper, and silk snapper)in or from the South Atlantic exclusive economic zone in depths greater than 240-ft (40-fathoms) was prohibited (**Figure 1-1**).

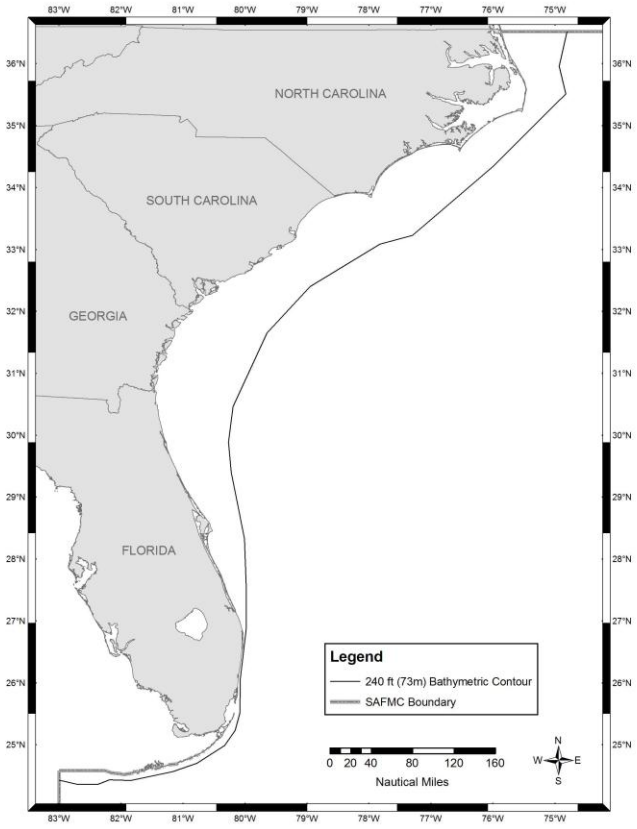

Figure 1-1. The 240-foot (40-fathom) depth line that marks the western boundary of the closure**.**

**What are deepwater species?*

*Species considered to be deepwater stocks include speckled hind, warsaw grouper, snowy grouper, blueline tilefish, yellowedge grouper, misty grouper, queen snapper, and silk snapper. Despite being referred to as 'deepwater species', some of these species such as speckled hind and warsaw grouper also occur at the shelf break as juveniles and adults. See **Section 3.2.1** for life history information.

1.3 Who is Proposing the Actions?

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

1.4 Why is the South Atlantic Council Considering Action?

Amendment 17B prohibited the harvest and possession of the remaining six deepwater species that co-occur with speckled hind and warsaw grouper to reduce bycatch of speckled hind and warsaw grouper in water deeper than 240-ft (40-fathoms) where release mortality is very high. The South Atlantic Council believes deepwater stocks* may be managed in a way that decreases the socio-economic effects expected from the regulations in Amendment 17B while maintaining the biological protection to speckled hind and warsaw grouper in the South Atlantic to the extent practical. More specifically, the South Atlantic Council believes the harvest of blueline tilefish off the coast of North Carolina and South Florida could be allowed without negatively affecting the mortality of speckled hind and warsaw grouper. This could be accomplished through modifications to the 240-foot (40-fathom) closure.

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 and 4 non-voting members
- Management area is from 3 to 200 mi off the coasts of North Carolina, South Carolina, Georgia, and Florida through the Atlantic side of Key West
- Develops management plans and recommends plans/amendments/regulations to NOAA for implementation

Purpose for Action

Modify regulations pertaining to the deepwater species in order to reduce the socio-economic effects from the regulations in Amendment 17B to the Snapper Grouper FMP while maintaining the biological protection to speckled hind and warsaw grouper in the South Atlantic to the extent practicable.

Need for Action

To prevent unnecessary negative socio-economic impacts that would otherwise be realized in the snapper grouper fishery and fishing community, in accordance with the provisions set forth in the Magnuson-Stevens Fishery Conservation and Management Act.

1.5 Why was the 240-Foot (40-Fathom) Closure Implemented?

Speckled hind and warsaw grouper are both undergoing overfishing according to the 1st Quarter of 2011 Report to Congress on the Status of U.S. Fisheries (and in all previous such Reports to Congress). Their overfished status is unknown. The Acceptable Biological Catch (ABC) recommendation from the Scientific and Statistical Committee (SSC) is zero landings for each species (see text box). This recommendation applies to landings and does not apply to other sources of mortality (i.e., discards).

The South Atlantic Council is required to establish Annual Catch Limits (ACLs) at levels to end and prevent overfishing of speckled hind and warsaw grouper, along with management measures to limit harvest levels to the ACL. In the case of speckled hind and warsaw grouper, the ACL is zero (landings only), and the deepwater closure is intended to reduce depth-related bycatch mortality to reduce the probability that overfishing will occur.

Both speckled hind and warsaw grouper are extremely vulnerable to overfishing because they are slow growing, long-lived, and change sex from female to male with increasing size and age. Fishermen do not target these species due to a total prohibition implemented through Amendment 17B, but when they are caught, they are likely to suffer release mortality (near 100%). The incidental catch of speckled hind and warsaw grouper, particularly in deep water where release mortality is high, may be responsible for the continued overfishing of these species. Therefore, the South Atlantic Council determined that a prohibition on the harvest and possession of speckled hind and warsaw grouper, along with their co-occurring species caught in 240-ft (40-fathoms) and greater, was an appropriate action to reduce bycatch mortality of speckled hind and warsaw grouper at depths where depth-related release mortality is very high. Like gag, speckled hind and warsaw grouper are slow growing, long lived, and have similar life histories. Therefore, speckled hind and warsaw grouper may be expected to have similar depth related bycatch mortality rates to gag. If depth-related mortality of speckled hind and warsaw grouper is similar to gag, release mortality at depths of 240-ft (40-fathoms) would be expected to be greater than 70 percent. The deepwater closure is expected to provide protection to the largest, most fecund fish and help ensure a natural sex ratio into the future. According to the Amendment 17B biological impacts analysis, prohibiting all harvest of deepwater snapper grouper species beyond 240-ft (40-fathoms) would also protect spawning aggregations.

Excerpt from June 2008 SSC Report

"For those data poor species identified in Amendment 17, we had landings. We attempted to develop an overarching procedure to be used for the four species, however, information from members indicated that fishery-independent projects indicated that speckled hind and warsaw grouper were conspicuously absent from historical areas of catch. The group then decided to address the ABCs and OFL for the individual species. Because the OFL could not be determined, the incredibly small biomass for speckled hind and warsaw and the high degree of uncertainty associated with these species, the group felt that any catch would likely result in overfishing of these stocks and therefore felt an ABC of zero was warranted*."

*At the December 2008 meeting, the SSC clarified that for speckled hind and warsaw grouper, the ABC of 0 is for directed landings only, not discards.

Chapter 2. Proposed Actions

This section contains the proposed actions that the Council considered to meet the purpose and need (page 2). Each action contains a range of alternatives, including the no action (the current regulations). For all alternatives in **Action 1**, the prohibition of speckled hind and warsaw grouper harvest would remain.

The South Atlantic Fishery Management Council (South Atlantic Council) is considering whether fishermen should be allowed to transit through the 240-foot (40-fathom) closed area with prohibited species onboard. The need to specify transit provisions is not equal across the alternatives. For example, transit provisions would not need to be specified for **Alternative 11 (Preferred)** as this alternative would completely remove the 240-foot (40-fathom) closure. The South Atlantic Council may decide, however, to allow transit through closed areas specified in the other alternatives, such as the one proposed in **Alternative 6** that would apply between a depth of 240 and 500 ft depth. In this instance, the South Atlantic Council may want to specify whether fishermen would be allowed to transit through the closed area with fish caught in waters less than 240-ft deep or greater than 500 ft deep.

Actions in Regulatory Amendment 11

- Changes to the 240-foot (40-fathom) closure
- Determination of transit provisions

2.1 List of Alternatives

2.1.1 Action 1: Changes to the 240-ft (40-fathom) Closure

Alternative 1 (No Action). Retain existing regulations for deepwater species (snowy grouper, blueline tilefish, yellowedge grouper, warsaw grouper, speckled hind, misty grouper, queen snapper, and silk snapper), including the prohibition of fishing for, possession, and retention of deepwater snapper species beyond a depth of 240-ft (40-fathoms; 73 m).

Alternative 2. Allow harvest of blueline tilefish in the South Atlantic in the deep water (seaward of the 240-ft depth contour).

Alternative 3. Allow harvest of blueline tilefish off North Carolina in the deep water (seaward of the 240-ft depth contour).

Alternative 4. Allow harvest of blueline tilefish off North Carolina north of Cape Hatteras in the deep water (seaward of the 240-ft depth contour).

Alternative 5. Exclude blueline tilefish from the deepwater closure south of Cape Canaveral.

Alternative 6. Open the closed area in the South Atlantic seaward of 500 ft. The intent is for closed area to extend from 240 to 500 ft.

Alternative 7. Allow harvest of snowy grouper in the South Atlantic in the deep water (seaward of the 240-ft depth contour).

Alternative 8. Allow harvest of snowy grouper off North Carolina in the deep water (seaward of the 240-ft depth contour).

Alternative 9. Allow harvest of snowy grouper off North Carolina north of Cape Hatteras in the deep water (seaward of the 240-ft depth contour).

Alternative 10. Exclude snowy grouper from the deepwater closure south of Cape Canaveral.

Alternative 11 (Preferred). Remove the prohibition of fishing for, possession, and retention of other deepwater snapper species beyond a depth of 240-ft (40-fathoms; 73 m).

2.1.2 Action 2: Transit Provisions

Alternative 1 (No Action) (Preferred). Do not allow transit through the 240-ft (40-fathom) closure with prohibited species onboard.

Alternative 2. The prohibition on possession does not apply to a person aboard a vessel that has snapper grouper species onboard if the vessel is in transit.

Alternative 3. The prohibition on possession does not apply to a person aboard a vessel that is in transit with snapper grouper species on board and with fishing gear appropriately stowed.

Definitions for Alternatives in Action 2

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, and any additional such nets not attached to the drum must be stowed below deck. **Crustacean traps** or **golden crab traps** 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".

Chapter 3. Affected Environment

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

- **Habitat environment** (Section 3.1)

  Examples include deepwater corals and sea grass beds

- **Biological environment** (Section 3.2)

  Examples include populations of blueline tilefish, 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

3.1 Habitat Environment

3.1.1 Inshore/Estuarine Habitat

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

3.1.2 Offshore Habitat

Predominant snapper grouper offshore fishing areas are located in live bottom and shelf-edge habitats, where water temperatures range from 11º to 27º C (52º to 81º F) due to the proximity of the Gulf Stream, with lower shelf habitat temperatures varying from 11º to 14º C (52º to 57º F). Water depths range from 16 to 27 meters (54 to 90 ft) or greater for live-bottom habitats, 55 to 110 meters (180 to 360 ft) for the shelf-edge habitat, and from 110 to 183 meters (360 to 600 ft) for lower-shelf habitat areas.

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

Rock outcroppings occur throughout the continental shelf from Cape Hatteras, NC to Key West, FL (MacIntyre and Milliman 1970; Miller and Richards 1979; Parker et al. 1983), which are principally composed of limestone and carbonate sandstone (Newton et al. 1971), and exhibit vertical relief ranging from less than 0.5 to over 10 meters (33 ft). Ledge systems formed by rock outcrops and piles of irregularly sized boulders are also common. Parker et al. (1983) estimated that 24% (9,443 km^2) of the area between the 27 and 101 meter (89 and 331 ft) depth contours from Cape Hatteras, NC to Cape Canaveral, FL is reef habitat. Although the bottom communities

found in water depths between 100 and 300 meters (328 and 984 ft) from Cape Hatteras, NC to Key West, FL is relatively small compared to the whole shelf, this area, based upon landing information of fishers, constitutes prime reef fish habitat and probably significantly contributes to the total amount of reef habitat in this region.

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

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

Plots of the spatial distribution of offshore species were generated from the Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP) data. The plots serve as point confirmation of the presence of each species within the scope of the sampling program. These plots, in combination with the hard bottom habitat distributions previously mentioned, can be employed as proxies for offshore snapper grouper complex distributions in the south Atlantic region. Maps of the distribution of snapper grouper species by gear type based on MARMAP data can also be generated through the South Atlantic Council's Internet Mapping System at the above address.

3.1.3 Essential Fish Habitat

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

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

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

3.1.4 Habitat Areas of Particular Concern

Areas which meet the criteria for Essential Fish Habitat-Habitat Areas of Particular Concern (EFH-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 South Atlantic Council-designated Artificial Reef Special Management Zones (SMZs).

Areas that meet the criteria for EFH-HAPCs include habitats required during each life stage (including egg, larval, postlarval, juvenile, and adult stages).

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

3.2 Biological and Ecological 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.

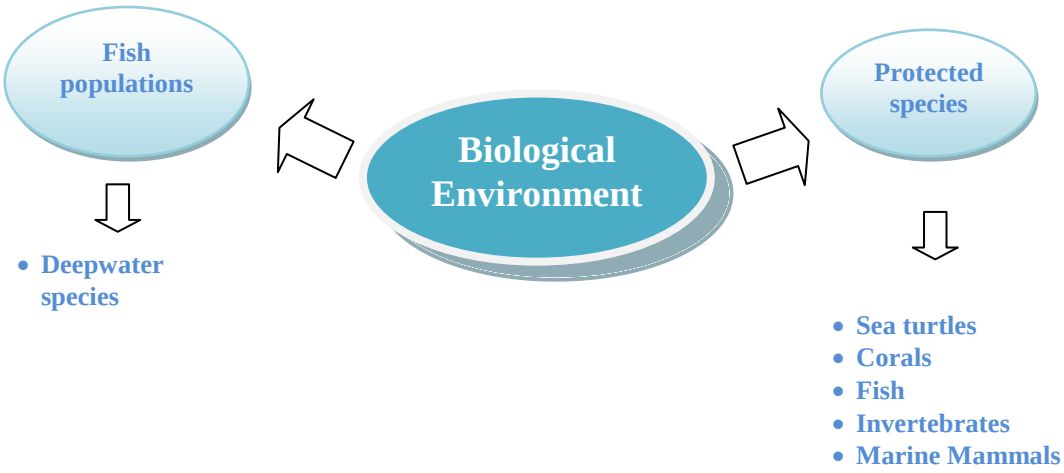

Figure 3-1. Two components of the biological environment described in this amendment.

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, many of them neither "snappers" nor "groupers". These species live in depths from a few feet (typically as juveniles) to hundreds of feet. As far as north/south distribution, the more temperate species tend to live in the upper reaches of the South Atlantic management area (e.g., black sea bass, red porgy) while the tropical variety's core residence is in the waters off South Florida, Caribbean Islands, and northern South America (e.g., black grouper, mutton snapper).

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

3.2.1.1 Speckled Hind

Speckled Hind
Stock Status

- Undergoing overfishing
- Overfished status unknown
- ABC=0 (landings only)
- ACL=0 (landings only; commercial and recreational)

Life History Information

Speckled hind occur in the Western Atlantic Ocean from North Carolina and Bermuda to the Florida Keys, and in the northern and eastern Gulf of Mexico (Heemstra and Randall 1993). The speckled hind is solitary and found in depths from 25 m (98 ft) (Heemstra and Randall 1993) to 400 m (1,312 ft) (Bullock and Smith 1991). Heemstra and Randall (1993) reported that it most commonly occurs at depths of 60-120 m (197-394 ft). Bullock and Smith (1991) indicated that most commercial catches are taken from depths of 50 m (164 ft) or more. Juveniles occur in shallower waters.

Maximum reported size is 110 cm (43.3 in) TL and 30 kg (66 lbs) (Heemstra and Randall 1993). The maximum size and age of individuals examined by Matheson and Huntsman (1984) in the South Atlantic Bight was 110 cm (43.3 in) and 15 years, respectively. Heemstra and Randall (1993) reported a maximum age of 25 years. Estimated size at maturity is 81.1 cm (32 in), and M (natural mortality) is estimated at 0.14 (Froese and Pauly 2003) to 0.15 (Potts et al. 1998).

The speckled hind is believed to form spawning aggregations (G. Gilmore, Dynamac Corporation, personal communication). Spawning reportedly occurs from July to September (Heemstra and Randall 1993). Prey items include fishes, crustaceans, and squids (Bullock and Smith 1991; Heemstra and Randall 1993).

Speckled hind probably migrate to deeper water as they grow and mature (Ziskin, 2008). Ziskin (2008) reported there was a positive relationship between depth and length for speckled hind examined during 1977 to 1993. Furthermore, like other grouper species, speckled hind change sex from female to male as they age (Ziskin 2008).

A study conducted by Ziskin (2008) indicated that total mortality and fishing mortality of speckled hind had increased since 1977-1993 suggesting that speckled hind continues to be overexploited, despite the 1994 regulation that limited commercial and recreational catch to one speckled hind per trip, and may not be reproductively resilient enough to recover from depressed population levels.

3.2.1.2 Warsaw Grouper

Warsaw Grouper
Stock Status

- Undergoing overfishing
- Overfished status unknown
- ABC=0 (landings only)
- ACL=0 (landings only; commercial and recreational)

Life History Information

Warsaw grouper occur in the Western Atlantic from Massachusetts to southeastern Brazil (Robins and Ray 1986), and in the Gulf of Mexico (Smith 1971). The warsaw grouper is a solitary species (Heemstra and Randall 1993), usually found on rocky ledges and seamounts (Robins and Ray 1986), at depths from 55 to 525 m (180-1,722 ft) (Heemstra and Randall 1993). Juveniles are sometimes observed in inshore waters (Robins and Ray 1986), on jetties and shallow reefs (Heemstra and Randall 1993).

Maximum reported size is 230 cm (91 in) TL (Heemstra and Randall 1993) and 263 kg (580 lbs) (Robins and Ray 1986). The oldest specimen was 41 years old (Manooch and Mason 1987). Natural mortality was estimated by the SouthEast Data Assessment and Review (SEDAR) group during November 2003 to range from 0.05 to 0.12 (SEDAR 4 2004). The warsaw grouper spawns during August, September, and October in the Gulf of Mexico (Peter Hood, NOAA Fisheries, personal communication), and during April and May off Cuba (Naranjo 1956). Adults feed on benthic invertebrates and on fishes (Heemstra and Randall 1993).

3.2.1.3 Snowy Grouper

Snowy Grouper
Stock Status

- Undergoing overfishing
- Overfished
- ABC=102,960 pounds whole weight (landings only)
- ACL=82,900 pounds gutted weight (commercial) and 523 fish (recreational)

Life History Information

Snowy grouper occur in the Eastern Pacific and the Western Atlantic from Massachusetts to southeastern Brazil, including the northern Gulf of Mexico (Robins and Ray 1986). They are found at depths of 30 to 525 m (98-1,722 ft). Adults occur offshore over rocky bottom habitat. Juveniles are often observed inshore and occasionally in estuaries (Heemstra and Randall 1993). Snowy grouper probably migrate to deeper water as they grow and mature (Wyanski et al. 2000).

The snowy grouper is a protogynous species (female first then turning to male at older ages). The smallest, youngest male examined by Wyanski et al. (2000) was 72.7 cm (28.8 in) TL and age 8. The median size and age of snowy grouper was 91.9 cm (34.5 in) and 16 years. The largest specimen observed was 122 cm (48 in) TL and 30 kg (66 lbs), and 27 years old (Heemstra and Randall 1993). The maximum age reported by Wyanski et al. (2000) was 29 years for fish collected off North Carolina and South Carolina. Radiocarbon techniques indicate

that snowy grouper may live for as long as 40 years (Pat Harris, South Carolina Department of Natural Resources, personal communication). Wyanski et al. (2000) reported that 50% of the females are mature at 54.1 cm (21.3 in) TL and 5 years of age. The smallest mature female was 46.9 cm (18.5 in) TL, and the largest immature female was 57.5 cm (22.6 in) TL.

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

SEDAR Assessment

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 SEDAR process, which was initiated in 2002, is a cooperative fishery management council endeavor intended to improve the quality 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. The goal of SEDAR is to seek improvements in the scientific quality of stock assessments, constituent and stakeholder participation in assessment development, transparency in the assessment process, and a rigorous and independent scientific review of completed stock assessments.

The snowy grouper stock in the Atlantic is undergoing overfishing and is overfished as of 2004 (last year of data in the stock assessment). For snowy grouper the most recent estimate of the fishing mortality rate is from 2002 and was = 0.154 and F_{MSY} = 0.05 as the maximum fishing mortality threshold (MFMT). Comparing these two numbers:

- F_{2002}/MFMT = 0.154/0.05 = 3.08

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

The snowy grouper stock in the Atlantic is overfished. For snowy grouper, the estimated level of spawning stock biomass

in 2003 was 869,503 pounds whole weight. The minimum stock size threshold (MSST) = 3,498,735 pounds whole weight. Comparing these two numbers:

- SSB_{2003}/MSST = 869,503/3,498,735 = 0.25

If the ratio is less than 1, then the stock is overfished. In the absence of fishing it was determined that it would take 13 years to rebuild the stock to B_{MSY}. The maximum recommended rebuilding time is 34 years based on the formula: T_{MIN} (13 years) + one generation time (21 years).

Data that provide information on stock status are the average weight and length from the fisheries landings as well as the observed age and length composition data. The 2002 average weights and lengths from the commercial fisheries suggest the population is at very low levels. The average weight and length in 2002 from the handline fishery suggests the population is near 11% and 3% of SSB_{MSY}, respectively. The average weight and length in 2002 from the longline fishery suggests the population is near 44% and 28% of SSB_{MSY}, respectively. The length composition data from the most recent years (2000-2002) also suggests a depleted population of snowy grouper. The observed length distributions are skewed toward smaller fish compared to an equilibrium, virgin state length composition.

3.2.1.4 Blueline Tilefish

Blueline tilefish
Stock Status

- Overfishing unknown
- Overfished unknown
- ABC=592,602 pounds whole weight
- ACL will be specified through the Comprehensive ACL Amendment

Life History Information

Blueline tilefish occurs in the Western Atlantic Ocean, North Carolina to southern Florida and Mexico, including the northern (and probably eastern) Gulf of Mexico (Dooley 1978). Blueline tilefish are found along the outer continental shelf, shelf break, and upper slope on irregular bottom with ledges or crevices, and around boulders or rubble piles in depths of 30 to 236 m (98-774 ft) and temperatures ranging from 15 to 23° C (59-73.4º F) (Ross 1978; Ross and Huntsman 1982; Robins and Ray 1986; Parker and Mays 1998). Fishermen off the coast of North Carolina north of Cape Hatteras report harvesting blueline tilefish off mud bottom. The number of fishermen using monofilament bottom longlines north of Cape Hatteras has increased since 2006. Monofilament longline gear requires fishing in specific habitat, particularly on mud bottom area, and is not as durable in strong current areas affiliated with rocky hardbottom.

Maximum reported size is 90 cm (35.7 in) TL and 7 kg (15 lbs) and maximum reported age is 42 years (Dooley 1978). The SEDAR group estimated M is between 0.04 and 0.17

(SEDAR 4 2004). Spawning occurs at night, from February to October, with a peak in May at depths of 48-232 m (157-761 ft) (Harris et al. 2004). This species feeds primarily on benthic invertebrates and fishes (Dooley 1978).

3.2.1.5 Yellowedge Grouper

Yellowedge grouper
Stock Status

- Overfishing unknown
- Overfished unknown
- ABC=30,221 pounds whole weight
- ACL will be specified through the Comprehensive ACL Amendment

Life History Information

Yellowedge grouper occur in the Western Atlantic from North Carolina to southern Brazil, including the Gulf of Mexico. A solitary, demersal, deep-water species, the yellowedge grouper occurs in rocky areas and on sand mud bottom, at depths ranging from 64 to 275 m (210 to 902 ft). On soft bottom habitats, this fish is often seen in or near trenches or burrow-like excavations (Heemstra and Randall 1993).

Maximum reported size is 114 cm (45.3 in) TL (male) and 18.6 kg (41 lbs). Cass-Calay and Bahnick (2002) observed a maximum age of 85 years that was validated by the use of radiocarbon dating. Natural mortality is estimated to be 0.05 (Cass-Calay and Bahnick 2002). Bullock et al. (1996) in the Gulf of Mexico reported that 50% of fishes are mature at 57 cm (22.4 in), and that 50% of females transform into males by 81 cm (32.2 in) TL. Spawning occurs from April through October in the South Atlantic (Keener 1984; Manooch 1984; Parker and Mays 1998). Ripe females were found in the eastern Gulf of Mexico from May through September (Bullock et al. 1996). Yellowedge grouper eat a wide variety of invertebrates (mainly brachyuran crabs) and fishes (Bullock and Smith 1991; Heemstra and Randall 1993).

3.2.1.6 Misty Grouper

Misty grouper
Stock Status

- Overfishing unknown
- Overfished unknown
- ABC=not provided by the SSC as misty grouper, at one time, was being considered for removal from the management unit in the Comprehensive ACL Amendment
- ACL will be specified through the Comprehensive ACL Amendment

Life History Information

Misty grouper occurs in the Western and Eastern Atlantic Ocean (Heemstra and Randall 1993). In the Western Atlantic, it ranges from Bermuda and the Bahamas to Brazil (Robins and Ray 1986). The misty grouper is a solitary, bottom-dwelling species. Adults generally occur at depths from about 100 to 550 m (327 to 1,803 ft) (Robins 1967). Juveniles occur in shallower waters (e.g., 30 m (98 ft)).

Little is known about the age, growth, and reproduction of this species. Maximum

reported size is 160 cm (63 in) TL and 100 cm (39 in) TL for males and females, respectively. Maximum reported weight is 107 kg (236 lbs) (Heemstra and Randall 1993). The estimated size at maturity is 81.1 cm (31.9 in), and M is 0.14 (Froese and Pauly 2003). This species feeds primarily on fishes, crustaceans, and squids (Heemstra and Randall 1993).

3.2.1.7 Queen Snapper

Queen snapper
Stock Status

- Overfishing unknown
- Overfished unknown
- ABC=not provided by the SSC as queen snapper, at one time, was being considered for removal from the management unit in the Comprehensive ACL Amendment
- ACL will be specified through the Comprehensive ACL Amendment

Life History Information

Queen snapper occurs in the Western Atlantic, ranging from Bermuda and North Carolina to Brazil, including the Gulf of Mexico and Caribbean Sea. It is commonly found near oceanic islands, and is particularly abundant in the Bahamas and the Antilles. This is a bottom-dwelling species (Allen 1985) and moves offshore to deep-water reefs and rocky ledges as it grows and matures (SAFMC 1998). Allen (1985) indicates it is primarily found over rocky bottom habitat, in depths of 100 to 450 m (327 to 1,475 ft). Thompson and Munro (1974) report it was caught on mud slopes of the south Jamaica shelf at a depth of 460 m (1,508 ft). Maximum reported size is 100 cm TL (39 in, male). Maximum reported weight is 5,300 g (11.7 lbs) (Allen 1985). Size at maturity and age at first maturity are estimated as 53.6 cm TL (21 in) and 1 year, respectively. Spawning is reported to occur during April and May off St. Lucia (Murray et al. 1988). Primary prey items include small fishes and squids (Allen 1985).

3.2.1.8 Silk Snapper

Silk snapper
Stock Status

- Overfishing unknown
- Overfished unknown
- ABC=27,519 lbs pounds whole weight
- ACL will be specified through the Comprehensive ACL Amendment

Life History Information

Silk snapper occur in the Western Atlantic, from North Carolina to Brazil, including the Bahamas and the northern Gulf of Mexico. It is commonly found along rocky ledges, in depths of 91-242 m (299-794 ft) (Robins and Ray 1986). Adults are generally found further offshore than juveniles (SAFMC 1998), and usually ascend to shallow water at night (Allen 1985). However, juveniles are sometimes observed on deep reefs (Robins and Ray 1986). Silk snapper form moving aggregations of similar-sized individuals (Boardman and Weiler 1980).

Maximum reported size is 83.0 cm (32.9 in) TL and 8.3 kg (18.3 lb) (Allen 1985). Size at maturity and age at first maturity are

estimated at 43.4 cm (17.2 in) TL and 6.3 years, respectively (Froese and Pauly 2003). Silk snapper do not change sex. Spawning occurs in June, July, and August in waters off North and South Carolina (Grimes 1987).

Silk snapper eat primarily fishes, shrimps, crabs, gastropods, cephalopods, tunicates, and some pelagic items, including urochordates (Allen 1985).

3.2.2 Protected Species

There are 31 different species of marine mammals that may occur in the exclusive economic zone (EEZ) of the South Atlantic region. All 31 species are protected under the Marine Mammal Protection Act and six are also listed as endangered under the ESA (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. Portions of designated critical habitat for North Atlantic right whales and *Acropora* corals also occur within the South Atlantic Council's jurisdiction. Section 3.5.5 of the Comprehensive ACL Amendment discusses the features essential for conservation found in each critical habitat area.

3.2.2.1 ESA-Listed Sea Turtles

Green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles are all highly migratory and travel widely throughout the South Atlantic. The following sections are a brief overview of the general life history characteristics of the sea turtles found in the South Atlantic region. Several volumes exist that cover the biology and ecology of these species more thoroughly (e.g., Lutz and Musick (eds.) 1997, Lutz et al. (eds.) 2002).

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

The **hawksbill's** pelagic stage lasts from the time they leave the nesting beach as hatchlings until they are approximately 22-25 cm in straight carapace length (Meylan 1988, Meylan and Donnelly 1999). The pelagic stage is followed by residency in developmental habitats (foraging areas where juveniles reside and grow) in coastal waters. Little is known about the diet of pelagic stage hawksbills. Adult foraging typically occurs over coral reefs, although other hard-bottom communities and mangrove-fringed areas are occupied occasionally. Hawksbills show fidelity to their foraging areas over several years (Van Dam and Diéz 1997). The hawksbill's diet is highly specialized and consists primarily of sponges (Meylan 1988). Gravid females have been noted ingesting coralline substrate (Meylan 1984) and calcareous algae (Anderes Alvarez and Uchida 1994), which are believed to be possible sources of calcium to aid in eggshell production. The maximum diving depths of these animals are not known, but the maximum length of dives is estimated at 73.5 minutes. More routinely, dives last about 56 minutes (Hughes 1974).

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

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

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

3.2.2.2 ESA-Listed Marine Fish

Historically the **smalltooth sawfish** in the U.S. ranged from New York to the Mexico border. Their current range is poorly understood but believed to have contracted from these historical areas. In the South Atlantic region, they are most commonly found in Florida, primarily off the Florida Keys (Simpfendorfer and Wiley 2004). Only two smalltooth sawfish have been recorded north of Florida since 1963 [the first was captured off North Carolina in 1963 and the other off Georgia in 2002 (National Smalltooth Sawfish Database, Florida Museum of Natural History)]. Historical accounts and recent encounter data suggest that immature individuals are most common in shallow coastal waters less than 25 meters (Bigelow and Schroeder 1953, Adams and Wilson 1995), while mature animals occur in waters in excess of 100 meters (Simpfendorfer pers. comm. 2006). Smalltooth sawfish feed primarily on fish. Mullet, jacks, and ladyfish are believed to be their primary food resources (Simpfendorfer 2001). Smalltooth sawfish also prey on crustaceans (mostly shrimp and crabs) by disturbing bottom sediment with their saw (Norman and Fraser 1938, Bigelow and Schroeder 1953).

3.2.2.3 ESA-Listed Marine Invertebrates

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

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

Wells 1967), while staghorn corals are found slightly deeper, 5 to 15 m (Goreau and Goreau 1973).

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

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

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

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

The SDDP does not provide data on recreational fishing interactions with ESA-listed sea turtle species; it only looked at commercial fisheries. However, anecdotal information indicates that recreational fishermen occasionally take sea turtles with hook-and-line gear. In order to develop an estimate of the recreational interactions with sea turtles, the extrapolated data from the SDDP (commercial interactions only) was used in the Biological Opinion.

Smalltooth sawfish are also considered vulnerable to capture by bottom longline and vertical hook-and-line gear based on their capture in other southeast fisheries using such gear (Poulakis and Seitz 2004; Simpfendorfer and Wiley 2004). SDDP data do not include any reports of smalltooth sawfish being caught in the South Atlantic commercial snapper grouper fishery. There are no other documented interactions

between smalltooth sawfish and the South Atlantic commercial snapper grouper fishery. However, the potential for interaction, led NOAA Fisheries Service to estimate future interactions between smalltooth sawfish and the snapper grouper fishery in the 2006 biological opinion (**Table 3-2**).

Regulations implemented through Snapper Grouper Amendment 15B (74 FR 31225; June 30, 2009) required all commercial or charter/headboat vessels with a South Atlantic snapper grouper permit, carrying hook-and-line gear on board, to possess required literature and release gear to aid in the safe release of incidentally caught sea turtles and smalltooth sawfish. These regulations are thought to decrease the mortality associated with accidental interactions with sea turtles and smalltooth sawfish.

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

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

Source: SEFSC Supplementary Discard Data Program

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

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

Source: NMFS 2006

3.3 Human Environment

Additional information on the commercial snapper grouper fishery is contained in previous amendments [Amendment 17B (SAFMC 2010b); Regulatory Amendment 9 (SAFMC 2011b); Amendment 25 (Comprehensive ACL Amendment) (SAFMC 2011c)] and is incorporated herein by reference.

3.3.1 Economic Description of the Commercial Fisheries

The commercial snapper grouper fishermen targeting the species affected by the proposed action (snowy grouper and blueline tilefish) utilize vertical lines and longlines, and mostly work from the North Carolina/Virginia border to the Atlantic side of Key West, Florida. The South Atlantic Council allows the use of bottom longlines north of St. Lucie Inlet, Florida, in depths greater than 50 fathoms, and only for deepwater species. Bottom longline gear is used to target snowy grouper and golden tilefish. Longline boats are typically bigger than bandit (vertical line) boats, their trips are longer, and they cost more to operate because they operate farther offshore. A longline spool generally holds about 15 mi of cable. Longlines are fished from daylight to dark because sea lice eat the flesh of hooked fish at night. The fishery is operated year round with little or no seasonal fluctuation barring hurricane disruption and quota closures.

Amendment 17B (SAFMC 2010b) contains detailed information regarding a description of the snapper grouper fishery including landings, ex-vessel value of those landings, price and effort over time, and all information in this section (Section 3.3.1) is from Amendment 17B:

In 2009, the snapper grouper commercial fishery landed 8.4 million pounds with a dockside value of $17.7 million dollars. On average, about 82% of snapper grouper vessels landed less than 10,000 pounds of snapper grouper species annually. A little over 2% harvested 50,000 pounds or more of snapper grouper species.

3.3.1.1 Snowy Grouper

Snowy grouper were landed on an average of 1,057 trips per year during 2003-2007, with total average annual landings of 230,000 pounds valued at $619,000 in 2007 dollars. Average annual landings of all other species on these trips came to 1.2 million pounds valued at $2.3 million. Snowy grouper accounted for 7.4% of the $8.4 million for logbook-reported landings of all species on all trips (including trips that did not land snowy grouper) by boats that harvested snowy grouper. Snowy grouper were landed by an average of 160 boats during 2003-2007, and 117 of them landed 1,000 pounds or less per year while 13 landed more than 5,000 pounds per year.

On average there were 387 trips per year where snowy grouper was the top source of revenue. Snowy grouper accounted for 170,000 pounds valued at $455,000 (2007 dollars), while all other species accounted for 149,000 pounds valued at $234,000. These 387 trips

accounted for 37% of the total number of trips with snowy grouper landings and 74% of the snowy grouper landings and ex-vessel value. There were an average of 607 trips on which snowy grouper was harvested but was not the top revenue species; total average annual landings of snowy grouper was approximately 61,000 pounds, compared with 1.0 million pounds worth $2.1 million for all other species.

3.3.1.2 Blueline Tilefish

North Carolina reported the highest blueline tilefish commercial landings among the states for each year from 2005-2009. South Carolina and Florida have reported landings, but each year there is a decline in these states, and blueline tilefish is not a significant fishery in either state. Georgia has not reported blueline tilefish landings.

The North Carolina fishery experienced a rapid increase in landings between 2007 and 2008; in 2008 and 2009 blueline tilefish commercial landings are over 400,000 lbs and over 450,000 lbs, respectively. Fishery value increased as landings increased, and in 2009 the fishery value was $732,239. Blueline tilefish was primarily harvested with vertical lines in 2005-2007, but in 2008 (when landings for North Carolina sharply increased) the use of longlines increased as well.

3.3.1.3 Imports

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

3.3.2 Economic Description of the Recreational Fishery

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

Amendment 17B (SAFMC 2010b) contains detailed information regarding a description of the snapper grouper recreational fishery including recreational landings, recreational effort, for-hire permits, and economic expenditures from recreational fishing. Note that this information

generally includes all snapper grouper species. All of the following information in this section (Section 3.3.2) is from Amendment 17B:

3.3.2.1 Recreational Harvest

Recreational harvest for blueline tilefish averages almost 250,000 lbs annually. Most of the harvest occurs by the for-hire sector. Recreational harvest of snowy grouper averages at about 85,000 lbs annually, with a majority coming from the for-hire sector. Recreational harvest is only 35% of the total snowy grouper harvest.

3.3.2.2 Recreational Effort

In general, North Carolina has the highest effort and recreational harvest of blueline tilefish, and Florida has the highest recreational effort for snowy grouper. Georgia and South Carolina report no target or catch effort for either species. While private mode target effort is greater than charter target effort for both species, charter catch effort values are the highest for both blueline tilefish and snowy grouper. Shore fishing for these species is not possible.

3.3.2.3 Permits

On January 11, 2011, there were 1,453 snapper grouper for-hire permits. For-hire permits do not distinguish charterboats from headboats. Based on a 1997 survey, Holland et al. (1999) estimated that a total of 1,080 charter vessels and 96 headboats supplied for-hire services in all South Atlantic fisheries during 1997. By 2010, the estimated number of headboats supplying for-hire services in all South Atlantic fisheries had fallen to 85, indicating a decrease in headboat fleet size of approximately 11% between 1997 and 2010 (K. Brennan, Beaufort Laboratory, SEFSC, personal communication, Feb. 2011).

There are no specific permitting requirements for recreational anglers to harvest snapper grouper. Instead, anglers are required to possess either a state recreational fishing permit that authorizes saltwater fishing in general, or be registered in the federal National Saltwater Angler Registry system, subject to appropriate exemptions.

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 17B (SAFMC 2010b), and Amendment 25 (SAFMC 2011c) and are incorporated herein by reference.

The following information utilizes NMFS summary harvest data (2005-2009) located at http://www.st.nmfs.noaa.gov/st1/commercial/landings/annual_landings.html to identify the states which have accounted for the highest commercial landings of the species covered by the proposed amendment.

Over 2005-2009, North Carolina is the dominant state for blueline tilefish commercial harvest, particularly in the most recent years when North Carolina harvested over 90% of the blueline tilefish commercial landings (**Table 3-3**). South Carolina and Florida follow in commercial harvest, but landings from both states drop from less than 25% of total regional landings to less than 5% in the most recent years. This proportional change results from a sharp increase in North Carolina landings since 2007, and drops in landings from South Carolina and Florida. Georgia has no reported landings of blueline tilefish for this period.

Table 3-3. Blueline tilefish commercial landings in lbs and proportion in parentheses for each year.

	North Carolina	South Carolina	Florida- East	Total
2005	40,280 (53%)	20,789 (28%)	14,768 (19%)	75,837
2006	135,184 (80%)	27,519 (17%)	4,561 (3%)	167,264
2007	54,724 (91%)	3,956 (7%)	1,210 (2%)	59,890
2008	400,142 (98%)	7,079 (1.7%)	1,221 (0.3%)	408,442
2009	467,805 (99%)	4,511 (0.01%)	293 (<0.01%)	472,609
2010	423,679 (96.5%)	14,723 (3%)	791 (<1%)	439,193

Source: NMFS Office of Science and Technology Commercial Landings Statistics (URL: http://www.st.nmfs.noaa.gov/st1/commercial/landings/monthly_landings.html)

The Snapper Grouper Advisory Panel reported that blueline tilefish is growing in importance as a commercial species in North Carolina recently because of closures and reductions for other target species. However, in recent years blueline tilefish is not identified as one of the top fifteen commercial species (in landings and ex-vessel value) for any community in the South Atlantic (more information can be found in Section 3.8.3 in Amendment 25, SAFMC 2011c).

From 2005-2009 North Carolina also reported the highest proportion of South Atlantic commercial landings for snowy grouper (average > 50% of regional landings) (**Table 3-4**). Landings from South Carolina make up almost 40% of landings in 2005 and 2006 but that proportion has decreased as Florida's proportion increased to over >20% in recent years. Over all, commercial landings from all three states have decreased since 2005. Georgia reported a small proportion of commercial landings in 2007 only.

Table 3-4. Snowy grouper commercial landings in lbs and each state's proportion in parentheses for each year.

	North Carolina	South Carolina	Georgia	Florida- East	Total
2005	86,146 (46%)	72,440 (39%)	0	28,496 (15%)	187,082
2006	102,567 (51%)	78,410 (39%)	0	20,243 (10%)	201,220
2007	48,363 (60%)	13,450 (17%)	672 (<1%)	17,895 (22%)	80,380
2008	26,714 (50%)	12,716 (24%)	0	13,941 (26%)	53,371
2009	32,943 (56%)	10,937 (19%)	0	14,715 (25%)	58,595
2010	35,482 (52%)	16,347 (24%)	0	15,933 (24%)	67,762

Source: NMFS Office of Science and Technology Commercial Landings Statistics
(URL: http://www.st.nmfs.noaa.gov/st1/commercial/landings/monthly_landings.html)

In North Carolina, the top three counties for snowy grouper commercial landings are Dare County, Carteret County, and New Hanover County. In Florida, commercial landings for snowy grouper place Key West, Port Orange, and Tavernier as the top three communities (**Table 3-5**). Relative to other species however, snowy grouper landings are much lower than landings for black sea bass and vermilion snapper in North Carolina, and vermilion snapper, black grouper and red grouper in Florida (see Section 3.8.3 in Amendment 17B, SAFMC 2010b).

Table 3-5. Cumulative snowy grouper commercial landings for the top three counties/communities 2003-2007

North Carolina	Dare County	439,301 lbs
	Carteret County	387,333 lbs
	New Hanover County	211,988 lbs
Florida	Key West	269,315 lbs
	Pt Orange	195,872 lbs
	Tavernier	114,877 lbs
Source: Logbook data, SEFSC 2009.		

Snowy grouper is one of the top fifteen commercial species in landings and value for the following communities in the South Atlantic (**Section 3.8.3**, Comprehensive ACL Amendment, SAFMC 2011c):

- Islamorada, FL
- Key West, FL
- Little River, SC
- Murrell's Inlet, SC
- Southport, NC
- Morehead City, NC

- Carolina Beach, NC
- Wilmington, NC

Across the three main reporting areas, North Carolina, South Carolina, Georgia, and Florida, landings averaged 71,000 to 81,000 pounds each for the years 2003 to 2007 (**Table 3-6**). The majority of snowy grouper, approximately 75%, are caught using vertical lines versus all other gears.

Table 3-6. Annual landings of snowy grouper for trips with at least one pound of snowy grouper, by region and primary gear, 2003-2007 (landings in thousand pounds, whole weight).

Landing region or primary gear	2003	2004	2005	2006	2007	Average
North Carolina	95	90	81	91	47	81
South Carolina	94	65	86	95	13	71
Georgia and northeast Florida	9	6	4	3	3	5
Central and southeast Florida	36	28	25	15	15	24
Florida Keys	50	51	52	54	46	51
Vertical lines	197	176	185	188	117	173
Other gear	87	64	62	69	6	58

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of September 22, 2008, and Accumulated Landings System database as of September 17, 2008. NOAA Fisheries Service, Southeast Regional Office permits database.

Recreational fishing is also an important component for South Atlantic coastal communities, including both the private sector and for-hire sector. Target trips for deepwater species such as blueline tilefish and snowy grouper are referred to as "deep dropping". This method usually includes an electric reel, special line, and 6-12 lbs of weight, and is advertised as a specialty type of fishing. Reports and press coverage indicate deep dropping is growing in popularity among private anglers and the for-hire sector. Because of the gear, boat, and expertise required to catch blueline tilefish and snowy grouper, it is likely that private anglers who target these species are more heavily invested (suitable boat to reach fishing grounds, electronic reel, etc.) in recreational fishing. At least one deep drop tournament has been held in Marathon, FL.

Blueline tilefish recreational effort is most significant in North Carolina, followed by Florida. Florida has the largest reported recreational effort for snowy grouper, followed by North Carolina. In general recreational effort for blueline tilefish and snowy grouper is minimal in South Carolina and Georgia (see **Section 3.3.2.2**).

Recreational effort is highest during the summer months, which suggests that recreational trips for snowy groupers and blueline tilefish are tied to the high season for tourism and good weather in the North Carolina and Florida coastal communities. Deep dropping is generally seen advertised for charter trips (versus headboats), which cater to clientele wishing to target a certain species or type of fish, and have the ability to pay for the specialized trip.

Social Vulnerability

Recent research has identified counties along the South Atlantic Coast that may be vulnerable to a variety of coastal hazards through the use of what has been called the Social Vulnerability

Index (SoVI) (Cutter et al. 2003). These vulnerabilities may come in the form of high unemployment, high poverty rates, low education, and other demographic characteristics and the SoVI is an index that consists of 32 different variables combined into one comprehensive index to measure social vulnerability. Although the SoVI was created to understand social vulnerability to coastal environmental hazards, it can also be interpreted as a general measure of vulnerability to other social disruptions, such as adverse regulatory change or manmade hazards. This does not mean that there will be adverse effects, only that there may be a potential for adverse effects under the right circumstances. Fishing communities in these counties may have more difficulty adjusting to regulatory changes if those impacts affect employment or other critical social capital. At present, a social vulnerability index is being created for fishing communities in the Southeast region with more timely data (the SoVI uses 2000 census data). Until that index is completed, the SoVI will substitute at the county level for a measure of vulnerability for those communities that are within the boundaries of a particular coastal county. This concept is closely tied to environmental justice and the thresholds that are addressed with regard to that concept.

Those counties in Florida that were categorized as having high social vulnerability using the SoVI are: Miami-Dade, Palm Beach, Martin, St. Lucie, and Duval; those counties with medium high social vulnerability are: Broward, Indian River, Volusia, and Flagler. Much of the Florida eastern coast is classified as either medium high or high social vulnerability, likely due to the fact that there are a high number of retirees and a high number of minorities in these counties, especially in south Florida.

Those counties in Georgia that were categorized as having medium high vulnerability were Liberty and Chatham counties. The fishing communities within those counties are: Savannah, Tybee Island, Thunderbolt, Skidaway Island, and Midway.

There were no coastal counties in South Carolina that were categorized as having high social vulnerability with Colleton County the only coastal county with medium high vulnerability. The communities of Walterboro, Green Pond, and Edisto Beach are located within Colleton County.

Those counties in North Carolina, that were categorized as having high social vulnerability using the SoVI, are: Onlsow, Washington, Bertie, Chowan, and Perquimans. Those with medium high vulnerability were New Hanover, Carteret, and Craven.

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

Responsibility for federal fishery management decision-making is divided between the U.S. Secretary of Commerce (Secretary) and eight regional fishery management councils that represent the expertise and interests of constituent states. Regional councils are responsible for preparing, monitoring, and revising management plans for fisheries needing management within their jurisdiction. The Secretary is responsible for collecting and providing the data necessary for the councils to prepare fishery management plans and for promulgating regulations to implement proposed plans and amendments after ensuring that management measures are consistent with the Magnuson-Stevens Act and with other applicable laws. In most cases, the Secretary has delegated this authority to NOAA Fisheries Service.

The South Atlantic Council is responsible for conservation and management of fishery resources in federal waters of the U.S. South Atlantic. These waters extend from 3 to 200 mi offshore from the seaward boundary of the States of North Carolina, South Carolina, Georgia, and east Florida to Key West. The South Atlantic 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 South Atlantic Council Committees have full voting rights at the Committee level but not at the full South Atlantic Council level. South Atlantic Council members serve three-year terms and are recommended by State Governors and appointed by the Secretary from lists of nominees submitted by State governors. Appointed members may serve a maximum of three consecutive terms.

Public interests also are involved in the fishery management process through participation on Advisory Panels and through council meetings, which, with few exceptions for discussing personnel matters, are open to the public. The South Atlantic 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 Procedure Act, in the form of "notice and comment" rulemaking.

3.4.1.2 State Fishery Management

The state governments of North Carolina, South Carolina, Georgia, and Florida have the authority to manage fisheries that occur in waters extending three nautical miles from their respective shorelines. North Carolina's marine fisheries are managed by the Marine Fisheries Division of the North Carolina Department of 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 South Atlantic Council level is to ensure state participation in federal fishery management decision-making and to promote the development of compatible regulations in state and federal waters.

The South Atlantic States are also involved through the Atlantic States Marine Fisheries Commission (ASMFC) in management of marine fisheries. This commission was created to coordinate state regulations and develop management plans for interstate fisheries. It has significant authority, through the Atlantic Striped Bass Conservation Act and the Atlantic Coastal Fisheries Cooperative Management Act, to compel adoption of consistent state regulations to conserve coastal species. The ASFMC also is represented at the South Atlantic Council level, but does not have voting authority at the South Atlantic Council level.

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

3.4.1.3 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 The Final Penalty Policy was issued and announced on April 14, 2011 (76 FR 20959).

Chapter 4. Environmental Consequences

This section contains the environmental consequences of the alternatives. The South Atlantic Fishery Management Council (South Atlantic Council) is considering the implementation of transit provisions in **Action 2** as one alternative in **Action 1** (**Alternative 6**) would allow fishing to occur seaward of a spatial closure and transit may be necessary. For all alternatives in **Action 1**, the prohibition of speckled hind and warsaw grouper harvest would remain.

4.1 Action 1: Changes to the 240-ft (40-fathom) Closure

Alternative 1 (No Action). Retain existing regulations for deepwater species (snowy grouper, blueline tilefish, yellowedge grouper, warsaw grouper, speckled hind, misty grouper, queen snapper, and silk snapper), including the prohibition of fishing for, possession, and retention of deepwater snapper species beyond a depth of 240-ft (40-fathoms; 73 m).

Alternative 2. Allow harvest of blueline tilefish in the South Atlantic in the deep water (seaward of the 240-ft depth contour).

Alternative 3. Allow harvest of blueline tilefish off North Carolina in the deep water (seaward of the 240-ft depth contour).

Alternative 4. Allow harvest of blueline tilefish off North Carolina north of Cape Hatteras in the deep water (seaward of the 240-ft depth contour).

Alternative 5. Exclude blueline tilefish from the deepwater closure south of Cape Canaveral.

Alternative 6. Open the closed area in the South Atlantic seaward of 500 ft. The intent is for closed area to extend from 240 to 500 ft.

Alternative 7. Allow harvest of snowy grouper in the South Atlantic in the deep water (seaward of the 240-ft depth contour).

Alternative 8. Allow harvest of snowy grouper off North Carolina in the deep water (seaward of the 240-ft depth contour).

Alternative 9. Allow harvest of snowy grouper off North Carolina north of Cape Hatteras in the deep water (seaward of the 240-ft depth contour).

Alternative 10. Exclude snowy grouper from the deepwater closure south of Cape Canaveral.

Alternative 11 (Preferred). Remove the prohibition of fishing for, possession, and retention of other deepwater snapper species beyond a depth of 240-ft (40-fathoms; 73 m).

4.1.1 Biological Effects

4.1.1.1 What Are the Biological Effects of the No Action Alternative (Retaining the 240-ft (40-Fathom) Closure)?

Alternative 1 (No Action) would retain the existing regulations for deepwater species (snowy grouper, blueline tilefish, yellowedge grouper, warsaw grouper, speckled hind, misty grouper, queen snapper, and silk snapper), including the prohibition of fishing for, possession, and retention of other deepwater snapper species beyond a depth of 240-ft (referred to herein as the "240-ft (40-fathom closure)"). The following discussion of the expected effects to the biological environment was included in Amendment 17B to Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (Amendment 17B; SAFMC 2010b):

> "Closing the area beyond 240-ft **(Alternative 4 Preferred)**, to deepwater snapper grouper fishing, would provide protection to the largest, most fecund fish and promote a natural sex ratio into the future. Speckled hind are thought to form spawning aggregations, which can be susceptible to targeted fishing pressure (G. Gilmore, Dynamac Corporation, personal communication). Prohibiting all harvest of deepwater snapper grouper species beyond 240-ft would also protect these spawning aggregations, as well as decrease bycatch mortality of speckled hind, warsaw grouper, and other co-occurring deepwater snapper grouper species."

4.1.1.2 What Are the Biological Effects of Alternatives 2 – 11 (Those Alternatives That Would Open All or a Portion of the 240-ft (40-Fathom) Closure)?

Alternatives 2-11 (Preferred) would modify the 240-ft (40-fathom) closure established through Amendment 17B. **Alternatives 2-5** would exempt blueline tilefish from the harvest prohibition deeper than 240-ft; whereas, **Alternatives 7-10** would exempt snowy grouper from these regulations. **Alternative 6** would open the closed area for deepwater snapper grouper species in the South Atlantic seaward of 500 ft and maintain a closed area from 240 to 500 ft. The South Atlantic Fishery Management Council (South Atlantic Council) considered **Alternative 6** as some fishermen from the Florida Keys have stated that they do not catch warsaw grouper and speckled hind in waters deeper than a 500 ft depth while they fish for snowy grouper and blueline tilefish. **Alternative 11 (Preferred)** would remove the 240-ft (40-fathom) closure from the regulations. For all alternatives in **Action 1**, the prohibition of speckled hind and warsaw grouper harvest would remain.

Allowing retention of deepwater species when fishing beyond a 240-ft depth (**Alternatives 2-Preferred Alternative 11**) could result in increased fishing mortality to the deepwater species. However, the South Atlantic Council is proposing, in the Comprehensive Annual Catch Limit (ACL) Amendment, the specification of annual catch limits (ACLs), annual catch targets

(ACTs), and accountability measures (AMs) for a deepwater species complex. This complex includes black snapper, blackfin snapper, blueline tilefish, misty grouper, queen snapper, sand tilefish, silk snapper, and yellowedge grouper. NOAA Fisheries will implement the Comprehensive ACL Amendment in 2012. Furthermore, ACLs are already in place for snowy grouper, speckled hind, and warsaw grouper. Catch levels specified in the Comprehensive ACL Amendment should ensure catch levels are sustainable for the deepwater species and ensure overfishing does not occur. The South Atlantic Council's Scientific and Statistical Committee (SSC) provided the following acceptable biological catch (ABC) recommendations at their April 2011 meeting:

- blueline tilefish: ABC = 592,602 lbs whole weight
- silk snapper: ABC = 27,519 lbs whole weight
- yellowedge grouper: ABC = 30,221 lbs whole weight

The SSC did not apply their ABC Control Rule to black snapper, blackfin snapper, misty grouper, queen snapper, and sand tilefish. At the time they were assigning ABCs, the South Atlantic Council was proposing to remove those species from the fishery management unit (FMU) through the Comprehensive ACL Amendment. At their August 2011 meeting, the South Atlantic Council decided not to remove those species from the FMU. The SSC will apply their ABC Control Rule to these species at an upcoming meeting.

Prior to the 240-ft (40-fathom closure), commercial blueline tilefish landings had been increasing in recent years, particularly off the coast of Cape Hatteras, North Carolina (**Figure 4-1**). Off the coast of North Carolina in federal waters in 2010, landings of blueline tilefish by commercial fishermen were 423,675 pounds whole weight. Fishermen have testified that the 240-ft (40-fathom) closure has resulted in the cancellation of trips as they are no longer economically-feasible. Therefore, removal of the closure would re-open the blueline tilefish fishery, which had been limited since the closure was implemented in early 2010, and increase the current level of fishing mortality to the deepwater species, particularly blueline tilefish. However, after the Comprehensive ACL Amendment has been put in place, any increase in mortality would not be expected to negatively impact blueline tilefish, silk snapper, or yellowedge grouper as catches would be at sustainable levels due to the implementation of ACLs and AMs.

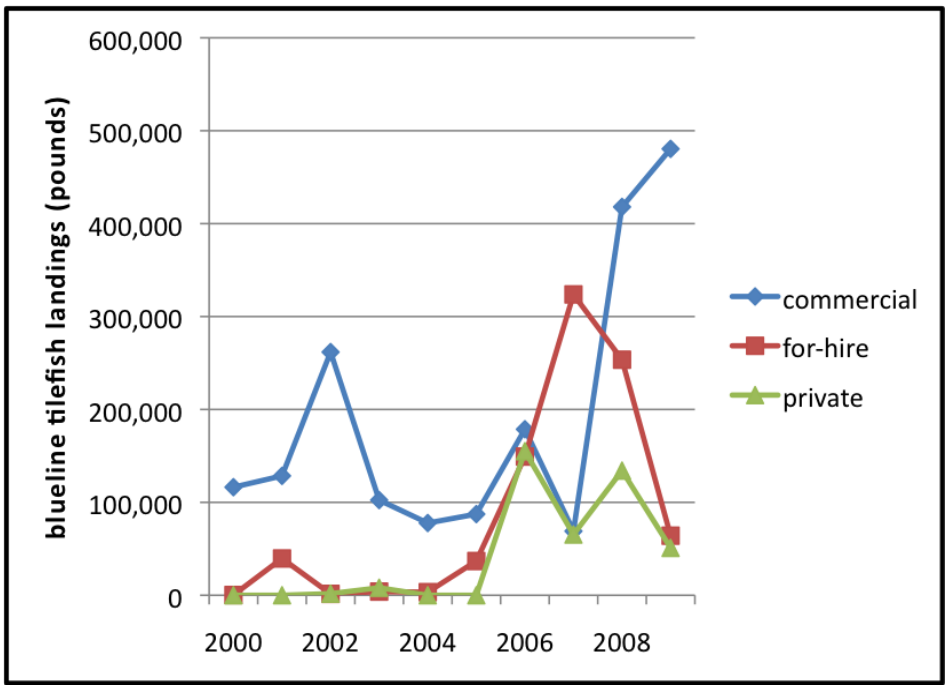

Figure 4-1. Reported blueline tilefish landings between 2000 and 2009 in the South Atlantic Council's area of jurisdiction.
Source: SEFSC ACL Dataset dated June 14, 2011.

In the absence of specifying ACLs through the Comprehensive ACL Amendment, increased levels of fishing mortality to blueline tilefish and other deepwater species could have impacts to the stocks by reducing the biomass from current levels. Reduced biomass below sustainable levels may have adverse effects to future population levels. Types of adverse effects include changes in sex ratio of the population, disruption of food webs, and changes in the genetic characteristics of the stock. Further, some species, including snowy grouper, aggregate annually in the same locations and during the same time each season to spawn, making them vulnerable for fishermen to target and remove in large numbers (Coleman et al. 2000). Disruption of spawning activities may reduce the reproductive potential of the stock. Despite the increase in fishing mortality to the blueline tilefish stock, the system of ACLs, ACTs, and AMs, when implemented, is expected to keep harvest at sustainable levels, even with the expected increase in fishing mortality being proposed in **Alternatives 2 - Preferred Alternative 11**.

The alternatives could increase the amount of snowy grouper and undersized silk snapper discards. The minimum size limit for silk snapper is 12 in, and fishermen would discard undersized fish. The current commercial trip limit for snowy grouper is 100 pounds gutted weight; fishermen may be forced to discard snowy grouper once the trip limit is reached if they continue to fish for other deepwater species such as blueline tilefish. Fishermen have reported that they choose fishing locations to avoid snowy grouper once the 100 pound trip limit is reached. However, as mentioned previously, ACLs are in place for snowy grouper, speckled hind, and warsaw grouper, and are being proposed for other deepwater species and associated fish populations. The ACL for speckled hind and warsaw grouper is 0 (landings only). Harvest

of speckled hind and warsaw grouper is prohibited and deepwater marine protected areas have been implemented to reduce mortality of these stocks.

4.1.1.3 What Are the Biological Effects of Alternatives 2-11 Concerning Mortality to Speckled Hind and Warsaw Grouper?

Fishery managers implemented the 240-ft (40-fathom) closure to reduce the discard mortality of speckled hind and warsaw grouper. Speckled hind and warsaw grouper are extremely vulnerable to overfishing because they are slow growing, long-lived, and change sex from female to male with increasing size and age. Furthermore, speckled hind is believed to form spawning aggregations, which can increase its vulnerability to fishing pressure.

The Analysis in Appendix B Evaluates the Following Data Sets

- Commercial logbook
- Headboat survey
- Reef fish observer program
- MARMAP
- Accumulated landing system
- Trip tickets
  -North Carolina
  -South Carolina
  -Georgia
  -Florida

The following discussion summarizes the effects of **Alternatives 2-Preferred Alternative 11** to speckled hind and warsaw grouper. This discussion is based on an evaluation of speckled hind and warsaw grouper landings contained in **Appendix B**. More specifically, the analyses contained in **Appendix B** seeks to identify: (1) What data are available for speckled hind and warsaw grouper, (2) where speckled hind and warsaw grouper are caught, and (3) what species are caught with speckled hind and warsaw grouper.

In order to evaluate the potential effects to speckled hind and warsaw grouper stocks from **Alternatives 2-Preferred Alternative 11**, the following six questions have been evaluated. A greater level of technical information is contained in **Appendix B**.

1. Have speckled hind and warsaw grouper been encountered off the South Atlantic coast north of Cape Hatteras, North Carolina?
2. Have speckled hind and warsaw grouper been encountered off the South Atlantic coast south of Cape Canaveral, Florida?
3. Have speckled hind and warsaw grouper been encountered off the South Atlantic coast north of Cape Hatteras, North Carolina, beyond 240-ft depth?
4. Have speckled hind and warsaw grouper been encountered off the South Atlantic coast south of Cape Canaveral, Florida, beyond 240-ft depth?
5. Have speckled hind and warsaw grouper been encountered off the South Atlantic coast beyond 500 ft depth?
6. Are speckled hind and warsaw grouper caught on trips where blueline tilefish or snowy grouper are caught?

(1) Have speckled hind and warsaw grouper been encountered off the South Atlantic coast north of Cape Hatteras, North Carolina?

Speckled hind and warsaw grouper are rarely encountered by headboat and commercial fishermen north of Cape Hatteras **(Table 4-1)** however, data are limited in this area**.**

Table 4-1. Percent of warsaw grouper and speckled hind records north of Cape Hatteras, North Carolina. The years included in each dataset are covered in Appendix B.

	North of Cape Hatteras	
Dataset	**Speckled Hind**	**Warsaw Grouper**
ALS	0%	0%
NC Trip Ticket	2%	0%
Headboat Survey	1%	0%
MARMAP	0%	0%
RFOP	0%	0%
CLB	2%	0%

Sampling by the Marine Resources Monitoring, Assessment, and Prediction (MARMAP) program and Reef Fish Observer Program (RFOP) has not occurred in sites north of Cape Hatteras.

(2) Have speckled hind and warsaw grouper been encountered off the South Atlantic coast south of Cape Canaveral, Florida?

Speckled hind and warsaw grouper are sometimes encountered by headboat and commercial fishermen south of Cape Canaveral **(Table 4-2).**

Table 4-2. Percent of warsaw grouper and speckled hind records south of Cape Canaveral, Florida. The years included in each dataset are covered in Appendix B.

	South of Cape Canaveral	
Dataset	**Speckled Hind**	**Warsaw Grouper**
ALS	12%	4%
Florida Trip Ticket	1%	24%
Headboat Survey	3%	5%
MARMAP	0%	0%
RFOP	0%	0%
CLB	5%	0%

Sampling by MARMAP and Reef Fish Observer Program is very limited south of Cape Canaveral.

(3) Have speckled hind and warsaw grouper been encountered off the South Atlantic coast north of Cape Hatteras beyond 240-ft depth?

Speckled hind and warsaw grouper are rarely encountered north of Cape Hatteras, North Carolina, in waters deeper than 240-ft **(Table 4-3)**. Depth of capture is not available for headboat. Few MARMAP or Reef Fish Observer Program (RFOP) data are available north of Cape Hatteras, North Carolina.

Table 4-3. Percent of observations by depth and area north of Cape Hatteras, North Carolina. The years included in each dataset are covered in Appendix B.

	Speckled Hind				Warsaw Grouper			
Range	**Comm LB***	**Discard LB**	**RFOP**	**MARMAP**	**Comm LB***	**Discard LB**	**RFOP**	**MARMAP**
>240-ft North of 35°00 N	4%	0%	0%	0%	0%	0%	0%	0%

*Ratio of lbs landed

(4) Have speckled hind and warsaw grouper been encountered off the South Atlantic coast south of Cape Canaveral, Florida, beyond 240-ft depth?

Speckled hind and warsaw grouper are rarely encountered south of Cape Canaveral in waters deeper than 240-ft **(Table 4-4)**. Depth of capture is not available for headboat. Few MARMAP or RFOP data are available south of Cape Canaveral.

Table 4-4. Percent of observations by depth and area south of Cape Canaveral, FL. The years included in each dataset are covered in Appendix B.

	Speckled Hind				Warsaw Grouper			
Range	**Comm LB***	**Discard LB**	**RFOP**	**MARMAP**	**Comm LB***	**Discard LB**	**RFOP**	**MARMAP**
>240-ft South of 27°00N	2%	0%	0%	0%	0%	0%	0%	0%

*Ratio of lbs landed.

(5) Have speckled hind and warsaw grouper been encountered off the South Atlantic coast beyond 500 ft depth?

Speckled hind and warsaw grouper are rarely encountered in waters deeper than 500 ft **(Table 4-5)**. Depth of capture is not available for headboat. Few MARMAP or RFOP data are available from waters greater than a 500 ft depth.

Table 4-5. Percent of observations by depth and area in EEZ waters greater than 500 ft. The years included in each dataset are covered in Appendix B.

	Speckled Hind				Warsaw Grouper			
Range	Comm LB*	Discard LB	RFOP	MARMAP	Comm LB*	Discard LB	RFOP	MARMAP
>500 ft Entire EEZ	4%	0%	0%	0%	0%	0%	0%	0%

*Ratio of lbs landed.

(6) Are speckled hind and warsaw grouper caught on trips where blueline tilefish or snowy grouper are caught?

Cluster analyses indicated low association between warsaw grouper and speckled hind with blueline tilefish and snowy grouper in the South Atlantic. This finding may be attributable to the unique habitat preferences of these species. Warsaw grouper and speckled hind prefer hard bottom structure with relief. Manooch and Mason (1987) indicated warsaw grouper inhabit steep cliffs, notches, and rocky ledges of the continental shelf break, and Huntsman and Dixon (1976) stated that speckled hind prefers to inhabit high- and low-profile hard bottom. The habitat preference for blueline tilefish appears to be somewhat different from warsaw grouper and speckled hind. Parker and Ross (1986) and Parker and Mays (1998) indicate blueline tilefish inhabits irregular bottoms comprised of troughs and terraces inter-mingled with sand, mud, or shell hash bottom where they live in burrows. The majority of snowy grouper landings in the South Atlantic are in waters deeper than 500 ft, where landings of speckled hind and warsaw grouper are extremely rare.

Cluster analysis results suggest allowing harvest of blueline tilefish and snowy grouper would not likely result in significant increases in the mortality of speckled hind or warsaw grouper, although low levels of bycatch of these species might occur. The cluster analysis indicated low levels of association between warsaw grouper and speckled hind with blueline tilefish and snowy grouper. This is supported by anecdotal information from fishermen. In addition, it appears that speckled hind and warsaw grouper have different habitat preferences than blueline tilefish and a shallower depth distribution than the exploited portion of the snowy grouper stock.

Alternative 11 (Preferred) could decrease discards of speckled hind and warsaw grouper in waters shallower than 240-ft (40-fathoms) and have positive benefits to the stocks. The South Atlantic Council's SSC, as well as the Snapper Grouper Advisory Panel, indicated the 240-ft (40-fathom) closure established in Amendment 17B could increase negative biological harm to speckled hind and warsaw grouper by increasing fishing pressure at the shelf edge (160 ft; 27 fathoms), which is the nursery area and zone of greatest abundance for these species.

4.1.1.4 What Are the Biological Effects of the Proposed Alternatives on Protected Resources?

Alternative 1 (**No Action**) will perpetuate the existing level of risk for interactions between ESA-listed species and the fishery. **Alternative 2-10** and **Preferred Alternative 11** are not

anticipated to have any affects on smalltooth sawfish or elkhorn and staghorn coral because these species are not know to occur in waters that deep. The effects of **Alternatives 2-10** and **Preferred Alternative 11** on sea turtles is unclear. The previous closure appears unlikely to have reduced fishing effort in the fishery as whole; rather it appears to have caused effort occurring seaward of 240 feet to shift inshore. **Alternatives 2-10** and **Preferred Alternative 11** may increase the levels of fishing effort occurring in the current closed area as fishers targeting those species move beyond 240 feet. However, this increased fishing effort is likely to be a redistribution of effort currently occurring in areas shoreward of 240 feet and is therefore unlikely to actually change the potential for interaction with sea turtles.

4.1.1.5 What Are the Ranking of the Alternatives in Terms of Expected Biological Effects?

Alternatives

1. No action. Retain 40-fathom closure
2. Allow blueline entire EEZ
3. Allow blueline off North Carolina
4. Allow blueline north of Cape Hatteras
5. Allow blueline south of Cape Canaveral
6. Open 240-500 ft
7. Allow snowy grouper entire EEZ
8. Allow snowy grouper of North Carolina
9. Allow snowy grouper north of Cape Hatteras
10. Allow snowy grouper south of Cape Canaveral
11. (**Preferred**)Remove the 240-ft (40-fathom) closure from the regulations

Each of the alternatives has been ranked according to its anticipated biological effects **(Figure 4-2). Alternative 1** (**No Action**) would have the least amount of negative biological impacts as the alternative would retain the 240-ft (40-fathom) closure. Encounters with speckled hind and warsaw grouper are greater south of Cape Canaveral than they are north of Cape Hatteras or north of the North Carolina/Virginia border; however, data north of Cape Hatteras, North Carolina are limited. An exempted fishing permit has been approved to augment information in that area. As such, the alternatives that would allow fishing for blueline tilefish and snowy grouper north of Cape Hatteras (**Alternatives 4** and **9**, respectively) would have fewer negative biological impacts to the stocks than the other action alternatives. Effects to the biological environment would be expected to be similar for alternatives that allow fishing for snowy grouper and those that allow fishing for blueline tilefish beyond a 240-ft depth. This is because the probability of catching either species with speckled hind and warsaw grouper is low according to the cluster analysis outlined in **Appendix B**. **Alternative 11 (Preferred)** could result in the greatest level of negative biological effects as it would allow the greatest amount of fishing of all the alternatives. However, with respect to speckled hind and warsaw grouper, **Alternative 11 (Preferred)** could have the greatest positive biological effect for the species if it reduces fishing pressure and bycatch. As mentioned previously, the South Atlantic Council's SSC and Snapper Grouper AP indicated the 240-ft (40-fathom closure) might actually increase fishing mortality of speckled hind and warsaw grouper if it resulted in a shift in fishing pressure from deep water to the shelf edge (131 to 262 ft depth) where speckled hind and warsaw grouper are most abundant.

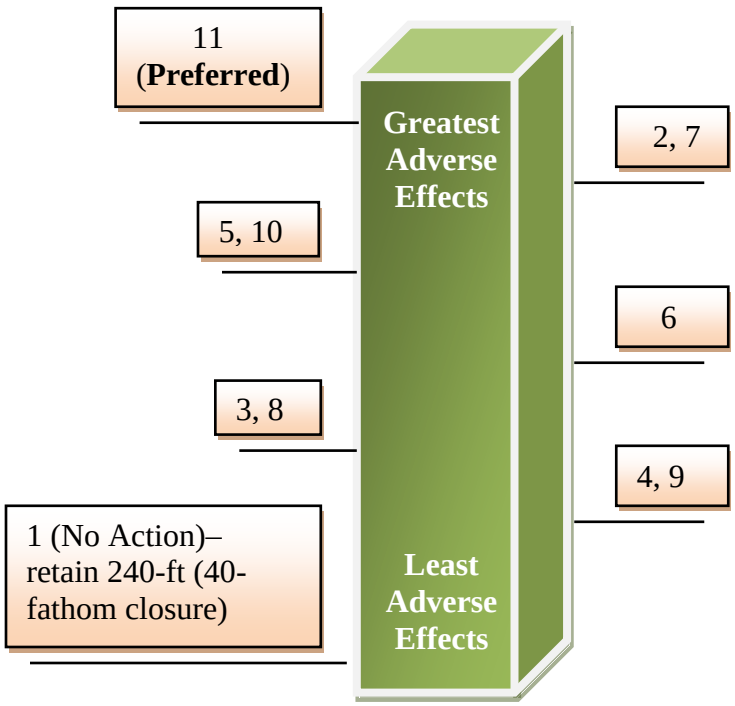

Figure 4-2. Ranking of the alternatives in terms of overall biological effects.

4.1.2 Economic Effects

Discussion of the expected economic effects of **Alternative 1 (No Action)** and **Alternative 11 (Preferred)** is provided in **Appendix D**. In summary, **Alternative 1 (No Action)** would be expected to result in a continued reduction in annual ex-vessel revenues of $348,076 (2008 dollars), and **Preferred Alternative 11** would be expected to result in an elimination of these annual revenue losses. Because **Alternatives 2-10** would reduce the harvest prohibitions of the current closed area, but not eliminate the closed area, the estimated economic effects of these alternatives would be expected to be bounded by the estimates provided for **Alternative 1 (No Action)** and **Alternative 11 (Preferred)**. Estimates of the expected economic effects of **Alternatives 2-10** are not available. However, inferences on the possible ranking of these alternatives can be derived from the information in **Figure 4-2,** which provides ranking of the alternatives from the perspective of expected biological effects. Under the assumption that the long-term biological status of these stocks, and associated economic effects, would not be harmed by lifting the respective harvest prohibitions, the expected economic effects would be the reverse of the biological effects. The logic of this determination is the lower the adverse

biological effects (greater harvest reduction), the greater the reduction in ex-vessel revenues. Because, by assumption, these fish need not be saved from a biological perspective, any harvest reduction would be an unnecessary economic loss. As a result, **Alternative 11 (Preferred)** would be expected to result in the greatest economic benefit (increased ex-vessel revenues), followed by **Alternatives 2** and **7**, **Alternatives 5** and **10**, **Alternative 6**, **Alternatives 3** and **8**, **Alternatives 4** and **9**, and **Alternative 1 (No Action)**.

4.1.3 Social Effects

Maintaining long-term stock targets or conditions is assumed to result in net long-term positive social and economic benefits because these targets and conditions encompass a balance of the considerations of the health of the resource and the economic and social needs of society. Thus, it is important that short-term decisions be consistent with the long-term objectives. However, although the net long-term outcome of a management path may be positive, the short-term consequences to fishery participants and associated businesses and communities of short-term management decisions may be so severe (e.g., these entities may be forced to leave the fishery) that the long-term benefits accrue to different entities than those who bear the consequences of the short-term actions.

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

A major indirect effect of fisheries management on the fishing community and related sectors is increased confusion and differences between the community and the management sector in levels of understanding and agreement on what is best for both the resource and the community. The fact that "the science" can result in closures of other fisheries to protect specific stocks not usually targeted, such as the deepwater closure to protect warsaw grouper and speckled hind, is particularly disconcerting to many fishermen and concerned stakeholders, especially when there are little data beyond landings information to verify the stock status of warsaw grouper and speckled hind. This can result in enforcement problems and non-compliance with current and future regulations leading to inefficient use of resources, ineffectual regulations, and failure to meet management targets, which may precipitate additional restrictions.

In general, area closures entail greater short-term dislocations and adjustments for the social environment. Commercial and recreational fishermen may be able to adjust to area closures by switching to other species available outside the closed area, or by leaving fishing and seeking other employment or recreational opportunities elsewhere. If other species are depleted, regulations may prevent fishermen from freely switching to another fishery, or if other forms of employment or recreational activities are unavailable or difficult to find, then the adjustments would be more severe than if alternatives were readily available.

Alternative 1 (no action), would continue the prohibition implemented in Amendment 17B of the harvest of additional deepwater species in order to minimize the incidental catch of speckled hind and warsaw grouper. This alternative is the most restrictive of all alternatives considered and, as a result, would be expected to have the greatest negative social impact on fishermen and associated businesses and communities, particularly due to the continued inclusion of snowy grouper and blueline tilefish in the list of prohibited species. Most effects would be expected to accrue to Florida and North Carolina fishermen and associated businesses and communities.

Alternatives 2-5 include exemptions to the deepwater closure to allow harvest of blueline tilefish. All fishermen targeting blueline tilefish in the South Atlantic EEZ would benefit from **Alternative 2**. Fishermen working in the EEZ off North Carolina would be benefit from the exemption in **Alternative 3**, but only fishermen fishing for blueline tilefish north of Cape Hatteras would benefit from **Alternative 4**. Fishermen working in the EEZs of South Carolina, Georgia and Florida would not benefit from **Alternatives 3** and **4**, which may result in continuation of negative social impacts from the deepwater closure in Amendment 17B. **Alternative 5** would exempt blueline tilefish from the closure in waters south of Cape Canaveral, FL, which would benefit only fishermen fishing in the EEZ off of south Florida. **Alternative 5** would continue prohibition of blueline tilefish harvest by North Carolina fishermen, and would likely result in similar impacts on North Carolina as **Alternative 1 (no action)**. Specifically, dependence on blueline tilefish by the North Carolina commercial sector has grown significantly over the past few years (see **Section 3.3.3**), and any alternative that did not allow harvest of blueline tilefish in North Carolina waters would have significant social impacts on the fishermen and communities, including loss of income and employment opportunities.

Alternative 6 would allow harvest of deepwater species seaward of 500 ft, which would allow harvest of the deepwater species while allowing protection of warsaw grouper and speckled hind in depths of 240-500 ft. This alternative would likely lessen the negative social impacts on fishermen due to the deepwater closure in Amendment 17B by allowing some harvest of deepwater species, although it could add additional travel time (and costs) on fishing trips. For some smaller vessels, although harvest is permitted, the additional costs could be substantial enough to cause fishermen to target other species (if possible) or exit the fishery. **Alternatives 7-10** include exemptions in the deepwater closure to allow harvest of snowy grouper. All fishermen targeting snowy grouper in the South Atlantic EEZ would benefit from **Alternative 7**. Fishermen working in the EEZ off North Carolina would be benefit from the exemption in **Alternative 8**, but only fishermen fishing for snowy grouper north of Cape Hatteras would benefit from **Alternative 9**. Fishermen working in the EEZs of South Carolina, Georgia and

Florida would not benefit from **Alternatives 8** and **9**, which may result in continuation of negative social impacts from the deepwater closure in Amendment 17B. Specifically, **Alternatives 8** and **9** would continue prohibiton of snowy grouper harvest by Florida fishermen, and would likely result in similar impacts on Florida as **Alternative 1 (no action).** Specifically this may result in reduced recreational opportunities for fishermen targeting snowy grouper, and negatively affect the for-hire fleet and clientele. In the recreational sector, this is a specialized type of fishing (**Section 3.3.3**) and a continued prohibition on harvest of snowy grouper will significantly alter the fishing experience of deep dropping. This in turn, could affect demand for charter trips that specialize in deepwater species, negatively impacting the for-hire fleet. **Alternative 10** would exempt snowy grouper from the closure in waters south of Cape Caneveral, FL, which would benefit only fishermen fishing in the EEZ off of south Florida, which may have negative social impacts on fishermen who target or depend on snowy grouper in the other states, specifically commercial fishermen in North Carolina.

Alternative 11 (Preferred) will result in the most social benefits by removing the deepwater closure and allowing harvest of deepwater species, in particular blueline tilefish and snowy grouper. While there are broad social benefits in protecting warsaw grouper and speckled hind, there is little evidence that the deepwater closure is necessary to achieve an adequate level of protection, and social benefits will accrue through subsequent actions of the South Atlantic Council to protect warsaw grouper and speckled hind. Additionally there are broad social benefits from removing the deepwater closure and once again allowing the harvest of blueline tilefish and snowy grouper to provide income and employment opportunities to commercial fishermen and the for-hire sector, specifically in North Carolina and Florida, and continued recreational opportunities.

4.1.4 Administrative Effects

Alternative 1 would not impact the administrative environment beyond the status quo. Monitoring for compliance by law enforcement personnel would continue and distribution of periodic fishery bulletin reminders of the closed area provisions may be necessary. **Alternatives 2-5** would result in similar time and cost burdens on the administrative environment since they each would allow harvest of blueline tilefish without allowing harvest of the other five deepwater species included in the deepwater closure. Allowing harvest of blueline tilefish, regardless of where harvest would be permitted, is likely to make law enforcement efforts slightly more complex since the species is harvested in the same areas where five other snapper grouper species are prohibited. Verifying that fishermen are targeting only blueline tilefish rather than other deepwater snapper grouper species may be challenging if no prohibited species are found onboard. **Alternative 6** would open the area between the 240-ft and 500 ft depth contour. Allowing harvest of deepwater species within this depth zone but not beyond 500 ft would likely result in an increase in fuel costs associated with monitoring efforts since the boundary would be located further offshore. **Alternatives 7-10** would all allow harvest of snowy grouper in various areas within the EEZ. Administrative impacts of **Alternatives 7-10** would be the same as those under **Alternatives 2-5** since only the species affected differs. However, more than one alternative could be chosen under this action. A combination of one or more alternatives that would allow harvest of both blueline tilefish and snowy grouper would result in the greatest

impacts on the administrative environment due to increased enforcement challenges associated with monitoring harvest of two species within a closed area compared to one or none. **Alternative 11 (Preferred)** would result in the least negative impact on the administrative environment since monitoring of the closed areas would no longer be required, and fishermen would no longer need to be reminded of the provisions associated with the deepwater closed area.

4.2 Action 2: Transit Provisions

Alternative 1 (No Action) (Preferred). Do not allow transit through the 240-ft (40-fathom) closure with prohibited species onboard.

Alternative 2. The prohibition on possession does not apply to a person aboard a vessel that has snapper grouper species onboard if the vessel is in transit.

Alternative 3. The prohibition on possession does not apply to a person aboard a vessel that is in transit with snapper grouper species on board and with fishing gear appropriately stowed.

The South Atlantic Fishery Management Council (South Atlantic Council) is considering whether fishermen should be allowed to transit through the 240-ft (40-fathom) closed area with prohibited species onboard. The need to specify transit provisions is not equal across the Action 1 alternatives. For example, transit provisions would not need to be specified for **Alternative 11** as this alternative would completely remove the 240-ft (40-fathom) closure. The South Atlantic Council may decide, however, to allow transit through closed areas specified in the other alternatives, such as the one proposed in **Alternative 6** that would apply between a depth of 240 and 500 ft depth. In this instance, the South Atlantic Council may want to specify if fishermen would be allowed to transit through the closed area with fish caught in waters less than 240-ft deep or greater than 500 ft deep.

4.2.1 Biological Effects

Alternative 1 (No Action) (Preferred) would not allow transit through the area closure. **Alternative 2** would allow transit through areas closed to harvest of deepwater species. If the South Atlantic Council chooses to retain an area closure with retention of deepwater species allowed seaward of the closure, deepwater species that are caught outside a closed area may still need to be transported through a closed area to the vessel's home port or snapper grouper dealer. In order to reduce safety risks that could result from vessels having to navigate around a closed area in bad weather, the South Atlantic Council is considering allowing such vessels to legally transit through a proposed closed area under specific conditions. **Alternative 2** would apply to vessels that have onboard legally harvested snapper grouper who wish to transit through a proposed closed area. **Alternative 3** would require that such a vessel must appropriately stow prohibited fishing gear while transiting through the subject area.

Allowing transit through a closed area is likely to have negligible negative direct or indirect effects on the biological environment. The efficacy and control of such a provision is largely the responsibility of law enforcement personnel. As with any fishery management provision, there is the chance that some level of non-compliance may occur at any given time. One hundred percent compliance is not a realistic expectation for proposed snapper grouper closures; however, with a closure in place the biological impacts of illegal snapper grouper harvest would likely be minimal.

Alternatives 1 (No Action) (Preferred) and **Alternatives 2 and 3** will not affect smalltooth sawfish or elkhorn and staghorn coral because they are benthic species that are unlikely to contact vessels transiting through the 240-foot closure area. **Alternatives 2 and 3** are also unlikely to impact sea turtles. Transiting vessels could potentially strike sea turtles but this appears unlikely because of the speed at which most snapper grouper vessels travel. As the amount of vessel traffic and sea turtle abundance in a given area increase, the potential for interactions between sea turtles and vessels also increases. The impact of **Alternatives 1 (No Action) (Preferred)** and **Alternative2 and 3** are unclear. If the alternatives reduce the amount of vessel traffic in the area of the closure then the risk of a vessel strike in the area is likely to decrease. Consequently, if they simply shift the same amount of vessel traffic to other areas, then an increase in vessel strike potential could occur in areas outside the closure. Regardless, these potential shifts in vessel traffic are unlikely to increase the risk of vessel interactions for the fishery as a whole.

4.2.2 Economic Effects

In tandem with any area closure, a prohibition on transit would be expected to result in increased fishing costs because vessels with prohibited species would be required to navigate around the closed area. As a result, if an area closure for any of the species addressed in this proposed amendment remains in effect, **Alternative 1 (No Action) (Preferred)** would be expected to result in the greatest economic costs. **Alternatives 2** and **3** would be expected to reduce these economic costs, because they would allow transit. Although transit would be allowed, some costs would continue but change from costs associated with increased travel time and associated fuel costs to costs associated with managing the gear on-board the vessel. Among these two alternatives, **Alternative 3** would be expected to be the most burdensome from a gear management perspective because fishing gear would have to be appropriately stored. This may become a practical issue for a vessel that intends to fish upon exiting the closed area if the additional gear management time reduces the time available to fish and subsequent harvest and revenues. The effects of **Alternative 2** would be reduced relative to **Alternative 3** because the gear could not be fished while transiting (trolling would not be allowed; trolling by definition would be fishing and not transiting), but would not have to be fully stored. It is noted, however, that the adoption of the proposed alternative to eliminate the area closure would render this discussion moot because transit issues would not be relevant if an area closure does not exist.

4.2.3 Social Effects

Under the Preferred Alternative in Action 1, which removes the deepwater closure, a transit provision is not necessary. Thus, **Alternative 1 (No Action) (Preferred)** will not result in any social effects. Under any alternative in Action 1, **Alternatives 2** and **3** would be expected to result in positive social effects by permitting fishermen to continue fishing in waters outside of any closure.

4.2.4 Administrative Effects

Transit provisions would only be necessary if the South Atlantic Council chooses to maintain some form of the deepwater area closure. Therefore, a transit provision would apply under **Alternatives 2-10** under **Action 1** of this amendment. **Alternative 11 (Preferred)** under **Action 1** would do away with the current deepwater closure and the transit provision would not be necessary if **Alternative 11 (Preferred)** is promulgated through rulemaking. **Alternatives 2** and **3** under **Action 2** would result in similar administrative impacts when compared to the status quo. These alternatives would serve to further impact the administrative environment via increased or re-allocated enforcement efforts. **Alternative 1** is the least administratively burdensome transit alternative since no transit would be allowed through the deepwater closed area, which would relieve enforcement personnel of having to determine if vessels carrying deepwater snapper grouper species onboard are in compliance with the closure provision.

Chapter 5. Council's Choice for the Preferred Alternative

5.1 Changes to the 240-ft (40-fathom) Closure

5.1.1 Snapper Grouper Advisory Panel Comments and Recommendations

The Snapper Grouper Advisory Panel (SGAP) met in April of 2011. Their recommendation was to eliminate the deepwater closure. However, the SGAP acknowledged that while they doubted the benefit of the deepwater closure in protecting speckled hind or warsaw group, they felt strongly that these species did need additional protection. They suggested the South Atlantic Council might want to consider other management measures such as spawning season or small, targeted area closures.

5.1.2 Law Enforcement Advisory Panel Comments and Recommendations

The Law Enforcement Advisory Panel (LEAP) met in July of 2011. The LEAP was not in favor of the deepwater closure. The panelists stated they would have difficulty enforcing any of the closed area options since the closed areas are located so far offshore in most of the South Atlantic region and because other than speckled hind and warsaw grouper, it is not illegal to possess any of the other species protected by the deepwater closure once outside of any closed area.

5.1.3 Scientific and Statistical Committee Comments and Recommendations

The Science and Statistical Committee (SSC) met in April of 2011. The SSC felt it had not been provided with enough information to determine the efficacy of the deepwater closure and the proposed alternatives for modifying the closed area. However, they did state, in general, that it appears the deepwater closure has little, or limited effect on protecting speckled hind and warsaw grouper.

5.1.4 South Atlantic Council Choice for Preferred Alternative

The South Atlantic Council chose **Preferred Alternative 11** to remove the prohibition of fishing for deepwater snapper species. The South Atlantic Council concluded that the species that the 240-ft (40-fathom) closure was primarily intended to protect are rarely encountered in waters at these depths. In addition, the economic hardship imposed on fishermen from the 240-ft (40-fathom) closure is greater than was anticipated when Amendment 17B was approved by the South Atlantic Council. Speckled hind and warsaw grouper are more likely to be encountered at shallower depths in more specific, concentrated areas. However, recent data analyses suggest speckled hind and warsaw grouper rarely co-occur with snowy grouper, blueline tilefish, yellowedge grouper, misty grouper, queen snapper, or silk snapper. Warsaw grouper and speckled hind prefer hard bottom structure with relief. Manooch and Mason (1987) indicated warsaw grouper inhabit steep cliffs, notches, and rocky ledges of the continental shelf break. Huntsman and Dixon (1976) stated that speckled hind prefers to inhabit high- and low-profile hard bottom. The habitat preference for blueline tilefish appears to be somewhat different from warsaw grouper and speckled hind. The Council did not choose **Alternatives 1-10** because all were shown to not provide significant biological protection for speckled hind and warsaw grouper. Despite the increase in fishing mortality to the blueline tilefish stock, the system of ACLs, ACTs, and AMs, when implemented, is expected to keep harvest at sustainable levels, even with the expected increase in fishing mortality being proposed in **Alternatives 2-11**. The Council concluded the preferred alternative best meets the goals and objectives of the Snapper Grouper FMP as amended.

5.2 Transit Provisions

5.2.1 Snapper Grouper Advisory Panel Comments and Recommendations

The SGAP did not have specific comments about the transit provisions proposed in this amendment.

5.2.2 Law Enforcement Advisory Panel Comments and Recommendations

The LEAP preferred **Alternative 1** due to enforceability issues related to knowing specific depths during transiting by vessels. Vessels could only be cited if they were stopped in a closed area.

5.2.3 Scientific and Statistical Committee Comments and Recommendations

The SSC made no comments on the transiting provisions of this amendment.

5.2.4 South Atlantic Council Choice for Preferred Alternative

The Council selected **Alternative 1 (No Action)**, as its preferred alternative. **Alternative 1 (No Action)** does not require any transit provisions. The Council did not choose **Alternative 2** or **Alternative 3**, because the selection of **Alternative 11** in **Action 1** as the preferred negates the need to specify transit provisions as it completely removes the 240-ft (40-fathom) closure. Had the South Atlantic Council chosen **Alternatives 2-10** of **Action 1**, a provision to allow transit through closed areas could apply. For example, a transit provision could apply if a spatial closure was created between a 240 and 500 ft depth as specified in **Alternative 6**. However, such a provision became irrelevant with the choice of the preferred alternative for **Action 1**. The Council concluded the preferred alternative best meets the goals and objectives of the Snapper Grouper FMP as amended.

Chapter 6. Cumulative Effects

6.1 Biological

As directed by the National Environmental Policy Act (NEPA), federal agencies are mandated to assess not only the indirect and direct impacts, but the cumulative impacts of proposed actions as well. NEPA defines a cumulative impact as *"the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time"* (40 C.F.R. 1508.7). Cumulative effects can either be additive or synergistic. A synergistic effect is when the combined effects are greater than the sum of the individual effects.

Various approaches for assessing cumulative effects have been identified, including checklists, matrices, indices, and detailed models (MacDonald 2000). The Council on Environmental Quality (CEQ 1997) offers guidance on conducting a Cumulative Effects Analysis (CEA) in a report titled "Considering Cumulative Effects under the National Environmental Policy Act". The report outlines 11 items for consideration in drafting a CEA for a proposed action.

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.
2. Establish the geographic scope of the analysis.
3. Establish the timeframe for the analysis.
4. Identify the other actions affecting the resources, ecosystems, and human communities of concern.
5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stress.
6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.
7. Define a baseline condition for the resources, ecosystems, and human communities.
8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.
9. Determine the magnitude and significance of cumulative effects.
10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.
11. Monitor the cumulative effects of the selected alternative and adapt management.

This CEA for the biophysical environment will follow a modified version of the 11 steps. Cumulative effects for the socio-economic environment will be analyzed separately.

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.

The Council on Environmental Quality (CEQ) cumulative effects guidance states that this step is done through three activities. The three activities and the location in the document are as follows:

I. The direct and indirect effects of the proposed actions **(Section 4.0)**;
II. Which resources, ecosystems, and human communities are affected **(Section 3.0)**; and
III. Which effects are important from a cumulative effects perspective **(information revealed in this Cumulative Effects Analysis (CEA)**.

2. Establish the geographic scope of the analysis.

The immediate impact area would be the federal 200-mile limit of the Atlantic off the coasts of North Carolina, South Carolina, Georgia, and east Florida to Key West, which is also the South Atlantic Fishery Management Council's (South Atlantic 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 (EEZ). The ranges of affected species are described in **Section 3.2**. 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. For the species addressed in this amendment, landings data through 2009 were used in the subject biological analysis.

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 the snapper grouper species addressed in this amendment

A. Past

Past regulatory activity for the relevant snapper grouper species includes bag and size limits, spawning season closures, commercial quotas, gear prohibitions and limitations, area closures, and a commercial limited access system.

Snapper Grouper Amendment 13C (SAFMC 2006) was implemented on October 23, 2006. Amendment 13C established quotas, trip limits, and bag limits to end overfishing of snowy grouper, golden tilefish, vermilion snapper, and black sea bass. It also increased harvest of red porgy consistent with the rebuilding program.

Snapper Grouper Amendment 14 (SAFMC 2007) was implemented on February 12, 2009. Implementing regulations established eight Type 2 Marine Protected Areas (MPAs) in federal waters ranging from North Carolina to Florida (see **Figure 6-1**). A Type 2 MPA is an area within which fishing for or retention of snapper grouper species is prohibited but other types of legal fishing, such as trolling, are allowed. The prohibition on possession does not apply to a person aboard a vessel that is in transit with fishing gear appropriately stowed. The MPAs are being used as a management tool to promote the optimum size, age, and genetic structure of slow growing, long-lived deepwater snapper grouper species (speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, blueline tilefish, and sand tilefish). Studies to assess the effectiveness of the deepwater MPAs have been conducted annually by the Southeast Fisheries Science Center since 2004. For purposes of this amendment, the South Atlantic Council will use these studies to determine whether a change in the size and/or configuration of the existing MPAs is needed to increase the biological benefits to deepwater snapper grouper species, particularly for speckled hind and warsaw grouper.

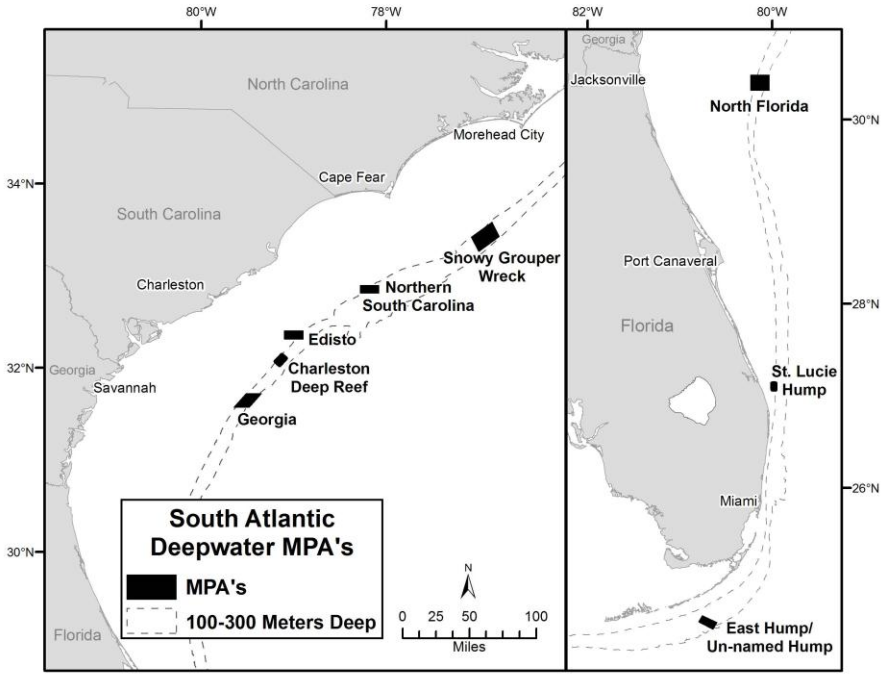

Figure 6-1. Marine protected areas implemented under Snapper Grouper Amendment 14.

Amendment 16 to the Fishery Management Plan (FMP) for the Snapper Grouper Fishery of the South Atlantic Region (Amendment 16; SAFMC 2009a) was partially approved by the Secretary of Commerce (Secretary); all regulations were effective on 7/29/09. Amendment 16 implemented a January-April shallow water grouper spawning season closure and created a five- month seasonal closure for vermilion snapper.

Amendment 17A to the FMP for the Snapper Grouper Fishery of the South Atlantic Region (Amendment 17A; SAFMC 2010a) included a rebuilding plan and management measures that would end overfishing of red snapper. Amendment 17A specified an Annual Catch Limit (ACL) and Accountability Measures (AMs) for red snapper as required by the Magnuson-Stevens Fishery Conservation and Management (Magnuson-Stevens Act). One of several management measures the South Atlantic Council considered in Amendment 17A was a large area closure for all snapper grouper fishing off the coasts of Georgia and Northern Florida. This closure would have enhanced the expected biological benefits of the spawning season closure for shallow water grouper in Amendment 16, and the deepwater snapper grouper closure in Amendment 17B to the FMP for the Snapper Grouper Fishery of the South Atlantic Region (Amendment 17B; SAFMC 2010b). The Final Rule for Amendment 17A, issued on December 3, 2010, extended the prohibition of red snapper in federal waters throughout the South Atlantic EEZ effective immediately. The implementation of the area

closure, however, was delayed. The South Atlantic Council approved Regulatory Amendment 10 to the FMP for the Snapper Grouper Fishery of the South Atlantic Region (Regulatory Amendment 10; SAFMC 2011a) for submission to the Secretary during its December 2010 meeting in order to eliminate the area closure based on updated stock assessment information for red snapper (SEDAR 24, 2010).

Amendment 17B (SAFMC 2010b) was effective on January 31, 2011. The amendment established ACLs and AMs for nine species in the snapper grouper management complex listed as undergoing overfishing: golden tilefish, snowy grouper, speckled hind, warsaw grouper, black grouper, black sea bass, gag, red grouper, and vermilion snapper. Measures in the amendment included the deepwater closure (240-ft (40-fathom) seaward) for deepwater species to help protect warsaw grouper and speckled hind. The closure was also intended to help protect other deepwater species where release mortality is estimated at 100% for the multi-species fishery. Additional measures in the amendment included a reduction in the snowy grouper bag limit to one fish per vessel per trip; establishment of a combined ACL for gag, black grouper, and red grouper of 662,403 lbs gutted weight for the commercial fishery, and 648,663 lbs gutted weight for the recreational fishery; an allocation of 97% commercial and 3% recreational for the golden tilefish fishery based on landings history; and establishment of AMs as necessary.

The 240-ft (40-fathom) closure implemented through Amendment 17B has likely precluded much of the effort shift into deeper water that may have otherwise taken place as a result of the spawning season closure in Amendment 16. The remaining available species, such as black sea bass, vermilion snapper, and golden tilefish, are managed under commercial quotas and the effort shift into those fisheries as a result of the combined effects of Snapper Grouper Amendments 16 and 17B has partly contributed to the quotas for these species being met faster.

B. Present

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

Amendment 23 to the FMP for the Snapper Grouper Fishery of the South Atlantic Region is included in the Comprehensive Ecosystem-Based Amendment 2 (CE-BA 2; SAFMC 2011d), which has been submitted by the South Atlantic Council for review by the Secretary. The amendment would limit harvest of snapper grouper species in Special Management Zones off South Carolina to the bag limit.

Amendment 24 (SAFMC 2011e) to the FMP for the Snapper Grouper Fishery of the South Atlantic Region is being developed to address overfishing of red grouper. The amendment includes actions for: Maximum Sustainable Yield; Minimum Stock Size Threshold; a rebuilding schedule and rebuilding strategy: ABC; sector allocations; and sector ACLs, optimum yield, and AMs.

Amendment 25 to the FMP for the Snapper Grouper Fishery of the South Atlantic Region is included in the Comprehensive Annual Catch Limit Amendment (SAFMC 2001c). The amendments contained in this document are being developed to meet the requirements of the Magnuson-Stevens Act to establish ACLs and AMs for species not undergoing overfishing including snapper grouper complex species, dolphin, wahoo, and golden crab. Actions contained within the ACL Amendment include: an action to remove species from the fishery management unit, as appropriate; establishment of species groupings; specification of jurisdictional and sector allocations; management measures to limit recreational and commercial sectors to their ACLs; AMs; and any necessary modifications to the range of regulations.

Amendments to other FMPs that could affect snapper grouper species include Amendment 18 to the FMP for Coastal Migratory Pelagic Resources in the Atlantic and Gulf of Mexico (Coastal Migratory Pelagics (Mackerel) Amendment 18; GMFMC and SAFMC 2011b), and Amendment 10 to the FMP for Spiny Lobster in the Gulf of Mexico and South Atlantic (Spiny Lobster Amendment 10; GMFMC and SAFMC 2011a). Mackerel Amendment 18 has been approved for formal review by both Councils and would establish ACLs, AMs, and ACTs for king mackerel, Spanish mackerel, and cobia. A number of snapper grouper fishers also participate in the mackerel fishery. Spiny Lobster Amendment 10 is currently under review by the Secretary of Commerce and would establish ACLs, AMs, and ACTs for spiny lobster. A number of snapper grouper fishers also participate in the lobster fishery.

C. Reasonably Foreseeable Future

Amendment 18A to the FMP for the Snapper Grouper Fishery of the South Atlantic Region is currently under development. The amendment would limit effort in the black sea bass portion of the snapper grouper fishery, reduce bycatch in the black sea bass pot sector, and improve the accuracy and timing of fisheries statistics. In addition, the amendment would change the constant-catch rebuilding strategy for black sea bass and change the recreational AMs put in place for black sea bass through Amendment 17B. A stock assessment for black sea bass is currently underway. It is the South Atlantic Council's intent for Amendment 18A to address any needed changes to the management of this fishery as a result of the stock assessment.

Amendment 18B to the FMP for the Snapper Grouper Fishery of the South Atlantic Region is currently under development and will contain actions addressing golden tilefish. Actions would include limiting participation in the golden tilefish fishery, allocating commercial quota between gear groups, changing the golden tilefish fishing year, and changing the commercial trip limit. A stock assessment for golden tilefish is currently underway. It is the South Atlantic Council's intent for Amendment 18B to address any needed changes to the management of this fishery as a result of the stock assessment.

As mentioned previously, studies to assess the effectiveness of the deepwater MPAs have been conducted annually by the Southeast Fisheries Science Center since 2004. For purposes of this amendment, the South Atlantic Council will use these studies to determine whether a change in the size and/or configuration of the existing MPAs is needed to increase the biological benefits to deepwater snapper grouper species, particularly for speckled hind and warsaw grouper in a future amendment. In addition, the South Atlantic Council intends to obtain information directly from fishermen on areas that may be considered for spawning closures to further protect populations of speckled hind and warsaw grouper.

Regulatory Amendment 9 to the FMP for the Snapper Grouper Fishery of the South Atlantic Region (Regulatory Amendment 9; SAFMC 2011b) addresses trip limits for vermilion snapper, gag, and greater amberjack. Regulatory Amendment 9 also includes alternatives that modify the bag limit for black sea bass. Regulations became effective on July 15, 2011, and June 22, 2011, for the trip limits and black sea bass bag limit reduction, respectively.

Amendments 20A and 20B to the FMP for the Snapper Grouper Fishery of the South Atlantic Region (under development) would update the Individual Transfer Quota program for wreckfish and bring the program into compliance with the Magnuson-Stevens Act.

Additionally, the South Atlantic Council has requested an amendment to explore alternate management methods specifically for red snapper for long-term implementation (Amendment 22), and other snapper grouper species (Amendment 21).

Dr. Louis B. Daniel, III of North Carolina Division of Marine Fisheries has submitted a request for an Exempted Fishing Permit (EFP). The EFP notice was filed in the Federal Register on July 15, 2011, for a 15-day comment period and approved on August 1, 2011. The EFP would authorize a maximum of 12 commercial vessels to harvest and land two species currently prohibited (speckled hind and warsaw grouper), as well as those fish prohibited beyond a 240-ft depth (blueline tilefish, misty grouper, queen snapper, silk snapper, snowy grouper, and yellowedge grouper). The purpose of this EFP would be to provide basic life history information for any fish harvested, particularly blueline tilefish. An

additional purpose of the EFP would be to determine if speckled hind and warsaw grouper are bycatch in the commercial blueline tilefish component of the South Atlantic snapper grouper fishery.

II. Non-Council and other non-fishery related actions, including natural events affecting snapper grouper species in this amendment.

A. Past
B. Present
C. Reasonably foreseeable future

In terms of natural disturbances, it is difficult to determine the effect of non-South Atlantic 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 since 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.

How global climate changes will affect Gulf of Mexico and South Atlantic fisheries is unclear. Climate change can impact marine ecosystems through ocean warming by increased thermal stratification, reduced upwelling, sea level rise; and through increases in wave height and frequency, loss of sea ice, and increased risk of diseases in marine biota. Decreases in surface ocean pH due to absorption of anthropogenic carbon dioxide emissions may impact a wide range of organisms and ecosystems, particularly organisms that absorb calcium from surface waters, such as corals and crustaceans (IPCC 2007 and references therein).

The BP/Deepwater Horizon oil spill event, which occurred in the Gulf of Mexico on April 20, 2010, is not expected to impact fisheries operating in the South Atlantic. Oil from the spill site has not been detected in the South Atlantic region, and is not likely to pose a threat to South Atlantic snapper grouper species included in this regulatory amendment.

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 deepwater snapper grouper species are documented through the Southeast Data, Assessment and Review (SEDAR) process. The status of each of the assessed stocks is described in **Section 3.2.1** of this document.

6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.

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

Fish populations

Numeric values of overfishing and overfished thresholds have been updated in previous amendments for snowy grouper. These values includes 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 (MSST) below which a stock is considered to be overfished, the maximum fishing mortality threshold (MFMT) above which a stock is considered to be undergoing overfishing, and optimum yield (OY).

Applicable stock assessment sources include:

- SEDAR 4 (2004) – under SEDAR 4 a stock assessment was attempted for deepwater snapper grouper species in the South Atlantic and Caribbean. Based on the available data, the data workshop panel recommended moving forward with analytical assessments for snowy grouper and golden tilefish in the South Atlantic. The data workshop reports, however, include compilations of data for all species initially considered;
- Potts and Brennan (2001) for speckled hind, black grouper, and red grouper; and
- Huntsman et al. (1993) for warsaw grouper.

Detailed discussions of the science and processes used to determine the stock status of these species are contained in the information sources above and are hereby incorporated by reference.

7. Define a baseline condition for the resources, ecosystems, and human communities.

The purpose of defining a baseline condition for the resource and ecosystems in the area of the proposed action is to establish a point of reference for evaluating the extent and significance of expected cumulative effects. The SEDAR assessments show trends in biomass, fishing mortality, fish weight, and fish length going back to the earliest periods of data collection.

For a detailed discussion of the baseline conditions of each of the species addressed in this amendment the reader is referred to those stock assessment and stock information sources referenced in **Item Number 6** of this CEA.

DETERMINING THE ENVIRONMENTAL CONSEQUENCES OF CUMULATIVE EFFECTS

8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities (Table 6-1).

Table 6-1. The cause and effect relationship of fishing and regulatory actions within the time period of the Cumulative Effects Analysis (CEA).

Time period/dates	Cause	Observed and/or Expected Effects
1960s-1983	Growth overfishing of many reef fish species.	Declines in mean size and weight of many species including black sea bass.
August 1983	4" trawl mesh size to achieve a 12" TL commercial vermilion snapper minimum size limit (SAFMC 1983).	Protected youngest spawning age classes.
Pre-January 12, 1989	Habitat destruction, growth overfishing of vermilion snapper.	Damage to snapper grouper habitat, decreased yield per recruit of vermilion snapper.
January 1989	Trawl prohibition to harvest fish (SAFMC 1988).	Increase yield per recruit of vermilion snapper; eliminate trawl damage to live bottom habitat.
Pre-January 1, 1992	Overfishing of many reef species including vermilion snapper, and gag.	Spawning stock ratio of these species is estimated to be less than 30% indicating that they are overfished.
January 1992	Prohibited gear: fish traps south of Cape Canaveral, FL; entanglement nets; longline gear inside of 50 fathoms; powerheads and bangsticks in designated SMZs off SC. Size/Bag limits: 10" TL vermilion snapper (recreational only); 12" TL vermilion snapper (commercial only); 10 vermilion snapper/person/day; aggregate grouper bag limit of 5/person/day; and 20" TL gag, red, black, scamp, yellowfin, and yellowmouth grouper size	Protected smaller spawning age classes of vermilion snapper.

Time period/dates	Cause	Observed and/or Expected Effects
	limit (SAFMC 1991).	
Pre-June 27, 1994	Damage to *Oculina* habitat.	Noticeable decrease in numbers and species diversity in areas of *Oculina* off FL
July 1994	Prohibition of fishing for and retention of snapper grouper species (HAPC renamed OECA; SAFMC 1993)	Initiated the recovery of snapper grouper species in OECA.
1992-1999	Declining trends in biomass and overfishing continue for a number of 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.
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 (1998).	F for gag vermilion snapper declines but is still above F_{MSY}.
October 23, 2006	Snapper grouper FMP Amendment 13C (SAFMC 2006)	Commercial vermilion snapper quota set at 1.1 million lbs gutted weight; recreational vermilion snapper size limit increased to 12" TL to prevent vermilion snapper overfishing
Effective February 12, 2009	Snapper grouper FMP Amendment 14 (SAFMC 2007)	Use marine protected areas (MPAs) as a management tool to promote the optimum size, age, and genetic structure of slow growing, long-lived deepwater snapper grouper species (e.g., speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, blueline tilefish, and sand tilefish). Gag 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 2009a)	Protect spawning aggregations and snapper grouper in spawning condition by increasing the length of the spawning

Time period/dates	Cause	Observed and/or Expected Effects
		season closure, decrease discard mortality by requiring the use of dehooking tools, reduce overall harvest of gag and vermilion snapper to end overfishing.
Effective Date January 4, 2010	Red Snapper Interim Rule (NMFS 2010)	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 31, 2011	Snapper Grouper FMP Amendment 17B (SAFMC 2010b)	ACLs and ACTs; management measures to limit recreational and commercial sectors to their ACTs; AMs, for species undergoing overfishing.
Effective Date May 31, 2011	Regulatory Amendment 10 (SAFMC 2011a)	Removed area closure implemented through Amendment 17A to reduce mortality of red snapper.
Effective Dates June 22, 2011 (bsb bag limit reduction) and July 15, 2011 (commercial trip limits)	Regulatory Amendment 9 (SAFMC 2011b)	Control derby fisheries for black sea bass, vermilion snapper, gag, and greater amberjack and reduce the bag limit for black sea bass
Target 2012	Snapper Grouper FMP Amendment 18A	Prevent overexploitation in the black sea bass fishery, revise rebuilding strategy and AMs for black sea bass, and

Time period/dates	Cause	Observed and/or Expected Effects
		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	Snapper Grouper FMP Amendment 20A (Wreckfish)	Review the current ITQ program and update the ITQ program as necessary to comply with MSA LAPP requirements.
Target 2012	Snapper Grouper FMP Amendment 18B	Prevent overexploitation in the golden tilefish fishery.
Target 2012	Snapper Grouper FMP Amendment 24	Rebuilding plan for red grouper
Target 2013	Snapper Grouper FMP 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 remove the 240-ft closure implemented through Amendment 17B and therefore allow harvest of deepwater species (snowy grouper, blueline tilefish, yellowedge grouper, misty grouper, queen snapper and silk snapper) beyond 240-ft. Detailed discussions of the magnitude and significance of the preferred alternatives appear in **Section 4** of this document.

10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.

The cumulative effects on the biophysical environment are expected to be negligible. Avoidance, minimization, and mitigation are not applicable.

11. Monitor the cumulative effects of the selected alternative and adopt management.

The effects of the proposed action are, and will continue to be, monitored through collection of data by NOAA Fisheries Service, states, stock assessments and stock assessment updates, life history studies, and other scientific observations.

6.2 Socioeconomic

The cumulative short-term economic and social effects of recent Snapper Grouper Amendment 17A (SAFMC 2010a), Amendment 17B (SAFMC 2010b) and Regulatory Amendment 9 (SAFMC 2011b), as well as Amendment 18A and 18 B (2012) and the Comprehensive ACL Amendment (2011) is expected to be negative while the long-term economic and social outcome is expected to be positive. Recent amendments restrict aggregate quotas for all species, impose new trip limits and bag limits, implement accountability measures, and create area and seasonal closures. A number of commercial and recreational businesses are expected to close. A decrease in overall participation is also expected in the form of the number of individual vessels. It is logical to expect that the remaining vessels will switch from the most severely restricted fisheries to those with higher trip limits or aggregate quotas or bag limits, perhaps creating or exasperating derby fisheries. Season length for commercial and recreational fisheries will decrease further for some species.

Regulatory Amendment 11 is expected to reduce the short-term social and economic costs that are likely to have resulted from the deepwater closure implemented in Amendment 17B. Specifically, the prohibition on harvest of deepwater species seaward of the 240-ft contour including two economically and socially important species: blueline tilefish and snowy grouper. The proposed actions in Regulatory Amendment 11 will allow for fishermen to harvest these two species along with other deepwater species. With restrictions and closures in other fisheries, allowing these two important species to be harvested may help to lessen social and economic impacts from recent and future amendments. Overall, the proposed actions should contribute to sustained commercial and recreational participation in the blueline tilefish and snowy grouper commercial fisheries.

Chapter 7. List of Preparers

Table 7-1. List of Regulatory Amendment 11 preparers.

Name	Agency/Division	Area of Amendment Responsibility
Myra Brouwer	SAFMC	IPT Lead/Fishery Biologist
Rick DeVictor	NMFS/SF	IPT Lead/Fishery Biologist
Brian Cheuvront	SAFMC	Fishery Economist
David Dale	NMFS/HC	EFH Specialist
Andy Herndon	NMFS/PR	Biologist
Stephen Holiman	NMFS/SF	Economist
Denise Johnson	NMFS/SF	Economist
Kari MacLauchlin	SAFMC	Fishery Social Scientist
Jack McGovern	NMFS/SF	Fishery Scientist
Kate Michie	NMFS/SF	Fishery Management Plan Coordinator

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 7-2. List of Regulatory Amendment 11 interdisciplinary plan team members.

Name	Organization	Title
Myra Brouwer	SAFMC	IPT Lead/Fishery Biologist
Brian Cheuvront	SAFMC	IPT Lead/Fishery Economist
Anik Clemens	NMFS/SF	Technical Writer & Editor
David Dale	NMFS/HC	EFH Specialist
Rick DeVictor	NMFS/SF	IPT Lead/Fishery Biologist
Otha Easley	NMFS/LE	Supervisory Criminal Investigator
Nick Farmer	NMFS/SF	Data Analyst
Andy Herndon	NMFS/PR	Fishery Biologist (Protected Resources)
Stephen Holiman	NMFS/SF	Economist
Denise Johnson	NMFS/SF	Economist
David Keys	NMFS/SER	Regional NEPA Coordinator
Mike Larkin	NMFS/SF	Fishery Biologist
Jennifer Lee	NMFS/PR	Fishery Biologist (Protected Resources)
Christopher Liese	SEFSC	Economist
Anna Martin	SAFMC	Coral Biologist
Kari MacLauchlin	SAFMC	Fishery Social Scientist
Jack McGovern	NMFS/SF	Fishery Biologist
Kate Michie	NMFS/SF	Fishery Biologist
Roger Pugliese	SAFMC	Fishery Biologist
Scott Sandorf	NMFS/SF	Technical Writer & Editor
Monica Smit-Brunello	NOAA/GC	Attorney
Andy Strelcheck	NMFS/SF	Fishery Biologist
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 8. Agencies and Persons Consulted

Responsible Agency

Regulatory Amendment 11:
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Environmental Assessment:
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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 Information and Education 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 9. References

Acropora Biological Review Team (BRT). 2005. Atlantic Acropora Status Review Document. Report to National Marine Fisheries Service, Southeast Regional Office. March 3, 2005. 152pp + App.

Adams, W.F. and C. Wilson. 1995. The status of the smalltooth sawfish, *Pristis pectinata* Latham 1794 (Pristiformes: Pristidae) in the United States. Chondros 6(4): 1-5.

Anderes Alvarez, B.A. and I. Uchida. 1994. Study of the Hawksbill turtle (*Eretmochelys imbricata*) stomach content in Cuban waters. In: Study of the Hawksbill turtle in Cuba (I), Ministry of Fishing Industry, Cuba.

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 p.

Bak, R.P.M., J.J.W.M. Brouns, and F.M.L. Hayes. 1977. Regeneration and aspects of spatial competition in the scleractinian corals *Agaricia agaricites* and *Monastrea annularis*. Proceedings of the 3rd International Coral Reef Symposium, Miami, pp 143-148.

Bigelow, H.B. and W.C. Schroeder. 1953. Sawfishes, guitarfishes, skates and rays, pp. 1-514. In: Tee-Van, J., C.M Breder, A.E. Parr, W.C. Schroeder and L.P. Schultz (eds). Fishes of the Western North Atlantic, Part Two. Mem. Sears Found. Mar. Res. I.

Bjorndal, K.A. 1980. Nutrition and grazing behavior of the green sea turtle, *Chelonia mydas*. Marine Biology 56:147.

Bjorndal, K.A. 1997. Foraging ecology and nutrition of sea turtles. In: Lutz, P.L. and J.A. Musick (eds.), The Biology of Sea Turtles. CRC Press, Boca Raton, Florida.

Boardman, C. and D. Weiler. 1980. Aspects of the life history of three deep water snappers Proceeding of the Gulf Caribbean Fisheries Institute 32:158-172.

Bolten, A.B. and G.H. Balazs. 1995. Biology of the early pelagic stage – the "lost year." In: Bjorndal, K.A. (ed.), Biology and Conservation of Sea Turtles, Revised edition. Smithsonian Institute Press, Washington, D.C., 579.

Brongersma, L.D. 1972. European Atlantic Turtles. Zool. Verhand. Leiden, 121:318

Bullock L.H. and Smith G.B. 1991. Seabasses (Pisces: Serranidae). Florida Marine Research Institute, St. Petersburg, FL. Memoirs of the Hourglass Cruises. 243 p.

Bullock, L. H., M. F. Godcharles, and R. E. Crabtree. 1996. Reproduction of yellowedge grouper, *Epinephelus flavolimbatus*, for the eastern Gulf of Mexico. Bull. Mar. Sci. 59:216-224.

Burke, V.J., E.A. Standora, and S.J. Morreale. 1993. Diet of juvenile Kemp's ridley and loggerhead sea turtles from Long Island, New York. Copeia, 1993, 1176.

Byles, R.A. 1988. Behavior and Ecology of Sea Turtles from Chesapeake Bay, Virginia. Ph.D. dissertation, College of William and Mary, Williamsburg, VA.

Carr, A. 1986. Rips, FADS, and little loggerheads. BioScience 36:92.

Carr, A. 1987. New perspectives of the pelagic stage of sea turtle development. Conservation Biology 1(2):103.

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

Cass-Calay, S.L. and M. Bahnick. 2002. Status of the yellowedge grouper fishery in the Gulf of Mexico. Sustainable Fisheries Division Contribut ion No. SFD-02/03-172. NMFS, Southeast Fisheries Science Center, Miami, FL.

Coleman, F.C., C.C. Koenig, G.R. Huntsman, J.A. Musick, A.M. Eklund, J.C. McGovern, R.W. Chapman, G.R. Sedberry, and C.B. Grimes. 2000. Long-lived reef fishes: The grouper-snapper complex. Fisheries 25(3): 14-21.

Cutter, Susan L. Byron J. Boruff, and W. Lynn Shirley. (2003). Social Vulnerability to Environmental Hazards. Social Science Quarterly 84(2):242-261.

Dooley, J.K. 1978. Malacanthidae. In W. Fischer (ed.) FAO species identification sheets for fishery purposes. Western Central Atlantic (Fishing Area 31). Volume 3. FAO, Rome.

Eckert, S.A., D.W., Nellis, K.L., Eckert, and G.L., Kooyman. 1986. Diving patterns of two leatherback sea turtles (*Dermochelys coriacea*) during internesting intervals at Sandy Point, St. Croix, U.S. Virgin Islands. Herpetologica 42:381.

Eckert, S.A., K.L., Eckert, P., Ponganis, and G.L., Kooyman. 1989. Diving patterns of two leatherback sea turtles (*Dermochelys coriacea*). Canadian Journal of Zoology 67:2834.

Frick, J. 1976. Orientation and behavior of hatchling green turtles (*Chelonia mydas*) in the sea. Animal Behavior 24:849.

Froese, R. and D. Pauly, Editors. 2003. FishBase. World Wide Web electronic publication. www.fishbase.org, version 24 September 2003.

Ghiold, J. and S. H. Smith. 1990. Bleaching and recovery of deep-water, reef-dwelling invertebrates in the Cayman Islands, BWI. Caribbean Journal of Science 26:52-61.

GMFMC and SAFMC. 2011a. Amendment 18 to the Fishery Management Plan for Coastal Migratory Pelagic Resources in the Gulf of Mexico and Atlantic Region Including Environmental Assessment, Regulatory Impact Review, and Regulatory Flexibility Act Analysis. Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, FL 33607 and South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201, North Charleston, SC 29405

GMFMC and SAFMC. 2011b. Amendment 10 to the Fishery Management Plan for Spiny Lobster in the Gulf of Mexico and South Atlantic Including Final Environmental Impact Statement, Regulatory Impact Review, and Regulatory Flexibility Act Analysis July 2011 Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, FL 33607 and South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201, North Charleston, SC 29405

Goreau, T. F. and J. W. Wells. 1967. The shallow-water Scleractinia of Jamaica: revised list of species and their vertical range. Bulletin of Marine Science 17:442-453.

Goreau, T. F. and N. I. Goreau. 1973. Coral Reef Project-Papers in Memory of Dr. Thomas F. Goreau. Bulletin of Marine Science 23:399-464.

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.

Harris, P. J., D.M. Wyanski, and P.T.P. Mikell. 2004. Age, growth and reproductive biology of blueline tilefish along the southeastern coast of the United States, 1982–1999. Transactions of the American Fisheries Society 133, 1190–1204.

Heemstra, P.C. and J.E. Randall. 1993. FAO species catalogue. Vol. 16. Groupers of the world. (Family Serranidae, Subfamily Epinephelinae). An annotated and illustrated catalogue of the grouper, rockcod, hind, coral grouper and lyretail species known to date. FAO Fish. Synops. 16(125).

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.

Hughes, G.R. 1974. The sea-turtles of south-east Africa. II. The biology of the Tongaland loggerhead turtle Caretta caretta L. with comments on the leatherback turtle Dermochelys coriacea L. and green turtle Chelonia mydas L. in the study region. Oceanographic Research Institute (Durban) Investigative Report. No. 36.

Huntsman, G.R., J.C. Potts, and R.W. Mays. 1993. Estimates of spawning stock biomass per recruit ratio based on catches and samples from 1991 for five species of reef fish from the U.S. South Atlantic. Report to the South Atlantic Fishery Management Council, June 1993. NMFS Beaufort Lab, 101 Pivers Island Road, Beaufort, NC, 28516-9722.

Huntsman, G.R. and R.L. Dixon. 1976. Recreational catches of four species of groupers in the Carolina headboat fishery. Proceedings of the Annual Conference Southeastern Association of Game and Fish Commissioners. 29:185-194.

IPCC. 2007: Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 104 pp.

Jaap, W.C., W.G. Lyons, P. Dustan, and J.C. Halas. 1989. Stony coral (Scleractinia and Milleporina) community structure at Bird Key Reef, Ft. Jefferson National Monument, Dry Tortugas, Florida. Fla. Mar. Res. Publ. 46.

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. NOAA Technical Report No. (TBD).

Keener, P. 1984. Age, growth, and reproductive biology of the yellowedge grouper, *Epinephelus fiavolimbatus*. off the coast of South Carolina. M.S. Thesis, College of Charleston, Charleston, South Carolina. 65 p.

Keinath, J.A. and J.A. Musick. 1993. Movements and diving behavior of a leatherback sea turtle, *Dermochelys coriacea*. Copeia 1993:1010.

Lanyon, J.M., C.J. Limpus, and H., Marsh. 1989. Dugongs and turtles: grazers in the seagrass system. In: Larkum, A.W.D, A.J., McComb and S.A., Shepard (eds.) Biology of Seagrasses. Elsevier, Amsterdam, 610.

Lewis, J.B. 1977. Suspension feeding in Atlantic reef corals and the importance of suspended particulate matter as a food source. Proceedings of the 3rd International Coral Reef Symposium. pp. 405-408.

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".

Limpus, C.J. and N. Nichols. 1988. The southern oscillation regulates the annual numbers of green turtles (*Chelonia mydas*) breeding around northern Australia. Australian Journal of Wildlife Research 15:157.

Limpus, C.J. and N. Nichols. 1994. Progress report on the study of the interaction of El Niño Southern Oscillation on annual *Chelonia mydas* numbers at the southern Great Barrier Reef rookeries. In: Proceedings of the Australian Marine Turtle Conservation Workshop, Queensland Australia.

Lutz, P.L. and J.A. Musick (eds.). 1997. The Biology of Sea Turtles. CRC Press, Boca Raton, Florida.

Lutz, P.L., J.A., Musick, and J. Wyneken (eds.). 2002. The Biology of Sea Turtles, Volume II. CRC Press, Boca Raton, Florida.

MacDonald, L.H. 2000. Evaluating and managing cumulative effects: process and constraints. Environmental Management 26(3): 299-315.

MacIntyre, I. G. and J. D. Milliman. 1970. Physiographic features on the outer shelf and upper slope, Atlantic Continental Margin, southeastern United States. Geological Society of America Bulletin 81:2577-2598.

Manooch, C.S. 1984. Fisherman's Guide: Fishes of the Southeastern United States. Raleigh, NC: Museum of Natural History. 362 pp.

Manooch, C.S. and D.L. Mason. 1987. Age and growth of warsaw grouper from the southeast region of the United States. Northeast Gulf Sci. 9(2):65-75.

Márquez-M, R. 1994. Synopsis of biological data on the Kemp's ridley turtles, *Lepidochelys kempii* (Garman, 1880). NOAA Technical Memo, NMFS-SEFSC-343. Miami, FL.

Matheson, R.H., III and G.R. Huntsman. 1984. Growth, mortality, and yield-per-recruit models for speckled hind and snowy grouper from the United States South Atlantic Bight. Transactions of the American Fisheries Society 113: 607-616.

Mendonca, M.T. and P.C.H. Pritchard. 1986. Offshore movements of post-nesting Kemp's ridley sea turtles (*Lepidochelys kempi*). Herpetologica 42:373.

Meylan, A. 1984. Feeding Ecology of the Hawksbill turtle (*Eretmochelys imbricata*): Spongivory as a Feeding Niche in the Coral Reef Community. Dissertation, University of Florida, Gainesville, FL.

Meylan, A. 1988. Spongivory in hawksbill turtles: a diet of glass. Science 239:393-395.

Meylan, A.B. and M. Donnelly. 1999. Status justification for listing the hawksbill turtle (*Eretmochelys imbricata*) as critically endangered on the 1996 IUCN Red List of Threatened Animals. Chelonian Conservation and Biology 3(2): 200-204.

Miller, G. C. and W. J. Richards. 1979. Reef fish habitat, faunal assemblages and factors determining distributions in the South Atlantic Bight. Proceedings of the Gulf and Caribbean Fisheries Institute 32:114-130.

Moore, C.M. and R.F. Labinsky. 1984. Population parameters of a relatively unexploited stock of snowy groupers in the lower Florida Keys. Trans. Am. Fish. Soc. 113:322-329.

Mortimer, J.A. 1981. The feeding ecology of the West Caribbean green turtle (*Chelonia mydas*) in Nicaragua. Biotropica 13:49.

Mortimer, J.A. 1982. Feeding ecology of sea turtles. In: Bjorndal, K.A. (ed.), Biology and Conservation of Sea Turtles. Smithsonian Institute Press, Washington, D.C.

Murray, P.A., L.E. Chinnery, and E.A. Moore. 1988. The recruitment of the queen snapper *Etelis oculatus* Val., into the St. Lucian fishery: Recruitment of fish and recruitment of fishermen. Proceedings of the Gulf and Caribbean Fisheries Institute 41:297-303.

Naranjo, A. 1956. Cordel y anzuelo. Editorial Cenit, La Habana, Cuba. 251 pp.

Newton J.G., O.H. Pilkey, and J.O. Blanton. 1971. An Oceanographic Atlas of the Carolina and continental margin. North Carolina Dept. of Conservation and Development. 57 p.

NMFS (National Marine Fisheries Service). 2006. Endangered Species Act section 7 consultation on the Continued Authorization of Snapper-Grouper Fishing under the South Atlantic Snapper-Grouper Fishery Management Plan (RFFMP) and Proposed Amendment 13C. Biological Opinion. June 7.

.

NMFS (National Marine Fisheries Service). 2009a. Fisheries Economics of the United States 2006. U.S. Depart. of Commerce, NOAA Tech. Memo. NMFS-F/SPO-97. 158 p. Available at: http://www.st.nmfs.gov/st5/publications/index.html.

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

NMFS (National Marine Fisheries Service). 2010. Interim Rule for Red Snapper. Federal Register, September 24, 2010 (Volume 75, Number 185).

Norman, J. R. and F. C. Fraser. 1938. Giant Fishes, Whales and Dolphins. W. W. Norton and Company, Inc, New York, NY. 361 pp.

Ogren, L.H. 1989. Distribution of juvenile and subadult Kemp's ridley turtles: Preliminary results from the 1984-1987 surveys. In: C.W. Caillouet Jr. and A.M. Landry Jr. (eds.) Proceedings from the 1st Symposium on Kemp's ridley Sea Turtle Biology, Conservation, and Management. Sea Grant College Program, Galveston, TX. 116.

Paredes, R.P. 1969. Introduccion al Estudio Biologico de Chelonia mydas agassizi en el Perfil de Pisco, Master's thesis, Universidad Nacional Federico Villareal, Lima, Peru.

Parker, R. O., D. R. Colby, and T. D. Willis. 1983. Estimated amount of reef habitat on a portion of the US South Atlantic and Gulf of Mexico continental shelf. Bulletin of Marine Science 33:935-940.

Parker, Jr., R.O. and R.W. Mays. 1998. Southeastern U.S. deepwater reef fish assemblages, habitat characteristics, catches, and life history summaries. NOAA Tech. Report, National Marine Fisheries Service 138.

Parker, Jr., R.O. and S. W. Ross. 1986. Observing reef fishes from submersibles off North Carolina. Northeast Gulf Science 8(1): 31-49.

Porter, J.W. 1976. Autotrophy, heterotrophy, and resource partitioning in Caribbean reef-building corals. American Naturalist 110: 731-742.

Potts, J.C., M.L. Burton, and C.S. Manooch, III. 1998. Trends in catch data and static SPR values for 15 species of reef fish landed along the southeastern United States. Report for South Atlantic Fishery Management Council, Charleston, SC.

Potts, J.C. and K. Brennan. 2001. Trends in catch data and static SPR values for 15 species of reef fish landed along the southeastern United States. Report for South Atlantic Fishery Management Council, Charleston, SC.

Poulakis, G. R. and J. C. Seitz. 2004. Recent occurrence of the smalltooth sawfish, *Pristis pectinata* (Elasmobranchiomorphi: Pristidae), in Florida Bay and the Florida Keys, with comments on sawfish ecology. Florida Scientist 67(27): 27-35.

Robins, C.R. 1967. The juvenile of the serranid fish *Epinephelus mystacinus* and its status in Florida waters. Copeia 1967(4):838-839.

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.

Ross, S.W. 1978. Life history aspects of the gray tilefish *Caulolatilus microps* (Goode and Bean, 1878). M.S. Thesis, College of William and Mary, Williamsburg, VA. 125 p.

Ross, S.W. and G.R. Huntsman. 1982. Age, growth, and mortality of blueline tilefish from North Carolina and South Carolina. Trans. Am. Fish. Soc. 111:585-592.

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

Rylaarsdam, K.W. 1983. Life histories and abundance patterns of colonial corals on Jamaican reefs. Marine Ecology Progress Series 13:249-260.

SAFMC (South Atlantic Fishery Management Council). 1983. Fishery Management Plan, Regulatory Impact Review and Final Environmental Impact Statement for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Circle, Suite 306, Charleston, South Carolina, 29407-4699.

SAFMC (South Atlantic Fishery Management Council). 1988. Regulatory Amendment 2 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, S.C. 29407-4699.

SAFMC (South Atlantic Fishery Management Council). 1991. Amendment Number 4, Regulatory Impact Review, Initial Regulatory Flexibility Analysis and Environmental Assessment for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, S.C. 29407-4699. 200 pp.

SAFMC (South Atlantic Fishery Management Council). 1993. Amendment Number 6, Regulatory Impact Review, Initial Regulatory Flexibility Analysis and Environmental Assessment for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, S.C. 29407-4699. 155 pp.

SAFMC (South Atlantic Fishery Management Council). 1998. Comprehensive Amendment Addressing Sustainable Fishery Act Definitions and Other Required Provisions in Fishery Management Plans of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, S.C. 29407-4699. 151 pp.

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. 29407-4699. 631 pp.

SAFMC (South Atlantic Fishery Management Council). 2007. Final Amendment 14, Final Environmental Impact Statement, 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, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2008a. Amendment 15A, Final Environmental Impact Statement, 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, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405. 325 pp.

SAFMC (South Atlantic Fishery Management Council). 2008b. Amendment 15B, Final Environmental Impact Statement, 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, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405. 325 pp.

SAFMC (South Atlantic Fishery Management Council). 2009a. Amendment Number 16, Final Environmental Impact Statement, 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, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2009b. Fishery Ecosystem Plan for the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2010a. Amendment 17A, Final Environmental Impact Statement, 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, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2010b. Amendment 17B, Final Environmental Impact Statement, 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, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2011a. Regulatory Amendment 10 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2011b. Regulatory Amendment 9 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2011c. Comprehensive Annual Catch Limit (ACL) Amendment of the South Atlantic Region including Snapper Grouper Amendment 25. South Atlantic Fishery Management Council, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2011d. Comprehensive Ecosystem-Based Amendment 2 (CEBA 2). South Atlantic Fishery Management Council, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2011e. Amendment 24 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

Sammarco, P.W. 1980. Diadema and its relationship to coral spat mortality: grazing, competition, and biological disturbance. Journal of Experimental Marine Biology and Ecology, 45:245-272.

SEDAR 4. 2004. Stock Assessment Report 1. Stock assessment of the deep-water snapper-grouper complex in the South Atlantic. Available from the SEDAR website: www.sefsc.noaa.gov/sedar/

SEDAR 24. 2010. Stock Assessment Report. Stock assessment of South Atlantic red snapper. Available from the SEDAR website: www.sefsc.noaa.gov/sedar/download/SEDAR%2024_SAR_October%202010_26.pdf?id=DOCUMENT

Shaver. D.J. 1991. Feeding ecology of wild and head-started Kemp's ridley sea turtles in south Texas waters. Journal of Herpetology 25:327.

Simpfendorfer, CA. 2001. Essential habitat of the smalltooth sawfish, *Pristis pectinata*. Report to the National Fisheries Service's Protected Resources Division. Mote Marine Laboratory, Technical Report (786) 21pp.

Simpfendorfer, C.A. and T.R. Wiley. 2004. Determination of the distribution of Florida's remnant sawfish population, and identification of areas critical to their conservation. Mote Marine Laboratory, Technical Report July 2, 2004, 37 pp.

Smith, C.L. 1971. A revision of the American groupers: *Epinephelus* and allied genera. Bull. Am. Mus. Nat. Hist. 146:1-241.

Soma, M. 1985. Radio biotelemetry system applied to migratory study of turtle. Journal of the Faculty of Marine Science and Technology, Tokai University, Japan, 21:47.

Soong, K. and J. C. Lang. 1992. Reproductive integration in coral reefs. Biological Bulletin 183:418-431.

Standora, E.A., J.R. Spotila, J.A. Keinath, and C.R. Shoop. 1984. Body temperatures, diving cycles, and movements of a subadult leatherback turtle, *Dermochelys coriacea*. Herpetologica 40:169.

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 University, MARFIN program grant number NA77FF0551.

Szmant, A. M. and M. W. Miller. 2006. Settlement preferences and post-settlement mortality of laboratory cultured and settled larvae of the Caribbean hermatypic corals *Montastraea faveolata* and *Acropora palmata* in the Florida Keys, USA. Proceedings of the 10th International Coral Reef Symposium.

Thayer, G.W., K.A. Bjorndal, J.C. Ogden, S.L. Williams, and J.C. Zieman. 1984. Role of large herbivores in seagrass communities. Estuaries 7:351.

Thompson, R. and J.L. Munro. 1974. The biology, ecology and bionomics of Caribbean reef fishes: Lutjanidae (snappers). Zoology Dep., Univ. West Indies, Kingston, Jamaica Res. Rep. 3.

Van Dam, R. and C. Diéz. 1997. Predation by hawksbill turtles on sponges at Mona Island, Puerto Rico. pp. 1421-1426 Proc. 8th International Coral Reef Symposium, v. 2.

Walker, T.A. 1994. Post-hatchling dispersal of sea turtles. p. 79. In: Proceedings of the Australian Marine Turtle Conservation Workshop, Queensland Australia.

Williams, E. H. and L. Bunkley-Williams. 1990. The worldwide coral reef bleaching cycle and related sources of coral mortality. Atoll Research Bulletin 335:1-71.

Witzell, W.N. 2002. Immature Atlantic loggerhead turtles (*Caretta caretta*): suggested changes to the life history model. Herpetological Review 33(4):266-269.

Wyanski, D.M., D.B. White, and C.A. Barans. 2000. Growth, population age structure, and aspects of the reproductive biology of snowy grouper, *Epinephelus niveatus*, off North Carolina and South Carolina. Fish. Bull. 126:199-218.

Ziskin, G.L. 2008. Age, growth, and reproduction of speckled hind, *Epinephelus drummondhayi*, off the Atlantic coast of the Southeast United States. Master's Thesis, The Graduate School of The College of Charleston. 120 pp.