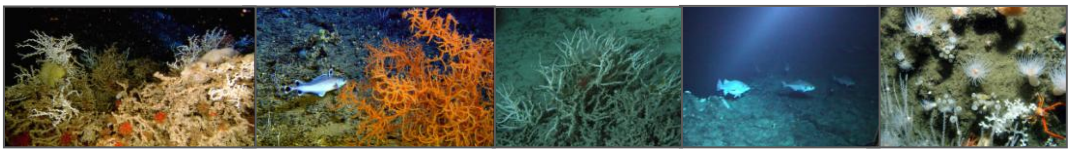
COMPREHENSIVE ECOSYSTEM-BASED AMENDMENT FOR THE SOUTH ATLANTIC REGION



AMENDMENT 6 TO THE CORAL, CORAL REEFS, AND LIVE/HARDBOTTOM HABITAT FISHERY MANAGEMENT PLAN
AMENDMENT 4 TO THE GOLDEN CRAB FISHERY MANAGEMENT PLAN
(DEEPWATER CORAL HABITAT AREAS OF PARTICULAR CONCERN)

AMENDMENT 7 TO THE CORAL, CORAL REEFS, AND LIVE/HARDBOTTOM HABITAT FISHERY MANAGEMENT PLAN
AMENDMENT 8 TO THE FISHERY MANAGEMENT PLAN FOR THE SHRIMP FISHERY OF THE SOUTH ATLANTIC REGION
AMENDMENT 18 TO THE FISHERY MANAGEMENT PLAN FOR THE COASTAL MIGRATORY PELAGICS FISHERY OF THE SOUTH ATLANTIC REGION
AMENDMENT 4 TO THE THE GOLDEN CRAB FISHERY MANAGEMENT PLAN
AMENDMENT 5 TO THE SPINY LOBSTER FISHERY OF THE SOUTH ATLANTIC REGION
AMENDMENT 1 TO THE DOLPHIN WAHOO FISHERY OF THE SOUTH ATLANTIC REGION
AMENDMENT 18 TO THE FISHERY MANAGEMENT PLAN FOR THE SNAPPER GROUPER FISHERY OF THE SOUTH ATLANTIC REGION
(ESSENTIAL FISH HABITAT)

(INCLUDING A DEIS, IRFA, RIR & SIA/FIS)

November 2008

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

National Marine Fisheries Service
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701
(727) 824-5301 / FAX (727) 824-5308

This is a publication of the South Atlantic Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Award No. NA05NMF4410004

ABBREVIATIONS AND ACRONYMS

ABC	Acceptable Biological Catch
ACCSP	Atlantic Coastal Cooperative Statistics Program
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
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 FOR THE SOUTH ATLANTIC REGION

AMENDMENT 6 TO THE CORAL, CORAL REEFS, AND LIVE/HARDBOTTOM HABITAT FISHERY MANAGEMENT PLAN, AND
AMENDMENT 4 TO THE GOLDEN CRAB FISHERY MANAGEMENT PLAN (DEEPWATER CORAL HABITAT AREAS OF PARTICULAR CONCERN)

AMENDMENT 7 TO THE CORAL, CORAL REEFS, AND LIVE/HARDBOTTOM HABITAT FISHERY MANAGEMENT PLAN
AMENDMENT 8 TO THE FISHERY MANAGEMENT PLAN FOR THE SHRIMP FISHERY OF THE SOUTH ATLANTIC REGION
AMENDMENT 18 TO THE FISHERY MANAGEMENT PLAN FOR THE COASTAL MIGRATORY PELAGICS FISHERY OF THE SOUTH ATLANTIC REGION
AMENDMENT 4 TO THE THE GOLDEN CRAB FISHERY MANAGEMENT PLAN
AMENDMENT 5 TO THE SPINY LOBSTER FISHERY OF THE SOUTH ATLANTIC REGION
AMENDMENT 1 TO THE DOLPHIN WAHOO FISHERY OF THE SOUTH ATLANTIC REGION (ESSENTIAL FISH HABITAT)
AMENDMENT 18 TO THE FISHERY MANAGEMENT PLAN FOR THE SNAPPER GROUPER FISHERY OF THE SOUTH ATLANTIC REGION

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

Proposed actions:

ACTION 1. Amend the Coral, Coral Reefs, and Live/Hardbottom Habitat FMP to establish deepwater Coral HAPCs (CHAPCs).

ACTION 2. Create a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries.

ACTION 3. Create "Allowable Golden Crab Fishing Areas" within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC and Pourtales Terrace CHAPC boundaries.

ACTION 4. Amend the Golden Crab Fishery Management Plan to Require Vessel Monitoring.

This amendment also includes presentation of spatial information for Essential Fish Habitat (EFH) and EFH-Habitat Areas of Particular Concern (EFH-HAPC) designations under the Fishery Management Plans for Coral, Coral Reefs and Live/Hardbottom Habitat; Shrimp, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Dolphin Wahoo and Snapper Grouper.

Lead agency:

FMP Amendments – South Atlantic Fishery Management Council
EIS - NOAA Fisheries Service

For Further Information Contact:

Robert K. Mahood
4055 Faber Place, Suite 201
North Charleston, SC 29405
843-571-4366
843-769-4520 (fax)
866-SAFMC-10
Robert.mahood@safmc.net

Roy E. Crabtree
NOAA Fisheries Service, Southeast Region
263 13th Avenue South
St. Petersburg, FL 33701
727-824-5301
727-824-5320 (fax)

NOI: [May 23, 2005; 70 FR 29482]
Scoping meetings held: February 28 – June 13, 2005

The Council added "Ecosystem-Based Management" as an agenda item to each of the Advisory Panel meetings in 2004 and 2005. Each Advisory Panel was asked to provide recommendations on items to be addressed in the Comprehensive Ecosystem-Based Amendment (CE-BA). Advisory Panels met as follows:

Advisory Panel	Date/Location
Mackerel	June 16, 2004 in Key West, FL
Information & Education	August 24-26, 2004 in Charleston, SC
Joint Habitat and Coral	October 25-29, 2004 in Charleston, SC
Shrimp	September 2004 in Pawley's Island, SC
Law Enforcement	November 2004
Snapper Grouper	June 13-14, 2005

Beginning with the September 2004 meeting, the Council also scheduled time during each species committee meeting and each Ecosystem-Based Management Committee meeting to give the public an opportunity to provide input.

In developing Action 1 in this CE-BA, the Council followed the designation process for Coral Habitat Areas of Particular Concern established through the Coral FMP (SAFMC 1982). The Habitat Adisory Panel began a review of background material which identified the need for additional characterization and mapping. The Coral Advisory Panel, re-structured to include the primary regional deepwater researchers, was also involved in this process. The Habitat and Coral Advisory Panels subsequently met

jointly between 2004 and 2007 and provided the Council with recommendations for CHAPC designation, regulatory provisions in this CE-BA, and future research needs.

Advisory Panel	Date/Location
Joint Habitat and Coral	October 2004 in Charleston, SC
Joint Habitat and Coral	June 2006 in Miami, FL
Rock Shrimp	May 2007 in Charleston, SC
Joint Habitat and Coral	November 2007 in Charleston, SC
Golden Crab	January 2008 in Cape Canaveral, FL
Deepwater Shrimp	January 2008 in Cape Canaveral, FL

A first round of public hearings for the Draft CE-BA was held between May 7 and May 15, 2008:

Wednesday, May 7, 2008 Key Largo Grande Resort & Beach Club (MM #97) 97000 South Overseas Highway Key Largo, FL 33037	**Tuesday, May 13, 2008** Hilton Garden Inn 5265 International Blvd. N. Charleston, SC 29418
Friday, May 9, 2008 Radisson Resort at the Port 8701 Astronaut Boulevard Cape Canaveral, FL 32920	**Thursday May 15, 2008** Sheraton New Bern 100 Middle Street New Bern, NC 28560
Monday, May 12, 2008 Mighty Eighth Air Force Museum 175 Bourne Ave. Pooler, GA 31322	

Other Advisory Panel meetings took place as follows:

Advisory Panel	Scheduled 2008 Meeting Date/Location
Golden Crab	September 2008 in Charleston, SC
Deepwater Shrimp	September 2008 in Charleston, SC
Joint Habitat and Coral	November 17-19, 2008 in Charleston, SC

A second round of public hearings for the draft CE-BA is scheduled as follow:

(1) January 26, 2009 in Charleston, SC
(2) January 27, 2009 in New Bern, NC
(3) February 3, 2009 in Key Largo, FL
(4) February 4, 2009 in Cape Canaveral, FL
(5) February 5, 2009 in Pooler, GA

This approach followed the Council's process for gathering stakeholder input and incorporating the input into the FMP/Amendment/EIS development process.

DEIS filed:	DATE TO BE FILLED IN
DEIS Comments received by:	DATE TO BE FILLED IN
FEIS filed:	DATE TO BE FILLED IN
FEIS Comments received by:	DATE TO BE FILLED IN

ABSTRACT

This Comprehensive Ecosystem-Based Amendment (CE-BA) consists of regulatory actions that focus on deepwater coral ecosystem conservation and non-regulatory actions that update existing EFH information.

Management actions proposed in the CE-BA include the establishment of deepwater Coral HAPCs (CHAPCs) to protect what is currently thought to be the largest contiguous distribution (>23,000 square miles) of pristine deepwater coral ecosystems in the world. Actions in the amendment will allow for the creation of allowable fishing zones within the CHAPCs in the historical fishing grounds of the golden crab and deepwater shrimp fisheries. The CE-BA will also update and expand upon information relative to essential fish habitat (EFH) in the SAFMC Habitat Plan (SAFMC 1998).

Actions in this Comprehensive Ecosystem-based Amendment will:

- Amend the Coral Coral Reefs, and Live/Hardbottom Habitat FMP (Coral FMP) to establish Deepwater Coral Habitat Areas of Particular Concern (CHAPCs).

- Create a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries.

- Create "Allowable Golden Crab Fishing Areas" within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC and Pourtales Terrace CHAPC boundaries.

- Amend the Golden Crab FMP to require vessel monitoring.

- Amend various FMPs to present spatial information of Council-designated Essential Fish Habitat and Essential Fish Habitat Areas of Particular Concern.

The Draft Environmental Impact Statement (DEIS) analyzes the effects of implementing the proposed actions listed above. Comments on the DEIS will be accepted for 45 days from publication of the Notice of Availability (NOA) in the Federal Register.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

TABLE OF CONTENTS
FOR THE ENVIRONMENTAL IMPACT STATEMENT

Summary

Purpose and Need

This Comprehensive Ecosystem-based Amendment (CE-BA) consists of regulatory actions that focus on deepwater coral ecosystem conservation and non-regulatory actions that update existing EFH information.

Management actions proposed in the CE-BA include the establishment of deepwater Coral HAPCs (CHAPCs) to protect what is currently thought to be the largest contiguous distribution (>23,000 square miles) of pristine deepwater coral ecosystems in the world. Actions in the amendment will allow for the creation of allowable fishing zones within the CHAPCs in the historical fishing grounds of the golden crab and deepwater shrimp fisheries. The CE-BA will also update and expand information on essential fish habitat (EFH) in the SAFMC Habitat Plan (SAFMC 1998a). Information includes spatial presentation of EFH for the Coral, Coral Reefs, and Live/Hardbottom Habitat FMP; Shrimp FMP; Coastal Migratory Pelagics FMP; Golden Crab FMP; Spiny Lobster FMP; Dolphin Wahoo FMP; and Snapper Grouper FMP.

Alternatives Being Considered

Action 1. Amend the Coral, Coral Reefs, and Live/Hardbottom Habitat FMP to establish Deepwater Coral Habitat Areas of Particular Concern (CHAPCs).

Alternative 1. No action. Do not establish deepwater CHAPCs.

Alternative 2. Establish deepwater CHAPCs in one or more of the areas described in sub-alternatives 2a-2e:

Sub-alternative 2a. Establish the Cape Lookout Lophelia Banks CHAPC.

The proposed Cape Lookout Lophelia CHAPC encompasses two areas described by Dr. S. Ross in the report to the Council presented in **Appendix B**. This area was originally proposed by the Habitat and Coral Advisory Panels for CHAPC designation in 2004, reviewed and reaffirmed in June 2006 and November 2007. The northernmost area contains the most extensive deepwater coral mounds found off North Carolina. The main mound system rises vertically nearly 80 meters over a distance of about one kilometer. Sides and tops of these mounds are covered with extensive *Lophelia pertusa*. The second area contains mounds that rise at least 53 meters over a distance of about 0.4 kilometers. They appear to be of the same general construction as the northern Bank, built of coral rubble matrix with trapped sediments. Extensive fields of coral rubble surround the area. Both living and dead corals are common on this bank, with some living bushes being quite large. Over 54 fish species have been observed along the banks encompassed by this proposed CHAPC. In addition, these areas support a well-developed invertebrate fauna.

Sub-alternative 2b. Establish the Cape Fear Lophelia Banks CHAPC.

The proposed Cape Fear Lophelia CHAPC was also originally proposed by the Habitat and Coral Advisory Panels for CHAPC designation in 2004, reviewed and reaffirmed in June 2006 and November 2007. The mounds encompassed within this proposed CHAPC rise nearly 80 meters over a distance of about 0.4 kilometers and exhibit some of the most rugged habitat and vertical excursion of any area sampled. The mounds appear to be of the same general construction as the Cape Lookout Banks described above with extensive fields of coral rubble surrounding the area. Both living and dead corals are common on this bank and over 12 fish species have been observed, including the greatest numbers of large fishes off North Carolina. In addition, this area supports a well-developed invertebrate fauna and is the only area off North Carolina where wreckfish (*Polyprion americanus*) have been observed.

Sub-alternative 2c. Establish the Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC.

The proposed Stetson Reef/Savannah and East Florida Lithoherms/Miami Terrace CHAPC (Stetson-Miami Terrace CHAPC) is the largest of the five proposed deepwater CHAPCs. It encompasses three of the former proposed CHAPCs off the coasts of South Carolina, Georgia and East Florida to the Miami Terrace off Biscayne Bay. The proposed CHAPC is bound on its western side by the 400-meter depth contour. Off the Miami Terrace, however, the CHAPC's western boundary is the 300-meter depth contour. Following are descriptions of the main areas encompassed by this proposed CHAPC.

The Stetson Reef is characterized by hundreds of pinnacles along the eastern Blake Plateau offshore South Carolina. Over 200 coral mounds occur over this area. This area supports a 152 meter-tall pinnacle in 822 meters of water where recent submersible dives discovered live bushes of *Lophelia* coral, sponges, gorgonians, and black coral bushes. One of the tallest *Lophelia* coral lithoherms known to date is found in this area. The Savannah and East Florida Lithoherms are characterized by numerous lithoherms at depths of 550 meters with relief up to 60 meters that provide live-bottom habitat. Submersible dives found that these features provided habitat for large populations of massive sponges and gorgonians in addition to smaller macroinvertebrates which have not been studied in detail. Some ridges exhibit nearly 100% coverage of sponges.

Although few large fish have been observed at the Savannah and East Florida Lithoherms site, a swordfish, several sharks, and numerous blackbelly rosefish were noted. Further south, echosounder transects along a 222-kilometer stretch off northeastern and central Florida (depth 700-800 meters) mapped nearly 300 coral mounds from 8 to 168 meters tall. The Miami Terrace and Escarpment is a Miocene-age terrace off southeast Florida that supports high relief hardbottom habitats and rich benthic communities in 300-600 meter depths. Dense aggregations of 50 to 100 wreckfish have been 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.

Sub-alternative 2d. Establish the Pourtales Terrace CHAPC.

Like the Miami Terrace, the Pourtales Terrace is a Miocene-age terrace. Located off the Florida Reef Tract, the terrace provides 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 sinkholes known. A total of 26 fish taxa have been identified from the sinkhole and bioherm sites. Observed species include tilefish, sharks, speckled hind, yellowedge grouper, Warsaw grouper, snowy grouper, blackbelly rosefish, red porgy, drum, scorpion fish, amberjack and phycid hakes.

Sub-alternative 2e. Establish the Blake Ridge Diapir Methane Seep CHAPC.

The proposed Blake Ridge Diapir CHAPC is located between 800 and 1000 meters deep. Methane gas hydrates formed below a rock overhang at the sea floor on the Blake Ridge diapir. Images, taken from the DSV *Alvin* during the NOAA-sponsored Deep East cruise in 2001, marked the first discovery of a gas hydrate on the sea floor in this area. Methane bubbling out of the sea floor below the overhang quickly "freezes," forming a downward hanging hydrate deposit, dubbed the "inverted snowcone." Vertically-oriented features above the center of the diapir are faults that provide conduits for methane and other chemicals to reach the sea floor, where they can be used to sustain chemosynthetic communities.

Action 2. Create a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries.

Alternative 1. No Action. Do not create a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries.

Preferred Alternative 2. Create a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries where fishing with a shrimp trawl and/or shrimp possession is allowed by any vessel holding a rock shrimp limited access endorsement and equipped with an approved vessel monitoring system (VMS).

Alternative 3. Move the west boundary of the proposed CHAPC 6 nautical miles to the east between the following points: (a) 30 degrees 16 minutes 35.354 seconds N and (b) 26 degrees 12 minutes 56.273 seconds N.

Action 3. Create "Allowable Golden Crab Fishing Areas" within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC and Pourtales Terrace CHAPC boundaries.

Alternative 1. No Action. Do not create "Allowable Golden Crab Fishing Areas" within the proposed deepwater CHAPC boundaries.

Preferred Alternative 2. Create "Allowable Golden Crab Fishing Areas" in one or more areas as described in sub-alternatives 2a-2c:

Sub-alternative 2a. Create an "Allowable Golden Crab Fishing Area" in the Northern Golden Crab Fishing Zone -- within the proposed Stetson-Miami Terrace CHAPC boundaries;

Sub-alternative 2b. Create an "Allowable Golden Crab Fishing Area" in the Middle Golden Crab Fishing Zone -- within the proposed Stetson-Miami Terrace CHAPC boundaries;

Sub-alternative 2c. Create an "Allowable Golden Crab Fishing Area" in the Southern Golden Crab Fishing Zone -- within the proposed Pourtales Terrace CHAPC boundaries.

Alternative 3. Move the western boundary of the proposed Northern and Middle Zone Allowable Golden Crab Fishing Areas west to include the proposed Shrimp Fishery Access Area.

Action 4: Amend the Golden Crab FMP to Require Vessel Monitoring.

Alternative 1. No action. Do not require use of an approved vessel monitoring system (VMS) by any vessel with a limited access golden crab permit.

Alternative 2. Require use of an approved vessel monitoring system (VMS) by any vessel with a limited access golden crab permit and approved crustacean traps fishing for golden crab within designated areas in the Stetson-Miami Terrace CHAPC and Pourtales Terrace CHAPC where fishing has occurred historically and does not impact deepwater coral habitats.

Alternative 3. Require use of an approved vessel monitoring system (VMS) by any vessel fishing with a limited access golden crab permit in the South Atlantic Council's area of jurisdiction.

Affected Environment

The immediate impact area would be the federal 200-mile limit of the Atlantic off the coasts of North Carolina, South Carolina, Georgia, and east Florida to Key West.

The biological environment is described in **Section 3.0**. A description of the human environment is provided in **Section 3.6**. **Section 4.5** provides a description and links to spatial representations of the essential fish habitat for all SAFMC managed species.

Environmental Consequences

Action 1: Amend the Coral, Coral Reefs, and Live/Hardbottom Habitat FMP to Establish Deepwater Coral HAPCs

Biological Effects

Alternative 1 (No action) would not protect any of the deepwater coral habitat identified. This would result in negative biological impacts to this habitat as fisheries could potentially begin to exploit these areas. This could also result in negative impacts to commercially important species that rely on these areas/habitats as EFH and EFH-HAPCs. Currently, the only fisheries with potentially bottom-damaging gear that operate in the proposed CHAPCs are the wreckfish, golden crab and royal red shrimp fisheries.

Damage inflicted by bottom tending gear, anchors, chains and grapples is not limited to living coral and hardbottom resources but extends to disruption of the balanced and highly productive nature of the coral and live/hardbottom ecosystems. Under **Alternative 1 (No action),** bottom tending gears, anchors, chains and grapples deployed by fishing vessels would degrade the functional characteristics of these complex deepwater coral ecosystems. This alternative would provide no additional protection for **24,215 square miles** of these complex deepwater ecosystems and would result in negative biological effects on deepwater coral habitats and the species that utilize this habitat.

Under **Alternative 2,** the Council could select *one or more* of the proposed sub-alternatives. The area that would be protected under each of these sub-alternatives is shown in **Table 4-1**. A spatial presentation of sub-alternatives 2a-2e is in **Figure 1**.

Protecting one or all of these areas would provide positive biological benefits to the deepwater corals and to the species that rely on these areas for EFH and EFH-HAPC. Given the slow-growth of these deepwater corals, any impacts would be expected to result in long-term biological losses of deepwater coral habitat as well as the species that utilize this habitat. **Sub-alternatives 2a** and **2b** encompass practically the entire known deepwater coral habitat off the coast of North Carolina. Protection of the Miami Terrace habitat under **sub-alternative 2c** would protect recently verified areas of wreckfish aggregation and spawning habitat. The wreckfish fishery is not expected to affect deepwater coral habitat proposed for protection under **sub-alternatives 2a -2c (**data show no landings occurring south of proposed **sub-alternative 2c**). Wreckfish are harvested using a 30-50 pound sinker, cable and terminal rig while motor fishing (SAFMC 1991). However, it is unknown if this harvest technique has any impacts on bottom habitat. Submersible dive observations have shown wreckfish associated with coral mounds (comprised mostly of dead corals) and hardbottom habitat with individual clumps of bamboo coral and small *Lophelia* colonies (G. Sedberry, personal communication). It is the Council's intent to assess whether gear impacts from the wreckfish fishery are likely

to jeopardize the integrity of deepwater coral habitat in the South Atlantic region in a future plan amendment. The conservation of the Pourtales Terrace under **sub-alternative 2d** would not only be important to benthic species but would also serve pelagic species that use the high-profile habitats and dynamic currents for navigation, feeding and migration. **Sub-alternative 2e**, the Blake Ridge Diapir Methane Seep CHAPC, includes a unique benthic habitat inhabited by chemosynthetic organisms. This proposed CHAPC is 800-1000 m deep and is unlikely to be subject to any fishing operations that would impact the bottom habitat.

Economic Effects

Alternative 1 (No action) could result in long-term negative economic impacts to commercial fisheries from the potential loss of habitat for commercial species due to lack of protection of deepwater coral habitat. However, it would provide short-term economic benefits by allowing fishing to continue in these areas without change from current fishing effort levels. The various sub-alternatives under **Alternative 2** would have negative short-term impacts on the golden crab fishery and the royal red shrimp fishery. The royal red shrimp fishery is expected to experience small negative economic and social impacts from establishment of **sub-alternative 2c**. However, the royal red shrimp fishery operates almost exclusively inshore of the 400 meter contour, which is the western boundary of the deepwater habitat being proposed for protection under **sub-alternative 2c** (Stetson-Miami Terrace CHAPC). Analysis of VMS data indicate that only 1% of the royal red shrimp landings potentially originate from waters inside the proposed Stetson-Miami Terrace CHAPC. Using the annual total average of royal red shrimp landings for the 2005-2007 (267,000 pounds) and average ex-vessel price per pound ($3.25) it is estimated that economic losses to the fishery could result in $8,678 annually. However, these impacts can be offset by establishing a "Shrimp Fishery Access Area" within the Stetson-Miami Terrace CHAPC as proposed under **Action 2.**

The golden crab fishery is expected to experience substantial negative economic and social impacts as a result of implementation of two of the proposed CHAPCs. The golden crab fishery operates in the proposed Stetson-Miami Terrace CHAPC (**sub-alternative 2c**) and in a small portion of the proposed Pourtales Terrace CHAPC (**sub-alternative 2d**). In the long-term, establishment of these CHAPCs would benefit fishermen if the species' populations expanded beyond the boundaries of the CHAPCs and fishermen were able to fish these areas. However, the Stetson-Miami Terrace and Pourtales Terrace CHAPCs encompass almost all of the traditional fishing grounds for golden crab. As a result, in the short-term, golden crab fishermen would experience significant negative economic impacts from establishment of these CHAPCs because they would no longer be able to fish on their traditional fishing grounds. However, these impacts can be offset by establishing "Allowable Golden Crab Fihsing Areas" within the proposed Stetson-Miami Terrace CHAPC and Pourtales Terrace CHAPC as proposed under **Action 3.** A spatial presentation of the proposed "Allowable Golden Crab Fishing Areas" is in **Figures 1a, 1b, 1c and 1d.**

The wreckfish fishery is not expected to be impacted by the prohibition of the fishing methods and gears proposed under **Alternative 2**. Bottom longline gear is prohibited in this fishery.

One of the proposed Type 2 Marine Protected Areas (MPAs) identified in Snapper Grouper Amendment 14 (SAFMC 2007), East Hump/Un-named Hump MPA, is located within **sub-alternative 2d**, the proposed Pourtales Terrace CHAPC. Establishment of a CHAPC via this amendment restricts the use of bottom-tending gear as well as anchoring; however, these rules do not restrict the use of hook-and-line gear commonly used by snapper grouper fishermen. Therefore, while negative impacts may result from implementation of a Type 2 MPA via Amendment 14 for part of the area in **sub-alternative 2d**, only small negative impacts, due to the restriction on anchoring, are expected on snapper grouper fishermen as a result.

With regard to recreational fisheries, impacts would be minimal. Establishing the CHAPCs and prohibiting anchoring of fishing vessels within them would have only a small negative economic impact on recreational fisheries. The anchoring prohibition would not impact fishing activities for the fisheries that do not anchor (e.g., troll fishery for billfish, dolphin, wahoo, tuna etc.).

Social Effects
The expected significant negative social impacts on the golden crab fishery from implementation of **sub-alternatives 2c** and **2d** can be offset with establishment of "Allowable Golden Crab Fishing Areas" within the proposed CHAPCs under **Action 3**. If offsetting action is not undertaken, however, and CHAPCs are established as proposed under **Alternative 2** of **Action 1**, the golden crab fishery would cease to exist. The social impacts on the families involved in the golden crab fishery would be significant since it may not be possible for golden crab vessels to be converted from crab fishing to fishing for other species. As a result, the financial stress and other problems that result from financial stress and unemployment would ensue.

Action 2. Create a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries.

Biological Effects
Alternative 1 (No action) would not create a "Shrimp Fishery Access Area" within the proposed Stetson-Miami Terrace proposed CHAPC boundaries. The biological impacts of this alternative would be positive in that it would prohibit permitted rock shrimp fishermen from targeting royal red shrimp found in proximity of deepwater habitats proposed for CHAPC designation. This would result in reduced fishing pressure on the royal red shrimp population in the vicinity of this CHAPC. Not creating a SFAA is expected to result in small negative economic impacts for the shrimp fishery since, according to VMS data; only 1% of the effort in the royal red shrimp fishery takes place within the boundaries of the proposed CHAPC. **Preferred Alternative 2** would have positive biological effects through limiting the fishery to traditional grounds and ensuring

no expansion into know low-relief and high-relief deepwater habitat in the proposed Stetson-Miami Terrace CHAPC. **Alternative 3** moves the west boundary of the proposed CHAPC 6 nm to the east. This alternative would not protect vulnerable deepwater coral habitats because it would exclude significant known and highly probable low- and high-relief deepwater coral habitats and would allow the fishery to expand into non-traditional fishing grounds. A spatial presentation of **Preferred Alternative 2** is shown in **Figures 1a, 1b, 1c** and **1d**.

Economic Effects

Alternative 1 (No action) is expected to result in small negative economic impacts for the shrimp fishery. Rock shrimp fishermen in the South Atlantic region also target royal red shrimp. However, the SAFMC does not currently manage royal red shrimp. Since, according to VMS data, only 1% of the effort in the royal red shrimp fishery takes place within the boundaries of the proposed CHAPC, impacts are expected to be minimal. **Preferred Alternative 2** would be expected to produce the most beneficial direct effects on the socio-economic environment by providing for traditional fishing operations. **Alternative 3** would potentially create gear conflict by allowing shrimp trawling within the major golden crab fishing area in the Middle Zone. While this area is not a traditional fishing ground for the royal red shrimp fishery and may not result in trawling in these areas, it would benefit the shrimp fishery in that vessels could drift (i.e. during an emergency or mechanical failure) without entering the proposed CHAPC. If this area is not harvested, there are no expected economic impacts to the shrimp fleet. However, there is the potential for this area to provide new fishing opportunities for the shrimp fleet which would have positive economic impacts.

Social Effects

Establishing SFAA under **Preferred Alternative 2** would essentially eliminate any small negative economic impacts on the fishery that might occur under **Alternative 1 (No action)** thus resulting in small positive social benefits for the shrimp fishery compared to **Alternative 1 (No action)**. **Alternative 3** might provide new fishing areas for the fishery to exploit which would result in positive economic and social effects. However, **Alternative 3** could potentially result in gear conflict between the shrimp fishery and the golden crab fishery. Gear conflict would result in negative social effects to both the shrimp fishermen and the golden crab fishermen.

Action 3: Create "Allowable Golden Crab Fishing Areas" within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC and Pourtales Terrace CHAPC boundaries.

Biological Effects

Under **Alternative 1 (No action)** all impacts from golden crab fishing gear would be eliminated, resulting in significantly beneficial biological effects to deepwater coral habitats. This alternative would also offer positive biological impacts to the golden crab resource as the fishery for this resource would not be allowed to occur in historically significant fishing areas.

Each of the sub-alternatives under **Preferred Alternative 2** will restrict the golden crab fishery to its traditional grounds. These sub-alternatives would have minimal impact on deepwater coral as golden crab fishermen do not intentionally set their gear on or intentionally impact the deepwater coral. However, golden crab fishermen have indicated that they do attempt to set their gear in close proximity to the deepwater coral habitats. While the fishermen are careful not to intentionally impact the bottom, there are instances when gear may land on top of deepwater coral thickets. Creation of "Allowable Golden Crab Fishing Areas" is expected to have negative impacts on the golden crab resource as harvest will not be restricted. A spatial presentation of **Preferred Sub-alternatives 2a-2c** is shown in **Figures 1a, 1b, 1c** and **1d**.

Economic Effects

Alternative 1 (No action) would result in significant negative economic impacts to the golden crab fishery and the fishing communities that depend on income generated by golden crab landings compared to **Alternatives 2 and 3**, assuming the establishment of the Stetson-Miami Terrace CHAPC (**sub-alternative 2c**) in **Action 1**. Logbook data indicate that the fishery caught 510,000 pounds of golden crab on average over the period 2005-2007. If all three proposed "Allowable Golden Crab Fishing Areas" (**Sub-Alternatives 2a, 2b,** and **2c**) are not established, the fishery, consisting of 7 commercial golden crab vessels, would likely lose almost all of these landings estimated at approximately $714,000 ex-vessel value annually. **Alternative 3** proposes to move the western boundary of the proposed Northern and Middle Zone "Allowable Golden Crab Fishing Areas" west to include the proposed "Shrimp Fishery Access Area". This alternative could potentially create gear conflicts between the shrimp fishery and the golden crab fishery, resulting in negative economic and social impacts to both fisheries. Assuming CHAPCs are implemented as proposed under **Action 1**, the implementation of **Alternative 3** would provide a potential economic benefit as it provides the golden crab vessels with additional areas to explore in the future.

Social Effects

Under **Alternative 1 (No action)**, five to seven vessels would likely have to be sold or be refitted for participation in another fishery. Under this alternative it is possible that the golden crab fishery will cease to exist. The social impacts on the families involved in the golden crab fishery will be significant since it may not be possible for golden crab vessels to be converted from crab fishing to fishing for other species. As a result, the financial stress, unemployment and other problems resulting from these would ensue. Establishment of **sub-alternative 2b** would have the greatest positive social impacts because this is the area yielding the greatest golden crab harvest.

Action 4: Amend the Golden Crab FMP to require vessel monitoring.

Biological Effects

Alternative 1 (No action) would not require a Vessel Monitoring System (VMS) on golden crab vessels fishing within the CHAPCs. Without requiring VMS, vessels could potentially fish in areas where gear would be likely to impact deepwater coral habitat. However, VMS will not provide information on whether the gear is impacting the bottom

habitat. It has been determined that the use of VMS alone is not a useful enforcement tool for this fishery and will not have any positive or negative biological effects on the deepwater coral resource. Habitat damage could occur outside the proposed Allowable Golden Crab Fishing Areas and on extensive habitat in the CHAPCs proposed for conservation. However, the use of VMS will not prevent this damage from occurring nor will it provide evidence of such offenses.

Under **Alternative 2** monitoring of permitted golden crab vessels in the Allowable Golden Crab Fishing Areas with VMS will allow law enforcement to determine where the vessels are in relation to the CHAPCs but will not provide information to determine where the fishing *gear* is in relation to the CHAPCs. The use of VMS will not have a direct impact (either positive or negative) on the deepwater coral resource as it will not prevent fishermen from deploying gear on the deepwater coral. **Alternative 3** would require the use of an approved VMS by any vessel fishing with a limited access golden crab permit in the South Atlantic Council's area of jurisdiction. With all vessels monitored, law enforcement will be able to determine where the vessels are in relation to the CHAPCs but will not be able to determine where the fishing gear is in relation to the CHAPCs. Similar to the previous alternatives, **Alternative 3** will not have a direct impact (either positive or negative) on the deepwater coral resource as it will not prevent fishermen from deploying gear on the deepwater coral.

Economic Effects

Assuming that CHAPCs under **Action 1** and Allowable Golden Crab Fishing Areas under **Action 3** are approved, **Alternative 1 (No action)** would have no expected economic impact to golden crab fishermen. Failure of this alternative to effectively deter fishing outside the Allowable Golden Crab Fishing Areas may result in damage to corals and habitat that could in turn bring about negative long-term economic impact to fishermen and the general public. The negative long-term economic impact would result from destruction of species that provide known and yet unknown value to the health of the ecosystem and various sectors of the economy including the medical sector. Negative long-term economic impacts could also result from a decrease in existence value, bequest value, and the value from diversity of corals or other habitat if damaged. However, the probability that fishing will occur outside the Allowable Golden Crab Fishing Areas may be low given that the Allowable Golden Crab Fishing Areas encompass almost all traditional fishing grounds. By contrast, **Alternative 2** would result in increased costs to golden crab fishermen that fish in these areas unless government funding was used to subsidize the costs of VMS unit purchase. Some fishermen may consider the requirement of a VMS to be an intrusion on their privacy and their autonomy as an independent fisherman.

If government funds were made available to cover the costs of VMS units, there would still be ongoing costs associated with maintenance and operation of the VMS units. The proposed Stetson-Miami Terrace CHAPC and the Pourtales Terrace CHAPC encompass almost all of the traditional fishing grounds of the golden crab fishery. There are eleven currently active permits in the golden crab fishery. Of these, seven permits have landed at least 1,000 pounds of golden crab sometime between 2005 and 2007. Therefore, if

those permitted vessels remained active and continued to fish, seven vessels would require installation and continued operation of VMS units under **Alternative 2.** Detailed cost estimates of implementing this alternative are provided in **Section 4.4.2.**

Assuming that CHAPCs and Allowable Golden Crab Fishing Areas are approved under **Actions 1 and 3, Alternative 3** would result in increased costs to all golden crab fishermen unless government funding was used to subsidize those costs. Under **Alternative 3**, all eleven permitted golden crab vessels would be required to install VMS units on their vessels to remain active even if they did not fish in the areas where CHAPCs are located. Detailed cost estimates of implementing this alternative are provided in **Section 4.4.2.**

Social Effects

Assuming that CHAPCs and Allowable Golden Crab Fishing Areas are approved under **Actions 1 and 3**, respectively, **Alternative 1 (No action)** would have no expected social impacts to golden crab fishermen. Assuming that CHAPCs and Allowable Golden Crab Fishing Areas are approved, **Alternative 2** would result in increased costs to golden crab fishermen that fish in these areas unless government funding was used to subsidize those costs. Any increase in costs of fishery operations places increased stress on fishermen and their families. Seven vessels have participated in the fishery between 2005 and 2007. In addition to the emotional stress associated with increased costs, it is expected that fishermen will have negative emotions associated with "being watched" via VMS monitoring. While many fishermen favor increased enforcement, for some VMS monitoring will increase their distrust towards fisheries managers since VMS regulations are considered when there are concerns regarding compliance. VMS has been determined to be an ineffective enforcement tool for this fishery and making it a requirement may undermine the usefulness of this tool in other fisheries. However, VMS would have positive social benefits including improved data collection by fishermen for personal use and improved communications between fishermen and the outside world.

Alternative 3 would have the same results as **Alternative 2** but include four additional vessels with active permits. However, these four permits have not been fished for at least 3 years and therefore the permit owners may opt to let their permits expire rather than comply with the costly and ineffective VMS requirements.

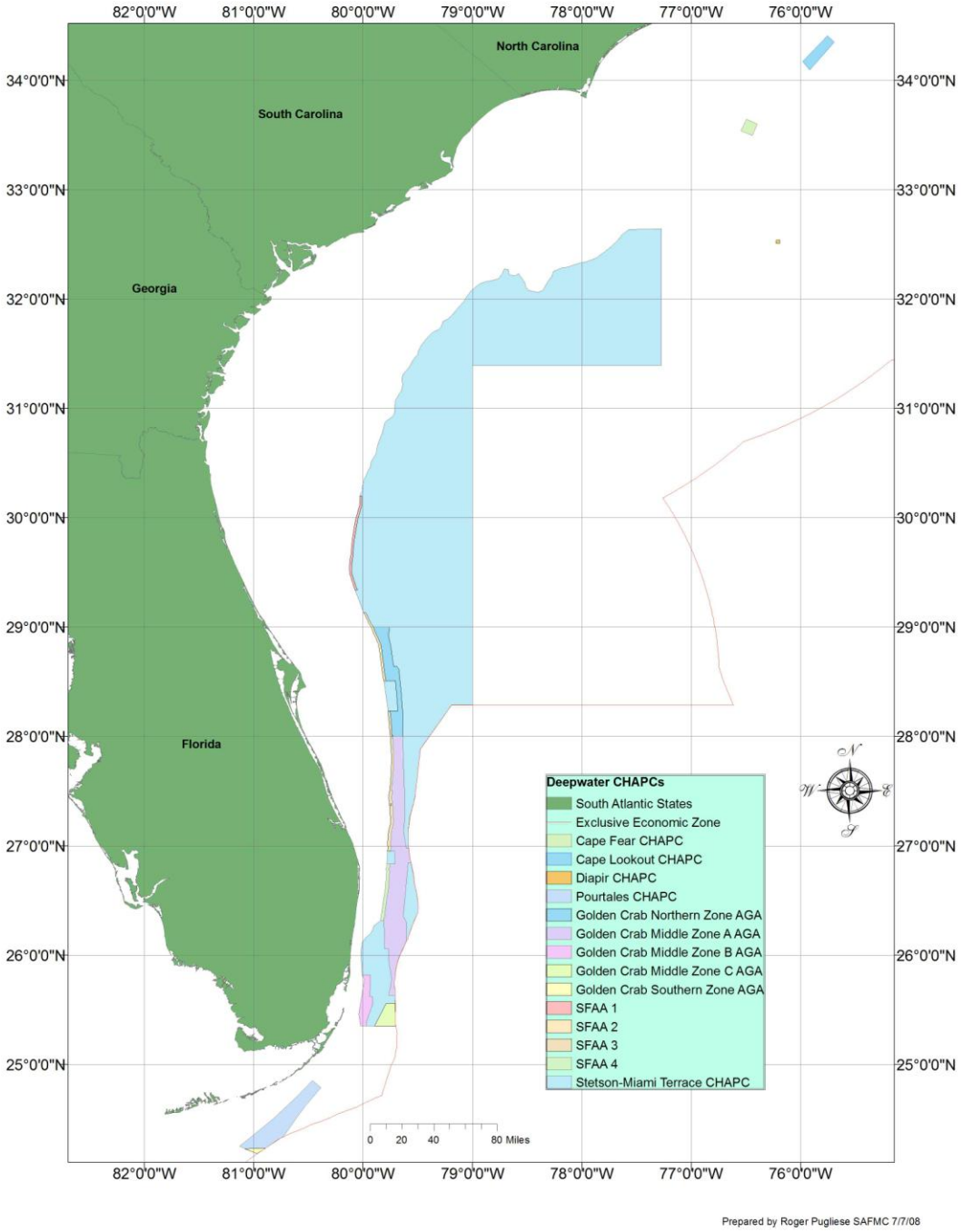


Figure 1a. Proposed Deepwater Coral Habitat Areas of Particular Concern, "Allowable Golden Crab Fishing Areas", and "Shrimp Fishery Access Area".

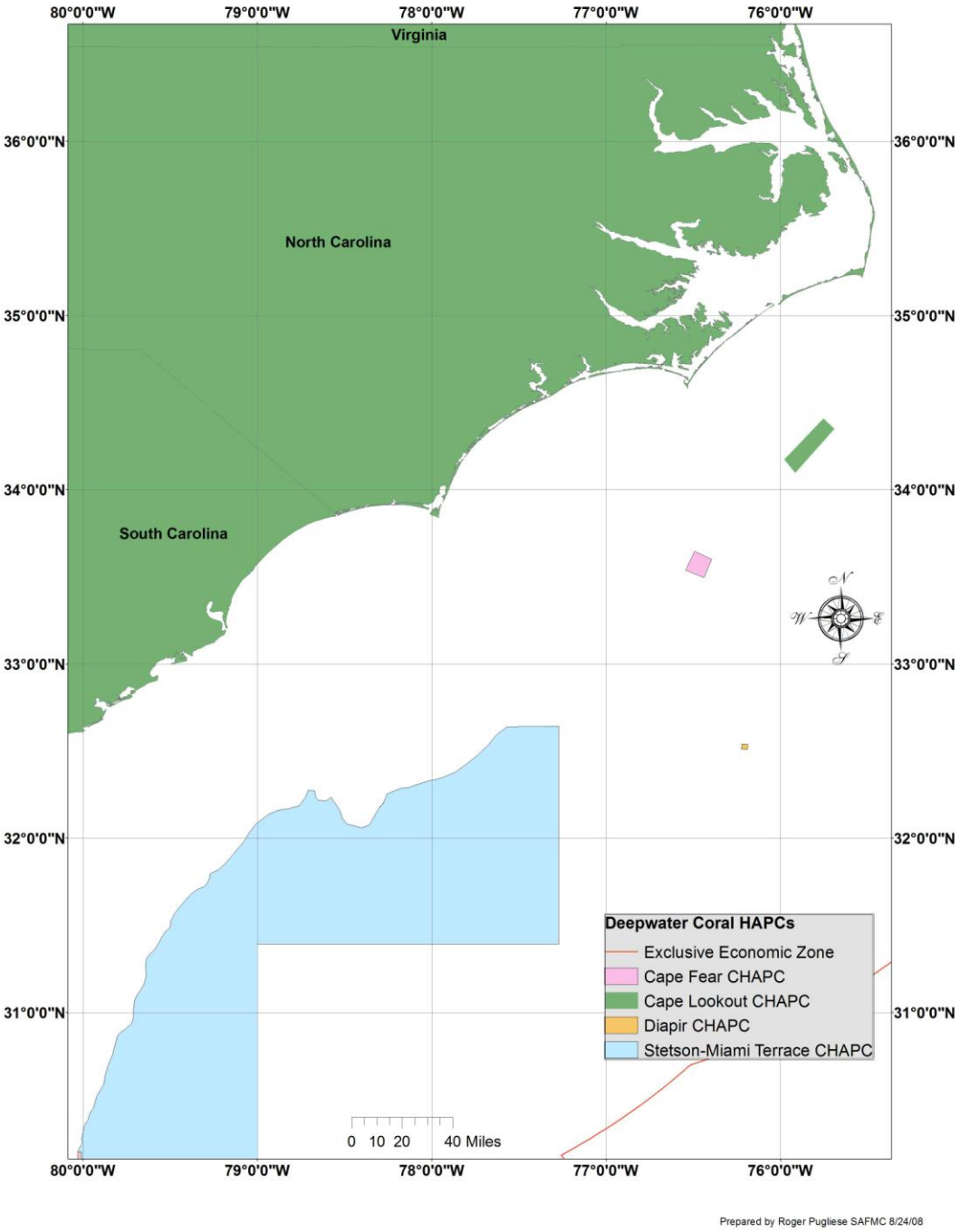


Figure 1b. Proposed Deepwater Coral Habitat Areas of Particular Concern, "Allowable Golden Crab Fishing Areas", and "Shrimp Fishery Access Area" (North of 30° N).

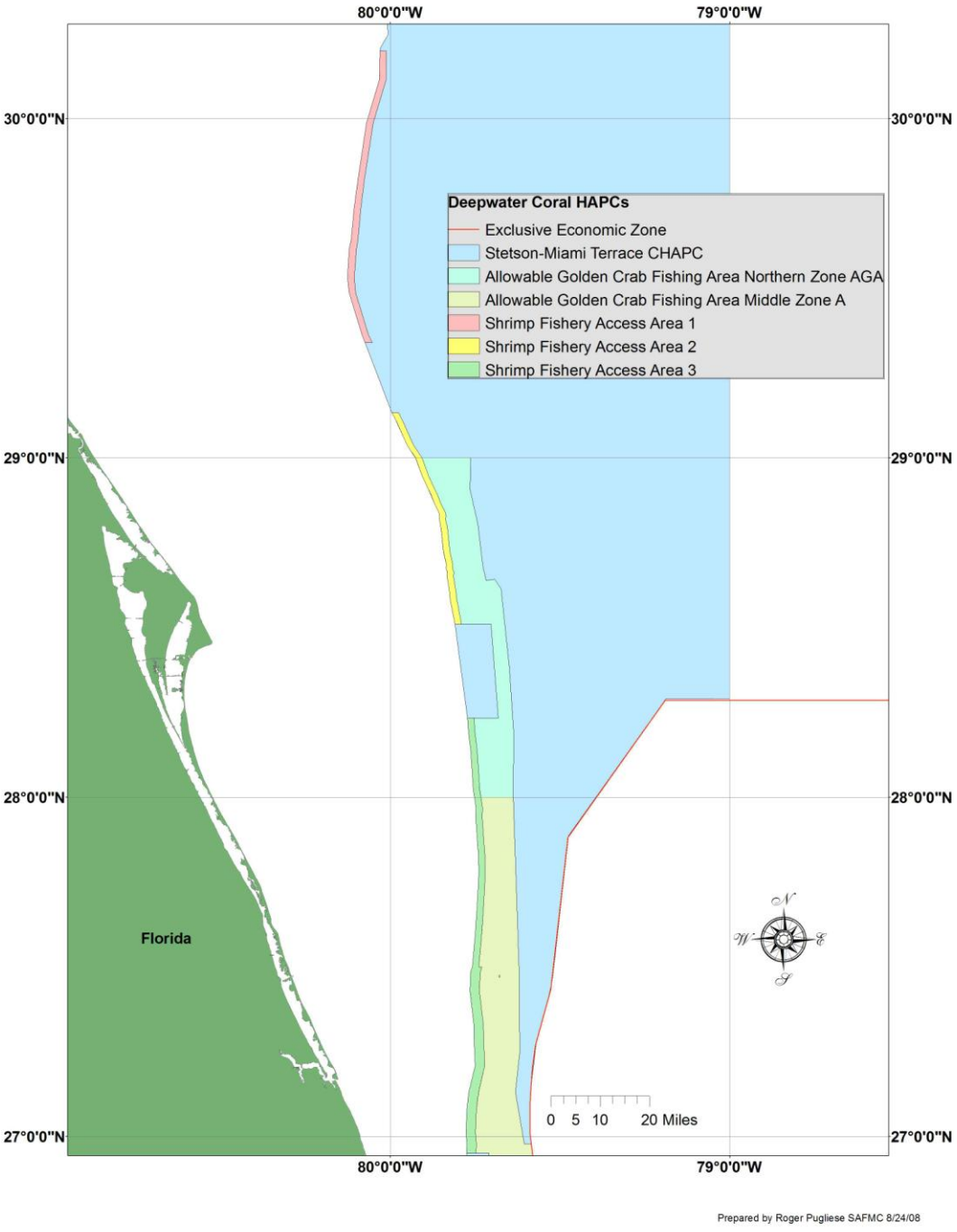


Figure 1c. Proposed Deepwater Coral Habitat Areas of Particular Concern, "Allowable Golden Crab Fishing Areas", and "Shrimp Fishery Access Areas" (North of 27° N).

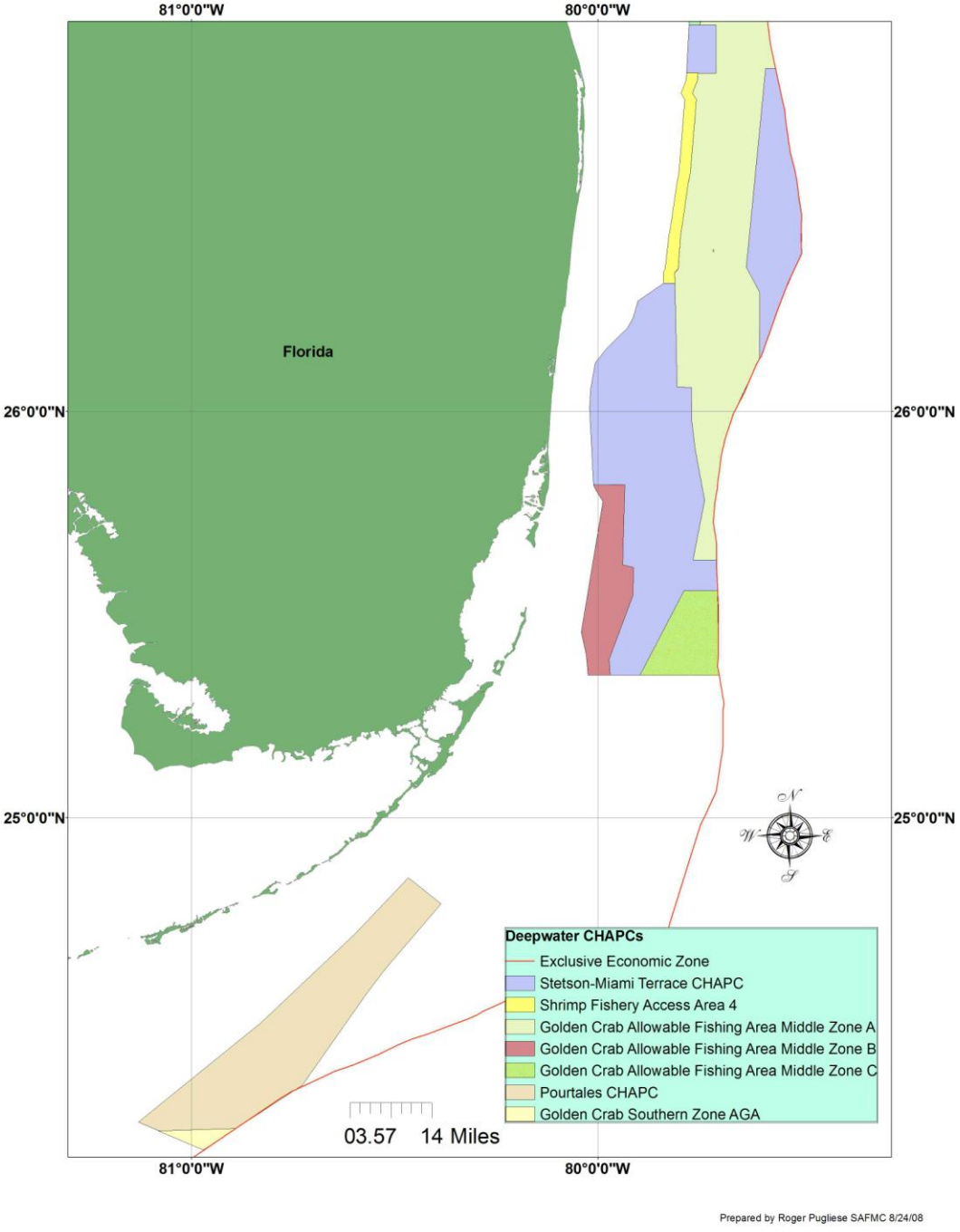


Figure 1d. Proposed Deepwater Coral Habitat Areas of Particular Concern, "Allowable Golden Crab Fishing Areas", and "Shrimp Fishery Access Area" (South of 27° N).

1 Introduction

1.1 Purpose and Need

This Comprehensive Ecosystem-based Amendment (CE-BA) consists of four regulatory actions that focus on deepwater coral ecosystem conservation and seven non-regulatory actions that update existing Essential Fish Habitat (EFH) information.

Management actions proposed in the CE-BA include the establishment of deepwater Coral Habitat Areas of Particular Concern (CHAPCs) to protect what is currently thought to be the largest contiguous distribution (>23,000 square miles) of deepwater coral ecosystems in the world. Actions in the amendment will allow for the creation of allowable fishing zones within the CHAPCs in the historical fishing grounds of the golden crab and deepwater shrimp fisheries. The CE-BA will also address the need for spatial representations of designated EFH and EFH-HAPCs included in the SAFMC's Comprehensive EFH Amendment (SAFMC 1998b). Thus, this CE-BA amends the following FMPs to include such spatial information: Coral, Coral Reefs, and Live/Hard Bottom Habitat (Coral FMP); Coastal Migratory Pelagics; Shrimp; Golden Crab; Spiny Lobster; Dolphin Wahoo; and Snapper Grouper.

This CE-BA will amend the Coral FMP and the Golden Crab FMP and proposes the following regulatory actions:

- Amend the Coral FMP to establish Deepwater Coral Habitat Areas of Particular Concern. The document analyzes various areas in which to establish the CHAPCs;

- Create Shrimp Fishery Access Areas within the Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries to allow the shrimp fishery to continue to operate in historical areas without impacting deepwater coral;

- Create "Allowable Golden Crab Fishing Areas" within the Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC and Pourtales Terrace CHAPC boundaries in areas that will not impact deepwater coral; and

- Amend the Golden Crab FMP to require vessel monitoring.

Creation of Deepwater Coral HAPCs

In the South Atlantic region, deepwater coral ecosystems are deepwater coral, coral reefs, and live/hardbottom habitat in waters extending from 400 m to the seaward boundary of the EEZ. Azooxanthellate cnidarians include branching stony corals (Scleractinia), gorgonians and soft corals (Octocorallia), black corals (Antipatharia), and lace corals (Stylasteridae).

These deepwater coral ecosystems include the constructional habitats generated chiefly by colonial scleractinians as well as the non-constructional "gardens" dominated chiefly by other anthozoans and sponges. Deepwater coral ecosystems are common within the Exclusive Economic Zone (EEZ) off the southeastern U.S. and include a variety of high-relief, hardbottom habitats at numerous sites from the Blake Plateau off North Carolina, southward through the Straits of Florida to the eastern Gulf of Mexico. Despite a series of exploratory expeditions during the last decade, only a few deepwater coral ecosystems in this region have been mapped in detail, observed directly or have had their benthic and fish assemblages examined. The limited number of direct observations via submersible or Remotely Operated Vehicle (ROV) indicate that they provide hard substrates and habitat for a relatively unknown but biologically rich and diverse community of associated fishes and invertebrates, including commercial species such as wreckfish (*Polyprion americanus*), deepwater groupers, and golden crab (*Chaceon fenneri*). In addition, Ross and Quattrini (2007) recently identified over 99 species of fish associated with deepwater coral habitats.

Potential threats to the deep ocean include damage from fishing gear and energy exploration and development creating a time-sensitive need to map and characterize these habitats. A moratorium on oil/gas exploration in Florida waters has long prevented impact from fossil fuel extraction; however, recent U.S. legislation directed at expanding energy production in the Gulf of Mexico, coupled with exploration by Cuba in waters adjacent to the Florida Keys, has expanded this threat. Liquefied natural gas (LNG) re-gassification facilities and several proposed natural gas pipelines and offshore facilities could also directly impact local deepwater coral ecosystems. With respect to fishing, deepwater coral ecosystems worldwide have been seriously impacted by bottom trawls (Fosså *et al.* 2002, Freiwald *et al.* 2004).

The underlying need for the proposed actions in this amendment is to protect the deepwater coral ecosystems in the South Atlantic Fishery Management Council's jurisdiction. The proposed alternatives would establish deepwater CHAPCs in which the use of bottom longline, trawl (mid-water and bottom), dredge, pot or trap gear would be prohibited as well as the possession of any species regulated by the Coral FMP. The use of an anchor, anchor and chain, or the use of a grapple and chain would also be prohibited.

Creation of Shrimp Fishery Access Areas

This amendment proposes the creation of deepwater CHAPCs, the locations of which contain historical fishing grounds for the royal red shrimp fishery. Although the royal red shrimp fishery is not directly managed by the SAFMC, participants in the rock shrimp fishery will occasionally target royal red shrimp. In order to participate in the limited access portion of the rock shrimp fishery, vessels are required to have a VMS while on a trip in the South Atlantic. Data from VMS monitoring were used to define the spatial extent of this fishery and revealed that some fishing is taking place inside the proposed CHAPCs. Since rock shrimp are not found beyond 183 m (600 ft) these VMS tracks likely represent vessels fishing for royal red shrimp, a deepwater species often targeted by rock shrimpers. To allow rock shrimp fishermen (managed under the Shrimp

FMP) to continue operating in traditional fishing grounds, the Council proposes establishment of a Shrimp Fishery Access Area within the boundaries of the proposed Stetson-Miami Terrace CHAPC where a vessel with a rock shrimp limited access endorsement (and therefore VMS) will be allowed to operate.

Creation of Allowable Golden Crab Fishing Areas
The golden crab fishery has traditionally operated in deep water currently encompassed within the proposed deepwater Stetson-Miami Terrace CHAPC and Pourtales Terrace CHAPC off of east Florida. To allow the golden crab fishery to continue, the Council proposes creation of Allowable Golden Crab Fishing Areas within the CHAPCs. This amendment provides analysis of three alternatives for the creation of these areas that constitute historical fishing grounds of the golden crab fishery but where fishing for golden crab would not impact deepwater coral habitat.

Implement a Vessel Monitoring (Data Collection and Law Enforcement) program for the golden crab fishery
To gather data on area fished and to ensure compliance with the Allowable Golden Crab Fishing Areas, this amendment provides analysis on requiring vessel monitoring, specifically a Vessel Monitoring System. VMS is a tool used to enforce regulations in other fisheries and was recommended by the Council as a possible means to monitor compliance with the Allowable Golden Crab Fishing Areas and to provide data on fishing effort and location.

Updating of EFH Information
This non-regulatory aspect of this CE-BA, responds to the EFH Final Rule which requires that FMPs 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. Maps should identify the different types of habitat designated as EFH to the extent possible. Maps should also explicitly distinguish EFH from non-EFH areas and should be incorporated into a geographic information system (GIS) to facilitate analysis and presentation. A comprehensive spatial presentation of Council-designated EFH and EFH-HAPCs is presented in this CE-BA building on information in the Habitat Plan (SAFMC 1998a) and Comprehensive Essential Fish Habitat Amendment (SAFMC 1998b). Further updates are contained in the Council's Fishery Ecosystem Plan of the South Atlantic Region (SAFMC in prep.).

This CE-BA proposes the following non-regulatory amendments:

Amendment 7 to the Coral, Coral Reefs, and Live/Hardbottom Habitat Fishery Management Plan
This amendment will update existing EFH information for the Coral, Coral Reefs, and Live/Hardbottom Habitat Fishery Management Plan by including spatial presentation of EFH and EFH-HAPC designations in the South Atlantic region in a GIS. The action does not change EFH specifications from those implemented by Amendment 4 to the Coral, Coral Reefs, and Live/Hardbottom Habitat Fishery Management Plan (SAFMC 1998b)

but provides recent information and spatial presentation of EFH as required by the EFH Final Rule (67 FR 2343, January 17, 2002).

Amendment 8 to the Shrimp Fishery Management Plan
This amendment will update existing EFH information for the Shrimp Fishery Management Plan by including spatial presentation of EFH and EFH-HAPC designations in the South Atlantic region in a GIS. The action does not change EFH specifications from those implemented by Amendment 3 to the Shrimp Fishery Management Plan (SAFMC 1998b) but provides recent information and spatial presentation of EFH as required by the EFH Final Rule.

Amendment 18 to the Coastal Migratory Pelagics Fishery of the South Atlantic Region
This amendment will update existing EFH information for the Coastal Migratory Pelagics Fishery Management Plan by including spatial presentation of EFH and EFH-HAPC designations in the South Atlantic region in a GIS. The action does not change EFH specifications from those implemented by Amendment 10 to the Coastal Migratory Pelagics Fishery Management Plan (SAFMC 1998b) but provides recent information and spatial presentation of EFH as required by the EFH Final Rule.

Amendment 4 to the Fishery Management Plan for the Golden Crab Fishery of the South Atlantic Region
This amendment will update existing EFH information for the Golden Crab Fishery Management Plan by including spatial presentation of EFH and EFH-HAPC designations in the South Atlantic region in a GIS. The action does not change EFH specifications from those implemented by Amendment 1 to the Golden Crab Management Plan (SAFMC 1998b) but provides recent information and spatial presentation of EFH as required by the EFH Final Rule.

Amendment 5 to the Fishery Management Plan for the Spiny Lobster Fishery in the South Atlantic Region
This amendment will update existing EFH information for the Spiny Lobster Fishery Management Plan by including spatial presentation of EFH and EFH-HAPC designations in the South Atlantic region in a GIS. The action does not change EFH specifications from those implemented by Amendment 5 to the Spiny Lobster Fishery Management Plan (SAFMC 1998b) but provides recent information and spatial presentation of EFH as required by the EFH Final Rule.

Amendment 1 to the Fishery Management Plan for the Dolphin Wahoo Fishery of the South Atlantic
This amendment will update existing EFH information for the Dolphin Wahoo Fishery Management Plan by including spatial presentation of EFH and EFH-HAPC designations in the South Atlantic region in a GIS. The action does not change EFH specifications from those implemented by the fishery management plan (SAFMC 2003) but provides recent information and spatial presentation of EFH as required by the EFH Final Rule.

1.2 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.

1.3 History of Management

The following is a summary of management actions for plans amended through this CE-BA (Coral, Coral Reefs and Live/Hardbottom Habitat and The Golden Crab Fishery Management Plans of the South Atlantic Region). Other summaries of Council actions and history of management for other Fishery Management Plans are available online at www.safmc.net.

The Fishery Management Plan for Coral, Coral Reefs, and Live/Hardbottom Habitat of the South Atlantic Region

Management of coral resources was originally promulgated under the joint Gulf of Mexico and South Atlantic Coral Fishery Management Plan (GMFMC & SAFMC 1982). The FMP's intent was to optimize the benefits generated from the coral resource while conserving the coral and coral reefs. Specific management objectives addressed through the FMP were to: (1) develop scientific information necessary to determine feasibility and advisability of harvest of coral; (2) minimize, as appropriate, adverse human impacts on coral and coral reefs; (3) provide, where appropriate, special management for Coral Habitat Areas of Particular Concern (CHAPCs); (4) increase public awareness of the importance and sensitivity of coral and coral reefs; and (5) provide a coordinated management regime for the conservation of coral and coral reefs.

The FMP implemented the following management measures for coral and coral reefs: (1) disallowed any level of foreign fishing and established the domestic annual harvest to equal the Optimum Yield (OY); (2) prohibited the taking of stony corals and sea fans or the destruction of these corals and coral reefs anywhere in the EEZ of the Gulf and South Atlantic Councils' area of jurisdiction; (3) established that stony corals and sea fans taken incidentally in other fisheries must be returned to the water in the general area of capture as soon as possible (with the exception of the groundfish, scallop, or other similar fisheries where the entire unsorted catch is landed, in which case stony corals and sea fans may be landed but not sold); (4) established that the Councils may notify the Secretary of the threat of widespread or localized depletion from overharvest of one or more species of octocorals and recommend specific actions; (5) established a permit system for the use of chemicals for the taking of fish or other organisms that inhabit coral reefs; (6) established a permit system for taking prohibited corals for scientific and educational purposes; and (7) identified Habitat Areas of Particular Concern and established time and area restrictions in Habitat Areas of Particular Concern.

Amendment 1 (GMFMC & SAFMC 1990) implemented the following regulations: (1) included octocorals in the management unit as a controlled species; (2) implemented a combined octocoral quota for the Gulf of Mexico and South Atlantic EEZ of 50,000 individual colonies; (3) stated the Optimum Yield (OY) for coral reefs, stony corals, and sea fans to be zero; (4) included a definition of overfishing; (5) established a permit system to take octocorals; (6) provided reporting requirements for those taking corals under federal permit; (7) included a section on vessel safety considerations; and (8) revised the section on habitat.

Amendment 2 (GMFMC & SAFMC 1994) included the following regulations: (1) defined live rock and added it to the Coral FMP management unit (live rock is defined as living marine organisms or an assemblage thereof attached to a hard substrate including dead coral or rock); (2) redefined allowable octocorals to mean erect, non-encrusting species of the subclass Octocorallia, except the prohibited sea fans, including only the substrate covered by and within one inch of the holdfast; (3) revised management measures to address bycatch of octocorals; (4) provided for different management in the jurisdictional areas of the two Councils by promulgating a separate set of management measures and regulations for the South Atlantic; (5) prohibited all wild live rock harvest north of Dade County, Florida, and prohibited chipping throughout the jurisdiction of the South Atlantic Council; (6) capped harvest of wild live rock to 485,000 pounds annually until January 1, 1996 when all wild live rock harvest was prohibited; (7) allowed and facilitated aquaculture of live rock in the EEZ and required live rock harvest federal permits; and (8) required a federal permit for harvest and possession of prohibited corals and prohibited live rock from the EEZ for scientific, educational, and restoration purposes.

Amendment 3 (SAFMC 1995a) implemented the following: (1) established a live rock aquaculture permit system for the South Atlantic EEZ; (2) prohibited octocoral harvest north of Cape Canaveral to prevent expansion of the fishery to areas where octocorals constitute a more significant portion of the live/hardbottom habitat; and (3) prohibited anchoring of all fishing vessels in the Oculina Habitat Area of Particular Concern.

Amendment 4/EIS to the South Atlantic Coral FMP, included in the Comprehensive EFH Amendment (SAFMC 1998b) expanded the Oculina Bank Habitat Area of Particular Concern (HAPC) to an area bounded to the west by 80°W., to the north by 28°30'N., to the south by 27°30'N., and to the east by the 100 fathom (600 feet) depth contour. Amendment 4 expanded the Oculina Bank HAPC to include the area closed to rock shrimp harvest. The expanded Oculina Bank HAPC is 60 nautical miles long by about 5 nautical miles wide although the width tracks the 100 fathom (600 foot) depth contour rather than a longitude line. Within the expanded Oculina Bank HAPC area, no person may:

1. Use a bottom longline, bottom trawl, dredge, pot, or trap.
2. If aboard a fishing vessel, anchor, use an anchor and chain, or use a grapple and chain.

3. Fish for rock shrimp or possess rock shrimp in or from the area on board a fishing vessel.
4. Possess *Oculina* coral.

Amendment 5 to the Coral FMP included in the Comprehensive SFA Amendment (SAFMC 1998c) extended the Optimum Yield (OY) definition to include harvest allowances under live rock aquaculture permits.

The Fishery Management Plan for Golden Crab in the South Atlantic Region
The golden crab resource and fishery in the South Atlantic Region was unprotected prior to implementation of the FMP. The Council approved a control date that was published in the Federal Register on April 7, 1995. The Council completed the Golden Crab FMP (SAFMC 1995b) and submitted the plan for formal Secretarial Review on December 15, 1995. Regulations implementing the FMP were published in the Federal Register on August 27, 1996 [61 Federal Register 43952]; various regulations became effective August 27, September 26, and October 28, 1996 and September 7, 1997.

The Golden Crab FMP relies on a system of traditional fishery management plus controlled access. Traditional fisheries management includes measures to provide biological protection to the resource (escape gaps in traps and no retention of female crabs); gear regulation (define allowable gear, degradable panel, tending requirements, gear identification, and maximum trap size by zone); provides for law enforcement (depth limitations and prohibit possession of whole fish or fillets of snapper grouper species); determine the number of participants (vessel and dealer/processor permits); collect the necessary data (vessel/fishermen and dealer/processor reporting); and a framework procedure to adjust the management program (framework adjustments and adjustments to activities authorized by the Secretary of Commerce). Use of these traditional management techniques in other fishery management plans has not solved all fisheries management problems. At best, the fishery resource, in this case golden crab, is biologically protected. Ignored or even exacerbated are underlying social and economic problems resulting from gear conflicts, high regulatory costs, and low marketing incentives. To solve these social and economic problems, managers have increasingly turned to various forms of controlled access or effort limitation. The Council chose to limit the number of vessels in the golden crab fishery. Combining the more traditional fisheries management measures with controlled access best allowed the Council to solve problems in the golden crab fishery.

Framework Seasonal Adjustment #1 (SAFMC 1997) revised the vessel size limitations applicable when a vessel permit is transferred to another vessel and extended through December 31, 2000, the authorization to use wire cable for a mainline attached to a golden crab trap. The framework document was sent to NMFS on September 26, 1997 and the proposed rule was published on June 26, 1998. The final rule was published in the Federal Register on October 28, 1998 with regulations effective upon publication.

Amendment 1 (SAFMC 1998b) was a part of the Council's Comprehensive Amendment addressing Essential Fish Habitat in FMPs of the South Atlantic Region. Essential fish

habitat for golden crab includes the U.S. Continental Shelf from Chesapeake Bay south through the Florida Straits (and into the Gulf of Mexico). In addition, the Gulf Stream is an essential fish habitat because it provides a mechanism to disperse golden crab larvae. The detailed description of seven essential fish habitat types (a flat foraminferan ooze habitat; distinct mounds, primarily of dead coral; ripple habitat; dunes; black pebble habitat; low outcrop; and soft-bioturbated habitat) for golden crab is provided in Wenner *et al.* (1987). Refer to Section 4.0 in this Amendment, Volume II of the FEP (SAFMC in prep.) and the Habitat Plan (SAFMC 1998a) for a more detailed description of habitat utilized by the managed species. Also, it should be noted that the Gulf Stream occurs within the EEZ. There is insufficient knowledge of the biology of golden crabs to identify spawning and nursery areas and to identify HAPCs. As information becomes available, the Council will evaluate such data and identify HAPCs as appropriate through the framework. In addition, Amendment 1 established a framework procedure to address habitat issues; this framework was added to the framework of all approved FMPs including the Golden Crab FMP. Amendment 1 was submitted to the NMFS on October 9, 1998. The Notice of Availability was published in the Federal Register on March 5, 1999, and the Comprehensive Habitat Amendment was approved on June 3, 1999. The proposed rule was published on July 9, 1999 and a supplement to the proposed rule was published on November 2, 1999. The final rule was published in the Federal Register on June 14, 2000 with regulations becoming effective July 14, 2000.

Amendment 2 (SAFMC 1998c) was a part of the Council's Comprehensive Amendment addressing Sustainable Fishery Act definitions and other required provisions in FMPs of the South Atlantic Region. The amendment was partially approved on May 19, 1999. The final rule was published in the Federal Register on November 2, 1999 with regulations becoming effective December 2, 1999. The description of fisheries and communities was approved and bycatch reporting was approved. The remaining items for golden crab were disapproved because "the stock status determination criteria are incomplete and, thus, do not totally fulfill the new requirements of the Magnuson-Stevens Act and the national standard guidelines."

Amendment 3 (SAFMC 2000) extended the authorization to use wire cable for mainlines attached to golden crab traps to December, 31, 2002; modified escape panel sizes for traps; addressed permit renewal requirements including removal of the 5,000-pound harvest requirement for renewing biannual permits and addressed the minimum harvest requirement for permit holders in the Southern Zone; allowed up to a 20% increase in vessel size from the vessel size of the original permit; created a sub-zone within the Southern Zone with specified conditions; allowed two new vessels to be permitted to fish only in the Northern Zone using an earlier list of those wanting to enter the fishery; specified status determination criteria; and modified the FMP framework to allow modifications to the sub-zone.

Lastly, the current effort at managing the golden crab fishery is distinguished by the practice of co-management, which has been defined by McGoodwin (1990) as "a shift away from autocratic and paternalistic modes of management to modes that rely on the joint efforts of traditional fisheries specialists and fishing peoples. The options for

managing the fishery that are put forth in this document have been developed by the golden crab fishermen and refined in consultation with the SAFMC. It is hoped that such efforts will increase the legitimacy of the future regulations and make the rationale for such regulations more understandable to all involved.

The South Atlantic Fishery Ecosystem Plan and Ecosystem-Based Management
The Council, working with many other partners, is developing a Fishery Ecosystem Plan (FEP) which identifies and describes the current suite of knowledge on many parameters in the South Atlantic ecosystem. It is the Council's intent to use the information in the FEP to evaluate the biological, economic, and social conditions in the South Atlantic ecosystem. By reviewing the information on a regional basis the Council will be able to evaluate the impacts of future proposed actions across multiple fisheries, thus facilitating development of management regulations that could apply across FMPs.

A 1999 congressionally-mandated report set the stage for subsequent federal efforts to implement Ecosystem-Based Management (EBM). In response to a congressional request, the NOAA Fisheries Service convened a panel of experts to assess the extent to which ecosystem principles are currently applied in fisheries research and management, and recommend how best to integrate these principles into future activities. This Ecosystem Principles Advisory Panel (EPAP) concluded that NOAA Fisheries Service and the regional Fishery Management Councils did apply some EBM principles, goals, and policies, but did not apply them comprehensively or evenly. They attributed this to the lack of a clear mandate and resources to carry out EBM, and the "considerable gaps in knowledge and practice" of this new concept. The EPAP recommended that Councils continue to use Fishery Management Plans (FMPs) for single species and species complexes, but amend these to incorporate ecosystem approaches consistent with an overall Fishery Ecosystem Plan (FEP).

The EPAP outlined eight elements that should be included in each FEP and recommended that the Magnuson-Stevens Act be amended to require FEPs. It also called on NOAA Fisheries Service and the Fishery Management Councils to establish guidelines for FEP development.

The Council is developing the South Atlantic FEP with the long-term vision of embracing the 8 elements presented by the EPAP:

1. *Delineate the geographic extent of the ecosytem(s) that occur(s) within Council authority, including characterization of the biological, chemical, and physical dynamics of those ecosystems, and "zone" the area for alternative uses.*
   The Council's management jurisdiction and the core area of the South Atlantic Ecosystem is shown in **Figure 1-1**. Building on the scope of the Habitat Plan (SAFMC 1998a), the area of consideration extends from the coastal watersheds including the extent of anadromous and catadromous species to off the continental shelf through the extent of the Councils' jurisdiction. However, the South Atlantic ecosystem is invariably linked to other systems and collaboration to link research efforts and share management considerations will be pursued.

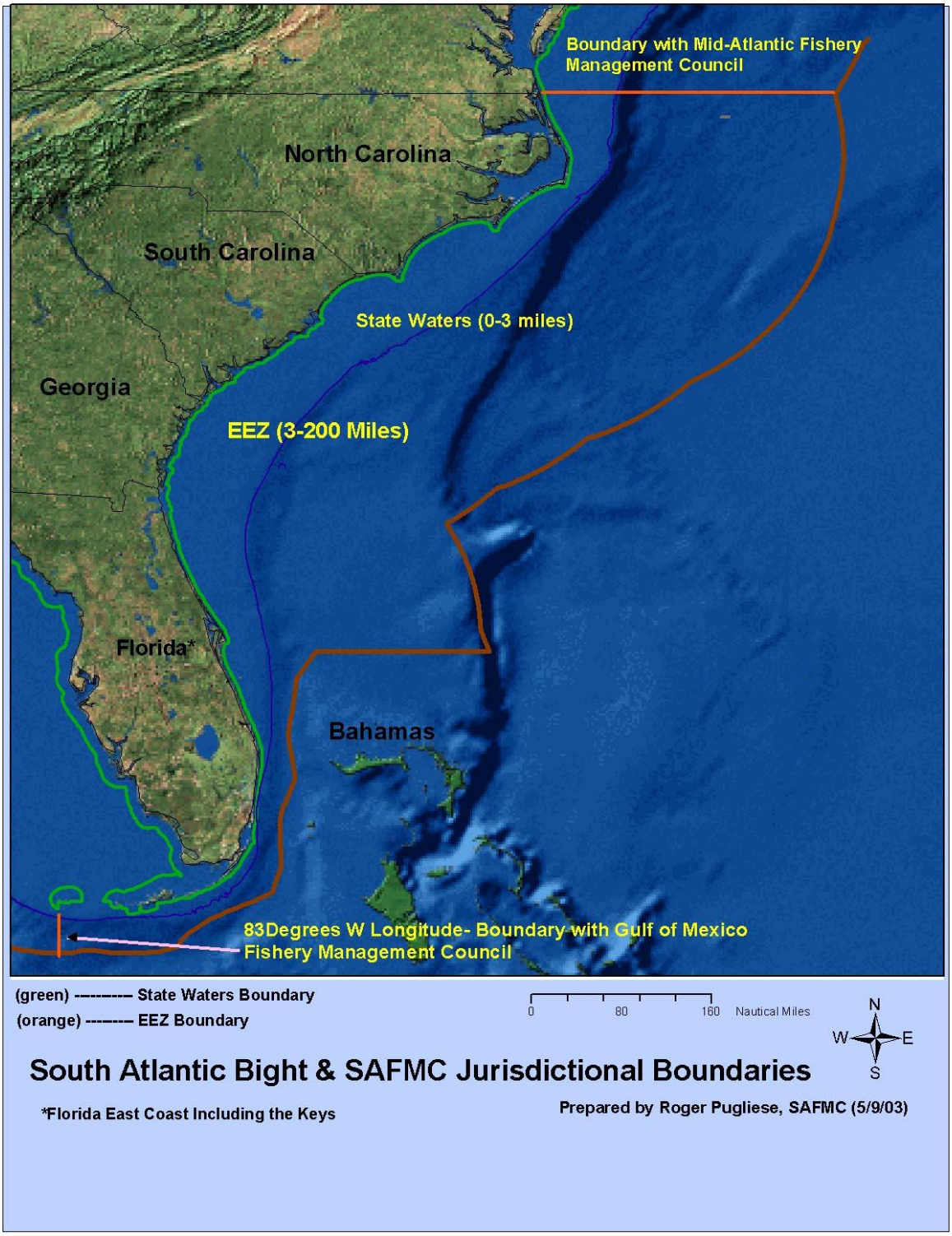


Figure 1-1. Jurisdictional boundaries of the South Atlantic Fishery Management Council.

2. *Develop a conceptual model of the food web.*
   Detailed species life history and habitat use information representing the complex food webs of the South Atlantic region is presented in FEP Volume II. Investigation into ecosystem modeling through the development of a straw man 48-functional group mass-balanced Ecopath model and a 96-functional group preliminary Ecopath model highlighted species linkages and prey and predator interactions in the region. The most recent attempt was to develop an even greater expanded model with over 126 functional groups providing an even broader view of the south Atlantic food web; however, given the limited diet information for many groups, full parameterization of the model has not yet been accomplished.

3. *Describe the habitat needs of different life history stages for all plants and animals that represent the "significant food web" and how they are considered in conservation and management measures.*
   Detailed species life history and habitat use information representing the complex food webs of the South Atlantic region as well as species and/or habitat conservation recommendations are presented in Volumes II and IV of the FEP. Research programs and long-term needs to enhance the Council ability to implement conservation and management measures in the region are highlighted in Volume V.

4. *Calculate total removals – including incidental mortality – and show how they relate to standing biomass, production, optimum yields, natural mortality, and trophic structure.*
   A regional snapshot of all fisheries in the region is presented in FEP Volume III.

5. *Assess how uncertainty is characterized and what kinds of buffers against uncertainty are included in conservation and management actions.* The Council is working with its Scientific and Statistical Committee (SSC) to address this item.

6. *Develop indices of ecosystem health as targets for management.*
   As a first step in identifying and establishing ecosystem targets, conservation targets for southeast habitats as presented in the Southeast Aquatic Resources Partnership (SARP) Aquatic Habitat Plan are included in FEP Volume V.

7. *Describe available long-term monitoring data and how they are used.*
   Research programs and long-term monitoring datasets as well as Council priority research needs to enhance the Council's ability to implement conservation and management measures in the region and support the move to ecosystem-based management are highlighted in FEP Volume V.

8. *Assess the ecological, human, and institutional elements of the ecosystem which most significantly affect fisheries and are outside of Council/Department of Commerce authority, and include a strategy to address those influences.*

A view of ecological, human, and institutional elements of the South Atlantic ecosystem is presented in FEP Volumes III, IV and V. For example, recommendations for consideration of fishing non-fishing activities impact on fish and fish habitat are presented in FEP Volume IV.

The Council has implemented ecosystem-based principles through several existing fishery management actions including establishment of deepwater Marine Protected Areas, proactive harvest control rules on species (e.g., dolphin and wahoo) which are not overfished, extensive gear area closures which in most cases eliminate the impact of fishing gear on Essential Fish Habitat, and use of other spatial management tools including Special Management Zones. Through this CE-BA the Council is taking an ecosystem approach to protecting deepwater ecosystems while providing for the continuation of traditional fisheries in areas where they do not impact deepwater coral habitat. The stakeholder-based process taps into an extensive regional network of experts. Support tools, such as the Council's Internet Mapping System http://www.safmc.net/EcosystemManagement/EcosystemBoundaries/MappingandGISData/tabid/62/Default.aspx, facilitate Council deliberations and, with the help of regional partners, are being refined to address long-term ecosystem management needs.

Conservation of Deepwater Coral Ecosystems in the South Atlantic

In 1982, NMFS approved the Fishery Management Plan and Final Environmental Impact Statement for Coral and Coral Reefs (GMFMC &SAFMC, 1982). The guidelines for developing FMPs at the time (50 CFR Part 602.3b.6.ii) described "areas of special biological significance" as those "which are of particular concern because of a requirement in the life cycle of the stock(s), e.g. spawning grounds, nurseries, migratory routes, etc…(and)…those areas which are currently or potentially threatened with destruction or degradation". Under these guidelines the Councils established criteria for habitat areas of particular concern "to focus regulatory and enforcement abilities on particular localized areas of significance".

In January 1998, the Interim Final Rule implementing the EFH provisions of the Magnuson-Stevens Act became effective and defined habitat areas of particular concern as "those areas of EFH identified pursuant to Sec. 600.815(a)(9)" and identified the criteria (importance of ecological function, sensitivity to human-induced degradation, threat from development, and/or rarity) for identifying "specific types or areas of habitat within EFH" as HAPC. The Final Rule became effective on February 19, 2002.

In 1998 NMFS approved the Council's Comprehensive EFH Amendment of the Fishery Management Plans of the South Atlantic Region (SAFMC 1998b). In addition to describing and identifying EFH and EFH-HAPCs for each fishery, the amendment carried forward the concept of a Coral Habitat Area of Particular Concern (CHAPC) through the establishment of a framework procedure to allow for rapid modification to definitions of EFH; establishment of new or modification of existing, EFH-HAPC; and establishment of new, or modification of existing, CHAPCs.

In January 2007, the Magnuson-Stevens Act was reauthorized and included in Section 302(b)(2) was discretionary authority to the Councils and the Secretary to protect deep sea corals from physical damage from fishing gear.

2 Actions and Alternatives

This section outlines the proposed actions and alternatives considered by the Council. A complete analysis of these alternatives can be found in **Section 4.0.** These alternatives were identified and developed over a number of years, with input from numerous sources, and through multiple processes, including the scoping process conducted for the FEP and CE-BA, meetings of the Council, the Council's Habitat and Ecosystem Committees, Habitat and Environmental Protection Advisory Panel, Coral Advisory Panel, Rock Shrimp Advisory Panel, Deepwater Shrimp Advisory Panel, Golden Crab Advisory Panel and Scientific and Statistical Committee. Alternatives the Council considered during the development of this amendment and/or presented at the first round of public hearings but eliminated from further detailed study are described in **Appendix E**.

2.1 Action 1. Amend the Coral, Coral Reefs and Live/Hardbottom Habitat FMP to establish deepwater Coral HAPCs (CHAPCs)

Alternative 1. No action. Do not establish deepwater CHAPCs.

Alternative 2. Establish deepwater CHAPCs in one or more areas proposed in sub-alternatives 2a - 2e

Sub-alternative 2a. Establish the Cape Lookout Lophelia Banks CHAPC;
Sub-alternative 2b. Establish the Cape Fear Lophelia Banks CHAPC;
Sub-alternative 2c. Establish the Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC;
Sub-alternative 2d. Establish the Pourtales Terrace CHAPC; and
Sub-alternative 2e. Establish the Blake Ridge Diapir Methane Seep CHAPC.

Detailed analysis of these sub-alternatives is provided in **Section 4.0.**

Sub-alternative 2a.
Under this alternative, the area specified by coordinates in **Appendix F** would be designated as the Cape Lookout Lophelia Banks CHAPC (**Figure 2.1** and **Figure 4-1** in **Section 4.1**). This area would protect **122 square miles** of deepwater coral habitat. A detailed description of this area is included in **Section 4.1.**

Sub-alternative 2b.
Under this alternative, the area specified by coordinates in **Appendix F** would be designated as the Cape Fear Lophelia Banks CHAPC (**Figure 2.1** and **Figure 4-1** in **Section 4.1**). This area would encompass **52 square miles** of deepwater coral habitat. A detailed description of this area is included in **Section 4.1.**

Sub-alternative 2c.

Under this alternative, the area specified by coordinates in **Appendix F** would be designated as the Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace CHAPC (**Figure 2.1** and **Figure 4-2** in **Section 4.1**). This area would encompass **23,528 square miles** of deepwater coral habitat. A detailed description of this area is included in **Section 4.1.**

Sub-alternative 2d.
Under this alternative, the area specified by coordinates in **Appendix F** would be designated as the Pourtales Terrace CHAPC (**Figure 2.1** and **Figure 4-3** in **Section 4.1**). This area would encompass **509 square miles** of deepwater coral habitat. A detailed description of this area is included in **Section 4.1.**

Sub-alternative 2e.
Under this alternative, the area specified by coordinates in **Appendix F** would be designated as the Blake Ridge Diapir Methane Seep CHAPC (**Figure 2.1** and **Figure 4-4** in **Section 4.1)**. This area would encompass **4 square miles** of deepwater coral habitat. A detailed description of this area is included in **Section 4.1.**

Selection of Alternatives
In October 2004, at a joint meeting of the Council's Habitat and Environmental Protection and Coral Advisory Panels six areas were proposed for consideration as new deepwater CHAPCs. Subsequently, the Council, at their December 2004 meeting, approved establishing the new deepwater CHAPCs through the developing Comprehensive Ecosystem-based Amendment. At their joint meeting in Miami in June 2006, the Habitat and Coral Advisory Panels received updated reports on research on the status and distribution of deepwater coral systems in the region. Based on this new information, the panels proposed to consolidate the six original areas into four. The Council subsequently voted to adopt the Panel's proposal and take action to establish the four new deepwater CHAPCs through this Comprehensive Ecosystem-based Amendment. At their November 2007 meeting, the Habitat and Coral Advisory Panels recommended an additional methane seep CHAPC. In December 2007 the Council approved adding consideration of a fifth CHAPC, the Blake Ridge Diapir (methane seep).

Alternative 2 is based on the latest recommendations of the Habitat and Coral Advisory Panels supported by information presented in both the 2004 and 2006 reports (**Appendices A & B**) to the Council on deepwater coral habitat distribution in the South Atlantic Region. The Habitat and Coral Advisory Panels expanded their rationale and provided additional justification for these CHAPCs at their November 2007 meeting. In addition, John Reed (Harbor Branch Oceanographic Institute) provided updated deepwater habitat distribution information that was reviewed in relationship to deepwater shrimp and golden crab advisory panel proposals presented at the March 2008 meeting.

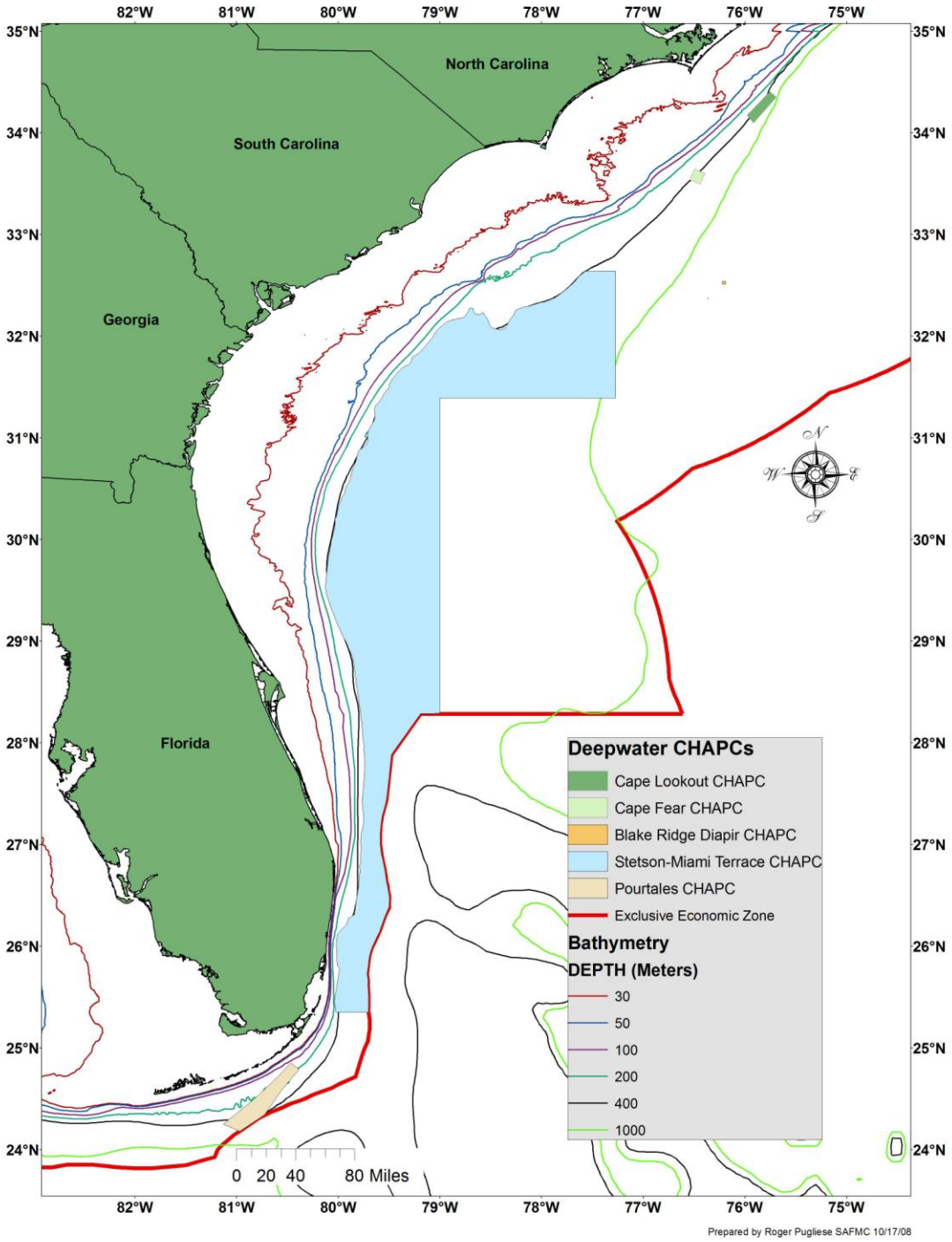


Figure 2-1. Proposed Deepwater Coral Habitat Areas of Particular Concern.

2.1.1 Comparison of Alternatives

Alternative 1 (No Action) would not protect any of the deepwater coral habitat identified. This would result in negative biological impacts to this important habitat as fisheries move into these areas. This could also result in negative impacts to

commercially important species that rely on these areas/habitats as EFH and EFH-HAPCs. Currently, the only fisheries that operate in the areas are the wreckfish fishery, golden crab and royal red shrimp fisheries.

Damage inflicted by bottom tending gear, anchors, chains and grapples is not limited to living coral and hardbottom resources but extends to disruption of the balanced and highly productive nature of the coral and live/hardbottom ecosystems. Under **Alternative 1 (No action),** bottom tending gears, anchors, chains and grapples deployed by fishing vessels would degrade the functional characteristics of these complex deepwater coral ecosystems. **Alternative 1 (No action)** would provide no additional protection for **24,215 square miles** of these complex deepwater ecosystems and would result in negative biological effects on deepwater coral habitats and the species that utilize this habitat.

Under **Alternative 2,** the Council could select *one or more* of the proposed sub-alternatives. **Sub-alternative 2a**, the Cape Lookout Lophelia Banks CHAPC, would protect **122 square miles** or 0.5% of deepwater habitats proposed for protection while **sub-alternative 2b**, the Cape Fear Lophelia Banks CHAPC, would protect **52 square miles** of the deepwater coral habitat proposed for protection. **Sub-alternative 2c**, the Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace CHAPC (Stetson-Miami Terrace CHAPC) would protect **23,528 square miles** or 97.16% of deepwater habitats proposed for protection and **sub-alternative 2d**, the Pourtales Terrace CHAPC, would protect **509 square miles** or 2.10% of the deepwater habitats proposed for protection under **Alternative 2**.

Protecting one or more of these areas would provide positive biological benefits to the deepwater corals and to the species that rely on these areas for EFH and EFH-HAPC. Given the slow-growth of these deepwater corals, any impacts would be expected to result in long-term biological losses of deepwater coral habitat as well as the species that utilize this habitat. **Sub-alternatives 2a** and **2b** encompass practically the entire known deepwater coral habitat off the coast of North Carolina. Protection of the Miami Terrace habitat under **sub-alternative 2c** would protect recently verified areas of wreckfish aggregation and spawning habitat. However, the wreckfish fishery would be allowed to continue within the CHAPCs as it is not expected to affect deepwater coral habitat proposed for protection under **sub-alternatives 2a - 2c**. Wreckfish are harvested using a 30-50 pound sinker, cable and terminal rig while motor fishing (SAFMC 1991). However, it is unknown if this harvest technique has any impacts on bottom habitat. Submersible dive observations have shown wreckfish associated with coral mounds (comprised mostly of dead corals) and hardbottom habitat with individual clumps of bamboo coral and small *Lophelia* colonies (G. Sedberry, personal communication). It is the Council's intent to assess whether gear impacts from the wreckfish fishery are likely to jeopardize the integrity of deepwater coral habitat in the South Atlantic region in a future plan amendment.

The conservation of the Pourtales Terrace under **sub-alternative 2d** would not only important to benthic species but would also serve pelagic species that use the high-profile

habitats and dynamic currents for navigation, feeding and migration. **Sub-alternative 2e**, the Blake Ridge Diapir Methane Seep CHAPC, would protect **4 square miles** or 0.02% of deepwater habitats proposed for protection that includes a unique benthic habitat inhabited by chemosynthetic organisms. This proposed CHAPC is 800-1000 m deep and is unlikely to be subject to any fishing operations that would impact the bottom habitat.

Alternative 1 (No action) could result in long-term negative economic impacts to commercial fisheries from the potential loss of habitat for commercial species due to lack of protection of deepwater coral habitat. The various sub-alternatives under **Alternative 2** would have negative short-term economic impacts on the golden crab fishery and the royal red shrimp fishery.

Alternative 2 could have negative economic and social impacts on the royal red shrimp fishery. The royal red shrimp fishery is expected to experience small negative economic and social impacts from establishment of **sub-alternative 2c**. However, the royal red shrimp fishery operates almost exclusively inshore of the 400 meter contour, which is the western boundary of the deepwater habitat being proposed for protection under **sub-alternative 2c** (Stetson-Miami Terrace CHAPC). Analysis of VMS data indicate that only 1% of the royal red shrimp landings potentially originate from waters inside the proposed Stetson-Miami Terrace CHAPC. Using the annual average of total royal red shrimp landings for the 2005-2007 (267,000 pounds) and average ex-vessel price per pound ($3.25) it is estimated that economic losses to the fishery could result in $8,678 annually. However, these impacts can be offset by establishing a "Shrimp Fishery Access Area" within the Stetson-Miami Terrace CHAPC as proposed under **Action 2.**

No negative socioeconomic impact on the rock shrimp fishery is expected which operates shallower than the proposed CHAPCs. NOTE: If royal red shrimpers are also rock shrimpers, could these fishermen increase effort in the rock shrimp fishery to mitigate any losses of catch and revenues from royal red shrimp?

The golden crab fishery is expected to experience substantial negative economic and social impacts as a result of implementation of two of the proposed CHAPCs. The golden crab fishery operates in the proposed Stetson-Miami Terrace CHAPC (**sub-alternative 2c**) and in a small portion of the proposed Pourtales Terrace CHAPC (**sub-alternative 2d**). In the long-term, establishment of these CHAPCs would benefit fishermen if the species' populations expanded beyond the boundaries of the CHAPCs and fishermen were able to fish these areas. However, the Stetson-Miami Terrace and Pourtales Terrace CHAPCs encompass almost all of the traditional fishing grounds for golden crab. As a result, in the short-term, golden crab fishermen are not likely to benefit economically from establishment of these CHAPCs because they would no longer be able to fish on their traditional fishing grounds. However, the expected significant negative economic impacts on the golden crab fishery from implementation of **sub-alternatives 2c** and **2d** would be offset with establishment of "Allowable Golden Crab Fishing Areas" within the proposed CHAPCs under **Action 3**. If offsetting action is not undertaken, it is possible that the golden crab fishery would cease to exist. The social impacts on the families involved in the golden crab fishery would be significant since it may not be

possible for golden crab vessels to be converted from crab fishing to fishing for other species. As a result, the financial stress and other problems that result from financial stress and unemployment would ensue.

The wreckfish fishery is not expected to be impacted by the prohibition of the fishing methods and gears proposed in the sub-alternatives under **Alternative 2**. Wreckfish are harvested using a 30-50 pound sinker, cable and terminal rig while motor fishing (SAFMC 1991). However, it is unknown if this harvest technique has any impacts on bottom habitat. Submersible dive observations have shown wreckfish associated with coral mounds (comprised mostly of dead corals) and hardbottom habitat with individual clumps of bamboo coral and small *Lophelia* colonies (G. Sedberry, personal communication). It is the Council's intent to assess whether gear impacts from the wreckfish fishery are likely to jeopardize the integrity of deepwater coral habitat in the South Atlantic region in a future plan amendment.

One of the proposed Type 2 Marine Protected Areas (MPAs) identified in Snapper Grouper Amendment 14 (SAFMC 2007), the East Hump/Un-named Hump MPA, is located within **sub-alternative 2d**, the proposed Pourtales Terrace CHAPC. Analyses conducted for Amendment 14 estimated that 18,503 pounds of all snapper grouper species were taken from the proposed East Hump/Unnamed Hump MPA. In addition, the immediate socioeconomic impacts of the proposed East Hump MPA site were assessed to be less than minimally negative but the medium- and long-term effects would be slightly and minimally positive. These impacts were assessed for a Type 2 MPA which would prohibit fishing for or possession of snapper grouper species in the Type 2 MPA. Establishment of a CHAPC via this amendment would restrict the use of bottom-tending gear as well as anchoring but not the use of hook-and-line gear commonly used by snapper grouper fishermen. Therefore, only small negative impacts, due to the restriction on anchoring, are expected on snapper grouper fishermen as a result of **sub-alternative 2d**.

With regard to recreational fisheries, impacts would be minimal. Establishing the CHAPCs and prohibiting anchoring of fishing vessels within them would have only a small negative economic impact on recreational fisheries. The anchoring prohibition would not impact fishing activities for the fisheries that do not anchor (e.g., troll fishery for billfish, dolphin, wahoo, tuna etc.).

Alternative 1 (No action) would require no immediate administrative action. However, in the long-term if coral species found within the proposed areas become listed under the Endangered Species Act, or other species which depend on them become compromised because of destructive fishing practices in the area the administrative environment could be burdened with processing and implementing future regulatory actions. Any of the sub-alternatives under **Alternative 2** (establishing proposed CHAPCs) would require the coordination of several divisions within NOAA Fisheries Service including the Office of Law Enforcement, General Counsel, Sustainable Fisheries, and Habitat in order for the areas to be successfully enforced, and for proper EFH consultations to be conducted. It is likely the issuance of citations for violations might increase as a result of the

establishment of the much larger restricted area and its proximity to royal red and rock shrimp fishing grounds. If violations increase as a result of designating any or all of the proposed CHAPCs the administrative burden would increase proportionately for the Office of General Counsel and the attorneys tasked with prosecuting such violations.

Under this action, any consultations for activities within the proposed CHAPCs would be subjected to a higher level of scrutiny under the EFH consultation process conducted by the Habitat Division. However, only a minimal administrative burden would be created for that division as a result. Additionally, a wide array of outreach and education materials would need to be generated and disseminated to the public. This administrative burden would likely be borne by the Office of Sustainable Fisheries and would take the form of fishery bulletins and web site content.

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

	Alternative 1	**Sub-Alternative 2a**	**Sub-alternative 2b**	**Sub-alternative 2c**	**Sub-Alternative 2d**	**Sub-Alternative 2e**
Biological Impacts	Negative; No protection for deepwater coral	Positive	Positive; Allows for protection of larger area than 2a	Greatest positive impact; allows for protection of large area	Positive impact, unique sinkhole habitat	Positive impact; unique chemosynthetic habitat
Economic Impacts	No negative impact for fisheries; negative impact for non-consumptive use	Positive impact for non-consumptive use; small negative impact on fisheries	Positive impact for non-consumptive use; small negative impact on fisheries	Significant negative impacts for golden crab fishery, minor negative impacts for royal red shrimp fishery	Significant negative impacts for golden crab fishery, minor negative impacts for royal red shrimp fishery; positive impact for non-consumptive use	Positive impact for non-consumptive use; small negative impact on fisheries
Social Impacts				Significant negative impacts for golden crab fishery, minor negative impacts for royal red shrimp fishery	Significant negative impacts for golden crab fishery	
Administrative Impacts	No new administrative burden	Increase in administrative burden	Increase in administrative burden	Increase in administrative burden	Increase in administrative burden	Increase in administrative burden

2.1.2 Conclusion

The Council is considering one or more sub-alternatives to establish deepwater CHAPCs to protect deepwater coral and live bottom resources. Fishing gear -- including bottom longlines, dredges, pots and traps -- anchors, chain and grapples, all contact the bottom and would impact the *Lophelia* and *Enallopsamnia* corals and associated complex habitats encompassed by the proposed CHAPCs. This action would also eliminate damage from mid-water trawls, which if configured with trailing weights as was done in Pacific Seamount fisheries (P. Auster, pers. comm.) can be trawled over pinnacles or seamounts causing damage to the bottom habitat. This amendment also includes actions that, if chosen for implementation, would accommodate the royal red shrimp and golden crab fisheries and allow them to continue to operate in a manner that does not impact the deepwater coral habitat. **Alternative 1 (No action)** would not protect the *Lophelia* coral and live/hardbottom habitat or maximize the likelihood that the essential fish habitat contained in the CHAPCs will be protected. Thus, this alternative would provide no additional protection for **24,215 square miles** of complex deepwater ecosystems described in **Section 3.1.1** and **Appendices A-D**. **Sub-alternatives 2a-2e** under **Alternative 2**, best address the objective of this action to protect deepwater habitats from fishing gear which directly or indirectly takes coral or live/hardbottom reducing habitat essential to species utilizing the area. This action reduces the impact of the deepwater shrimp fisheries and the golden crab fishery on live/hardbottom and coral habitat by prohibiting their operation in the deepwater CHAPCs except as allowed under proposed **Actions 2 and 3**. However, **Alternative 2** would eliminate use of virtually all golden crab traditional fishing grounds by the golden crab fishery thus not allowing this fishery to continue. The Council's intent is to establish deepwater CHAPCs while considering

industry proposals that allow fishing which will not impact deepwater habitat in the proposed deepwater CHAPCs. Subsequently, **Actions 2 and 3** are being proposed to allow traditional fishing in areas that do not impact deepwater coral habitat.

2.2 Action 2. Create a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries

Alternative 1. No action. Do not create a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries.

Preferred Alternative 2. Create a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries where fishing with a shrimp trawl and/or shrimp possession is allowed by any vessel holding a rock shrimp limited access endorsement and equipped with an approved vessel monitoring system (VMS).

The four-part SFAA is located as follows: The western boundary is the western boundary of the CHAPC. The northern boundary of the SFAA is at latitude 30° 12' N. The southern boundary is at latitude 26° 18' 56" N. From the northern boundary extending southward to latitude 27° 30' N, the eastern boundary is 1.0 nm due east of the western boundary of the CHAPC, except between latitudes 29° 20' 25" N. and 29° 8' N., and between latitudes 28° 30' 37" N. and 28° 14' N., where shrimping is not allowed within the CHAPC. From the southern boundary extending northward to latitude 27° 30' N, the eastern boundary is 1.5 nm due east of the western boundary of the CHAPC, except between latitudes 26° 57' 6" N. and 26° 49' 58" N., where shrimping is not allowed within the CHAPC. Coordinates for the proposed Shrimp Fishery Access Area are also contained in **Appendix G**. Areas for each of the four parts comprised in the SFAA are 69, 49, 123, and 62 square miles, respectively.

This alternative assumes that CHAPCs will be created with the approval and implementation of **sub-alternative 2c** under **Action 1**.

Alternative 3. Move the west boundary of the proposed CHAPC 6 nautical miles to the east between the following points: (a) 30 degrees 16 minutes 35.354 seconds N and (b) 26 degrees 12 minutes 56.273 seconds N.

Selection of Alternatives

Alternative proposals were developed based on comments provided during the first round of public hearings. These were reviewed and evaluated by the Council which subsequently recommended moving those alternatives which proposed shifting the CHAPC boundary to the Considered but Rejected Alternatives (**Appendix E**). The Council reviewed and adopted **Alternative 3** as a follow-up to an industry recommendation provided at public hearing. **Alternative 3** addresses both fishery operation concerns (i.e. mechanical failure resulting in shrimp vessels drifting inside the

CHAPC) and encompasses traditional shrimping grounds (based on VMS points and industry-provided royal red shrimp trawl tracks), near the western edge of the Stetson-Miami Terrace CHAPC.

2.2.1 Comparison of Alternatives

Alternative 1 (No action) would not create a "Shrimp Fishery Access Area" within the proposed Stetson-Miami Terrace proposed CHAPC boundaries. The biological impacts of this alternative would be positive in that it would prohibit permitted fishermen from potentially targeting royal red shrimp found in deepwater habitats designated as CHAPCs. This would result in reduced fishing pressure on the royal red shrimp population in this CHAPC. **Alternative 1 (No action)** is expected to result in small negative economic impacts for the shrimp fishery since, according to VMS data, only 1% of the effort in the royal red shrimp fishery takes place within the boundaries of the proposed CHAPC. **Preferred Alternative 2** would have positive biological effects through limiting the fishery to traditional grounds and ensuring no expansion into known low-relief and high-relief deepwater habitat in the proposed Stetson-Miami Terrace CHAPC. Also, **Preferred Alternative 2** would be expected to produce the most beneficial direct effects on the socio-economic environment by providing for traditional fishing operations. **Alternative 3** moves the west boundary of the proposed CHAPC 6 nm to the east. This alternative would not address the objective of the amendment to protect vulnerable deepwater coral habitats because it would exclude significant known and highly probable low- and high-relief deepwater coral habitats, would allow the fishery to expand into non-traditional fishing grounds and would potentially create gear conflict by allowing trawling within the major golden crab fishing area in the Middle Zone. While this area is not a traditional fishing ground for the royal red shrimp fishery and may not result in trawling in these areas, it would benefit the shrimp fishery in that vessels could drift (i.e. during an emergency or mechanical failure) without entering the proposed CHAPC. If this area is not harvested, there are no expected economic impacts to the shrimp fleet. However, there is the potential for this area to provide new fishing opportunities for the shrimp fleet which would have positive economic impacts. **Alternatives 2** and **3** would have small administrative impacts related to rulemaking, enforcement, and outreach.

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

	Alternative 1	Alternative 2	Alternative 3
Biological Impacts	Positive impacts to the deepwater coral and royal red shrimp.	Positive to deepwater coral; Negative impacts to royal red shrimp	Negative impacts to deepwater coral and royal red shrimp.
Economic Impacts	Small negative impacts to fishery	Small positive impacts to fishery	Potential positive impacts to fishery
Social Impacts	Small negative impacts to fishery	Small positive impacts to fishery	Potential positive impacts to fishery
Administrative Impacts	No change in administrative burden from status quo	Increase in administrative burden	Slight increase in administrative burden

2.2.2 Conclusion

The Council selected **Alternative 2** as their preferred to establish a Shrimp Fishery Access Area. The Council's intent through this amendment is to establish deepwater CHAPCs while considering industry proposals that allow fishing to continue without impacting deepwater habitat. **Alternative 1 (No action)** would meet the biological objectives of the amendment in that it would protect the deepwater coral habitat and not permit any shrimp trawling in the CHAPCs. However, it would have minor economic and social impacts on the royal red shrimp fisheries and related industries, which are able to operate in these areas without impacting the deepwater coral ecosystems. Of all the alternatives considered, **Alternative 2** would be expected to produce the most beneficial direct effects on the socioeconomic environment by providing for traditional fishing operations given the knife-edge characteristics of the fishery along the west of the proposed Stetson-Miami Terrace CHAPC. **Alternative 3** was one of four proposed by the deepwater Advisory Panel and brought to Public Hearings in May 2008. **Alternative 3** would not meet the objective of the amendment because it overlaps significant known and highly probable low- and high-relief deepwater coral habitats, allows the fishery to expand into non-traditional fishing grounds and would create gear conflict by allowing trawling within the major golden crab fishing area in the Middle Zone.

2.3 Action 3. Create "Allowable Golden Crab Fishing Areas" within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC and Pourtales Terrace CHAPC boundaries.

This would amend the coral, coral reefs and live/hardbottom habitat FMP to create "Allowable Golden Crab Fishing Areas" within the proposed Stetson-Miami Terrace CHAPC and Pourtales Terrace CHAPC boundaries. Designation of these Allowable Golden Crab Fishing Areas would be relevant if **sub-alternatives 2c and 2d** under **Action 1** are chosen for implementation.

Alternative 1. No action. Do not create "Allowable Golden Crab Fishing Areas" in the proposed deepwater CHAPCs.

Preferred Alternative 2. Create "Allowable Golden Crab Fishing Areas" in one or more of the areas as described in sub-alternatives 2a - 2c:

> **Sub-alternative 2a.** Create an Allowable Golden Crab Fishing Area in the Northern Golden Crab Fishing Zone -- within the Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries.
>
> Under this sub-alternative, an Allowable Golden Crab Fishing Area would be designated in the Northern Golden Crab Fishing Zone (**Figure 2-2**). This Allowable Golden Crab Fishing Area would be **376 square miles**. Coordinates for this proposed area are found in **Appendix H**.
>
> **Sub-alternative 2b.** Create an Allowable Golden Crab Fishing Area in the Middle Golden Crab Fishing Zone -- within the Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries.
>
> Under this sub-alternative, an Allowable Golden Crab Fishing Area (divided into Parts A, B and C) would be designated in the Middle Golden Crab Fishing Zone (**Figure 2-2**). This Allowable Golden Crab Fishing Area would be **1,526 square miles**. Coordinates for this proposed area are found in **Appendix H**.
>
> **Sub-alternative 2c.** Create an Allowable Golden Crab Fishing Area in the Southern Golden Crab Fishing Zone -- within the Pourtales Terrace CHAPC boundaries.
>
> Under this sub-alternative, an Allowable Golden Crab Fishing Area would be designated in the Southern Golden Crab Fishing Zone (**Figure 2-2**). This Allowable Golden Crab Fishing Area would be **21 square miles**. Coordinates for this proposed area are found in **Appendix H**.

Alternative 3. Move the western boundary of the proposed Northern and Middle Zone Allowable Golden Crab Fishing Areas west to include the proposed Shrimp Fishery Access Area.

Selection of Alternatives

Preferred Alternative 2 proposes creation of Allowable Golden Crab Fishing Areas which will support traditional fishing operations in the Northern, Middle, and Southern zones respectively, while protecting deepwater coral habitats in the deepwater CHAPCs (**Figure 2-2)**. **Preferred Alternative 2** is based on the latest recommendations of the Golden Crab Advisory Panel. This alternative was developed in response to Public Hearing comments and through input provided at the June 2008 SAFMC meeting in Orlando, Florida. The Advisory Panel also requested the Council consider **Alternative 3** which extends the Middle Zone to include the proposed Shrimp Fishery Access Area based on preliminary comments that the shrimp fishery would not be impacted. Previous

alternatives/recommendations provided by the Advisory Panel are included in detail in **Appendix E**.

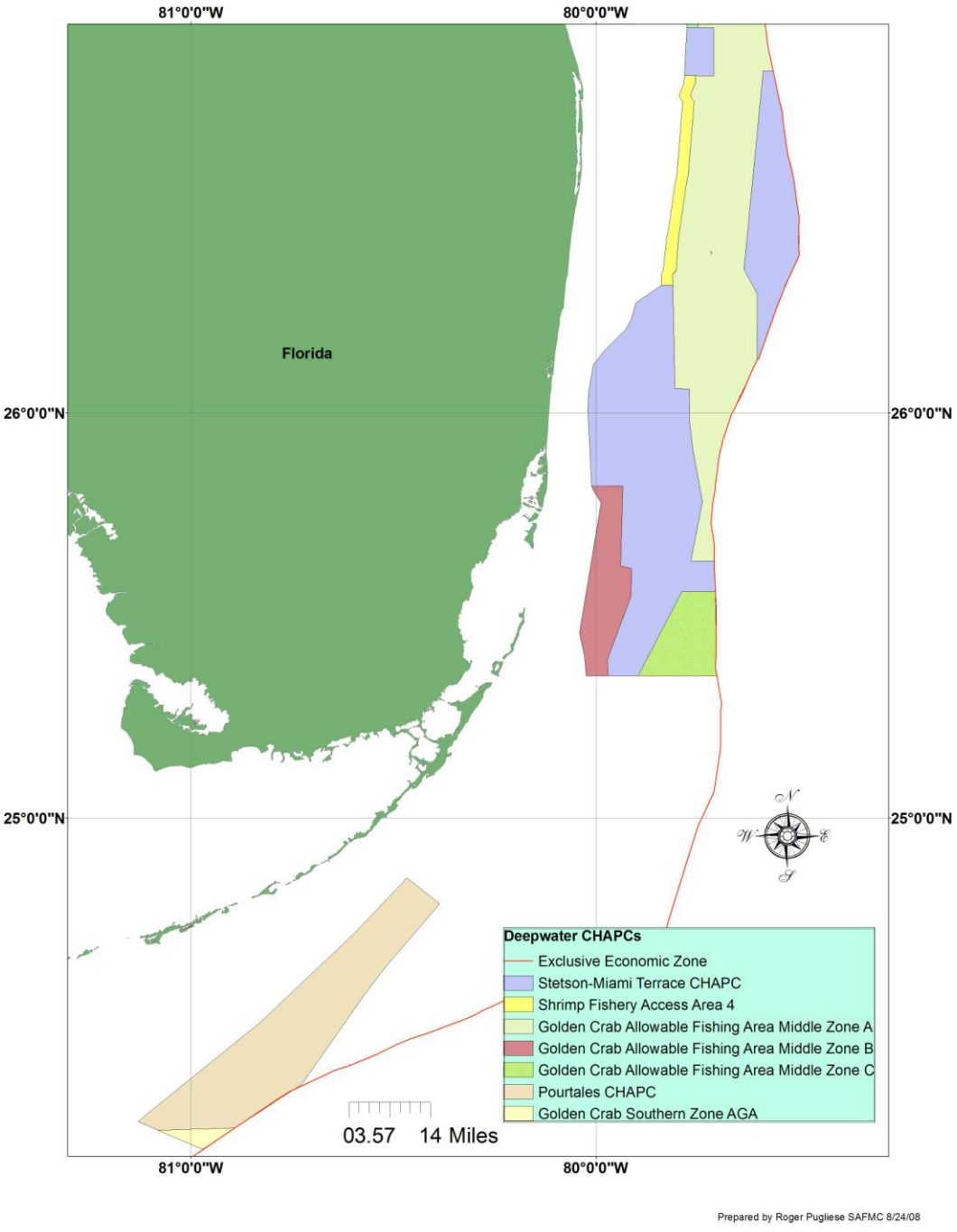


Figure 2-2. Proposed Golden Crab Allowable Gear Areas and Shrimp Fishery Access Areas (South of 27° N.) in proposed Stetson-Miami Terrace CHAPC and Pourtales Terrace CHAPC.

2.3.1 Comparison of Alternatives

Under **Alternative 1 (No action)** all impacts from golden crab fishing gear would be eliminated resulting in significantly beneficial biological effects. This alternative would also offer positive biological impacts to the golden crab resource as the fishery for this resource would not be allowed to occur in historically significant fishing areas.

Each of these sub-alternatives under **Preferred Alternative 2** will restrict the fishery to traditional golden crab fishing grounds and would have minimal impact on deepwater coral as golden crab fishermen do not intentionally set their gear on or intentionally impact the deepwater coral. Golden crab fishermen have indicated that they do attempt to set their gear in close proximity to the deepwater coral habitats. While the fishermen are careful not to intentionally impact the bottom, there are instances when gear may land on top of deepwater coral thickets. Creation of Allowable Golden Crab Fishing Areas is expected to have negative impacts on the golden crab resource as harvest will not be restricted.

Alternative 1 (No action) would result in significant negative socioeconomic impacts to the golden crab fishery and the fishing communities that depend on income generated by golden crab landings compared to **Alternatives 2 and 3**, assuming the establishment of the Stetson-Miami Terrace CHAPC (**sub-alternative 2c**) in **Action 1**. Logbook data indicate that the fishery caught an average of 510,000 pounds of golden crab annually over the period 2005-2007. If none of the proposed Allowable Golden Crab Fishing Areas (**sub-alternatives 2a, 2b,** and **2c**) are established, the fishery, would likely lose almost all of these landings estimated at approximately $714,000 ex-vessel value annually. **Alternative 3** proposes to move the western boundary of the proposed Northern and Middle Zone Allowable Golden Crab Fishing Areas west to include the proposed Shrimp Fishery Access Area (**Action 2**). Assuming CHAPCs are implemented as proposed under **Action 1**, a potential economic benefit of implementing **Alternative 3** compared to **Preferred Alternative 2** is that it would provide the golden crab vessels with additional areas to explore in the future.

Implementation of **sub-alternative 2b** would have the greatest positive social impacts because this area yields the greatest golden crab harvest. Under **Alternative 1 (No action)**, existing golden crab vessels would likely have to be sold or be refitted for participation in another fishery. Under this alternative it is possible that the golden crab fishery will cease to exist. The social impacts on the families involved in the golden crab fishery will be significant since it may not be possible for golden crab vessels to be converted from crab fishing to fishing for other species. As a result, the financial stress, unemployment and other problems resulting from these would ensue.

Alternative 1 (No action) would have a positive administrative impact since there would be no need to develop a monitoring mechanism, or maintain a permit and landings database for the fishery. **Preferred Alternative 2** would have minor to moderate effects on the administrative environment, especially that of the Office of Law Enforcement because they would responsible for overseeing fishery compliance within the allowable fishing areas. **Alternative 3** is not likely to produce any adverse administrative impacts

outside of those already discussed under **Action 2 Preferred Alternative 2** and **Preferred Alternative 2** under this action. However, outreach and education materials would need to be drafted in such a way as to make the locations of the designated boundaries of the shrimp fishery access areas very clear, since they would be within the allowable golden crab fishing area. Additionally, golden crab fishery participants would be responsible for identifying the location of their gear in relation to any shrimp trawl gear that may be co-occurring within the shrimp fishery access area in order to prevent any gear overlap and entanglement.

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

	Alternative 1	**Sub-alternative 2a**	**Sub-alternative 2b**	**Sub-alternative 2c**	**Alternative 3**
Biological Impacts	Positive for coral and golden crab	Small negative for coral and golden crab	Small negative for coral and golden crab	Small negative for coral and golden crab	Potential[1] long run negative for coral and golden crab
Economic Impacts	Significant negative to fishers	Small positive to fishers	Greatest positive benefit to fishery	Minor positive benefit to fishery	Potential long-run positive benefit to fishery
Social Impacts	Significant negative impacts to fishers	Small positive benefit to fishery	Greatest positive benefit to fishery	Minor positive benefit to fishery	Potential long run positive benefit to fishery
Administrative Impacts	Smaller administrative burden to agency	Greater administrative burden to agency	Greater administrative burden to agency	Greater administrative burden to agency	Greater administrative burden to agency

2.3.2 Conclusion

Action 3 would create "Allowable Golden Crab Fishing Areas" within the CHAPCs, assuming that they are chosen for implementation under **Action 1**. **Alternative 1 (No action)**, under **Action 3** would not create these allowable fishing areas and would cause negative economic and social impacts to the golden crab fishery. **Sub-alternatives 2a, 2b,** and **2c** would allow golden crab fishing in the traditional fishing grounds of this fishery and would have positive economic and social impacts relative to **Alternative 1 (No action)**. **Sub-alternative 2b** would provide the greatest positive economic and social impacts because the majority of the golden crab fishery operates in the Middle Zone. All of the sub-alternatives are expected to have small negative biological impacts on both the deepwater coral (due to accidental loss of gear) and the golden crab resource. **Alternative 3** is expected to have the greatest negative biological impacts to the deepwater coral because it would create a larger Allowable Golden Crab Fishing Area than those proposed in **sub-alternatives 2a, 2b, and 2c.** The long-run economic and social impacts have the potential to be positive if fishing for golden crab in the area proposed under **Alternative 3** is found to be successful. However, negative social

[1] Potential for the fishery to develop in this area is unknown. If it were to develop, the long-run effects could be positive.

impacts are possible with the potential for gear conflict between the golden crab fishery and the royal red shrimp fishery.

2.4 Action 4. Amend the Golden Crab FMP to require vessel monitoring

Alternative 1 (No action). Do not require use of an approved vessel monitoring system (VMS) by any vessel with a limited access golden crab permit.

Alternative 2. Require use of an approved vessel monitoring system (VMS) by any vessel with a limited access golden crab permit and approved crustacean traps fishing for golden crab within designated areas in the Stetson-Miami Terrace CHAPC and Pourtales Terrace CHAPC.

Alternative 3. Require use of an approved vessel monitoring system (VMS) by any vessel fishing with a limited access golden crab permit in the South Atlantic Council's area of jurisdiction.

2.4.1 Comparison of Alternatives

Alternative 1 (No action) would not require VMS on golden crab vessels fishing within the CHAPCs. Without requiring VMS, vessels could potentially fish in areas where gear would be likely to impact deepwater coral habitat. However, VMS will not provide information on where the gear is impacting the bottom habitat and will not provide a useful enforcement tool. Habitat damage could occur outside the proposed Allowable Golden Crab Fishing Areas and on extensive habitat in the CHAPCs proposed for conservation. However, the use of VMS will not prevent this damage from occurring nor will it provide evidence of such offenses.

Under **Alternative 2** monitoring of permitted golden crab vessels in the Allowable Golden Crab Fishing Areas with VMS will allow law enforcement to determine where the vessels are in relation to the CHAPCs but will not provide information to determine where the fishing *gear* is in relation to the CHAPCs. The use of VMS will not have a direct impact (either positive or negative) on the deepwater coral resource as it will not prevent fishermen from deploying gear on the deepwater coral. **Alternative 3** would require the use of an approved VMS by any vessel fishing with a limited access golden crab permit in the South Atlantic Council's area of jurisdiction. With all vessels monitored, law enforcement will be able to determine where the vessels are in relation to the CHAPCs but will not be able to determine where the fishing gear is in relation to the CHAPCs. Similar to the previous alternative, **Alternative 3** will not have a direct impact (either positive or negative) on the deepwater coral resource as it will not prevent fishermen from deploying gear on the deepwater coral.

Assuming that CHAPCs under **Action 1** and Allowable Golden Crab Fishing Areas under **Action 3** are approved, **Alternative 1 (No action)** would have no expected economic impact to golden crab fishermen. However, this alternative may not effectively deter fishing outside the Allowable Golden Crab Fishing Areas which might result in damage to corals and habitat that could in turn bring about negative long-term economic impact to

fishermen and the general public. The negative long-term economic impact would result from destruction of species that provide known and yet unknown value to the health of the ecosystem and various sectors of the economy including the medical sector. Negative long-term economic impacts could also result from a decrease in existence value, bequest value, and the value from diversity of corals or other habitat if damaged. However, the probability that fishing will occur outside the Allowable Golden Crab Fishing Areas is likely to be low given that the Allowable Golden Crab Fishing Areas encompass almost all traditional fishing grounds and fishermen have no incentive for setting their fishing gear on the deepwater coral beds. By contrast, **Alternative 2** would result in increased costs to golden crab fishermen that fish in these areas unless government funding was used to subsidize the costs of VMS unit purchase and installation. Based on discussions with the NOAA Office of Law Enforcement, VMS is not an appropriate monitoring mechanism for the golden crab fishery due to environmental and mechanical variables that often lead to a great distance between the gear itself and the vessel during both deployment and haul back. The combination of current and depth cause the gear to be quite far away from the vessel during both deployment and haul-back. In addition, some fishermen may consider the requirement of a VMS to be an intrusion on their privacy and their autonomy as an independent fisherman.

Even if government funds were made available to cover the costs of VMS units, there would still be ongoing costs associated with maintenance and operation of the VMS units. The proposed Stetson-Miami Terrace CHAPC and the Pourtales Terrace CHAPC encompass almost all of the traditional fishing grounds of the golden crab fishery. There are eleven currently active permits in the golden crab fishery. Of these, seven permits have landed at least 1,000 pounds golden crab sometime between 2005 and 2007. Therefore, if those permits remained active and continued to fish, seven permits would require installation of VMS units under **Alternative 2.** Detailed cost estimates of implementing this alternative are provided in **Section 4.4.2.** However, as previously stated VMS will not provide information on where the gear is impacting the bottom habitat and will not provide a useful enforcement tool.

Alternative 3 would require use of an approved VMS by any vessel fishing with a limited access golden crab permit in the South Atlantic Council's area of jurisdiction. Based on discussions with the NOAA Office of Law Enforcement, VMS is not an appropriate monitoring mechanism for the golden crab fishery due to environmental and mechanical variables that often lead to a great distance between the gear itself and the vessel during both deployment and haul back. The combination of current and depth cause the gear to be quite far away from the vessel during both deployment and haul-back. Assuming that CHAPCs and Allowable Golden Crab Fishing Areas are approved under **Actions 1 and 3, Alternative 3** would result in increased costs to all golden crab fishermen unless government funding was used to subsidize those costs. There are eleven currently active permits in the golden crab fishery. Under **Alternative 3**, all eleven vessels would be required to install VMS units on their vessels to remain active even if they did not fish in the areas where CHAPCs are located. Detailed cost estimates of implementing this alternative are provided in **Section 4.4.2.** However, as previously

stated VMS will not provide information on where the gear is impacting the bottom habitat and will not provide a useful enforcement tool.

Assuming that CHAPCs and Allowable Golden Crab Fishing Areas are approved under **Actions 1 and 3**, respectively, **Alternative 1 (No action)** would have no expected social impacts to golden crab fishermen. Assuming that CHAPCs and Allowable Golden Crab Fishing Areas are approved, **Alternative 2** would result in increased costs to golden crab fishermen that fish in these areas unless government funding was used to subsidize those costs. Any increase in costs of fishery operations places increased stress on fishermen and their families. Seven vessels have participated in the fishery between 2005 and 2007. In addition to the emotional stress associated with increased costs, it is expected that fishermen will have negative emotions associated with "being watched" via VMS monitoring. While many fishermen favor increased enforcement, for some VMS monitoring will increase their distrust towards fisheries managers since VMS regulations are considered when there are concerns regarding compliance.

Social benefits may include improved data collection by fishermen for personal use and improved communications between fishermen and the outside world.

Alternative 3 would have the same results as **Alternative 2** but include four additional vessels with active permits. However, these permitted vessels have not fished for golden crab for at least 3 years and therefore the permit owners may opt to let their permits expire rather than comply with expensive and ineffective VMS.

Alternative 1 (No action) would produce no increased administrative cost or burden beyond the status quo. **Alternatives 2 and 3** would require the use of VMS on federally permitted golden crab vessels either fishing within the proposed allowable golden crab fishing areas, or fishing anywhere within the Council's jurisdiction, respectively. Based on discussions with the NOAA Office of Law Enforcement, VMS is not an appropriate monitoring mechanism for the golden crab fishery due to environmental and mechanical variables that often lead to a great distance between the gear itself and the vessel during both deployment and haul back. The combination of current and depth cause the gear to be quite far away from the vessel during both deployment and haul-back. This unavoidable aspect of golden crab fishing would create scenarios in which the vessel itself is located outside the allowable area but within the CHAPC while that vessel's gear is located within the allowable area. Since the VMS unit would be located on the vessel and not the gear, a violation would be incurred and would require the Office of Law Enforcement to process citations, thus adding to their administrative burden. Additionally, the irregular and sometimes very narrow shape of the proposed allowable golden crab fishing areas would compound the difficulty of utilizing VMS as a fishery monitoring tool and successfully prosecuting violations.

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

	Alternative 1	**Alternative 2**	**Alternative 3**
Biological Impacts	Neither Positive or Negative	Neither Positive or Negative	Neither positive or negative
Economic Impacts	None	Negative impacts to fishery	Negative impacts to fishery
Social Impacts	None to fishery. Negative impacts to concerned public that fishery is operating with no monitoring.	Significant negative impacts to fishery.	Significant negative impacts to fishery.
Administrative Impacts	No change from the status-quo	Significant increase in administrative burden	Significant increase in administrative burden

2.4.2 Conclusion

Action 4 relates to monitoring of the golden crab fishery while operating within the CHAPCs and only analyzed the use of VMS as a monitoring tool. A meeting with the the Office of Law Enforcement, golden crab fishermen and fisheries managers confirmed that VMS is not a useful enforcement tool for this fishery as it would not provide information on where the *gear* was located on the bottom habitat. **Alternatives 2 and 3** would only provide information on where the *vessel* is located in relation to the CHAPC, and due to the nature of this fishery, the vessel may be quite a distance from the gear itself. Neither alternative would have positive or negative biological impacts on the deepwater coral resource but would have significant negative social and economic impacts to the fishery and significant administrative impacts to the agency. Because the use of VMS as a monitoring method (as described in **Alternatives 2 and 3**) is not a viable option for the fishery, other monitoring systems should be researched in order to allow the fishery to continue while ensuring the protection of corals in very close proximity to golden crab fishing gear. Possible methods of monitoring which may be explored through a research program are included in **Appendix I.**

3 Affected Environment

3.1 Habitat

3.1.1 Description and distribution

Information on distribution and description of deepwater coral habitats contained in this section has been consolidated from **Appendices A-D** and Ross and Nizinski (2007).

As the understanding of deep coral communities and ecosystems has increased, so has appreciation of their value. Deepwater coral communities can be hot-spots of biodiversity in the deeper ocean, making them areas of particular conservation interest. Stony coral "reefs" as well as thickets of gorgonian corals, black corals, and hydrocorals are often associated with a large number of other species. Through quantitative surveys of the macroinvertebrate fauna, Reed (2002b) found over 20,000 individual invertebrates from more than 300 species living among the branches of ivory tree coral (*Oculina varicosa*) off the coast of Florida. Over 1,300 species of invertebrates have been recorded in an ongoing census of numerous *Lophelia* reefs in the northeast Atlantic (Freiwald *et al.* 2004), and Mortensen and Fosså (2006) reported 361 species in 24 samples from *Lophelia* reefs off Norway. Gorgonian corals in the northwest Atlantic have been shown to host more than 100 species of invertebrates (Buhl-Mortensen and Mortensen 2004). An investigation by Richer de Forges *et al*. (2000) reported over 850 macro- and megafaunal species associated with seamounts in the Tasman and south Coral Seas with many of these species associated with the deep coral, *Solenosmilia variabilis* (Rogers 2004). The three-dimensional structure of deep corals may function in very similar ways to their tropical counterparts, providing enhanced feeding opportunities for aggregating species, a hiding place from predators, a nursery area for juveniles, fish spawning aggregation sites, and attachment substrate for sedentary invertebrates (Fosså *et al*. 2002; Mortensen 2000; Reed 2002b).

The high biodiversity associated with deep coral communities is intrinsically valuable and may provide numerous targets for chemical and biological research on marine organisms. For example, several deepwater sponges have been shown to contain bioactive compounds of pharmaceutical interest; sponges are often associated with deep coral communities. Bamboo corals (family Isididae) are being investigated for their medical potential as bone grafts and for the properties of their collagen-like gorgonin (Ehrlich *et al.* 2006). A number of deep corals are also of commercial importance, especially black corals (order Antipatharia) and pink and red corals (*Corallium* spp.), which are the basis of a large jewelry industry. Black coral is Hawaii's "State Gem".

Deepwater coral communities have also been identified as habitat for certain commercially-important fishes. For example, commercially valuable species of rockfish, shrimp, and crabs are known to use coral branches for suspension feeding or protection from predators in Alaskan waters (Krieger and Wing 2002). Husebø *et al.* (2002) documented a higher abundance and larger size of commercially valuable redfish, ling, and tusk in Norwegian waters in coral habitats compared to non-coral habitats. Costello *et al*. (2005), working at several sites in the Northeast Atlantic, reported that 92% of fish species and 80% of individual fish were associated with *Lophelia* reef habitats rather than on the surrounding

seabed. Koenig (2001) found a relationship between the abundance of economically valuable fish (e.g., grouper, snapper, sea bass, and amberjack) and the condition (dead, sparse, and intact) of *Oculina* colonies. *Oculina* reefs off Florida have been identified as EFH for Council-managed species. Although it occurs from Bermuda and North Carolina south through the Gulf of Mexico and the Caribbean in 2-152 m depths, this coral only forms large reefs off east-central Florida, 27° 32' N to 28° 59' N, in 70-100 m (Reed 2002b). The shallow water form of *Oculina* may have symbiotic zooxanthellae, but the deeper form does not. The deeper reefs are almost monotypic mounds and ridges which exhibit a vertical profile of 3-35 m (Avent *et al*. 1977; Reed 2002b). Superficially, these structures resemble the deep reefs formed by *Lophelia pertusa*. Despite cool temperatures, the shelf edge *Oculina* exhibit rapid growth, probably facilitated by regular upwellings of nutrient rich water (Reed 1983).

Lophelia pertusa, the major structure building coral in the deep sea, is the dominant scleractinian off the southeastern U.S. This species has a cosmopolitan distribution, occurring on the southeastern U.S. slope, in the Gulf of Mexico, off Nova Scotia, in the northeastern Atlantic, the South Atlantic, the Mediterranean, Indian Ocean and in parts of the Pacific Ocean over a depth range of 50 to 2,170 m (Cairns 1979; Rogers 1999). The 3,380 m depth record off New York for *L. pertusa* reported by Squires (1959) was based on a misidentified specimen (Cairns 1979). Coral habitats dominated by *Lophelia pertusa* are common throughout the southeast U.S. in depths of about 370 to at least 800 m.

Detailed descriptions of deepwater coral areas proposed for CHAPC designation are provided in reports developed by S. Ross and J. Reed for the SAFMC in 2004 and 2006 (**Appendices A-D**).

Deepwater coral habitat may be more important to western Atlantic slope species than previously known. Some commercially valuable deepwater species congregate around deepwater coral habitat **(Table 3-1).** Various crabs, especially galatheoids, are abundant on the deep reefs, playing a role of both predators and prey. Other invertebrates, particularly ophiuroids, populate the coral matrix in high numbers. On the relatively barren Blake Plateau, reefs (coral and hardgrounds) and surrounding coral rubble habitat seem to offer abundant shelter and prey.

There are few deepwater coral ecosystem references for the southeast region related to fishes, and those are generally qualitative (fishes neither collected nor counted) or fishes were not a specific target of the research (Popenoe and Manheim 2001; Weaver and Sedberry 2001; Reed *et al*. 2005a, 2005b, 2006). In the most detailed study of fishes to date, Ross and Quattrini (2007) identified 99 benthic or benthopelagic fish species on and around southeastern U.S. deepwater coral banks, 19% of which yielded new distributional data for the region. Additional publications resulting from their fish database documented the anglerfish fauna (Caruso *et al*. 2007), midwater fish interactions with the reefs (Gartner *et al.* in review), a new species of eel (McCosker and Ross in press), and a new species of hagfish (Fernholm and Quattrini in press). Although some variability in fish fauna was observed over this region, most of the deepwater coral habitat was dominated by relatively few fish species **(Table 3-1).**

Many of these species are cryptic, being well hidden within the corals (e.g., *Hoplostethus occidentalis*, *Netenchelys exoria*, and *Conger oceanicus*). Various reef habitats were characterized by *Laemonema melanurum*, *L. barbatulum*, *Nezumia sclerorhynchus*, *Beryx decadactylus*, and *Helicolenus dactylopterus* (Ross and Quattrini 2007). Nearby off reef areas were dominated by *Fenestraja plutonia*, *Laemonema barbatulum*, *Myxine glutinosa*, and *Chlorophthalmus agassizi*. *Beryx decadactylus* usually occurs in large aggregations moving over the reef, while most other major species occur as single individuals. The morid, *Laemonema melanurum*, is one of the larger fishes abundant at most sites with corals. This fish seems to rarely leave the prime reef area, while its congener *L. barbatulum* roams over a broader range of habitats. Although *Helicolenus dactylopterus* can be common in all habitats, it occurs most often around structures. It is intimately associated with the coral substrate, and it is abundant around deepwater reef habitat. Results (Ross and Quattrini 2007) suggested that some of the fishes observed around the deepwater coral habitats may be primary (obligate) reef fishes.

Table 3-1. Dominant benthic fish species (in phylogenetic order) observed and/or collected during submersible dives (2000-2005) on or near southeastern U.S. *Lophelia* habitat. Source: Based on Ross and Quattrini (2007). Asterisk (*) indicate commercially important species.

Myxinidae (mixed Myxine glutinosa and Eptatretus spp.)	hagfishes
Scyliorhinus retifer	chain dogfish
Scyliorhinus meadi	
Cirrhigaleus asper	roughskin dogfish
Dysommina rugosa	
Synaphobranchus spp.	cutthroat eels
*Conger oceanicus**	conger eel
Netenchelys exoria	
Nezumia sclerorhynchus	
Laemonema barbatulum	shortbeard codling
Laemonema melanurum	reef codling
Physiculus karrerae	
Lophiodes beroe	
Hoplostethus occidentalis	western roughy
*Beryx decadactylus**	red bream
*Helicolenus dactylopterus**	blackbelly rosefish
Idiastion kyphos	
Trachyscorpia cristulata	Atlantic thornyhead
*Polyprion americanus**	wreckfish

One of the most impressive biological aspects of these coral habitats (aside from the corals themselves) is the diverse and abundant invertebrate fauna (**Table 3-2** and Reed *et al*. 2006). *Eumunida picta* (galatheoid crab; squat lobster) and *Novodinia antillensis* (brisingid seastar) were particularly obvious, perched high on coral bushes to catch passing animals or filter food from the currents. One very different aspect of the North Carolina deepwater coral

habitat compared to the rest of the southeast region is the massive numbers of the brittle star, *Ophiacantha bidentata*, covering dead coral colonies, coral rubble, and to a lesser extent, living *Lophelia* colonies. It is perhaps the most abundant macroinvertebrate on these banks and may constitute a major food source for fishes (Brooks *et al*. 2007). In places the bottom is covered with huge numbers of several species of anemones. The hydroid fauna is also rich with many species being newly reported to the area and some species being new to science (Henry *et al*. in press). The abundance of filter feeders suggests a food rich habitat. Various species of sponges, echinoderms, cnidarians (Messing *et al*. 1990), and crustaceans (Wenner and Barans 2001) also have been reported from deep water coral reefs off Florida, the northeastern Straits of Florida, and the Charleston Bump region (Reed *et al*. 2006). Reed *et al*. (2006) provided a preliminary list of invertebrates, mostly sponges and corals, from some deepwater coral habitats on the Blake Plateau and Straits of Florida.

Table 3-2. Preliminary list of dominant benthic megainvertebrates observed or collected on or near southeastern U.S. deepwater coral habitats.
Source: References are 1= Nizinski *et al.* unpublished data, 2= Reed *et al.* 2006, 3 = Henry *et al.* in press.

Dominant Non-Coralline Invertebrate Taxa	
Phylum Porifera (Sponges) Class Demospongiae multiple species[1,2] Class Hexactinellida (glass sponges) multiple species[1,2] including *Aphrocallistes beatrix*[1]	Phylum Cnidaria Class Hydrozoa (Hydroids) multiple species (≥ 37 species)[3] Class Anthozoa Order Actinaria (anemones) multiple species including *Actinaugi rugosa* (Venus flytrap anemone)[1] Order Zoanthidea (zoanthids) multiple species[1,2]
Phylum Mollusca Class Cephalopoda Squids, *Ilex* sp.[1] Octopus, multiple species[1] Class Gastropoda *Coralliophila* (?) sp.[1]	Phylum Annelida Class Polychaeta (polychaetes) multiple species including *Eunice* sp.[1]

Table 3-2. Preliminary list of dominant benthic megainvertebrates observed or collected on or near southeastern U.S. deepwater coral habitats (Continued).

Phylum Arthopoda	Phylum Echinodermata
Subphylum Crustacea	Class Crinoidea (crinoids)
Class Malacostraca	multiple species[1]
Order Decapoda	Class Asteroidea (sea stars)
Infraorder Anomura	multiple species[1,2]
Family Chirostylidae (squat lobster)	Order Brisingida (brisingid sea star)
Eumunida picta [1,2]	Family Brisingidae
Gastroptychus salvadori[1]	*Novodinia antillensis*[1]
Uroptychus spp.[1]	Class Ophiuroidea (brittle stars)
Family Galatheidae (squat lobster)	multiple species[1], including *Ophiacantha bidentata*[1]
Munida spp.[1]	Class Echinoidea (sea urchins)
Munidopsis spp.[1]	Order Echinoida
Superfamily Paguroidea (hermit crabs and their relatives)	Family Echinidae
multiple species[1]	*Echinus gracilis*[1]
Infraorder Brachyura	*E. tylodes*[1]
Family Pisidae	Order Echinothurioida
Rochinia crassa (inflated spiny crab)[1]	Family Echinothuriidae
Family Geryonidae	*Hygrosoma* spp.[2]
Chaceon fenneri (golden deepsea crab)[1,2]	Order Cidaroida
Family Portunidae	Family Cidaridae
Bathynectes longispina (bathyal swimming crab)[1,2]	*Cidaris rugosa*[1]
Other taxa	*Stylocidaris* spp.[2]
Shrimps, multiple species[1]	

Although the invertebrate assemblage associated with northeastern Atlantic *Lophelia* reefs has been described as being as diverse as shallow water tropical coral reefs (e.g., Jensen and Frederickson 1992), data analysis of invertebrates associated with western Atlantic deepwater corals is too preliminary to speculate on the degree of species richness. Preliminary data on the invertebrate fauna (Nizinski *et al*. unpublished data) seem to indicate a faunal and habitat transition with latitude. In addition to changes in reef structure and morphology (see above), relative abundance within a single species decreases, overall species diversity increases, and numerical dominance between species decreases with decreasing latitude. In contrast to some fishes, the reef associated invertebrate assemblage appears to use deep reefs more opportunistically.

3.1.2 Deepwater coral habitat as Essential Fish Habitat

Essential fish habitat (EFH) is defined in the Magnuson-Stevens Fishery Conservation and Management Act as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S. C. 1802(10)). Specific categories of EFH identified in the South Atlantic Bight which are utilized by federally managed fish and invertebrate species include both estuarine/inshore and marine/offshore areas. Specifically, marine/offshore EFH includes: Live/hardbottom habitats, coral and coral reefs, artificial and manmade reefs, *Sargassum* species, and marine water column. Pelagic or benthic components of deepwater coral ecosystems are, therefore, EFH for Council-managed species

including species in the snapper grouper complex (wreckfish and snowy grouper) and dolphin and wahoo.

In addition to designating EFH, Council's must also identify EFH-Habitat Areas of Particular Concern (HAPCs) within EFH. In determining which areas should be designated as HAPCs the area must meet one or more of the following criteria:

1) Ecological function provided by the habitat is important
2) Habitat is sensitive to human-induced environmental degradation
3) Development activities are or will be stressing the habitat type
4) Habitat type is rare

Snapper Grouper

Designated EFH utilized by snapper grouper species in deepwater includes coral reefs, live/hardbottom, to at least 2,000 feet for wreckfish. EFH also includes the spawning area in the water column above the adult habitat (e.g., wreckfish on Miami Terrace) 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.

Designated EFH-HAPCs for species in the snapper grouper management unit associated with the deepwater CHAPCs include medium to high profile offshore hardbottoms where spawning normally occurs; localities of known or likely periodic spawning aggregations; The Point, and Big Rock (North Carolina); The Charleston Bump (South Carolina); pelagic Sargassum; Hoyt Hills for wreckfish; all hermatypic coral habitats and reefs; and manganese outcroppings on the Blake Plateau. Areas that meet the criteria for designating essential fish habitat-habitat areas of particular concern include habitats required during each life stage (including egg, larval, postlarval, juvenile, and adult stages).

Coastal Migratory Pelagics

Designated EFH-HAPCs for coastal migratory species includes The Point (North Carolina); The Charleston Bump (South Carolina); The Hump off Islamorada, Florida; The Marathon Hump off Marathon, Florida; The "Wall" off of the Florida Keys; and Pelagic *Sargassum*.

Dolphin Wahoo

Designated EFH for dolphin and wahoo associated with deepwater ecosystems includes the Gulf Stream, Charleston Gyre, Florida Current, and pelagic *Sargassum* (for dolphin).

Note: This EFH definition for dolphin was approved by the Secretary of Commerce on June 3, 1999 as a part of the South Atlantic Council's Comprehensive Habitat Amendment (SAFMC 1998b) (dolphin was included within the Coastal Migratory Pelagics FMP). This definition does not apply to extra-jurisdictional areas. A detailed description of the pelagic habitats used by dolphin and wahoo is presented the Habitat Plan and Volume II of the Fishery Ecosystem Plan.

Designated EFH-HAPCs for dolphin and wahoo in the Atlantic include The Point, The Ten-Fathom Ledge, and Big Rock (North Carolina); The Charleston Bump and The Georgetown

Hole (South Carolina); The Point off Jupiter Inlet (Florida); The Hump off Islamorada and The Marathon Hump off Marathon (Florida); and Pelagic *Sargassum* (for dolphin).

3.2 Biological/Ecological Environment

3.2.1 Species Most Impacted by this Amendment

3.2.1.1 Deepwater Corals

Stony Corals (Class Anthozoa, Order Scleractinia)
The southeast U.S. slope area, including the slope off the Florida Keys, appears to have a unique assemblage of deepwater Scleractinia (Cairns and Chapman 2001). The warm temperate assemblage identified by Cairns and Chapman (2001) contained about 62 species, four endemic to the region. This group was characterized by many free living species, few species living deeper than 1000 m, and many species with amphi-Atlantic distributions. For the southeastern U.S., in areas deeper than 200 m, they reported a similar assemblage, consisting of 57 species of scleractinians (including 47 solitary and ten colonial structure-forming corals), four antipatharians, one zoanthid, 44 octocorals, one pennatulid, and seven stylasterids. Thus the region contains at least 114 species of deepwater corals (classes Hydrozoa and Anthozoa). This list is conservative, however; it is expected that more species will be discovered in the region as exploration and sampling increase. The major structure-forming corals that most contribute to reef-like habitats in the southeastern U.S. are discussed below.

Lophelia pertusa
Although *Lophelia* may occur in small scattered colonies attached to various hard substrata, it also forms complex, high profile features. For instance, off North Carolina, *Lophelia* forms what may be considered classic mounds that appear to be a sediment/coral rubble matrix topped with almost monotypic stands of *L. pertusa*. Along the sides and around the bases of these banks are rubble zones of dead, gray coral pieces which may extend large distances away from the mounds. To the south, sediment/coral mounds vary in size, and *L. pertusa* and other hard and soft corals populate the abundant hard substrata of the Blake Plateau in great numbers.

Data are lacking on how *Lophelia* coral banks in the southeastern U.S. are formed. Hypotheses for coral mound formation in the northeastern Atlantic were proposed (Hovland *et al.* 1998; Hovland and Risk 2003; Masson *et al*. 2003), but it is unclear how relevant these are off the southeastern U.S. The mounds off North Carolina and those in other locations off the southeastern U.S. (particularly east of south-central Florida) appear to be formed by successive coral growth, collapse, and sediment entrapment (Wilson 1979; Ayers and Pilkey 1981; Paull *et al*. 2000; Popenoe and Manheim 2001). Other coral formations in the area (especially on the Blake Plateau) seem to form by coral colonization of appropriate hard substrates, without mound formation by the corals. If bottom currents are too strong, mound formation may be prevented (Popenoe and Manheim 2001) because sediments cannot be trapped. Ayers and Pilkey (1981) suggested that Gulf Stream currents may erode coral mounds, and that present coral bank sizes may be related to historical displacements of that current. Assuming currents also carry appropriate foods, it may be that currents with variable

speeds or at least currents of moderate speeds (fast enough to facilitate filter feeding but not too fast to prevent sediment entrapment) coupled with a supply of sediment are the conditions necessary to facilitate coral mound formation (Rogers 1999). Regardless of how coral formations are created, Masson *et al*. (2003) suggest that that elevated topography appears to be an important attribute for well developed coral communities.

Reproduction

Lophelia pertusa has been studied more extensively than other species, using samples from Norway, the Gulf of Mexico, and the Florida Straits. Seasonality of gametogenesis appears to vary with location. The gametogenic cycle of samples collected from the Norwegian Fjords began in April and terminated with spawning in March the following year (Brooke and Jarnegren in prep.). In the Gulf of Mexico, however, gametogenesis begins in November and spawning probably occurs in late September/October (S. Brooke unpubl.). Fecundity of both sets of samples is high but quantified data have not yet been compiled. Research into reproduction of octocorals from Alaska and New England is also underway (Simpson unpubl), and some work has been done on reproduction in Alaskan stylasterines, which are all brooders and produce short-lived planulae (Brooke and Stone in press). Larval biology has been described for *O. varicosa* (Brooke and Young 2005) but not for any of the other deepwater corals.

Development and growth

The growth of *L. pertusa* has been measured using various methods (Duncan 1877; Dons 1944; Freiwald 1998; Gass and Roberts 2006), which have estimated growth rates between 4-26 mm per year, with the most likely estimates at approximately 5mm per year (Mortensen and Rapp 1998). These methods have measured linear extension rather than calcification rates, but the latter could potentially be calculated from growth rates and skeletal density. Growth rates of some gorgonians and antipatharians have also been measured using rings in the gorgonian skeleton and isotopic analysis (e.g., Sherwood *et al*. 2005, Andrews *et al*. 2002, Risk *et al*. 2002; Williams *et al*. 2006) and in some cases the colonies are extremely old (hundreds to thousands of years) and have very slow growth rates (e.g., Druffel *et al*. 1995; C. Holmes *et al.* unpubl. data).

Field observations on distribution of *L. pertusa* indicate that the upper thermal limit for survival is approximately 12°C, and laboratory studies on *L. pertusa* tolerance to temperature extremes corroborate these observations (S. Brooke unpubl. data). Preliminary experiments with heat shock proteins show expression of HSP-70 in response to exposure of temperature greater than 10°C (S. Brooke unpubl. data). Experiments on tolerance to sediment load indicate that samples of *L. pertusa* from the Gulf of Mexico show >50% survival in sediment loads of 103 mgL-1 for 14 days, and can survive complete burial for up to 2 days (Continental Shelf Associates in review). Given the proximity of some coral habitats to oil and gas extraction sites, tolerance to drilling fluids and fossil fuels should also be investigated.

Further laboratory and field experiments are needed to examine the individual and interactive effects of environmental conditions such as temperature, sedimentation, and toxins. A range of responses or endpoints should be examined including more modern techniques such as

cellular diagnostics. These include examination of levels of stress proteins produced by cells in response to external conditions such as heat shock proteins, ubiquitin, etc. There are general classes of cellular products that are known to be indicative of specific stressors such as nutritional stress, xenobiotics, metals, and temperature. These techniques are being increasingly used in shallow coral systems as a more sensitive organismal response to stress (i.e., more sensitive than mortality). These responses should be measured in combination with more standard parameters such as growth, respiration, and fecundity.

Coral growth rates provide information on the rates of habitat production in deepwater coral ecosystems while coral mortality and bioerosion counterbalance this production with destruction. Understanding the positive and negative sides of this balance, particularly under the changes in environmental conditions that are anticipated in the coming decade or two, is crucial to the management and conservation of deepwater coral habitat and habitat function (e.g., fishery production).

Although *Lophelia* is the dominant hard coral off North Carolina, other scleractinians contribute to the overall complexity of the habitat **(Table 3-3)**. Overall, species diversity of scleractinians increases south of Cape Fear, NC, but *L. pertusa* is still dominant. For example, the colonial corals *Madrepora oculata* and *Enallopsammia profunda*, rare off Cape Lookout, NC, are relatively common south of Cape Fear, NC. These hard corals tend not to occur singly or as species-specific mounds, but rather live on or adjacent to the *Lophelia* mounds. A variety of solitary corals are also found off the southeastern U.S. Individuals are often attached to coral rubble or underlying hard substrata. Most species appear to be either uncommon or rare. But, in some instances, particularly in the central portion of the region, local abundance can be high. For example, aggregations of *Thecopsammia socialis* and *Bathypsammia fallosocialis* carpet the bottom adjacent to reef habitat at study sites off South Carolina and northern Florida (Ross *et al*. unpublished data).

Black corals (Class Anthozoa, Order Antipatharia)

Black corals (Families Leiopathidae and Schizopathidae, ca. four species) are important structure-forming corals on the southeastern U.S. slope (**Table 3-3**). These corals occur locally in moderate abundances, but their distributions seem to be limited to the region south of Cape Fear, NC. Colonies may reach heights of 1-2 m. Black coral colonies, occurring singly or in small aggregations, may be observed either in association with hard coral colonies or as separate entities. Some of these living components of the deep reefs attain ages of hundreds to thousands of years (Williams *et al.* 2006; Williams *et al.* in press; C. Holmes and S.W. Ross, unpublished data), and thus, along with gold corals, are among the oldest known animals on Earth. Black corals form annual or regular bands, and these bands contain important chemical records on past climates, ocean physics, ocean productivity, pollution, and data relevant to global geochemical cycles. An effort to investigate these geochemical data is underway by U.S. Geological Survey (C. Holmes and S.W. Ross).

Gold corals (Class Anthozoa, Order Zoanthidae)

Gerardia spp. colonies are found most often singly away from other coral structure, but these corals are also found associated with colonies of other structure-forming corals such as *Lophelia pertusa*, *Keratoisis* spp., or antipatharians (*Leiopathes* spp.). Very little is known

about this group of organisms. They apparently exhibit slow growth, reaching ages of at least 1,800 years old (Griffin and Druffel 1989; Druffel *et al.* 1995) and may be valuable in paleoecology studies.

Table 3-3. Attributes of structure-forming deepwater corals of the southeastern U.S.

Taxa	Reef-building	Abundance	Max colony size	Morphology	Associations with other structure-forming invertebrates	Colony spatial dispersion	Overall structural importance
Lophelia pertusa	Yes	High	Large	Branching	Many	Clumped	High
Solenosmillia variabilis	No	Low	Small	Branching	Many	Clumped	Low
Enallopsammia profunda	No	Low-Medium	Small-Medium	Branching	Many	Clumped	Low-Medium
Madrepora oculata	No	Low	Small	Branching	Many	Clumped	Low
Oculina varicosa	Yes	High	Large	Branching	Many	Clumped	High
Madracis myriaster	No	Low	Small-Medium	Branching	Many	Clumped	Low
Leiopathes glaberrima	No	Medium	Medium - Large	Branching	Many	Solitary	Medium
Bathypathes alternata	No	Low	Medium - Large	Branching	Many	Solitary	Low
Keratoisis spp.	No	Medium	Medium - Large	Branching	Many	Solitary	Medium

Table Key	
Attribute	**Measure**
Reef-Building	Yes/No
Relative Abundance	Low/ Medium/ High
Size (width or height)	Small (< 30cm)/ Medium (30cm-1m)/ Large (>1m)
Morphology	Branching/ Non-branching
Associations	None/ Few (1-2)/ Many (>2)
Spatial Dispersion	Solitary/ Clumped
Overall Rating	Low/ Medium/ High

Gorgonians (Class Anthozoa, Order Gorgonacea)

The gorgonians are by far the most diverse taxon on the southeastern U.S. slope represented by seven families, 17 genera, and 32 species. The diversity of gorgonians increases dramatically south of Cape Fear, NC. Additional sampling is likely to increase the numbers of known species in this group for this region. To date, material collected off Jacksonville, FL represented a newly described species (*Thourella bipinnata* Cairns 2006); the specimen

of *Chrysogorgia squamata* also collected off Jacksonville represented the fifth known specimen of this species and increased our knowledge of its geographic range (previously known only from the Caribbean).

Bamboo corals (Family Isididae, four species), possibly the best known members of this group because of their larger size and distinctive morphology, are also important structure-forming corals off the southeast region **(Table 3-3)**. They occur locally in moderate abundances and their distributions also seem to be limited to the region south of Cape Fear, NC. Colonies may reach heights of 1-2 m. Bamboo coral colonies occur either singly or in small aggregations and may be observed either in association with hard coral colonies or as separate entities.

True soft corals (Class Anthozoa, Order Alcyonacea)
Three families, Alcyoniidae, Nephtheidae, and Nidaliidae, comprise the Alcyonacea off the southeastern U.S. No family is speciose; total known diversity for this group is only six species. The most abundant species observed in the region is *Anthomastus agassizi*, which is relatively abundant at sites off Florida. It is usually attached to dead *Lophelia*, but some individuals have also been observed on dermosponges and coral rubble. The majority of the alcyonacean species are smaller in size, both in vertical extent and diameter, than the gorgonians. Thus, these corals add to the overall structural complexity of the habitat by attaching to hard substrata such as dead scleractinian skeletons and coral rubble.

Stoloniferans, a suborder (Stolonifera) within the Alcyonacea, are represented by one family (Clavulariidae) off the southeast region. Six species from four genera have been reported from the region. One species, *Clavularia modesta*, is widespread throughout the western Atlantic; the other five species are known from North Carolina southward to the Caribbean.

Pennatulaceans (Class Anthozoa, Order Pennatulacea)
Little is known about pennatulids (sea pens) off the southeastern U.S. It is unlikely that this group contributes significantly to the overall complexity and diversity of the system. No sea pens have been observed during recent surveys (Ross *et al*. unpublished data) and based on museum records, only one species (*Kophobelemnon sertum*) is known in the region.

Stylasterids (Class Hydrozoa, Order Anthoathecatae)
Although not found in great abundances, stylasterids (lace corals) commonly occur off the southeastern U.S. Seven species representing four genera have been reported from the region. Individuals observed in situ are often attached to dead scleractinian corals or coral rubble. Abundance and diversity of stylasterids increase southward from the Carolinas.

3.2.1.2 Golden Crab

Description and Distribution
The golden crab, *Chaceon fenneri* (**Figure 3-1**), is a large gold or buff colored species whose diagnostic characters include a hexagonal carapace; five anterolateral teeth on each side of carapace; well-developed, large frontal teeth; shallow, rounded orbits; chelipeds unequal; and the dactyli of the walking legs laterally compressed (Manning and Holthuis 1984, 1989). Golden crabs inhabit the continental slope of Bermuda (Luckhurst 1986, Manning and

Holthuis 1986) and the southeastern US from off Chesapeake Bay (Schroeder 1959), south through the Straits of Florida and into the eastern Gulf of Mexico (Manning and Holthuis 1984, 1986; Otwell *et al.* 1984; Wenner *et al.* 1987; Erdman 1990).

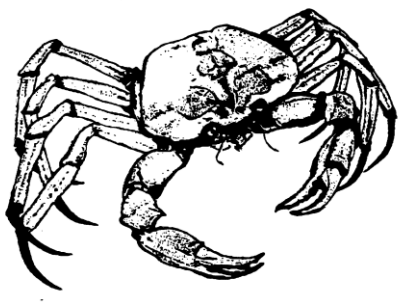


Figure 3-1. Golden Crab, *Chaceon fenneri*.

Reported depth distributions of *C. fenneri* range from 205 m off the Dry Tortugas (Manning and Holthuis 1984) to 1007 m off Bermuda (Manning and Holthuis 1986). Size of males examined range from 34 to 139 mm carapace length (CL) and females range from 39 to 118 mm CL. Ovigerous females have been reported during September, October, and November, and range in size from 91 to 118 mm CL (Manning and Holthuis 1984, 1986).

Wenner *et al.* (1987) note: "Other studies have described an association of *G. quinquedens* with soft substrates. Wigley *et al.* (1975) noted that bottom sediments throughout the area surveyed for red crab from offshore Maryland to Corsair Canyon (Georges Bank) consisted of a soft, olive-green, silt-clay mixture. If golden crabs preferentially inhabit soft substrates, then their zone of maximum abundance may be limited within the South Atlantic Bight. Surveys by Bullis and Rathjen (1959) indicated that green mud occurred consistently at 270-450 m between St. Augustine and Cape Canaveral, FL (30°N and 28°N). This same depth range from Savannah, GA to St. Augustine was generally characterized by Bullis and Rathjen (1959) as extremely irregular bottom with some smooth limestone or "slab" rock present. Our study indicates, however, that the bottom due east between Savannah and St. Catherines Island, GA at 270-540 m consists of mud and biogenic ooze. Further north from Cape Fear, NC to Savannah, bottom topography between 270 and 450 m is highly variable with rocky outcrops, sand and mud ooze present (Low and Ulrich 1983)."

In a subsequent study using a submersible, Wenner and Barans (1990) found the greatest abundance in rock outcrops:

"Observations on density and a characterization of essential habitat for golden crab, *Chaceon fenneri*, were made from a submersible along 85 transects in depths of 389-567 m approximately 122 km southeast of Charleston, South Carolina. Additional observations on habitat were made on 16 transects that crossed isobaths between 293-517 m.

Seven essential habitat types can be identified for golden crab from observations:

- A flat foraminiferan ooze habitat (405-567 m) was the most frequently encountered habitat. This habitat type is characterized by pteropod-foraminiferan debris mixed

with larger shell fragments, a sediment surface mostly covered with a black phosphorite precipitate;

- Distinct mounds, primarily of dead coral at depths of 503 to 555 meters, constituted 20% of the bottom surveyed on dives to count crabs. Coral mounds rose approximately 15 to 23 meters in height above the surrounding sea floor and included several that were thinly veneered with a fine sediment and dead coral fragments, as well as a number that were thickly encrusted with live branching ahermatypic corals (*Lophelia prolifera* and *Enallopsammia profunda*). Fan-shaped sponges, pennatulids and crinoids were oriented into the northerly 1.4-1.9 km- h-1 current. The decapod crustaceans *Bathynectes longispina, Eugonatonotus crassus* and *Eumunida pita*, the black-bellied rosefish, *Helicolenus dactylopterus*, and the wreckfish, *Polyprion americanus*, were frequently sighted along transects in the coral mound habitat.

- Ripple habitat (320-539 m); dunes (389-472 m); black pebble habitat (446-564 m); low outcrop (466-512 m); and soft-bioturbated habitat (293-475 m). A total of 109 *C. fenneri* were sighted within the 583,480 m^2 of bottom surveyed. Density (mean no. per 1,000 m^2) was significantly different among habitats, with highest values (0.7 per 1,000 m^2) noted among low rock outcrops. Lowest densities were observed in the dune habitat (<0.1 per 1,000 m^2), while densities for other habitats were similar (0.15-0.22 per 1,000 m^2)."

A similar submersible study in the eastern Gulf of Mexico (Lindberg and Lockhart 1993) found similar results with higher abundance of golden crab on hardbottom: "Within the bathymetric range of golden crabs, crab abundance may be related more to habitat type than to depth. The greatest density (36.5 crabs/ha) occurred on or near hard-bottom canyon features."

Golden crabs occupy offshore oceanic waters along the Atlantic and Gulf of Mexico coasts as adults. Offshore areas used by adults are probably the least affected by habitat alterations and water quality degradation. Currently, the primary threat comes from oil and gas development and production, offshore dumping of dredged material, disposal of chemical and other wastes, and the discharge of contaminants by river systems.

Reproduction

Reproduction and anatomy of the reproductive tracts of males and females of the golden crab *Geryon fenneri* were studied by Hinsch (1988) in specimens collected from deep water of the eastern Gulf of Mexico:

"The male crab is larger than female. Their reproductive tracts are typical of brachyurans. Light and electron microscopic studies of the testes and vasa deferentia at various times during the year indicate that *G. fenneri* has a single reproductive season. Spermatogenesis begins in the fall. Mating occurs during March and April. The reproductive organs of males are reduced in size from May through September.

The fully developed ovary of golden crabs is purple in color. Females oviposit in September and October. Females undergo vitellogenesis at the same time that they carry eggs undergoing embryonic development. Females with broods have ovaries which vary in color and size. They release their larvae during February and March. Females may be reproductive for several seasons and appear to be capable of mating while in the hardened condition"

Development, growth and movement patterns
Wenner *et al.* (1987) found in the South Atlantic Bight that: "Size-related distribution of *C. fenneri* with depth, similar to that reported for red crab, may occur in the South Atlantic Bight. We found the largest crabs in the shallowest (274-366 m) and deepest (733-823 m) strata. A clear trend of size-related up-slope migrations such as Wigley *et al.* (1975) reported for *C. quinquedens* is not apparent, however, because of trap bias for capture of larger crabs of both sexes. Otwell *et al.* (1984) also noted no pattern in size of golden crab by depth for either sex. Tagging studies of red crab off southern New England provided no evidence for migration patterns and indicated instead that tagged crabs seldom moved more than 20 km from their site of release (Lux *et al.* 1982)."

Lindberg and Lockhart (1993) found in the Gulf of Mexico:
"The golden crab *Chaceon fenneri* in the eastern Gulf of Mexico exhibits a typical bathymetric pattern of partial sex zonation and an inverse size-depth relationship, as first reported for red crabs (*C. quinquedens*: Wigley *et al.*, 1975; *C. maritae*: Beyers and Wilke, 1980). Sex segregation, with females shallower than most males, was more evident in our results than in those of Wenner *et al.* (1987) from the South Atlantic Bight, primarily because our trap catch had a higher proportion of females (25.9% compared to 5.2%)."

Ecological relationships
Feeding habits are very poorly known. Golden crabs are often categorized as scavengers that feed opportunistically on dead carcasses deposited on the bottom from overlying waters (Hines 1990).

Abundance and status of stocks
Golden crab abundance studies are limited. Data from the South Atlantic Bight (Wenner *et al.* 1987) estimated abundance from visual assessment was 1.9 crabs per hectare while traps caught between 2 and 10 kg per trap. Wenner and Barans (1990) estimated the golden crab population in small areas of 26-29 square km between 300-500 m off Charleston to be 5,000-6,000 adult crabs. In the eastern Gulf of Mexico adult standing stock was estimated to be 7.8 million golden crabs and the biomass was estimated to be 6.16 million kg (13.6 million pounds) (Lindberg *et al.* 1989). Experimental trapping off Georgia yielded an average catch of 7 kg per trap (Kendall 1990).

Based on exploratory trapping, golden crab maximum abundance occurs between 367 and 549 meters in the South Atlantic Bight. Information on sediment composition suggests that golden crab abundance is influenced by sediment type with highest catches on substrates containing a mixture of silt-clay and foraminiferan shell (Wenner *et al.* 1987).

3.2.1.3 Deepwater Shrimp

Rock shrimp are not directly impacted by the actions in this amendment; however, fishermen harvesting rock shrimp in the South Atlantic also target royal red shrimp. The latter is currently not a Council-managed species. Hence, descriptions of both the rock shrimp and royal red shrimp resource are offered here.

Rock Shrimp

Description and distribution

Rock shrimp, *Sicyonia brevirostris*, (**Figure 3-2**) are very different in appearance from the three penaeid species. Rock shrimp can be easily separated from penaeid species by their thick, rigid, stony exoskeleton. The body of the rock shrimp is covered with short hair and the abdomen has deep transverse grooves and numerous tubercles.

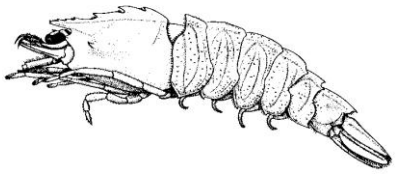


Figure 3-2. Rock shrimp, *Sicyonia brevirostris*.

Recruitment to the area offshore of Cape Canaveral occurs between April and August with two or more influxes of recruits entering within one season (Kennedy *et al.* 1977). Keiser (1976) described the distribution of rock shrimp in coastal waters of the southeastern United States. Whitaker (1982) presented a summary of information on rock shrimp off South Carolina. The only comprehensive research to date on rock shrimp off the east coast of Florida was by Kennedy *et al.* (1977). This section presents some of the more significant findings by Kennedy *et al.* (1977) regarding the biology of rock shrimp on the east coast of Florida.

Rock shrimp are found in the Gulf of Mexico, Cuba, the Bahamas, and the Atlantic Coast of the U.S. up to Virginia (SAFMC 1993). The center of abundance and the concentrated commercial fishery for rock shrimp in the south Atlantic region occurs off northeast Florida south to Jupiter Inlet. Rock shrimp live mainly on sand bottom from a few meters to 183 m (600 ft), occasionally deeper (SAFMC 1993). The largest concentrations are found between 25 and 65 m (82 and 213 ft).

Although rock shrimp are also found off North Carolina, South Carolina, and Georgia and are occasionally landed in these states, no sustainable commercially harvestable quantities of rock shrimp comparable to the fishery prosecuted in the EEZ off Florida are being exploited. Rock shrimp are included in the fishery management unit (FMU) of the Shrimp FMP of the South Atlantic Region.

Reproduction

Rock shrimp are dioecious (separate sexes). Female rock shrimp attain sexual maturity at about 17 mm carapace length (CL), and all males are mature by 24 mm CL. Seasonal temperature initiates maturation. Rock shrimp have ovaries that extend from the anterior end of the cephalothorax to the posterior end of the abdomen.

Female rock shrimp attain sexual maturity at about 0.7 in (17 mm) carapace length (CL), and all males are mature by 0.9 in (24 mm) CL. Rock shrimp, as with most shrimp species, are highly fecund. Fecundity most probably, as with penaeids, increases with size. In rock shrimp, copulation is believed to take place between hard-shelled individuals. During copulation, similar to penaeid shrimp, the male anchors the spermatophore to the female's thelycum by the petasma and other structures and a glutinous material. Fertilization is believed to take place as ova and spermatozoa are simultaneously expulsed from the female. The spawning season for rock shrimp is variable with peak spawning beginning between November and January and lasting 3 months (Kennedy *et al.* 1977). Individual females may spawn three or more times in one season. Peak spawning activity seems to occur monthly and coincides with the full moon (Kennedy *et al.* 1977).

Development, growth and movement patterns

Kennedy *et al.* (1977) found rock shrimp larvae to be present year round with no trend relative to depth, temperature, salinity, and length or moon phase. The development from egg to postlarvae takes approximately one month. Subsequently the development from postlarvae to the smallest mode of recruits takes two to three months.

For rock shrimp the development from egg to postlarvae takes approximately one month. Subsequently, the development from postlarvae to the smallest mode of recruits takes two to three months. The major transport mechanism affecting planktonic larval rock shrimp is the shelf current systems near Cape Canaveral, Florida (Bumpus 1973). These currents keep larvae on the Florida Shelf and may transport them inshore during spring. Recruitment to the area offshore of Cape Canaveral occurs between April and August with two or more influxes of recruits entering within one season (Kennedy *et al.* 1977).

Rates of growth in rock shrimp are variable and depend on factors such as season, water temperature, shrimp density, size, and sex. Rock shrimp grow about 2 to 3 mm CL (0.08 – 0.1 in) per month as juveniles and 0.5 - 0.6 mm CL (0.02 in) per month as adults (Kennedy *et al.* 1977).

Density is thought to also affect growth of rock shrimp. In 1993, the industry indicated that rock shrimp were abundant but never grew significantly over 36/40, the predominant count that was harvested during July and August of that year. During years of low densities, the average size appears to be generally larger.

Since rock shrimp live between 20 and 22 months, natural mortality rates are very high, and with fishing, virtually the entire year class will be dead at the end of the season. The intense fishing effort that exists in today's fishery, harvests exclusively the incoming year class.

Three year classes were present in sampling conducted between 1973 and 1974 by Kennedy *et al.* (1977). Fishing mortality in combination with high natural mortality and possibly poor environmental conditions may be high enough to prevent any significant escapement of adults to constitute a harvestable segment of the population. The better than average rock shrimp production in the 1996 season possibly resulted from better environmental conditions more conducive to rock shrimp reproduction and spawning.

Ecological relationships

Along the Florida Atlantic coast, the predominant substrate inside of 200 m depth is fine to medium sand with small patches of silt and clay (Milliman 1972). Juvenile and adult rock shrimp are bottom feeders. Rock shrimp are most active at night (Carpenter 2003). Stomach contents analyses indicated that rock shrimp primarily feed on small bivalve mollusks and decapod crustaceans (Cobb *et al.* 1973). Kennedy *et al.* (1977) found the relative abundance of particular crustaceans and mollusks in stomach contents of rock shrimp corresponding to their availability in the surrounding benthic habitat. The diet of *Sicyonia brevirostris* consists primarily of mollusks, crustaceans, and polychaete worms. Also included are nematodes and foraminiferans. Ostracods, amphipods, and decapods made up the bulk of the diet, with lesser amounts of tanaidaceans, isopods, cumaceans, gastropods, and other bivalves also present (Kennedy *et al.* 1977).

Kennedy *et al.* (1977) characterized rock shrimp habitat and compiled a list of crustacean and molluscan taxa associated with rock shrimp benthic habitat. The bottom habitat on which rock shrimp thrive is limited and thus limits the depth distribution of these shrimp. Cobb *et al.* (1973) found the inshore distribution of rock shrimp to be associated with terrigenous and biogenic sand substrates and only sporadically on mud. Rock shrimp also utilize hardbottom and coral, more specifically *Oculina*, habitat areas. This was confirmed with research trawls capturing large amounts of rock shrimp in and around the Oculina Bank HAPC prior to its designation.

Abundance and status of stocks

For stocks such as rock shrimp, information from which to establish stock status determination criteria is limited to measures of catch. Nevertheless, with the development of a permitting system and reporting requirements associated with the permit, better information will be collected on the effort and catch in this fishery. Data should be reviewed periodically to determine if better inferences can be drawn to address $B_{MSY.}$ Additionally, any time that annual catch levels trigger one of the selected thresholds, new effort should be made to infer B_{MSY} or a reasonable proxy.

Stock status determination criteria for rock shrimp were calculated from catch estimates as reported in Amendment 1 of the Shrimp Plan (SAFMC 1996a) during the period 1984-1996 (**Table 3-4**).

Table 3-4. Landings data used to calculate the current MSY value for rock shrimp in the South Atlantic.

Year	Landings
1986	2,514,895
1987	3,223,692
1988	1,933,097
1989	3,964,942
1990	3,507,955
1991	1,330,919
1992	2,572,727
1993	5,297,197
1994	6,714,761

Note: Data for the period 1986 to 1994 are taken from Shrimp Amendment 1 (SAFMC 1996a).

Maximum Sustainable Yield -- Because rock shrimp live only 20 to 22 months, landings fluctuate considerably from year to year depending primarily on environmental factors. Although there is a good historical time series of catch data, the associated effort data were not considered adequate to calculate a biologically realistic value for MSY. Nevertheless, two standard deviations above the mean total landings was considered to be a reasonable proxy for MSY (SAFMC 1996a). The MSY proxy for rock shrimp, based on the state data from 1986 to 1994, is 6,829,449 pounds heads on (SAFMC 1996a).

Optimum Yield -- OY is equal to MSY. The intent is to allow the amount of harvest that can be taken by U.S. fishermen without reducing the spawning stock below the level necessary to ensure adequate reproduction. This is appropriate for an annual crop like rock shrimp when recruitment is dependent on environmental conditions rather than female biomass. A relatively small number of mature shrimp can provide sufficient recruits for the subsequent year's production (SAFMC 1996a).

Overfished Definition -- The South Atlantic rock shrimp resource is overfished when annual landings exceed a value two standard deviations above mean landings during 1986 to 1994 (mean=3,451,132 lb., s.d. =1,689,159), or 6,829,449 pounds heads on (SAFMC 1996a). In other words, the stock would be overfished if landings exceeded MSY. The status of rock shrimp stocks in the South Atlantic are not considered overfished at this time. High fecundity enables rock shrimp to rebound from a very low population size in one year to a high population size in the next when environmental conditions are favorable (SAFMC 1996a).

Overfishing Definition -- There is no designation of overfishing for rock shrimp. The overfished definition, which is based on landings (and fishing effort) in excess of average catch is, in essence, an overfishing definition.

For further information on rock shrimp, see Shrimp Amendment 7 (SAFMC in prep).

Royal Red Shrimp

Description and distribution

Royal red shrimp, *Pleoticus robustus* (**Figure 3-3**) are members of the family Solenoceridae, and are characterized by a body covered with short hair and a rostrum with the ventral margin toothless. Color can range from orange to milky white. Royal red shrimp are found on the continental slope throughout the Gulf of Mexico and South Atlantic area from Cape Cod to French Guiana. In the South Atlantic they are found in large concentrations primarily off northeast Florida. They inhabit the upper regions of the continental slope from 180 m (590 ft) to about 730 m (2,395 ft), but concentrations are usually found at depths of between 250 m (820 ft) and 475 m (1,558 ft) over blue/black mud, sand, muddy sand, or white calcareous mud. Royal red shrimp are not burrowers but dig grooves in the substrate in search of small benthic organisms (Carpenter 2002). They have been commercially harvested in a relatively limited capacity. Royal red shrimp are not included in the Fishery Management Unit for the Shrimp FMP of the South Atlantic.

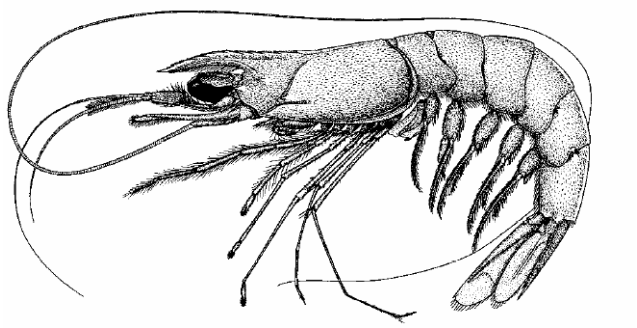


Figure 3-3. Royal red shrimp, *Pleoticus robustus.*
(Perez-Farfante and Kenlsey 1997)

Reproduction

Anderson and Lindner (1975), in a study off the east coast of Florida, stated that males matured at 125mm total length (TL), while females matured at 155mm. Based on examination of ovaries they determined that peak spawning off that area was during winter and spring, although some spawning occurs throughout the year. Mating is similar to penaeid shrimp, with the male placing a relatively large spermatophore on the female's thelycum (Perez Farfante 1977).

Development, growth and movement patterns

Larvae of this species are unknown (Anderson and Lindner 1975), although several stages of nauplii, protozoeae, and mysis were described for the closest related species, *Pleoticus muelleri*, which occurs in much shallower depths off Brazil and Argentina (Scelzo and Boschi 1975). Anderson and Lindner (1975) collected no shrimp smaller than 55 mm TL, and concluded that royal red shrimp do not fully recruit to fishing gear until age 2. They surmised that this species can live up to 5 years. Movement appears restricted to the above mentioned depth ranges.

Ecological relationships

Other than bottom type preferences mentioned above, little published information exists on ecological relationships. Gut content studies on the shrimp and identification of potential predators in their habitat could elucidate trophic relationships.

Abundance and status of stocks

Other than the study by Anderson and Lindner (1975), little fishery-independent information exists on *Pleoticus robustus* in the south Atlantic, therefore abundance must estimated from reported fisheries landings. Landings in this region have averaged approximately 225,000 pounds over the last 5 years. Concerns over overfishing a relatively long-lived species have led to conservative catch limits in the Gulf of Mexico fishery (GMFMC 1995), and similar constraints should be observed in the south Atlantic, until estimates of abundance and sustainable yield can be made.

3.2.2 Other Affected Species

3.2.2.1 Bycatch in the deepwater shrimp fishery

As the rock shrimp fishery developed and vessels began fishing earlier in the year (June/July versus August/September), discards of unmarketable juvenile rock shrimp increased. Members of the Advisory Panel recommended the gear modifications implemented in Amendment 5 (SAFMC 2002).

The most recent information on bycatch in this fishery comes from a preliminary report of a NOAA Fisheries Service observer study conducted during the period September 2001 through September 2006 (NOAA SEFSC preliminary report; see Appendix C in Shrimp Amendment 7). The main findings in this report are:

1. Rock shrimp comprised 19% of the catch by weight and 28% by number.
2. Penaeid shrimp comprised 4% of the catch by weight and 3% by number.
3. Finfish comprised 49% of the catch by weight and 30% of the catch by number.

No observer trips or bycatch study exists pertaining to bycatch in the royal red shrimp fishery.

3.2.3 Endangered Species Act (ESA)-Listed Species

Species listed as endangered or threatened under the ESA, along with any designated critical habitat(s) in the action area, are listed below. A review of the species' biology, population status, distribution, and on-going threats is provided in order to evaluate potential effects of the fishery and proposed action(s) on the listed species, as required by Section 7 of the ESA.

Section 7(a)(2) requires federal agencies ensure any activity they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species or result in destruction or adverse modification of designated critical habitat.

List of Species and Designated Critical Habitat

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*

*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.

Threatened

Loggerhead turtle	*Caretta caretta*	
Elkhorn coral	*Acropora palmata*	(Critical Habitat Proposed)
Staghorn coral	*A. cervicornis*	(Critical Habitat Proposed)

Proposed Species
None

Designated 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 15 nm and from Jacksonville, Florida, to Sebastian Inlet, Florida, out 5 nm. A portion of this area lies within the EEZ.

Proposed Critical Habitat
The geographical area occupied by *Acropora* species that is within the jurisdiction of the United States is limited to four counties in the State of Florida (Palm Beach County, Broward County, Miami-Dade County, and Monroe County); Flower Garden Banks National Marine Sanctuary; and the U.S. territories of Puerto Rico, U.S.V.I, and Navassa Island. Within these areas, the physical or biological feature essential to the conservation of elkhorn and staghorn corals is substrate of suitable quality and availability, in water depths from 0 to 98 feet (0 to 30 m), to support successful larval settlement, recruitment, and reattachment of asexual fragments. Proposed Critical Habitat areas, therefore, comprise all waters in the depths of 98 feet (30 m) and shallower to the MHW or COLREG line off: (1) Palm Beach, Broward, Miami-Dade, and Monroe Counties, including the Marquesas Keys and the Dry Tortugas, Florida; (2) Puerto Rico and associated Islands; (3) St. John/St. Thomas, U.S.V.I.; and (4) St. Croix, U.S.V.I. Within these specific areas, the "Primary Constituent Elements" (PCEs) consist of consolidated hardbottom or dead coral skeleton that are free from fleshy macroalgae cover and sediment cover.

Species under U.S. Fish and Wildlife Service (USFWS) Jurisdiction:
Endangered

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.

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 cm carapace length, juveniles migrate from pelagic habitats to benthic foraging areas (Bjorndal 1997). As juveniles move into benthic foraging areas a diet shift towards herbivory occurs. They consume primarily seagrasses and algae, but are also know to consume jellyfish, salps, and sponges (Bjorndal 1980, 1997; Paredes 1969; Mortimer 1981, 1982). The diving abilities of all sea turtles species vary by their life stages. The maximum diving range of green sea turtles is estimated at 110 m (360 ft) (Frick 1976), but they are most frequently making dives of less than 20 m (65 ft.) (Walker 1994). The time of these dives also varies by life stage. The maximum dive length is estimated at 66 minutes with most dives lasting from 9 to 23 minutes (Walker 1994).

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

Kemp's ridley hatchlings are also pelagic during the early stages of life and feed in surface waters (Carr 1987, Ogren 1989). Once the juveniles reach approximately 20 cm carapace length they move to relatively shallow (less than 50m) benthic foraging habitat over

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

Leatherbacks are the most pelagic of all ESA-listed sea turtles and spend most of their time in the open ocean although they will enter coastal waters and are seen over the continental shelf on a seasonal basis to feed in areas where jellyfish are concentrated. Leatherbacks feed primarily on cnidarians (medusae, siphonophores) and tunicates. Unlike other sea turtles, leatherbacks' diets do not shift during their life cycles. Because leatherbacks' ability to capture and eat jellyfish is not constrained by size or age, they continue to feed on these species regardless of life stage (Bjorndal 1997). Leatherbacks are the deepest diving of all sea turtles. It is estimated that these species can dive in excess of 1000 m (Eckert *et al.* 1989) but more frequently dive to depths of 50 m to 84 m (Eckert *et al.* 1986). Dive times range from a maximum of 37 minutes to more routines dives of 4 to 14.5 minutes (Standora *et al.* 1984, Eckert *et al.* 1986, Eckert *et al.* 1989, Keinath and Musick 1993). Leatherbacks may spend 74% to 91% of their time submerged (Standora *et al.* 1984).

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

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 m (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.

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.

ESA-Listed Marine Invertebrates

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

Elkhorn and **staghorn** corals are two of the major reef-building corals in the wider Caribbean. In the South Atlantic region, they are found most commonly in the Florida Keys; staghorn coral occurs the furthest north with colonies documented off Palm Beach, Florida (26°3'N). The depth range for these species ranges from <1 m to 60 m. The optimal depth range for elkhorn is considered to be 1 to 5 m depth (Goreau and Wells 1967), while staghorn corals are found slightly deeper, 5 to 15 m (Goreau and Goreau 1973).

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

Fertilization and development of elkhorn and staghorn corals is exclusively external. Embryonic development culminates with the development of planktonic larvae called

planulae (Bak *et al.* 1977, Sammarco 1980, Rylaarsdam 1983). Unlike most other coral larvae, elkhorn and staghorn planulae appear to prefer to settle on upper, exposed surfaces, rather than in dark or cryptic ones (Szmant and Miller 2006), at least in a laboratory setting. Studies of elkhorn and staghorn corals indicated that larger colonies of both species[2] had higher fertility rates than smaller colonies (Soong and Lang 1992).

Species of Concern

NOAA Fisheries Service has created a list of Species of Concern 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, but for which insufficient information is available to indicate a need to list the species under the Endangered Species Act (ESA). 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. To date, no incidental capture of any of these species has been reported in the shrimp fishery or golden crab fishery in the South Atlantic region.

List of Marine Species of Concern in the Southeastern U. S.

Dusky shark	*Carcharhinus obscurus*
Sand tiger shark	*Odontaspis taurus*
Night shark	*Carcharhinus signatus*
Atlantic sturgeon	*Acipenser oxyrhynchus oxyrhynchus*
Mangrove rivulus	*Rivulus mamoratus*
Oposum pipefish	*Microphis barchyurus lineatus*
Key silverside	*Menidia conchorum*
Goliath grouper	*Epinephelus itajara*
Speckled hind	*Epinephelus drummondhayi*
Warsaw grouper	*Epinephelus nigritus*
Nassau grouper	*Epinephelus striatus*
Atlantic white marlin	*Tetrapturus albidus*
Ivory Tree Coral	*Oculina varicosa*

3.3 Administrative Environment

3.3.1 The Fishery Management Process and Applicable Laws

3.3.1.1 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.

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

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 **Section 8.0**. In most cases, the Secretary has delegated this authority to NOAA Fisheries Service.

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

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

3.3.1.2 State Fishery Management

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

council level is to ensure state participation in Federal fishery management decision-making and to promote the development of compatible regulations in state and Federal waters.

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

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

3.3.2 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 South Atlantic Council regulations. NOAA/OLE agents, who specialize in living marine resource violations, provide fisheries expertise and investigative support for the overall fisheries mission. The USCG is a multi-mission agency, which provides at-sea patrol services for the fisheries mission.

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

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

3.4 Human Environment

3.4.1 Description of the Fisheries

3.4.1.1 The Golden Crab Fishery

3.4.1.1.1 Description of fishing practices, vessels and gear

The description below was summarized from observations recorded by Council staff (Gregg Waugh) on a commercial golden crab fishing trip aboard the *Lady Mary*, the fishing vessel belonging to the Nielsen family. Additional information was obtained during the course of presentations by fishermen at the April 1995 Council meeting and the 2008 Golden Crab Advisory Panel meeting.

The golden crab fishery employs baited traps attached with gangions to a 5/8" polypropylene line up to 5 miles long. There are 20 to 50 traps per line, or "trawl," set 500 feet apart. Fishermen may fish 4 trawls in a two-week period pulling 100 traps one week and 100 the next (Howard Rau, Golden crab AP). In 2008, vessels in the golden crab fishery averaged 57 feet in length (Golden Crab AP, 2008)

A typical trip to fish for golden crabs begins with the vessel leaving the dock at 3:00 a.m. Bait wells to be placed in the traps are prepared on the way out. The bait consists of available fish heads and racks (cod, snapper, grouper, dolphin, mackerel or any other available fish), chicken parts, pigs' feet, etc. Four and a half hours after leaving dock, the vessel is on site and the crew ready to begin the process of picking up traps and deploying new ones. When the traps are retrieved, the empty bait container is removed and a full one is put in place. It was estimated that at least 65 tons of bait were being used in this fishery at the time this description was compiled.

The location of the traps is noted using GPS; buoys are not used to mark the location of traps due to strong currents. Trawls are set south to north with the current. Retrieval begins at the south end of the trawl. To begin retrieval of traps, the main line, which may be sitting 1,000 feet below, must be grappled. The success of this operation depends on currents and sea conditions. At different times of the year, when the current is not as swift and is moving in a favorable direction, it is easier to place the grapple on the bottom. The grapple consists of links of large chain and is used to hook the main line towards one end of the string. On the observed trip, the grapple did not appear to have disturbed the bottom. Sometimes, however, the grapple or the trap itself may have mud adhered to it when it is pulled out of the water.

Once the grapple successfully hooks the main line, the line is pulled up and looped over the pulley allowing crew members to pull over to the first trap on the line. Traps are stacked on deck as the string is worked toward the short end of the line. Upon reaching one end of the line, the vessel turns around to work the string toward the other end. It takes approximately two hours to work a string of traps. The determining factor for how long a day of fishing will last is how quickly each trap string can be grappled. Sometimes it is necessary to move traps up or down the slope, keeping the same latitude and moving in a range of 5 to 15 miles east or west in order to avoid hardbottom or to follow the crabs. After a soak period, traps may

be moved as described depending on the success of the catch. Twenty to 30 lbs of crabs per trap is a desirable catch. On a good season, fishermen may catch 70 to 100 lbs per trap.

Golden crab traps have two entrances, one on the top and one on the bottom. As each trap is brought on deck, the empty bait wells are replaced with full ones. A spike coming up from the bottom of the frame holds the bait well in place. The trap string is deployed off the stern. The end of the string is weighted and its position recorded using GPS.

Towards the stern of the vessel is a spacious ice hold. As the traps are retrieved and brought on deck, golden crabs are removed by hand. The crabs are immediately placed into plastic boxes or coolers and layered with ice. As each crab is removed from the trap, a crew member checks its size (weight) and sex. All females and individuals weighing less than 1 ¼ pounds are released back into the water. Only male crabs are harvested because, since the beginning of this fishery, fishermen felt that an integral factor in the sustainable harvest of this resource was not to harvest the females. Besides, females are smaller than males and therefore less marketable.

On the observed trip, three trawls were retrieved (about 100 traps) out of which only 20-25 crabs were discarded. Such a low number of crabs are released upon trap retrieval because the majority of the culling is being accomplished through the escape panels while the traps are still submerged. Thus, escape gaps are very effective in culling out undersized individuals.

Detailed trap description

The modern golden crab traps are constructed of 3/8" smooth rebar. The latter makes it easier to place the stainless steel hog rings on it to hold the wire in place. The trap is 4 feet long, 30 inches wide and 18 inches high. The body of the trap consists of 1" x 2" mesh and 14 gauge galvanized wire with plastic coating. The corners of the trap are reinforced with zinc to prevent the wire from falling off. The zinc reinforcements are replaced every four or five months as they wear out. At the time this description was compiled (1995), golden crab traps cost about $100 to construct. A golden crab trap weighs approximately 30 lbs.

The trap has two funnels through which the crabs enter the trap. Initially one entrance funnel was placed in the center of the trap. However, fishermen soon realized that traps sometimes landed on the bottom upside down thus preventing the crabs' from entering the trap. The only crabs that would then have access to the bait would be the smaller ones that could enter through the escape gaps. Fishermen then designed the traps with two funnels on opposite sides of the trap that were offset to either side. That way, if the trap landed in such a way as to cover up one of the funnels, it would still be able to fish through the other.

Degradable wire is used to lock the traps. To open the trap, the wire is simply cut. Since the main trap door is shut using degradable wire, ghost fishing is not a concern if the trap becomes lost. In addition, traps are required to have two escape gaps on either side of the trap to allow females and small individuals to escape.

Allowable gear

Traps are the only allowable gear in the golden crab fishery. Rope is the only allowable material for mainlines and buoy line. Maximum trap size is 64 cubic feet in volume in the Northern zone and 48 cubic feet in volume in the Middle and Southern zones. Traps must have at least 2 escape gaps or rings and an escape panel. Traps must be identified with a permit number.

3.4.1.1.2 Economic Description

The Golden Crab Fishery Management Plan went into effect beginning on August 27, 1996 and established three golden crab fishing zones. The Northern Zone is defined as the EEZ north of 28 degrees N. latitude. The Middle Zone is contained within the EEZ between 25 degrees North and 28 degrees North latitude. The Southern Zone extends south from 25 degrees North latitude within the South Atlantic Council's EEZ (see **Figure 4-20a**). Federal permits are issued for a specific zone and fishing is allowed only in that zone for which the permit is issued.

In the South Atlantic region initially 35 vessels were granted permits to operate in this fishery: 27 permits were issued for the southern zone; 6 permits were issued for the middle zone; and 2 permits were granted to vessels for the northern zone. Other management regulations imposed by the golden crab FMP included: dealer and vessel permitting and reporting; limitations on the size of vessels; prescribing allowable gear (including escape gaps and escape panels); and prohibiting possession of female crabs (see the FMP for a complete list of measures).

Number of Participants

The number of permit holders that land golden crab has fluctuated from year to year (**Table 3-5**). The greatest number of vessels making landings since 1995 was 14 (**Table 3-6**). In recent years, only 5 to 6 vessels have landed any golden crab. The majority of vessels currently fishing for golden crab have Middle Zone permits. In 1997, 1998, and 2000, there were more vessels fishing for golden crab with Southern Zone permits than Middle Zone permits. Only in 2006 and 2007 have vessels with Northern Zone permits participated in the fishery.

Table 3-5. Numbers of active permit holders and vessels landing golden crab, 1995-2007. Source: SEFSC, 2008.

Year	Permit Holders	Vessels Making Landings
1996	34	4
1997	35	14
1998	29	14
1999	11	8
2000	10	10
2001	8	6
2002	12	7
2003	14	6
2004	12	5
2005	11	5
2006	12	6
2007	11	6

Table 3-6. Number of vessels making landings by Zone, 1995-2007. Source: SEFSC, 2008.

Year	Northern	Middle	Southern
1995	0	confidential	0
1996	0	4	0
1997	0	5	9
1998	0	7	7
1999	0	6	confidential
2000	0	4	6
2001	0	4	confidential
2002	0	5	confidential
2003	0	5	confidential
2004	0	confidential	confidential
2005	0	5	0
2006	confidential	4	confidential
2007	confidential	5	0

Information on the golden crab fishery participation was taken from logbook data (SEFSC 2008), and Accumulative Landings System (ALS) data.

Annual and Monthly Landings

Total landings and landings by zone of golden crab are shown in **Table 3-7**. **Figure 3-4** shows these data in chart form. Golden crab landings reached a peak of over 1 million pounds in 1997. Since then, landings have averaged about 550,000 pounds annually. However, the trend shows an average of 665,000 pounds from 1998-2002 and 355,000 pounds from 2003-2006.

The overwhelming majority of landings in recent years have come from the Middle Zone (90-100%) (**Table 3-7**). However, historically, a significant portion of landings came from

the Southern Zone (up to 36%). Only in the past two years have any landings at all come from the Northern Zone. Landings from the Middle Zone have averaged around 470,000 pounds since 1996 with a high of about 662,000 pounds in 1997. Landings from the Southern Zone were significant 1997 through 2001. Landings peaked at about 373,000 pounds in 1997.

Table 3-7. Landings of golden crab by Zone, 1995-2007.
Source: SEFSC, 2008.

Year	Northern Zone	Middle Zone	Southern Zone	Total
1995	0	confidential	confidential	61,660
1996	0	523,160	0	523,160
1997	0	661,896	372,551	1,034,447
1998	0	361,480	156,836	518,316
1999	0	confidential	confidential	682,224
2000	0	584,130	257,617	841,747
2001	0	confidential	confidential	781,138
2002	0	confidential	confidential	500,774
2003	0	confidential	confidential	359,087
2004	0	confidential	confidential	278,336
2005	0	432,846	0	432,846
2006	confidential	566,780	confidential	599,374
2007	confidential	confidential	0	502,292

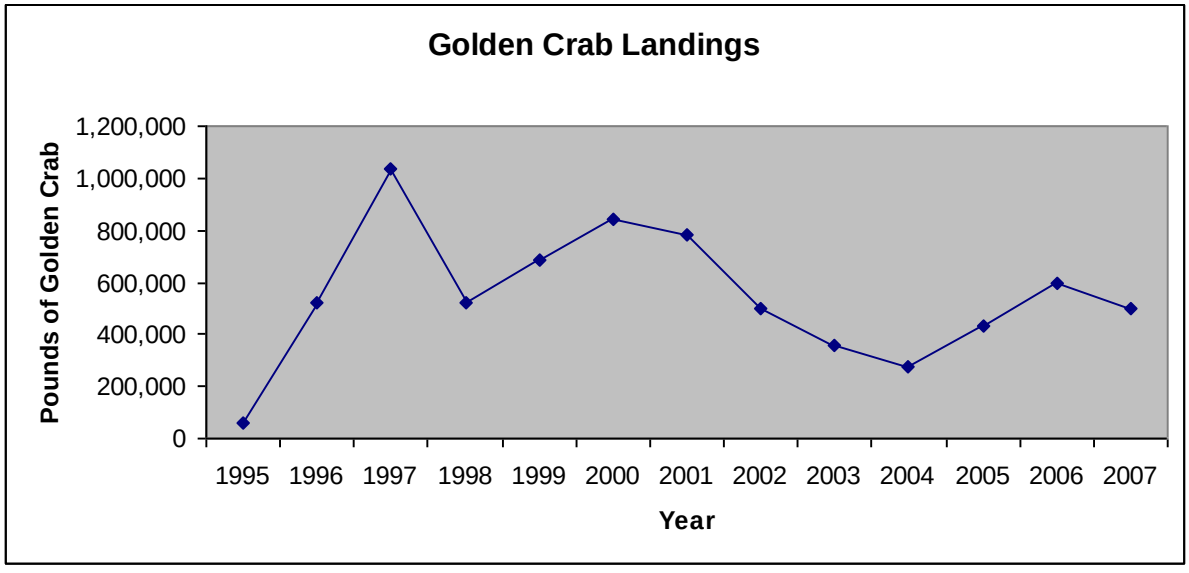


Figure 3-4. Landings of Golden Crab, 1995-2007.
Source: SEFSC 2008.

Figure 3-5 shows monthly golden crab landings from 2003 to 2007. Golden crab landings have varied widely from month to month over the past 5 years. In general, more golden crab are landed from May to December than in the first half of the year due to Keys fishermen

entering the fishery in the second half of the year after the spiny lobster season winds down. On average, from 1996 to 2007, 45% of total golden crab landings were made between January and May while 55% of landings were made between May and December.

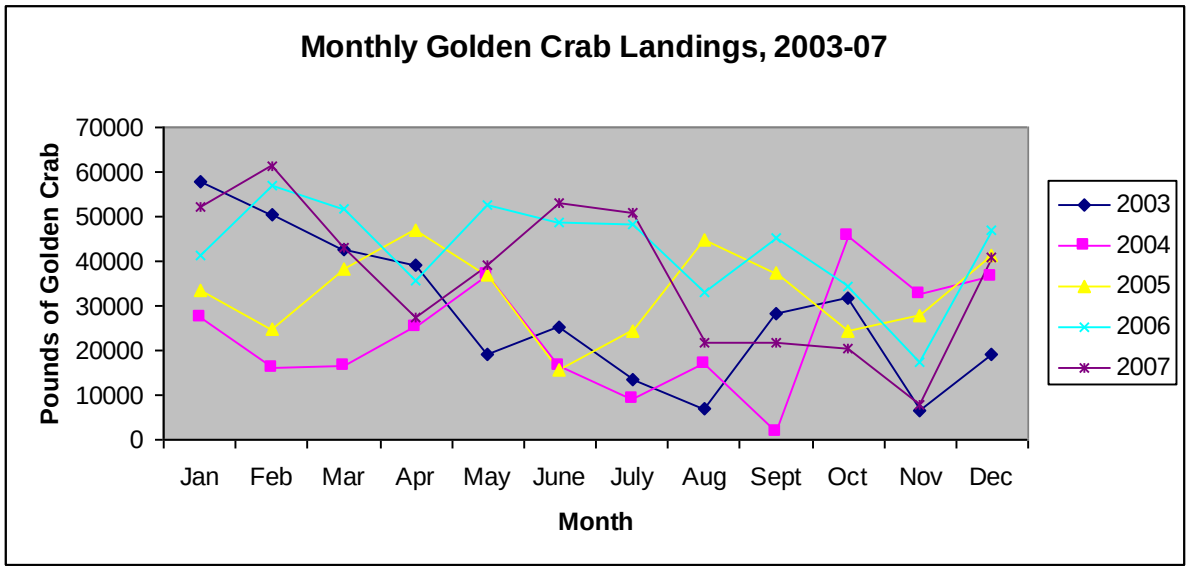


Figure 3-5. Monthly golden crab landings, 2003-2007.
Source: ALS data.

Golden crab is viewed in the marketplace as a substitute for snow crab clusters. Most of the product is processed into clusters, which is not as favored as other large crab species such as snow crabs. The golden crab market is strongly influenced by the wholesale market for snow crabs (Antozzi 1998). A large proportion of the Alaskan catch of snow crab goes to Japan and the drop in the yen reduced the export demand for this product. The excess supply entered the domestic market and lowered snow crab prices, which may be partly responsible for depressed golden crab prices. The increase in production from Russia and Canada also magnified this problem.

Antozzi (1997) concluded that the market for golden crab is inhibited from expanding due to a supply constraint. He attributes this lack of production to the difficulty and cost of operating in this fishery, which requires a sizable investment in specialized gear including on-board holding facilities that keep crabs alive. This fishery takes place in deep water and this can result in lengthy trips under adverse sea conditions. Some industry members have stated that vessels larger than 50 feet are needed to cope with rough sea conditions offshore and to provide the stability needed for trap deployment and retrieval.

The future outlook for this market will be strongly influenced by the market supply of other large crabs, and the health of export markets. The outlook on this market would improve if this product could be viewed as more than just a substitute for snow crabs.

In recent years, ex-vessel price value has ranged from $1.25 to $1.55 per pound (personal communication, Howard Rau, 2008).

3.4.1.2 The Deepwater Shrimp Fisheries

Descriptions of both the rock shrimp fishery and the royal red shrimp fishery are presented below. While royal red shrimp are not a Council-managed species, they are targeted by fishermen harvesting rock shrimp in the South Atlantic. Moreover, both fisheries are prosecuted in similar manner with the same gear and vessels. Hence the description of the rock shrimp fishery is also provided to supplement the limited characterization available for the royal red shrimp fishery at this time.

3.4.1.2.1 Description of fishing practices, vessels and gear

Rock Shrimp

Given the distance from shore, depth of water, and gear necessary to harvest rock shrimp, there is no recreational fishery. The rock shrimp commercial fishery has existed off the east coast of Florida for approximately thirty years once extending from Jacksonville to Cape Canaveral. The relatively recent beginning for this shrimp fishery, compared to other southeast shrimp fisheries can be attributed to the lack of a viable market for the crustacean once considered "trash." Rock shrimp found a niche in the local fresh market and restaurant trade during the early 1970s, and became a regional delicacy. The increase in participants and market opportunities for smaller rock shrimp brought about a subsequent change in harvesting patterns as the fishing grounds extended south as far as St. Lucie County (SAFMC 1996a). Limited sporadic harvest has also occurred off Georgia, North Carolina and South Carolina. A limited access program was established in 2003 for vessels harvesting, in possession of and landing rock shrimp in Georgia and Florida. Expanding markets created growth within the industry that in turn has changed the composition of the rock shrimp fishery including the harvesting and the intermediate sectors (SAFMC 1996a).

In the south Atlantic region, essentially the only user group exploiting the rock shrimp resource is commercial trawlers. Rock shrimp harvested by commercial vessels is the only one of six species of *Sicyonia* reported for the south Atlantic coast that attains a commercial size (Keiser 1976). When the rock shrimp industry began, few vessels participated on a full-time basis with some vessels making a few trips a year when the white and brown shrimping ended, or as a bycatch of the penaeid shrimp fishery (Dennis 1992). During the period 1986 to 1994 there was an increase in effort in terms of the number of vessels participating (SAFMC 1996a).

Rock shrimp have been harvested along Florida's east coast from Cape Canaveral to as far north as Jacksonville. At one time, this fishery extended into south Georgia (statements at Public hearings for Shrimp Amendment 5). The increase in participants and market opportunities for smaller rock shrimp brought about a subsequent change in harvesting patterns as vessels began fishing as far south as St. Lucie County. This shift in effort to the south reflected new participation in the fishery as the majority of those harvesting these new areas were from the Gulf region. A control date for this fishery of April 4, 1994 was set to put the industry on notice that the Council could at some future date develop a limited access program for this fishery (SAFMC 1996a).

Season and Harvest Area

The peak rock shrimping season generally occurs from July through October (SAFMC 2002). Historically, the fishery did not begin until August or September (SAFMC 1996a). To a degree, the amount and timing of effort in the rock shrimp fishery are dependent on the success of the white and brown shrimp fisheries. During development of Shrimp Amendment 1, the Rock Shrimp Producers Association submitted information to the Council indicating that the harvest area extended between just north of New Smyrna Beach to Stuart between 36.6 m (120 ft) and 47.5 m (156 feet) and between 61 m (200 ft) and 73 m (240 feet) (SAFMC, 1996a). The fishable grounds are hard sand to shell hash bottoms, which run north and south with a width as narrow as one mile. There was an effort shift to the south of Cape Canaveral which exposed the known concentrations of *Oculina* coral and the Oculina Bank HAPC to bottom trawls. Trawling was prohibited in the HAPC (a 4 x 23 nm strip bounded by latitude 27°30' N. and 27°53' N. and longitude 79°56' W. and 80°00' W.) in 1982 as one of the measures under the Coral Fishery Management Plan (GMFMC and SAFMC 1982). In addition, Amendment 1 to the Snapper Grouper Fishery Management Plan prohibited the retention of snapper grouper species caught by roller rig trawls and their use on live/hardbottom habitat north of 28° 35' N. latitude (SAFMC 1988). Furthermore Amendment 1 to the Shrimp Plan (SAFMC, 1996a) prohibited trawling in the area east of 80° 00' W. longitude between 27° 30' N. latitude and 28° 30' N. latitude shoreward of the 183 m (600 ft) contour.

In recent years, fishing activity has been concentrated off the Atlantic coast of Florida and particularly near Cape Canaveral (Sea Grant Louisiana 2006; SAFMC 1999). Some sources describe the coast between Jacksonville and St. Lucie Inlet as being of particular importance (Hill 2005b).

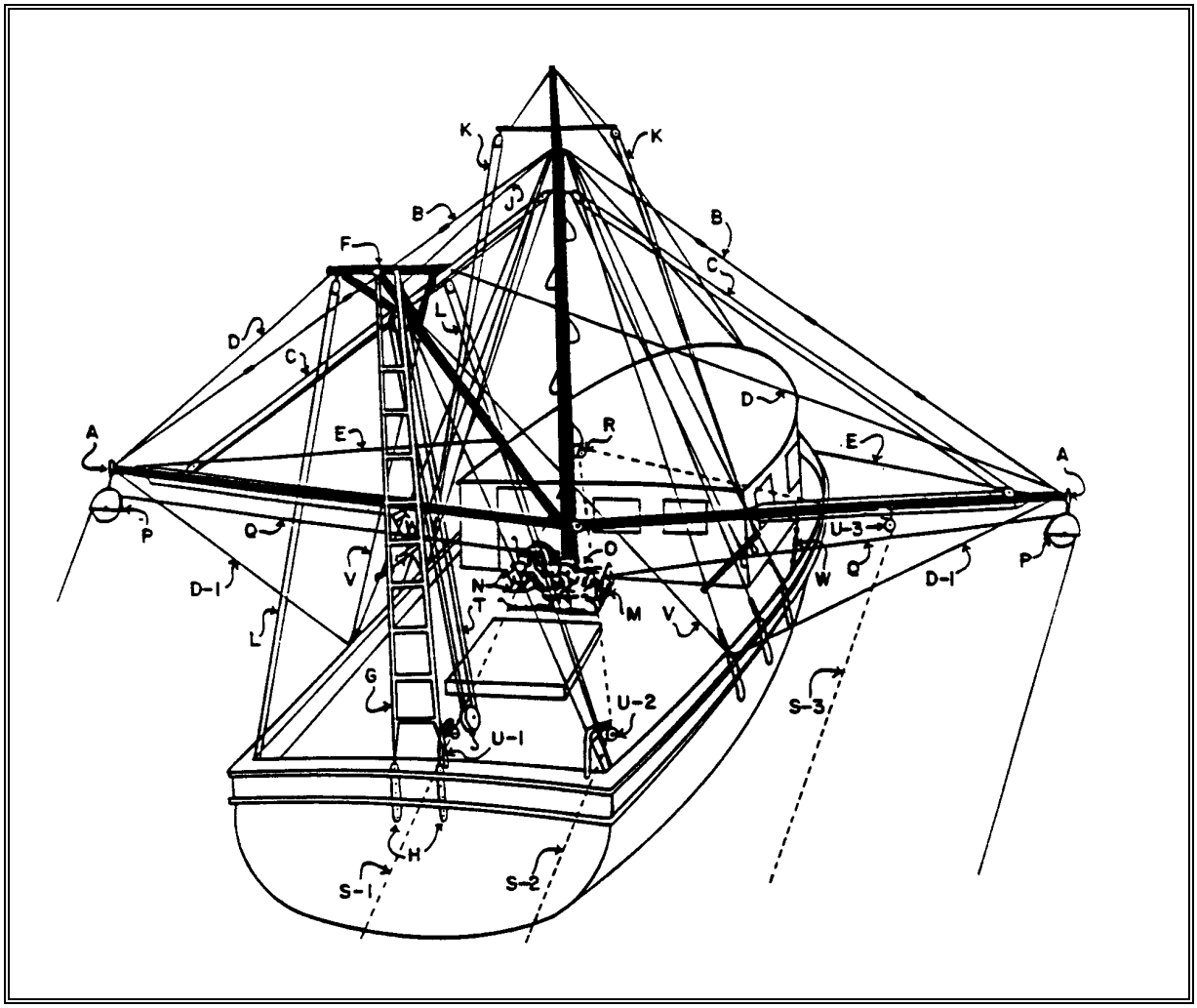
Vessels and Gear

There are two types of vessels in the rock shrimp fishery: ice or fresh boats and freezer boats. Most new rock shrimp trawlers are 23-24 m (75-80 ft) in length and are rigged to tow two to four nets simultaneously. The double-rigged shrimp trawler has two outrigger booms from whose ends the cable from the winch drum is run through a block to the two nets. Testimony at Amendment 1 (SAFMC 1996a) hearings indicated that a standard freezer trawler was around 22 m (73 ft) and would pull four 12 m (40 ft) nets.

Some vessels use twin trawls, which are essentially two trawls on a single set of doors, joined together at the head and foot ropes to a neutral door connected to a third bridle leg. Thus, instead of towing two 21 m (70 ft) nets the vessel tows four 12 m (40 ft) nets. This rig has some advantages in ease of handling and increased efficiency.

The only gear used in the rock shrimp fishery is the trawl (**Figure 3-6**) which consists of: (1) a cone-shaped bag in which the shrimp are gathered into the tail or cod end; (2) wings on each side of the net for herding shrimp into the bag; (3) trawl doors at the extreme end of each wing for holding the wings apart and holding the mouth of the net open; and (4) two lines attached to the trawl doors and fastened to the vessel. A ground line extends from door to door on the bottom of the wings and mouth of the net while a float line is similarly extended at the top of the wings and mouth of the net. A flat net is more often used when

fishing for rock shrimp since they burrow into the bottom to escape the trawl. This net has a wider horizontal spread than other designs and is believed more effective (SAFMC 1996a). The minimum mesh size for the cod end of a rock shrimp trawl net in the South Atlantic EEZ off Georgia and Florida is 4.8 cm (1-7/8 inches), stretched mesh. This minimum mesh size is required in at least the last 40 meshes forward of the cod end drawstring (tie off strings), and smaller mesh bag liners are not allowed. A vessel that has a trawl net on board that does not meet these specifications may not possess rock shrimp in or from the South Atlantic EEZ off Georgia and Florida.



A- Towing boom or outrigger; B- towing boom topping stay; C- topping lift tackles; D- or D-1-towing boom outrigger back stay; E- towing boom outrigger bow stay; F- modified boom; G- boom back stays- ratline structure; H- boom back stay plate on transom; J- boom topping lift stay; K- single block tackle; L- single block tackle; M- trawl winch; N- heads, two on trawl winch; O- center drum for trynet warp; R- leading block for try net; S-1, S-2, S-3- trynet lead block; T- main fish tackle tail block; U-1, U-2, U-3- trynet lead block; any one may be used to accord with selection of S-1, S-2, or S-3; V- boom shrouds; W- chain stoppers for outriggers.

Figure 3-6. Rigged shrimp vessel similar to ones used in the rock shrimp fishery. Source: SAFMC 1993.

As of January 11, 2006, on a vessel that fishes for or possesses rock shrimp in the South Atlantic EEZ, each trawl net or try net that is rigged for fishing must have a certified Bycatch Reduction Device (BRD) installed (FR Vol. 70 No. 327, Final Rule implementing Shrimp Amendment 6). Turtle Excluder Devices (TEDs) are also required in the rock shrimp fishery.

The tow length varies depending on many factors including the concentration of shrimp. Large boats fishing in offshore waters make much longer drags lasting several hours. Testimony at public hearings for Shrimp Amendment 1 indicated that vessels may drag up to 30 to 35 miles over a number of tows in one night fishing for rock shrimp (SAFMC 1996a). Data presented in **Tables 3-8 and 3-9** indicate that the rock shrimp fleet, though having some heterogeneity, is fairly homogeneous (i.e. the means of these characteristics are fairly large relative to the standard deviations). The average or typical vessel in this fleet is approximately 20 years old, nearly 73 feet in length, gross tonnage of 132 tons, with a fuel capacity of approximately 16,000 gallons and a hold capacity of more than 63,000 pounds of shrimp. The average vessel typically uses four nets of an average length between 55 and 60 feet, and uses between three and four crew on each trip. More than 90% of these vessels are "large" while less than 9% are "small." The vast majority (more than 87%) has on-board freezing capacity and more than two-thirds have steel hulls. The remaining vessels are nearly equally split between fiberglass and wood hulls.

Table 3-8. Physical Characteristics and Selected Statistics for All Vessels with Limited Access Rock Shrimp Endorsements[3].

	Crew Size	Number of Nets	Net Size (ft)	Vessel Age	Length	Horsepower	Fuel Capacity (gallons)	Gross Tons	Hold Capacity (pounds)
# vessels	124	120	122	154	155	155	133	144	142
Minimum	1	2	30	5	12	5	5	51	10
Maximum	5	4	80	42	93	1,720	48,000	205	160,000
Total	429	464	6,912	3,133	11,233	86,571	2,126,333	19,036	9,015,260
Mean	3.5	3.9	56.7	20.3	72.5	558.5	15,987	132.2	63,488
St. Dev.	0.7	0.4	11.0	9.9	16.8	226.9	9,545	27.4	32,541

[3] The 2006 Vessel Operating Units File (VOUF) was the source of data for crew size, number of nets, and net size. The Permits database is the source of data for all other characteristics. Characteristics data was not available for every permitted vessel for a variety of reasons (e.g. tonnage data is not available for state registered boats, vessel owners do not always provide the requested data on their application form, etc.).

Table 3-9. Distribution of Additional Physical Characteristics for All Vessels Limited Access Rock Shrimp Endorsements.

Hull Type	Percent	Refrigeration	Percent	Vessel Size Category	Percent
Steel	68.2	Freezer	87.4	Large	91.6
Fiberglass	16.2	Ice	12.6	Small	8.4
Wood	14.9				
Aluminum	.6				

Compared to vessels with limited access rock shrimp endorsements, vessels with open access rock shrimp permits tend to be somewhat smaller and less powerful on average.

Proportionally fewer have steel hulls and a much lower percentage have on-board freezing capacity. Given that vessels with endorsements are a significant subset of vessels with open access permits, this result implies that vessels with open access permits that do not have endorsements are probably quite a bit smaller, less powerful, and less technologically advanced than those that do have endorsements. As with the other vessel groups that have been discussed, those vessels with open access rock shrimp permits that have been commercially active are somewhat larger and more powerful compared to all vessels that possess such permits. Of the 266 vessels with these permits, 245 (92%) have been commercially active in fishing at one point in time or another between 2003 and 2007, though not all of these vessels were active in each year, varying between 198 in 2004 to 225 in 2007.

Royal Red Shrimp

The royal red shrimp fishery had its beginnings as an experimental fishery in 1950 with support from the Bureau of Fisheries, the federal agency that later became NOAA Fisheries Service (NOAA 2004a, NOAA 2004c, Sherman, personal communication). The commercial fishery began officially in 1962 in the Gulf of Mexico and off Florida's east coast (NOAA 2004b). Trawl boats were converted from other shrimp fisheries and the fleet grew to 19 boats by the end of the first year (NOAA 2004b). The New England fishery did not develop until 1995, when an experimental fishery was initiated (Balcom et. al 1996).

The South Atlantic royal red shrimp fishery is prosecuted in the U.S. EEZ in depths from 1,080 to 1,260 feet (330 - 380 meters) (W. Moore, personal communication) to just over 1,320 feet (400 meters) (M. Solorzano, personal communication). Elsewhere, reported depth for this fishery ranges from 800 feet to more than 1800 feet (250-550m) (Perry and Larson 2004, Rezak *et al.* 1985, Alabama Sea Grant 1987). Because of the depths in which this fishery operates, no Turtle Excluder Devices (TEDs) or Bycatch Reduction Devices (BRDs) are required off the east coast of Florida.

The fishery utilizes the same vessels and gear as that used in the rock shrimp fishery. In fact, many rock shrimp fishermen also participate part-time in the royal red shrimp fishery. Off

Florida's east coast, as many as 15 vessels once participated in this fishery on a full-time basis. Currently, only two vessels fish for royal red shrimp full-time in the South Atlantic EEZ (W. Moore, personal communication) with 6 total vessels fishing in this season with most also fishing for rock shrimp and penaeid shrimp. In the Gulf of Mexico, less than 1% of the estimated 2,600 shrimp vessels land royal red shrimp in any given year (GMFMC 2005).

The extreme ocean depths of the east coast royal red shrimp fishery require additional cable, approximately 1 mile in length (M. Solorzano, personal communication), strong winches, and a solidly seaworthy boat due to the risk of capsizing in poor weather conditions (Nicholson and Sherman personal communications). Standard shrimp boats focused on shallow-water penaeid species are not always large enough to fish for royal reds and fish for them less often (Nicholson, personal communication). When fishing for royal red shrimp, vessels drag two to four nets at a time that are each 55 feet (17 m) long (Cajun Steamer 2005, Florida Dept. of Agriculture 2006). Nets are made out of eighteen-webbing twine, about a sixteenth-of-an-inch in diameter. The breaking strength is 300 pounds. Unlike the rock shrimp fishery, the royal red shrimp fishery operates 24 hours a-day. A typical royal red shrimp fishing trip lasts 20 days, during which time a vessel may make 65 to 75 trawls (W. Moore, personal communication).

Season and Harvest Area

In the U.S. EEZ off the east coast of Florida, the royal red shrimp fishery operates south of the 30 degree latitude line down to West Palm Beach and in water off the Florida Keys.

Generally, when trawling, a vessel remains within a certain depth and may make several trawls at that depth. Trawling depth in the royal red shrimp fishery off Florida can vary from 1,000 feet to 1,800 feet (off the Florida Keys). Vessels trawl in straight lines with the current and at the same depth at a maximum speed of 2 ½ knots.

In the South Atlantic, the royal red fishing season is more dominant in the winter months (November to April) but it operates year-round.

Royal red shrimp has been caught off Texas, Louisiana, Mississippi, Florida, Georgia, and the Carolinas (GMFMC 2005; Moon, personal communication, Graham and Loney, personal communication). Core areas are located off Florida and the northeastern Gulf, including specific sites off of Mississippi, Tampa and Pensacola on the Gulf coast of Florida, the east coast of Florida, and Georgia (Sherman, personal communication; Moon, personal communication).

3.4.1.2.2 Economic Description

Rock Shrimp

As Amendments 1 (SAFMC 1996a), 5 (SAFMC 2002), and 6 (SAFMC 2004) to the South Atlantic Shrimp Fisheries Management Plan (FMP) describe in detail, the South Atlantic rock shrimp fishery is quite volatile, demonstrating significant ups and downs in terms of landings, revenues, and vessel participation from one year to the next. These Amendments describe the nature of the fishery from its inception through 2002. Amendment 6 also

provides considerable information on the nature and history of the South Atlantic penaeid shrimp fishery. The information from those Amendments is incorporated herein by reference. The purpose of the information provided in this section is to update this historical information and specifically focuses on the years 2003 through 2006, though information specific to the rock shrimp fishery and its participants has been updated through 2007. However, all landings related information for 2007 should be considered preliminary. These years have been selected since data on earlier years has been provided in previous Amendments to the Shrimp FMP.

Table 3-10 presents data on rock shrimp landings and revenues in the South Atlantic states, including preliminary data for 2007. However, from a management perspective, the landings of greatest interest are those coming from a particular body of water (e.g. South Atlantic waters under the Council's jurisdiction) or a particular group of vessels (e.g. vessels that possess a particular type of permit or endorsement issued under one of the Council's FMPs). Thus, in the current case, it is more appropriate to examine rock shrimp landings harvested from South Atlantic waters and rock shrimp landings by vessels with South Atlantic limited access rock shrimp endorsements. The former is presented in **Table 3-10** for the years 2003 through 2007. These data and subsequently discussed landings and revenue information represent a compilation of Florida trip ticket data, Gulf shrimp landings data, other South Atlantic states' trip ticket data and Standard Atlantic Fisheries Information Systems (SAFIS) data, the latter two of which are maintained by the Atlantic Coastal Cooperative Statistics Program (ACCSP).

Table 3-10. Rock Shrimp Landings and Revenue in South Atlantic States, 2003-2007. (Source: Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division, Silver Spring, MD and Southeast Fisheries Science Center, Fisheries Statistics Division Miami, FL).

Year	Landings (Heads-on pounds)	Revenue (Nominal)[4]
2003	2,756,101	$4,145,951
2004	5,955,295	$4,416,274
2005	127,827	$123,838
2006	2,951,078	$4,171,062
2007*	233,712	$434,938

*2007 data are preliminary

[4] Nominal values are those that have not been adjusted for inflation.

Table 3-11. South Atlantic Rock Shrimp Landings, Revenue, and Participation, 2003-2007[5].

Year	Number of Harvesting Vessels	Landings (Heads-on pounds)	Revenue (Nominal)	Average Price per Pound	Average Landings per Vessel	Average Revenue per Vessel	Number of Trips	Average Landings per Trip	Average Revenue per Trip
2003	97	2,980,623	$4,489,905	$1.51	30,728	$46,288	360	8,280	$12,472
2004	85	6,591,583	$5,012,147	$0.76	77,548	$58,966	300	21,972	$16,707
2005	21	109,281	$99,611	$0.91	5,204	$4,743	29	3,768	$3,435
2006	44	3,018,322	$4,264,576	$1.41	68,598	$96,922	142	21,256	$30,032
2007*	26	240,550	$441,277	$1.83	9,252	$16,972	78	3,084	$5,657

The information in **Table 3-10 and 3-11** illustrates that the South Atlantic rock shrimp fishery has continued its historically cyclical nature in recent years. Recall that landings in 2002 were at their lowest level in over two decades (i.e. since 1980). In 2003, landings increased significantly, comparable to landings seen between 1997 and 1999. And in 2004, landings increased further, back to levels similar to those experienced in 2000 and 2001 even though the number of participating vessels decreased from 97 to 85 vessels. However, in 2005, landings plunged to their lowest level since South Atlantic rock shrimp landings were first tracked back in 1978 and the number of participating vessels similarly plunged to only 21 vessels. And although landings, revenues, and even prices rebounded in 2006, vessel participation in 2006 (44 vessels) was considerably less than in 2003 or during the previous decade. The fact that landings and revenues per trip and per vessel were relatively high in 2006, even compared to previous "good years," suggests that factors outside the fishery played a role in limiting participation. In 2007, production and the number of harvesting vessels fell back to levels just slightly above their historic lows in 2005. Using the MSY/OY figure of approximately 4.912 million lbs for this fishery as a reference point, landings were above this reference point in 2004, below it in 2003 and 2006, and significantly below this value in 2005 and 2007.

Thus, it would appear that the fishery's cyclical nature has intensified in the past four years. It is highly likely that the instability of various economic factors has exacerbated the fishery's biological volatility. Although a definitive explanation cannot be provided at this time, it is likely that the extremely low level of landings in 2005 were not only a function of biological factors (e.g. relatively low abundance), but also economic factors (e.g. historically low rock shrimp prices, particularly relative to other potential target species, and high fuel prices, given that rock shrimp are harvested in more distant waters relative to penaeid species) and possibly natural disasters (e.g. the impact of Hurricane Katrina on vessels from ports in the Gulf of Mexico, particularly in Alabama). For example, rock shrimp prices fell dramatically in 2004, by 50%, relative to 2003. Rock shrimp prices basically remained at this historically low level in 2005, likely discouraging potential participants from engaging in the fishery. And although the number of trips is only a very rough estimate of effort, and

[5] With the exception of 150 pounds in 2003 and 22 pounds in 2004, all reported landings of rock shrimp from South Atlantic waters could be ascribed to a specific vessel, which reflects a marked improvement in the quality of the data in this respect since the analysis for Amendment 5 was conducted.

thus landings per trip are similarly only a rough estimate of abundance, landings per trip were also very low in 2005 and similarly provided a significant disincentive for other vessels to prosecute the fishery that year. And though rock shrimp prices were considerably higher in 2007 than in 2005, so too were fuel prices. In a more distant water fishery such as rock shrimp, the higher fuel expenses likely offset any incentive to participate in the fishery generated by the higher price for rock shrimp. And, as in 2005, the landings per trip were very low, and in fact slightly lower than in 2005. The combination of these two factors likely explains the low level of production in 2007.

Except in 2005, the landings and revenue figures in **Table 3-11** are slightly larger than those in **Table 3-10**, which would indicate that some of the rock shrimp harvested from South Atlantic waters are being landed in Gulf of Mexico ports. Information in Amendment 5 (SAFMC 2002) suggests that participation in the fishery by vessels with homeports in the Gulf of Mexico increased during the 1990s through at least 2000. In combination with data from the NOAA Fisheries Service website, information in Amendment 5 also suggests that the "leakage" of rock shrimp landings from South Atlantic waters to Gulf ports was considerably larger in previous years, particularly in 1999 and 2000, relative to the 2003-2007 time periods. And though the subject requires more research, it appears likely that market forces, particularly fuel prices, have caused it to be far less economically viable in recent years for vessels to harvest rock shrimp from South Atlantic waters, particularly off the east coast of Florida, and then transport and land them in Gulf ports, with the exception of Key West, which basically serves as a "dividing point" between South Atlantic and Gulf waters and, to a lesser extent, the Ft. Myers/Ft. Myers Beach area.

Federal Permit Requirements in the South Atlantic Rock Shrimp Fishery

Federal permit requirements in the South Atlantic rock shrimp fishery were initially implemented under Amendment 1 to the South Atlantic Shrimp FMP (SAFMC 1996a). Specifically, the regulations that implemented Amendment 1 state that "for a person aboard a vessel to fish for rock shrimp in the South Atlantic EEZ or possess rock shrimp in or from the South Atlantic EEZ, a commercial vessel permit for rock shrimp must be issued to the vessel and must be on board." Since available information suggests that the rock shrimp fishery in the South Atlantic is prosecuted exclusively within federal waters, this requirement implies that rock shrimp in the South Atlantic can only be harvested by vessels with a federal South Atlantic rock shrimp permit. At the time of its implementation, and currently, this permit is "open access" in nature. That is, the Council did not impose any restrictions on the number of permits that could be issued or the nature of the vessels to which the permits could be issued. Therefore, in effect, a permit would basically be issued to any vessel whose owner applied for one. Amendment 1 also required permits for rock shrimp dealers. Specifically, the regulations indicate that "for a dealer to receive rock shrimp harvested from the South Atlantic EEZ, a dealer permit for rock shrimp must be issued to the dealer." Both the vessel and dealer permit requirements went into effect in November 1996. The dealer permit requirement has remained unchanged and is still in effect at this time. New actions to effect changes to maintain effort in this fishery will take place 2009 with implementation of Shrimp Amendment 7.

Between 40 and 50 dealers have typically held rock shrimp dealer permits at any given point in time during recent years and 46 dealers held one at one time or another during 2006 and 2007. For more detailed information on rock shrimp dealers and processors, refer to Shrimp Amendment 7 (under development).

Royal Red Shrimp

The description below was compiled from information obtained in the Oceana's 2007 report "Deep Sea Trawl Fisheries of the Southeast US and Gulf of Mexico: Rock shrimp, Royal red shrimp, Calico scallops" by Margot L. Stiles, Ellycia Harrould-Kolieb, Prisca Faure, Heather Ylitalo-Ward, Michael F. Hirshfield and from personal communications with SAFMC Deepwater Shrimp AP members.

Fishermen perceive the royal red shrimp fishery as a more difficult fishery, requiring greater investment and specialization and presenting higher risks. This may explain why past participation has been relatively low. Costs are higher due to the longer distance traveled to reach offshore areas and higher fuel consumption to trawl deep water shrimp (GMFMC 2005). In the strong currents and deep water of the Gulf Stream, sea conditions increase both safety concerns and fuel costs (National Shrimp Festival 2004).

Royal red shrimp occupy a niche market due to their small size, sweet taste, and bright red color. However, the market for royal red shrimp in the South Atlantic is variable as it is difficult to maintain a steady supply of shrimp. Royal red shrimp are often hard to sell because of their red coloration, oftentimes consumers mistakenly think the shrimp have already been cooked and will pass them by (W. Moore, pers. comm.). Currently, a pound of average size heads-off, shrimp sells for $4.00. The most common sizes are a 10/15 count, heads-on, 21/25 count tail or a 26/30 count tail. There are two fish houses that market royal red shrimp in Florida: Safe Harbor Seafood in Mayport, Florida and Ocean Wild. Canaveral Seafood also markets royal red shrimp to the Dixie Crossroads restaurant, owned by Rodney Thompson, Deepwater Shrimp Advisory Panel member (M. Solorzano, personal communication). A good catch of royal red shrimp is between 800 and 1,200 pounds; however, poundage varies with the average size of the catch (W. Moore, personal communication).

Royal red shrimp are sometimes popular because they look good on a plate (Nicholson, personal communication) or are used as "sweet shrimp" in sushi and in Asian restaurants (T. Jamir, personal communication, The Shrimp Lady 2007). The market for this species is relatively small because they do not freeze as well as shallow water shrimp (National Shrimp Festival 2004). Royal red shrimp require specialized equipment on board so that they can be individually quick frozen and stored in brine (Alabama Sea Grant 1987, The Shrimp Lady 2007).

Landings from the Gulf of Mexico and South Atlantic Council regions are illustrated in **Figure 3-7** and **Table 3-12** with ALS data.

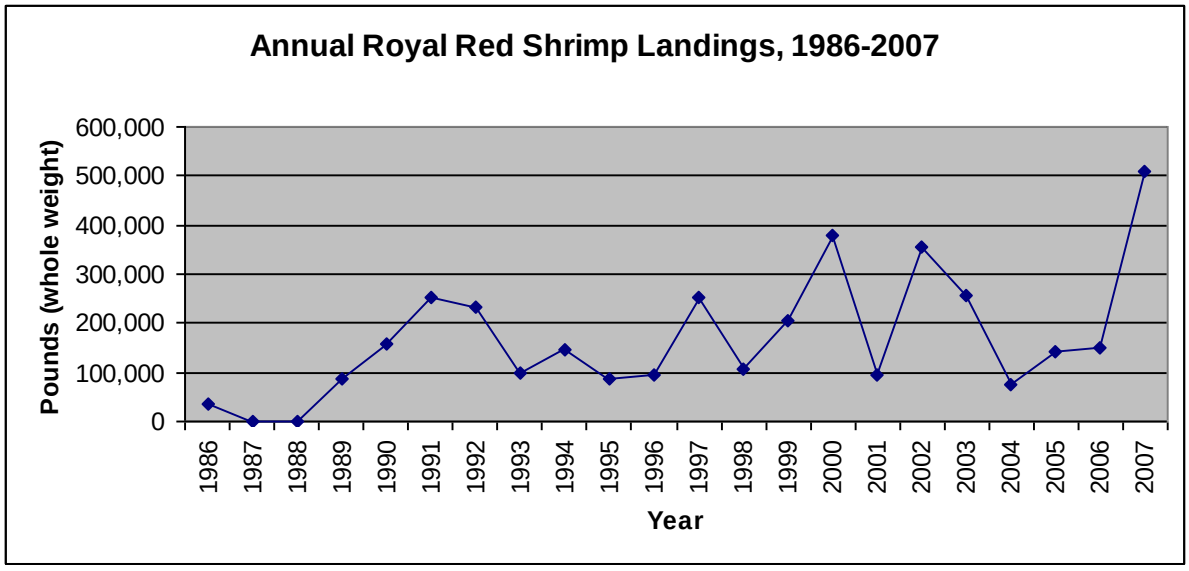


Figure 3-7. Annual royal red shrimp landings, 1986-2007.

Table 3-12. Royal red shrimp landings, 1986-2007.

Year	Landings
1986	37,110
1987	211,075
1988	0
1989	86,535
1990	158,717
1991	251,614
1992	232,315
1993	98,182
1994	147,791
1995	87,007
1996	93,344
1997	254,518
1998	106,862
1999	204,217
2000	377,081
2001	96,002
2002	354,886
2003	257,682
2004	75,324
2005	142,942
2006	148,979
2007	508,012

3.4.2 Social and Cultural Environment

As previously stated, a limited number of fishermen participate in the golden crab fishery. Participation in the royal red shrimp fishery is hard to quantify because it is not a managed fishery and is closely tied with the fishery for rock shrimp. Hence, due to these limitations, a placed-based definition of community is inadequate to characterize communities that may be affected by the actions proposed in this amendment. Even at a county level, data confidentiality issues prevent an adequate description of potentially affected communities. The Council therefore requests comments from golden crab fishermen, their families, and associated dealers as well as royal red shrimp fishers to improve the social impacts analysis for these actions. Presented below is information to provide the reader a general view of the potential fishing communities existing off the east coast of Florida.

Florida Fishing Infrastructure and Community Characterization

The following tables provide a general view of the presence or absence of fishing infrastructure located within the coastal communities of Florida with substantial fishing activity. It should be noted that there are many other attributes that might have been included in this table, however, because of inconsistency in rapid appraisal for all communities, these items were selected as the most consistently reported or had secondary data available to determine presence or absence. Also, it should also be noted that in some cases certain infrastructure may exist within a community but was not readily apparent or could not be ascertained through secondary data. **Table 3-13** offers an overview of the presence of the selected infrastructure items and provides an overall total score which is merely the total of infrastructure present.

Table 3-13. Fishing infrastructure table for Florida potential fishing communities.

Community	Federal Commercial Permits (5+)	State Commercial Licenses (10+)	Federal Charter Permits (5+)	Seafood Landings	Seafood retail markets	Fish processors, Wholesale fish house	Recreational docks / marinas	Recreational Fishing Tournaments	Total
Atlantic Beach	-	+	-	+	+	+	+	-	5
Big Pine Key	+	+	+	+	+	+	+	-	7
Boca Raton	+	+	-	-	+	-	+	-	4
Cape Canaveral	+	+	-	+	+	+	+	+	7
Fernandina Beach	+	+	+	+	+	+	+	+	8
Fort Pierce	+	+	+	+	+	+	+	+	8
Islamorada	+	+	+	+	+	+	+	+	8
Jupiter	+	+	+	+	+	+	+	+	8
Key Largo	+	+	+	+	+	+	+	+	8
Key West	+	+	+	+	+	+	+	+	8
Marathon	+	+	+	+	+	+	+	+	8
Merritt Island	+	+	-	+	+	+	+	-	6
Palm Beach	+	+	-	+	+	-	+	+	6
Ponce Inlet	+	+	+	+	+	+	+	+	8
Sebastian	+	+	+	+	+	+	+	+	8
St. Augustine	+	+	+	+	+	+	+	+	8

In attempting a preliminary characterization of potential fishing communities in **Table 3-14**, we have provided a grouping of communities that appear to have more involvement in various fishing enterprises and therefore are classified as primarily involved. These communities have considerable fishing infrastructure, but also have a history and culture surrounding both commercial and recreational fishing that contributes to an appearance and perception of being a fishing community in the mind of residents and others. The communities are not ranked in any particular order, this is merely a categorization.

Table 3-14. Preliminary Characterization of Potential Fishing Communities in Florida.

Primarily-Involved	Secondarily-Involved
Fernandina Beach	Atlantic Beach
Fort Pierce	Boca Raton
Islamorada	Palm Beach
Jupiter	
Key Largo	
Key West	
Marathon	
Fernandina Beach	
Fort Pierce	
Islamorada	

Many of these communities are in transition due to various social and demographic changes from coastal development, growing populations, increasing tourism, changing regulations, etc. This preliminary characterization is just that and should not be considered a definite designation as fishing community, but a general guide for locating communities that may warrant consideration as a potential fishing community.

4 Environmental Consequences

4.1 Action 1. Amend the Coral, Coral Reefs, and Live/Hardbottom Habitat FMP to Establish Deepwater Coral HAPCs (CHAPCs).

Alternative 1. No action. Do not establish deepwater CHAPCs.

Alternative 2. Establish deepwater CHAPCs in one or more of the areas proposed in sub-alternatives 2a - 2c:

Sub-alternative 2a. Establish the Cape Lookout Lophelia Banks CHAPC;
Sub-alternative 2b. Establish the Cape Fear Lophelia Banks CHAPC;
Sub-alternative 2c. Establish the Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC;
Sub-alternative 2d. Establish the Pourtales Terrace CHAPC; and
Sub-alternative 2e. Establish the Blake Ridge Diapir Methane Seep CHAPC.

4.1.1 Biological Effects

Alternative 1 (No Action) would not protect any of the deepwater coral habitat identified. This could result in negative biological impacts to this habitat if fisheries moved into these areas. This could also result in negative impacts to commercially important species that rely on these areas/habitats as EFH and EFH-HAPCs. Currently, the only commercial fisheries that operate in the areas are the wreckfish fishery, golden crab, and royal red shrimp fisheries.

Coral and attached marine organisms associated with deepwater coral reefs and live/hardbottom are considered to be fish under the Magnuson-Stevens Act and under existing regulations (§ 600.10), their take is prohibited. It is reasonable to expect that when a fishing vessel uses bottom tending gear, anchors, or grapples and chains in the deepwater CHAPCs, it would result in a taking/killing of prohibited coral or live rock. Corals covered by the Coral FMP are considered to be non-renewable resources. Bottom tending gear and anchors, grapples, and chains can break fragile corals, dislodge reef framework, and scar corals, opening lesions for infection. Impacts of gear damage are not limited to direct crushing of live coral but also include effects of the attached chains which will abrade and denude coral structures. Stress caused by abrasion may result in a decline in health or stability of the reef or live bottom system. In shallow water, coral will respond through polyp retraction, altered physiology or behavior, and when sheered by anchor chains provide a point for infection. It is thought deepwater corals may respond similarly (John Reed HBOI pers. comm. 2007). Damage inflicted by bottom tending gear, anchors, chains, and grapples is not limited to living coral and hardbottom resources but extends to disruption of the balanced and highly productive nature of the coral and live/hardbottom ecosystems.

Under **Alternative 1 (No action)**, bottom tending gear, anchors, chains, and grapples deployed by fishing vessels could degrade the functional characteristics of these complex

deepwater coral ecosystems. This alternative would provide no additional protection for 24,215 square miles of these complex deepwater ecosystems. **Alternative 1 (No action)** could have negative biological effects on deepwater coral habitats and the species that utilize this habitat. This alternative would not offer any protection from fisheries to species such as red bream, blackbelly rosefish, wreckfish, etc. that are known to be found in these deepwater coral ecosystems (**Appendix B**). However, these fisheries tend to use gear that does not impact the bottom habitat and may not have much impact on the deepwater corals themselves.

The Council is proposing to establish deepwater CHAPCs and prohibit: Use of bottom longlines, trawls (mid-water and bottom), dredge, pots, or traps; use of anchor and chain, or use of grapple and chain by all fishing vessels; and possession of any species regulated by the Coral FMP. These are the same regulations currently in place within the Oculina HAPC (with the exception of mid-water trawls). In addition, golden crab and deepwater shrimp fishing would be limited to allowable gear areas in the proposed deepwater CHAPCs. Furthermore, the fishery for wreckfish would not be affected since the use of bottom tending hook-and-line gear would not be prohibited in the proposed CHAPCs.

The Council is considering proposing one or more of the areas shown as sub-alternatives under **Alternative 2**. The size of each proposed area is shown in **Table 4-1**.

Table 4-1. Deepwater CHAPC sub-alternatives and size of area.

Sub-Alternative	Size of Area
2a. Cape Lookout *Lophelia* Banks	122 square miles
2b. Cape Fear *Lophelia* Banks	52 square miles
2c. Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace	23,528 square miles
2d. Pourtales Terrace	509 square miles
2e. Blake Ridge Diapir Methane Seep	4 square miles

A brief description of each proposed deepwater coral area (sub-alternatives a-e) is provided below summarized from: Reed, J. 2004. *Deep-Water Coral Reefs of Florida, Georgia and South Carolina: A Summary of the Distribution, Habitat and Associated Fauna* (**Appendix A**); Ross, S. 2004. *General Description of Distribution, Habitat and Associated Fauna of Deep Water Coral Reefs on the North Carolina Continental Slope* (**Appendix B**); Reed, J. 2006. *Habitat and Fauna of Deep-Water Coral Reefs off the Southeastern USA - A Report to the South Atlantic Fishery Management Council. Addendum to 2004 Report* (**Appendix C**)*;* and Ross, S. 2006. *Review of Distribution, Habitats, and Associated Fauna of Deep Water Coral Reefs on the Southeastern United States Continental Slope (North Carolina to Cape Canaveral, FL)* (**Appendix D**).

Sub-alternative 2a: Cape Lookout Lophelia Banks CHAPC

This proposed CHAPC (**Figure 4-1**) encompasses two areas described by Dr. S. Ross in the above mentioned reports. This area was originally proposed for CHAPC designation in 2004 and reviewed in June 2006. The northernmost area contains the most extensive coral mounds off North Carolina. The main mound system rises vertically nearly 80 meters (262 ft.) over a distance of about one kilometer (0.62 mi.). Sides and tops of these mounds are covered with

extensive *Lophelia pertusa*. The second area contains mounds that rise at least 53 meters (174 ft.) over a distance of about 0.4 kilometers (0.2 mi.). 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. **Table 4-2** below contains fish species found in the proposed areas taken with bottom longline or hook-and-line gear during 2004-2006. Coordinates for this proposed CHAPC are contained in **Appendix F**.

Table 4-2. Fish species found proposed areas taken with bottom longline (BLL) or hook-and-line (H&L) gear during 2004-2006 (pounds whole weight).
Note: Alternative 2d was not examined due to the small size of the proposed area relative to the size of the statistical grid.

Alt 2a	BLL	H&L
Blackbelly rosefish	0	3
Alt 2b	BLL	H&L
Blackbelly rosefish	399	105
Anglerfish	0	3
Alt 2c	BLL	H&L
Blackbelly rosefish	19,682	65
Anglerfish	0	24
Wreckfish	0	Confidential
Alt 2d	BLL	H&L
Blackbelly rosefish	0	457
Alt 2d	BLL	H&L
Not examined		

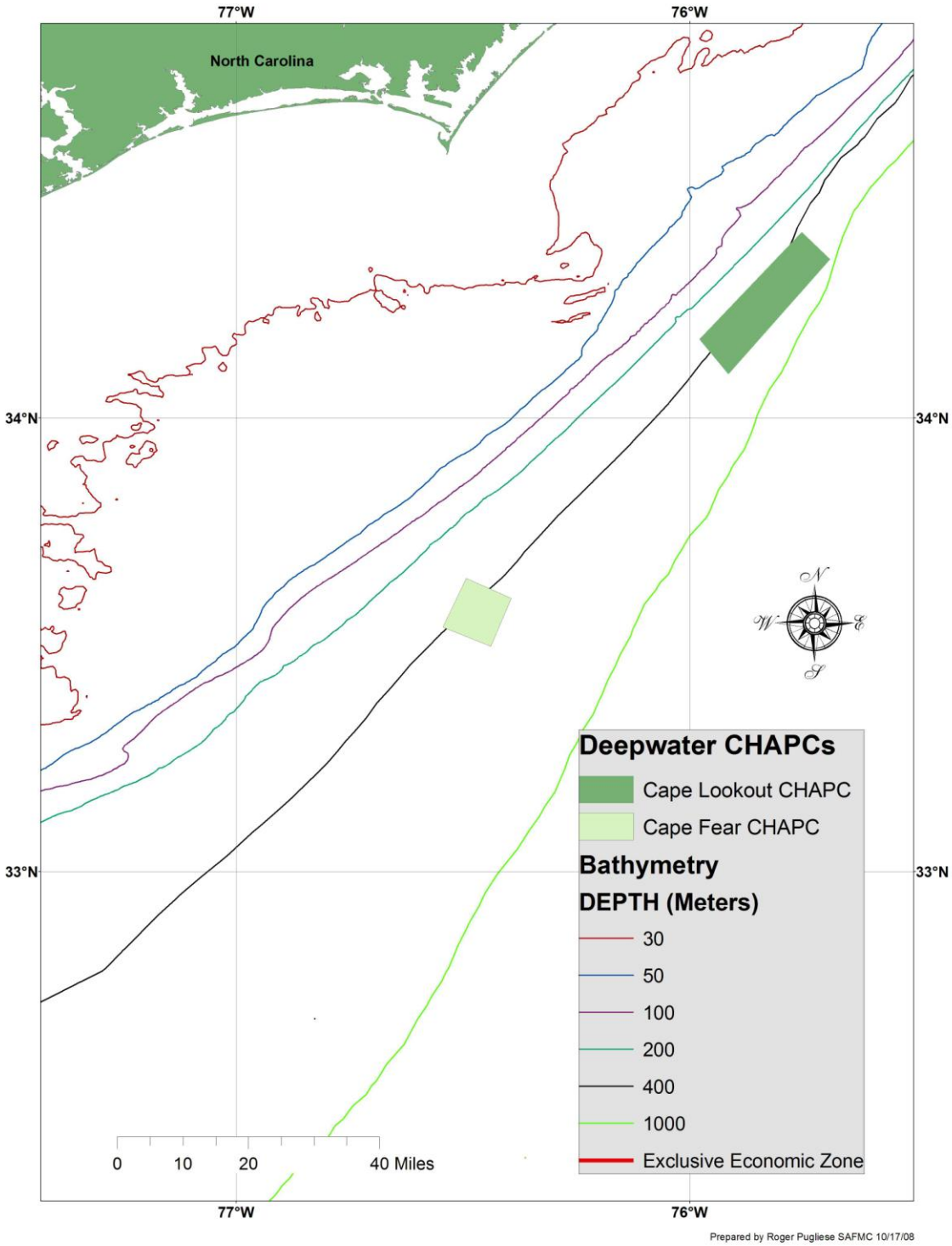


Figure 4-1. Proposed Cape Lookout and Cape Fear Deepwater Coral Habitat Areas of Particular Concern.
Coordinates for these areas are in **Appendix F**. (Source: Roger Pugliese, SAFMC).

Sub-alternative 2b: Cape Fear Lophelia Bank CHAPC
The Cape Fear Lophelia CHAPC (**Figure 4-1**), which occupies 52 square miles (**Table 4-1**), encompasses mounds rising nearly 80 meters (262 ft.) over a distance of about 0.4 kilometers (0.2 mi.) 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 (**Appendix B**). 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. No snapper grouper species have been found in the area encompassed by **sub-alternative 2b** during submersible dives (**Appendix B)**. Furthermore, analysis of the NMFS logbook data base indicate there were no landings of snapper grouper species with bottom longline gear within the statistical grid containing the Cape Fear Lophelia Banks for **sub-alternative 2b**. Of species commonly taken in proposed **sub-alternative 2b**, only blackbelly rosefish were reported. Therefore, **sub-alternative 2b** would not be expected to have an impact on the commercial longline fishery for snapper grouper species. Furthermore, since hook-and-line gear would not be prohibited, establishment of **sub-alternative 2b** would not impact fishermen targeting wreckfish. This area also supports a well-developed invertebrate fauna. Coordinates for this proposed CHAPC are contained in **Appendix F**.

Sub-alternative 2a, the Cape Lookout Lophelia Banks CHAPC, would protect 122 square miles or 0.5% of deepwater habitats proposed for protection of deepwater coral habitat and **sub-alternative 2b**, the Cape Fear Lophelia Banks CHAPC, would protect 52 square miles of deepwater coral habitat. These two areas include the known distribution of deepwater coral habitat occurring in offshore waters off North Carolina. Protecting one or both of these areas would provide positive biological benefits to the deepwater corals and to the species that rely on these areas for EFH and EFH-HAPC in the waters off North Carolina. Since the habitat types and species are similar in the two areas, the biological effects of **sub-alternative 2a** would be expected to be greater than **sub-alternative 2b** as a larger area would be protected in the former sub-alternative. Given the slow growth of these deepwater corals, any impacts could be expected to result in long-term biological losses of deepwater coral habitat as well as the species that utilize this habitat. Under these sub-alternatives, habitats within the Cape Lookout and Cape Fear Lophelia Banks proposed CHAPCs would be protected from damaging fishing gear, which would have positive biological impacts on the species in the areas.

The wreckfish fishery is not expected to affect deepwater coral habitat proposed for protection under **sub-alternatives 2a** and **2b**. Wreckfish are harvested using a 30-50 pound sinker, cable, and terminal rig while motor fishing (SAFMC 1991). However, it is unknown if this harvest technique has any impacts on bottom habitat. Submersible dive observations have shown wreckfish associated with coral mounds (comprised mostly of dead corals) and hardbottom habitat with individual clumps of bamboo coral and small *Lophelia* colonies (G. Sedberry, personal communication). It is the Council's intent to assess whether gear impacts

from the wreckfish fishery are likely to jeopardize the integrity of deepwater coral habitat in the South Atlantic region in a future plan amendment.

Sub-alternative 2c: Stetson Reef/Savannah and East Florida Lithoherms/Miami Terrace CHAPC (Stetson-Miami Terrace CHAPC)

Sub-alternative 2c is the largest (23,528 square miles; **Table 4-1**) of the five proposed deepwater CHAPCs, encompasses three of the former proposed CHAPCs off the coasts of South Carolina, Georgia, and East Florida to the Miami Terrace off of Biscayne Bay, and extends the western boundary to the 400-meter depth contour (**Figure 4-2**). Coordinates for this proposed CHAPC are contained in **Appendix F**. Below are descriptions of the main areas encompassed by this proposed CHAPC.

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 ft.) pinnacle in 822 meters (2,697 ft.) 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 ft.) with relief up to 60 meters (197 ft.) 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 mi.) stretch off northeastern and central Florida (depth 700-800 meters; 2,297-2,625 ft.) mapped nearly 300 coral mounds from 8 to 168 meters tall (26-551 ft.).

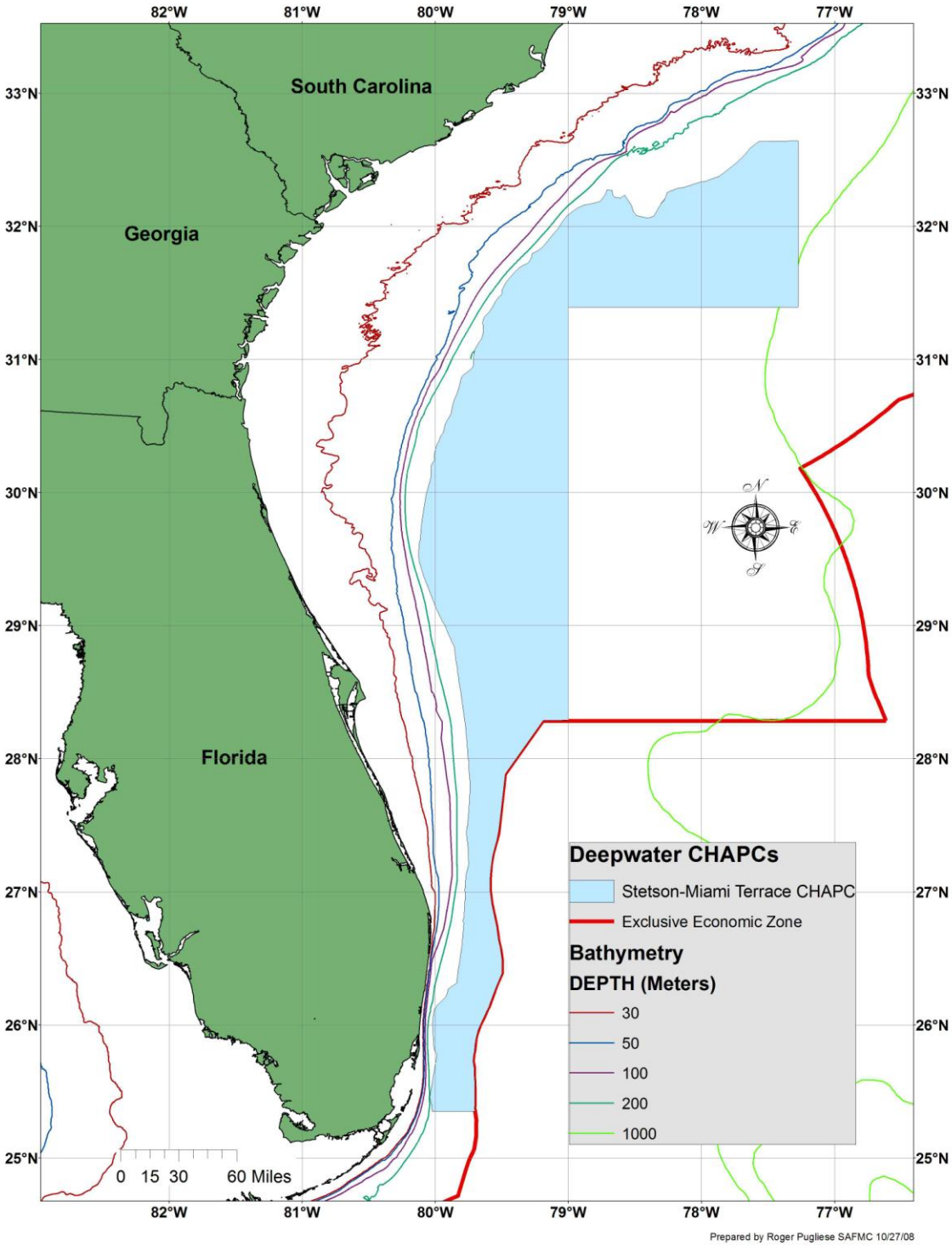


Figure 4-2. Proposed Stetson Reef, Savannah and East Florida Lithoherms and Miami Terrace Deepwater Coral Habitat Area of Particular Concern.
Coordinates for this area are in **Appendix F** (Source: Roger Pugliese, SAFMC).

Miami Terrace - 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 ft.) depths (**Figures 4-3 and 4-4**). 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.

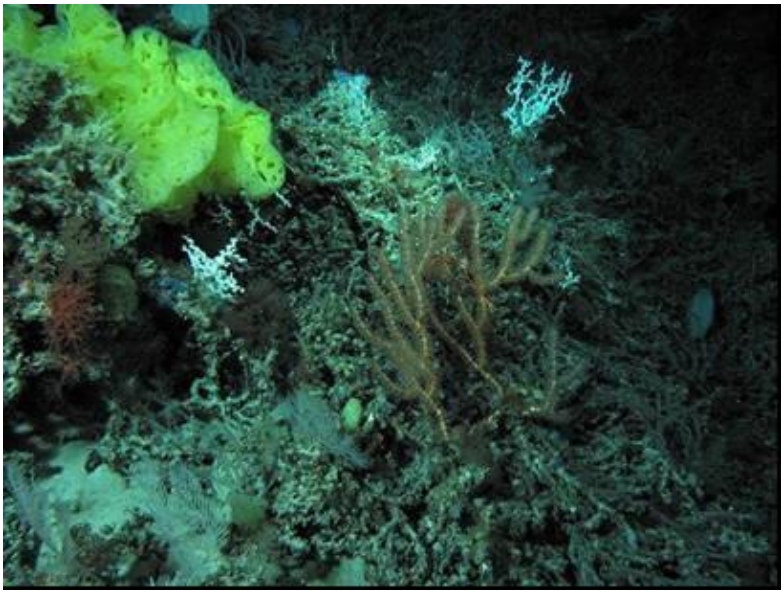


Figure 4-3. Image of deepwater coral habitat on the Miami Terrace. (Source: HBOI, UNCW, NURC, 2007).

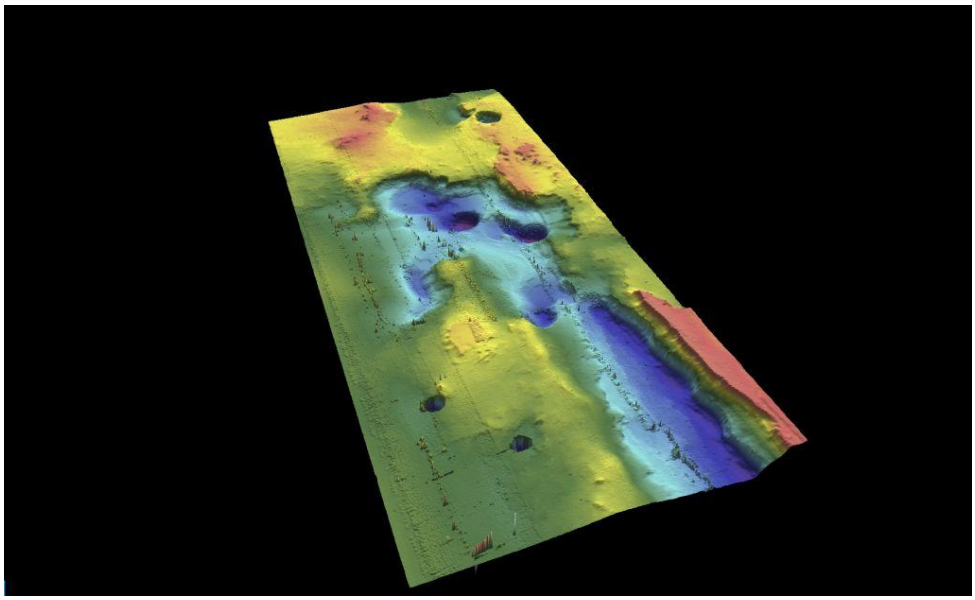


Figure 4-4. High resolution multibeam map of a potion of the Miami Terrace. (Source: HBOI, UNCW, NURC, 2007).

Sub-alternative 2c, the Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace CHAPC (Stetson-Miami Terrace CHAPC) would protect 23,528 square miles or 97.2% of deepwater habitats varying from the deepwater reef complexes occurring on the Blake Plateau, lithoherms with a vast network of coral pinnacles occurring off Georgia through north Florida and the Miami Terrace. Protection of the Miami Terrace habitat would protect recently verified areas of wreckfish aggregation and spawning habitat.

The NMFS logbook database was analyzed to determine if there were landings of snapper grouper species within the statistical grids occupied by **sub-alternative 2c**. Analysis was restricted to grids north of St. Lucie Inlet Florida since use of longline gear is prohibited south of this location. There are landings of snapper grouper species within the grids shared by **sub-alternative 2c** (**Table 4-3**). However, landings are dominated by golden tilefish and snowy grouper, which are commonly taken with bottom longline gear at depths ranging from 180 to 300 meters (590-984 ft.). Most bottom longline for snapper grouper species is set at depths ranging from 180 to 300 meters, which includes the depth range in which golden tilefish most commonly occur (Low and Ulrich 1983). Of the species found within **sub-alternative 2c**, only blackbelly rosefish were taken with bottom longline gear during 2004-2006. Blackbelly rosefish are commonly found in depths of 200 meters (656 ft.) and greater (White *et al.* 1998) but are not included in the snapper grouper fishery management unit. Golden tilefish are usually caught over mud habitat in depths of 180 to 300 meters (Low and Ulrich 1983; Able *et al.* 1993) but most commonly occur at depths of 200 meters (Dooley 1978). Longline gear is sometimes set over rocky bottom in 180 to 300 m where snowy grouper, blueline tilefish, and blackbelly rosefish are caught, which is shallower than the western boundary of **sub-alternative 2c** (400 meters; 1,312 ft.). Statistical grids in which **sub-alternative 2c** occurs includes a broad depth zone, including the 200 meter area most commonly fished with bottom longline gear (**Figure 4-5b**).

Examination of NMFS logbook data (2004-2006) for statistical grids overlapping **sub-alternative 2c** reveals that species commonly occurring in this area are not taken with bottom longline gear (**Table 4-3**). Since the primary species targeted with bottom longline gear is golden tilefish, and golden tilefish do not commonly occur within the depths of **sub-alternative 2c**, this alternative would not be expected to have an impact on the commercial longline fishery for snapper grouper species. Furthermore, since hook-and-line gear would not be prohibited, the establishment of **sub-alternative 2c** would not impact fishermen targeting wreckfish.

Table 4-3. Snapper grouper species taken with bottom longline gear within statistical grids overlapping proposed sub-alternative 2c.
Average weight, pounds whole weight. Years=2004-2006. Source: SERO.

Area 27-28°N; 79-80'W	
Species	Average
TILEFISH	63,351
GROUPER,SNOWY	210
GROUPER,GAG	131
SNAPPER,YELLOWTAIL	48
AMBERJACK,GREATER	46
TILEFISH,BLUELINE	10

Area 28-29°N; 79-80'W	
Species	Average
TILEFISH	60,304
GROUPER,SNOWY	850
GROUPER,GAG	404
GROUPER,YELLOWEDGE	332
TILEFISH,BLUELINE	104
GROUPER,RED	26
AMBERJACK,GREATER	11
SNAPPER,RED	6
SCAMP	5

Area 29-30°N; 79-80'W	
Species	Average
TILEFISH	4,249
GROUPER,SNOWY	30

Area 31-32°N; 79-80'W	
Species	Average
TILEFISH	4,904
GROUPER,SNOWY	161
GROUPER,GAG	46
TILEFISH,BLUELINE	9

Area 31-32°N; 77-78'W	
Species	Average
TILEFISH	1,348
GROUPER,SNOWY	237
TILEFISH,BLUELINE	103
GROUPER,YELLOWEDGE	31

Area 32-33°N; 77-78'W	
Species	Average
GROUPER,SNOWY	7,581
TILEFISH	4,386
TILEFISH,BLUELINE	2,628
GROUPER,YELLOWEDGE	772

Area 32-33°N; 78-79'W	
Species	Average
TILEFISH	38,133
GROUPER,SNOWY	23,717
TILEFISH,BLUELINE	8,403
GROUPER,YELLOWEDGE	2,065
AMBERJACK,LESSER	357
TRIGGERFISH,GRAY	289
GROUPER,WARSAW	131
AMBERJACK	125
GROUPER,GAG	42
JACK,ALMACO	23
HIND,SPECKLED	2
GROUPER,YELLOWFIN	2

Sub-alternative 2c would be expected to have the greatest biological benefits of the sub-alternatives considered since it is the largest (23,528 square miles) of the five proposed deepwater CHAPCs, and would protect more extensive stands of deepwater coral and associated habitat. **Sub-alternative 2c** would be expected to result in positive biological impacts to the deepwater coral habitat in these areas. Given the slow growth of deepwater corals, any impacts would be expected to result in long-term biological losses of deepwater coral habitat as well as the species that utilize this habitat. Under this sub-alternative, habitats within the Stetson-Miami Terrace proposed CHAPC would be protected from damaging fishing gear such as bottom longline, which would have positive biological impacts on the species in the area.

The wreckfish fishery is not expected to affect deepwater coral habitat proposed for protection under **sub-alternative 2c**. Wreckfish are harvested using a 30-50 pound sinker, cable, and terminal rig while motor fishing (SAFMC 1991). However, it is unknown if this harvest technique has any impacts on bottom habitat. Submersible dive observations have shown wreckfish associated with coral mounds (comprised mostly of dead corals) and hardbottom habitat with individual clumps of bamboo coral and small *Lophelia* colonies (G. Sedberry, personal communication). It is the Council's intent to assess whether gear impacts from the wreckfish fishery are likely to jeopardize the integrity of deepwater coral habitat in the South Atlantic region in a future plan amendment.

Sub-alternative 2d: Pourtales Terrace CHAPC

Like the Miami Terrace, the proposed Pourtales Terrace CHAPC (**Figure 4-5**) 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 other sub-alternatives, the Pourtales Terrace is in depths of 200 to 450 meters (656-1,476 ft.) 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.

Examination of NMFS logbook data indicates many snapper grouper species are taken in the statistical grid which contains the Pourtales Terrace (**Table 4-4**). However, the grid encompasses a very broad depth range from less than 1 to over 1,000 meters (3 to 3,281 ft.). Furthermore, there are reports of recreational fishing where hook-and-line gear is used in the "deep drop" fishery to target species such as golden tilefish and snowy grouper. Since bottom longline gear are already prohibited in this area, and fishing with hook-and-line gear would be allowed, **sub-alternative 2d** would have no impact on fishing for snapper grouper species. Coordinates for this proposed CHAPC are contained in **Appendix F**.

Sub-alternative 2d, the Pourtales Terrace CHAPC would protect 509 square miles or 2.1% of the proposed deepwater habitats and a different suite of fish species than **sub-alternatives 2a-2c**. Therefore, biological effects of **sub-alternative 2d** could be considered to be greater than the smaller areas of **sub-alternatives 2a** and **2b** but less than the very large **sub-alternative 2c.**

One of the proposed Type 2 Marine Protected Areas (MPAs) identified in Snapper Grouper Amendment 14, East Hump/Un-named Hump MPA, is located within **sub-alternative 2d**, the proposed Pourtales Terrace CHAPC. The MPA is located approximately 13 nautical miles southeast of Long Key, Florida. The size of the area is 5 by 10 nautical miles and is located in 194 to 296 meters (636-971 ft.) of water while the tops of the humps are 155 to 165 meters (508-541 ft.) deep. It is likely the proposed MPA contains deepwater snapper grouper species such as golden tilefish, snowy grouper, and speckled hind.

Table 4-4. Species taken by commercial fishermen during 2004-2006 with all gear in area between 24-25°N and 80-81'W. Average weight in pounds, whole weight.

Species	Average	Species	Average
AMBERJACK,GREATER	304,784	TRIGGERFISHES	9
SNAPPER,YELLOWTAIL	195,436	SNAPPER, DOG	8
GROUPER, SNOWY	33,772	JACKS, UNC.	7
SNAPPER, MANGROVE	20,721	GROUPER,YELLOWMOUTH	6
GROUPER, BLACK	15,815	HIND, SPECKLED	2
JACK, ALMACO	15,239	SNAPPER, SCHOOLMASTER	2
BLUE RUNNER	6,401	MARGATE, BLACK	1
SNAPPER, MUTTON	5,372	SEA BASS, ATLANTIC, BLACK, UNC	1
TILEFISH, BLUELINE	3,366		
GROUPER, RED	3,169		
SNAPPER, VERMILION	3,068		
GRUNTS	2,934		
SNAPPER, QUEEN	2,270		
SNAPPER, SILK	2,205		
HOGFISH	1,337		
AMBERJACK, LESSER	1,133		
PORGY, JOLTHEAD	1,096		
GROUPER, MISTY	1,007		
SNAPPER, LANE	824		
GROUPER, YELLOWEDGE	780		
TRIGGERFISH, GRAY	638		
BANDED RUDDERFISH	630		
SNAPPER, RED	565		
PORGY, WHITEBONE	504		
GRUNT, WHITE	450		
SCUPS OR PORGIES, UNC	388		
HIND, ROCK	316		
TILEFISH	314		
GROUPER, GAG	305		
PORGY, RED, UNC	218		
GRUNT, FRENCH	191		
GRUNT, BLUESTRIPED	165		
CREVALLE	144		
SNAPPER, BLACKFIN	130		
MARGATE	108		
SCAMP	87		
JACK, BAR	31		
TRIGGERFISH, OCEAN	30		
PORGY, KNOBBED	29		
SNAPPER, CUBERA	19		
GROUPER, YELLOWFIN	18		
HIND, RED	10		
TILEFISH, SAND	10		

Conservation of the proposed Pourtales Terrace CHAPC is not only important to benthic species but also is thought to serve pelagic species using the high profile habitats and dynamic currents for navigation, feeding, and migration. Given the slow growth of deepwater corals, any impacts would be expected to result in long-term biological losses of deepwater coral habitat as well as the species that utilize this habitat. Under **sub-alternative 2d**, habitats within the Pourtales Terrace proposed CHAPC would be protected from damaging fishing gear, which would have positive biological impacts on the species in the area.

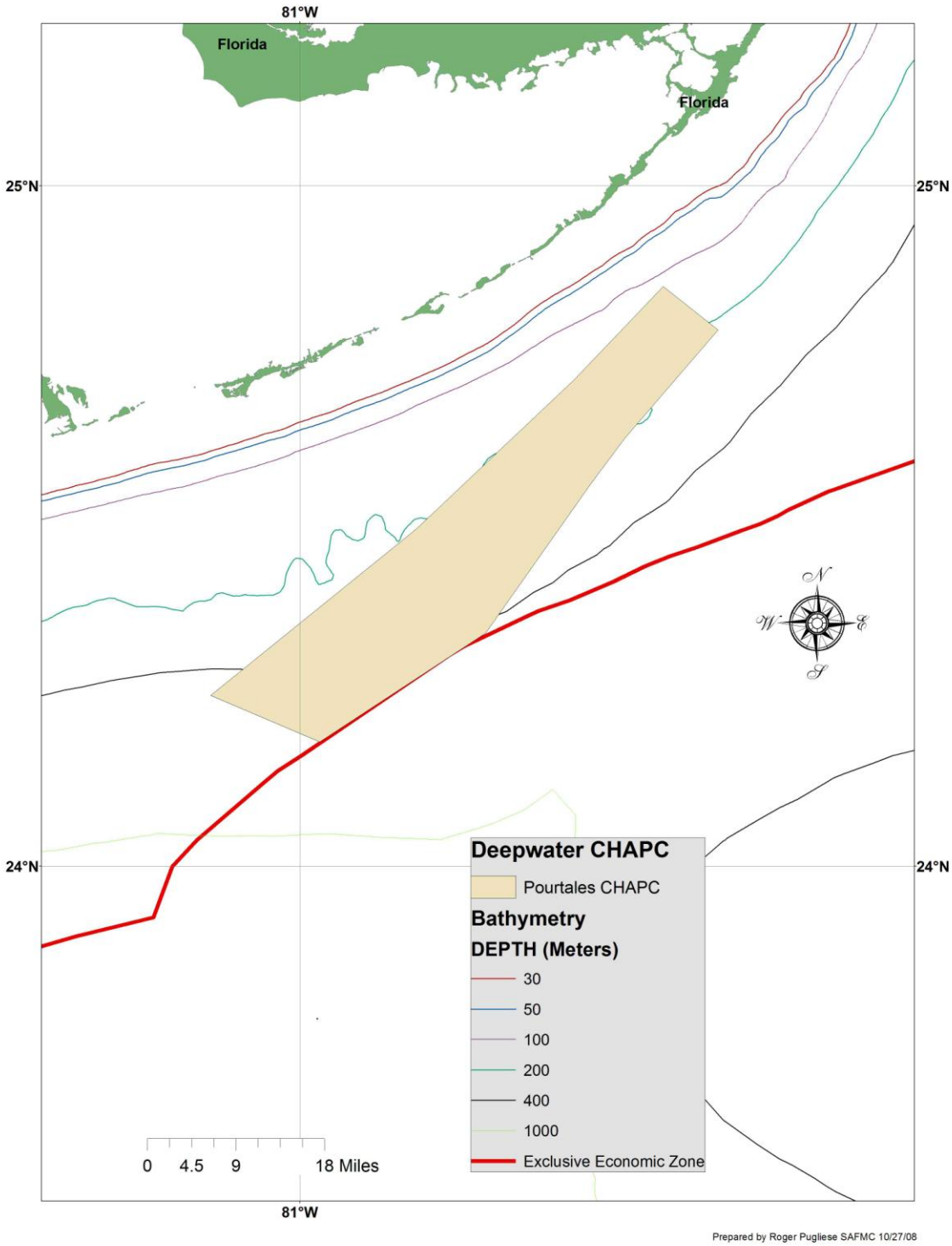
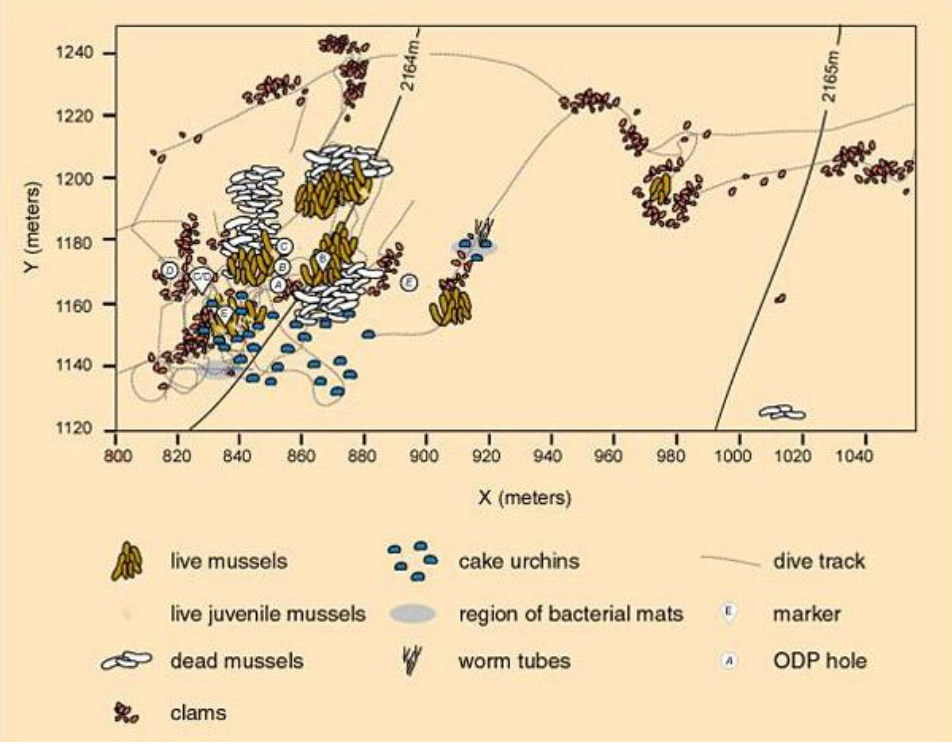


Figure 4-5. Proposed Pourtales Terrace CHAPC and coordinates. (Source: FWRI/SAFMC).

Sub-alternative 2e: Blake Ridge Diapir CHAPC
Methane gas hydrate formed below a rock overhang at the sea floor on the Blake Ridge diapir. Images (**Figure 4-6**), taken from the *Alvin* submersible during the NOAA-sponsored Deep East cruise in 2001, marked the first discovery of gas hydrate at the sea floor on the Blake Ridge. Methane bubbling out of the sea floor below this overhang quickly "freezes", forming a downward hanging hydrate deposit, dubbed the "inverted snowcone" (NOAA Ocean Explorer Dive Logs 2003).

The NOAA Ocean Exploration expedition "Windows to the Deep" focused on exploration of the Blake Ridge and the Blake Ridge Diapir which occurs between 800 and 1000 meters (2,625-3,281 ft.) deep. The expedition used high-resolution multichannel seismic data that W.S. Holbrook (University of Wyoming), D. Lizarralde (Georgia Tech), and I. Pecher (now in New Zealand) acquired in autumn 2000. The Blake Ridge Diapir was observed for the first time during the expedition. The high-resolution image revealed the distribution of gas hydrate and free gas to depths of hundreds of meters. The new sub-seafloor images provided even greater resolution necessary to better study features near the sea floor, just beneath methane seeps and potential chemosynthetic communities (**Figure 4-7**) (NOAA Ocean Explorer 2003 Dive Logs).

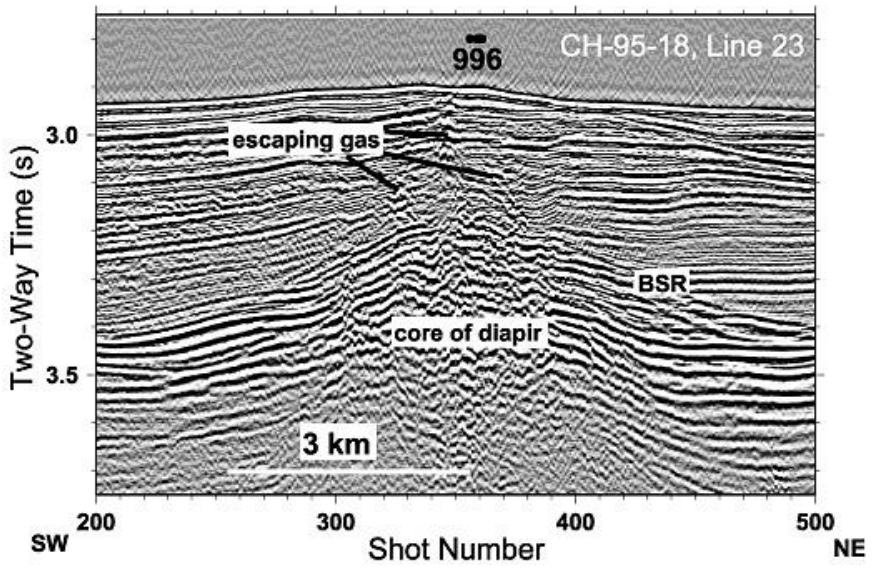


http://oceanexplorer.noaa.gov/explorations/03windows/logs/jul26/media/blakeridgemap.html

Figure 4-6. Map of Blake Ridge Diapir showing distribution of seep organisms. (Source: Van Dover *et al.* 2003. Deep-Sea Research I 50, p. 287; image from NOAA Ocean Explorer website.)

On this exploration, scientists used the *Alvin* submersible and other tools to explore the biology, physics, and chemistry of sea-floor methane seeps at water depths of 2,000 m to 2,800 meters (6,562-9,186 ft.) off the coast of the southeastern United States. These seeps occur where methane hydrate deposits—a solid form of methane and water stable at high pressures and low temperatures—rise to shallow depths beneath the sea floor and break down to produce methane gas. The *Alvin* dives explored three sea-floor features where scientists found chemosynthetic communities that live on or near the sea-floor emission sites (NOAA Ocean Explorer Dive Logs 2003).

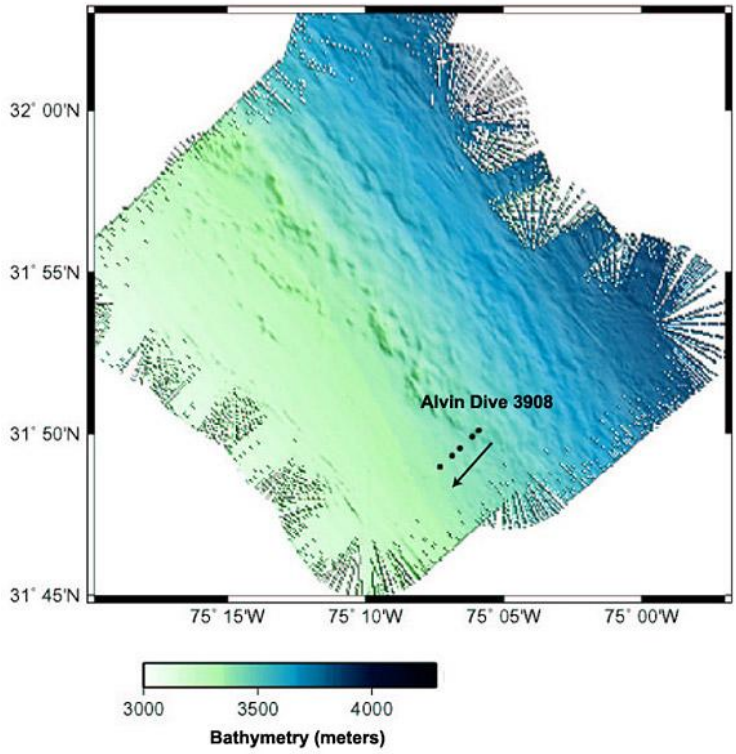
Background information for this exploration can be found on NOAA Ocean Explorer http://oceanexplorer.noaa.gov/explorations/03windows/welcome.html. Daily updates, detailed logs, and summaries of exploration activities are posted.



http://oceanexplorer.noaa.gov/explorations/03windows/background/plan/media/fig4_seism.html

Figure 4-7. Single channel seismic data collected by the US Geological Survey crossing the Blake Ridge Diapir from southwest to northeast.

The Blake Ridge Diapir is shown in **Figure 4-7** as the pronounced concave feature in the middle of the diagram. The feature labeled BSR is a bottom-simulating reflector that marks the base of the gas hydrate zone. Gas hydrate ("methane ice") is stable in the overlying sediments, but only methane gas can exist in the sediments beneath the BSR. The BSR is clearly visible on the diapir's flanks, but it is warped upward and disrupted over the center of the diapir. Vertically oriented features above the center of the diapir are faults that provide conduits for methane and other chemicals to reach the sea floor, where they can be used to sustain chemosynthetic communities (NOAA Ocean Explorer 2003 Dive Logs).



http://oceanexplorer.noaa.gov/explorations/03windows/logs/jul24/media/bathy.html

Figure 4-8. Seabeam survey of the northeastern side of the Blake Ridge. Source: Image by C. Ruppel in NOAA Ocean Explorer.

The location of *Alvin* submersible dive 3908 conducted on 25 July 2003 to explore the geology of this area and to search for signs of past or ongoing methane seepage is shown in **Figure 4-8**. The location of the proposed Blake Ridge Diapir CHAPC is presented in **Figure 4-9.** Coordinates for this proposed CHAPC are contained in **Appendix F**.

Sub-alternative 2e, the Blake Ridge Diapir Methane Seep CHAPC, would protect 4 square miles or 0.02% of proposed deepwater habitats. This is a unique benthic habitat occurring nowhere else in the region and not considered in any of the other sub-alternatives. Chemosynthetic organisms are known to utilize this habitat. The proposed CHAPC is 800-1000 meters (2,625-3,281 ft.) deep and is unlikely to be subject to any fishing operations that would impact the bottom habitat.

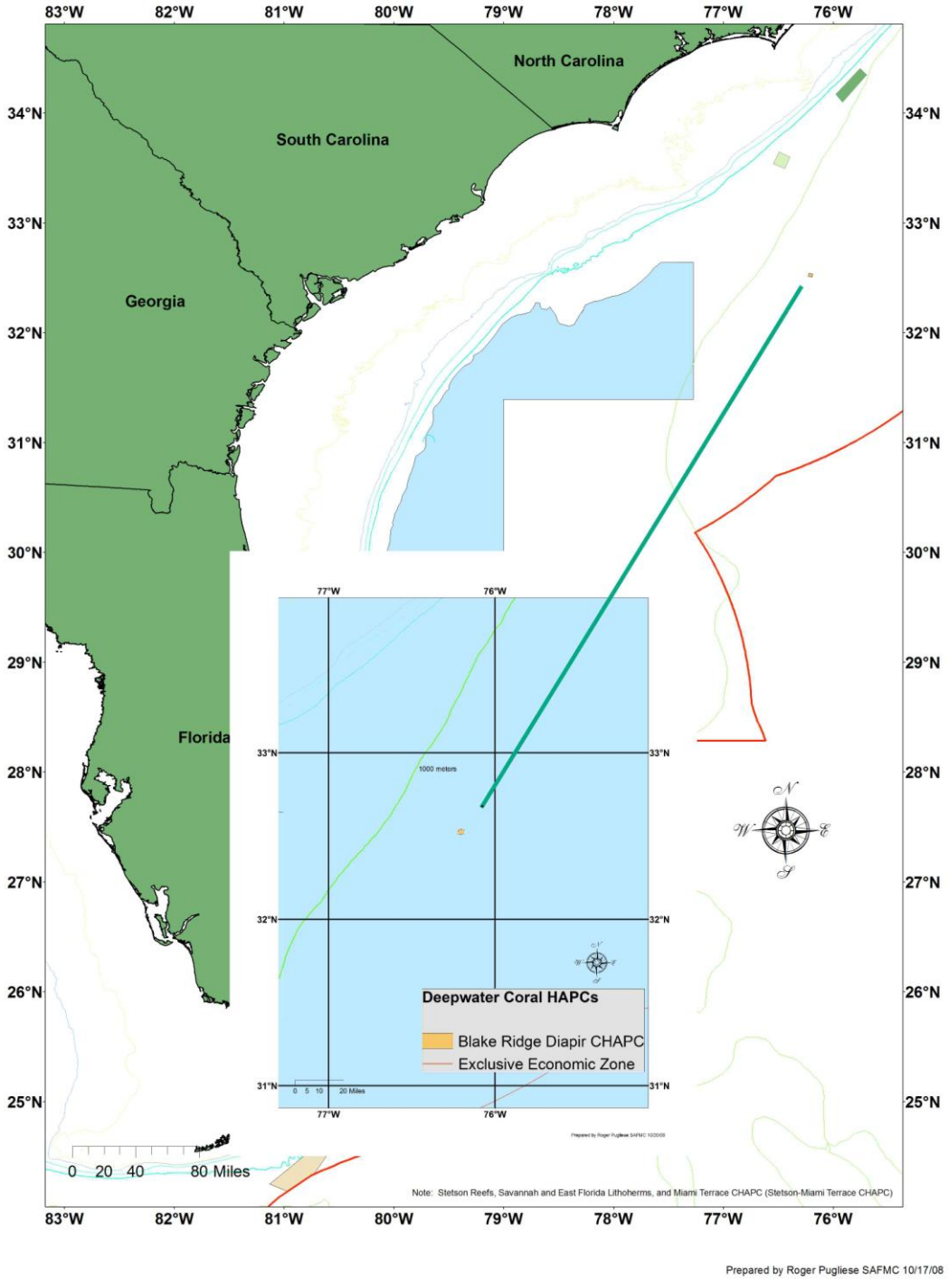


Figure 4-9. Location of proposed Blake Ridge Diapir CHAPC. Coordinates for this area are in **Appendix F.**

Effects on Protected Species

Alternative 2 and its various sub-alternatives will have no impact on ESA-listed *Acropora* species. The proposed CHAPC would circumscribe areas deeper than the species occur. The impact of **Alternative 2** and its various sub-alternatives on sea turtles and smalltooth sawfish is uncertain. If these CHAPC shift effort away from these areas, sea turtles and smalltooth sawfish occurring within them may have a lower risk of interactions with fishing gear. Likewise, if a prohibition on the use of fishing gears known to interact with sea turtles and smalltooth sawfish [i.e., bottom longlines, trawls (mid-water and bottom), dredge, pots or traps] is implemented, the risk of interactions between these species occurring in these areas and fishing gear may be diminished.

4.1.2 Economic Effects

General Effects

"Marine resources are a type of natural capital that can be invested or used to generate a return to its owner" (Carter 2003). From an economic perspective, these CHAPCs may be viewed as an investment instrument that is applied to a public asset (i.e., federal fishery resources). To be considered economically successful, total social benefits from the CHAPCs investment must outweigh all opportunity costs that are incurred, after accounting for risk. The most efficient investment scheme is the one that either maximizes excess social benefit over cost or possibly minimizes excess social cost over benefit. In other words, the preferred regulatory option should be the one that provides the greatest benefit for the least cost. A similar approach was used for Snapper Grouper Amendment 14 (SAFMC 2007) that established a network of MPAs. In this context, the net value of the proposed CHAPCs can be evaluated using a traditional benefit-cost framework: do the potential benefits of protection, adjusted to account for risks, outweigh the potential costs realized over both the short and long run?

For the most part benefit-cost valuation for MPAs, and similar designations (like CHAPCs), is determined by distributional effects related to the displacement of recreational and commercial fishermen, changes in economic impact on surrounding communities, and bio-economic linkages associated with the protected stock. However, societal issues may be present as well. Economic benefits and costs resulting from CHAPC protection may be characterized as either consumptive (e.g., commercial and recreational fishing) or non-consumptive (e.g., diving for sightseeing purposes). Consumptive costs and benefits are direct biological and economic effects that affect the profitability of a commercial fishing fleet, the satisfaction of recreational fishermen, and the efficient use of society's resources. Non-consumptive benefits and costs include societal losses and gains as well as effects on fishery management. The following subsections describe specific costs and benefits relevant to implementation of CHAPCs for deepwater species. After that, specific information is provided regarding the economic environment surrounding the golden crab, royal red shrimp, and wreckfish fisheries.

4.1.2.1 Costs

Consumptive Costs

Most of the consumptive costs associated with these CHAPCs can be generalized as displacement effects directly incurred by golden crab and royal red shrimp commercial vessels that normally fish in the protected areas. Direct consumptive costs to fishermen unable to fish in protected areas, like CHAPCs, include a decrease in catch levels; an increase in trip-level costs associated with searching for new fishing grounds; an increase in opportunity costs associated with learning a new type of fishing; congestion and user conflicts on new fishing grounds; and increased personal risk. Displacement effects have a negative impact on the predicted value of the proposed CHAPCs in **Action 1**. Sometimes fishermen are able to mitigate these costs by redirecting effort to open areas and targeting different species. This may not be possible in the case of golden crab (**Actions 3 and 4** propose ways to mitigate these expected negative effects). Although displaced fishermen may avoid some displacement costs as a result of redirecting effort and targeting different species, the addition of new fishing effort to open areas could have an extra negative effect on the health of other stocks.

4.1.2.2 Major Types of Displacement Costs

Decreased Catch Levels

In the short run, total catch by displaced vessels may be reduced. This result depends on technological decision-making by the affected vessels in response to an area closure. Changes in fishermen behavior are likely to have a temporal and spatial context and depend on both economic and biological conditions. Short-run technological decisions could involve changes in the variable cost structure, gear modifications, and location choices involving fishing grounds as well as homeports. Decreased harvest levels may be mitigated to the extent that fishermen can find alternative forms of fishing or spillover effects may create future harvest benefits such as increased catches or reduced harvest variability.

Increase in Trip-Level/Search/Opportunity Costs

Perhaps the most significant portion of displacement costs comes from the effect the Closed area has on fishing behavior. Displaced operators must now choose new fishing locations, maybe target new species, or even learn a new type of fishing. These new trip level decisions have a direct impact on trip-related variable costs as well as time-related opportunity costs. In particular, fuel costs are likely to change. The immediate search for profitable alternative fishing grounds likely results in additional fuel expenditures and lost opportunities to fish. In the case of the deepwater closures, vessels may actually use less fuel if the new fishing grounds are closer to shore or if significant spillover effects are realized on adjacent boundaries. If displaced fishermen try to learn a new type of fishing or employ new types of gear, additional costs may be incurred as the fishermen go along the learning curve.

Harvest and Personal Risks

Closed area regulations could cause fishermen to incur extra risk as they seek new and unfamiliar fishing grounds or employ unfamiliar fishing techniques. This risk could incorporate both harvest and personal dimensions. Again though, the closure of deepwater

areas may force vessels inshore, which could decrease the personal risk to the crew while reduced harvest variability from spillover effects could result in extra benefits.

Regional Economic Impacts

A possible indirect consumptive cost is the short-run impact that a reduction in income has on the surrounding communities. If displaced fishermen cannot mitigate all losses incurred from the MPA, their communities likewise will be negatively affected as less income flows through different sectors of the local economy. Fishing income originally spent in the community by fishermen cycles throughout the regional economy producing a multiplier effect, which induces regional expenditures and savings totaling more than the original income. The amount of fishing income lost and the magnitude of the multiplier effect determines the extent of the negative impact on the predicted value.

Non-consumptive Costs

Decreases in the quality of inshore fishing grounds and reduced option, bequest, and existence values resulting from increased fishing pressure redirected toward inshore fish stocks result in non-consumptive costs. **Actions 2 and 3** may mitigate some of these consequences. To the extent that these costs are realized, a negative influence must be accounted for in the predicted valuation of CHAPCs. See **Figure 4-10** for examples of non-consumptive uses and a depiction of how non-consumptive uses relate to other economic values of CHAPCs.

Management Costs

Direct costs incurred by management or some institutional body include funding for planning, maintenance, and enforcement; however, enforcement costs could be mitigated relative to other types of effort restrictions resulting in a net benefit. The added regulatory cost that management must incur due to implementation of a closed area is a negative impact on the predicted value. **Action 4** in this document considers requiring golden crab vessels to install VMS units. Because the infrastructure to monitor vessels with VMS units has already been implemented for the rock shrimp fleet and the Gulf red snapper fishery, the management costs associated with requiring golden crab vessels to install and use VMS units will be lower than otherwise. The VMS units installed in the southeast in the referred to fisheries have been subsidized by the federal government. Funding availability for VMS units for the golden crab fishery is uncertain.

4.1.2.3 Benefits

Consumptive Benefits

Consumptive benefits could be realized over the long run if spillover effects are assumed to affect aggregate harvest levels in the remaining fishable areas as stocks become healthier. Major consumptive benefits include spillover effects, increased stock biomass, increased harvest levels, and reduced variability of harvests and revenues.

Replenishment/Stock Effects

These effects refer to a net increase in biomass and aggregate harvest in the remaining open areas as a result of improved habitat due to implementation of the CHAPCs. The amount of economic benefit that will eventually be derived due to spillover effects from the CHAPCs

depends on a myriad of biological and economic factors specific to the species in question and the vessels that target them. The long-term realization of spillover effects will have a positive impact on the predicted economic value of the proposed CHAPCs.

Increased Catch Levels

Over the long run, aggregate catch by displaced and unaffected vessels alike may increase due to spillover effects. This result depends on biological characteristics of the stock as well as fleet wide technological decision-making in response to the area closure. If spillover occurs in open fishing grounds, which historically have contributed a relatively small share towards aggregate catch (perhaps due to overexploitation), then the probability of increased harvests is relatively higher; however, if the protected species are overly sessile, the probability of increased harvests is relatively lower (Sanchirico *et al.* 2002).

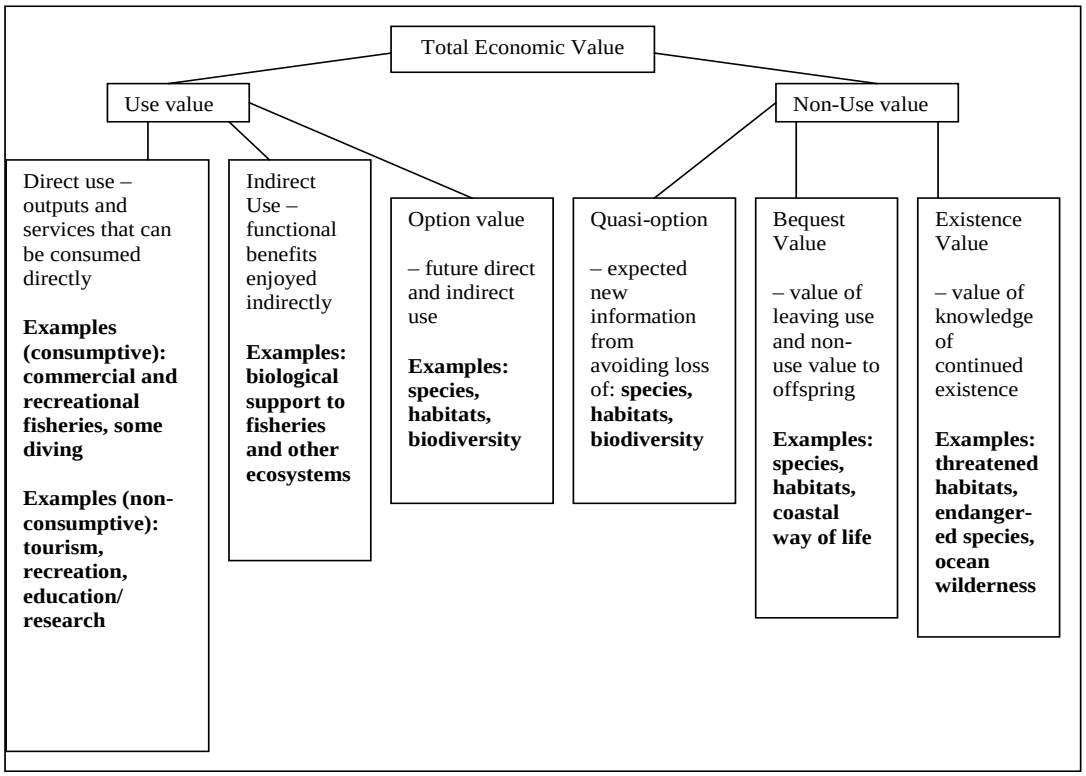


Figure 4-10. Flow chart depicting different economic values associated with protected areas.

Non-consumptive Benefits

Quality Increases in CHAPCs

If regulation works from a biological perspective, then habitat and protected fish in the CHAPCs over time become more numerous and heavier, on average, due to an increase of older fish in the population. Protection could also increase biodiversity, community structure, and general habitat conditions in the short- and long-term (Leeworthy and Wiley 2002). These benefits could contribute to an overall healthier ecosystem which eventually supports sustained recreational and commercial fishing activities. Thus, environmental quality increases constitute a positive addition to the predicted value of an MPA.

Option Values

Benefits may arise from maintaining the option to use the ecological resources within the proposed CHAPCs in the future. In essence, society is paying a risk premium (i.e., closing the area to certain activities) to keep the option of future use available and hedge the uncertainty associated with damaging corals and their habitat. Thus, the capture of option value through gear restrictions constitutes a positive addition to the predicted value of the proposed CHAPCs. See **Figure 4-10** for a depiction of how option values relate to other economic values of MPAs.

Bequest and Existence Values

Benefits may arise from CHAPCs as future generations are able to utilize the resources in these areas. The amount that society is willing to pay for this benefit is known as a bequest value. Additionally, knowing that deepwater species will continue to exist in the future is known as an existence value. Thus, the realization of bequest and existence values through closures constitutes a positive addition to the predicted value of the proposed CHAPCs. See **Figure 4-10** for a depiction of how bequest and existence values relate to other economic values of MPAs.

4.1.2.4 Commercial Fishery

Alternative 1 (No action) would not establish deepwater CHAPCs and important habitat areas would not be protected from bottom longlines; trawls (mid-water and bottom); dredge, pots, or traps; or use of anchor and chain, or use of grapple and chain by all fishing vessels. As a result, the commercial fishery could experience long-term negative impacts from potential loss of habitat for commercial species due to lack of protection of these areas. The various sub-alternatives under **Alternative 2** would have negative short-term impacts on the golden crab fishery and the royal red shrimp fishery [Note: **Actions 2** and **3** mitigate these effects]. Detail is provided below for all fisheries with species in the areas encompassed by the sub-alternatives under **Alternative 2**.

Royal Red Shrimp

The royal red shrimp fishery is expected to experience small negative impacts from establishment of **sub-alternative 2c**. The royal red shrimp fishery operates almost exclusively inshore of the 400 meter (1,312 ft.) contour, which is the western boundary of the deepwater habitat being protected by the proposed Stetson-Miami Terrace CHAPC under **sub-alternative 2c**. NMFS SEFSC provided the Council with the following analysis vessel

monitoring data required for participation in the rock shrimp fishery but used by vessels when fishing for royal red shrimp.

Data depicting VMS locations for the rock shrimp/royal red shrimp fishing industry were analyzed to determine the relationship between vessel speed and fishing activity (Carlos Rivero NMFS SEFSC; **Figure 4-11**). Frequency distributions were created from the average speeds of over 1.6 million VMS locations. This information showed three distinct speed distributions for each vessel (0-2 knots, 2-4 knots, and 4-10 knots) (**Figure 4-12**). For this project we were specifically interested in trawling behavior and realized that the 0-2 knot category was too slow for trawling and the 4-10 knot category was too fast. Therefore, the 2-4 knot category seemed to characterize trawling behavior in the data. This was later confirmed by industry fishers.

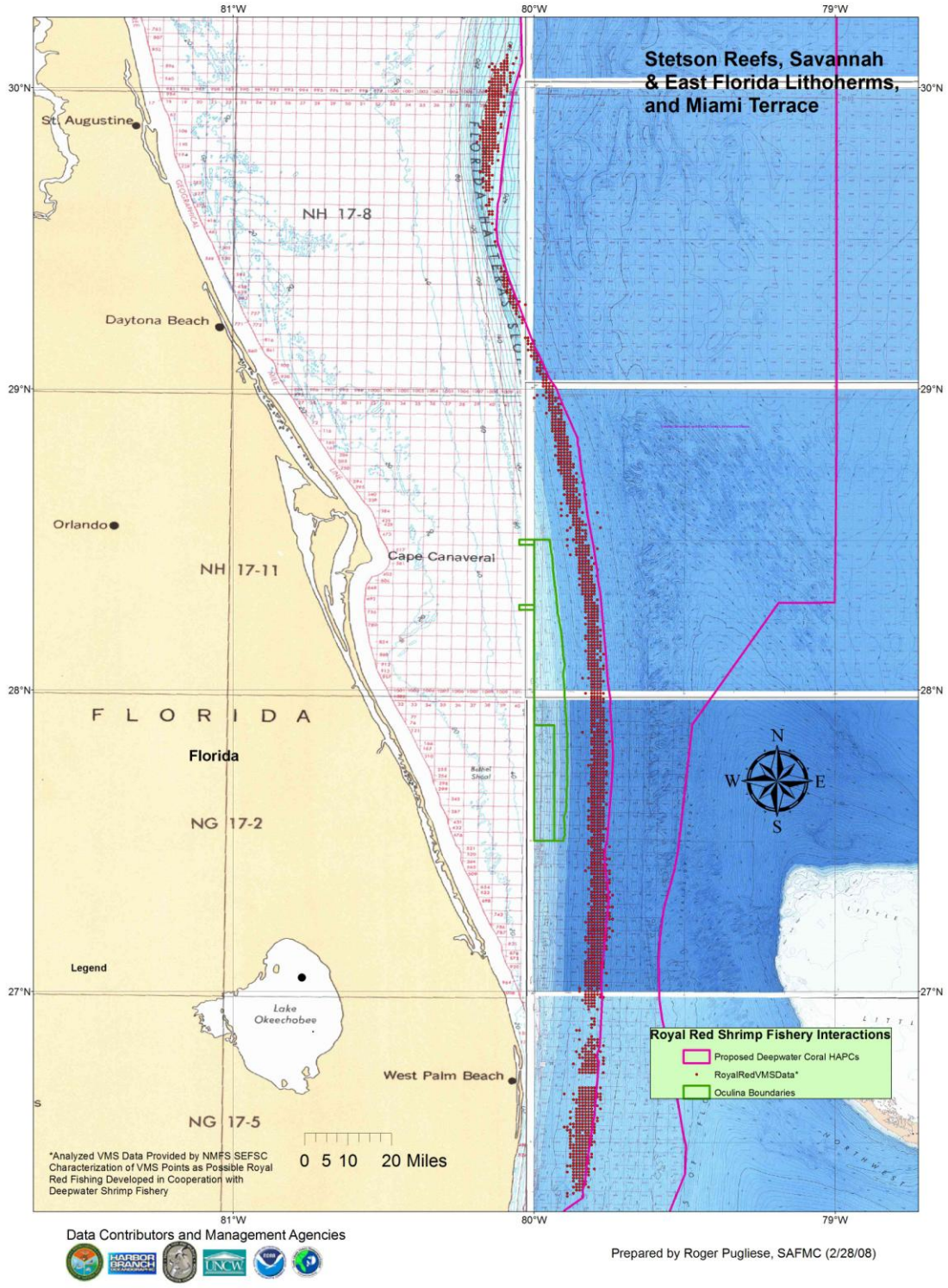


Figure 4-11. Royal red shrimp fishing trips as shown by Vessel Monitoring System (VMS) data.
Source: NMFS SEFSC; Roger Pugliese.

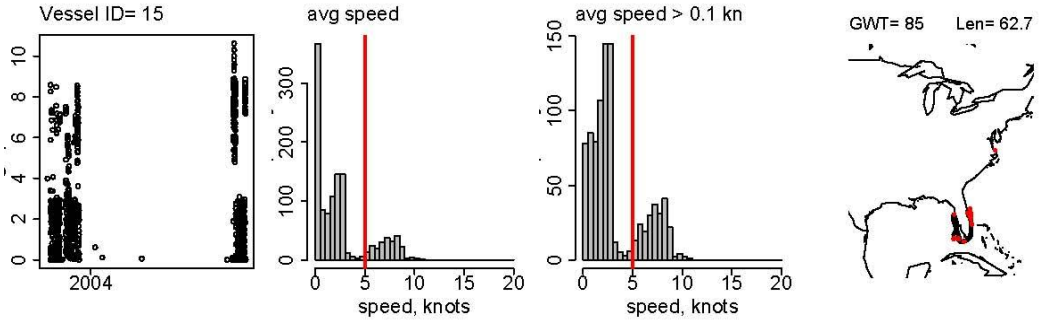


Figure 4-12. Frequency distribution of average speed for vessel # 15.

Using this information, the distribution of VMS locations with average speeds between 2 and 4 knots over the proposed Stetson-Miami Terrace CHAPC was plotted. The first iteration of the proposed area overlapped considerably with the VMS locations where 25% of the VMS points were located within the proposed CHAPC (**Figure 4-13**).

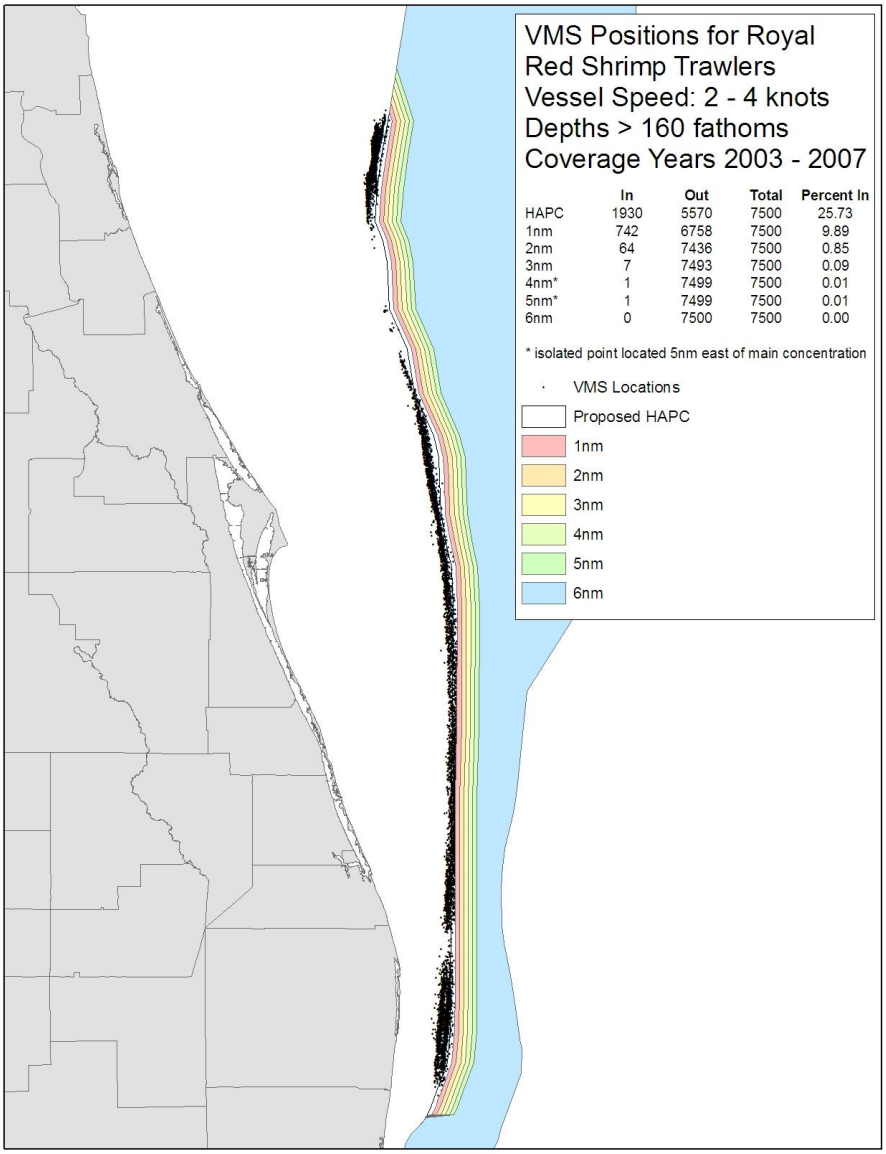


Figure 4-13. Comparison of overlap between the VMS locations and the original version of the proposed Stetson-Miami Terrace CHAPC.

The proposed boundary of the Stetson-Miami Terrace CHAPC was refined using high resolution bathymetry to more accurately follow the 400 meter (1,312 ft.) depth contour and a new plot was created to determine the amount of overlap. The revised boundary contained less than 1% of the VMS locations (**Figure 4-14**). Although the map shows a "trawling" point 5nm east of the main concentration of points, it was determined that the point was part of the track showing the vessel in transit and not associated with trawling (**Figure 4-15**).

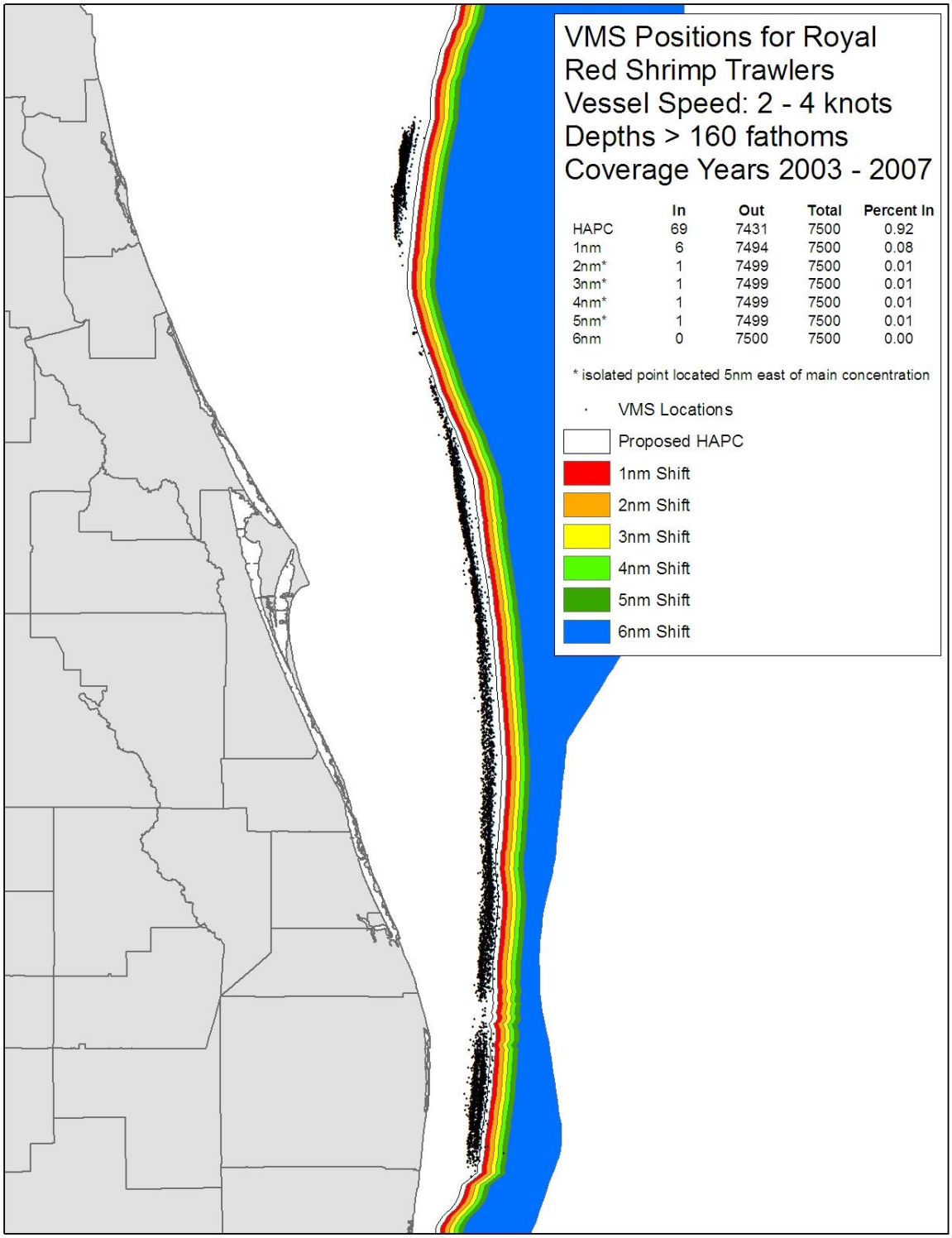


Figure 4-14. Comparison of overlap between the VMS locations and the revised version of the proposed Stetson-Miami Terrace CHAPC.

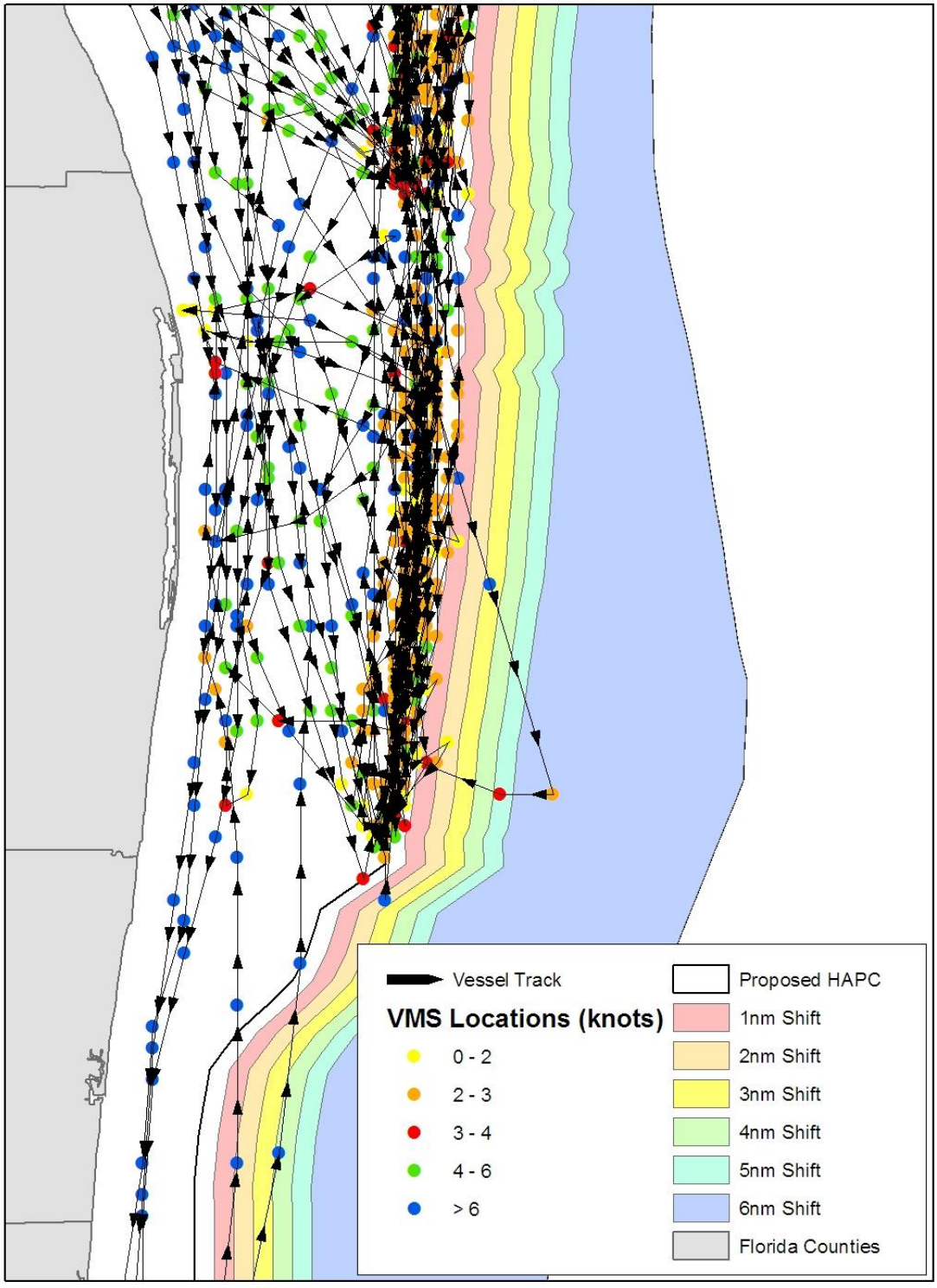


Figure 4-15. Track showing the behavior associated with the "trawling" point 5nm east of the main concentration of trawling activity.

There are expected to be small negative economic impacts on the deepwater shrimp (royal red shrimp) fishery as a result of establishing **sub-alternative 2c**. The other sub-alternatives under **Alternative 2** are not expected to impact the royal red shrimp fishery. The impacts of

sub-alternative 2c cannot be accurately quantified since landings associated with the VMS data points are unknown. To assess the economic impacts that this action will have on the royal red shrimp fishery, catch by ACCSP statistical grid was examined (**Figure 4-16**). However, the grid areas were too large to be used for quantitative analysis and are included here for informational purposes only. However, a portion of average royal red shrimp landings could serve as a proxy. The average of the landings for the three year period 2005-2007 was 267,000 pounds. For the purposes of making an estimate of economic impact, it is assumed that perhaps 1%, 5%, or 10% of landings could be eliminated through establishment of **sub-alternative 2c.** These impacts are shown in pounds and dollars in **Table 4-5** below.

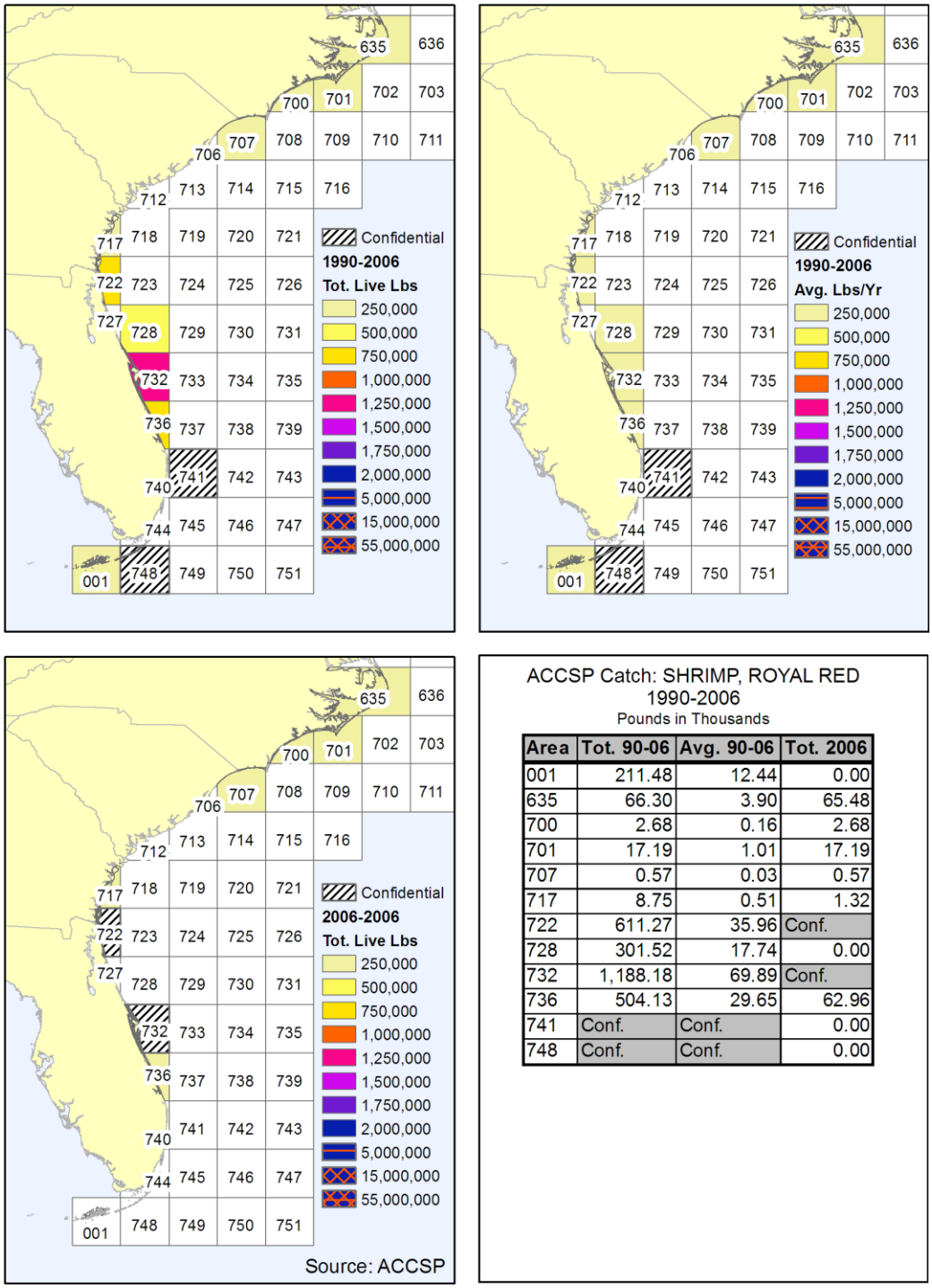
Table 4-5. Potential royal red shrimp landings and ex-vessel value impacted as a result of sub-alternative 2c.

Percentage of Landings Eliminated Through Alt 2c	Landings (pounds)	Estimated Ex-Vessel Value for shrimp ($3.25/lb)
1%	2,667	$8,668
5%	13,332	$43,330
10%	26,664	$86,659

Note: The price of $3.25 per pound is used because it is an average of the price received for large heads-off shrimp ($5/lb) and small heads-on shrimp ($1.50/lb).

Duval County in Florida is estimated to suffer the greatest economic impacts. These negative impacts can be offset with provisions for a "Shrimp Fishery Access Area" in the proposed Stetson-Miami Terrace CHAPC under **Action 2.**

Royal red shrimp show some overlap in terms of catch by grid (**Figure 4-16**). However, examination of detailed bathymetry and VMS data indicate little to no overlap (**Figure 4-15**).



ACCSP Catch: SHRIMP, ROYAL RED
1990-2006
Pounds in Thousands

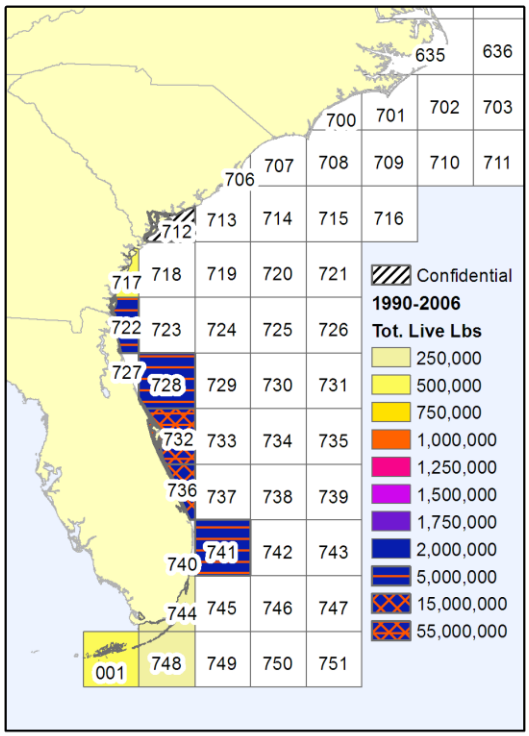
Area	Tot. 90-06	Avg. 90-06	Tot. 2006
001	211.48	12.44	0.00
635	66.30	3.90	65.48
700	2.68	0.16	2.68
701	17.19	1.01	17.19
707	0.57	0.03	0.57
717	8.75	0.51	1.32
722	611.27	35.96	Conf.
728	301.52	17.74	0.00
732	1,188.18	69.89	Conf.
736	504.13	29.65	62.96
741	Conf.	Conf.	0.00
748	Conf.	Conf.	0.00

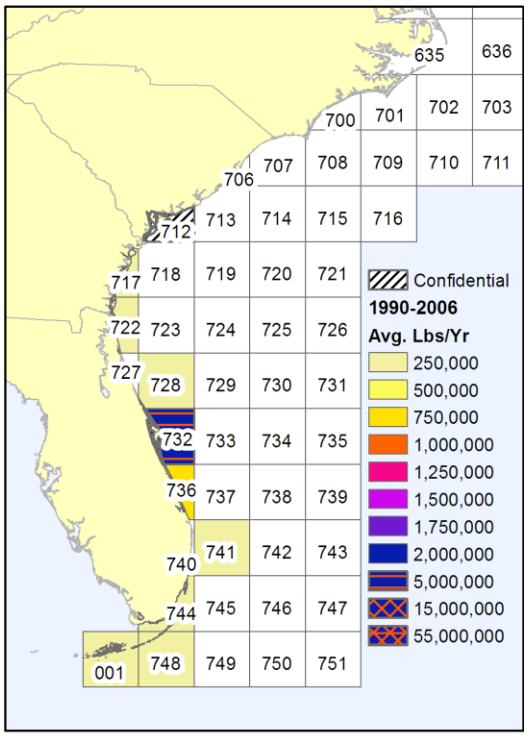
Figure 4-16. Royal red shrimp catch by ACCSP statistical grid.
Source: Atlantic Coastal Cooperative Statistics Program, ACCSP.

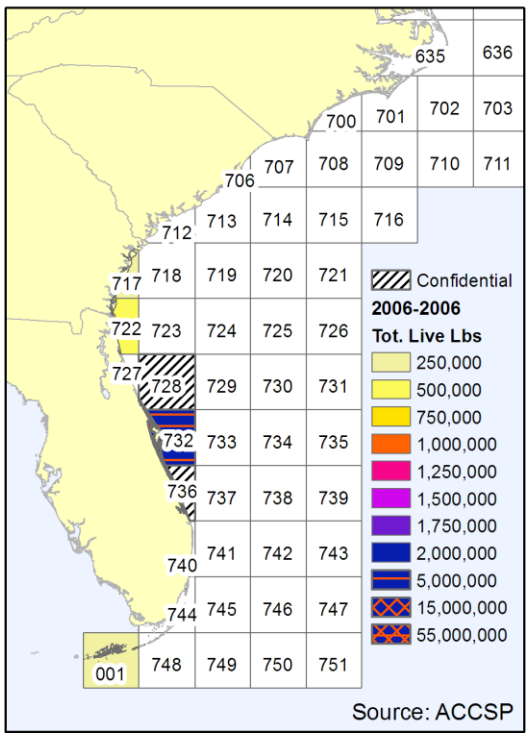
Rock Shrimp

Rock shrimp shows some overlap in terms of catch by grid (**Figure 4-17**). However, all catches of rock shrimp occur in water shallower than the western boundary of the Stetson-

Miami Terrace CHAPC proposed in **sub-alternative 2c**. The other sub-alternatives under **Alternative 2** are not expected to impact the rock shrimp fishery.







ACCSP Catch: SHRIMP, ROCK
1990-2006
Pounds in Thousands

Area	Tot. 90-06	Avg. 90-06	Tot. 2006
001	360.59	21.21	13.12
712	Conf.	Conf.	0.00
717	266.45	15.67	155.34
722	2,427.36	142.79	445.66
728	2,143.15	126.07	Conf.
732	50,286.93	2,958.05	2,307.82
736	11,121.82	654.22	Conf.
741	2,776.69	163.33	0.00
744	10.81	0.64	0.00
748	76.03	4.47	0.00

Figure 4-17. Rock shrimp catch by statistical grid.
Source: Atlantic Coastal Cooperative Statistics Program, ACCSP.

Golden Crab

The golden crab fishery is expected to experience large negative economic impacts as a result of implementation of two of the proposed CHAPCs. The golden crab fishery operates in the area proposed as the Stetson-Miami Terrace CHAPC (**sub-alternative 2c**) and in a small portion of the proposed Pourtales Terrace CHAPC (**sub-alternative 2d**). While fishing in the Southern Zone occurs east and west of the Pourtales CHAPC (**sub-alternative 2d**), all harvest in the Middle Zone occurs in the mud, sand, and shell areas in the Stetson-Miami Terrace CHAPC (**sub-alternative 2c**). Fishing operations have been verified in the Middle Zone, the Northern Zone, and the Southern Zone based on trap-set data provided by industry. It is expected that the CHAPCs proposed in **Alternative 2** of **Action 1** would protect habitat for golden crab, royal red shrimp, and wreckfish, among other species. In the long term, in the case of golden crab, this would benefit fishermen if the species' populations expanded beyond the boundaries of the CHAPCs and fishermen were able to fish these areas. As discussed, the proposed Stetson-Miami Terrace and Pourtales Terrace CHAPCs encompass almost all of the traditional fishing grounds for golden crab. As a result, in the short-term, golden crab fishermen are not likely to benefit economically from establishment of these CHAPCs because they would no longer be able to fish on their traditional fishing grounds.

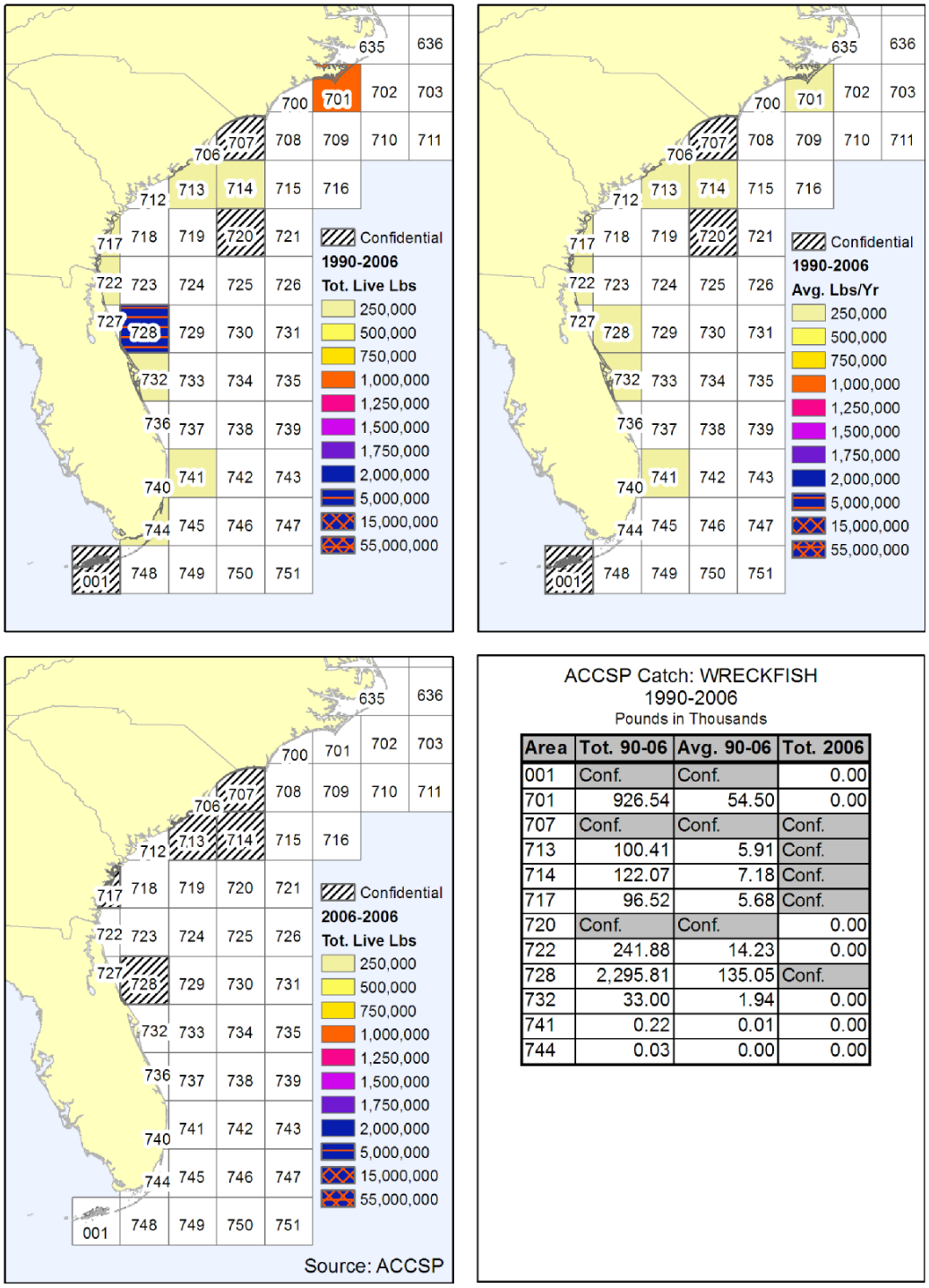
The golden crab fishery participants primarily supply golden crab to seafood processors and other businesses in southern Florida. While some of the golden crab supply is sold in restaurants within Florida, a portion is sold to seafood processers that in turn ship the crab nationally. The geographic areas most likely to feel the greatest economic impact from a decline in golden crab harvest are Broward and Monroe counties in Florida. While golden crab sales contribute a very small portion of economic activity to each county, the sales are important to a small number of businesses that use golden crab as a substitute for blue crab (Public scoping comments, June 2008). Golden crabs have also been delivered to three other southern Florida counties within the past three years.

However, the expected significant negative economic impacts on the golden crab fishery from implementation of **sub-alternatives 2c** and **2d** under **Alternative 2** can be offset with provisions for allowable gear areas or "Allowable Golden Crab Fishing Areas" within the proposed CHAPCs under **Action 3**. Input provided by the Golden Crab Advisory Panel and other affected fishermen indicated that the proposed CHAPCs would eliminate the golden crab fishery because so much of their fishing grounds are included in these areas (**see Figures 4-20a, 4-20b,** and **4-20c**). To assess the economic impact that this action would have on the golden crab fishery, catch by ACCSP statistical grid was examined (see **Action 3, Figure 4-21**). However, the grid areas were too large to be used for quantitative analysis and are included here for informational purposes only. To provide the reader with an estimate of the economic value of the golden crab fishery that would be lost due to adoption of **sub-alternative 2c** under **Action 1** exclusive of **Alternative 2 or 3 under Action 3**, historic logbook data were analyzed. The logbook data indicate that the golden crab fishery caught 510,000 pounds on average over the period 2005-2007. In the absence of establishment of "Allowable Golden Crab Fishing Areas," the fishery, consisting of 7 commercial golden crab vessels that landed golden crab between 2005 and 2007, would likely lose almost all of these landings, estimated at approximately $714,000 ex-vessel value annually. This estimate assumes that fishermen receive $1.40 per pound on average for

golden crab landings (personal communication, Howard Rau, 2008). Accumulative Landings System (ALS) data indicate that 2005-07 average landings were 433,236 pounds valued at $673,516 ex-vessel.

Wreckfish

The wreckfish fishery is not expected to be impacted by the prohibition of the fishing methods and gears proposed in the sub-alternatives under **Alternative 2**. Wreckfish are harvested using a 30-50 pound sinker, cable, and terminal rig while motor fishing (SAFMC 1991). It is currently unknown if this harvest technique has any impacts on bottom habitat. While annual reports have been developed by NMFS that include wreckfish landings and other economic information on the vessels that land wreckfish, almost all of this information is confidential after 2001 and cannot be included here. Wreckfish show some overlap in terms of catch by grid using catch by ACCSP statistical grid (**Figure 4-18**). However, the wreckfish fishery will not be affected by the proposed action because bottom longlines are prohibited in this fishery. It is the Council's intent to assess whether gear impacts from the wreckfish fishery are likely to jeopardize the integrity of deepwater coral habitat in the South Atlantic region in a future plan amendment.



ACCSP Catch: WRECKFISH
1990-2006
Pounds in Thousands

Area	Tot. 90-06	Avg. 90-06	Tot. 2006
001	Conf.	Conf.	0.00
701	926.54	54.50	0.00
707	Conf.	Conf.	Conf.
713	100.41	5.91	Conf.
714	122.07	7.18	Conf.
717	96.52	5.68	Conf.
720	Conf.	Conf.	0.00
722	241.88	14.23	0.00
728	2,295.81	135.05	Conf.
732	33.00	1.94	0.00
741	0.22	0.01	0.00
744	0.03	0.00	0.00

Figure 4-18. Wreckfish catch by ACCSP statistical grid.
Source: Atlantic Coastal Cooperative Statistics Program, ACCSP.

Snapper Grouper

One of the proposed Type 2 Marine Protected Areas (MPAs) identified in Snapper Grouper Amendment 14, East Hump/Un-named Hump MPA, is located within **sub-alternative 2d**, the proposed Pourtales Terrace CHAPC. The MPA is located approximately 13 nautical

miles southeast of Long Key, Florida. The size of the area is 5 by 10 nautical miles and is located in 194 to 296 meters (636-971 ft.) of water while the tops of the humps are 155 to 165 meters (508-541 ft.) deep. The site of the proposed Type 2 MPA has never been sampled by SEAMAP, so there is no documentation of available habitat. It is located beyond where MARMAP currently samples, so there is no species occurrence data available. However, the Snapper Grouper Committee received a proposal from the Islamorada Charterboat Association explaining the characteristics of the East Hump and Unnamed Hump (both humps are included in the proposed MPA) and discussed it at their October 2001 meeting. The document stated that snowy grouper, golden tilefish, and warsaw grouper were found at the site, as were many other fish species. The proposed Pourtales Terrace CHAPC in **sub-alternative 2d**, therefore, has the potential to hold snapper grouper species. In Snapper Grouper Amendment 14 (SAFMC 2007), it was estimated (using a proportional method on logbook grid data) that 18,503 pounds of all snapper grouper species were taken from the proposed East Hump/Unnamed Hump MPA. In addition, a Delphi analysis was undertaken as part of Snapper Grouper Amendment 14 to estimate the potential impacts of the individual proposed MPA sites. The Delphi panel concluded the immediate socioeconomic impacts of the proposed East Hump MPA site would be less than minimally negative but the medium- and long-term effects would be slightly and minimally positive. These impacts were assessed for a Type 2 MPA which would prohibit fishing for or possession of snapper grouper species in the Type 2 MPA. Establishment of a CHAPC via this amendment restricts the use of bottom-tending gear as well as anchoring. These rules do not restrict the use of hook-and-line gear commonly used by snapper grouper fishermen. Therefore, while negative impacts are expected from implementation of a Type 2 MPA via Snapper Grouper Amendment 14 for part of the area in **sub-alternative 2d**, only small negative impacts are expected to snapper grouper fishermen as a result of **sub-alternative 2d** since this alternative allows continued fishing in these areas by snapper grouper fishermen. The small negative impact would be due to the restriction on anchoring.

The commercial fishery in general is expected to benefit in the long-term from an overall healthier ecosystem resulting from protection of corals and habitat and from increased stock levels.

4.1.2.5 Recreational Fishery

With regard to recreational fisheries, the anchoring prohibition would not impact fishing activities for the fisheries that do not anchor (e.g., troll fishery for billfish, dolphin, wahoo, tuna, etc.) and impacts on these recreational activities would be minimal. Most fishing vessels would not be able to anchor effectively in depths greater than 300 meters (984 ft.) anyway which is the depth of most of the proposed CHAPCs (the exception is **sub-alternative 2d** which encompasses areas with depths less than 400 meters or 1,312 feet). However, the action would act as a deterrent to vessels anchoring on the tops of the hundreds of existing pinnacles, where all observations to date indicate thriving, undisturbed, complex coral ecosystems exist. Thus, the action of establishing the CHAPCs and prohibiting anchoring of fishing vessels within them would have only a small negative impact on recreational fisheries. The small negative impact would be due to the restriction on anchoring.

The recreational fishery is expected to benefit in the long term from an overall healthier ecosystem resulting from protection of corals and habitat and from increased stock levels.

4.1.2.6 Non-Use Value

Protecting this habitat described in **Action 1** is expected to result in overall positive net economic benefits to society. Specifically, society is expected to benefit from the possible availability of new information resulting from avoiding the loss of coral species that could be used to benefit society, an increase in bequest value, and an increase in existence value (see the beginning of the economic impacts section for an explanation of these terms). The full suite of benefits the species that the proposed CHAPCs would protect are unknown but could include medicinal and environmental benefits.

4.1.3 Social Effects

There are expected to be significant negative social impacts on the golden crab fishery resulting from establishment of the Stetson-Miami Terrace and Pourtales Terrace CHAPCs (**sub-alternatives 2c** and **2d**) since these two proposed areas contain the traditional golden crab fishing grounds almost in their entirety. These impacts, however, can be offset with provisions for allowable gear areas or "Allowable Golden Crab Fishing Areas" within the relevant CHAPCs under **Action 3**. If offsetting actions are not undertaken, it is possible that the golden crab fishery would cease to exist. The social impacts on the families involved in the golden crab fishery would be significant since it may not be possible for golden crab vessels to be converted from crab fishing to fishing for other species. While it may be physically possible to make the vessel changes, it is not seen as a profitable endeavor given the lack of fisheries with trip limits and commercial quota sufficient to support an additional vessel. A golden crab fisherman would have to obtain additional permits to participate in other fisheries as well which typically requires a substantial investment of funds. As a result of the demise of the golden crab fishery, and the inability of golden crab vessels to transfer to another fishery, the financial stress and other problems that result from financial stress and unemployment on a family would ensue. These could include an increase in transfer payments and stress, depression, and other mental health problems.

There are expected to be minor negative social impacts on the deepwater shrimp (royal red shrimp) fishery from establishment of the Stetson-Miami Terrace CHAPC (**sub-alternative 2c**) but these can be offset with provisions for "Shrimp Fishery Access Areas" within the Stetson-Miami Terrace CHAPC under **Action 2**.

4.1.4 Administrative Effects

Alternative 1 (No action) would require no immediate administrative effects. However, in the long term if coral species found within the proposed areas become listed, or other species which depend on them become compromised because of destructive fishing practices in the area, the administrative environment could be burdened with processing and implementing future regulatory actions. Any of the sub-alternatives under **Alternative 2** would require the coordination of several divisions within NOAA Fisheries Service including the Office of Law Enforcement, General Counsel, Sustainable Fisheries, and Habitat.

The Office of Law Enforcement would be responsible for the coordination of enforcement efforts needed under **Alternative 2**. This would include monitoring VMS positions of rock shrimp vessels in relation to the CHAPC boundaries. If a violation is detected, a NOAA Fisheries Service law enforcement officer, state law enforcement officer, or Coast Guard patrol would be dispatched to the vessel in question or meet the vessel upon arrival back at the dock at which point an interview would be conducted, a report filed, and a possible citation issued. Since similar law enforcement efforts are already being utilized for the restricted Oculina Bank area located east of the proposed northern CHAPCs, the nature of enforcement for the proposed sub-alternative areas under **Action 1** would remain unchanged. However, it is likely the issuance of citations for violations might increase as a result of the establishment of a larger restricted area and its proximity to royal red and rock shrimp fishing grounds. If violations increase as a result of **Action 1** the administrative burden would increase proportionately for the Office of General Counsel and the attorneys tasked with prosecuting such violations.

Under this action, any consultations for activities within the proposed sub-alternative CHAPCs would be subjected to a higher level of scrutiny under the EFH consultation process conducted by the Habitat Division. As a result, it is expected that a minimal administrative burden would be created for that division. Additionally, a wide array of outreach and education materials would need to be generated and disseminated to the public. This administrative burden would likely be borne by the Office of Sustainable Fisheries, and would take the form of fishery bulletins and web site content.

4.1.5 Conclusion

The Council has received input during preparation of this amendment that there may be gear impacts from the wreckfish and swordfish fisheries and for deep-dropping for snapper grouper species. The Council will evaluate these impacts in a future amendment.

Expand after December 2008 meeting and public hearings

4.2 Action 2. Create a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries

Alternative 1. No action. Do not create a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries.

Preferred Alternative 2. Create a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries where fishing with a shrimp trawl and/or shrimp possession is allowed by any vessel holding a rock shrimp limited access endorsement and equipped with an approved vessel monitoring system (VMS).

The SFAA (parts 1-4) is located as follows: The western boundary is the western boundary of the CHAPC. The northern boundary of the SFAA is at latitude 30° 12' N. The southern boundary is at latitude 26° 18' 56" N. From the northern boundary extending southward to latitude 27° 30' N, the eastern boundary is 1.0 nm due east of the western boundary of the CHAPC, except between latitudes 29° 20' 25" N. and 29° 8' N., and between latitudes 28° 30' 37" N. and 28° 14' N., where shrimping is not allowed within the CHAPC. From the southern boundary extending northward to latitude 27° 30' N, the eastern boundary is 1.5 nm due east of the western boundary of the CHAPC, except between latitudes 26° 57' 6" N. and 26° 49' 58" N., where shrimping is not allowed within the CHAPC **(Figure 4-19)**. See **Appendix G** for coordinates.

Alternative 3. Move the west boundary of the proposed CHAPC 6 nautical miles to the east between the following points: (a) 30 degrees 16 minutes 35.354 seconds N and (b) 26 degrees 12 minutes 56.273 seconds N.

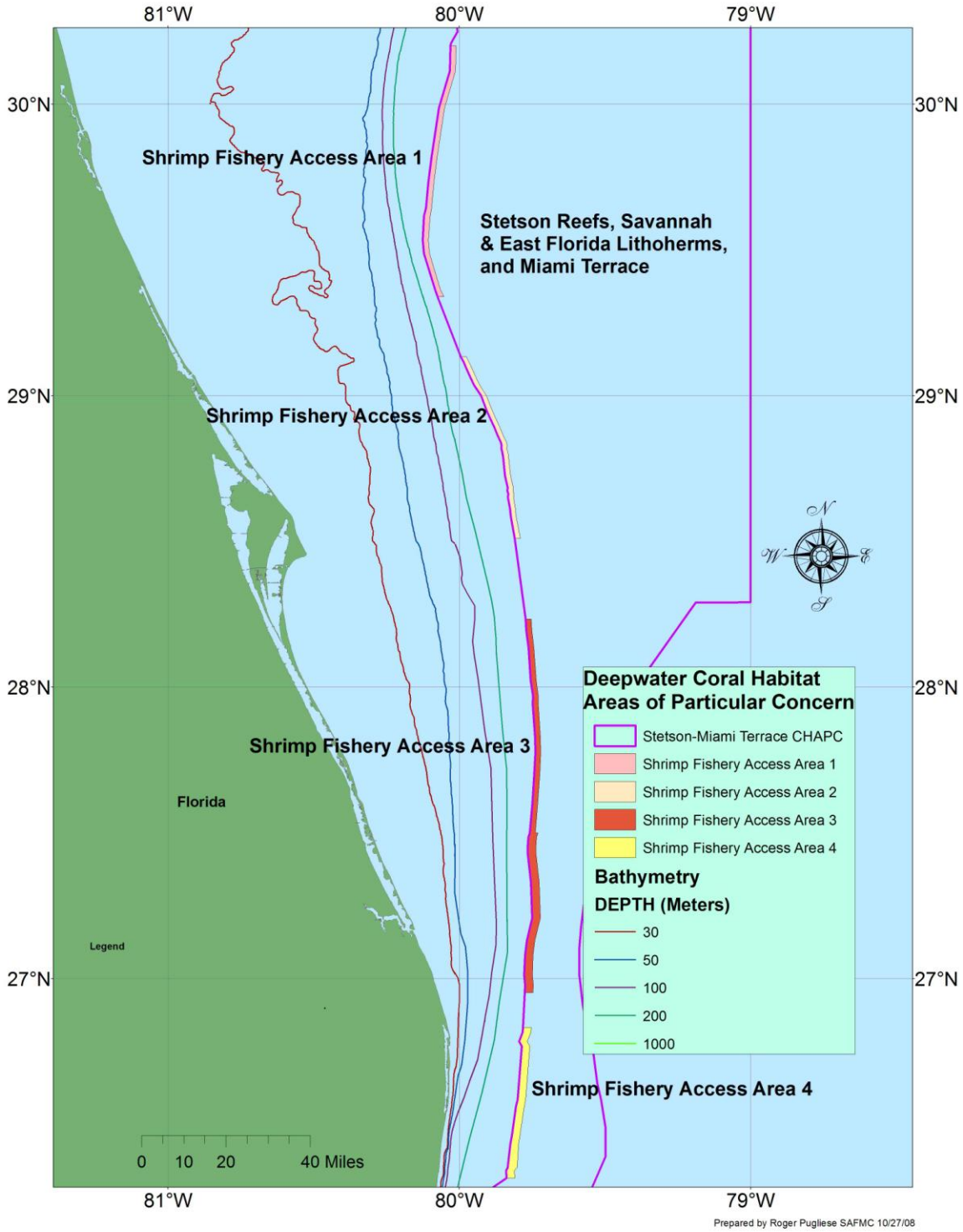


Figure 4-19. Shrimp Fishery Access Area (SFAA).
Source: Roger Pugliese, SAFMC.

4.2.1 Biological Effects

Alternative 1 (No action) would not create a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson-Miami Terrace CHAPC boundaries. The biological impacts of this alternative would be positive in that it would prohibit permitted rock shrimp fishermen from potentially targeting royal red shrimp found in deepwater habitats designated as CHAPCs. This would result in reduced fishing pressure on the royal red shrimp population in this CHPAC. Royal red shrimp are not included in the Fishery Management Unit of the Shrimp FMP and their overfished/overfishing status is unknown.

Preferred Alternative 2 would create a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace CHAPC boundaries, where fishing with a shrimp trawl and/or shrimp possession is allowed by any vessel holding a rock shrimp limited access endorsement and equipped with an approved vessel monitoring system (VMS). Creation of the four part area will have positive biological effects through limiting the fishery to traditional grounds and ensuring no expansion into know low relief and high relief deepwater habitat in the proposed Stetson-Miami Terrace CHAPC.

The royal red shrimp fishery operates almost exclusively inshore of the 400 meter (1,312 ft.) contour, which is the western boundary of the deepwater habitat distribution being protected by the proposed CHAPCs north of the Miami Terrace. Based on analyses of VMS data, less than 1% of all collected points between 2003 and 2007 identified as potential royal red fishing activity, occurred in the proposed deepwater CHAPC.

Alternative 3 would have the greatest negative biological impact on deepwater coral habitat because it proposes to change the boundary of the Stetson-Miami Terrace CHAPC to allow deepwater trawlers to fish in depths deeper than the traditional fishery has operated. The Habitat and Coral Advisory Panels and deepwater researchers have concluded that the best scientific information indicates the deepwater coral ecosystem, north of the Miami Terrace starts at a depth of 400 meters and in some cases extends to the eastern boundary of the US EEZ. **Alternative 3** would allow trawling and the use of all other damaging gear including bottom longlines, anchoring and grappling up to 6 miles seaward of the proposed Stetson-Miami Terrace CHAPC. This action would potentially have negative effects on the royal red shrimp populations as more areas would be accessible for fishing activities. There would be negative impacts on the coral and coral ecosystems in this area.

Effects on Protected Species

Preferred Alternative 2 will have no impact on ESA-listed *Acropora* species because they do not occur in waters proposed as a Shrimp Fishery Access Area. This alternative is likely to perpetuate the existing level of risk to ESA-listed sea turtles and smalltooth sawfish. Allowing the shrimp fishery to operate as it has traditionally will maintain the current level of risk for interactions between the fishery and these species.

4.2.2 Economic Effects

Alternative 1 (No action) would not create a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson-Miami Terrace CHAPC boundaries. This is expected to result in small

negative economic impacts to the shrimp fishery. As discussed above, analysis of VMS data indicated that less than 1% of all collected VMS points identified as potential royal red shrimp fishing occurred in the proposed Stetson-Miami Terrace CHAPCs between 2003 and 2007 (**Figures 4-13 - 4-15**). Duval County in Florida is estimated to suffer the greatest economic impacts under **Alternative 1 (No action)**. Is this confidential???

Preferred Alterative 2 creates a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC boundaries, where fishing with a shrimp trawl and/or shrimp possession is allowed by any vessel holding a rock shrimp limited access endorsement and equipped with an approved VMS. According to data analyses conducted on VMS data by NMFS SEFSC, less than 1% of VMS points collected between 2003 and 2007 and identified as engaged in royal red fishing occurred within the proposed deepwater Stetson-Miami Terrace CHAPC (**Figures 4-13 - 4-15**). Establishing a SFAA under **Preferred Alternative 2** would essentially eliminate any negative economic impacts on the fishery that might occur under **Alternative 1**. Therefore, the creation of the SFAA within the Stetson-Miami Terrace CHAPC is expected to have small positive economic benefits for the shrimp fishery relative **Alternative 1 (No action).**

The non-use value to the general public of the knowledge that corals are protected will not change with adoption of **Preferred Alternative 2** compared to **Alternative 1 (No action)**.

Alternative 3 moves the west boundary of the proposed Stetson-Miami Terrace CHAPC 6 nautical miles to the east. While this area is not a traditional fishing ground for the royal red shrimp fishery and trawling may not be taking place in this area, it would allow shrimp vessels to drift when needed without entering the proposed CHAPC. If this area is not harvested, there are no expected economic impacts to the shrimp fleet. There is the potential for this area to provide new fishing opportunities for the shrimp fleet which would have positive economic impacts. Impacts on corals and coral ecosystems would be negative if fishing occurred in this area and would result in negative economic impacts.

4.2.3 Social Effects

Establishing SFAA under **Preferred Alternative 2** would essentially eliminate any small negative economic impacts on the fishery that might occur under **Alternative 1 (No action)** thus resulting in small positive social benefits for the shrimp fishery compared to the **Alternative 1 (No action)**. **Alternative 3** would allow the shrimp fishery to potentially explore new fishing grounds which would be expected to have positive social impacts.

4.2.4 Administrative Effects

Alternative 1 (No action) would not create a "Shrimp Fishery Access Area" (SFAA) where shrimp trawl deployment would be allowed within the boundaries of the proposed Stetson-Miami Terrace CHAPC. This alternative would create no adverse impacts on the administrative environment, beyond those discussed under **Action 1, Alternative 2**. **Preferred Alternative 2** would allow for the deployment of shrimp trawl gear within the designated SFAA for any vessel holding a rock shrimp limited access endorsement and equipped with an approved and operating VMS. This alternative would increase the need for

the dissemination of detailed outreach materials such as fishery bulletins and web site content, which would clearly list all SFAA coordinates for fishery and law enforcement purposes. Because the boundaries of the CHAPC are already irregular along the western edge, enforcement of the restricted areas would be more difficult. The more irregular a boundary is the more difficult it is to prosecute cases where violations occur. Establishing the SFAAs could possibly compound this problem since there would not only be one irregular western boundary to enforce, but also an eastern boundary associated with each proposed SFAA. Coordinating how the VMS tracks for rock shrimp vessels would be monitored and processing potentially complex violation cases could cause a moderate adverse administrative impact for the Office of Law Enforcement as well as the Office of General Counsel. Additionally, fishery participants would be responsible for maintaining a vessel position inside the SFAA but outside the proposed boundary of the CHAPC. In order to do this, vessel operators would need to become very familiar with the SFAA boundary coordinates or enter those into their GPS units to closely track their position.

Alternative 3 would be less administratively burdensome than **Preferred Alternative 2**; however, it would also reduce the area of protection for subject coral species. Administrative impacts under **Alternative 3** would be the same as those under **Action 1 Alternative 2**, including coordination among the various divisions within the Southeast Region of NOAA Fisheries Service, and the preparation and distribution of various outreach materials for public consumption.

4.2.5 Conclusion

Preferred Alternative 2 was brought to the Council at their June 2008 meeting by shrimp industry and conservation organization representatives serving on the Council's Shrimp and Habitat Advisory Panels, respectively. The alternative represents a compromise that allows trawling to continue on the bottom, close to sensitive habitat, in a way that provides some flexibility to accommodate law enforcement and industry concerns. This alternative is based on the fact that if the area in question has been subjected to shrimp trawling in the past, then deepwater corals are not likely to be found in that area. And, if deepwater corals are present, rock and royal red shrimp fishermen want to avoid them anyways because of the high potential for gear damage at such great depths and current speeds. In addition, the alternative specifies that the "Shrimp Fishery Access Area" would only be accessible to vessels equipped with a VMS. Since the latter is required to fish for rock shrimp off Georgia and Florida, and fishermen who harvest rock shrimp also harvest royal red shrimp, then **Preferred Alternative 2** also addresses enforcement needs.

Expand after December 2008 meeting and public hearings

4.3 Action 3. Create "Allowable Golden Crab Fishing Areas" within the proposed Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC and Pourtales Terrace CHAPC boundaries

Alternative 1. No Action. Do not create "Allowable Golden Crab Fishing Areas" within the proposed deepwater CHAPC boundaries.

Preferred Alternative 2. Create "Allowable Golden Crab Fishing Areas" in one or more areas as described in sub-alternatives 2a-2c:

Sub-alternative 2a. Create an "Allowable Golden Crab Fishing Area" in the Northern Golden Crab Fishing Zone -- within the Stetson-Miami Terrace CHAPC boundaries;

Sub-alternative 2b. Create an "Allowable Golden Crab Fishing Area" in the Middle Golden Crab Fishing Zone -- within the Stetson-Miami Terrace CHAPC boundaries; and

Sub-alternative 2c. Create an "Allowable Golden Crab Fishing Area" in the Southern Golden Crab Fishing Zone -- within the Pourtales Terrace CHAPC boundaries.

Alternative 3. Move the western boundary of the proposed Northern and Middle Zone Allowable Golden Crab Fishing Areas west to include the proposed Shrimp Fishery Access Area.

The "Allowable Golden Crab Fishing Areas" are shown in **Figures 4-20a - 4-20d**. See **Appendix H** for coordinates.

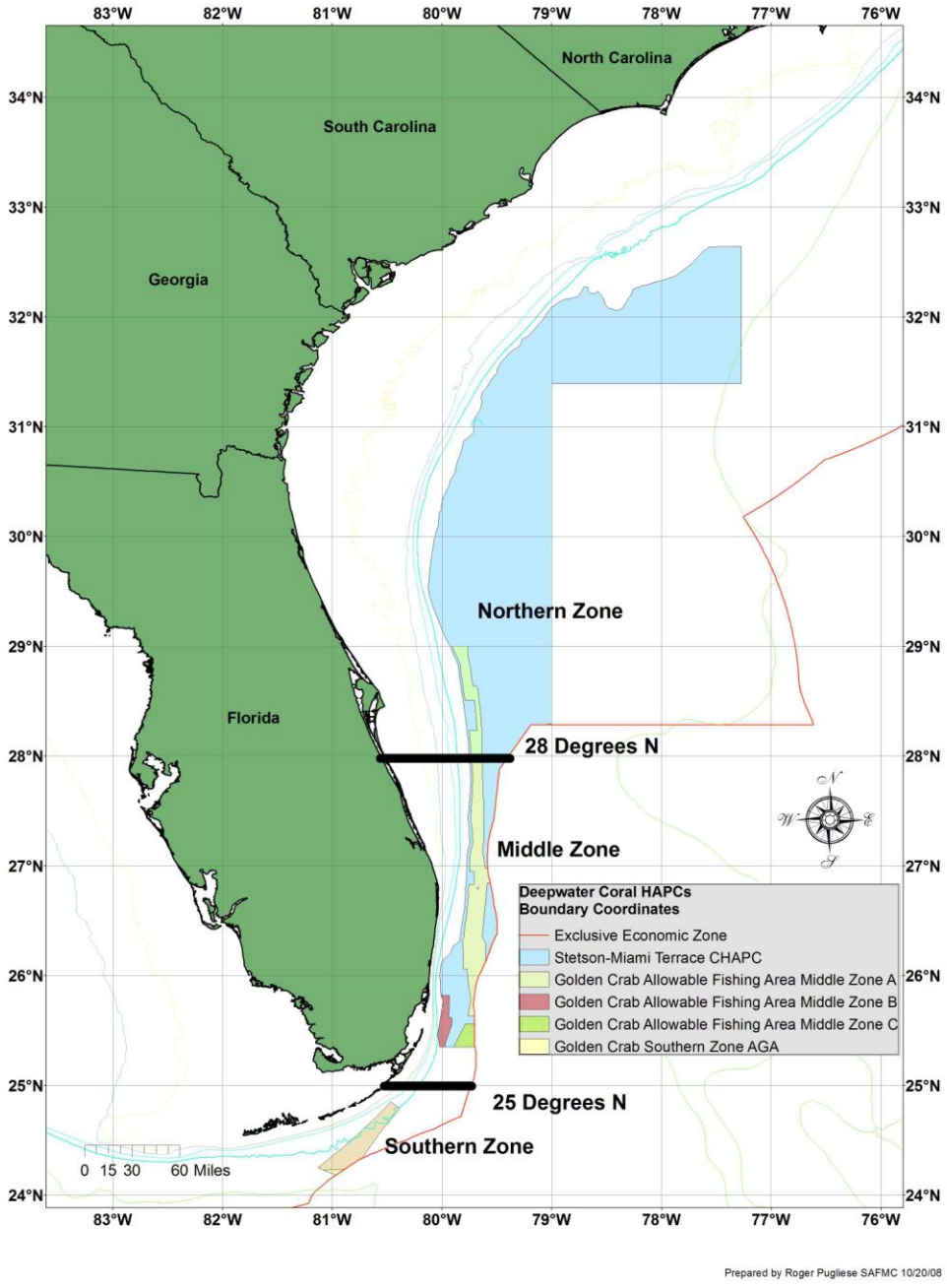


Figure 4-20a. Proposed Allowable Golden Crab Fishing Areas and Golden Crab Fishing Zones.
AGA = Allowable Golden Crab Fishing Area. Source: Roger Pugliese, SAFMC.

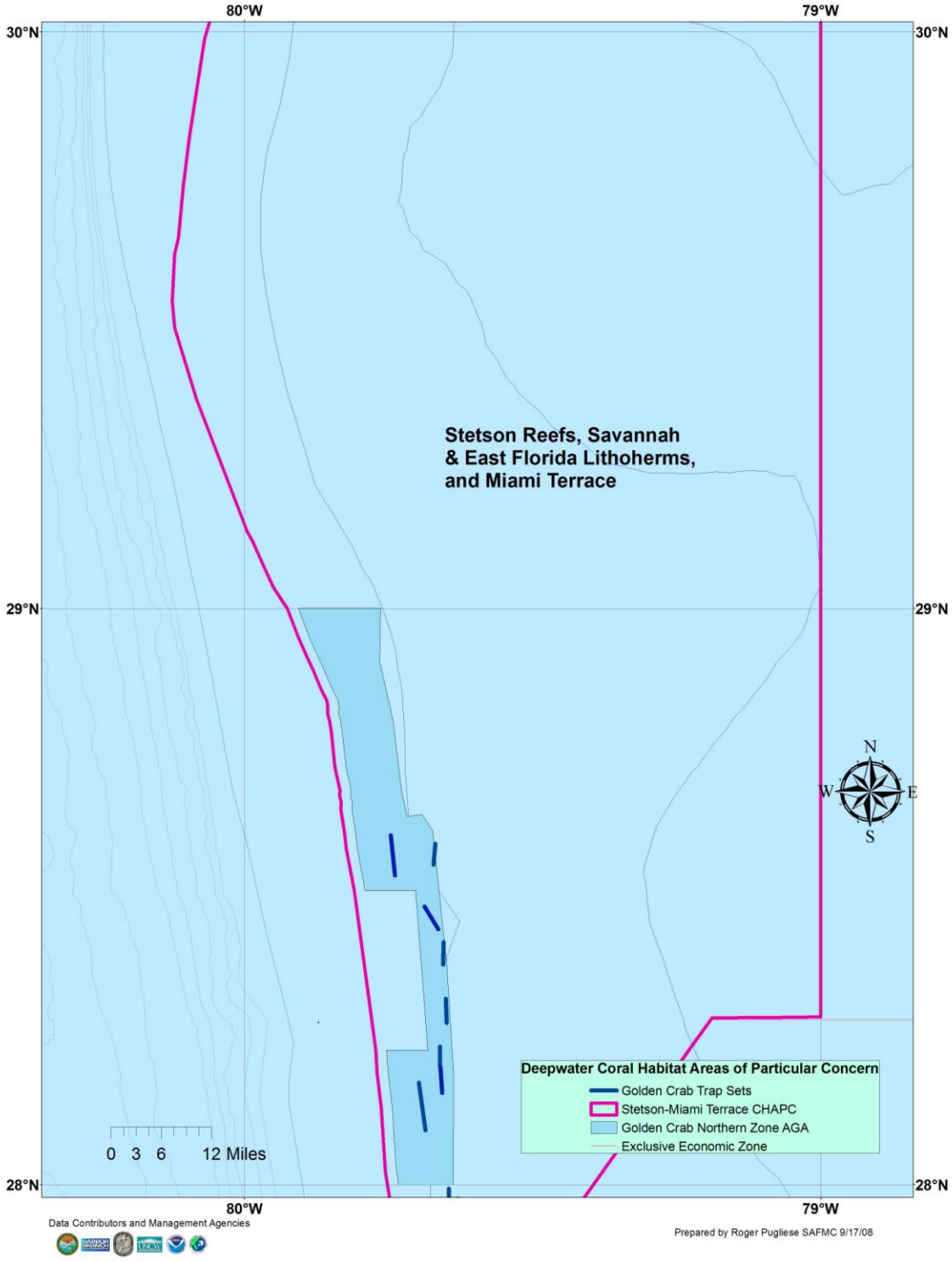


Figure 4-20b. Golden Crab Allowable Fishing Area for the Northern Zone.
Note: Developed in cooperation with Golden Crab Advisory Panel, see **Appendix H** for coordinates. Trap set data provided by golden crab fishermen. AGA = Allowable Golden Crab Fishing Area. Source: Roger Pugliese, SAFMC.

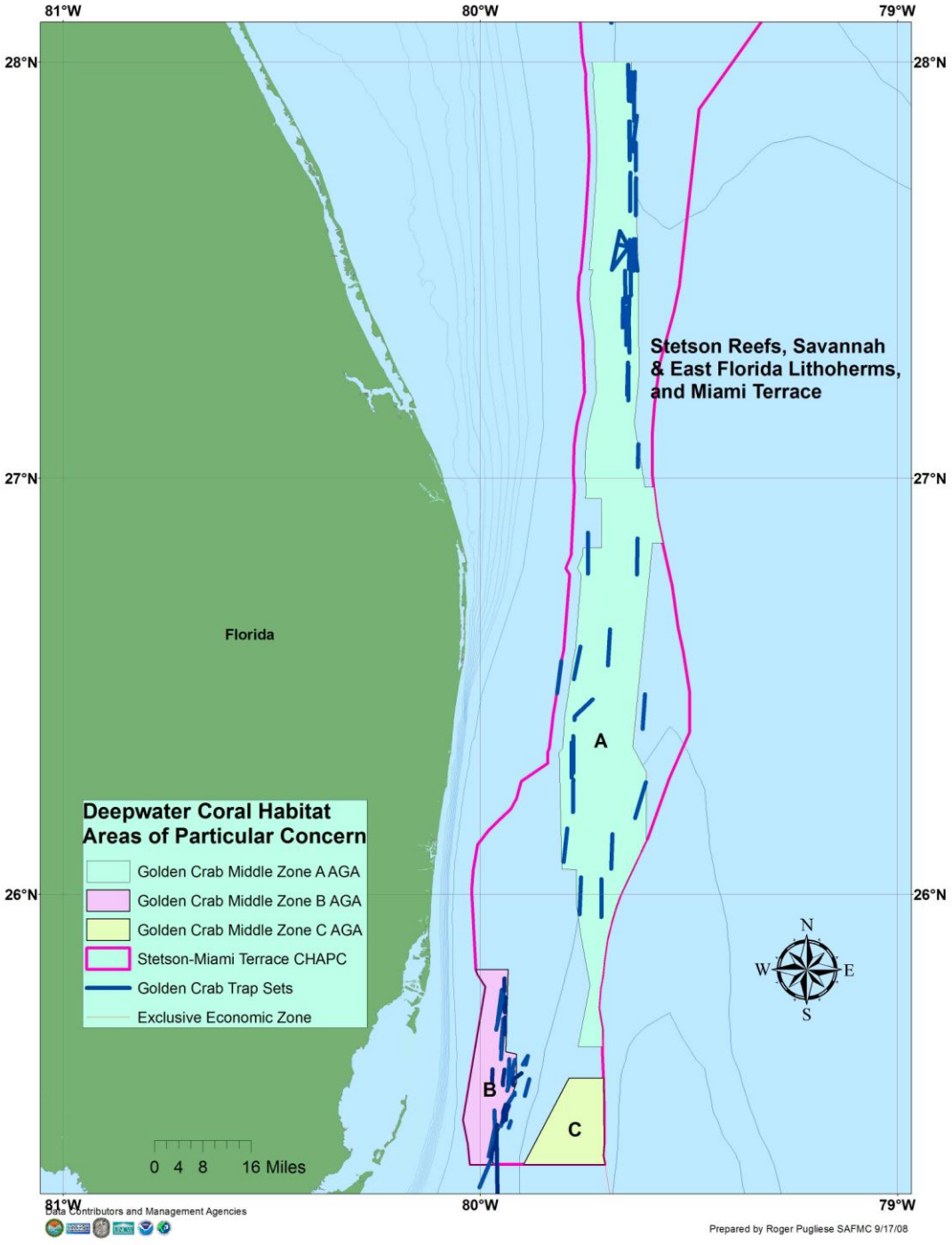


Figure 4-20c. Allowable Golden Crab Fishing Areas for the Middle Zone A-C
Note: Developed in cooperation with Golden Crab Advisory Panel, see **Appendix H** for coordinates. Trap set data provided by golden crab fishermen AGA = Allowable Golden Crab Fishing Area. Source: Roger Pugliese, SAFMC.

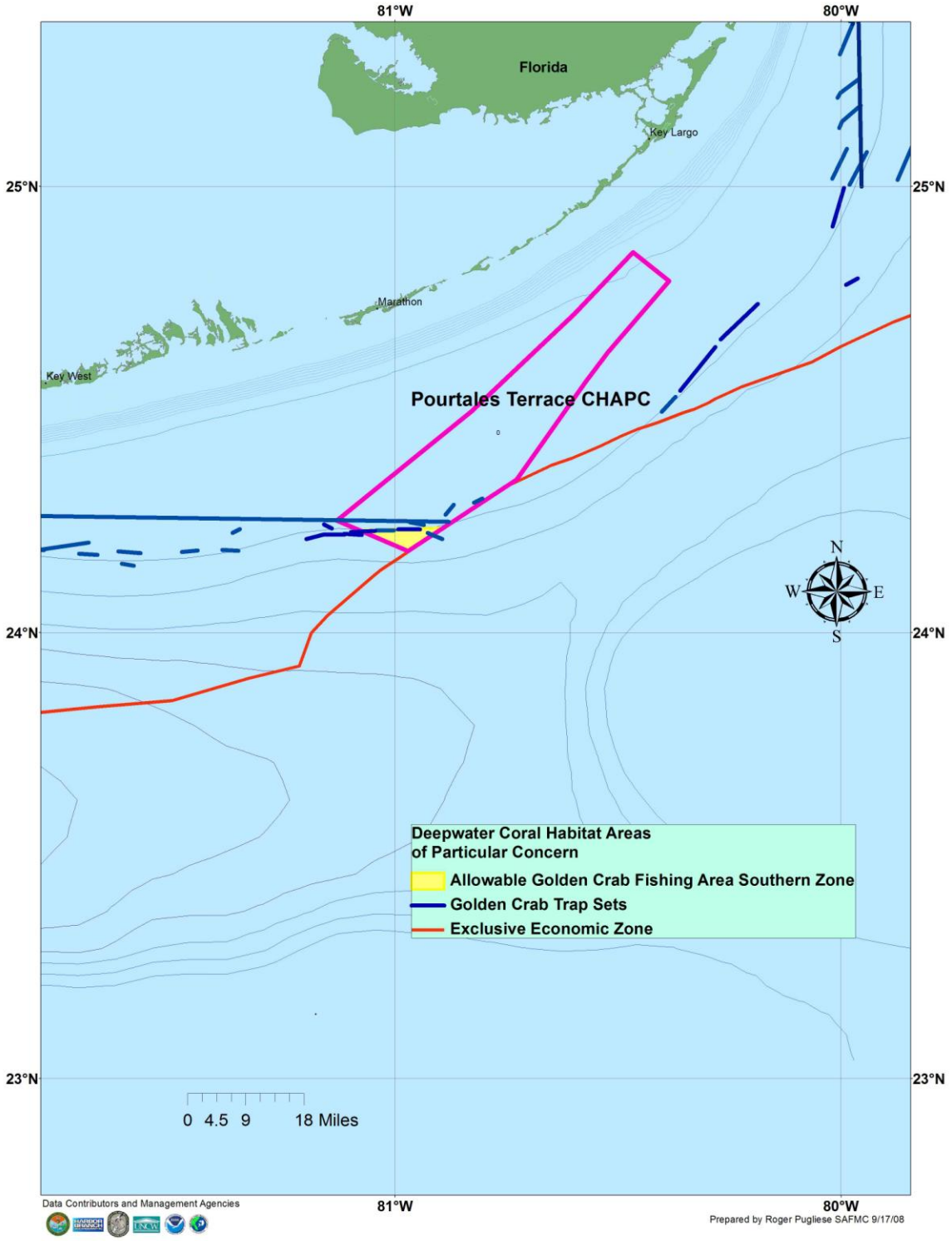


Figure 4-20d. Golden Crab Southern Zone Allowable Gear Area.
Note: Developed in cooperation with Golden Crab Advisory Panel, see **Appendix H** for coordinates. Trap set data provided by golden crab fishermen. AGA = Allowable Golden Crab Fishing Area. Source: Roger Pugliese, SAFMC.

4.3.1 Biological Effects

Alternative 1 (No action) does not create "Allowable Golden Crab Fishing Areas" within the proposed Stetson-Miami Terrace CHAPC and Pourtales Terrace CHAPC boundaries. All potential impacts on deepwater coral habitats from golden crab fishing gear would be eliminated under this alternative. This alternative would also offer positive biological impacts to the golden crab resource as the fishery for this resource would not be allowed to occur in historically significant fishing areas.

Golden crab fishermen have indicated that they do attempt to set their gear in close proximity to the deepwater coral habitats. While the fishermen are careful not to intentionally impact the bottom with their gear, there could be instances when gear lands on top of deepwater coral thickets. Therefore, **Alternative 1 (No action)** would have the greatest positive biological benefit to the deepwater coral habitat as it would eliminate any accidental damage to the coral as a result of golden crab fishing operations.

Preferred Alternative 2 proposes to establish "Allowable Golden Crab Fishing Areas" in the three golden crab fishing zones (Northern Zone – north of 28 degrees N. latitude; Middle Zone between 28 degrees N. latitude and 25 degrees N. latitude; and Southern Zone- south of 25 degrees N. latitude) (**Figure 4-20a**).

Sub-alternative 2a would establish an "Allowable Golden Crab Fishing Area" in the Northern Golden Crab Fishing Zone within the Stetson-Miami Terrace CHAPC boundaries (**Figure 4-20b**). This alternative was developed to avoid potential gear impacts to existing and potential deepwater habitat north of 28 degrees N. Latitude. This sub-alternative will restrict the fishery to traditional golden crab fishing grounds and would have minimal impact on deepwater coral as golden crab fishermen do not intentionally set their gear on or intentionally impact the deepwater coral. Golden crab fishermen have indicated that they do attempt to set their gear in close proximity to the deepwater coral habitats. While the fishermen are careful not to intentionally impact the bottom, there could be instances when gear lands on top of deepwater coral thickets which may lead to damage to deepwater corals during retrieval of the gear. Creation of an "Allowable Golden Crab Fishing Area" in the Northern Zone is expected to have negative impacts on the golden crab resource as harvest will continue to occur. However, the golden crab fishery is small, heavily regulated, and harvest is relatively low. There is currently one fisherman active in the Northern Zone fishery. The golden crab fishery's overfished/overfishing status is unknown.

Sub-alternative 2b creates an "Allowable Golden Crab Fishing Area" in the Middle Golden Crab Fishing Zone within the proposed Stetson-Miami Terrace CHAPC boundaries (**Figure 4-20c**). This sub-alternative includes three sub-areas A, B, and C, developed to restrict the fishery to traditional grounds and not impact deepwater habitat. This sub-alternative will restrict the fishery to traditional golden crab fishing grounds and would have minimal impact on deepwater coral as golden crab fishermen do not intentionally set their gear on or intentionally impact the deepwater coral. Golden crab fishermen have indicated that they do attempt to set their gear in close proximity to the deepwater coral habitats. While the

fishermen are careful not to intentionally impact the bottom, there could be instances when gear lands on top of deepwater coral thickets which can lead to damage to deepwater corals during retrieval of the gear. Creation of an Allowable Golden Crab Fishing Area in the Middle Zone is expected to have negative impacts on the golden crab resource as harvest will continue to occur. However, the golden crab fishery is small, heavily regulated, and harvest is relatively low. There are currently three fishermen active in the Middle Zone golden crab fishery. The golden crab fishery's overfished/overfishing status is unknown.

Sub-alternative 2c creates an "Allowable Golden Crab Fishing Area" in the Southern Golden Crab Fishing Zone within the proposed Pourtales Terrace CHAPC boundaries (**Figure 4-20d**). This sub-alternative will restrict the fishery to traditional golden crab fishing grounds and would have minimal impact on deepwater coral as golden crab fishermen do not intentionally set their gear on or intentionally impact the deepwater coral. Golden crab fishermen have indicated that they do attempt to set their gear in close proximity to the deepwater coral habitats. While the fishermen are careful not to intentionally impact the bottom, there are instances when gear may land on top of deepwater coral thickets which can lead to damage to deepwater corals during retrieval of the gear. Creation of an Allowable Golden Crab Fishing Area in the Southern Zone is expected to have negative impacts on the golden crab resource as harvest will not be restricted. However, the golden crab fishery is small and harvest is relatively low. There are currently no fishermen active in the Southern Zone golden crab fishery. The golden crab fishery's overfished/overfishing status is unknown.

Proposed **sub-alternatives a-c** in combination with available deepwater habitat data including both direct observation and interpreted data are shown in **Figures H-1, H-2** and **H-3** in **Appendix H**.

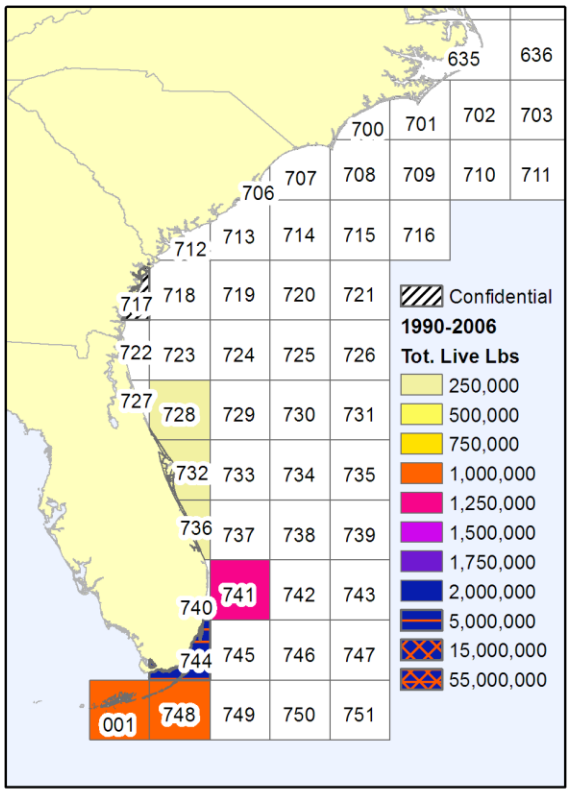
Effects on Protected Species

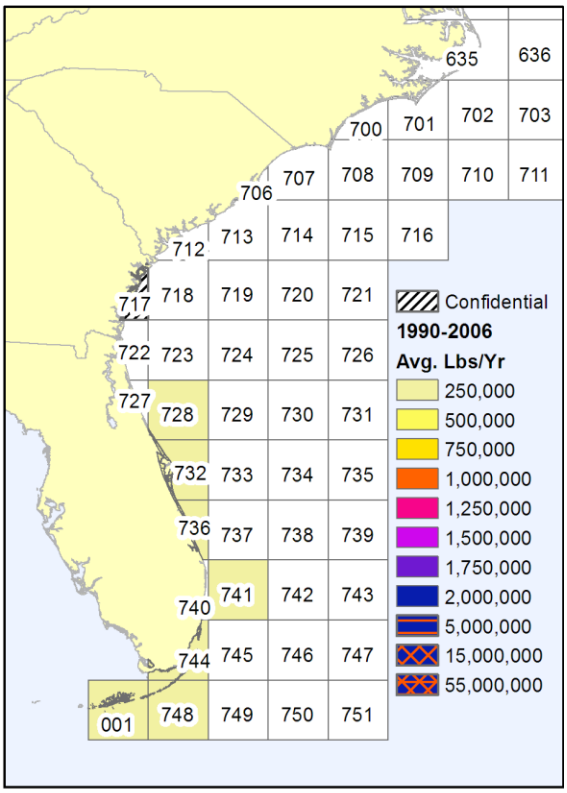
Preferred sub-alternatives 2a-2c will have no impact on ESA-listed *Acropora* species because they do not occur in waters proposed as "Allowable Golden Crab Fishing Areas". These alternatives are likely to perpetuate the existing level of risk to ESA-listed sea turtles and smalltooth sawfish. Allowing the golden crab fishery to operate as it has traditionally will maintain the current level of risk for interactions between the fishery and these species.

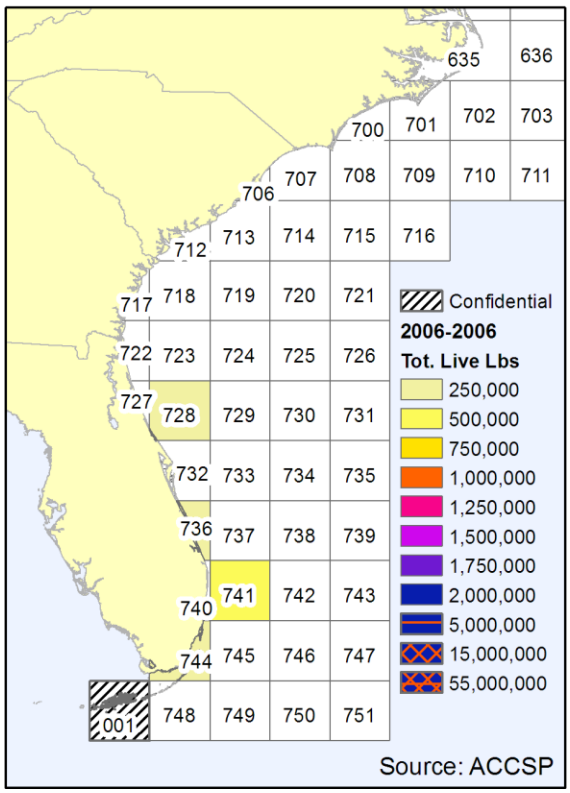
4.3.2 Economic Effects

Alternative 1 (No action) does not create "Allowable Golden Crab Fishing Areas" within the proposed Stetson-Miami Terrace CHAPC and Pourtales Terrace CHAPC boundaries. Input provided by the Golden Crab Advisory Panel and other affected fishermen indicated that the proposed CHAPCs would eliminate the golden crab fishery because the majority of their fishing grounds are included in these areas (see **Figures 4-20b, 4-20c, and 4-20d**). Therefore, **Alternative 1 (No action)** would significantly negatively impact the golden crab fishery and the fishing communities that depend on income generated by golden crab landings compared to **Alternatives 2 and 3**, assuming the establishment of the Stetson-Miami Terrace CHAPC (**sub-alternative 2c**) in **Action 1**.

Sub-alternatives 2a, 2b, and 2c under this action would create "Allowable Golden Crab Fishing Areas" in the Northern, Middle, and Southern Zones, respectively, within the proposed Stetson-Miami Terrace and Pourtales Terrace CHAPC boundaries. The **Preferred Alternative 2 sub-alternatives** would thus mitigate against impacts caused by **Action 1 sub-alternative 2c** and **2d** by providing for the continued operation of the golden crab fishery in areas where deepwater coral habitat will not be impacted. Establishment of allowable gear areas under the existing industry proposals for each of the Middle Zone, the Northern Zone, and the Southern Zone are based on trap-set data provided by industry (see **Figures 4-20b, 4-20c, and 4-20d**). To assess the beneficial impact that this action will have on the golden crab fishery compared to **Alternative 1 (No action)**, catch by ACCSP statistical grid was examined (**Figure 4-21**). However, the grid areas were too large to be used for quantitative analysis and are included here for informational purposes only. In the absence of quantitative data of this kind, an assessment of the impacts of "Allowable Golden Crab Fishing Areas" relies on a visual comparison between traditional fishing grounds (see **Figures 4-20b, 4-20c, and 4-20d**) and the areas identified in the sub-alternatives. A visual comparison shows that the areas identified in the sub-alternatives encompass the overwhelming majority of trawl lines. Therefore, the sub-alternatives under **Preferred Alternative 2** are expected to provide positive economic impacts to the golden crab fishery compared to **Alternative 1 (No action)**, under which, if the CHAPC boundaries are established under **Alternative 2 in Action 1**, the golden crab vessels would not be able to fish.







ACCSP Catch: CRAB, GOLDEN DEEPSEA
1990-2006
Pounds in Thousands

Area	Tot. 90-06	Avg. 90-06	Tot. 2006
001	957.21	56.31	Conf.
717	Conf.	Conf.	0.00
728	36.81	2.17	5.15
732	74.75	4.40	0.00
736	21.08	1.24	21.08
741	1,178.92	69.35	259.31
744	3,164.60	186.15	212.75
748	945.07	55.59	0.00

Figure 4-21. Golden crab catches by ACCSP statistical grid.
Source: Atlantic Coastal Cooperative Statistical Survey.

The logbook data indicate that the golden crab fishery caught 510,000 pounds on average over the period 2005-2007. Without "Allowable Golden Crab Fishing Areas" (**sub-alternatives 2a, 2b**, and **2c**) the fishery would likely lose almost all of these landings estimated at approximately $714,000 ex-vessel value annually. This estimate assumes that fishermen receive $1.40 per pound on average for golden crab landings (Personal communication, Howard Rau, 2008). ALS data indicate that 2005-07 average landings were 433,236 pounds valued at $673,516 ex-vessel.

Golden crab landings from each of the three golden crab fishing zones are shown in **Table 3-7 (Section 3.0)**. The majority of landings come from the Middle Zone historically. Approximately 90-100% of golden crab harvest has come from the Middle Zone in the past three years with an average of 94.6%. A smaller portion of landings came from the Northern Zone. And, a portion of landings came from the Southern Zone in 2006 while no golden crab was harvested from that zone in 2005 or 2007. Using the estimates of historical catch shown in **Table 3-7**, implementation of **sub-alternative 2a** (Northern Zone) in the absence of the other two sub-alternatives, would provide relatively small positive benefits to the golden crab fishery. A quantitative estimate cannot be made for the Northern Zone due to confidentiality concerns. That is, there are three or less vessels harvesting in the Northern Zone and while their associated landings could theoretically be used to calculate a quantitative assessment of lost annual ex-vessel revenue in future years, due to confidentiality concerns, these estimates cannot be made. Confidentiality requirements restrict sharing of data that would reveal landings or ex-vessel revenue data for individual vessels. Typically, landings associated with three vessels or less cannot be revealed. Implementation of **sub-alternative 2b** (Middle Zone) in the absence of the other two sub-alternatives, would provide positive benefits to the golden crab fishery in comparison to **Alternative 1 (No action)** in the amount of 483,460 pounds or $675,444 on average. Implementation of **sub-alternative 2c** (Southern Zone) in the absence of the other two sub-alternatives, would provide positive benefits to the golden crab fishery in comparison to **Alternative 1 (No action)**. However, economic impacts cannot be estimated for this zone due to confidentiality concerns.

The non-use value to the general public of the knowledge that corals are protected will not change with adoption of **Preferred Alternative 2** and sub-alternatives compared to **Alternative 1 (No action).**

Alternative 3 proposes to move the western boundary of the proposed Northern and Middle Zone Allowable Golden Crab Fishing Areas west to include the proposed Shrimp Fishery Access Area. Assuming CHAPCs are implemented as proposed under **Action 1**, a potential benefit of implementing **Alternative 3** compared to **Preferred Alternative 2** is that it provides the golden crab vessels with additional areas to explore in the future. While the additional areas encompassed in **Alternative 3** are not part of the golden crab traditional fishing grounds, they are adjacent to those traditional fishing areas and may provide yields in the future that the golden crab vessels would want to harvest. If these areas are exploited successfully, the landings and effort levels for the golden crab fishery are likely to increase.

The golden crab fishery participants primarily supply golden crab to seafood processors and other businesses in southern Florida. While some of the golden crab supply is sold in

restaurants within Florida, a portion is sold to seafood processers that in turn ship the crab nationally. The geographic areas most likely to feel the greatest economic impact from a decline in golden crab harvest are Broward and Monroe counties in Florida. While golden crab sales contribute a very small portion of economic activity to each county, the sales are important to a small number of businesses that use golden crab as a substitute for blue crab (Public scoping comments, June 2008). Golden crabs have also been delivered to three other southern Florida counties within the past three years.

Assuming CHAPCs are implemented as proposed under **Action 1**, the non-use value to the general public of allowing golden crab fishing in certain areas will not change with adoption of **Preferred Alternative 2** compared to **Alternative 1** under **Action 1**. That is, protecting this special habitat through **Alternative 2 in Action 1** and **Preferred Alternative 2 or Alternative 3** in **Action 3** is expected to result in overall positive net economic benefits to society. Specifically, society is expected to benefit from the possible availability of new information resulting from avoiding the loss of coral species that could be used to benefit society, an increase in bequest value, and an increase in existence value. The full suite of benefits that the proposed CHAPCs would bring about is unknown but could include medicinal and environmental benefits.

4.3.3 Social Effects

Establishing "Allowable Golden Crab Fishing Areas" under **Preferred Alternative 2** and **Alternative 3** are both expected to have positive social impacts on the golden crab fishery compared to **Alternative 1 (No action)**, under which, if the CHAPC areas were approved, the golden crab vessels would not be able to fish. Establishment of **sub-alternative 2b** would have the greatest positive social impacts because this is the area yielding the greatest golden crab harvest. Under **Alternative 1 (No action)**, five to seven vessels would likely have to be sold or be refitted for participation in another fishery. Under this alternative it is possible that the golden crab fishery will cease to exist. The social impacts on the families involved in the golden crab fishery will be significant since it may not be possible for golden crab vessels to be converted from crab fishing to fishing for other species. While it may be physically possible to make the vessel changes, it is not seen as a profitable endeavor given the lack of fisheries with trip limits and commercial quota sufficient to support an additional vessel. A golden crab fisherman would have to obtain additional permits to participate in other fisheries as well which typically requires a substantial investment of funds. As a result of the demise of the golden crab fishery and the inability of golden crab vessels to transfer to another fishery, the financial stress and other problems that result from financial stress and unemployment on a family would ensue. These could include an increase in transfer payments and stress, depression, and other mental health problems.

Positive social benefits would accrue from the expected positive economic benefits under **Preferred Alternative 2 and Alternative 3** compared to **Alternative 1 (No action)**.

4.3.4 Administrative Effects

Alternative 1 (No action) would effectively terminate the golden crab fishery as it currently exists, unless alternate fishing grounds are found. If this were to occur, **Alternative 1 (No action)** would have a positive administrative impact since there would be no need to develop

a monitoring mechanism, or maintain a permit and landings database for the fishery. **Preferred Alternative 2** would have minor to moderate effects on the administrative environment, especially that of the Office of Law Enforcement because they would be responsible for overseeing fishery compliance within the allowable fishing areas. See administrative impacts under **Action 4, Alternative 2** for a full explanation of enforcement issues related to this action. If **Preferred Alternative 2** were implemented through rulemaking, public outreach materials would need to be developed and they should include the coordinates of each of the three proposed golden crab fishing areas.

Alternative 3 would effectively enlarge the proposed northern and middle zone allowable golden crab fishing areas to include the proposed shrimp fishery access area. Administratively, this alternative is not likely to produce any adverse administrative impacts outside of those already discussed under **Action 2, Preferred Alternative 2** and **Preferred Alternative 2** under this action. However, outreach and education materials would need to be drafted in such a way as to make the locations of the designated boundaries of the shrimp fishery access area very clear, since they would be within the allowable golden crab fishing area. Additionally, golden crab fishery participants would be responsible for identifying the location of their gear in relation to any shrimp trawl gear that may be co-occurring within the shrimp fishery access area in order to prevent any gear overlap and entanglement.

4.3.5 Conclusion

At the June 2008 meeting in Orlando, FL, the Council received proposals from golden crab fishermen serving on the Golden Crab AP for "Allowable Golden Crab Fishing Areas" in the Southern, Middle, and Northern Zones, based on the traditional fishery operations and an additional area for the Northern Zone, to provide for allowable areas for permit holders that are not presently fishing. In addition, inout on deepwater coral distribution was obtained from experts serving on the Council's Coral AP. Hence, the sub-alternatives under **Preferred Alternative 2** capture the traditional golden crab fishing gounds almost entirely while considering areas of known and potential deepwater coral distribution based on the most recent scientific information.

Expand after December 2008 meeting and public hearings

4.4 Action 4. Amend the Golden Crab FMP to require vessel monitoring

Alternative 1 (No action). Do not require use of an approved vessel monitoring system (VMS) by any vessel with a limited access golden crab permit.

Alternative 2. Require use of an approved vessel monitoring system (VMS) by any vessel with a limited access golden crab permit and approved crustacean traps fishing for golden crab within designated areas in the Stetson-Miami Terrace CHAPC and Pourtales Terrace CHAPC.

Alternative 3. Require use of an approved vessel monitoring system (VMS) by any vessel fishing with a limited access golden crab permit in the South Atlantic Council's area of jurisdiction.

4.4.1 Biological Effects

Alternative 1 (No action) would not require VMS on golden crab vessels fishing within the CHPACs. Without requiring VMS, vessels could fish in the CHAPCs without monitoring. However, this is unlikely given that golden crab fishermen strive to place gear in areas that will not cause gear damage and that are known habitat for golden crab (i.e., muddy flat bottom). It has been determined by the Office of Law Enforcement (OLE) that VMS will not be a useful enforcement tool for the golden crab fishery as it cannot provide information on where the gear is on the seabed. Habitat damage could occur outside the proposed Allowable Golden Crab Fishing Areas and on extensive habitat in the CHAPCs proposed for conservation. However, the use of VMS will not prevent this damage from occurring nor will it provide evidence of such offenses. Because the use of VMS as a monitoring method is not a viable option for the fishery, other monitoring systems should be researched to ensure the protection of corals in very close proximity to golden crab fishing gear. A list of possible methods of monitoring to explore are included in **Appendix I.**

Alternative 2 would require use of an approved vessel monitoring system (VMS) by any vessel with a limited access golden crab permit and approved crustacean traps fishing for golden crab within "Allowable Golden Crab Fihsing Areas" within the CHAPCs. The majority of the golden crab fishing effort occurs in the Northern and Middle Zone. Monitoring of these vessels with VMS would allow law enforcement to determine where the vessels are in relation to the CHAPCs but would not be able to determine where the fishing gear is in relation to the CHAPCs. The use of VMS will not have a direct impact (either positive or negative) on the deepwater coral resource as it will not prevent fishermen from deploying gear on the deepwater coral. The use of VMS will not prevent deepwater coral habitat damage from occurring nor will it provide evidence of such offenses. Because the use of VMS as a monitoring method is not a viable option for the fishery, other monitoring systems would need to be researched in order to allow the fishery to continue while ensuring the protection of corals in very close proximity to golden crab fishing gear. A list of possible methods of monitoring to explore are included in **Appendix I**.

Alternative 3 would require the use of an approved VMS by any vessel fishing with a limited access golden crab permit in the South Atlantic Council's area of jurisdiction. With all vessels monitored, law enforcement would be able to determine where the vessels are in relation to the CHAPCs but would not be able to determine where the fishing gear is in relation to the CHAPCs. The use of VMS would not have a direct impact (either positive or negative) on the deepwater coral resource as it would not prevent fishermen from deploying gear on the deepwater coral. The use of VMS would not prevent this deepwater coral habitat damage from occurring nor would it provide evidence of such offenses. Because the use of VMS as a monitoring method is not a viable option for the fishery, other monitoring systems would need to be researched in order to allow the fishery to continue while ensuring the protection of corals in very close proximity to golden crab fishing gear. A list of possible methods of monitoring to explore are included in **Appendix I.**

Effects on Protected Species

Alternatives 2 and **3** will have no impact on ESA-listed *Acropora* species because they do not occur in areas where VMS would be required. These alternatives will likely perpetuate the existing level of risk for interactions between the fishery and ESA-listed sea turtles and smalltooth sawfish. Since VMS is a monitoring tool, the requirement for its use is unlikely to alter fishing behavior in a way that would measurably reduce interactions between the fishery and sea turtles and smalltooth sawfish.

4.4.2 Economic Effects

Alternative 1 (No action) would not require use of an approved vessel monitoring system (VMS) by any vessel with a limited access golden crab permit. Assuming that CHAPCs under **Action 1** and "Allowable Golden Crab Fishing Areas" under **Action 3** are approved, **Alternative 1 (No action)** would have no expected economic impact to golden crab fishermen. Fishermen would be able to continue fishing in the "Allowable Golden Crab Fishing Areas" without change to their current fishing practices. However, this alternative may not effectively deter fishing outside the "Allowable Golden Crab Fishing Areas" which might result in damage to corals and habitat that could in turn bring about negative long-term economic impact to fishermen and the general public. The negative, long-term economic impact would result from destruction of species that provide known and yet unknown value to the health of the ecosystem and various sectors of the economy including the medical sector. Negative, long-term economic impacts could also result from a decrease in existence value, bequest value, and the value from diversity of corals or other habitat if damaged. However, the probability that fishing will occur outside the "Allowable Golden Crab Fishing Areas" are low given that the "Allowable Golden Crab Fishing Areas" encompass almost all traditional fishing grounds and fishermen avoid setting their fishing gear in coral to prevent gear damage and lost fishing time.

Alternative 2 would require use of an approved vessel monitoring system (VMS) by any vessel with a limited access golden crab permit and approved crustacean traps fishing for golden crab within designated areas in the Stetson-Miami Terrace CHAPC and Pourtales Terrace CHAPC where fishing has occurred historically and does not impact deepwater coral habitats. Assuming that CHAPCs under **Action 1** and "Allowable Golden Crab Fishing Areas" under **Action 3** are approved, **Alternative 2** would result in increased costs to golden

crab fishermen that fish in these areas unless government funding was used to subsidize the costs of VMS unit purchase. Some fishermen may consider the requirement of a VMS to be an intrusion on their privacy and their autonomy as an independent fisherman.

If government funds were made available to cover the costs of VMS units, there would still be ongoing costs associated with maintenance and operation of the VMS units. The proposed Stetson-Miami Terrace CHAPC and the Pourtales Terrace CHAPC encompass almost all of the traditional fishing grounds of the golden crab fishery. There are eleven currently active permits in the golden crab fishery. Of these, seven permits have landed at least 1,000 pounds golden crab sometime between 2005 and 2007. Therefore, if those permits remained active and continued to fish, seven permits would require installation of VMS units under **Alternative 2.**

The VMS unit costs differ depending on the model purchased. The NMFS-approved VMS unit costs are shown in **Table 4-6**.

Table 4-6. NMFS-approved VMS units and costs.

Brand and Model	Cost
Boatracs FMCT-G	$3095
Thrane and Thrane TT-3026D	$3595
Faria Watchdog KTW304	$3295
Skymate 250	$

Source: Data provided by NMFS Office of Law Enforcement, July 2008.

The current reimbursement amount from NMFS for the HMS and rock shrimp fisheries for purchase of a VMS unit is $3,100.

The VMS regulations changed in 2008 and now only authorize the purchase of Enhanced Mobile Transmitting Units (EMTU). These are VMS units that have a computer screen which enables the fishermen to submit any forms. Previously, HMS and rock shrimp vessel owners were able to purchase "pingers" only which were half the cost of these newer units. All fisheries are now required to comply with the new EMTU requirements and those estimated costs are provided in **Table 4-6**.

If all seven vessels were outfitted with VMS units, the total cost of unit purchase to the fishery would range from $21,665 to $25,165. If reimbursements were issued, the aggregate cost of unit purchase to the fishery would range from $0 to $3,465. Individually, this results in $0 to $495 per vessel. The cost to management would be $21,700. However, this does not include the cost of installation or maintenance. While installation costs are approximately $300 per unit, maintenance costs cannot be estimated with existing information. Communication costs for each of the models which average from $30 to $80 per month are provided in **Table 4-7**.

Table 4-7. NMFS-approved VMS communications costs.

1. Qualcomm (for Boatracs units)
$30/mo satellite fee, $.30/message, $.006 per character for messaging (average price $80/month which includes 24/7 operations center support)
2. Telenor (for Thrane units)
$.06 per position report or $1.44 per day for 1 hour reporting. If in the "In Harbor" mode, then $.36 per day. Messaging costs $.24 per e-mail. ($30/mo average)
3. Xantic (for Thrane units)
$.06 per position report or $1.44 per day for 1 hour reporting. If in the "In Harbor" mode, then $.36 per day. Messaging costs $.22 per message and $.22 per e-mail. ($35/mo average)
4. Iridium/Cingular Wireless (for Faria units)
$44.95 per month which includes 4,000 Iridium bytes and 35,000 GSM bytes for email and e-forms reporting.
5. Orbcomm (for Skymate units) - (still awaiting updated costs for new unit)

Source: Data provided by NMFS Office of Law Enforcement, July 2008.

The annual aggregate costs of implementing VMS under **Alternatives 2 and 3** assuming management does not help subsidize the cost of the VMS units is summarized in **Table 4-8** and the annual aggregate costs of implementing VMS under **Alternatives 2 and 3** assuming management helps subsidize the cost of the VMS units is summarized in **Table 4-9**.

Table 4-8. Summary of annual costs of implementing Alternatives 2 and 3 assuming VMS unit cost is not subsidized[1].

Alternatives	Number of People Potentially Impacted	Unit Cost	Implementation of Unit	Unit Maintenance	Communication Costs	Total Cost[2]
Alternative 2	**7**					
First year		$21,665-$25,165	$2,100	Unknown	$2,520-$6,720	$26,285-$33,985
Subsequent year		NA	NA	Unknown	$2,520-$6,720	$2,520-$6,720
Alternative 3	**11**					
First year		$34,045-$39,545	$3,300	Unknown	$3,960-$10,560	$41,305-$53,405
Subsequent year		NA	NA	Unknown	$3,960-$10,560	$3,960-$10,560

Note 1: This table assumes that the VMS unit cost is not subsidized by management.
Note 2: The Total Cost column uses the lower Unit Cost and lower Communication Cost estimates to calculate the value at the lower end of the range. Likewise, the Total Cost column uses the higher Unit Cost and higher Communication Cost estimates to calculate the value at the lower end of the range.
Note 3: These costs do not include the incremental administrative costs associated with data collection, employees, function, and maintenance of the VMS system for the golden crab fishery.

Table 4-9. Summary of annual costs of implementing Alternatives 2 and 3 assuming VMS unit cost is subsidized[1].

Alternatives	Number of People Potentially Impacted	Unit Cost (fishermen/ management)	Implementation of Unit (fishermen)	Unit Maintenance (fishermen)	Communication Costs (fishermen)	Total Cost (fishermen/ management)[2]
Alternative 2	**7**					
First year		($0-$3,465)/ ($21,700)	$2,100	Unknown	$2,520-$6,720	($4,620-$12,285)/ ($21,700)
Subsequent year		NA	NA	Unknown	$2,520-$6,720	($2,520-$6,720)/$0)[3]
Alternative 3	**11**					
First year		($0-$5,445) ($34,100)	$3,300	Unknown	$3,960-$10,560	($7,260-$13,860)/ ($34,100)
Subsequent year		NA	NA	Unknown	$3,960-$10,560	($3,960-$10,560)/($0)[3]

Note 1: This table assumes that the VMS unit cost is subsidized by management.
Note 2: The Total Cost column uses the lower Unit Cost and lower Communication Cost estimates to calculate the value at the lower end of the range. Likewise, the Total Cost column uses the higher Unit Cost and higher Communication Cost estimates to calculate the value at the lower end of the range.
Note 3: This $0 estimate does not account for the fact that management may subsidize VMS units that need replacement. It is not possible to make an estimate as to how many units may need replacement at this time.
Note 4: These costs do not include the incremental administrative costs associated with data collection, employees, function, and maintenance of the VMS system for the golden crab fishery.

If the fleet pays the cost of VMS, the producer surplus would be expected to decrease by the variable component of the total VMS costs, since VMS is expected to neither increase revenue nor decrease fishing costs not associated with the VMS. If NMFS pays for the cost of the VMS it would not change producer surplus because transfer payments are excluded from the calculation.

Alternative 3 would require use of an approved vessel monitoring system (VMS) by any vessel fishing with a limited access golden crab permit in the South Atlantic Council's area of jurisdiction. Assuming that CHAPCs and "Allowable Golden Crab Fishing Areas" are approved under **Actions 1 and 3, Alternative 3** would result in increased costs to all golden crab fishermen unless government funding was used to subsidize those costs. There are eleven currently active permits in the golden crab fishery. Under **Alternative 3**, all eleven vessels would be required to install VMS units on their vessels to remain active even if they did not fish in the areas where CHAPCs are located.

The costs of implementing VMS under **Alternatives 2 and 3** are summarized in **Table 4-8**. If all eleven vessels purchased VMS units, the cost would range from $34,045 to $39,545. If reimbursements were issued, the aggregate cost to the fishery would be from $0 to $5,445 (**Table 4-9**). The average cost to the 11 fishermen would be $495. The cost to management would be $34,100. However, this does not include the cost of installation or maintenance. While installation costs approximate $300 per unit, maintenance costs cannot be estimated with existing information. Communication costs for each of the models are provided in **Table 4-7**.

4.4.3 Social Effects

Alternative 1 (No action) would not require use of an approved vessel monitoring system (VMS) by any vessel with a limited access golden crab permit. Assuming that CHAPCs and "Allowable Golden Crab Fishing Areas" are approved under **Actions 1 and 3**, respectively, **Alternative 1 (No action)** would have no expected social impacts to golden crab fishermen. Under this alternative, there may be concern that the fishery is allowed to operate within the CHAPCs unmonitored.

Alternative 2 would require use of an approved VMS by any vessel with a limited access golden crab permit and approved crustacean traps fishing for golden crab within designated areas in the Stetson-Miami Terrace CHAPC and Pourtales Terrace CHAPC where fishing has occurred historically and does not impact deepwater coral habitats. Assuming that CHAPCs and "Allowable Golden Crab Fishing Areas" are approved, **Alternative 2** would result in increased costs to golden crab fishermen that fish in these areas unless government funding was used to subsidize those costs. If government funds were made available to cover the costs of VMS units, there would still be ongoing costs associated with maintenance and operation of the VMS units. Any increase in costs of fishery operations places increased stress on fishermen and their families. Seven vessels have participated in the fishery between 2005 and 2007.

In addition to the emotional stress associated with increased costs, it is expected that fishermen will have negative emotions associated with "being watched" via VMS monitoring. While many fishermen favor increased enforcement, for some VMS monitoring will increase their distrust towards fisheries managers since VMS regulations are considered when there are concerns regarding compliance.

Social benefits may include improved data collection by the fishermen for personal use and improved communications between fishermen and the outside world.

Alternative 3 would require use of an approved VMS by any vessel fishing with a limited access golden crab permit in the South Atlantic Council's area of jurisdiction. Assuming that CHAPCs and "Allowable Golden Crab Fishing Areas" are approved, **Alternative 3** would have the same results as **Alternative 2** but include four additional vessels with active permits. However, these four permits have not been fished for at least 3 years and therefore the permit owners may opt to let their permits expire rather than comply with the expensive VMS requirements.

4.4.4 Administrative Effects

Alternative 1 (No action) would produce no increased administrative cost or burden beyond the status-quo. **Alternatives 2** and **3** would require the use of vessel monitoring on federally permitted golden crab vessels either fishing within the proposed allowable golden crab fishing areas, or fishing anywhere within the Council's jurisdiction respectively. In order to gain several perspectives on the feasibility of using VMS in this fishery a meeting was held on October 7, 2008 to discuss the issue. In attendance were golden crab fishermen, Office of Law Enforcement representatives, a Law Enforcement General Counsel representative, Council staff, and Office of Sustainable Fisheries staff. After considering input from all

parties involved, it was determined that VMS is not an appropriate monitoring mechanism for the golden crab fishery.

The most problematic issue related to the use of VMS in this fishery is born from environmental and mechanical variables that often lead to a great distance between the gear itself and the vessel during both deployment and haul back. The combination of current and depth cause the gear to be as far away from the vessel as one and one half miles. This unavoidable aspect of golden crab fishing would create scenarios in which the vessel itself is located outside the allowable area but within the CHAPC, while that vessel's gear is located within the allowable area. Since the VMS unit would be located on the vessel and not the gear, a violation would be incurred and would require the Office of Law Enforcement to process citations, thus adding to their administrative burden. Additionally, the irregular and sometimes very narrow shape of the proposed allowable golden crab fishing areas would compound the difficulty of utilizing VMS as a fishery monitoring tool and successfully prosecuting violations.

Because the use of VMS as a monitoring method is not a viable option for the fishery, other monitoring systems would need to be researched in order to allow the fishery to continue while ensuring the protection of corals in very close proximity to golden crab fishing gear. Possible methods of monitoring which may be explored through a research program are included in **Appendix I**. Such methods include the use of observers to gather initial fishery characteristic data and the use of video monitoring joined with GPS to record the positions of trap deployment and retrieval and the condition of the gear during deployment and retrieval. Administratively, the development of such a research program would be a major undertaking and would require drafting grant proposals, coordinating field research efforts, and analyzing subsequent data. Golden crab fishery participants are amenable to hosting experimental monitoring devices, researchers, and observers on their fishing vessels. They are also willing to offer their own fishing related data in order to provide information that might be of use in developing an appropriate monitoring mechanism for the fishery.

4.4.5 Conclusion

At the June 2008 meeting, the Council considered a request ffrom golden crab fishery representatives and members of the Golden Crab AP for a one-year "break-in" period regarding the possible requirement of VMS for this fishery. AP members suggested this to allow time for the entire VMS system to become operations and ensure that it is collecting the right information. Additionally, fishermen expressed to the Council their interest in integrating logbook and VMS to refine fishing operations and habitat characterization in the region. As previously mentioned, in order to explore the feasibility of using VMS in this fishery a meeting was held on October 7, 2008 with golden crab fishermen, Office of Law Enforcement representatives, a Law Enforcement General Counsel representative, Council staff, and Office of Sustainable Fisheries staff. After considering input from all parties involved, it was determined that VMS would not be an appropriate monitoring mechanism for the golden crab fishery.

Another suggestion was to explore the use of pingers on traps. This recommendation had been brought forward by golden crab fishermen as a means of monitoring the location of the

traps on the seabed. This option was also discussed at the Ocotber 2008 meeting mentioned previously. Use of pingers on the traps themselves coupled with acoustic monitoring would provide useful information on trap location. In order for this technology to be effective, however, there would need to be enough platforms equipped with acoustic monitors throughout the region. Council cooperation with regional organization such as the Southeast Coastal Ocean Observing Regional Association (SECOORA) could set the stage for those types of capabilies to evolve in the South Atlantic region.

Appendix I contains summarized information on various technology options that the Council could consider for monitoring the golden crab fishery and ensuring compliance with the proposed fishing restrictions in this amendment.

Expand after December 2008 meeting and public hearings

4.5 Essential Fish Habitat and Essential Fish Habitat Areas of Particular Concern

A non-regulatory aspect of this CE-BA is to announce the availability of spatial representations of Council-designated Essential Fish Habitat and Essential Fish Habitat Areas of Particular Concern as directed by the Final Rule for EFH. The following presents a description of the Council's habitat conservation (EFH) mandates, a summary of the existing EFH and EFH-HAPC designations for managed species, and a listing of maps that have been created and are being served through the Council's Habitat and Ecosystem Internet Map Server.

The EFH Mandate and EFH Final Rule

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

The definition for EFH may include habitat for an individual species or an assemblage of species, whichever is appropriate within each FMP. For the purpose of interpreting the definition of EFH: "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. Water quality, including but not limited to nutrient levels, oxygen concentration, and turbidity levels is also considered to be a component of this definition. Examples of "waters" that may be considered EFH, include open waters, wetlands, estuarine habitats, riverine habitats, and wetlands hydrologically connected to productive water bodies.

"Necessary", relative to the definition of EFH, means the habitat required to support a sustainable fishery and a healthy ecosystem, while "spawning, breeding, feeding, or growth to maturity" covers a species full life cycle. In the context of this definition the term "substrate" includes sediment, hardbottom, structures underlying the waters, and associated biological communities. These communities could encompass mangroves, tidal marshes, mussel beds, cobble with attached fauna, mud and clay burrows, coral reefs, and submerged aquatic vegetation. Migratory routes such as rivers and passes serving as passageways to and from anadromous fish spawning grounds should also be considered EFH. Included in the interpretation of "substrate" are artificial reefs and shipwrecks (if providing EFH), and partially or entirely submerged structures such as jetties.

The National Marine Fisheries Service assists the Councils in implementing EFH by assessing the quality of available data in a four-level system:

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 must identify EFH-Habitat Areas of Particular Concern (HAPCs) within EFH. In determining which areas should be designated as HAPCs the area must meet one or more of the following criteria:

1) Ecological function provided by the habitat is important;
2) Habitat is sensitive to human-induced environmental degradation;
3) Development activities are or will be stressing the habitat type; and
4) Habitat type is rare.

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

The Magnuson-Stevens Act, Public Law 104-208, reflects the new Secretary of Commerce and Fishery Management Council authority and responsibilities for the protection of essential fishery habitat. Section 305 (b) Fish Habitat, indicates the Secretary (through NMFS) shall, within 6 months of the date of enactment of the Sustainable Fisheries Act, establish by regulation guidelines 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 NMFS) shall: 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, shall 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 the Secretary shall 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 by such agency 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 establishes 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 NMFS), other Federal agencies, State agencies, and the Councils would use to coordinate, consult, or provide recommendations on Federal and State activities that may adversely affect EFH. The intended effect of the rule was 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 FMPs. The final rule provides more clear guidelines for prioritizing and analyzing habitat effects for managed species. The final rule retains the four tiered level for data division 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 Fishery Ecosystem Plan (SAFMC in prep.) updates EFH information in the Habitat Plan (SAFMC 1998a) 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 the Habitat and Coral Advisory Panels and through a series of workshops, identified available environmental and fisheries data sources relevant to the managed species that would be useful in describing and identifying EFH. The EFH workshop process utilized habitat experts at the State, Federal, and regional level to participate in the description and identification of EFH in the South Atlantic region.

Based on the ecological relationships of species and relationships between species and their habitat, the Council took an ecosystem approach in designating EFH in the Habitat Plan and Comprehensive Ecosystem-Based Amendment and in refining the information presented in the FEP (SAFMC in prep.) for managed species and species assemblages. This approach is consistent with NMFS guidelines and broader goals for ecosystem management. Through

the existing habitat policy, the Council directs the protection of EFH types and the enhancement and restoration of their quality and quantity.

The EFH Final Rule

The Final EFH Rule requires FMPs 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. Maps should identify the different types of habitat designated as EFH to the extent possible. Maps should explicitly distinguish EFH from non-EFH areas and should 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, data availability do not support such use at this time for the South Atlantic. Instead, the best use of GIS within the South Atlantic is visualizing where EFH occurs within the constraints of available information.

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.

Maps of EFH and EFH-HAPCs

The Council has developed an Internet Map Server (IMS) for displaying EFH and HAPCs within the constraints of available data and technology. The IMS contains GIS layers showing the distribution and geographic limits of EFH by life history stage (**Figure 4-22**). The IMS is largely based on information developed by the Council, Florida Fish & Wildlife Research Institute, NOAA NMFS 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. Many were consolidated and homogenized from other sources. The Council encourages use of these data and urges users to thoroughly review the metadata and original source documentation prior to interpreting the data. It is the user's responsibility to ensure data are used in a manner consistent with their intended purpose and within stated limitations.

As new data become available, the Council will update the IMS to ensure the public has the best available spatial depictions of the EFH descriptions in the Comprehensive EFH Amendment (SAFMC 1988b) and future Comprehensive Ecosystem-Based Amendments.

While the Council believes spatial depictions of EFH and HAPCs are informative, textual descriptions within the Comprehensive EFH Amendment (SAFMC 1988b) are the ultimate source for determining the limits of EFH and HAPCs. The IMS can be found at: http://ocean.floridamarine.org/efh_coral/ims/viewer.htm.

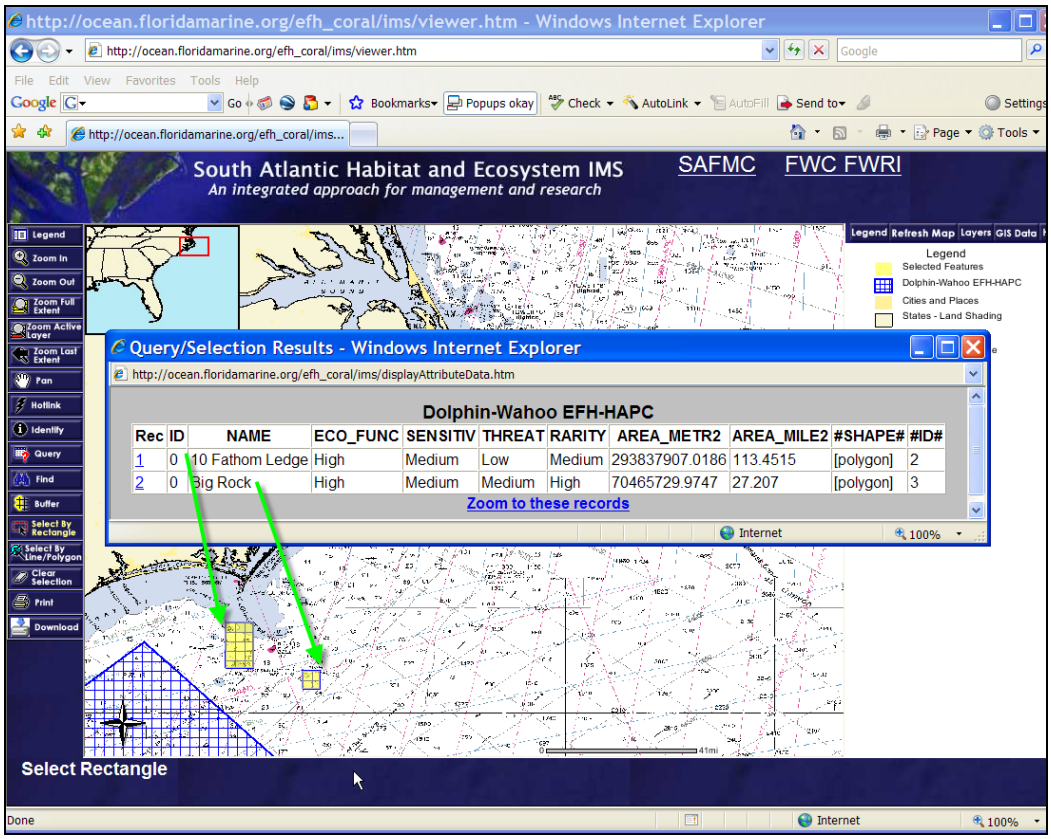


Figure 4-22. Sample screen shot of spatial presentation of EFH-HAPCs on South Atlantic Habitat and Ecosystem Internet Map Server.

The Habitat Plan (SAFMC 1998a) and Fishery Ecosystem Plan (SAFMC in prep.) present 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 NMFS 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 is considering evidence that some fishing practices may have an identifiable adverse effect on habitat and is addressing those pertaining to deepwater coral ecosystems in

this first Comprehensive Ecosystem-Based Amendment. The Council, as indicated in the previous section, 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 HAPCs; and harvest limits.

The FEP (SAFMC in prep.) identifies non-fishing related activities that have the potential to adversely affect EFH quantity or quality. Examples of these activities are dredging, fill, excavation, mining, impoundment, discharge, water diversions, thermal additions, 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 FEP is an analysis of how fishing and non-fishing activities influence habitat function on an ecosystem or watershed scale. 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 FEP. 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 FEP as new information becomes available. NMFS should provide some of this information as part of the annual Stock Assessment and Fishery Evaluation (SAFE) report. A complete update of the FEP and assessment of EFH information will also be conducted as recommended in the guidelines in no longer than 5 years.

The Council established a framework procedure whereby additional EFH and EFH-HAPCs designations would be accomplished. This is described in Section 4.2.8 of the Comprehensive EFH Amendment (SAFMC 1998b).

4.5.1 Penaeid and deepwater shrimp

4.5.1.1 Essential Fish Habitat

Penaeid Shrimp

For penaeid shrimp, EFH includes inshore estuarine nursery areas, offshore marine habitats used for spawning and growth to maturity, and all interconnecting water bodies as described in the SAFMC Habitat Plan (SAFMC 1998a). Inshore nursery areas include tidal freshwater (palustrine), estuarine, and marine emergent wetlands (e.g., intertidal marshes); tidal palustrine forested areas; mangroves; tidal freshwater, estuarine, and marine submerged aquatic vegetation (e.g., seagrass); and subtidal and intertidal non-vegetated flats. This applies from North Carolina through the Florida Keys.

Rock Shrimp

For rock shrimp, EFH consists of offshore terrigenous and biogenic sand bottom habitats from 18 to 182 meters (59-597 ft.) in depth with highest concentrations occurring between 34 and 55 meters (111-180 ft.). This applies for all areas from North Carolina through the Florida Keys. EFH includes the shelf current systems near Cape Canaveral, Florida which provide major transport mechanisms affecting planktonic larval rock shrimp. These currents keep larvae on the Florida Shelf and may transport them inshore in spring. In addition the Gulf Stream is an EFH because it provides a mechanism to disperse rock shrimp larvae.

The bottom habitat on which rock shrimp thrive is thought to be limited. Kennedy *et al.* (1977) determined that the deepwater limit of rock shrimp was most likely due to the decrease of suitable bottom habitat rather than to other physical parameters including salinity and temperature. Cobb *et al.* (1973) found the inshore distribution of rock shrimp to be associated with terrigenous and biogenic sand substrates and only sporadically on mud. Rock shrimp also utilize hardbottom and coral or more specifically *Oculina* coral habitat areas. This was confirmed with research trawls capturing large amounts of rock shrimp in and around the Oculina Bank HAPC prior to its designation.

Royal Red Shrimp

EFH for royal red shrimp include the upper regions of the continental slope from 180 meters (590 feet) to about 730 meters (2,395 feet), with concentrations found at depths of between 250 meters (820 feet) and 475 meters (1,558 feet) over blue/black mud, sand, muddy sand, or white calcareous mud. In addition the Gulf Stream is an EFH because it provides a mechanism to disperse royal red shrimp larvae.

4.5.1.2 Essential Fish Habitat-Habitat Areas of Particular Concern

Penaeid Shrimp

Areas which meet the criteria for EFH-Habitat Areas of Particular Concern (EFH-HAPCs) for penaeid shrimp include all coastal inlets, all State-designated nursery habitats of particular importance to shrimp (for example, in North Carolina this would include all

Primary Nursery Areas and all Secondary Nursery Areas), and State-identified overwintering areas.

Estuarine tidal creeks and salt marshes that serve as nursery grounds are perhaps the most important habitats occupied by penaeid shrimp. The major factor controlling shrimp growth and production is the availability of nursery habitat. Remaining wetland habitat must be protected if present production levels are to be maintained. In addition, impacted habitats must be restored if future production is to be increased. Other areas of specific concern are the barrier islands since these land masses are vital to the maintenance of estuarine conditions needed by shrimp during their juvenile stage. Passes between barrier islands into estuaries also are important since the slow mixing of sea water and fresh water are also of prime importance to estuarine productivity.

In North Carolina, EFH-HAPCs include estuarine shoreline habitats since juveniles congregate here. Seagrass beds, prevalent in the sounds and bays of North Carolina and Florida, are particularly critical areas. Core Sound and eastern Pamlico Sound, based on a preliminary aerial survey funded through the Albemarle-Pamlico Estuarine Study, have approximately 200,000 acres of seagrass beds making North Carolina second only to Florida in abundance of this type of habitat (Department of Commerce 1988b). In subtropical and tropical regions shrimp and spiny lobster postlarvae recruit into grass beds from distant offshore spawning grounds (Fonseca *et al.* 1992).

South Carolina and Georgia lack seagrass beds. Here, the nursery habitat of shrimp is the high marsh areas with shell hash and mud bottoms. In addition, there is seasonal movement out of the marsh into deep holes and creek channels adjoining the marsh system during winter. Therefore, the area of particular concern for early growth and development encompasses the entire estuarine system from the lower salinity portions of the river systems through the inlet mouths.

Section 600.815 (a) (8) of the final rule on EFH determinations recognizes that subunits of EFH may be of particular concern. A summary evaluation of the EFH-HAPC as it relates to the criteria is shown in **Table 4-10**.

Table 4-10. Summary evaluation of the EFH-HAPC for shrimp as it relates to the criteria.

EFH-HAPC and Criteria Evaluation	Ecological Function	Sensitivity to Environmental Degradation	Threat from Development Activities	Rarity of Habitat
Coastal inlets	High	Low	Medium	Medium
State-designated nursery habitats	High	High	Medium	High
State-identified overwintering habitats	Medium	Low	Medium	Medium
High marsh areas with shell hash and mud bottom in SC and GA	High	Medium	Medium	Medium

Rock Shrimp
No EFH-HAPCs have been identified for rock shrimp; however, deepwater habitat (e.g., the rock shrimp closed area/proposed expanded Oculina Bank HAPC) may serve as nursery habitat and protect the stock by providing a refuge for rock shrimp.

Royal Red Shrimp
Although no EFH-HAPCs have been identified specifically for royal red shrimp, they are caught in association with deepwater corals on the continental slope. Deepwater corals support high levels of marine biodiversity by providing habitat for numerous benthic species. As structure-forming animals, deepwater corals enhance habitat complexity by growing in the form of "reefs", fans, stalks, and "bushes". The *Enallopsamia* reefs off South Carolina, the *Oculina* habitat off Florida, and the *Lophelia* reefs from North Carolina to Florida may be important in the life history of royal red shrimp. Bottom impacting mobile gear such as trawls will likely impact these important habitats.

4.5.1.3 GIS for Shrimp Fishery Management Plan EFH and EFH-HAPCs

The Council has mapped the locations of EFH and EFH-HAPCs for shrimp within the constraints of available information. To obtain copies of these maps, please visit the Council's Habitat and Ecosystem Internet Map Server at www.safmc.net. While the Council believes spatial depictions of EFH and EFH-HAPCs are informative, textual descriptions are the ultimate source for determining the limits of EFH and EFH-HAPCs.

4.5.2 Snapper Grouper

4.5.2.1 Essential Fish Habitat

Essential Fish Habitat utilized by snapper grouper species in this region 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 ft. (but to at least 2,000 ft. for wreckfish)] where the annual water temperature range is sufficiently warm to maintain adult populations of members of this largely tropical fish complex. EFH includes the spawning area in the water column above the adult habitat and the additional pelagic environment, including *Sargassum*, required for survival of larvae and growth up to and including settlement. In addition, the Gulf Stream is also EFH because it provides a mechanism to disperse snapper grouper larvae.

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

4.5.2.2 Essential Fish Habitat-Habitat Areas of Particular Concern

Areas which meet the criteria for Essential Fish Habitat-Habitat Areas of Particular Concern (EFH-HAPCs) for species in the snapper grouper management unit include medium to high profile offshore 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).

Areas that meet the criteria for designating EFH-HAPCs include habitats required during each life stage (including egg, larval, postlarval, juvenile, and adult stages). **Table 4-11** below is a summary evaluation of the EFH-HAPC as it relates to the criteria.

Table 4-11. Summary evaluation of the 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	Hugh
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

4.5.2.3 GIS for Snapper Grouper Fishery Management Plan EFH and EFH-HAPCs

The Council has mapped the locations of EFH and EFH-HAPCs for snapper grouper species within the constraints of available information. To obtain copies of these maps, please visit the Council's Habitat and Ecosystem Internet Map Server at www.safmc.net. While the Council believes spatial depictions of EFH and EFH-HAPCs are informative, textual descriptions are the ultimate source for determining the limits of EFH and EFH-HAPCs.

4.5.3 Coastal Migratory Pelagics

4.5.3.1 Essential Fish Habitat

EFH for coastal migratory pelagic species includes sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone, but from the Gulf Stream shoreward, including *Sargassum*. In addition, all coastal inlets, all State-designated nursery habitats of particular importance to coastal migratory pelagics (for example, in North Carolina this would include all Primary Nursery Areas and all Secondary Nursery Areas).

For cobia EFH also includes high salinity bays, estuaries, and seagrass habitat. In addition, the Gulf Stream is an EFH because it provides a mechanism to disperse coastal migratory pelagic larvae. For king and Spanish mackerel and cobia EFH occurs in the South Atlantic and Mid-Atlantic Bights.

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. Also, it should be noted that the Gulf Stream occurs within the EEZ.

4.5.3.2 Essential Fish Habitat-Habitat Areas of Particular Concern

Areas which meet the criteria for Essential Fish Habitat-Habitat Areas of Particular Concern (EFH-HAPCs) include sandy shoals of Cape Lookout, Cape Fear, and Cape Hatteras from shore to the ends of the respective shoals, but shoreward of the Gulf stream; The Point, The Ten-Fathom Ledge, and Big Rock (North Carolina); The Charleston Bump and Hurl Rocks (South Carolina); The Point off Jupiter Inlet (Florida); *Phragmatopoma* (worm reefs) reefs off the central east coast of Florida; nearshore hardbottom south of Cape Canaveral; The Hump off Islamorada, Florida; The Marathon Hump off Marathon, Florida; The "Wall" off of the Florida Keys; Pelagic *Sargassum*; and Atlantic coast estuaries with high numbers of Spanish mackerel and cobia based on abundance data from the ELMR Program. Estuaries meeting this criteria for Spanish mackerel include Bogue Sound and New River, North Carolina: Bogue Sound, North Carolina (Adults May-September salinity >30 ppt); and New River, North Carolina (Adults May-October salinity >30 ppt). For cobia they include Broad River, South Carolina; and Broad River, South Carolina (Adults & juveniles May-July salinity >25ppt). A summary evaluation of the EFH-HAPC as it relates to the criteria is presented in **Table 4-12**.

Table 4-12. Summary evaluation of the EFH-HAPC for coastal migratory pelagics as it relates to the criteria.

EFH-HAPC and Criteria Evaluation	Ecological Function	Sensitivity to Environmental Degradation	Threat from Development Activities	Rarity of Habitat
Sandy shoals of Cape Lookout, Cape Fear and Cape Hatteras (from shore to the end of shoals but shoreward from Gulf Stream)	Medium	Low	Medium	Medium
The Point, NC	Medium	Low	Medium	High
The Ten Fathom Ledge, NC	Medium	Low	Medium	Medium
Big Rock, NC	Medium	Low	Low	Medium
Charleston Bump, SC	Medium	Low	Medium	Medium
Hurl Rocks, SC	Medium	Low	Medium	Medium
The Point off Jupiter Inlet, FL	Medium	Low	Low	Low
Phragmatopoma (worm reefs) reefs off central E. coast of FL	High	Medium	Medium	High
nearshore hardbottom south of Cape Canaveral, FL	High	High	High	High
The Hump off Islamorada, FL	Medium	Low	Low	Medium
The Marathon Hump, FL	High	Low	Low	Medium
Pelagic Sargassum	High	Low	Low	Medium
Bogue Sound and New River estuaries, NC (Spanish mackerel)	High	High	High	Medium
Broad River, SC (cobia)	High	High	High	Medium

4.5.3.3 GIS of Coastal Migratory Pelagics Fishery Management Plan EFH and EFH-HAPCs

The Council has mapped the locations of EFH and EFH-HAPCs for coastal migratory pelagic species within the constraints of available information. To obtain copies of these maps, please visit the Council's Habitat and Ecosystem Internet Map Server at www.safmc.net. While the Council believes spatial depictions of EFH and EFH-HAPCs are informative, textual descriptions are the ultimate source for determining the limits of EFH and EFH-HAPCs.

4.5.4 Golden Crab

4.5.4.1 Essential Fish Habitat

EFH for golden crab includes the U.S. Continental Shelf from Chesapeake Bay south through the Florida Straits (and into the Gulf of Mexico). In addition, the Gulf Stream is an EFH because it provides a mechanism to disperse golden crab larvae. The detailed description of seven EFH types (a flat foraminferan ooze habitat; distinct mounds, primarily of dead coral;

ripple habitat; dunes; black pebble habitat; low outcrop; and soft-bioturbated habitat) for golden crab is provided in Wenner *et al.* (1987).

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. Also, it should be noted that the Gulf Stream occurs within the EEZ.

4.5.4.2 Essential Fish Habitat-Habitat Areas of Particular Concern

There is insufficient knowledge of the biology of golden crabs to identify spawning and nursery areas and to identify EFH-HAPCs at this time. As information becomes available, the Council will evaluate such data and identify HAPCs as appropriate through the framework.

4.5.4.3 GIS for Golden Crab Fishery Management Plan EFH and EFH-HAPCs

The Council has mapped the locations of EFH and EFH-HAPCs for golden crab within the constraints of available information. To obtain copies of these maps, please visit the Council's Habitat and Ecosystem Internet Map Server at www.safmc.net. While the Council believes spatial depictions of EFH and EFH-HAPCs are informative, textual descriptions are the ultimate source for determining the limits of EFH and EFH-HAPCs.

4.5.5 Spiny Lobster

4.5.5.1 Essential Fish Habitat

EFH for spiny lobster includes nearshore shelf/oceanic waters; shallow subtidal bottom; seagrass habitat; unconsolidated bottom (soft sediments); coral and live/hardbottom habitat; sponges; algal communities (Laurencia); and mangrove habitat (prop roots). In addition the Gulf Stream is an EFH because it provides a mechanism to disperse spiny lobster larvae.

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. Also, it should be noted that the Gulf Stream occurs within the EEZ.

4.5.5.2 Essential Fish Habitat-Habitat Areas of Particular Concern

Areas which meet the criteria for Essential Fish Habitat-Habitat Areas of Particular Concern (EFH-HAPCs) for spiny lobster include Florida Bay, Biscayne Bay, Card Sound, and coral/hardbottom habitat from Jupiter Inlet, Florida through the Dry Tortugas, Florida. A summary evaluation of the EFH-HAPC as it relates to the criteria is presented in **Table 4-13**.

Table 4-13. Summary evaluation of the EFH-HAPC for spiny lobster as it relates to the criteria.

EFH-HAPC and Criteria Evaluation	Ecological Function	Sensitivity to Environmental Degradation	Threat from Development Activities	Rarity of Habitat
Florida Bay	High	High	Medium	Medium
Biscayne Bay	High	High	Medium	Medium
Card Sound	High	High	Medium	Medium
Coral/hardbottom habitat from Jupiter Inlet through the Dry Tortugas, FL	High	High	High	High

4.5.5.3 GIS for Spiny Lobster Fishery Management Plan EFH and EFH-HAPCs

The Council has mapped the locations of EFH and EFH-HAPCs for spiny lobster within the constraints of available information. To obtain copies of these maps, please visit the Council's Habitat and Ecosystem Internet Map Server at www.safmc.net. While the Council believes spatial depictions of EFH and EFH-HAPCs are informative, textual descriptions are the ultimate source for determining the limits of EFH and EFH-HAPCs.

4.5.6 Coral, Coral Reefs and Live/Hardbottom Habitat

4.5.6.1 Essential Fish Habitat

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 ft.) depth, subtropical (15°-35° C), 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.

4.5.6.2 Essential Fish Habitat-Habitat Areas of Particular Concern

Areas which meet the criteria for Essential Fish Habitat-Habitat Areas of Particular Concern (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 meter; 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. A summary evaluation of the EFH-HAPC as it relates to the criteria is in **Table 4-14.**

Table 4-14. 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

4.5.6.3 GIS for Coral, Coral Reefs and Live Hardbottom Habitat Fishery Management Plan EFH and EFH-HAPCs

The Council has mapped the locations of EFH and EFH-HAPCs for coral, coral reefs and live hardbottom habitat within the constraints of available information. To obtain copies of these maps, please visit the Council's Habitat and Ecosystem Internet Map Server at www.safmc.net. While the Council believes spatial depictions of EFH and EFH-HAPCs are informative, textual descriptions are the ultimate source for determining the limits of EFH and EFH-HAPCs.

4.5.7 Dolphin Wahoo

4.5.7.1 Essential Fish Habitat

Essential Fish Habitat (EFH) for dolphin and wahoo is the Gulf Stream, Charleston Gyre, Florida Current, and pelagic *Sargassum*.

Note: This EFH definition for dolphin was approved by the Secretary of Commerce on June 3, 1999 as a part of the South Atlantic Council's Comprehensive Habitat Amendment (SAFMC 1998b) (dolphin was included within the Coastal Migratory Pelagics FMP). This definition does not apply to extra-jurisdictional areas. A detailed description of the pelagic habitats used by dolphin and wahoo is presented the Habitat Plan and Volume II of the Fishery Ecosystem Plan.

4.5.7.2 Essential Fish Habitat-Habitat Areas of Particular Concern

Essential Fish Habitat-Habitat Areas of Particular Concern (EFH-HAPCs) for dolphin and wahoo in the Atlantic include The Point, The Ten-Fathom Ledge, and Big Rock (North Carolina); The Charleston Bump and The Georgetown Hole (South Carolina); The Point off Jupiter Inlet (Florida); The Hump off Islamorada, Florida; The Marathon Hump off Marathon, Florida; The "Wall" off of the Florida Keys; and Pelagic *Sargassum*.

Note: This EFH-HAPC definition for dolphin was approved by the Secretary of Commerce on June 3, 1999 as a part of the South Atlantic Council's Comprehensive Habitat Amendment (dolphin was included within the Coastal Migratory Pelagics FMP). The following table (**Table 4-15**) is a summary evaluation of the EFH-HAPC as it relates to the criteria.

Table 4-15. Summary evaluation of the EFH-HAPC for dolphin and wahoo 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	High	Medium	Medium	High
The Ten Fathom Ledge	High	Medium	Low	Medium
Big Rock	High	Medium	Medium	High
The Charleston Bump	High	Low	Medium	High
The Georgetown Hole	High	Low	Low	High
The Point off Jupiter Inlet	High	Medium	Low	High
The Hump off Islamorada	High	Low	Low	High
The Marathon Hump	High	Medium	Low	High
The Wall off of the Florida Keys	Medium	Medium	Low	Medium
Pelagic *Sargassum*	High	Medium	Low	High

The EFH-HAPCs for dolphin and wahoo all meet at least one or more of the above criteria. This action enables the Councils to protect these EFH-HAPCs effectively and take timely actions when necessary. This could prevent further decreases in biological productivity and may lead to possible increases in yield of fish stocks.

This evaluation is based on information presented in the Habitat Plan (SAFMC 1998a) and Comprehensive EFH Amendment (SAFMC 1998b) and further supported by the Fishery Ecosystem Plan (SAFMC in prep.) which in combination describe the characteristics of the unique habitat type and where available specific descriptions of the habitat associated with the designated or proposed EFH-HAPC. In addition, supporting rationale for designation including identified threats from fishing and non-fishing activities is presented in the Habitat Plan (SAFMC 1998a), the Comprehensive EFH Amendment (SAFMC 1998b), the *Sargassum* Fishery Management Plan (SAFMC 2002b), and Fishery Ecosystem Plan (SAFMC in prep.) and are included herein by reference.

4.5.7.3 GIS for Dolphin and Wahoo EFH and EFH-HAPCs

The Council has mapped the locations of EFH and EFH-HAPCs for dolphin and wahoo within the constraints of available information. To obtain copies of these maps, please visit the Council's Habitat and Ecosystem Internet Map Server at www.safmc.net. While the Council believes spatial depictions of EFH and EFH-HAPCs are informative, textual descriptions are the ultimate source for determining the limits of EFH and EFH-HAPCs.

4.6 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.

4.6.1 Biological

SCOPING FOR CUMULATIVE EFFECTS

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

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

I. The direct and indirect effects of the proposed action (**Section 4.0**);

II. Which resources, ecosystems, and human communities are affected (**Section 3.0**). The species primarily affected by the actions in this amendment include South Atlantic deepwater corals and associated communities, golden crab, royal red shrimp, and to a much smaller extent, rock shrimp.

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-mile limit of the Atlantic off the coasts of North Carolina, South Carolina, Georgia, and east Florida to Key West; specifically, deepwater coral ecosystems identified in **Section 3.0**.

3. Establish the timeframe for the analysis.

It would be advantageous to go back to a time when there was a natural, or some modified (but ecologically sustainable) condition. However, data collection for many fisheries began when species were already fully exploited. Therefore, the timeframe for any analysis should be initiated when data collection began for the subject fishery. In determining how far into the future to analyze cumulative effects, the length of the effects will depend on the species. The CE-BA would establish CHAPCs, shrimp fishery access areas, and allowable golden crab fishing areas. It would also update special representations of EFH for all South Atlantic FMPs. These actions would be expected to take place upon the final rule becoming effective and would not affect fishing effort in the shrimp or golden crab fisheries. The effectiveness of this action regarding coral protection should continue to be monitored indefinitely to ensure that management measures are adequate to protect the subject coral species.

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 deepwater coral, shrimp, and golden crab.

A. Past

The reader is referred to **Section 1.3 History of Management** for past regulatory activity for coral, shrimp, and golden crab fisheries. For the shrimp fishery, these include the requirement of a rock shrimp permit, prohibitions on trawling to limit the impact of the rock shrimp fishery on the Oculina HAPC, defining EFH for the South Atlantic shrimp resource, reporting requirements, and the establishment of the rock shrimp limited access program. The most recent regulatory action was implemented through Shrimp Amendment 6 (SAFMC 2005), which: 1) transferred authority to make appropriate revisions to the Bycatch Reduction Device (BRD) Testing Protocol to NOAA Fisheries Service; 2) specified reductions in the total weight of finfish of at least 30% for new BRDs to be certified; 3) adopted the Atlantic Coastal Cooperative Statistics Program Release, Discard, and Protected

Species Module as the preferred methodology to monitor and assess bycatch and until this module is fully funded, require the use of a variety of sources to assess and monitor bycatch including, observers, logbooks, state cooperation, grants, and federal shrimp permits; 4) required BRDs on all rock shrimp trips in the South Atlantic; 5) required federal penaeid shrimp permits; 6) revised status determination criteria for penaeid shrimp; and 7) revised status determination criteria for rock shrimp.

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.

The golden crab fishery has been under the Councils management since 1996 (SAFMC 1995b). The FMP established three golden crab fishing zones each with their own permit, and limited effort through a controlled access program. Subsequent amendments to the golden crab FMP defined EFH for golden crab, and required bycatch reporting.

B. Present

In this amendment the Council has recommended: 1) amending the Coral FMP to establish Deepwater Coral Habitat Areas of Particular Concern; 2) amending the Coral FMP to create a "Shrimp Fishery Access Area" (SFAA) within the proposed Stetson-Miami Terrace CHAPC boundaries; 3) amending the Coral FMP to create "Allowable Golden Crab Fishing Areas" within the proposed Stetson-Miami Terrace CHAPC and Pourtales Terrace CHAPC boundaries; 4) amending the Golden Crab FMP to require vessel monitoring; and 5) amending various FMPs to present spatial information of Council-designated Essential Fish Habitat and Essential Fish Habitat-Habitat Areas of Particular Concern.

The Northeast Region of NOAA Fisheries Service has recently published a rule implementing a limited access program for the general fishery category. In order to fish for, possess, or land scallops in or from federal waters under general category rules, a vessel must be issued a limited access general category (LAGC) scallop permit. It is expected that some of the fishermen who would not qualify to receive an LAGC may also have at one time a rock shrimp limited access endorsement, and may want to re-enter the rock shrimp fishery. Since the limited access program is in the early stages of implementation, data on scallop fishermen who may want to reenter the rock shrimp fishery are currently unavailable, and thus effects of the limited access program in combination with effects created by this CE-BA cannot be evaluated.

Currently Amendment 7 to the Shrimp FMP of the South Atlantic Region (SAFMC 2008) is also under development. In this amendment the Council has recommended: 1) eliminating the 15,000-pound landing requirement; 2) reinstating endorsements lost due to not meeting the 15,000-pound landing requirement by December 31, 2007; 3) reinstating endorsements lost due to failure to renew; 4) renaming the existing rock shrimp open access permit and limited access endorsement to minimize confusion; and 5) requiring the collection of economic data from penaeid and rock shrimp fishery participants.

It is expected that some of the fishermen who would not qualify to receive an LAGC may also have had at one time a rock shrimp limited access endorsement, and may wish to be considered amongst the group of fishermen under Action 3 in Shrimp Amendment 7. This action would reinstate all limited access endorsements for those vessel owners who renewed their open access permit in the year in which they failed to renew their limited access endorsement. It would also require vessel owners eligible to have their vessel endorsements reinstated to apply for a limited access endorsement within one year after the effective date of the final rule for this amendment, and all eligible individuals need to have had a limited access rock shrimp endorsement at one time.

Additionally, Amendment 14 to the FMP for the Snapper Grouper Fishery of the South Atlantic (SAFMC 2007) was approved by the Secretary of Commerce on September 3, 2008. This amendment established eight marine protected areas (MPAs), one of which (East Hump MPA) is in the proposed Pourtales Terrace CHAPC. Within the MPAs fishing for and/or harvest of deepwater snapper grouper species is prohibited, while other types of legal fishing such as pelagic trolling are allowed. The cumulative effect of this overlap would be a prohibition of the use of any bottom tending gear within the area in addition to the Snapper Grouper Amendment Amendment 14 prohibition on fishing for and/or harvest of deepwater snapper-grouper species. In the other seven MPAs, only fishing for and/or possession of deepwater snapper-grouper species would be prohibited.

Currently there are several amendments to the FMP for the Snapper Grouper Fishery of the South Atlantic Region. These include Amendments 15B, 16, and 17. Amendment 15B (SAFMC in review) would prohibit the sale of bag limit caught snapper grouper in the South Atlantic among other measures, and Amendment 16 (SAFMC in review) contains measures to reduce overall harvest of gag and vermilion snapper, with a focus on protecting shallow water grouper species in spawning condition. Amendment 17 (SAFMC in prep.) would implement Annual Catch Limits (ACLs) for all species in the South Atlantic undergoing overfishing as required under the Magnuson-Stevens Act. Cumulative economic effect of these amendments on the snapper grouper fishery of the South Atlantic would be negative; however, cumulative biological effects are expected to be positive. In the long term, positive economic and biological effects are expected to result from the establishment of a more economically and biologically sustainable fishery. The reductions in snapper grouper harvest and sale under these amendments may result in effort shifts to other South Atlantic fisheries.

B. Reasonably Foreseeable Future

Within the reasonably foreseeable future, it is likely that an amendment to the Shrimp FMP will bring royal red shrimp into the Council's shrimp fishery management unit. If this action were to take place a permit for the fishery would likely be implemented and royal red shrimp vessels may be required to use NMFS approved BRDs on their trawls. This action would also make permitted royal red shrimp vessels subject to enforcement of any future fishery management measures implemented through the FMP amendment process. It should be noted, that all vessels currently fishing for royal red shrimp in the South Atlantic also hold limited access rock shrimp endorsements in the South Atlantic, and are therefore subject to all management measures affecting the rock shrimp fishery.

A Comprehensive ACL Amendment will be under development during 2009-2010 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 deepwater coral, shrimp, and golden crab.

A. Past
B. Present
C. Reasonably foreseeable future

Coral

Because deepwater corals are stationary entities they are subjected to several ongoing environmental conditions, which they cannot escape and may only endure. If bottom currents are too strong, mound formation may be prevented (Popenoe and Manheim 2001) because sediments cannot be trapped. Ayers and Pilkey (1981) suggested that Gulf Stream currents may erode coral mounds, and that present coral bank sizes may be related to historical displacements of that current. Assuming currents also carry appropriate foods, it may be that currents with variable speeds or at least currents of moderate speeds (fast enough to facilitate filter feeding but not too fast to prevent sediment entrapment), coupled with a supply of sediment, are the conditions necessary to facilitate coral mound formation (Rogers 1999). Other factors which may affect coral growth and reproduction are changing temperatures of the surrounding water. Studies suggest that some deepwater corals may not tolerate temperatures above 12°C. Sediment loading may also impede coral growth and their overall ability to survive, especially in oil and gas extraction sites. Further laboratory and field experiments are needed to examine the individual and interactive effects of environmental conditions such as temperature, sediments, and toxins.

Shrimp

In terms of natural disturbances, it is difficult to determine the effect of non-Council and non-fishery related actions on stocks of shrimp. Annual variability in natural conditions such as water temperature, currents, food availability, predator abundance, etc. can affect the abundance of young shrimp. This natural variability in year class strength is difficult to predict as it is a function of many interactive and synergistic factors that cannot all be measured (Rothschild 1986). Furthermore, natural factors such as storms, can potentially affect the survival of juvenile and adult shrimp; however, it is very difficult to quantify the magnitude of mortality it may have on a stock. Higher gas prices combined with highly variable environmental conditions have caused extreme highs and lows in shrimp landings and fishery participation from year to year. The highly volatile nature of the shrimp fishery is likely to persist through the reasonably foreseeable future, as gas prices continue to fluctuate, and environmental factors remain difficult to predict.

Golden Crab

Because golden crab depend on deepwater corals for survival, those factors which may directly affect deepwater corals (noted above), would indirectly effect the overall health of golden crab stocks associated with them. If deepwater coral colonies are negatively impacted by temperature shifts, sediment loading, and/or toxins, it can be assumed golden crab

associated with those colonies would also be adversely affected to a proportionate degree. Currently, the primary threat comes from oil and gas development and production, offshore dumping of dredged material, disposal of chemical and other wastes, and the discharge of contaminants by river systems.

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.

Coral

As mentioned previously in this CE-BA, deepwater corals are susceptible to various negative influences and are unable to adapt quickly enough to withstand external stressors such as increasing water temperatures, sediment loading, and other toxic depositions. Communities which benefit from various targeted species associated with deepwater corals may be able to adapt to changing environmental conditions by shifting effort to other species that are not dependent upon deepwater corals for sustained health and abundance. Expand

Shrimp

Rock shrimp are distributed worldwide in tropical and temperate waters. In the southeastern United States, the rock shrimp fishery is based entirely on rock shrimp (*Sicyonia brevisrostris*). The center of abundance occurs off northeast Florida south to Jupiter Inlet (SAFMC 1996a). Small quantities of rock shrimp are also found off North Carolina, South Carolina, and Georgia; however, there exists no sustainable commercially harvestable quantities of rock shrimp in those areas comparable to the fishery prosecuted in the EEZ off the coast of eastern Florida (SAFMC 2002a). Rock shrimp occur in deeper waters than the associated three penaeid shrimp species.

The peak rock shrimping season generally runs from July through October (SAFMC 2002a). Historically, the fishery did not begin until August or September (SAFMC 1996a). To a degree, the amount and timing of effort in the rock shrimp fishery are dependent on the success of the white and brown shrimp fisheries.

Using the MSY/OY figure of approximately 4.9 million pounds for rock shrimp, it can be seen that landings were above this reference point in 2004, below it in 2003 and 2006, and significantly below this value in 2005. In fact, available information suggests that, in terms of landings and revenues, 2005 was the worst year on record since rock shrimp became a targeted species. And although landings, revenues, and even prices rebounded in 2006, vessel participation in both 2005 and 2006 was considerably less than during the previous decade. Although no definitive reasons can be provided at this time, it is likely that the extremely low level of landings in 2005 are a function of biological factors (e.g., relatively low abundance), economic factors (e.g., historically low rock shrimp prices, particularly relative to other potential target species, and high fuel prices, given that rock shrimp are

harvested in more distant waters relative to penaeid species), and possibly natural disasters (e.g., the impact of Hurricane Katrina on vessels from ports in the Gulf of Mexico).

Royal red shrimp are found on the continental slope throughout the Gulf of Mexico and South Atlantic area from Cape Cod to French Guiana. In the South Atlantic they are found in large concentrations primarily off northeast Florida. They inhabit the upper regions of the continental slope from 180 m (590 ft) to about 730 m (2,395 ft), but concentrations are usually found at depths of between 250 m (820 ft) and 475 m (1,558 ft) over blue/black mud, sand, muddy sand, or white calcareous mud. Though data on growth and reproduction is limited, it is likely that royal red shrimp do not fully recruit to fishing gear until age 2, and they can probably live up to 5 years. Because data are so limited, royal red shrimp abundance must be estimated by landing data. Landings in this region have averaged approximately 225,000 pounds over the last 5 years. Concerns over overfishing a relatively long-lived species have led to conservative catch limits in the Gulf of Mexico fishery (GMFMC 1995), and similar constraints should be observed in the south Atlantic, until estimates of abundance and sustainable yield can be made.

Golden Crab

Golden crabs occupy offshore oceanic waters along the Atlantic and Gulf of Mexico coasts as adults. In a subsequent study using a submersible, Wenner and Barans (1990) found the greatest abundance in rock outcrops. Feeding habits are very poorly known. Golden crabs are often categorized as scavengers that feed opportunistically on dead carcasses deposited on the bottom from overlying waters (Hines 1990). The male crab is larger than female. Their reproductive tracts are typical of brachyurans. Light and electron microscopic studies of the testes and vasa deferentia at various times during the year indicate that golden crabs have a single reproductive season. The golden crab fishery is extremely small, only 11 permits total. For all of the permitted vessels, the golden crab fishery is their primary fishery, and they do not target other marine species for the purpose of revenue creation. Therefore, the fisheries' ability to withstand a sudden drop or constant fluctuations in golden crab abundance and subsequent harvest rate fluctuations is minimal.

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

The goal of this step is to determine whether South Atlantic deepwater corals, shrimp, and golden crab populations are approaching a condition where additional stresses could have an important cumulative effect beyond any current plan, regulatory, or sustainability threshold (CEQ 1997). Sustainability thresholds can be identified for some resources, which are levels of impact beyond which the resources cannot be sustained in a stable state. Other thresholds are established through numerical standard, qualitative standards, or management goals. This CE-BA addresses whether thresholds could be exceeded because of the contribution of the proposed action to other cumulative activities affecting resources.

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 reed 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 not a specific definition of an overfished condition of coral species in the South Atlantic; however, Coral Amendment 5 (SAFMC 1998c) defines overfishing as an annual harvest that exceeds OY.

It is more likely that not implementing the CHAPCs in this amendment would allow low abundance thresholds to be exceeded, while implementing the measures would be expected to prevent such an event from occurring.

Shrimp

Quantitative definitions of overfishing and overfished for rock shrimp are identified in Shrimp Amendments 2 (SAFMC 1996b), 4 (SAFMC 1998c) and 6 (SAFMC 2005). Royal red shrimp are not a federally managed species therefore management reference points have not been established for the species.

Maximum Sustainable Yield

Shrimp Amendment 6 (SAFMC 2002) established a stock status determination criteria for rock shrimp consistent with those of penaeid shrimp, where MSY/OY for rock shrimp is the mean total landings for the South Atlantic during 1986 through 2000 (4,912,927 pounds heads on), where overfishing for rock shrimp would be a fishing mortality rate that led to annual landings larger than two standard deviations (9,774,848 pounds heads on) above MSY (4,912,927 + 9,77,848 = 14,687,775 pounds heads on) for two consecutive years, and minimum sustainable stock threshold would be a parent stock size less than ½ biomass at MSY (B_{msy}) for two consecutive years.

Optimum Yield

OY is equal to MSY. The intent is to allow the amount of harvest that can be taken by U.S. fishermen without reducing the spawning stock below the level necessary to ensure adequate reproduction. This is appropriate for an annual crop like rock shrimp when recruitment is dependent on environmental conditions rather than female biomass. A relatively small number of mature shrimp can provide sufficient recruits for the subsequent year's production (SAFMC 1996b).

Overfished Definition

The South Atlantic rock shrimp resource is overfished when a parent stock size is less than ½ B_{msy} for two consecutive years. High fecundity enables rock shrimp to rebound from a very low population size in one year to a high population size in the next when environmental conditions are favorable (SAFMC 1996).

Overfishing Definition

Shrimp Amendment 6 (SAFMC 2005) established the overfishing definition as a rate that leads to annual landings larger than two standard deviations above MSY (14,687,775 pounds heads on) for two consecutive years.

Overfishing thresholds would not be exceeded as a result of the proposed actions in addition to other cumulative activities affecting this resource.

Golden Crab

Quantitative definitions of overfished and overfishing for the golden crab resource in the South Atlantic are identified in Amendment 2 (1998).

Maximum Sustainable Yield

Golden Crab Amendment 2 (SAFMC 1998c) states MSY was should not be specified for the South Atlantic, but as soon as sufficient information becomes available to calculate MSY, the framework procedure in the Golden Crab FMP (SAFMC 1995) will be used to incorporate the MSY figures into the FMP.

Optimum Yield

OY is all golden crab that are harvested legally under the provisions of the golden crab FMP which is equivalent to that level of golden crab harvest that would minimize user conflict among vessels, minimize the cost of fishing, produce a stable level of landings that would maximize returns to the fishermen, provide for a stable supply, and minimize management costs.

Overfished and Overfishing Definitions

Currently there is not a specific definition of an overfished condition of golden crab in the South Atlantic; however, Golden Crab Amendment 2 (SAFMC 1998c) defines overfishing as any rate of fishing mortality in excess of F_{msy}, where the maximum allowable fishing mortality rate is estimated to equal the natural mortality rate of mature male crabs; in-season fishing mortality rate may be based on a change in the in-season ratio of catch-per-unit (CPUE) effort of legal to mature male crabs or proportionate reduction in average weekly CPUE.

Overfishing thresholds would not be exceeded as a result of the proposed actions in addition to other cumulative activities affecting this resource.

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.

Coral
Deepwater corals are varied in their colony densities, as well as growth rates. A full description of the deepwater coral species impacted through this amendment appears in **Section 3.2.1.1** of this document and is hereby incorporated by reference as baseline information.

Shrimp
Rock shrimp are annual crops that fluctuate considerably from year to year depending primarily on environmental factors. Population size is regulated by environmental condition, and while fishing certainly reduces the population size over the course of the season, fishing is not believed to have any impact on subsequent year class strength unless the spawning stock has been reduced below a minimum level by environmental conditions (SAFMC 1993). Because of this, one could consider the baseline to be reset every year.

Royal red shrimp are found in large concentrations primarily off northeast Florida. They inhabit the upper regions of the continental slope from 180 m (590 ft) to about 730 m (2,395 ft), but concentrations are usually found at depths of between 250 m (820 ft) and 475 m (1,558 ft) over blue/black mud, sand, muddy sand, or white calcareous mud. They have been commercially harvested in a relatively limited capacity. Landings in this region have averaged approximately 225,000 pounds over the last 5 years. Royal red shrimp are not a federally managed species therefore management reference points have not been established for the species.

Golden Crab
Golden crab is not listed as being overfished in the NMFS 2007 Report to Congress on Status of Fisheries of the United States. Considering the small number of fishery participants it is unlikely that golden crab may be fished above a sustainable level in the near future.

DETERMINING THE ENVIRONMENTAL CONSEQUENCES OF CUMULATIVE EFFECTS

8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.
The relationship between human activities and biophysical ecosystems within the context of this CE-BA is solely related to extractive activities and the installment of regulations as outlined in **Table 4-16**. *Note: royal red shrimp are not a federally managed species, therefore no cause-and-effect relationships between human activities and the installment of regulations are depicted in this table.*

Table 4-16. Cause and effect relationships between human activities and resources, ecosystems and human communities.

Time period/dates	Cause	Observed and/or Expected Effects
1982	Coral FMP Set OY for stony corals at zero accept as may be authorized for scientific purposes. (SAFMC 1982)	Measures contained in the Coral FMP limited the harvest of various coral species in the South Atlantic Region.
1991	SAFMC allowed concurrent closure of EEZ adjacent to closed state waters after cold winter kills. Restricted trawling areas and mesh size, and defined MSY, and OY for white shrimp, and established overfishing criterion for white shrimp. (South Atlantic Shrimp FMP, SAFMC 1991)	Reduced fishing effort during times of lower stock abundance. Reduced bycatch of unmarketable fish.
1995	Golden Crab FMP (SAFMC 1995b) Finalized. Implemented various management measures to ensure a sustainable golden crab fishery.	Prevented overcapitalization of the fishery, defined allowable gear types, prohibited retention of females, and established dealer reporting requirements.
1995	Established a live rock aquaculture permit system, prohibited anchoring of fishing vessels in the Oculina Bank.	Allowed for the controlled growth of live rock through aquaculture, and protected fragile Oculina coral from anchor damage.
1996	Require federal rock shrimp permit, trawling area limited. (SAFMC 1996a)	Enhanced existing federal regulations for coral and snapper grouper by protecting EFH, coral, and the Oculina Bank HAPC from trawl related damage.
1996	Required use of BRDs in all penaeid shrimp trawls in the South Atlantic EEZ. (SAFMC 1996b)	BRDs reduced bycatch, and standardized BRD certification criteria and testing protocol.
1997	Golden Crab Framework Seasonal Adjustment to extend the use of cable for mainlines for one year, and limit vessel size indicated on the original permit issued to the original permit holder (SAFMC 1997)	The one year period allowed for an evaluation and transition period thereby minimizing impacts on affected fishermen. Limiting vessel size allowed permit holder to fish a smaller vessel under their permit and to then return to the size vessel indicated on the original permit, this preventing an expansion of effort through capital stuffing.

Table 4-16. Continued. Cause and effect relationships between human activities and resources, ecosystems and human communities.

1998	Defined EFH and EFH-HAPCs for South Atlantic shrimp resource. (SAFMC 1998a)	Created protections for South Atlantic shrimp EFH.
1998	Defined Golden Crab EFH for South Atlantic Region (SAFMC 1998a)	Created protections under the EFH consultation process for South Atlantic Golden crab EFH.
1998	Defines coral EFH for the South Atlantic Region (SAFMC 1998a)	Created protections under the RFH consultation process for South Atlantic coral.
1998	Expanded the Oculina HAPC to include the area closed to rock shrimp harvest (SAFMC 1998c)	No person may use bottom longline, bottom trawl, dredge, pot or trap, anchors and chains, or grapples and chains. No one may fish for rock shrimp or possess rock shrimp in or from the area on board a fishing vessel, or possess *Oculina* coral.
1998	Established a reporting requirement and designated biological reference points (SAFMC 1998c)	Enhanced and supplemented existing data for the shrimp fishery, and helped to inform future management actions.
2000	20% increase for golden crab vessels from the size on the original permit, specified status determination criteria, removed 5,000 lb landing requirement as a condition for permit renewal. (SAFMC 2000)	Amendment 3 to the Golden Crab FMP implemented measures to ensure the sustainability of the fishery and its infrastructure while preventing overfishing of the golden crab resource.
2002/2003	Established rock shrimp limited access program, required vessel operators permit, established minimum mesh size for tail bag, required use of VMS in rock shrimp limited access fishery. (SAFMC 2002a)	Reduced number of latent permits in the rock shrimp fishery, and helped rock shrimpers avoid catching small unmarketable shrimp. Use of VMS enhanced enforcement of the limited access rock shrimp fishery.
2005	Specified reduction in total weight of finfish of at least 30% for new BRDs to be certified; adopted the ACCSP release, discard and protected species module; and required BRDs on all rock shrimp trips in the South Atlantic (SAFMC 2005)	Reduced the level of catch allowed for a BRD to be certified, thereby reducing bycatch overall; will be able to more accurately assess bycatch mortality; and reduce bycatch in the rock shrimp fishery.

Table 4-16. **Continued.** Cause and effect relationships between human activities and resources, ecosystems and human communities.

2008 (Under development)	Do away with current rock shrimp landing requirement for limited access endorsement; reinstate endorsement lost due to not meeting the rock shrimp landing requirement, reinstate endorsements lost due to failure to renew, change endorsement and permit names; require proof of VMS for endorsement renewal or transfer; and require the collection of economic data (SAFMC 2008).	Expected to help maintain the rock shrimp fishery at a sustainable level, while still preventing overexploitation of the fishery. Expected to clarify any confusion about the endorsement vs. permit names and application process, improve enforcement of closed areas, and ensure the collection of economic data to fill large economic data gaps for the rock shrimp fishery.

9. Determine the magnitude and significance of cumulative effects.

Past, present, and reasonably foreseeable future actions probably have not and would not have a significant, adverse effect on the coral, shrimp, or golden crab resource. Management actions in the CE-BA would be expected to yield minimal cumulative effects on the biological environment. There would be no increase or decrease of fishing effort or fishing pressure on target species as a result of this amendment. Impacts to coral would be positive due to increased protective measures that would be implemented through rulemaking.

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

The cumulative effects on the biophysical environment are expected to be negligible. Therefore, avoidance, minimization, and mitigation are not necessary.

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

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

4.6.1.1 Effects on protected species

Cumulative effects, as defined under the Endangered Species Act (ESA), refer to any known unrelated, future, non-federal activities reasonably certain to occur within the action area that are likely to affect listed or proposed species. Future federal action requiring separate consultation (unrelated to the proposed action) are not considered in the CE-BA section.

ESA-listed species that occur within areas where the proposed CHAPCs would be located and that may be impacted by unrelated, future, non-federal activities reasonably certain to occur within the action area include:

Marine Mammals

For listed whales occurring within the action area, the potential for adverse effects from the southeast Atlantic shrimp fishery executed within the action area are unlikely. However, these whale species may incur negative impacts from other sources such as disease, vessel strikes, entanglements in other fishery's gear, and habitat degradation due to chemical and noise pollution, as well as marine debris. These impacts may cause adverse effects on a population's overall recovery. For detailed descriptions on cumulative impacts to listed whale species found in the action area see Warring *et al*. (2002).

Sea Turtles

To fully assess the recovery of sea turtles, the full range of human and natural phenomena need to be considered. Hurricanes may have potentially negative effects on the survival of eggs or on nesting habitat itself if the beach is greatly reduced. Human-related activities pose multiple threats such as: entanglement in fishing gear; diminished nesting success due to coastal development and artificial lighting on nesting beaches; degradation of the marine habitat by chemical pollution and marine debris; and the direct (legal or illegal) taking of eggs or individual turtles. The impacts of many of these activities are under-monitored, particularly on the international level. NOAA Fisheries Service has estimated that thousands of sea turtles of all species are incidentally or intentionally caught or killed annually by international activities (NOAA Fisheries Service 2001).

Some anthropogenic mortality that contributed to the decline of sea turtles has been mitigated since sea turtles were listed under ESA. Examples include the use of turtle excluder devices in shrimp trawlers, reduction or closure of certain fisheries that use entangling nets, and prohibiting the harvest of eggs and nesting females in the U.S. as well as other areas (for further information on sea turtle impacts see NOAA Fisheries Service 2001).

Fish

Smalltooth sawfish are extremely vulnerable to overexploitation because of their tendency to become entangled in nets, their restricted habitat, and low rate of population growth. Smalltooth sawfish are vulnerable to incidental capture in various fisheries including gillnet, otter trawl, trammel net, seine, and to a lesser degree, hand line (NOAA Fisheries Service 2000). Due to this species' dependence on coastal habitat, loss and degradation of coastal habitat by urban development, agriculture, and channel dredging have also contributed to their decline. Marine pollutants may also negatively impact the smalltooth sawfish, particularly because of its slow growth and late maturation.

4.6.2 Socioeconomic

A description of the human environment and associated key fishing communities is contained in **Section 3.4** and incorporated herein by reference. A description of the history of management of the shrimp fishery is contained in **Section 1.3** and is incorporated herein by reference. Participation in and the economic performance of shrimp and golden crab

fisheries have been effected by a combination of regulatory, biological, social, and external economic factors.

Given the variety of factors that affect fisheries, persistent data issues, and the complexity of trying to identify cause-and-effect relationships, it is not possible to differentiate actual or cumulative regulatory effects from external cause-induced effects. For each regulatory action, expected effects are projected. However, these projections typically only minimally, if at all, are capable of incorporating the variety of external factors, and evaluation in hindsight is similarly incapable of isolating regulatory effects from other factors.

It can be stated that the regulatory environment for all fisheries has become progressively more complex and burdensome, increasing, in tandem with other adverse influences, the pressure on economic losses, business failure, occupational changes, and associated adverse pressures on associated families, communities, and industries. Some reverse of this trend is possible and expected. However, certain pressures would remain, such as total effort and total harvest considerations, increasing input costs, import induced price pressure, and competition for coastal access.

Detailed descriptions of the expected social and economic impacts of the actions in this amendment are contained elsewhere in **Section 4.0**, and in **Sections 5.0** and **6.0**, and are incorporated herein by reference. The actions contained within this amendment are expected to serve as greater protections of fragile deepwater coral species, while still allowing deepwater shrimpers and golden crab fishermen to continue to prosecute these fisheries as they always have.

4.6.3 Administrative

The cumulative impacts of the preferred alternatives contained within this amendment when considered with those of past, present, and reasonably foreseeable actions may be moderate in the short term and minimal in the long term. Prior to, and upon implementation of, actions in the CE-BA, several forms of outreach materials in the form of letters, fishery bulletins, web sites, and notices will need to be developed to inform vessel owners of CHAPC boundaries. Additionally, early coordination with offices of Law Enforcement, VMS Monitoring, General Counsel, and Sustainable Fisheries, would be necessary to change current regulatory text, implement the actions, and enforce new CHAPC boundaries. This would compound the present workload in several regional offices that are carrying out duties associated with management measures already implemented for other fisheries throughout the region.

4.7 Bycatch Practicability Analysis

The Council is required by MSFCMA §303(a)(11) to establish a standardized bycatch reporting methodology for federal fisheries and to identify and implement conservation and management measures that, to the extent practicable and in the following order: (A) minimize bycatch and (B) minimize the mortality of bycatch that cannot be avoided. The MSFCMA defines bycatch as "fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch-and-release fishery management program" (MSFCMA §3(2)). Economic discards are species that are discarded because they are undesirable to the harvester. This category of discards generally includes certain species, sizes, and/or sexes with low or no market value. Regulatory discards are species required by regulation to be discarded, but also include fish that may be retained but not sold.

NMFS outlines at 50 CFR §600.350(d)(3)(i) ten factors that should be considered in determining whether a management measure minimizes bycatch or bycatch mortality to the extent practicable. These are:

1. Population effects for the bycatch species;
2. Ecological effects due to changes in the bycatch of that species (effects on other species in the ecosystem);
3. Changes in the bycatch of other species of fish and the resulting population and ecosystem effects;
4. Effects on marine mammals and birds;
5. Changes in fishing, processing, disposal, and marketing costs;
6. Changes in fishing practices and behavior of fishermen;
7. Changes in research, administration, enforcement costs and management effectiveness;
8. Changes in the economic, social, or cultural value of fishing activities and non-consumptive uses of fishery resources;
9. Changes in the distribution of benefits and costs; and
10. Social effects.

Agency guidance provided at 50 CFR §600.350(d)(3)(ii) suggests the Councils adhere to the precautionary approach found in the Food and Agriculture Organization of the United Nations (FAO) Code of Conduct for Responsible Fisheries (Article 6.5) when faced with uncertainty concerning these ten practicability factors. According to Article 6.5 of the FAO Code of Conduct for Responsible Fisheries, using the absence of adequate scientific information as a reason for postponing or failing to take measures to conserve target species, associated or dependent species, and non-target species and their environment, would not be consistent with a precautionary approach.

4.7.1 Population Effects for the Bycatch Species

4.7.1.1 Background

Actions in this CE-BA are intended to prohibit damaging gear from operating in deepwater coral habitat. The action will have a positive impact on reducing the potential for bycatch interactions to the degree it reduces interaction of gear, habitat, and deepwater species that may be directly or indirectly affected by habitat damage or unintended capture. **Action 1** in **Section 4.1** identifies the proposed CHAPCs.

> ***Action 1.*** *Amend the Coral, Coral Reefs and Live/Hardbottom Habitat FMP to Establish Deepwater Coral HAPCs (CHAPCs).*
>
> ***Alternative 1. No action.*** *Do not establish deepwater CHAPCs.*
>
> ***Alternative 2.*** *Establish deepwater CHAPCs in one or more of the areas in sub-alternatives 2a-2e:.*
>
> ***Sub-alternative 2a.*** *Establish the Cape Lookout Lophelia Banks CHAPC;*
> ***Sub-alternative 2b.*** *Establish the Cape Fear Lophelia Banks CHAPC;*
> ***Sub-alternative 2c.*** *Establish the Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson-Miami Terrace) CHAPC;*
> ***Sub-alternative 2d.*** *Establish the Pourtales Terrace CHAPC; and*
> ***Sub-alternative 2e.*** *Establish the The Blake Ridge Diapir Methane Seep CHAPC.*

Detailed descriptions of deepwater coral areas proposed for CHAPC designation are provided in reports developed by S. Ross and J. Reed for the SAFMC in 2004 and 2006 (**Appendices A-D**). Some commercially valuable deepwater species congregate around deepwater coral habitat. Various crabs, especially galatheoids, are abundant on the deep reefs. Other invertebrates, particularly ophiuroids, populate the coral matrix in high numbers. Although some variability in fish fauna has been observed in the region, most of the deepwater coral habitat was dominated by relatively few fish species (**Table 3-1**). The commercially important species in the proposed areas include golden crab, royal red shrimp, blackbelly rosefish, red bream, and wreckfish. Landings of red bream and wreckfish are confidential.

There is a bottom longline fishery for snapper grouper species but it occurs in shallower water than proposed in **sub-alternatives 2a-2c**. Bottom longline gear is prohibited north of St. Lucie Inlet, Florida and does not impact **sub-alternatives 2d and 2e** in South Florida. Therefore, the proposed CHAPCs are not impacted by bottom longline gear. The primary gear types potentially impacting the proposed areas are traps in the golden crab fishery, trawls in the rock shrimp fishery, and hook-and-line gear in the wreckfish fishery.

The golden crab fishery operates in the area proposed as the Stetson-Miami Terrace CHAPC (**sub-alternative 2c**) and in a small portion of the proposed Pourtales Terrace CHAPC (**Sub-alternative 2d**). While fishing for golden crab in the Southern Zone occurs east and west of the proposed Pourtales CHAPC (**sub-alternative 2d**), all harvest in the Middle Zone occurs

in the mud, sand, and shell areas in the Stetson-Miami Terrace CHAPC (**sub-alternative 2c**). It is expected that the CHAPCs proposed in **Alternative 2** of **Action 1** would protect habitat for golden crab, royal red shrimp, and wreckfish, among other species. The proposed Stetson-Miami Terrace and Pourtales Terrace CHAPCs encompass almost all of the traditional fishing grounds for golden crab.

In the U.S. EEZ off the east coast of Florida, the royal red shrimp fishery operates south of the 30 degree latitude line down to West Palm Beach and in water off the Florida Keys. Generally, when trawling, a vessel remains within a certain depth and may make several trawls at that depth. Trawling depth in the royal red shrimp fishery off Florida can vary from 1,000 feet to 1,800 feet (off the Florida Keys). Vessels trawl in straight lines with the current and at the same depth at a maximum speed of 2 ½ knots. According to data analyses conducted on VMS data by NMFS SEFSC, less than 1% of VMS points collected between 2003 and 2007 and identified as engaged in royal red fishing occurred within the proposed Stetson-Miami Terrace CHAPC. The royal red shrimp fishery operates almost exclusively inshore of the 400 meter (1,312 ft.) contour, which is the western boundary of the deepwater habitat being protected by the proposed Stetson-Miami Terrace CHAPC under **sub-alternative 2c**.

The wreckfish fishery, which also captures red bream, occurs within the proposed CHAPCs. Wreckfish are harvested using a 30-50 pound sinker, cable, and terminal rig while motor fishing (SAFMC 1991). However, it is unknown if this harvest technique has any impacts on bottom habitat. Submersible dive observations have shown wreckfish associated with coral mounds (comprised mostly of dead corals) and hardbottom habitat with individual clumps of bamboo coral and small *Lophelia* colonies (G. Sedberry, personal communication). It is the Council's intent to assess whether gear impacts from the wreckfish fishery are likely to jeopardize the integrity of deepwater coral habitat in the South Atlantic region in a future plan amendment. The use of bottom longlines is prohibited in this fishery.

The fisheries for golden crab, royal red shrimp, wreckfish, and red bream are entirely commercial. There could be some catch of blackbelly rosefish by the recreational sector but it would be minor. There are no recreational landings of blackbelly rosefish from the MRFSS or headboat data bases.

4.7.1.2 Commercial Fishery

Snapper Grouper

During 2001 to 2006, approximately 20% of snapper grouper permitted vessels from the Gulf of Mexico and South Atlantic were randomly selected to fill out supplementary logbooks. A small number of trips that reported discards but did not report numbers or species were not included in analyses. On average, the number of trips per year during 2001 to 2006 was 15,500 (**Table 4-17**). Fishermen spent an average of 1.70 days at sea per trip.

Table 4-17. Snapper grouper fishery effort for South Atlantic.
Source: NMFS SEFSC Logbook Program.

YEAR	Trips	Days	Days per Trip
2001	17,283	29,940	1.73
2002	17,231	29,683	1.72
2003	16,586	27,680	1.67
2004	15,060	24,911	1.65
2005	13,773	22,880	1.66
2006	13,067	22,926	1.75
Mean	15,500	26,337	1.70

Values for blackbelly rosefish and wreckfish were included in the discard logbook database. There were very few wreckfish or blackbelly rosefish discarded. However, wreckfish data are confidential and cannot be presented here. Since the discard logbook database represents a sample, data were expanded to estimate the number of discard fish in the whole fishery. The method of expansion was to (1) estimate the probability of discarding a species; (2) estimate the number of fish discarded per trip; and (3) estimate the number discarded in the whole fishery (total discarded = total trips * discard probability * discard number). During 2001-2006, an average of 43 blackbelly rosefish were discarded per year (**Table 4-18**).

Table 4-18. Discard information for blackbelly rosefish including number of trips reporting discards, percentage of trips with blackbelly rosefish discards, number of discards report, and expanded number of discards.

Year	# trips reporting discards	% of trips	unexpanded discards	expanded discards
2001	7	0.60%	8	118
2002	3	0.11%	6	38
2003	0	0.00%	0	0
2004	3	0.10%	20	104
2005	0	0.00%	0	0
2006	0	0.00%	0	0
Mean	2	0.14%	6	43

The 50 most commonly discarded species are shown in **Table 4-19**. Blackbelly rosefish and wreckfish were very rarely discarded.

Table 4-19. The 50 most commonly discarded species during 2001-2006 for the South Atlantic.

Species	Number trips reported discarding the species	Number discarded
SEA BASS, ATLANTIC, BLACK, UNC	526	98,206
PORGY, RED, UNC	907	60,138
SNAPPER, VERMILION	743	55,144
MENHADEN	162	22,445
SHARK, DOGFISH, SPINY	138	22,193
SNAPPER, YELLOWTAIL	1496	14,134
SNAPPER, RED	358	9,867
SEA BASS, ROCK	115	9,469
SCAMP	720	8,937
GRUNT, WHITE	71	4,518
FINFISHES, UNC, BAIT, ANIMAL FOOD	43	4,351
GROUPER, GAG	609	4,258
KING MACKEREL and CERO	584	4,193
GROUPERS	73	3,858
GRUNTS	153	3,780
SHARK, ATLANTIC SHARPNOSE	143	3,654
SHARK, DOGFISH, UNC	50	3,043
GROUPER, RED	580	2,986
GROUPER, BLACK	424	2,891
SHARK, UNC	375	2,702
GRUNT, TOMTATE	23	2,652
HIND, SPECKLED	202	2,444
AMBERJACK, GREATER	327	2,120
SHARK, BLACKTIP	163	2,042
SNAPPER, MANGROVE (Duplicate of 3760)	203	2,035
BLUEFISH	50	1,799
TRIGGERFISH, GRAY	118	1,655
KING MACKEREL	241	1,647
SHARK, SANDBAR	97	1,544
TRIGGERFISHES	133	1,500
BALLYHOO	31	1,472
TUNA,LITTLE (TUNNY)	242	1,364
SHARK, DOGFISH, SMOOTH	34	1,339
DOLPHINFISH	192	1,225
BONITO, ATLANTIC	252	1,139
BLUE RUNNER	162	1,084
SCUPS OR PORGIES, UNC	101	1,028
SKATES	42	1,020
SNAPPER, MANGROVE	126	944
FINFISHES, UNC FOR FOOD	110	919
SHARK, TIGER	64	918
BARRACUDA	178	848

Table 4-19. Continued. The 50 most commonly discarded species during 2001-2006 for the South Atlantic.

Species	Number trips reported discarding the species	Number discarded
AMBERJACK	191	797
SPANISH MACKEREL	85	782
SNAPPERS, UNC	28	702
PINFISH, SPOTTAIL	38	571
SNAPPER, MUTTON	184	560
STINGRAYS	49	507
CHUBS	27	493
AMBERJACK, LESSER	10	489

Royal Red Shrimp

One important difference in the effects of the shrimp trawl fishery and directed fisheries on finfish is fishes taken in shrimp trawls are generally small and young. Juveniles are more expendable in one respect because they occur in high numbers, and relatively few actually survive to adulthood. But the reproductive potential of a stock can be compromised if fish are not provided sufficient opportunities to reproduce before they are exposed to fishing or bycatch mortality. The risk of stock collapse increases markedly if the fish are subject to fishing or bycatch mortality before they mature (Myers and Mertz 1998).

The current level of bycatch in the penaeid shrimp trawl fishery continues to be substantial despite these advancements in bycatch reduction. However, bycatch mortality is incorporated in assessments of finfish stocks if estimates are available (e.g., weakfish and sharks). Additionally, the sustainability of finfish species taken as bycatch in shrimp trawls does not appear to be threatened by this source of mortality (Nance 1998).

The royal red fishery utilizes the same vessels and gear as that used in the rock shrimp fishery. In addition, many rock shrimp fishermen also participate part-time in the royal red shrimp fishery. Off Florida's east coast, as many as 15 vessels once participated in this fishery on a full-time basis. Currently, only two vessels fish for royal red shrimp full-time in the South Atlantic EEZ (W. Moore, personal communication) with 6 total vessels fishing in this season with most also fishing for rock shrimp and penaeid shrimp. In the Gulf of Mexico, less than one percent of the estimated 2,600 shrimp vessels land royal red shrimp in any given year (GMFMC 2005a).

The South Atlantic royal red shrimp fishery is prosecuted in the U.S. EEZ in depths from 1,080 to 1,260 feet (330 - 380 meters) (W. Moore, personal communication) to just over 1,320 feet (400 meters) (M. Solorzano, personal communication). Elsewhere, reported depth for this fishery ranges from 800 feet to more than 1,800 feet (250-550 m) (Perry and Larson 2004, Rezak *et al*. 1985, Alabama Sea Grant, 1987). Because of the depths in which this fishery operates, no Turtle Excluder Devices (TEDs) or Bycatch Reduction Devices (BRDs) are required off the east coast of Florida.

No observer trips or bycatch study exists pertaining to bycatch in the royal red shrimp fishery; however, there are some bycatch data for the rock shrimp fishery. The most recent

information on bycatch in this rock shrimp fishery comes from a preliminary report of a NOAA Fisheries Service observer study conducted during September 2001 through September 2006. The main findings in this report are:

1. Rock shrimp comprised 19% of the catch by weight and 28% by number.
2. Penaeid shrimp comprised 4% of the catch by weight and 3% by number.
3. Finfish comprised 49% of the catch by weight and 30% of the catch by number.

Little is known about the status of finfish (e.g., dusky flounder, inshore lizardfish, spot, and red goatfish) and invertebrate (e.g., iridescent swimming crab, longspine swimming crab, and blotched swimming crab) species present in rock shrimp trawl bycatch in the greatest numbers. None of these species have undergone (or are likely to undergo) formal stock assessments because most, with the exception of spot, are not targeted in commercial or recreational fisheries. Data are inadequate to conduct a formal, coast-wide assessment of spot. But fishery managers believe a combination of BRD and minimum size limit requirements is sufficient to protect this stock until such an assessment can be completed (ASMFC 2004).

Golden Crab

The golden crab fishery employs baited traps attached with gangions to a 5/8" polypropylene line up to 5 miles long. There are 50 traps per line, or "trawl," set 400 feet apart. Fishermen may fish 4 trawls in a two-week period pulling 100 traps one week and 100 the next (Howard Rau, Golden crab AP). Twenty to 30 lbs of crabs per trap is a desirable catch. On a good season, fishermen may catch 70 to 100 lbs per trap. All females and individuals weighing less than 1¼ pounds are released back into the water. Only male crabs are harvested because, since the beginning of this fishery, fishermen felt that an integral factor in the sustainable harvest of this resource was not to harvest the females. In addition, females are smaller than males and therefore less marketable.

On an observed trip, three trawls were retrieved (about 100 traps) out of which only 20-25 crabs were discarded. Such a low number of crabs are released upon trap retrieval because the majority of the culling is being accomplished through the escape panels while the traps are still submerged. Thus, escape gaps are very effective in culling out undersized individuals.

Degradable wire is used to lock the traps. To open the trap, the wire is simply cut. Since the main trap door is shut using degradable wire, ghost fishing is not a concern if the trap becomes lost. In addition, traps are required to have two escape gaps on either side of the trap to allow females and small individuals to escape.

4.7.1.3 Recreational Fishery

Given the distance from shore, depth of water, and gear required, there is no recreational fishery for wreckfish or royal red shrimp. There could be some catch of blackbelly rosefish by the recreational sector but it would be minor. There are no recreational landings of blackbelly rosefish from the MRFSS or headboat data bases.

4.7.1.4 Practicability of Management Measures in Directed Fisheries Relative to their Impact on Bycatch and Bycatch Mortality

Management measures proposed in the CE-BA would establish up to five CHAPCs from North Carolina to southern Florida. Currently, there is probably very little bycatch within the proposed areas since there is a small amount of fishing currently taking place. The proposed actions in the amendment would minimize any future bycatch in the proposed CHAPCs by: 1) prohibiting use of bottom longline, trawls (mid-water and bottom), dredge, pot, or trap; 2) prohibiting use of anchor and chain, or use a grapple and chain; 3) prohibiting possession of any species regulated by the coral FMP; and 4) restricting fishing for golden crab and royal red shrimp to designated areas. The proposed Shrimp Fishery Access Area will limit operations to traditional fishing areas in the western edge of the Stetson-Miami Terrace CHAPC where they will not impact deepwater coral habitat. Golden crab fishermen propose limiting their operations to traditional fishing areas in the CHAPC where they will not impact deepwater coral habitat. To validate their operations, the golden crab fishermen have recommended monitoring vessels in the fishery. Golden crab fishermen have indicated a desire to, through cooperative research, use technology where available to refine fishing operations and better define golden crab habitat. **Action 4** proposes requiring vessel monitoring in the golden crab fishery.

4.7.2 Ecological Effects Due to Changes in the Bycatch of the Species

The ecological effects of bycatch mortality are the same as fishing mortality from directed fishing efforts. If not properly managed and accounted for, either form of mortality could potentially reduce stock biomass to an unsustainable level. Currently, there is probably very little bycatch within the proposed areas since there is not much fishing taking place. The proposed actions in the amendment would minimize any future bycatch in the proposed CHAPCs by: 1) prohibiting use of bottom longline, trawls (mid-water and bottom), dredge, pot, or trap; 2) prohibiting use of anchor and chain, or use a grapple and chain; 3) prohibiting possession of any species regulated by the coral FMP; and 4) restricting fishing for golden crab and royal red shrimp to designated areas. Therefore, establishment of deepwater CHAPCs will likely result in positive ecological benefits in the community structure and species diversity of deepwater ecosystems occupied by these species.

The Comprehensive Allowable Catch Limits (ACL) Amendment (SAFMC in prep.) for species in all FMPs not experiencing overfishing could propose additional measures to reduce bycatch in the golden crab, royal red shrimp, and wreckfish fisheries. In addition, the Council may consider further amending the Shrimp FMP to include royal red shrimp into the fishery management unit.

4.7.3 Changes in Bycatch of Other Fish Species and Resulting Population and Ecosystem Effects

Establishment of deepwater CHAPCs along with actions to: 1) prohibit use of bottom longline, trawls (mid-water and bottom), dredge, pot, or trap; 2) prohibit use of anchor and chain, or use a grapple and chain; 3) prohibit possession of any species regulated by the coral FMP; and 4) restrict of fishing for golden crab and royal red shrimp to designated areas are intended to preserve pristine areas from habitat damage. These proposed actions would prevent fisheries from expanding into the proposed areas along with associated bycatch.

Therefore, the actions in CE-BA will likely result in long-term, positive ecological benefits and prevent disruptive changes that could occur in the community structure of reef ecosystems if fisheries with damaging were to move into the proposed areas.

4.7.4 Effects on Marine Mammals and Birds

Under Section 118 of the Marine Mammal Protection Act (MMPA), NMFS must publish, at least annually, a List of Fisheries (LOF) that places all U.S. commercial fisheries into one of three categories based on the level of incidental serious injury and mortality of marine mammals that occurs in each fishery.

Right and humpback whales may overlap both spatially and temporally with the black sea bass pot fishery. Measures to reduce entanglement risk in pot/trap fisheries for these two species are being addressed under the revised Atlantic Large Whale Take Reduction Plan (70 FR 118; June 21, 2005).

The Bermuda petrel and roseate tern occur within the action area. Bermuda petrels are occasionally seen in the waters of the Gulf Stream off the coasts of North and South Carolina during the summer. Sightings are considered rare and only occurring in low numbers (Alsop 2001). Roseate terns occur widely along the Atlantic coast during the summer but in the southeast region they are found mainly off the Florida Keys (unpublished USFWS data). Interaction with South Atlantic fisheries has not been reported as a concern for either of these species.

4.7.5 Changes in Fishing, Processing, Disposal, and Marketing Costs

(Insert after Dec 2008 Council meeting)

4.7.6 Changes in Fishing Practices and Behavior of Fishermen

Analyses of the royal red shrimp fishery operations provided by NMFS SEFSC, as represented by the VMS data, indicates over five years of operations (2003-2007), less than 1% of all points collected have occurred east of the proposed CHAPC boundary. Given the overall low percent of trips fishing deeper than the 400 meter (1,312 ft.) contour, vessels should be able to easily recoup the minimal loss of fishing area by adding as little as 1 trip outside the deepwater CHAPC. The proposed Shrimp Fishery Access Area will limit operations to traditional fishing areas in the western edge of the CHAPC where they will not impact deepwater coral habitat. Golden crab fishermen propose limiting their operations to traditional fishing areas in the CHAPC where they will not impact deepwater coral habitat. To validate their operations, the golden crab fishermen have recommended monitoring vessels in the fishery. Golden crab fishermen have indicated a desire to, through cooperative research, use technology where available to refine fishing operations and better define golden crab habitat. **Action 4** proposes requiring vessel monitoring in the golden crab fishery.

4.7.7 Changes in Research, Administration, and Enforcement Costs and Management Effectiveness

Bycatch in southeastern shrimp trawl fisheries has been a priority issue for scientists and administrators for a number of years but data are lacking for the royal red shrimp fishery. This focus is likely to continue as the Council addresses future management needs in the

fishery. Further, the magnitude of bycatch in golden crab traps has not been investigated. Some observer information has recently been provided by MARFIN and Cooperative Research Programs in the snapper grouper fishery but more is needed. Approximately 20% of snapper grouper commercial fishermen are asked to fill out discard information in logbooks; however, a greater percentage of fishermen could be selected with emphasis on individuals that dominate landings. Furthermore, the use of electronic logbooks could be enhanced to enable fishery managers to obtain information on species composition, size distribution, geographic range, disposition, and depth of fishes that are released. Additional administrative and enforcement efforts will be needed to implement and enforce these regulations.

4.7.8 Changes in the Economic, Social, or Cultural Value of Fishing Activities and Non-Consumptive Uses of Fishery Resources

Management measures, including those likely to decrease discards could result in social and/or economic impacts as discussed in **Section 4.0.**

The U.S. Congress recognized the need to balance the costs of bycatch reduction with the social and economic benefits provided by the shrimp fishery when it mandated the study of shrimp trawl bycatch (and potential gear modifications) through the 1990 Magnuson-Stevens Act reauthorization. The resulting cooperative bycatch research program identified gear options that could reduce shrimp trawl bycatch with minimum loss of shrimp production.

While BRD and TED requirements certainly present direct costs to participants in the shrimp fishery, they could reduce overall costs by increasing efficiency. Additionally, studies suggest the use of BRDs or similar techniques to reduce finfish capture would not negatively affect shrimp production in the long-term if finfish exhibit even moderate selectivity against shrimp as prey (Nance 1998).

Decreases in bycatch mortality attributed to these technologies are believed to have contributed to the survival and recovery of at least some sea turtle populations and finfish stocks. The societal benefits associated with recovering these species are not easily quantified, but are believed to outweigh any short-term costs to penaeid shrimp fishermen related to the required bycatch reduction technology.

4.7.9 Changes in the Distribution of Benefits and Costs

(Insert after Dec 2008 Council meeting)

4.7.10 Social Effects

The Social Effects of all the proposed management measures are described in **Section 4.0**.

4.7.11 Conclusion

This section evaluates the practicability of taking additional action to minimize bycatch and bycatch mortality in the South Atlantic snapper grouper fishery using the ten factors provided at 50 CFR 600.350(d)(3)(i). Actions in this CE-BA are intended to prohibit damaging gear from operating in deepwater coral habitat. The actions will have a positive impact on

reducing the potential for bycatch interactions to the degree it reduces interaction of gear, habitat and deepwater species that may be directly or indirectly affected by habitat damage or unintended capture. Management measures proposed in the CE-BA would establish up to five CHAPCs from North Carolina to southern Florida. Currently, there is probably very little bycatch within the proposed areas since there is not much fishing taking place. The proposed actions in the amendment would minimize any future bycatch in the proposed CHAPCs by: 1) prohibiting use of bottom longline, trawls (mid-water and bottom), dredge, pot, or trap; 2) prohibiting use of anchor and chain, or use a grapple and chain; 3) prohibiting possession of any species regulated by the coral FMP; and 4) restricting fishing for golden crab and royal red shrimp to designated areas. Therefore, establishment of deepwater CHAPCs will likely result in positive ecological benefits in the community structure and species diversity of deepwater ecosystems occupied by these species.

4.8 Unavoidable Adverse Effects

These regulatory actions proposed in this CE-BA would apply primarily to the golden crab and deepwater shrimp (royal red shrimp) fisheries prosecuted within the South Atlantic Council's area of jurisdiction. Under the proposed actions, these fisheries would be permitted to continue operating in traditional fishing areas where no damage to deepwater coral habitat is expected. In the future, however, these fisheries would not be allowed to expand into other areas located within the CHAPCs. Other fisheries that use bottom-tending gear or anchors would also be prohibited from expanding their operations into the CHAPCs.

4.9 Effects of the Fishery on the Environment

The biological impacts of the proposed actions are described in **Section 4.0**, including impacts on habitat. No actions proposed by this amendment are expected to have any adverse impacts on EFH or EFH-HAPCs for managed species. This amendment aims to protect EFH and create new deepwater CHAPCs. This document also updates the EFH and EFH-HAPC information by including spatial presentations of EFH and EFH-HAPCs for the Coral FMP, Shrimp FMP, Coastal Migratory Pelagics FMP, Golden Crab FMP, Spiny Lobster FMP, Dolphin Wahoo FMP, and Snapper Grouper FMP.

4.9.1 Damage to Ocean and Coastal Habitats

The proposed actions are expected to have beneficial effects on ocean and coastal habitats. The measures proposed by this amendment will create deepwater CHAPCs which will enhance the protection of these habitats. Other measures are proposed to allow for golden crab and shrimp fishing within the proposed CHAPCs but these measures will still offer more protection to these habitats than the current situation. **Action 2** will create shrimp fishery access areas within the proposed CHAPCs but fishing will be limited to areas that will not impact deepwater coral habitat. **Action 3** proposes measures for the golden crab fishery that creates allowable fishing zones that will allow fishing to continue in the historical fishing grounds without impacting deepwater corals. **Action 4** proposes the use of some type of vessel monitoring technology for the golden crab fishery. This proposed action will not result in any adverse impacts to the ocean and coastal habitats.

The Final EFH Rule, published on January 17, 2002, replaced the interim Final Rule of December 19, 1997 under which the original EFH and HAPC designations were made. The

Final Rule directs the Councils to periodically update EFH and HAPC information and designations within fishery management plans. This amendment contains information and spatial representation of available information of the distribution of EFH and EFH-HAPCs.

4.9.2 Public Health and Safety

The proposed actions are not expected to have any substantial adverse impact on public health or safety.

4.9.3 Endangered Species and Marine Mammals

The proposed actions are not expected to change the level of marine mammal or endangered species impacts from the status quo.

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

The Council weighed the short-term impacts upon the fishery against the long-term productivity and stability of this fishery and concluded that the proposed actions would result in net benefits to society. **Action 1** would create CHAPCs to protect deepwater coral habitat. While this action may have some negative short-term impacts on fishermen who fish inside the proposed areas, other actions described in the document would create allowable fishing zones to reduce the impact of this action on the fishermen. Creating the CHAPCs and protecting the deepwater habitat is expected to have positive effects on the long-term productivity of the area.

Action 2 would amend the coral FMP to create a four-part "Shrimp Fishery Access Area" (SFAA). This action is not expected to have any negative short-term impacts to the resource as it will create these zones in areas such that the fishery can continue to operate without impacting the bottom habitat. No short-term impacts to the fishermen are expected due to the fact that these areas are being created to allow fishermen access to historic fishing areas. No impacts to the long-term stability or productivity of the shrimp fishery due to this action are expected.

Action 3 would amend the coral FMP to create allowable golden crab fishing areas. This action is not expected to have any negative short-term impacts to the resource as these zones are in areas within the CHAPCs where the fishery can operate without impacting the bottom habitat. No short-term impacts to the fishermen are expected due to the fact that these areas are being created to allow fishermen access to historic fishing areas. This action will not reduce the fishing effort and will not restrict effort from areas that were not historically fished. No impacts to the long-term stability or productivity of the golden crab fishery are expected due to this action.

Action 4 would amend the golden crab FMP to require vessel monitoring for golden crab fishermen. While other forms of vessel monitoring exist, this action looks at VMS. This action would have short-term negative economic impacts on the fishery due to fishermen purchasing, installing, and maintaining the required VMS units. There may also be short-term social impacts related to the VMS installation. The installation of VMS is not expected to affect any short-term uses of the resource or fishery infrastructure.

The use of VMS is expected to have negative impacts on the long-term productivity of the golden crab fishery. VMS will severely restrict the golden crab fishermen from fishing in their traditional manner and will require them to limit their fishing areas to those within the middle of the allowable gear areas. VMS technology is not able to determine where the fishing gear is on the bottom and definitively provide law enforcement with such information. VMS has been determined not to be a practical or effective enforcement tool for this fishery.

4.11 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments are defined as commitments which cannot be reversed, except perhaps in the extreme long-term, whereas irretrievable commitments are lost for a period of time. None of the actions proposed by this amendment will result in irreversible or irretrievable commitments of resources.

4.12 Monitoring and Mitigation Measures

No actions in this amendment require establishing mitigation measures. **Action 4** relates to the monitoring of the golden crab fishery and proposes VMS equipment onboard vessels in this fishery. VMS technology is not able to determine where the fishing gear is on the bottom and definitively provide law enforcement with such information. VMS has been determined not to be a practical or effective enforcement tool for this fishery.

5 Regulatory Impact Review

Information for this section is contained within the amendment. The RIR is in development and will be completed prior Public Hearings.

6 Initial Regulatory Flexibility Analysis

Information for this section is contained within the amendment. The IRFA is in development and will be completed prior Public Hearings.

7 Fishery Impact Statement – Social Impact Assessment

Information for this section is contained within the amendment. The SIA/FIS is in development and will be completed prior Public Hearings.

8 Other Applicable Law

8.1 Administrative Procedures Act

All federal rulemaking is governed under the provisions of the Administrative Procedure Act (APA) (5 U.S.C. Subchapter II), which establishes a "notice and comment" procedure to enable public participation in the rulemaking process. Under the APA, NMFS is required to publish notification of proposed rules in the Federal Register and to solicit, consider and respond to public comment on those rules before they are finalized. The APA also establishes a 30-day wait period from the time a final rule is published until it takes effect, with some exceptions. This amendment complies with the provisions of the APA through the Council's extensive use of public meetings, requests for comments and consideration of comments. The proposed rule associated with this amendment will have request for public comments which complies with the APA.

8.2 Information Quality Act

The Information Quality Act (Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Public Law 106-443)) which took effect October 1, 2002, directed the Office of Management and Budget (OMB) to issue government-wide guidelines that "provide policy and procedural guidelines to federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information disseminated by federal agencies." OMB directed each federal agency to issue its own guidelines, establish administrative mechanisms allowing affected persons to seek and obtain correction of information that does not comply with OMB guidelines, and report periodically to OMB on the number and nature of complaints.

The NOAA Section 515 Information Quality Guidelines require a series of actions for each new information product subject to the Information Quality Act. This document has used the best available information and made a broad presentation thereof. The process of public review of this document provides an opportunity for comment and challenge to this information, as well as for the provision of additional information.

The information contained in this document was developed using best available scientific information. Therefore, this Amendment and EIS are in compliance with the IQA.

8.3 Coastal Zone Management Act

Section 307(c)(1) of the federal Coastal Zone Management Act (CZMA) of 1972 requires that all federal activities that directly affect the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable. While it is the goal of the South Atlantic Council to have management measures that complement those of the states, Federal and state administrative procedures vary and regulatory changes are unlikely to be fully instituted at the same time. Based on the analysis of the environmental consequences of the proposed action in Section 4.0, the Council has concluded this amendment would improve Federal management of deepwater coral ecosystems.

The Council believes this amendment is consistent to the maximum extent practicable with the Coastal Zone Management Plans of Florida, Georgia, South Carolina, and North Carolina. This determination will be submitted to the responsible state agencies under Section 307 of the CZMA administering approved Coastal Zone Management Programs in the States of Florida, South Carolina, Georgia, and North Carolina.

8.4 Executive Order 12612: Federalism

E.O. 12612 requires agencies to be guided by the fundamental federalism principles when formulating and implementing policies that have federalism implications. The purpose of the Order is to guarantee the division of governmental responsibilities between the Federal government and the States, as intended by the framers of the Constitution. No federalism issues have been identified relative to the actions proposed in this amendment and associated regulations. Therefore, preparation of a Federalism assessment under E.O. 13132 is not necessary.

8.5 Executive Order 12866: Regulatory Planning and Review

E.O. 12866, signed in 1993, requires federal agencies to assess the costs and benefits of their proposed regulations, including distributional impacts, and to select alternatives that maximize net benefits to society. To comply with E.O. 12866, NMFS prepares a Regulatory Impact Review (RIR) for all fishery regulatory actions that implement a new FMP or that significantly amend an existing plan. RIRs provide a comprehensive analysis of the costs and benefits to society associated with proposed regulatory actions, the problems and policy objectives prompting the regulatory proposals, and the major alternatives that could be used to solve the problems. The reviews also serve as the basis for the agency's determinations as to whether proposed regulations are a "significant regulatory action" under the criteria provided in E.O. 12866 and whether proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the RFA. A regulation is significant if it is likely to result in an annual effect on the economy of at least $100,000,000 or if it has other major economic effects.

In accordance with E.O. 12866, the following is set forth by the Council: (1) this rule is not likely to have an annual effect on the economy of more than $100 million or to adversely affect in a material way the economy, a sector of the economy, productivity, jobs, the environment, public health or safety, or state, local, or tribal governments or communities; (2) this rule is not likely to create any serious inconsistencies or otherwise interfere with any action take or planned by another agency; (3) this rule is not likely to materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; (4) this rule is not likely to raise novel or policy issues arising out of legal mandates, or the principles set forth in the Executive Order; (5) this rule is not controversial.

8.6 Executive Order 12898: Environmental Justice

E.O. 12898 requires that "to the greatest extent practicable and permitted by law…each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or

environmental effects of its programs, policies and activities on minority populations and low-income populations in the United States and its territories and possessions…"

The alternatives being considered in this amendment are not expected to result in any disproportionate adverse human health or environmental effects to minority populations or low-income populations of Florida, North Carolina, South Carolina or Georgia, rather the impacts would be spread across all participants in the golden crab and shrimp fisheries participants regardless of race or income.

8.7 Executive Order 12962: Recreational Fisheries

E.O. 12962 requires Federal agencies, in cooperation with States and Tribes, to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities through a variety of methods including, but not limited to, developing joint partnerships; promoting the restoration of recreational fishing areas that are limited by water quality and habitat degradation; fostering sound aquatic conservation and restoration endeavors; and evaluating the effects of Federally-funded, permitted, or authorized actions on aquatic systems and evaluating the effects of Federally-funded, permitted, or authorized actions on aquatic systems and recreational fisheries, and documenting those effects. Additionally, the order establishes a seven member National Recreational Fisheries Coordination Council responsible for, among other things, ensuring that social and economic values of healthy aquatic systems that support recreational fisheries are considered by Federal agencies in the course of their actions, sharing the latest resource information and management technologies, and reducing duplicative and cost-inefficient programs among Federal agencies involved in conserving or managing recreational fisheries. The Council also is responsible for developing, in cooperation with Federal agencies, States and Tribes, a Recreational Fishery Resource Conservation Plan - to include a five-year agenda. Finally, the Order requires NMFS and the U.S. Fish and Wildlife Service to develop a joint agency policy for administering the ESA.

The alternatives considered in this amendment are consistent with the directives of E.O. 12962.

8.8 Executive Order 13089: Coral Reef Protection

E.O. 13089, signed by President William Clinton on June 11, 1998, recognizes the ecological, social, and economic values provided by the Nation's coral reefs and ensures that Federal agencies are protecting these ecosystems. More specifically, the Order requires Federal agencies to identify actions that may harm U.S. coral reef ecosystems, to utilize their program and authorities to protect and enhance the conditions of such ecosystems, and to ensure that their actions do not degrade the condition of the coral reef ecosystem.

The alternatives considered in this amendment are consistent with the directives of E.O. 13089.

8.9 Executive Order 13158: Marine Protected Areas

E. O. 13158 was signed on May 26, 2000 to strengthen the protection of U.S. ocean and coastal resources through the use of Marine Protected Areas (MPAs). The E.O. defined

MPAs as "any area of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." It directs federal agencies to work closely with state, local and non-governmental partners to create a comprehensive network of MPAs "representing diverse U.S. marine ecosystems, and the Nation's natural and cultural resources".

The alternatives considered in this amendment are consistent with the directives of E.O. 13158.

8.10 Marine Mammal Protection Act

The MMPA established a moratorium, with certain exceptions, on the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas. It also prohibits the importing of marine mammals and marine mammal products into the United States. Under the MMPA, the Secretary of Commerce (authority delegated to NOAA Fisheries Service) is responsible for the conservation and management of cetaceans and pinnipeds (other than walruses). The Secretary of the Interior is responsible for walruses, sea otters, polar bears, manatees, and dugongs.

Part of the responsibility that NOAA Fisheries Service has under the MMPA involves monitoring populations of marine mammals to make sure that they stay at optimum levels. If a population falls below its optimum level, it is designated as "depleted." A conservation plan is then developed to guide research and management actions to restore the population to healthy levels.

In 1994, Congress amended the MMPA, to govern the taking of marine mammals incidental to commercial fishing operations. This amendment required the preparation of stock assessments for all marine mammal stocks in waters under U.S. jurisdiction; development and implementation of take-reduction plans for stocks that may be reduced or are being maintained below their optimum sustainable population levels due to interactions with commercial fisheries; and studies of pinniped-fishery interactions. The MMPA requires a commercial fishery to be placed in one of three categories, based on the relative frequency of incidental serious injuries and mortalities of marine mammals. Category I designates fisheries with frequent serious injuries and mortalities incidental to commercial fishing; Category II designates fisheries with occasional serious injuries and mortalities; Category III designates fisheries with a remote likelihood or no known serious injuries or mortalities.

Under the MMPA, to legally fish in a Category I and/or II fishery, a fisherman must take certain steps. For example, owners of vessels or gear engaging in a Category I or II fishery, are required to obtain a marine mammal authorization by registering with the Marine Mammal Authorization Program (50 CFR 229.4). They are also required to accommodate an observer if requested (50 CFR 229.7(c)) and they must comply with any applicable take reduction plans.

The golden crab fishery in the South Atlantic is listed as a Category III fishery in the 2009 Proposed List of Fisheries (LOF)(73 FR 33760; June 13, 2008). No incidentally killed or injured marine mammal species has been documented in this fishery.

The rock shrimp fishery and royal red shrimp fishery are listed as Category III fisheries in the 2009 Proposed List of Fisheries (LOF)(73 FR 33760; June 13, 2008). No incidentally killed or injured marine mammal species have been documented in these fisheries.

8.11 Migratory Bird Treaty Act and Executive Order 13186

The Migratory Bird Treaty Act (MBTA) implemented several bilateral treaties for bird conservation between the United States and Great Britain, the United States and Mexico, the United States and Japan, and the United States and the former Union of Soviet Socialists Republics. Under the MBTA, it is unlawful to pursue, hunt, take, capture, kill, possess, trade, or transport any migratory bird, or any part, nest, or egg of a migratory bird, included in treaties between the, except as permitted by regulations issued by the Department of the Interior (16 U.S.C. 703-712). Violations of the MBTA carry criminal penalties. Any equipment and means of transportation used in activities in violation of the MBTA may be seized by the United States government and, upon conviction, must be forfeited to it.

Executive Order 13186 directs each federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement a memorandum of understanding (MOU) with the U.S. Fish and Wildlife Service (USFWS) to conserve those bird populations. In the instance of unintentional take of migratory birds, NOAA Fisheries Service would develop and use principles, standards, and practices that will lessen the amount of unintentional take in cooperation with the USFWS. Additionally, the MOU would ensure that NEPA analyses evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern.

An MOU is currently being developed, which will address the incidental take of migratory birds in commercial fisheries under the jurisdiction of NOAA Fisheries Service. NOAA Fisheries Service must monitor, report, and take steps to reduce the incidental take of seabirds that occurs in fishing operations. The United States has already developed the U.S. National Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries. Under that plan many potential MOU components are already being implemented.

The alternatives considered in this amendment are consistent with the directives of E.O. 13186.

8.12 National Environmental Policy Act

This amendment to the Councils' Coral FMP and the Golden Crab FMP has been written and organized in a manner that meets NEPA requirements, and thus is a consolidated NEPA document, including a draft Environmental Impact Statement, as described in NOAA Administrative Order (NAO) 216-6, Section 6.03.a.2.

Purpose and Need for Action

The purpose and need for this action are described in **Section 1.1.**

Alternatives
The alternatives for this action are described in **Section 2.0.**

Affected Environment
The affected environment is described in **Section 3.0**.

Impacts of the Alternatives
The impacts of the alternatives on the environment are described in **Section 4.0.**

8.13 National Marine Sanctuaries Act

Under the National Marine Sanctuaries Act (NMSA) (also known as Title III of the Marine Protection, Research and Sanctuaries Act of 1972), as amended, the U.S. Secretary of Commerce is authorized to designate National Marine Sanctuaries to protect distinctive natural and cultural resources whose protection and beneficial use requires comprehensive planning and management. The National Marine Sanctuary Program is administered by the Sanctuaries and Reserves Division of the NOAA. The Act provides authority for comprehensive and coordinated conservation and management of these marine areas. The National Marine Sanctuary Program currently comprises 13 sanctuaries around the country, including sites in American Samoa and Hawaii. These sites include significant coral reef and kelp forest habitats, and breeding and feeding grounds of whales, sea lions, sharks, and sea turtles. The two main sanctuaries in the South Atlantic EEZ are Gray's Reef and Florida Keys National Marine Sanctuaries.

The alternatives considered by this document are not expected to have any adverse impacts on the resources managed by the Gray's Reef and Florida Keys National Marine Sanctuaries.

8.14 Paperwork Reduction Act

The purpose of the Paperwork Reduction Act (PRA) is to minimize the burden on the public. The Act is intended to ensure that the information collected under the proposed action is needed and is collected in an efficient manner (44 U.S.C. 3501 (1)). The authority to manage information collection and record keeping requirements is vested with the Director of the Office of Management and Budget (OMB). This authority encompasses establishment of guidelines and policies, approval of information collection requests, and reduction of paperwork burdens and duplications. The PRA requires NMFS to obtain approval from the OMB before requesting most types of fishery information from the public.

The VMS requirements proposed in this amendment establish an electronic data collection system. Additional data collection requirements will be associated with registering the VMS unit with NMFS and/or arranging installation of a VMS unit on a vessel. If VMS for the golden crab fishery is selected as a preferred alternative, NMFS will submit a request for approval of the data collection to the OMB for review under the Paperwork Reduction Act.

8.15 Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) of 1980 (5 U.S.C. 601 et seq.) requires Federal agencies to assess the impacts of regulatory actions implemented through notice and

comment rulemaking procedures on small businesses, small organizations, and small governmental entities, with the goal of minimizing adverse impacts of burdensome regulations and record-keeping requirements on those entities. Under the RFA, NMFS must determine whether a proposed fishery regulation would have a significant economic impact on a substantial number of small entities. If not, a certification to this effect must be prepared and submitted to the Chief Counsel for Advocacy of the Small Business Administration. Alternatively, if a regulation is determined to significantly impact a substantial number of small entities, the Act requires the agency to prepare an initial and final Regulatory Flexibility Analysis to accompany the proposed and final rule, respectively. These analyses, which describe the type and number of small businesses, affected, the nature and size of the impacts, and alternatives that minimize these impacts while accomplishing stated objectives, must be published in the Federal Register in full or in summary for public comment and submitted to the chief counsel for advocacy of the Small Business Administration. Changes to the RFA in June 1996 enable small entities to seek court review of an agency's compliance with the Act's provisions.

This amendment document includes an Initial Regulatory Flexibility Analysis (IRFA) in **Section 6.0**.

8.16 Small Business Act

Enacted in 1953, the Small Business Act requires that agencies assist and protect small-business interests to the extent possible to preserve free competitive enterprise. The objectives of the act are to foster business ownership by individuals who are both socially and economically disadvantaged; and to promote the competitive viability of such firms by providing business development assistance including, but not limited to, management and technical assistance, access to capital and other forms of financial assistance, business training, and counseling, and access to sole source and limited competition federal contract opportunities, to help firms achieve competitive viability. Because most businesses associated with fishing are considered small businesses, NMFS, in implementing regulations, must make an assessment of how those regulations will affect small businesses.

8.17 Public Law 99-659: Vessel Safety

Public Law 99-659 amended the MSFCMA to require that a FMP or FMP amendment must consider, and may provide for, temporary adjustments (after consultation with the U.S. Coast Guard and persons utilizing the fishery) regarding access to a fishery for vessels that would be otherwise prevented from participating in the fishery because of safety concerns related to weather or to other ocean conditions.

No vessel would be forced to participate in South Atlantic fisheries under adverse weather or ocean conditions as a result of the imposition of management regulations proposed in this amendment.

No concerns have been raised by South Atlantic fishermen or by the U.S. Coast Guard that the proposed management measures directly or indirectly pose a hazard to crew or vessel safety under adverse weather or ocean conditions. Therefore, this amendment proposes neither procedures for making management adjustments due to vessel safety problems nor

procedures to monitor, evaluate, or report on the effects of management measures on vessel or crew safety under adverse weather or ocean conditions.

9 List of Preparers

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

Interagency CE-BA Planning Team/Reviewers

Name	Title	Agency	Location
Myra Brouwer	Fishery Scientist CE-BA Coordinator SAFMC Lead	SAFMC	SAFMC
Kate Michie	Fishery Biologist NMFS Co-Lead	NMFS SERO	NMFS SERO
Roger Pugliese	Senior Fishery Biologist	SAFMC	SAFMC
Karla Gore	Fishery Biologist NMFS Co-Lead	NMFS SERO	NMFS SERO
Kate Quigley	Economist	SAFMC	SAFMC
Monica Smit-Brunello	Attorney Advisor General	NOAA	SERO
Gregg Waugh	Deputy Director	SAFMC	SAFMC
Janet Miller	Program Specialist	NMFS SERO	NMFS SERO
Denise Johnson	Industry Economist	NMFS SERO	NMFS SERO
Andrew Herndon	Fishery Biologist	NMFS SERO	NMFS SERO
Jack McGovern	Fishery Biologist	NMFS SERO	NMFS SERO
David Dale	NEPA/EFH Specialist	NMFS SERO	NMFS SERO
Pace Wilber	Atlantic Branch Supervisor, Fishery Biologist	NMFS SERO	NMFS SERO
Tom Jamir	Fishery Biologist	NMFS SEFSC	NMFS SEFSC

Carlos Rivero	Physical Scientist	NMFS SEFSC	NMFS SEFSC
Joan Browder	Research Fishery Biologist	NMFS SEFSC	NMFS SEFSC
Michael Burton	Research Fishery Biologist	NMFS SEFSC	NMFS SEFSC
Tracy Dunn	Supervisory Criminal Investigator	NMFS OLE	NMFS SERO
Brad McHale	Fishery Management Specialist	NMFS HMS	NMFS HMS
Chris Rilling	Supervisory Fish Management Officer	NMFS HMS	NMFS HMS

10 Entities Consulted

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)
(727) 824-5320 (FAX)

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

11 References

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

Able, K. W., C. B Grimes, R. S. Jones and D. C. Twichell. 1993. Temporal and spatial variation in habitat characteristics of tilefish (*Lopholatilus chamaeleonticeps*) off the east coast of Florida. Bull. Mar. Sci. 53:1013-1026.

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.

Alabama Sea Grant. 1987. Extension Bulletin MASGP-87-017 Royal Red Shrimp. Auburn University.

Alsop, III, F. J. 2001. Smithsonian Handbooks: Birds of North America eastern region. DK Publishing, Inc. New York, NY.

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.

Anderson, W. W., and M. L. Lindner. 1975. Contributions to the biology of the royal red shrimp, *Hymenopenaeus robustus* Smith. U.S. Fish. Bull. 69: 313-336.

Andrews, A. H., E. E. Cordes, M. M. Mahoney, K. Munk, K. H. Coale, G. M. Cailliet, and J. Heifetz. 2002. Age, growth and radiometric age validation of a deep-sea, habitat-forming gorgonian (*Primnoa resedaeformis*) from the Gulf of Alaska. Hydrobiologia 471 (1-3): 101-110.

ASMFC (Atlantic States Marine Fisheries Commission). 2004. Review of the Fishery Management Plan for Spot (Leiostomus xanthurus). Available online at www.asfmc.org.

Auster, P. J. and R. W. Langton 1998. The indirect effects of fishing -- draft 2. Draft report for the National Marine Fisheries Service.

Avent, R. M., M. E. King, and R. H. Gore. 1977. Topographic and faunal studies of shelf-edge prominences off the central eastern Florida coast. Internationale Revue der Gesamten Hydrobiologie 62:185-208.

Ayers, M. W. and O. H. Pilkey. 1981. Piston cores and surficial sediment investigations of the Florida-Hatteras slope and inner Blake Plateau. Pages 5-89 *In* Popenoe, P. (ed.). Environmental geologic studies of the southeastern Atlantic outer continental shelf. USGS Open File Report 81-582-A.

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

Balcom, N., J. Leamon, and W. Bomster. 1996. Royal Red Shrimp: An Emerging Deep-Sea Fishery in the Northeast. A Report on the results of a federal Fishing Industry Grant project awarded to Clinton Fisheries, Inc.

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

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

Bjorndal, K. A. (ed.). 1995. Biology and Conservation of Sea Turtles, revised edition. Smithsonian Institute Press, Washington, D.C., 579.

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

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

Brooke, S. and J. Jarnegren. In prep. Comparison of the reproductive cycles of *Lophelia pertusa* from a Norwegian Fjord and the Gulf of Mexico.

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

Brooke S. and R. Stone. In press. Reproduction of Hydrocorals (order stylasterina) from the Aleutian Islands, Alaska. Bulletin of Marine Science.

Brooke, S. and C. M. Young. 2005. Embryogenesis and larval biology of the ahermatypic scleractinian *Oculina varicosa*. Marine Biology 146(4): 665-675.

Brooks, R. A., M. S. Nizinski, S. W. Ross, and K. J. Sulak. 2007. Frequency of sublethal injury in a deepwater ophiuroid, *Ophiacantha bidentata*, an important component of western Atlantic *Lophelia* reef communities. Marine Biology 152:307-314.

Buhl-Mortensen, L. and P. B. Mortensen. 2004. Symbiosis in deep-water corals. Symbiosis 37:33-61.

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.

Beyers, C. J. De B., and C. G. Wilke. 1980. Quantitative stock survey and some biological and morphometric characteristics of the deep-sea red crab *Geryon quinquedens* off southwest Africa. Fisheries Bulletin of South Africa 13:9-12.

Bullis, H. R., Jr., and W. F. Rathjen. 1959. Shrimp explorations off southeastern coast of the United States (1956-1958). Comm. Fish. Rev. 21(6):1-20.

Bumpus, D. F. 1973. A description of the circulation on the continental shelf of the east coast of the U. S. Progress in Oceanography (6): 111-157.

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

Cairns, S. D. 1979. The deep-water scleractinia of the Caribbean Sea and adjacent waters. Studies on the fauna of Curacao and other Caribbean islands 57(180), 341 p.

Cairns, S. D., and R. E. Chapman. 2001. Biogeographic affinities of the North Atlantic deep-water scleractinia. *In* Willison, J. H., J. Hall, S. E. Gass, E. L. R. Kenchington, M. Butler, P. Doherty (eds.). Proceedings of the First International Symposium on Deep-Sea Corals.

Cairns, S. D. 2006. Studies on Western Atlantic Octocorallia (Coelenterata: Anthozoa). Part 6: The genera *Primnoella* Gray, 1858; *Thouarella*, Gray 1870; *Dasystenella* Versluys, 1906. Proceedings of the Biological Society of Washington 119: 161-194.

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.

Carter, D. W. 2003. Protected areas in marine resource management: another look at the economics and research issues. Ocean and Coastal Management 46(5):439-456.

Caruso, J. H., S. W. Ross, K. J. Sulak, G. R. Sedberry. 2007. Deep-water chaunacid and lophiid anglerfishes (Pisces: Lophiiformes) off the south-eastern United States. Journal of Fisheries Biology 70: 1015-1026.

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

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, 538 pp.

Cobb S. P., C. R. Futch, and D. Camp. 1973. The rock shrimp, *Sicyionia brevirostris*, Stimpson, 1871 (Decapoda: Penaeidae). Memoirs of the Hourglass Cruises Volume III, Part I. 38 p.

Continental Shelf Associates, Inc. In review. Characterization of northern Gulf of Mexico deepwater hardbottom communities with emphasis on Lophelia coral. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study.

Costello, M. J., M. McCrea, A. Freiwald, T. Lundalv, L. Jonsson, B. J. Brett, T. C. E. van Weering, H. de Haas, J. M. Roberts and D. Allen. 2005. Role of cold-water *Lophelia pertusa* coral reefs as fish habitat in the NE Atlantic. Pages 771-805 *In* Freiwald, A. and J. M. Roberts (eds.). Cold-Water Corals and Ecosystems. Springer-Verlag, Berlin.

DOC (Department of Commerce). 1988b. Report of the Interagency Task Force on persistent Marine Debris. Washington, DC, U.S. Department of Commerce. 170 p.

Dennis, C. 1992. A summary of rock shrimp landings and effort information off Florida east coast from 1985-1991. NMFS Southeast Fisheries Science Center. MIA-91/92-97. 5 p.

Dooley, J. K. 1978. Systematic revision and comparative biology of the tilefishes (Perciformes: Branchiostegidae and Malacanthidae. Ph.D. Dissertation, University of North Carolina, Chapel Hill, NC.

Druffel, E. R. M., S. Griffin, A. Witter, E. Nelson, J. Southon, M. Kashgarian, and J. Vogel. 1995. *Gerardia*: bristlecone pine of the deep-sea? Geochimica et Cosmochimica Acta 59: 5031–5036.

Duncan, P. M. 1877. On the rapidity of growth and variability of some Madreporaria on an Atlantic cable, with remarks upon the rate of accumulation of Foraminiferal deposits. Proceedings of the Royal Society of London 26 (180): 133–137.

Ehrlich, H., P. Etnoyer, S. D. Litivinov, M. Olennikova, H. Domaschke, T. Hanke, R. Born, H. Meissner, and H. Worch. 2006. Biomaterial structure in deep-sea bamboo coral (Gorgonacea: Isididae): perspectives for the development of bone implants. Materialwissenchaft und Werkstofftechnik 37(6): 553-557.

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.

Erdman, R. B. 1990. Reproductive ecology and distribution of deep-sea crabs (Family Geryonidae) from southeast Florida and the eastern Gulf of Mexico. Ph.D. Dissertation, April 1990. University of South Florida, Tampa, Florida. 147 pp.

Fernholm, B. and A. M. Quattrini. In press. A New Species of Hagfish (Myxinidae: Eptatretus) Associated with Deep-Sea Coral Habitat in the Western North Atlantic. Copeia.

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, GA.

Fosså, J. H., P. B. Mortensen, and D. M. Furevik. 2002. The deep-water coral *Lophelia pertusa* in Norwegian waters: distribution and fishery impacts. Hydrobiologia 471:1-12.

Freiwald, A. R. 1998. Geobiology of *Lophelia pertusa* (Scleractinia) reefs in the North Atlantic. Habilitationsschrift zur Erlangung der venia legendi am Fachbereich Geowissenschaften der Universität. Bremen. 116 pp.

Freiwald, A., J. H. Fosså, A. Grehan, T. Koslow, and J. M. Roberts. 2004. Cold-Water Coral Reefs. UNEP-WCMC, Cambridge, UK.

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. 316 pp.

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. 316 pp.

GMFMC (Gulf of Mexico Fishery Management Council). 1995. Amendment 8 to the fishery management plan for the shrimp fishery of the Gulf of Mexico. Gulf of Mexico Fishery Management Council, 5401 West Kennedy Boulevard, Suite 881, Tampa, Florida.

GMFMC (Gulf of Mexico Fishery Management Council). 2005a. Final Amendment Number 13 to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, U.S. Waters. Available at: http://www.gulfcouncil.org/Beta/GMFMCWeb/downloads/shrimp%20Amend%2013%20Final%.pdf

GMFMC (Gulf of Mexico Fishery Management Council). 2005b. Shrimp Amendment 13 FAQs. Available at: http://www.gulfcouncil.org/Beta/GMFMCWeb/Shrimp12FAQs.htm

Gartner, J. V., Jr., K. J. Sulak, S. W. Ross, and A-M. Necaise. In review. Persistent near-bottom aggregations of mesopelagic animals along the North Carolina and Virginia continental slopes. Marine Biology.

Gass, S. E. and J. M. Roberts. 2006. The occurrence of the cold-water coral, *Lophelia pertusa* (Scleractinia) on oil and gas platforms in the North Sea: colony growth, recruitment and environmental controls on distribution. Marine Pollution Bulletin 52: 549-559.

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.

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.

Griffin, S., and E. R. M. Druffel. 1989. Sources of carbon to deep-sea corals. Radiocarbon incomplete ref.

Hain, J. H. W., M. J. Ratnaswamy, R. D. Kenney, and H. E. Winn. 1993. The fin whale, *Balaenoptera physalus*, in waters of the northeastern United States continental shelf. Report to the International Whaling Commission, 42:653-669.

Henry, L. A., M. A. Nisinzki, and S. W. Ross. In press. Diversity, distribution and biogeography of hydroid assemblages collected from deep-water coral habitats off the southeastern United States. Deep-Sea Research I.

Hill, K. 2005. *Sicyonia brevirostris* (Rock Shrimp) Species Report, Smithsonian Marine Station at Fort Pierce. Available at: http://www.sms.si.edu/IRLSpec/Sicyon_brevir.htm

Hines, A. H. 1990. Fecundity and reproductive output in *Chaceon fenneri* and *C. quinquedens.* Pages 12-13 *In*: Lindberg, W. J. and E. L. Wenner (eds.). 1990. Geryonid Crabs and Associated Continental Slope Fauna: A Research Workshop Report. S.C. Sea Grant Consortium and FL Sea Grant College Program. FL SG Technical Paper 58:61 pp.

Hinsch, G.W. 1988. Ultrastructure of the sperm and spermatophores of the golden crab *Geryon fenneri* and a closely related species, the red crab *G. quinquedens* from the eastern Gulf of Mexico. J. Crust. Bio. 8(3): 340-345

Hovland, M., P. B. Mortensen, T. Brattegard, P. Strass, K. Rokoengen. 1998. Ahermatypic coral banks off mid-Norway: evidence for a link with seepage of light hydrocarbons. Palaios 13:89-200.

Hovland, M., and M. Risk. 2003. Do Norwegian deep-water coral reefs rely on seeping fluids? Marine Geology 198: 83-96.

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

Husebø, A., L. Nøttestad, J. H. Fosså, D. M. Furevik, and S. B. Jørgensen. 2002. Distribution and abundance of fish in deep-sea coral habitats. Hydrobiologia 471:91-99.

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.

Jensen, A. and R. Frederickson. 1992. The fauna associated with the bank-forming deepwater coral *Lophelia pertusa* (Scleractinia) on the Faroe Shelf. Sarsia 77: 53-69.

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

Keiser, R. K. 1976. Distribution of the Rock Shrimp (*Sycionia brevirostris*) in coastal waters of the southeastern United States. South Carolina Marine Resources Research Institute, Charleston, SC. 19 p.

Kendall, D. 1990. An Assessment of the Georgia golden crab fishery. Pages 18-19 *In*: Lindberg, W. J. and E. L. Wenner (eds.). 1990. Geryonid Crabs and Associated Continental Slope Fauna: A Research Workshop Report. S.C. Sea Grant Consortium and FL Sea Grant College Program. FL SG Technical Paper 58:61 pp.

Kennedy F. S., J. J. Crane, R. A. Schlieder, and D. G. Barber. 1977. Studies of the rock shrimp, *Sycionia brevirostris*. A new fishery on Florida's Atlantic Shelf. Florida Department of Natural Resources, Marine Research Laboratory, St. Petersburg, FL. 69 p.

Knowlton, A. R., S. D. Kraus, and R. D. Kenney. 1994. Reproduction in North Atlantic right whales (*Eubalaena glacialis*). Canadian Journal of Zoology, 72: 1297-1305.

Koenig, C. C. 2001. Oculina Banks: habitat, fish populations, restoration and enforcement. Report to the South Atlantic Fishery Management Council available at http://www.safmc.net

Kraus, S. D., P. K. Hamilton, R. D. Kenney, A. Knowlton, and C. K. Slay. 2001. Reproductive parameters of the North Atlantic right whale. Journal of Cetacean Resource Management (Special Issue) 2: 231-236.

Krieger, K. J. and B. L. Wing. 2002. Megafaunal associations with deepwater corals (*Primnoa* spp.) in the Gulf of Alaska. Hydrobiologia 471:83-90.

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

Last, P. R. and J. D. Stevens. 1994. Sharks and Rays of Australia. CSIRO Australia. 513 pp.

Leeworthy, V. S., and P. C. Wiley. 2002. Socioeconomic impact analysis of marine reserve alternatives for the Channel Islands National Marine Sanctuary. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, Special Projects, Silver Spring, MD.

Leon, Y. M. and C. E. Diez. 2000. Ecology and population biology of hawksbill turtles at a Caribbean feeding ground. Pages.32-33 *In*: Abreau-Grobois, F.A., R. Briseno-Duenas and L. Sarti, Compilers. Proceedings of the 18th International Sea Turtle Symposium, NOAA Technical Memorandum NMFS-SEFSC-436.

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.

Lindberg, W. J., N. J. Blake, H. M. Perry, R. S. Waller, F. D. Lockhart, and R. B. Erdman. 1989. Fisheries development of the deep-sea golden crab, *Geryon fenneri*: Geogrphic and seasonal production potential in the Gulf of Mexico. Final Project Report. Marine Fisheries Initiation Program, National Marine Fisheries Service, 98pp.

Lindberg, W. J. and F. D. Lockhart. 1993. Depth-stratified population structure of Geryonid crabs in the eastern Gulf of Mexico. Journal Crustacean Biology 13(4): 713-732.

Low, R. N. and G. F. Ulrich. 1983. Deep-water demersal finfish resources and fisheries off South Carolina. S.C. Mar. Resour. Cent. Tech. Rep. No. 57, 24 p.

Luckhurst, B. 1986. Discovery of deep-water crabs (Geryon spp.) at Bermuda – A new potential fishery resource. Proceedings of the Gulf and Caribbean Fisheries Institute, 37th Meeting. P. 209-211.

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

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

Lux, F. E., A. R. Ganz, and W. F. Rathjen. 1982. Marking studies on the red crab, *Geryon quinquedens* Smith off southern New England. J. Shellfish Res. 2(1): 71-80.

Manning, R. B. and L. B. Holthuis. 1984. *Geryon fenneri*, a new deep-water crab from Florida (Crustacea: Decapoda: Geryonidae). Proceedings of the Biological Society of Washington 97:666-673.

Manning, R. B. and L. B. Holthuis. 1986. Notes on the *Geryon* from the Bahamas, with the description of *Geryon inghami*, a new species (Crustacea: Decapoda: Geryonidae). Proceedings of the Biological Society of Washington 99: 366-373.

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, FL.

Masson, D. G., B. J. Bett, and D. S. M. Billet. 2003. The origin of deep-water, coral topped mounds in the northern Rockall Trough, Northeast Atlantic. Marine Geology 194:159-180.

Mayor, P., B. Phillips, and Z. Hillis-Starr. 1998. Results of stomach content analysis on the juvenile hawksbill turtles of Buck Island Reef National Monument, U.S.V.I. Pages 230-232. *In:* S. Epperly and J. Braun, Compilers. Proceedings of the 17th Annual Sea Turtle Symposium. NOAA Technical Memorandum NMFS-SEFSC-415.

McCosker, J. E. and S. W. Ross. In press. A new deepwater species of the snake eel genus *Ophichthus* (Anguilliformes: Ophicthidae), from North Carolina. Copeia.

McGoodwin, J. R. 1990. Crisis in the World's Fisheries, Stanford: Stanford University Press.

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

Messing, C. G., A. C. Neuman, and J. C. Lang. 1990. Biozonations of deep-water lithoherms and associated hardgrounds in the northeastern Straits of Florida. Palaios 5:15-33.

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

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

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

Milliman, J. D. 1972. Atlantic Continental Shelf and Slope of the United States- Petrology of the sand fraction of sediments, northern New Jersey to southern Florida. U.S.G.S. Prof. Pap. 529-J. 40 pp.

Mortensen, P. B. 2000. *Lophelia pertusa* in Norwegian waters: distribution, growth and associated fauna. Ph.D. Dissertation, University of Bergen, Department of Fisheries and Marine Biology.

Mortensen, P. B. and J. H. Fosså. 2006. Species diversity and spatial distribution of invertebrates on *Lophelia* reefs in Norway. Pages 1849-1868 *In:* Proceedings of the 10th International Coral Reef Symposium, Okinawa, Japan.

Mortensen, P. B. and H. T. Rapp. 1998. Oxygen and carbon isotope ratios related to growth line patterns in skeletons of *Lophelia pertusa* (L) (Anthozoa, Scleractinia): implications for determination of linear extension rates. Sarsia 83: 433-446.

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

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

Myers, R. A. and G. Mertz. 1998. Reducing uncertainty in the biological basis of fisheries management by meta-analysis of data from many populations: A synthesis. Fish. Res. 37: 51-60.

NOAA (National Oceanic and Atmospheric Administration). 2004a. Historical Highlights, 1950s. Available at: http://www.nefs.noaa.gov/history/timeline/1950.html

NOAA (National Oceanic and Atmospheric Administration). 2004b. Historical Highlights, 1960s. Avaialble at http://nefs.noaa.gov/history/timeline/1960.html

NOAA (National Oceanic and Atmospheric Administration). 2004c. Baird's Legacy; Progress and Change 1947-1971. Avaialble at http://www.nefsc.noaa.gov/history/stories/legacy/1947-71.html

NOAA Fisheries Service. 2000.

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, FL SEFSC Contribution PRD-00/01-08, Parts I-III and Appendices I-VI.

Nance, J. M. (Editor). 1998. Report to Congress. Southeastern United States Shrimp Trawl Bycatch Program. NOAA National Marine Fisheries Service, Southeast Fisheries Science Center Galveston Laboratory, 154 p.

National Shrimp Festival. 2004. Shrimp Info. Available at: http://www.gulf-shores-shrimp-festival.com/shrimp-info-recipies.html

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

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

Otwell, W. S., J. Bellairs, and D. Sweat. 1984. Initial development of a deep sea crab fishery in the Gulf of Mexico. Fla. Sea Grant Coll. Rep. No. 61, 29p.

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.

Paull, C. K., A. C. Neumann, B. A. am Ende, W. Ussler, III, and N. M. Rodriguez. 2000. Lithoherms on the Florida-Hatteras slope. Marine Geology 166: 83-101. Abstract.

Perez-Farfante, I. 1977. American solenocerid shrimps of the genera *Hymenopenaeus*, *Halioporides*, *Pleoticus*, *Hadropenaeus* new genus, and *Mesopenaeus* new genus. U.S. Fish. Bull. 75:261-346.

Perry, H. and K. Larsen. 2004. Picture Guide to Shelf Invertebrates of the Northern Gulf of Mexico. NOAA/NMFS. Avaialble at: http://www.gsmfc.org/seamap/picture_guide/main.htm

Popenoe, P. and F. T. Manheim. 2001. Origin and history of the Charleston Bump-geological formations, currents, bottom conditions, and their relationship to wreckfish habitats on the Blake Plateau. Pages 43-93 *In:* G. R. Sedberry (ed.). Island in the Stream: oceanography and fisheries of the Charleston Bump. American Fisheries Society Symposium 25. American Fisheries Society, Bethesda, MD.

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

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

Reed, J. K. 1983. Nearshore and shelf-edge *Oculina* coral reefs: the effects of upwelling on coral growth and on the associated faunal communities. NOAA Symposium Series Undersea research 1:119-124.

_____. 2002b. Comparison of deep-water coral reefs and lithoherms off southeastern U.S.A. Hydrobiologia 471: 57–69.

Reed, J. K., S. A. Pomponi, D. Weaver, C. K. Paull, and A. E. Wright. 2005a. Deep-water sinkholes and bioherms of south Florida and the Pourtales Terrace-habitat and fauna. Bulletin of Marine Science 77: 267-296.

Reed, J. K., A. Shepard, C. Koenig, K. Scanlon, and G. Gilmore. 2005b. Mapping, habitat characterization, and fish surveys of the deep-water *Oculina* coral reef Marine Protected Area: a review of historical and current research. Pages 443-465 *In:* Freiwald, A., and J. M. Roberts (eds.). Cold-water Corals and Ecosystems, Proceedings of Second

International Symposium on Deep Sea Corals, Sept. 9-12, 2003, Erlangen, Germany, Springer-Verlag, Berlin Heidelberg.

Reed, J. K., D. C. Weaver, and S. A. Pomponi. 2006. Habitat and fauna of deep-water *Lophelia pertusa* coral reefs off the southeastern U.S.: Blake Plateau, Straits of Florida, and Gulf of Mexico. Bulletin of Marine Science 78: 343–375.

Rezak, R., T. J. Bright, and D. W. McGrail. 1985. Reefs and Banks of the Northwestern Gulf of Mexico. New York: John Wiley and Sons.

Richer de Forges, B., J. A. Koslow, and G. C. B. Poore. 2000. Diversity and endemism of the benthic seaount fauna in the southwest Pacific. Nature 405:944-947.

Risk, M. J., J. M. Heikoop, M. G. Snow, and R. Beukens. 2002. Lifespans and growth patterns of two deep-sea corals: *Primnoa resedaeformis* and *Desmophyllum cristagalli*. Hydrobiologia 471 (1-3): 125-131.

Rogers, A. D. 1999. The biology of *Lophelia pertusa* (Linnaeus 1758) and other deep-water reef-forming corals and impacts from human activities. International Review of Hydrobiology 84: 315-406.

Rogers, A. D. 2004. The biology, ecology and vulnerability of seaount communities. International Union for the Conservation of Nature and Natural Resources http:///www.iucn.org/themes/marine/pdf/AlexRogers-CBDCOP7-Seamounts-Complete.pdf

Ross, S. W. and M. S. Nizinski. 2007. State of the U.S. Deep Coral Ecosystems in the Southeastern United States Region: Cape Hatteras to the Florida Straits. NOAA Tech. Memo. NMFS-OPR-29. Silver Spring, MD.

Ross, S. W. and A. M. Quattrini. 2007. The Fish Fauna Associated with Deep Coral Banks off the Southeastern United States. Deep-sea Research I 54:975-1007.

Rothschild, B. J. 1986. Dynamics of marine fish populations. Harvard University Press, Cambridge, MA.

Rylaarsdam, K.W. 1983. Life histories and abundance patterns of colonial corals on Jamaican reefs. Mar Ecol Prog Ser 13: 249-260.

SAFMC (South Atlantic Fishery Management Council). 1998a. Comprehensive Amendment Addressing Essential Fish Habitat in Fishery Management Plans of the South Atlantic Region (Amendment 3 to the Shrimp Fishery Management Plan). South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, S.C. 29407-4699.

SAFMC (South Atlantic Fishery Management Council). 1998b. Habitat Plan for the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407-4699.

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 (Amendment 4 to

the Shrimp Fishery Management Plan). South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, S.C. 29407-4699. 151 p.

SAFMC (South Atlantic Fishery Management Council). 2004. 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, S.C. 29407-4699. 256p + appendices.

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, S.C. 29407-4699.

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, S.C. 29407-4699. 184 p + appendices.

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, S.C. 29407-4699.

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, S.C. 29407. 239 pp.

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, S.C. 29407-4699. 118 p + appendices.

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, S.C. 29407-4699. 108p + appendices.

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, S.C. 29407-4699.

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, S.C. 29407-4699

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, S.C. 29407-4699.

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, S.C. 29407-4699. 151 pp.

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, S.C. 29407-4699.

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). 2002 b. Fishery Management Plan for Pelagic *Sargassum* Habitat. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, S.C. 29407-4699. 228 p.

SAFMC (South Atlantic Fishery Management Council). 2003. Fishery Management Plan for the Dolphin and Wahoo Fishery of the Atlantic. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, S.C. 29407-4699.

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, SC 29405.

SAFMC (South Atlantic Fishery Management Council). 2008. 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, SC 29405. 186 pp.

SAFMC (South Atlantic Fishery Management Council). In review. Snapper Grouper Amendment 15B. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201, North Charleston, SC 29405.

SAFMC (South Atlantic Fishery Management Council). In review. Snapper Grouper Amendment 16. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201, North Charleston, SC 29405.

SAFMC (South Atlantic Fishery Management Council). In prep. Fishery Ecosystem Plan For the South Atlantic Region, Volumes I-V. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201, North Charleston, SC 29405. 3,000 pp.

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, SC 29405.

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, SC 29405.

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

Sanchirico, J. N., K. A. Cochran, and P. M. Emerson. 2002. Marine protected areas: economic and social implications. Resources for the Future, Discussion Paper 02-26, Washington, D.C.

Scelzo, M. A. and E. E. Boschi. 1975. Cultivo del langostino *Hymenopenaeus muelleri* (Crustacea, Decapoda, Penaeidae). Physis, Secc. A, 34: 193-197.

Scott, T. M. and S. S. Sadove. 1997. Sperm whale, *Physeter macrocephalus*, sightings in the shallow shelf waters off Long Island, New York. Marine Mammal Science. 13:317-321.

Schroeder, W. C. 1959. The lobster *Homarus americanus*, and the red crab, *Geryon quinquedenes*, in the offshore waters of the western North Atlantic. Deep-Sea Research 5: 266-279.

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.

Sea Grant Louisiana. 2006. Rock Shrimp. Lagniappe Vol.30, No.9

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.

Sherwood, O. A., D. B. Scott, M. J. Risk, and T. P. Guilderson. 2005. Radiocarbon evidence for annual growth rings in the deep-sea octocoral *Primnoa resedaeformis*. Marine Ecology Progress Series 301: 129-134.

Shrimp Lady (Accessed 2007). Available at: http://www.shrimplady.com/default.htm

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) 21pp.

Simpfendorfer, C.A. 2002. Smalltooth sawfish: The USA's first endangered elasmobranch? Endangered Species Update 19: 53-57.

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

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. Biol. Bull. 183: 418-431.

Squires, D. F. 1959. Deep sea corals collected by the Lamont Geological Observatory. I. Atlantic corals. American Museum Novitates No. 1965:1-42.

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. 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. 1997. Predation by hawksbill turtles on sponges at Mona Island, Puerto Rico. pp. 1421-1426, Proceedings of the 8th International Coral Reef Symposium, v. 2.

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.

Van Dover, C.L., P. Aharonb, J. M. Bernhardc, E. Caylord, M. Doerriesa, W. Flickingera, W. Gilhoolyd, S. K. Goffredie, K. E. Knicka, S. A. Mackod, S. Rapoporta, E. C. Raulfsa, C. Ruppelf, J. L. Salernoa, R. D. Seitzg, B. K. Sen Guptah, T. Shanki, M. Turnipseeda and R. Vrijenhoeke. 2003. Blake Ridge methane seeps: characterization of a soft-sediment, chemosynthetically based ecosystem. Deep Sea Research Part I : Oceanographic Research Papers 50(2) :281-300.

Walker, T. A. 1994. Post-hatchling dispersal of sea turtles. p. 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 NOAA Technical Memorandum NMFS-NEFSC. Northeast Fisheries Science Center, Woods Hole, Massachusetts 02543-1026. December.

Waring, G. T., J. M. Quintal, and C. P. Fairfield (eds). 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 02543-1026. September.

Waring, G. T, R. M. Pace, J. M. Quintal, C. P. Fairfield and K. Maze-Foley (eds). 2004. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2003. NOAA Technical Memorandum NMFS-NE-182. Northeast Fisheries Science Center, Woods Hole, Massachusetts 02543-1026. May.

Watkins, W. A., M. A. Daher, G. M. Reppucci, J. E. George, D. L. Martin, N. A. DiMarzio, and D. P. Gannon. 2000. Seasonality and distribution of whale calls in the North Pacific. Oceanography 13: 62-67.

Weaver, D. C. and G. R. Sedberry. 2001. Trophic subsidies at the Charleston Bump: food web structure of reef fishes on the continental slope of the southeastern United States. P. 137-152 *In:* Sedberry, G.R. (ed.). Island in the Stream: oceanography and fisheries of the Charleston Bump. American Fisheries Society Symposium 25. American Fisheries Society, Bethesda, MD.

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.

Wenner, E. L. and C. A. Barans. 1990. *In situ* estimates of golden crab, *Chaceon fenneri*, from habitats on the continental slope, southeast U.S. Bulletin of Marine Science 46(3): 723-734.

Wenner, E. L. and C. A. Barans. 2001. Benthic habitats and associated fauna of the upper- and middle-continental slope near the Charleston Bump. Pages 161-178 *In:* Sedbery, G. R. (ed.). Island in the Stream: oceanography and fisheries of the Charleston Bump. American Fisheries Society Symposium 25. Bethesda, MD.

Wenzel, F., D. K. Mattila, and P. J. Clapham. 1988. *Balaenoptera musculus* in the Gulf of Maine. Marine Mammal Science, 4(2):172-175.

Whitaker, D. L. 1982. Notes on biology of the rock shrimp off South Carolina. Presented at the joint Southeastern Estuarine Research Society/Gulf Estuarine Research Society meeting, Nov. 12, 1982. 14 p.

White, D. B., D. M. Wyanski, and G. R. Sedberry. 1998. Age, growth, and reproductive biology of the blackbelly rosefish from the Carolinas, USA. J. Fish Biol. 53(6):1274-1291.

Wigley, R. L., R. B. Theroux, and H. E. Murray. 1975. Deep sea red crab, *Geryon quinquedens*, survey off northeastern United States. Mar. Fish. Rev. 37(8):1-27.

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.

Williams, B., M. J. Risk, S. W. Ross, and K. J. Sulak. 2006. Deep-water Antipatharians: proxies of environmental change. Geology 34(9): 773-776.

Williams, B., M. J. Risk, S. W. Ross, K. J. Sulak. In press. Stable isotope records from deep-water antipatharians: 400-year records from the south-eastern coast of the United States of America. Bulletin of Marine Science.

Wilson, J. B. 1979. "Patch" development of the deep-water coral *Lophelia pertusa* (L.) on Rockall Bank. Journal of the Marine Biological Association of the United Kingdom 59:165-177.

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

12 Index

To be updated