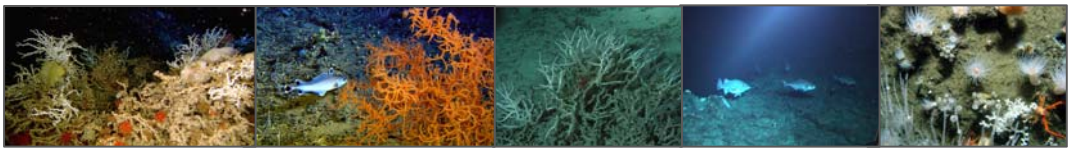
COMPREHENSIVE ECOSYSTEM-BASED AMENDMENT 2 FOR THE SOUTH ATLANTIC REGION



AMENDMENT 7 TO THE FISHERY MANAGEMENT PLAN FOR CORAL, CORAL REEFS, AND LIVE/HARDBOTTOM HABITATS OF THE SOUTH ATLANTIC REGION
AMENDMENT 25 TO THE FISHERY MANAGEMENT PLAN FOR THE SNAPPER GROUPER FISHERY OF THE SOUTH ATLANTIC REGION
AMENDMENT 21 TO THE FISHERY MANAGEMENT PLAN FOR THE COASTAL MIGRATORY PELAGIC RESOURCES IN THE ATLANTIC AND GULF OF MEXICO
AMENDMENT 1 TO THE FISHERY MANAGEMENT PLAN FOR PELAGIC *SARGASSUM* HABITAT OF THE SOUTH ATLANTIC REGION

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ABBREVIATIONS AND ACRONYMS

ABC	Acceptable Biological Catch
ACL	Annual catch Limit
ACCSP	Atlantic Coastal Cooperative Statistics Program
AM	Accountability Measure
APA	Administrative Procedures Act
AUV	Autonomous Underwater Vehicle
B	A measure of stock biomass either in weight or other appropriate unit
B_{MSY}	The stock biomass expected to exist under equilibrium conditions when fishing at F_{MSY}
B_{OY}	The stock biomass expected to exist under equilibrium conditions when fishing at F_{OY}
B_{CURR}	The current stock biomass
CEA	Cumulative Effects Analysis
CEQ	Council on Environmental Quality
CFMC	Caribbean Fishery Management Council
CPUE	Catch per unit effort
CRP	Cooperative Research Program
CZMA	Coastal Zone Management Act
DEIS	Draft Environmental Impact Statement
EA	Environmental Assessment
EBM	Ecosystem-Based Management
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EFH-HAPC	Essential Fish Habitat - Habitat Area of Particular Concern
EIS	Environmental Impact Statement
EPAP	Ecosystem Principles Advisory Panel
ESA	Endangered Species Act of 1973
F	A measure of the instantaneous rate of fishing mortality
$F_{30\%SPR}$	Fishing mortality that will produce a static SPR = 30%
$F_{45\%SPR}$	Fishing mortality that will produce a static SPR = 45%
F_{CURR}	The current instantaneous rate of fishing mortality
FMP	Fishery Management Plan
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
FMU	Fishery Management Unit
FONSI	Finding Of No Significant Impact
GFMC	Gulf of Mexico Fishery Management Council
GIS	Geographic Information System
IFQ	Individual fishing quota
IMS	Internet Mapping Server
M	Natural mortality rate

MARMAP	Marine Resources Monitoring Assessment and Prediction Program
MARFIN	Marine Fisheries Initiative
MBTA	Migratory Bird Treaty Act
MFMT	Maximum Fishing Mortality Threshold
MMPA	Marine Mammal Protection Act of 1973
MRFSS	Marine Recreational Fisheries Statistics Survey
MSA	Magnuson-Stevens Act
MSST	Minimum Stock Size Threshold
MSY	Maximum Sustainable Yield
NEPA	National Environmental Policy Act of 1969
NFMS	National Marine Fisheries Service
NMSA	National Marine Sanctuary Act
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council
OFL	Overfishing Level
OY	Optimum Yield
POC	Pew Oceans Commission
R	Recruitment
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SAFE	Stock Assessment and Fishery Evaluation Report
SAMFC	South Atlantic Fishery Management Council
SEDAR	Southeast Data, Assessment, and Review
SEFSC	Southeast Fisheries Science Center
SERO	Southeast Regional Office
SDDP	Supplementary Discard Data Program
SFA	Sustainable Fisheries Act
SIA	Social Impact Assessment
SSC	Scientific and Statistical Committee
TAC	Total allowable catch
T_{MIN}	The length of time in which a stock could rebuild to B_{MSY} in the absence of fishing mortality
USCG	U.S. Coast Guard
USCOP	U.S. Commission on Ocean Policy
VMS	Vessel Monitoring System

COMPREHENSIVE ECOSYSTEM-BASED AMENDMENT 2 FOR THE SOUTH ATLANTIC REGION

INCLUDING A DRAFT ENVIRONMENTAL ASSESSMENT AND DRAFT SOCIAL IMPACT ASSESSMENT/FISHERY IMPACT STATEMENT

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ABSTRACT

This Comprehensive Ecosystem-Based Amendment 2 (CE-BA 2) consists of regulatory actions that focus on management of the octocoral fishery, modification of management of South Carolina's Special Management Zones (SMZs), modification of sea turtle and smalltooth sawfish release gear requirements for the snapper grouper fishery and non-regulatory actions that designate new essential fish habitat (EFH) and EFH-habitat areas of particular concern (EFH-HAPCs). The South Atlantic Fishery Management Council (Council) developed the actions in the amendment consistent with a focus on Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) sections 303(b)(2)(A), 303(b)4, 303(b)(12), and 303(b)(14).

This CE-BA 2 proposes to modify the annual catch limit (ACL) for octocorals in the South Atlantic region. The current 50,000 colony quota includes South Atlantic and Gulf of Mexico exclusive economic zone (EEZ) waters, only, is set at a value much higher than the historical landings history, and the quota has never been reached. The Council is considering an alternative to modify the ACL to include State and EEZ waters in the Gulf and South Atlantic, combined. The Council is also considering removing octocorals from the fishery management unit under the Fishery Management Plan (FMP) for Coral, Coral Reefs and Hard/Live Bottom Habitat of the South Atlantic Region (Coral FMP), and extending the management unit for octocorals into the Gulf of Mexico Fishery Management Council's area of jurisdiction.

An action to modify management of SMZs is included in CE-BA 2, including alternatives that would require that harvest (with the use of all non-prohibited fishing gear) and possession of snapper grouper and coastal migratory pelagic managed species in South Carolina SMZs be limited to the recreational bag limit. This action stems from concern about commercial exploitation of state's artificial reefs.

An action to modify sea turtle and smalltooth sawfish release gear requirements for the snapper grouper fishery is also included in CE-BA 2. Fishermen have expressed concern that the current sea turtle and smalltooth sawfish handling and release gear requirements are intended for "heavier duty" gears used in longline fisheries and are unwieldy and less effective when used with the lighter tackle employed in the non-longline, hook and line component of the fishery.

This amendment would amend Council FMPs as needed to designate new or modify existing EFH and EFH-HAPCs. CE-BA 2 would amend the FMP for Snapper Grouper of the South Atlantic Region (Snapper Grouper FMP) and the Coral FMP to designate additional EFH-HAPCs. To meet the Magnuson-Stevens Act requirement that all managed species have EFH designated, CE-BA 2 amends the FMP for Pelagic *Sargassum* Habitat FMP of the South Atlantic Region (*Sargassum* FMP) to designate EFH and EFH-HAPCs.

Actions in this Comprehensive Ecosystem-Based Amendment 2 consider the following measures:

- Modify management of the octocoral fishery
- Modify management of South Carolina's SMZs
- Modify sea turtle and smalltooth sawfish release gear requirements for the snapper grouper fishery
- Amend the following FMPs to designate new EFH and EFH-HAPCs: Snapper Grouper FMP; Coral FMP; *Sargassum* FMP

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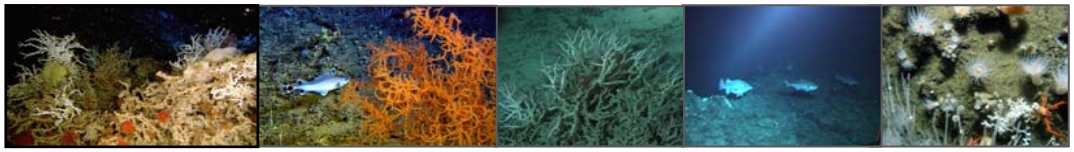
SUMMARY OF COMPREHENSIVE ECOSYSTEM-BASED AMENDMENT 2 FOR THE SOUTH ATLANTIC REGION (CE-BA 2)



The South Atlantic Fishery Management Council (Council) is developing various management measures in order to address additional criteria for Fishery Management Plans required by the reauthorized Magnuson-Stevens Fishery Conservation and Management Act (2006). In the Comprehensive Ecosystem-Based Amendment 2 (CE-BA 2), regulatory actions are being proposed that focus on management of the octocoral fishery, modifying management of South Carolina's Special Management Zones, and modifying sea turtle and smalltooth sawfish release gear requirements in the Snapper Grouper Fishery. Additionally, non-regulatory actions are being proposed that will designate essential fish habitat as well as essential fish habitat-habitat areas of particular concern in specific Fishery Management Plans to ensure conservation and enhancement of habitat.

This document is intended to serve as a SUMMARY for all the actions and alternatives in CE-BA 2. It also includes a summary of the expected biological and socio-economic effects from the management measures.

Purpose and Need of the Proposed Actions

The *purpose* of Comprehensive Ecosystem Amendment 2 (CE-BA 2) is to amend Fishery Management Plans as needed to respond to ecosystem management issues that may go across fisheries as opposed to single species management for these issues. CE-BA 2 intends to specify management of the octocoral fishery, modify the Annual Catch Limit for octocorals, modify how South Carolina's Special Management Zones are managed, revise sea turtle release and smalltooth sawfish gear requirements for the snapper grouper fishery, and designate Essential Fish Habitat (EFH) and Essential Fish Habitat – Habitat Areas of Particular Concern (EFH-HAPC) in the South Atlantic.

These actions are *needed* in part to address mandates of the reauthorized Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), that requires Fishery Management Plans (FMP), by 2011, to establish a mechanism for specifying Annual Catch Limits and accountability measures for fisheries not undergoing overfishing (such as the octocoral fishery). Actions are also *needed* to ensure overfishing does not occur and to allow the stocks to increase in biomass, when necessary, in order to maximize their reproductive potential so that populations may produce optimum yield (OY). OY, the ultimate goal of any fishery management plan, is the portion of the fish stock that provides the greatest economic, social, and ecological benefit to the nation.

List of Management Actions

There are 9 actions in CE-BA 2 that will accomplish the Purpose and Need:

1. Remove octocorals from the Fishery Management Unit under the South Atlantic Coral FMP
2. Extend the Council's management unit for octocorals into the Gulf of Mexico Council's area of jurisdiction
3. Modify the Annual Catch Limit for octocorals in the South Atlantic
4. Modify management of South Carolina's Special Management Zones
5. Modify sea turtle release gear requirements for the snapper grouper fishery
6. Amend the Snapper Grouper FMP to designate new EFH-HAPCs
7. Amend the Coral FMP to designate new EFH-HAPCs
8. Amend the FMP for Pelagic *Sargassum* habitat to designate new EFH
9. Amend the FMP for Pelagic *Sargassum* habitat to designate EFH-HAPCs

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

Background

The Octocoral Fishery

Octocorals, designated as Essential Fish Habitat, are commercially caught and sold live to wholesale and retail dealers and aquarium owners. The South Atlantic Council along with the Gulf Council first described the fishery in their 1982 joint Coral FMP. Amendment 1 of the fishery management plan (FMP) specified the joint commercial quota for the harvest of allowable octocorals in Gulf and South Atlantic federal waters as 50,000 colonies per year. Amendment 3 of the FMP prohibited harvest of octocorals north of Cape Canaveral, FL, where they constitute a significant portion of the live/ hardbottom habitat. Octocorals are primarily found in the Florida Keys region, where the majority is harvested in Florida state waters primarily for the aquarium industry. They are included under Florida Fish and Wildlife Commission's Marine Life Fishery Program, and managed through a limit on the number of commercial harvesters allowed (currently there are ~100-140 fishers) and also a recreational daily bag limit. Florida rules state that harvest of allowable octocorals will close in state waters when the adjacent federal quota has been met. To-date this fishery has never closed.

The Council is concerned that the annual quota (also the Annual Catch Limit) does not include state waters and may be set at a value much higher than historically landed. They are also considering the implications of other management measures for this fishery.

What are Octocorals?

Octocorals consist primarily of gorgonians as well as soft corals, horny corals, sea fans, sea whips, and sea pens. They contribute greatly to coral reef diversity, providing habitat for an array of managed fishery species and organisms. Similar to stony corals, octocorals are colonial animals with a polyp as the individual building unit. They have both sexual and asexual reproductive modes. Octocorals are sedentary and derive energy from sunlight, consumption of zooplankton, detritus and dissolved organics.

South Carolina SMZ Regulations

- **Use of a powerhead to take South Atlantic snapper grouper is prohibited**
- **Fishing may only be conducted with handline, rod and reel, and spearfishing gear**
- **Use of a sea bass pot or bottom longline is prohibited**

South Carolina's Special Management Zones

Artificial reefs in South Carolina are built and managed by SC Department of Natural Resources (SC DNR) to promote recreational fishing opportunities. Construction is funded by the recreational community through the SC Saltwater Fishing License Program and Federal Aid in Sportfish Restoration Program. SC DNR may request the Council designate an artificial reef as a Special Management Zone (SMZ) (artificial reef and surrounding area) in order to prohibit or restrain the use of specific types of fishing gear that are not compatible with the intent of establishing them. Currently 29 SMZs have been designated in federal waters offshore of South Carolina. The Council is concerned over reports of commercial vessels operating on SMZs, a practice not keeping with the intended purpose of the SMZs. The Snapper Grouper FMP states

that fishing gear offering "exceptional advantages" over other gear types may significantly reduce improved fishing opportunities and thus eliminate any incentive for establishing SMZs.

Sea Turtle Release Gear Requirements

Current sea turtle release gear requirements were established in Snapper Grouper Amendment 15B and include the same dehooking and disentanglement gear as required in the pelagic longline fishery. Since the Amendment's approval and implementation of the regulations, concerns have been raised regarding the appropriateness of several required gears for smaller vessels carrying much lighter tackle than the pelagic longline fishery. An action has been developed to address these concerns and modify requirements for vessels in the snapper grouper fishery.

Designating Essential Fish Habitat

The Magnuson-Stevens Act directs the Councils to describe and identify essential fish habitat (EFH) for each federally managed species, to minimize the extent of adverse effects on habitat caused by fishing and non-fishing activities, and to identify actions to encourage conservation and enhancement of those habitats. Councils may also identify EFH-Habitat Areas of Particular Concern (EFH-HAPC). The Council is considering amending additional EFH-HAPC areas in the Snapper Grouper FMP, Coral FMP, as well as designating EFH-HAPCs and new EFH areas in the Pelagic *Sargassum* FMP.

❖ Action 1. Remove Octocorals from the Fishery Management Unit under the South Atlantic Coral FMP

Alternative 1. No Action. Do not remove octocorals from the FMU under the South Atlantic Coral FMP.

Alternative 2. Remove octocorals from the FMU.

Preferred Alternative 3. Modify the FMU to indicate that octocorals are included in the EEZ off NC, SC & GA

Impacts from Action 1

Biological

Under **Alternative 1 (No Action),** octocorals would continue to be managed through the South Atlantic Coral fishery management plan (FMP) and would be subject to a harvest level or 50,000 colonies combined for the Gulf and South Atlantic exclusive economic zone. Octocorals are considered a data-poor stock; with no stock assessment and limited landings information. Fishery independent survey data indicate there is a relatively high octocoral abundance in the historically known distribution area (the Florida Keys). The fishery is also managed under other management measures overseen by Florida Fish and Wildlife Commission (because the fishery largely exists in Florida state waters) including commercial permits, reporting requirements, and a six-colony recreational bag limit for octocorals.

Alternative 2 would remove octocorals from the Coral FMP and would eliminate current management measures for octocorals in the South Atlantic. Under this alternative, octocorals would not be protected through a commercial quota, commercial permits, reporting requirements or a recreational bag limit in Federal waters. **Alternative 2** may result in a significant increase in the harvest of octocorals however, the market demand for this species is limited and would likely be the driving factor in an increase in effort.

Preferred Alternative 3

Socio-economic

Under **Alternative 2**, landings would be allowed to increase in these areas, although the market for octocorals would limit harvest. Due to the increased risk of overfishing octocorals under **Alternative 2**, long-term economic benefits are expected to decrease compared to **Alternative 1**. Short-term economic benefits could increase if the market demand for octocorals increased.

❖ Action 2. Extend the SAFMC's Fishery Management Unit for Octocorals into the Gulf of Mexico Fishery Management Council's Area of Jurisdiction

Preferred Alternative 1. No Action. Do not extend the FMU for octocorals into the GMFMC's jurisdiction.

Alternative 2. Extend the management boundaries for all octocorals species in the coral FMP to include the GMFMC jurisdiction.

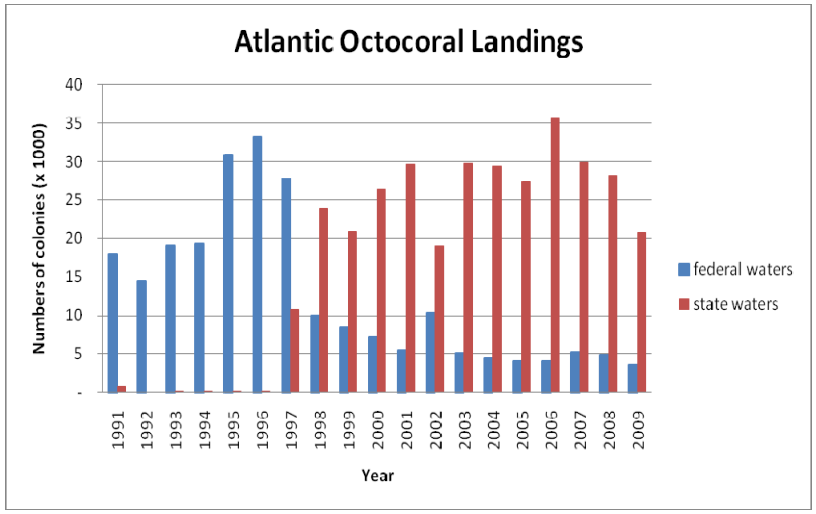


Figure 1 – Octocoral harvest in South Atlantic Federal and state waters for the period 1991-2009 (Source: FL FWC, FWRI)

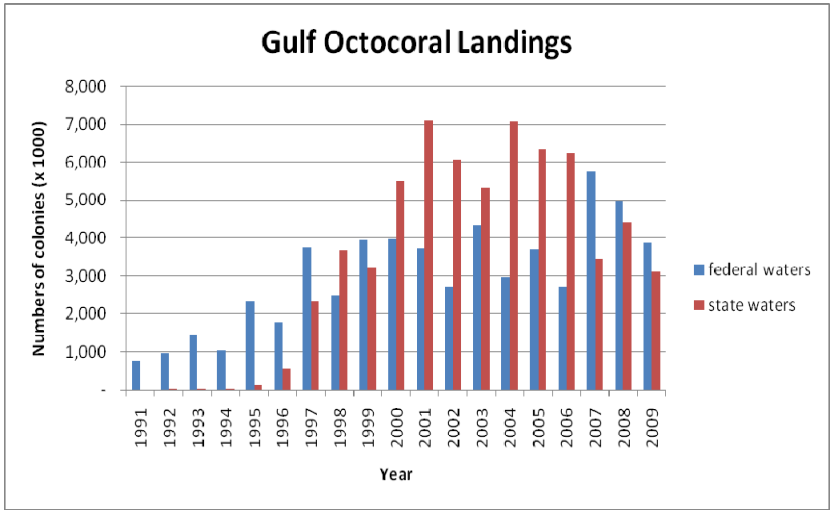


Figure 2 – Octocoral harvest in Gulf of Mexico Federal and state waters for the period 1991-2009 (Source: FL FWC, FWRI)

Impacts from Action 2

Biological

Currently, the quota for octocorals is 50,000 colonies combined in the Gulf and South Atlantic exclusive economic zone. **Preferred Alternative 1 (No Action)** would continue this quota and would maintain the current biological impacts to the resource. **Alternative 2** would extend management jurisdiction of octocorals to include the Gulf of Mexico Fishery Management Council's area of jurisdiction. Under this alternative, the 50,000 colony quota would still apply to octocoral harvest in the Gulf of Mexico and the South Atlantic and would not result in increased biological impacts to the resource. **Preferred Alternative 1** and **Alternative 2** address jurisdictional issues but do not have an impact on harvest of the octocoral species and are expected to have similar biological impacts to the resource.

Socio-economic

Given that there are no impacts on the harvest of octocoral species as a result of **Preferred Alternative 1 and Alternative 2**, socio-economic effects are not expected to change. The two alternatives are expected to have similar biological impacts to the resource. Similarly, economic effects are likely to be similar between **Preferred Alternative 1 and Alternative 2**.

❖ Action 3. Modify the Annual Catch Limit (ACL) for Octocorals in the South Atlantic

Alternative 1. No action. Do not modify the existing ACL for octocorals in the South Atlantic (ACL=current 50,000 colony quota for South Atlantic and Gulf of Mexico EEZ).

Alternative 2. Modify the existing ACL in the South Atlantic and Gulf of Mexico (ACL=current 50,000 colony quota for South Atlantic and Gulf of Mexico EEZ) to include State waters.

Preferred Alternative 3. ACL = 0

Annual Catch Limits (ACL)

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

Year	*Combined South Atlantic and Gulf State Landings*	*Combined South Atlantic and Gulf Federal Landings*	*Total Landings*
2000	31,847	11,253	43,100
2001	36,734	9,160	45,894
2002	25,024	13,114	38,138
2003	35,104	9,380	44,484
2004	36,406	7,352	43,758
2005	33,752	7,700	41,452
2006	41,822	6,745	48,567
2007	33,275	10,997	44,272
2008	32,651	9,841	42,492
2009	23,887	7,372	31,259

Table 1 - Landings of octocorals in both South Atlantic and Gulf Federal and state waters (Source: Landings data FL FWC, FWRI)

Impacts from Action 3

Biological

Alternative 1 (No Action) would continue to manage octocorals with the 50,000 colony quota and would not account for landings in state waters. The State of Florida has implemented compatible regulations which allow the state octocoral fishery to close when the Federal quota is met, however, that quota has never been reached and the state fishery for octocorals has never been closed.

Alternative 2 would modify the existing annual catch limit (ACL) for octocorals to include landings from Gulf and South Atlantic state waters in addition to landings in the exclusive economic zone (EEZ). The majority of octocoral harvest occurs in the state waters off of Florida. The landings off of states in the Gulf and South Atlantic have not exceeded the 50,000 colony quota but have come fairly close. In November 2010, the Council's Scientific and Statistical Committee (SSC) clarified that their acceptable biological catch (ABC) recommendation of 50,000 colonies annually includes Gulf and South Atlantic EEZ and state waters. (Councils review the SSC recommendations for ABC and set the ACL.) Combined landings for state and Federal waters in the Gulf and South Atlantic have not reached the 50,000 colony quota but may in the future. **Alternative 2** would allow more protection to the resource by considering state landings towards the quota.

Preferred Alternative 3

Socio-economic

Alternative 2 is expected to result in long-term economic benefits to fishermen due to a limit placed on how many colonies can be harvested in state and federal waters. There are no short-term economic losses to fishermen from implementation of the 50,000 quota combined federal and state waters as the ACL. **Alternative 2** is expected to produce long-term social benefits compared to **Alternative 1 (No Action)** as a result of the long-term economic benefits expected.

Preferred Alternative 3

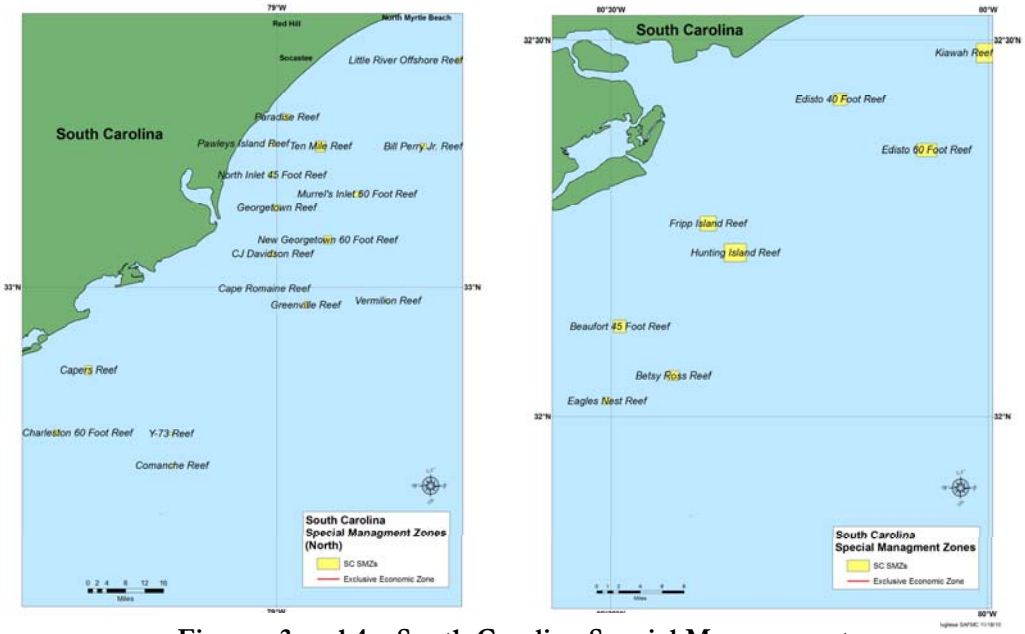
❖ Action 4. Modify Management of South Carolina's Special Management Zones

Alternative 1. No action. Do not modify the current management of SMZs off South Carolina.

Preferred Alternative 2. Limit harvest and possession of snapper grouper species (with the use of all non-prohibited fishing gear) in South Carolina's Special Management Zones to the recreational bag limit.

Preferred Alternative 3. Limit harvest and possession of CMP species (with the use of all non-prohibited fishing gear) in South Carolina's Special Management Zones to the recreational bag limit.

Alternative 4. Prohibit use of hand spear and spear guns in South Carolina SMZs.



Figures 3 and 4 – South Carolina Special Management Zones, North and South geographic areas

Impacts from Action 4

The intended purpose behind designation of an artificial reef as an SMZ is to "prohibit or restrain the use of specific types of fishing gear that are not compatible with the intent of the permittee for the artificial reef." Designating an artificial reef as an SMZ preserves the fishing opportunities artificial reefs provide and serves as an incentive to establish them. Fishing gear that offers "exceptional advantages" over other gear types may significantly reduce the improved fishing opportunities, and eliminate the incentive for developing an artificial reef, which would prevent improved fishing opportunities that would not otherwise exist (Snapper Grouper FMP, SAFMC 1983).

Biological

Modifying management of the SMZs to restrict commercial fishing effort to the bag limit could possibly reduce the amount of harvest and have a positive biological impact on the resource. However, there is little information on the amount of commercial harvest in the SMZs and any commercial effort is expected to be small. In general, given that an expected decrease in commercial harvest could occur and biological benefits could accrue, long-term economic benefits are also expected. As a result of increased biological benefits and long-term economic benefits, social benefits are also expected to accrue as a result of **Preferred Alternatives 2 and 3, and Alternative 4**.

Socio-economic

The major species targeted included Atlantic spadefish, black sea bass, flounder, king mackerel, sharks, and Spanish mackerel. However, no information exists on commercial fishing in South Carolina SMZs and therefore the economic effects of **Preferred Alternatives 2 and 3** cannot be quantified at this time due to lack of data. Neither is there information on gear usage in the South Carolina SMZs and therefore the economic effects of **Alternative 4** cannot be quantified. However, in general, given that an expected decrease in commercial harvest could occur and biological benefits could accrue, long-term economic benefits are also expected. As a result of increased biological benefits and long-term economic benefits, social benefits are also expected to accrue as a result of **Preferred Alternatives 2 and 3 and also Alternative 4**.

❖ Action 5. Modify Sea Turtle Release Gear Requirements for the Snapper Grouper Fishery

Alternative 1. No Action. Maintain current sea turtle and smalltooth sawfish release gear requirements for the snapper grouper fishery in federal waters of the South Atlantic. Currently, required gear (regardless of freeboard height) includes:

- a long-handled line clipper or cutter,
- a long-handled dehooker for ingested hooks,
- a long-handled dehooker for external hooks,
- a long-handled device to pull an "inverted V",
- a dipnet,
- a tire (or other comparable cushioned, elevated surface that immobilizes boated sea turtles),
- a short-handled dehooker for ingested hooks,
- a short-handled dehooker for external hooks,
- long-nose or needle-nose pliers,
- bolt cutters,
- monofilament line cutters, and
- at least two types of mouth openers/mouth gags.

This equipment must meet the specifications described in 50 CFR 635.21(c)(5)(i)(A-L) with the following modification: any other comparable, cushioned, elevated surface that allows boated sea turtles to be immobilized, may be used as an alternative to the requirement in 50 CFR 635.21(c)(5)(i)(F) to have a tire on board.

Alternative 2. Require all federally-permitted hook-and-line vessels with no longline gear onboard to have and use a tool capable of cutting the fishing line and a tool capable of removing a hook from a sea turtle or smalltooth sawfish. Fishermen would still be required to comply with all current sea turtle and smalltooth sawfish release guidelines.

Alternative 3. Require all sea turtle release and smalltooth sawfish gear listed under Alternative 1 (No Action) for federally permitted snapper grouper vessels using longline gear, and require [insert specific sea turtle release gear] for federally permitted vessels fishing with hook-and-line gear.

Preferred Alternative 4. Modify sea turtle and smalltooth sawfish release gear based on freeboard height. Fishermen would still be required to comply with all current sea turtle and smalltooth sawfish release guidelines. The design specifications of required gear and the

handling and release techniques employed must comply with those described in the NOAA Fisheries Service document entitled "Careful Release Protocols for Sea Turtle Release with Minimal Injury."

Sub-Alternative 4a. Vessels with freeboard height of 4 feet or less would be required to carry and use:

- a short-handled dehooker for ingested hooks; or a dehooker for ingested and a dehooker for external hooks
- long-nose or needle-nose pliers,
- bolt-cutters
- mono-filament line cutters
- cushion/support device (i.e., boat cushion)
- a dipnet
- at least two types of mouth openers/mouth gags

Sub-Alternative 4b. Vessels with freeboard height of 4 feet or more (and/or using longline gear) would be required to carry and use:

- a long-handled line cutter,
- a long-handled dehooker for ingested hooks; or a dehooker for ingested and a dehooker for external hooks,
- a long-handled device to pull an "inverted V",
- a dipnet,
- cushion/support device (i.e., boat cushion)
- a short-handled dehooker for ingested hooks; or a dehooker for ingested and a dehooker for external hooks
- long-nose or needle-nose pliers,
- bolt cutters,
- monofilament line cutters, and
- at least two types of mouth openers/mouth gags

Alternative 5. Modify the design specifications of the current sea turtle release and smalltooth sawfish gear equipment for all federally permitted non-longline snapper grouper vessels with hook-and-line gear on board to match the specifications described in the NOAA Fisheries Service document entitled "Careful Release Protocols for Sea Turtle Release with Minimal Injury." These new design criteria allow for less "heavy-duty" gears more appropriate for lighter tackle used by snapper-grouper fishers.

Council may select one or more sub-alternatives. *NOTE:* Sub-alternative 5a is recommended by the Southeast Regional Office of Protected Resources Division as the minimum requirement necessary to remain in compliance with the biological opinion. Choosing additional sub-alternatives would be especially beneficial for species conservation, but not required to remain in compliance with the biological opinion.

Sub-Alternative 5a. Require all federally permitted non-longline snapper grouper vessels with hook-and-line gear on board:

- a short-handled dehooker for ingested hooks, or a short-handled dehooker for external hooks
- cushion/support device (i.e., standard automobile tire or boat cushion)
- long-nose or needle-nose pliers,
- bolt-cutters
- mono-filament line cutters
- a dipnet
- at least two types of mouth openers/mouth gags

Sub-Alternative 5b. Also require:

- a long-handled dehooker for ingested hooks, or a long-handled dehooker for external hooks

Sub-Alternative 5c. Also require:

- a long-handled line clipper or cutter

Sub-Alternative 5d. Also require:

- a long-handled device to pull an "inverted V"

Impacts from Action 5

Biological

Alternative 1 (No Action) would maintain the current sea turtle and smalltooth sawfish release gear requirements for the snapper-grouper fishery. The dehookers, line cutters, and bolt cutters specified under current regulations were designed for and are required in the HMS pelagic longline and shark bottom longline fisheries. Utilizing specialized dehooking and disentanglement gear has been shown to reduce hooking mortality in sea turtles; however, there is some concern that using sea turtle dehooking equipment not designed for the lighter tackle typically used by snapper grouper fishermen could in fact harm sea turtles or smalltooth sawfish during the dehooking process. If the heavier-duty dehooking gear required under **Alternative 1 (No Action)** is causing harm, or is less effective than gear designed for lighter tackle, the benefits of using the current gear may not be as great as could be achieved under other alternatives.

Alternatives 2 and 3 modify the sea turtle and smalltooth sawfish release gear specifications for vessels carrying hook-and-line gear on board that is not longline gear. Under these alternatives, all vessels with longline gear on board will be required to continue carrying all the dehooking and disentanglement gears outlined in **Alternative 1**. Under **Alternative 2**, the only tools that would be required for vessels carrying non-longline, hook-and-line gear is a tool capable of cutting fishing line, such as a knife, and a tool capable of removing a hook from a sea turtle, such as a pair of pliers. The dehooking and line cutting capabilities of any tool onboard a vessel are subjective, and would therefore be difficult to enforce. Because of the requirements of the biological opinion outlining how sea turtle and smalltooth sawfish release equipment should be implemented, **Alternative 2** would not be in compliance with the biological opinion. Selecting **Alternative 2** may require re-initiation of ESA section 7 consultation and may require the development of a new biological opinion.

Alternative 3 differs from **Alternative 2** by identifying specific types of sea turtle and smalltooth sawfish release equipment for snapper-grouper vessels carrying hook-and-line gear onboard that is not longline gear. **Alternative 3** also maintains the status quo requirement for snapper-grouper vessels carrying longline gear onboard. The compliance of this alternative with the biological opinion would depend on which specific types of sea turtle and smalltooth sawfish release equipment were ultimately required.

Preferred Alternative 4 would require different lengths and types of dehooking tools dependent upon the freeboard height of the vessel, which tracks the sea turtle release gear regulations in the Gulf of Mexico. **Preferred Alternative 4** also offers the option of tailoring sea turtle and smalltooth sawfish release gear specifications to increase effectiveness when used with lighter tackle in the snapper grouper fishery. **Preferred Sub-Alternatives 4a and 4b** would either allow for gear specifications to be changed for only vessels with freeboard heights less than four feet, or for all snapper grouper vessels regardless of freeboard height. While this alternative could authorize vessels with lower freeboard heights to carry a truncated suite of equipment, the equipment required would still be the "heavier-duty" tools used in the HMS fisheries.

Alternative 5 would modify the design specifications of the current sea turtle release gear requirements for all federally permitted non-longline snapper grouper vessels with hook-and-line gear on board. **Sub-alternative 5a** would require a minimum set of release equipment more appropriate for the smaller tackle used in the snapper-grouper hook-and-line fishery. The biological benefit of **sub-alternative 5a** would likely be similar to **Alternative 1**. The changes in design specifications to the required equipment could make them more effective in releasing hooked or disentangled sea turtles or smalltooth sawfish. Under these circumstances the biological benefits from **sub-alternative 5a** may be greater than **Alternative 1**. Since each piece of equipment has new design criteria, each piece is likely to be more effective at dehooking and disentangling the lighter tackle used in the fishery. Selecting all four sub-alternatives is likely to have the greatest biological benefit of the all the proposed alternatives. This would ensure that both short- and long-handled release equipment is on board, and that those gears are designed to handle lighter tackle.

Socio-economic

In general, **Alternative 1 (No Action)** could result in the highest long-term economic benefits in that this alternative results in the greatest biological benefits under the assumption that more substantial gear than necessary is used for boats fishing with light tackle. However, use of release gear specified for larger vessels using pelagic longline gear could result in negative biological and long-term economic effects from damage to sea turtles. Under **Alternative 1 (No Action)**, expenses totaled $617-$1,115 (2006 dollars) per vessel as estimated in Snapper Grouper Amendment 15B. Additional expenses were incurred in onboard storage requirements of the gear. When analyzing **Alternatives 2-5**, it was assumed that all vessels participating in the snapper grouper fishery already carry the release gear under **Alternative 1 (No Action)**.

While **Alternative 2** may result in increased economic benefits resulting from increased biological benefits compared to **Alternative 1 (No Action)** because more appropriate release gear is being used, effectiveness is difficult to estimate and enforcement may be difficult since success relies heavily on how well sea turtle release guidelines are adhered to. **Alternative 3** differs slightly from **Alternative 2** in that specific gear is identified for vessels using light tackle. Therefore, no enforcement issues should arise and all vessels would be carrying appropriate gear. For this reason, **Alternative 3** is expected to yield slightly higher long-term economic benefits than **Alternatives 1 and 2**. In the short-term, **Alternatives 2 and 3** would result in an increase in out of pocket expenses. However, these are unquantifiable but expected to be minimal.

Preferred Alternative 4 would result in out of pocket expenses totaling $324-$490 for vessels with less than 4 feet freeboard. The aggregate cost resulting from **Preferred Alternative 4** depends on the number of vessels with less than 4 feet freeboard and the number of vessels with more than 4 feet freeboard, and this cannot be estimated.

Alternative 5 modifies the gear requirements under **Alternative 1**. **Alternatives 5a-5d** require gear already possessed by fishermen and listed under **Alternative 1**. Therefore, no negative economic effects are expected as a result of the **Alternative 5 sub-alternatives**.

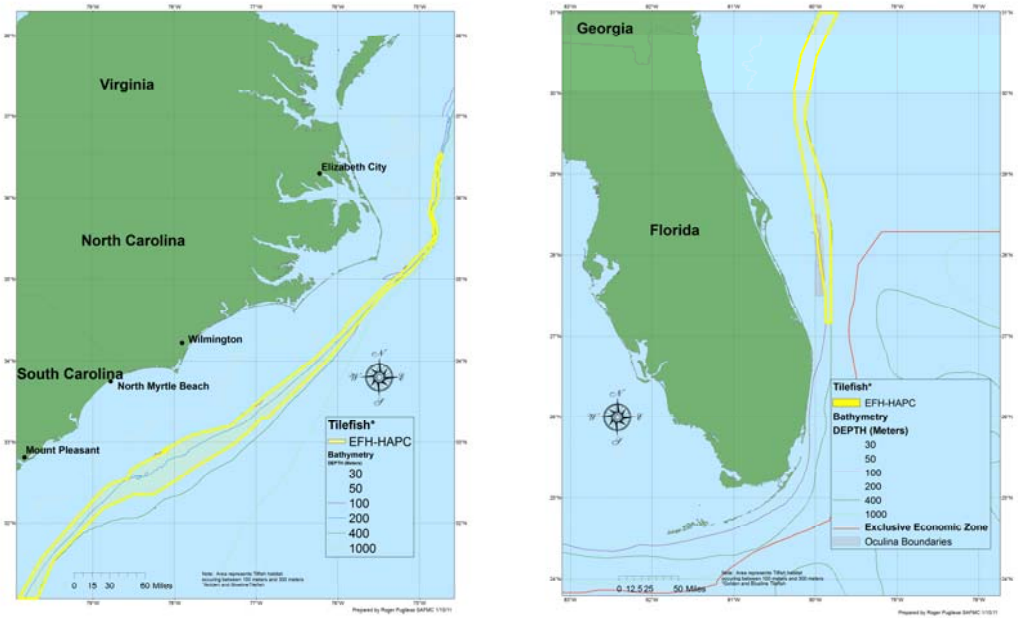
❖ Action 6. Amend the Snapper Grouper FMP to designate new EFH-HAPCs

Alternative 1. No Action. Do not amend the Snapper Grouper FMP to designate new Essential Fish Habitat-Habitat Areas of Particular Concern (EFH-HAPCs).

Preferred Alternative 2. Amend the Snapper Grouper FMP to designate one or more of the following EFH-HAPCs.

Sub-alternative 2a. Designate EFH-HAPCs for golden tilefish to include irregular bottom comprised of troughs and terraces inter-mingled with sand, mud, or shell hash bottom. Mud-clay bottoms in depths of 150-300 meters are HAPC. Golden tilefish are generally found in 80-540 meters, but most commonly found in 200-meter depths.

Sub-alternative 2b. Designate EFH-HAPC for blueline tilefish to include irregular bottom habitats along the shelf edge in 45-65 meters depth; shelf break; or upper slope along the 100-fathom contour (150-225 meters); hardbottom habitats characterized as rock overhangs, rock outcrops, manganese-phosphorite rock slab formations, or rocky reefs in the South Atlantic Bight; and the Georgetown Hole (Charleston Lumps) off Georgetown, SC.



Figures 5 and 6 – Tilefish Essential Fish Habitat - HAPC

Preferred Alternative 3. Designate EFH-HAPCs for the snapper-grouper complex to include Deepwater Marine Protected Areas (MPAs).

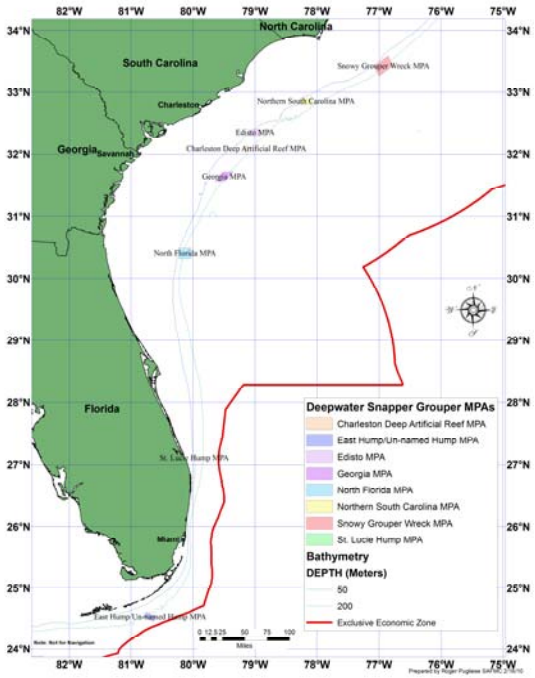


Figure 7 - Deepwater Snapper Grouper MPAs

Impacts from Action 6

Biological

Alternative 1 (No Action) would not add an area highlighting the importance of golden tilefish and blueline tilefish or an area emphasizing the value of the habitat in the Deepwater MPAs (established in Snapper Grouper Amendment 14). **Preferred Alternative 2** addresses an oversight in the initial designation of Snapper Grouper EFH in the Comprehensive EFH Amendment, and while considered EFH, the area was not included in the proposed list of EFH-HAPCs. **Preferred Alternative 2a** for golden tilefish, and **Preferred Alternative 2b** for blueline tilefish propose respective detailed descriptions for EFH-HAPCs. **Preferred Alternative 3** would designate previously specified deepwater MPAs as EFH-HAPCs. This alternative is intended to protect these MPAs as a unique habitat complex and require enhanced EFH consultations pertaining to non-fishing activities that could potentially impact these protected habitats.

EFH-HAPC designation would provide a future opportunity for the Council to establish regulations to protect EFH from fishing activities in the EEZ and to review and recommend EFH conservation measures to protect surface waters from non-fishing activities which are undertaken, authorized, or funded by Federal agencies.

Socio-economic

Designation of additional EFH-HAPCs will require the Council to consider all operations or actions that might interact with or affect the EFH-HAPC, and may trigger a consultation for any activity that may affect the habitat. The direct effects of additional regulatory consideration would be the financial costs of a lengthy regulatory process. Additional effects would accrue to any restrictions imposed as a result of the evaluation of impact of these activities. A consultation may incur costs associated with production delays, project/activity design modification, or mitigation measures.

❖ Action 7. Amend the Coral Fishery Management Plan to designate new EFH – Habitat Areas of Particular Concern (EFH-HAPCs)

Alternative 1. No Action. Do not amend the Coral FMP to designate new Essential Fish Habitat-Habitat Areas of Particular Concern (EFH-HAPCs). The following existing designations would remain in effect.

Preferred Alternative 2. Amend the Coral FMP to designate Deepwater Coral HAPCs as EFH-HAPCs.

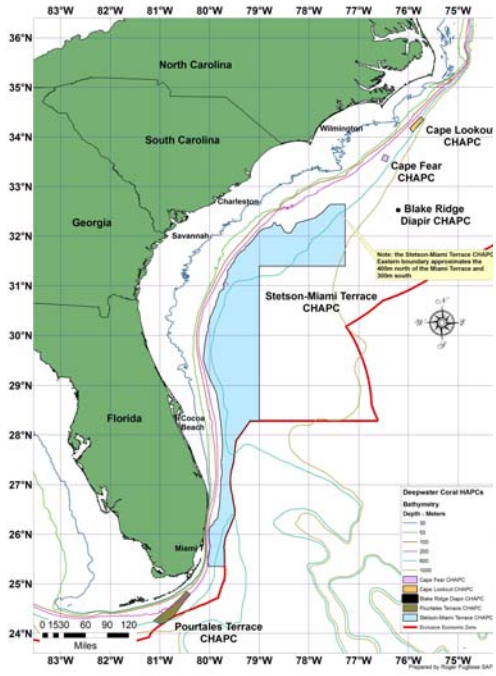


Figure 8 - Deepwater Coral HAPCs

Impacts from Action 7

Biological

Alternative 1 (No Action) would not propose additional EFH-HAPCs intended to aid in the conservation of coral and live bottom habitat, especially when addressing policy or permit activities associated with non-fishing activities. **Preferred Alternative 2** proposes to further emphasize the importance of these protected deepwater ecosystems by designating them as EFH-HAPCs.

The EFH-HAPC designation under this option would provide a future opportunity for the Council to establish regulations to protect EFH from fishing activities in the EEZ and to review and recommend EFH conservation measures to protect habitat from non-fishing activities which are undertaken, authorized, or funded by Federal agencies.

Socio-economic

Designation of EFH-HAPC will require the Council to consider all operations or actions that might interact with or affect the EFH-HAPC, and may trigger a consultation for any activity that may affect the habitat. The direct effects of additional regulatory consideration would be the financial costs of a lengthy regulatory process. Additional effects would accrue to any restrictions imposed as a result of the evaluation of impact of these activities. A consultation may incur costs associated with production delays, project/activity design modification, or mitigation measures.

❖ Action 8. Amend the Fishery Management Plan for Pelagic *Sargassum* Habitat to Designate new EFH

Alternative 1. No action. Do not amend the *Sargassum* FMP to designate Essential Fish Habitat (EFH). The Council must designate EFH for all managed species including Pelagic *Sargassum* Habitat.

Alternative 2. Amend the *Sargassum* FMP to designate the top 10 meters of the water column in the South Atlantic EEZ as EFH for Pelagic *Sargassum*.

Preferred Alternative 3. Amend the *Sargassum* FMP to designate the top 10 meters of the water column in the South Atlantic EEZ bounded by the Gulfstream, as EFH for pelagic *Sargassum*.

Impacts from Action 8

Biological

Alternative 1 (No Action) would not specify EFH for *Sargassum* and would not be in compliance with the EFH Final Rule. **Alternative 2** proposes an EFH designation that includes the top ten meters of the water column where it occurs in the South Atlantic. **Preferred Alternative 3** proposes a smaller EFH designation than **Alternative 2** that includes the top ten meters of the water column in the South Atlantic with the bounds of the Gulf Stream being the most Eastern boundary. The Gulf Stream is the most significant oceanographic feature supporting Sargassum species occurrence, distribution and transport.

Limiting the EFH identification to the upper 10 meters of the surface as bounded by the Gulf Stream was recommended by NMFS in the development of the Final Environmental Impact Statement for the Pelagic *Sargassum* Habitat FMP. The identification of essential habitat for pelagic *Sargassum* enables the Council to protect EFH more effectively and take timely actions when necessary. Identifying and describing EFH is the first step in preventing decreases in biological productivity of pelagic *Sargassum* and other managed or prey species dependent on pelagic *Sargassum*.

Socio-economic

The identification of EFH for pelagic *Sargassum* will not have any direct economic impacts. However, this measure will enable the Council to protect EFH effectively and take timely actions when necessary which could lead to increased net economic benefits to society.

❖ Action 9. Amend the Fishery Management Plan for Pelagic *Sargassum* Habitat to designate EFH-HAPCs

Preferred Alternative 1. No action. Do not designate EFH-HAPCs for Pelagic *Sargassum*.

Alternative 2. Amend the *Sargassum* FMP to designate one or more of the following as EFH-HAPCs

Sub-Alternative 2a. The Charleston Bump Complex

Sub-Alternative 2b. The Point, NC.

Impacts from Action 9

Biological

Preferred Alternative 1 (No Action) would not acknowledge areas within EFH that have been identified as important to the growth and survival of *Sargassum*. **Alternative 2** offers the designation of EFH-HAPCs for Pelagic *Sargassum* as the "Charleston Bump" (**Sub-alternative 2a**) or The Point, NC (**Sub-alternative 2b**). The Charleston Bump Complex, given its unique oceanographic characteristics, is a critical subset of the proposed EFH and is therefore proposed as an EFH-HAPC. The Point, off NC, given its unique oceanographic characteristics, is also a critical subset of the proposed EFH and is proposed as EFH-HAPC for pelagic *Sargassum*.

The designation as EFH-HAPC for pelagic *Sargassum* would provide a future opportunity for the Council to establish regulations to protect EFH from fishing activities in the EEZ and to review and recommend EFH conservation measures to protect surface waters from non-fishing activities which are undertaken, authorized, or funded by Federal agencies.

Socio-economic

Designation of EFH-HAPC will require the Council to consider all operations or actions that might interact with or affect the EFH-HAPC, and may trigger a consultation for any activity that may affect the habitat. The direct effects of additional regulatory consideration would be the financial costs of a lengthy regulatory process. Additional effects would accrue to any restrictions imposed as a result of the evaluation of impact of these activities. A consultation may incur costs associated with production delays, project/activity design modification, or mitigation measures.

1 Introduction

1.1 Background

The South Atlantic Fishery Management Council manages the snapper grouper, coastal migratory pelagic fisheries, coral and coral reefs and *Sargassum* fisheries in the South Atlantic exclusive economic zone (EEZ) (**Figure 1-1**) under their respective Fishery Management Plans (FMPs). The FMPs and their amendments are developed under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), other applicable Federal laws, and executive orders. The species managed under the FMPs addressed in this amendment are listed in **Table 1-1**.

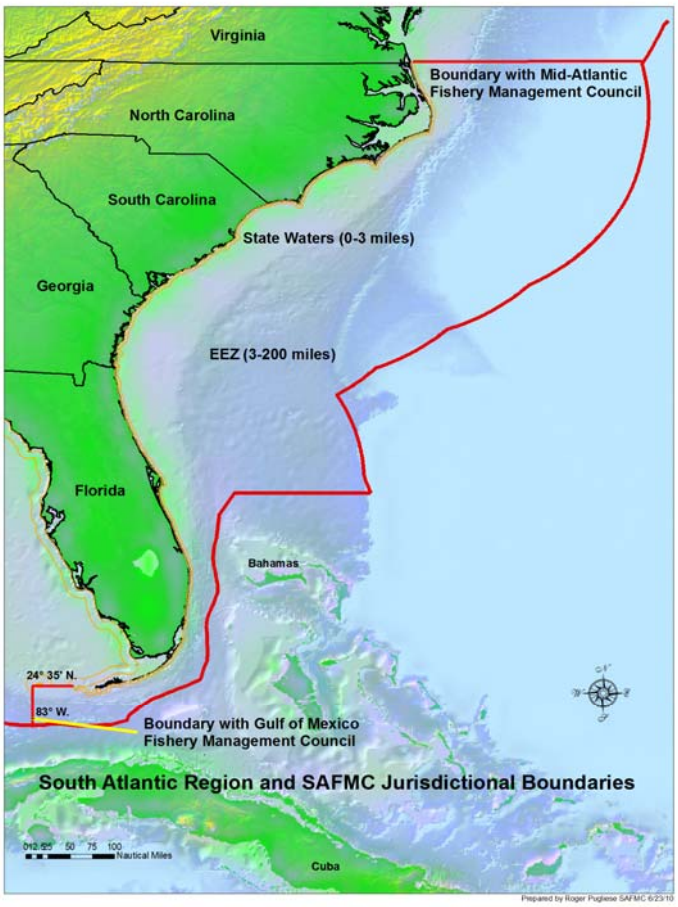


Figure 1-1. Jurisdictional boundaries of the South Atlantic Fishery Management Council.

Table 1-1. Species in the FMUs for Snapper Grouper, Coastal Migratory Pelagic, Coral and *Sargassum*.

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

Coastal Migratory Pelagic FMU
Cero *Scomberomous regalis*
Cobia *Rachycentron canadum*
King mackerel *Scomberomous cavalla*
Spanish mackerel *Scomberomorus maculates*
Little tunny *Euthynnus alleterattus*

Coral FMU
Coral Reefs – hardbottom, deepwater banks, patch reefs and outer banks (as defined in Amendment 1 to the FMP for Coral and Coral Reefs)
Stony Corals – species belonging to Class Hydrozoa, Class Anthozoa, Subclass Zoantharia
Octocorals – Class Anthozoa, Subclass Octocorallia (including sea fans, *Gorgonia ventalina*, *Gorgonia flabellum*)

***Sargassum* FMU**
Sargassum fluitans
Sargassum natans

1.2 Purpose of the Proposed Action

The purpose of Comprehensive Ecosystem-Based Amendment 2 (CE-BA 2) is to modify management of octocorals through the establishment of an annual catch limit (ACL); modify management of the South Carolina Special Management Zones (SMZs); revise sea turtle release gear requirements for the snapper grouper fishery; and designate new essential fish habitat (EFH) and EFH-habitat areas of particular concern (EFH-HAPCs) in the South Atlantic. These actions are needed to remain in compliance with the Magnuson Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), and to respond to concern from fishermen.

This amendment proposes to specify and modify the annual catch limit (ACL) for octocorals in the South Atlantic region. The current 50,000 colony quota includes South Atlantic and Gulf of Mexico EEZ waters and has never been reached. The Council is considering an alternative to modify the ACL to 50,000 colonies which would include harvest from both State and EEZ waters in the Gulf and South Atlantic, combined. This amendment also includes actions to remove octocorals from the Fishery Management Unit (FMU) under the Coral Fishery Management Plan (FMP), and an action to extend the management unit for octocorals into the Gulf of Mexico Fishery Management Council's area of jurisdiction.

An action to modify management of SMZs is also included in this amendment. The action includes an alternative that would require harvest (with the use of all non-prohibited fishing gear) and possession of managed species in South Carolina SMZs to be limited to the recreational bag limit for snapper grouper and coastal migratory pelagic species. This action responds to concern from the recreational sector about the potential for commercial exploitation of South Carolina SMZs.

An action to modify sea turtle release gear requirements for the snapper grouper fishery is also included in CE-BA 2. Fishermen have expressed concern that the current sea turtle handling and release gear requirements are intended for larger longline vessels using heavy tackle and are ineffective and unwieldy for smaller snapper grouper hook and line vessels.

This amendment would amend Council FMPs as needed to designate new or modify existing EFH and EFH-HAPCs. CE-BA 2 would amend the Snapper Grouper FMP and the Coral, Coral Reefs and Hard/Live Bottom Habitat FMP to designate additional EFH-HAPCs. To meet the Magnuson-Stevens Act requirement that all managed species have EFH designated, CE-BA 2 amends the Pelagic *Sargassum* Habitat FMP to designate EFH and EFH-HAPCs.

1.3 Need for the Proposed Action

The *need* of the action is to ensure overfishing does not occur and to allow the stocks to increase in biomass, when necessary, in order to maximize their reproductive potential so that populations may produce optimum yield (OY). The actions in CE-BA 2 are needed to remain in compliance with the Magnuson-Stevens Act, and to respond to concern from fishermen.

1.4 Management Objectives

Management objectives of the Coral, Coral Reefs, and Live/Hardbottom Habitat FMP addressed by this amendment include the following:
1. Minimize, as appropriate, adverse human impacts on coral and coral reefs;
2. Provide, where appropriate, special management for Coral Habitat Areas of Particular Concern (CHAPCs);
3. Increase public awareness of the importance and sensitivity of coral and coral reefs and;
4. Provide a coordinated management regime for the conservation of coral and coral reefs.

Management objectives of the Snapper Grouper FMP addressed by this amendment include the following:
1. Prevent overfishing.
2. Collect necessary data.
3. Promote orderly utilization of the resource.
4. Provide for a flexible management system.
5. Minimize habitat damage.
6. Promote public compliance and enforcement.
7. Mechanism to vest participants.
8. Promote stability and facilitate long run planning.
9. Create market-driven harvest pace and increase product continuity.
10. Minimize gear and area conflicts among fishermen.
11. Decrease incentives for overcapitalization.
12. Prevent continual dissipation of returns from fishing through open access.
13. Evaluate and minimize localized depletion.
14. End overfishing of snapper grouper stocks undergoing overfishing.
15. Rebuild stocks declared overfished.

Management objectives of the Coastal Migratory Pelagic FMP addressed by this amendment include the following:

<u>King Mackerel</u>
1. Institute management measures necessary to prevent exceeding MSY.
2. Establish a mandatory statistical reporting system for monitoring catch.
3. Minimize gear and user group conflicts.

<u>Spanish Mackerel</u>
1. Institute management measures to prevent exceeding MSY.
2. Establish a mandatory statistical reporting system for monitoring bycatch.
3. Minimize gear and user group conflicts in the event they arise.
4. Promote the maximum use of the resource up to the OY estimate.

<u>Cobia</u>
1. Institute management measures necessary to increase yield per recruit and average size and to prevent overfishing.

Management objectives of the *Sargassum* FMP addressed by this amendment include the following:
1. Establish a management structure to regulate pelagic *Sargassum* habitat.
2. Reduce the impact of the pelagic *Sargassum* fishery on essential fish habitat.

3. Reduce the potential for conflict.
4. As a federally managed species/habitat, direct needed research to better determine distribution, production, and ecology of pelagic *Sargassum* habitat.

1.5 History of Management

A summary of the history of management for Coral, Snapper Grouper, Coastal Migratory Pelagics and Sargassum FMPs can be found in Appendix B. More information on the history of management can be found online at: **www.safmc.net**.

2 Management Alternatives

This section outlines the proposed actions and alternatives considered by the South Atlantic Fishery Management Council (Council). A complete analysis of these alternatives can be found in **Section 4.0.** These alternatives were identified and developed through multiple processes, including the scoping meetings and public hearings conducted for CE-BA 2, meetings of the Council, the Council's Habitat and Ecosystem Committees, Habitat and Environmental Protection Advisory Panel, Coral Advisory Panel, and Scientific and Statistical Committee.

Alternatives the Council considered during the development of this amendment but eliminated from further detailed study are described in **Appendix A**.

The Reauthorized Magnuson-Stevens Act (2006) requires specification of Overfishing Limit (OFLs), ACLs and Accountability Measures (AMs). The Reauthorized Magnuson-Stevens Act required that for species undergoing overfishing, ACLs must be established at a level that prevents overfishing by the end of 2010. The Magnuson-Stevens Act also requires AMs, which are management controls to prevent ACLs from being exceeded; and include corrective measures if overages occur.

ACLs and AMs must be established for all other species managed by the Council (with the exception of species with an annual life cycle) by the end of 2011. ACLs and AMs for octocorals are being addressed in this amendment.

The final NS1 guidelines recognizes that existing FMPs may use terms and values that are similar to, associated with, or may be equivalent to OFL, ABC, ACLs, annual catch targets, and AMs. As such, the Council has removed actions from this document establishing the maximum sustainable yield (MSY), OFL, ABC, and AMs as a result of existing values within previous Coral Fishery Management Plan (FMP) amendments that are equivalent to the required values under the Magnuson-Stevens Act.

These actions include:

Establishing MSY for Octocorals in the South Atlantic

The Coral Plan (Coral FMP; SAFMC & GMFMC 1990) cited lack of sufficient data on biomass and mortality, and the absence of a fishery from which catch and effort data may be obtained, as factors preventing any calculation of MSY from the entire management area for the octocoral fishery. When the Council revisited this issue during the development of the Comprehensive Sustainable Fisheries Amendment (SAFMC, 1998), the same conclusions were drawn and no estimate of MSY was provided.

An estimate of MSY has been determined for several coral species at specific reefs in the Florida reef tract, but cannot be expanded to other corals due to great differences in species, densities, growth rates, and other factors. The Council's Scientific and Statistical Committee (SSC) indicates that although the MSY value is unknown, it is estimated to be some value higher than the 50,000 colony status quo quota. The SSC believes that overfishing is not

occurring because the octocoral fishery is small and effort and participation in Florida waters (where most of the harvest comes from) is capped by a limited entry program; there are no signs of local depletion in areas where the fishery operates; and there are no indications that the fishery has been operating at unsustainable levels.

Establish an Overfishing Level (OFL) for Octocorals in the South Atlantic

The Comprehensive Sustainable Fisheries Amendment (SAFMC, 1998) defines overfishing as the level of harvest that exceeds Optimum Yield (OY). OY for allowable octocorals in the South Atlantic and Gulf exclusive economic zone (EEZ) is not to exceed 50,000 colonies per year and fishing for octocorals in the EEZ will cease when the quota is reached (Amendment 1 to the Coral FMP). The level of harvest in the South Atlantic and Gulf EEZ has never exceeded OY and the fishery has never been closed in federal waters, thus overfishing has not occurred.

At their August 2010 meeting, the SSC discussed the lack of a stock assessment for octocorals and limited landings information. The SSC determined an estimate of OFL could not be quantified but is considered to be an unknown value above ABC. The Council further discussed the fact that there are no signs of local depletion in areas where the octocoral fishery operates or any other indication that the fishery has been operating at unsustainable levels.

Establish Acceptable Biological Catch (ABC) for Octocorals in the South Atlantic

In April 2010, the SSC met to discuss development of an ABC control rule for data poor stocks, including octocorals. The Council received the proposed data-poor control rule in June 2010. However, some aspects of the proposed ABC control rule and its criteria were considered inappropriate considering guidance that the rule should account for scientific uncertainty. The SSC was asked to reconvene in August 2010 to reconsider an ABC control rule for data poor stocks, including octocorals. At their August 2010 meeting, the SSC reviewed and discussed background information on octocoral landings, life history, and possible fishery reference points. The SSC discussed the fact that there is no stock assessment for octocorals, landings information is limited, and an estimate of OFL could not be provided but is considered to be an unknown value above ABC. Fishery-independent information is also limited but available survey data (monitoring programs and directed studies conducted by Florida Fish and Wildlife Commission (FL FWC), University of North Carolina-Wilmington, and University of Georgia) suggests relatively high octocoral abundance in the historically known distribution area (Florida Keys).

The SSC recommended no changes to the current quota and recommended an ABC of 50,000 colonies annually for Gulf and South Atlantic EEZ waters, combined. The SSC was asked to clarify their ABC recommendation during their November 2010 meeting. They explained the current quota is set at a value higher than what is historically landed. Based upon the number of licensed participants (100-140 fishers), the magnitude of landings, and the quota never having been met, they clarified it was their intent for the ABC recommendation for octocorals to include Gulf and South Atlantic EEZ and State waters. Because the ABC for

octocorals is an existing value provided by the SSC, it was removed as an action from the document.

Establish Accountability Measures (AMs) for Octocorals in the South Atlantic

Once the annual octocoral quota of 50,000 colonies in the South Atlantic and Gulf of Mexico EEZ is reached the federal fishery will close. This provision was established in Coral Amendment 1 to the Coral FMP (1990) and is considered an accountability measure for the fishery. For this reason, an action to specify an AM for this fishery does not need to be considered in this amendment.

2.1 Action 1. Remove octocorals from the Fishery Management Unit (FMU) under the South Atlantic Coral FMP.

Alternative 1. No Action. Do not remove octocorals from the FMU under the South Atlantic Coral FMP.

Alternative 2. Remove octocorals from the FMU.

Preferred Alternative 3. Modify the FMU to indicate that octocorals are included in the EEZ off NC, SC, and GA

2.1.1 Comparison of Alternatives

Under **Alternative 1 (no action),** octocorals would continue to be managed through the South Atlantic Coral FMP and would be subject to a harvest level or 50,000 colonies combined for the Gulf and South Atlantic exclusive economic zone (EEZ). Octocorals are considered to be data-poor with no stock assessment and limited landings information. Fishery-independent survey data indicate there is a relatively high octocoral abundance in the historically known distribution area (Florida Keys). The fishery is also managed under other management measures including commercial permits, reporting requirements, and a six-colony recreational bag limit for octocorals. The Florida Fish and Wildlife Commission (FWC) is responsible for most of the management, implementation and enforcement of the regulations because most of the effort in the fishery occurs in state waters. Octocoral harvest off of Georgia, South Carolina and North Carolina will continue to be prohibited in Federal waters.

Alternative 2 would remove octocorals from the Coral FMP and would eliminate current management measures for octocorals in the South Atlantic. Although the state of Florida could adopt management of octocorals off of Florida, there would be no protection of the resource in Federal waters off of Georgia, South Carolina and North Carolina.
The biological benefits of **Alternative 2** would be expected to be less than **Alternative 1 (No Action)**. Furthermore, adoption of **Alternative 2** would be contrary to the Council's intent stated in Amendment 3 of preventing expansion of octocoral harvest and ensuring essential

fish habitat in the EEZ is protected. Essential Fish Habitat is designated for octocorals, a designation that would be withdrawn if they are removed from the management unit.

Current management of the octocoral fishery by the State of Florida would be expected to continue and while there could be an increase in the harvest of octocorals, it would be unlikely. The market for octocorals is demand driven and there is not likely to be a significant increase in demand. Although the state of Florida could adopt management of octocorals off of Florida, under **Alternative 2** there would be no protection of the resource in Federal waters off of Georgia, South Carolina and North Carolina.

The biological benefits of **Alternative 2** would be expected to be less than **Alternative 1 (No Action)**. Furthermore, adoption of **Alternative 2** would be contrary to the Council's intent stated in Amendment 3 of preventing expansion of octocoral harvest and ensuring essential fish habitat in the EEZ is protected.

The economic and social impacts of the action alternatives are expected to be similar. Due to the increased risk of overfishing octocorals under **Alternative 2**, long-term economic and social benefits are expected to decrease slightly compared to **Alternative 1**. Short-term economic and social benefits could increase if the market demand for octocorals increased. With regards to administrative impacts, neither alternative is expected to result in an increase in impacts. **Alternative 2** would lessen the administrative burden on the agency as management of these species would no longer be necessary. However, if the need for Federal management of octocorals were to arise in the future, the administrative burden of including them in the FMU could result in a significant administrative burden.

Preferred Alternative 3 biological rationale

Table 2-1. Summarized comparison of the impacts among alternatives for Action 1.

	Alternative 1	**Alternative 2**	**Alternative 3**
Biological	No new impacts	Slightly negative impacts on the resource in Florida. Negative impacts in Georgia, North Carolina and South Carolina.	
Economic	No new impacts	Short-term positive	
Social	No new impacts	Short-term positive Long-term negative	
Administrative	No new impacts	Reduce administrative burden	

2.1.2 Council Conclusion

2.2 Action 2. Extend the SAFMC's Fishery Management Unit for octocorals into the Gulf of Mexico Fishery Management Council's area of jurisdiction.

Preferred Alternative 1. No Action. Do not extend the FMU for octocorals into the GMFMC's jurisdiction.

Alternative 2. Extend the management boundaries for all octocorals species in the coral FMP to include the GMFMC jurisdiction.

2.2.1 Comparison of Alternatives

Currently, the quota for octocorals is 50,000 colonies combined in the Gulf and South Atlantic exclusive economic zone (EEZ). Harvest of octocorals is prohibited north of Cape Canaveral, Florida. At its October 2010, meeting the Gulf of Mexico Fishery Management Council (Gulf Council) voted to remove octocorals from their Fishery Management Plan for Corals and Coral Reefs of the Gulf of Mexico (Gulf Coral FMP).

Currently, the only harvest of octocorals in the Gulf of Mexico is off of Florida and this fishery is monitored and enforced by the State of Florida. Under **Preferred Alternative 1**, the South Atlantic Fishery Management Council (South Atlantic Council) would continue to manage octocorals in the South Atlantic but management of octocorals in the Gulf of Mexico would fall under the state of Florida. This could provide difficulties in monitoring and enforcing the joint South Atlantic and Gulf of Mexico Federal quota. Under **Preferred Alternative 1**, harvest in any of the other Gulf states could not be controlled if a fishery were to develop, leaving octocoral populations vulnerable to overexploitation.

Alternative 2 would extend management jurisdiction of octocorals to include the Gulf Council's area of jurisdiction. Under this alternative, the 50,000 colony quota would still apply to octocoral harvest in the Gulf of Mexico and the South Atlantic and would not result in increased negative biological impacts to the resource. However, failure to adopt **Alternative 2** could increase harvest of octocorals if a fishery were to develop in the EEZ outside the state of Florida. Therefore, adoption of **Alternative 2** could prevent negative biological effects from occurring in the future if there is an expansion of octocoral harvest in Gulf states besides Florida.

Given that there are no impacts on the current harvest of octocoral species as a result of **Alternatives 1 and 2**, economic and social effects are not expected to change. However, adoption of **Alternative 2** would prevent future exploitation of octocoral species in the EEZ of other Gulf states and therefore could reduce future economic opportunities. The administrative impacts of **Alternative 2** would increase slightly from those of **Preferred Alternative 1** due to revising regulations, outreach and education.

It is expected that under either alternative the State of Florida would continue to collect data and monitor the octocoral fishery. **Alternative 2** would allow for octocorals to continue to be managed throughout their range and would allow for future management of octocorals in the Gulf states if the need arises. **Alternative 2** addresses jurisdictional issues but may provide a positive biological impact to the resource by allowing for management throughout their range.

Table 2-2. Summarized comparison of the impacts among alternatives for Action 2.

	Alternative 1	**Alternative 2**
Biological	Slightly negative impacts	Slightly positive impacts
Economic	Slightly positive impacts	Slightly negative impacts
Social	Slightly positive impacts	Slightly negative impacts
Administrative	No impact	Slight increase in impacts

2.2.2 Council Conclusion

2.3 Action 3. Modify the Annual Catch Limit (ACL) for octocorals in the South Atlantic

Alternative 1. No Action. Do not modify the existing ACL for octocorals in the South Atlantic (ACL=current 50,000 colony quota for South Atlantic and Gulf of Mexico EEZ).

Alternative 2. Modify the existing ACL in the South Atlantic and Gulf of Mexico (ACL=current 50,000 colony quota for South Atlantic and Gulf of Mexico EEZ) to include State waters.

Preferred Alternative 3. ACL = 0

2.3.1 Comparison of alternatives

Alternative 1 (No Action) would continue to manage octocorals with the 50,000 colony quota for the EEZ and would not account for landings in state waters. The State of Florida has implemented compatible regulations and closes the state octocoral fishery when the Federal quota is met, however, that quota has never been reached and the state fishery for octocorals has never been closed.

Alternative 2 would include harvest from state waters in the 50,000 colony quota. The quota for the octocoral fishery was implemented in 1990 (Amendment 1 Coral FMP, GMFMC & SAFMC) and reporting mechanisms have been established. **Alternative 2**

would result in a slightly higher administrative burden due to outreach and education, increased monitoring, and enforcement.

Preferred Alternative 3

Table 2-3. Summarized comparison of the impacts among alternatives for Action 3.

	Alternative 1	Alternative 2	Alternative 3
Biological	No impact	Positive impact to the resource	
Economic	No impact	Long-term positive impacts	
Social	No impact	Long-term positive impacts	
Administrative	No impact	Slight increase in impacts	

2.3.2 Council Conclusion

2.4 Action 4. Modify management of South Carolina Special Management Zones (SMZs).

Alternative 1. No Action. Do not modify the current management of SMZs off South Carolina.

Preferred Alternative 2. Limit harvest and possession of snapper grouper species (with the use of all non-prohibited fishing gear) in South Carolina's SMZs to the recreational bag limit.

Preferred Alternative 3. Limit harvest and possession of CMP species (with the use of all non-prohibited fishing gear) in South Carolina's SMZs to the recreational bag limit.

Alternative 4. Prohibit use of hand spear and spear guns in South Carolina SMZs.

2.4.1 Comparison of Alternatives

In South Carolina, almost all of the artificial reefs (**Figure 4-1 a**, and **Figure 4-2 b**) are managed as special management zones (SMZs) under the Snapper Grouper FMP to protect these relatively small reef communities from the effects of overly-efficient fishing practices. The Council has designated SMZs as Essential Fish Habitat – Habitat Areas of Particular Concern (EFH-HAPC).

Recreational constituents and the South Carolina Department of Natural Resources (SC DNR) have voiced concerns over the presence of commercial snapper grouper fishing vessels

operating on SMZs. Specifically, these constituents and SC DNR indicate the use of conventional spearguns by commercial fishermen to harvest fish on these sites might be harmful to the reef fish populations and is not in keeping with the intended purpose of the SMZs outlined in Snapper Grouper Regulatory Amendment #7.

The major species targeted in the SMZs include Atlantic spadefish, black sea bass, flounder, king mackerel, sharks, and Spanish mackerel. However, no information exists on commercial fishing in the South Carolina Special Management Zones and therefore the economic effects of **Preferred Alternative 2 and Preferred Alternative 3** cannot be quantified at this time due to lack of data. It is expected that modifying management of the SMZs to restrict commercial fishing effort to the bag limit could possibly reduce the amount of harvest in the area and have a positive biological impact on the species regularly targeted. However, there is little information on the amount of commercial harvest occurring in the SMZs and any commercial effort is expected to be small.

Alternative 4 would prohibit the use of spearfishing gear within the SMZs, which may provide a slight positive impact to the resource. Spearfishing allows fishermen to more effectively select for larger individuals within target species populations (Sadovy et al. 1994; Meyer 2007; Lloret et al. 2008). Spearfishing is considered to be an efficient harvesting activity that can significantly alter abundance and size structure of target species toward fewer and smaller fish by selective removal of larger individual fish. The removal of larger individual fish of the target species leaves behind smaller individuals to spawn. Over time this can decrease the size and age at sexual maturity and decrease the average size of the population (Sluka and Sullivan 1998, Chapman and Kramer 1999, Matos-Caraballo et al. 2006; Lloret et al. 2008).

As a result of increased biological benefits and long-term economic benefits, social benefits are also expected to accrue as a result of **Preferred Alternative 2, Preferred Alternative 3, and Alternative 4**.

Under the **No Action alternative**, the administrative impacts will not increase. Administrative impacts associated with the action alternatives are expected increase. Administrative impacts may take the form of preparation of regulations, education and outreach and law enforcement.

Table 2-4. Summarized comparison of the impacts among alternatives for Action 4.

	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
Biological	Possible negative impact	Possible positive impact	Possible positive impact	Possible positive impact
Economic	Possible negative impact	Long-term positive impacts	Long-term positive impacts	Long-term positive impacts
Social	Possible negative impact	Long-term positive impacts	Long-term positive impacts	Long-term positive impacts
Administrative	No impact	Slight increase in impacts	Slight increase in impacts	Slight increase in impacts

2.4.2 Council Conclusion

2.5 Action 5. Modify Sea Turtle Release Gear Requirements for the Snapper Grouper Fishery

Alternative 1. No Action. Maintain current sea turtle and smalltooth sawfish release gear requirements for the
Snapper grouper fishery in federal waters of the South Atlantic. Currently, required gear (regardless of freeboard height) includes:

- a long-handled line clipper or cutter,
- a long-handled dehooker for ingested hooks,
- a long-handled dehooker for external hooks,
- a long-handled device to pull an "inverted V",
- a dipnet,
- a tire (or other comparable cushioned, elevated surface that immobilizes boated sea turtles),
- a short-handled dehooker for ingested hooks,
- a short-handled dehooker for external hooks,
- long-nose or needle-nose pliers,
- bolt cutters,
- monofilament line cutters, and
- at least two types of mouth openers/mouth gags.

This equipment must meet the specifications described in 50 CFR 635.21(c)(5)(i)(A-L) with the following modification: any other comparable, cushioned, elevated surface that allows boated sea turtles to be immobilized, may be used as an alternative to the requirement in 50 CFR 635.21(c)(5)(i)(F) to have a tire on board.

Alternative 2. Require all federally-permitted hook-and-line vessels with no longline gear onboard to have and use a tool capable of cutting the fishing line and a tool capable of removing a hook from a sea turtle or smalltooth sawfish. Fishermen would still be required to comply with all current sea turtle and smalltooth sawfish release guidelines.

Alternative 3. Require all sea turtle and smalltooth sawfish release gear listed under **Alternative 1 (No Action)** for federally permitted snapper grouper vessels using longline gear, and require [insert specific sea turtle release gear] for federally permitted vessels fishing with hook-and-line gear.

Preferred Alternative 4. Modify sea turtle and smalltooth sawfish release gear based on freeboard height. Fishermen would still be required to comply with all current sea turtle and smalltooth sawfish release guidelines. The design specifications of required gear and the handling and release techniques employed must comply with those described in the NOAA Fisheries Service document entitled "Careful Release Protocols for Sea Turtle Release with Minimal Injury."

Preferred Sub-Alternative 4a. Vessels with freeboard height of 4 feet or less would be required to carry and use:

- a short-handled dehooker for ingested hooks; or a dehooker for ingested and a dehooker for external hooks
- long-nose or needle-nose pliers,
- bolt-cutters
- mono-filament line cutters
- cushion/support device (i.e., boat cushion)
- a dipnet
- at least two types of mouth openers/mouth gags

Preferred Sub-Alternative 4b. Vessels with freeboard height of 4 feet or more (and/or using longline gear) would be required to carry and use:

- a long-handled line cutter,
- a long-handled dehooker for ingested hooks; or a dehooker for ingested and a dehooker for external hooks,
- a long-handled device to pull an "inverted V",
- a dipnet,
- cushion/support device (i.e., boat cushion)
- a short-handled dehooker for ingested hooks; or a dehooker for ingested and a dehooker for external hooks
- long-nose or needle-nose pliers,
- bolt cutters,
- monofilament line cutters, and
- at least two types of mouth openers/mouth gags.

Alternative 5. Modify the design specifications of the current sea turtle and smalltooth sawfish release gear equipment for all federally permitted non-longline snapper grouper vessels with hook-and-line gear on board to match the specifications described in the NOAA Fisheries Service document entitled "Careful Release Protocols for Sea Turtle Release with Minimal Injury."
These new design criteria allow for less "heavy-duty" gears more appropriate for lighter tackle used by snapper-grouper fishers (see **Appendix E** for specification on each gear type).

Council may select one or more sub-alternatives.

NOTE: Sub-alternative 5a is recommended by the Southeast Region's Office of Protected Resources Division as the minimum requirement necessary to remain in compliance with the biological opinion. Choosing additional sub-alternatives would be especially beneficial for species conservation, but not required to remain in compliance with the biological opinion.

Sub-Alternative 5a. Require all federally permitted non-longline snapper grouper vessels with hook-and-line gear on board (see **Appendix E**) for specification on each gear type):

- a short-handled dehooker for ingested hooks, or a short-handled dehooker for external hooks,
- cushion/support device (i.e., standard automobile tire or boat cushion)
- long-nose or needle-nose pliers,
- bolt-cutters
- mono-filament line cutters
- a dipnet
- at least two types of mouth openers/mouth gags

Sub-Alternative 5b. Also require:

- a long-handled dehooker for ingested hooks, or a long-handled dehooker for external hooks,

Sub-Alternative 5c. Also require:

- a long-handled line clipper or cutter,

Sub-Alternative 5d. Also require:

- a long-handled device to pull an "inverted V"

2.5.1 Comparison of Alternatives

The current sea turtle and smalltooth sawfish release gear requirements in Amendment 15B were developed to satisfy requirements of the Endangered Species Act (ESA) biological opinion on the snapper grouper fishery. The biological opinion directed the South Atlantic Fishery Management Council (Council) to implement sea turtle and smalltooth sawfish release gear requirements, and required the implementation of safe handling protocols for sea turtles and smalltooth sawfish, among other things. The biological opinion required that the Council consider the sea turtle and smalltooth sawfish release gear requirements in place for the Highly Migratory Species (HMS) fisheries, and at a minimum, implement sea turtle and smalltooth sawfish release gear requirements similar to those for the Gulf of Mexico reef fish fishery (NMFS, 2006). The Gulf of Mexico reef fish fishery requires the same dehooking and disentanglement gear currently used in the HMS longline fisheries for vessels with freeboard heights greater than 4 feet (**Appendix D**). Vessels with freeboard heights of 4 feet or less are also required the carry HMS dehooking and disentanglement gears, with the exception that only short-handled equipment is mandatory. The Council ultimately chose to require the same sea turtle and smalltooth sawfish release gears required in the HMS fisheries, making no distinction for vessel freeboard height.

The HMS pelagic longline fishery was the first to require sea turtle and smalltooth sawfish release gears in the Atlantic, and the release equipment developed was originally designed to handle the heavier tackle used in this fishery. As snapper-grouper fishermen began using the dehooking and disentanglement gears required in Amendment 15B, the effectiveness and necessity of using these "heavy-duty" tools with lighter snapper grouper tackle was called into question. Therefore, the Council has been asked to consider developing an action that would re-address and possibly modify sea turtle and smalltooth sawfish release gear requirements for the snapper grouper fishery.

Alternative 1 (No Action) would maintain the current sea turtle and smalltooth sawfish release gear requirements for the snapper grouper fishery. Regardless of freeboard height, all vessels using hook-and-line gear would be required to carry the gear listed under **Alternative**

1 (No Action). The current sea turtle and smalltooth sawfish release gear requirements were established through Snapper Grouper Amendment 15B (SAFMC, 2009) and require all vessels having a South Atlantic Unlimited Snapper-Grouper Permit, a South Atlantic 225 lb Trip Limit Snapper-Grouper Permit, or a South Atlantic Charter/Headboat Permit for Snapper-Grouper, and carrying hook-and-line gear onboard to: (1) Post the *Sea Turtle Handling/Release Guidelines* placard inside the wheelhouse, or in any easily viewable area, if there is no wheelhouse; (2) have a copy of the Protocols posted inside the wheelhouse, or within a waterproof case in a readily accessible area, and; (3) possess and use sea turtle handling and release gear consistent with the Protocols.

Alternatives 2 and **3** address the concerns raised regarding the modification of sea turtle and smalltooth sawfish release gear specifications for vessels carrying non-longline hook-and-line gear on board. Under these alternatives, all vessels with longline gear on board will be required to continue carrying all the dehooking and disentanglement gears outlined in **Alternative 1**. Under **Alternative 2** the only tools that would be required for vessels carrying hook-and-line gear that is not longline gear, is a tool capable of cutting fishing line, such as a knife, and tool capable of removing a hook from a sea turtle, such as a pair of pliers. The dehooking and line cutting capabilities of any tool onboard a vessel are subjective, and would therefore be difficult to enforce. **Alternative 2** is similar to regulations currently in place in the Western Pacific (**Appendix F**). This alternative would likely achieve the goal of implementing sea turtle and smalltooth sawfish release equipment more appropriate for the lighter tackle commonly used in the snapper grouper fishery. The potential biological effects are difficult to predict under **Alternative 2** because effectiveness of only certain sea turtle release tools has been tested for longline vessels. However, if the sea turtle release guidelines are followed, and hooks or entangling line are safely removed, there would likely be a biological benefit to the sea turtle. However, because of the requirements of the biological opinion outlining how sea turtle and smalltooth sawfish release equipment should be implemented, **Alternative 2** would not be in compliance with the current biological opinion. Selecting **Alternative 2** may require re-initiation of ESA section 7 consultation and if the new action is expected to result in exceeding the incidental take statement, may require development of a new biological opinion.

Alternative 3 differs from **Alternative 2** by identifying specific types of sea turtle and smalltooth sawfish release equipment for snapper grouper vessels carrying hook-and-line gear onboard that is not longline gear. **Alternative 3** also maintains the status quo requirement for snapper grouper vessels carrying longline gear onboard. This requirement ensures that vessels with heavier tackle are adequately equipped to release sea turtles that become hooked or entangled in fishing gear.

Alternative 4 would require different lengths and types of dehooking tools dependent upon the freeboard height of the vessel, which tracks the sea turtle release gear regulations in the Gulf of Mexico (**Appendix D**). **Alternative 4** also offers the option (through **Sub-Alternatives 4a and 4b**) of tailoring sea turtle and smalltooth sawfish release gear specifications to be more appropriate for use with the lighter tackle of the snapper grouper fishery. **Sub-Alternatives 4a** and **4b** would either allow for gear specifications to be changed for only vessels with freeboard heights less than four feet, or for all snapper grouper

vessels regardless of freeboard height. The sea turtle and smalltooth sawfish release equipment requirements for the Gulf of Mexico reef fish fishery allow vessels with freeboard heights of 4 feet or less to carry a truncated suite of equipment. Those vessels are only required to carry short-handled tools, not both short- and long-handled equipment. However, the Gulf of Mexico reef fish fishery regulations (**Alternative 4**) still require the use of equipment originally designed for use in the HMS longline fisheries. While **Alternative 4** could authorize vessels with lower freeboard heights to carry a truncated suite of equipment, the equipment required would still be the "heavier-duty" tools used in the HMS fisheries. Thus, **Alternative 4** alone may not accomplish the goal of establishing requirements for release tools more appropriate for the lighter tackle used in the snapper grouper fishery, if the design specifications are not modified by selecting **Sub-Alternatives 4a** or **4b**.

Alternative 5 would modify the design specifications of the current sea turtle and smalltooth sawfish release equipment for all federally permitted non-longline snapper-grouper vessels with hook-and-line gear on board.

The alternatives of this action have been developed to address the concern that heavy duty tools are ineffective and unnecessary, while ensuring the fishery remains in compliance with the biological opinion. **Sub-Alternative 5a** lists a set of gear that should be required as a minimum for all vessels with hook-and-line gear on board that is not longline gear. The pieces of equipment listed were selected to match those currently required by the Gulf of Mexico reef fish fishery for vessels with freeboard heights of 4 feet or less. An important distinction is that the design criteria for the gears in this alternative (see **Appendix E**) would allow for lighter duty tools to be used. The equipment in this alternative ensures that even if a minimum suite of equipment is selected, the fishery will remain in compliance with the biological opinion. The design criteria for the equipment listed in the other sub-alternatives would also allow for lighter duty tools to be used. Choosing additional sub-alternatives (i.e., in addition to **Sub-Alternative 5a**) would be especially beneficial for species conservation, but is not required to remain in compliance with the biological opinion.

Table 2-5. Summarized comparison of the impacts among alternatives for Action 5.

	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Alternative 5**
Biological	Neutral impacts	Not in compliance with current biological opinion	Varying compliance with biological opinion	Overall positive impacts	Overall positive impacts
Economic	Overall positive impacts	Overall positive impacts	Overall positive impacts	Long-term positive impacts	Long-term positive impacts
Social	Overall negative impacts	Overall positive impacts	Overall positive impacts	Overall positive impacts	Overall positive impacts
Administrative	No impact	Slight increase in impacts	Slight increase in impacts	Slight increase in impacts	Slight increase in impacts

2.5.2 Council Conclusion

2.6 Action 6. Amend the Snapper Grouper Fishery Management Plan (FMP) to designate new EFH-HAPCs.

Alternative 1. No Action. Do not amend the Snapper Grouper FMP to designate new Essential Fish Habitat-Habitat Areas of Particular Concern (EFH-HAPCs).

Preferred Alternative 2. Amend the Snapper Grouper FMP to designate one or more of the following as EFH-HAPCs.

Sub-alternative 2a. Designate EFH-HAPCs for golden tilefish to include irregular bottom comprised of troughs and terraces inter-mingled with sand, mud, or shell hash bottom. Mud-clay bottoms in depths of 150-300 meters are HAPC. Golden tilefish are generally found in 80-540 meters, but most commonly found in 200 meter depths.

Sub-alternative 2b. Designate EFH-HAPC for blueline tilefish to include irregular bottom habitats along the shelf edge in 45-65 meters depth; shelf break; or upper slope along the 100-fathom contour (150-225 meters); hardbottom habitats characterized as rock overhangs, rock outcrops, manganese-phosphorite rock slab formations, or rocky reefs in the South Atlantic Bight; and the Georgetown Hole (Charleston Lumps) off Georgetown, SC.

Preferred Alternative 3. Designate EFH-HAPCs for the snapper grouper complex to include the deepwater marine protected areas (MPAs).

2.6.1 Comparison of Alternatives

EFH and EFH-HAPCs were established for the snapper grouper FMP as part of the Comprehensive EFH Amendment (SAFMC 1998b) and are presented in Section 3.4.2. **Alternative 1 (No Action)** would not add an area highlighting the importance of golden tilefish and blueline tilefish or the value of emphasizing the value of the habitat in the Deepwater MPAs established in Snapper Grouper Amendment 14 (SAFMC 2007). **Preferred Alternative 2** addresses an oversight in the initial designation of Snapper Grouper EFH through the Comprehensive EFH Amendment (SAFMC 1998b) where the Habitat Plan describes in detail tilefish habitat and proposes the general distribution between 100 and 300 meters as an area considered to be an EFH-HAPC for tilefish. While considered EFH, the area was not included in the proposed list of EFH-HAPCs. **Alternative 2a** for golden tilefish and **Alternative 2b** for blueline tilefish propose respective detailed descriptions for EFH-HAPCs. **Preferred Alternative 3** would designate previously specified (Snapper Grouper Amendment 14) deepwater MPAs as EFH-HAPCs. This alternative is intended to protect these MPAs as a unique habitat complex and require enhanced EFH consultations pertaining to non-fishing activities that could potentially impact these protected habitats.

The designation of additional EFH-HAPCs for snapper grouper species would not result in direct impacts to the biological resources of the west-central Atlantic Ocean. Rather, the EFH-HAPC designation under this action would provide a future opportunity for the Council to establish regulations to protect EFH from fishing activities in the EEZ and to review and recommend EFH conservation measures to protect surface waters from non-fishing activities which are undertaken, authorized, or funded by Federal agencies. Similarly, designation of

additional snapper grouper EFH-HAPCs would require Federal agencies to consult with NMFS on activities which may adversely affect that habitat. Designation of additional EFH-HAPCs will require the Council to consider all operations or actions that might interact with or affect the EFH-HAPC, and may trigger a consultation for any activity that may affect the habitat. This consultation process associated with EFH-HAPCs may result in increased economic, social and administrative impacts. The direct effects of additional regulatory consideration would be the financial costs of a lengthy regulatory process. The nature and extent of those impacts are unknown and will undoubtedly vary depending upon the individual and/or agency and the actions to be taken within the designated EFH-HAPCs.

Table 2-6. Summarized comparison of the impacts among alternatives for Action 6.

	Alternative 1	**Alternative 2a**	**Alternative 2b**	**Alternative 3**
Biological	Overall negative impacts	Overall positive impacts	Overall positive impacts	Overall positive impacts
Economic	Neutral impacts	Overall positive impacts	Overall positive impacts	Overall positive impacts
Social	Overall negative impacts	Overall positive impacts	Overall positive impacts	Overall positive impacts
Administrative	Neutral impacts	Overall negative impacts	Overall negative impacts	Overall negative impacts

2.6.2 Council Conclusion

2.7 Action 7. Amend the Coral, Coral Reefs and Live/Hardbottom Habitat Fishery Management Plan (Coral FMP) to designate new EFH-HAPCs

Alternative 1. No Action. Do not amend the Coral FMP to designate new Essential Fish Habitat – Habitat Areas of Particular Concern (EFH-HAPCs)

Preferred Alternative 2. Amend the Coral FMP to designate the Deepwater Coral HAPCs as EFH-HAPCs.

2.7.1 Comparison of Alternatives

EFH and EFH-HAPCs were established for Coral, Coral Reefs and Live-Hard Bottom Habitat as part of the Comprehensive EFH Amendment (SAFMC 1998b) and are presented in Section 3.4.1. **Alternative 1 (No Action)** would not propose additional EFH-HAPCs intended to aid in the conservation of coral and live bottom habitat especially when addressing policy or permit activities associated with non-fishing activities. However, in July 2010, a final rule was published establishing deepwater Coral HAPCs in the South Atlantic region which offers protection from bottom damaging fishing activities (Comprehensive Ecosystem-Based Amendment 1, SAFMC 2010). **Preferred Alternative 2** proposes to further emphasize the importance of these protected deepwater coral ecosystems by designating them as EFH-HAPCs. While habitats within the boundaries of the coral HAPCs are essential fish habitat for other managed species, designation of the entire area as an EFH-

HAPC would require enhanced EFH consultation pertaining to non-fishing activities that may negatively impact the deepwater Coral HAPCs.

The designation of additional EFH-HAPCs for the Coral FMP would not result in direct impacts to the biological resources of the South Atlantic. Rather, the EFH-HAPC designation under this action would provide a future opportunity for the Council to establish regulations to protect EFH from fishing activities in the EEZ and to review and recommend EFH conservation measures to protect surface waters from non-fishing activities which are undertaken, authorized, or funded by Federal agencies. Similarly, designation of additional EFH-HAPCs would require Federal agencies to consult with NMFS on activities which may adversely affect that habitat. Designation of EFH-HAPCs will require the Council to consider all operations or actions that might interact with or affect the EFH-HAPC, and may trigger a consultation for any activity that may affect the habitat. This consultation process associated with EFH-HAPCs may result in increased economic, social and administrative impacts. The direct effects of additional regulatory consideration would be the financial costs of a lengthy regulatory process. The nature and extent of those impacts are unknown and will undoubtedly vary depending upon the individual and/or agency and the actions to be taken within the designated EFH-HAPCs.

Table 2-7. Summarized comparison of the impacts among alternatives for Action 7.

	Alternative 1	**Alternative 2**
Biological	Overall negative impacts	Overall positive impacts
Economic	Neutral impacts	Overall positive impacts
Social	Overall negative impacts	Overall positive impacts
Administrative	Neutral impacts	Overall negative impacts

2.7.2 Council Conclusion

2.8 Action 8. Amend the Fishery Management Plan (FMP) for Pelagic *Sargassum* Habitat to designate new EFH

Alternative 1. No Action. Do not amend the *Sargassum* FMP to designate Essential Fish Habitat (EFH).

Alternative 2. Amend the *Sargassum* FMP to designate the top ten meters of the water column in the South Atlantic EEZ as EFH for pelagic *Sargassum*.

Preferred Alternative 3. Amend the *Sargassum* FMP to designate the top ten meters of the water column in the South Atlantic EEZ bounded by the Gulfstream, as EFH for pelagic *Sargassum*.

2.8.1 Comparison of Alternatives

The *Sargassum* FMP (SAFMC 2002) was approved in 2003. However, the provisions proposing the designation of EFH and EFH-HAPCs for Pelagic *Sargassum* were disapproved. Pursuant to the Magnuson-Stevens Act, all managed species must have EFH designated and where information exists consider establishment of EFH-HAPCs. In addition, actions to reduce the impact of fishing on EFH must be evaluated and if needed, non-fishing threats identified. Regulations in the *Sargassum* Plan prohibit harvest in the majority of the South Atlantic waters and establishes a restrictive 5,000 annual quota, address the Councils' mandate to reduce or eliminate the impact of fishing on *Sargassum* habitat.

Alternative 1 (No Action) would not specify EFH for *Sargassum* and would not be in compliance with the EFH Final Rule. **Alternative 2** proposes an EFH designation that includes the top ten meters of the water column where it occurs in the South Atlantic. **Preferred Alternative 3** proposes a smaller EFH designation and includes the top ten meters of the water column in the South Atlantic with the bounds of the Gulf Stream being the most Eastern boundary. The Gulf Stream is the most significant oceanographic feature supporting *Sargassum* species occurrence, distribution and transport.

The EFH designation under this action would provide a future opportunity for the Council to establish regulations to protect EFH from fishing activities in the EEZ and to review and recommend EFH conservation measures to protect surface waters from non-fishing activities which are undertaken, authorized, or funded by Federal agencies. Similarly, designation of *Sargassum* EFH would require Federal agencies to consult with NMFS on activities which may adversely affect that habitat. Designation of additional EFH will require the Council to consider all operations or actions that might interact with or affect the EFH, and may trigger a consultation for any activity that may affect the habitat. This consultation process associated with EFH may result in increased economic, social and administrative impacts. The direct effects of additional regulatory consideration would be the financial costs of a lengthy regulatory process. The nature and extent of those impacts are unknown and will undoubtedly vary depending upon the individual and/or agency and the actions to be taken and expected impacts on designated EFH.

Table 2-8. Summarized comparison of the impacts among alternatives for Action 8.

	Alternative 1	Alternative 2	Alternative 3
Biological	Overall negative impacts	Overall positive impacts	Overall positive impacts
Economic	Overall negative impacts	Neutral impacts	Overall positive impacts
Social	Overall negative impacts	Overall positive impacts	Overall positive impacts
Administrative	Overall positive impacts	Overall negative impacts	Overall negative impacts

2.8.2 Council Conclusion

2.9 Action 9. Amend the Fishery Management Plan (FMP) for Pelagic *Sargassum* Habitat to designate EFH-HAPCs

Preferred Alternative 1. No Action. Do not amend the *Sargassum* FMP to designate EFH-HAPCs

Alternative 2. Amend the *Sargassum* FMP to designate one or more of the following EFH-HAPCs

Sub-Alternative 2a. The Charleston Bump Complex

Sub-Alternative 2b. The Point, NC

2.9.1 Comparison of Alternatives

The *Sargassum* FMP (SAFMC 2002) was approved in 2003. However, the provisions proposing the designation of EFH-HAPCs for Pelagic *Sargassum* were disapproved. Pursuant to the Magnuson-Stevens Act all managed species must have EFH designated and consider establishment of EFH-HAPCs. **Preferred Alternative 1 (No Action)** would not acknowledge the areas within EFH that have been identified as important to the growth and survival of *Sargassum*. **Alternative 2** is designated as an EFH-HAPC pursuant to the Dolphin Wahoo FMP and is proposed as an EFH-HAPC for *Sargassum*. The Charleston Bump Complex, proposed under **Sub-alternative 2a**, given its unique oceanographic characteristics**,** is a critical subset of the proposed EFH and is therefore proposed as an EFH-HAPC. The Point off NC, proposed under **Sub-alternative 2b**, given its unique oceanographic characteristics, is also a critical subset of the proposed EFH and therefore is also proposed as an EFH-HAPC for pelagic *Sargassum*.

The designation of additional EFH-HAPCs for *Sargassum* would not result in direct impacts to the biological resources in the South Atlantic. Rather, the EFH-HAPC designation under this action would provide a future opportunity for the Council to establish regulations to protect EFH from fishing activities in the EEZ and to review and recommend EFH conservation measures to protect surface waters from non-fishing activities which are undertaken, authorized, or funded by Federal agencies. Similarly, designation of additional *Sargassum* EFH-HAPCs would require Federal agencies to consult with NMFS on activities which may adversely affect that habitat. Designation of additional EFH-HAPCs will require the Council to consider all operations or actions that might interact with or affect the EFH-HAPC, and may trigger a consultation for any activity that may affect the habitat. This consultation process associated with EFH-HAPCs may result in increased economic, social and administrative impacts. The direct effects of additional regulatory consideration would be the financial costs of a protracted regulatory process. The nature and extent of those impacts are unknown and will undoubtedly vary depending upon the individual and/or agency and the actions to be taken within the designated EFH-HAPCs.

Table 2-9. Summarized comparison of the impacts among alternatives for Action 9.

	Alternative 1	Alternative 2a	Alternative 2b
Biological	Overall negative impacts	Overall positive impacts	Overall positive impacts
Economic	Overall negative impacts	Neutral impacts	Neutral impacts
Social	Overall negative impacts	Overall positive impacts	Overall positive impacts
Administrative	Overall positive impacts	Overall negative impacts	Overall negative impacts

2.9.2 Council Conclusion

3 Affected Environment

3.1 Habitat

3.1.1 Description and distribution of Coral, Coral Reefs and Live Hard Bottom Habitat

It is commonly known that stony corals are the main builders of the reef framework in tropical reefs and also major occupiers of space in such habitats. However, in certain coral reef habitats, non-stony coral anthozoans, typically zooanthids and octocorals, occupy comparable expanses of substratum and are functionally comparable to reef-building corals (Fautin 1988). Coral reef environments also have vast expanses of solid substrata heavily populated by epibiotic micro- and algoflora (Sorokin 1973). The physical and biological characteristics of a habitat are fundamental to determining which organisms live there. Octocorals are functionally as important as stony corals for habitat topographic complexity.

North Carolina to Cape Canaveral

Coral communities on the outer continental shelf proper are characterized by patches of low-relief hard bottoms also referred to as "live bottom" habitats. Perkins et al. (1997) estimated the distribution and areal amount of hardbottom for the Florida/Georgia border to Jupiter Inlet. These hardbottom habitats are often dominated by octocorals. Bayer (1961) stated that the shelf octocoral fauna from the East Coast of Florida north of Cape Canaveral is indistinguishable from the fauna from Georgia and the Carolinas. Reports from North Carolina (Menzies et al. 1966; Cerame-Vivas and Gray 1966), South Carolina (Powles and Barans 1979), and Georgia (Reed 1978, personal communication) appear to confirm this conclusion for both octocorals and scleractinians.

Southeast Florida Coast (Palm Beach to Fowey Rocks)

South of 27° North latitude to near Miami, the continental shelf narrows to 3 to 5 km (1.6 to 2.7 nm) and the warm waters of the Florida current become the most dominant hydrographic feature (Lee and McGuire 1972). Thus, in the vicinity of Palm Beach, Florida, a diverse reef community develops. The coral communities in the southeast Florida region are tropical in character, zoogeographically similar to that of the Florida Keys but less well developed than the majority of the Florida reef tract.

Much of the underlying substrate in this region is a Holocene elkhorn coral, *Acropora palmata*, and staghorn coral, *A. cervicornis*, relic reef which lies 15 to 30 m (50 to 100 ft.) below present sea level. The reef has not been actively accreting for the last 8,000 years (Lighty et al. 1977; Banks et al. 2007). The system of coral communities from Palm Beach County to Miami-Dade County can be characterized as a series of discontinuous reef lines that parallel the shoreline. As an example, in Broward County there are generally three lines of reef (terraces); inner reef crests in 3 to 5 m, middle reef crests in 7 to 9 m, and the outer reef in16 to 23 m water depths (Banks et al. 2007; Walker et al. 2007). Nearshore of the Inner Reef is a series of nearshore ridges (Moyer 2003; Banks et al. 2007, Walker et al. 2007).

The coral community found within this region is generally dominated by gorgonian corals (Order Alcyonacea). A number of earlier studies have provided limited descriptions of the

reef community in this region. Goldberg (1973a and b) has characterized the deeper zones of this community (20 to 30 m; 66 to 100 ft) by the presence of the gorgonian *Iciligorgia schrammi*. Wheaton and Jaap (1976) and Courtenay et al. (1975) discussed reef zonation off Palm Beach and Miami Beach, respectively. Wheaton described the octocoral fauna on the offshore reef terrace from Palm Beach County to Looe Key (Wheaton 1987). Blair and Flynn (1989) observed coral community structure off Miami. Goldberg (1973a) reported an average octocoral density off Palm Beach County of 25 colonies/m^2.

Coral, coral reefs, and coral community habitat status is mostly recorded as part of monitoring efforts (Gilliam et al. 2007a, b) originated as impact and mitigation studies from adverse environmental impacts to specific sites (dredge insults, ship groundings, pipeline and cable deployments, and beach renourishment). Beginning in 1997, in response to beach renourishment efforts in Broward County, annual collection of environmental data (sedimentation quantities and rates and limited temperature measurements), and coral (stony corals and gorgonians), sponge, and fish abundance/cover data was conducted at 18 sites. In 2000 five new sites were added and in 2003 two additional sites were added for a total 25 sites (Gilliam et al. 2007a). In 2003, the Florida Department of Environmental Protection (FDEP) was awarded funding for a coral reef monitoring along the southeast Florida coast. Florida DEP contracted this work *en toto* to the Florida Fish and Wildlife Conservation Commission's Fish and Wildlife Research Institute (FWC-FWRI) who is working with Nova Southeastern University's National Coral Reef Institute. Ten sites were installed: three in Miami-Dade County, four in Broward County, and three in Palm Beach County (Gilliam et al. 2007b). Three additional sites were installed in Martin County in 2006. The Southeast Florida Coral Reef Evaluation and Monitoring Project (SECREMP) is an extension of the Florida Keys Coral Reef Evaluation and Monitoring Project (CREMP) which utilizes the same methods (Beaver et al. 2005).

Octocorals are more abundant that stony corals in this region. Density can approach 20 colonies/m^2 (Gilliam et al. 2007a) with coverage of 20% (Gilliam et al. 2007b). Much less data exist on the species richness due to the difficulty of field identification, but common species include several *Eunicea* species, *Plexaura flexuosa*, *Pseudopterogorgia americana*, and *Muricea muricata*.

Monitoring data have shown that, although some differences were determined between years at some sites, in general stony coral cover on the reefs off Broward County (Gilliam et al. 2007a) has been stable. Regional data collected by the SECREMP project has also shown stability in stony coral and octocoral cover (Gilliam et al. 2007b). SECREMP and CREMP data indicate that southeast Florida reefs generally have reduced stony coral species richness and stony coral cover than the Dry Tortugas or Florida Keys coral reefs. Benthic cover by octocorals is, interestingly, very similar throughout the Florida reef system while southeast Florida reefs appear to have reduced macroalgae cover compared to reefs in the Dry Tortugas and the Florida Keys (Beaver et al. 2005, Gilliam et al. 2007b).

Florida Keys (Fowey Rocks to the Dry Tortugas)

Coral reefs and coral communities are common within the south Florida coastal ecosystem. Well developed coral reefs similar to those found in the Bahamas and Caribbean occur from

Fowey Rocks to Tortugas Banks: 25° 40' – 24° 30'N latitude, 80° 30' – 82° 40'W longitude (Jaap 1984, Jaap and Hallock 1990). The diversity and abundance of octocorals tends to be greatest in patch reefs and offshore deep reefs. Functionally, coral reefs enhance the abundance and variety of life, provide a living breakwater that protects the coast from storm waves, provide economic benefit from fisheries and tourism, and are important education and research resources. Quantitative information dealing with distribution and abundance of gorgonians is available for several back reef areas in the Florida Keys. Opresko (1973) has analyzed gorgonian data for Boca Chita Pass, Soldier Key, and Red Reef. Bagby (1978) studied three sites off Key Largo, Florida, chosen to provide a view of the influence of increasing oceanic conditions. Bagby (1978) found that *Pseudopterogorgia americana* and *P. acerosa* were the most widespread species. In agreement with the conclusions of Opresko (1973), *P. acerosa* was most common inshore, while *P. americana* was more dominant at offshore patch reefs. Equally widespread, but numerically less dominant, were the species double-forked *Plexaurella* (*Plexaurella dichotoma*) and *Plexaura flexuosa*. Two species, *Eunicea succinea* and *Pterogorgia citrina*, were distributed in abundance at both Soldier Key and Nine Kilometer Reef, but not in intermediate areas. *Pseudoplexaura porosa* was dominant on Five Kilometer Reef and black sea rod (*Plexaura homomalla*) was of considerable importance on Red Reef, but neither was prominent elsewhere in the areas studied. *Plexaura flexuosa* and *Pseudopterogorgia americana* dominated the shallow reefs at Long Key, Dry Tortugas (Wheaton, unpublished). Thus, any or all of these species can be found prominently on inshore or offshore reefs, in shallow water or on outer reefs at depths up to 20 m (66 ft). Their relative abundance on a given reef must therefore be interpreted with caution. Shallow patch reefs near the outer reef tract display a number of clear-water indicator species. *Gorgonia ventalina*, *Muriceopsis flavida*, *Briareum asbestinum*, and *Pseudopterogorgia bipinnata* all fall in this category, in decreasing order of consistency (Opresko 1973, Bagby 1978). At four pairs of reefs in Biscayne National Park Wheaton (unpublished) surveyed octocoral abundance and density by transect, species count, and photographic analysts. Octocoral colonies usually comprised more than half of the total coral colonies. The five most abundant species (53.9 percent of total octocorals) were *Plexaura flexuosa*, *P. homomalla*, *Gorgonia ventalina*, *Eunicea succinea*, and *Pseudopterogorgia americana*. Mean numbers of octocoral colonies counted along a 20 m (66 ft) transect of the eight reefs were 102.81 and 155.17 (Wheaton unpublished).

Description and Distribution of Marine Water Column

The following is a description of marine water column habitats presented in the Fishery Ecosystem Plan (SAFMC 2009a). Specific habitats in the water column can best be defined in terms of gradients and physical and biological characteristics, such as temperature, salinity, density, nutrients, light and depth. These "structural" components of the water column environment (sensu Peters and Cross 1992) are not static but change both in time and space. Therefore, there are numerous potentially distinct water column habitats for a broad array of species and life-stages within species.

Winds are important in all layers of the marine water column. Wind stress can alter or reverse the generally southern pattern of flow in the coastal frontal zone, CFZ (Blanton et al. 1999). Winds can also mix and move water masses inshore. In the mid-Atlantic, waters from Gulf Stream intrusions move across the shelf at a rate of approximately 2-3 miles/day

(3-5 km/day), and parallel to the coast at a rate of approximately 3-9 miles/day (5-15 km/day) (Hare et al. 1999). Georgian shelf waters flow into the North Carolina Capes region during periods of persistent southwesterly winds, while Virginian coastal waters flow south across Diamond, and occasionally Lookout, shoals during periods of persistent northerly winds (Pietrafesa 1989). Current and wind patterns will have a strong effect on the recruitment and retention of various fish larvae from different offshore areas.

The continental shelf off the southeastern U.S., extending from the Dry Tortugas to Cape Hatteras, encompasses an area in excess of 100,000 km^2 (Menzel 1993). Based on physical oceanography and geomorphology, this environment can be divided into two regions: Dry Tortugas to Cape Canaveral and Cape Canaveral to Cape Hatteras. The break between these two regions is not precise and ranges from West Palm Beach to the Florida-Georgia border depending on the specific data considered. The shelf from the Dry Tortugas to Miami is ~25 km wide and narrows to approximately 5 km off Palm Beach. The shelf then broadens to approximately 120 km off of Georgia and South Carolina before narrowing to 30 km off Cape Hatteras. The Florida Current/Gulf Stream flows along the shelf edge throughout the region. In the southern region, this boundary current dominates the physics of the entire shelf (Lee et al. 1992, 1994). In the northern region, additional physical processes are important and the shelf environment can be subdivided into three oceanographic zones (Atkinson et al. 1985; Menzel 1993). The outer shelf (40-75 m) is influenced primarily by the Gulf Stream and secondarily by winds and tides. On the mid-shelf (20-40 m), the Gulf Stream, winds, and tides almost equally affect the water column. Freshwater runoff, winds, tides and bottom friction influence inner shelf waters (0-20 m).

Several water masses are present in the region. From the Dry Tortugas to Cape Canaveral, the three water types are: Florida Current Water (FCW), waters originating in Florida Bay, and shelf water. Shelf waters off the Florida Keys are an admixture of FCW and waters from Florida Bay (Lee et al. 1992, 1994). From Cape Canaveral to Cape Hatteras, four water masses are found: Gulf Stream Water (GSW), Carolina Capes Water (CCW), Georgia Water (GW) and Virginia Coastal Water (VCW). Virginia Coastal Water enters the region from north of Cape Hatteras. Carolina Capes Water and GW are admixtures of freshwater runoff and GSW (Pietrafesa et al. 1985, 1994).

Spatial and temporal variation in the position of the western boundary current has dramatic affects on water column habitats. Variation in the path of the Florida Current near the Dry Tortugas induces formation of the Tortugas Gyre (Lee et al. 1992, 1994). This cyclonic eddy has horizontal dimensions on the order of 100 km and may persist in the vicinity of the Florida Keys for several months. The Pourtalés Gyre, which has been found to the east, is formed when the Tortugas Gyres moves eastward along the shelf. Upwelling occurs in the center of these gyres, thereby adding nutrients to the near surface (<100 m) water column. Wind and input of Florida Bay water also influence the water column structure on the shelf off the Florida Keys (Smith 1994; Wang et al. 1994).

Similarly, further downstream, the Gulf Stream encounters the Charleston Bump, a topographic rise on the upper Blake Ridge. Here the current is often deflected offshore, again resulting in the formation a cold, quasi-permanent cyclonic gyre, and associated

upwelling (Brooks and Bane 1978). Along the entire length of the Florida Current and Gulf Stream, cold cyclonic eddies are imbedded in meanders along the western front. Three areas of eddy amplification are known: Downstream of Dry Tortugas, downstream of Jupiter Inlet (27°N to 30°N latitude) ("The Point" or "Amberjack Hole"), and downstream of the Charleston Bump (32°N to 34°N latitude) ("The Charleston Gyre"). Meanders propagate northward (i.e., downstream) as waves. The crests and troughs represent the onshore and offshore positions of the Gulf Stream front. Cross-shelf amplitudes of these waves are on the order 10 to 100 km. Upwelling within meander troughs is the dominant source of "new" nutrients to the southeastern U.S. shelf and supports primary, secondary, and ultimately fisheries production (Yoder 1985; Menzel 1993). Off Cape Hatteras the Gulf Stream turns offshore to the northeast. Here, the confluence of the Gulf Stream, the Western Boundary Under-Current (WBUC), Mid-Atlantic Shelf Water (MASW), Slope Sea Water (SSW), CCW, and VCW create a dynamic and highly productive environment, known as the "Hatteras Corner" or "The Point".

On the continental shelf, offshore projecting shoals at Cape Fear, Cape Lookout and Cape Hatteras affect longshore coastal currents and interact with Gulf Stream intrusions to produce local upwelling (Blanton et al. 1981; Janowitz and Pietrafesa 1982). Shoreward of the Gulf Stream, seasonal horizontal temperature and salinity gradients define the mid-shelf and inner-shelf fronts. In coastal waters, river discharge and estuarine tidal plumes contribute to the water column structure.

3.2 Biological/Ecological Environment

3.2.1 Species Most Impacted by this Amendment

3.2.1.1 Octocorals

Octocorallia (sea fans, sea whips, etc.)

For the purpose of this plan, includes species belonging to the Class Anthozoa, Subclass Octocorallia (soft corals and gorgonians), Order Alcyonacea. Similar to stony corals, octocorals are colonial animals with a polyp as the individual building unit and may contain endosymbiotic algae (zooxanthellae). Unlike stony coral, octocorals do not secret a calcium carbonate skeleton but have a axial skeleton mainly composed of collagen fibers in a proteinaceous matrix. Although octocorals do not contribute to reef framework, they do contribute greatly to reef complexity and diversity.

The hardbottom, coral reef, and coral community habitats within the management area contain a considerable diversity of octocorals. **Table 3-1** lists the distribution of the common octocorals within the management area and includes possible endemic species.

Cairns (1977) published a field guide to the more common gorgonians of the Gulf of Mexico, Caribbean, and Florida. Sanchez and Wirshing (2005) published a field guide to western tropical Atlantic octocorals. Wheaton described the octocoral fauna off southeast Florida in 20-50 meter zones (1987), off Key Largo, in 27-57 m depths (1981), at Looe Key (1988), and at Dry Tortugas (1975, 1989). DeVictor and Morton (2007) recently produced a shallow water octocoral guide for the South Atlantic Bight from Cape Hatteras, NC to Cape Canaveral, FL.

Table 3-1. Common octocoral species from the shallow-water continental shelf regions (less than 200 meter or 660 ft) of the southern United States.

Order	Suborder	Family	Genus species	Distribution
Alcyonacea				
	Scleraxonia			
		Briareidae		
			Briarium asbestinum	2,3,4
		Anthothelidae		
			Icilogorgia schrammi	1,2,3,4
			Anthothela tropicalis	1
			Erythropodium caribaeorum	2,3,4
			**Titanideum frauenteldii*	1,2
	Holaxonia			
		Plexauridae		
			Plexaura homomalla	2,3,4
			Plexaura flexuosa	2,3,4
			Plexaura kuna	2,3,4
			Pseudoplexaura porosa	2,3,4
			Pseudoplexaura flagellosa	3,4
			Pseudoplexaura wagenaari	2,3,4
			**Eunicea palmeri*	3
			Eunicea mammosa	2,3,4
			Eunicea succinea	2,3,4
			Eunicea fusca	1,2,3,4
			Eunicea laciniata	3,4
			Eunicea tourneforti	2,3,4
			Eunicea asperula	2,3,4
			Eunicea clavigera	2,3,4
			**Eunicea knighti*	3
			Eunicea calyculata	2,3,4
			Muriceopsis flavida	2,3,4
			Muriceopsis petila	1,2,3,4
			Plexaurella dichotoma	2,3,4
			Plexaurella nutans	2,3,4
			Plexaurella fusifera	2,3,4
			Plexaurella grisea	3,4
			Muricea muricata	2,3,4
			Muricea atlantica	2,3,4
			Muricea laxa	2,3,4
			Muricea elongata	2,3,4
			**Muricea pendula*	1,2,3,4
	Holaxonia			
		Gorgoniidae		
			**Leptogorgia cardinalis*	2,3,4
			Leptogorgia hebes	1
			Leptogorgia virgulata	1
			Leptogorgia setacea	1
			Leptogorgia eurale	1
			Pseudopterogorgia bipinnata	3,4
			Pseudopterogorgia acerosa	2,3,4
			Pseudopterogorgia elisabethae	3
			Pseudopterogorgia americana	2,3,4
			Pseudopterogorgia rigida	2,3,4
			Pseudopterogorgia kallos	3,4
			Gorgonia ventalina	2,3,4
			Gorgonia flabellum	3,4
			Pterogorgia citrina	2,3,4

			Pterogorgia anceps	2,3,4
			Pterogorgia guadalupensis	3,4

Note: The distribution zones are divided as follows: (1) Atlantic Coast to NE. Florida (South Atlantic Bight); (2) SE. Florida; (3) Florida Keys; (4) Dry Tortugas. * Indicates species with principal distribution within study area (possibly endemic).

Reproduction

Octocorals have both sexual and asexual reproductive modes. The addition of new polyps to a colony occurs through budding of existing polyps. In this way, colonies grow in size through an asexual means of reproduction. In addition, many coral species, particularly branching ones, are also highly clonal in that they can reproduce asexually by fragmentation. That is, individual branches, when broken off from the parent colony, can re-attach to the substrate and form a new, distinct colony. These characteristics greatly complicate the population biology of corals, particularly branching species.

Corals also reproduce sexually, with sperm fertilizing egg, followed by a process of embryonic development into a planula larva. The larvae may survive long periods (i.e., one to a few weeks) floating in the water currents until they settle and metamorphose into a sessile polyp on some hard substrate. Different coral species display different sexual reproduction strategies. Some species have separate sexes while others are hermaphroditic. Some have internal fertilization and retain the developing embryos inside the mother colony to a relatively late stage of development (brooders) while others (broadcast spawners) release their gametes into the water column so that fertilization and the entire larval development phase occurs in an oceanic, highly diluting environment. Among octocorals, another reproductive strategy is surface brooding, where eggs are released passively onto the surface of the colony (Benayahu and Loya 1983, Brazeau and Lasker 1990, Guitiérrez-Rodríguez and Lasker 2004). While sampling female colonies of *Pseudopterogorgia elisabethae*, Guitiérrez-Rodríguez and Lasker (2004) did not find developing embryos or planula inside the polyps, and they suggested that fertilization occurred either internally immediately before the eggs were released or externally on the surface of the maternal colony.
Brooded larvae are often able to settle shortly after release (hence higher recruitment success and lower average dispersal than broadcast spawning species). An advantage of brooding is that the eggs avoid the risk of being advected off of the reef and away from sperm of potential mates (Lasker 2006). Generally, broadcast spawning stony coral species tend to have high longevity, lower recruitment, larger maximum colony size (i.e., K-selected life history traits). Brooding stony corals are generally more weedy species which do not attain large colony size and hence have limited contribution to reef accretion (Szmant 1986). Such inter-specific differences in the mechanisms of fertilization, dispersal, recruitment, and mortality are likely important in determining the species composition of reef corals in different environments. Such differences reflect the differential allocation of energy to the basic life history functions of growth (rate and density of the skeleton), reproduction (fecundity, mode of larval dispersal, recruitment success), and colony maintenance (intra- and interspecific interactions, competitive ability, regeneration) (Connell 1973, Lang 1973, Bak and Engel 1979, Szmant 1986).

Most broadcast spawning corals release gametes only on a few nights per year. In southeast Florida, most species spawn over a few nights clustered around the full moon in late summer. Spawning synchrony is crucial in order for sessile organisms to accomplish external fertilization. Also, in the context of declining population density as is being observed for many shallow reef corals in the region, fertilization may constitute the major life-history bottleneck as dilution between colonies even few to tens of meters distant may be prohibitive.

Brooding species often release larvae on a lunar cycle over several months or year round. *Porites astreoides*, a brooding stony coral species, releases larvae around the new moon, primarily from April to June in the Florida Keys (McGuire and Szmant1997). However, the brooding season has been reported to be from January to September farther south in Puerto Rico (Szmant 1986). *Favia fragum*, another brooding species, releases larvae monthly year-round (Szmant 1986). Surface brooding has been reported in a few octocoral species found in the management area, including *Briaerium asbestinum* and *Pseudopterogorgia elisabethae* (Guitiérrez-Rodríguez and Lasker 2004).

In either mode of larval development, planula larvae presumably experience considerable mortality (up to 90% or more) from predation or other factors prior to settlement and metamorphosis (Goreau et al. 1981). The selection of appropriate settlement substrate is not well-understood, but for several coral species, chemical cues from crustose coralline algae and microbial biofilms have been shown to induce settlement and metamorphosis (Morse et al. 1994, Morse and Morse 1996, Webster et al. 2004). Settled larvae undergo metamorphosis by generating a calcium carbonate skeleton. The mouth is situated at the upper end, and a ring of tentacles develops around the mouth. After metamorphosis onto appropriate hard substrata, metabolic energy is diverted to colony growth and maintenance. Because newly settled corals barely protrude above the substratum, juveniles need to reach a certain size to reduce damage or mortality from impacts such as grazing, sediment burial, and algal overgrowth (Bak and Elgershuizen 1976, Birkeland 1977, Sammarco 1985). Cary (1914) points out the obvious advantage of young octocorals over stony coral recruits in that their most rapid growth is perpendicular to the substratum, keeping the most active growing part of the colony in a favorable position for resource allocation. Recent studies examining early survivorship of lab cultured *A. palmata* settled onto experimental limestone plates and placed in the field indicate that survivorship is substantially higher than for *Montastraea faveolata*, another broadcast spawner, and similar to brooding species over the first 9 months after settlement (Szmant and Miller 2006). This pattern corresponds to the size of planulae; *A. palmata* eggs and larvae are much larger than those of *Montastraea* spp.

Development and growth

Most corals are colonial in that they are composed of individual units called polyps. Each polyp is an individual: it captures food, has independent digestive, nervous, respiration, and reproductive systems. A large coral colony has thousands of polyps working semi-independently to sustain the colony. Coral colonies grow via the addition (budding) of new polyps. By the same token, colonies can exhibit partial mortality whereby a subset of the polyps in a colony die, but the colony persists.

For most gorgonian genera, the major axial skeleton component is gorgonin, which is mainly composed of collagen fibers in a proteinaceous matrix (Leversee 1969). Gorgonin is deposited in concentric layers extracellularly around a central, hollow chambered canal, seldom exceeding a diameter of 100 µm. The axis functions as a mechanical support system facilitating the passive suspension feeding by octocorals (Lewis et al. 1992). The axis must be rigid enough to withstand the total water velocities for the particular habitat while supporting the polyps off the substratum (Muzik and Wainwright 1977). Lowenstam (1964) explains that the flexibility of the axial skeleton of gorgonians can apparently be modulated by sclerotization of the collagen within the axial skeleton. Gorgonian axes can be stiffened by the extracellular deposition of carbonates within the collagen interstitial spaces (Jeyasuria and Lewis 1987). Lewis et al. (1992) suggests that this process may be a mechanism for dealing with different hydrodynamic forces encountered at various depths.

Many gorgonian species can be characterized by a distinct colony form and a maximum colony size, indicating determinate growth, which suggests that growth is constrained in some way (Lasker et al. 2003). In two studies on *Pseudopterogorgia elisabethae*, the developmental cycle showed a rapid growth rate after settlement which then decreased dramatically with age, suggesting an age-dependent decrease in growth rate (Lasker et al. 2003, Goffredo and Lasker 2006). This size- or age-dependent decrease in growth rates may be due to interactions between the gorgonian colony and its environment (i.e., the balance between nutrient uptake and metabolic rates) instead of a genetically determined developmental plan (Lasker et al. 2003). A common method to determine growth rates of octocorals is by taking linear height measurements of a tagged colony over a period of time, the results usually varying between species. The most accurate method of estimating the age of a colony is counting growth rings seen within the axial skeleton rather than basing it on growth rates. However, counting growth rings usually requires the collection of the colony. Using both methods, height-age equations can be derived for a species (Grigg 1974).

Growth rates can vary dramatically within a species and between different species. Lasker et al. (2003) studied determinate growth in *Pseudopterogorgia elisabethae*. The resulting branch growth rates varied, ranging from negative values (branch loss) to 17.8 cm per year. A later study on this species performed by Goffredo and Lasker (2006) showed growth rates that decreased as a function of height. Colonies that were 0-10 cm in height had a growth rate of 3.5 cm per year; 20-30 cm colonies had a growth rate of 2.6cm per year; and 40-50 cm colonies had a growth rate of 0.5 cm per year. Yoshioka (1979) studied the ecology of *Pseudopterogorgia americana* and *Pseudopterogorgia acerosa*, calculating their linear growth rates to be about 5 cm per year for *P. americana* and 6 cm per year for *P. acerosa*.

Growth rates were higher for colonies exposed to higher light levels, showing that environmental factors affect the growth of a colony. Reproduction was delayed for 3–5 years until colonies were mature, ranging 15-30 cm respectively. Growth rates of *Pseudoplexaura porosa* branches can exceed 15cm per year (Lasker unpublished data). Due to these variations in growth rates, calculations determining the accurate age of a given colony should be based on growth rings and colony height (not solely on height).

Ecological Relationships

Octocorals derive energy from several sources including from sunlight through their photosynthetic, symbiotic zooxanthellae (algae living in the coral tissue), from consumption of zooplankton, from bacteria (which act as biochemical recycling agents), from consumption of detritus, and perhaps even directly from dissolved organics.

Corals are subject to the ecological pressures of predation (by fish and invertebrates), competition for space, and other interactions with associated organisms. In some instances, such as the symbiotic relationship of corals to zooxanthellae, the association is mutually beneficial. At the other end of the spectrum, however, are predatory pressures such as those applied by certain reef fishes and invertebrates that eat corals.

The importance of coral ecosystems and associated habitats has been well documented by numerous studies, reviews, and symposia (e.g., Jones and Endean 1973; Bright and Pequegnat 1974, Taylor 1977, Bright et al. 1981, Jaap 1984, Jaap and Hallock 1990, Chiappone 1996). Many of those documents emphasize the complex structure of coral ecosystems, the importance of coral for habitat, the sedentary lifestyle and its implications, the wide geographic and bathymetric distributions, and the many behavioral, physiological, ecological, and physical associations that combine to yield an exceedingly complex biological community. The Magnuson-Stevens Act recognizes these values and lists several corals as continental shelf fishery resources subject to exclusive U.S. use beyond the EEZ.

Ecosystems which include coral (hardbottoms, coral reefs, and coral communities) often represent unique arrays of plants and animals in an integrated ecosystem. The key to many of these systems, if there can be one most important link, is often coral itself, since the corals provide habitat and/or food for most of the other members of the ecosystem. Connell (1973) and Grassle (1973) have studied aspects of population ecology and diversity within coral reefs. Individual biotic components have also been studied -- among them, microbes (DiSalvo 1973), algae (Cribb 1973), holothurians (Bakus 1973), shrimps and prawns (Bruce 1976), echinoderms (Clark 1976), fishes (Goldman and Talbot 1976), and others. The resultant coral community is exceedingly complex and productive. Helfrich and Townsley (1965), Odum (1971), DiSalvo (1973), Sorokin (1973), and others have attempted to quantify and qualify the productivity of corals and their associated biota (e.g., microorganisms) compared to other marine and terrestrial communities.

Because of their vast species diversity, trophic complexity, and productivity, mature coral communities possess numerous mechanisms that past researchers believed may enable them to resist normal disturbances, especially those biological in nature (Endean 1976). However, coral reefs have declined throughout the Caribbean including off the Florida coast over the past several decades. Numerous factors play major roles in coral health and may potentially threaten the continued viability of domestic corals. These factors include water quality, algal blooms, increased water temperatures, physical impacts from ship groundings and marine construction activities, sedimentation, pollution, nutrient enrichment, diver/snorkeler damage, disease, and over-fishing. Most of the coral reefs and coral communities in the management area may be degraded to such a degree that self-regulating mechanisms are no longer functional.

The special nature of corals as a fishery is further highlighted by their sedentary attached (not mobile) existence, which separates them from the subjects of many other fishery plans. Protection via escape or camouflage is limited by the design of coral skeletons and polyps. Although some protection is afforded by polyp withdrawal, strict energy budgets restrict the use of such behavior. Hence, in the midst of persistent adversity, (e.g., water pollution, extreme temperatures, sedimentation), corals appear precariously susceptible. The life history of the octocorallian and scleractinian corals is similar to the other invertebrate species. The fruits of coral sexual reproduction are planulae larvae; the larvae are free living (planktonic or benthic). The larvae select settlement sites through chemoreceptors, settle, and undergo metamorphosis to juvenile, sessile corals. Because of their vulnerability to environmental conditions, continued survival of corals will be dependent on management strategies that incorporate more of an ecosystem approach and tackle large scale issues such as water quality.

3.2.1.2 Snapper Grouper Complex

A detailed description of the 73 species included in the Snapper Grouper Complex is presented in Section 4.1.2 of the Fishery Ecosystem Plan (SAFMC 2009a). A description of the habitats occupied by snapper grouper species, their abundance and the current status of the stocks is also included in this section.

3.2.1.1 Coastal Migratory Pelagics

A detailed description of the coastal migratory pelagic species, their abundance and the current status of the stocks and the habitats they occupy is presented in Section 4.1.3 of the Fishery Ecosystem Plan (SAFMC 2009a).

3.2.1.2 Pelagic *Sargassum*

A detailed description of Pelagic *Sargassum* is presented in Section 4.1.7 of the Fishery Ecosystem Plan (SAFMC 2009a). A description of the oceanographic habitats occupied by pelagic *Sargassum* is presented in Section 3.1.2 of this Amendment.

3.2.2 Other Affected Species

3.2.3 Protected Species

There are 31 different species of marine mammals that may occur in the South Atlantic region. All marine mammal species are protected under the Marine Mammal Protection Act (MMPA) and six are also listed as endangered under the ESA (i.e., sperm, sei, fin, blue, humpback, and North Atlantic right whales). Other species listed under the ESA that occur in the South Atlantic include five species of sea turtle, a species of marine fish, and two coral species. Designated critical habitat for some of these species also occurs in the South Atlantic region. A discussion of these species and their critical habitat is below.

3.2.3.1 Endangered Species Act (ESA)-Listed Species

Species and Designated Critical Habitat in the Action Area Under NOAA Fisheries' Purview

Endangered

Blue whale	*Balaenoptera musculus*
Humpback whale	*Megaptera novaeangliae*
Fin whale	*Balaenoptera physalus*
North Atlantic right whale	*Eubalaena glacialis*
Sei whale	*Balaenoptera borealis*
Sperm whale	*Physeter macrocephalus*
Leatherback sea turtle	*Dermochelys coriacea*
Hawksbill sea turtle	*Eretmochelys imbricata*
Kemp's Ridley turtle	*Lepidochelys kempii*
Green turtle*	*Chelonia mydas*
Smalltooth sawfish**	*Pristis pectinata*

Threatened

Loggerhead turtle	*Caretta caretta*
Elkhorn coral	*Acropora palmata*
Staghorn coral	*A. cervicornis*

Proposed Species

Atlantic sturgeon***	*Acipenser oxyrinchus oxyrinchus*

*Green turtles in U.S. waters are listed as threatened except the Florida breeding population, which is listed as endangered.
**U.S. distinct population segment (DPS)
*** North Carolina and South Carolina DPS

Critical Habitat

North Atlantic right whale critical habitat has been designated in the U.S. Southeast Atlantic from the mouth of the Altamaha River, Georgia, to Jacksonville, Florida, out 27 kilometers (15 nautical miles) and from Jacksonville, Florida, to Sebastian Inlet, Florida, out 9 kilometers (5 nautical miles). A portion of this area lies within the South Atlantic EEZ.

The physical feature essential to the conservation of elkhorn and staghorn corals is: substrate of suitable quality and availability to support larval settlement and recruitment, and re-attachment and recruitment of asexual fragments. ''Substrate of suitable quality and availability'' is defined as natural consolidated hard substrate or dead coral skeleton that is free from fleshy or turf macroalgae cover and sediment cover.

Critical habitat includes one specific area of the Atlantic Ocean offshore of Palm Beach, Broward, Miami-Dade, and Monroe counties, Florida, and three specific areas of the Atlantic Ocean and Caribbean Sea offshore of the U.S. Territories of Puerto Rico and the U.S. Virgin Islands. The boundaries of specific critical habitat area within the South Atlantic EEZ are described below.

Except as specified below, the seaward boundary is the 30-meter (98-foot) depth contour and the shoreward boundary is the line of mean low water (MLW; 33 CFR 2.20). Within these boundaries, discrete areas of water deeper than 30 meters (98 feet) are not included.

(1) Florida Area: The Florida area contains three sub-areas.

(i) The shoreward boundary for Florida sub-area A begins at the 1.8-meter (6-foot) contour at the south side of Boynton Inlet, Palm Beach County at 26° 32′ 42.5″ N; then runs due east to the point of intersection with the 30-meter (98-foot) contour; then follows the 30-meter (98-foot) contour to the point of intersection with latitude 25° 45′ 55″ N, Government Cut, Miami-Dade County; then runs due west to the point of intersection with the 6-foot (1.8-meter) contour, then follows the 1.8-meter (6-foot) contour to the beginning point.

(ii) The shoreward boundary of Florida sub-area B begins at the MLW line at 25° 45′ 55″ N, Government Cut, Miami-Dade County; then runs due east to the point of intersection with the 30-meter (98-foot) contour; then follows the 30-meter (98-foot) contour to the point of intersection with longitude 82° W; then runs due north to the point of intersection with the South Atlantic Fishery Management Council boundary at 24° 31′ 35.75″ N; then follows this boundary to a point of intersection with the MLW line at Key West, Monroe County; then follows the MLW line, the Council boundary (see 50 CFR 600.105(c)), and the COLREGS line (see 33 CFR 80.727. 730, 735, and 740) to the beginning point.

(iii) The seaward boundary of Florida sub-area C (the Dry Tortugas) begins at the northern intersection of the 30-meter (98-foot) contour and longitude 82° 45’ W; then follows the 30-meter (98-foot) contour west around the Dry Tortugas, to the southern point of intersection with longitude 82° 45’ W; then runs due north to the beginning point.

<u>Species under U.S. Fish and Wildlife Service (USFWS) Jurisdiction:</u>
<u>Endangered</u>

Bermuda Petrel	*Pterodrama cahow*
Roseate Tern****	*Sterna dougallii*

**** North American populations federally listed under the ESA: endangered on Atlantic coast south to NC, threatened elsewhere.

3.2.3.1.1 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 more thoroughly the biology and ecology of these species (i.e., Lutz and Musick (eds.) 1997, Lutz *et al.* (eds.) 2002).

Green sea turtle hatchlings are thought to occupy pelagic areas of the open ocean and are often associated with *Sargassum* rafts (Carr 1987, Walker 1994). Pelagic stage green sea turtles are thought to be carnivorous. Stomach samples of these animals found ctenophores and pelagic snails (Frick 1976, Hughes 1974). At approximately 20 to 25 centimeters (8-10

inches) 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 meters (360 feet) (Frick 1976), but they are most frequently making dives of less than 20 meters (65 feet) (Walker 1994). The time of these dives also varies by life stage. The maximum dive length is estimated at 66 minutes with most dives lasting from 9 to 23 minutes (Walker 1994).

The **hawksbill's** pelagic stage lasts from the time they leave the nesting beach as hatchlings until they are approximately 22-25 centimeters (8-10 inches) in straight carapace length (Meylan 1988, Meylan and Donnelly 1999). The pelagic stage is followed by residency in developmental habitats (foraging areas where juveniles reside and grow) in coastal waters. Little is known about the diet of pelagic stage hawksbills. Adult foraging typically occurs over coral reefs, although other hard-bottom communities and mangrove-fringed areas are occupied occasionally. Hawksbills show fidelity to their foraging areas over several years (van Dam and Diéz 1998). The hawksbill's diet is highly specialized and consists primarily of sponges (Meylan 1988). Gravid females have been noted ingesting coralline substrate (Meylan 1984) and calcareous algae (Anderes Alvarez and Uchida 1994), which are believed to be possible sources of calcium to aid in eggshell production. The maximum diving depths of these animals are not known, but the maximum length of dives is estimated at 73.5 minutes. More routinely, dives last about 56 minutes (Hughes 1974).

Kemp's ridley hatchlings are also pelagic during the early stages of life and feed in surface waters (Carr 1987, Ogren 1989). Once the juveniles reach approximately 20 centimeters (8 inches) carapace length they move to relatively shallow (less than 50 meters; 164 feet.) benthic foraging habitat over unconsolidated substrates (Márquez-M. 1994). They have also been observed transiting long distances between foraging habitats (Ogren 1989). Kemp's ridleys feeding in these nearshore areas primarily prey on crabs, though they are also known to ingest mollusks, fish, marine vegetation, and shrimp (Shaver 1991). The fish and shrimp Kemp's ridleys ingest are not thought to be a primary prey item but instead may be scavenged opportunistically from bycatch discards or from discarded bait (Shaver 1991). Given their predilection for shallower water, Kemp's ridleys most routinely make dives of 50 m or less (Soma 1985, Byles 1988). Their maximum diving range is unknown. Depending on the life stage Kemp's ridleys may be able to stay submerged anywhere from 167 minutes to 300 minutes, though dives of 12.7 minutes to 16.7 minutes are much more common (Soma 1985, Mendonca and Pritchard 1986, Byles 1988). Kemp's ridleys may also spend as much as 96% of their time underwater (Soma 1985, Byles 1988).

Leatherbacks are the most pelagic of all ESA-listed sea turtles and spend most of their time in the open ocean although they will enter coastal waters and are seen over the continental shelf on a seasonal basis to feed in areas where jellyfish are concentrated. Leatherbacks feed primarily on cnidarians (medusae, siphonophores) and tunicates. Unlike other sea turtles, leatherbacks' diets do not shift during their life cycles. Because leatherbacks' ability to capture and eat jellyfish is not constrained by size or age, they continue to feed on these

species regardless of life stage (Bjorndal 1997). Leatherbacks are the deepest diving of all sea turtles. It is estimated that these species can dive in excess of 1000 meters (Eckert *et al.* 1989) but more frequently dive to depths of 50 to 84 meters (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 centimeters (16-23 inches) 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 to 233 meters (692-764 feet.) (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).

3.2.3.1.2 ESA-Listed Marine Fish

The historical range of 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 1999 (Schwartz 2003) and the other off Georgia 2002 [Burgess unpublished data]). 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).

NMFS convened the Smalltooth Sawfish Recovery Team, comprising sawfish scientists, managers, and environmental managers, to develop a plan to recover the U.S. distinct population segment (DPS) of smalltooth sawfish. The plan recommends specific steps to recover the DPS, focusing on reducing fishing impacts, protecting important habitats, and educating the public. The draft recovery plan was made available for public comment in August 2006 and can be found at www.nmfs.noaa.gov. On May 1, 2009, the Southeast Regional Office, Sustainable Fisheries Division, requested reinitiation of the Endangered Species Act Section 7 consultation on the South Atlantic shrimp fishery and its effects on

smalltooth sawfish because the amount of authorized incidental take for smalltooth sawfish had been exceeded. The most recent biological opinion on shrimp fishing under the Shrimp Fishery Management Plan for the South Atlantic, completed on February 25, 2005, concluded the continued authorization of the South Atlantic shrimp fishery is not likely to jeopardize the continued existence of smalltooth sawfish. An incidental take statement was issued authorizing the annual incidental lethal take of up to one smalltooth sawfish. A smalltooth sawfish take was observed in a shrimp trawl in the South Atlantic exclusive economic zone (EEZ) on July 26, 2008. It was in poor condition and believed not to have survived the interaction. Three additional smalltooth sawfish were observed taken in a shrimp trawls in the South Atlantic EEZ during a fishing trip from March 5-9, 2009. One of the smalltooth sawfish is thought to have died from the interaction; the other two were released alive and assumed to have survived.

Under the Endangered Species Act (ESA), it is illegal to catch or harm an endangered sawfish. However, some fishermen catch sawfish incidentally while fishing for other species. NMFS and the Smalltooth Sawfish Recovery Team have developed guidelines to fishermen telling them how to safely handle and release any sawfish they catch.

3.2.3.1.3 ESA-Listed Marine Invertebrates

Elkhorn and staghorn 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 (26°3'N). The depth range for these species ranges from <1 meter (3 feet) to 60 meters (197 feet). The optimal depth range for elkhorn is considered to be 1 to 5 meters (3-16 feet) depth (Goreau and Wells 1967), while staghorn corals are found slightly deeper, 5 to 15 meters (16-49 feet) (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 (77-84°F) (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[1] had higher fertility rates than smaller colonies (Soong and Lang 1992).

3.2.3.2 Species of Concern

NOAA Fisheries Service has created a list of Species of Concern (SOC) as a publicly available list identifying other species of concern. These are species about which NOAA Fisheries Service has some concerns regarding status and threats. NOAA Fisheries Service uses the list to draw proactive attention and conservation action to these species. No federal mandate protects species of concern under the ESA although voluntary protection of these species is urged. NOAA Fisheries Service recently received petitions to list five SOC species (denoted below). NOAA Fisheries Service is currently reviewing those petitions to determine if further investigation into whether these species should be listed under the ESA is warranted.

List of Marine Species of Concern in the Southeastern United States

Dusky shark	*Carcharhinus obscurus*	
Sand tiger shark	*Odontaspis taurus*	
Mangrove rivulus	*Rivulus mamoratus*	
Opossum pipefish	*Microphis barchyurus lineatus*	
Key silverside	*Menidia conchorum*	
Speckled hind	*Epinephelus drummondhayi*	(petition pending)
Warsaw grouper	*Epinephelus nigritus*	(petition pending)
Nassau grouper	*Epinephelus striatus*	(petition pending)
Ivory Tree Coral	*Oculina varicose*	
Saltmarsh Topminnow	*Fundulus jenkinsi*	(petition pending)
Striped Croaker	*Bairdiella sanctaeluciae*	
Alabama Shad	*Alosa alabamae*	(petition pending)

3.3 Essential Fish Habitat

The Magnuson-Stevens Act defines EFH as "all waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." The Magnuson-Stevens Act directs Regional Fishery Management Councils to describe and identify EFH for each federally managed species, to minimize the extent of adverse effects on habitat caused by fishing and non-fishing activities, and to identify actions to encourage conservation and enhancement of those habitats. It is required that EFH designations be based on the best available scientific information.

EFH designations may include habitat for an individual species or an assemblage of species, whichever is appropriate within a particular Fishery Management Plan. Under the definition of EFH:

[1] As measured by surface area of the live colony

- "Waters" includes aquatic areas and their associated physical, chemical, and biological properties that are utilized by fish. When appropriate this may include areas used historically.
- "Necessary" means the habitat required to support a sustainable fishery and a healthy ecosystem, while "spawning, breeding, feeding, or growth to maturity" covers the full life cycle of a species.
- "Substrate" includes sediment, hardbottom, structures underlying the waters, and associated biological communities.

Councils should obtain information to describe and identify EFH from the best available sources. Information should be analyzed and organized as follows, striving to describe habitat based on their highest level of detail:

- Level 1: species distribution data for all or part of its geographic range;
- Level 2: data on habitat-related densities or relative abundance of the species;
- Level 3: data on growth, reproduction, and survival rates within habitats; and
- Level 4: production rates by habitat

In addition to EFH, the Councils may identify EFH- HAPCs as a subset of EFH. In determining which areas should be designated as HAPCs, the area must meet one or more of the following criteria:

- Importance of the ecological function provided by the habitat;
- Extent to which the habitat is sensitive to human-induced environmental degradation;
- Whether, and to what extent, development activities are, or will be, stressing the habitat type; and
- Rarity of the habitat type

Council Habitat Responsibilities as Defined in the Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Act provides for authorities and responsibilities of the Secretary of Commerce and Fishery Management Council for the protection of EFH. Section 305 (b) Fish Habitat, requires the Secretary (through NOAA Fisheries Service) to assist the Councils in the description and identification of EFH in fishery management plans (including adverse impacts on such habitat) and in the consideration of actions to ensure the conservation and enhancement of such habitat. In addition, the Secretary (through NOAA Fisheries Service) was required to: set forth a schedule for the amendment of fishery management plans to include the identification of EFH and for the review and updating of such identifications based on new scientific evidence or other relevant information; in consultation with participants in the fishery, provide each Council with recommendations and information regarding each fishery under that Council's authority to assist it in the identification of EFH, the adverse impacts on that habitat, and the actions that should be considered to ensure the conservation and enhancement of that habitat; review programs administered by the Department of Commerce and ensure that any relevant programs further the conservation and enhancement of EFH; and coordinate with and provide information to other Federal agencies to further the conservation and enhancement of EFH.

The Act specifies that each Federal agency shall consult with the Secretary with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any EFH identified under the Act. Additional provisions specify that each Council: may comment on and make recommendations to the Secretary and any Federal or state agency concerning any activity authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by any Federal or state agency that, in the view of the Council, may affect the habitat, including EFH, of a fishery resource under its authority; and shall comment on and make recommendations to the Secretary and any Federal or state agency concerning any such activity that, in the view of the Council, is likely to substantially affect the habitat, including EFH, of an anadromous fishery resource under its authority. If the Secretary receives information from a Council or Federal or state agency or determines from other sources that an action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by any state or Federal agency would adversely affect any EFH identified under the Act, the Secretary shall recommend to such agency measures that can be taken to conserve such habitat. Within 30 days after receiving a recommendation, a Federal agency shall provide a detailed response in writing to any Council commenting and the Secretary regarding the matter. The response shall include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on such habitat. In the case of a response that is inconsistent with the recommendations of the Secretary, the Federal agency shall explain its reasons for not following the recommendations.

The South Atlantic Council's current process for reviewing and commenting on projects is described in Appendix A of the Habitat Plan (SAFMC 1998a).

On December 19, 1997, an interim final rule was published in the Federal Register to implement the EFH provisions of the Magnuson-Stevens Act. This rule established guidelines to assist the Councils and the Secretary of Commerce in the description and identification of EFH in fishery management plans, including identification of adverse impacts from both fishing and non-fishing activities on EFH, and identification of actions required to conserve and enhance EFH. The regulations also detailed procedures the Secretary (acting through NOAA Fisheries Service), other Federal agencies, State agencies, and the Councils can use to coordinate, consult, or provide recommendations on Federal and State activities that may adversely affect EFH. The intended effect of the rule is to promote the protection, conservation, and enhancement of EFH. On January 17, 2002, the Final Rule for EFH was published with an effective date of February 19, 2002. This rule supersedes the interim final rule with the main changes being in the procedures for consultation, coordination, and recommendations on permit activities and guidelines for EFH information in fishery management plans. The final rule provides more clear guidelines for prioritizing and analyzing habitat effects for managed species. The final rule retains the four-level system for assessing the data applied in identifying EFH. The final rule provides more flexibility in designating EFH when information is limited and allows Councils to use available distribution information as well as presence/absence data. It also allows informed decision based on similar species and other life stages.

The Habitat Plan (SAFMC 1998a) was the initial synthesis of technical information for the EFH designated in the Comprehensive EFH Amendment to the Fishery Management Plans of the South Atlantic Region (SAFMC 1998b). The Fishery Ecosystem Plan (SAFMC 2009a) updates that technical information and presents refined information on habitat requirements (by life stage where information exists) for species managed by the Council, including information on environmental and habitat variables that control or limit distribution, abundance, reproduction, growth, survival, and productivity of the managed species.

The Council, in working with its Habitat and Environmental Protection and Coral Advisory Panels and through a series of workshops, reviewed the Fishery Ecosystem Plan (SAFMC 2009a) to identify available environmental and fisheries data useful in describing and identifying EFH. In addition to the members of these Advisory Panels, the workshops included relevant experts from state, Federal, and regional levels.

The review continued the Council's ecosystem approach to designating EFH and is consistent with NOAA Fisheries Service guidelines and broader goals for ecosystem management. The Council further pursues this ecosystem approach via a set of formal, published habitat policies that are tailored to specific management issues.

Maps of EFH and EFH-HAPCs under the Final EFH Rule

The Final EFH Rule requires Fishery Management Plans to include maps that display, within the constraints of available information, the geographic locations of EFH or the geographic boundaries within which EFH for each species and life stage is found. To the extent practicable, maps should identify the different types of habitat designated as EFH, explicitly distinguish EFH from non-EFH areas, and be incorporated into a geographic information system (GIS) to facilitate analysis and presentation. While GIS, in combination with models that examine habitat requirements, can be used as a tool for designating EFH, current data availability do not support such use at this time for the South Atlantic at fine spatial scales. Instead, the best use of GIS within the South Atlantic is visualizing where EFH occurs at coarse spatial scales.

Mapping efforts require accuracy standards for location and thematic content as well as designation of minimum mapping units (i.e., the smallest area that the map will depict for a thematic category, such as seagrass). Mapping standards for EFH have not yet been set. While technological improvements within the surveying and remote sensing communities are rapidly increasing location and thematic accuracy, designation of minimum mapping units for EFH has not progressed similarly since enactment of the EFH Final Rule. Within the South Atlantic, especially for estuaries, the data available for mapping the locations of EFH are not at a geographic scale suitable for use in most EFH consultations. For example, data on the location of salt marshes that have a minimum mapping unit of one acre usually will not show fringe marshes, which are the subject of many EFH consultations. As additional information becomes available, it is advisable to develop minimum mapping units for the specific habitat types that are designated as EFH. These standards also might be tiered to account for geographic realm (e.g., riverine, estuarine, coastal, and offshore areas), life stages, data rich versus data poor species, and number of species within a FMP.

While remaining mindful of the above caveats, the Council has developed an Internet Map Server (IMS), and an EFH Arc Service for displaying EFH and EFH-HAPCs within the constraints of available data and technology. The IMS and EFH Arc Service contain GIS layers showing the general distribution and geographic limits of EFH by life history stage (Figure 3-1). The IMS is largely based on information developed by the Council, Florida Fish & Wildlife Research Institute, NOAA Fisheries Service Southeast Fisheries Science Center, North Carolina Division of Marine Fisheries, and South Carolina Department of Natural Resources. The datasets provided vary in accuracy, scale, completeness, extent of coverage, and origin. Several data layers were derived from other sources and this processing can affect the fidelity of the underlying data. While the Council encourages use of these GIS data, users are urged to thoroughly review the metadata and original source documentation prior to interpreting the GIS data. It is the user's responsibility to ensure data are used in a manner consistent with stated limitations.

As new data become available, the Council will update the IMS and EFH Arc Service to ensure the public has the best available spatial depictions of EFH descriptions. While the Council believes spatial depictions of EFH and EFH-HAPCs are informative, textual descriptions within the Comprehensive EFH Amendment (SAFMC 1988b) are the ultimate source for determining the limits of EFH and EFH-HAPCs. The IMS can be found at: http://ocean.floridamarine.org/efh_coral/ims/viewer.htm. The EFH Arc Service can be found at: http://ocean.floridamarine.org/SAFMC_EFH/ .

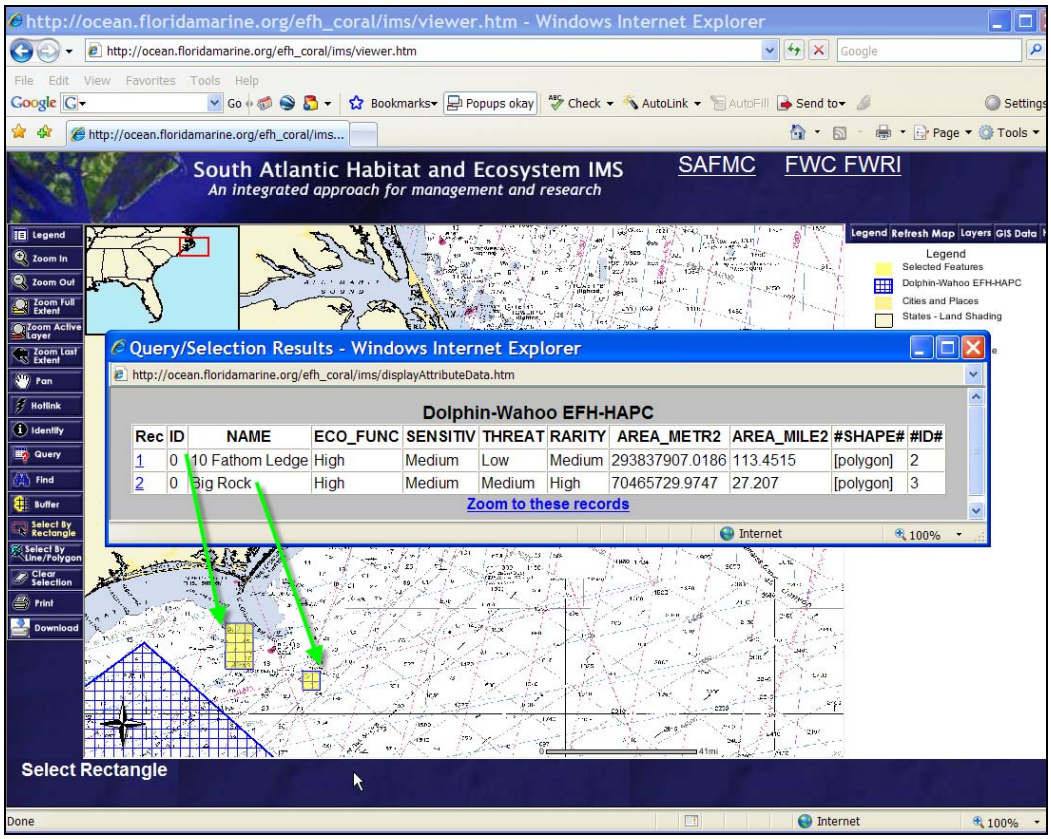


Figure 3-1. Sample screen shot of spatial presentation of EFH-HAPCs on South Atlantic Habitat and Ecosystem IMS.

EFH 5-Year Review

The Final EFH Rule requires EFH designations to be reviewed every 5 years. Activities associated with this first 5-year review included the Council updating and expanding the Habitat Plan (SAFMC 1998a) into the Fishery Ecosystem Plan (SAFMC 2009a). Actions recommended by the 5-year review for the Council to take include those described in CE-BA 1 (SAFMC 2009b) and CE-BA 2. NOAA Fisheries Service is in the process of providing a summary report highlighting these activities as part of its requirement to document and approve 5-year reviews. A few key elements of the Council's review are summarized below.

The Fishery Ecosystem Plan (SAFMC 2009a) presents information on adverse effects from fishing and describes management measures the Council has implemented to minimize adverse effects on EFH from fishing. The conservation and enhancement measures implemented by the Council to date may include ones that eliminate or minimize physical, chemical, or biological alterations of the substrate, and loss of, or injury to, benthic organisms, prey species and their habitat, and other components of the ecosystem. The Council has implemented restrictions on fisheries to the extent that no significant activities were identified in the review of gear impact conducted for the NOAA Fisheries Service by Auster and Langton (1998) that presented available information on adverse effects of all fishing equipment types used in waters described as EFH. The Council has already prevented, mitigated, or minimized most adverse effects from most fisheries prosecuted in the South Atlantic EEZ.

The Council considered evidence that some fishing practices may have an identifiable adverse effect on habitat and addressed those pertaining to deepwater coral ecosystems in CE-BA 1 (SAFMC 2009b). The Council has already used many of the options recommended in the guidelines for managing adverse effects from fishing including: fishing equipment restrictions; seasonal and areal restrictions on the use of specified gear; equipment modifications to allow the escape of particular species or particular life stages (e.g., juveniles); prohibitions on the use of explosives and chemicals; prohibitions on anchoring or setting equipment in sensitive areas; prohibitions on fishing activities that cause significant physical damage in EFH; time/area closures including closing areas to all fishing or specific equipment types during spawning, migration, foraging, and nursery activities; designating zones as Marine Protected Areas to limit adverse effects of fishing practices on certain vulnerable or rare areas/species/life history stages, such as those areas designated as EFH-HAPCs; and harvest limits.

The Fishery Ecosystem Plan (SAFMC 2009a) identifies non-fishing related activities that have the potential to adversely affect EFH quantity or quality. Examples of these activities are dredging, filling, mining, impounding or diverting waters altering thermal regimes, actions that contribute to non-point source pollution and sedimentation, introduction of potentially hazardous materials, introduction of exotic species, and the conversion of aquatic habitat that may eliminate, diminish, or disrupt the functions of EFH. Included in the Fishery Ecosystem Plan is an analysis of how fishing and non-fishing activities influence habitat function. This information presents available information describing the ecosystem or watershed and the dependence of managed species on the ecosystem or watershed. An assessment of the cumulative and synergistic effects of multiple threats, including the effects

of natural stresses (such as storm damage or climate-based environmental shifts), and an assessment of the ecological risks resulting from the impact of those threats on the managed species' habitat is included.

General conservation and enhancement recommendations are included in Volume IV of the Fishery Ecosystem Plan (SAFMC 2009a). These include recommending the enhancement of rivers, streams, and coastal areas; protection of water quality and quantity; and recommendations to local and State organizations to minimize destruction/degradation of wetlands, restore and maintain the ecological health of watersheds, and replace lost or degraded EFH.

The Council will periodically review and update EFH information and revise the Fishery Ecosystem Plan (SAFMC 2009a) as new information becomes available. NOAA Fisheries Service will provide some of this information to the Council as part of the annual Stock Assessment and Fishery Evaluation (SAFE) report. A complete update of and assessment of EFH information will also be conducted at least every 5 years. Amendments to EFH or EFH-HAPCs will occur, when appropriate via the Council established framework described in Section 4.2.8 of the Comprehensive EFH Amendment (SAFMC 1998b) or by future Comprehensive Ecosystem-Based Amendments.

Proposed List of New EFH and EFH-HAPC:
The Council designated EFH-HAPCs to emphasize subsets of EFH that warrant special protection. EFH-HAPCs on their own do not carry regulatory authority; however, the FMPs under which they were designated may include regulations that protect habitat from fishing impacts. EFH-HAPCs include general habitat types (e.g., submerged aquatic vegetation) and geographic locations (e.g., Charleston Bump).

The EFH Final Rule identifies four criteria to be used to select candidate habitats or locations for EFH-HAPC designation:

1. Importance of the ecological function provided by the habitat (E)
2. Extent to which the habitat is sensitive to human-induced environmental degradation (S)
3. Whether, and to what extent, development activities are, or will be, stressing the habitat type (ES); and
4. Rarity of the habitat type (R).

After careful consideration of the Fishery Ecosystem Plan (SAFMC 2009a) and input from the Council Advisory Panels and other experts, the following new EFH-HAPCs are proposed along with their respective FMP(s) and EFH-HAPC criteria:

- Golden tilefish habitat and blueline tilefish habitat (Snapper Grouper) R, S, E
- Deepwater MPAs (Snapper Grouper – deepwater species/snowy grouper, golden tilefish) R, E
- The Gulfstream, Charleston Bump and the Point (*Sargassum*) R, E
- Deepwater Coral HAPCs (Coral) R, E

After similar consideration, the top 10 meters of the water column in the South Atlantic EEZ are proposed as EFH under the *Sargassum* FMP; as noted below, the FMP for *Sargassum* currently does not include an EFH designation.

3.4 Current EFH Designations

The Comprehensive EFH Amendment (SAFMC 1998b) and Dolphin/Wahoo FMP provide the Council's current EFH and EFH-HAPC designations. Since CE-BA 2 only proposes amending designations made under the Snapper Grouper FMP and Coral and Coral Reef FMP, only those EFH and EFH-HAPC designations are listed below.

3.4.1 Coral and Coral Reef FMP

Coral and Coral Reef EFH

EFH for corals (stony corals, octocorals, and black corals) must incorporate habitat for over 200 species. EFH for corals include the following:

A. EFH for hermatypic stony corals includes rough, hard, exposed, stable substrate from Palm Beach County south through the Florida reef tract in subtidal to 30 meters (98 feet) depth, subtropical (15-35°C; 59-95°F), oligotrophic waters with high (30-35 ppt) salinity and turbidity levels sufficiently low enough to provide algal symbionts adequate sunlight penetration for photosynthesis. Ahermatypic stony corals are not light restricted and their EFH includes defined hard substrate in subtidal to outer shelf depths throughout the management area.

B. EFH for Antipatharia (black corals) includes rough, hard, exposed, stable substrate, offshore in high (30-35 ppt) salinity waters in depths exceeding 18 meters (54 feet), not restricted by light penetration on the outer shelf throughout the management area.

C. EFH for octocorals excepting the Order Pennatulacea (sea pens and sea pansies) includes rough, hard, exposed, stable substrate in subtidal to outer shelf depths within a wide range of salinity and light penetration throughout the management area.

D. EFH for Pennatulacea (sea pens and sea pansies) includes muddy, silty bottoms in subtidal to outer shelf depths within a wide range of salinity and light penetration.

Refer to Volume II of the FEP: Habitat and Species (SAFMC in prep.) for a more detailed description of habitat utilized by the managed species.

Coral and Coral Reef EFH-HAPCs

Existing EFH-HAPCs for coral, coral reefs, and live/hardbottom include: The 10-Fathom Ledge, Big Rock, and The Point (North Carolina); Hurl Rocks and The Charleston Bump (South Carolina); Gray's Reef National Marine Sanctuary (Georgia); The *Phragmatopoma* (worm reefs) reefs off the central east coast of Florida; *Oculina* Banks off the east coast of Florida from Ft. Pierce to Cape Canaveral; nearshore (0-4 meters; 0-12 feet) hardbottom off the east coast of Florida from Cape Canaveral to Broward County; offshore (5-30 meters; 15-

90 feet) hardbottom off the east coast of Florida from Palm Beach County to Fowey Rocks; Biscayne Bay, Florida; Biscayne National Park, Florida; and the Florida Keys National Marine Sanctuary.

3.4.2 Snapper Grouper EFH and EFH-HAPCs

Snapper Grouper EFH

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

For specific life stages of estuarine dependent and near shore snapper grouper species, EFH includes areas inshore of the 30-meter (100-foot) 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/hardbottom habitats.

Snapper Grouper EFH-HAPC

Existing EFH-HAPCs for species in the snapper grouper management unit include medium to high profile offshore hardbottoms where spawning normally occurs; localities of known or likely periodic spawning aggregations; near shore hardbottom areas; The Point, The Ten Fathom Ledge, and Big Rock (North Carolina); The Charleston Bump (South Carolina); mangrove habitat; seagrass habitat; oyster/shell habitat; all coastal inlets; all state-designated nursery habitats of particular importance to snapper grouper (e.g., Primary and Secondary Nursery Areas designated in North Carolina); pelagic and benthic *Sargassum*; Hoyt Hills for wreckfish; the Oculina Bank Habitat Area of Particular Concern; all hermatypic coral habitats and reefs; manganese outcroppings on the Blake Plateau; and Council-designated Artificial Reef Special Management Zones (SMZs).

3.4.3 International Consideration of EFH

A resolution to protect pelagic *Sargassum* as essential fish habitat for highly migratory species, drafted by the National Coalition for Marine Conservation, was submitted by the US delegation at ICCAT's 2005 meeting in Seville, Spain. This represents a first action by ICCAT to address habitat and ecosystem concerns.

3.5 Administrative Environment

3.5.1 The Fishery Management Process and Applicable Laws

3.5.1.1 Federal Fishery Management

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

Responsibility for Federal fishery management decision-making is divided between the U.S. Secretary of Commerce (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 summarized in **Appendix G**. In most cases, the Secretary has delegated this authority to NOAA Fisheries Service.

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

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

3.5.1.2 State Fishery Management

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

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

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

3.5.2 Enforcement

Both the NOAA Fisheries Service Office for Enforcement (NOAA/OLE) and the United States Coast Guard (USCG) have the authority and the responsibility to enforce NOAA Fisheries 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 enforcement of fisheries regulations.

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 Florida, Georgia, and South Carolina which granted authority to state officers to enforce the laws for which NOAA/OLE has jurisdiction. In recent years, the level of involvement by the states has increased through Joint Enforcement Agreements, whereby states conduct patrols that focus on Federal priorities

and, in some circumstances, prosecute resultant violators through the state when a state violation has occurred.

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

3.6 Human Environment

3.6.1 Description of the Fisheries

3.6.1.1 Octocoral Fishery Description

3.6.1.1.1 *History of the Commercial Fishery*

The commercial live octocoral fishery probably dates back to the late 1950s or early 1960s when salt water aquariums first started to become popular and the supply of marine specimens began to appear in major cities in the United States. In the early days, filtration systems tended to be crude and the average marine aquarist stocked his aquarium with fish and a few common invertebrates such as crabs, shrimp, and starfish. As the hobby grew and filtration systems improved, more and more aquarists began to stock their aquariums with difficult-to-keep invertebrates such as clams, snails, stony corals, and octocorals. By 1980, the octocoral fishery was becoming well established, and a handful of the hardier octocoral species collected off the Florida coasts could be found in most large marine aquarium stores throughout the U.S. The demand for Florida octocorals has continued to grow, as has the list of species harvested and successfully kept in the average marine aquarium. Florida-collected octocorals dominate the U.S. market as well as some of the European and Asian markets.

The Council, together with the Gulf of Mexico Fishery Management Council, became the first fishery management councils to describe the octocoral fishery in 1982 in the original Coral FMP (SAFMC 1982). Amendment 1 to the Coral FMP, developed in 1990 set an annual harvest limit of 50,000 octocoral colonies from federal waters, allowed for a minimal bycatch of substrate around the holdfast, set allowable gear types, and defined the area where harvest was permitted. The FWC then ruled that octocoral harvest in Florida waters would be unlimited. If the exclusive economic zone (EEZ) yearly quota was reached before September 30, then harvest would be closed in state waters until the following October.

Over the years, there has been occasional interest in collecting octocorals for use in biomedical research. Past work has mostly focused on sampling a wide variety of species and searching for chemical compounds that might be of interest to this type of research. Compounds of interest were eventually synthesized in the lab, eliminating the need to continue harvesting specific octocoral species for their extraction (K. Nedimeyer, personal communication). No large-scale harvest of octocorals for biomedical purposes is presently taking place in the South Atlantic EEZ (K. Nedimeyer, personal communication).

Although octocoral harvest in the South Atlantic EEZ is legal in almost all areas from south of Cape Canaveral, the overwhelming bulk of the commercial octocoral harvest is located primarily in the Florida Keys. Harvest of octocorals from state waters occurs as far north as Jupiter Inlet, but it is also mostly a Florida Keys based fishery. Octocoral landings since 1991 indicate that the majority of the harvest has occurred on the east coast of Florida **(Figures 3-2 & 3-3)** and almost exclusively in the Florida Keys (K. Nedimeyer, personal communication). In this area, the shelf is narrower and water clarity is greater than off the west coast of Florida. Consequently, a greater variety of octocoral species is found in the waters off the Florida Keys. In addition, conditions in the field are favorable to harvesting octocorals. Harvest data from 2000-2009 show that 84% of annual landings originate in state waters (**Table 3-2**). This trend has been anecdotally corroborated by the SAFMC Coral Advisory Panel.

3.6.1.1.2 *Licenses and Permits*

Commercial harvest of octocorals in federal waters is restricted to individuals or corporations holding a federal octocoral permit or a valid Florida Saltwater Products License (SPL) with a marine life (ML) endorsement issued by NOAA Fisheries. Saltwater products licenses from FWC are unrestricted, but the ML endorsement necessary to land commercial quantities of any organism designated as a "marine life" species, which includes all octocorals, is restricted. The commercial marine life fishery in Florida waters and the adjacent federal waters is managed by a limited entry program administered by the FWC, and only a limited number of the licenses currently issued are transferable and valid for harvesting octocorals. NOAA Fisheries has no record of issuance of a federal octocoral permit since 2004. FWC data from 2010 indicates there are 161 active ML endorsement licenses, including 108 MLD transferable dive endorsements, 38 MLB (bycatch) endorsements, and 22 MLN non-transferable dive endorsements. Commercial harvesters must have an SPL, an MLD or an MLN, and a restricted species endorsement to collect. Since only MLD and MLN endorsements can be used to dive to collect octocorals, then only 130 possible harvesters could be collecting based on 2010 data.

In 2005, a three-tiered limited entry system was implemented by FWC with the industry recommendation, under which issuance of one of the types of endorsements was based how much income from Marine Life sales that the applicant reported during at least one of the four qualifying harvest seasons (1999-2000, 2000-01, 2001-02, 2002-03). Issuance of a Marine Life Bycatch (MLB) or non-transferable Marine Life Dive (MLD) endorsement required income reports of $1-$4,999 during at least one of the qualifying periods; a transferable MLD endorsement was issued to applicants with more than $5,000 from Marine Life landings during on the years. Holders of transferable MLD endorsements are also allowed to hold multiple endorsements if they reported more than $10,000 in income during the qualifying periods.

No additional endorsements will be issued for the ML fishery, and as of 2010, only 4 MLNs have been forfeited to the State. Some endorsements are no activated each year, but a new rule starting 2011 requires annual 'requalification' for endorsement holders under the age of 62.

The State of Florida also has a Special Activities License (SAL) that can be issued to researchers, public aquariums, and educational institutions, which allows the harvest of octocorals in state and federal waters. The permit holder must state in the application the number and species of octocorals they wish to harvest, and the request is reviewed by FWC staff before being issued. Requests for any substantial amounts of octocoral harvest in federal waters are referred to NOAA Fisheries for review and approval. The SAL permit may have additional requirements or exemptions that are issued by the state of Florida on a case-by-case basis.

Recreational harvest of octocorals is permitted with a Florida Saltwater Fishing License (SFL) and is restricted to six specimens per day, and the harvest is considered part of the aggregate recreational bag limit of marine life, which is no more than a total of 20 marine specimens per license-holder per day. This permit must adhere to the most stringent of federal or state criteria.

3.6.1.1.3 *Reporting requirements*

All octocorals harvested commercially by marine life fishermen must be reported monthly to the Florida Fish and Wildlife Research Institute (FWRI). Landings are reported on trip tickets that were originally designed to report landings of lobster and other marine resources. Landings must be identified as coming from specific zones along the coast, and within each zone it must be specified as coming from state or federal waters. On the trip ticket, however, an octocoral harvester cannot specifically report landings originating in different areas. Due to demand from the aquarium trade, harvesters often seek particular species in a certain size range; therefore, several areas may be harvested in one trip. This may have resulted in inadequate reporting of octocoral landings over the years.

3.6.1.1.4 *Harvest Methods*

Almost all commercial harvest of octocorals is done by marine life fishermen for the live aquarium trade; therefore, harvest is by hand and is done in small numbers on any given day. Because octocorals are listed as a marine life species by the state of Florida, fishermen harvesting them using a Florida SPL with ML endorsement must transport and land them in a live and healthy condition.

As many as 50 different species of octocorals are harvested off the east and west coasts of Florida, but only about a dozen species make up the majority of the harvest. In a typical day, a harvester may visit from six to eight sites to collect specimens; between 50 and 200 colonies are thus collected once every two or three weeks. Water depth ranges from 5 to 150 feet, but most specimens from federal waters are photosynthetic specimens from shallow waters (less than 80 feet). Sea fans, *Gorgonia ventalina*, and *G. flabellum* as well as all black corals of the genus *Antipathes* are protected in state and federal waters and there is no allowable harvest.

The aquarium trade has specific size and shape requirements, which force marine life fishermen to be very selective in their harvest. For the most part, small specimens are not selected by harvesters, and few specimens larger than about 20 inches are collected because they are too big for most aquariums and are difficult to ship. The standard shipping box has

an inside dimension of 15 x 15 inches, so although a 20-inch specimen could fit diagonally in a standard box or could be bent, most wholesale shippers and purchasers prefer specimens less than 15 inches long. Shape and quality are other factors that fishermen must consider when selecting specimens. The ideal specimen is one that has several lateral branches and no dead spots or odd growths.

The Coral FMP states that harvest by non-powered hand tools is permitted. Most corals are harvested with a dive knife, a mason's hammer, or a hammer and wood chisel. The Coral FMP allows for the harvest of a minimal amount of substrate (1 inch around the base of the octocoral), and most harvesters harvest much less than this amount. Allowing the substrate around the holdfast to be harvested reduces the chance of injuring the specimen and also makes it easier for the final consumer, the aquarist, to attach it to a rock in their aquarium or place it upright in the sand.

Most marine life fishing vessels are open, equipped with outboard motors, and less than 25 feet long. Fishermen either work alone or with one other person on the boat. Most divers use standard self contained underwater breathing apparatus (SCUBA) gear, but a few use boat-mounted surface supplied air systems. Marine life vessels must have a continuously circulating live well or aeration or oxygenation system aboard the vessel of adequate size and capacity to maintain harvested organisms in a healthy condition (68B-42 of the Florida Administrative Code).

Recreational harvest is carried out similarly to the commercial harvest and uses the same types of vessels and gear. Recreational harvesters are not required to aerate their catch, but the catch must be landed live.

Allowable gear

Hand harvest is the only allowable method. A toxic chemical may not be used or possessed in a coral area in the EEZ. A power-assisted tool may not be used to take prohibited coral, allowable octocoral or live rock. Possession in the EEZ of coral resources harvested with a power-assisted tool is prohibited.

3.6.1.1.5 *Economic description*

The FWRI collects and maintains fishery harvest data for this fishery. However, the total economic value of the catch increases as the product moves from the harvester to the final consumer. The traditional chain of possession of the product is harvester to wholesaler to pet shop to aquarist, and traditionally the price is at least doubled at each step of the process. Therefore, a $4 octocoral reported to the FWRI will sell for at least $16 to the final aquarist, and could be much more than that. Most of this income comes into Florida from the rest of the United States and from other parts of the world (primarily Europe).

Octocoral harvest differs markedly between the South Atlantic and Gulf federal waters, with total harvest for 2000 through 2009 reported at 54,232 and 38,682 colonies, respectively (**Tables 3-2 & 3-3**). Similarly, harvest in South Atlantic federal waters versus state waters varies widely with a substantial majority of the landings in east Florida occurring in state waters (**Figure 3-2**). For the period 2000 through 2009, total harvest for South Atlantic

federal and state waters was 54,232 and 275,882 colonies, respectively. Mean landings for the same time period were 5,423 and 27,588 colonies for federal and state waters, respectively. Total 2009 ex-vessel values for the same time period were $142,790 and $799,383 for South Atlantic federal and state waters, respectively (**Table 3-2**). Harvest levels have fluctuated over the last several years, with 2006 showing the highest landings (**Figure 3-2**). Total harvest levels in 2004 and 2005 were lower than those for 2003, most likely reflecting the disruptive impacts of hurricanes on the ability of the fishermen to harvest (**Table 3-2**). Re-growth of corals in an area scoured by hurricanes to a level that will sustain a harvest varies from two to four years, depending on the habitat type and the targeted species. FWRI data indicate there were 26 fishermen reporting harvest from the South Atlantic EEZ from 2002 to 2006, and 103 fishermen reporting state harvest during that same time period (K. Nedimeyer, pers. comm.).

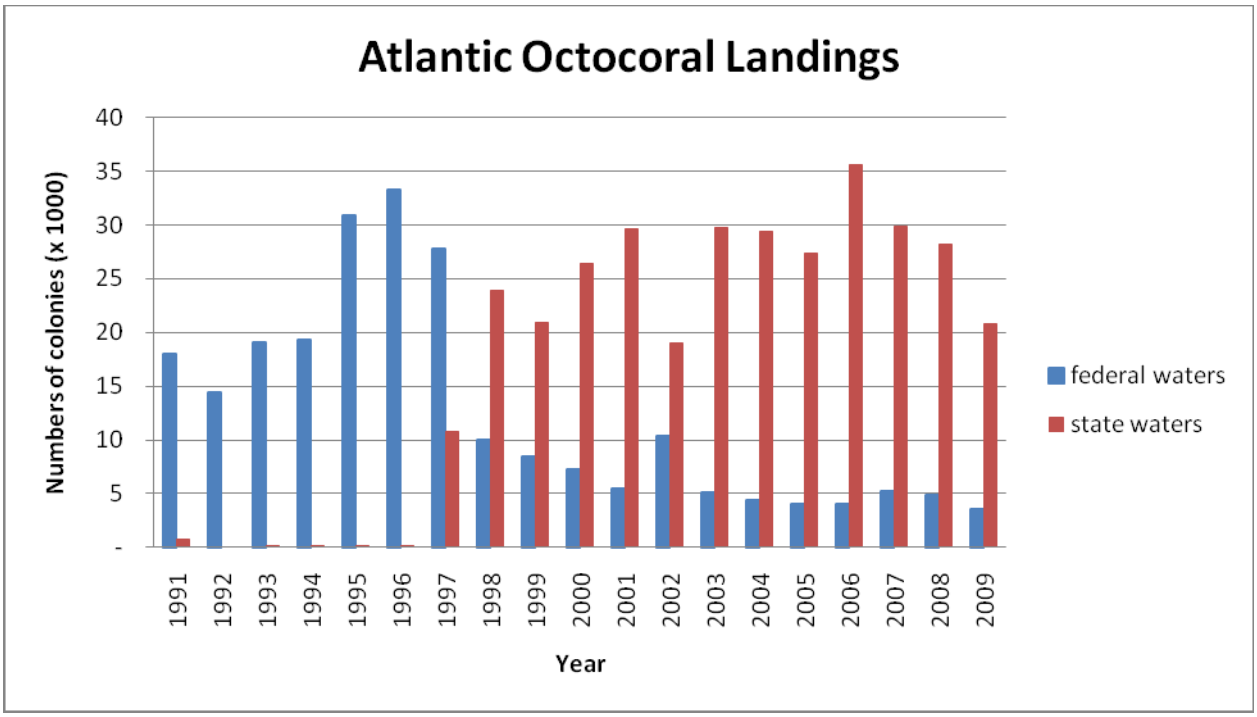


Figure 3-2. Octocoral harvest in South Atlantic Federal and state waters for the period 1991-2009 (Source: Florida Fish and Wildlife Research Institute).

Table 3-2. Octocoral harvest (in numbers of colonies) and 2009 ex-vessel value for South Atlantic federal and state waters for the period 2000-2009.

Year	State/Fed Waters	Numbers of colonies	Ex-vessel Value 2009 ($)
2000	Federal	7,278	18,858
2001	Federal	5,432	12,998
2002	Federal	10,407	32,007
2003	Federal	5,049	15,275
2004	Federal	4,386	13,520
2005	Federal	4,007	12,928
2006	Federal	4,024	12,138
2007	Federal	5,250	16,332
2008	Federal	4,890	15,671
2009	Federal	3,509	10,396
TOTAL		**54,232**	**160,122**
2000	State	26,355	87,397
2001	State	29,624	95,429
2002	State	18,968	52,065
2003	State	29,768	88,201
2004	State	29,339	88,968
2005	State	27,401	86,739
2006	State	35,589	114,620
2007	State	29,824	99,956
2008	State	28,230	98,859
2009	State	20,784	70,281
TOTAL		**275,882**	**882,515**

(Source: Landings data provided by Florida Fish and Wildlife Research Institute).

In the Gulf of Mexico, total octocoral harvest in 2000-2009 was 38,682 and 54,620 colonies in federal and state waters, respectively (**Table 3-3**; **Figure 3-3**). As in the South Atlantic, harvest of octocorals in the Gulf of Mexico occurs mainly in state waters but mean landings over the period 2000-2009 were more similar than in South Atlantic waters at 3,868.20 and 5,462 colonies in federal and state waters, respectively.

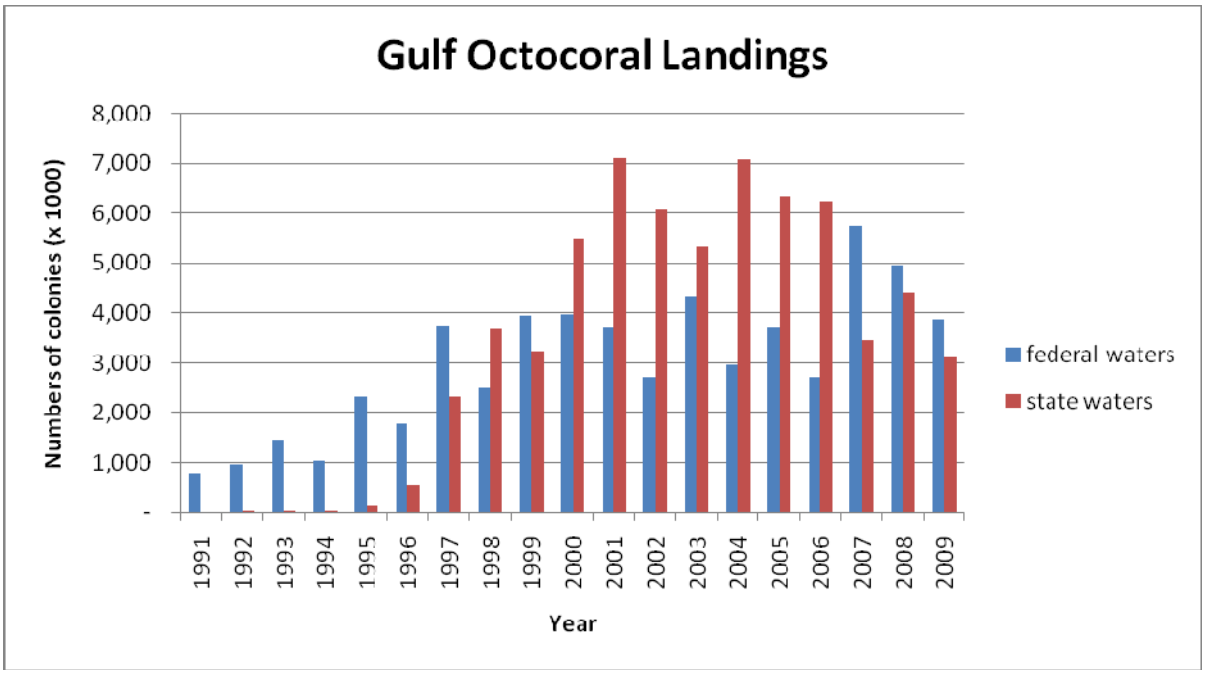


Figure 3-3. Octocoral harvest in Gulf of Mexico Federal and state waters for the period 1991-2009 (Source: Florida Fish and Wildlife Research Institute).

Table 3-3. Octocoral harvest (in numbers of colonies) and 2009 ex-vessel value for Gulf of Mexico Federal and state waters for the period 2000-2009.

Year	State/Fed	Numbers of colonies	Ex-vessel value 2009 ($)
2000	Federal	3,975	12,926
2001	Federal	3,728	9,085
2002	Federal	2,707	7,500
2003	Federal	4,331	14,936
2004	Federal	2,966	10,757
2005	Federal	3,693	15,509
2006	Federal	2,721	9,934
2007	Federal	5,747	22,301
2008	Federal	4,951	10,061
2009	Federal	3,863	15,504
TOTAL		**38,682**	**128,513**
2000	State	5,492	15,278
2001	State	7,110	26,965
2002	State	6,056	22,635
2003	State	5,336	18,148
2004	State	7,067	23,051
2005	State	6,351	16,053
2006	State	6,233	16,033
2007	State	3,451	12,269
2008	State	4,421	17,544
2009	State	3,103	13,235

Year	State/Fed	Numbers of colonies	Ex-vessel value 2009 ($)
TOTAL		**54,620**	**181,210**

(Source: Florida Fish and Wildlife Research Institute).

3.6.1.1.6 *Social and cultural environment*

In the 2010-11 harvest season there are 170 inviduals or entities that hold the Florida Marine Life endorsement (108 MLD; 22 MLN; 40 MLB). Although the area where octocoral harvest is permitted extends from the Florida Keys to Cape Canaveral, the entire harvest from the South Atlantic EEZ is from the Florida Keys with most of the harvesters either living in the Florida Keys or in Southeast Florida. Based on addresses associated with ML endorsements, the majority of the ML endorsement holders live in the Florida Keys, mostly in the Lower Keys (**Figure 3-4**). There are five MLDs listed as aquarium shops, and one as a bait and tackle shop. Two of the MLB endorsement holders are fish houses on the West Coast, and one MLN endorsement is an aquarium shop. Within the Florida Keys, there is no harvest in Key Largo National Marine Sanctuary or in Biscayne National Park, and within the Florida Keys National Marine Sanctuary there are several closed areas where all consumptive harvest is prohibited.

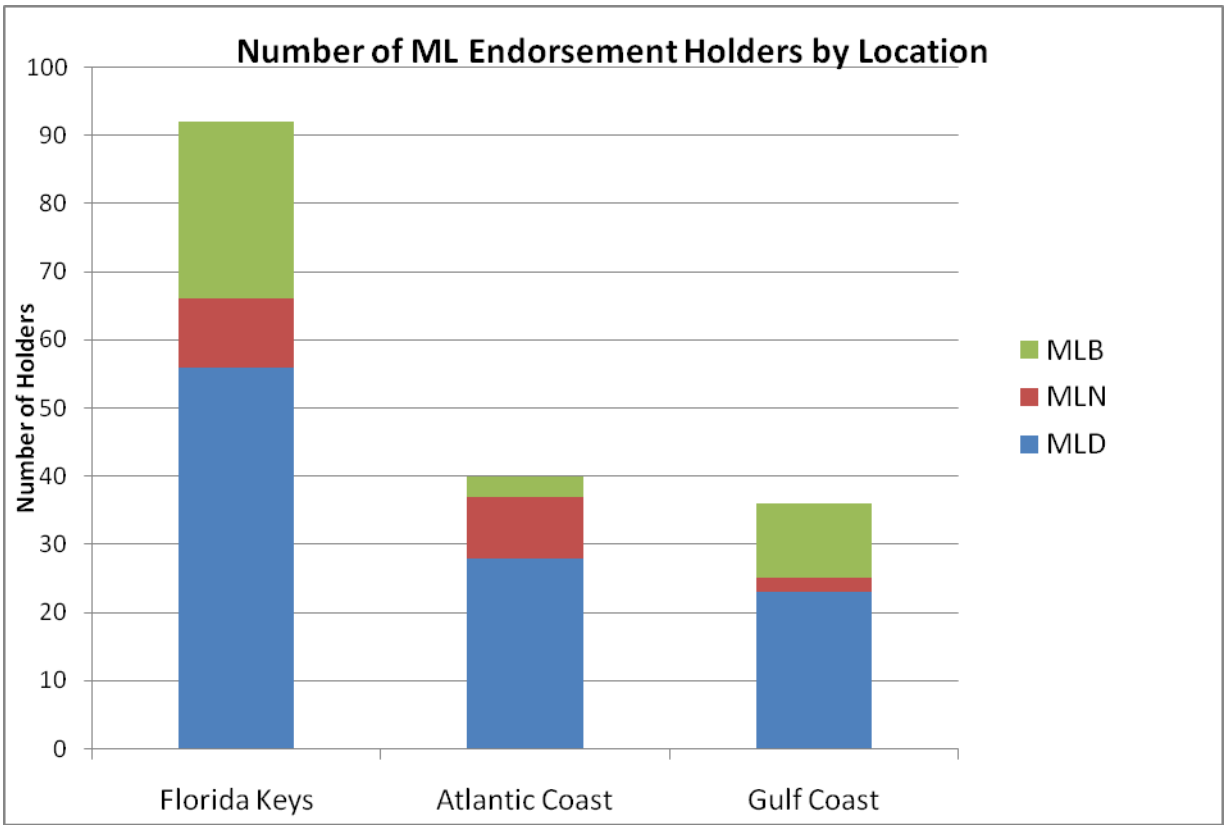


Figure 3-4. Geographic distribution of ML endorsement holders (source: FWC).

Octocorals are just one type of specimen that commercial Marine Life harvesters target, and do not make up a significant portion of all Marine Life landings. Additionally, there are daily harvest limits per endorsement on several Marine Life finfish, invertebrates, and coral specimens. Because trips include collection of multiple species, of which some have daily limit, holders of MLD endorsements are permitted to 'stack' multiple endorsements on a Saltwater Product License if they meet income requirements specified in the rule (>$10,000 of income from Marine Life landings). It is common for a Marine Life endorsement holder to have multiple SPLs and/or multiple vessels.

Of the 108 individuals or entities that hold MLD endorsements, 43 have single endorsements; 59 have two endorsements; 5 hold three; and one individual holds 4 MLD endorsements (**Figure 3-5**). The purpose of holding multiple endorsements is to increase the harvest limit, or to use MLD endorsements on multiple vessels at the same time. In general, MLD endorsement holders have participated in the Marine Life fishery for ten or more years. Over half (56 holders) live in the Florida Keys and the rest are nearly evenly split on the southeast and west coasts of Florida.

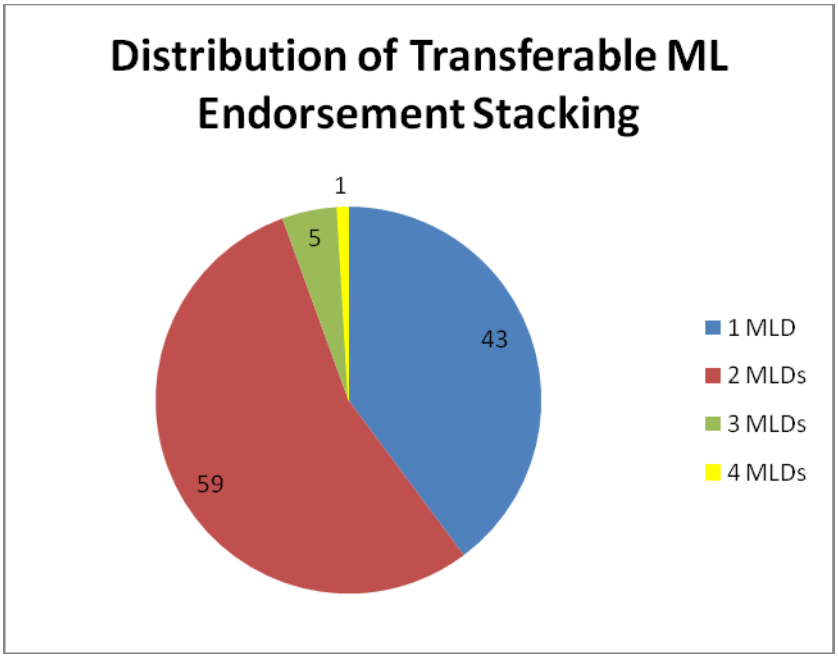


Figure 3-5. Number of MLD endorsement holders with multiple MLDs

Of the 22 MLN endorsement holders, only ten are listed with addresses in the Florida Keys. The 43 MLB endorsement holders are primarily bait shrimpers and lobster/crab trap fishermen; most are listed with Florida Keys addresses, but 11 are on the west coast of Florida.

Marine Life endorsement holders can sell to local wholesalers, stores throughout the U.S. and Europe, or to another Marine Life collector who also holds a wholesaler license. Most stores are outside of Florida, although some local aquarium shops hold their own MLD or MLN endorsements. Over the last few decades, demand has been fairly stable throughout the year

and the fishery generally does not experience seasonal fluctuations. It is common for a Marine Life collector to maintain established relationships with some buyers.

3.6.1.1.7 *Bycatch*

Because the octocorals are almost exclusively harvested one at a time by divers, there is very little bycatch. However, all octocorals most likely have communities of invertebrates living on them that may be specially adapted to each of the different species of octocorals. These invertebrates may include different types of shrimp, amphipods, nudibranchs, and starfish. Some of these organisms are occasionally seen on the specimens (in the field) or at the bottom of containers used to transport freshly harvested specimens, but the amount per colony is generally very small. Accurate bycatch species identification and counts can only be done in a laboratory, and it is unlikely that this information is available for most of the species harvested by marine life fishermen.

There is no visible bycatch among most of the shallow water, photosynthetic species of octocorals. There may be an occasional macro-alga or sponge attached to the substrate that surrounds the base of the octocorals. Experienced harvesters usually collect octocorals in areas where the target species are abundant and they can quickly and easily remove a specimen without damaging any surrounding benthic communities.

Bycatch is slightly more common on some of the deepwater, non-photosynthetic specimens, very little of which are collected in the federal waters of the Florida Keys. Most deepwater octocorals are collected off Broward and Palm Beach counties in state waters. Bycatch associated with deepwater octocorals usually consists of small brittle stars and basket stars, and the number and species composition varies greatly by species, location, and season.

The impact of harvesting octocorals is most likely not discernable. Few fish feed directly on octocorals, and the selective nature of the harvest has very little impact on the overall community. Also, due to the rapid growth of octocorals and their short natural lifespan, there is a rapid population replacement cycle in hardbottom habitats.

3.6.1.2 South Carolina Special Management Zones

3.6.1.2.1 *Economic Description*

An estimate of trips and associated expenditures to SMZs off South Carolina is not available. However, an Economic Impact and Use Survey of South Carolina Artificial Reef Users (**Appendix C**) (Rhodes and Pan 2007) contains relatively recent information on the importance of artificial reefs to South Carolina fishermen. Rhodes and Pan (2007) estimated the total (aggregate) SC private boat fishing trips involving SC permitted marine artificial reef sites by SC licensees during 2006. The projected total number of SC private boat saltwater fishing trips involving permitted marine artificial reefs in 2006 was ~203,400 trips. This estimated number of trips constituted about 49% of all 2006 ocean SC fishing trips presented by the Marine Recreational Fisheries Statistics Survey (MRFSS). Estimates of total annual trips to artificial reefs approximately tripled between 1992 and 2006 while the number of permitted artificial reef areas only doubled during the same time period. Based on primary data collected on charter divers, a total of 3,571 divers participated in charted SC

offshore dive trips during 2006 with 53% of these charter divers (1,902 divers) making one or more dives on structures within SC permitted artificial reef sites.

The estimating of economic impacts and economic importance of anglers and charter divers related to the use of SC permitted marine artificial reef sites was predicated upon estimating total (aggregate) annual trip expenditures for each user group (i.e., anglers and charter divers) using their daily trip expenditure averages (means) by major license regions and overnight trips in the SC coastal counties. All of the following values are in 2006 dollars. The mean total daily trip expenditures by private boat anglers making a fishing trip to an SC artificial reef site during a sampled month ranged from $548 for non-coastal anglers staying overnight to about $255 for SC coastal anglers not making overnight trips, and the total mean daily expenditures by non-coastal charter divers staying overnight were $381. The estimated total (aggregate) trip expenditures by private boat anglers and charter divers making trips to artificial reef sites were $28.7 million and $0.6 million, respectively, during 2006. These artificial reef users in 2006 represented an economic impact (i.e. economic importance) of approximately $83 million in total sales (output) that generated approximately 1,000 jobs. It is readily apparent that the SC marine artificial reef system, as developed and managed by the SCDNR, is a significant component of the entire SC coastal economy. In addition, the man-made structures within SC permitted artificial reef areas, as recreational outdoor "destinations," are an important component of the economic impacts generated by a special group or subset of tourists, i.e. anglers and scuba divers.

3.6.1.2.2 *Social and Cultural Environment*

Development of marine artificial reefs along the South Carolina coast began in the early 1960s, with initial state involvement in reef construction and management beginning in 1967 through the efforts of the South Carolina Wildlife Resources Department (now the SC Department of Natural Resources) with assistance from Federal and private sector funding (Bell 1989). In 1973 a Marine Artificial Reef Program within the Recreational Fisheries Section of the Marine Resources Division was established. The program was designed to oversee the continued development and maintenance of a system of artificial reefs constructed for the express purpose of improving saltwater recreational fishing opportunities in South Carolina's coastal and offshore waters.

A detailed survey of saltwater recreational boat anglers conducted in 1977 (Liao and Cupka 1979) determined that the total economic impact of the state's marine artificial reef program was $10.4 million annually, with a direct expenditure by artificial reef fishermen in 1977 alone of $4.94 million. Not only were artificial reefs an effective means of improving fishing success for thousands of sport fishermen, but they were also a sound economic investment with the potential of substantial long-term economic benefit to the state.

While South Carolina's marine artificial reefs had from the very beginning, due to their size and especially their funding sources, been intended for use by saltwater recreational fishermen only (i.e. hand-held rod and reel anglers), there was a small but growing use of the reefs by commercial fishing interests (particularly black sea bass trap fishermen) since no regulations prohibited this activity. Even though some legitimate commercial trap fishermen utilized artificial reefs from time to time, it is more like that most of the trapping that took

place on the reefs was a result of fishermen employing more efficient commercial-type gear to significantly improve their catches for personal consumption or under-the-table sales.

The use of efficient commercial fishing gear, and its potential and observed short- and long-term impacts on fish populations on the relatively small-scale artificial reefs became a point of concern among recreational anglers and their political representatives, as well as state fisheries biologists. The fear was that allowing a few individuals to remove a disproportionate share of the standing fish populations from artificial reefs through the use of commercial-type gear would negatively impact their overall success and intended purpose.

In 1983, implementation of the Snapper Grouper FMP (SAFMC 1983) allowed for the eventual establishment of protective regulations for the state's reefs. Management Measure #17 in the Snapper Grouper FMP states:

"Upon request to the Council from the permittee (possessor of a Corps of Engineers permit) for any artificial reef or fish attraction device (or other modification of habitat for the purpose of fishing) the modified area and an appropriate surrounding area may be designated as a Special Management Zone (SMZ) that prohibits or restrains the use of specific types of fishing gear that are not compatible with the intent of the permittee for the artificial reef or fish attraction device. This will be done by regulatory amendment similar to adding or changing minimum sizes (Section 10.2.3)".

Furthermore, the FMP states: "The intent of a SMZ is to provide incentive to create artificial reefs and fish attraction devices that will increase biological production and/or create fishing opportunities that would not otherwise exist. The drawback to investing in artificial reefs or fish attraction devices is that they are costly and have limited advantages that can be rapidly dissipated by certain types of fishing gear (e.g., traps harvesting black sea bass from artificial reefs). Fishing gear that offers 'exceptional advantages' over other gear to the point of eliminating the incentive for artificial reef and fish attraction devices for users with other types of fishing gear prevent improved fishing opportunities that would otherwise not exist".

The frequency of reported or detected evidence of the use of restricted gear types on South Carolina's SMZs decreased to an insignificant degree by late 1989. However, a new problem arose with recreational anglers using SCUBA gear and powerheads, or "bang-sticks" to harvest large quantities of snapper grouper species, primarily amberjacks, on many of the offshore sites. The Council acted to add powerheads to the list of restricted gears and regulations to this effect were implemented in 1992. Since then, no evidence of large-scale harvesting of amberjack by divers has been reported or encountered.

However, during 2008 and 2009, representatives of South Carolina's recreational fishing community expressed concerns over commercial snapper-grouper fishing vessels allegedly operating on several permitted offshore artificial reef sites. Specifically, these recreational constituents felt that the use of conventional spearguns by commercial fishermen to harvest fish on these sites might be harmful to the reef fish populations and was not in keeping with the intended purpose of the reefs.

4 Environmental Consequences

4.1 Action 1. Remove octocorals from the Fishery Management Unit (FMU) under the South Atlantic Coral FMP.

Alternative 1. No Action. Do not remove octocorals from the FMU under the South Atlantic Coral FMP.

Alternative 2. Remove octocorals from the FMU.

Preferred Alternative 3. Modify the FMU to indicate that octocorals are included in the EEZ off NC, SC, and GA

4.1.1 Biological Effects

Alternative 1 (No action) would not remove octocorals from the South Atlantic Coral FMU. Although octocoral harvest is managed under the Council's Coral FMP and subsequent amendments, the Florida Fish and Wildlife Commission (FWC) is responsible for most of the management, implementation and enforcement of regulations because the majority of the harvest occurs in state waters,. In 1990, Amendment 1 to the Coral FMP (SAFMC & GMFMC 1990) established a total allowable harvest for commercial harvesters of octocorals as 50,000 colonies annually. It also established commercial permits, reporting requirements, and a six-colony recreational bag limit for octocorals. These regulations were consistent with regulations adopted in Florida waters. Currently, there is a prohibition of harvest of octocorals off of Georgia, South Carolina, and North Carolina.

Octocorals are included in Florida's Marine Life Fishery which consists of the commercial and recreational harvest of more than 600 species of live saltwater fish, invertebrates, and plants. These organisms are collected primarily for aquaria. Commercially, organisms are collected and sold live to wholesalers, retailers, and aquarium owners. It is estimated that 800,000 U.S. households maintain marine fish in aquariums as pets. The commercial marine life fishery also supplies public and private marine aquariums, which are important in promoting marine conservation and education, especially about coral reefs and their associated species. The domestic collection of many of these species is limited to Florida, Hawaii, and California. Unlike many of the other marine fisheries that FWC manages, there are no stock assessments and very little biological information available for many marine life species.

Florida's management strategy for this fishery is to limit the number of harvesters in the commercial fishery and use an aggregate daily bag limit for the recreational harvesters. For species that need additional protection, more stringent bag limits, vessel limits, size limits, gear restrictions, substrate restrictions, etc. are applied. Soft corals, except for the common sea fan (*Gorgonia flavellum*) and Venus sea fan (*G. ventalina*), are designated as a restricted

species in the FWC's marine life rule (68B-42 of the Florida Administrative Code). This means that commercial harvesters must hold a valid restricted species endorsement (in addition to a saltwater products license and marine life endorsement) to harvest octocorals. One of two marine life endorsements is required to be able to dive to harvest octocorals, a MLD transferable dive endorsement, or a MLN non-transferable dive endorsement. As of 2010 data, there are 130 active ML dive endorsement licenses (Florida FWC, Division of Marine Fisheries Management Office). Octocorals are defined in the FWC marine life rule as any erect, nonencrusting species of the Subclass Octocorallia, except for the common sea an and Venus sea fan. Harvest of these sea fans is prohibited in Florida waters. There are no commercial bag limits for octocorals in Florida waters. However, FWC rules state that the commercial harvest of octocorals shall close in state waters if the harvest of octocorals in adjacent federal waters is closed. Harvest of substrate within one inch of the perimeter of the holdfast at the base of the octocoral is allowed as long as the substrate remains attached to the octocoral. All commercial marine life landings in Florida are required to be recorded using Florida's commercial trip ticket system.

Trip tickets allow the FWC to monitor commercial harvest and effort through time and by location. Each trip ticket contains detailed information about the harvest including the date and location, types and quantities of organisms harvested, gear used, and the price of each organism. A trip ticket must be filled out by a wholesale dealer every time a marine life collector lands their harvest, and in many cases, marine life collectors also serve as their own wholesale dealer. Landings of marine life species are recorded on trip tickets using a list of codes unique to a particular species, genus, or taxonomic group. Nearly 400 different codes are used by the FWC for reporting marine life landings. The FWC provides a special trip ticket form to collectors and wholesale dealers for recording marine life landings, but collectors may also create their own trip ticket forms. Such forms must be approved by the FWC before they are used to record landings. The location from which organisms are harvested is reported on each trip ticket using a "fishing area code." For reporting purposes, the waters off Florida are divided into several "fishing areas." Each fishing area has separate codes for sub-regions within the area such as bays, offshore waters, and federal waters. For example there are ten different fishing area codes for the Keys and nine different fishing area codes for waters off Miami-Dade County. Reporting harvest locations accurately is important, especially when regulations or quotas differ by region (e.g., state waters vs. federal waters). As such, harvests from separate locations on the same day should be reported on separate trip tickets, but this does not always happen. Such misreporting results in less reliable information about harvest locations and could affect region-specific quotas.

There are at least 40 different species of octocorals found off Florida and three trip ticket codes for reporting octocorals. Individual octocoral species do not have unique codes; however, the codes used are based on species commonly or historically harvested and trade demand. Many octocoral species are difficult to distinguish from each other, so creating unique codes for each species could result in misreporting and make reporting too cumbersome for marine life collectors.

Alternative 2 would remove octocorals from the FMU, eliminating any existing management measures in federal waters such as permits, quota, trip or bag limits. Although

the state of Florida may adopt the management of octocorals off of Florida, there would be no protection of the resource in Federal waters outside of Florida. Alternative 2 would result in the elimination of the current prohibition of octocoral harvest off of Georgia, South Carolina and North Carolina. Essential Fish Habitat was designated for octocorals, a designation that would be withdrawn if they are removed from the management unit. Under **Alternative 2**, harvest of octocorals would be allowed in the five Deepwater Coral HAPCs designated in Comprehensive Ecosystem-Based Amendment 1 (CE-BA 1, 2010), the Oculina Bank HAPC, and the Deepwater Marine Protected Areas.

Preferred Alternative 3

4.1.2 Economic Effects

Under **Alternative 2**, octocorals will not be protected in Federal waters by commercial or recreational management measures such as permits, quotas, trip limits, or bag limits unless Florida extends their jurisdiction into Federal waters. If the State of Florida extends their jurisdiction, Florida waters can be protected and no short or long-term changes will be expected with regard to economic effects in Florida waters. If Florida does not extend their jurisdiction into federal waters, landings will be allowed to increase in federal waters, although, as stated above, the market for octocorals will limit harvest. In this case, due to the possible increased risk of overfishing octocorals under **Alternative 2**, long-term economic benefits will be expected to decrease compared to **Alternative 1**. Short-term economic benefits could increase if the market demand for octocorals increases.

However, if Florida does extend their jurisdiction into federal waters, concerns would only exist for waters north of Florida. However, the species of concern are not generally harvested in waters north of Florida. Regardless, without federal management in waters north of Florida, long-term economic effects will decline under **Alternative 2** compared to **Alternative 1**.

Preferred Alternative 3

4.1.3 Social Effects

The long-term social effect of **Alternative 2**, like the long-term economic effect, would be negative. However, since there has never been a stock assessment for octocorals in the South Atlantic and populations are considered high, **Alternative 2** may be seen as a logical management decision by participants.

Preferred Alternative 3

4.1.4 Administrative Effects

Alternative 1 would not result in increased administrative impacts from the status quo. The octocoral fishery is currently operating under a 50,000 colony quota which once reached the

fishery is closed in Federal waters. This quota and associated closure are the ACL and AM for the fishery. The quota was implemented in Coral Amendment 1 (1990) and mechanisms for reporting, monitoring and enforcement have been established. **Alternative 1** is not expected to result in an increased administrative burden. **Alternative 2** would lessen the administrative burden on the agency as management of these species would no longer be necessary. However, if the need for Federal management of octocorals were to arise in the future, the administrative burden of including them in the FMU could be result in a significant administrative burden.

Preferred Alternative 3

4.2 Action 2. Extend the SAFMC's Fishery Management Unit for octocorals into the Gulf of Mexico Fishery Management Council's area of jurisdiction.

Preferred Alternative 1. No Action. Do not extend the FMU for octocorals into the GMFMC's jurisdiction.

Alternative 2. Extend the management boundaries for all octocorals species in the coral FMP to include the GMFMC jurisdiction.

4.2.1 Biological Effects

Currently, the quota for octocorals is 50,000 colonies combined in the Gulf and South Atlantic EEZ. Harvest of octocorals is prohibited north of Cape Canaveral, Florida. **Preferred Alternative 1 (No Action)** would continue this quota and would maintain the current biological impacts to the resource. At its October 2010, meeting the Gulf of Mexico Fishery Management Council (Gulf Council) voted to remove octocorals from their Fishery Management Plan for Corals and Coral Reefs of the Gulf of Mexico (Gulf Coral FMP). Currently, the only harvest of octocorals in the Gulf of Mexico is off of Florida and this fishery is monitored and enforced by the State of Florida. Under **Preferred Alternative 1**, the South Atlantic Fishery Management Council (South Atlantic Council) would continue to manage octocorals in the South Atlantic, but management of octocorals in the Gulf of Mexico would fall under the state of Florida. This could provide difficulties in monitoring and enforcing the joint South Atlantic and Gulf of Mexico Federal quota. Under **Preferred Alternative 1**, harvest in any of the other Gulf states could not be controlled if a fishery were to develop leaving populations vulnerable to overexploitation. Therefore, adoption of no action **Preferred Alternative 1** could have negative biological effects on the octocoral resource.

Under **Alternative 2,** the South Atlantic Council management jurisdiction of octocorals would include the Gulf of Mexico to manage octocoral species throughout their range. Under this alternative, the 50,000 colony quota would still apply to octocoral harvest in the Gulf of Mexico and the South Atlantic EEZ and would not result in increased negative biological impacts to the resource. Furthermore, **Alternative 2** would allow for the

collection of data including harvest level, development of monitoring programs, a more accurate description of the magnitude of octocoral populations, and better enforcement in the Federal waters of the Gulf of Mexico, if necessary. **Preferred Alternative 1** and **Alternative 2** refer only to who manages the fishery and would not change the quota or the management mechanism currently in place.

4.2.2 Economic Effects

Extension of the FMU for octocorals into the GMFMC's jurisdiction is largely an administrative action and is not expected to have biological effects. There is no reason to believe that harvest will increase as a result of this administrative change either. Therefore, no short-term economic effects are expected. As stated above, the two alternatives are expected to have similar biological impacts to the resource. Therefore, there are no expected changes to long-term economic effects as a result of **Alternative 2** compared to **Preferred Alternative 1**.

4.2.3 Social Effects

There are not expected to be any change social effects resulting from **Preferred Alternative 1 and Alternative 2**. This follows from a lack of change in harvest expected.

4.2.4 Administrative Effects

The administrative impacts of **Preferred Alternative 1** would not change from the status quo. Under **Alternative 2**, the GMFMC must first remove octocorals from their Coral and Coral Reefs Fishery Management Plan and request the Secretary of Commerce to designate the SAMFC to manage octocorals throughout their range. The administrative impacts of **Alternative 2** would be increase slightly from those of **Preferred Alternative 1.**

4.3 Action 3. Modify the Annual Catch Limit (ACL) for octocorals in the South Atlantic.

Alternative 1. No Action. Do not modify the existing ACL for octocorals in the South Atlantic (ACL=current 50,000 colony quota for South Atlantic and Gulf of Mexico EEZ).

Alternative 2. Modify the existing ACL in the South Atlantic and Gulf of Mexico (ACL=current 50,000 colony quota for South Atlantic and Gulf of Mexico EEZ) to include State waters.

Preferred Alternative 3. ACL = 0

4.3.1 Biological Effects

At their August 2010 meeting, the South Atlantic Fishery Management Council's Scientific and Statistical Committee (SSC) reviewed and discussed background information on

octocoral landings, life history, and possible fishery reference points. The SSC recommended no changes to the current quota of 50,000 colonies annually for the Gulf and South Atlantic exclusive economic zone (EEZ) because: the fishery is small and effort/participation in Florida waters is capped by a limited entry program; there are no signs of local depletion in areas where the fishery operates; and there are no other indications that the fishery has been operating at unsustainable levels. During their November 2010 meeting, the SSC revisited their ABC recommendation for octocorals and clarified their intent for the value to include Gulf and South Atlantic EEZ and state waters combined, annually.

Alternative 1 (No Action) would continue to manage octocorals with the 50,000 colony quota and would not account for landings in state waters. The State of Florida has implemented compatible regulations which closes the state octocoral fishery when the Federal quota is met, however, that quota has never been reached and the state fishery for octocorals has never been closed (**Tables 4-1** and **4-2**).

Preferred Alternative 3 bio/econ/social analysis

Table 4-1. Landings (colonies) of octocorals in the Gulf and South Atlantic EEZ

Year	*Gulf Landings*	*South Atlantic Landings*	*Total Landings*
2000	3,975	7,278	11,253
2001	3,728	5,432	9,160
2002	2,707	10,407	13,114
2003	4,331	5,049	9,380
2004	2,966	4,386	7,352
2005	3,693	4,007	7,700
2006	2,721	4,024	6,745
2007	5,747	5,250	10,997
2008	4,951	4,890	9,841
2009	3,863	3,509	7,372

Source: Landings data FL FWC, FWRI

Alternative 2 would modify the existing ACL for octocorals to include landings from Gulf and South Atlantic EEZ as well as landings in state waters. The majority of the octocoral harvest occurs in the state waters off of Florida. Landings off of states in the Gulf and South Atlantic have not exceeded the 50,000 colony quota but have come fairly close to meeting that quota (**Table 4-1**). Under **Alternative 2**, the octocoral fishery in Federal waters would close when harvest of octocorals in state and Federal waters reached 50,000 colonies. Harvest of octocorals in state waters would close upon reaching the ACL if the state of Florida adopted compatible regulations. There is currently minimal harvest of octocorals in any other Gulf state waters (other than FL state waters) and harvest of octocorals in the South Atlantic is prohibited north of Cape Canaveral.

Table 4-2. Landings (colonies) of octocorals in State Waters

Year	*Gulf Landings*	*South Atlantic Landings*	*Total Landings*
2000	5,492	26,355	31,847
2001	7,110	29,624	36,734
2002	6,056	18,968	25,024
2003	5,336	29,768	35,104
2004	7,067	29,339	36,406
2005	6,351	27,401	33,752
2006	6,233	35,589	41,822
2007	3,451	29,824	33,275
2008	4,421	28,230	32,651
2009	3,103	20,784	23,887

Source: Landings data FL FWC, FWRI

The biological effect of **Alternative 2** would be greater than **Alternative 1** since there would be greater assurance that the ACL would not be exceeded and overfishing would not occur. Combined landings for state and Federal waters in the Gulf and South Atlantic have not reached the 50,000 colony quota but may in the future. **Alternative 2** would allow more protection to the resource by considering state landings towards the quota.

Table 4-3. Landings (colonies) of octocorals in both Federal and State waters

Year	*Combined State Landings*	*Combined Federal Landings*	*Total Landings*
2000	31,847	11,253	43,100
2001	36,734	9,160	45,894
2002	25,024	13,114	38,138
2003	35,104	9,380	44,484
2004	36,406	7,352	43,758
2005	33,752	7,700	41,452
2006	41,822	6,745	48,567
2007	33,275	10,997	44,272
2008	32,651	9,841	42,492
2009	23,887	7,372	31,259

Source: Landings data FL FWC, FWRI

Neither **Alternative 1** nor **Alternative 2** is expected to have any impact on protected species in the area.

4.3.2 Economic Effects

Landings in state and federal waters have never exceeded the **Alternative 2** proposed ACL of 50,000 colonies and therefore there are no expected short-term economic losses to fishermen of implementation of the 50,000 quota as the ACL. However, there is loss of opportunity to those looking to expand harvest operations in the future. Also, in the case where state and federal landings of octocorals are underreported, economic losses could occur. However, this cannot be quantified since there is no record that this is occurring.

4.3.3 Social Effects

Alternative 2 is expected to produce long-term social benefits compared to **Alternative 1** (No Action) as a result of the long-term economic benefits expected. **Alternative 2** may result in a loss of opportunity for octocoral harvesters to expand. Collector-buyer relationships are commonly established in this industry and a closure of the fishery (if the quota were to be met) would interrupt supply, possibly resulting in long-term loss if the buyer took business elsewhere and did not return to the original collector. Additionally, closure of the fishery could affect wholesale dealers, aquarium shops, and consumers that depend on supply of octocorals throughout the year.

4.3.4 Administrative Effects

Specifying an ACL alone would not increase the administrative burden over the status-quo. However, the monitoring and documentation needed to track the ACL can potentially result in a need for additional cost and personnel resources if a monitoring mechanism is not already in place. The quota for the octocoral fishery was implemented in 1990 (Amendment 1 Coral FMP, GMFMC & SAFMC) and reporting mechanisms have been established. Under **Alternative 2**, it is more likely that harvest will come close to reaching the ACL than **Alternative 1** and the fishery may be closed as a result. This could result in a higher administrative burden due to outreach and education, increased monitoring and enforcement.

4.4 Action 4. Modify management of South Carolina Special Management Zones (SMZs).

Alternative 1. No Action. Do not modify the current management of SMZs off South Carolina.

Preferred Alternative 2. Limit harvest and possession of snapper grouper species (with the use of all non-prohibited fishing gear) in South Carolina's Special Management Zones to the recreational bag limit.

Preferred Alternative 3. Limit harvest and possession of CMP species (with the use of all non-prohibited fishing gear) in South Carolina's Special Management Zones to the recreational bag limit.

Alternative 4. Prohibit use of hand spear and spear guns in South Carolina SMZs.

4.4.1 Biological Effects

The Army Corps of Engineers permits South Carolina Department of Natural Resources (SC DNR) to construct, maintain and manage the state's artificial reefs (**Figure 4-1 a**, and **Figure 4-1 b**). Artificial reefs off of South Carolina are located on an expansive shelf area largely devoid of any hard or live bottom. The artificial reefs were built to promote recreational fishing and were not sited on live bottom in order to avoid any impact to commercial fisheries. The artificial reefs have been promoted since their original construction as recreational fishing areas (SAFMC Snapper Grouper Monitoring Team Report #5: SC SMZs, 1992) and the South Carolina Marine Artificial Reef Program is financially supported primarily by the recreational community through South Carolina's Saltwater Recreational Fishing License Program and the Federal Aid in Sportfish Restoration Program (SC DNR letter, R. Boyles to SAFMC Chair D. Harris, August 3, 2009).

In South Carolina, almost all of the artificial reefs (**Figure 4-1 a**, and **Figure 4-2 b**) are managed as special management zones (SMZs) under the Snapper Grouper FMP to protect these relatively small reef communities from the effects of overly-efficient fishing practices. The Council has designated SMZs as Essential Fish Habitat – Habitat Areas of Particular Concern (EFH-HAPC). The development and protection of these habitats from gear impacts and excessive harvest by highly efficient gear types promotes conservation and enhances protection of EFH and EFH-HAPCs in the South Atlantic region (Snapper Grouper Regulatory Amendment 8, SAFMC, 2000).

The use of certain types of fishing gear within the boundaries of the SMZ reefs is prohibited. Regulatory Amendment #7 to the Snapper Grouper FMP restricted fishing on the SMZs to handline, rod and reel, and spearfishing gear (excluding powerheads), and prohibited the use of black sea bass pots and bottom longlines on South Carolina SMZs. This prohibition was the result of evidence that use of efficient fishing gear, such as black sea bass pots, does not allow for equitable utilization of the reefs by a larger number of fishermen, and results in a rapid decline in resident finfish populations on the reefs (Snapper Grouper Regulatory Amendment #7, SAFMC, 1998). The use of bangsticks (powerheads) by divers to harvest snapper grouper species is prohibited on the state's SMZs, a regulation that went into place after the Snapper Grouper Monitoring Team Report #5 evaluation concluded that some of the designated SMZ sites had received considerable fishing pressure from commercial fishing activities utilizing bang sticks and fish traps. The report included findings provided by South Carolina Department of Natural Resources' (SC DNR) Marine Resources Division staff that the practice of bangsticking on the State's offshore artificial reefs had created a condition of overfishing on a localized basis. Specifically, Marine Division staff found evidence during routine examinations of several offshore reef sites of spent shell casings, in some instances up to 50 casings in an area, and a visible lack of amberjack at a time when the long-term seasonal residents had been largely present on the offshore reefs (Snapper Grouper Monitoring Team Report #5: SC SMZs, 1992). Currently, there are no restrictions on the use of conventional spearguns or hand spears, which are considered additional types of efficient fishing gears. Regulations allow permitted commercial snapper grouper fishermen to use spearguns or hand spears to harvest commercially allowable quantities of these species within the SMZs.

Recreational constituents have voiced concerns over the presence of commercial snapper-grouper fishing vessels operating on SMZs. Specifically, these recreational constituents feel the use of conventional spearguns by commercial fishermen to harvest fish on these sites may be harmful to the reef fish populations on SMZs. In an August 2009 letter to the Council, the SC DNR expressed concern over reports of commercially viable quantities of snapper grouper species being removed from the SMZs, a practice not keeping with the intended purpose for which the sites were established (Regulatory Amendment #7). In a letter to the SAFMC Chairman, August 2009, SC DNR requested that the Council consider restricting all recreational, for-hire, and commercial users of SMZs off of South Carolina to the recreational bag limit.

An objective of designating an artificial reef an SMZ as described in Management Measure #17 of the Snapper Grouper FMP: "Upon request to the Council from the permittee (possessor of a Corps of Engineers permit) for any artificial reef or fish attraction device (or other modification of habitat for the purpose of fishing) the modified area and an appropriate surrounding area may be designated as a Special Management Zone (SMZ) that prohibits or restrains the use of specific types of fishing gear that are not compatible with the intent of the permittee for the artificial reef or fish attraction device," (Snapper Grouper FMP, SAFMC 1983). SC DNR letter, R. Boyles to SAFMC Chair D. Harris, August, 2009, states that harvest of commercially viable quantities of species on SMZs off of South Carolina is not a sustainable practice for these relatively small areas originally designated to improve recreational fishing opportunities and to protect the reef communities from overly-efficient fishing practices, SC DNR's primary objectives in their construction. Designating an artificial reef as an SMZ preserves the fishing opportunities artificial reefs provide and serves as an incentive to establish them. Fishing gear that offers "exceptional advantages" over other gear types may significantly reduce the improved fishing opportunities, and eliminate the incentive for developing an artificial reef, which would prevent improved fishing opportunities that would not otherwise exist (Snapper Grouper FMP, SAFMC 1983). Furthermore, the initial designation of the SMZs was to promote orderly use of the fishery resources on and around the artificial reefs, to reduce potential user group conflicts, and to maintain the intended socioeconomic benefits of the artificial reefs to the maximum extent practicable (Snapper Grouper Regulatory Amendment #1, SAFMC, 1987).

The following 29 Special Management Zones (artificial reefs and surrounding areas) have been established in the EEZ offshore of South Carolina (**Table 4-4, Figures 4-1a**, **4-1b**).

Table 4-4. South Carolina Special Management Zone Northeast and Southwest coordinates

	Latitude	**Longitude**
Paradise Reef	33°31.59' N. 33°30.51' N.	78°57.55' W. 78°58.85' W.
Ten Mile Reef	33°26.65' N. 33°24.80' N.	78°51.08' W. 78°52.97' W.
Pawleys Island Reef	33°26.58' N.	79°00.29' W.

	33°25.76' N.	79°01.24' W.
Georgetown Reef	33°14.90' N. 33°13.85' N.	78°59.45' W. 79°00.65' W.
Capers Reef	32°45.45' N. 32°43.91' N.	79°33.81' W. 79°35.10' W.
Kiawah Reef	32°29.78' N. 32°28.25' N.	79°59.00' W. 80°00.95' W.
Edisto Offshore Reef	32°15.30' N. 32°13.90' N.	79°50.25' W. 79°51.45' W.
Hunting Island Reef	32°13.72' N. 32°12.30' N.	80°19.23' W. 80°21.00' W.
Fripp Island Reef	32°15.92' N. 32°14.75' N.	80°21.62' W. 80°22.90' W.
Besty Ross Reef	32°03.60' N. 32°02.88' N.	80°24.57' W. 80°25.50' W.
Hilton Head Reef (Artificial Reef - T)	32°00.71' N. 31°59.42' N.	80°35.23' W. 80°36.37' W.
Little River Offshore Reef	33°42.10' N. 33°41.10' N.	78°26.40' W. 78°27.10' W.
BP-25 Reef	33°21.70' N. 33°20.70' N.	78°24.80' W. 78°25.60' W.
Vermilion Reef	32°57.80' N. 32°57.30' N.	78°39.30' W. 78°40.10' W.
Cape Romaine Reef	33°00.00' N. 32°59.50' N.	79°02.01' W. 79°02.62' W.
Y-73 Reef	32°33.20' N. 32°32.70' N.	79°19.10' W. 79°19.70' W.
Eagles Nest Reef	32°01.48' N. 32°00.98' N.	80°30.00' W. 80°30.65' W.
Bill Perry Jr. Reef	33°26.20' N. 33°25.20' N.	78°32.70' W. 78°33.80' W.

Comanche Reef	32°27.40' N. 32°26.90' N.	79°18.80' W. 79°19.60' W.
Murrells Inlet 60 Foot Reef	33°17.50' N. 33°16.50' N.	78°44.67' W. 78°45.98' W.
Georgetown 95 Foot Reef	33°11.75' N. 33°10.75' N.	78°24.10' W. 78°25.63' W.
New Georgetown 60 Foot Reef	33°09.25' N. 33°07.75' N.	78°49.95' W. 78°51.45' W.
North Inlet 45 Foot Reef	33°21.03' N. 33°20.03' N.	79°00.31' W. 79°01.51' W.
CJ Davidson Reef	33°06.48' N. 33°05.48' N.	79°00.27' W. 79°01.39' W.
Greenville Reef	32°57.25' N. 32°56.25' N.	78°54.25' W. 78°55.25' W.
Charleston 60 Foot Reef	32°33.60' N. 32°32.60' N.	79°39.70' W. 79°40.90' W.
Edisto 60 Foot Reef	32°21.75' N. 32°20.75' N.	80°04.10' W. 80°05.70' W.
Edisto 40 Foot Reef	32°25.78' N. 32°24.78' N.	80°11.24' W. 80°12.32' W.
Beaufort 45 Foot Reef	32°07.65' N. 32°06.65' N.	80°28.80' W. 80°29.80' W.

Restrictions in SMZs off South Carolina include the following:

- The use of a powerhead to take South Atlantic snapper-grouper is prohibited. Possession of a powerhead and a mutilated South Atlantic snapper-grouper in, or after having fished in, one of these SMZs constitutes prima facie evidence that such fish was taken with a powerhead in the SMZ.
- Fishing may only be conducted with handline, rod and reel, and spearfishing gear.
- Use of a sea bass pot or bottom longline is prohibited.

The major species targeted in the SMZs include Atlantic spadefish, black sea bass, flounder, king mackerel, sharks, and Spanish mackerel. However, no information exists on commercial fishing in the South Carolina Special Management Zones and therefore the biological impacts of **Preferred Alternative 2 and Preferred Alternative 3** cannot be quantified at this time due to lack of data. It is expected that modifying management of the

SMZs to restrict commercial fishing effort to the bag limit could possibly reduce the amount of harvest in the area and have a positive biological impact on the species regularly targeted. However, there is little information on the amount of commercial harvest occurring in the SMZs and any commercial effort is expected to be small.

Alternative 4 would prohibit the use of spearfishing gear within the SMZs, which may provide a slight positive impact to the resource. Spearfishing allows fishermen to more effectively select for larger individuals within target species populations (Sadovy et al. 1994; Meyer 2007; Lloret et al. 2008). Spearfishing is considered to be an efficient harvesting activity that can significantly alter abundance and size structure of target species toward fewer and smaller fish by selective removal of larger individual fish. The removal of larger individual fish of the target species leaves behind smaller individuals to spawn. Over time this can decrease the size and age at sexual maturity and decrease the average size of the population (Sluka and Sullivan 1998, Chapman and Kramer 1999, Matos-Caraballo et al. 2006; Lloret et al. 2008).

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

Spearfishing has been found to alter fish behavior (Schroeder and Parrish 2005) and may cause fish to move to different habitats (Jouvenel and Pollard 2001). These habitats may be less favorable for growth and reproduction. Frisch et al. (2008) and Harper et al. (2000) indicate a small percentage of fish speared are discarded. Frisch et al. (2008) also found that some percentage of fish also escape with spear-induced injuries. There is also little marine debris associated with spearfishing activities compared to rod and reel fishing.

4.4.2 Economic Effects

As discussed in **Section 3.6.1.2**, Rhodes and Pan (2007) provide results of a survey of private boat anglers and charter divers fishing on artificial reefs (see **Appendix B**). As stated in Chapter 3, the estimated total (aggregate) trip expenditures by private boat anglers and charter divers making trips to artificial reef sites were $28.7 million and $0.6 million, respectively, during 2006. These artificial reef users in 2006 represented an economic impact (i.e. economic importance) of approximately $83 million in total sales (output) that generated approximately 1,000 jobs. The SC marine artificial reef system, as developed and managed by the SCDNR, is a significant component of the entire SC coastal economy. In addition, the man-made structures within SC permitted artificial reef areas, as recreational outdoor "destinations," are an important component of the economic impacts generated by a

special group or subset of tourists, i.e. anglers and scuba divers. One of the goals of implementing the SMZ structures was to maintain intended socioeconomic benefits of the SMZs to recreational anglers.

Commercial landings of species caught on these artificial reefs are not able to be quantified due to the way that logbook landings are recorded. The level of detail of reporting where fish are caught is insufficient to allow for harvest on the SMZs to be broken out from harvest made in the fishing zones the SMZs lie in, which are 60 nautical miles square. Therefore, the loss associated with a ban on harvest above the recreational bag limit by commercial fishermen is not able to be quantified. However, there are expected to be some commercial losses associated with **Preferred Alternative 2 and Preferred Alternative 3**. At the same time, **Preferred Alternative 2 and Preferred Alternative 3** are expected to benefit recreational fishermen by allocating the harvest that might have been taken by commercial fishermen to recreational fishermen.

As stated above, based on primary data collected on charter divers, a total of 3,571 divers participated in charted SC offshore dive trips during 2006 with 53% of these charter divers (1,902 divers) making one or more dives on structures within SC permitted artificial reef sites. The effect of **Alternative 4** on the recreational fishery of South Carolina is expected to be significant. However, this is not easily quantified since the number of trips may have been made in conjunction with the use of other gear. Also, if **Alternative 4** is implemented, recreational divers may decide to use other gear in order to continue fishing in the SMZs or fish outside the SMZs. Therefore, any estimate of losses due to **Alternative 4** would likely be an over estimate of actual losses.

4.4.3 Social Effects

Artificial reefs create unique fishing destinations, and there may not be nearby sites that offer the same fishing opportunities. Because of this, congestion and user conflicts between recreational users and commercial fishermen may increase under **Alternative 1**. Additionally, because commercial harvest is a relatively recent activity in the SMZs, long-term recreational anglers will bear more of the social costs of additional congestion by being more impacted than the newcomers. However, **Alternative 1** allows for continued commercial harvest and opportunities to expand the commercial fishery to create jobs and provide local seafood.

Preferred Alternative 2 and Preferred Alternative 3 would ‘level the playing field’ for recreational and commercial fishermen. This may result in a decline or cessation of all commercial harvest within the SMZs because other areas with fewer restrictions may be better options for commercial fishermen. However, commercial harvesters would no longer be able to fully utilize the unique opportunities of these artificial reef habitats. Less or no commercial fishing in the SMZs could lead to reduced congestion issues, less competition between recreational and commercial fishermen, and decreased user conflict.

Additionally, **Preferred Alternative 2 and Preferred Alternative 3** are more aligned with the overall purposes and goals for the SMZs. Funding to support construction and

maintenance for South Carolina's artificial reefs derives from state and federal sources, and also private donations. A percentage of sales of South Carolina's recreational fishing licenses is attributed to the state's Marine Artificial Reef Program to support construction and maintenance of the state's artificial reefs. The Federal Aid in Sportfish Restoration Program administered by the U.S. Fish and Wildlife Service provides funding to support artificial reefs in South Carolina and can only be used for projects and programs that impact or enhance recreational fishing. Recreational fishing clubs and other entities tied to recreational fishing interests also contribute to South Carolina's Marine Artificial Reef Program through private donations. Since the artificial reef program's inception in 1973, over $7.7 million has been contributed from these 3 primary funding sources (personal communication, Mel Bell, SC DNR Office of Fisheries Management).

Alternative 4 could negatively impact the recreational dive experience, and cause decline in charter dive trips. Without a suitable alternative gear that provides the same level of satisfaction, prohibition of hand spears and spear guns would cause decreased opportunities for recreational spearfishers. The impact on recreational anglers using other gear types would be positive due to the possibility of more fish available if these highly efficient gear types were no longer allowed.

4.4.4 Administrative Effects

Under the **No Action Alternative**, the administrative impacts will not increase. Administrative impacts associated with the action alternatives are expected to increase. Administrative impacts may take the form of preparation of regulations, education and outreach and law enforcement.

Figure 4-1 a. South Carolina Special Management Zones, North geographic area.

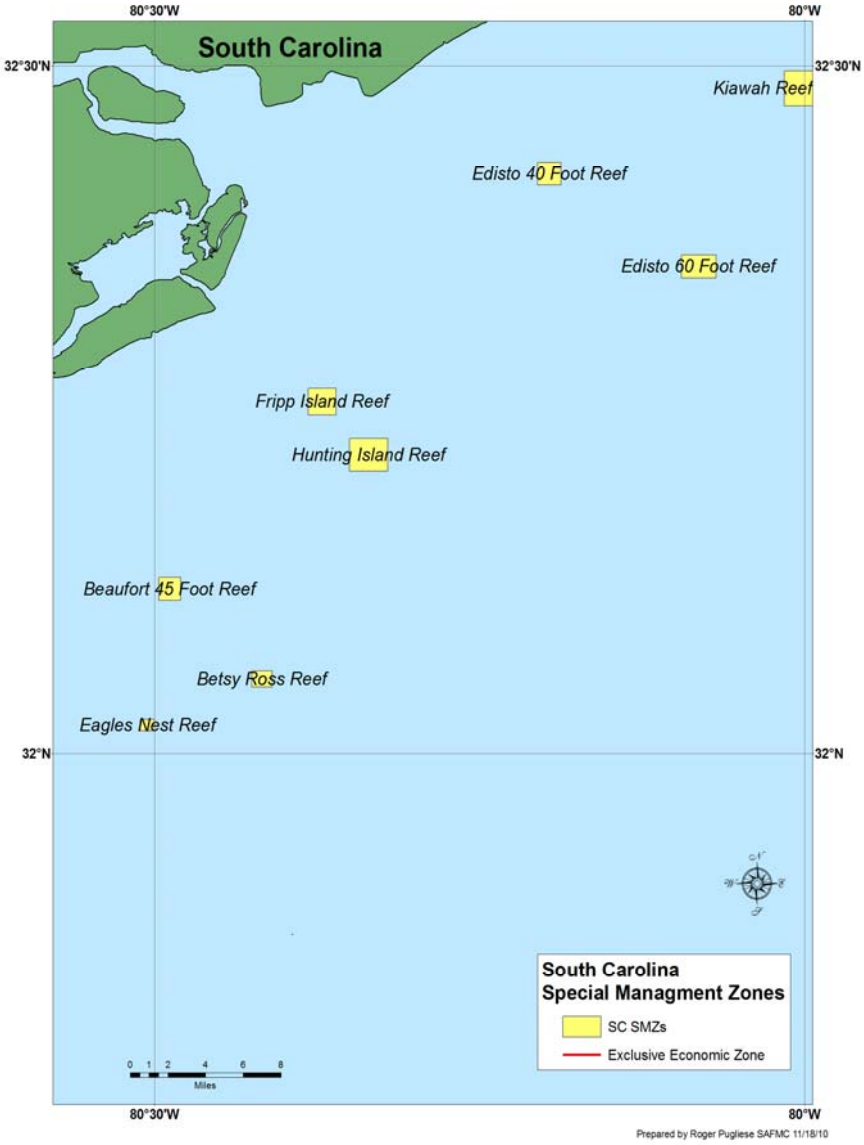


Figure 4-1 b. South Carolina Special Management Zones, South geographic area.

4.5 Action 5. Modify Sea Turtle Release Gear Requirements for the Snapper Grouper Fishery

Alternative 1. No Action. Maintain current sea turtle and smalltooth sawfish release gear requirements for the snapper grouper fishery in federal waters of the South Atlantic. Currently, required gear (regardless of freeboard height) includes:

- a long-handled line clipper or cutter,
- a long-handled dehooker for ingested hooks,
- a long-handled dehooker for external hooks,
- a long-handled device to pull an "inverted V",

- a dipnet,
- a tire (or other comparable cushioned, elevated surface that immobilizes boated sea turtles),
- a short-handled dehooker for ingested hooks,
- a short-handled dehooker for external hooks,
- long-nose or needle-nose pliers,
- bolt cutters,
- monofilament line cutters, and
- at least two types of mouth openers/mouth gags.

This equipment must meet the specifications described in 50 CFR 635.21(c)(5)(i)(A-L) with the following modification: any other comparable, cushioned, elevated surface that allows boated sea turtles to be immobilized, may be used as an alternative to the requirement in 50 CFR 635.21(c)(5)(i)(F) to have a tire on board.

Alternative 2. Require all federally-permitted hook and line vessels with no longline gear onboard to have and use a tool capable of cutting the fishing line and a tool capable of removing a hook from a sea turtle. Require fishermen to follow the sea turtle handling and release guidelines.

Alternative 3. Require all sea turtle and smalltooth sawfish release gear listed under **Alternative 1 (No Action)** for federally permitted snapper grouper vessels using longline gear, and require [insert specific sea turtle release gear] for federally permitted vessels fishing with hook-and-line gear.

Preferred Alternative 4. Modify sea turtle and smalltooth sawfish release gear based on freeboard height. Fishermen would still be required to comply with all current sea turtle and smalltooth sawfish release guidelines. The design specifications of required gear and the handling and release techniques employed must comply with those described in the NOAA Fisheries Service document entitled "Careful Release Protocols for Sea Turtle Release with Minimal Injury."

Preferred Sub-Alternative 4a. Vessels with freeboard height of 4 feet or less would be required to carry and use:

- a short-handled dehooker for ingested hooks; or a dehooker for ingested and a dehooker for external hooks
- long-nose or needle-nose pliers,
- bolt-cutters
- mono-filament line cutters
- cushion/support device (i.e., boat cushion)
- a dipnet
- at least two types of mouth openers/mouth gags

Preferred Sub-Alternative 4b. Vessels with freeboard height of 4 feet or more (and/or using longline gear) would be required to carry and use:

- a long-handled line cutter,

- a long-handled dehooker for ingested hooks; or a dehooker for ingested and a dehooker for external hooks,
- a long-handled device to pull an "inverted V",
- a dipnet,
- cushion/support device (i.e., boat cushion)
- a short-handled dehooker for ingested hooks; or a dehooker for ingested and a dehooker for external hooks
- long-nose or needle-nose pliers,
- bolt cutters,
- monofilament line cutters, and
- at least two types of mouth openers/mouth gags.

Alternative 5. Modify the design specifications of the current sea turtle and smalltooth sawfish release gear equipment for all federally permitted non-longline snapper grouper vessels with hook-and-line gear on board to match the specifications described in the NOAA Fisheries Service document entitled "Careful Release Protocols for Sea Turtle Release with Minimal Injury."
These new design criteria allow for less "heavy-duty" gears more appropriate for lighter tackle used by snapper-grouper fishers (see **Appendix E** for specification on each gear type).

Note: Alternative 5 has been restructured into sub-alternatives based on an IPT recommendation. The IPT developed sub-alternatives to reflect minimum gear requirements recommended by Protected Resources Division staff (5a), and additional but not required gears in sub-alternatives 5b-5d.

Council may select one or more sub-alternatives.

NOTE: Sub-alternative 5a is recommended by the Southeast Region's Office of Protected Resources Division as the minimum requirement necessary to remain in compliance with the biological opinion. Choosing additional sub-alternatives would be especially beneficial for species conservation, but not required to remain in compliance with the biological opinion.

Sub-Alternative 5a. Require all federally permitted non-longline snapper grouper vessels with hook-and-line gear on board (see **Appendix E**) for specification on each gear type):

- a short-handled dehooker for ingested hooks, or a short-handled dehooker for external hooks,
- cushion/support device (i.e., standard automobile tire or boat cushion)
- long-nose or needle-nose pliers,
- bolt-cutters
- mono-filament line cutters
- a dipnet
- at least two types of mouth openers/mouth gags

Sub-Alternative 5b. Also require:

- a long-handled dehooker for ingested hooks, or a long-handled dehooker for external hooks,

Sub-Alternative 5c. Also require:

- a long-handled line clipper or cutter,

Sub-Alternative 5d. Also require:

- a long-handled device to pull an "inverted V"

4.5.1 Biological Effects

The current sea turtle and smalltooth sawfish release gear requirements in Snapper Grouper Amendment 15B were developed to satisfy requirements of the ESA biological opinion on the snapper-grouper fishery. The biological opinion directed the South Atlantic Fishery Management Council (Council) to implement sea turtle and smalltooth sawfish release gear requirements, and required the implementation of safe handling protocols for sea turtles and smalltooth sawfish, among other things. The biological opinion required that the Council consider the sea turtle and smalltooth sawfish release gear requirements in place for the Highly Migratory Species (HMS) fisheries, and at a minimum, implement sea turtle and smalltooth sawfish release gear requirements similar to those for the Gulf of Mexico reef fish fishery (NMFS 2006). The Gulf of Mexico reef fish fishery requires the same dehooking and disentanglement gear currently used in the HMS longline fisheries for vessels with freeboard heights greater than 4 feet. Vessels with freeboard heights of 4 feet or less are also required the carry HMS dehooking and disentanglement gears, with the exception that only short-handled equipment is mandatory. In Snapper Grouper 15B, the SAFMC ultimately chose to require the same sea turtle and smalltooth sawfish release gears required in the HMS fisheries, making no distinction for vessel freeboard height.

The HMS pelagic longline fishery was the first to require sea turtle and smalltooth sawfish release gear in the Atlantic, and the release equipment developed was originally designed to handle the heavier tackle used in this fishery. As snapper grouper fishermen began using the dehooking and disentanglement gears required in Snapper Grouper Amendment 15B, the effectiveness and necessity of using these "heavy-duty" tools with lighter snapper grouper tackle was called into question. Therefore, the SAFMC has been asked to consider developing an action that would re-address and possibly modify sea turtle and smalltooth sawfish release gear requirements for the snapper grouper fishery.

Alternative 1 (No Action) would maintain the current sea turtle and smalltooth sawfish release gear requirements for the snapper-grouper fishery. Regardless of freeboard height, all vessels with hook-and-line (non longline and longline) gear on board would continue to be required to carry the gear listed under **Alternative 1 (No Action)**. The dehookers, line cutters, and bolt cutters specified under current regulations were designed for and are required in the HMS pelagic longline and shark bottom longline fisheries. Utilizing specialized dehooking and disentanglement gear has been shown to reduce hooking mortality in sea turtles; however, there is some concern that using sea turtle dehooking equipment not designed for the lighter tackle typically used by snapper grouper fishermen could in fact harm sea turtles or smalltooth sawfish during the dehooking process. However, if the heavier-duty dehooking gear required under **Alternative 1** (**No Action**) is causing harm, or is

less effective than gear designed for lighter tackle, the benefits of using the current gear may not be as great as could be achieved under other alternatives.

Alternatives 2 and 3 modify the sea turtle and smalltooth sawfish release gear specifications for vessels carrying non-longline hook-and-line gear. Under these alternatives, all vessels with longline gear on board would be required to continue carrying all the dehooking and disentanglement gears outlined in **Alternative 1**. Under **Alternative 2,** non-longline vessels would be required to carry a tool for cutting the fishing line and a tool for removing an external hook from a sea turtle. **Alternative 2** is similar to sea turtle take mitigation measures currently in place in the Western Pacific (**Appendix F**). Examples of these tools may be a knife and a pair of pliers. Under **Alternative 2**, the fishermen would be required to follow safe sea turtle handling and release guidelines for sea turtles incidentally hooked. Of the alternatives, **Alternative 2** would be the easiest to comply with because a cutting tool and pliers are standard equipment on fishing vessels. The potential biological effects are difficult to predict under **Alternative 2** because effectiveness of only certain sea turtle release tools has been tested for longline vessels. However, if the sea turtle release guidelines are followed, and hooks or entangling line are safely removed, there would likely be a biological benefit to sea turtles.

The requirement to have tools onboard that are capable of ridding a sea turtle or smalltooth sawfish of fishing gear would be biologically preferable to not requiring any such tools at all, and may in fact result in greater or equal biological benefit relative to **Alternative 1 (No Action)** since possible injury inflicted on a sea turtle or smalltooth sawfish from use of inappropriate release gear could be avoided.

However, because the requirements of the biological opinion, outlining how sea turtle and smalltooth sawfish release equipment should be implemented, are designed for longline gear, **Alternative 2** would not be in compliance with the current biological opinion. Selecting **Alternative 2** may require re-initiation of ESA section 7 consultation and if the new action is expected to result in an exceeding the incidental take statement, may require the development of a new biological opinion.

Alternative 3 differs from **Alternative 2** by identifying specific types of sea turtle and smalltooth sawfish release equipment for snapper grouper vessels carrying non-longline gear. **Alternative 3** also maintains the status quo turtle release gear requirements for snapper-grouper vessels carrying longline gear onboard. This requirement ensures that vessels with heavier tackle are adequately equipped to release sea turtles that become hooked or entangled in fishing gear. **Alternative 3** may have a slightly greater positive biological impact than **Alternative 2** since the risk of fishermen not having adequate gear onboard to safely release a hooked or entangled sea turtle or smalltooth sawfish would be minimized through the specification of required tools.

Alternative 4 would require different lengths and types of dehooking tools dependent upon the freeboard height of the vessel, which tracks the sea turtle release gear regulations in the Gulf of Mexico (see **Appendix D**). **Alternative 4** also offers the option (through **sub-alternatives 4a** and **4b**) of tailoring sea turtle and smalltooth sawfish release gear

specifications to increase effectiveness when used with lighter tackle in the snapper grouper fishery. The Gulf of Mexico reef fish fishery regulations (**Alternative 4**) still require the use of equipment originally designed for use in the HMS longline fisheries. While **Alternative 4** could authorize vessels with lower freeboard heights to carry a truncated suite of equipment, the equipment required would still be the "heavier-duty" tools used in the HMS fisheries. Thus, **Alternative 4** alone may not accomplish the goal of establishing requirements for release tools more appropriate for the lighter tackle used in the snapper grouper fishery, if the design specifications are not modified by selecting **Sub-Alternatives 4a** or **4b**. **Sub-Alternatives 4a** and **4b** would either allow for gear specifications to be changed for only vessels with freeboard heights less than four feet, or for all snapper grouper vessels regardless of freeboard height.

Alternative 5 would modify the design specifications of the current sea turtle release gear requirements (noted in **Alternative 1**) for all federally permitted non-longline snapper grouper vessels with hook-and-line gear on board. **Sub-alternative 5a** would require a minimum set of release equipment more appropriate for the smaller tackle used in the snapper-grouper hook-and-line fishery. The biological benefit of **sub-alternative 5a** would likely be similar to **Alternative 1**. Since **sub-alternative 5a** requires less release equipment than **Alternative 1**, it is possible a fisher would be unable to safely release a sea turtle or smalltooth sawfish due to a lack of long-handled release equipment. In such a case the biological benefits of **sub-alternative 5a** may be less than **Alternative 1**. However, the changes in design specifications to the required equipment could make them more effective in releasing hooked or disentangled sea turtles or smalltooth sawfish. Under these circumstances the biological benefits from **sub-alternative 5a** may be greater than **Alternative 1.** With each additional sub-alternative selected, the overall biological benefit from the action is likely to increase. Since each piece of equipment has new design criteria, each piece is likely to be more effective at dehooking and disentangling the lighter tackle used in the fishery. Selecting all four sub-alternatives is likely to have the greatest biological benefit of all the proposed alternatives. This would ensure that both short- and long-handled release equipment is on board, and that those gears are designed to handle lighter tackle.

4.5.2 Economic Effects

Under **Alternative 1 (No Action)**, expenses totaled $617-$1,115 (2006 dollars) per vessel as estimated in Snapper Grouper Amendment 15B. Additional expenses were incurred in onboard storage requirements of the gear. When analyzing **Alternatives 2-5**, it was assumed that all vessels participating in the snapper grouper fishery already carry the release gear under **Alternative 1 (No Action)**.

As suggested above, biological gains may be realized with the use of release gear more appropriate to the vessel. **Alternatives 2 and 3** attempt to better match gear with the vessel and are likely to yield greater biological and economic benefits than **Alternative 1**. Under **Alternative 2**, no specific gear is listed. While **Alternative 2** may result in increased economic benefits resulting from increased biological benefits compared to **Alternative 1 (No Action)** because more appropriate release gear is being used, effectiveness is difficult to

estimate and enforcement may be difficult since success relies heavily on how well sea turtle release guidelines are adhered to.

Alternative 3 differs slightly from **Alternative 2** in that specific gear is identified for vessels using light tackle. Therefore, no enforcement issues should arise and all vessels would be carrying appropriate gear. For this reason, **Alternative 3** is expected to yield slightly higher long-term economic benefits than **Alternatives 1 and 2**. Appropriate cutting and de-hooking gear is assumed to already be on board all vessels, so no additional gear costs would be expected to be incurred under **Alternatives 2 and 3**.

Alternative 4 would result in out of pocket expenses totaling $324-$490 for vessels with less than 4 feet freeboard. The aggregate cost resulting from **Alternative 4** depends on the number of vessels with less than 4 feet freeboard and the number of vessels with more than 4 feet freeboard. These aggregate costs cannot be estimated because there is no information collected on how many vessels have more or less than 4 feet freeboard in the South Atlantic.

Alternative 5 would modify the gear requirements under **Alternative 1**. **Alternatives 5a-5d** would require gear already possessed by fishermen and listed under **Alternative 1,** but smaller sizes of the same required gears. Therefore, no negative economic effects would be expected as a result of the **Alternative 5 sub-alternatives** unless fishermen purchased the smaller gears identified in the sub-alternatives.

4.5.3 Social Effects

Alternative 2 will likely have the least social effects in the short-term since it allows fishermen to determine appropriate gear for dehooking and releasing sea turtles. **Alternatives 4 and 5** would also likely yield social benefits in that they are economically less expensive than **Alternative 1 (No Action)** and also have biological benefits. **Alternative 3** may be seen as burdensome in that it requires vessels to carry all dehooking and release gear required currently as well as additional gear.

4.5.4 Administrative Effects

Alternative 1 (no action) would not result in an increase in administrative impacts. These requirements were implemented in 2008 and fishermen are aware of the requirements. **Alternative 2 and Alternative 3** would require education and outreach to ensure fishermen understand the proper sea turtle handling techniques. These alternatives are expected to have the highest rate of voluntary compliance due to the ease of the regulations so the enforcement burden is expected to be lower than the other alternatives. **Alternative 4** would increase the administrative burden related to education, outreach and enforcement because there would be different requirements for vessels with differing freeboard heights. **Alternative 5** and associated **sub-alternatives 5a-5d** would increase the administrative burden in the form of education, outreach and monitoring and enforcement.

4.6 Action 6. Amend the Snapper Grouper FMP to designate new EFH-HAPCs

Alternative 1. No Action. Do not amend the Snapper Grouper FMP to designate new Essential Fish Habitat – Habitat Areas of Particular Concern (EFH-HAPCs).

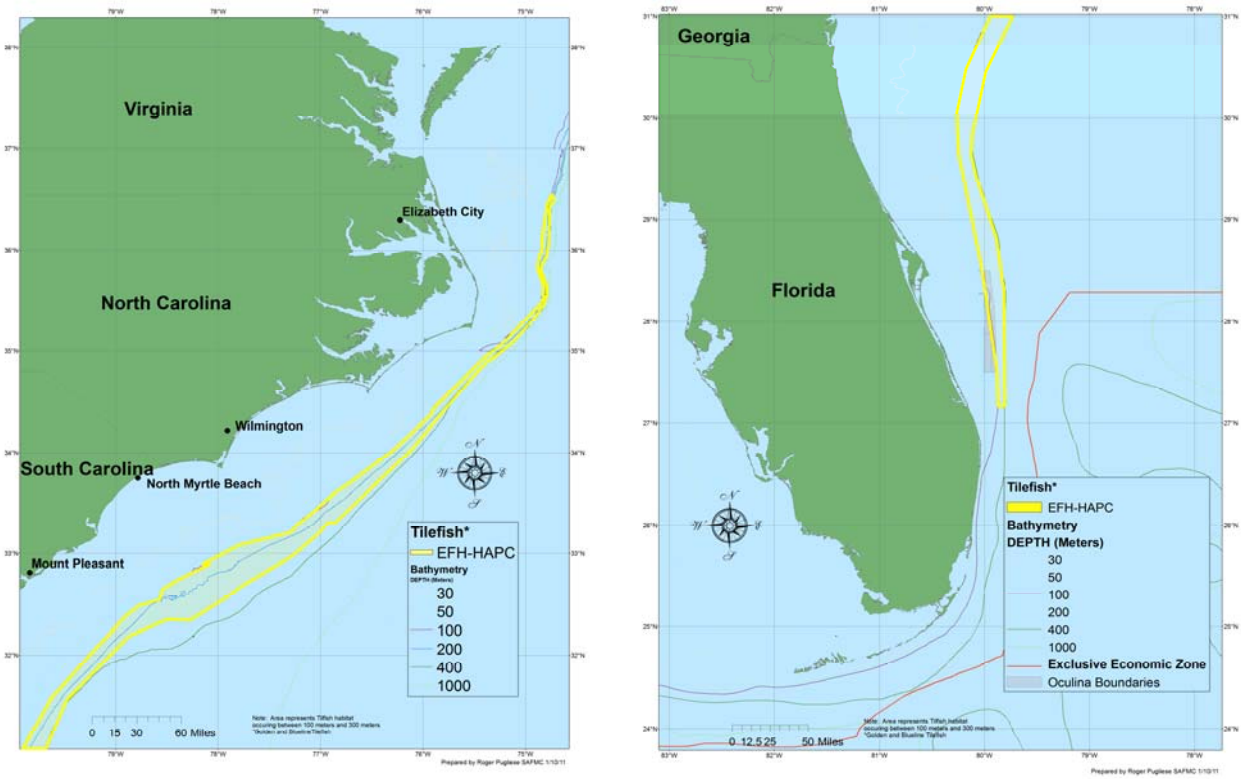
Preferred Alternative 2. Amend the Snapper Grouper FMP to designate one or more of the following EFH-HAPCs.

Sub-alternative 2a. Designate EFH-HAPCs for golden tilefish to include irregular bottom comprised of troughs and terraces inter-mingled with sand, mud, or shell hash bottom. Mud-clay bottoms in depths of 150-300 meters are HAPC. Golden tilefish are generally found in 80-540 meters, but most commonly found in 200-meter depths.

Sub-alternative 2b. Designate EFH-HAPC for blueline tilefish to include irregular bottom habitats along the shelf edge in 45-65 meters depth; shelf break; or upper slope along the 100-fathom contour (150-225 meters); hardbottom habitats characterized as rock overhangs, rock outcrops, manganese-phosphorite rock slab formations, or rocky reefs in the South Atlantic Bight; and the Georgetown Hole (Charleston Lumps) off Georgetown, SC.

Preferred Alternative 3. Designate EFH-HAPCs for the snapper-grouper complex to include Deepwater Marine Protected Areas (MPAs).

Figure 4-2. Spatial Presentation of Tilefish EFH-HAPC.



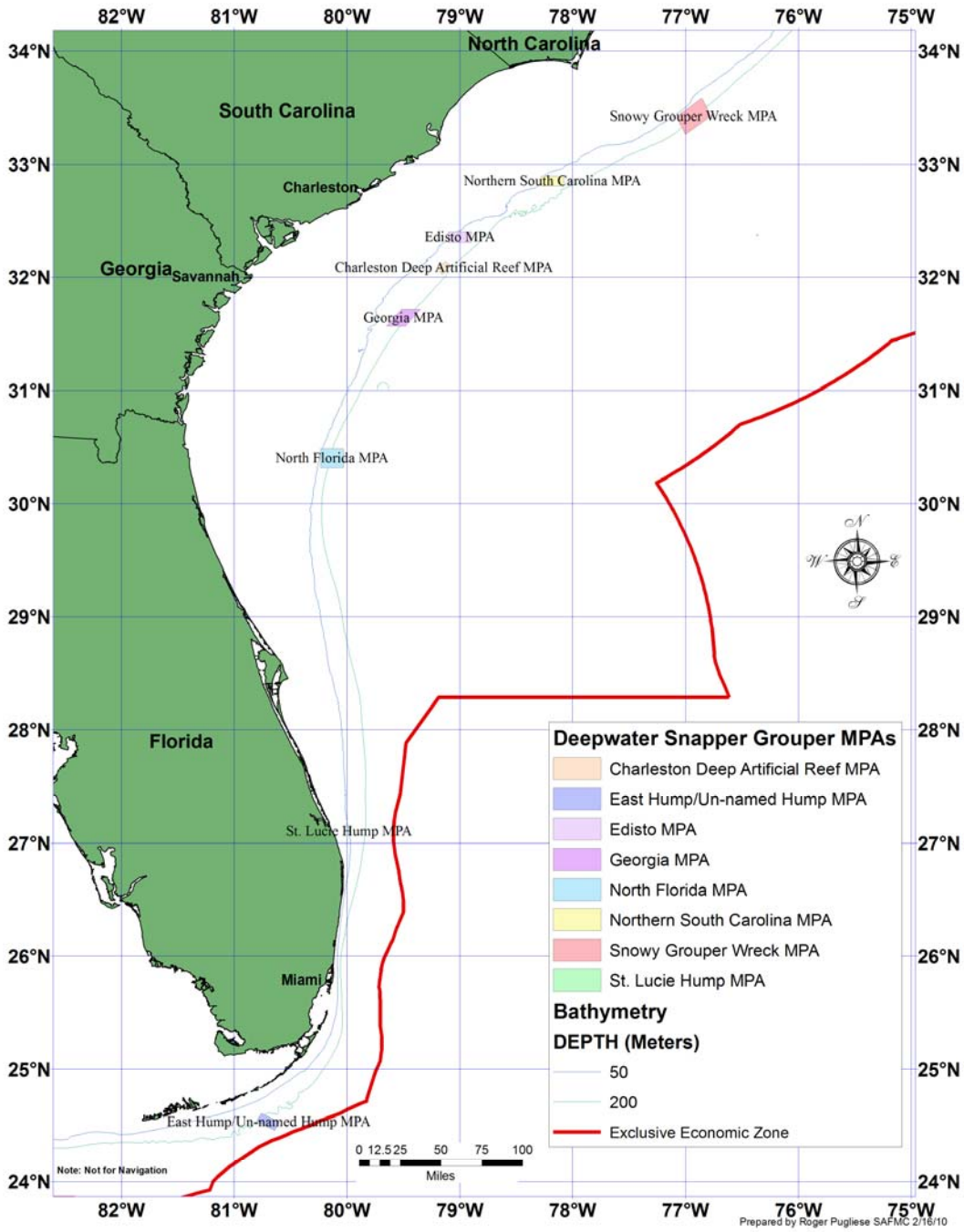


Figure 4-3. Deepwater Snapper Grouper Marine Protected Areas.

4.6.1 Biological Effects

EFH and EFH-HAPCs were established for the snapper grouper FMP as part of the Comprehensive EFH Amendment (SAFMC 1998b) and are presented in **Section 3.4.2** and **Table 4-5**.

Alternative 1 (No Action) would not add an area highlighting the importance of golden tilefish and blueline tilefish (**Figure 4-2**) or the value of emphasizing the habitat in the Deepwater MPAs (**Figure 4-3)** established in Snapper Grouper Amendment 14 (SAFMC 2007). **Preferred Alternative 2** addresses an oversight in the initial designation of Snapper Grouper EFH through the Comprehensive EFH Amendment (SAFMC 1998b) where the habitat plan describes in detail tilefish habitat and proposes the general distribution between 100 and 300 meters as an area considered to be an EFH-HAPC for tilefish. While considered EFH, the area was not included in the proposed list of EFH-HAPCs. **Alternative 2a** for golden tilefish and **Alternative 2b** for blueline tilefish propose respective detailed descriptions for EFH-HAPCs. The additional specification of the MPAs for deepwater species as EFH-HAPCs is intended to protect the entire area as a unique habitat complex and enhance EFH consultations pertaining to non-fishing activities that could potentially impact these protected habitats.

Table 4-5. Summary evaluation of the existing and proposed EFH-HAPC for snapper grouper as it relates to the criteria.

EFH-HAPC and Criteria Evaluation	Ecological Function	Sensitivity to Environmental Degradation	Threat from Development Activities	Rarity of Habitat
The Point, NC	Medium	Low	Medium	High
The Ten Fathom Ledge, NC	High	Low	Low	High
Big Rock, NC	High	Low	Medium	High
Charleston Bump, SC	High	Low	Medium	High
Mangrove habitat	High	High	High	High
Seagrass habitat	High	High	High	High
Oyster/shell habitat	High	Medium	High	High
All coastal inlets	Medium	Low	Medium	Medium
All state-designated nursery habitats	High	High	High	High
Pelagic and benthic *Sargassum*	High	Low	Low	High
Hoyt Hills (wreckfish)	High	Low	Medium	High
Oculina HAPC, FL	High	Medium	Low	High
All hermatypic coral habitats and reefs	High	High	Low	High
Manganese outcroppings of the Blake Plateau	High	Low	Medium	High
Artificial reef SMZs	Medium	Low	Low	High
Golden Tilefish Habitat	High	Low	Medium	High
Blueline Tilefish Habitat	High	Low	Medium	High
Deepwater Marine Protected Areas	High	Low	Medium	Medium

The designation of additional EFH-HAPCs for snapper grouper species would not result in direct impacts to the biological resources of the west-central Atlantic Ocean. Rather, the EFH-HAPC designation under this option would provide a future opportunity for the Council to establish regulations to protect EFH from fishing activities in the EEZ and to review and recommend EFH conservation measures to protect surface waters from non-fishing activities which are undertaken, authorized, or funded by Federal agencies.

4.6.2 Economic Effects

Designation of additional EFH-HAPCs will require the Council to consider all operations or actions that might interact with or affect the EFH-HAPC, and may trigger a consultation for any activity that may affect the habitat. The direct effects of additional regulatory consideration would be the financial costs of a protracted regulatory process. Additional effects would accrue to any restrictions imposed as a result of the evaluation of impact of these activities. A consultation may incur costs associated with production delays, project/activity design modification, or mitigation measures. Since any restrictions that may subsequently be placed on these activities are unknown at this time, it is not possible to explicitly describe their effects. However, designation of additional EFH-HAPCs is expected to increase the likelihood that long-term resource goals are met due to increased protection through consultation requirements. A healthy, sustainable resource is presumed to result in increased long-term economic benefits relative to less protection.

4.6.3 Social Effects

There will be few social impacts from establishing EFH-HAPCs. The social impacts will most likely come from future actions that are associated with such designations. In some cases, protection of habitat may mean harvesting restrictions in areas where harvesting presently takes place or other actions which may impose similar constraints on penaeid shrimp fishermen or processors. This could conceivably impose negative short-term impacts.

It is worth noting that the designation of essential fish habitat will alter the process by which permits for activities which impact essential fish habitat are issued. The potential for increased restrictions, mitigation, and permitting requirements may have impacts upon the behavior of individuals and agencies seeking permits. The nature and extent of those impacts are unknown and will undoubtedly vary depending upon the individual and/or agency.

4.6.4 Administrative Effects

Designation of new EFH and EFH-HAPC will require consideration of all operations or actions that might interact with or affect the EFH, and may trigger a consultation for any activity that may affect the habitat. The direct effects of additional regulatory consideration would be the financial costs of a protracted regulatory process. Additional effects would accrue to any restrictions imposed as a result of the evaluation of impact of these activities. A consultation may incur costs associated with production delays, project/activity design modification, or mitigation measures. Since any restrictions that may subsequently be placed on these activities are unknown at this time, it is not possible to explicitly describe their effects.

It is worth noting that identification of EFH will alter the process by which permits for activities which impact EFH and EFH-HAPCs are issued. The potential for increased restrictions, mitigation, and permitting requirements may have impacts upon the behavior of individuals and agencies seeking permits. The nature and extent of those impacts are unknown and will undoubtedly vary depending upon the individual and/or agency.

4.7 Action 7. Amend the Coral, Coral Reefs and Live/Hardbottom Habitat Fishery Management Plan (Coral FMP) to designate new Essential Fish Habitat-Habitat Areas of Particular Concern (EFH-HAPCs).

Alternative 1. No Action. Do not amend the Coral FMP to designate new Essential Fish Habitat-Habitat Areas of Particular Concern (EFH-HAPCs). The following existing designations would remain in effect.

Preferred Alternative 2. Amend the Coral FMP to designate Deepwater Coral HAPCs as EFH-HAPCs.

4.7.1 Biological Effects

EFH and EFH-HAPCs were established for Coral, Coral Reefs and Live-Hard Bottom Habitat as part of the Comprehensive EFH Amendment (SAFMC 1998b) and are presented in **Section 3.4.1**. **Alternative 1 (No Action)** would not propose additional EFH-HAPCs intended to aid in the conservation of coral and live bottom habitat especially when addressing policy or permit activities associated with non-fishing activities. In July 2010, a final rule was published establishing deepwater Coral HAPCs in the South Atlantic region. **Preferred Alternative 2** proposes to further emphasize the importance of these protected deepwater ecosystems by designating them as EFH-HAPCs. While habitats within the boundaries of the coral HAPCs are essential fish habitat for other managed species, designation of the entire area as an EFH-HAPC would in policy and permit review, support consideration of conservation of the contiguous habitats found in this unique deepwater ecosystem. The Deepwater Coral HAPCs designated in CE-BA1 are being proposed as EFH-HAPCs to highlight the value of this unique deepwater ecosystem and facilitate more effective EFH conservation. Brief description of the CHAPCs contained in CE-BA1 follows:

The Cape Lookout Lophelia Banks Coral HAPC encompasses two areas. The northernmost area contains the most extensive coral mounds off of North Carolina. The main mound system rises vertically nearly 80 meters (262 feet) over a distance of about one kilometer (0.62 miles). Sides and tops of these mounds are covered with extensive Lophelia pertusa. The second area contains mounds that rise at least 53 meters (174 feet) over a distance of about 0.4 kilometers (0.2 miles). They appear to be of the same general construction as the northern Bank, built of coral rubble matrix that had trapped sediments. Extensive fields of coral rubble surround the area. Both living and dead corals are common to this bank, with some living bushes being quite large. Over 54 fish species have been observed along these banks. In addition, these areas support a well-developed invertebrate fauna.

The Cape Fear Lophelia Coral HAPC, which occupies 135 square kilometers (52 square miles), encompasses mounds rising nearly 80 meters (262 feet) over a distance of about 0.4 kilometers (0.2 miles) and exhibits some of the most rugged habitat and vertical excursion of any area sampled. The mounds appear to be of the same general construction as those in the Cape Lookout Banks, built of coral rubble matrix with trapped sediments. Extensive fields of coral rubble surround the area and both living and dead corals are common on this bank. Over 12 fish species have been observed, including the greatest numbers of large fishes off

North Carolina. Of the 12 species, commercially important species includes red bream and wreckfish. This is the only area off North Carolina where wreckfish have been observed. Of species commonly taken, only blackbelly rosefish were reported.

The Stetson-Miami Terrace Coral HAPC is the largest of the deepwater Coral HAPCs and encompasses areas off the coasts of South Carolina, Georgia, and East Florida to the Miami Terrace off of Biscayne Bay. Below are descriptions of the main areas encompassed by this proposed Coral HAPC.

Stetson Reef - Stetson Reef is characterized by hundreds of pinnacles along the eastern Blake Plateau offshore South Carolina and over 200 coral mounds. This area supports a 152 meter-tall (500 feet) pinnacle in 822 meters (2,697 feet) of water where recent submersible dives discovered live bushes of Lophelia coral, sponges, gorgonians, and black coral bushes. This represents one of the tallest Lophelia coral lithoherms known.

Savannah and East Florida Lithoherms - This site is characterized by numerous lithoherms at depths of 550 meters (1,804 feet) with relief up to 60 meters (197 feet) that provide live-bottom habitat. Submersible dives found that these lithoherms provided habitat for large populations of massive sponges and gorgonians in addition to smaller macroinvertebrates which have not been studied in detail. Some ridges have nearly 100% cover of sponges. Although few large fish have been observed at this site, a swordfish, several sharks, and numerous blackbelly rosefish were noted. Further south, echosounder transects along a 222-kilometer (138-mile) stretch off northeastern and central Florida (depth 700-800 meters; 2,297-2,625 feet) mapped nearly 300 coral mounds from 8 to 168 meters tall (26-551 feet).

The Miami Terrace and Escarpment is a Miocene-age terrace off southeast Florida that supports high relief hardbottom habitats and rich benthic communities in 200-600 meter (1,969 feet) depths. Dense aggregations of 50 to 100 wreckfish were observed, in addition to blackbelly rosefish, skates, sharks, and dense schools of jacks. Lophelia mounds are also present at the base of the escarpment, within the Straits of Florida, but little is known of their abundance, distribution, or associated fauna. The steep escarpments, especially near the top of the ridges, are rich in corals, octocorals, and sponges.

Like the Miami Terrace, the Pourtalés Terrace Coral HAPC is a Miocene-age terrace. It is located off the Florida Reef Tract and includes high relief hardbottom habitats and rich benthic communities. Sinkholes are present on the outer edge of the terrace, including the Jordon sinkhole, which may be one of the deepest known. A total of 26 fish taxa were identified from the sinkhole and bioherm sites. In contrast to the Coral HAPCs, the Pourtalés Terrace is in depths of 200 to 450 meters (656-1,476 feet) and a number of deepwater snapper grouper species have been observed in the area. Observed species include tilefish, sharks, speckled hind, yellowedge grouper, warsaw grouper, snowy grouper, blackbelly rosefish, red porgy, drum, scorpion fish, amberjack and phycid hakes. One of the Type 2 Marine Protected Areas (MPAs) identified in Snapper Grouper Amendment 14, East Hump/Un-named Hump MPA, is located within the Pourtales Terrace Coral HAPC. The MPA is located approximately 27 kilometers (13 nm) southeast of Long Key, Florida.

A summary evaluation of the existing and proposed EFH-HAPC as it relates to the criteria is in **Table 4-6.**

Table 4-6. Summary evaluation of the EFH-HAPC for coral, coral reefs and live hardbottom habitat as it relates to the criteria.

EFH-HAPC and Criteria Evaluation	Ecological Function	Sensitivity to Environmental Degradation	Threat from Development Activities	Rarity of Habitat
Ten Fathom Ledge, NC	Medium	Low	Medium	Medium
Big Rock, NC	Medium	Low	Medium	Medium
The Point, NC	Medium	Low	Medium	Medium
Hurl Rocks, SC	Medium	High	High	Medium
Charleston Bump, SC	Medium	Low	Medium	Medium
Gray's Reef NMS, GA	High	Low	Low	Medium
Phragmatopoma worm reefs, FL	Medium	High	Medium	High
Oculina Banks from Ft. Pierce to Cape Canaveral, FL	High	Low	Low	High
Nearshore hardbottom off from Cape Canaveral to Broward County, FL	High	Medium	High	Medium
Offshore hardbottom from Palm Beach County to Fowey Rocks, FL	High	Low	Medium	Medium
Biscayne Bay, FL	Medium	Low	Medium	Medium
Biscayne National Park, FL	Medium		Medium	Low
Florida Keys NMS, FL	High	High	High	High
Deepwater Marine Protected Areas	High	Low	Medium	Medium

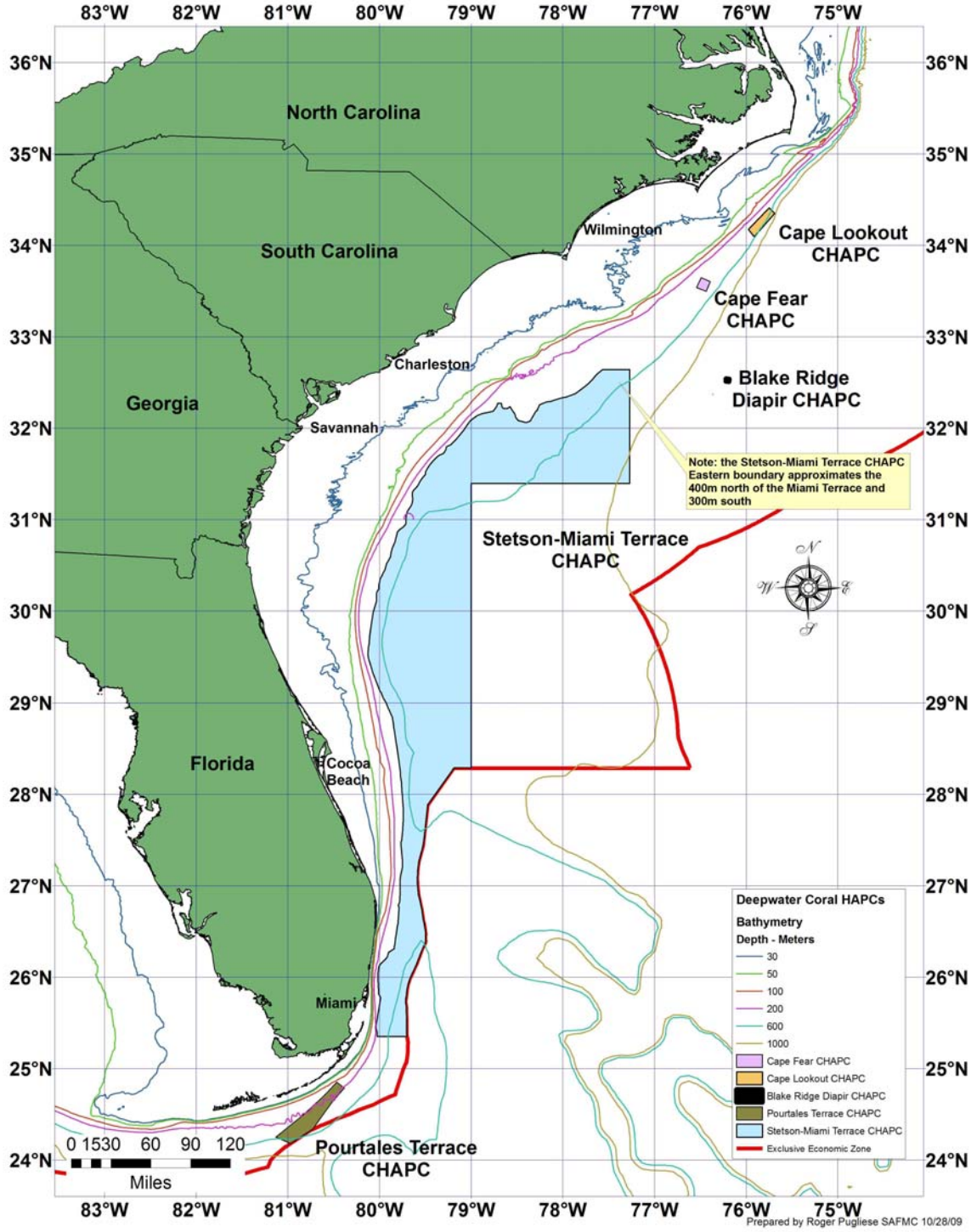


Figure 4-4. Deepwater Coral Habitat Areas of Particular Concern (SAFMC 2009a).

The designation of additional EFH-HAPCs for coral would not result in direct impacts to the biological resources of the west-central Atlantic Ocean. Rather, the EFH-HAPC designation under this option would provide a future opportunity for the Council to establish regulations

to protect EFH from fishing activities in the EEZ and to review and recommend EFH conservation measures to protect habitat from non-fishing activities which are undertaken, authorized, or funded by Federal agencies.

4.7.2 Economic Effects

Designation of EFH-HAPC will require the Council to consider all operations or actions that might interact with or affect the EFH-HAPC, and may trigger a consultation for any activity that may affect the habitat. The direct effects of additional regulatory consideration would be the financial costs of a protracted regulatory process. Additional effects would accrue to any restrictions imposed as a result of the evaluation of impact of these activities. A consultation may incur costs associated with production delays, project/activity design modification, or mitigation measures. Since any restrictions that may subsequently be placed on these activities are unknown at this time, it is not possible to explicitly describe their effects. However, designation of additional EFH-HAPCs is expected to increase the likelihood that long-term resource goals are met due to increased protection through consultation requirements. A healthy, sustainable resource is presumed to result in increased long-term economic benefits relative to less protection.

4.7.3 Social Effects

There will be few social impacts from establishing EFH-HAPCs. The social impacts will most likely come from future actions that are associated with such designations.

It is worth noting that the designation of essential fish habitat will alter the process by which permits for activities which impact essential fish habitat are issued. The potential for increased restrictions, mitigation, and permitting requirements may have impacts upon the behavior of individuals and agencies seeking permits. The nature and extent of those impacts are unknown and will undoubtedly vary depending upon the individual and/or agency.

4.7.4 Administrative Effects

Designation of new EFH and EFH-HAPC will require consideration of all operations or actions that might interact with or affect the EFH, and may trigger a consultation for any activity that may affect the habitat. The direct effects of additional regulatory consideration would be the financial costs of a protracted regulatory process. Additional effects would accrue to any restrictions imposed as a result of the evaluation of impact of these activities. A consultation may incur costs associated with production delays, project/activity design modification, or mitigation measures. Since any restrictions that may subsequently be placed on these activities are unknown at this time, it is not possible to explicitly describe their effects.

It is worth noting that identification of EFH will alter the process by which permits for activities which impact EFH and EFH-HAPCs are issued. The potential for increased restrictions, mitigation, and permitting requirements may have impacts upon the behavior of

individuals and agencies seeking permits. The nature and extent of those impacts are unknown and will undoubtedly vary depending upon the individual and/or agency.

4.8 Action 8. Amend the Fishery Management Plan (FMP) for Pelagic *Sargassum* Habitat to designate new EFH

Alternative 1. No Action. Do not amend the *Sargassum* FMP to designate Essential Fish Habitat (EFH). The Council must designate EFH for all managed species including Pelagic *Sargassum* Habitat.

Alternative 2. Amend the *Sargassum* FMP to designate the top 10 meters of the water column in the South Atlantic EEZ as EFH for Pelagic *Sargassum*.

Preferred Alternative 3. Amend the *Sargassum* FMP to designate the top 10 meters of the water column in the South Atlantic EEZ bounded by the Gulfstream, as EFH for pelagic *Sargassum*.

4.8.1 Biological Effects

The identification of essential habitat for pelagic *Sargassum* enables the Council to protect EFH more effectively and take timely actions when necessary. Identifying and describing essential fish habitat is the first step in preventing decreases in biological productivity of pelagic *Sargassum* and other managed or prey species dependent on pelagic *Sargassum*.

The *Sargassum* FMP and the Fishery Ecosystem Plan highlight the productivity of pelagic *Sargassum* as being directly dependent on the larval fish utilizing this habitat. Species using pelagic *Sargassum* provide a primary source of nitrogen in an otherwise nutrient poor water column environment. In addition, the relationship between fishes and pelagic *Sargassum* is mutualistic and more important than previously thought. Therefore, the productivity of pelagic *Sargassum* is tightly coupled to associated fish schools and explains how pelagic *Sargassum* sustains growth in oligotrophic (low nutrient) oceanic waters often devoid of dissolved nutrients.

In consideration of conditions limiting growth and survival of *Sargassum* and the known utilization of large rafts of *Sargassum* by early life stages of Federally managed fisheries and other marine species, this alternative EFH designation only would encompass the uppermost 10 m of the marine water column. This area considered for designation as EFH for pelagic *Sargassum* has already been specified as EFH for one or more of the various Council and NMFS managed fisheries: shrimp, snapper grouper, dolphin and wahoo, coastal migratory pelagics, and highly migratory species.

Limiting the EFH identification to the upper 10 meters of the surface as bounded by the Gulf Stream was recommended by NMFS in the development of the FEIS (NMFS 2002) for the

Pelagic *Sargassum* Habitat FMP. This area is the upper 10 meters of the surface of the area shown in **Figure 4-5**.

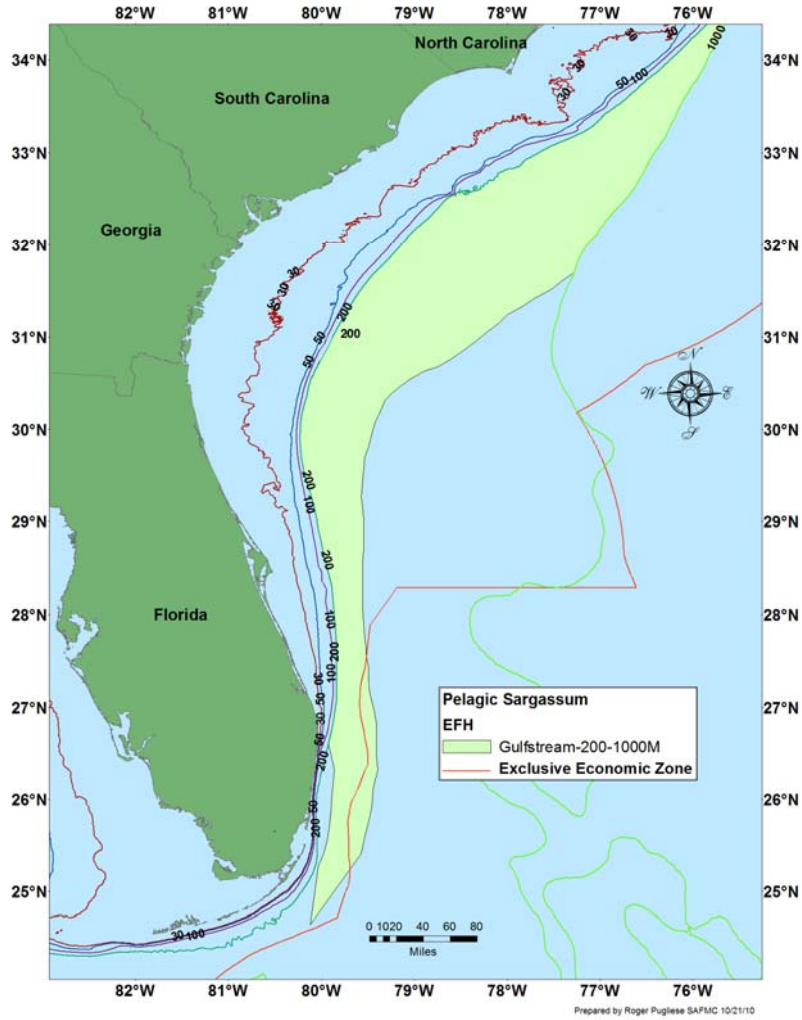


Figure 4-5. Proposed EFH for Pelagic *Sargassum***.**

Designation of near-surface oceanic and nearshore habitats as EFH for pelagic *Sargassum*, as an action independent of any others, would not impact the biological quality of those habitats. However, designation would provide an additional mechanism by which the Council could manage or influence activities which could cause or lead to the degradation of *Sargassum* EFH.

The action alternatives proposed in Action 8 would not result in direct impacts to the biological resources of the west-central Atlantic Ocean. Rather, EFH designation under this option would provide a future opportunity for the Council to establish regulations to protect EFH from fishing activities in the EEZ and to review and recommend EFH conservation measures to protect surface waters from non-fishing activities which are undertaken, authorized, or funded by Federal agencies. Similarly, designation of pelagic *Sargassum* EFH

would require Federal agencies to consult with NMFS on activities which may adversely affect that habitat.

4.8.2 Economic Effects

The identification of EFH is a mandated requirement of an FMP. Therefore, the No Action alternative would not allow the full implementation of the *Sargassum* FMP and establishment of a platform for future management actions. Also, the Council would be limited in the future in terms of protecting pelagic *Sargassum* habitat and minimizing any possible habitat damage from occurring. This could result in reduced net economic benefits to society in the long-term.

The identification of EFH for pelagic *Sargassum* will not have any direct economic impacts. However, this measure will enable the Council to protect essential fish habitat effectively and take timely actions when necessary which could lead to increased net economic benefits to society. Identification of EFH will require the Council to consider all operations or actions that might interact with or affect the EFH, and may trigger a consultation for any activity that may affect the habitat. The direct effects of additional regulatory consideration would be the financial costs of a protracted regulatory process. Additional effects would accrue to any restrictions imposed as a result of the evaluation of impact of these activities. A consultation may incur costs associated with production delays, project/activity design modification, or mitigation measures. Since any restrictions that may subsequently be placed on these activities are unknown at this time, it is not possible to explicitly describe their effects. However, designation of additional EFH is expected to increase the likelihood that long-term resource goals are met due to increased protection through consultation requirements. A healthy, sustainable resource is presumed to result in increased long-term economic benefits relative to less protection.

4.8.3 Social Effects

Alternative 1 would not meet Magnuson-Stevens Act mandates to identify EFH. Although there would be few social impacts from no action, it is in the best interest of the Council and fishermen to identify this habitat. Designation of essential pelagic *Sargassum* habitat can facilitate expeditious Council action in the future to protect habitat.

There would be few social impacts from identifying EFH for pelagic *Sargassum*. The social impacts would most likely come from the actions that were associated with such a designation. The assumption would be that such designation would provide protection for habitat. In that case, the social impacts would be positive in the long-term. However, in some cases, protection of habitat may mean harvesting restrictions in areas where harvesting presently takes place or other actions which may impose constraints on those who harvest habitat. This would certainly impose negative short-term impacts that may be mitigated in the long term if productivity is increased.

4.8.4 Administrative Effects

Designation of new EFH and EFH-HAPC will require consideration of all operations or actions that might interact with or affect the EFH, and may trigger a consultation for any activity that may affect the habitat. The direct effects of additional regulatory consideration would be the financial costs of a protracted regulatory process. Additional effects would accrue to any restrictions imposed as a result of the evaluation of impact of these activities. A consultation may incur costs associated with production delays, project/activity design modification, or mitigation measures. Since any restrictions that may subsequently be placed on these activities are unknown at this time, it is not possible to explicitly describe their effects.

It is worth noting that identification of EFH will alter the process by which permits for activities which impact EFH and EFH-HAPCs are issued. The potential for increased restrictions, mitigation, and permitting requirements may have impacts upon the behavior of individuals and agencies seeking permits. The nature and extent of those impacts are unknown and will undoubtedly vary depending upon the individual and/or agency.

4.9 Action 9. Amend the Fishery Management Plan (FMP) for Pelagic *Sargassum* Habitat to designate EFH-HAPCs

Preferred Alternative 1. No Action. Do not designate EFH-HAPCs for Pelagic *Sargassum*.

Alternative 2. Amend the *Sargassum* FMP to designate one or more of the following as EFH-HAPCs

Sub-Alternative 2a. The Charleston Bump Complex

Sub-Alternative 2b. The Point, NC.

4.9.1 Biological Effects

Preferred Alternative 1 would not designate EFH-HAPCs for Pelagic *Sargassum*. **Alternative 2** offers the designation of EFH-HAPCs for Pelagic *Sargassum* as the "Charleston Bump" (**sub-alternative 2a**) or The Point, NC (**sub-alternative 2b**). The quasi-permanent gyres impinge upon the shelf near the "Charleston Bump" with this habitat complex serving as important spawning/larval retention habitat for a variety of fishes (Collins and Stender, 1987; Lee et al., 1994). The region known as "The Point" off Cape Hatteras (**Figure 4-7**) supports an unusually high biomass of upper trophic level predators, including many important pelagic fishes. It has been suggested that the area is the most productive sport fishery on the east coast (Ross, 1989).

Due to their important ecological function, at least two offshore pelagic environments, the "Charleston Bump" and "The Point", were designated essential fish habitat-habitat areas of

particular concern (EFH-HAPCs) for coastal migratory pelagics, snapper grouper species, and coral and live/hard bottom habitat (SAFMC, 1998a,b). Both regions are productive and highly dynamic oceanic areas where pelagic *Sargassum* is concentrated. This was noted in the SAFMC essential fish habitat workshop on pelagic habitat. A quasi-permanent, cyclonic eddy with attendant upwelling of nutrient-rich deep water sets-up in the wake of the Charleston Bump. Upwelling results in persistent primary and secondary production that may well result in an important, if not essential feeding environment for the larvae of fishes that congregate to spawn there. The hydrodynamics of the eddy may well serve in the retention of fish propagules that are lost from local populations elsewhere through entrainment into the Gulf Stream. "The Point" off Cape Hatteras is also highly productive due to the confluence of as many as four water masses. Adults of highly migratory species congregate in this area, while the diversity of larval fishes found there is high (SAFMC 2002).

The Charleston Bump (**Figure 4-6**) is a bottom feature of great topographic relief located southeast of Charleston South Carolina (Sedberry et al., 2000) The Bump complex includes a quasi-permanent, cyclonic eddy the "Charleston Gyre" with attendant upwelling of nutrient-rich deep water sets-up in the wake of the "Charleston Bump". Upwelling results in persistent primary and secondary production that results in an important, if not essential feeding environment for larvae of fishes and the adults that congregate to spawn there. The hydrodynamics of the eddy, thermal fronts associated with the Gulf Stream and the benthic habitat contribute to attract pelagic fish and retain and concentrate larvae, juvenile, prey for larger fish (Sedberry et al., 2000) and pelagic *Sargassum*. Therefore this area is being proposed as EFH-HAPC for pelagic *Sargassum*.

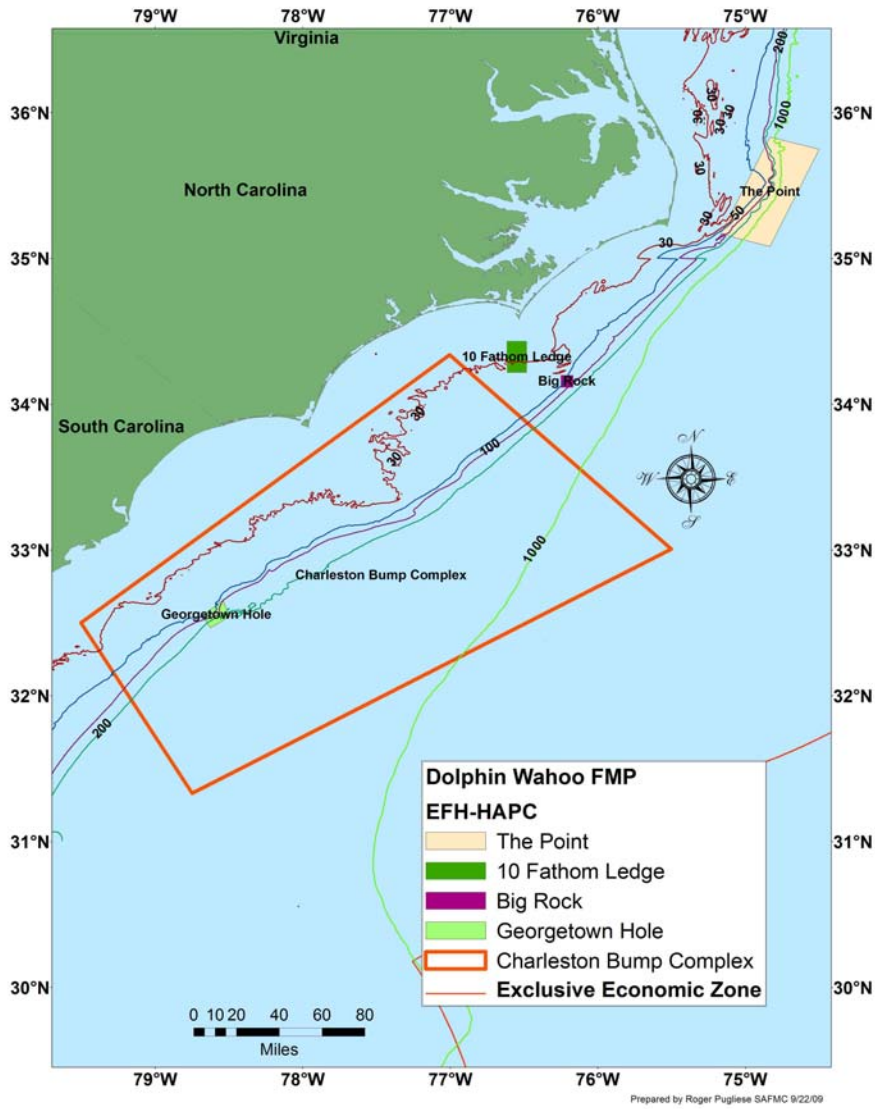


Figure 4-6. "The Charleston Bump Complex" and "The Point" Essential Fish Habitat-Habitat Areas of Particular Concern (Source: Dolphin Wahoo FMP SAFMC 2002).

"The Point" off Cape Hatteras (**Figure 4-7**) is also highly productive due to the confluence of as many as four water masses. Adults of highly migratory species congregate in this area, while the diversity of larval fishes found there is truly astounding (Table 18b of the Habitat Plan (SAFMC, 1998b).

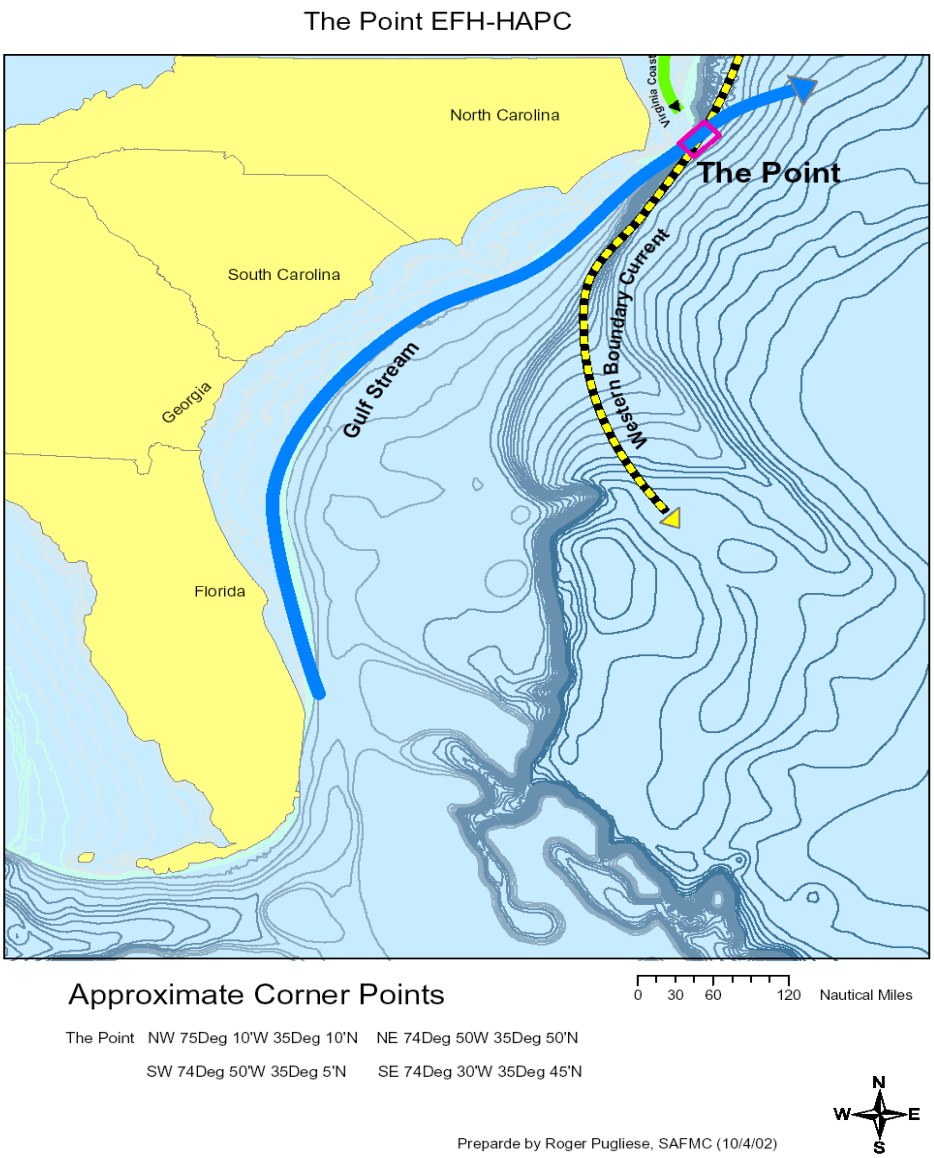


Figure 4-7. "The Point" Essential Fish Habitat-Habitat Area of Particular Concern (Source: Dolphin Wahoo FMP SAFMC 2002).

The designation of an EFH-HAPC for pelagic *Sargassum* would not result in direct impacts to the biological resources of the west-central Atlantic Ocean. Rather, the EFH-HAPC designation under this option would provide a future opportunity for the Council to establish regulations to protect EFH from fishing activities in the EEZ and to review and recommend EFH conservation measures to protect surface waters from non-fishing activities which are undertaken, authorized, or funded by Federal agencies.

4.9.2 Economic Effects

Designation of EFH-HAPC will require the Council to consider all operations or actions that might interact with or affect the EFH-HAPC, and may trigger a consultation for any activity that may affect the habitat. The direct effects of additional regulatory consideration would be

the financial costs of a protracted regulatory process. Additional effects would accrue to any restrictions imposed as a result of the evaluation of impact of these activities. A consultation may incur costs associated with production delays, project/activity design modification, or mitigation measures. Since any restrictions that may subsequently be placed on these activities are unknown at this time, it is not possible to explicitly describe their effects. However, designation of additional EFH is expected to increase the likelihood that long-term resource goals are met due to increased protection through consultation requirements. A healthy, sustainable resource is presumed to result in increased long-term economic benefits relative to less protection.

4.9.3 Social Effects

There will be few social impacts from establishing EFH-HAPCs. The social impacts will most likely come from future actions that are associated with such designations. In some cases, protection of habitat may mean harvesting restrictions in areas where harvesting presently takes place or other actions which may impose similar constraints on pelagic *Sargassum* fishermen or processors. This could conceivably impose negative short-term impacts.

It is worth noting that the designation of essential fish habitat will alter the process by which permits for activities which impact essential fish habitat are issued. The potential for increased restrictions, mitigation, and permitting requirements may have impacts upon the behavior of individuals and agencies seeking permits. The nature and extent of those impacts are unknown and will undoubtedly vary depending upon the individual and/or agency.

4.9.4 Administrative Effects

Designation of new EFH and EFH-HAPC will require consideration of all operations or actions that might interact with or affect the EFH, and may trigger a consultation for any activity that may affect the habitat. The direct effects of additional regulatory consideration would be the financial costs of a protracted regulatory process. Additional effects would accrue to any restrictions imposed as a result of the evaluation of impact of these activities. A consultation may incur costs associated with production delays, project/activity design modification, or mitigation measures. Since any restrictions that may subsequently be placed on these activities are unknown at this time, it is not possible to explicitly describe their effects.

It is worth noting that identification of EFH will alter the process by which permits for activities which impact EFH and EFH-HAPCs are issued. The potential for increased restrictions, mitigation, and permitting requirements may have impacts upon the behavior of individuals and agencies seeking permits. The nature and extent of those impacts are unknown and will undoubtedly vary depending upon the individual and/or agency.

4.10 Cumulative Effects

As directed by the National Environmental Policy Act (NEPA), federal agencies are mandated to assess not only the indirect and direct impacts, but the cumulative impacts of proposed actions as well. NEPA defines a cumulative impact as *"the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time"* (40 CFR 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.

The Council on Environmental Quality (CEQ) offers guidance on conducting a Cumulative Effects Analysis (CEA) in a report titled "Considering Cumulative Effects under the National Environmental Policy Act" (CEQ 1997). 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, ecosystem, and human communities identified in scoping in terms of their response to change and capacity to withstand stresses.
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.

4.10.1 Biological

SCOPING FOR CUMULATIVE EFFECTS

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

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

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

2. **Establish the geographic scope of the analysis.**

The immediate impact area would be the federal 200-nautical mile limit of the Atlantic off the coasts of North Carolina, South Carolina, Georgia, and east Florida to Key West; specifically, octocoral habitat and SMZs off of South Carolina identified in **Section 3.0**.

3. **Establish the timeframe for the 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 4.0.**
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 South Atlantic octocoral, snapper grouper, and coastal migratory pelagic, and *Sargassum*.

A. Past

Coral reefs and live hard bottom habitat have been managed since 1982 (GMFMC & SAFMC 1982). Through several amendments to the original FMP, an octocoral quota was implemented, defined OY for corals and sea fans, implemented live rock harvest prohibitions in certain areas, allowed for the aquaculture of live rock in the EEZ, and established the Oculina HAPC.

B. Present

In this amendment the Council has recommended:

B. Reasonably Foreseeable Future

A Comprehensive ACL Amendment will be under development during 2010 to implement ACLs, Annual Catch Targets (ACTs) and Accountability Measures (AMs) for all species managed by the South Atlantic Council.

II. Non-Council and other non-fishery related actions, including natural events affecting

A. Past
B. Present
C. Reasonably foreseeable future

AFFECTED ENVIRONMENT

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

This step should identify the trends, existing conditions, and the ability to withstand stresses of the environmental components.

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

Coral

Quantitative definitions of OY and live rock and allowable octocoral are identified in the Joint Coral FMP (GMFMC & SAFMC 1982) and Amendment 1 (GMFMC & SAFMC 1990), Amendment 2 (GMFMC & SAFMC 1994), and Amendment 5 (SAFMC 1998c).

Maximum Sustainable Yield

Coral Amendment 5 (SAFMC 1998c) states an estimated MSY has been determined for several species at specific reefs in the Florida reef tract, but cannot be expanded to other corals due to great differences in species, density, growth rates, and other factors. An approximation to MSY was calculated for several communities. One option considered for MSY in Amendment 5 was: MSY is equal to 30%-40% static SPR; however, the Council rejected this range because the level of data was poor.

Optimum Yield

Coral Amendment 5 (SAFMC 1998c) holds that in Amendment 2 (GMFMC & SAFMC 1994), for live rock: OY is to be 485,000 lbs annually for the South Atlantic Region where harvest is allowed during 1994 and 1995, after which it is to be zero. Therefore, currently, OY is equal to zero accept as may be authorized for scientific and educational purposes and under live rock aquaculture permits.

Overfished and Overfishing Definitions

Currently there is no specific definition of an overfished condition for coral species in the South Atlantic; however, Coral Amendment 5 (SAFMC 1998c) defines overfishing as an annual harvest that exceeds OY.

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.

DETERMINING THE ENVIRONMENTAL CONSEQUENCES OF CUMULATIVE EFFECTS

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.

4.10.1.1 Effects on protected species

4.10.2 Socioeconomic

4.10.3 Administrative

4.11 Unavoidable Adverse Effects

4.12 Effects of the Fishery on the Environment

4.12.1 Effects on Ocean and Coastal Habitats

4.12.2 Public Health and Safety

4.12.3 Endangered Species and Marine Mammals

4.13 Relationship of Short-Term Uses and Long-Term Productivity

4.14 Irreversible and Irretrievable Commitments of Resources

4.15 Monitoring and Mitigation Measures

5 List of Preparers

Name	Title	Agency	Location
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Karla Gore	Fishery Biologist NMFS Co-Lead	NMFS	SERO
Roger Pugliese	Senior Fishery Biologist	SAFMC	SAFMC
Kate Quigley	Economist	SAFMC	SAFMC
Kate Michie	Fishery Biologist	NMFS	SERO
Gregg Waugh	Deputy Director	SAFMC	SAFMC
Carlos Rivero	Physical Scientist	NMFS	SEFSC

Interagency CE-BA 2 Planning Team/Reviewers

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Michael Jepson	Anthropologist	NMFS	SERO
Andrew Herndon	Fishery Biologist	NMFS	SERO
Amanda Frick	GIS Coordinator	NMFS	SERO
Jack McGovern	Fishery Biologist	NMFS	SERO
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Pace Wilber	Atlantic Branch Supervisor, Fishery Biologist	NMFS	SERO
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	Investigator	OLE	SERO
Brad McHale	Fishery Management Specialist	NMFS HMS	NMFS HMS
Chris Rilling	Supervisory Fish Management Officer	NMFS HMS	NMFS HMS

6 List of Agencies, Organizations, and Persons to Whom Copies of the Statement are Sent

Responsible Agency

Amendment:
South Atlantic Fishery Management Council
4055 Faber Place Drive, Suite 201
North Charleston, South Carolina 29405
(843) 571-4366 (TEL)
Toll Free: 866-SAFMC-10
(843) 769-4520 (FAX)
safmc@safmc.net

Environmental Impact Statement:
NMFS, Southeast Region
263 13th Avenue South
St. Petersburg, Florida 33701=
(727) 824-5301 (TEL)
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List of Agencies, Organizations, and Persons Consulted

SAFMC Habitat and Environmental Protection Panel
SAFMC Coral Advisory Panel
SAFMC Scientific and Statistical Committee
SAFMC Law Enforcement Advisory Panel
SAFMC Snapper Grouper Advisory Panel
SAFMC Golden Crab Advisory Panel
SAFMC Shrimp Advisory Panel
SAFMC Deepwater Shrimp 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

7 References

Acropora Biological Review Team. 2005. Atlantic *Acropora* Status Review Document. Report to National Marine Fisheries Service, Southeast Regional Office, March 3. 152 p.

Adams, W. F., 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.

Auster, P .J. and R.W. Langton. 1999. The effects of fishing on fish habitat. *In* Benaka, L. (ed.) Fish Habitat: Essential Fish Habitat and Rehabilitation. American Fisheries Society, Bethesda, Maryland.

Bagby, M. 1978. The ecology of patch reef gorgonians off the coast of Key Largo, Florida. Florida International University, Miami.

Bak, R. P. M. 1976. The growth of coral colonies and the importance of crustose coralline algae and burrowing sponges in relation with carbonate accumulation. Netherlands Journal of Sea Research 10: 285-337.

Bak, R. P. M and M. S. Engel. 1979. Distribution, abundance and survival of juvenile hermatypic corals (Scleractinia) and the importance of life history strategies in the parent coral community. Marine Biology 54: 341-352.

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*. Pages 143-148 *in* Proceedings of the 3rd International Coral Reef Symposium, Miami, Florida.

Bayer, F. M. 1961. The shallow water octocorallia of the West Indian Region. Studies in the Fauna of Curacao 12.

Benayahu, Y. and Y. Loya. 1983. Surface brooding in the Red Sea soft coral *Parerythropodium fulvum fulvum* (Forskal, 1775). Biological Bulletin 165: 353-369.

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, editors. 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., editor. 1995. Biology and Conservation of Sea Turtles, revised edition. Smithsonian Institute Press, Washington, D.C.

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

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

Brazeau, D. A and H. R. Lasker. 1990. Sexual reproduction and external brooding by the Caribbean gorgonian *Briareum asbestinum*. Marine Biology 104: 465-474.

Bright, T. J. and L. H. Pequegnat. 1974. Biota of the West Flower Garden Bank. Gulf Publishing Company, Houston, Texas.

Bright, T. J., W. C. Jaap, and C. W. Cashman. 1981. Ecology and management of coral reefs and organic banks. Pages 53-160 *in* Environmental Research Needs in the Gulf of Mexico (Gomex). U.S. Department of Commerce, NOAA Environmental Research Laboratories, Miami, Florida.

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

Bruce, A. J. 1976. Shrimps and prawns of coral reefs with special references to commensalism. Pages 38-94 *in* O. A. Jones, and R. Endean, editors. Biology and geology of coral reefs. Academic Press, New York.

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, Virginia.

Cairns, S.D. 1977. Guide to the commoner shallow-water gorgonians (sea whips, sea feathers, and sea fans) of Florida, the Gulf of Mexico and the Caribbean region. [6]. University of Miami Sea Grant Program. Field Guide Series. 74 pp.

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

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

CEQ (Council on Environmental Quality). 1997. Considering Cumulative Effects Under the National Environmental Policy Act. http://ceq.eh.doe.gov/nepa/ccenepa/toc.pdf

Cerame-Vivas, M. J., and I. E. Gray. 1966. The distribution pattern of benthic invertebrates of the continental shelf off North Carolina. Ecology 47:260-270.

CETAP (Cetacean and Turtle Assessment Program). 1982. A characterization of marine mammals and turtles in the mid- and north Atlantic areas of the U.S. outer continental shelf. Cetacean and Turtle Assessment Program, University of Rhode Island. Final Report #AA551-CT8-48 to the Bureau of Land Management, Washington, DC.

Chiappone, M. and R. Sluka. 1996. Fishes and fisheries: Site characterization of the Florida Keys National Marine Sanctuary and environs. The Nature Conservancy and Farley Court Publishers.

Clark, A. M. 1976. Echinoderms of coral reefs. Pages 95-123 *In* O. A. Jones, and R. Endean editors. Biology and geology of coral reefs, Volume III. Academic Press, New York, New York.

Connell, J. H. 1973. Population ecology of reef-building corals. *In* O. A. Jones, and R. Endean, editors. Biology and Geology of Coral Reefs, Vol III. Biology 2. Academic Press, New York, New York.

Courtenay W. R., Jr., H. L. Blakesley, J. K. Reed and R. E. Waldner. 1975. Environmental assessment of offshore reefs off Miami Beach, Dade County, Florida. Research Report Submitted to the U.S. Army Corps of Engineers, Jacksonville District, Florida.

DeVictor, S. D and S. L. Morton. 2007. Guide to the shallow water (0-200 m) octocorals of the South Atlantic Bight. Southeast Regional Taxonomic Center. Available at: http://www.dnr.sc.gov/marine/sertc/octocoral%20guide/octocoral.htm

DiSalvo, L. H. 1973. Microbial ecology. Pages 1-15 i*n* O. A. Jones, and R. Endean, editors. Biology and Geology of Coral Reefs. Vol. II Biology. Academic Press, New York, New York.

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.

Endean, R. 1976. Destruction and recovery of coral reef communities. Pages 215-254 *in* O. A. Jones, and R. Endean, editors. Biology and Geology of Coral Reefs, Vol. III. Biology 2. Academic Press, New York, New York.

Fautin, D. G. 1988. Anthozoan-dominated benthic environments, Abs. # 114 *in* Choat, J. H. and O. Bellsood, editors. Proceedings of the Sixth International Coral Reef Symposium, Australia.

Fonseca, M. S., W. Kenworthy, and G. W. Thayer. 1992. Seagrass beds: Nursery for coastal species. *In* R. H. Stroud, editor. Stemming the Tide of Coastal Fish Habitat Loss. Proceedings of a Symposium on Conservation of Coastal Fish Habitat, Baltimore, March 7-9, 1991. National Coalition for Marine Conservation, Inc., Savannah, Georgia.

Frick, J. 1976. Orientation and behaviour of hatchling green turtles (*Chelonia mydas*) in the sea. Animal Behavior 24:849.31:533-543.

GMFMC (Gulf of Mexico Fishery Management Council) and South Atlantic Fishery Management Council. 1982. Fishery Management Plan and Final Environmental Impact Statement for Coral and Coral Reefs of the Gulf of Mexico and South Atlantic. Gulf of Mexico Fishery Management Council, 5401 West Kennedy Boulevard, Suite 881, Tampa, Florida.

GMFMC (Gulf of Mexico Fishery Management Council) and South Atlantic Fishery Management Council. 1990. Amendment 1 and Final Environmental Impact Statement for Coral and Coral Reefs of the Gulf of Mexico and South Atlantic. Gulf of Mexico Fishery Management Council, 5401 West Kennedy Boulevard, Suite 881, Tampa, Florida.

GMFMC (Gulf of Mexico Fishery Management Council) and South Atlantic Fishery Management Council. 1994. Amendment 2 and Final Environmental Impact Statement for Coral and Coral Reefs of the Gulf of Mexico and South Atlantic. Gulf of Mexico Fishery Management Council, 5401 West Kennedy Boulevard, Suite 881, Tampa, Florida.

Gilliam D.S., R.E. Dodge, R.E. Spieler, L. K. B. Jordan and J. C. Walczak. 2007a. Marine biological monitoring in Broward County, Florida: Year 7 Annual Report. Technical Report EPD 07-02. Prepared for the Broward County Board of County Commissioners, BC Environ. Prot. Dep., Bio. Res. Div.

Gilliam, D. S., R.E. Dodge, R.E. Spieler, L. K. B. Jordan and J. C. Walczak. 2007b. Southeast Florida Coral Reef Evaluation and Monitoring Project 2006 Year 4 Final Report. Florida DEP report #G0099. Miami Beach, Florida.

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.

Goldberg, W. M. 1973a. The ecology of the coral-octocoral communities off the southeast Florida coast: Geomorphology, species composition and zonation. Bulletin of Marine Science 23:465-488.

Goldberg, W. M. 1973b. Ecological aspects of the salinity and temperature tolerances of some reef-dwelling gorgonians from Florida. Caribbean Journal of Science 13:173-177.

Goldman, B. and F. H. Talbot. 1976. Aspects of the ecology of coral reef fishes. Pages 125-154 *in* O. A. Jones, and R. Endean, editors. Biology and Geology of Coral Reefs, Vol III. Biology 2. Academic Press, New York, New York.

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.

Goreau, N. I., Goreau, T. J. and R. L. Hayes. 1981. Settling, survivorship and spatial aggregation in planulae and juveniles of the coral *Porites porites* (Pallas). Bulletin of Marine Science 31: 424-435.

Guiterrez-Rodriguez, C.and H. R. Lasker. 2004. Reproductive biology, development, and planula behavior in the Caribbean gorgonian *Pseudopterogorgia elisabethae*. Invertebrate Biology 123(1): 54-67.

Harris, P.J. and D.J. Machowski. 2004. Data Report On The Status of Some Reef Fish Stocks off the Southeast United States, 1983-2004. Marine Resources Research Institute, South Carolina Department of Natural Resources, Charleston.

Helfrich, P. and S. J. Townsley. 1965. Influence of the Sea. Pages 39-56 *in* F. R. Fosberg, editor. Man's place in the islands ecosystem. Tenth Pacific Science Congress 1961. Bishop Museum Press, Honolulu, Hawaii.

Hughes, G. R. 1974. The sea-turtles of south-east Africa. 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.

Jaap W.C. 1984. The ecology of the South Florida coral reefs: a community profile. FWS/OBS 82/08. US Fish and Wildlife Service.

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. Florida Marine Research Publication 46: 31.

Jaap, W. C. and P. Hallock. 1990. Coral Reefs. Pages 574-616 *in* R. L. Meyers, and J. J. Ewel, editors. Ecosystems of Florida. University of Central Florida Press, Orlando, Florida.

Jones, O. A. and R. Endean, editors. 1973. Biology and geology of coral reefs. Academic Press, New York.

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

Lasker, H.R. 2006. High Fertilization Success in a Surface-Brooding Caribbean Gorgonian. Biological Bulletin 210(1): 10-17.

Lee, T. N., and J. B. McGuire. 1972. An analysis of marine waste disposal in southeast Florida's coastal waters. Advances in Water Pollution Research 6:865-878.

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 1:405-408.

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, editors. 1997. The Biology of Sea Turtles. CRC Press, Boca Raton, Florida.

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

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

McGuire M, P. and A. M. Szmant. 1997. Time course of physiological responses to NH, enrichment by a coral-zooxanthellae symbiosis. Proceedings of the 8th International Coral Reef Symposium 1: 909-914.

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

Menzies, R. J., O. H. Pilkey, B. W. Blackwelder, D. Dexter, P. Huling, and L. R. McCloskey. 1966. A submerged reef off North Carolina. Internationale Revue der Gesamten Hydrobiologie 51:393-431.

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

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.

Morse A. N. C. and D. E. Morse. 1996. Flypapers for coral and other planktonic larvae. BioScience 46 (4): 254-262.

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., editor. Biology and Conservation of Sea Turtles. Smithsonian Institute Press, Washington, DC.

Moyer, M. A., N. J. Blake, and W. S. Arnold. 1993. An asceptosporan disease causing mass mortality in the Atlantic calico scallop *Argopecten gibbus* (Linnaeus, 1758). Journal of Shellfish Research 12:305-310.

NOAA Fisheries Service. 2000. Smalltooth Sawfish Status Review. NOAA National Marine Fisheries Service, Southeast Regional Office. St. Petersburg, Florida.

NOAA Fisheries Service. 2001. Stock assessments of loggerhead and leatherback sea turtles and an assessment of the impact of the pelagic longline fishery on the loggerhead and leatherback sea turtles of the Western North Atlantic. U.S. Department of Commerce, National Marine Fisheries Service, Miami, Florida. SEFSC Contribution PRD-00/01-08, Parts I-III and Appendices I-VI.

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

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., editors. Proceedings from the 1st Symposium on Kemp's ridley Sea Turtle Biology, Conservation, and Management. Sea Grant College Program, Galveston, Texas.

Opresko, D. M. 1973. Abundance and distribution of shallow-water gorgonians in the area of Miami. Florida. Bulletin of Marine Science 23(3): 535-558.

Paredes, R. P. 1969. Introduccion al Estudio Biologico de *Chelonia mydas agassizi* en el Perfil de Pisco. M.S. Thesis, Universidad Nacional Federico Villareal, Lima, Peru.

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.

Perkins, T.H., H. A. Norris, D. T. Wilder, S. D. Kaiser, D. K. Camp, R. E. Matheson, Jr., F. J. Sargent, M. M. Colby, W. G. Lyons, R. G. Gilmore, Jr., J. K. Reed, G. A. Zarillo, K. Connell, M. Fillingfin, and F. M. Idris. 1997. Distribution of hard-bottom habitats on the Continental Shelf off the Northern and Central East Coast of Florida. Final SEAMAP Report, NOAA Grant No. NA47FS0036.

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

Rhodes, R. J. and B. Pan. 2007. Economic Impact and Use Survey of South Carolina Artificial Reef Users: Private Boat Anglers and Charter Divers, 2006. Report Prepared for the South Carolina Department of Natural Resources, Marine Resources Division, Charleston, South Carolina.

Ross, J.L. 1978. Life history aspects of the gray tilefish Caulolatilus microps (Goode and Bean, 1878). Master's Thesis, College of William and Mary, Williamsburg, VA, 125 p.

Ross, J.L. and G.R. Huntsman. 1982. Age, growth, and mortality of blueline tilefish of North Carolina and South Carolina. Transaction of the American Fisheries Society 11: 585-592.

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) & GMFMC (Gulf of Mexico Fishery Management Council). 1982. Fishery Management Plan for Coral and Coral Reefs of the Gulf of Mexico and South Atlantic. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, South Carolina & Gulf of Mexico Fishery Management Council, 2203 N Lois Avenue Suite 1100 Tampa, Florida.

SAFMC (South Atlantic Fishery Management Council). 1988. Amendment 1 to the Snapper Grouper Fishery Management Plan. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 1990. Amendment 1 to the Fishery Management Plan for Coral and Coral Reefs, (Including Environmental Assessment, Regulatory Impact Review, and Initial Regulatory Flexibility Analysis). Gulf of Mexico Fishery Management Council, 5401 West Kennedy Boulevard, Suite 881, Tampa, Florida. 18 pp.

SAFMC (South Atlantic Fishery Management Council). 1991a. Fishery Management Plan for the Shrimp Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 1991b. Amendment 5 (Wreckfish) to the Snapper Grouper Fishery Management Plan. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 1995. Fishery Management Plan for the Golden Crab Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 1996a. Amendment 1 to the Fishery Management Plan for the Shrimp Fishery of the South Atlantic Region (Rock Shrimp). South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 1996b. Amendment 2 (Bycatch Reduction) to the Fishery Management Plan for the Shrimp Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 1997. Framework Seasonal Adjustment #1. Fishery Management Plan for the Golden Crab Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 1998a. Habitat Plan for the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 1998b. Comprehensive Amendment Addressing Essential Fish Habitat in Fishery Management Plans of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 1998c. 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, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 2000. Amendment 3 to the Fishery Management Plan for the Golden Crab Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 2002a. Amendment 5 to the Fishery Management Plan for the Shrimp Fishery of the South Atlantic Region (Rock Shrimp). South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, S.C. 29407-4699. 139 p + appendices.

SAFMC (South Atlantic Fishery Management Council). 2002b. Fishery Management Plan for Pelagic *Sargassum* Habitat. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 2003a. Fishery Management Plan for the Dolphin and Wahoo Fishery of the Atlantic. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 2003b. Fishery Management Plan for the Dolphin and Wahoo Fishery of the Atlantic. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 2005. Amendment 6 to the Fishery Management Plan for the Shrimp Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 2007. Amendment 14 to the Snapper Grouper Fishery Management Plan. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201; North Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 2008a. Amendment 7 to the Fishery Management Plan for the Shrimp Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, , 4055 Faber Place Drive, Suite 201, North Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 2008b. Snapper Grouper Amendment 16. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201, North Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 2008c. Snapper Grouper Amendment 15B. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201, North Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 2009a. Fishery Ecosystem Plan For the South Atlantic Region, Volumes I-V. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201, North Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). 2009b. Comprehensive Ecosystem-Based Amendment 1. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201, North Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). In prep. Snapper Grouper Amendment 17. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201, North Charleston, South Carolina.

SAFMC (South Atlantic Fishery Management Council). In prep. Comprehensive Annual Catch Limits (ACL) Amendment. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201, North Charleston, South Carolina.

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.

Sánchez J. A. and H. Wirshing. 2005. A field key to the identification of zooxanthellate octocorals from the Caribbean and Western Atlantic. Caribbean Journal of Science 41(3): 508 – 522.

Schwartz, F. J. 2003. Bilateral asymmetry in the rostrum of the smalltooth sawfish, *Pristis pectinata* (pristiformes: family pristidae). Journal of North Carolina Academy of Science, 119:41-47.

Sedberry, G. personal communication; NOAA, NOS, Grays Reef National Marine Sanctuary, GA. June 29, 2010

Sedberry, G. personal communication; NOAA, NOS, Grays Reef National Marine Sanctuary, GA. June 30, 2010

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, C. A. 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.

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.

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. Biololgical Bulletin 183: 418-431.

Sorokin, Y. I. 1973. Microbiological aspects of the productivity of coral reefs. *In* Bology and Geology of Coral Reefs: Vol II, Biology. Academic Press, New York.

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.

Szmant, A.M. 1986. Reproductive ecology of Caribbean reef corals. Coral Reefs 5: 43-53.

Szmant, A. M. and M. 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.

Van Dam, R. and C. Diéz. 1998. Home range of immature hawksbill turtles (*Eretmochelys imbricata*) at two Caribbean islands. Journal of Experimental Marine Biology and Ecology 220(1):15-24.

Walker, T. A. 1994. Post-hatchling dispersal of sea turtles. Page 79 *in* Proceedings of the Australian Marine Turtle Conservation Workshop, Queensland Australia.

Waring, G. T., D. L. Palka, P. J. Clapham, S. Swartz, M. Rossman, T. Cole, K. D. Bisack, and L. J. Hansen. 1998. U.S. Atlantic Marine Mammal Stock Assessments. NOAA Technical Memorandum NMFS-NEFSC. Northeast Fisheries Science Center, Woods Hole, Massachusetts.

Waring, G. T., J. M. Quintal, and C. P. Fairfield, editors. 2002. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2002. NOAA Technical Memorandum NMFS-NE-169. Northeast Fisheries Science Center, Woods Hole, Massachusetts.

Wenner, E. L., G. F. Ulrich, and J. B. Wise. 1987. Exploration for the golden crab, *Geryon fenneri*, in the South Atlantic Bight: distribution, population structure, and gear assessment. Fishery Bulletin 85: 547-560.

Wheaton J. and W. C. Jaap. 1976. Survey of Breaker's Reef, Palm Beach, Florida. Marine Research Laboratory, Florida Department of Natural Resources, St. Petersburg, Florida. (Unpublished report).

Wheaton, J. L. 1987. Observations on the Octocoral fauna of southeast Florida's outer slope and fore reef zones. Caribbean Journal of Science 23:306-312.

Williams, E. H. and L. Bunkley-Williams. 1990. The world-wide 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

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