Coral Amendment 8




AMENDMENT 8

TO THE FISHERY MANAGEMENT PLAN FOR CORAL, CORAL REEFS, AND LIVE/HARDBOTTOM HABITATS of the SOUTH ATLANTIC REGION

Modifications to Coral Habitat Areas of Particular Concern

Environmental Assessment **Regulatory Impact Review** **Fishery Impact Statement**

June 2013

Definitions of Abbreviations and Acronyms Used in the Amendment

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

Coral Amendment 8

Amends the Coral, Coral Reef, and Live/Hardbottom Fishery Management Plan of the South Atlantic with Environmental Assessment (EA), Regulatory Flexibility Act Analysis (RFAA), Regulatory Impact Review (RIR), and Fishery Impact Statement (FIS)

Proposed actions:	Modify Coral Habitat Areas of Particular Concern, including Oculina Bank HAPC, Stetson-Miami Terrace CHAPC, and Cape Lookout CHAPC
Lead agency:	FMP Amendment – South Atlantic Fishery Management Council EA - NOAA Fisheries Service
For Further Information Contact:	Robert K. Mahood South Atlantic Fishery Management Council 4055 Faber Place, Suite 201 North Charleston, SC 29405 843-571-4366 866-SAFMC-10 Robert.Mahood@safmc.net Phil Steele NOAA Fisheries, Southeast Region 263 13th Avenue South St. Petersburg, FL 33701 727-824-5301 Phil.Steele@noaa.gov
NOI for Coral Amendment 8: Scoping meetings held: Public Hearings held:	January 24, 26, and January 30-February 2, 2012

Abstract

Actions in Coral Amendment 8 address modifications to Coral Habitat Areas of Particular Concern in the South Atlantic. Coral Amendment 8 amends the Fishery Management Plan for Coral, Coral Reefs, and Live/Hardbottom Habitats of the South Atlantic Region. The management unit for coral includes coral belonging to the Class Hydrozoa (fire corals and hydrocorals) and coral belonging to the Class Anthozoa (sea fans, whips, precious corals, sea pens and stony corals). Coral reefs constitute hardbottoms, deepwater banks, patch reefs and outer bank reefs as defined in the Coral, Coral Reefs and Live/Hardbottom Habitat Fishery Management Plan (FMP) (SAFMC 1982) and in the Code of Federal Regulations (50 CFR 622.2).

Discoveries of previously uncharacterized areas of deepwater coral resources have been brought forward by the South Atlantic Council's Coral Advisory Panel (AP). Recent scientific exploration has identified areas of high relief features and hardbottom habitat outside of the boundaries of existing Coral Habitat Areas of Particular Concern (CHAPCs). During their 2011 October meeting, the Coral Advisory Panel came forward with recommendations to the South Atlantic Council to revisit the boundaries of the Oculina Bank HAPC, Stetson-Miami Terrace CHAPC, and the Cape Lookout CHAPC to incorporate areas of additional deepwater coral habitat that were previously uncharacterized. The South Atlantic Council reviewed the recommendations and associated Vessel Monitoring System (VMS) analyses of rock shrimp fishing activity for expansion of these areas, and approved the measures for public scoping through Comprehensive Ecosystem-Based Amendment 3 (CE-BA 3). The Coral, Habitat, Deepwater Shrimp and Law Enforcement APs have been working collectively to refine the recommendations since the public scoping process and provide input to the South Atlantic Council on these proposed management measures.

Coral Amendment 8 consists of regulatory actions that focus on deepwater coral ecosystem conservation. Actions consider alternatives that could:

- Expand boundaries of the Oculina Bank Habitat Area of Particular Concern (HAPC)
- Implement a transit provision through the Oculina Bank HAPC
- Expand the boundaries of the Stetson-Miami Terrace CHAPC
- Expand the boundaries of the Cape Lookout CHAPC

This Environmental Assessment has been prepared to analyze the effects of the actions considered in the amendment.

Table of Contents

List of Appendices

List of Figures

List of Tables

Coral Amendment 8 List of Actions

Action 1. Expand the Boundaries of the Oculina Bank HAPC

Action 2. Implement a Transit Provision through Oculina Bank HAPC

Action 3. Expand Boundaries of Stetson-Miami Terrace CHAPC

Action 4. Expand Boundaries of Cape Lookout CHAPC

SUMMARY

of

Coral Amendment 8 to the Fishery Management Plan for Coral, Coral Reef, and Live/Hardbottom Habitats in the South Atlantic Region

Why is the South Atlantic Council taking Action?

Discoveries of previously uncharacterized areas of deepwater coral resources have been brought forward by the South Atlantic Council's Coral Advisory Panel (AP). Recent scientific exploration has identified areas of high relief features and hardbottom habitat outside of the boundaries of existing Coral Habitat Areas of Particular Concern (CHAPCs) (**Appendices J-L**). During their 2011 October meeting, the Coral Advisory Panel came forward with recommendations to the South Atlantic Council to revisit the boundaries of the Oculina Bank HAPC, Stetson-Miami Terrace CHAPC, and the Cape Lookout CHAPC to incorporate areas of additional deepwater coral habitat that were previously uncharacterized. The South Atlantic Council reviewed the recommendations and associated Vessel Monitoring System (VMS) analyses of rock shrimp fishing activity for expansion of these areas, and approved the measures for public scoping through Comprehensive Ecosystem-Based Amendment 3 (CE-BA 3). The Coral, Habitat, Deepwater Shrimp and Law Enforcement APs have been working collectively to refine the recommendations since the public scoping process and provide input to the South Atlantic Council on these proposed management measures.

Coral Amendment 8 consists of regulatory actions that focus on deepwater coral ecosystem conservation.

Purpose for Action

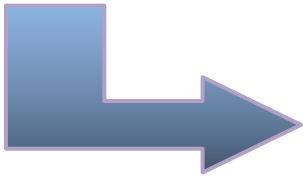
The ***purpose*** of Coral Amendment 8 is to increase protections for deepwater coral based on new information of deepwater coral resources in the South Atlantic.

Need for Action

The ***need*** for action in Coral Amendment 8 is to address recent discoveries of deepwater coral resources and protect deepwater coral ecosystems in the South Atlantic Council's jurisdiction from future activities that could compromise their condition.

What Are the Proposed Actions?

There are 4 actions being proposed in Coral Amendment 8. Each action has a range of alternatives, including a 'no action alternative' and a 'preferred alternative'.



Proposed Actions in Coral Amendment 8

1. Expand Boundaries of the Oculina Bank HAPC
2. Implement a Transit Provision through Oculina Bank HAPC
3. Expand Boundaries of the Stetson-Miami Terrace CHAPC
4. Expand Boundaries of the Cape Lookout CHAPC

What Are the Alternatives?

Proposed Actions in Coral Amendment 8

1. **Expand Boundaries of the Oculina Bank HAPC**
2. Implement a Transit Provision through Oculina Bank HAPC
3. Expand Boundaries of Stetson-Miami Terrace CHAPC
4. Expand Boundaries of Cape Lookout CHAPC

Action 1. Expand boundaries of the Oculina Bank HAPC

Alternative 1 (No Action). Do not modify the boundaries of the Oculina Bank HAPC

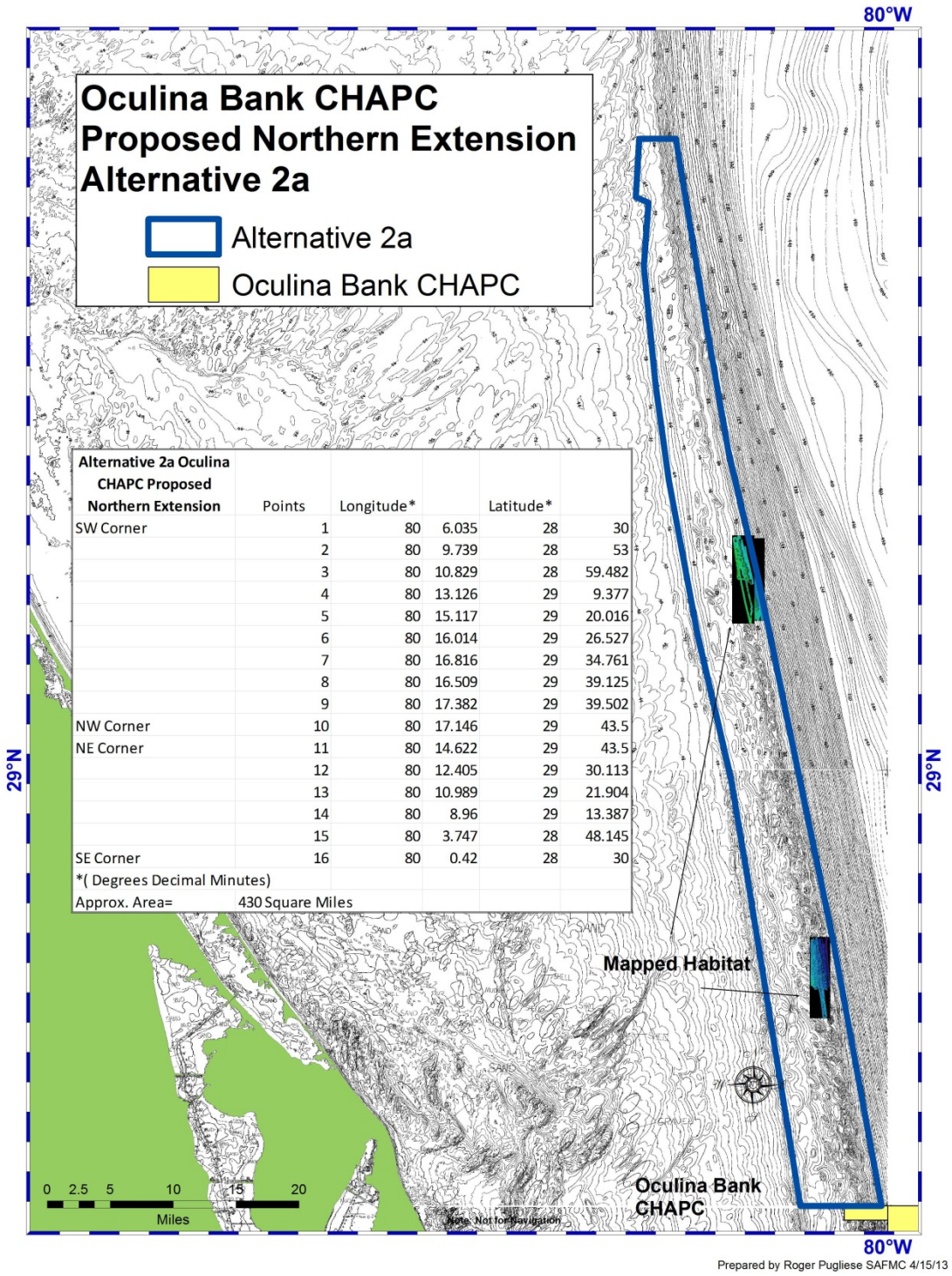
The existing Oculina Bank HAPC is delineated by the following boundaries: on the north by 28°30' N, on the south by 27°30' N., on the east by the 100-fathom (183-m) contour, and on the west by 80°00' W.; and two adjacent satellite sites: the first bounded on the north by 28°30' N., on the south by 28°29' N., on the east by 80°00' W., and on the west by 80°03' W.; and the second bounded on the north by 28°17' N., on the south by 28°16' N., on the east by 80°00 W., and on the west by 80°03' W.

Alternative 2. Modify the northern boundary of the Oculina Bank HAPC

Sub-Alternative 2a. Modify the northern boundary of the Oculina Bank HAPC: from the current northern boundary of the Oculina HAPC (28° 30'N) to 29° 43.5'W. The west and east boundaries would follow the 60 meter and 100 meter depth contour lines, respectively, as represented in the simplified polygon (**Figure S-1 and S-2**). Sub-Alternative 2a = 430 square miles

Sub-Alternative 2b. Modify the northern boundary of the Oculina Bank HAPC from the current northern boundary of the Oculina HAPC (28° 30'N) to 29° 43.5'W. The west and east boundaries would follow close to the 70 meter and 100 meter depth contour lines, respectively, while annexing hard bottom features, as represented in the simplified polygon (**Figure S-3 and S-4**). Sub-alternative 2b = 329 square miles

Alternative 3. Modify the western boundary of the Oculina Bank HAPC from 28° 4.5'N to the north boundary of the current Oculina HAPC (28° 30'N). The east boundary would coincide with the current western boundary of the Oculina HAPC (80° W). The west boundary could either use the 60 meter contour line, or the 80° 03'W longitude (**Figure S-5**). Alternative 3 = 76 square miles



Alternative 2a Oculina CHAPC Proposed Northern Extension	Points	Longitude*		Latitude*	
SW Corner	1	80	6.035	28	30
	2	80	9.739	28	53
	3	80	10.829	28	59.482
	4	80	13.126	29	9.377
	5	80	15.117	29	20.016
	6	80	16.014	29	26.527
	7	80	16.816	29	34.761
	8	80	16.509	29	39.125
	9	80	17.382	29	39.502
NW Corner	10	80	17.146	29	43.5
NE Corner	11	80	14.622	29	43.5
	12	80	12.405	29	30.113
	13	80	10.989	29	21.904
	14	80	8.96	29	13.387
	15	80	3.747	28	48.145
SE Corner	16	80	0.42	28	30
*(Degrees Decimal Minutes)					
Approx. Area=	430 Square Miles				

Figure S-1. Action 1, Sub-Alternative 2a. Oculina Bank HAPC Proposed Northern Extension and Associated Habitat Mapping and Bathymetry.

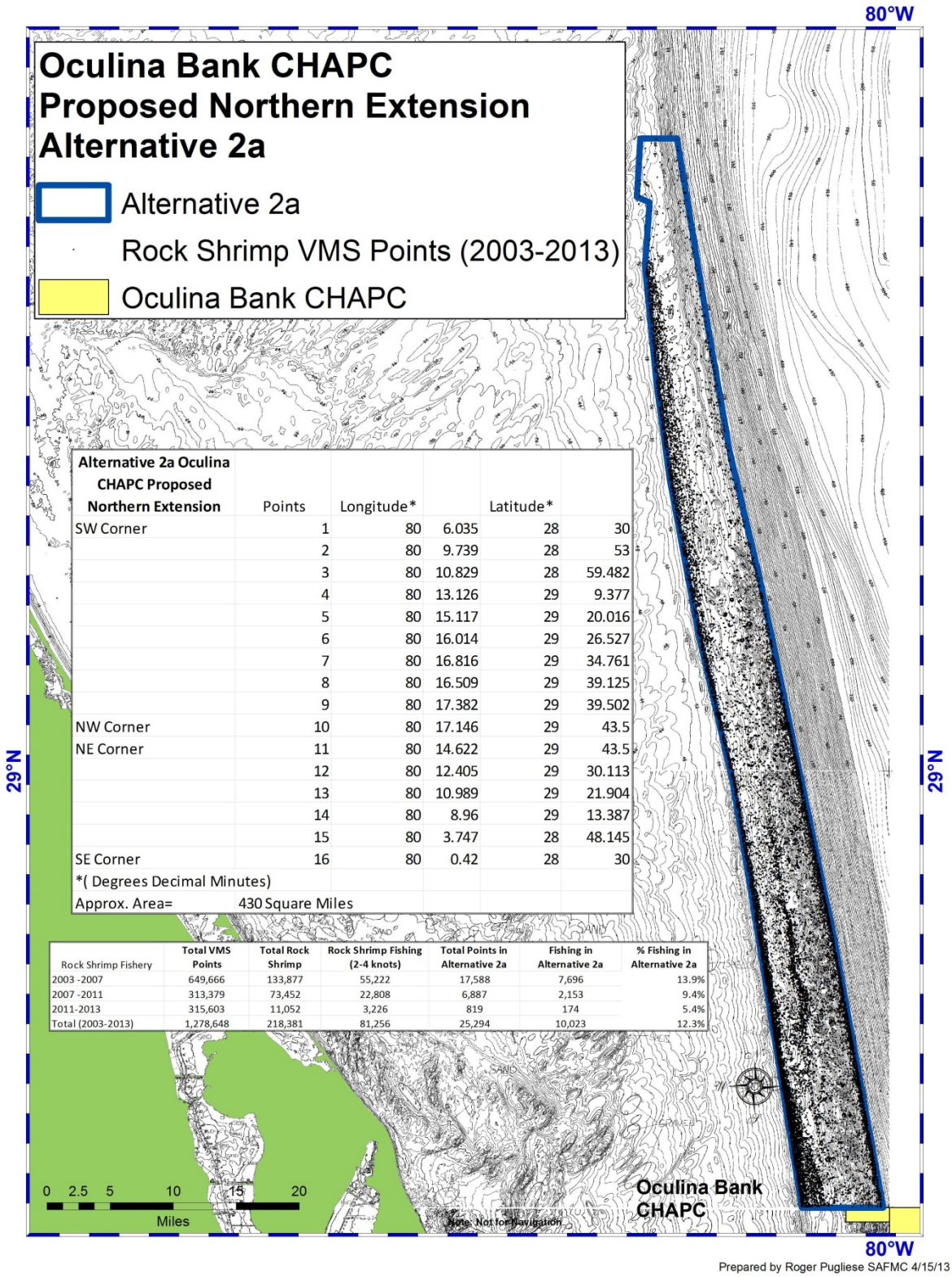
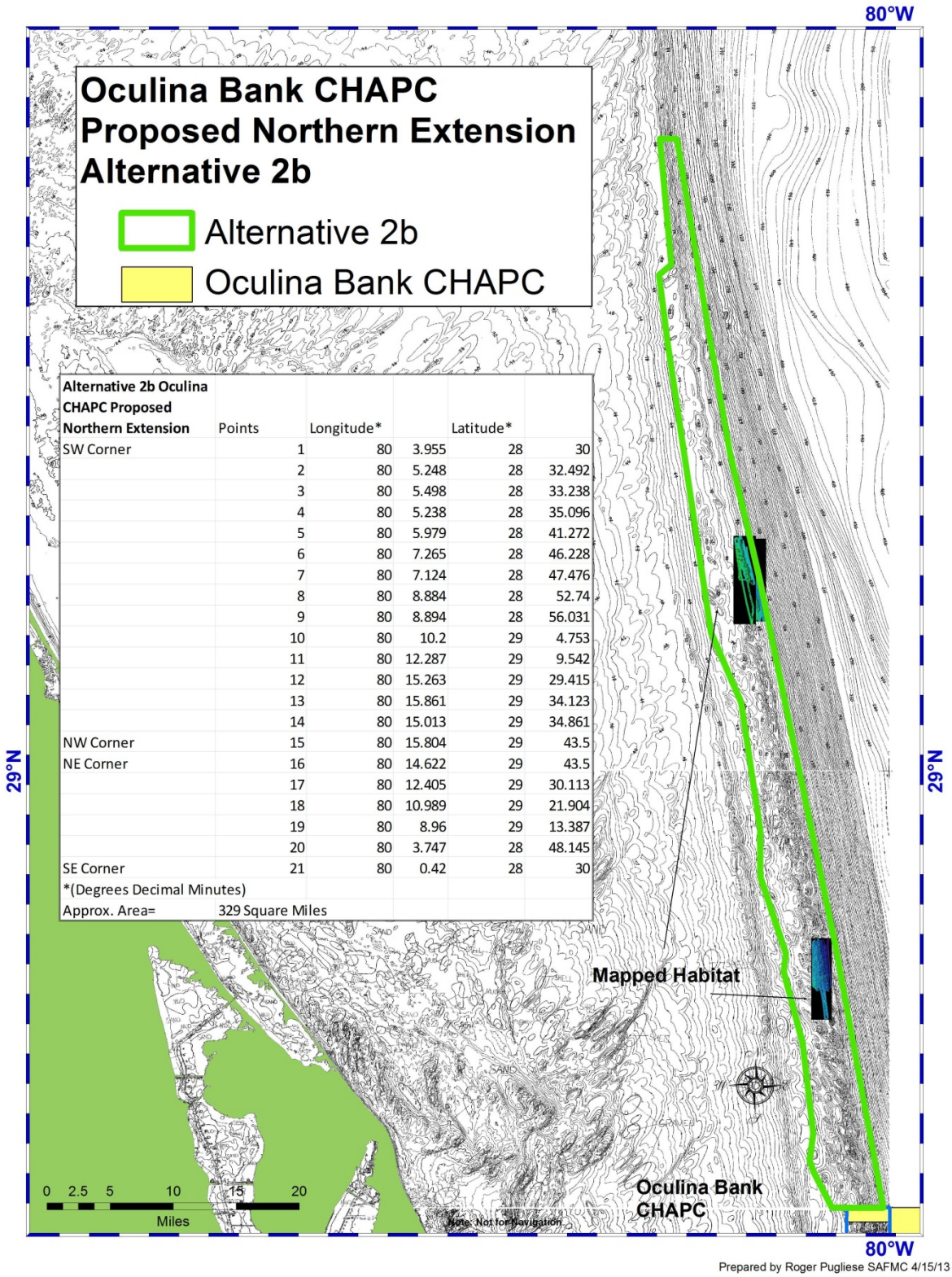


Figure S-2. Action 1, Sub-Alternative 2a. Oculina Bank HAPC Proposed Northern Extension and Rock Shrimp VMS (2003-2013).



Alternative 2b Oculina CHAPC Proposed Northern Extension	Points	Longitude*		Latitude*	
SW Corner	1	80	3.955	28	30
	2	80	5.248	28	32.492
	3	80	5.498	28	33.238
	4	80	5.238	28	35.096
	5	80	5.979	28	41.272
	6	80	7.265	28	46.228
	7	80	7.124	28	47.476
	8	80	8.884	28	52.74
	9	80	8.894	28	56.031
	10	80	10.2	29	4.753
	11	80	12.287	29	9.542
	12	80	15.263	29	29.415
	13	80	15.861	29	34.123
	14	80	15.013	29	34.861
NW Corner	15	80	15.804	29	43.5
NE Corner	16	80	14.622	29	43.5
	17	80	12.405	29	30.113
	18	80	10.989	29	21.904
	19	80	8.96	29	13.387
	20	80	3.747	28	48.145
SE Corner	21	80	0.42	28	30
*(Degrees Decimal Minutes)					
Approx. Area=	329 Square Miles				

Figure S-3. Action 1, Sub-Alternative 2b. Oculina Bank HAPC Proposed Northern Extension and Associated Habitat Mapping and Bathymetry.

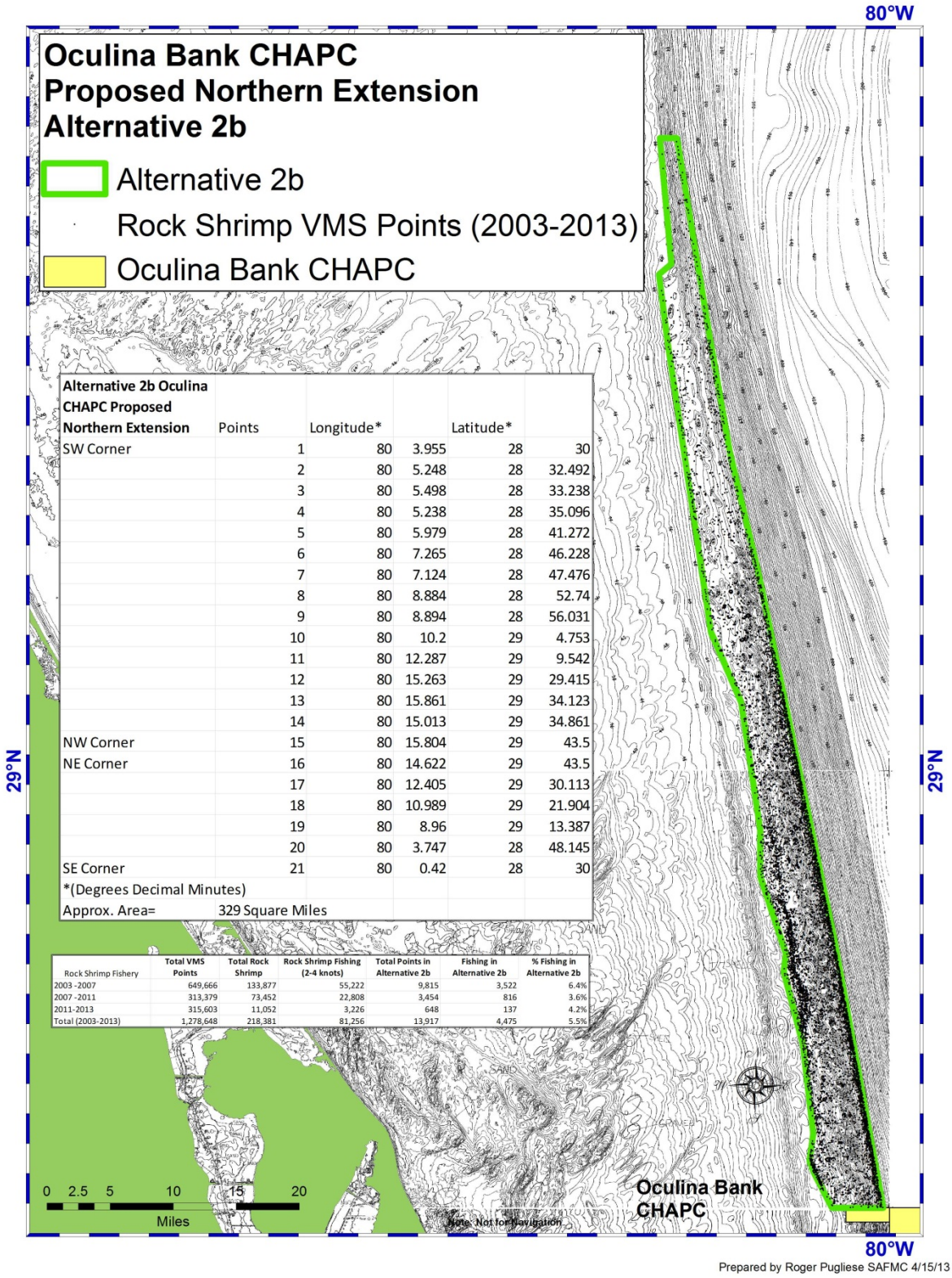


Figure S-4. Action 1, Sub-Alternative 2b. Oculina Bank HAPC Proposed Northern Extension and Rock Shrimp VMS (2003-2013).

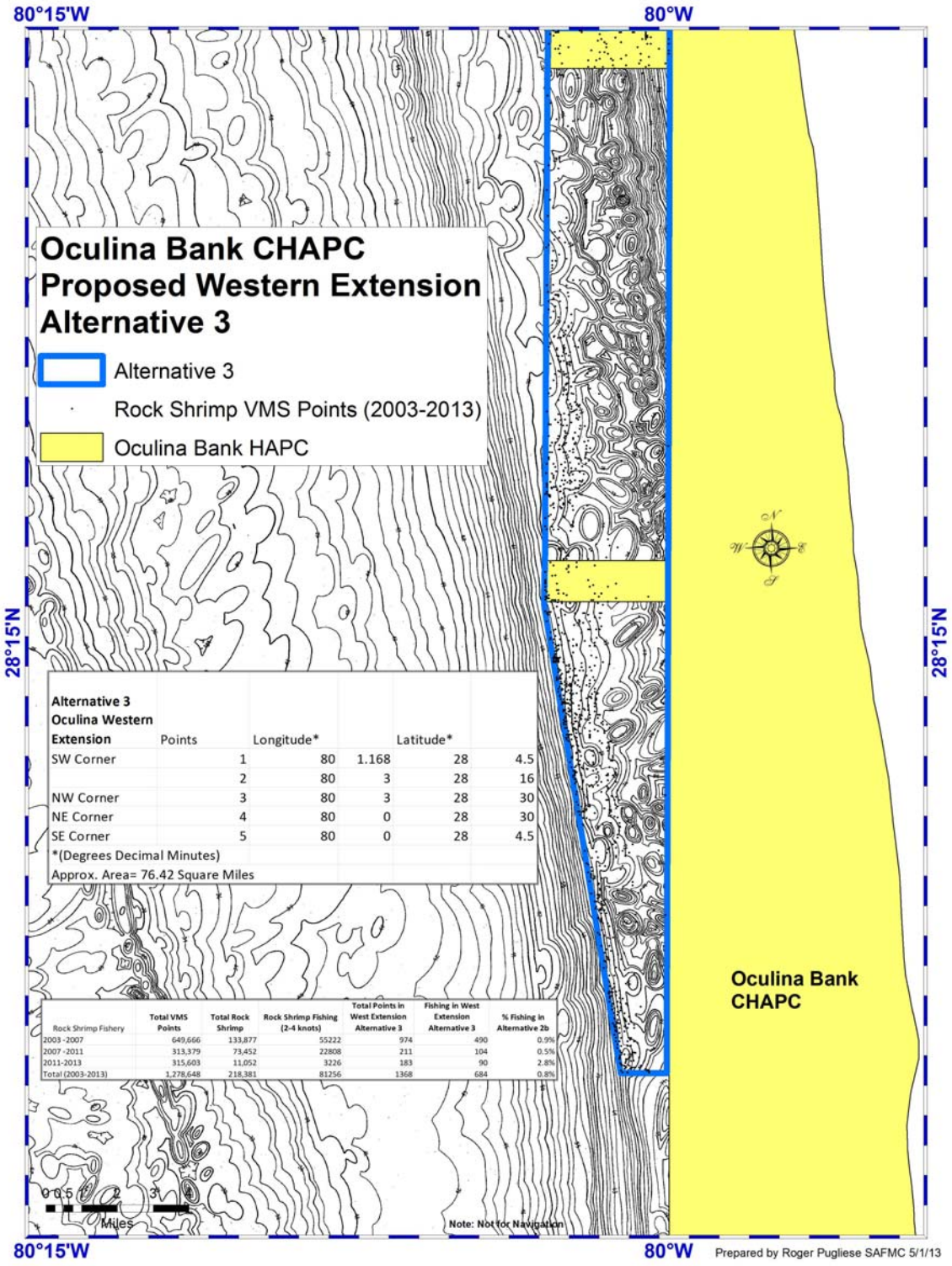


Figure S-5. Action 1, Alternative 3. Oculina Bank HAPC Proposed Western Extension and Rock Shrimp VMS (2003-2013).

Table S-1. Fishing Associated with Oculina Bank HAPC Proposed Northern Extension Alternative 2a and Alternative 2b (Rock Shrimp VMS: 2003-2013).

Rock Shrimp Fishery	Total VMS Points	Total Rock Shrimp	Rock Shrimp Fishing (2-4 knots)	Total Points in Alternative 2a	Fishing in Alternative 2a	% Fishing in Alternative 2a
2003 -2007	649,666	133,877	55,222	17,588	7,696	13.9%
2007 -2011	313,379	73,452	22,808	6,887	2,153	9.4%
2011-2013	315,603	11,052	3,226	819	174	5.4%
Total (2003-2013)	1,278,648	218,381	81,256	25,294	10,023	12.3%
Rock Shrimp Fishery	Total VMS Points	Total Rock Shrimp	Rock Shrimp Fishing (2-4 knots)	Total Points in Alternative 2b	Fishing in Alternative 2b	% Fishing in Alternative 2b
2003 -2007	649,666	133,877	55,222	9,815	3,522	6.4%
2007 -2011	313,379	73,452	22,808	3,454	816	3.6%
2011-2013	315,603	11,052	3,226	648	137	4.2%
Total (2003-2013)	1,278,648	218,381	81,256	13,917	4,475	5.5%

Table S-2. Fishing Associated with Oculina Bank HAPC Proposed Western Extension Alternative 3 (Rock Shrimp VMS: 2003-2013).

Rock Shrimp Fishery	Total VMS Points	Total Rock Shrimp	Rock Shrimp Fishing (2-4 knots)	Total Points in West Extension Alternative 3	Fishing in West Extension Alternative 3	% Fishing in Alternative 2b
2003 -2007	649,666	133,877	55222	974	490	0.9%
2007 -2011	313,379	73,452	22808	211	104	0.5%
2011-2013	315,603	11,052	3226	183	90	2.8%
Total (2003-2013)	1,278,648	218,381	81256	1368	684	0.8%

Summary of Effects

Biological: Under **Alternative 1 (No Action)** gear prohibitions that are currently restricted in the existing Oculina Bank HAPC would continue to be prohibited. Prohibited gear within the Oculina HAPC includes bottom longline, bottom trawl, dredge, pot or trap as well as the use of an anchor, anchor and chain, or grapple and chain. Within Oculina Bank HAPC fishing for or possessing rock shrimp or *Oculina* coral is also prohibited. **Alternative 2** and associated **sub-alternatives** and **Alternative 3** propose increasing the size of the Oculina Bank HAPC and extending the prohibitions to a larger area. As the size of the Oculina HAPC is increased, the biological benefit increases for the coral in the area, including *Oculina*; the species that use the bottom substrate as habitat; and for the rock shrimp populations in the HAPC. Increasing the size of the Oculina Bank HAPC, may provide a refuge for other important species in the area, such as snapper grouper populations.

Economic: Under **Alternative 1 (No Action)**, the additional areas proposed in **Alternatives 2** and **3** 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** and **Alternative 3** could have negative short-term impacts on the rock shrimp and snapper grouper fisheries.

With regard to recreational fisheries, the anchoring prohibition that would be effect in **Action 1, Alternatives 2** and **3** (including sub-alternatives) 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 the depths proposed under **Alternatives 2** and **3**. Thus, the action of expanding the CHAPCs and prohibiting anchoring of fishing vessels within them would have only a small negative impact on recreational fisheries.

Social: Alternative 1 (No Action) would have minimal social effects because the fleet is already harvesting in open areas and prohibited from working in the closed areas. **Alternative 2** and **Alternative 3** would impact the rock shrimp fleet and possibly other commercial fisheries by closing some historic, present and potential future fishing grounds. Additionally, if a transit provision is not established (as considered under Action 2), travel costs could negatively affect some operations. If the cost to travel to or from the fishing grounds is too high due to new closed areas under **Alternatives 2** and **3**, a business may choose to no longer participate in the fishery. The size and the location of the closed areas are the two most significant factors that would be expected to negatively impact fishermen.

Administrative: Administrative impacts would be incurred through the rule making process, outreach and enforcement. The impacts associated with enforcement would differ between the alternatives based on the size of the closed area. It is expected the larger the expansion of the HAPC the more enforcement will be needed. Most of the administrative impacts associated with these alternatives relate to at-sea enforcement.

Action 2. Implement a Transit Provision through the Oculina Bank HAPC

Alternative 1 (No Action). Do not implement a transit provision through Oculina Bank HAPC. Currently, possession of rock shrimp in or from the area on board a fishing vessel is prohibited.

Alternative 2. Allow for transit through the Oculina Bank HAPC. When transiting the Oculina Bank, gear must be stowed in accordance with CFR Section 622.35 (i)(2). Vessels must maintain a minimum speed of 5 knots while in transit through the Oculina HAPC. In the event minimal speed is not sustainable, vessel must communicate to appropriate contact.

Alternative 3. Allow for transit through the Oculina Bank HAPC with possession of rock shrimp on board. When transiting through the Oculina Bank HAPC vessels must maintain a speed of not less than 6 knots, determined by ping rate that is acceptable by law enforcement (i.e. 5 minutes), with gear appropriately stowed (stowed is defined as doors and nets out of water). The transit provision includes a call-in specification in case of mechanical failure or emergency.

Proposed Actions in Coral Amendment 8

1. Expand Boundaries of the Oculina Bank HAPC
2. **Implement a Transit Provision through Oculina Bank HAPC**
3. Expand Boundaries of the Stetson-Miami Terrace CHAPC
4. Expand Boundaries of the Cape Lookout CHAPC

Summary of Effects

Biological: The establishment of a transit provision would not result in biological effects within the Oculina HAPC. A transit provision has been established in the South Atlantic for other fisheries through closed areas to allow for easier access to traditional fishing grounds. Establishing a transit provision through Oculina may have negative biological benefits for the shrimp stocks that are on the eastern side of Oculina Bank HAPC as fishing vessels will have easier access to them. Without a transit provision, the trip to those fishing grounds would be long and not cost effective to fishermen, providing an indirect protection to those shrimp populations.

Economic: Moving the northern boundary further north would increase the direct economic costs in terms of increased expenses (fuel) and lost opportunity, not only due to the loss of fishing grounds in the additional closed area, but also due to fishing time lost by having to transit around the closed area. While the exact extent of the economic effects of **Action 1**, **Sub-Alternatives 2a** and **2b** combined with **Action 2, Alternative 1 (No Action)** cannot be determined, the overall range of economic effects of the sub-alternatives would be characterized best in terms of the total additional area closed. Rock shrimp fishermen would receive some relief from the expected negative economic effects should **Action 2, Alternative 2** be selected as the preferred. This alternative would allow fishermen to transit the Oculina Bank with gear stowed and transiting at a minimum speed of 5 knots.

Social: If additional closed areas are established under **Action 1,** some negative impacts on the fishing vessels and crew may be reduced with a transit provision. The transit provision in **Alternative 2** would be beneficial to the shrimp and snapper grouper vessels by reducing the risk of negative impacts due to increased travel time and costs when traveling around a closed area to outer fishing grounds. Establishment of a transit provision under **Alternative 2** would not be expected to reduce the long-term social benefits of coral protection while reducing some of the negative impacts on the fishing fleet.

Administrative: There would be minor administrative impacts associated with the transit provision. Administrative impacts associated with enforcement would be greatest for these action alternatives. If modifications are made to the transit regulations, administrative impacts would increase on the agency during the development and implementation phase. **Alternative 3** would require the vessel to maintain a speed of 6 knots as indicated by an increased ping rate on the vessel monitoring system (VMS). Depending on the frequency of transit, this might lead to a slight increase in the impacts associated with monitoring of VMS by law enforcement. If modifications are not made to the transit provisions to suit the shrimp fishery, impacts on the fishery participants will increase as they will need to modify fishing behavior.

Action 3. Expand boundaries of the Stetson-Miami Terrace CHAPC

Alternative 1. (No Action) Do not expand the boundaries of the Stetson-Miami CHAPC.

The existing Stetson-Miami Terrace CHAPC is delineated by the coordinates identified in CFR §633.35 (n)(iii).

Alternative 2. Modify the southern southeast boundary of the Stetson-Miami Terrace CHAPC western extension in a manner that releases the flatbottom region to the extent possible while maintaining protection of coral habitat (**Figure S-6**).

Alternative 3. Modify the Coral AP recommendation for expanding the Stetson-Miami Terrace CHAPC to include area of mapped habitat within the expansion, and exclude areas of royal red fishery activity based on VMS data (**Figure S-7**).

Proposed Actions in Coral Amendment 8

1. Expand Boundaries of the Oculina Bank HAPC
2. Implement a Transit Provision through Oculina Bank HAPC
3. **Expand Boundaries of the Stetson-Miami Terrace CHAPC**
4. Expand Boundaries of the Cape Lookout CHAPC

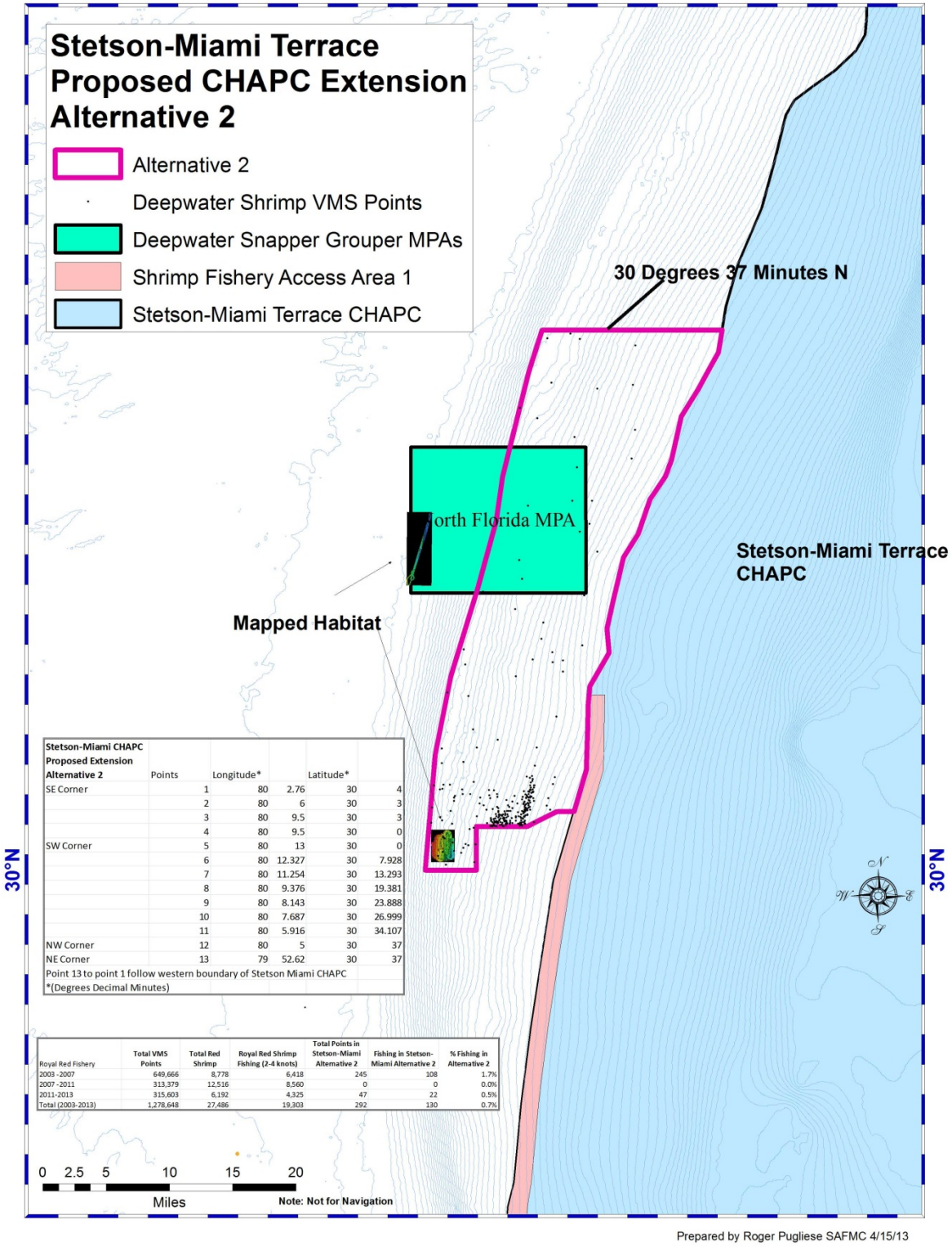


Figure S-6. Action 3, Alternative 2. Proposed Modification to the Southeast Boundary of a Western Extension of Stetson-Miami Terrace CHAPC. (Deepwater Shrimp VMS 2003-2013.)

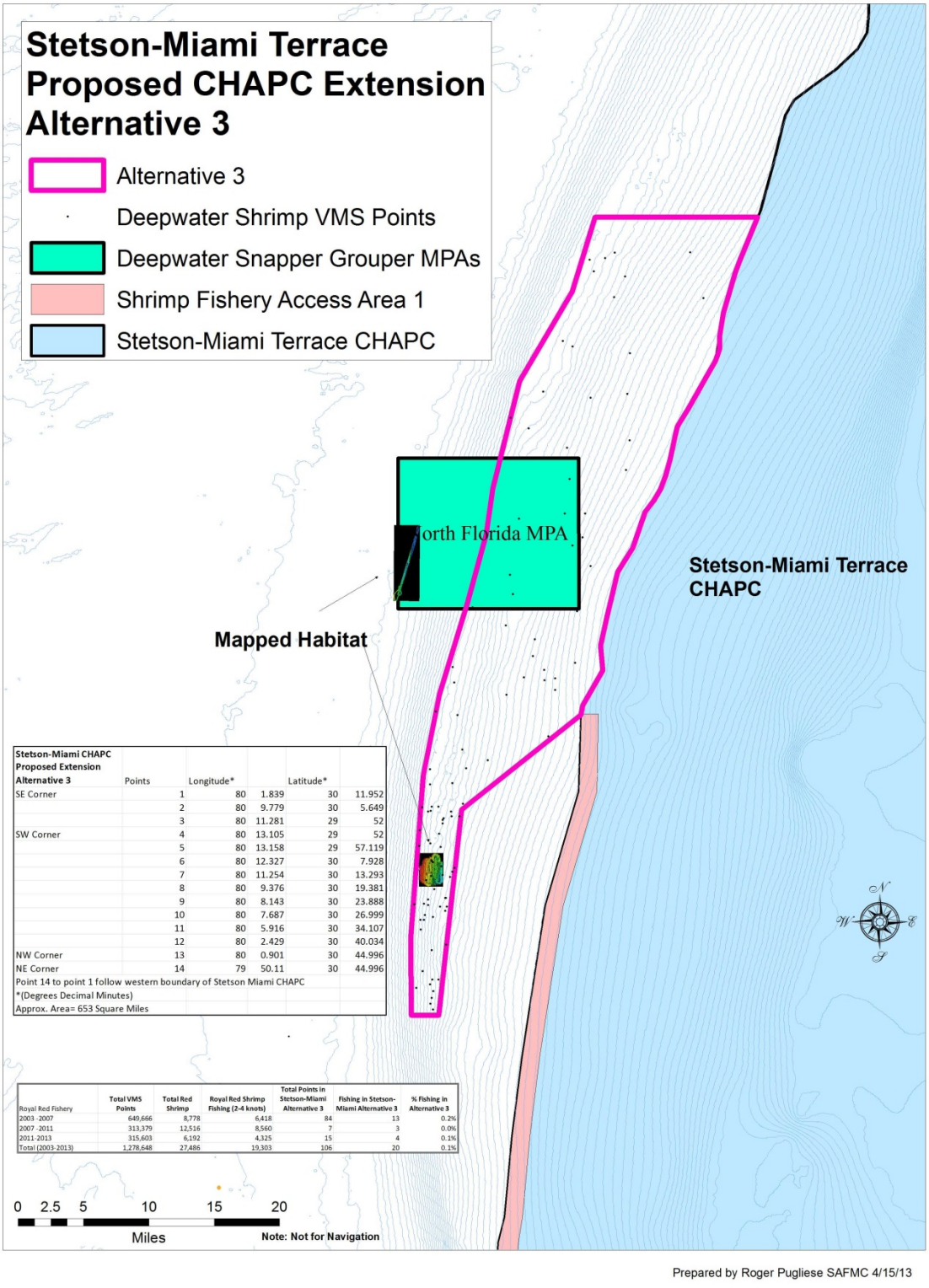


Figure S-7. Action 3, Alternative 3. Proposed Modifications to Stetson-Miami Terrace CHAPC. (Deepwater Shrimp VMS 2003-2013.)

Table S-3. Fishing Associated with Stetson-Miami Terrace CHAPC Alternatives 2 and 3 (Deepwater Shrimp VMS: 2003-2013).

Royal Red Fishery	Total VMS Points	Total Red Shrimp	Royal Red Shrimp Fishing (2-4 knots)	Total Points in Stetson-Miami Alternative 2	Fishing in Stetson-Miami Alternative 2	% Fishing in Alternative 2
2003 -2007	649,666	8,778	6,418	245	108	1.7%
2007 -2011	313,379	12,516	8,560	0	0	0.0%
2011-2013	315,603	6,192	4,325	47	22	0.5%
Total (2003-2013)	1,278,648	27,486	19,303	292	130	0.7%
Royal Red Fishery	Total VMS Points	Total Red Shrimp	Royal Red Shrimp Fishing (2-4 knots)	Total Points in Stetson-Miami Alternative 3	Fishing in Stetson-Miami Alternative 3	% Fishing in Alternative 3
2003 -2007	649,666	8,778	6,418	84	13	0.2%
2007 -2011	313,379	12,516	8,560	7	3	0.0%
2011-2013	315,603	6,192	4,325	15	4	0.1%
Total (2003-2013)	1,278,648	27,486	19,303	106	20	0.1%

Summary of Effects

Biological: Alternative 1 (No Action) would not modify coordinates for the Stetson Miami Terrace CHAPC. Within the CHAPCs, the use of bottom longline, bottom trawl, mid-water trawl, dredge, anchor, pot or trap, anchor and chain and grapple and chain is prohibited. **Alternative 2** would provide greater biological benefits to species caught within the expanded area. **Alternative 3** would have provide greater biological benefits to all species caught within the expanded area with the exception of royal red species.

Alternative 2 and **Alternative 3** would be expected to result in positive biological impacts to the deepwater coral habitat in these areas as it would extend the prohibitions on bottom damaging gear. 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 these alternatives, habitats within the Stetson-Miami Terrace proposed CHPAC expansion would be protected from damaging fishing gear such as bottom longline, which would have positive biological impacts on the species in the area.

Economic: Alternative 1 (No Action) would likely have minimal social effects because this would maintain access to harvest areas. The proposed extension of the Stetson-Miami Terrace CHAPC under **Alternative 2** could have negative social effects on the royal red shrimp and snapper grouper fishing fleet if historic fishing grounds are no longer available. **Alternative 3** would likely have minimal social impacts on the deepwater shrimp fleet because this would maintain access to harvest areas.

Social: Alternative 1 (No Action) would likely have minimal social effects because this would maintain access to shrimp and snapper grouper harvest areas that would be reduced under **Alternative 2**. The proposed extension of the Stetson-Miami Terrace CHAPC under **Alternative 2** could have negative social effects on the royal red and rock shrimp fleet, and possibly other fisheries, if historic fishing grounds are no longer available, but **Alternative 3**

would likely reduce the potential impacts on the deepwater shrimp fleet because this would maintain access to harvest areas.

Administrative: The expansion of the Stetson Miami Terrace CHAPC (**Alternative 2** and **Alternative 3**) would have minimal administrative impacts. Administrative impacts would be incurred through the rule making process, outreach and enforcement. The administrative impacts would differ between the alternatives in the amount of area they cover. It is expected the larger the expansion of the CHAPC the more enforcement will be needed. Most of the administrative impacts associated with these alternatives relate to at-sea enforcement.

Action 4. Expand boundaries of the Cape Lookout CHAPC

Alternative 1. (No Action) Do not modify the boundaries of the Cape Lookout CHAPC.

The existing Cape Lookout CHAPC is identified by the following coordinates:

Latitude	Longitude
34°24'37"	75°45'11"
34°10'26"	75°58'44"
34°05'47"	75°54'54"
34°21'02"	75°41'25"

Proposed Actions in Coral Amendment 8

1. Expand Boundaries of the Oculina Bank HAPC
2. Implement a Transit Provision through Oculina Bank HAPC
3. Expand Boundaries of Stetson-Miami Terrace CHAPC
4. **Expand Boundaries of Cape Lookout CHAPC**

Alternative 2. Extend the northern boundary to encompass the area identified by the following coordinates (**Figure S-8**):

Latitude	Longitude
34°24.6166'	75°45.1833'
34°23.4833'	75°43.9667'
34°27.9'	75°42.75'
34°27.0'	75°41.5'

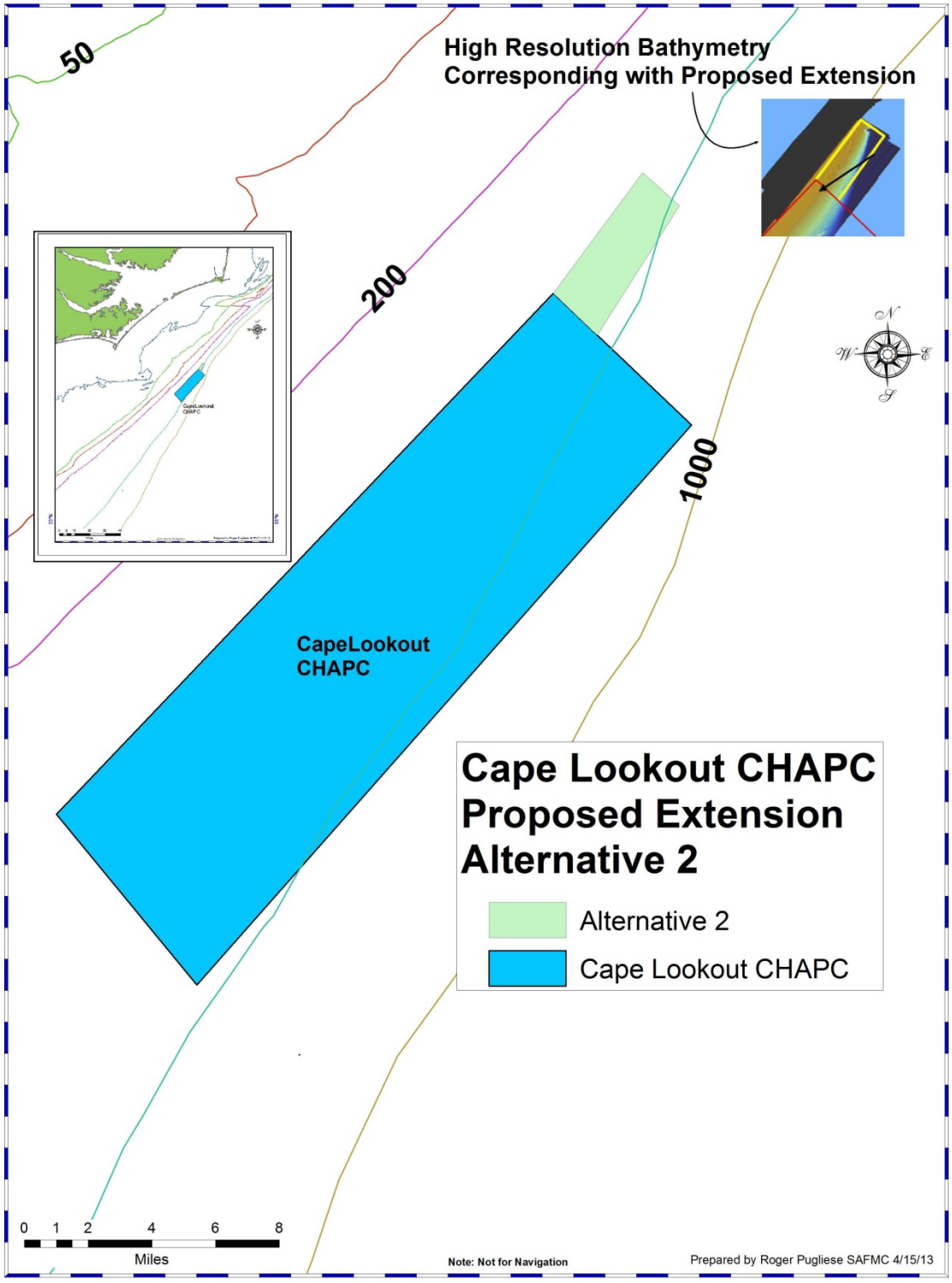


Figure S-8. Action 4, Alternative 2. Cape Lookout CHAPC proposed extension and habitat mapping.

Summary of Effects

Biological: Under **Alternative 1 (No Action)**, the same prohibitions currently restricted within the CHAPC would apply. Within the CHAPCs, the use of bottom longline, bottom trawl, mid-water trawl, dredge, anchor, pot or trap, anchor and chain and grapple and chain is prohibited. **Alternative 2** proposes to expand the original Cape Lookout CHAPC along the northern boundary. This would increase the size of the Cape Lookout CHAPC from 316 square kilometers to 324 square kilometers. This expansion would benefit deepwater coral ecosystems and has been proposed based on new information of occurrence of deepwater *Lophelia* corals in the area.

Economic: Alternative 1 (No Action) would likely have minimal economic effects because this would maintain access to current harvest areas. The proposed extension of the Cape Lookout CHAPC under **Alternative 2** could have negative economic effects particularly on the snapper grouper fleet if historic fishing grounds are no longer available.

Social: Alternative 1 (**No Action**) would likely have minimal negative social effects because no current or potential fishing grounds would be closed. The proposed extension of the Cape Lookout CHAPC under **Alternative 2** could have negative social effects on the royal red and rock shrimp fleet if historic fishing grounds are no longer available, or if the closed area affected travel to and from harvest areas. The small size of the expansion proposed under **Alternative 2** would also be expected to result in less social impact than a larger area.

Administrative: The expansion of the Cape Lookout CHAPC (**Alternative 2**) would have a minimal administrative impact. Administrative impacts would be felt through the rule making process, outreach and enforcement. The administrative impacts would differ between the alternatives in the amount of area they cover. It is expected the larger the expansion of the Cape Lookout CHAPC the more enforcement will be needed. Most of the administrative impacts associated with these alternatives relate to at-sea enforcement.

Chapter 1. Introduction

1.1 What Actions Are Being Proposed?

Fishery managers are proposing changes to regulations through Coral Amendment 8. Actions included in Coral Amendment 8 would expand protection of deepwater coral resources that have been designated as Habitat Areas of Particular Concern (HAPC) and Coral Habitat Areas of Particular Concern (CHAPCs).

South Atlantic Fishery Management Council

- Is responsible for conservation and management of fish stocks in the South Atlantic Region
- Consists of 13 voting members who are appointed by the Secretary of Commerce
- Manages the waters from 3 to 200 miles off the coasts of North Carolina, South Carolina, Georgia, and Florida
- Develops management plans and recommends regulations to NOAA Fisheries Service for implementation

1.2 Who is Proposing the Actions?

The South Atlantic Fishery Management Council (South Atlantic Council) is proposing the actions contained within this document. The South Atlantic Council recommends management measures and submits them to the National Marine Fisheries Service (NMFS) who ultimately approves, disapproves, or partially approves, and implements the actions in the amendment on behalf of the Secretary of Commerce. NMFS is an agency in the National Oceanic and Atmospheric Administration within the Department of Commerce.

1.3 Where is the Project Located?

Management of the federal fisheries in the South Atlantic covers the area between 3-200 nautical miles (nm) (**Figure 1-1**). This management is conducted under the fishery management plans (FMP) developed by the South Atlantic Fishery Management Council. Actions in this document would amend the FMP for Coral and Coral Reefs of the South Atlantic.

1.4 Why is the South Atlantic Council Considering Action?

Recent studies have indicated pinnacles and mounds of deepwater coral ecosystems in the South Atlantic Region. The South Atlantic Council has a history of protecting these important habitats through the development of the Oculina HAPC (1994), and the Deepwater CHAPCs (2010c). New discoveries of deepwater coral ecosystems have led the Council to propose boundary modifications to the original coral protection areas.

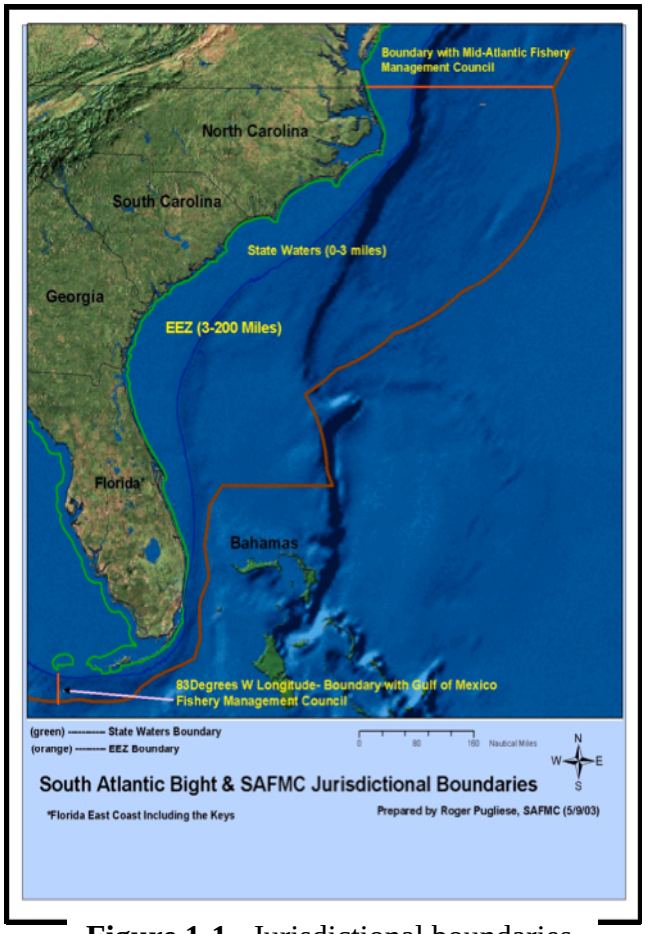


Figure 1-1. Jurisdictional boundaries of the South Atlantic Council

Purpose for Action

The ***purpose*** of Coral Amendment 8 is to increase protections for deepwater coral based on new information of deepwater coral resources in the South Atlantic.

Need for Action

The need for action in Coral Amendment 8 is to address recent discoveries of deepwater coral resources and protect deepwater coral ecosystems in the South Atlantic Council's jurisdiction from activities that could compromise their condition.

Chapter 2. Proposed Actions

This section contains the proposed actions being considered to meet the purpose and need. Each action contains a range of alternatives, including the no action (status-quo). Alternatives the South Atlantic Council considered but eliminated from detailed study during the development of this amendment are described in **Appendix A**.

Proposed Actions in Coral Amendment 8

1. Expand Boundaries of the Oculina Bank HAPC
2. Implement a Transit Provision through Oculina Bank HAPC
3. Expand Boundaries of the Stetson-Miami Terrace CHAPC
4. Expand Boundaries of the Cape Lookout CHAPC

2.1 Action 1. Expand Boundaries of the Oculina Bank HAPC

Alternative 1. (No Action) Do not revise boundaries of the Oculina Bank HAPC

The existing Oculina Bank HAPC is delineated by the following boundaries: on the north by 28°30' N, on the south by 27°30' N., on the east by the 100-fathom (183-m) contour, and on the west by 80°00' W.; and two adjacent satellite sites: the first bounded on the north by 28°30' N., on the south by 28°29' N., on the east by 80°00' W., and on the west by 80°03' W.; and the second bounded on the north by 28°17' N., on the south by 28°16' N., on the east by 80°00 W., and on the west by 80°03' W.

Alternative 2. Modify the northern boundary of the Oculina Bank HAPC.

> **Sub-Alternative 2a**. Modify the northern boundary of the Oculina Bank HAPC: from the current northern boundary of the Oculina HAPC (28° 30'N) to 29° 43.5'W. The west and east boundaries would follow the 60 meter and 100 meter depth contour lines, respectively, as represented in the simplified polygon. Sub-alternative 2a = 430 square miles
>
> **Sub-alternative 2b.** Modify the northern boundary of the Oculina Bank HAPC from the current northern boundary of the Oculina HAPC (28° 30'N) to 29° 43.5'W. The west and east boundaries would follow close to the 70 meter and 100 meter depth contour lines, respectively, while annexing obvious hard bottom features as represented in the simplified polygon. Sub-alternative 2b = 329 square miles

Alternative 3. Modify the western boundary of the Oculina Bank HAPC from 28° 4.5'N to the north boundary of the current Oculina HAPC (28° 30'N). The east boundary would coincide with the current western boundary of the Oculina HAPC (80° W). The west boundary could either use the 60 meter contour line, or the 80° 03'W longitude. Alternative 3 = 76 square miles

Comparison of Alternatives

Biological: Under **Alternative 1 (No Action)** gear prohibitions that are currently restricted in the existing Oculina Bank HAPC would continue to be prohibited. Prohibited gear within the Oculina HAPC includes bottom longline, bottom trawl, dredge, pot or trap as well as the use of an anchor, anchor and chain, or grapple and chain. Within Oculina Bank HAPC, fishing for or possessing rock shrimp or *Oculina* coral is also prohibited. **Alternative 2** and associated sub-alternatives and **Alternative 3**, propose increasing the size of the Oculina Bank HAPC and extending the prohibitions to a larger area. As the size of the Oculina HAPC is increased, the biological benefit increases for the coral in the area, including *Oculina*; the species that use the bottom substrate as habitat; and for the rock shrimp populations in the HAPC. Increasing the size of the Oculina Bank HAPC, may provide a refuge for other important species in the area, such as snapper grouper populations.

Economic: Under **Alternative 1 (No Action)**, the additional areas proposed in **Alternatives 2** and **3** 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** and **Alternative** 3 could have negative short-term impacts on the rock shrimp and snapper grouper fisheries.

With regard to recreational fisheries, the anchoring prohibition that would be effect in **Action 1, Alternatives 2** and **3** (including sub-alternatives) 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 the depths proposed under **Alternatives 2** and **3**. 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.

Social: Alternative 1 (No Action) would have minimal social effects because the fleet is already harvesting in open areas and prohibited from working in the closed areas. **Alternative 2** and **Alternative 3** would impact the rock shrimp fleet and possibly other commercial fisheries by closing some historic, present and potential future fishing grounds. Additionally, if a transit provision is not established, travel costs could negatively affect some operations. If the cost to travel to or from the fishing grounds is too high due to new closed areas under **Alternatives 2** and **3**, a business may choose to no longer participate in the fishery. The size and the location of the closed areas are the two most significant factors that would be expected to negatively impact fishermen.

Administrative: Administrative impacts would be incurred through the rule making process, outreach and enforcement. The impacts associated with enforcement would differ between the alternatives based on the size of the closed area. It is expected the larger the expansion of the HAPC the more enforcement will be needed. Most of the administrative impacts associated with these alternatives relate to at-sea enforcement.

Table 2-1. Summary of effects under **Action 1**.

Alternatives	Biological Effects	Socioeconomic/Administrative Effects
Alternative 1 (No Action)		
Alternative 2		
Alternative 3		

2.2 Action 2. Implement a transit provision through the Oculina Bank HAPC

Alternative 1 (No Action). Do not implement a transit provision through Oculina Bank HAPC. Currently, possession of rock shrimp in or from the area on board a fishing vessel is prohibited.

Alternative 2. Allow for transit through the Oculina Bank HAPC. When transiting the Oculina Bank, gear must be stowed in accordance with CFR Section 622.35 (i)(2). Vessels must maintain a minimum speed of 5 knots while in transit through the Oculina HAPC. In the event minimal speed is not sustainable, vessel must communicate to appropriate contact.

Alternative 3. Allow for transit through the Oculina Bank HAPC with possession of rock shrimp on board. When transiting through the Oculina Bank HAPC vessels must maintain a speed of not less than 6 knots, determined by a ping rate that is acceptable by law enforcement (i.e. 5 minutes), with gear appropriately stowed (stowed is defined as doors and nets out of water). The transit provision includes a call-in specification in case of mechanical failure or emergency.

Comparison of Alternatives

Biological: The establishment of a transit provision would not result in biological effects within the Oculina HAPC. A transit provision has been established in the South Atlantic for other fisheries through closed areas to allow for easier access to traditional fishing grounds. Establishing a transit provision through Oculina may have negative biological benefits for the shrimp stocks that are on the eastern side of Oculina Bank HAPC as fishing vessels will have easier access to them. Without a transit provision, the trip to those fishing grounds would be long and not cost effective to fishermen, providing an indirect protection to those shrimp populations.

Economic: Moving the northern boundary further north would increase the direct economic costs in terms of increased expenses (fuel) and lost opportunity, not only due to the loss of fishing grounds in the additional closed area, but also due to fishing time lost by having to transit around the closed area. While the exact extent of the economic effects of **Action 1**, **Sub-Alternatives 2a and 2b** combined with **Action 2, Alternative 1 (No Action)** cannot be determined, the overall range of economic effects of the sub-alternatives would best be characterized in terms of the total additional area closed. Rock shrimp fishermen would receive some relief from the expected negative economic effects should **Action 2, Alternative 2** be selected as the preferred. This alternative would allow fishermen to transit the Oculina Bank with gear stowed and transiting at a minimum speed of 5 knots.

Social: If additional closed areas are established under **Action 1,** some negative impacts on the fishing vessels and crew may be reduced with a transit provision. The transit provision in **Alternative 2** would be beneficial to the shrimp and snapper grouper vessels by reducing the risk of negative impacts due to increased travel time and costs when traveling around a closed area to

outer fishing grounds. Establishment of a transit provision under **Alternative 2** would not be expected to reduce the long-term social benefits of coral protection while reducing some of the negative impacts on the fishing fleet.

Administrative: There would be minor administrative impacts associated with a transit provision through Oculina Bank HAPC. Administrative impacts associated with enforcement would be greatest for these action alternatives. If modifications are made to the transit regulations, administrative impacts would increase on the agency during the development and implementation phase. Alternative 3 would require the vessel to maintain a speed of 6 knots as indicated by an increased ping rate on the vessel monitoring system (VMS). Depending on the frequency of transit, this might lead to a slight increase in the impacts associated with monitoring of VMS by law enforcement. If modifications are not made to the transit provisions to suit the shrimp fishery, impacts on the fishery participants will increase as they will need to modify fishing behavior.

Table 2-2. Summary of effects under **Action 2**

Alternatives	Biological Effects	Socioeconomic/Administrative Effects
Alternative 1 (No Action)		
Alternative 2		
Alternative 3		

2.3 Action 3. Expand boundaries of the Stetson-Miami Terrace CHAPC

Alternative 1. (**No Action**) Do not revise the boundaries of the Stetson-Miami Terrace CHAPC. The existing Stetson-Miami Terrace CHAPC is delineated by the coordinates identified in CFR §633.35 (n)(iii).

Alternative 2. Modify the southern southeast boundary of the Stetson-Miami Terrace CHAPC western extension in a manner that releases the flatbottom region to the extent possible while maintaining protection of coral habitat.

Alternative 3. Modify the Coral AP recommendation for expanding the Stetson-Miami Terrace CHAPC to include area of mapped habitat within the expansion, and exclude areas of royal red fishery activity based on VMS data.

Comparison of Alternatives

Biological: Alternative 1 (No Action) would not modify the coordinates for the Stetson Miami Terrace CHAPC. Within the CHAPCs, the use of bottom longline, bottom trawl, mid-water trawl, dredge, anchor, pot or trap, anchor and chain and grapple and chain is prohibited. **Alternative 2** would provide greater biological benefits to species caught within the expanded area. **Alternative 3** would provide greater biological benefits to all species caught within the expanded area with the exception of royal red shrimp.

Alternative 2 and **Alternative 3** would be expected to result in positive biological impacts to the deepwater coral habitat in these areas as it would extend the prohibitions on bottom damaging gear. 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 these alternatives, habitats within the Stetson-Miami Terrace proposed CHAPC expansion would be protected from damaging fishing gear such as bottom longline, which would have positive biological impacts on the species in the area.

Economic: Alternative 1 (No Action) would likely have minimal social effects because this would maintain access to harvest areas. The proposed extension of the Stetson-Miami Terrace CHAPC under **Alternative 2** could have negative social effects on the royal red shrimp and snapper grouper fishing fleet if historic fishing grounds are no longer available. **Alternative 3** would likely have minimal social impacts on the deepwater shrimp fleet because this would maintain access to harvest areas.

Social: Alternative 1 (No Action) would likely have minimal social effects because this would maintain access to shrimp and snapper grouper harvest areas that would be reduced under **Alternative 2**. The proposed extension of the Stetson-Miami Terrace CHAPC under **Alternative 2** could have negative social effects on the royal red and rock shrimp fleet, and possibly other fisheries, if historic fishing grounds are no longer available, but **Alternative 3**

would likely reduce the potential impacts on the deepwater shrimp fleet because this would maintain access to harvest areas.

Administrative: The expansion of the Stetson Miami Terrace CHAPC (**Alternative 2** and **Alternative 3**) would have minimal administrative impacts. Administrative impacts would be incurred through the rule making process, outreach and enforcement. The administrative impacts would differ between the alternatives in the amount of area they cover. It is expected the larger the expansion of the CHAPC the more enforcement will be needed. Most of the administrative impacts associated with these alternatives relate to at-sea enforcement.

Table 2-3. Summary of effects under **Action 3**.

Alternatives	Biological Effects	Socioeconomic/Administrative Effects
Alternative 1 (No Action)		
Alternative 2		
Alternative 3		

2.4 Action 4. Expand boundaries of the Cape Lookout CHAPC

Alternative 1 (**No Action**). Do not modify the boundaries of the Cape Lookout CHAPC. The existing Cape Lookout CHAPC is identified by the following coordinates:

Latitude	Longitude
34°24’37”	75°45’11”
34°10’26”	75°58’44”
34°05’47”	75°54’54”
34°21’02”	75°41’25”

Alternative 2. Extend the northern boundary to encompass the area identified by the following coordinates:

Latitude	Longitude
34°24.6166’	75°45.1833’
34°23.4833’	75°43.9667’
34°27.9’	75°42.75’
34°27.0’	75°41.5’

Comparison of Alternatives

Biological: Under **Alternative 1 (No Action)**, the same prohibitions currently restricted within the CHAPC would apply. Within the CHAPCs, the use of bottom longline, bottom trawl, mid-water trawl, dredge, anchor, pot or trap, anchor and chain and grapple and chain is prohibited. **Alternative 2** proposes to expand the original Cape Lookout CHAPC along the northern boundary. This would increase the size of the Cape Lookout CHAPC from 316 square kilometers to 324 square kilometers. This expansion would benefit deepwater coral ecosystems and has been proposed based on new information of occurrence of deepwater *Lophelia* corals in the area.

Economic: Alternative 1 (No Action) would likely have minimal economic effects because this would maintain access to current harvest areas. The proposed extension of the Cape Lookout CHAPC under **Alternative 2** could have negative economic effects particularly on the snapper grouper fleet if historic fishing grounds are no longer available.

Social: Alternative 1 (No Action) would likely have minimal negative social effects because no current or potential fishing grounds would be closed. The proposed extension of the Cape Lookout CHAPC under **Alternative 2** could have negative social effects on the royal red and rock shrimp fleet if historic fishing grounds are no longer available, or if the closed area affected travel to and from harvest areas. The small size of the expansion proposed under **Alternative 2** would also be expected to result in less social impact than a larger area.

Administrative: The expansion of the Cape Lookout CHAPC (**Alternative 2**) would have a minimal administrative impact. Administrative impacts would be felt through the rule making process, outreach and enforcement. The administrative impacts would differ between the alternatives in the amount of area they cover. It is expected the larger the expansion of the Cape Lookout HAPC the more enforcement will be needed. Most of the administrative impacts associated with these alternatives relate to at-sea enforcement.

Table 2-4. Summary of effects under **Action 4**.

Alternatives	Biological Effects	Socioeconomic/Administrative Effects
Alternative 1 (No Action)		
Alternative 2		

Chapter 3. Affected Environment

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

- **Habitat environment** (Section 3.1)

  Examples include coral reefs and sea grass beds

- **Biological environment** (Section 3.2)

  Examples include populations of golden tilefish, corals, turtles

- **Human environment** (Sections 3.3 & 3.4)

  Examples include fishing communities and economic descriptions of the fisheries

- **Administrative environment** (Section 3.5)

  Examples include the fishery management process and enforcement activities

3.1 Habitat Environment

Coral Amendment 8 addresses management measures to protect deepwater coral ecosystems, including *Oculina* and *Lophelia*. Chapter 3 details the biological environment for the species that will be most affected by this amendment.

Detailed information on the life history of the other species affected by this amendment through the data collection action can be found in previous amendments and the habitat and biological environment can be found in the Fishery Ecosystem Plan (FEP) (SAFMC 2009b).

The actions in this amendment are expected to have an impact on the snapper grouper fisheries and the deepwater shrimp fisheries. The affected environment for these fisheries are described in **Sections 3.1.2** and **3.1.3**.

Information on the habitat utilized by species in the Snapper Grouper Complex is included in Volume II of the FEP (SAFMC 2009b) and incorporated here by reference. The FEP can be found at: http://www.safmc.net/ecosystem/Home/EcosystemHome/tabid/435/Default.aspx

The affected environment for the snapper grouper fishery has recently been described in the Comprehensive Annual Catch Limit (ACL) Amendment (SAFMC 2011c), Amendment 17B (Amendment 17B) to the Fishery Management Plan for the Snapper Grouper of the South Atlantic Region (SAMFC 2010b), and the FEP of the South Atlantic Region (SAFMC 2009b). Those descriptions of the biological, social, economic, and administrative environments are herein incorporated by reference.

3.1.1 Deepwater Coral Reef Habitat

Deepwater coral reefs are common off the southeastern U.S. within the exclusive economic zone. These habitats include high-relief, hardbottom features at numerous sites on the Blake Plateau from North Carolina southward through the Straits of Florida. A limited number of sites have been mapped to a high resolution and even fewer reefs have been characterized in detail (Reed et al. 2006). However, there is increasing evidence that deepwater corals are important fish habitat (Costello et al. 2005) and hotspots of increased biodiversity. Similar to shallow tropical coral reefs, deepwater coral reefs support important ecosystem functions. Like their shallow-water counterparts, deepwater coral habitats are affected by human activities (e.g., fishing pressure, marine debris, fishing gear interactions). Contrary to shallow-water corals, deepwater corals are located in aphotic zones which are deeper than light can penetrate and allow for photosynthesis. Major damage from trawling activities has been documented on deepwater *Oculina* and *Lophelia* reefs in the northeastern Atlantic (Rogers 1999; Fossa et al. 2002; Koenig et al. 2005; Reed et al. 2007) and to a lesser degree off the southeastern U.S. (Ross et al. 2012a).

Two types of azooxanthellate (lacking symbiotic algae) corals form deepwater reefs along the Florida coast: *Oculina varicosa* and *Lophelia pertusa*. Other dominant azooxanthellate, colonial scleractinian (stony or hard) corals on deepwater reefs in the southeastern U.S. include *Enallopsammia profunda, Madrepora oculata,* and *Solenosmilia variabilis* (Reed 2002a,b).

Several solitary coral species are also common (Cairns 1979, 2000) along with many species of bamboo octocorals (Family Isididae), black corals (Order Antipatharia), and calcified hydrozoans (Family Stylasteridae). In addition, these deepwater reefs provide substrate and habitat for other sessile macrofauna including octocorals (gorgonians) and sponges, which in turn provide habitat for a not well-studied, but biologically rich and diverse community of associated fishes, crustaceans, mollusks, echinoderms, polychaete and sipunculan worms, and other macrofauna (Reed et al. 2006).

Deepwater *Oculina* reefs are unique to Florida with the only known reefs located off the east coast. *Lophelia* reefs are also present in this area, but their distribution is broader (Reed et al. 2005). Deepwater corals are likely controlled (in part) by their upper temperature limits (Ross et al. 2012a). While *Oculina* and *Lophelia* reefs occur at disparate depths, 60 to 100 m and 500 to 800 m, respectively, they are notably similar in morphology. They are also similar in mound structure, which is composed of layers of coral debris and sediment. In addition, both form topographic high-relief mound features (termed bioherm or lithoherm) that are capped with living coral thickets (Reed et al. 2005). Bioherms are deepwater coral banks that over centuries have formed a mound of unconsolidated sediment and coral debris (Reed 2002a,b), whereas lithoherms are high-relief, lithified carbonate mounds (Neumann and Ball 1970).

Both *Oculina* and *Lophelia* reefs occur in regions of strong currents (Florida Current, Gulf Stream). In addition, *Oculina* reefs are periodically exposed to nutrient-rich, coldwater upwelling temperatures of 7.4 to 10 °C, which is similar to the mean temperatures of the *Lophelia* reefs in this region. However, the associated fauna are noticeably different between *Oculina* and *Lophelia* reefs. For example, Reed et al. (2006) identified 38 taxa of Porifera (sponges) and 41 Cnidaria (corals and anemones) from the *Lophelia* reefs, but no massive sponges or gorgonians were common to the *Oculina* bioherms. Live coral coverage is generally low on the majority of both *Lophelia* and *Oculina* reefs in this region (1% to 10%); however, cover varies from nearly 100% living coral on a few reefs to of 100% dead coral rubble on other reefs.

3.1.1.1 *Oculina varicosa* reef habitat characterization

The majority of the *Oculina* reefs are found in depths of 60 to 100 m in a zone 2 to 6 km wide along the eastern Florida shelf of the United States (Avent et al. 1977; Reed 1980). Much of the habitat that has been mapped and characterized is within or adjacent to the Oculina Bank HAPC, located 15 nautical miles off Fort Pierce and extending northward towards Cape Canaveral. However, in 1982 Reed discovered a mound located approximately 55 km north of the Oculina HAPC, located offshore of New Smyrna Beach (Reed et al. 2005) (described in **3.1.2**).

Categories of deepwater *Oculina* habitats include pinnacles or bioherms, isolated coral thickets on hardbottom, and rubble with isolated live colonies. The bioherms range in height from 3 to 35 m and are capped with live and standing dead coral. The age of one mound was estimated to be between 1,000 to 1,500 years old based on core sampling and coral growth rates (1.6 cm yr; Reed 1981). Standing dead coral is common in each type of habitat (Reed et al. 2005). Coral thickets can be found on flat sandy bottom habitats and are common on low-relief hardbottom. They typically consist of 3 to 4 m linear colonies or groups of 1 to 2 m diameter colonies (Reed

1980). In addition, extensive areas of dead *Oculina* can form rubble habitat with isolated colonies of live coral. Reed et al. (2005) described two types of coral rubble habitat: 1) extensive areas of coral rubble/sediment matrix that provide little habitat for epifaunal growth, relative to standing live or dead coral; and 2) structured coral rubble habitat, but without the sediment matrix, which provides some habitat for epifauna, and is often associated with the flanks and peaks of the high-relief pinnacles. The dead coral rubble can result from natural processes such as bioerosion, disease, or global warming, or from human impacts, e.g., fish and shrimp trawling, scallop dredging, anchoring, bottom longlines, and depth charges (Reed et al. 2005).

Reed (1980) describes several sites within the Oculina Bank HAPC. One of the most notable sites, referred to as Jeff's Reef, is also the southernmost known intact *Oculina* reef (Figure 1). Jeff's Reef is an isolated bank, approximately 300 m in width, with a minimum depth of 64 m at the crest and maximum depth of 81 m at the base that contains three

parallel east-west ridges that are capped with live coral 1 to 2 m in height. The south face has a steep slope (30 to 45°) and is covered with contiguous *Oculina* that measures 1 to 2 m in height; whereas the north slope is less steep (<25°) and has more rubble and scattered colonies that are 0.5 to 2.0 m in diameter. In some areas along the bank, the colonies establish east-west rows, which are 2 to 3 m in width, and form step-like terraces up the slope of the bank. In addition to the high-relief *Oculina* banks and low-relief coral thickets, Reed (1980) further described over 50 sites within the Oculina Bank HAPC that had sparsely scattered live *Oculina* colonies from 0.25 to 2.0 m in diameter.

In addition to the natural habitats, restoration modules were deployed in the Experimental *Oculina* Research Reserve (Figure 1; EORR) from 1996 to 2001. In total, 281 large and 450 small modules were deployed over a 315 square km area in various configurations. Some of the modules were deployed with coral transplants, which have survived. Additionally, recruitment of new colonies had been observed on the older modules (Brooke et al. 2004).

Much of the *Oculina* habitat had been severely degraded or destroyed since the 1980s. Reed et al. (2005) described evidence of habitat damage, particularly in northern areas. In 1976, one site off Cape Canaveral was described as having up to 100% cover of live coral. Observations from this same site in 2001 revealed that the coral thickets on the mound had been reduced to rubble except for a few scattered intact coral colonies at the base. The coral structure on parts of Chapman's Reef and Steeple Pinnacle had been damaged, and Sebastian Pinnacles and Twin Peaks were covered with small pieces of coral rubble (Figure 1; Brooke et al. 2004). Other signs of habitat damage included visual sightings of trawlers in closed areas, fishing lines and bottom longlines wrapped around coral colonies and remnants of bottom trawl nets that appear to be recent, damaged artificial reef modules, and trawl tracks in the rubble noted near the damaged restoration modules. Changes in fish communities have also occurred during this same time frame. The dominant species shifted from grouper species, particularly scamp (*Mycteroperca phenax*), to small non-fishery species, such as red barbier (*Hemanthius vivanus*) and roughtongue bass (*Holanthius martinicensis*) (Koenig et al. 2000). Spawning aggregations of gag (*M. microlepis*) and scamp previously observed on Jeff's and Chapman's Reef had either disappeared completely or been reduced to a few small individuals (Brooke et al. 2004).

The deep shelf-edge *Oculina* reefs form natural spawning grounds for species managed under the SAFMC snapper-grouper fishery management plan, including commercially important populations of gag and scamp. They also serve as nursery grounds for snowy grouper (*Epinephelus niveatus*), and feeding grounds for these and many other commercial fish species including black sea bass (*Centropristis striata*), red grouper (*E. morio*), speckled hind (*E. drummondhayi*), Warsaw grouper (*E. nigritus*), amberjack (*Seriola* spp.), red porgy (*Pagrus pagrus*), and red snapper (*Lutjanus campechanus*) (Gilmore and Jones 1992). Biodiversity, grouper densities, and percentage of intact coral have been documented to be higher inside the Oculina Bank HAPC compared to outside (Harter et al. 2009).

3.1.1.2 *Lophelia pertusa* reef habitat

Compared to deepwater *Oculina* reefs, *Lophelia* reefs are cosmopolitan, occurring not only along the southeastern U.S. continental slope, but also in the Gulf of Mexico, off Nova Scotia, in the northeastern Atlantic, the Mediterranean Sea, the Indian Ocean, and in parts of the Pacific Ocean over a depth range of 50 to 2,170 m (Cairns 1979; Rogers 1999). Although more extensive surveys are needed, *Lophelia* reefs appear to populate the southeastern U.S. continental slope in great abundance (Stetson et al. 1962; Paull et al. 2000; Reed 2002b). The southeastern U.S. and Gulf of Mexico are estimated to have the most extensive deep coral areas in the U.S. (Hain and Corcoran 2004).

The structure-building coral, *L. pertusa*, has a morphology similar to *Oculina*, forming massive bushy colonies. It is fragile and susceptible to physical destruction (Fossa et al. 2002). Most *Lophelia* habitats in the southeast U.S. are in depths from about 370 to at least 900 m (Reed and Ross 2005). *Lophelia* habitats can occur in small scattered colonies attached to hardbottom substrates. In addition, they form complex, high profile features (bioherms and lithoherms) that can range in height from 8 to 168 m. The ridges and reef mounds accelerate bottom currents which are favorable to attached filter-feeders. Thus, the growing reef alters local currents, enhancing the environment for continued coral growth and faunal recruitment (Genin et al. 1986). Along the sides and around the bases of these banks are rubble zones of dead coral pieces which may extend large distances away from the mounds (Reed and Ross 2005).

Reed and Ross (2005) described the known deepwater *Lophelia* habitats in the southeast U.S., including the North Carolina *Lophelia* Reefs, Stetson Reefs, Savannah Lithoherms, East Florida *Lophelia* Pinnacles, Miami Terrace, and Pourtales Terrace (Figure 2). The North Carolina *Lophelia* Reefs appear to be the northernmost deepwater reefs on the southeastern U.S. slope. The Stetson Reefs, located offshore of Charleston, South Carolina, contain over 200 coral mounds with *L. pertusa* and *E. profunda* as the dominant coral species. The Savannah Lithoherms contain numerous mounds that range in height from 30 to 60 m. The East Florida *Lophelia* Pinnacles extend from southern Georgia south to Jupiter, Florida). In 2004, nearly 300 deepwater reefs were identified in this area (Reed et al. 2005). The Miami Terrace provides high-relief rocky hardbottom habitats, and along the eastern edge, a 90 m tall escarpment is capped with live *Lophelia* coral, stylasterid hydrocoral, bamboo coral, black coral, and various sponges and octocorals. The Pourtales Terrace runs parallel to the Florida Keys and provides extensive, high-relief, hardbottom habitat and bioherms covered with live coral. In addition,

numerous sinkholes occur on the outer edge of the Terrace with bottoms 600 m deep and up to 600 m in diameter.

A total of 146 species of benthic invertebrates has been identified from six deepwater reef sites off the southeastern U.S. (Reed 2004). The dominant benthic species include 70 Porifera (sponges) and 58 Cnidaria (corals and anemones). In total, at least 67 fish species have been identified from these deepwater reef sites (Reed 2004; Ross and Quattrini 2009; Reed et al. 2005). Species that are common to most deepwater reef sites include the blackbelly rosefish (*Helicolenus dactylopterus*), morid cod (*Laemonema melanurum*), red bream (*Beryx decadactylus*), Atlantic roughy (*Hoplostethus occidentalis*), conger eel (*Conger oceanicus*), and wreckfish (*Polyprion americanus*). Additional sampling of the deeper *Lophelia* reefs may greatly add to this faunal list.

3.1.1.3 Habitat characterization of *Oculina varicosa* habitat within expansion areas under consideration for SAFMC management action

In 1982, Reed discovered pinnacles (14 to 20 m tall) as far north as 28°59.2'N, 80°06.6'W (located east of New Smyrna Beach) at depths from 79 to 84 m (Figure 3). These *Oculina* reefs extend at least 55 km north of the current Oculina Bank HAPC. At that time, these reefs were the northernmost known *Oculina* pinnacles that had been discovered. The pinnacles were described as having more exposed rock than the pinnacles south of Cape Canaveral, with also having scattered thickets of live *Oculina* (Reed et al. 2005).

In 2011, Reed gave a presentation to the SAFMC on two new areas of high-relief *Oculina* coral mounds and hardbottom habitats that had been discovered outside, but adjacent to, the current boundaries of the Oculina Bank HAPC. The locations of these sites were originally identified from NOAA regional bathymetric charts (Cape Canaveral 85, Titusville 84, New Smyrna 83, and Daytona 82) and later verified in 2011 (as described in the next paragraph) with multibeam sonar and ground-truthed with Remotely Operated Vehicles (ROV) and submersible video surveys. One area extends from the northern boundary of the Oculina Bank HAPC up to St. Augustine. The second area is to the west of the current boundary, primarily between the Oculina Bank HAPC satellite areas (Figure 3; Reed and Farrington 2011).

These areas were examined during a recent research cruise (June 2011, funded by NOAA's Deep Sea Coral Program and Harbor Branch Oceanographic Institute's Cooperative Institute for Ocean Exploration, Research, and Technology). The sonar maps and ROV dives confirmed that the high-relief features of the NOAA regional charts were high-relief *Oculina* coral mounds. Reed (2011) characterized these areas as similar habitat to those *Oculina* reefs within the Oculina Bank HAPC with individual mounds that are 15 to 20 m in height, a maximum depth of 92 m, and a minimum depth of 64 m at the peaks. It is estimated that over 100 mounds exist in this area. Other observations include gentle slopes (10 to 45°) covered with coral rubble, standing dead coral, and sparse live *Oculina* coral colonies. Exposed limerock (hardbottom) with 1 to 2 m relief ledges was observed at the base of some mounds. Between the mounds and west of the main reef track, the substrate is mostly soft sediment but patchy rock pavement (hardbottom) habitat and coral rubble is also present.

This cruise also documented *Oculina* coral mounds and hardbottom habitat west of the current Oculina Bank HAPC boundary. Multibeam sonar maps made earlier in 2002 and 2005 revealed numerous (dozens) high-relief coral mounds and hardbottom habitat that are west of the western Oculina Bank HAPC boundary, primarily between the two satellite areas (Reed et al. 2005). A few of these mounds are comprised mostly of coral rubble, with live and standing dead *Oculina* (Harter et al. 2009). The dominant fish fauna in these areas included scamp and snowy grouper. Gag, greater amberjack (*Seriola dumerili*), and black seabass were also observed, in addition to a tilefish (*Lopholatilus chamaeleonticeps* or *Caulolatilus microps*) burrow (Reed 2011).

3.1.1.4 Habitat characterization of *Lophelia pertusa* habitat within expansion areas under consideration off Jacksonville for SAFMC management action

In 2010, live colonies of *Lophelia* were discovered in unusually shallow depths (180 to 250 m) during ROV surveys off northeast Florida. Prior to this discovery, small colonies of *Lophelia* had been seen in depths of approximately 300 m off the southeastern U.S., but no substantial amounts had been reported in depths < 370 m. The bottom temperatures (7-10° C) were colder than expected at these shallow depths, and more similar to temperatures encountered at 400 to 600 m. Common deepwater fauna not only occured at this site, but were much more abundant and larger than observed elsewhere. Typical hardbottom macroinvertebrates included octocorals, stony corals, black corals, and golden crab (*Chaceon fenneri*). The most common fishes recorded here were blackbelly rosefish, morid cod, a synaphobranchid eel (*Dysommina rugosa*), and small serranids (*Anthias* spp.) (Ross et al. 2012a).

This *Lophelia* habitat is unique at this shallow depth and largely driven by the abundance of hardbottom habitat and its proximity to the Gulf Stream. In this area, the Gulf Stream is directed away from the coast, which creates an upwelling of deep water and consequently a long-term primary productivity envelope. These oceanographic features create an environment suitable for supporting a deepwater *Lophelia* community. The presence of bioherms and abundant coral rubble, the well-developed coldwater sessile community, and the abundance of associated fauna suggest that this site is a long-term feature, rather than short-term opportunistic colonization (Ross et al. 2012a).

The extent to which this habitat may be subject to bottom-damaging activities is not well known. However, Ross et al. (2012a) observed discarded fishing gear, indicating to some extent that the area is a known fishing ground.

3.1.1.5 Habitat characterization of *Lophelia pertusa* habitat within expansion areas under consideration off Cape Lookout for SAFMC management action

Cape Lookout is a coral bank system composed of two distinct areas located approximately 75 km southeast of Cape Lookout, North Carolina. This area appears to be the northernmost deepwater coral habitat on the southeastern U.S. slope. Within the CHAPC, individual mounds capped with *Lophelia* can reach up to 100 m in height and exhibit slopes of 60°. The sides of these mounds are covered with small to large (up to 5 m in height) bushes of living and dead

Lophelia. Low-profile hardbottom habitats and extensive zones of coral rubble are also within this area (Ross and Quattrini 2009).

The expansion area was mapped with multibeam sonar opportunistically during a research cruise that transited through the area. The multibeam map depicts numerous low-relief mounds that are located north of the CHAPC (Figure 4). Ross et al. (2012b) described two museum records of *Lophelia* off Cape Lookout. The northernmost record was collected from the newly discovered low-profile mounds.

3.1.2 Snapper Grouper Habitat

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

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

Rock outcroppings occur throughout the continental shelf from Cape Hatteras, North Carolina to Key West, Florida (MacIntyre and Milliman 1970; Miller and Richards 1979; Parker et al. 1983), which are principally composed of limestone and carbonate sandstone (Newton et al. 1971), and exhibit vertical relief ranging from less than 0.5 to over 10 meters (33 feet). Ledge systems formed by rock outcrops and piles of irregularly sized boulders are also common. Parker et al. (1983) estimated that 24% (9,443 km^2) of the area between the 27 and 101 meters (89 and 331 feet) depth contours from Cape Hatteras, North Carolina to Cape Canaveral, Florida is reef habitat. Although the bottom communities found in water depths between 100 and 300 meters (328 and 984 feet) from Cape Hatteras, North Carolina to Key West, Florida is relatively small compared to the whole shelf, this area, based upon landing information of fishers, constitutes prime reef fish habitat and probably significantly contributes to the total amount of reef habitat in this region.

Artificial reef structures are also utilized to attract fish and increase fish harvests; however, research on artificial reefs is limited and opinions differ as to whether or not these structures

promote an increase of ecological biomass or merely concentrate fishes by attracting them from nearby, natural un-vegetated areas of little or no relief.

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

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

3.1.3 Shrimp Habitat

A description of council concerns and recommendations on protecting shrimp habitat is included in the Shrimp FMP (SAFMC 1993a). Rock shrimp are distributed worldwide in tropical and temperate waters. They are found in the Gulf of Mexico, Cuba, the Bahamas, and the Atlantic Coast of the U.S. up to Virginia (SAFMC 1993a). 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 (SAFMC 1996a). Small quantities of rock shrimp are also found off North Carolina, South Carolina, and Georgia. The largest concentrations are in areas where water depth is 111-180 feet (34-55 m). Although rock shrimp occasionally are landed from EEZ waters off North Carolina, South Carolina, and Georgia, they are not landed in quantities capable of supporting a sustainable commercial fishery comparable to the fishery prosecuted in the EEZ off Florida.

The bottom habitat on which rock shrimp thrive is thought to be limited (SAFMC 1996a). 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 and only sporadically on mud. Rock shrimp also utilize hard bottom and coral, or more specifically, Oculina coral habitat areas (SAFMC 1996a).

White shrimp range from Fire Island, New York, to St. Lucie Inlet on the Atlantic Coast of Florida, and from the Ochlochonee River on the Gulf Coast of Florida to Ciudad Campeche, Mexico. Along the Atlantic Coast of the U.S., the white shrimp is more common off South Carolina, Georgia, and northeast Florida. White shrimp are generally concentrated on the continental shelf where water

depths are 89 feet (27 m) or less, although occasionally they are found much deeper (up to 270 feet) (SAFMC 1996a).

Brown shrimp occur from Martha's Vineyard, Massachusetts to the Florida Keys and northward into the Gulf to the Sanibel grounds. The species reappears near Apalachicola Bay and occurs around the Gulf Coast to northwestern Yucatan. Although brown shrimp may occur seasonally along the Mid-Atlantic States, breeding populations apparently do not occur north of North Carolina. The species may occur in commercial quantities in areas where water depth is as great as 361 feet (110 m), but they are most abundant in areas where the water depth is less than 180 feet (55 m) (SAFMC 1996a).

Pink shrimp occur from southern Chesapeake Bay to the Florida Keys and around the coast of the Gulf of Mexico to Yucatan south of Cabo Catoche. Maximum abundance is reached off southwestern Florida and the southeastern Golfo de Campeche. Along the Atlantic coast of the U.S. pink shrimp are of major commercial significance only in North Carolina and the Florida Keys. Pink shrimp are most abundant in areas where water depth is 36-121 feet (11-37 m) although in some areas they may be abundant where water depth is as much as 213 feet (65 m) (SAFMC 1996a).

3.1.4 Essential Fish Habitat

Snapper Grouper

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

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

For specific life stages of estuarine- dependent and near shore snapper grouper species, EFH includes areas inshore of the 30 meter (100-foot) contour, such as attached macroalgae; submerged rooted vascular plants (seagrasses); estuarine emergent vegetated wetlands (saltmarshes, brackish marsh); tidal creeks; estuarine scrub/shrub (mangrove fringe); oyster reefs

and shell banks; unconsolidated bottom (soft sediments); artificial reefs; and coral reefs and live/hard bottom habitats.

Coral

Habitat characterization of *Oculina varicosa* habitat within expansion areas under consideration for SAFMC management action

In 1982, Reed discovered pinnacles (14 to 20 m tall) as far north as 28°59.2'N, 80°06.6'W (located east of New Smyrna Beach) at depths from 79 to 84 m (Figure 3). These *Oculina* reefs extend at least 55 km north of the current Oculina Bank HAPC. At that time, these reefs were the northernmost known *Oculina* pinnacles that had been discovered. The pinnacles were described as having more exposed rock than the pinnacles south of Cape Canaveral, with also having scattered thickets of live *Oculina* (Reed et al. 2005).

In 2011, Reed gave a presentation to the SAFMC's Coral Advisory Panel on two new areas of high-relief *Oculina* coral mounds and hardbottom habitats that had been discovered outside, but adjacent to, the current boundaries of the Oculina Bank HAPC. The locations of these sites were originally identified from NOAA regional bathymetric charts (Cape Canaveral 85, Titusville 84, New Smyrna 83, and Daytona 82) and later verified in 2011 (as described in the next paragraph) with multibeam sonar and ground-truthed with Remotely Operated Vehicles (ROV) and submersible video surveys. One area extends from the northern boundary of the Oculina Bank HAPC up St. Augustine. The second area is to the west of the current boundary, primarily between the Oculina Bank HAPC satellite areas (Figure 3; Reed and Farrington, 2011).

These areas were examined during a recent research cruise (June 2011, funded by NOAA's Deep Sea Coral Program and Harbor Branch Oceanographic Institute's Cooperative Institute for Ocean Exploration, Research, and Technology). The sonar maps and ROV dives confirmed that the high-relief features of the NOAA regional charts were high-relief *Oculina* coral mounds. Reed (2011) characterized these areas as similar habitat to those *Oculina* reefs within the Oculina Bank HAPC with individual mounds that are 15 to 20 m in height, a maximum depth of 92 m, and a minimum depth of 64 m at the peaks. It is estimated that over 100 mounds exist in this area. Other observations include gentle slopes (10 to 45°) covered with coral rubble, standing dead coral, and sparse live *Oculina* coral colonies. Exposed limerock (hardbottom) with 1 to 2 m relief ledges was observed at the base of some mounds. Between the mounds and west of the main reef track, the substrate is mostly soft sediment but patchy rock pavement (hardbottom) habitat and coral rubble is also present.

This cruise also documented *Oculina* coral mounds and hardbottom habitat west of the current Oculina Bank HAPC boundary. Multibeam sonar maps made earlier in 2002 and 2005 revealed numerous (dozens) high-relief coral mounds and hardbottom habitat that are west of the western Oculina Bank HAPC boundary, primarily between the two satellite areas (Reed et al. 2005). A few of these mounds are comprised mostly of coral rubble, with live and standing dead *Oculina* (Harter et al. 2009). The dominant fish fauna in these areas included scamp and snowy grouper. Gag, greater amberjack (*Seriola dumerili*), and black seabass were also observed, in addition to a tilefish (*Lopholatilus chamaeleonticeps* or *Caulolatilus microps*) burrow (Reed and Farrington 2011).

3.1.3.1 Habitat Areas of Particular Concern

Snapper Grouper

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

Areas that meet the criteria for EFH-HAPCs include habitats required during each life stage (including egg, larval, postlarval, juvenile, and adult stages). In addition to protecting habitat from fishing related degradation though fishery management plan (FMP) regulations, the South Atlantic Council, in cooperation with NOAA Fisheries Service, actively comments on non-fishing projects or policies that may impact essential fish habitat. With guidance from the Habitat Advisory Panel, the South Atlantic Council has developed and approved policies on: energy exploration, development, transportation and hydropower re-licensing; beach dredging and filling and large-scale coastal engineering; protection and enhancement of submerged aquatic vegetation; alterations to riverine, estuarine and near shore flows; offshore aquaculture; marine invasive species and estuarine invasive species.

3.2 Biological and Ecological Environment

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

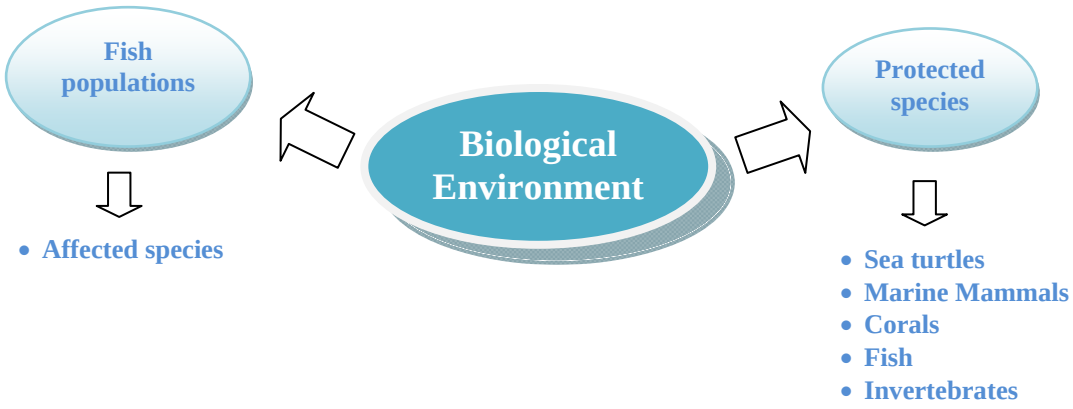


Figure 3-1. Two components of the biological environment described in this amendment

3.2.1 Fish Populations

The waters off the South Atlantic coast are home to a diverse population of fish. The snapper grouper fishery management unit currently contains 73 species of fish, many of them neither "snappers" nor "groupers". These species live in depths from a few feet (typically as juveniles) to hundreds of feet. As far as north/south distribution, the more temperate species tend to live in the upper reaches of the South Atlantic management area (black sea bass, red grouper) while the tropical variety's core residence is in the waters off south Florida waters, Caribbean Islands, and northern South America (black grouper, mutton snapper).

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

Snapper grouper species commonly taken with red grouper could be affected by actions in this amendment. Snapper grouper species most likely to be affected by the proposed actions include many species that occupy the same habitat at the same time. Therefore, snapper grouper species are likely to be caught when regulated since they will be incidentally caught when fishermen target other co-occurring species.

3.2.2 Deepwater Shrimp

Rock shrimp and royal red shrimp are directly impacted by the actions in this amendment. 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.

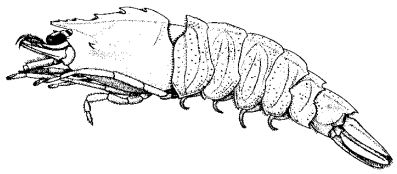


Figure 3-2. Rock shrimp, *Sicyonia brevirostris*.

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 (1983) 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. 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 feet), and occasionally deeper (SAFMC 1993). The largest concentrations are found between 25 and 65 meters (82 and 213 feet).

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 millimeter (0.6 inches) carapace length (CL), and all males are mature by 24 millimeters (0.9 inches) 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.

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. 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 millimeters CL (0.08-0.1 inches) per month as juveniles and 0.5 - 0.6 millimeters CL (0.02 inches) 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 2002). 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 rock shrimp 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 changes to the permitting system and new reporting requirements established in Amendment 7 to the Shrimp Plan (SAFMC 2008c), better information is 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 3-1**).

Table 3-1. Landings (pounds) 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 pounds., 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 2008c).

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 meters (590 feet) to about 730 meters (2,395 feet), but concentrations are usually found at depths of between 250 meters (820 feet). 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 because no management measures were being proposed for the species when the FMP was developed.

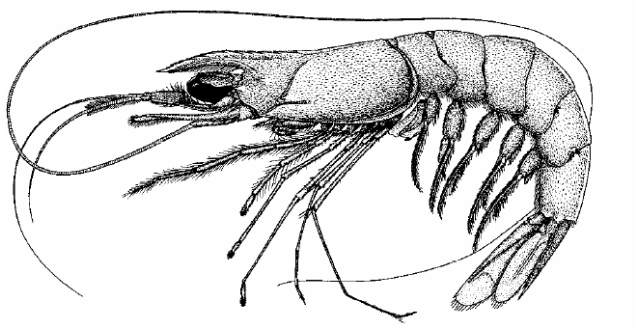


Figure 3-3. Royal red shrimp, *Pleoticus robustus.*
(Perez-Farfante 1969)

Reproduction

Anderson and Lindner (1975), in a study off the east coast of Florida, stated that males mature at 125 millimeters (5 inches) total length (TL), while females mature at 155 millimeters (6 inches) TL. Based on examination of ovaries they determined that peak spawning off that area is 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 developmental stages have been 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 millimeters (2 inches) 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 be 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.

3.2.3 Protected Species

There are 31 different species of marine mammals that may occur in the EEZ of the South Atlantic region. All 31 species are protected under the Marine Mammal Protection Act (MMPA) and six are also listed as endangered under the ESA (i.e., sperm, sei, fin, blue, humpback, and North Atlantic right whales). In addition to those six marine mammals, five species of sea turtle, the smalltooth sawfish, five distinct population segments (DPSs) of Atlantic sturgeon, and two *Acropora* coral species (elkhorn [*Acropora palmata*] and staghorn [*A. cervicornis*]) are protected under the ESA. Portions of designated critical habitat for North Atlantic right whales and *Acropora* corals also occur within the South Atlantic Council's jurisdiction. Descriptions of the life history characteristics of the protected species can be found in the FEP (SAMFC 2009b) and in Comprehensive ACL Amendment (SAFMC 2011c), and are herein incorporated by reference.

Table 3-2. Species listed as endangered or threatened under the ESA, along with any designated critical habitat(s) in the action area. 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.

Potentially Affected ESA-Listed Species Under NOAA Fisheries Service's Purview		
Marine mammals	Scientific Name	Status
Blue whale	*Balaenoptera musculus*	Endangered
Humpback whale	*Megaptera novaeangliae*	Endangered
Fin whale	*Balaenoptera physalus*	Endangered
North Atlantic right whale	*Eubalaena glacialis*	Endangered
Sei whale	*Balaenoptera borealis*	Endangered
Sperm whale	*Physeter macrocephalus*	Endangered
Sea Turtles	Scientific Name	Status
Green sea turtle	*Chelonia mydas*	Endangered/Threatened *
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered

Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened**
Kemp's ridley sea turtle	*Lepidochelys kempii*	Threatened
Invertebrates		
Elkhorn coral	*Acropora palmata*	Threatened
Staghorn coral	*Acropora cervicornis*	Threatened
Fish	Scientific Name	Status
Smalltooth sawfish	*Pristis pectinata*	Endangered ***
Atlantic sturgeon	*Acipenser oxyrinchus*	Endangered/Threatened ****
Critical Habitat		
Elkhorn and staghorn coral		
North Atlantic right whale		
*Green sea turtles in U.S. waters are listed as threatened except for the Florida breeding population, which is listed as endangered. **The Northwest Atlantic distinct population segment (DPS). ***The United States DPS. *** The New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs are listed as endangered; the Gulf of Maine DPS is listed as threatened.		
Potentially Affected ESA-Listed Species Under U.S. Fish and Wildlife Service (USFWS) Purview		
Birds	Scientific Name	Status
Bermuda Petrel	*Pterodrama cahow*	Endangered
Roseate Tern	*Sterna dougallii*	Endangered*****
***** 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 the NW Atlantic DPS of loggerhead sea turtles are all highly migratory and travel widely throughout the South Atlantic. The following sections are a brief overview of the general life history characteristics of the sea turtles found in the South Atlantic region. Several volumes exist that cover more thoroughly the biology and ecology of these species (i.e., Lutz and Musick (eds.) 1997, Lutz *et al.* (eds.) 2002).

Green sea turtle hatchlings are thought to occupy pelagic areas of the open ocean and are often associated with *Sargassum* rafts (Carr 1987, Walker 1994). Pelagic stage green sea turtles are thought to be carnivorous. Stomach samples of these animals found ctenophores and pelagic snails (Frick 1976, Hughes 1974). At approximately 20 to 25 centimeters (8-10 inches) carapace length, juveniles migrate from pelagic habitats to benthic foraging areas (Bjorndal 1997). As juveniles move into benthic foraging areas a diet shift towards herbivory occurs. They consume primarily seagrasses and algae, but are also know to consume jellyfish, salps, and sponges (Bjorndal 1980, 1997; Paredes 1969; Mortimer 1981, 1982). The diving abilities of all sea turtles species vary by their life stages. The maximum diving range of green sea turtles is estimated at 110 meters (360 feet) (Frick 1974), but they are most frequently making dives of less than 20 meters (65 feet) (Walker 1994). The time of these dives also varies by life stage. The maximum dive length is estimated at 66 minutes with most dives lasting from 9 to 23 minutes (Walker 1994).

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

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

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

Loggerhead hatchlings forage in the open ocean and are often associated with *Sargassum* rafts (Hughes 1974, Carr 1987, Walker 1994, Bolten and Balazs 1995). The pelagic stage of these sea

turtles are known to eat a wide range of things including salps, jellyfish, amphipods, crabs, syngnathid fish, squid, and pelagic snails (Brongersma 1972). Stranding records indicate that when pelagic immature loggerheads reach 40-60 centimeters (16-23 inches) straight-line carapace length they begin to live in coastal inshore and nearshore waters of the continental shelf throughout the U.S. Atlantic (Witzell 2002). Here they forage over hard- and soft-bottom habitats (Carr 1986). Benthic foraging loggerheads eat a variety of invertebrates with crabs and mollusks being an important prey source (Burke *et al.* 1993). Estimates of the maximum diving depths of loggerheads range from 211 to 233 meters (692-764 feet.) (Thayer *et al.* 1984, Limpus and Nichols 1988). The lengths of loggerhead dives are frequently between 17 and 30 minutes (Thayer *et al.* 1984, Limpus and Nichols 1988, Limpus and Nichols 1994, Lanyan *et al.* 1989) and they may spend anywhere from 80 to 94% of their time submerged (Limpus and Nichols 1994, Lanyan *et al.* 1989).

ESA-Listed Marine Fish

The historical range of the **smalltooth sawfish** in the U.S. ranged from New York to the Mexico border. Their current range is poorly understood but believed to have contracted from these historical areas. In the South Atlantic region, they are most commonly found in Florida, primarily off the Florida Keys (Simpfendorfer and Wiley 2004). Only two smalltooth sawfish have been recorded north of Florida since 1963 (the first was captured off North Carolina in 1999 (Schwartz 2003) and the other off Georgia 2002 [Burgess unpublished data]). Historical accounts and recent encounter data suggest that immature individuals are most common in shallow coastal waters less than 25 meters (Bigelow and Schroeder 1953, Adams and Wilson 1995), while mature animals occur in waters in excess of 100 meters (Simpfendorfer pers. comm. 2006). Smalltooth sawfish feed primarily on fish. Mullet, jacks, and ladyfish are believed to be their primary food resources (Simpfendorfer 2001). Smalltooth sawfish also prey on crustaceans (mostly shrimp and crabs) by disturbing bottom sediment with their saw (Norman and Fraser 1938, Bigelow and Schroeder 1953).

NMFS convened the Smalltooth Sawfish Recovery Team, comprising sawfish scientists, managers, and environmental managers, to develop a plan to recover the U.S. distinct population segment (DPS) of smalltooth sawfish. The plan recommends specific steps to recover the DPS, focusing on reducing fishing impacts, protecting important habitats, and educating the public. The draft recovery plan was made available for public comment in August 2006 and can be found at www.nmfs.noaa.gov.

On May 1, 2009, the Southeast Regional Office, Sustainable Fisheries Division, requested reinitiation of the Endangered Species Act Section 7 consultation on the South Atlantic shrimp fishery and its effects on smalltooth sawfish because the amount of authorized incidental take for smalltooth sawfish had been exceeded. The most recent biological opinion on shrimp fishing under the Shrimp Fishery Management Plan for the South Atlantic, completed on February 25, 2005, concluded the continued authorization of the South Atlantic shrimp fishery is not likely to jeopardize the continued existence of smalltooth sawfish. An incidental take statement was issued authorizing the annual incidental lethal take of up to one smalltooth sawfish. A smalltooth sawfish take was observed in a shrimp trawl in the South Atlantic exclusive economic zone (EEZ) on July 26, 2008. It was in poor condition and believed not to have survived the interaction. Three additional smalltooth sawfish were observed taken in a shrimp trawls in the

South Atlantic EEZ during a fishing trip from March 5-9, 2009. One of the smalltooth sawfish is thought to have died from the interaction; the other two were released alive and assumed to have survived.

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

Five separate distinct population segments (DPSs) of the **Atlantic sturgeon** (*Acipenser oxyrinchus oxyrinchus*) were listed under the ESA effective April 6, 2012 (76 FR 5914; February 12, 2012). From north to south, the DPSs are the Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic (**Figure 3-4**). The New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs are listed as endangered, and the Gulf of Maine DPS is listed as threatened. The five DPSs were listed under the ESA as a result of threats from a combination of habitat curtailment and modification, overutilization (i.e., being taken as bycatch) in commercial fisheries, and the inadequacy of regulatory mechanisms in ameliorating these impacts and threats.

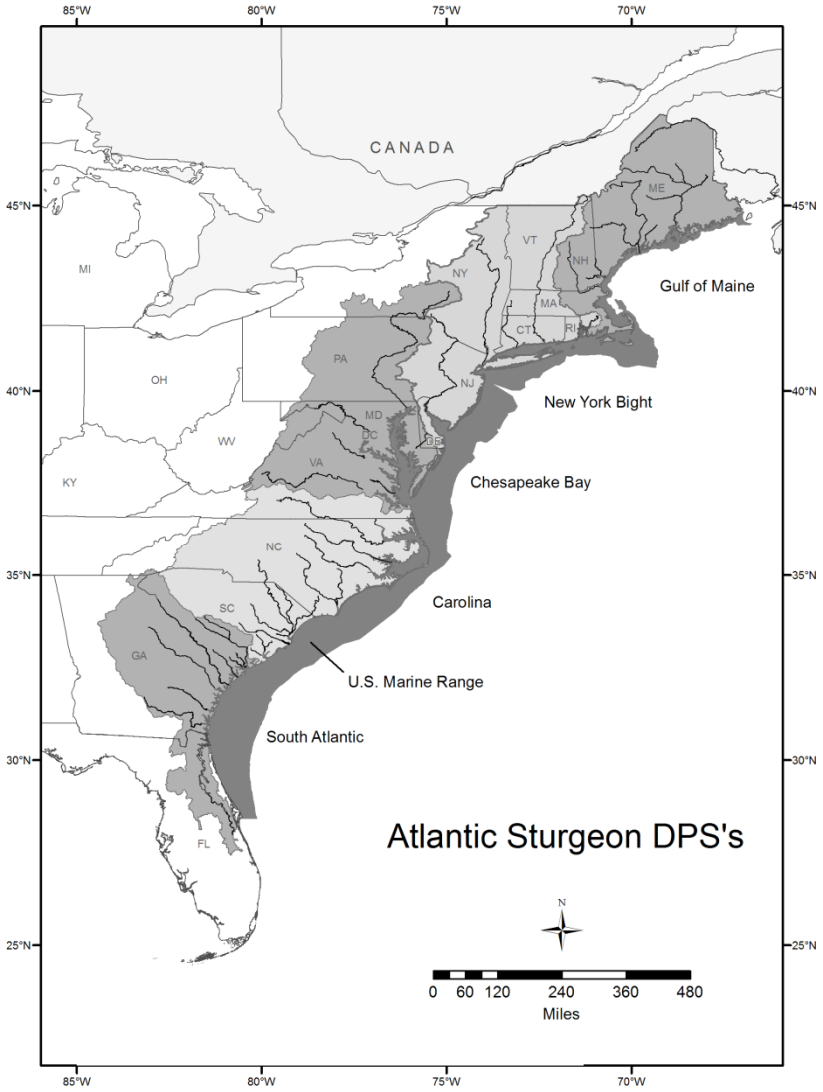


Figure 3-4. Map Depicting the Five DPSs of Atlantic sturgeon

Atlantic sturgeon are long-lived, estuarine dependent, anadromous[1] fish (Bigelow and Schroeder 1953, Vladykov and Greeley 1963, Mangin 1964, Pikitch et al. 2005, Dadswell 2006, ASSRT 2007), that historically occurred from Labrador south to the St. Johns River, Florida. Generally, Atlantic sturgeon use coastal bays, sounds, and ocean waters in depths less than 132 ft (Vladykov and Greeley 1963, Murawski and Pacheco 1977, Dovel and Berggren 1983, Smith 1985, Collins and Smith 1997, Welsh et al. 2002, Savoy and Pacileo 2003, Stein et al. 2004, USFWS 2004, Laney et al. 2007, Dunton et al. 2010, Erickson et al. 2011, Wirgin and King 2011), where they feed on a variety of benthic invertebrates and fish (Bigelow and Schroeder 1953, ASSRT 2007, Guilbard et al. 2007, Savoy 2007). Mature Atlantic sturgeon make spawning migrations from estuarine waters to rivers as water temperatures reach 43ºF for males (Smith et al. 1982, Dovel and Berggren 1983, Smith 1985, ASMFC 2009) and 54ºF for females

[1] Anadromous refers to a fish that is born in freshwater, spends most of its life in the sea, and returns to freshwater to spawn (NEFSC FAQ's, available at http://www.nefsc.noaa.gov/faq/fishfaq1a.html, modified June 16, 2011)

(Dovel and Berggren 1983, Smith 1985, Collins et al. 2000a), typically between February (southern systems) and July (northern systems). Individuals spawn at intervals of once every 1-5 years for males and once every 2-5 years for females. Spawning is believed to occur in flowing water between the salt front of estuaries and the fall line of large rivers, when and where optimal flows are 18-30 in/s and depths are 36-89 ft (Borodin 1925, Dees 1961, Leland 1968, Scott and Crossman 1973, Crance, 1987, Shirey et al. 1999, Bain et al. 2000, Collins et al. 2000a, Caron et al. 2002, Hatin et al. 2002, ASMFC 2009). Females may produce 400,000 to 4 million eggs per spawning year (Vladykov and Greeley 1963, Smith et al., 1982, Van Eenennaam et al. 1996, Van Eenennaam and Doroshov 1998, Stevenson and Secor 1999, Dadswell 2006) and deposit eggs on hard bottom substrate such as cobble, coarse sand, and bedrock (Dees 1961, Scott and Crossman 1973, Gilbert 1989, Smith and Clugston 1997, Bain et al. 2000, Collins et al. 2000a, Caron et al. 2002, Hatin et al. 2002, Mohler, 2003, ASMFC 2009). Upon hatching, studies suggest that early juvenile Atlantic sturgeon (age-0 [i.e., YOY], age-1, and age-2) remain in low salinity waters of their natal estuaries (Haley 1999, Hatin et al. 2007, McCord et al. 2007, Munro et al. 2007) for months to years before emigrating to open ocean as subadults (Holland and Yelverton 1973, Dovel and Berggen 1983, Waldman et al. 1996, Dadswell 2006, ASSRT 2007). Growth rates and age at maturity are both influenced by water temperature, as Atlantic sturgeon grow larger and mature faster in warmer waters. Atlantic sturgeon may live up to 60 years, reach lengths up to 14 feet and weigh over 800 lbs. Tagging studies and genetic analyses (Wirgin et al. 2000, King et al. 2001, Waldman et al. 2002, ASSRT 2007, Grunwald et al. 2008) indicate that Atlantic sturgeon exhibit ecological separation during spawning throughout their range that has resulted in multiple, genetically distinct, interbreeding population segments.

The construction of dams, dredging, and modification of water flows have reduced the amount and quality of habitat available for Atlantic sturgeon spawning and foraging. Water quality (temperature, salinity, and dissolved oxygen) has also been reduced by terrestrial activities, leading to further declines in available spawning and nursery habitat. Although spawning historically occurred within many Atlantic coast rivers, only 16 U.S. rivers are known to currently support spawning based on available evidence (i.e., presence of YOY or gravid Atlantic sturgeon documented within the past 15 years) (ASSRT 2007).

Overutilization of Atlantic sturgeon from directed fishing caused initial severe declines in Atlantic sturgeon populations in the Southeast, from which they have never recovered. Although directed harvest of this species has ceased, Atlantic sturgeon continue to be incidentally caught as bycatch in other commercial fisheries. Because Atlantic sturgeon mix extensively in marine waters and may utilize multiple river systems for nursery and foraging habitat in addition to their natal spawning river, they are subject to being caught in multiple fisheries throughout their range. Additionally, Atlantic sturgeon are more sensitive to bycatch mortality because they are a long-lived species, have an older age at maturity, have lower maximum fecundity values, and a large percentage of egg production occurs later in life. Based on these life history traits, Boreman (1997) calculated that Atlantic sturgeon can only withstand the annual loss of up to five percent of their population to bycatch mortality without suffering population declines. Mortality rates of Atlantic sturgeon taken as bycatch in various types of fishing gear range between 0-51 percent, with the greatest mortality occurring in sturgeon caught by sink gillnets. While many of the threats to the Atlantic sturgeon have been ameliorated or reduced due to the existing

regulatory mechanisms, such as the moratorium on directed fisheries for Atlantic sturgeon, bycatch is currently not being addressed through existing mechanisms.

The recovery of Atlantic sturgeon along the Atlantic Coast, especially in areas where habitat is limited and water quality is severely degraded, will require improvements in the following areas: (1) elimination of barriers to spawning habitat either through dam removal, breaching, or installation of successful fish passage facilities; (2) operation of water control structures to provide appropriate flows, especially during spawning season; (3) imposition of dredging restrictions including seasonal moratoriums and avoidance of spawning/nursery habitat; and, (4) mitigation of water quality parameters that are restricting sturgeon use of a rivers (i.e., DO). Stronger regulatory mechanisms may likely aid in achieving these improvements. These regulatory mechanisms may also aid in reducing bycatch mortality in commercial fisheries, again assisting in the recovery of the species.

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 meter (3 feet) to 60 meters (197 feet). The optimal depth range for elkhorn is considered to be 1 to 5 meters (3-16 feet) depth (Goreau and Wells 1967), while staghorn corals are found slightly deeper, 5 to 15 meters (16-49 feet) (Goreau and Goreau 1973).

All Atlantic *Acropora* species (including elkhorn and staghorn coral) are considered to be environmentally sensitive, requiring relatively clear, well-circulated water (Jaap *et al.* 1989). Optimal water temperatures for elkhorn and staghorn coral range from 25° to 29°C (77-84°F) (Ghiold and Smith 1990, Williams and Bunkley-Williams 1990). Both species are almost entirely dependent upon sunlight for nourishment, contrasting the massive, boulder-shaped species in the region (Porter 1976, Lewis 1977) that are more dependent on zooplankton. Thus, Atlantic *Acropora* species are much more susceptible to increases in water turbidity than some other coral species.

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

List of Marine Species of Concern in the Southeastern United States
Alwife herring **Alosa pseudoharengus**
Atlantic bluefin tuna **Thunnus thynnus**
Blueback herring **Alosa aestivalis**
Dusky shark *Carcharhinus obscurus*
Sand tiger shark *Odontaspis taurus*
Speckled hind *Epinephelus drummondhayi*
Warsaw grouper *Epinephelus nigritus*
Nassau grouper *Epinephelus striatus*
Ivory Tree Coral *Oculina varicosa*

3.3 Human Environment

3.3.1 Economic Description of the Commercial Fishery

3.3.1.4 Economic Activity

3.3.2 Economic Description of the Recreational Fishery

3.3.2.1 Harvest

3.3.2.2 Effort

3.3.2.3 Permits

For-hire vessels are required to have a for-hire snapper grouper permit to fish for or possess snapper grouper species in the South Atlantic EEZ. The number of vessels with for-hire snapper

grouper permits for the period 2005-2010 is provided in **Table 3-3**. This sector operates as an open access fishery and not all permitted vessels are necessarily active in the fishery. Some vessel owners obtain open access permits as insurance for uncertainties in the fisheries in which they currently operate.

The number of for-hire permits issued for the South Atlantic snapper grouper fishery increased from 1,904 permits in 2005 to 2,104 permits in 2008, but subsequently decreased to 2,091 in 2009 and 1,815 in 2010. The majority of snapper grouper for-hire permitted vessels were home-ported in Florida; a relatively high proportion of these permitted vessels were also home-ported in North Carolina and South Carolina. Many vessels with South Atlantic for-hire snapper-grouper permits were homeported in states outside of SAFMC's area of jurisdiction, particularly in the Gulf states of Alabama through Texas. Although the number of vessels with South Atlantic for-hire snapper grouper permits homeported in states outside of SAFMC's area of jurisdiction increased from 2005 to 2009, they still accounted for approximately the same proportion (9-10%) of the total number of permits. For-hire snapper-grouper permits in these other areas fell in 2010.

Table 3-3. Number of South Atlantic for-hire snapper-grouper vessel permits, 2005-2010.

Home Port State	2005	2006	2007	2008	2009	2010	Avg.
North Carolina	294	317	353	399	391	333	348
South Carolina	136	142	152	160	167	147	151
Georgia	37	36	37	35	36	28	35
Florida	1,267	1,304	1,312	1,310	1,280	1,110	1,264
Gulf States (AL-TX)	102	84	79	84	87	84	87
Other States	68	84	93	116	130	113	101
Total	1,904	1,967	2,026	2,104	2,091	1,815	1,985

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

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

3.3.2.4 Economic Value and Expenditures

Participation, effort, and harvest are indicators of the value of saltwater recreational fishing. However, a more specific indicator of value is the satisfaction that anglers experience over and above their costs of fishing. The monetary value of this satisfaction is referred to as consumer

surplus. The value or benefit derived from the recreational experience is dependent on several quality determinants, which include fish size, catch success rate, and the number of fish kept. These variables help determine the value of a fishing trip and influence total demand for recreational fishing trips.

While anglers receive economic value as measured by the consumer surplus associated with fishing, for-hire businesses receive value from the services they provide. Producer surplus is the measure of the economic value these operations receive. Producer surplus is the difference between the revenue a business receives for a good or service, such as a charter or headboat trip, and the cost the business incurs to provide that good or service. Estimates of the producer surplus associated with for-hire trips are not available. However, proxy values in the form of net operating revenues are available (David Carter, NMFS SEFSC, personal communication, August 2010). These estimates were culled from several studies – Liese *et al.* (NMFS 2009), Dumas *et al.* (2009), Holland *et al.* (1999), and Sutton *et al.* (1999). Estimates of net operating revenue per angler trip (2009 dollars) on representative charter trips (average charter trip regardless of area fished) are $146 for Louisiana through east Florida, $135 for east Florida, $156 for northeast Florida, and $128 for North Carolina. For charter trips into the EEZ only, net operating revenues are $141 in east Florida and $148 in northeast Florida. For full-day and overnight trips only, net operating revenues are estimated to be $155-$160 in North Carolina. Comparable estimates are not available for Georgia, South Carolina, or Texas.

Net operating revenues per angler trip are lower for headboats than for charterboats. Net operating revenue estimates for a representative headboat trip are $48 in the Gulf of Mexico (all states and all of Florida), and $63-$68 in North Carolina. For full-day and overnight headboat trips, net operating revenues are estimated to be $74-$77 in North Carolina. Comparable estimates are not available for Georgia and South Carolina.

The foregoing value estimates should not be confused with angler expenditures or the economic activity (impacts) associated with these expenditures. While expenditures for a specific good or service may represent a proxy or lower bound of value (a person would not logically pay more for something than it was worth to them), they do not represent the net value (benefits minus cost), nor the change in value associated with a change in the fishing experience.

Estimates of the economic activity (impacts) associated with recreational fishing for any species could be derived using average coefficients for recreational angling across all fisheries (species), as derived by an economic add-on to the MRFSS, and described and utilized in NMFS (NMFS 2009). Business activity is characterized in the form of FTE jobs, income impacts (wages, salaries, and self-employed income), output (sales) impacts (gross business sales), and value-added impacts (difference between the value of goods and the cost of materials or supplies). Job and output (sales) impacts are equivalent metrics across both the commercial and recreational sectors. Income and value-added impacts are not equivalent, though similarity in the magnitude of multipliers may result in roughly equivalent values. Neither income nor value-added impacts should be added to output (sales) impacts because this would result in double counting. Job and output (sales) impacts, however, may be added across sectors.

It should be noted that output impacts and value added impacts are not additive and the impacts for individual species should not be added because of possible duplication (some trips may target multiple species). Also, the estimates of economic activity should not be added across states to generate a regional total because state-level impacts reflect the economic activity expected to occur within the state before the revenues or expenditures "leak" outside the state, possibly to another state within the region. Under a regional model, economic activity that "leaks" from, for example, Florida into Georgia would still occur within the region and continue to be tabulated. As a result, regional totals would be expected to be greater than the sum of the individual state totals. Regional estimates of the economic activity associated with golden tilefish recreational fishing are unavailable at this time.

Because the headboat sector in the Southeast is not covered by the MRFSS, the current model used in deriving estimates could not provide this sector's estimates of economic activity. In the particular case of golden tilefish, estimating economic activity of the headboat sector is also unnecessary because this sector did not report any landings of the species during the period considered.

3.3.2.5 Financial Operations of the Charter and Headboat Sectors

Holland et al. (1999) estimated that the charterboat fee in the South Atlantic ranged from $292 to $2,000. The actual cost depended on state, trip length, and the variety of services offered by the charter operation. Depending on the state, the average fee for a half-day trip ranged from $296 to $360, for a full day trip the range was $575 to $710, and for an overnight trip the range was $1,000 to $2,000. Most (>90%) Florida charter operators offered half-day and full-day trips and about 15% of the fleet offered overnight trips. In comparison, only about 3% of operations in the other South Atlantic states offered overnight trips.

For headboats, the average fee in Florida was $29 for a half-day trip and $45 for a full day trip. For North and South Carolina, the average base fee was $34 per person for a half-day trip and $61 per person for a full day trip. Most of these headboat trips operated in Federal waters in the South Atlantic (Holland et al. 1999).

Capital investment in charter vessels averaged $109,301 in Florida, $79,868 for North Carolina, $38,150 for South Carolina and $51,554 for Georgia (Holland et al. 1999). Charterboat owners incur expenses for inputs such as fuel, ice, and tackle in order to offer the services required by their passengers. Most expenses incurred in 1997 by charter vessel owners were on crew wages and salaries and fuel. The average annual charterboat business expenditures incurred was $68,816 for Florida vessels, $46,888 for North Carolina vessels, $23,235 for South Carolina vessels, and $41,688 for vessels in Georgia in 1997. The average capital investment for headboats in the South Atlantic was approximately $220,000 in 1997. Total annual business expenditures averaged $135,737 for headboats in Florida and $105,045 for headboats in other states in the South Atlantic.

The 1999 study on the for-hire sector in the Southeastern U.S. presented two sets of average gross revenue estimates for the charter and headboat sectors in the South Atlantic (Holland et al.,

1999). The first set of estimates were those reported by survey respondents and were as follows: $51,000 for charterboats on the Atlantic coast of Florida; $60,135 for charterboats in North Carolina; $26,304 for charterboats in South Carolina; $56,551 for charterboats in Georgia; $140,714 for headboats in Florida; and $123,000 for headboats in the other South Atlantic states (Holland *et al*., 1999). The authors generated a second set of estimates using the reported average trip fee, average number of trips per year, and average number of passengers per trip (for the headboat sector) for each vessel category for Florida vessels. Using this method, the resultant average gross revenue figures were $69,268 for charterboats and $299,551 for headboats. Since the calculated estimates were considerably higher than the reported estimates (22% higher for charterboats and 113% higher for headboats), the authors surmised that this was due to sensitivity associated with reporting gross receipts, and subsequent under reporting. Alternatively, the respondents could have overestimated individual components of the calculated estimates. Although the authors only applied this methodology to Florida vessels, assuming the same degree of under reporting in the other states results in the following estimates in average gross revenues: $73,365 for charterboats in North Carolina, $32,091 for charterboats in South Carolina; $68,992 for charterboats in Georgia; and $261,990 for headboats in the other South Atlantic states.

It should be noted that the study's authors were concerned that while the reported gross revenue figures may be underestimates of true vessel income, the calculated values could overestimate gross income per vessel from for-hire activity (Holland et al., 1999). Some of these vessels are also used in commercial fishing activities and that income is not reflected in these estimates.

A more recent study of the North Carolina for-hire fishery provides some updated information on the financial status of the for-hire fishery in the state (Dumas et al., 2009). Depending on vessel length, regional location, and season, charter fees per passenger per trip ranged from $168.14 to $251.59 for a full-day trip and from $93.63 to $123.95 for a half-day trip; headboat fees ranged from $72.50 to $81.78 for a full-day trip and from $38.08 to $45 for a half-day trip. Charterboats generated a total of $55.7 million in passenger fees, $3.2 million in other vessel income (e.g., food and beverages), and $4.8 million in tips. The corresponding figures for headboats were $9.8 million in passenger fees, $0.2 million in other vessel income, and $0.9 million in tips. Non-labor expenditures (e.g., boat insurance, dockage fees, bait, ice, fuel) amounted to $43.6 million for charterboats and $5.3 million for headboats. Summing across vessel lengths and regions, charter vessels had an aggregate value (depreciated) of $120.4 million and headboats had an aggregate value (depreciated) of $10.2 million.

3.4 Social and Cultural Environment

The proposed actions in this amendment may affect fishermen and communities associated with the snapper grouper fishery and the deepwater shrimp fisheries. Communities associated with each of the fisheries will be described in the sections below and previous amendments with detailed descriptions of social environments of these fisheries are incorporated as references. The fishing restrictions for the HAPCs included in this amendment are also described in order to provide context.

This amendment includes proposed changes for Oculina Bank HAPC, the Stetson-Miami Terrace CHAPC, and the Cape Lookout CHAPC. HAPC fishing restrictions include the prohibition of anchoring or using grapples; trawling, using fish traps, or bottom-longlines; fishing for or possession of rock shrimp; and possession of coral or bottom habitat. The Oculina Experimental Closed Area (located within in the Oculina Bank HAPC) includes additional restrictions including the prohibition of fishing for or possession of snapper or grouper species. All snapper or grouper taken incidentally by hook and line gear must be released immediately by cutting the line without removing the fish from water.

In general, the people who may be directly affected by the proposed regulations include captain and crew of commercial and for-hire vessels, vessel owners, recreational anglers, and coastal communities. In addition to regulatory change, individuals who may be affected by proposed actions also live and work in an environment with natural, economic, social and political dynamics.

Coastal growth and development affects many coastal communities, especially those with either or both commercial and recreational working waterfronts. The rapid disappearance of these types of waterfronts has important implications as the disruption of various types of fishing-related businesses and employment. The process of "gentrification," which tends to push those of a lower socio-economic class out of traditional communities as property values and taxes rise has become common along coastal areas of the U.S. and around the world. Working waterfronts tend to be displaced with development that is often stated as the "highest and best" use of waterfront property, but often is not associated with water-dependent occupations. However, with the continued removal of these types of businesses over time the local economy becomes less diverse and more reliant on the service sector and recreational tourism. As home values increase, people within lower socio-economic strata find it difficult to live within these communities and eventually must move. Consequently they spend more time and expense commuting to work, if jobs continue to be available. Newer residents often have no association with the water-dependent employment and may see that type of work and its associated infrastructure as unappealing. They often do not see the linkage between those occupations and the aesthetics of the community that produced the initial appeal for many migrants. The demographic trends within counties can provide some indication as to whether these types of coastal change may be occurring if an unusually high rate of growth or change in the demographic character of the population is present. A rise in education levels, property values, fewer owner occupied properties and an increase in the median age can at times indicate a growing process of gentrification (Colburn and Jepson 2012). Demographic profiles of coastal communities can be found in the Comprehensive Annual Catch Limit Amendment (SAFMC 2011c).

3.4.1 Fishing Communities

The communities displayed in the figures in Sections 3.4.2-3 below represent a categorization of communities based upon their commercial landings. When possible, the overall value of local commercial landings divided by the overall value of commercial landings referred to as a

"regional quotient" (RQ) was examined. For confidentially reasons this RQ measure could not be displayed for all fisheries. Instead, the top communities by total landings by pounds were examined for those species with confidentiality issues. These data were assembled from the accumulated landings system which includes all species from both state and federal waters landed in 2010. For the RQ analysis, all communities were ranked on this "RQ" and divided by those who were above the mean and those below. This breakdown of fisheries involvement is similar to the how communities were categorized in the community profiling of South Atlantic fishing communities (Jepson *et al*. 2005). However, the categorization within the community profiles included other aspects associated with fishing such as infrastructure and other measures to determine a community's status with regard to reliance upon fishing.

The social vulnerability index (SoVI) was created to understand social vulnerability of communities to coastal environmental hazards and can also be interpreted as a general measure of vulnerability to other social disruptions, such as adverse regulatory change or manmade hazards. Detailed information about the SoVI can be found in Comprehensive ACL Amendment (SAFMC 2011c). High social vulnerability does not necessarily mean that there will be adverse effects of proposed actions in this amendment, only that there may be a potential for adverse effects under the right circumstances. Fishing communities in these counties may have more difficulty adjusting to regulatory changes if those impacts affect employment or other critical social capital. The SoVI for counties in each state is illustrated in the maps in Sections 3.4.4-7.

3.4.2 Snapper Grouper Fishing Communities

Historical fishing areas or anchoring areas for snapper grouper could be impacted by the proposed actions in this amendment. Recent comments suggest that historical fishing areas are included in alternatives proposing boundary changes to the Oculina HAPC, particularly in the areas known as Big Ledge (also known as the 28 fathom ledge), the Steeples, several wrecks that are commonly fished, and about 20 miles to the north of the body of Steeples in the area known as the Roll down (J. Hull, letter to SAFMC dated November 1, 2012). The Oculina HAPC is located off the coast of Cocoa Beach, Florida at its northern boundary and runs about to off the coast of Fort Pierce, Florida at its southern boundary. In addition, snapper grouper fishing is conducted along the western edge of the curve of the Stetson-Miami Terrace CHAPC (which runs off the coast from about South Carolina to mid-Florida).

A detailed description of the social environment of the snapper grouper fishery is included in the Comprehensive ACL Amendment (SAFMC 2011c) and is incorporated herein by reference.

Figure 3-5 presents the top communities based upon a regional quotient of combined commercial landings and value for all snapper grouper species in the South Atlantic snapper grouper complex. There were 154 communities with snapper grouper landings but the 11 communities included in **Figure 3-5** were those with Pounds RQ larger than 3 percent. Therefore, because so many communities have snapper grouper landings, many had low RQs and are not included in the figure. There are also communities that have high landings of a particular species, such as black sea bass in Sneads Ferry, NC, or golden tilefish in Port Orange, FL.

Key West, FL, has the highest landings of combined snapper grouper species, followed by Murrell's Inlet, SC, and Miami FL. No Georgia communities made up more than 3% of the snapper grouper landings.

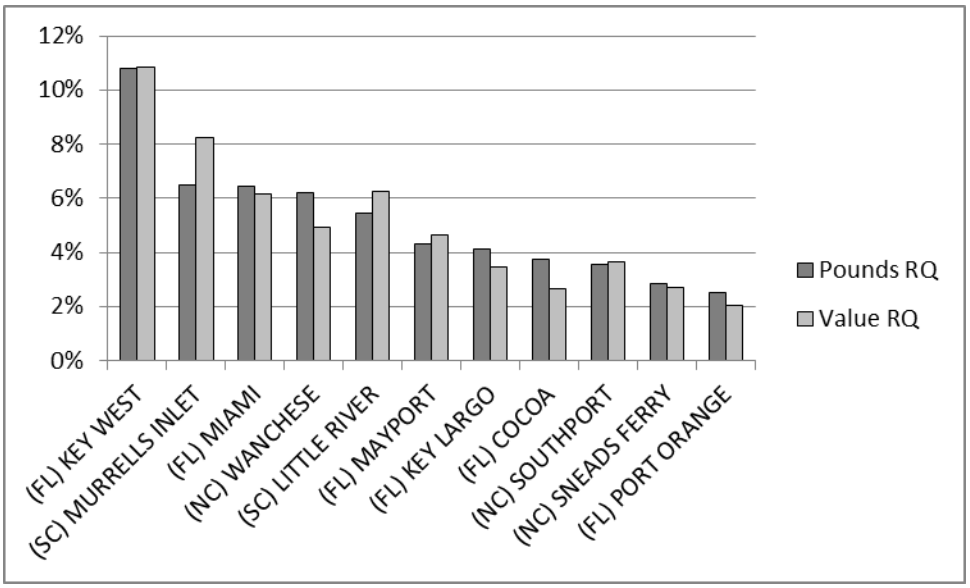


Figure 3-5. The top eleven South Atlantic communities ranked by Pounds and Value Regional Quotient (RQ) of Snapper Grouper species. Only communities with Pounds RQ larger than 3% were included. Data source: ALS 2010.

The recreational sector of the snapper grouper fishery is very important throughout the region, and recreational landings estimate vary depending on the region and species. Black sea bass, tilefish, vermilion snapper, silk snapper, red grouper, black grouper and gray triggerfish are some of the more important species for private recreational anglers.

The for-hire recreational fleet is also important in each state, and there is a federal charter permit required for snapper grouper. The distribution of charter permits at the county level is included in Sections 3.4.4-7. Overall, Florida has the largest number of charter permits (**Table 3-4**). The primary communities in North Carolina are part of Dare County, New Hanover County, Brunswick County, and Carteret County. Communities in South Carolina with significant for-hire fleets are in Charleston County and Horry County, and in Georgia most of the permits are associated with communities in Chatham County and Glynn County. In Florida, almost half of the permits are from Monroe County, and a majority of the permits are associated with communities in south Florida (Brevard, Palm Beach and Miami-Dade Counties).

Table 3-4. Federal snapper grouper charter permits in the South Atlantic region (2012).

State	Number of Snapper Grouper Charter Permits
North Carolina	253

South Carolina	105
Georgia	25
Florida	641
TOTAL	**1,024**

3.4.3 Deepwater Shrimp Fishing Communities

Deepwater shrimp (rock shrimp and royal red shrimp) are harvested in areas which might be impacted by the proposed actions in this amendment (see **Figure S-1** through **Figure S-5** for deepwater shrimp VMS points). Transit areas for these deepwater shrimp fisheries might also be impacted by actions in this amendment. A detailed description of these fisheries is included in the Comprehensive Ecosystem-Based Amendment 1 (SAFMC 2010c) and incorporated herein by reference. It should be noted that royal red shrimp is not a federally managed species in the South Atlantic.

Rock shrimp and royal red shrimp use the same vessels and gear. Royal red shrimp is primarily caught by fishermen targeting rock shrimp. **Table 3-5** and **Table 3-6** present the communities with commercial landings of rock shrimp and royal red shrimp respectively. In the South Atlantic, the majority of rock shrimp and royal red shrimp landings occur in Florida with some commercial landings in Georgia. A very small amount of rock shrimp has also historically been landed in South Carolina, although not in recent years.

Table 3-5. Fishing communities in the South Atlantic with rock shrimp landings, in descending order by pounds landed (ALS 2011)

State	**City**
FL	Titusville
FL	Mayport
FL	Jacksonville
FL	Cocoa Beach
GA	Brunswick
FL	Fernandina Beach
FL	Key West
FL	Cocoa
FL	Marathon

For rock shrimp, the communities with the highest amount of landings are located in Florida in Brevard and Duval Counties (**Table 3-5**). The top four communities of Titusville, Mayport, Jacksonville, and Cocoa Beach made up approximately 95% of rock shrimp landings in 2011.

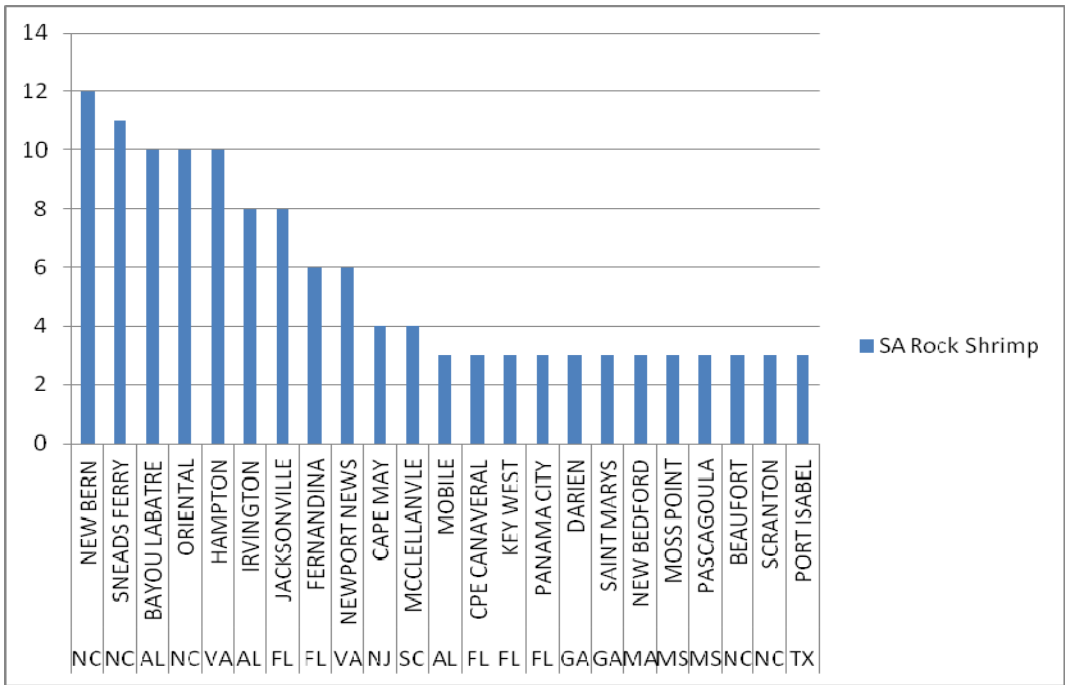


Figure 3-6. Top fishing communities with South Atlantic rock shrimp permits. Only communities with three or more permits were included. (SERO FOIA, permit list as of November 7, 2012).

As seen in **Figure 3-6**, fishing communities with the majority of South Atlantic rock shrimp permits are not confined to the this region. Several communities located in the Gulf region are among the top communities with South Atlantic rock shrimp permits. These Gulf vessels are likely participants who seasonally migrate to South Atlantic waters and have so since the mid-1990's. In addition, several communities located in the Northeast (Virginia, New Jersey, and Massachusetts) are among the top communities with South Atlantic rock shrimp permits. For South Atlantic states, the majority of permits are in located in North Carolina (59 permits) and Florida (54 permits).

Table 3-6. Fishing communities in the South Atlantic with royal red shrimp landings, in descending order by pounds landed (ALS 2011)

State	City
FL	Mayport
FL	Jacksonville
FL	Titusville
FL	Atlantic Beach

For royal red shrimp, four South Atlantic communities along the east coast of Florida received commercial landings in the year 2011 (**Table 3-6**). Three of the four communities with landings of royal red shrimp in 2011 also had landings of rock shrimp. A significant portion of the total landings of royal red shrimp were delivered to the top community of Mayport, Florida. Landings by community cannot be reported here because of confidentially issues.

3.4.4 North Carolina

There are a number of North Carolina counties classified as being either medium high or high on the social vulnerability scale and within those counties there are numerous fishing communities (**Figure 3-7**). Those counties that are considered to be either medium high or high on the SoVI are: New Hanover, Onslow, Carteret, Washington, Bertie, Chowan, Pasquotank, and Perquimans.

Many fishermen in North Carolina work under the dual jurisdiction of the Mid-Atlantic Fishery Management Council and the South Atlantic Fishery Management Council.

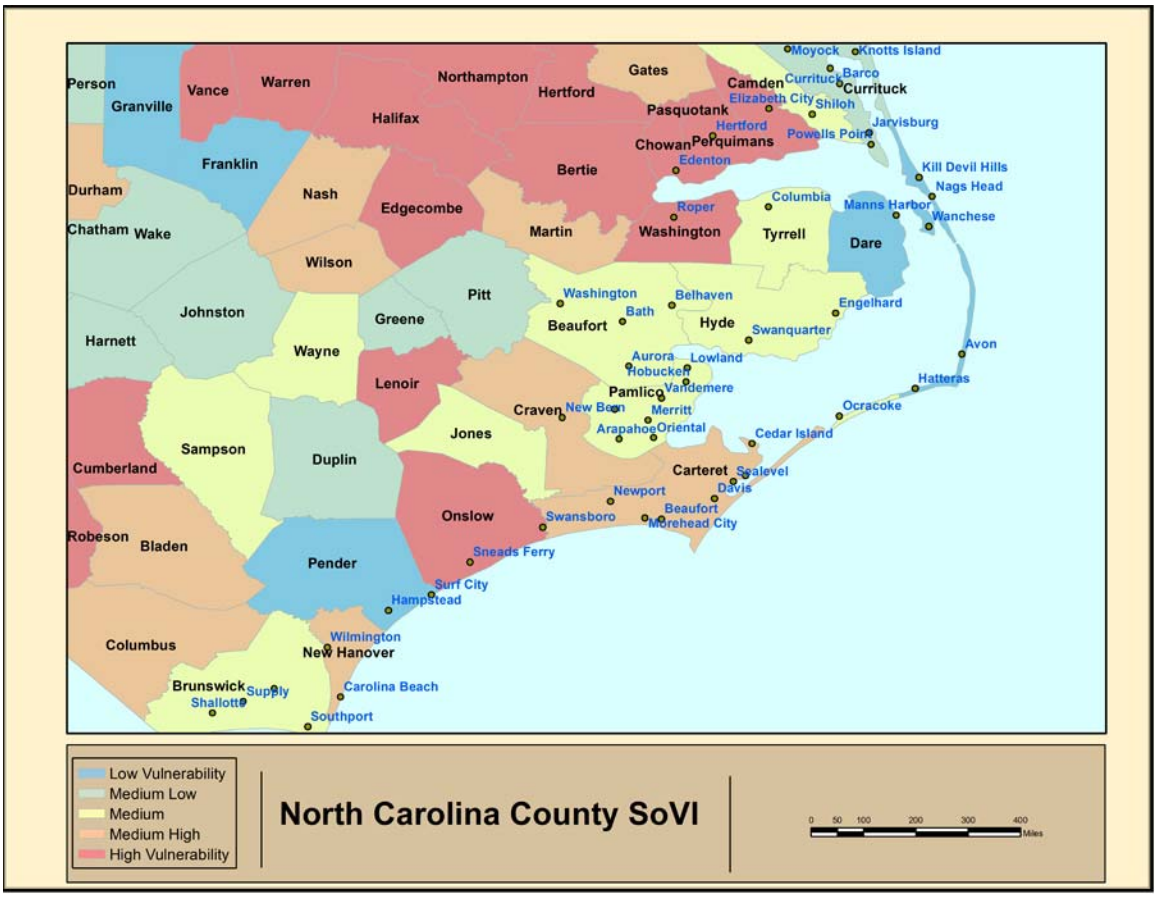


Figure 3-7. The Social Vulnerability Index applied to North Carolina Coastal Counties**.**

Commercial Fishing

There has been a steady decline in the number of federal commercial permits North Carolina and in 2012 there were 1,194 permits to fish commercial species (**Table 3-7**). Brunswick County, Carteret County, New Hanover County and Dare County have the largest number of permits, making up over half of all federal permits in North Carolina. Mackerel permits (Spanish mackerel and King mackerel) and dolphin wahoo permits are the most commonly held

commercial permits in North Carolina. Snapper grouper permits make up about one-tenth of commercial permits in the state.

Table 3-7. Federal commercial fishing permits in North Carolina coastal counties (2012).

County*	Snapper Grouper	Mackerels	Dolphin-Wahoo	Rock Shrimp	Penaeid Shrimp	Spiny Lobster**	Total
Beaufort	0	2	4	1	4	0	**11**
Brunswick	32	56	69	2	17	22	**198**
Carteret	21	30	55	4	12	7	**129**
Craven	0	0	2	12	12	0	**26**
Dare	19	77	108	1	6	2	**213**
Hyde	1	6	6	7	24	1	**45**
New Hanover	18	35	42	0	1	5	**101**
Onslow	11	19	13	17	27	2	**89**
Pamlico	0	2	9	14	17	19	**61**
Pasquotank	0	8	3	0	0	0	**11**
Pender	9	11	10	1	1	2	**34**
Total	**111**	**246**	**321**	**59**	**121**	**60**	**1,194**

* Based on the mailing address of the permit holder.
**Includes non-Florida permits and tailing permits.

Most dealer permits are associated with Carteret, Dare and New Hanover Counties (**Table 3-8**). Almost all of the dealer permits are snapper grouper and dolphin-wahoo permits.

Table 3-8. Federal dealer permits in North Carolina coastal counties (2012).

County*	Snapper Grouper	Dolphin-Wahoo	Rock Shrimp	Golden Crab	Wreckfish	Total
Beaufort	1	1	0	0	1	**3**
Brunswick	5	5	0	0	0	**10**
Carteret	10	10	1	0	1	**22**
Craven	2	2	2	0	1	**7**
Dare	9	11	2	1	4	**27**
Hyde	1	2	0	0	1	**4**
New Hanover	7	7	0	0	0	**14**
Onslow	4	5	0	0	1	**10**
Pamlico	0	0	0	0	0	**0**
Pasquotank	0	0	0	0	0	**0**
Pender	2	2	0	0	0	**4**
Total	**41**	**45**	**5**	**1**	**9**	**101**

* Based on the mailing address of the permit holder.

Recreational Fishing

Recreational fishing is well developed in North Carolina and, due to natural geography, is not limited to areas along the coast. North Carolina offers several types of private recreational licenses for residents and visitors, and for different durations (10-day, annual, and lifetime). Non-resident recreational license sales are high, indicating how coastal recreational fishing is tied to coastal tourism in the state. In general recreational license sales have remained stable or increased, with the exception of annual non-resident license sales, which have declined in recent years (**Table 3-9**)

Table 3-9. Coastal recreational fishing license sales by year and type.

License Type	2007	2008	2009	2010	2011
Annual Resident	23,793	19,222	19,398	20,254	19,270
Annual non-Resident	179,923	143,810	142,569	141,475	130,743
10-day Resident	40,255	39,110	45,724	47,619	45,467
10-day Non-Resident	131,105	125,564	132,193	137,066	130,026

Source: NC Division of Marine Fisheries

In 2012 there were 663 South Atlantic federal charter permits for dolphin wahoo, mackerel and cobia and snapper grouper registered to individuals in North Carolina coastal counties (**Table 3-10**). A majority of the charter permits are from Dare County, Brunswick County, and Carteret County. It is common for charter vessels to hold all three federal charter permits.

Table 3-10. Federal charter permits in North Carolina coastal counties (2012).

County*	Dolphin Wahoo	Mackerels and Cobia	Snapper Grouper	Total
Beaufort	1	1	1	3
Brunswick	46	46	44	136
Carteret	40	34	34	108
Craven	3	2	2	7
Dare	89	83	78	250
Hyde	4	4	4	12
New Hanover	36	33	29	98
Onslow	6	7	7	20
Pasquotank	3	3	2	8
Pamlico	0	0	0	0
Pender	7	7	7	21
Total	**235**	**220**	**208**	**663**

* Based on the mailing address of the permit holder.

3.4.5 South Carolina

Coastal South Carolina had no counties that were either medium or highly vulnerable (**Figure 3-8**). This does not mean that communities could not be vulnerable to adverse impacts because of regulatory action. It may suggest that coastal South Carolina is more resilient and capable of absorbing such impacts without substantial social disruption. South Carolina had no communities with landings or value over 3% for any coastal pelagic. While there were no substantial commercial landings within the state, the recreational fishery may be important.

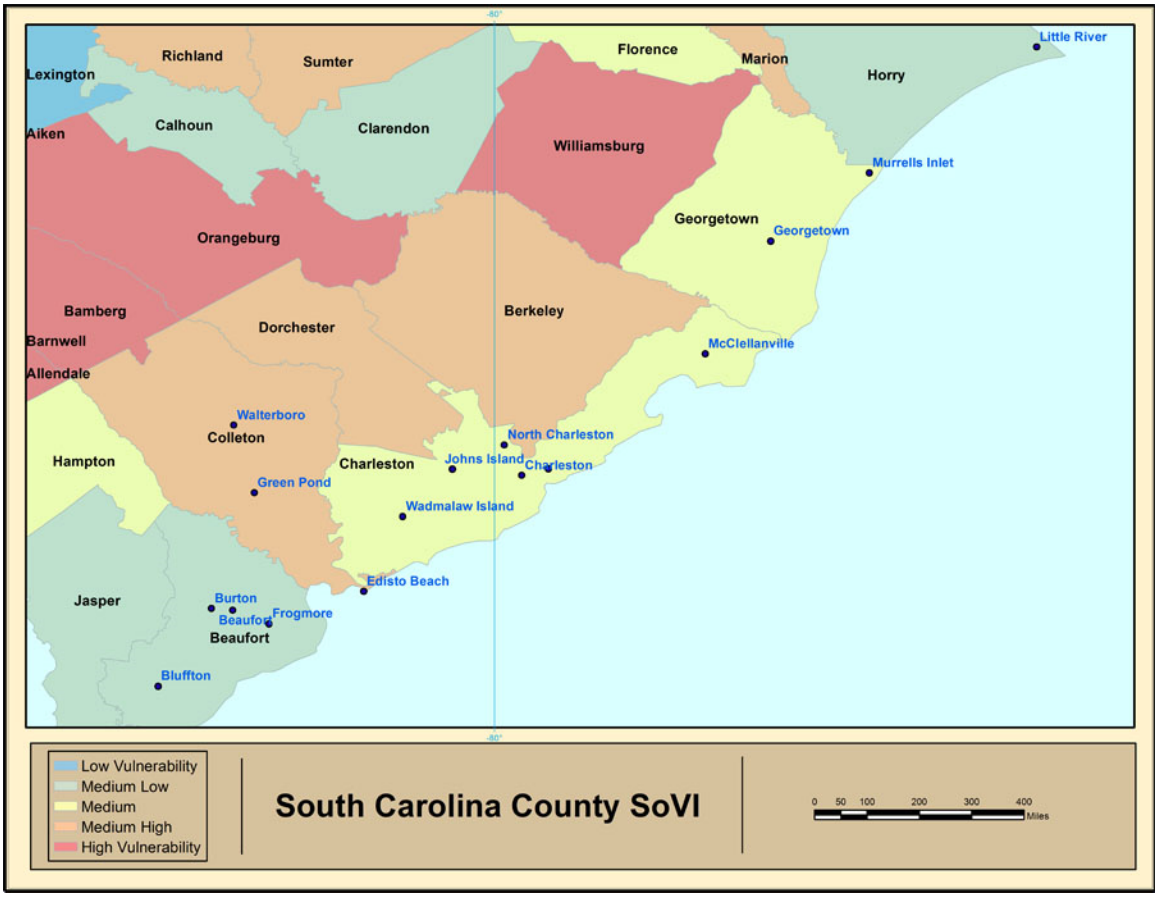


Figure 3-8. The Social Vulnerability Index applied to South Carolina Coastal Counties.

Commercial Fishing

While pockets of commercial fishing activities remain in the state, most are being displaced by the development forces and associated changes in demographics. There are 190 commercial permits in South Carolina coastal counties (**Table 3-11(a) and Table 3-11(b)**). Horry, Georgetown, and Charleston Counties have the majority of finfish permits, and Beaufort County and Charleston County have the highest number of shrimp permits.

Table 3-11(a). Federal commercial finfish permits in South Carolina coastal counties (2012).

County*	Dolphin-Wahoo	King Mackerel	Snapper Grouper	Spanish Mackerel	Wreckfish	Total
Beaufort	0	0	1	0	0	**1**
Berkeley	1	1	1	0	0	**3**
Charleston	17	4	9	2	2	**34**
Georgetown	17	11	12	4	0	**44**
Horry	21	7	20	6	0	**54**
Total	**56**	**23**	**43**	**12**	**2**	**136**

Table 3-11(b). Federal commercial lobster and shrimp permits in South Carolina coastal counties (2012).

County*	Spiny Lobster**	Rock Shrimp	Penaeid Shrimp	Total
Beaufort	0	1	13	**14**
Charleston	0	5	20	**25**
Georgetown	2	0	3	**5**
Horry	8	1	1	**10**
Total	**10**	**7**	**37**	**54**

* Based on the mailing address of the permit holder.
**Includes non-Florida permits and tailing permits.

There are 27 dealer permits registered to South Carolina coastal counties (**Table 3-12**). Most are in Charleston County. There are no federal dealer permits in Beaufort or Berkeley Counties.

Table 3-12. Federal dealer permits in South Carolina coastal counties (2012).

County*	Dolphin-Wahoo	Snapper Grouper	Wreckfish	Total
Charleston	7	6	2	**15**
Georgetown	2	2	1	**5**
Horry	3	4	0	**7**
Total	**12**	**12**	**3**	**27**

* Based on the mailing address of the permit holder.

Recreational Fishing

Many areas that used to be dedicated to commercial fishing endeavors are now geared towards the private recreational angler and for-hire sector. Most of the charter permits are associated with vessels from Charleston, Horry, and Georgetown Counties (**Table 3-13**). It is common for charter vessels to have all three federal charter permits.

Table 3-13. Federal charter permits in South Carolina coastal counties (2012).

County*	Dolphin-Wahoo	Mackerels and Cobia	Snapper Grouper	Total
Beaufort	10	17	14	**41**

Berkeley	0	1	1	**2**
Charleston	43	38	36	**117**
Georgetown	18	19	19	**56**
Horry	28	28	25	**81**
Total	**99**	**103**	**95**	**297**

*Based on the mailing address of the permit holder.

The majority of South Carolina saltwater anglers target coastal pelagic species such as king mackerel, Spanish mackerel, tunas, dolphins, and billfish. A lesser number focus primarily on bottom fish such as snapper and groupers and often these species are the specialty of the headboats that run out of Little River, Murrells Inlet, and Charleston. There are 35 coastal marinas in the state and 34 sport fishing tournaments. South Carolina offers private recreational licenses for residents and visitors, and sales of all license types have more than doubled since 2006 (**Table 3-14**).

Table 3-14. Sales of all saltwater recreational license types in South Carolina.

Year	Number of Licenses Sold
2006	106,385
2007	119,255
2008	132,324
2009	124,193
2010	208,204
2011	218,834

Source: SC DNR

3.4.6 Georgia

Overview

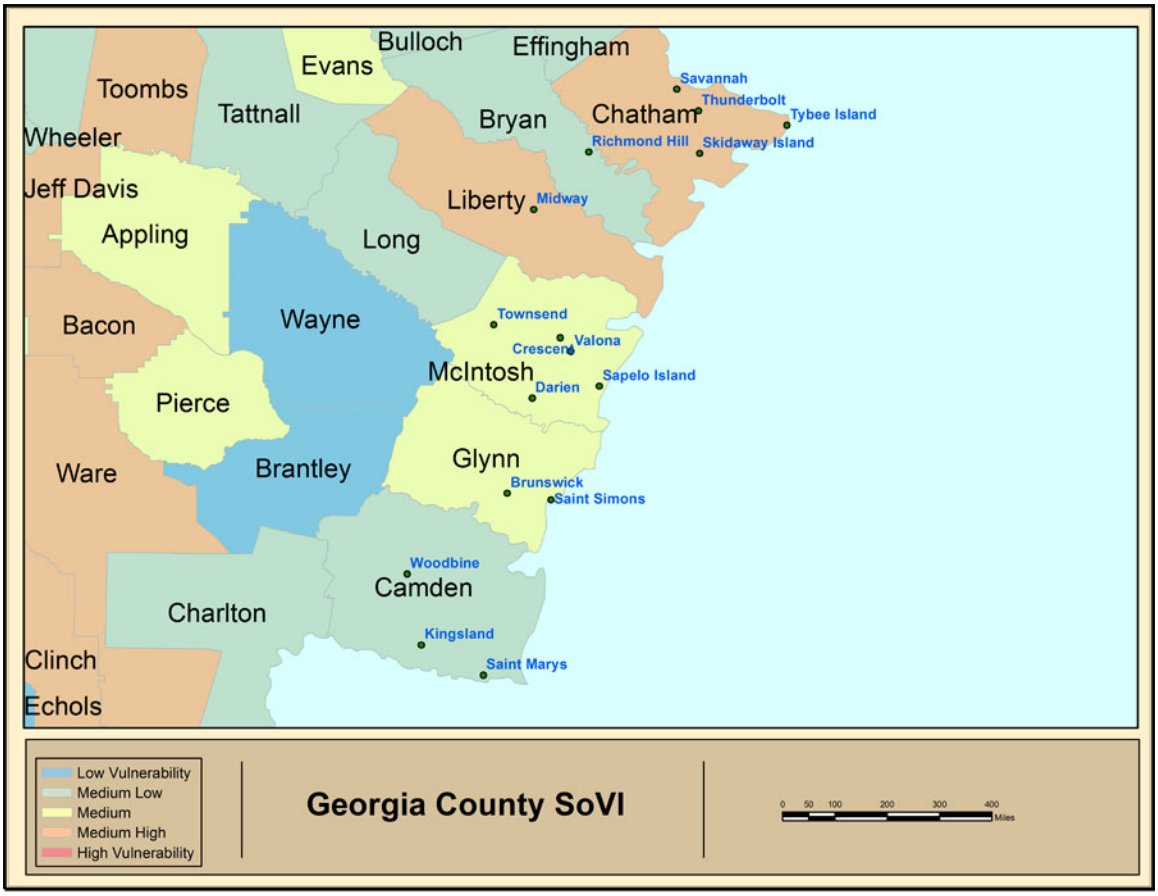


Figure 3-9. The Social Vulnerability Index applied to Georgia Coastal Counties.

There were two counties in Georgia with medium high vulnerability and those were Liberty and Chatham (**Figure 3-9**). The fishing communities located in those counties are Savannah, Thunderbolt, Tybee Island and Skidaway Island in Chatham County, and Midway in Liberty County.

Commercial Fishing

Overall Georgia has much lower numbers of permits than other states. McIntosh County has the most permits (**Table 3-15**). Many Georgia fishermen target shrimp or hold state commercial fishing permits.

Table 3-15. Federal commercial fishing permits in Georgia coastal counties (2012).

County*	Dolphin-Wahoo	King Mackerel	Spiny Lobster**	Rock Shrimp	Snapper Grouper	Spanish Mackerel	Penaeid Shrimp	Total
Camden	1	1	4	2	1	1	4	**14**
Chatham	2	1	0	1	1	1	17	**23**
Glynn	1	1	0	2	1	1	15	**21**
Liberty	0	0	0	0	0	0	2	**2**
McIntosh	3	3	4	5	3	2	34	**54**

Total	**7**	**6**	**8**	**10**	**6**	**5**	**72**	**114**

* Based on the mailing address of the permit holder.
**Includes non-Florida permits and tailing permits.

There are only seven federal dealer permits associated with Georgia coastal communities, and only in Glynn and McIntosh County (**Table 3-16**).

Table 3-16. Federal dealer permits in Georgia coastal communities (2012).

County*	Dolphin-Wahoo	Rock Shrimp	Snapper Grouper	Wreckfish	Total
Glynn	1	1	1	0	**3**
McIntosh	1	1	1	1	**4**
Total	**2**	**2**	**2**	**1**	**7**

* Based on the mailing address of the permit holder.

Recreational Fishing

Most federal charter permits are associated with Chatham and Glynn County (**Table 3-17**). Private recreational licenses in Georgia are included in a combination saltwater/freshwater license and offered in short-term and long-term licenses. Although license holders may or may not fish for saltwater species, license sales over the past five years (**Table 3-18**) suggest that in general, private recreational fishing in Georgia has stayed fairly steady with the exception of 2009, when license sales dropped for one year.

Table 3-17. Federal charter permits in Georgia coastal counties (2012).

County	Dolphin-Wahoo	Mackerels and Cobia	Snapper Grouper	Total
Chatham	9	10	9	**28**
Glynn	4	5	5	**14**
McIntosh	1	1	1	**3**
Total	**14**	**16**	**15**	**45**

*****Based on the mailing address of the permit holder.

Table 3-18. Sales of recreational fishing license types that include saltwater in Georgia.

Year	Number of Licenses Sold
2007	592,633
2008	526,294
2009	325,189
2010	567,175
2011	529,850

Source: GA DNR

3.4.7 Florida

Figure 3-10. The Social Vulnerability Index applied to South Atlantic Florida Counties.

A good portion of Florida's east coast (**Figure 3-10**) is considered either medium high or highly vulnerable in terms of social vulnerability. In fact, the only counties not included in those two categories are Nassau, St. John's and Monroe.

Commercial and recreational fishermen in the Florida Keys commonly fish both Gulf and Atlantic sides, and work under dual jurisdiction of the South Atlantic Fishery Management Council and the Gulf of Mexico Fishery Management Council.

Commercial Fishing

Despite the high population growth rates and emphasis on a tourism economy in Florida, the commercial fishing sector in Florida is still robust in some areas. There are several important communities that target snapper grouper species such as Mayport, Jacksonville, and Cocoa Beach, along with Key West, Marathon and Tavernier in the Florida Keys. Additional detailed information about Florida fishing communities can be found in the Comprehensive ACL Amendment (SAFMC 2011c).

Florida has the largest number of commercial permits in the region (**Table 3-19(a) and Table 3-19(b)**). The southern counties (Monroe, Miami-Dade, Broward, Palm Beach, and Duval) generally have the most commercial permits, especially finfish. The northern counties have the highest number of penaeid shrimp permits in the state. The federal spiny lobster permits are most commonly associated with Monroe County in addition to the more than 900 Florida spiny lobster endorsement holders (pers. comm, FWC).

Table 3-19(a). Federal commercial finfish permits in Florida coastal counties (2012).

County*	Dolphin-Wahoo	King Mackerel	Snapper Grouper	Spanish Mackerel	Wreckfish	Total
Brevard	98	84	28	85	0	**295**
Broward	87	47	13	60	0	**207**
Duval	37	27	27	26	0	**117**
Indian River	53	51	11	54	0	**169**
Martin	62	59	7	72	0	**200**
Miami-Dade	163	82	77	153	0	**475**
Monroe	365	163	217	245	2	**992**
Nassau	8	5	4	5	0	**22**
Palm Beach	173	150	43	156	0	**522**
St Johns	12	6	10	7	0	**35**
St Lucie	60	52	9	69	0	**190**
Volusia	24	15	16	17	3	**75**
Total	**1,142**	**741**	**462**	**949**	**5**	**3,299**

Table 3-19(b). Federal commercial crab, lobster and shrimp permits in Florida coastal counties (2012).

County*	Golden Crab	Spiny Lobster**	Rock Shrimp	Penaeid Shrimp	Total
Brevard	0	25	5	9	**39**
Broward	4	10	4	8	**26**
Duval	0	20	10	32	**62**
Indian River	0	7	0	1	**8**
Martin	0	12	2	2	**16**
Miami-Dade	0	30	3	7	**40**
Monroe	2	137	3	8	**150**
Nassau	0	4	7	13	**24**
Palm Beach	3	21	0	4	**28**
St Johns	0	2	0	4	**6**
St Lucie	0	11	1	2	**14**
Volusia	0	13	0	2	**15**
Total	**9**	**292**	**35**	**92**	**428**

*****Based on the mailing address of the permit holder.
**Includes only federal tailing permits, not Florida crawfish endorsements.

Florida is the only state that has permit holders for all federal dealer permits. Most deals are associated with Monroe, Miami-Dade, and Broward Counties (**Table 3-20**).

Table 3-20. Federal dealer permits in Florida (2012).

County*	Dolphin-Wahoo	Golden Crab	Rock Shrimp	Snapper Grouper	Wreckfish	Total
Brevard	5	3	4	6	2	**20**
Broward	14	6	0	13	1	**34**
Duval	2	1	2	3	1	**9**
Indian River	2	0	0	2	0	**4**
Martin	2	1	0	2	0	**5**
Miami-Dade	10	2	3	10	6	**31**
Monroe	23	6	5	24	9	**67**
Nassau	0	0	1	0	0	**1**
Palm Beach	7	3	1	6	1	**18**

St Johns	2	0	0	2	1	**5**
St Lucie	2	0	0	2	0	**4**
Volusia	6	0	1	7	2	**16**
Total	**75**	**22**	**17**	**77**	**23**	**214**

*****Based on the mailing address of the permit holder.

Recreational Fishing

Recreational fishing is economically and socially important for all Florida coastal counties, and for both residents and tourists. Most charter permits are associated with the southern counties (**Table 3-21**), but there are at least 20 permits in all counties.

Table 3-21. Federal charter permits in Florida coastal counties (2012).

County*	Dolphin-Wahoo	Mackerels and Cobia	Snapper Grouper	Total
Brevard	66	65	65	**196**
Broward	58	57	59	**174**
Duval	17	16	17	**50**
Indian River	18	18	20	**56**
Martin	10	10	11	**31**
Miami-Dade	39	38	42	**119**
Monroe	285	278	294	**857**
Nassau	6	7	7	**20**
Palm Beach	49	49	63	**161**
St Johns	23	23	23	**69**
St Lucie	7	6	8	**21**
Volusia	30	33	32	**95**
Total	**608**	**600**	**641**	**1,849**

*Based on mailing address of the permit holder.

In 2010/2011, there were approximately 860,000 resident marine recreational licenses and 394,000 non-resident marine recreational licenses sold in Florida (FWC 2012). Eastern Florida recreational anglers took 10 million fishing trips: 5.4 million by private/rental boats, 4.5 million from shore, and 180,000 by party/charter boat (NMFS 2009)

3.4.8 Environmental Justice Considerations

Executive Order 12898 requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. This executive order is generally referred to as environmental justice (EJ).

To evaluate EJ considerations for the proposed actions, information on poverty and minority rates is examined at the county level. Information on the race and income status for groups at the

different participation levels (vessel owners, crew, dealers, processors, employees, employees of associated support industries, etc.) is not available. Because the proposed actions would be expected to affect fishermen in several communities along the South Atlantic coast and not just those profiled, it is possible that other counties or communities have poverty or minority rates that exceed the EJ thresholds.

In order to identify the potential for EJ concern, the rates of minority populations (non-white, including Hispanic) and the percentage of the population that was below the poverty line were examined. The threshold for comparison that was used was 1.2 times the state average for minority population rate and percentage of the population below the poverty line. If the value for the community or county was greater than or equal to 1.2 times the state average, then the community or county was considered an area of potential EJ concern (EPA 1999). Census data for the year 2010 was used. Estimates of the state minority and poverty rates, associated thresholds, and community rates are provided in **Table 3-22**; note that only communities that exceed the minority threshold and/or the poverty threshold are included in the table**.**

While some communities expected to be affected by this proposed amendment may have minority or economic profiles that exceed the EJ thresholds and, therefore, may constitute areas of concern, significant EJ issues are not expected to arise as a result of this proposed amendment. No adverse human health or environmental effects are expected to accrue to this proposed amendment, nor are these measures expected to result in increased risk of exposure of affected individuals to adverse health hazards. The proposed management measures would apply to all participants in the affected area, regardless of minority status or income level, and information is not available to suggest that minorities or lower income persons are, on average, more dependent on the affected species than non-minority or higher income persons.

Table 3-22. Environmental Justice thresholds (2010 U.S. Census data) for counties in the South Atlantic region. Only coastal counties (east coast for Florida) with minority and/or poverty rates that exceed the state threshold are listed.

State	County	Minority Rate	Minority Threshold*	Poverty Rate	Poverty Threshold*
Florida		**47.4**	**56.88**	**13.18**	**15.81**
	Broward	52.0	-4.6	11.7	4.11
	Miami-Dade	81.9	-34.5	16.9	-1.09
	Orange County	50.3	-2.9	12.7	3.11
	Osceola	54.1	-6.7	13.3	2.51
Georgia		**50.0**	**60.0**	**15.0**	**18.0**
	Liberty	53.2	-3.2	17.5	0.5
South Carolina		**41.9**	**50.28**	**15.82**	**18.98**
	Colleton	44.4	-2.5	21.4	-2.42
	Georgetown	37.6	4.3	19.3	-0.32
	Hampton	59.0	-17.1	20.2	-1.22
	Jasper	61.8	-19.9	9.9	-0.92
North Carolina		**39.1**	**46.92**	**15.07**	**18.08**
	Bertie	64.6	-25.50	22.5	-4.42

State	County	Minority Rate	Minority Threshold*	Poverty Rate	Poverty Threshold*
	Chowan	39.2	-0.1	18.6	-0.52
	Gates	38.8	0.3	18.3	-0.22
	Hertford	65.3	-26.2	23.5	-5.42
	Hyde	44.5	-5.4	16.2	1.88
	Martin	48.4	-9.3	23.9	-5.82
	Pasquotank	43.4	-4.3	16.3	1.78
	Perquimans	27.7	11.4	18.6	-0.52
	Tyrrell	43.3	-4.2	19.9	-1.82
	Washington	54.7	-15.6	25.8	-7.72

*The county minority and poverty thresholds are calculated by comparing the county minority rate and poverty estimate to 1.2 times the state minority and poverty rates. A negative value for a county indicates that the threshold has been exceeded.

The actions in this proposed amendment are expected to incur social and economic benefits to users and communities by implementing management measures that would contribute to the protection of important habitat. Although there may be some impacts on vessels due to area closures (such as the inability to fish historic fishing grounds and the travel cost if not transit provision is provided), the overall long-term benefits are expected to contribute to the social and economic health of South Atlantic communities.

Finally, the general participatory process used in the development of fishery management measures (e.g., scoping meetings, public hearings, and open South Atlantic Council meetings) is expected to provide sufficient opportunity for meaningful involvement by potentially affected individuals to participate in the development process of this amendment and have their concerns factored into the decision process. Public input from individuals who participate in the fishery has been considered and incorporated into management decisions throughout development of the amendment.

3.5 Administrative Environment

3.5.1 The Fishery Management Process and Applicable Laws

3.5.1.1 Federal Fishery Management

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

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

The South Atlantic 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 South Atlantic Council has thirteen voting members: one from NOAA Fisheries Service; one each from the state fishery agencies of North Carolina, South Carolina, Georgia, and Florida; and eight public members appointed by the Secretary. On the South Atlantic Council, there are two public members from each of the four South Atlantic States. Non-voting members include representatives of the U.S. Fish and Wildlife Service, U.S. Coast Guard, State Department, and Atlantic States Marine Fisheries Commission (ASMFC). The South Atlantic Council has adopted procedures whereby the non-voting members serving on the Council Committees have full voting rights at the Committee level but not at the full Council level. South Atlantic 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 South Atlantic Council uses a Scientific and Statistical Committee to review the data and science being used in assessments and fishery management plans/amendments. In addition, the regulatory process is in accordance with the Administrative Procedures Act, in the form of "notice and comment" rulemaking.

3.5.1.2 State Fishery Management

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

in Federal fishery management decision-making and to promote the development of compatible regulations in state and Federal waters.

The South Atlantic States are also involved through the Atlantic States Marine Fisheries Commission (ASMFC) in management of marine fisheries. This commission was created to coordinate state regulations and develop management plans for interstate fisheries. It has significant authority, through the Atlantic Striped Bass Conservation Act and the Atlantic Coastal Fisheries Cooperative Management Act, to compel adoption of consistent state regulations to conserve coastal species. The 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.

3.5.1.3 Enforcement

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

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

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

Chapter 4. Environmental Consequences

4.1 Action 1. Expand boundaries of the Oculina Bank HAPC

Alternative 1 (**No Action**). Do not modify the boundaries of the Oculina Bank HAPC. The existing Oculina Bank HAPC is delineated by the following boundaries: on the north by 28°30' N, on the south by 27°30' N., on the east by the 100-fathom (183-m) contour, and on the west by 80°00' W.; and two adjacent satellite sites: the first bounded on the north by 28°30' N., on the south by 28°29' N., on the east by 80°00' W., and on the west by 80°03' W.; and the second bounded on the north by 28°17' N., on the south by 28°16' N., on the east by 80°00 W., and on the west by 80°03' W.

Alternative 2. Modify the northern boundary of the Oculina Bank HAPC.

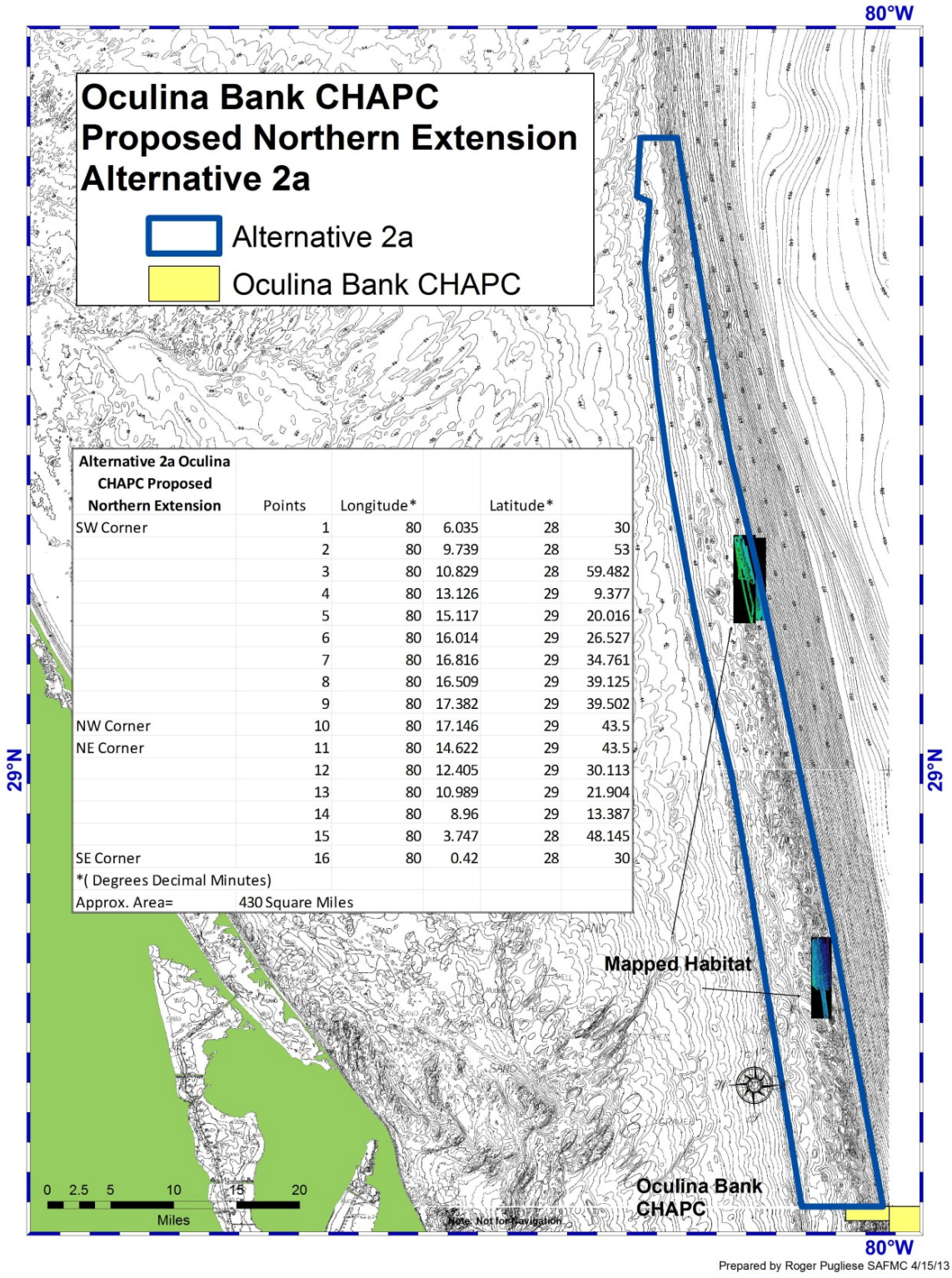
> **Sub-Alternative 2a**. Modify the northern boundary of the Oculina Bank HAPC: from the current northern boundary of the Oculina HAPC (28° 30'N) to 29° 43.5'W. The west and east boundaries would follow the 60 meter and 100 meter depth contour lines, respectively, as represented in the simplified polygon (**Figures 4-1 and 4-2**). Sub-alternative 2a = 430 square miles
>
> **Sub-Alternative 2b.** Modify the northern boundary of the Oculina Bank HAPC from the current northern boundary of the Oculina HAPC (28° 30'N) to 29° 43.5'W. The west and east boundaries would follow close to the 70 meter and 100 meter depth contour lines, respectively, while annexing obvious hard bottom features as represented in the simplified polygon (**Figures 4-3 and 4-4**). Sub-alternative 2b = 329 square miles

Alternative 3. Modify the western boundary of the Oculina Bank HAPC from 28° 4.5'N to the north boundary of the current Oculina HAPC (28° 30'N). The east boundary would coincide with the current western boundary of the Oculina HAPC (80° W). The west boundary could either use the 60 meter contour line, or the 80° 03'W longitude (**Figure 4-5**). Alternative 3 = 76 square miles

Background

Recommendations for boundary modifications to the Coral Habitat Areas of Particular Concern (CHAPCs) were brought forward by the Council's Coral Advisory Panel (AP) in October 2011. Coral scientists serving on the AP presented findings from recent research identifying new areas of deepwater coral habitat previously uncharacterized (reference **Section 3.1.1.3** for additional information). In a report submitted by Reed (**Appendix J**), scientists associate the discovery of habitat north and west of the existing Oculina Bank HAPC as a continuation of the original reef

track depicted in NOAA regional bathymetric charts. The charts were used by scientists to select sites north of Cape Canaveral, FL (off Daytona, FL and Titusville, FL areas) to further map with high resolution multibeam sonar and ground-truth with an Remotely Operated Vehicle (ROV) and submersible video surveys (**Appendix J**). The mapping and surveys, conducted during a June 2011 field excursion aboard the NOAA ship *Pisces* (funded in part through NOAA's Deep Sea Coral Research and Technology Program), verified the high-relief features were *Oculina varicosa* coral bioherms. Over 100 individual mounds were observed and determined to be approximately 49-65 feet (15-20 meters) in height and covered in dead coral rubble, standing dead coral, and sparse live *Oculina varicosa* colonies (**Appendix J**). The observations of hard-bottom habitat and high relief features resulted in AP recommendations to the Council for consideration of a northern and western expansion of the Oculina Bank HAPC.



Alternative 2a Oculina CHAPC Proposed Northern Extension	Points	Longitude*		Latitude*	
SW Corner	1	80	6.035	28	30
	2	80	9.739	28	53
	3	80	10.829	28	59.482
	4	80	13.126	29	9.377
	5	80	15.117	29	20.016
	6	80	16.014	29	26.527
	7	80	16.816	29	34.761
	8	80	16.509	29	39.125
	9	80	17.382	29	39.502
NW Corner	10	80	17.146	29	43.5
NE Corner	11	80	14.622	29	43.5
	12	80	12.405	29	30.113
	13	80	10.989	29	21.904
	14	80	8.96	29	13.387
	15	80	3.747	28	48.145
SE Corner	16	80	0.42	28	30
*(Degrees Decimal Minutes)					
Approx. Area=	430 Square Miles				

Figure 4-1. Action 1, Sub-Alternative 2a. Oculina Bank HAPC Proposed Northern Extension and Associated Habitat Mapping and Bathymetry.

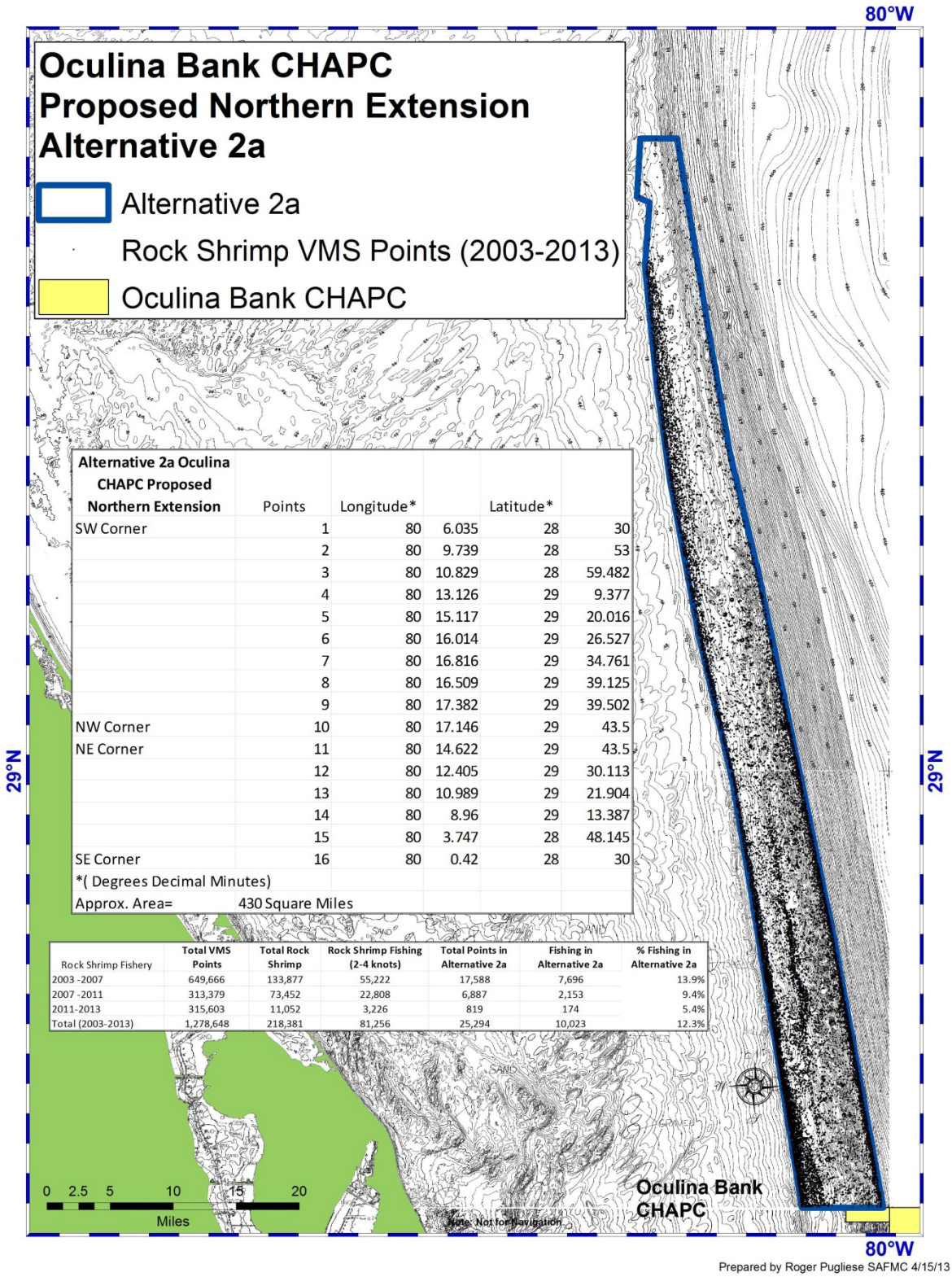
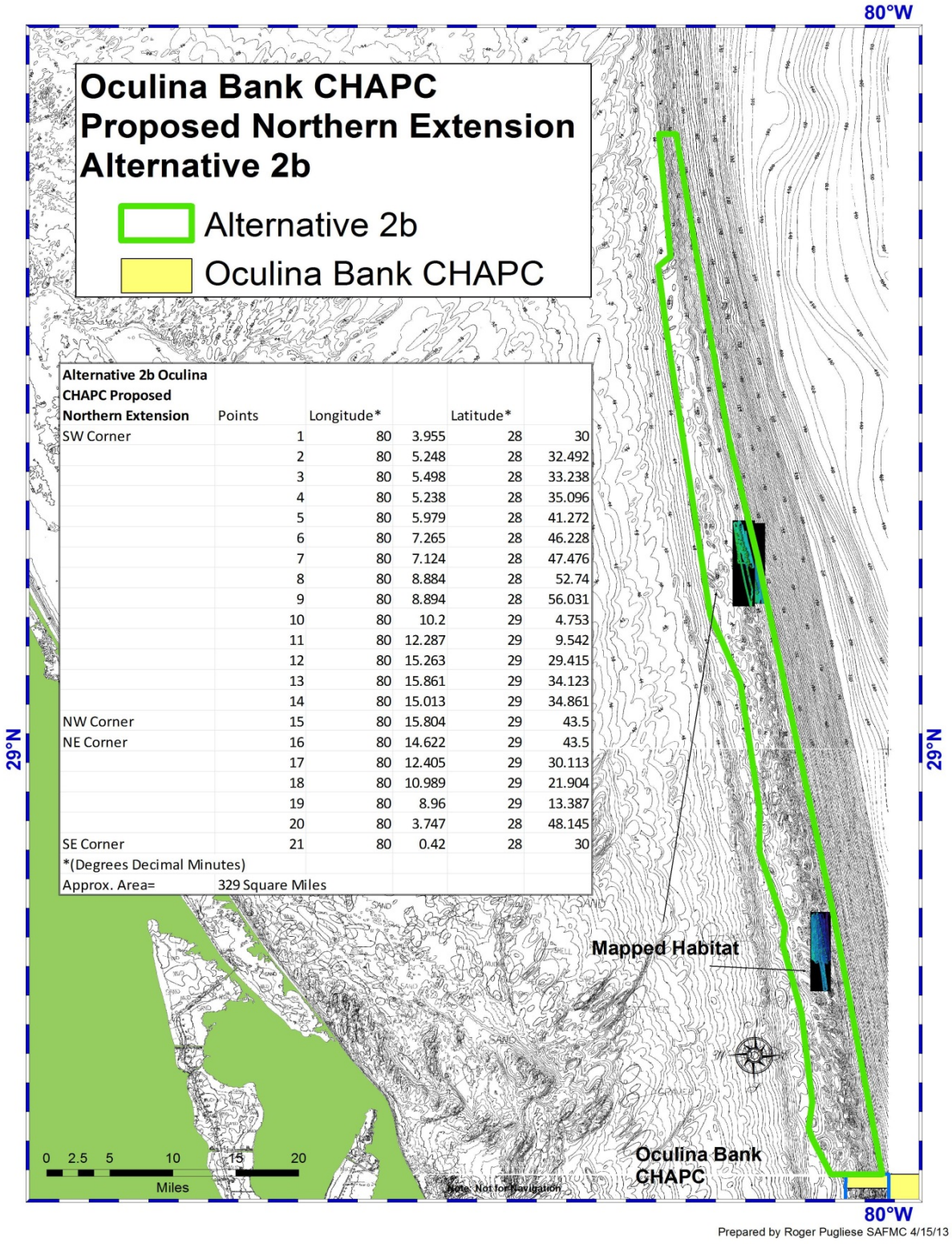


Figure 4-2. Action 1, Sub-Alternative 2a. Oculina Bank HAPC Proposed Northern Extension and Rock Shrimp VMS (2003-2013).



Alternative 2b Oculina CHAPC Proposed Northern Extension	Points	Longitude*		Latitude*	
SW Corner	1	80	3.955	28	30
	2	80	5.248	28	32.492
	3	80	5.498	28	33.238
	4	80	5.238	28	35.096
	5	80	5.979	28	41.272
	6	80	7.265	28	46.228
	7	80	7.124	28	47.476
	8	80	8.884	28	52.74
	9	80	8.894	28	56.031
	10	80	10.2	29	4.753
	11	80	12.287	29	9.542
	12	80	15.263	29	29.415
	13	80	15.861	29	34.123
	14	80	15.013	29	34.861
NW Corner	15	80	15.804	29	43.5
NE Corner	16	80	14.622	29	43.5
	17	80	12.405	29	30.113
	18	80	10.989	29	21.904
	19	80	8.96	29	13.387
	20	80	3.747	28	48.145
SE Corner	21	80	0.42	28	30
*(Degrees Decimal Minutes)					
Approx. Area=	329 Square Miles				

Figure 4-3. Action 1, Sub-Alternative 2b. Oculina Bank HAPC Proposed Northern Extension and Associated Habitat Mapping and Bathymetry.

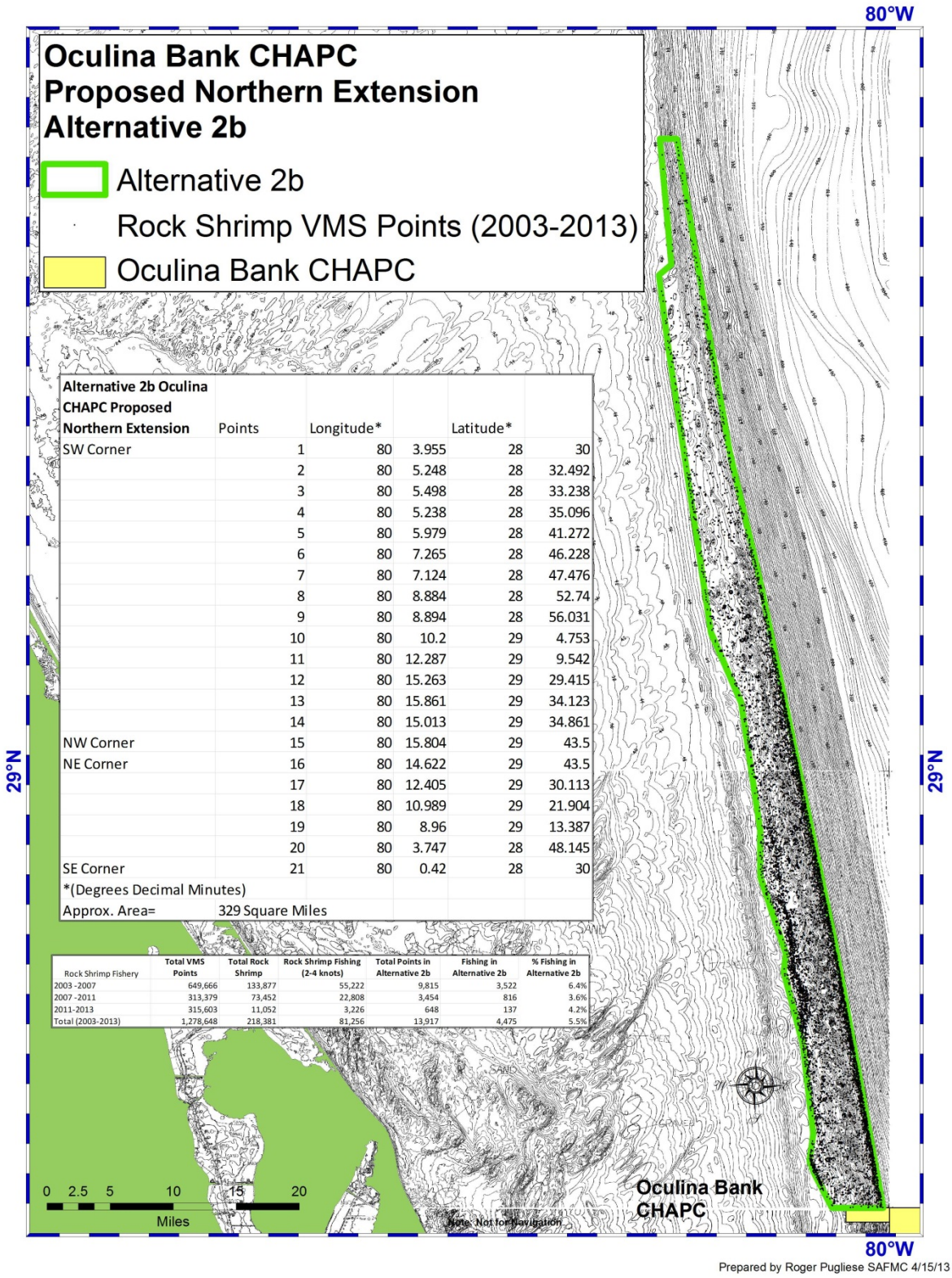


Figure 4-4. Action 1, Sub-Alternative 2b. Oculina Bank HAPC Proposed Northern Extension and Rock Shrimp VMS (2003-2013).

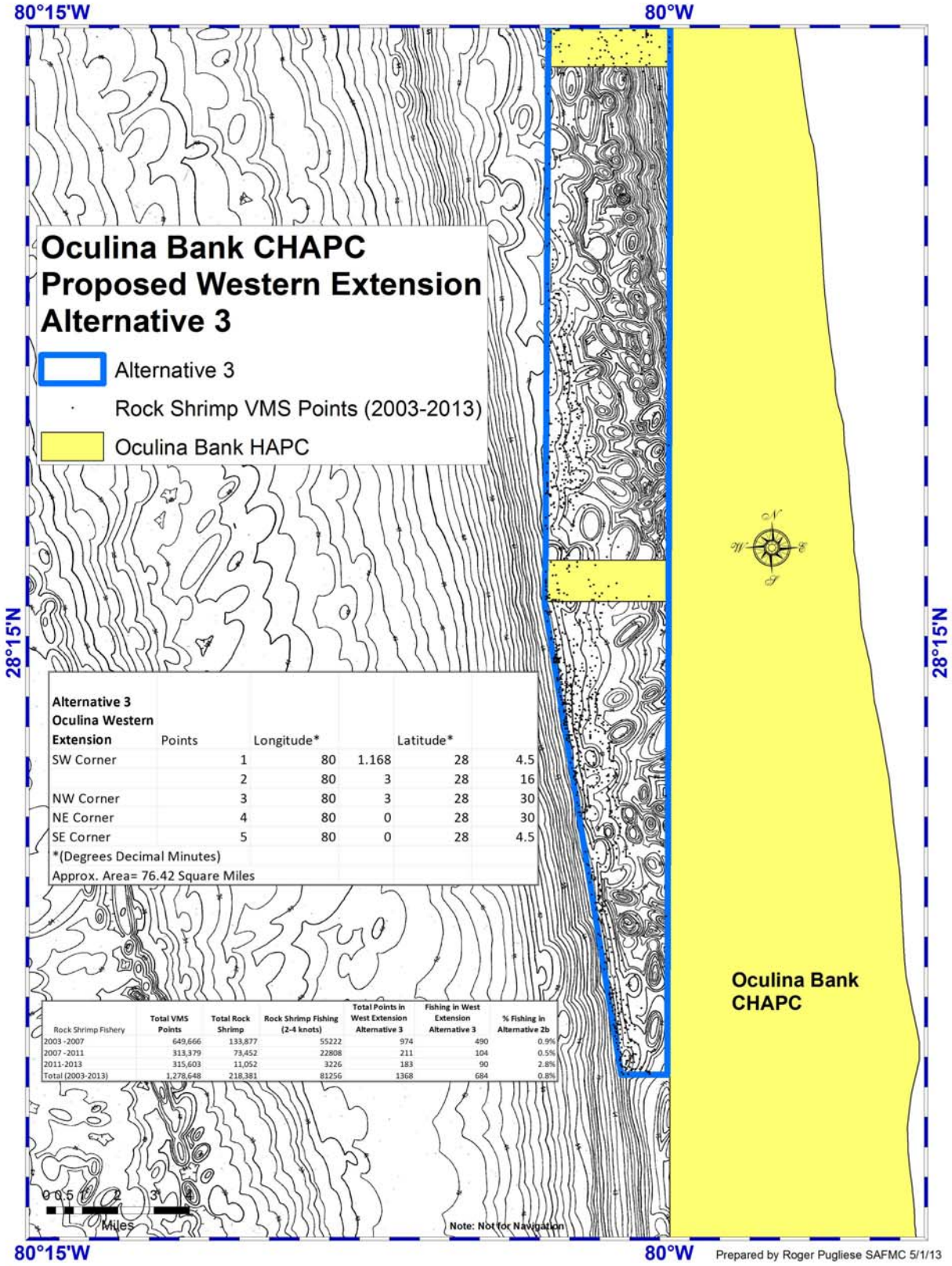


Figure 4-5. Action 1, Alternative 3. Oculina Bank HAPC Proposed Western Extension and Rock Shrimp VMS (2003-2013).

Table 4-1. Fishing Associated with Oculina Bank HAPC Proposed Northern Extension Alternative 2a and Alternative 2b (Rock Shrimp VMS: 2003-2013).

Rock Shrimp Fishery	Total VMS Points	Total Rock Shrimp	Rock Shrimp Fishing (2-4 knots)	Total Points in Alternative 2a	Fishing in Alternative 2a	% Fishing in Alternative 2a
2003 -2007	649,666	133,877	55,222	17,588	7,696	13.9%
2007 -2011	313,379	73,452	22,808	6,887	2,153	9.4%
2011-2013	315,603	11,052	3,226	819	174	5.4%
Total (2003-2013)	1,278,648	218,381	81,256	25,294	10,023	12.3%
Rock Shrimp Fishery	Total VMS Points	Total Rock Shrimp	Rock Shrimp Fishing (2-4 knots)	Total Points in Alternative 2b	Fishing in Alternative 2b	% Fishing in Alternative 2b
2003 -2007	649,666	133,877	55,222	9,815	3,522	6.4%
2007 -2011	313,379	73,452	22,808	3,454	816	3.6%
2011-2013	315,603	11,052	3,226	648	137	4.2%
Total (2003-2013)	1,278,648	218,381	81,256	13,917	4,475	5.5%

Table 4-2. Fishing Associated with Oculina Bank HAPC Proposed Western Extension Alternative 3 (Rock Shrimp VMS: 2003-2013).

Rock Shrimp Fishery	Total VMS Points	Total Rock Shrimp	Rock Shrimp Fishing (2-4 knots)	Total Points in West Extension Alternative 3	Fishing in West Extension Alternative 3	% Fishing in Alternative 2b
2003 -2007	649,666	133,877	55222	974	490	0.9%
2007 -2011	313,379	73,452	22808	211	104	0.5%
2011-2013	315,603	11,052	3226	183	90	2.8%
Total (2003-2013)	1,278,648	218,381	81256	1368	684	0.8%

4.1.1 Biological Effects

Within the Oculina Bank HAPC prohibited gear includes bottom longline, bottom trawl, dredge, pot or trap as well as the use of an anchor, anchor and chain, or grapple and chain. Within Oculina Bank HAPC, fishing for or possessing rock shrimp or *Oculina* coral is also prohibited. Under **Alternative 1 (No Action),** these actions would continue to be prohibited. **Alternative 2** and associated **sub-alternatives** and **Alternative 3** propose increasing the size of the Oculina Bank HAPC and extending the prohibitions to a larger area. As the size of the Oculina Bank HAPC is increased, the biological benefit increases for the coral in the area, including *Oculina* coral; the species that use the bottom substrate as habitat; and rock shrimp populations in the HAPC. Increasing the size of the Oculina Bank HAPC, may provide a refuge for other important species in the area, such as snapper grouper populations.

The rock shrimp, royal red shrimp and snapper-grouper fisheries are known to operate in the proposed Oculina Bank HAPC expansion.

Table 4-3. Estimated percent reductions in SAFMC recreational headboat harvest from proposed CHAPC extensions in **Action 1**, by species, based on mean harvest by area (2009-2011). This assumes harvest is uniformly distributed within 1°X1° headboat reporting grids and no effort redistribution. If effort redistributes, impacts on total harvest could be less than estimated. If fishing within the reporting grid is actually concentrated within the area of proposed extension, the impacts could be higher than estimated.

Extension	blueline tilefish	gag	greater amberjack	red grouper	red porgy	scamp	silk snapper	snowy grouper	vermilion snapper	yellowedge grouper
Alternative 2a	0.000%	0.055%	0.067%	0.000%	0.001%	0.018%	0.000%	0.000%	0.050%	0.000%
Alternative 2b	0.000%	0.036%	0.049%	0.000%	0.001%	0.013%	0.000%	0.000%	0.034%	0.000%
Alternative 3	0.000%	0.000%	0.012%	0.000%	0.000%	0.000%	0.000%	0.000%	0.008%	0.000%

Source: NMFS-SERO (2013) using headboat CRNF files (SEFSC 2012).

Table 4-4. Estimated percent reductions in SAFMC commercial harvest from proposed CHAPC extensions in **Action 1**, by species, based on mean harvest by area (2009-2011). This assumes harvest is uniformly distributed within 1°X5-fathom area-depth logbook reporting grids and no effort redistribution. If effort redistributes, impacts on total harvest could be less than estimated. If fishing within the reporting depth-grid is actually concentrated within the area of the proposed extension, the impacts could be higher than estimated.

Extension	blueline tilefish	gag	greater amberjack	red grouper	red porgy	scamp	silk snapper	snowy grouper	vermilion snapper	yellowedge grouper
Alternative 2a	0.016%	0.378%	5.809%	0.037%	0.027%	0.236%	0.012%	1.839%	0.066%	0.033%
Alternative 2b	0.009%	0.115%	3.720%	0.003%	0.004%	0.153%	0.000%	1.178%	0.004%	0.016%
Alternative 3	0.000%	0.023%	1.143%	0.002%	0.001%	0.022%	0.000%	0.280%	0.001%	0.007%

Source: NMFS-SERO (2013) using headboat CRNF files (SEFSC 2012).

The impacts of proposed spatial closures upon other stocks were evaluated by overlaying proposed MPAs upon commercial logbook and headboat logbook plots of landings for several Snapper-Grouper stocks. Commercial data were plotted in areas 1° tall by 5 fathoms wide. South Atlantic bathymetry was generalized from the NOAA Coastal Relief Model. Headboat data were plotted in areas 1/36° square. The percentage of average landings (2009-2011) within each logbook-area was computed. The total area of each logbook-area and the sliced area contained within each MPA were computed. The potential percent reduction in landings that could occur due to MPA implementation, assuming no effort shifting, was computed as the ratio of the logbook area within the MPA relative to the total area of each logbook-area multiplied by the percentage of mean landings within each logbook-area *i.* This approach assumes landings are distributed uniformly within the logbook-areas and fishermen do not redistribute effort to compensate for lost catches by fishing in other areas.

4.1.2 Economic 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, 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 CHAPC 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 CHAPC expansions 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. The discussion included here of general economic effects was covered in CE-BA 1 (SAFMC 2010c) and has been modified to fit the context of this amendment.

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 several affected fisheries.

4.1.2.1 Costs

Consumptive Costs

Most of the consumptive costs associated with CHAPCs can be generalized as displacement effects directly incurred by commercial vessels that normally fish in the protected areas. Direct consumptive costs to fishermen unable to fish in protected areas 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 expansions of the CHAPCs in **Actions 1, 3,** and **4**. Sometimes fishermen are able to mitigate these costs by redirecting effort to open areas and targeting different species. This may not be possible in a case where the fishing for a particular species is highly specialized such as golden crab. Although some 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 proposed CHAPC expansions, their communities likewise would 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. **Action 2** 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 4-6** for examples of non-consumptive uses and a depiction of how non-consumptive uses relate to other economic values of CHAPCs.

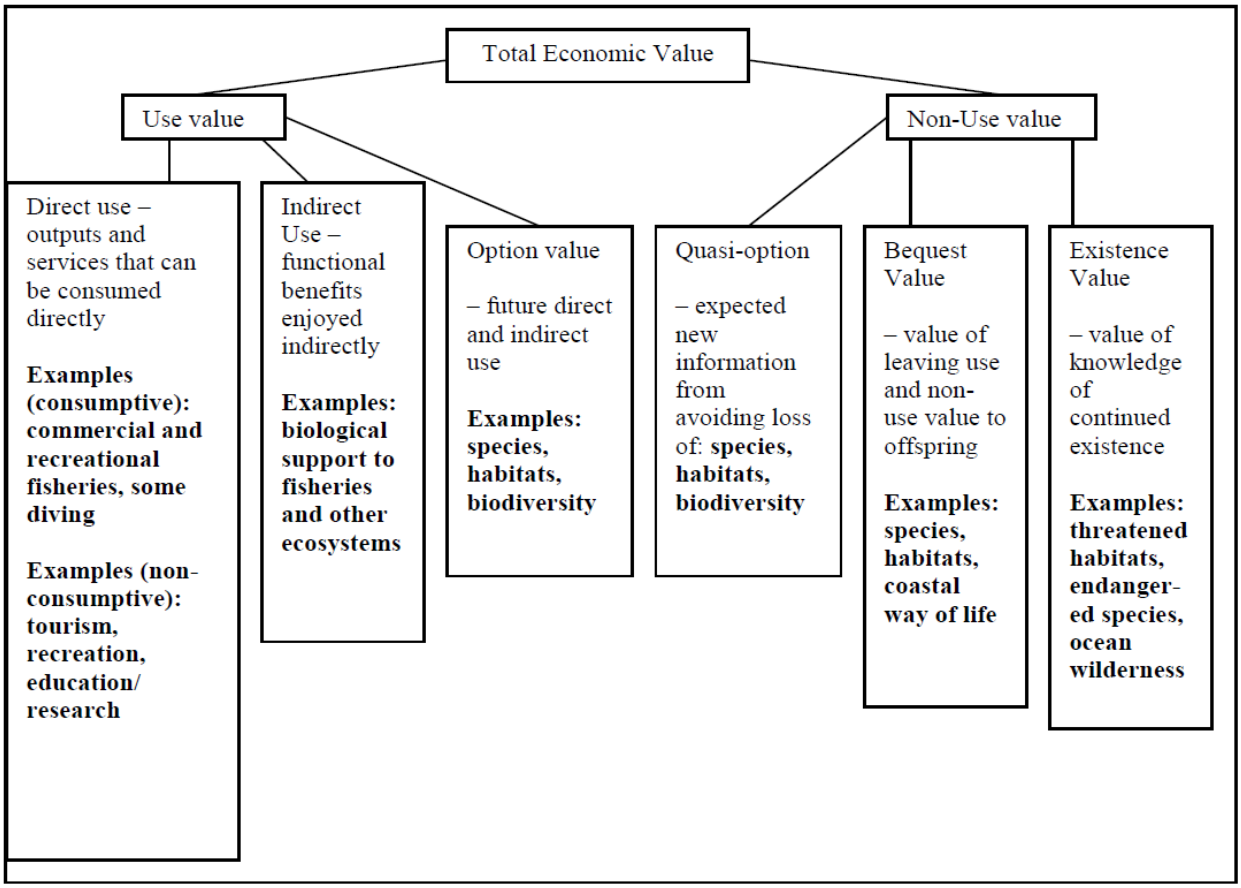


Figure 4-6. Flow chart depicting different economic values associated with protected areas.

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.

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 expansion of the CHAPCs. The amount of economic benefit that would 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 would have a positive impact on the predicted economic value of the proposed CHAPC expansions.

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).

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 a CHAPC.

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 4-6** for a depiction of how option values relate to other economic values of protected areas.

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 would 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 expansions. See **Figure 4-4** for a depiction of how bequest and existence values relate to other economic values of protected areas.

4.1.2.4 Commercial Fishery

Alternative 1 (No Action) would not expand the boundaries of the Oculina HAPC. Under **Alternative 1 (No Action)**, the additional areas proposed in **Alternatives 2** and **3** 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** and **Alternative** 3 could have negative short-term impacts on the rock shrimp and snapper grouper fisheries.

Rock Shrimp
A detailed discussion of the economic effects on the rock shrimp fishery will be forthcoming when the VMS data for the alternatives and sub-alternatives have been analyzed.

Snapper Grouper
A detailed discussion of the economic effects of **Action 1** on the snapper grouper fishery will be forthcoming when the existing data for the alternatives and sub-alternatives have been analyzed.

The commercial fishery in general 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 that would be effect in **Action 1, Alternatives 2** and **3** (including sub-alternatives) 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 the depths proposed under **Alternatives 2** and **3**. 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 CHAPC expansions would protect are unknown but could include medicinal and environmental benefits.

4.1.3 Social Effects

Closed areas can have significant negative social effects on fishermen if any fishing grounds are no longer open to harvest. Fishermen would need to fish other areas in order to maintain operations, which may result in user conflicts or overcrowding issues. Additionally, increased economic costs associated with travel to other fishing grounds could affect crew employment opportunities on vessels. Long-term social benefits may be associated with the long-term biological benefits of closed areas, as long as the closures are appropriately selected and include a periodic evaluation of effectiveness. Closing some areas may have broad social benefits by protecting more coral areas and may contribute to improved fishery resources.

Alternative 1 (No Action) would have minimal social effects because the fleet is already harvesting in open areas and prohibited from working in the closed areas. **Alternative 2** and **Alternative 3** would impact the rock shrimp fleet, royal red shrimp fleet and possibly other commercial fisheries by closing some historic, present and potential future fishing grounds. Additionally, if a transit provision is not established, travel costs could negatively affect some operations. If the cost to travel to or from the fishing grounds is too high due to new closed areas under **Alternatives** 2 and **3,** a business may choose to no longer participate in the fishery. The size and the location of the closed areas are the two most significant factors that would be expected to negatively impact fishermen. Larger areas (such as **Sub-alternative 2a**) could have more impact than smaller proposed areas (such as **Sub-alternative 2b**) if the location is in an area where harvest is occurring.

4.1.4 Administrative Effects

The expansion of the Oculina Bank HAPC (**Alternative 2** and sub-alternatives, **Alternative 3**) would have a moderate administrative impact. Administrative impacts would be incurred through the rule making process, outreach and enforcement. The impacts associated with enforcement would differ between the alternatives based on the size of the closed area. It is expected the larger the expansion of the HAPC the more enforcement will be needed. Most of the administrative impacts associated with these alternatives relate to at-sea enforcement. However, the shrimp fisheries that occur in the area are required to have a vessel monitoring system and this reduces the level of at-sea enforcement. Actions in the Amendment 30 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic propose the use of VMS for the commercial snapper-grouper fishery. If that action and amendment are approved, the VMS would help with enforcement in the HAPC.

4.2 Action 2. Implement a transit provision through the Oculina Bank HAPC

Alternative 1 (No Action). Do not implement a transit provision through Oculina Bank HAPC. Currently, possession of rock shrimp in or from the area on board a fishing vessel is prohibited.

Alternative 2. Allow for transit through the Oculina Bank HAPC. When transiting the Oculina Bank, gear must be stowed in accordance with CFR Section 622.35 (i)(2). Vessels must maintain a minimum speed of 5 knots while in transit through the Oculina HAPC. In the event minimal speed is not sustainable, vessel must communicate to appropriate contact.

Alternative 3. Allow for transit through the Oculina Bank HAPC with possession of rock shrimp on board. When transiting through the Oculina Bank HAPC vessels must maintain a speed of not less than 6 knots, determined by a ping rate that is acceptable by law enforcement (i.e. 5 minutes), with gear appropriately stowed (stowed is defined as doors and nets out of water). The transit provision includes a call-in specification in case of mechanical failure or emergency.

4.2.1 Biological Effects

The establishment of a transit provision would not result in biological effects within the Oculina Bank HAPC. A transit provision has been established in the South Atlantic for other fisheries through closed areas to allow for easier access to traditional fishing grounds. Establishing a transit provision through Oculina may have negative biological benefits for the shrimp stocks that are on the eastern side of Oculina Bank HAPC as fishing vessels will have easier access to them. Without a transit provision, the trip to those fishing grounds would be long and not cost effective to fishermen, providing an indirect protection to those shrimp populations.

4.2.2 Economic Effects

The intent of **Action 2** is to lessen the economic effects on rock shrimp fishermen should the Council choose to implement **Action 1**, **Sub-Alternatives 2a or 2b** or **Alternative 3** any of which would extend the size of the Oculina Bank HAPC northwards and westward. **Action 2, Alternative 1 (No Action)** would require rock shrimp fishermen to travel around either the northern or southern boundary of the Oculina Bank HAPC to reach allowable fishing grounds on the east side. None of the proposed sub-alternatives would extend the boundary of the HAPC southward. All of the sub-alternatives of **Action 1** would increase the northern latitude by the same distance. Moving the northern boundary further north would increase the direct economic costs in terms of increased expenses (fuel) and lost opportunity, not only due to the loss of fishing grounds in the additional closed area, but also due to fishing time lost by having to transit around the closed area. While the exact extent of the economic effects of **Action 1**, **Sub-Alternatives 2a and 2b** combined with **Action 2, Alternative 1 (No Action)** cannot be determined, the overall range of economic effects of the sub-alternatives would best be characterized in terms of the total additional area closed. In order of most to least expected direct negative economic effects, **Sub-Alternative 2a** would be expected to have the greatest effect by closing an additional 430 square miles, followed by **Sub-Alternative 2b** (228 square miles).

Rock shrimp fishermen would receive some relief from the expected negative economic effects should **Action 2, Alternative 2** be selected as the preferred. This alternative would allow fishermen to transit the Oculina Bank with gear stowed and transiting at a minimum speed of 5 knots. However, should the Council select **Alternative 2** as the preferred alternative, regardless of which alternative or sub-alternative is chosen in **Action 1** would see a benefit because the transit provision through the Oculina Bank HAPC would all transit through the entire HAPC. Fishermen that are now required to transit around the current boundaries could transit through as long as they follow the guidelines. This would be a positive, direct economic benefit for these fishermen as they will use less fuel and take less time to get to their fishing grounds.

4.2.3 Social Effects

If additional closed areas are established under **Action 1,** some negative impacts on the fishing vessels and crew may be reduced with a transit provision. The transit provision in **Alternative 2** would be beneficial to the shrimp and snapper grouper vessels by reducing the risk of negative impacts due to increased travel time and costs when traveling around a closed area to outer fishing grounds. Establishment of a transit provision under **Alternative 2** would not be expected to reduce the long-term social benefits of coral protection while reducing some of the negative impacts on the fishing fleet and other vessels.

Alternative 3 would also be expected to continue coral protection and reduce some of the negative impacts on fishermen, but would only apply to vessels harvesting rock shrimp in the adjacent areas. By specifying that a transit provision is for rock shrimp vessels only, this would also minimize any negative impacts and reduction in coral protection due to the allowable transit areas because rock shrimp vessel movement can be monitored through the required VMS systems on board.

4.2.4 Administrative Effects

There would be minor administrative impacts associated with the transit provision. Administrative impacts associated with enforcement would be greatest for these action alternatives. If modifications are made to the transit regulations, administrative impacts would increase on the agency during the development and implementation phase. Alternative 3 would require the vessel to maintain a speed of 6 knots as indicated by an increased ping rate on the vessel monitoring system (VMS). Depending on the frequency of transit, this might lead to a slight increase in the impacts associated with monitoring of VMS by law enforcement. If modifications are not made to the transit provisions to suit the shrimp fishery, impacts on the fishery participants will increase as they will need to modify fishing behavior.

4.3 Action 3. Expand boundaries of the Stetson-Miami Terrace CHAPC

Alternative 1. (No Action) Do not expand the boundaries of the Stetson-Miami Terrace CHAPC. The existing Stetson-Miami Terrace CHAPC is delineated by the coordinates identified in CFR §633.35 (n)(iii).

Alternative 2. Modify the southern southeast boundary of the Stetson-Miami Terrace CHAPC western extension in a manner that releases the flatbottom region to the extent possible while possible while maintaining protection of coral habitat (as depicted in **Figure 4-7**).

Alternative 3. Modify the Coral AP recommendation for expanding the Stetson-Miami Terrace CHAPC to include area of mapped habitat within the expansion, and exclude areas of royal red fishery activity based on VMS data (**Figure 4-8**).

Background

Brooke and Ross presented research to the Coral AP in 2011 from recent field surveys where observations of a shallow water *Lophelia pertusa* ecosystem outside of the western boundary of the Stetson-Miami Terrace CHAPC were documented (reference **Section 3.1.1.4** for additional information). The surveys, conducted during 2010, utilized a variety of assessment techniques including multibeam mapping, Remotely Operated Vehicle (ROV) dives and ROV video. A poster was presented during the 5th International Symposium on Deep-Sea Corals 2012 (**Appendix L**) describing the discovery of live *Lophelia pertusa* coral colonies and deepwater organisms in unusually shallow depths off the coast of Jacksonville and adjacent to the western CHAPC boundary. Observations at this site included a shallow occurrence of deep water species, including corals (predominantly *Lophelia pertusa*), sponges, invertebrates and fish. The presence of coral thickets and rubble led scientists to determine the area was an established and highly productive ecosystem rather than a short-term anomaly. Scientists predict the ecosystem to be maintained by a long-term oceanographic feature bringing colder water onto the continental shelf (**Appendix L**). The findings from this research resulted in the APs recommendation for modification of the western Stetson-Miami Terrace CHAPC boundary.

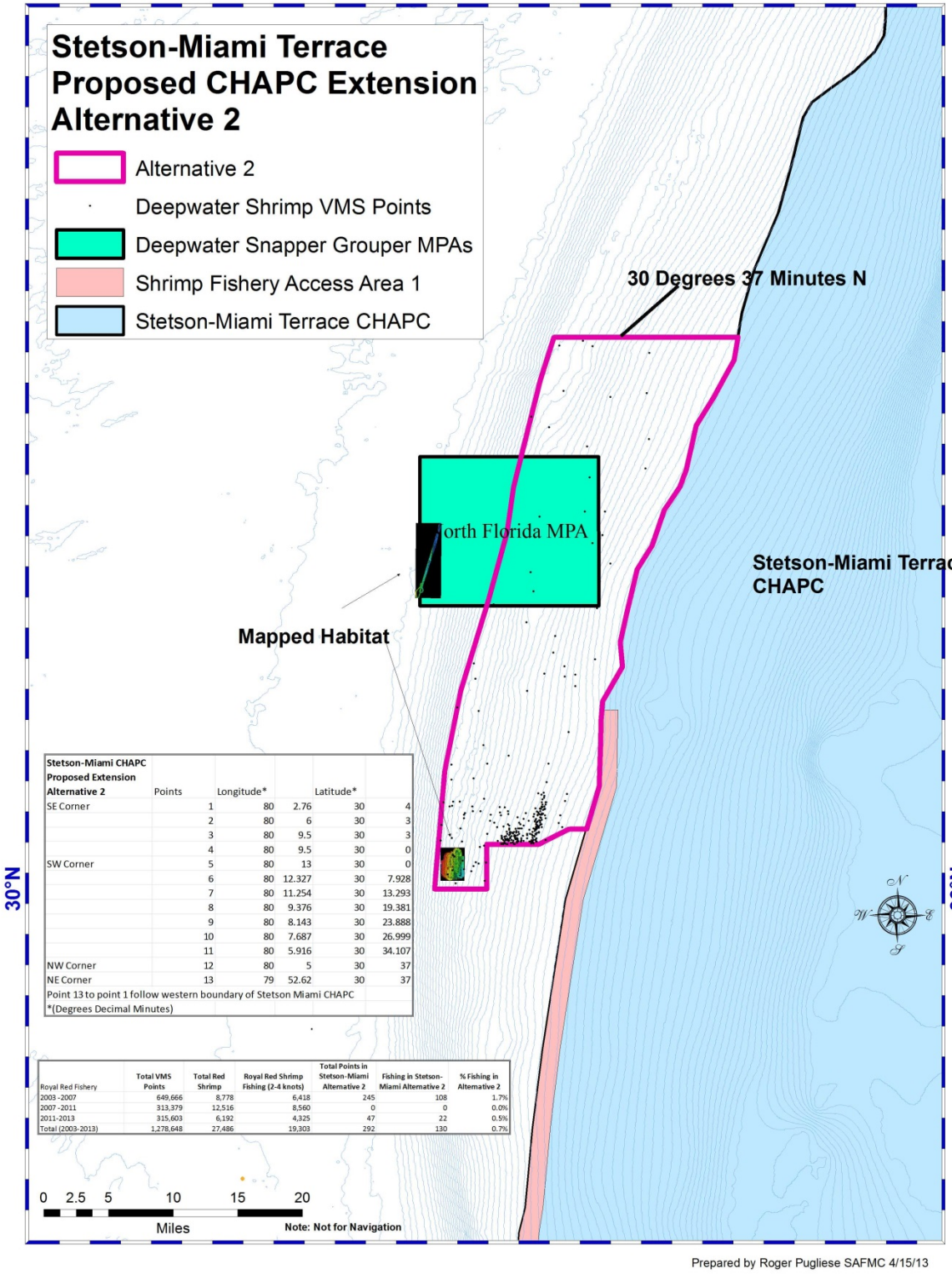


Figure 4-7. Action 3, Alternative 2. Proposed Modification to the Southeast Boundary of a Western Extension of Stetson-Miami Terrace CHAPC. Deepwater Shrimp VMS (2003-2013).

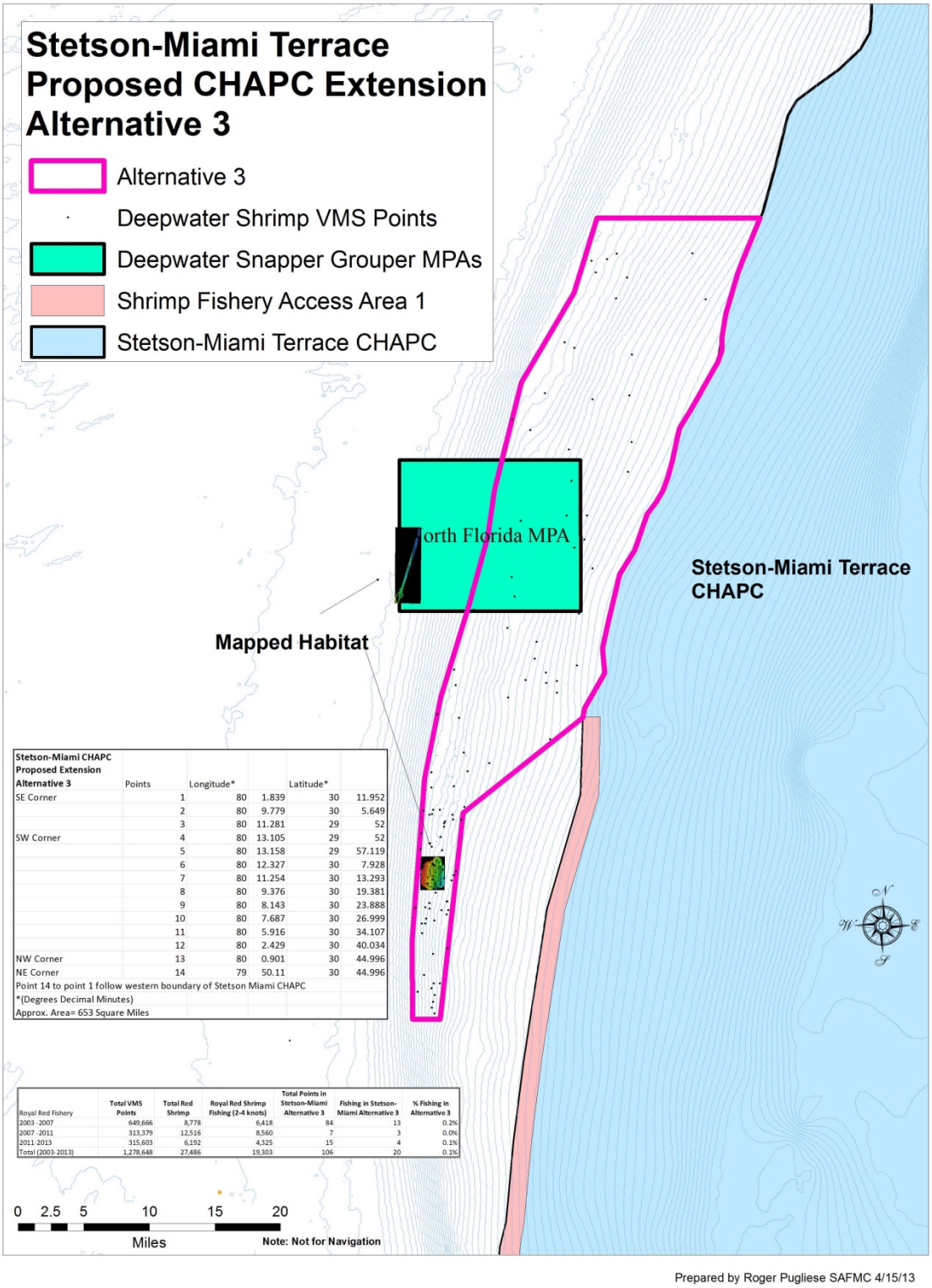


Figure 4-8. Action 3, Alternative 3. Proposed Modifications to Stetson-Miami Terrace CHAPC. Deepwater shrimp VMS data (2003-2013).

Table 4-4. Fishing Associated with Stetson-Miami Terrace CHAPC (Action 3) Alternatives 2 and 3 (Deepwater Shrimp VMS: 2003-2013).

Royal Red Fishery	Total VMS Points	Total Red Shrimp	Royal Red Shrimp Fishing (2-4 knots)	Total Points in Stetson-Miami Alternative 2	Fishing in Stetson-Miami Alternative 2	% Fishing in Alternative 2
2003 -2007	649,666	8,778	6,418	245	108	1.7%
2007 -2011	313,379	12,516	8,560	0	0	0.0%
2011-2013	315,603	6,192	4,325	47	22	0.5%
Total (2003-2013)	1,278,648	27,486	19,303	292	130	0.7%
Royal Red Fishery	Total VMS Points	Total Red Shrimp	Royal Red Shrimp Fishing (2-4 knots)	Total Points in Stetson-Miami Alternative 3	Fishing in Stetson-Miami Alternative 3	% Fishing in Alternative 3
2003 -2007	649,666	8,778	6,418	84	13	0.2%
2007 -2011	313,379	12,516	8,560	7	3	0.0%
2011-2013	315,603	6,192	4,325	15	4	0.1%
Total (2003-2013)	1,278,648	27,486	19,303	106	20	0.1%

4.3.1 Biological Effects

The Stetson Miami Terrace CHAPC (60, 937 square kilometers, 23,528 square miles) is the largest of the five deepwater CHAPCs implemented through the Comprehensive Ecosystem Based Amendment 1 (SAFMC 2010c). It 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.

Below is the description of the Stetson-Miami Terrace 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 feet) pinnacle in 822 meters (2,697 feet) of water where recent submersible dives discovered live bushes of *Lophelia* coral, sponges, gorgonians, and black coral bushes. This represents one of the tallest *Lophelia* coral lithoherms known.

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

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 feet) depths. Dense aggregations of 50 to 100 wreckfish were observed, in addition to blackbelly rosefish, skates, sharks, and dense schools of jacks. *Lophelia* mounds are also present at the base of the escarpment, within the Straits of Florida, but little is known of their abundance, distribution, or

associated fauna. The steep escarpments, especially near the top of the ridges, are rich in corals, octocorals, and sponges.

Alternative 1 (No Action) would not modify the CHAPC coordinates for the Stetson Miami Terrace CHAPC. Within the CHAPCs, the use of bottom longline, bottom trawl, mid-water trawl, dredge, anchor, pot or trap, anchor and chain and grapple and chain is prohibited. **Alternative 2** would provide greater biological benefits to species caught within the expanded area. **Alternative 3** would have provide greater biological benefits to all species caught within the expanded area with the exception of royal red species.

Alternative 2 and **Alternative 3** would be expected to result in positive biological impacts to the deepwater coral habitat in these areas as it would extend the prohibitions on bottom damaging gear. 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 these alternatives, habitats within the Stetson-Miami Terrace proposed CHAPC expansion would be protected from damaging fishing gear such as bottom longline, which would have positive biological impacts on the species in the area.

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. Fishing gear that comes in contact with the seafloor inevitably disturb the seabed and pose the most immediate direct threat to deepwater coral ecosystems. Fishing gear that impact the seafloor include bottom trawls, bottom longlines, bottom gillnets, dredges, and pots/traps (Chuenpagdee et al., 2003; Morgan and Chuenpagdee, 2003). 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, 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.

4.3.2 Economic Effects

The general economic effects of CHAPCs discussed previously in **Sections 4.1.2.1** through **4.1.2.3**, and **Section 4.1.2.5** regarding the recreational fishery apply to **Action 3** as well. Specific economic effects to commercial fisheries will be reported as the impact of the proposed additional closed bottom areas is analyzed.

Alternative 1 (No Action) would likely have minimal social effects because this would maintain access to harvest areas. The proposed extension of the Stetson-Miami Terrace CHAPC under **Alternative 2** could have negative social effects on the royal red shrimp and snapper grouper fishing fleet if historic fishing grounds are no longer available. **Alternative 3** would likely have

minimal social impacts on the deepwater shrimp fleet because this would maintain access to harvest areas.

4.3.3 Social Effects

The broad potential social effects of establishing or expanding closed areas are discussed in **Section 4.1.3**. **Alternative 1 (No Action)** would likely have minimal social effects (negative and positive) because this would maintain access to shrimp and snapper grouper harvest areas that would be reduced under **Alternatives 2** and **3**. The proposed extension of the Stetson-Miami Terrace CHAPC under **Alternatives 2** and **3** could have negative social effects on the royal red and rock shrimp fleet in the future and possibly other fisheries if potential fishing grounds are no longer available. However both alternatives consider the activity and fishing areas used by the royal red shrimp fleet. Although future opportunities could be reduced with expansion of the Stetson-Miami Terrace CHAPC, negative impacts on the fleet will likely be reduced while still enhancing coral protection in the area.

4.3.4 Administrative Effects

The expansion of the Stetson Miami Terrace CHPAC (**Alternative 2** and **Alternative 3**) would have minimal administrative impacts. Administrative impacts would be incurred through the rule making process, outreach and enforcement. The administrative impacts would differ between the alternatives in the amount of area they cover. It is expected the larger the expansion of the CHAPC the more enforcement will be needed. Most of the administrative impacts associated with these alternatives relate to at-sea enforcement.

4.4 Action 4. Expand boundaries of the Cape Lookout CHAPC

Alternative 1. (No Action) Do not modify the boundaries of the Cape Lookout CHAPC. The existing Cape Lookout CHAPC is identified by the following coordinates:

Latitude	Longitude
34°24’37”	75°45’11”
34°10’26”	75°58’44”
34°05’47”	75°54’54”
34°21’02”	75°41’25”

Alternative 2. Extend the northern boundary to encompass the area identified by the following coordinates (**Figure 4-9**):

Latitude	Longitude
34°24.6166’	75°45.1833’
34°23.4833’	75°43.9667’
34°27.9’	75°42.75’
34°27.0’	75°41.5’

Background

In a presentation to the Coral AP in 2011, Ross reviewed multibeam sonar mapping results indicating mounds of *Lophelia pertusa* habitat in an area north of the Cape Lookout CHAPC boundary (refer to **Section 3.1.1.5** for additional information). Scientists have determined the low-relief mounds to be *Lophelia* coral bioherms that occur outside of the CHAPC boundary. As a result, the AP recommended a northern extension of the Cape Lookout CHAPC to incorporate the newly discovered area of deepwater coral habitat.

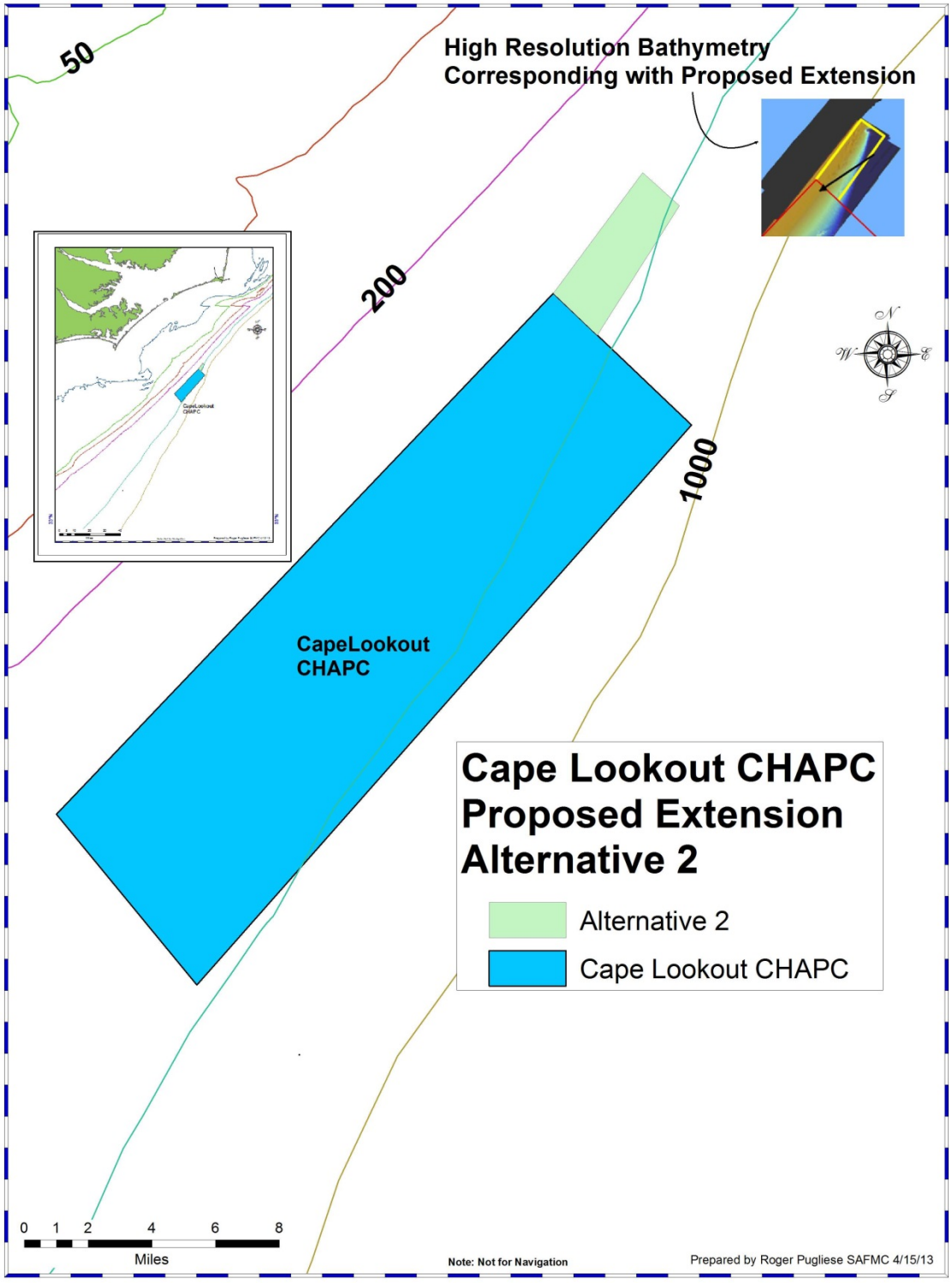


Figure 4-9. Action 4, Alternative 2. Cape Lookout CHAPC proposed extension and habitat mapping.

4.4.1 Biological Effects

CE-BA 1 implemented the Cape Lookout CHAPC in which the 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 are prohibited. Under **Alternative 1 (No Action)**, these same prohibitions would continue to apply. **Alternative 2** proposes to expand the original Cape Lookout CHAPC along the northern boundary. This would increase the size of the Cape Lookout CHAPC from 316 square kilometers to 324 square kilometers. This expansion would benefit deepwater coral ecosystems and has been proposed based on new information of occurrence of deepwater *Lophelia* corals in the area.

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. Fishing gear that comes in contact with the seafloor inevitably disturb the seabed and pose the most immediate direct threat to deepwater coral ecosystems. Fishing gear that impact the seafloor include bottom trawls, bottom longlines, bottom gillnets, dredges, and pots/traps (Chuenpagdee et al., 2003; Morgan and Chuenpagdee, 2003). 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, 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.

4.4.2 Economic Effects

The general economic effects of CHAPCs discussed previously in **Sections 4.1.2.1** through **4.1.2.3**, and **Section 4.1.2.5** regarding the recreational fishery apply to **Action 3**, as well. Specific economic effects to commercial fisheries will be reported as the impact of the proposed additional closed bottom areas is analyzed.

Alternative 1 (No Action) would likely have minimal economic effects because this would maintain access to current harvest areas. The proposed extension of the Cape Lookout CHAPC under **Alternative 2** could have negative economic effects particularly on the snapper grouper fleet if historic fishing grounds are no longer available.

4.4.3 Social Effects

The broad potential social effects of establishing or expanding closed areas are discussed in Section 4.1.3. **Alternative 1 (No Action)** would likely have minimal negative social effects because no current or potential fishing grounds would be closed. The proposed extension of the Cape Lookout CHAPC under **Alternative 2** could have negative social effects on some commercial vessels harvesting snapper grouper species if historic fishing grounds are no longer available, or if the closed area affected travel to and from harvest areas. The small size of the expansion proposed under **Alternative 2** would also be expected to result in less negative social impact than a larger area.

4.4.4 Administrative Effects

The expansion of the Cape Lookout CHAPC (**Alternative 2**) would have a minimal administrative impact. Administrative impacts would be felt through the rule making process, outreach and enforcement. The administrative impacts would differ between the alternatives in the amount of area they cover. It is expected the larger the expansion of the Cape Lookout CHAPC the more enforcement will be needed. Most of the administrative impacts associated with these alternatives relate to at-sea enforcement.

Chapter 5. Council's Choice for the Preferred Alternative

Chapter 6. Cumulative Effects

Will be updated after the June 2013 meeting.

6.1 Biological

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

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

I. The direct and indirect effects of the proposed actions **(Chapter 4)**;
II. Which resources, ecosystems, and human communities are affected **(Chapter 3)**; and
III. Which effects are important from a cumulative effects perspective **(information revealed in this Cumulative Effects Analysis (CEA)**?

2. Establish the geographic scope of the analysis.

The immediate impact area would be the federal 200-mile limit of the Atlantic off the coasts of North Carolina, South Carolina, Georgia, and east Florida to Key West, which is also the South Atlantic Council's area of jurisdiction. The extent of boundaries also would depend upon the degree of fish immigration/emigration and larval transport; whichever has the greatest geographical range. The ranges of affected species are described in **Section 3.2.1. Section 3.1.3** describes the essential fish habitat designation and requirements for species affected by this amendment.

3. Establish the timeframe for the analysis.

Establishing a timeframe for the CEA is important when the past, present, and reasonably foreseeable future actions are discussed. It would be advantageous to go back to a time when there was a natural, or some modified (but ecologically sustainable) condition. However, data collection for many fisheries began when species were already fully exploited. Therefore, the timeframe for analyses should be initiated when data collection began for the various fisheries. In determining how far into the future to analyze cumulative effects, the length of the effects will depend on the species and the alternatives chosen.

4. Identify the other actions affecting the resources, ecosystems, and human communities of concern (the cumulative effects to the human communities are discussed in Section 4).

Listed are other past, present, and reasonably foreseeable actions occurring in the South Atlantic region. These actions, when added to the proposed management measures, may result in cumulative effects on the biophysical environment.

I. Fishery-related actions

A. Past

B. Present

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

Amendment 18A to the Snapper Grouper FMP (SAFMC 2011f) contains measures to limit participation and effort in the black sea bass fishery, reduce bycatch in the black sea bass pot fishery, changes to the rebuilding strategy and other necessary changes to the management of black sea bass as a result of the ongoing stock assessment. In addition, Amendment 18A includes alternatives to improve data collection. The South Atlantic Council approved Amendment 18A in December 2011.

Regulatory Amendment 11 to the Snapper Grouper FMP (Regulatory Amendment 11; SAFMC 2011b) was approved by the South Atlantic Council at their August 9, 2011, meeting. If approved, Regulatory Amendment 11 would remove the current deepwater closure beyond 240 ft for six deepwater snapper grouper species.

The Comprehensive ACL Amendment (SAFMC 2011c) includes ACLs and AMs for federally managed species not undergoing overfishing in four FMPs (Snapper Grouper, Dolphin Wahoo, Golden Crab, and *Sargassum*. Actions contained within the Comprehensive ACL Amendment include: (1) Removal of species from the snapper grouper fishery management unit; (2) designating ecosystem component species; (3) allocations; (4) management measures to limit recreational and commercial sectors to their ACLs; (5) AMs; and (5) any necessary modifications to the range of regulations. The South Atlantic Council approved the Comprehensive ACL Amendment in September 2011. Regulations for the Comprehensive ACL Amendment will be in place on April 16, 2012.

Amendment 20A to the Snapper Grouper FMP (Amendment 20A; SAFMC 2011e) would distribute shares from inactive participants in the wreckfish individual transferable quota (ITQ) to active shareholders. The South Atlantic Council approved Amendment 20A in December 2011.

Amendment 24 to the Snapper Grouper FMP (Amendment 24; SAFMC 2011d) considers a rebuilding plan for red grouper, which is overfished and undergoing overfishing. The South Atlantic Council approved Amendment 24 in December 2011.

Regulatory Amendment 12 to the Snapper Grouper FMP (Regulatory Amendment 12; SAFMC 2012) includes alternatives to adjust the golden tilefish ACL based on the results of a new assessment, which indicates golden tilefish are no longer experiencing overfishing and are not overfished. Regulatory Amendment 12 also includes an action to adjust the recreational AM.

C. Reasonably Foreseeable Future

Amendment 20B to the Snapper Grouper FMP are currently under development. The amendment will include a formal review of the current wreckfish ITQ program, and will update/modify that program according to recommendations gleaned from the review. The amendments will also update the wreckfish ITQ program to comply with Reauthorized Magnuson-Stevens requirements.

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

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

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

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

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

Fish populations

Quantitative definitions of overfishing and overfished for golden tilefish are identified in Amendments 11 and 12 to the Snapper Grouper FMP (SAFMC 1998). Numeric values of thresholds overfishing and overfished for golden tilefish were updated/modified in Amendment 15B (SAFMC 2008b). These values include maximum sustainable yield (MSY), the fishing mortality rate that produces MSY (F_{MSY}), the biomass or biomass proxy that supports MSY (B_{MSY}), the minimum stock size threshold below which a stock is considered to be overfished (MSST), the maximum fishing mortality threshold above which a stock is considered to be undergoing overfishing (MFMT), and optimum yield (OY). Amendment 15b to the Snapper Grouper FMP also provided new definitions of MSST for golden tilefish. Amendment 15b became effective in December 2009.

Climate change

Global climate changes could have significant effects on South Atlantic fisheries. However, the extent of these effects is not known at this time. Possible impacts include temperature changes in coastal and marine ecosystems that can influence organism metabolism and alter ecological processes such as productivity and species interactions; changes in precipitation patterns and a rise in sea level which could change the water balance of coastal ecosystems; altering patterns of wind and water circulation in the ocean environment; and influencing the productivity of critical coastal ecosystems such as wetlands, estuaries, and coral reefs (Kennedy et al. 2002).

It is unclear how climate change would affect snapper grouper species in the South Atlantic. Climate change can affect factors such as migration, range, larval and juvenile survival, prey availability, and susceptibility to predators. In addition, the distribution of native and exotic species may change with increased water temperature, as may the prevalence of disease in keystone animals such as corals and the occurrence and intensity of toxic algae blooms. Climate change may significantly impact snapper grouper species in the future, but the level of impacts cannot be quantified at this time, nor is the time frame known in which these impacts will occur.

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

The purpose of defining a baseline condition for the resource and ecosystems in the area of the proposed action is to establish a point of reference for evaluating the extent and significance of expected cumulative effects. The SEDAR assessments show trends in biomass, fishing mortality, fish weight, and fish length going back to the earliest periods of data collection. For some species such as snowy grouper, assessments reflect initial periods when the stock was above B_{MSY} and fishing mortality was fairly low. However, some species such were heavily exploited or possibly overfished when data were first collected. As a result, the assessment must make an assumption of the biomass at the start of the assessment period thus modeling the baseline reference points for the species.

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

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

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

Time period/dates	Cause	Observed and/or Expected Effects
Pre-January 12, 1989	Habitat destruction, growth overfishing of vermilion snapper.	Damage to snapper grouper habitat, decreased yield per recruit of vermilion snapper.
January 1989	Trawl prohibition to harvest fish (SAFMC 1988a & b).	Increase yield per recruit of vermilion snapper; eliminate trawl damage to live bottom habitat.
Pre-January 1, 1992	Overfishing of many snapper grouper species.	Spawning stock ratio of these species is estimated to be less than 30% indicating that they are overfished.
January 1992	Prohibited gear: fish traps south of Cape Canaveral, FL; entanglement nets; longline gear inside of 50 fathoms; powerheads and bangsticks in designated SMZs off SC. Size/Bag limits: 10" TL vermilion snapper (recreational only); 12" TL vermilion snapper (commercial only);	Reduce mortality of snapper grouper species.

Time period/dates	Cause	Observed and/or Expected Effects
	10 vermilion snapper/person/day; aggregate grouper bag limit of 5/person/day; and 20" TL gag, red, black, scamp, yellowfin, and yellowmouth grouper size limit (SAFMC 1991a).	
Pre-June 27, 1994	Damage to *Oculina* habitat.	Noticeable decrease in numbers and species diversity in areas of *Oculina* off FL
July 1994	Prohibition of fishing for and retention of snapper grouper species (HAPC renamed OECA; SAFMC 1993)	Initiated the recovery of snapper grouper species in OECA.
1992-1999	Declining trends in biomass and overfishing continue for a number of snapper grouper species including golden tilefish.	Spawning potential ratio for golden tilefish is less than 30% indicating that they are overfished.
July 1994	Commercial quota for golden tilefish; commercial trip limits for golden tilefish; include golden tilefish in grouper recreational aggregate bag limits.	
February 24, 1999	All S-G without a bag limit: aggregate recreational bag limit 20 fish/person/day, excluding tomtate and blue runners. Vessels with longline gear aboard may only possess snowy, warsaw, yellowedge, and misty grouper, and golden, blueline and sand tilefish.	
October 23, 2006	Snapper grouper FMP Amendment 13C (SAFMC 2006)	Commercial vermilion snapper quota set at 1.1 million pounds gw; recreational vermilion snapper size limit increased to 12" TL to prevent vermilion snapper overfishing.
Effective February 12, 2009	Snapper grouper FMP Amendment 14 (SAFMC 2007)	Use marine protected areas (MPAs) as a management tool to promote the optimum size, age, and genetic structure of slow growing, long-lived deepwater snapper grouper species (e.g., speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, blueline tilefish, and sand tilefish). Gag and vermilion snapper occur in some of these areas.
Effective March 20, 2008	Snapper grouper FMP Amendment 15A (SAFMC 2008a)	Establish rebuilding plans and SFA parameters for snowy grouper, black sea bass, and red porgy.
Effective Dates Dec 16, 2009, to Feb 16, 2010.	Snapper grouper FMP Amendment 15B (SAFMC 2008b)	End double counting in the commercial and recreational reporting systems by prohibiting the sale of bag-limit caught

Time period/dates	Cause	Observed and/or Expected Effects
		snapper grouper, and minimize impacts on sea turtles and smalltooth sawfish.
Effective Date July 29, 2009	Snapper grouper FMP Amendment 16 (SAFMC 2009a)	Protect spawning aggregations and snapper grouper in spawning condition by increasing the length of the spawning season closure, decrease discard mortality by requiring the use of dehooking tools, reduce overall harvest of gag and vermilion snapper to end overfishing.
Effective Date January 4, 2010	Red Snapper Interim Rule	Prohibit commercial and recreational harvest of red snapper from January 4, 2010, to June 2, 2010 with a possible 186-day extension. Reduce overfishing of red snapper while long-term measures to end overfishing are addressed in Amendment 17A.
Effective Date December 4, 2010	Snapper Grouper FMP Amendment 17A (SAFMC 2010a).	SFA parameters for red snapper; ACLs and ACTs; management measures to limit recreational and commercial sectors to their ACTs; accountability measures. Establish rebuilding plan for red snapper.
Effective Date January 31, 2011	Snapper Grouper Amendment 17B (SAFMC 2010b)	ACLs and ACTs; management measures to limit recreational and commercial sectors to their ACTs; AMs, for species undergoing overfishing.
Target 2012	Snapper Grouper FMP Amendment 18A (SAFMC 2011f)	Prevent overexploitation in the black sea bass fishery.
Target 2011	Comprehensive ACL Amendment (SAFMC 2011c)	ACLs ACTs, and AMs for species not experiencing overfishing; accountability measures; an action to remove species from the fishery management unit as appropriate; and management measures to limit recreational and commercial sectors to their ACTs.
Target 2011	Regulatory Amendment 11 (SAFMC 2011b)	Re-addresses the deepwater area closure implemented in Amendment 17B
Effective Date July 15, 2011	Regulatory Amendment 9 (SAFMC 2011a)	Harvest management measures for black sea bass; commercial trip limits for gag, vermilion and greater amberjack
Target 2012	Amendment 20A (Wreckfish) (SAFMC 2011e)	Redistribute inactive wreckfish shares.

Time period/dates	Cause	Observed and/or Expected Effects
Target 2012	Amendment 24 (Red Grouper) (SAFMC 2011d)	Establishes a rebuilding plan for red grouper, specifies ABC, and establishes ACL, ACT and revises AMs for the commercial and recreational sectors.
Target 2012	Regulatory Amendment 12 (SAFMC 2012)	Adjusts the golden tilefish ACL based on the results of a new stock assessment and modifies the recreational golden tilefish AM.
Target 2013	Snapper Grouper Amendment 22 (under dev)	Develop a long-term management program for red snapper in the South Atlantic.

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 adopt management.

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

6.2 Socioeconomic

Chapter 7. Other Applicable Law

7.1 Administrative Procedures Act

All federal rulemaking is governed under the provisions of the Administrative Procedures 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 South Atlantic Fishery Management Council's (South Atlantic Council) extensive use of public meetings, requests for comments, and consideration of comments. The proposed rule associated with this amendment will have a request for public comments, which complies with the APA.

7.2 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 (IQA). 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 National Environmental Policy Act (NEPA) analysis are in compliance with the IQA.

7.3 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 **Chapter 4**, the South Atlantic Council has concluded this amendment would improve federal management of South Atlantic fisheries and is consistent to the maximum extent practicable with the Coastal Zone Management Plans of Florida, Georgia, South Carolina, and North Carolina. NOAA Fisheries will coordinate CZMA review with the appropriate state agencies.

7.4 Endangered Species Act

The Endangered Species Act (ESA) of 1973 (16 U.S.C. Section 1531 et seq.) requires that federal agencies must ensure actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of threatened or endangered species or the habitat designated as critical to their survival and recovery. The ESA requires NOAA Fisheries Service to consult with the appropriate administrative agency (itself for most marine species, and the U.S. Fish and Wildlife Service for all remaining species) when proposing an action that may affect threatened or endangered species or adversely modify critical habitat. Consultations are necessary to determine the potential impacts of the proposed action. They are concluded informally when proposed actions may affect but are "not likely to adversely affect" threatened or endangered species or designated critical habitat. Formal consultations, resulting in a biological opinion, are required when proposed actions may affect and are "likely to adversely affect" threatened or endangered species or adversely modify designated critical habitat.

The IPT, Council Staff, and Council will review the actions proposed in this amendment to determine whether or not there are impacts on threatened or endangered species or their habitat designated as critical to their survival and recovery.

7.5 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.

7.6 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 economically significant if it is likely to result in an annual effect on the economy of at least $100,000,000 or 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 .

The RIR is included as Appendix E.

7.7 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.

7.8 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.

7.9 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.

7.10 Marine Mammal Protection Act

The Marine Mammal Protection Act (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; and 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 actions in this amendment would modify the frequency and methods of data collection. None of the actions will have an impact on marine mammals.

7.11 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 countries, 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 the government.

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 National Environmental Policy Act (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.

7.12 National Environmental Policy Act

This amendment to the Coral FMP has been written and organized in a manner that meets NEPA requirements, and thus is a consolidated NEPA document, 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 1.4.**

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.**

7.13 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 exclusive economic zone are Gray's Reef and Florida Keys National Marine Sanctuaries.

The alternatives considered in this Amendment are not expected to have any adverse impacts on the resources managed by the Gray's Reef and Florida Keys National Marine Sanctuaries.

7.14 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. PRA requires NOAA Fisheries Service to obtain approval from the OMB before requesting most types of fishery information from the public.

None of the actions in this amendment will request information from the public and the actions will not trigger a PRA approval.

7.15 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, NOAA Fisheries Service 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.

The Initial Regulatory Flexibility Analysis is included as Appendix D.

7.16 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, NOAA Fisheries Service, in implementing regulations, must make an assessment of how those regulations will affect small businesses. Economic and social impacts of the actions and alternatives are included in the analysis in Chapter 4.

7.17 Public Law 99-659: Vessel Safety

Public Law 99-659 amended the Magnuson-Stevens Fishery Conservation and Management Act to require that a Fishery Management Plan (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.

Chapter 8. List of Agencies, Organizations, and Persons Consulted

Responsible Agency

Coral Amendment 8:
South Atlantic Fishery Management Council
4055 Faber Place Drive, Suite 201
Charleston, South Carolina 29405
(843) 571-4366 (TEL)
Toll Free: 866-SAFMC-10
(843) 769-4520 (FAX)
safmc@safmc.net

Environmental Assessment
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 Law Enforcement Advisory Panel
SAFMC Coral Advisory Panel
SAFMC Shrimp Advisory Panel
SAFMC Deepwater Shrimp Advisory Panel
SAFMC Snapper Grouper Advisory Panel
SAFMC Scientific and Statistical Committee
North Carolina Coastal Zone Management Program
South Carolina Coastal Zone Management Program
Georgia Coastal Zone Management Program
Florida Coastal Zone Management Program
Florida Fish and Wildlife Conservation Commission
Georgia Department of Natural Resources
South Carolina Department of Natural Resources
North Carolina Division of Marine Fisheries
North Carolina Sea Grant
South Carolina Sea Grant
Georgia Sea Grant
Florida Sea Grant
Atlantic States Marine Fisheries Commission
Gulf and South Atlantic Fisheries Development Foundation
Gulf of Mexico Fishery Management Council
National Marine Fisheries Service
- Washington Office
- Office of Ecology and Conservation
- Southeast Regional Office
- Southeast Fisheries Science Center

Chapter 9. List of Preparers

Table 9-1. List of Coral Amendment 8 preparers.

Name	Agency/Division	Area of Amendment Responsibility
Karla Gore	NMFS/SF	IPT Lead/Fishery Biologist
Anna Martin	SAFMC	IPT Lead/Fishery Biologist
Jack McGovern	NMFS/SF	Fishery Scientist
David Dale	NMFS/HC	EFH Specialist
Andy Herndon	NMFS/PR	Biologist
Nick Farmer	NMFS/SF	Biologist
Stephen Holiman	NMFS/SF	Economist
Christina Package	NMFS/SF	Social Scientist
Margaret Miller	SEFSC	Fishery Scientist
Monica Smit-Brunello	NOAA/GC	Attorney Advisor
Brian Cheuvront	SAFMC	Fishery Economist
Kari MacLauchlin	SAFMC	Social Scientist
Roger Pugliese	SAFMC	Fishery Biologist
Gregg Waugh	SAFMC	Deputy Executive Director

Chapter 10. References

ASMFC. 2009. Atlantic Sturgeon. In: Atlantic Coast Diadromous Fish Habitat: A review of utilization, threats, recommendations for conservation and research needs. Habitat Management Series No. 9. Pp. 195-253.

ASSRT (Atlantic Sturgeon Status Review Team). 2007. Status review of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). National Marine Fisheries Service. February 23, 2007. Bain, M.B., N. Haley, D. Peterson, J. R. Waldman, and K. Arend. 2000. Harvest and habitats of Atlantic sturgeon *Acipenser oxyrinchus* Mitchill, 1815, in the Hudson River Estuary: Lessons for Sturgeon Conservation. Instituto Espanol de Oceanografia. Boletin 16:43-53.

Anderes Alavrez, 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.

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. Int. Rev. Ges. Hydrobiol. 62: 185-208.

Bain, M.B., N. Haley, D. Peterson, J. R. Waldman, and K. Arend. 2000. Harvest and habitats of Atlantic sturgeon *Acipenser oxyrinchus* Mitchill, 1815, in the Hudson River Estuary: Lessons for Sturgeon Conservation. Instituto Espanol de Oceanografia. Boletin 16:43-53.

Bigelow, H.B. and W.C. Schroeder. 1953. Sea Sturgeon. *In*: Fishes of the Gulf of Maine. Fishery Bulletin 74. Fishery Bulletin of the Fish and Wildlife Service, vol. 53. 188 pp.

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.

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

Blount, B. 2007. Culture and resilience among shrimpers on the Georgia coast (USA): Responses to Globalization. *MAST* 5(2):22.

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

Boreman, J. 1997. Sensitivity of North American sturgeons and paddlefish to fishing mortality. Environmental Biology of Fishes 48(1-4): 399-405.

Borodin, N. 1925. Biological observations on the Atlantic sturgeon, *Acipenser sturio.* Transactions of the American Fisheries Society 55: 184-190.

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

Brooke, S., C.C. Koenig, A.N. Shepard. 2004. Oculina banks restoration project: description and preliminary assessment. Proceedings from the 57th Gulf and Caribbean Fisheries Institute, St. Petersburg, Florida. 13pp.

Bumpus, D.R. 1973. A description of the circulation on the Continental Shelf of the east coast of the U.S. Pp.111-157 *in* B. A. Warren, ed. Prog. Oceanogr. 6. Pergamon Co., New York.

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

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

Cairns, S. 1979. The deep-water Scleractinia of the Caribbean Sea and adjacent waters. Stud. Fauna Curaçao and Other Carib. Isl. 56: 1–341.

Cairns, S. 2000. A revision of the shallow-water azooxanthellate scleractinia of the western Atlantic. Stud. Nat. Hist. Carib. Reg. 75: 240 p.

Caron, F., D. Hatin, and R. Fortin. 2002. Biological characteristics of adult Atlantic sturgeon (*Acipenser oxyrinchus*) in the Saint Lawrence River estuary and the effectiveness of management rules. Journal of Applied Ichthyology 18:580-585.

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.

Chuenpagdee, R., L. E. Morgan, S. M. Maxwell, E. A. Norse, and D. Pauly. 2003. Shifting gears: assessing collateral impacts of fishing methods in U.S. waters. Frontiers in Ecology and the Environment 1: 517–524.

Cobb, S. P., Futch, C. R. and D. Camp. 1973. The Rock Shrimp, *Sicyonia brevirostris*, Stimpson, 1871 (Decapoda, Penaeidae). Memoirs of the Hourglass Cruises. Vol. III, Part I, February.

Colburn, L.L. and M. Jepson. 2012 Social Indicators of Gentrification Pressure in Fishing Communities: A Context for Social Impact Assessment. *Coastal Management* 40(3): 289-300.

Collins, M.R. and T.I.J. Smith. 1997. Distribution of shortnose and Atlantic sturgeons in South Carolina. North American Journal of Fisheries Management. 17: 995-1000.

Collins, M.R., T.I.J. Smith, W.C. Post, and O. Pashuk. 2000. Habitat Utilization and Biological Characteristics of Adult Atlantic Sturgeon in Two South Carolina Rivers. Transactions of the American Fisheries Society 129:982–988.

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 Heidelberg.

Crance, J.H. 1987. Habitat suitability index curves for anadromous fishes. In: Common Strategies of Anadromous and Catadromous Fishes, M. J. Dadswell (ed.). Bethesda, Maryland, American Fisheries Society. Symposium 1:554.

Dadswell, M. 2006. A review of the status of Atlantic sturgeon in Canada, with comparisons to populations in the United States and Europe. Fisheries 31: 218-229.

Dees, L.T. 1961. Sturgeons. United States Department of the Interior Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D.C.

Dovel, W.L. and T.J. Berggren. 1983. Atlantic sturgeon of the Hudson River Estuary, New York. New York Fish and Game Journal 30: 140-172.

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

Dunton, K.J., A. Jordaan, K.A. McKown, D.O. Conover, and M.J. Frisk. 2010. Abundance and distribution of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) within the Northwest Atlantic Ocean, determined from five fishery-independent surveys. Fishery Bulletin 108:450-465.

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.

Erickson D. L., A. Kahnle, M. J. Millard, E. A. Mora, M. Bryja, A. Higgs, J. Mohler, M. DuFour, G. Kenney, J. Sweka, and E. K. Pikitch. 2011. Use of pop-up satellite archival tags to identify oceanic-migratory patterns for adult Atlantic Sturgeon, Acipenser oxyrinchus oxyrinchus Mitchell, 1815. J. Appl. Ichthyol. 27 (2011), 356–365.

Fossa, 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.

Frick, J. 1974. Orientation and behaviour of hatchling green turtles (*Chelonia mydas*) in the sea. *Animal Behavior*, 24:849.

Genin, A., P.K. Dayton, P.F. Lonsdale, and F.N. Spiess. 1986. Corals on seamount peaks provide evidence of current acceleration over deep-sea topography. Nature 322: 59-61.

Gilbert, C.R. 1989. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Mid-Atlantic Bight): Atlantic and shortnose sturgeons. United States Fish and Wildlife Service Biological Report-Report Number-82 (11.91).

Gilmore, R.G. and R.S. Jones. 1992. Color variation and associated behavior in the epinepheline groupers, *Mycteroperca microlepis* (Goode and Bean) and *M. phenax* (Jordan and Swain). Bull. Mar. Sci. 51: 83-103.

Grunwald, C., L. Maceda, J. Waldman, J. Stabile, I. Wirgin. 2008. Conservation of Atlantic sturgeon *Acipenser oxyrinchus oxyrinchus*: delineation of stock structure and distinct population segments. Conserv. Genet 9:1111–1124.

Guilbard, F., J. Munro, P. Dumont, D. Hatin, and R. Fortin. 2007. Feeding ecology of Atlantic sturgeon and Lake sturgeon co-occurring in the St. Lawrence Estuarine Transition Zone. American Fisheries Society Symposium. 56: 85-104.

Hain, S. and E. Corcoran (eds.). 2004. The status of the cold-water coral reefs of the world. Pages 115-135. In: Wilkinson, C. (ed.). Status of coral reefs of the world: 2004. Vol. 1. Australian Inst. of Mar. Sci. Perth, Western Australia.

Harter, S.L, M.M. Ribera, A.N. Shepard, J.K. Reed. 2009. Assessment of fish populations and habitat on Oculina Bank, a deep-sea coral marine protected area off eastern Florida. Fish. Bull. 107: 195-206.

Harter, S., J. Reed, A. David, and S. Farington. 2012. NOAA CIOERT Cruise Report. NOAA Ship Pisces Cruise 12-03. South Atlantic MPAs and Deepwater CHAPCs: Characterization of Benthic Habitat and Fauna. July 6-19, 2012. 731 pp.

Hatin, D., R. Fortin, and F. Caron. 2002. Movements and aggregation areas of adult Atlantic sturgeon (*Acipenser oxyrinchus*) in the St. Lawrence River estuary, Québec, Canada. Journal of Applied Ichthyology 18: 586-594.

Holland, B.F., Jr. and G.F. Yelverton. 1973. Distribution and biological studies of anadromous fishes offshore North Carolina. Division of Commercial and Sports Fisheries, North Carolina Dept. of Natural and Economic Resources, Special Scientific Report No. 24. 130pp.

Holland, S. M., A. J. Fedler, and J. W. Milon. 1999. The Operation and Economics of the Charter and Headboat Fleets of the Eastern Gulf of Mexico and South Atlantic Coasts.

University of Florida Office of research, Technology, and Graduate Education. Report prepared for the National Marine Fisheries Service. Grant Number NA77FF0553.

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

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

Jepson, M., K. Kitner, A. Pitchon, W.W. Perry, and B. Stoffle. 2005. Potential fishing communities in the Carolinas, Georgia, and Florida: An effort in baseline profiling and mapping. NOAA Technical Report (available at http://www.st.nmfs.noaa.gov/st5/publication/fisheries_economics_2009.html.

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

Kennedy, F.S., Crane, J. J., Schlieder, R. A. and D.G. Barber. 1977. Studies of the rock shrimp, Sicyonia Brevirostris. A new fishery resource on Florida's Atlantic Shelf. Florida Marine Research Publications Number 27, Florida Department of Natural Resources.

King, T.L., B.A. Lubinski, and A.P. Spidle. 2001. Microsatellite DNA variation in Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and cross-species amplification in the Acipenseridae. Conservation Genetics 2: 103-119.

Koenig, C.C., F.C. Coleman, C.B. Grimes, G.R. Fitzhugh, C.T. Gledhill, K.M. Scanlon, and M. Grace. 2000. Protection of essential fish spawning habitat for the conservation of warm temperate reef fish fisheries of shelfedge reefs of Florida. Bull. Mar. Sci. 66:593-616.

Koenig, C.C., A.N. Shepard, J.K. Reed, F.C. Coleman, S.D. Brooke, J. Brusher, and K.M. Scanlon. 2005. Habitat and fish populations in the deep-sea *Oculina* coral ecosystem of the western Atlantic. Amer. Fish. Soc. Symp. 41: 795–805.

Laney, R. W., J. E. Hightower, B. R. Versak, M. F. Mangold, W. W. Cole Jr., and S. E. Winslow. 2007. Distribution, habitat use, and size of Atlantic sturgeon captured during cooperative winter tagging cruises, 1988–2006. In: Anadromous sturgeons: habitats, threats, and management (J. Munro, D. Hatin, J. E. Hightower, K. McKown, K. J. Sulak, A. W. Kahnle, and F. Caron, eds.) p. 167–182. Am. Fish. Soc. Symp. 56, Bethesda, MD.

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

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.

Leland, J.G., III. 1968. A survey of the sturgeon fishery of South Carolina. Bears Bluff Labs. No. 47, 27 pp.

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

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

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

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

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

McCord, J.W., M.R. Collins, W.C. Post, and T.J. Smith. 2007. Attempts to develop an index of abundance for age-1 Atlantic sturgeon in South Carolina, USA. Am. Fisheries Society Symposium 56: 397-403.

Mangin, E. 1964. Croissance en Longueur de Trois Esturgeons d'Amerique du Nord: *Acipenser oxyrhynchus*, Mitchill, *Acipenser fulvescens*, Rafinesque, et *Acipenser brevirostris* LeSueur. Verh. Int. Ver. Limnology 15: 968-974.

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

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

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

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. Geological Survey Professional Paper 529-J.

Mohler, J. W. 2003. Culture manual for the Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus*. U.S. Fish and Wildlife Service, Hadley, Massachusetts. 70 pp.

Morgan, L. E. and R. Chuenpagdee. 2003. Shifting gears: addressing the collateral impacts of fishing methods in U.S. waters. Island Press, Washington. 42 p.

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.

Munro, J. and D. Hatin, J. E. Hightower, K. McKown, K. J. Sulak, A. W. Kahnle, and F. Caron, eds. 2007. Anadromous Sturgeon: Habitats, Threats, Management, Synthesis and Summary. American Fisheries Society Symposium, 56: 1-15.

Murawski, S.A. and A.L. Pacheco. 1977. Biological and fisheries data on Atlantic sturgeon, *Acipenser oxyrhynchus* (Mitchill). National Marine Fisheries Service, Sandy Hook Lab., Sandy Hook. Tech. Report No. 10. 78 pp.

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

Neumann, A. C. and M. M. Ball. 1970. Submersible observations in the Straits of Florida: geology and bottom currents. Geol. Soc. Am. Bull. 81: 2861-2874.

NMFS (National Marine Fisheries Service). 2009. Economics of the Federal South Atlantic Shrimp Fisheries Annual Report. U.S. Department of Commerce, National Oceanic Atmospheric Administration, National Marine Fisheries Service. Available at http://www.sefsc.noaa.gov/docs/2009%20SA%20shrimp%20econ%20report.pdf.

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

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

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

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

Paull, C.K., A.C. Neumann, B.A. am Ende, W. Ussler III and N.M. Rodriguez. 2000. Lithoherms on the Florida-Hatteras slope. Mar. Geol. 166: 83-101.

Perez-Farfante, I. 1969. Western Atlantic shrimps of the genus *Penaeus*. Fishery Bulletin 67(3):461- 591.

Pikitch, E.K., P. Doukakis, L. Lauck, P. Chakrabarty, and D.L. Erickson. 2005. Status, trends and management of sturgeon and paddlefish fisheries. Fish and Fisheries 6: 233–265.

Reed, J.K. 1980. Distribution and structure of deep-water *Oculina varicosa* coral reefs off central eastern Florida. Bul. Mar. Sci. 30: 667-677.

Reed, J.K. 1981. In situ growth rates of the scleractinian coral *Oculina varicosa* occurring with zooxanthellae on 6-m reefs and without on 80-m banks. Proc 4th Int Coral Reef Symp, Manila 2, pp 201-206.

Reed, J.K. 2002a. Deep-water Oculina coral reefs of Florida: biology, impacts, and management. Hydrobiologia 471: 43-55.

Reed, J.K. 2002b. Comparison of deep-water coral reefs and lithoherms off southeastern U.S.A. Hydrobiologia 471: 57-69.

Reed, J.K. 2004. General Description of Deep-Water Coral Reefs of Florida, Georgia and South Carolina: A Summary of Current Knowledge of the Distribution, Habitat, and Associated Fauna. A Report to the South Atlantic Fishery Management Council, NOAA, NMFS, 71 pp.

Reed, J.K. 2011. A Proposal for Extension of the Boundaries of the Oculina Coral Habitat Area of Particular Concern (OCULINA BANK HAPC). Report submitted to the South Atlantic Fishery Management Council. December 2, 2011. 21pp.

Reed, J.K., and S.W. Ross. 2005. Deep-water reefs off the southeastern U.S.: Recent discoveries and research. Journal of Marine Education 21(4): 33-37.

Reed, J.K., A. Shepard, C. Koenig, K. Scanlon, and G. Gilmore. 2005. 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 R. A. Freiwald and J. M. Roberts, eds. Cold-water corals and ecosystems. Springer-Verlag Berlin Heidelberg.

Reed, J.K., D. Weaver, and S. A. Pomponi. 2006. Habitat and fauna of deep-water *Lophelia pertusa* coral reefs off the Southeastern USA: Blake Plateau, Straits of Florida, and Gulf of Mexico. Bulletin of Marine Science 78: 343-375.

Reed, J.K., C.C. Koenig, and A.N. Shepard. 2007. Impacts of bottom trawling on a deep-water *Oculina* Coral Ecosystems off Florida. Bulletin of Marine Science 81: 481-496.

Reed, J., and S. Farrington. 2011. A proposal for extension of the boundaries of the *Oculina* Coral Habitat Area of Particular Concern (Oculina Bank HAPC). Submitted to the South Atlantic Fishery Management Council on December 2, 2010. 21 pp.

Rogers, A.D. 1999. The biology of *Lophelia pertusa* (Linnaeus, 1758) and other deepwater reef-forming corals and impacts from human activities. Int. Rev. Hydrobiol. 84: 315-406.

Ross, S.W., and A.M. Quattrini. 2009. Deep-sea reef fish assemblage patterns on the Blake Plateau (Western North Atlantic Ocean). Marine Ecology 30: 74-92.

Ross, S.W., S.D. Brooke, and A.M. Quattrini. 2012a. An unusually shallow and productive deep-water coral community discovered off the southeastern United States. Poster presentation at the 5th International Symposium on Deep-Sea Corals, April 1-6, 2012, Amsterdam, The Netherlands.

Ross, S.W., M.C.T. Carlson, and A.M. Quattrini. 2012b. The utility of museum records for documenting distributions of deep-sea corals off the southeastern United States. Marine Biology Research 8: 101-114.

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

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

SAFMC (South Atlantic Fishery Management Council). 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). 1993a. Fishery Management Plan for Shrimp Fishery of the South Atlantic Region Including a Final Environmental Impact Statement and Regulatory Impact Review. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407-4699. 300 pp.

SAFMC (South Atlantic Fishery Management Council). 1993b. Amendment Number 6 to the

Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407-4699.

SAFMC (South Atlantic Fishery Management Council). 1994a. Amendment 2 to the Fishery Management Plan for Coral and Coral Reefs of the South Atlantic Region. 1 Southpark Cir., Suite 306, Charleston, S.C. 29407-4699.

SAFMC (South Atlantic Fishery Management Council). 1994b. Amendment Number 7 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407-4699.

SAFMC (South Atlantic Fishery Management Council). 1995. Amendment 3 to the Fishery Management Plan for Coral and Coral Reefs of the South Atlantic Region. 1 Southpark Cir., Suite 306, Charleston, S.C. 29407-4699.

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., Ste 306, Charleston, S.C. 29407.

SAFMC (South Atlantic Fishery Management Council). 1996b. Final 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., Ste 306, Charleston, S.C. 29407-4699.

SAFMC (South Atlantic Fishery Management Council). 1997. Amendment Number 8, Regulatory Impact Review, Social Impact Assessment, Initial Regulatory Flexibility Analysis and Supplemental Environmental Impact Statement for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407-4699.

SAFMC (South Atlantic Fishery Management Council). 1998a. Amendment Number 9 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407-4699.

SAFMC (South Atlantic Fishery Management Council). 1998b. Comprehensive Amendment Addressing Sustainable Fishery Act Definitions and Other Required Provisions in Fishery Management Plans of the South Atlantic Region (Amendment 4 to the Coral Fishery Management Plan). South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, S.C. 29407-4699.

SAFMC (South Atlantic Fishery Management Council). 1998c. Habitat Plan for the South

Atlantic Region. (Amendment 5 to the Coral Fishery Management Plan). South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407-4699.

SAFMC (South Atlantic Fishery Management Council). 1998d. 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). 2000. Amendment Number 12, Final Environmental Impact Statement, Initial Regulatory Flexibility Analysis/Regulatory Impact Review, and Social Impact Assessment/Fishery Impact Statement for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407-4699.

SAFMC (South Atlantic Fishery Management Council). 2002. 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). 2004. Amendment 6 to the Fishery Management Plan for Shrimp Fishery of the South Atlantic Region Including a Final Environmental Impact Statement and Regulatory Impact Review. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, S.C. 29407-4699

SAFMC (South Atlantic Fishery Management Council). 2006. Amendment Number 13C, Final Environmental Assessment, Initial Regulatory Flexibility Analysis/Regulatory Impact Review, and Social Impact Assessment/Fishery Impact Statement for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407-4699. 631 pp.

SAFMC (South Atlantic Fishery Management Council). 2007. Final Amendment Number 14, Final Environmental Impact Statement, Initial Regulatory Flexibility Analysis/Regulatory Impact Review, and Social Impact Assessment/Fishery Impact Statement for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2008a. Amendment Number 15A, Final Environmental Impact Statement, Initial Regulatory Flexibility Analysis/Regulatory Impact Review, and Social Impact Assessment/Fishery Impact Statement for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405. 325 pp.

SAFMC (South Atlantic Fishery Management Council). 2008b. Amendment Number 15B, Final Environmental Impact Statement, Initial Regulatory Flexibility Analysis/Regulatory Impact Review, and Social Impact Assessment/Fishery Impact Statement for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405. 325 pp.

SAFMC (South Atlantic Fishery Management Council). 2008c. 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. 186pp.

SAFMC (South Atlantic Fishery Management Council). 2009a. Amendment Number 16, Final Environmental Impact Statement, Initial Regulatory Flexibility Analysis/Regulatory Impact Review, and Social Impact Assessment/Fishery Impact Statement for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

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

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

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

SAFMC (South Atlantic Fishery Management Council). 2010c. Comprehensive Ecosystem-Based Amendment 1 for the South Atlantic Region. (Amendment 6 to the Coral Fishery Management Plan). South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201; North Charleston, SC 29405.

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

SAFMC (South Atlantic Fishery Management Council). 2011b. Regulatory Amendment 11 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

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

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

SAFMC (South Atlantic Fishery Management Council). 2011e. Amendment 20A to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2011f. Amendment 18A to the Snapper Grouper Fishery of the South Atlantic Region South Atlantic Fishery Management Council, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

SAFMC (South Atlantic Fishery Management Council). 2011g. Comprehensive Ecosystem-Based Amendment 2 for the South Atlantic Region. (Amendment 7 to the Coral Fishery Management Plan). South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201; North Charleston, SC 29405.

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.

Savoy, T. 2007. Prey eaten by Atlantic sturgeon in Connecticut waters. Am. Fisheries Society Symposium 56: 157-165.

Savoy, T. and D. Pacileo. 2003. Movements and important habitats of subadult Atlantic sturgeon in Connecticut waters. Transactions of the American Fisheries Society. 132: 1-8.

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.

Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Fisheries Research Board of Canada Bulletin 184: 966 pp.

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.

Shirey, C., C.C. Martin, and E.D. Stetzar. 1999. Atlantic sturgeon abundance and movement in the lower Delaware River. DE Division of Fish and Wildlife, Dover, DE, USA. Final Report to the National Marine Fisheries Service, Northeast Region, State, Federal & Constituent Programs Office. Project No. AFC-9, Grant No. NA86FA0315. 34 pp.

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

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

Smith, T.I.J. 1985. The fishery, biology, and management of Atlantic sturgeon, *Acipenser oxyrhynchus*, in North America. Environmental Biology of Fishes 14(1): 61-72.

Smith, T.I.J. and J.P. Clugston. 1997. Status and management of Atlantic sturgeon, *Acipenser oxyrinchus*, in North America. Environmental Biology of Fishes 48: 335-346.

Smith, T.I.J., D.E. Marchette and R.A. Smiley. 1982. Life history, ecology, culture and management of Atlantic sturgeon, *Acipenser oxyrhynchus oxyrhynchus*, Mitchill, in South Carolina. South Carolina Wildlife Marine Resources. Resources Department, Final Report to U.S. Fish and Wildlife Service Project AFS-9. 75 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.

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.

Stein, A. B., K. D. Friedland, and M. Sutherland. 2004. Atlantic sturgeon marine distribution and habitat use along the northeastern coast of the United States. Transactions of the American Fisheries Society 133: 527-537.

Stetson, T.R., D.F. Squires and R.M. Pratt. 1962. Coral banks occurring in deep water on the Blake Plateau. Amer. Mus. Novitates 2114: 1-39.

Stevenson, J. T. and D. H. Secor. 1999. Age determination and growth of Hudson River Atlantic sturgeon, *Acipenser oxyrinchus*. Fishery Bulletin 97: 153-166.

Sutton, S.G., R.B. Ditton, J.R. Stoll, and J.W. Milon. 1999. A cross-sectional study and

longitudinal perspective on the social and economic characteristics of the charter and party boat fishing industry of Alabama, Mississippi, Louisiana, and Texas. Texas A&M Univ., College Station, TX. Memo. Rpt. 198 p.

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

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

Van Eenennaam, J.P., S.I. Doroshov, G.P. Moerg, J.G. Watson, D.S. Moore and J. Linares. 1996. Reproductive conditions of the Atlantic sturgeon (*Acipenser oxyrhynchus*) in the Hudson River. Estuaries 19: 769-777.

Van Eenennaam, J. P. and S. I. Doroshov. 1998. Effects of age and body size on gonadal development of Atlantic sturgeon. Journal of Fish Biology 53: 624-637.

Vladykov, V.D. and J.R. Greeley. 1963. Order Acipenseroidei. In: Fishes of Western North Atlantic. Sears Foundation. Marine Research, Yale Univ. 1 630 pp.

Waldman, J.R., C. Grunwald, J. Stabile, and I. Wirgin. 2002. Impacts of life history and biogeography on the genetic stock structure of Atlantic sturgeon *Acipenser oxyrinchus oxyrinchus*, Gulf sturgeon *A. oxyrinchus desotoi*, and shortnose sturgeon *A. brevirostrum*. Journal of Applied Ichthyology 18: 509-518.

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

Welsh, S.A., S.M. Eyler, M.F. Mangold, and A. J. Spells. 2002. Capture locations and growth rates of Atlantic sturgeon in the Chesapeake Bay. Pages 183-194 In: W. Van Winkle, P. J. Anders, D. H. Secor, and D. A. Dixon, (eds), Biology, management, and protection of North American sturgeon. American Fisheries Society Symposium 28, Bethesda, Maryland.

Whitaker, J. D. 1983. Effects of severe winters on white shrimp stocks in the Atlantic Ocean off the Southeastern United States. Presented at the National Shellfish Association. Hilton Head, SC.

Wirgin, I. and T.L. King. 2011. Mixed stock analysis of Atlantic sturgeon from coastal locales and a non-spawning river. Presentation of the 2011 Sturgeon Workshop, Alexandria, VA, February 8-10.

Wirgin, I., J.R. Waldman, J. Rosko, R. Gross, M. Collins, S.G. Rogers, and J. Stabile. 2000. Genetic structure of Atlantic sturgeon populations based on mitochondrial DNA control region sequences. Transactions of the American Fisheries Society 129: 476-486.

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