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 Habitat Areas of Particular Concern and Transit Provisions

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

November 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_{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
CHAPC	Coral Habitat Area of Particular Concern
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_{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}
FMP	fishery management plan
FMU	fishery management unit
HAPC	Habitat Area of Particular Concern
M	natural mortality rate
MARMAP	Marine Resources Monitoring Assessment and Prediction Program
MMPA	Marine Mammal Protection Act
MPA	Marine Protected Area
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
SAFMC	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
VMS	Vessel Monitoring System

Coral Amendment 8

Amends the Coral, Coral Reef, and Live/Hard bottom 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 Habitat Areas of Particular Concern (HAPC), including Oculina Bank HAPC, Stetson-Miami Terrace Coral HAPC, and Cape Lookout Coral HAPC. Allow transit through Oculina Bank HAPC.
Lead agency:	FMP Amendment – South Atlantic Fishery Management Council EA - National Marine Fisheries Service (NMFS)
For Further Information Contact:	South Atlantic Fishery Management Council 4055 Faber Place, Suite 201 North Charleston, SC 29405 843-571-4366 866-SAFMC-10 Anna Martin Anna.Martin@safmc.net
	NMFS, Southeast Region 263 13th Avenue South St. Petersburg, FL 33701 727-824-5305 Karla Gore Karla.Gore@noaa.gov
Scoping meetings held:	January 24, 26, and January 30-February 2, 2012
Public Hearings held:	August 5-8, August 13, and August 15, 2013

Abstract

Actions in Amendment 8 to the Fishery Management Plan for Coral, Coral Reefs, and Live/Hard bottom Habitats of the South Atlantic Region (Coral Amendment 8) address modifications to Habitat Areas of Particular Concern (HAPC) in the South Atlantic, and transit through the Oculina HAPC. The management unit for coral includes coral belonging to the Class Hydrozoa (fire corals and hydrocorals) and Class Anthozoa (sea fans, whips, precious corals, sea pens and stony corals). Coral reefs constitute hard bottoms, deepwater banks, patch reefs, and outer bank reefs, as defined in the Coral, Coral Reefs and Live/Hard bottom Habitat Fishery Management Plan (FMP) (SAFMC and GMFMC 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 Fishery Management Council's (South Atlantic Council) Coral Advisory Panel (AP). Recent scientific exploration has identified areas of high relief features and hard bottom habitat outside the boundaries of existing HAPCs. During their 2011 October meeting, the Coral AP recommended the South Atlantic Council revisit the boundaries of the Oculina Bank HAPC, Stetson-Miami Terrace Coral HAPC (CHAPC), and the Cape Lookout Lophelia Banks 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 analyses of rock shrimp fishing activity for expansion of these areas, and approved the measures for public scoping through Comprehensive Ecosystem-Based Amendment 3. In June 2012, the measures were split out from Comprehensive-Ecosystem Based Amendment 3 and guidance was provided to develop the actions through a Coral Amendment. Approval for public hearings for Coral Amendment 8 occurred during the South Atlantic Council's June 2013 meeting, and public hearings were held during August 2013. The Coral, Habitat, Deepwater Shrimp, and Law Enforcement APs worked 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:

- Expand boundaries of the Oculina Bank 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 Lophelia Banks (Cape Lookout) CHAPC

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

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Preferred Sub-Alternative 2b. Modify the Oculina Bank HAPC to move the northern boundary to 29° 43.5' N. The western boundary would follow close to the 70 meter contour while annexing hard bottom features with two coordinates replaced in the southern portion of the boundary to reduce rock shrimp fishing tracks impacted. The eastern boundary line of the proposed Oculina Bank HAPC northern extension identified in **Sub-Alternative 2a** would be shifted west to further reduce rock shrimp fishing tracks impacted. The alternative is represented in the simplified polygons **Figures 4-3** and **4-4**. **Preferred Sub-Alternative 2b** = 267 square miles. Coordinates for **Preferred Sub-Alternative 2b** are found in **Appendix M**, **Table 2**.

Preferred 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 (**Figures 4-5** and **4-6**). **Preferred Alternative 3** = 76 square miles. Coordinates for **Preferred Alternative 3** are found in **Appendix M**, **Table 3**.

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

Preferred Alternative 3. Allow for transit through the Oculina Bank HAPC with possession of rock shrimp on board. When transiting through the HAPC, vessels must maintain a minimum speed of not less than 5 knots, determined by a ping rate acceptable by law enforcement (i.e. 5 minutes), with gear appropriately stowed (stowed is defined as doors and nets out of water).

Action 3. Expand Boundaries of the Stetson-Miami Terrace Coral HAPC (CHAPC)

Preferred Alternative 4. 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. Allow for a Shrimp Fishery Access Area to be used as a gear haul back/drift zone as shown in **Figure 4-10. Preferred Alternative 4** = 490 square miles. Coordinates for **Preferred Alternative 4** are found in **Appendix M**, **Tables 6** and **7**.

Action 4. Expand Boundaries of the Cape Lookout CHAPC

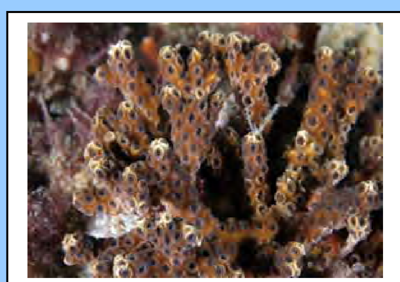
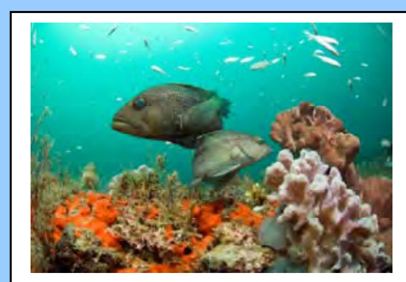
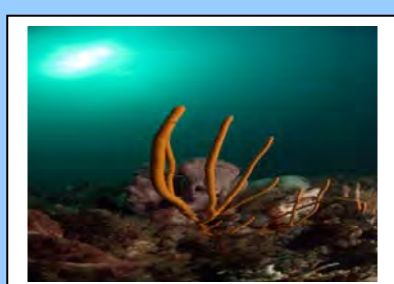
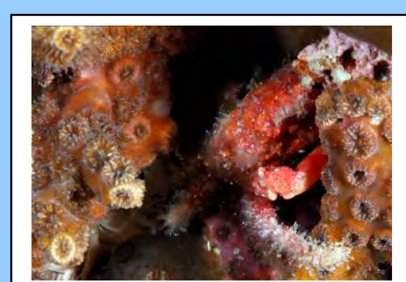
Preferred Alternative 2. Extend the northern boundary to encompass the area identified by the following coordinates (**Figure 4-12**) (**Preferred Alternative 2** = 10 square miles). Coordinates for **Preferred Alternative 2** are found in **Appendix M**, **Table 8**.

SUMMARY

of

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

Coral Amendment 8

AMENDMENT 8
TO THE FISHERY MANAGEMENT PLAN FOR CORAL, CORAL REEFS, AND LIVE/HARDBOTTOM HABITATS of the SOUTH ATLANTIC REGION

NOVEMBER 2013

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 Fishery Management Council's (South Atlantic Council) Coral Advisory Panel (AP). Recent deepwater scientific exploration and research have identified areas of high relief features and hard bottom habitat outside the boundaries of existing Habitat Areas of Particular Concern (HAPCs; **Appendices J-L**). During their October 2011 meeting, the Coral AP recommended the South Atlantic Council revisit the boundaries of the Oculina Bank HAPC, Stetson-Miami Terrace Coral HAPC (CHAPC) and Cape Lookout CHAPC to incorporate areas of additional deepwater coral habitat. 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. In June 2012, the measures were split out from Comprehensive-Ecosystem Based Amendment 3 and the South Atlantic Council provided guidance to develop the actions through a Coral Amendment. Approval for public hearings for Coral Amendment 8 occurred during the South Atlantic Council's June 2013 meeting, and public hearings were held during August 2013. The Coral, Habitat, Deepwater Shrimp, and Law Enforcement APs worked 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 four 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 the Oculina Bank HAPC
3. Expand Boundaries of the Stetson-Miami Terrace CHAPC
4. Expand Boundaries of the Cape Lookout CHAPC

What Are the Alternatives?

Action 1. Expand boundaries of the Oculina Bank HAPC

Proposed Actions in Coral Amendment 8

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

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

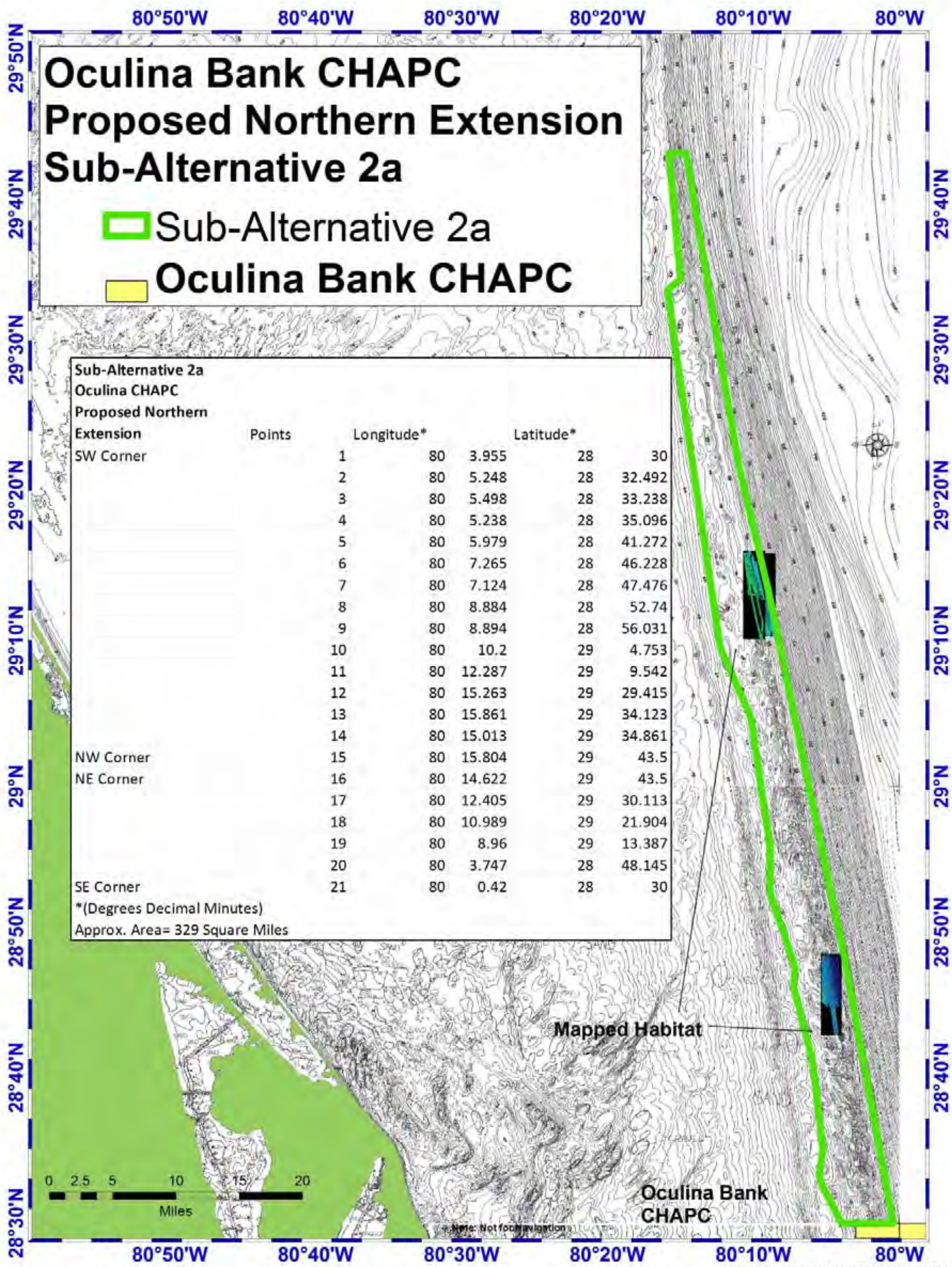
The existing Oculina Bank HAPC is delineated by the following boundaries: on the north by 28°30' N, on the south by 27°30' N, on the east by the 100-fathom (183-m) contour, and on the west by 80°00' W; and two adjacent satellite sites: the first bounded on the north by 28°30' N, on the south by 28°29' 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 close to the 70 meter and 100 meter depth contour lines, respectively, while annexing hard bottom features, as represented in the simplified polygon (**Figures S-1** and **S-2**). **Sub-Alternative 2a** = 329 square miles. Coordinates for **Sub-Alternative 2a** are found in **Appendix M**, **Table 1**.

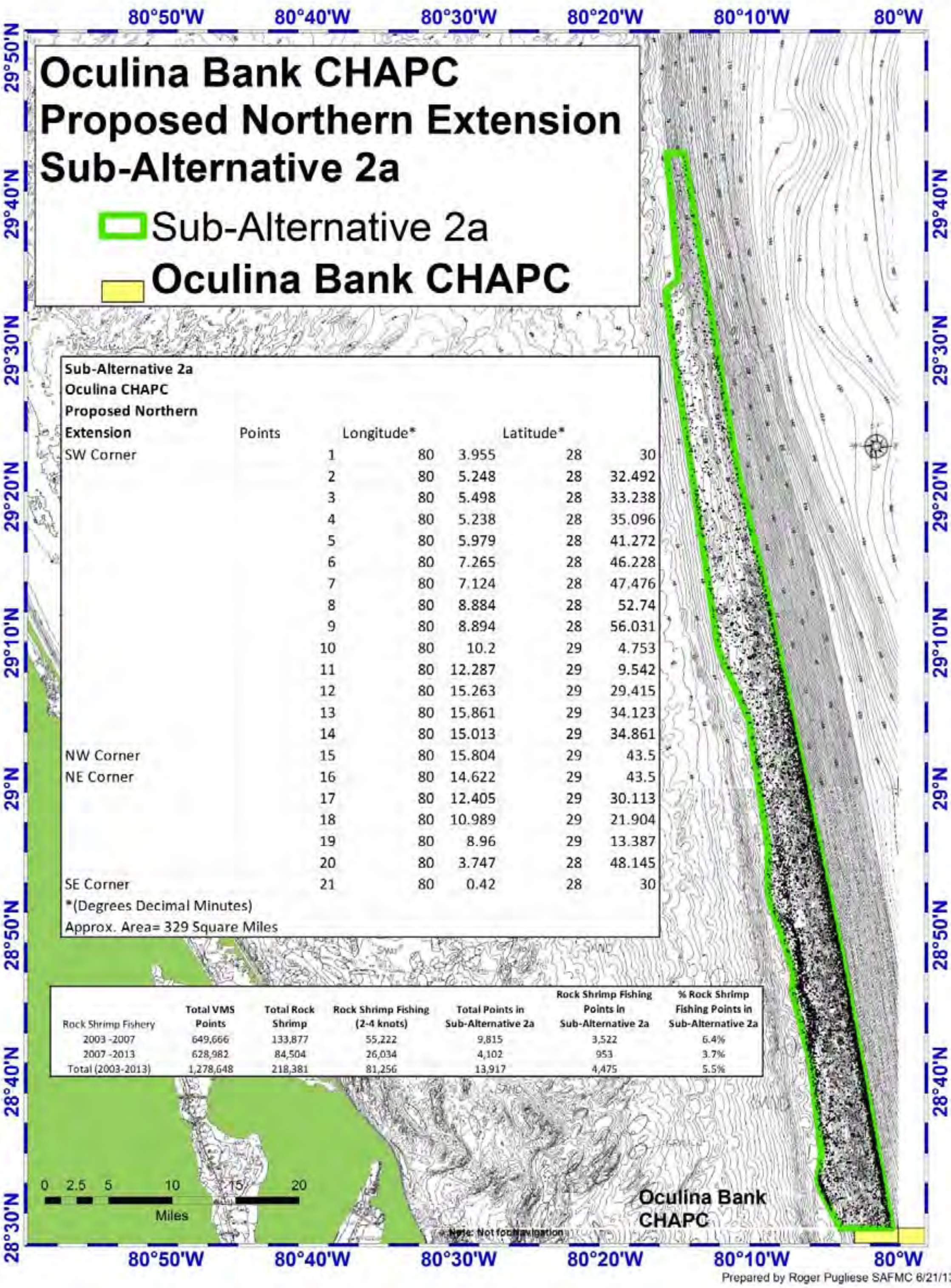
Preferred Sub-Alternative 2b. Modify the Oculina Bank HAPC to move the northern boundary to 29° 43.5' N. The western boundary would follow close to the 70 meter contour while annexing hard bottom features with two coordinates replaced in the southern portion of the boundary to reduce rock shrimp fishing tracks impacted. The eastern boundary line of the proposed Oculina Bank HAPC northern extension identified in **Sub-Alternative 2a** would be shifted west to further reduce rock shrimp fishing tracks impacted. The alternative is represented in the simplified polygons **Figures S-3** and **S-4**. **Preferred Sub-Alternative 2b** = 267 square miles. Coordinates for **Preferred Sub-Alternative 2b** are found in **Appendix M**, **Table 2**.

Preferred 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 (**Figures S-5** and **S-6**). **Alternative 3** = 76 square miles. Coordinates for **Preferred Alternative 3** are found in **Appendix M**, **Table 3**.



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



Sub-Alternative 2a Oculina CHAPC Proposed Northern Extension	Points	Longitude*		Latitude*	
SW Corner	1	80	3.955	28	30
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	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
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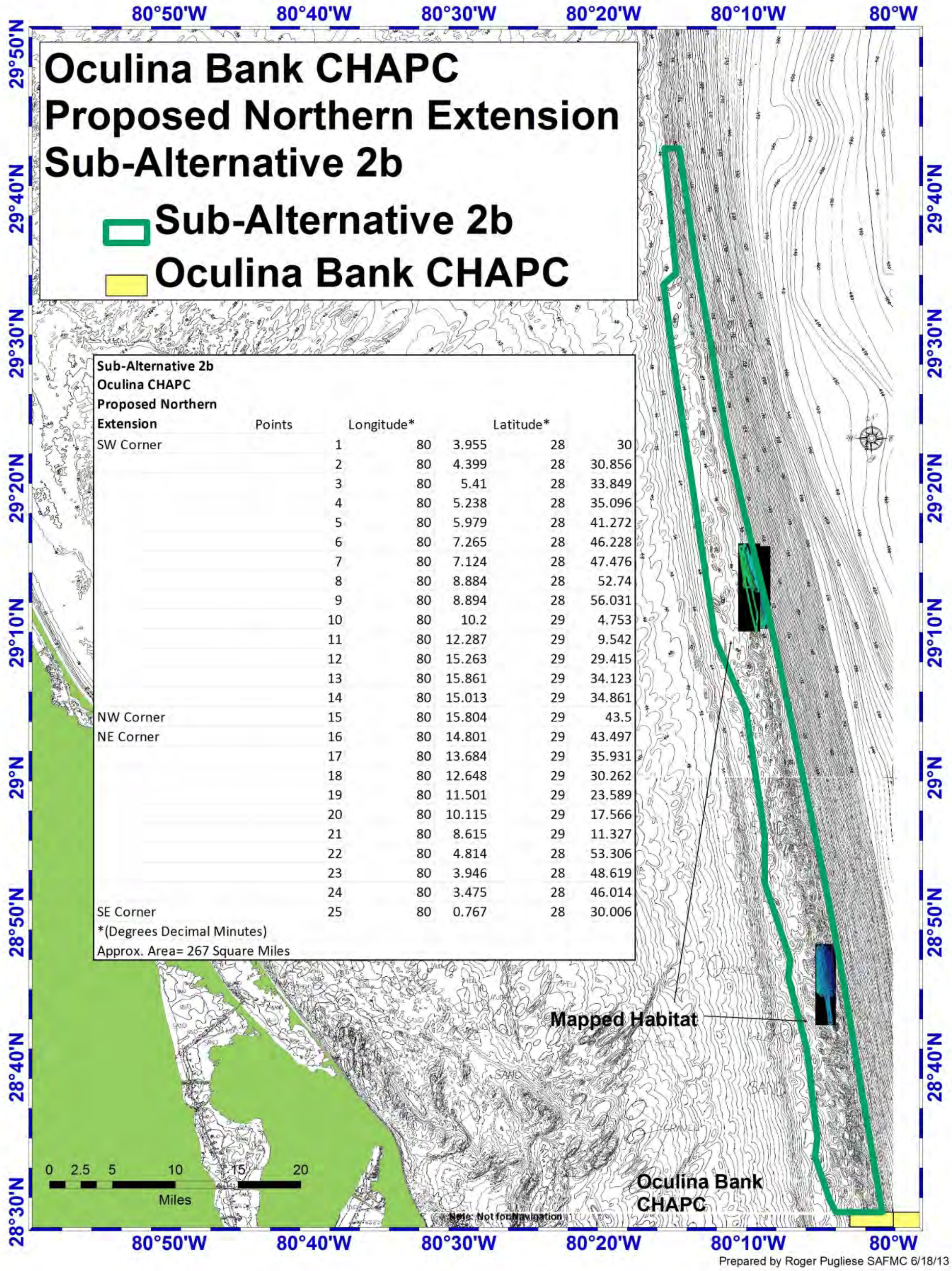
NW Corner	15	80	15.804	29	43.5
NE Corner	16	80	14.622	29	43.5
	17	80	12.405	29	30.113
	18	80	10.989	29	21.904
	19	80	8.96	29	13.387
	20	80	3.747	28	48.145
SE Corner	21	80	0.42	28	30

*(Degrees Decimal Minutes)
Approx. Area= 329 Square Miles

Rock Shrimp Fishery	Total VMS Points	Total Rock Shrimp	Rock Shrimp Fishing (2-4 knots)	Total Points in Sub-Alternative 2a	Rock Shrimp Fishing Points in Sub-Alternative 2a	% Rock Shrimp Fishing Points in Sub-Alternative 2a
2003 -2007	649,666	133,877	55,222	9,815	3,522	6.4%
2007 -2013	628,982	84,504	26,034	4,102	953	3.7%
Total (2003-2013)	1,278,648	218,381	81,256	13,917	4,475	5.5%

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



Sub-Alternative 2b Oculina CHAPC Proposed Northern Extension	Points	Longitude*		Latitude*	
SW Corner	1	80	3.955	28	30
	2	80	4.399	28	30.856
	3	80	5.41	28	33.849
	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	14.801	29	43.497
	17	80	13.684	29	35.931
	18	80	12.648	29	30.262
	19	80	11.501	29	23.589
	20	80	10.115	29	17.566
	21	80	8.615	29	11.327
	22	80	4.814	28	53.306
	23	80	3.946	28	48.619
	24	80	3.475	28	46.014
SE Corner	25	80	0.767	28	30.006

*(Degrees Decimal Minutes)
Approx. Area= 267 Square Miles

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

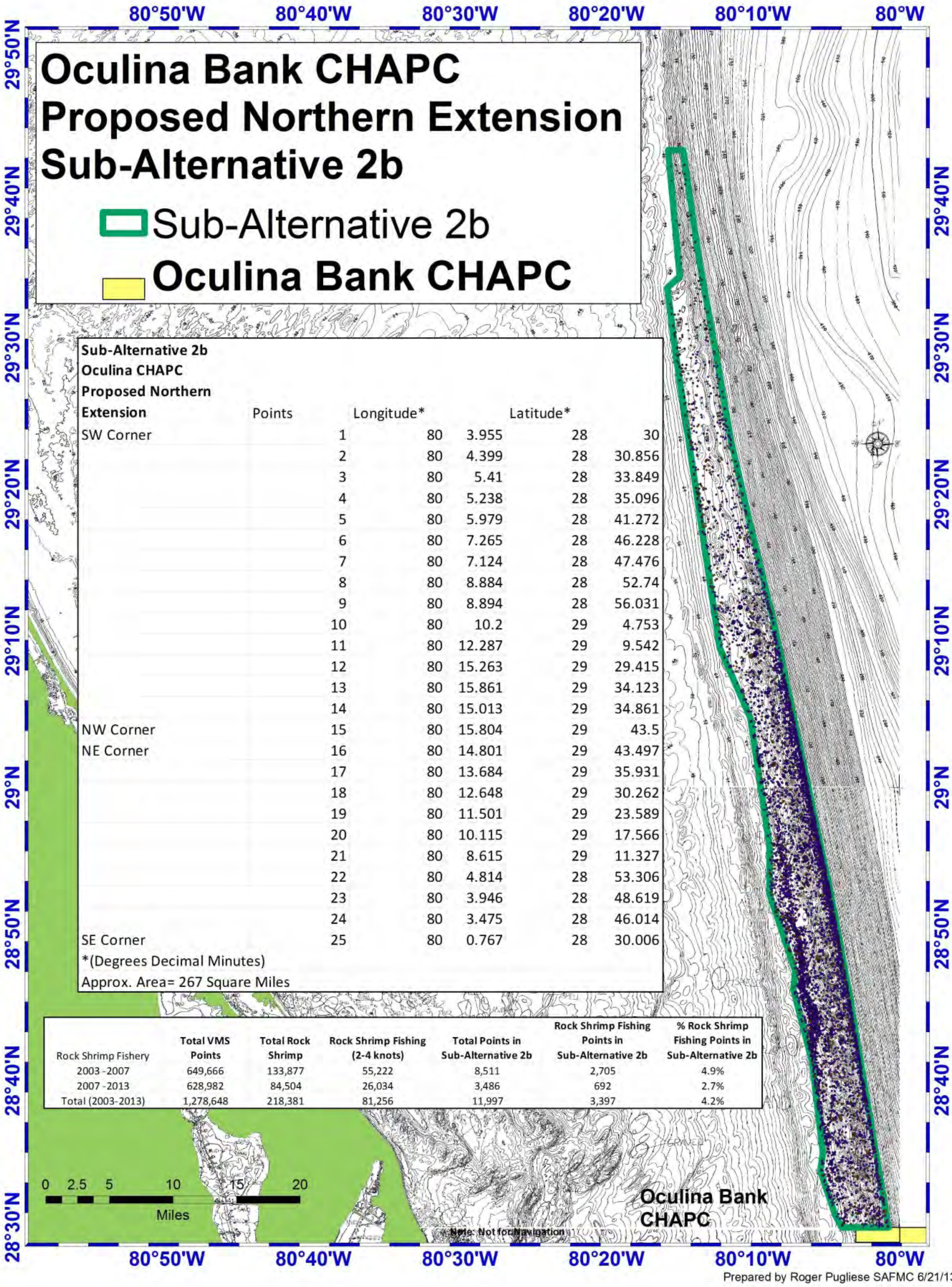


Figure S-4. Action 1, Preferred Sub-Alternative 2b. Oculina Bank CHAPC Proposed Northern Extension and VMS (2003-2013).

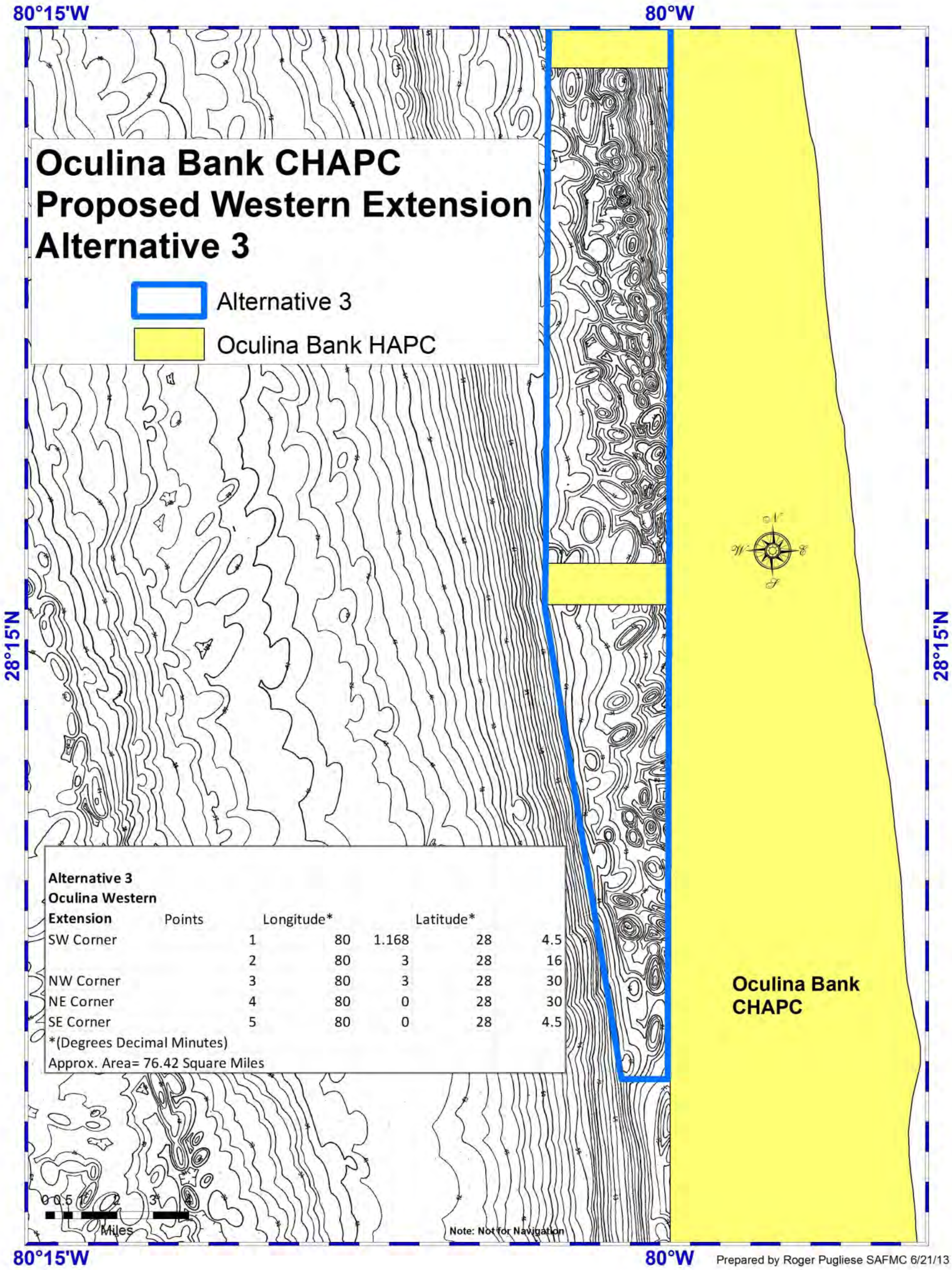


Figure S-5. Action 1, Preferred Alternative 3. Oculina Bank HAPC Proposed Western Extension and Associated Habitat and Bathymetry.

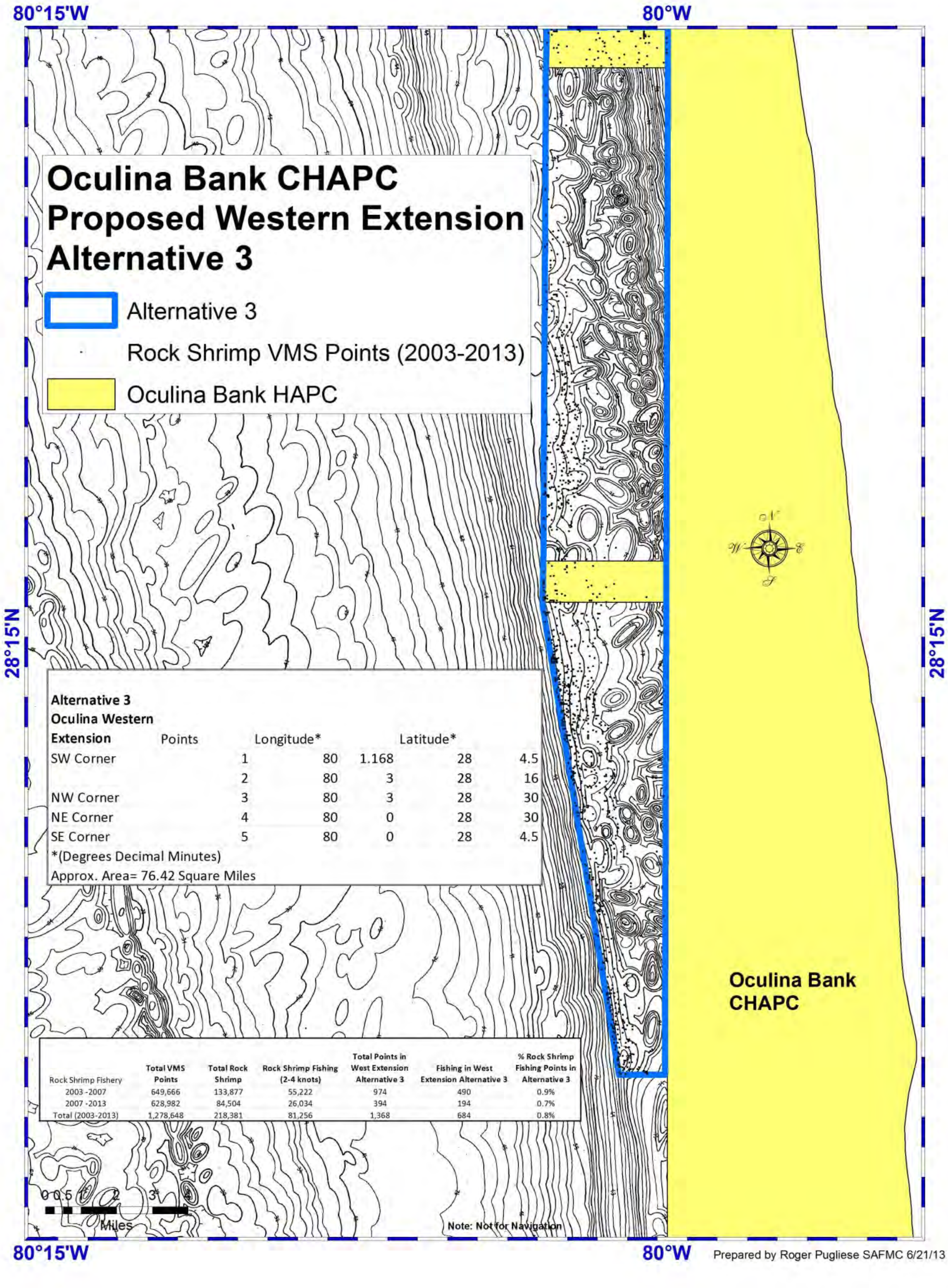


Figure S-6. Action 1, Preferred Alternative 3. Oculina Bank HAPC Proposed Western Extension and Rock Shrimp VMS (2003-2013).

Fishing impacts using the percentage of rock shrimp fishing points included in the proposed alternatives are summarized below in **Tables S-1** and **S-2**.

Table S-1. Rock shrimp fishing associated with the Oculina Bank HAPC proposed northern extension Sub-Alternative 2a and Preferred Sub-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 Sub-Alternative 2a	Rock Shrimp Fishing Points in Sub-Alternative 2a	% Rock Shrimp Fishing Points in Sub-Alternative 2a
2003 -2007	649,666	133,877	55,222	9,815	3,522	6.4%
2007 -2013	628,982	84,504	26,034	4,102	953	3.7%
Total (2003-2013)	1,278,648	218,381	81,256	13,917	4,475	5.5%
Rock Shrimp Fishery	Total VMS Points	Total Rock Shrimp	Rock Shrimp Fishing (2-4 knots)	Total Points in Sub-Alternative 2b	Rock Shrimp Fishing Points in Sub-Alternative 2b	% Rock Shrimp Fishing Points in Sub-Alternative 2b
2003 -2007	649,666	133,877	55,222	8,511	2,705	4.9%
2007 -2013	628,982	84,504	26,034	3,486	692	2.7%
Total (2003-2013)	1,278,648	218,381	81,256	11,997	3,397	4.2%

Table S-2. Rock shrimp fishing associated with Oculina Bank HAPC proposed western extension Preferred 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	% Rock Shrimp Fishing Points in Alternative 3
2003 -2007	649,666	133,877	55,222	974	490	0.9%
2007 -2013	628,982	84,504	26,034	394	194	0.7%
Total (2003-2013)	1,278,648	218,381	81,256	1,368	684	0.8%

Summary of Effects

Biological: The Oculina Bank HAPC is found at 50 CFR §622.224(b)(1). Under **Alternative 1 (No Action)** prohibited gear within the 289 square mile Oculina Bank 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 the Oculina Bank HAPC, fishing for or possessing rock shrimp or *Oculina* coral is also prohibited. **Sub-Alternative 2a, Preferred Sub-Alternative 2b,** and **Preferred Alternative 3** propose increasing the size of the Oculina Bank HAPC and extending these prohibitions to the larger area. As the size of the Oculina Bank HAPC is increased, the biological benefits would increase for the coral, including *Oculina*; the species that use the bottom substrate as habitat; and for the rock shrimp populations in the HAPC. Further, biological benefits would be expected for snapper grouper species in the proposed expanded areas since fishing for snapper grouper species while at anchor or with bottom longline would be prohibited. These activities would not have a direct biological impact on dolphin, wahoo, or coastal migratory pelagic species as gear used to target these species does not impact bottom habitat. Fishing for these species would be allowed in the expanded area proposed under **Alternative 2**, (including **Preferred Sub-Alternative 2b**) and **Preferred Alternative 3**. The golden crab fishery operates within allowable gear areas, which are not located in the proposed Oculina Bank HAPC.

Economic: Alternative 1 (No Action) would not expand the boundaries of the Oculina Bank HAPC and therefore, would not be expected to have any direct or indirect positive economic effects associated with expansion of this HAPC. Within the expanded areas of the Oculina Bank HAPC proposed in **Alternative 2**, (including **Preferred Sub-Alternative 2b**) and **Preferred Alternative 3**, certain gears (identified above) would be prohibited by all fishing vessels. As a result, various commercial fisheries could experience long-term direct negative effects from potential loss of habitat. The tradeoff for protecting additional habitat under the various sub-alternatives under **Alternative 2** (including **Preferred Sub-Alternative 2b**) and **Preferred Alternative 3** is that expansion of the Oculina Bank HAPC may result in short-term direct negative economic effects on the rock shrimp and snapper grouper fisheries.

For the rock shrimp fishery, **Sub-Alternative 2a** would be expected to result in the greatest short-term reduction in ex-vessel revenue, $208,410 (2012 dollars), followed by **Preferred Sub-Alternative 2b** ($159,149), and **Preferred Alternative 3** ($30,315). **Sub-Alternative 2a** would have a greater direct negative economic effect than would **Preferred Sub-Alternative 2b** or **Preferred Alternative 3**. The combined direct short-term negative economic effect of **Preferred Sub-Alternative 2b** and **Preferred Alternative 3** would be an expected reduction in revenue of $189,464 (2012 dollars). Over time, the habitat protected because of **Sub-Alternative 2a**, **Preferred Sub-Alternative 2b**, and **Preferred Alternative 3** would be expected to yield higher biomass of rock shrimp and other species.

Reliable estimates of the amount of effort or harvest by the recreational sector for the areas affected by **Sub-Alternative 2a**, **Preferred Sub-Alternative 2b**, or **Preferred Alternative 3** are not available. However, any potential reduction in fishing opportunities and harvest are likely to be small because any required change in fishing methods and any inconvenience recreational fishermen may experience from any of the proposed expansions of the Oculina Bank HAPC could likely be mitigated by fishing in other areas.

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. **Sub-Alternative 2a**, **Preferred Sub-Alternative 2b**, and **Preferred Alternative 3** would impact the rock shrimp fleet, royal red shrimp fleet, and possibly the snapper grouper fishery 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 expanded closed areas under **Sub-Alternative 2a**, **Preferred Sub-Alternative 2b**, and **Preferred Alternative 3**, a business may choose to no longer participate in a 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 **Preferred Sub-Alternative 2b**) if the location is in an area where harvest is occurring.

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 would be needed. Most of the administrative impacts associated with these alternatives would 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 the 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 50 CFR Section 622.183(a)(1)(ii). 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.

Preferred Alternative 3. Allow for transit through the Oculina Bank HAPC with possession of rock shrimp on board. When transiting through the HAPC, vessels must maintain a minimum speed of not less than 5 knots, determined by a ping rate acceptable by law enforcement (i.e. 5 minutes), with gear appropriately stowed (stowed is defined as doors and nets out of water).

> ***Proposed Actions in Coral Amendment 8***
>
> 1. Expand Boundaries of the Oculina Bank HAPC
> 2. **Implement a Transit Provision through the 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 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 Bank HAPC may have minor negative biological effects for the shrimp stocks that are on the eastern side of Oculina Bank HAPC as fishing vessels would have easier access to them. Without a transit provision, a trip to those fishing grounds would be long and not cost effective to fishermen, providing indirect protection to those shrimp populations. The transit provision would not have any biological impact on snapper grouper, dolphin wahoo, coastal migratory pelagic, or golden crab species as it pertains only to the rock shrimp fishery.

Economic: The intent of **Action 2** is to lessen the economic effects on rock shrimp fishermen by allowing transit through the Oculina Bank HAPC. By not allowing the shortest route of access, **Alternative 1 (No Action)** would be expected to result in increased fuel and other trip costs on vessels as they travel to and from the rock shrimp fishing grounds.

Alternative 2 and **Preferred Alternative 3** would allow fishermen to transit the Oculina Bank HAPC, thereby eliminating the costs that would occur under **Alternative 1**. Therefore, both **Alternative 2** and **Preferred Alternative 3** would provide moderate positive, direct economic benefits to fishermen because fishermen would be able to use less fuel and take less time to get to their fishing grounds, assuming that stowing their gear is feasible and complying with VMS regulations is not prohibitive. **Preferred Alternative 3** would require that doors and nets be out of the water (not disconnected and secured as is the case in **Alternative 2**), which would be less onerous than the stowing requirements of **Alternative 2**. **Preferred Alternative 3** would also require a higher VMS ping rate, which may result in increased costs to purchase a new VMS unit for vessels whose current VMS unit cannot ping at the higher rate.

Currently, 79 vessels in the rock shrimp fleet have a VMS unit. Of those vessels, 22 have older units purchased when the fishery was required to use VMS units in 2003. Those units would need to be upgraded under **Preferred Alternative 3**. None of these replacement units would be eligible for reimbursement by the National Marine Fisheries Service (NMFS) Office of Law Enforcement VMS fund. The 22 vessels needing to upgrade their units would have to pay for the installation, maintenance, and increased communications charges associated with having a VMS. Assuming all 22 vessels needing to upgrade their units choose the lowest priced Thrane unit at $2,495 each, the cost of the units is expected to be $54,890. The additional cost of installation would be approximately $6,600, for a total minimum cost of $61,490 to upgrade to the least expensive necessary hardware. Currently, all rock shrimp vessels, regardless of whether they must upgrade their units, would be expected to experience an increase in costs under **Preferred Alternative 3**. Even the 57 units that do not need to be replaced would incur charges of approximately $150 to $250 per unit to reconfigure or upgrade hardware/software to implement the higher ping rate through the closed area. Reconfiguration or upgrading could include delays if the antenna must be transported to the vendor to perform upgrades. Not knowing exactly how much each upgrade will cost, the middle of the range, $200 multiplied by the 57 units that do not need to replace their hardware would incur a one-time cost of $11,400. The total cost of hardware and software upgrades required to allow transit under **Preferred Alternative 3** for all vessels in the fleet is estimated to be $72,890, representing a minor impact only for the season in which the upgrades must be made.

Some, if not all, of the increased cost of upgrading hardware and software, plus increased communications charges to transit through the Oculina Bank HAPC would be offset by not being required to transit around the HAPC to get to fishing grounds. Allowing transit should increase the amount of time on a trip spent fishing, as well as provide savings on fuel and other vessel maintenance costs.

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** and **Preferred Alternative 3** would be beneficial to shrimp 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. A transit provision would also be expected to enhance safety of fishermen when a vessel needs to return to port due to inclement weather. **Preferred Alternative 3** would be expected to help reduce negative impacts from Action 1 on individual fishermen, fishing businesses, and the communities of Mayport and Titusville, Florida.

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 2**

would allow for a transit provision that is modified from other transit provisions to address unique circumstances of the fishery. **Preferred Alternative 3** would require the vessel to maintain a speed of not less than 5 knots as indicated by an increased ping rate of the VMS. Depending on the frequency of transit, this might lead to a slight increase in the impacts associated with monitoring by law enforcement.

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 50 CFR §622.224(c)(1)(iii).

Alternative 2. Modify the southern southeast boundary of the Stetson-Miami Terrace CHAPC western extension in a manner that maintains protection for the coral habitat but allows for bottom tending gear to be used in the flatbottom region (**Figure S-7**). **Alternative 2** = 490 square miles. Coordinates for **Alternative 2** are found in **Appendix M**, **Table 4**.

Proposed Actions in Coral Amendment 8

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

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-8**). **Alternative 3** = 653 square miles. Coordinates for **Alternative 3** are found in **Appendix M**, **Table 5**.

Preferred Alternative 4. 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. Allow for a Shrimp Fishery Access Area to be used as a gear haul back/drift zone as shown in **Figure S-9. Preferred Alternative 4** = 490 square miles. Coordinates for **Preferred Alternative 4** are found in **Appendix M**, **Tables 6** and **7**.

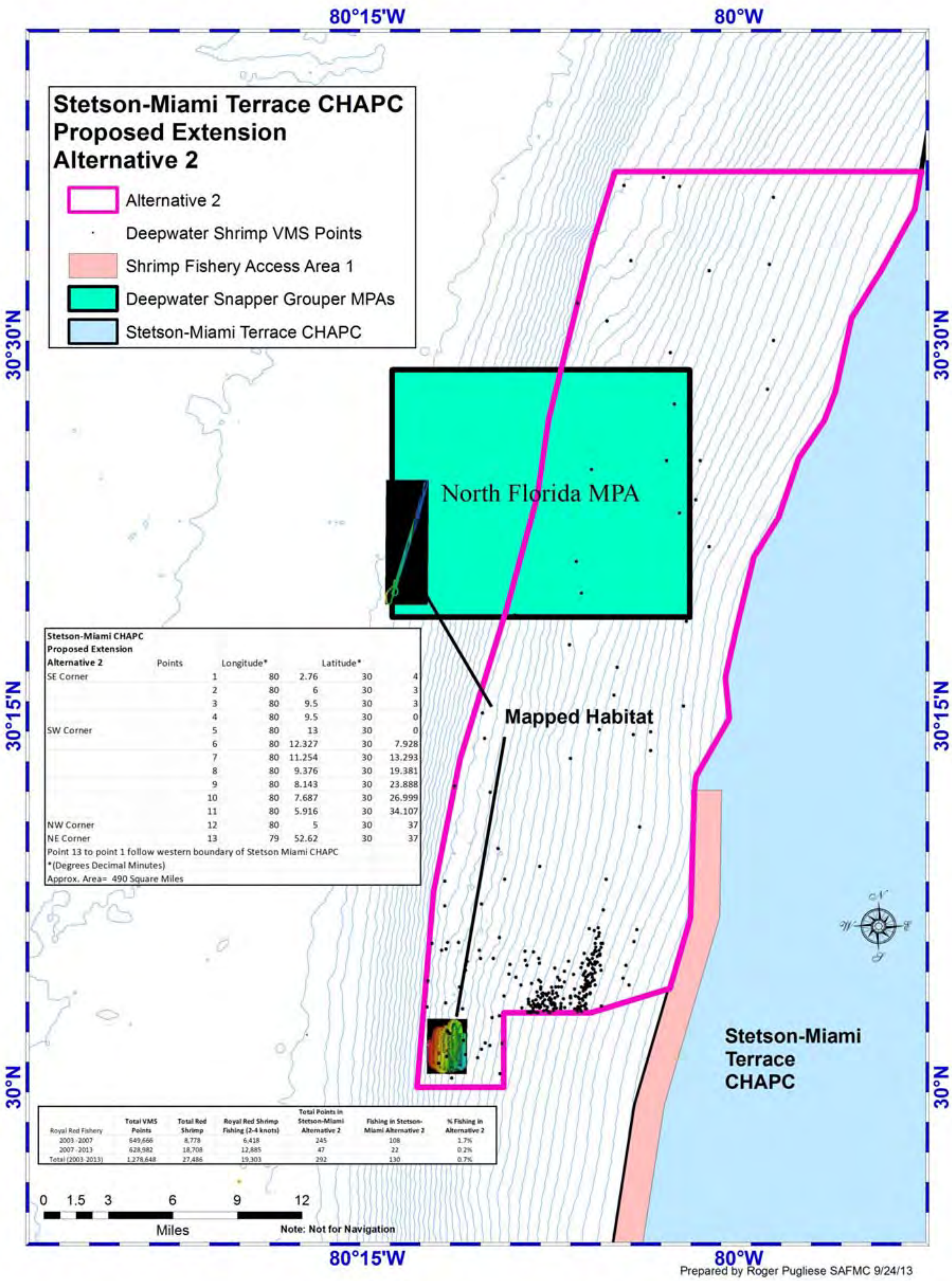
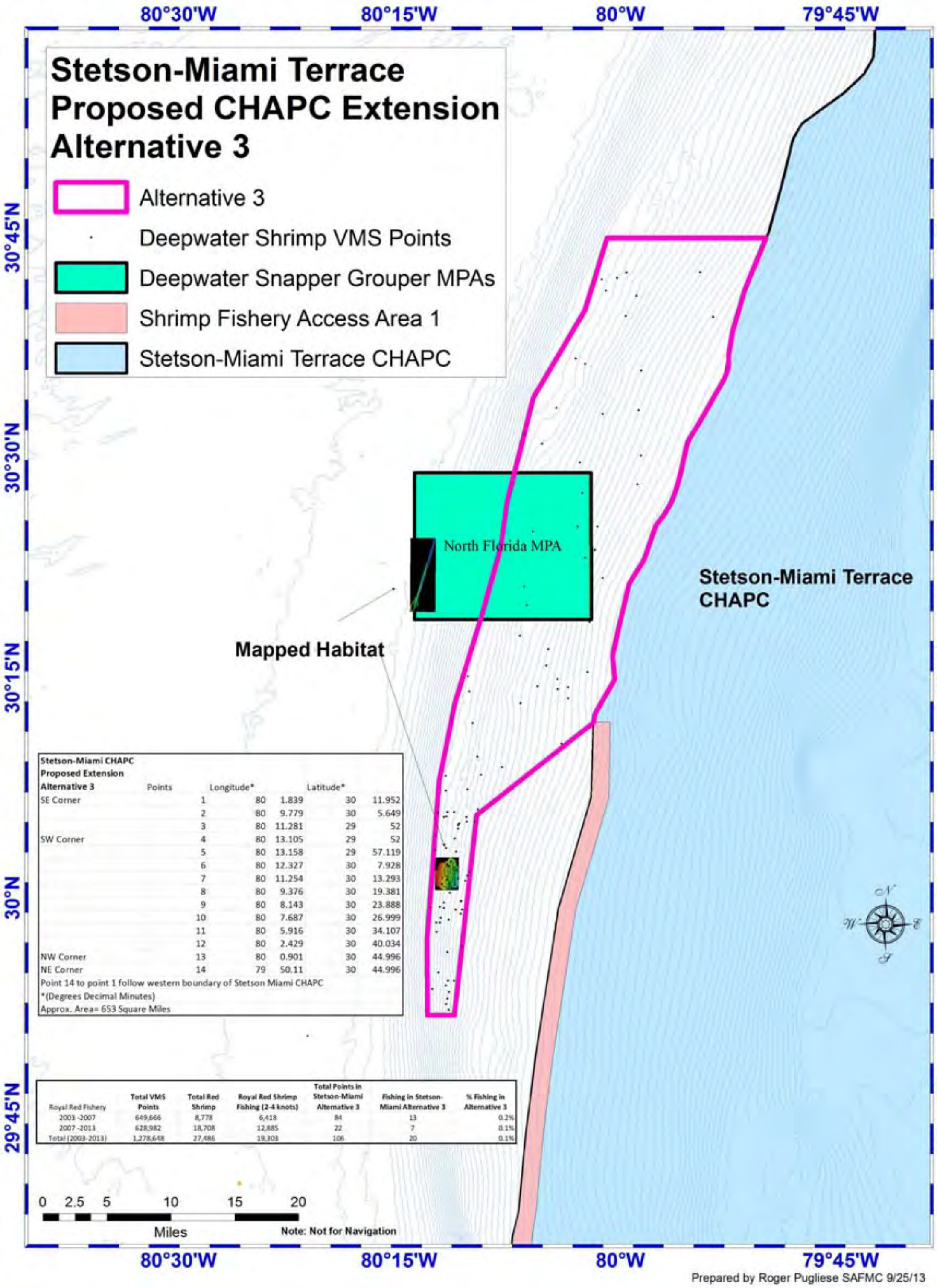


Figure S-7. Action 3, Alternative 2. Proposed Western Extension of Stetson-Miami Terrace CHAPC Mapped Habitat and Rock Shrimp VMS pertaining to Royal Red Shrimp Fishery (2003-2013).



Stetson-Miami CHAPC Proposed Extension Alternative 3	Points	Longitude*		Latitude*	
SE Corner	1	80	1.839	30	11.952
	2	80	9.779	30	5.649
	3	80	11.281	29	52
SW Corner	4	80	13.105	29	52
	5	80	13.158	29	57.119
	6	80	12.327	30	7.928
	7	80	11.254	30	13.293
	8	80	9.376	30	19.381
	9	80	8.143	30	23.888
	10	80	7.687	30	26.999
	11	80	5.916	30	34.107
	12	80	2.429	30	40.034
NW Corner	13	80	0.901	30	44.996
NE Corner	14	79	50.11	30	44.996

Point 14 to point 1 follow western boundary of Stetson Miami CHAPC
*(Degrees Decimal Minutes)
Approx. Area= 653 Square Miles

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 -2013	628,982	18,708	12,885	22	7	0.1%
Total (2003-2013)	1,278,648	27,486	19,303	106	20	0.1%

Figure S-8. Action 3, Alternative 3. Proposed Western Extension of Stetson-Miami Terrace CHAPC Mapped Habitat and Rock Shrimp VMS pertaining to Royal Red Shrimp Fishery (2003-2013).

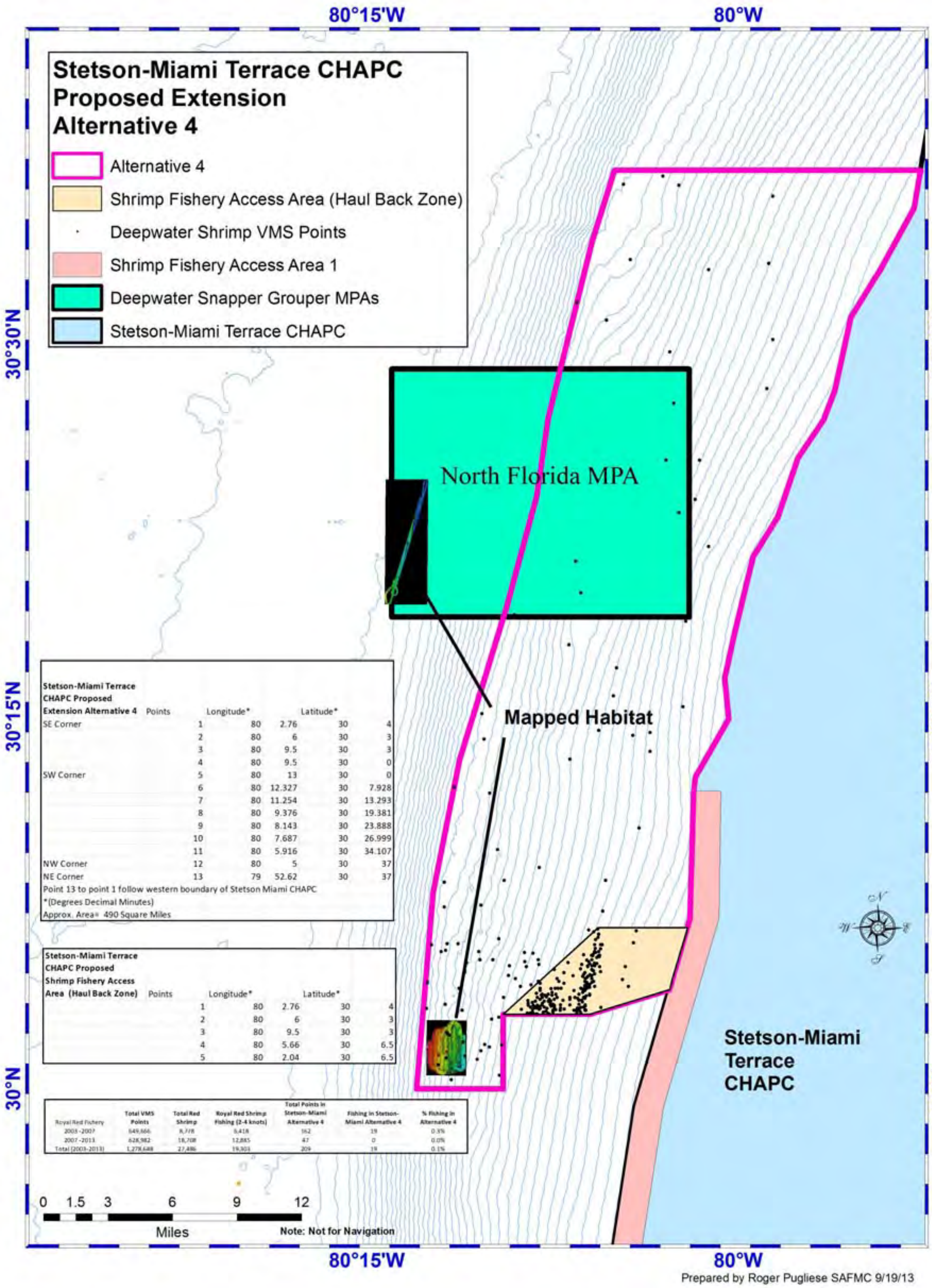


Figure S-9. Action 3, Preferred Alternative 4. Proposed Extension of Stetson-Miami Terrace CHAPC Mapped Habitat and Rock Shrimp VMS pertaining to Royal Red Shrimp Fishery (2003-2013).

Fishing impacts using the percentage of rock shrimp fishing points included in the proposed alternatives are summarized below in **Table S-3**.

Table S-3. Royal Red fishing associated with Stetson-Miami Terrace CHAPC Alternatives 2, 3 and 4 (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 -2013	628,982	18,708	12,885	47	22	0.2%
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 -2013	628,982	18,708	12,885	22	7	0.1%
Total (2003-2013)	1,278,648	27,486	19,303	106	20	0.1%
Royal Red Fishery	Total VMS Points	Total Red Shrimp	Royal Red Shrimp Fishing (2-4 knots)	Total Points in Stetson-Miami Alternative 4	Fishing in Stetson-Miami Alternative 4	% Fishing in Alternative 4
2003 -2007	649,666	8,778	6,418	162	19	0.3%
2007 -2013	628,982	18,708	12,885	47	0	0.0%
Total (2003-2013)	1,278,648	27,486	19,303	209	19	0.1%

<u>Summary of Effects</u>

Biological: Under **Alternative 1 (No Action),** the use of bottom longline, bottom trawl, mid-water trawl, dredge, anchor, pot, or trap, anchor and chain, and grapple and chain is prohibited within all CHAPCs. **Alternatives 2**, **3**, and **Preferred Alternative 4** would extend these prohibitions to the expansion area of the Stetson-Miami Terrace CHAPC. Therefore, the larger the expansion of the Stetson-Miami Terrace CHAPC, the greater the biological effects to species in the area.

Alternative 2 and **Alternative 3** would be expected to result in positive biological impacts to the deepwater coral habitat in the expanded 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 a long-term biological loss of deepwater coral habitat as well as the species that utilize this habitat. **Preferred Alternative 4** is similar to **Alternative 2** in that it would modify the coordinates to expand the CHAPC by 490 square miles. However, it would also provide royal red shrimp fishermen a zone within which they can haul back gear without drifting into an area where their gear is prohibited. This haul back zone may encourage fishermen to fish in the area giving a slight negative impact on the royal red populations. However, fishing effort in the area is historically low and the impact is not expected to be large. None of the alternatives would have any biological impact on dolphin wahoo or coastal migratory pelagic species as the typical gear used for these species does not impact bottom habitat. Fishing for snapper grouper species would be allowed as long as there was no anchoring or use of bottom longline gear. However, fishing for snapper grouper species in the proposed expansion areas of the Stetson-Miami Terrace CHAPC is uncommon and no biological impact on those species is expected. The golden crab fishery operates within allowable gear areas, which are not affected by the proposed expansion of the Stetson-Miami Terrace CHAPC.

Economic: The royal red shrimp fishery is known to operate in the proposed Stetson-Miami Terrace CHAPC expansion. Based on the VMS points as a percent of fishing that occurred in the alternative areas, **Action 3** will result in some minor loss of ex-vessel revenue to royal red shrimp fishermen. **Alternative 2** is expected to result in average annual losses of $1,752. **Alternative 3** would result in expected average annual losses of $557. Like **Alternative 1 (No Action)**, **Preferred Alternative 4**, which would allow for a gear haul back and drift zone, would not be expected to have any direct short-term economic effects.

Social: **Alternative 1 (No Action)** would likely have minimal social effects (negative and positive) because it would maintain access to shrimp and snapper grouper harvest areas that would be reduced under **Alternative 2** or **Alternative 3**. Because **Preferred Alternative 4** would also establish the Shrimp Fishery Access Area based on information of fishing grounds of the royal red shrimp vessels, negative impacts on the deepwater shrimp fleets and associated businesses and communities could be reduced or removed. The expected economic impacts under **Alternatives 2** and **3** would likely be avoided with the establishment of the Shrimp Fishery Access Area in **Preferred Alternative 4** (see **Section 4.3.2**), which would also contribute to minimized impact on the fishermen, businesses, and associated communities.

Administrative: The expansion of the Stetson Miami Terrace CHAPC (**Alternative 2-Preferred Alternative 4**) 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 would 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

> ***Proposed Actions in Coral Amendment 8***
>
> 1. Expand Boundaries of the Oculina Bank HAPC
> 2. Implement a Transit Provision through the Oculina Bank HAPC
> 3. Expand Boundaries of the Stetson-Miami Terrace CHAPC
> 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, also found at 50 CFR §622.224(c)(1)(i):

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”

Preferred Alternative 2. Extend the northern boundary to encompass the area identified by the following coordinates (**Figure S-10**) (**Preferred Alternative 2** = 10 square miles). Coordinates for **Preferred Alternative 2** are found in **Appendix M**, **Table 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’

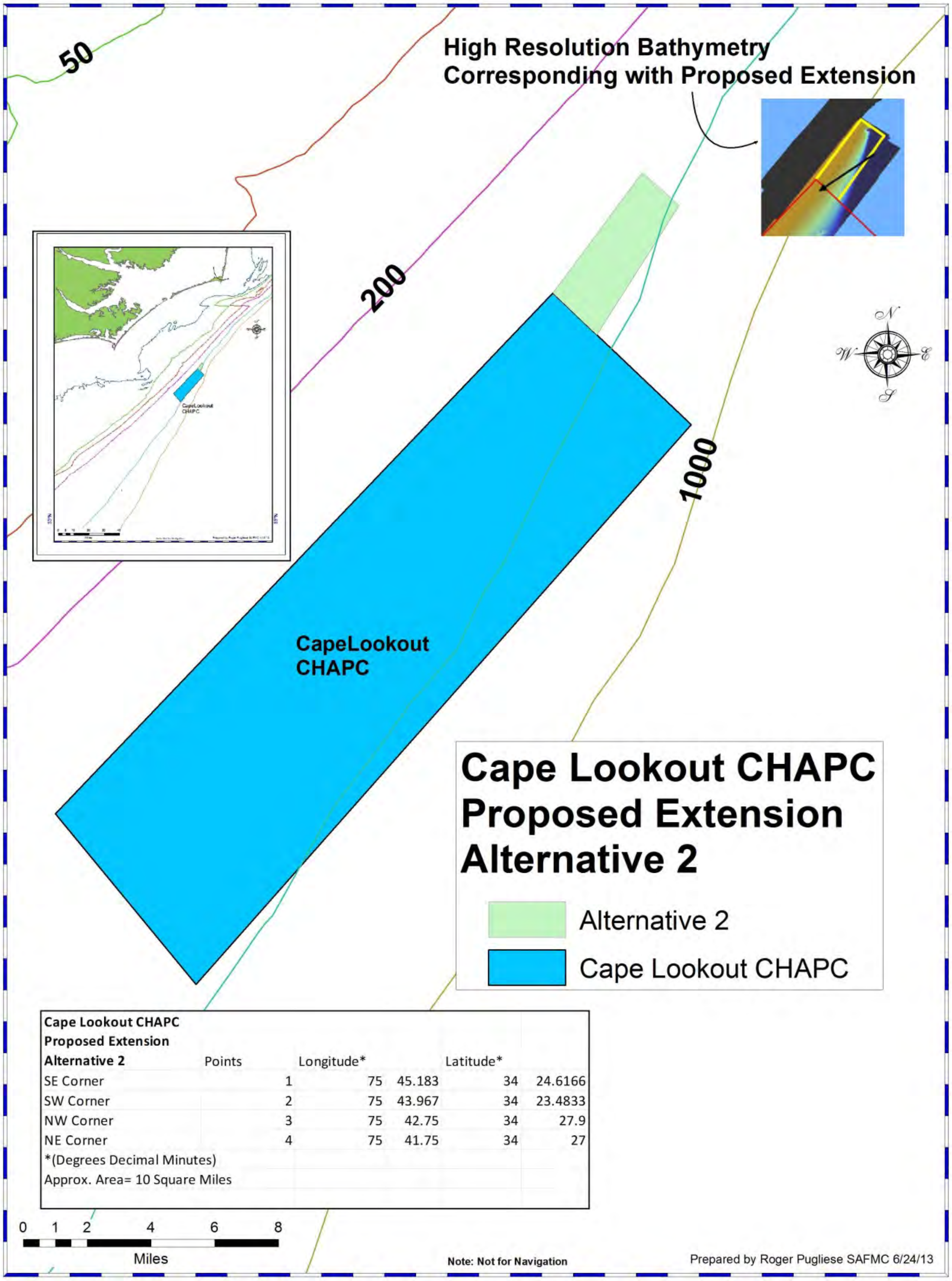


Figure S-10. Action 4, Preferred Alternative 2. Cape Lookout CHAPC Proposed Extension and Mapped Habitat.

Summary of Effects

Biological: The final rule for the Comprehensive Ecosystem-Based Amendment 1 (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)**, the Cape Lookout CHAPC would not be expanded and there would not be any additional biological benefits. **Preferred Alternative 2** proposes to expand the original Cape Lookout CHAPC along the northern boundary by approximately 10 square miles. Applying the existing prohibitions to the proposed expansion of the Cape Lookout CHAPC would provide biological benefits to important deepwater coral ecosystems. The specific coordinates have been proposed based on new information of occurrence of deepwater *Lophelia* corals in the proposed expansion area.

Preferred Alternative 2 would not have any biological impact on dolphin wahoo or coastal migratory pelagic as the typical gear used for these species does not impact bottom habitat. Fishing for snapper grouper species would be allowed as long as there was no anchoring or use of bottom longline gear. The size of the proposed expansion of the Cape Lookout CHAPC in **Preferred Alternative 2** is very small (approximately 10 square miles or 16 square kilometers) and landings data are not available at a fine enough resolution to perform analysis (pers. comm., Nick Farmer, NMFS SERO, July 9, 2013). However, fishing for snapper grouper species in the proposed expansion area is uncommon and little biological impact on those species is expected. Fishing for deepwater shrimp species does not occur within the proposed area. The golden crab fishery operates within allowable gear areas, which are not affected by the proposed expansion of the Cape Lookout CHAPC.

Economic: **Alternative 1 (No Action)** would likely have minimal economic effects because this would maintain access to current harvest areas. Because the proposed extension of the Cape Lookout CHAPC under **Preferred Alternative 2** is a relatively small area, the proposed expansion would be expected to have minimal direct negative economic effects particularly on the snapper grouper fleet or other fleets. No information is available on fishing activity specifically in this area. Species from the deepwater snapper grouper complex that tend to prefer this habitat and nearby environments include wreckfish. However, because the affected area is so small and there are other areas nearby where similar fishing activity is allowed, the direct negative economic effects of **Preferred Alternative 2** are expected to be minimal.

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 **Preferred 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. However, because the affected area is so small and there are other areas nearby where similar fishing activity is allowed, the direct negative social effects of **Preferred Alternative 2** are expected to be minimal.

Administrative: The expansion of the Cape Lookout CHAPC (**Preferred Alternative 2**) would have a minimal administrative impact. Administrative impacts would be through the rule making process, outreach, and enforcement. The administrative impacts would differ between the alternatives in the amount of area they cover. The larger the expansion of the Cape Lookout CHAPC the more enforcement would 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). Coral Amendment 8 also includes an action to allow for transit by rock shrimp fishermen through the Oculina Bank HAPC.

South Atlantic Fishery Management Council

- 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, 1 representative from each of the 4 South Atlantic states, the Southeast Regional Director of NMFS, and 4 non-voting members
- Responsible for developing fishery management plans and amendments under the Magnuson-Stevens Act; recommends actions to NMFS for implementation
- Management area is from 3 to 200 miles off the coasts of North Carolina, South Carolina, Georgia, and east Florida through Key West

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 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 (NOAA) within the Department of Commerce. The public has the opportunity to provide comments during the development of the proposed amendment through scoping meetings, public hearings, and South Atlantic Council meetings. If an amendment is approved by the South Atlantic Council, NMFS will make the amendment and proposed rule available for public comment.

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 Council. Actions in this document would amend the FMP for Coral and Coral Reefs of the South Atlantic.

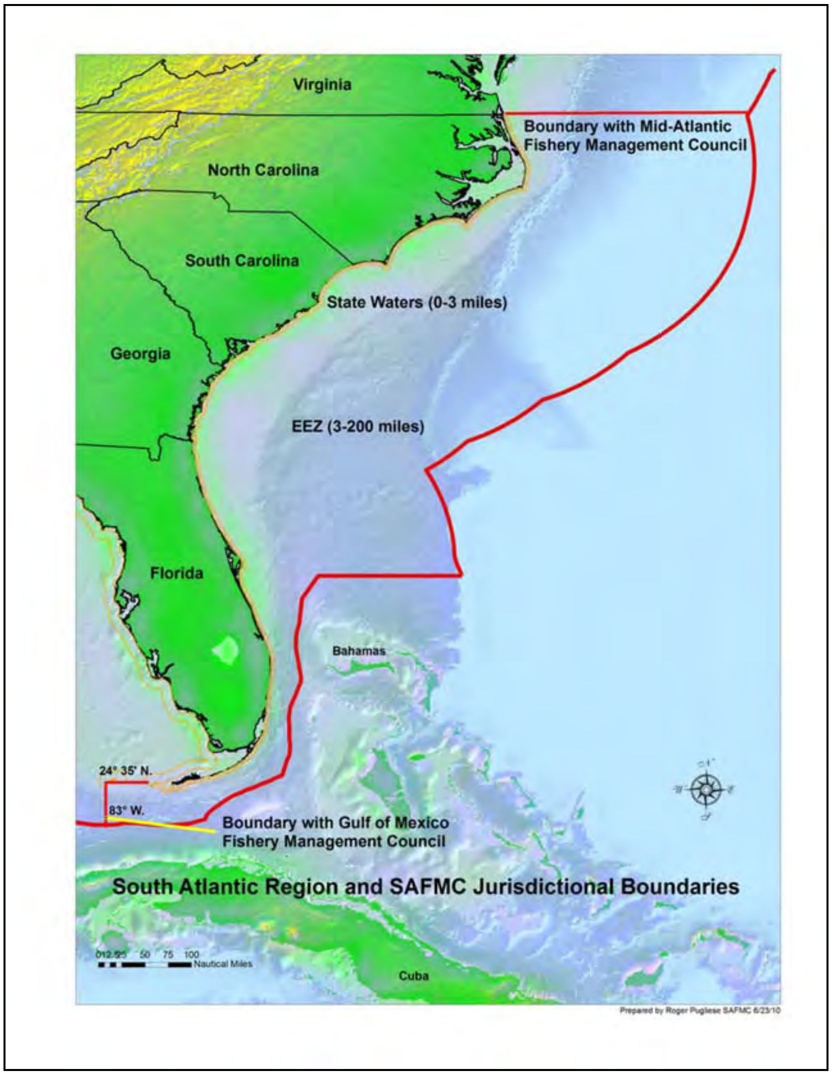


Figure 1-1. Jurisdictional boundaries of the South Atlantic Council.

1.4 Why is the South Atlantic Council Considering Action?

Recent studies (Reed 2011, **Appendix J** and Brooke and Ross 2012, **Appendix L**) have indicated the presence of pinnacles and mounds of deepwater coral ecosystems in the South Atlantic region. The South Atlantic Council has a history of protecting these important habitats. In 1984, the South Atlantic Council designated a 92-nm^2 portion of the Oculina Bank as the Oculina Bank HAPC. Additionally, the South Atlantic Council prohibited the use of bottom trawls, bottom longlines, dredges, fish traps, and fish pots within the HAPC to mitigate the threat of fishing gear to *Oculina* coral. These actions were taken through the FMP for Coral and Coral Reefs (SAFMC and GMFMC 1982), prepared jointly by the Gulf of Mexico Fishery Management Council and the South Atlantic Council. Deepwater CHAPCs, including the Stetson-Miami Terrace and Cape Lookout Lophelia Banks (Cape Lookout) CHAPCs, were implemented through CE-BA 1 (SAFMC 2010c).

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 and Alternatives

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) and preferred alternatives. Alternatives the South Atlantic Fishery Management Council (South Atlantic Council) considered but eliminated from detailed study during development of this amendment are described in **Appendix A**.

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 close to the 70 meter and 100 meter depth contour lines, respectively, while annexing hard bottom features, as represented in the simplified polygon (**Figures 4-1** and **4-2**). **Sub-Alternative 2a** = 329 square miles. Coordinates for **Sub-Alternative 2a** are found in **Appendix M**, **Table 1**.
>
> **Preferred Sub-Alternative 2b**. Modify the Oculina Bank HAPC to move the northern boundary to 29° 43.5' N. The western boundary would follow close to the 70 meter contour while annexing hard bottom features with two coordinates replaced in the southern portion of the boundary to reduce rock shrimp fishing tracks impacted. The eastern boundary line of the proposed Oculina Bank HAPC northern extension identified in **Sub-Alternative 2a** would be shifted west to further reduce rock shrimp fishing tracks impacted. The alternative is represented in the simplified polygons **Figures 4-3** and **4-4**. **Preferred Sub-Alternative 2b** = 267 square miles. Coordinates for **Preferred Sub-Alternative 2b** are found in **Appendix M**, **Table 2**.

Preferred 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 (**Figures 4-5** and **4-6**). **Preferred Alternative 3** = 76 square miles. Coordinates for **Preferred Alternative 3** are found in **Appendix M**, **Table 3**.

Comparison of Alternatives

Biological: The Oculina Bank HAPC is found at 50 CFR §622.224(b)(1). Under **Alternative 1 (No Action)**, prohibited gear in the 289 square mile Oculina Bank Habitat Area of Particular Concern (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 the Oculina Bank HAPC, fishing for or possessing rock shrimp is also prohibited. **Sub-Alternative 2a, Preferred Sub-Alternative 2b,** and **Preferred Alternative 3** propose increasing the size of the Oculina Bank HAPC and extending the gear prohibitions to the expanded area. These prohibitions would include the use of bottom longline, bottom trawl, dredge, pot, or trap as well as the use of an anchor, anchor and chain, or grapple and chain. As the size of the Oculina Bank HAPC is increased, there would be moderate biological benefits increase for the coral, including *Oculina*; species that use the bottom substrate as habitat; and rock shrimp populations. Increasing the size of the Oculina Bank HAPC may provide a refuge for other important species in the area, such as snapper grouper by prohibiting bottom longline activity as well as anchoring.

Economic: Alternative 1 (No Action) would not expand the boundaries of the Oculina Bank HAPC and therefore, would not be expected to have any direct or indirect positive economic effects associated with expansion of this HAPC. Within the expanded areas of the Oculina Bank HAPC proposed in **Alternative 2** (including **Preferred Sub-Alternative 2b**) and **Preferred Alternative 3,** certain gear types (identified above) would be prohibited by all fishing vessels. As a result, various commercial fisheries could experience long-term direct negative effects from potential loss of habitat. The tradeoff for protecting additional habitat under the various sub-alternatives under **Alternative 2** (including **Preferred Sub-Alternative 2b**) and **Preferred Alternative 3** is that expansion of the Oculina Bank HAPC may result in short-term direct negative economic effects on the rock shrimp and snapper grouper fisheries.

For the rock shrimp fishery, **Sub-Alternative 2a** would be expected to result in the greatest short-term reduction in ex-vessel revenue, $208,410 (2012 dollars), followed by **Preferred Sub-Alternative 2b** ($159,149), and **Preferred Alternative 3** ($30,315) (**Table 4-3**). **Sub-Alternative 2a** would have a greater direct negative economic effect than would **Preferred Sub-Alternative 2b** or **Preferred Alternative 3**. The combined direct short-term negative economic effect of **Preferred Sub-Alternative 2b** and **Preferred Alternative 3** would be an expected reduction in revenue of $189,464 (2012 dollars). Over time, the habitat protected because of **Sub-Alternative 2a**, **Preferred Sub-Alternative 2b**, and **Preferred Alternative 3** would be expected to yield higher biomass of rock shrimp and other species.

Reliable estimates of the amount of effort or harvest by the recreational sector for the areas affected by **Sub-Alternative 2a**, **Preferred Sub-Alternative 2b**, or **Preferred Alternative 3** are not available. However, any potential reduction in fishing opportunities and harvest are likely to be small because any required change in fishing methods and any inconvenience recreational fishermen may experience from any of the proposed expansions of the Oculina Bank HAPC could likely be mitigated by fishing in other areas.

Social: **Alternative 1 (No Action)** would have minimal social effects on the rock shrimp and royal red fishermen because the fleet is already harvesting in open areas and prohibited from working in the closed areas. **Sub-Alternative 2a**, **Preferred Sub-Alternative 2b**, and **Preferred Alternative 3** would have moderate impacts on 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 expanded closed areas under **Sub-Alternative 2a**, **Preferred Sub-Alternative 2b**, and **Preferred Alternative 3**, a business may choose to no longer participate in a 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 **Preferred Sub-Alternative 2b**) if the location is in an area where harvest is occurring.

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 would be needed. Most of the administrative impacts associated with these alternatives relate to at-sea enforcement.

A summary of the effects under **Action 1** is shown in **Table 2-1**.

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

Alternatives	Biological Effects	Socioeconomic/Administrative Effects
Alternative 1 (No Action)	Status Quo.	Status Quo.
Sub-Alternative 2a	Positive effects on coral, shrimp and snapper grouper species.	Minimal negative effects.
Preferred Sub-Alternative 2b	Positive effects on coral, shrimp and snapper grouper species.	Minimal negative effects.
Preferred Alternative 3	Positive effects on coral, shrimp and snapper grouper species.	Minimal negative effects.

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

Alternative 1 (No Action). Do not implement a transit provision through the 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 50 CFR Section 622.183(a)(1)(ii). 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.

Preferred Alternative 3. Allow for transit through the Oculina Bank HAPC with possession of rock shrimp on board. When transiting through the HAPC, vessels must maintain a minimum speed of not less than 5 knots, determined by a ping rate acceptable by law enforcement (i.e. 5 minutes), with gear appropriately stowed (stowed is defined as doors and nets out of water).

Comparison of Alternatives

Biological: Transit provisions have been established in the South Atlantic for other fisheries to allow for easier access to traditional fishing grounds through closed areas. Establishing a transit provision through the Oculina Bank HAPC may have minor negative biological benefits for the rock shrimp stocks that are on the eastern side of Oculina Bank HAPC as fishing vessels would be able to access them more easily than they have in the past. Without a transit provision, the trip to those fishing grounds would be long and not cost effective for fishermen, providing indirect protection to those shrimp populations. A transit provision for the dolphin and wahoo, coastal migratory pelagics, snapper grouper and golden crab fisheries is not needed as the regulations do not currently prevent them from transiting the area.

Economic: The intent of **Action 2** is to lessen the economic effects on rock shrimp fishermen by allowing transit through the Oculina Bank HAPC. By not allowing the shortest route of access, **Alternative 1 (No Action)** would be expected to result in increased fuel and other trip costs on vessels as they travel to and from the rock shrimp fishing grounds.

Alternative 2 and **Preferred Alternative 3** would allow fishermen to transit the Oculina Bank HAPC, thereby eliminating the costs that would occur under **Alternative 1**. Therefore, both **Alternative 2** and **Preferred Alternative 3** would provide moderate positive, direct economic benefits to fishermen because fishermen will be able to use less fuel and take less time to get to their fishing grounds, assuming that stowing their gear is feasible and complying with VMS regulations are not prohibitive. **Preferred Alternative 3** would require that doors and nets be out of the water (not disconnected and secured as is the case in **Alternative 2**), which would be less onerous than the stowing requirements of **Alternative 2**. **Preferred Alternative 3** would also require a higher VMS ping rate, which may result in increased costs to purchase a new VMS unit for vessels whose current VMS unit cannot ping at the higher rate.

Currently, the 79 vessels participating in the rock shrimp fleet have a VMS unit. Of those vessels, 22 have older units purchased when the fishery was required to use VMS units in 2003. Those units would need to be upgraded under **Preferred Alternative 3**. None of these replacement units would be eligible for reimbursement by the National Marine Fisheries Service (NMFS) Office of Law Enforcement VMS fund. The 22 vessels needing to upgrade their units would have to pay for the installation, maintenance, and increased communications charges associated with having a VMS. Assuming all 22 vessels needing to upgrade their units choose the lowest priced Thrane unit at $2,495 each, the cost of the units is expected to be $54,890. The additional cost of installation would be approximately $6,600, for a total minimum cost of $61,490 to upgrade to the least expensive necessary hardware. Currently, all rock shrimp vessels, regardless of whether they must upgrade their units, would be expected to experience an increase in costs under **Preferred Alternative 3**. Even the 57 units that do not need to be replaced would incur charges of approximately $150 to $250 per unit to reconfigure or upgrade hardware/software to implement the higher ping rate through the closed area. Reconfiguration or upgrading could include delays if the antenna must be transported to the vendor to perform upgrades. Not knowing exactly how much each upgrade will cost, the middle of the range, $200 multiplied by the 57 units that do not need to replace their hardware would incur a one-time cost of $11,400. The total cost of hardware and software upgrades required to allow transit under **Preferred Alternative 3** for all vessels in the fleet is estimated to be $72,890, representing a minor impact only for the season in which the upgrades must be made.

Some, if not all, of the increased cost of upgrading hardware and software, plus increased communications charges to transit through the Oculina Bank HAPC would be offset by not being required to transit around the HAPC to get to fishing grounds. Allowing transit should increase the amount of time on a trip spent fishing, as well as provide savings on fuel and other vessel maintenance costs.

Social: If additional closed areas are established under **Action 1**, some minor impacts on fishing vessels and crew may be reduced with a transit provision, as discussed in **Section 4.1.3**. The transit provision in **Alternative 2** and **Preferred Alternative 3** would be beneficial to shrimp 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. A transit provision would also be expected to enhance safety of fishermen when a vessel needs to return to port due to inclement weather. **Preferred Alternative 3** would be expected to help reduce negative impacts from **Action 1** on individual fishermen, fishing businesses, and the communities of Mayport and Titusville, Florida (see **Section 3.4.3**.)

Administrative:
There would be minor administrative impacts associated with a transit provision through the Oculina Bank HAPC. Administrative impacts associated with enforcement would be greatest for the action alternatives. If modifications are made to the transit regulations, administrative impacts would increase on the agency during the development and implementation phase. **Preferred Alternative 3** would require the vessel to maintain a speed of not less than 5 knots as indicated by an increased ping rate on the 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. There would be administrative impacts associated with ensuring that all VMS units are capable of the increased ping rate and supplying VMS units that need to be replaced.

A summary of the effects under **Action 2** is shown in **Table 2-2**.

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

Alternatives	**Biological Effects**	**Socioeconomic/Administrative Effects**
Alternative 1 (No Action)	Status Quo.	Status Quo.
Alternative 2	Small negative impacts on rock shrimp populations.	Moderate positive economic and social effects.
Preferred Alternative 3	Small negative impacts on rock shrimp populations.	Greater positive economic and social impacts than Alternative 2. Administrative impacts increase slightly.

2.3 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 50 CFR §622.224(c)(1)(iii).

Alternative 2. Modify the southern southeast boundary of the Stetson-Miami Terrace CHAPC western extension in a manner that maintains protection for the coral habitat but allows for bottom tending gear to be used in the flatbottom region (**Figure 4-8**). **Alternative 2** = 490 square miles. Coordinates for **Alternative 2** are found in **Appendix M**, **Table 4**.

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 4-9**). **Alternative 3** = 653 square miles. Coordinates for **Alternative 3** are found in **Appendix M**, **Table 5**.

Preferred Alternative 4. 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. Allow for a Shrimp Fishery Access Area to be used as a gear haul back/drift zone as shown in **Figure 4-10. Preferred Alternative 4** = 490 square miles. Coordinates for **Preferred Alternative 4** are found in **Appendix M**, **Table 6** and **7**.

Comparison of Alternatives

Biological: Under **Alternative 1 (No Action)**, the use of bottom longline, bottom trawl, mid-water trawl, dredge, anchor, pot or trap, anchor and chain and grapple and chain is prohibited within the CHAPCs. **Alternatives 2, 3,** and **Preferred Alternative 4** would extend these prohibitions to the expansion area of the Stetson-Miami Terrace HAPC. Therefore, the larger the expansion of the Stetson-Miami Terrace CHAPC, the greater the biological effects to species in the area.

Alternatives 2 and **3** would be expected to result in moderate 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 a long-term biological loss of deepwater coral habitat as well as the species that utilize this habitat.

Preferred Alternative 4 is similar to **Alternative 2**; however, **Preferred Alternative 4** would also provide royal red shrimp fishermen a zone within which they can haul back gear without drifting into an area where their gear would be prohibited. This haul back zone may encourage fishermen to fish in the area giving a slight negative impact on the royal red populations. However, fishing effort in the area is historically low and the impact is not expected to be large.

None of the alternatives would have any biological impact on dolphin wahoo or coastal migratory pelagic species as the typical gear used for these species do not impact bottom habitat. Fishing for snapper grouper species would be allowed as long as there was no anchoring or use of bottom longline gear. Fishing for snapper grouper species in the proposed expansion areas of the Stetson-Miami Terrace CHAPC is uncommon and no biological impact on those species is expected. The golden crab fishery operates within allowable gear areas, which are not affected by the proposed expansion of the Stetson-Miami Terrace CHAPC.

Economic: The royal red shrimp fishery is known to operate in the proposed Stetson-Miami Terrace CHAPC expansion. Based on the VMS points as a percent of fishing that occurred in the alternative areas, **Action 3** would result in some minor loss of ex-vessel revenue to royal red shrimp fishermen. **Alternative 2** would be expected to result in average annual losses of $1,752. **Alternative 3** would result in expected average annual losses of $557. Like **Alternative 1 (No Action)**, **Preferred Alternative 4**, which would allow for a gear haul back and drift zone, would not be expected to have any direct short-term economic effects **(Table 4-11)**.

Social: **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 **Alternative 2** or **Alternative 3**. Because **Preferred Alternative 4** would also establish the Shrimp Fishery Access Area based on information of fishing grounds of the royal red shrimp vessels, negative impacts on the deepwater shrimp fleets and associated businesses and communities could be reduced or removed. The expected economic impacts under **Alternatives 2** and **3** would likely be avoided with the establishment of the Shrimp Fishery Access Area in **Preferred Alternative 4** (see **Section 4.3.2**), which would also contribute to minimized impacts on the fishermen, businesses, and associated communities.

Administrative: The expansion of the Stetson-Miami Terrace CHAPC (**Alternative 2 – Preferred Alternative 4**) 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 would be needed. Most of the administrative impacts associated with these alternatives relate to at-sea enforcement.

A summary of the effects under **Action 3** is shown in **Table 2-3**.

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

Alternatives	Biological Effects	Socioeconomic/Administrative Effects
Alternative 1 (No Action)	Status Quo.	Status Quo.
Alternative 2	Moderate positive impacts for deepwater corals and species that utilize the habitat.	Slight negative impact on royal red shrimp fishermen due to reduction in fishing area, although the royal red shrimp fishery does not have much of a history in that area.
Alternative 3	Larger positive impact than Alternative 2 and 4 for deepwater corals and species that utilize the habitat.	Slight negative impact on royal red shrimp fishermen due to reduction in fishing area, although the royal red shrimp fishery does not have much of a history in that area.
Preferred Alternative 4	Positive effects for deepwater corals and species that utilize the habitat.	Slight negative impact on royal red shrimp fishermen due to reduction in fishing area, although there would be an allowance for a haul back zone which would give fisherman ability to fish in the area.

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, also found at 50 CFR §622.224(c)(1)(i):

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"

Preferred Alternative 2. Extend the northern boundary to encompass the area identified by the following coordinates (**Figure 4-12**) (**Preferred Alternative 2** = 10 square miles). Coordinates for **Preferred Alternative 2** are found in **Appendix M**, **Table 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'

Comparison of Alternatives

Biological: 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)**, the Cape Lookout CHAPC would not be expanded and there would not be any additional biological benefits. **Preferred Alternative 2** proposes to expand the original Cape Lookout CHAPC along the northern boundary by approximately 10 square miles. All bottom tending gear and activities would be prohibited in the expanded CHAPC; thereby providing biological benefits to deepwater coral ecosystems. The coordinates of the expanded CHAPC have been proposed based on new information of occurrence of deepwater *Lophelia* corals in the area. No other known deepwater corals have been found in the area, thus, the South Atlantic Council did not consider any additional alternatives to be reasonable. **Preferred Alternative 2** would not have any biological impact on dolphin wahoo or coastal migratory pelagic as the typical gear used for these species does not impact bottom habitat. Fishing for snapper grouper species would be allowed as long as there was no anchoring or use of bottom longline gear. The size of the proposed expansion of the Cape Lookout CHAPC in **Preferred Alternative 2** is very small (roughly 10 square miles) and landings data are not available at a fine enough resolution to perform analysis (pers. comm., Nick Farmer, NMFS SERO, July 9, 2013). However, fishing for snapper grouper species in the proposed expansion area is uncommon and little biological impact on those species is expected.

Fishing for deepwater shrimp species does not occur within the proposed area. The golden crab fishery operates within allowable gear areas, which are not affected by the proposed expansion of the Cape Lookout CHAPC.

Economic: Alternative 1 (No Action) would likely have minimal economic effects because this would maintain access to current harvest areas. Because the proposed extension of the Cape Lookout CHAPC under **Preferred Alternative 2** is a relatively small area, the proposed expansion would be expected to have minimal direct negative economic effects particularly on the snapper grouper fleet or other fleets. No information is available on fishing activity specifically in this area. Species from the deepwater snapper grouper complex that tend to prefer this habitat and nearby environments include wreckfish. However, because the affected area is so small and there are other areas nearby where similar fishing activity is allowed, the direct negative economic effects of **Preferred Alternative 2** are expected to be minimal.

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 **Preferred 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. However, because the affected area is so small and there are other areas nearby where similar fishing activity is allowed, the direct negative social effects of **Preferred Alternative 2** are expected to be minimal.

Administrative: The expansion of the Cape Lookout CHAPC (**Preferred 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 would be needed. Most of the administrative impacts associated with these alternatives relate to at-sea enforcement.

A summary of the effects under **Action 4** is shown in **Table 2-4**.

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

Alternatives	Biological Effects	Socioeconomic/Administrative Effects
Alternative 1 (No Action)	Status Quo.	Status Quo.
Preferred Alternative 2	Moderate positive impact on deepwater corals and species, which utilize the habitat.	Minimal economic, social and administrative impacts relative to the status quo.

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 live/hard bottom

- **Biological environment** (Section 3.2)

  Examples include populations of golden tilefish, corals, and 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 varicosa* and *Lophelia pertusa*. Chapter 3 details the biological environment for the species that will be most affected by this amendment.

The actions in this amendment are expected to have an impact on deepwater shrimp fisheries and the snapper grouper fisheries. Other fisheries that may occur in the action area but are not expected to be impacted are the coastal migratory pelagics, dolphin and wahoo, and golden crab. The affected environment for the potentially affected fisheries are described in **Sections 3.1.2** and **3.1.3**. Information on the other fisheries can be found in the Fishery Ecosystem Plan (SAFMC 2009).

3.1.1 Deepwater Coral Reef Habitat

Deepwater coral reefs are common off the southeastern U.S. within the exclusive economic zone (EEZ). These habitats include high-relief, hard bottom 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. 2005b). 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. 2005b). 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 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. 2005b) (described in **Section 3.1.2**).

Categories of deepwater *Oculina* habitats include pinnacles or bioherms, isolated coral thickets on hard bottom, 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 per year; Reed 1981). Standing dead coral is common in each type of habitat (Reed et al. 2005b). Coral thickets can be found on flat sandy bottom habitats and are common on low-relief hard bottom. 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. (2005b) 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 temperature extremes, or from human impacts, e.g., fish and shrimp trawling, scallop dredging, anchoring, bottom longlines, and depth charges (Reed et al. 2005b).

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. 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 Bank 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 Oculina Experimental Closed Area 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 has been observed on the older modules (Brooke et al. 2004).

Much of the *Oculina* habitat has been severely degraded or destroyed since the 1980s. Reed et al. (2005b) 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 (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, 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 2005a). *Lophelia* habitats can occur in small scattered colonies attached to hard bottom 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 2005a).

Reed and Ross (2005a) 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 Pourtalés Terrace. 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. 2005b). The Miami Terrace provides high-relief rocky hard bottom 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 Pourtalés Terrace runs parallel to the Florida Keys and provides extensive, high-relief, hard bottom 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. 2005b). 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 *Lophelia pertusa* habitat within expansion areas under consideration off Jacksonville

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 occurred at this site, but were much more abundant and larger than observed elsewhere. Typical hard bottom 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 hard bottom 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.

3.1.1.4 Habitat characterization of *Lophelia pertusa* habitat within expansion areas under consideration off Cape Lookout

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 hard bottom 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. Ross et al. (2012b) described two museum records of *Lophelia* off Cape Lookout HAPC. 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, then becoming more narrow 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 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 Council's Internet Mapping System website: http://ocean.floridamarine.org/sa_fisheries/.

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

3.1.3 Shrimp Habitat

A description of South Atlantic 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

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.

Coral

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

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

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

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

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

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

Habitat characterization of *Oculina varicosa* habitat within expansion areas under consideration

In 1982, Reed discovered pinnacles (14 to 20 meters; 46 to 66 feet 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 meters (259 to 276 feet). These *Oculina* reefs extend at least 55 km (34 miles) 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, while also having scattered thickets of live *Oculina* (Reed et al. 2005b).

In 2011, Reed gave a presentation to the South Atlantic Council's Coral Advisory Panel on two new areas of high-relief *Oculina* coral mounds and hard bottom 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 (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 and Farrington (2011) characterized these areas as similar habitat to those *Oculina* reefs within the Oculina Bank HAPC with individual mounds that are 15 to 20 meters (49 to 66 feet) in height, a maximum depth of 92 meters (302 feet), and a minimum depth of 64 meters (210 feet) 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 (hard bottom) with 1 to 2 meter (3 to 7 feet) 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 (hard bottom) habitat and coral rubble are also present.

This cruise also documented *Oculina* coral mounds and hard bottom 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 hard bottom habitat that are west of the western Oculina Bank HAPC boundary, primarily between the two satellite areas (Reed et al. 2005b). 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).

Shrimp

For rock shrimp, EFH consists of offshore terrigenous and biogenic sand bottom 59-597 feet (18-182 m) deep with highest concentrations occurring at 112-180 feet (34-55 m). This habitat is found from North Carolina through the Florida Keys. EFH includes the shelf current systems near Cape Canaveral, Florida which provide major transport mechanisms affecting planktonic larval rock shrimp (Bumpus 1973). These currents keep larvae on the Florida Shelf and may transport them inshore in spring. In addition, the Gulf Stream is an EFH because it also provides a mechanism to disperse rock shrimp larvae.

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

Habitat essential to rock shrimp has not been further characterized beyond the above studies. A list of species associated with rock shrimp benthic habitat was compiled from research trawling efforts (1955-1991) that captured harvestable levels of rock shrimp. In addition, Kennedy et al. (1977), during research efforts to sample the major distribution area of rock shrimp off the Florida east coast, compiled a list of crustacean and molluscan taxa associated with rock shrimp benthic habitat.

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

Snapper Grouper

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.

3.1.5 Habitat Areas of Particular Concern

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

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

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

Coral

Existing EFH-HAPCs for coral, coral reefs, and live/hard bottom include: The 10-Fathom Ledge, Big Rock, and The Point (North Carolina); Hurl Rocks and The Charleston Bump (South Carolina); Gray's Reef National Marine Sanctuary (Georgia); The Phragmatopoma (worm reefs) reefs off the central east coast of Florida; Oculina Bank off the east coast of Florida from Ft. Pierce to Cape Canaveral; nearshore (0-4 meters; 0-12 feet) hard bottom off the east coast of Florida from Cape Canaveral to Broward County; offshore (5-30 meters; 15-90 feet) hard bottom off the east coast of Florida from Palm Beach County to Fowey Rocks; Biscayne Bay, Florida; Biscayne National Park, Florida; the Florida Keys National Marine Sanctuary; Cape Lookout CHAPC, Cape Fear CHAPC, Blake Ridge Diapir CHAPC, and Stetson-Miami Terrace CHAPC, and Pourtalés Terrace CHAPC.

Shrimp

No EFH-HAPCs have been identified for rock shrimp; however, deep water habitat (e.g., expanded Oculina Bank HAPC) may serve as nursery habitat and protect the stock by providing a refuge for rock shrimp.

Snapper Grouper

Areas which meet the criteria for 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 HAPC; all hermatypic coral habitats and reefs; manganese outcroppings on the Blake Plateau; and South Atlantic Council-designated Artificial Reef Special Management Zones (SMZs).

Areas that meet the criteria for EFH-HAPCs include habitats required during each life stage (including egg, larval, postlarval, juvenile, and adult stages). In addition to protecting habitat from fishing related degradation though fishery management plan (FMP) regulations, the South Atlantic Council, in cooperation with NMFS, 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.

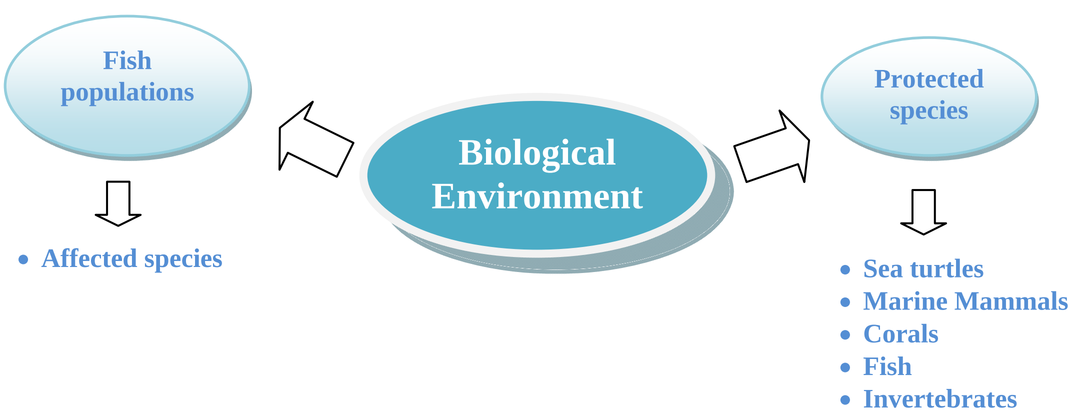


Figure 3-1. Two components of the biological environment described in this amendment.

3.2.1 Fish Populations

The waters off the South Atlantic coast are home to a diverse population of fish. The South Atlantic Council manages the shrimp, coastal migratory pelagics, dolphin wahoo, golden crab, and snapper grouper fisheries within the action area of this amendment.

Although located within the action area, this amendment will not have an impact on coastal migratory pelagics, or dolphin wahoo. Coastal migratory pelagics and dolphin wahoo are not fished with bottom tending gear and so the restrictions proposed by this amendment will not impact those fisheries. Bottom tending gear (traps) is currently used in the golden crab fishery but only within golden crab allowable gear zones and the actions proposed in this amendment do not modify those zones.

The actions in the amendment will directly impact the rock shrimp and royal red fisheries. The snapper grouper fishery may be impacted by this amendment because there is some anchoring and bottom longline activity that occurs in the proposed expanded areas of the Oculina Bank HAPC and the Stetson-Miami Terrace CHAPC. These impacts are discussed in Chapter 4.

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 South Atlantic Council-managed species although the regulations related to bottom tending gear apply to royal red shrimp also. Hence, descriptions of both the rock shrimp and royal red shrimp resource are offered here.

Rock Shrimp

Description and distribution

Rock shrimp, *Sicyonia brevirostris,* are very different in appearance from the three penaeid species (**Figure 3-2**). 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.

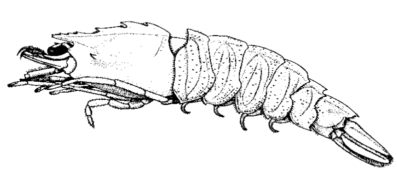


Figure 3-2. Rock shrimp, *Sicyonia brevirostris*.

Recruitment to the area offshore of Cape Canaveral, Florida 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 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. Rock shrimp live mainly on sand bottom from a few meters to 183 m (600 feet), and occasionally deeper (SAFMC 1993a). 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.

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 meters (656 feet) 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 content 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 correspond 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 hard bottom 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, heads on) 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 (MSY) -- 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) -- 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 necessary when the FMP was developed.

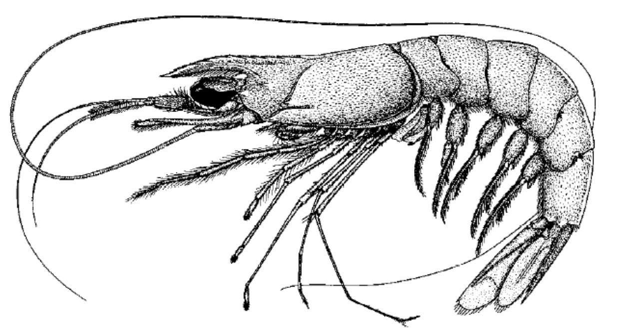


Figure 3-3. Royal red shrimp, *Pleoticus robustus.*
(Perez-Farfante 1969)

Reproduction

Anderson and Lindner (1971), 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 the Florida east coast 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 1969).

Development, growth, and movement patterns

Larvae of this species are unknown, although several developmental stages have been described for the closest related species, *Pleoticus muelleri*, which occurs in much shallower depths off Brazil and Argentina. Anderson and Lindner (1971) collected no shrimp smaller than 55 millimeters (2 inches) TL, and concluded that royal red shrimp do not fully recruit 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 identify trophic relationships.

Abundance and status of stocks
Other than the study by Anderson and Lindner (1971), little fishery-independent information exists on royal red shrimp in the 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 about 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 Snapper Grouper

The snapper grouper fishery management unit currently contains 60 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 co-exist. 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 are not likely to be affected by the actions in this amendment. The areas that will be expanded are not historical fishing grounds for snapper grouper and fishing effort will not be impacted for those species.

3.2.4 Protected Species

There are 44 different species of marine mammals that may occur in the EEZ of the South Atlantic region. 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 (**Table 3-2**). A review of the species' biology, population status, distribution, and on-going threats is provided in **Table 3-2**. 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 (SAFMC 2009) and in the 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.

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 1997, Lutz et al. 2002), and Witherington et al 2012.

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 1974, 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 and Donnelly 1999) 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 preference 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 1,000 meters 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, 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

Smalltooth sawfish in the U.S. historically 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).

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.

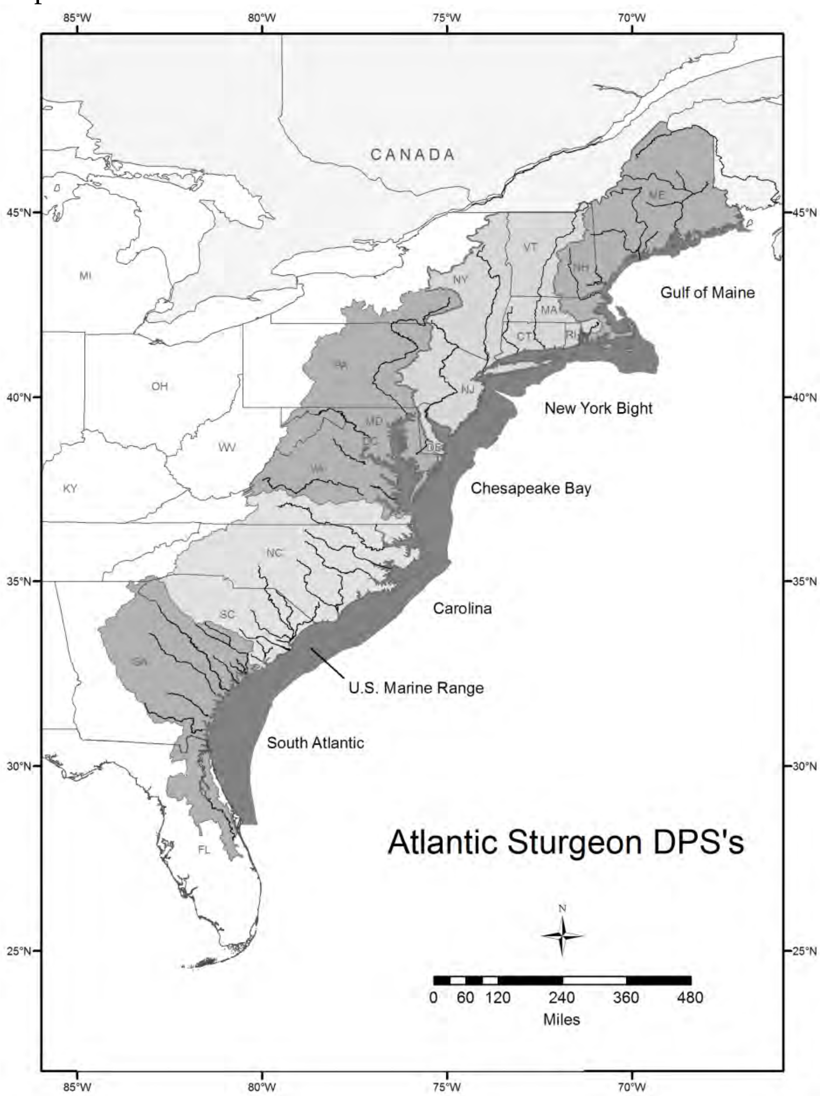


Figure 3-4. Map Depicting the Five DPSs of Atlantic sturgeon.

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

[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)

1985, Collins and Smith 1997, Welsh et al. 2002, Savoy and Pacileo 2003, Stein et al. 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 (Dovel and Berggren 1983, Smith 1985, Collins et al. 2000), 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. 2000, 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. 2000, 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 (Hatin et al. 2002, 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. 2002, 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% 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 and 51%, 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 Atlantic sturgeon's use of 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 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 is 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

NMFS has created a list of Species of Concern as a publicly available list identifying other species of concern. These are species about which NMFS 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. NMFS 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.

<u>List of Marine Species of Concern in the Southeastern United States</u>
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 Description of the Fisheries

3.3.1.2 The Deep Water Shrimp Fisheries

Descriptions of both the royal red shrimp fishery and the rock shrimp fishery are presented below and come primarily from the South Atlantic Council's Comprehensive Ecosystem Based Amendment 1 (SAFMC 2010c) and Shrimp Amendment 9 (SAFMC 2012a). While royal red shrimp are not a South Atlantic Council-managed species, they are targeted by fishermen harvesting rock shrimp in the South Atlantic. The royal red shrimp fishery must comply with the bottom tending gear requirements in the HAPC and CHAPC areas. Moreover, both fisheries are prosecuted in similar manner with the same gear and vessels. Hence, the description of the rock shrimp fishery is also provided to supplement the limited characterization available for the royal red shrimp fishery at this time.

3.3.1.2.1 Description of Fishing Practices, Vessels, and Gear

Royal Red Shrimp
The royal red shrimp fishery had its beginnings as an experimental fishery in 1950 with support from the Bureau of Fisheries, the federal agency that later became NOAA Fisheries Service (NOAA 2004a, NOAA 2004c, Sherman, pers. comm.). The commercial fishery began officially in 1962 in the Gulf of Mexico and off Florida's east coast (NOAA 2004b). Trawl boats were converted from other shrimp fisheries and the fleet grew to 19 boats by the end of the first year

(NOAA 2004b). The New England fishery did not develop until 1995, when an experimental fishery was initiated (Balcom et al. 1996). Royal red shrimp is not a federally managed species in the South Atlantic, although they must comply with HAPC and CHAPC regulations. This species is primarily caught by fishermen targeting rock shrimp (Deepwater Shrimp AP, pers. comm.).

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

The fishery utilizes the same vessels and gear as that used in the rock shrimp fishery. In fact, some rock shrimp fishermen also participate part-time in the royal red shrimp fishery. Off Florida's east coast, as many as 15 vessels once participated in this fishery on a full-time basis. In recent years, only two vessels fished for royal red shrimp full-time in the South Atlantic EEZ (W. Moore, pers. comm.) with 6 total vessels fishing in this season with most also fishing for rock shrimp and penaeid shrimp.

The extreme ocean depths of the east coast royal red shrimp fishery require additional cable, approximately 1.6 kilometers (1 mile) in length (M. Solorzano, pers. comm.), strong winches, and a solidly seaworthy boat due to the risk of capsizing in poor weather conditions (Nicholson and Sherman, pers. comm.). Standard shrimp boats focused on shallow-water penaeid species are not always large enough to fish for royal reds and fish for them less often (Nicholson, pers. comm.). When fishing for royal red shrimp, vessels drag two to four nets at a time that are each 17 meters (55 feet) long (Cajun Steamer 2005, Florida Dept. of Agriculture 2006). Nets are made out of 18 webbing twine, about a sixteenth-of-an-inch in diameter. The breaking strength is 136 kilograms (300 pounds). Unlike the rock shrimp fishery, the royal red shrimp fishery operates 24 hours a-day. A typical royal red shrimp fishing trip lasts 20 days, during which time a vessel may make 65 to 75 trawls (W. Moore, pers. comm.).

<u>Season and Harvest Area</u>

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

Generally, when trawling, a vessel remains within a certain depth and may make several trawls at that depth. Trawling depth in the royal red shrimp fishery off Florida can vary from 305 to 549 meters (1,000-1,800 feet) (off the Florida Keys). Vessels trawl in straight lines with the current and at the same depth at a maximum speed of 2.5 knots.

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

Royal red shrimp have been caught off Texas, Louisiana, Mississippi, Florida, Georgia, and the Carolinas (Moon, pers. comm.; Graham and Loney, pers. comm.). Core areas are located off

Florida and the northeastern Gulf, including specific sites off Mississippi, Tampa, and Pensacola on the Gulf coast of Florida; the east coast of Florida; and Georgia (Sherman, pers. comm.; Moon, pers. comm.).

Rock Shrimp

The only user group exploiting the rock shrimp resource in the South Atlantic region is commercial trawlers. Rock shrimp harvested by commercial vessels is the only one of six species of *Sicyonia* reported for the south Atlantic coast that attains a commercial size (Keiser 1976). The rock shrimp fishery has existed off the east coast of Florida for approximately thirty years once extending from Jacksonville to Cape Canaveral. The relatively recent beginning for this shrimp fishery, compared to other southeast shrimp fisheries, can be attributed to the lack of a viable market for the crustacean once considered "trash." Rock shrimp found a niche in the local fresh market and restaurant trade during the early 1970s, and became a regional delicacy. The increase in participants and market opportunities for smaller rock shrimp brought about a subsequent change in harvesting patterns as the fishing grounds extended south as far as St. Lucie County (SAFMC 1996a). This shift in effort to the south reflected new participation in the fishery as the majority of those harvesting these new areas were from the Gulf region. Limited sporadic harvest has also occurred off Georgia, North Carolina, and South Carolina. A limited access program was established in 2003 for vessels harvesting, in possession of and landing rock shrimp in Georgia and Florida (SAFMC 2002). Expanding markets created growth within the industry that in turn has changed the composition of the rock shrimp fishery including the harvesting and the intermediate sectors (SAFMC 1996a).

<u>Season and Harvest Area</u>

The peak rock shrimping season generally occurs from July through October (SAFMC 2002). Historically, the fishery did not begin until August or September (SAFMC 1996a). To a degree, the amount and timing of effort in the rock shrimp fishery are dependent on the success of the white and brown shrimp fisheries. The fishable grounds are hard sand to shell hash bottoms, which run north and south with a width as narrow as one mile. There was an effort shift to the south of Cape Canaveral which exposed the known concentrations of *Oculina* coral and the Oculina Bank HAPC to bottom trawls. Trawling was prohibited in the HAPC in 1982 as one of the measures under the Coral Fishery Management Plan (GMFMC and SAFMC 1982). In addition, Amendment 1 to the Snapper Grouper Fishery Management Plan prohibited the retention of snapper grouper species caught by roller rig trawls and their use on live/hard bottom habitat north of 28° 35' N. latitude (SAFMC 1988). Furthermore, Amendment 1 to the Shrimp Plan (SAFMC, 1996a) prohibited trawling in the area east of 80° 00' W. longitude between 27° 30' N. latitude and 28° 30' N. latitude shoreward of the 183-meter (600-foot) depth contour. Fishing activity has been concentrated off the Atlantic coast of Florida and particularly near Cape Canaveral (Sea Grant Louisiana 2006). Some sources describe the coast between Jacksonville and St. Lucie Inlet as being of particular importance (Hill 2005).

Since implementation of Comprehensive Ecosystem-Based Amendment 1 (CE-BA 1) (SAFMC 2010c), areas fished within the Coral HAPCs are restricted to Deepwater Shrimp Allowable Fishing Areas. See CE-BA Amendment 1 (SAFMC 2010c) for further details on the regulations that vessels harvesting shrimp must adhere to within the Coral HAPCs.

Vessels and Gear

Data presented in **Tables 3-3** and **3-4** indicate that the rock shrimp fleet, though having some heterogeneity, is fairly homogeneous (i.e., the means of these characteristics are fairly large relative to the standard deviations). The average or typical vessel in this fleet is approximately 20 years old, nearly 73 feet in length, gross tonnage of 132 tons, with a fuel capacity of approximately 16,000 gallons, and a hold capacity of more than 63,000 pounds of shrimp. The average vessel typically uses four nets of an average length between 17 and 18 meters (55-60 feet), and uses between three and four crew on each trip. More than 90% of these vessels are "large" while less than 9% are "small." The vast majority (more than 87%) has on-board freezing capacity and more than two-thirds have steel hulls. The remaining vessels are nearly equally split between fiberglass and wood hulls (SAFMC 2010c).

Table 3-3. Physical Characteristics and Selected Statistics for All Vessels with Limited Access Rock Shrimp Endorsements[2].

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

Table 3-4. Distribution of Additional Physical Characteristics for All Vessels Limited Access Rock Shrimp Endorsements.

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

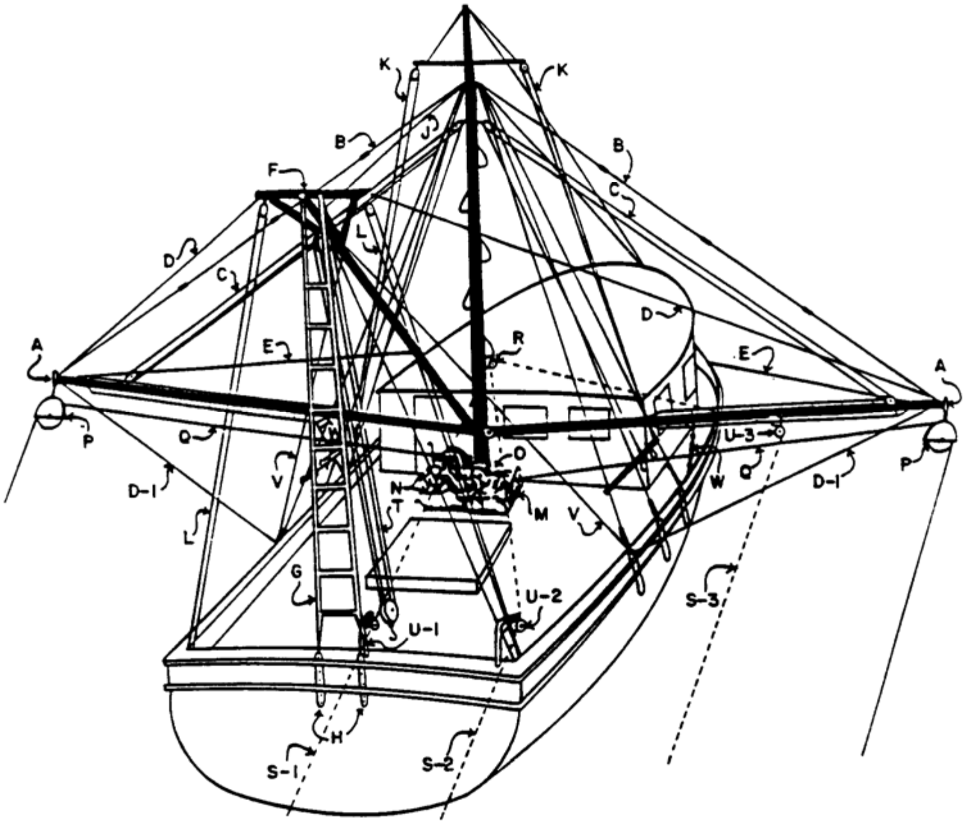
Source: SAFMC 2010c

Compared to vessels with limited access rock shrimp endorsements, vessels with open access rock shrimp permits tend to be somewhat smaller and less powerful on average. Proportionally fewer have steel hulls and a much lower percentage have on-board freezing capacity. Given that vessels with endorsements are a significant subset of vessels with open access permits, this result implies that vessels with open access permits that do not have endorsements are probably quite a

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

bit smaller, less powerful, and less technologically advanced than those that do have endorsements.

The only gear used in the rock shrimp fishery is the trawl (**Figure 3-5**) which consists of: (1) a cone-shaped bag in which the shrimp are gathered into the tail or cod end; (2) wings on each side of the net for herding shrimp into the bag; (3) trawl doors at the extreme end of each wing for holding the wings apart and holding the mouth of the net open; and (4) two lines attached to the trawl doors and fastened to the vessel. A ground line extends from door to door on the bottom of the wings and mouth of the net while a float line is similarly extended at the top of the wings and mouth of the net. A flat net is more often used when fishing for rock shrimp since they burrow into the bottom to escape the trawl. This net has a wider horizontal spread than other designs and is believed more effective (SAFMC 1996a). The minimum mesh size for the cod end of a rock shrimp trawl net in the South Atlantic EEZ off Georgia and Florida is 4.8 centimeters (1-7/8 inches), stretched mesh. This minimum mesh size is required in at least the last 40 meshes forward of the cod end drawstring (tie off strings), and smaller mesh bag liners are not allowed. A vessel that has a trawl net on board that does not meet these specifications may not possess rock shrimp in or from the South Atlantic EEZ off Georgia and Florida.



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

Figure 3-5. Rigged shrimp vessel similar to ones used in the rock shrimp fishery.
Source: SAFMC 1993a.

As of January 11, 2006, on a vessel that fishes for or possesses rock shrimp in the South Atlantic EEZ, each trawl net or try net that is rigged for fishing must have a certified Bycatch Reduction Device (BRD) installed (FR Vol. 70 No. 327, Final Rule implementing Shrimp Amendment 6 (SAFMC 2004)). Turtle Excluder Devices (TEDs) are also required in the rock shrimp fishery.

The tow length varies depending on many factors including the concentration of shrimp. Large boats fishing in offshore waters make much longer drags lasting several hours. Vessels may drag up to 48 to 56 kilometers (30-35 miles) over a number of tows in one night fishing for rock shrimp (SAFMC 1996a).

3.3.1.2.2 Economic Description

Royal Red Shrimp

The description below was compiled from information obtained in Stiles et al. (2007) and from personal communications with South Atlantic Council Deepwater Shrimp AP members and is taken from Comprehensive Ecosystem Based Amendment 1 (SAFMC 2010c) and supplemented with recent trip ticket information.

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

Royal red shrimp occupy a niche market due to their small size, sweet taste, and bright red color. However, the market for royal red shrimp in the South Atlantic is variable because it is difficult to maintain a steady supply of shrimp. Royal red shrimp are often hard to sell because of their red coloration and consumers mistakenly think the shrimp have already been cooked and pass them by (W. Moore, pers. comm.). In 2013, one pound of average size heads-off, shrimp sold for about $3.50 in Florida (M. Merrifield, pers. comm.). The most common sizes are a 10/15 count, heads-on, 21/25 count tail or a 26/30 count tail. There are two fish houses that market royal red shrimp in Florida: Safe Harbor Seafood in Mayport and Wild Ocean Seafood Market in Cape Canaveral. A good catch of royal red shrimp is between 800 and 1,200 pounds; however, poundage varies with the average size of the shrimp (W. Moore, pers. comm.).

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

<u>Annual Landings and Revenue</u>

Table 3-5 and **Figures 3-6** and **3-7** show annual royal red shrimp landings and revenue by state and in aggregate for the period 2000-2012. Reported landings and revenue have not been included in situations where there are fewer than three vessels participating within a year and/or a single state due to confidentiality issues. Only Florida and Georgia reported royal red shrimp landings over the 2000-2012 period and the latter state’s participation was sporadic. In aggregate, annual pounds have fluctuated significantly from year to year but recent years have shown a gradual increase in landings while ex-vessel revenue remained steady. Recent years (2010-2012) show relatively high landings and ex-vessel values with 2012 showing the highest landings (670,000) and second highest ex-vessel revenues (over $1.3 million) since 2000.

Table 3-5. South Atlantic Annual Reported Royal Red Shrimp Landings and Revenue, 2000-2012.

	Florida		Georgia		Total	
Year	Pounds	Ex-Vessel Revenue (2012 Dollars)	Pounds	Ex-Vessel Revenue (2012 Dollars)	Pounds	Ex-Vessel Revenue (2012 Dollars)
2000	568,531	$1,915,551	Confidential		569,123	$1,915,551
2001	226,215	$646,869	0	$0	226,215	$646,869
2002	425,895	$881,285	0	$0	425,895	$881,285
2003	385,072	$716,140	0	$0	385,072	$716,140
2004	105,839	$261,449	0	$0	105,839	$261,449
2005	151,331	$302,087	0	$0	151,331	$302,087
2006	142,193	$321,466	0	$0	142,193	$321,466
2007	489,902	$1,038,892	0	$0	489,902	$1,038,892
2008	253,091	$669,384	0	$0	253,091	$669,384
2009	152,772	$312,308	62,015	$208,875	214,787	$521,183
2010	446,660	$971,213	0	$0	446,660	$971,213
2011	559,018	$902,164	0	$0	559,018	$902,164
2012	670,023	$1,351,628	0	$0	670,023	$1,351,628

Source: Information reported from the Accumulative Landings System data. If there are fewer than three participants in the fishery, landings and revenue information are confidential and those pounds and values are not included in the table.

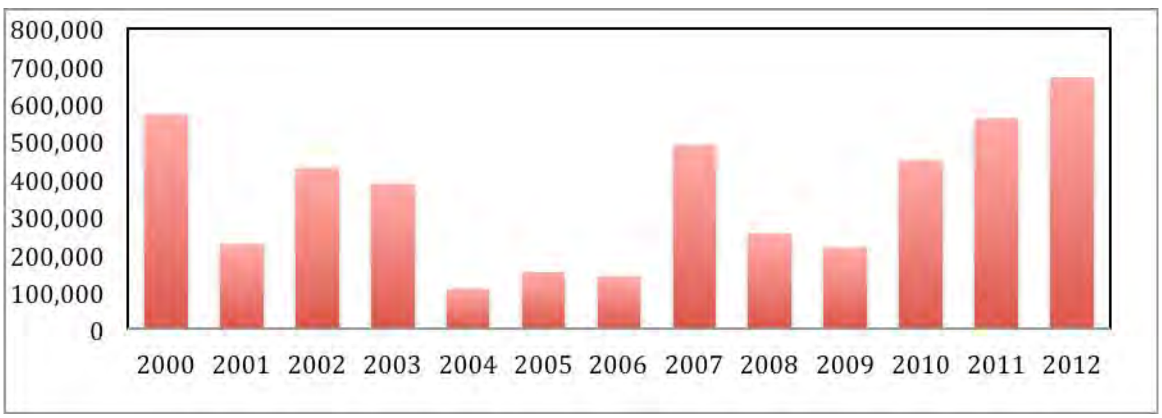


Figure 3-6. South Atlantic Annual Reported Royal Red Shrimp Landings (pounds), 2000-2012. Source: Information reported from the Accumulative Landings System data. If there are fewer than three participants in the fishery, landings and revenue information are confidential and those pounds and values are not included in the table.

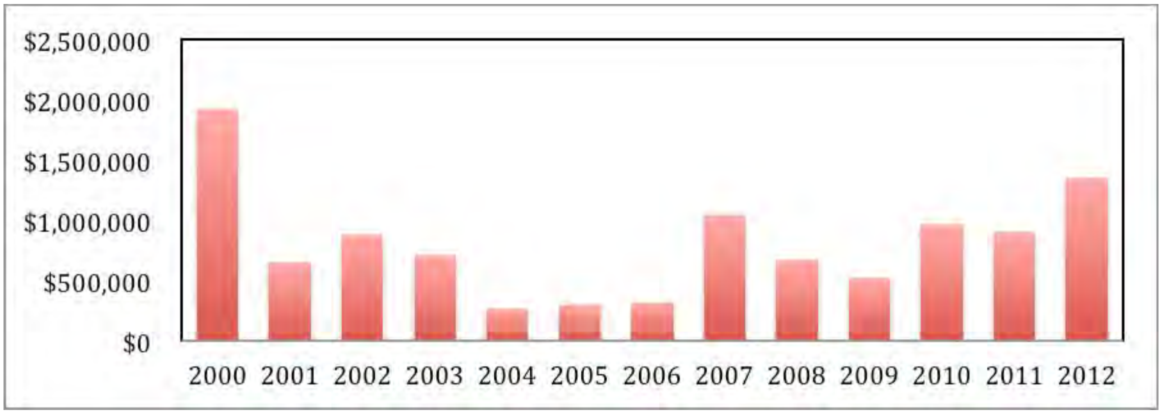


Figure 3-7. South Atlantic Annual Royal Red Shrimp Ex-Vessel Revenue, 2000-2012.
Source: Information reported from the Accumulative Landings System data. If there are fewer than three participants in the fishery, landings and revenue information are confidential and those pounds and values are not included in the table.

Table 3-6 and **Figure 3-8** show annual ex-vessel prices (2012 dollars) received for royal red shrimp over the past twelve years (2000-2012). These average ex-vessel prices differ significantly from the prices currently received by some fishermen such as those mentioned above for Florida. The reasons for this are mixed. Some of the reasons of the differences have to do with variability for different market categories, variability in prices received by region, and likely misreporting.

Although the last three years have shown gradually increasing landings, ex-vessel prices have declined with a slight recovery in 2012.

Table 3-6. Average Annual Ex-Vessel Price Received for South Atlantic Royal Red Shrimp, 2000-2012 (2012 dollars).

Year	Average Ex-Vessel Price (2012 Dollars)
2000	$3.37
2001	$2.86
2002	$2.07
2003	$1.86
2004	$2.47
2005	$2.00
2006	$2.26
2007	$2.12
2008	$2.64
2009	$2.43
2010	$2.17
2011	$1.61
2012	$2.02

Source: Information reported from the Accumulative Landings System data. If there are fewer than three participants in the fishery, landings and revenue information are confidential and those pounds and values are not included in the table.

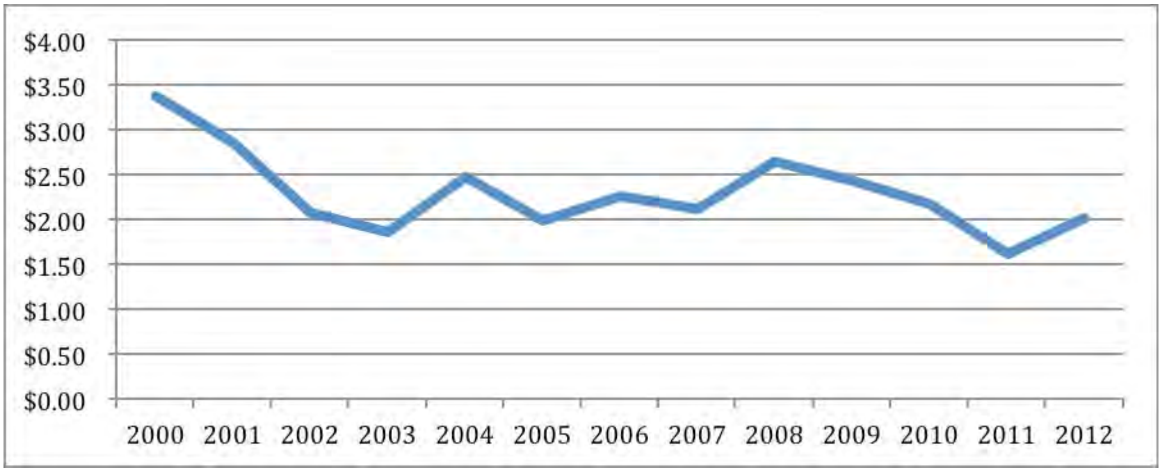


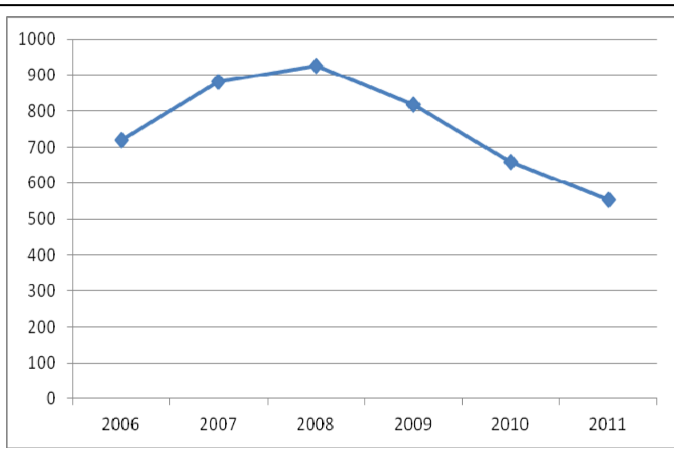
Figure 3-8. Average Annual Ex-Vessel Price Received for South Atlantic Royal Red Shrimp, 2000-2012 (2012 dollars).

<u>Monthly Landings</u>

For confidentiality reasons, monthly revenues and/or ex-vessel prices cannot be displayed.

Rock Shrimp

As Amendments 1 (SAFMC 1996a), 5 (SAFMC 2002), 6 (SAFMC 2004), 7 (SAFMC 2008c), and 9 (SAFMC 2012a) to the South Atlantic Shrimp Fisheries Management Plan (FMP) describe, the South Atlantic rock shrimp fishery is quite volatile, demonstrating significant ups and downs in terms of landings, revenues, and vessel participation from one year to the next. These amendments describe the nature of the fishery from its inception through 2011. The information from these amendments is incorporated herein by reference. The purpose of the information provided in this section is to update this historical information and specifically focuses on the years 2000 through 2011.



Total South Atlantic Shrimp Permits 2006-2011 (SERO 2011)

Figure 3-9. Total number of South Atlantic Shrimp Permits 2006-2011.
Source: SERO 2011

Although it is difficult to ascertain the current condition of the South Atlantic shrimp fishery from secondary data, over the past few years there has been a decline in the number of permits **(Figure 3-9)**. Whether this is due to current market forces or the more general economic downturn that has affected the economy overall is unknown, however, the industry is likely facing difficult times as the economy recovers at a slow pace and it still faces high fuel prices and continuing competition from imports for market share.

<u>Annual Landings and Revenue</u>

Table 3-7 and **Figures 3-10** and **3-11** show annual landings and revenue for rock shrimp from 2000-2012. **Table 3-7** shows annual landings and revenue by state. Although Florida has vessels that participate in the rock shrimp fishery regularly, the other South Atlantic states participate less consistently with North Carolina, South Carolina, and unclassified areas participating sporadically. Georgia had rock shrimp landings reported every year over the 2000-2012 time period except 2004, 2005, and 2010. Florida reports the overwhelming majority of rock shrimp pounds each year with the most recent year showing very low landings preceded by annual landings of 1.3-3.9 million pounds landed 2008-2011. Although higher than last year, these landings were much lower than most of the seven prior years. In 2013, one pound of average size heads-off shrimp sold for about $3.50 in Florida (M. Merrifield, pers. comm.).

Table 3-8 and **Figure 3-12** show average annual ex-vessel prices from 2000-2012. Average ex-vessel prices fell after 2008, gradually recovered and reached a ten-year high in 2012.

Table 3-7. South Atlantic Annual Reported Rock Shrimp Landings and Revenue, 2000-2012.

<table>
<tr><th></th><th colspan="2">Florida</th><th colspan="2">Georgia</th><th colspan="2">North Carolina</th><th colspan="2">South Carolina</th><th colspan="2">Unclassified</th><th colspan="2">Total</th></tr>
<tr><th>Year</th><th>Pounds</th><th>Ex-Vessel Revenue (2012 Dollars)</th><th>Pounds</th><th>Ex-Vessel Revenue (2012 Dollars)</th><th>Pounds</th><th>Ex-Vessel Revenue (2012 Dollars)</th><th>Pounds</th><th>Ex-Vessel Revenue (2012 Dollars)</th><th>Pounds</th><th>Ex-Vessel Revenue (2012 Dollars)</th><th>Pounds</th><th>Ex-Vessel Revenue (2012 Dollars)</th></tr>
<tr><td>2000</td><td>8,115,177</td><td>$14,977,947</td><td>49,741</td><td>$174,650</td><td>0</td><td>$0</td><td colspan="2" rowspan="13">CONFIDENTIAL</td><td>52,761</td><td>$120,910</td><td>8,217,679</td><td>$15,273,507</td></tr>
<tr><td>2001</td><td>5,844,675</td><td>$9,150,602</td><td>66,496</td><td>$185,628</td><td>82</td><td>$160</td><td>0</td><td>$0</td><td>5,911,253</td><td>$9,336,390</td></tr>
<tr><td>2002</td><td>687,573</td><td>$1,469,210</td><td>16,623</td><td>$70,177</td><td colspan="2">CONFIDENTIAL</td><td>0</td><td>$0</td><td>704,196</td><td>$1,539,387</td></tr>
<tr><td>2003</td><td>3,030,272</td><td>$5,025,831</td><td>33,460</td><td>$92,531</td><td>0</td><td>$0</td><td>0</td><td>$0</td><td>3,063,732</td><td>$5,118,362</td></tr>
<tr><td>2004</td><td>6,596,893</td><td>$5,034,159</td><td>0</td><td>$0</td><td colspan="2">CONFIDENTIAL</td><td>0</td><td>$0</td><td>6,596,893</td><td>$5,034,159</td></tr>
<tr><td>2005</td><td>140,840</td><td>$144,210</td><td>0</td><td>$0</td><td>0</td><td>$0</td><td>0</td><td>$0</td><td>140,840</td><td>$144,210</td></tr>
<tr><td>2006</td><td>2,994,709</td><td>$4,418,223</td><td colspan="2" rowspan="3">CONFIDENTIAL</td><td>0</td><td>$0</td><td>0</td><td>$0</td><td>2,994,709</td><td>$4,418,223</td></tr>
<tr><td>2007</td><td>240,577</td><td>$442,456</td><td>0</td><td>$0</td><td>0</td><td>$0</td><td>240,577</td><td>$442,456</td></tr>
<tr><td>2008</td><td>1,857,539</td><td>$3,885,850</td><td colspan="2">CONFIDENTIAL</td><td>0</td><td>$0</td><td>1,857,539</td><td>$3,885,850</td></tr>
<tr><td>2009</td><td>3,917,501</td><td>$2,779,727</td><td>111,928</td><td>$141,595</td><td>0</td><td>$0</td><td>0</td><td>$0</td><td>4,029,429</td><td>$2,921,322</td></tr>
<tr><td>2010</td><td>1,386,645</td><td>$2,003,245</td><td>0</td><td>$0</td><td>0</td><td>$0</td><td>0</td><td>$0</td><td>1,386,645</td><td>$2,003,245</td></tr>
<tr><td>2011</td><td>1,260,401</td><td>$1,672,126</td><td>18,650</td><td>$86,805</td><td>0</td><td>$0</td><td>0</td><td>$0</td><td>1,279,051</td><td>$1,758,931</td></tr>
<tr><td>2012</td><td>233,047</td><td>$500,752</td><td colspan="2">CONFIDENTIAL</td><td>0</td><td>$0</td><td>0</td><td>$0</td><td>233,047</td><td>$500,752</td></tr>
</table>

Source: Information reported from the Accumulative Landings System data. If there are fewer than three participants in the fishery, landings and revenue information are confidential and those pounds and values are not included in the table.

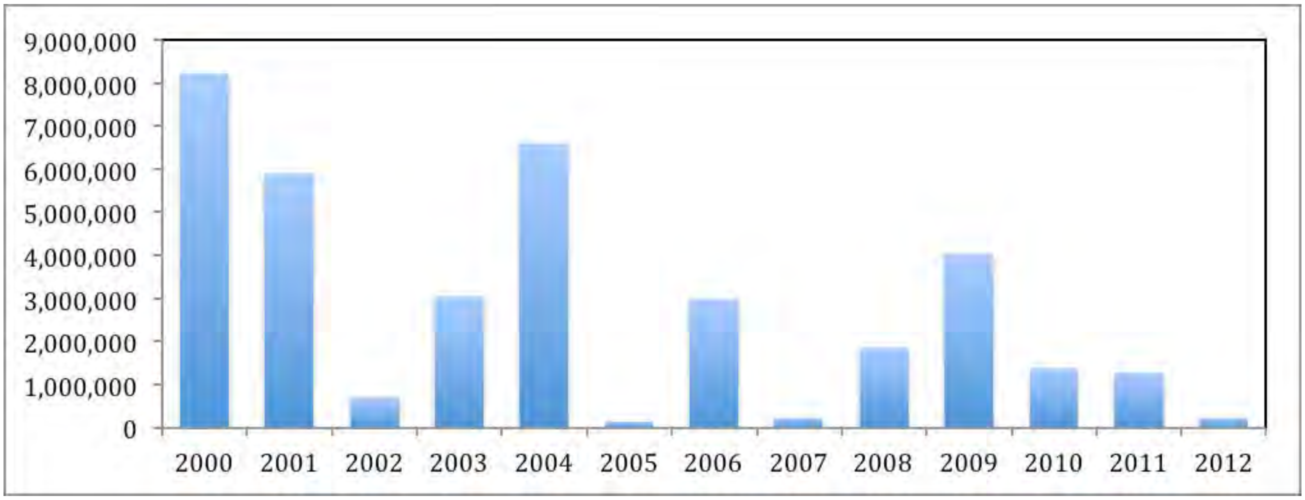


Figure 3-10. South Atlantic Annual Reported Rock Shrimp Landings, 2000-2012.
Source: Information reported from the Accumulative Landings System data. If there are fewer than three participants in the fishery, landings and revenue information are confidential and those pounds and values are not included in the table.

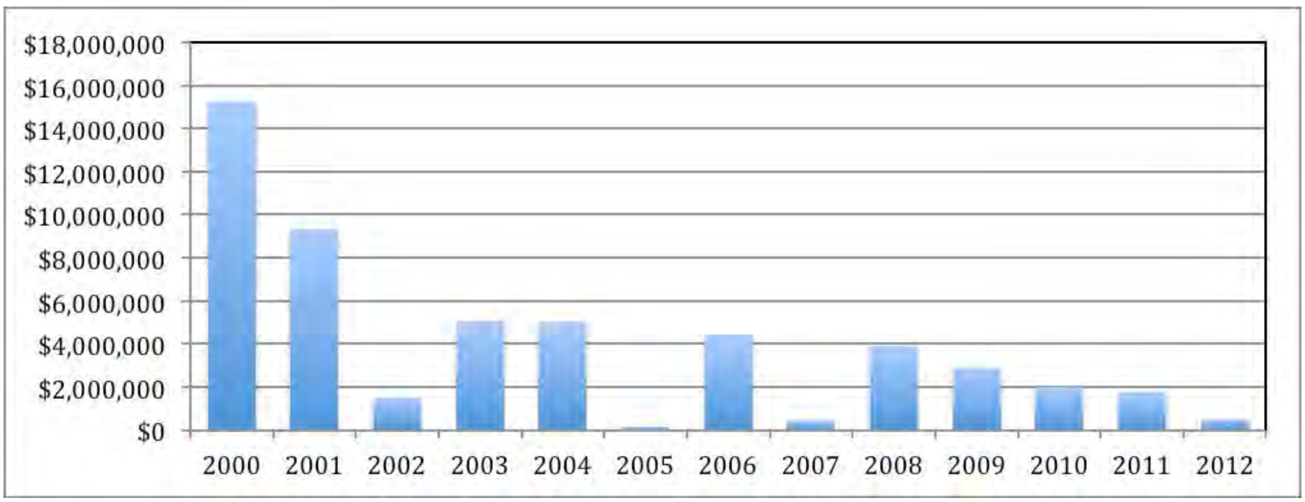


Figure 3-11. South Atlantic Annual Reported Rock Shrimp Ex-Vessel Revenue, 2000-2012.
Source: Information reported from the Accumulative Landings System data. If there are fewer than three participants in the fishery, landings and revenue information are confidential and those pounds and values are not included in the table.

Table 3-8. Average Annual Ex-Vessel Prices Received for South Atlantic Rock Shrimp, 2000-2012 (2012 dollars).

Year	Average Ex-Vessel Price (2012 Dollars)
2000	$1.86
2001	$1.58
2002	$2.19
2003	$1.67
2004	$0.76
2005	$1.02
2006	$1.48
2007	$1.84
2008	$2.09
2009	$0.72
2010	$1.44
2011	$1.38
2012	$2.15

Source: Information reported from the Accumulative Landings System data. If there are fewer than three participants in the fishery, landings and revenue information are confidential and those pounds and values are not included in the table.

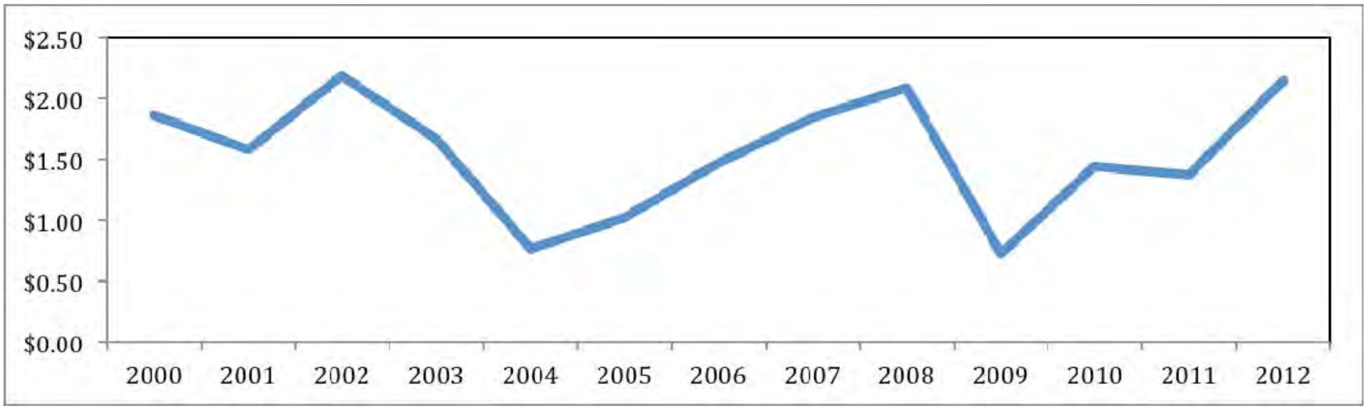


Figure 3-12. Average Annual Ex-Vessel Prices Received for South Atlantic Rock Shrimp, 2000-2012 (2012 dollars).
Source: Information reported from the Accumulative Landings System data. If there are fewer than three participants in the fishery, landings and revenue information are confidential and those pounds and values are not included in the table.

These average ex-vessel prices differ significantly from the prices received by some fisherman such as those mentioned above for Florida. The reasons for this are mixed. Some of the reasons have to do with variability for different market categories, variability in prices received by region, and likely misreporting.

<u>Monthly Landings</u>

Table 3-9 and **Figure 3-13** show monthly rock shrimp landings for 2008-2012. The majority of landings occur in the latter part of the year.

Table 3-9. South Atlantic Monthly Reported Rock Shrimp Landings, 2008-2012.

	Month												
Year	1	2	3	4	5	6	7	8	9	10	11	12	Total
2008	0	0	0	0	0	88,605	327,204	518,588	596,148	188,832	121,578	13,183	1,854,138
2009	0	0	27,021	0	0	0	1,495,100	769,675	725,467	300,425	499,617	113,333	3,930,638
2010	0	0	2,509	0	0	0	0	0	0	63,108	964,769	318,012	1,348,398
2011	8,410	0	0	0	0	0	85,022	80,947	599,770	329,934	102,874	0	1,206,957
2012	0	0	0	0	0	0	0	0	122,631	67,404	21,368	0	211,403

Note: Information reported from the Accumulative Landings System (ALS) data. If there are fewer than three participants in the fishery, landings and revenue information are confidential and those pounds and values are not included in the table.

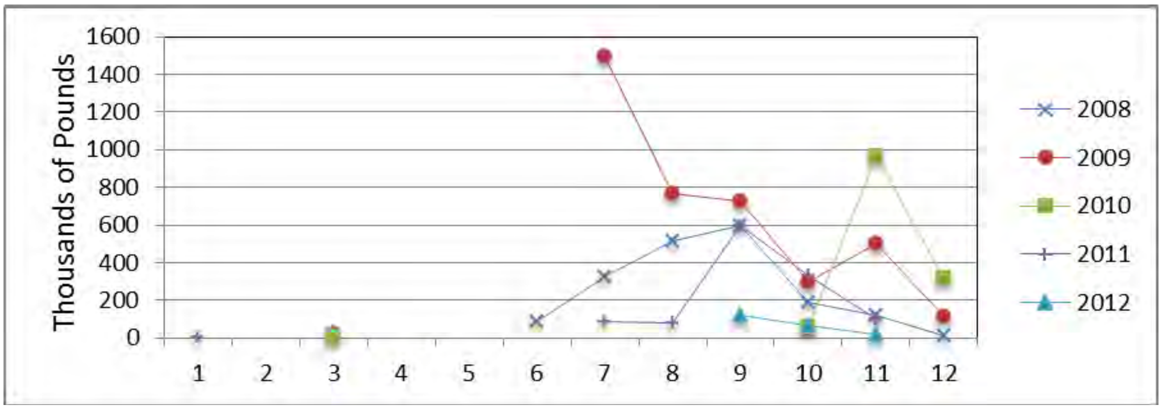


Figure 3-13. South Atlantic Monthly Reported Rock Shrimp Landings (pounds), 2008-2012. Source: Information reported from the Accumulative Landings System data. If there are fewer than three participants in the fishery, landings and revenue information are confidential and those pounds and values are not included in the table.

3.3.1.3 Snapper Grouper Fishery

A description of the commercial sector of the snapper grouper fishery is contained in Amendment 13C (SAFMC 2006), Amendment 15A (SAFMC 2008a), Amendment 15B (SAFMC 2008b), Amendment 17A (SAFMC 2010a), Amendment 17B (SAFMC 2010b), Regulatory Amendment 9 (SAFMC 2011a), Regulatory Amendment 10 (SAFMC 2010c), and the Comprehensive Annual Catch Limit (ACL) Amendment (SAFMC 2011c) and is incorporated herein by reference.

A description of the gag, red grouper, scamp, and/or shallow water grouper component of the snapper grouper fishery is contained in Amendment 17B (SAFMC 2010b), Regulatory Amendment 9 (SAFMC 2011a), Comprehensive ACL Amendment (SAFMC 2011c), Amendment 24 (SAFMC 2011d), and most recently, Regulatory Amendment 13 (SAFMC 2013a) and is incorporated herein by reference.

A description of the blueline tilefish, snowy grouper, yellowedge grouper, silk snapper, and/or deep water snapper grouper component of the snapper grouper fishery is contained in Amendment 17B (SAFMC 2010b), the Comprehensive ACL Amendment (SAFMC 2011c), Amendment 18B (2012b), and most recently, Regulatory Amendment 11 (SAFMC 2011b) and is incorporated herein by reference.

Descriptions of greater amberjack, red porgy, and/or vermilion snapper are included in Amendment 13C (SAFMC, 2006), Amendment 15A (SAFMC, 2008a), Amendment 16 (2009), Amendment 17B (2010b), and the Comprehensive ACL Amendment (SAFMC 2011c). Regulatory Amendment 13 (SAFMC, 2013a) contains the most recent economic information for vermilion snapper and greater amberjack. Draft Regulatory Amendment 18 (SAFMC, 2013b) contains the most recent economic information for red porgy.

Snapper Grouper Amendment 17A (SAFMC 2010a) reported average annual commercial landings of all snapper grouper species in the South Atlantic from 2003-2007 of approximately 6.43 mp with an ex-vessel value of approximately $14.98 million. The corresponding average figures for 2008-2011 are 5.03 mp valued at $13.66 million. The resulting most recent five-year average (2007-2011) landings totals are approximately 5.33 mp valued at $14.28 million in 2011 dollars, or $13.66 million in 2008 dollars.

All landings (all trips and all species) by all vessels landing snapper grouper averaged approximately 11.24 mp valued at $24.74 million over 2003-2007 (SAFMC 2010a, with some corrections based on the most recent logbook data). Comparable average figures for 2008-2011 are 12.21 mp valued at $23.86 million. The most recent five year average (2007-2011) landings is 12.21 mp valued at $24.35 million.

From 2003 through 2007, an average of 890 commercial vessels per year harvested snapper grouper species and took an annual average of 14,665 trips. The corresponding figures for 2007 through 2011 are 865 vessels and 14,271 trips. For 2007 through 2011, average annual gross revenue per vessel in the snapper grouper fishery was approximately $28,150.

From 2003 through 2007, the largest portion of snapper grouper harvests was landed in Georgia and Florida (Georgia landings are combined with Florida for confidentiality considerations), or approximately 46%, followed by North Carolina (28%), and South Carolina (25%). This relative distribution of snapper grouper landings and revenue by state has largely remained the same for 2008-2011: Florida/Georgia accounted for 52% of landings and 47% of revenue, North Carolina for 28% of landings and 27% or revenue, and South Carolina for 20% of landings and 26% of revenue.

From 2003 through 2007, snapper grouper landings were mostly caught by hook-and-line (81%), with longline accounting for 6% of landings and other gear types at 13%. This relative distribution of landings by gear type remained the same for 2008-2011, although the share of hook-and-line fell slightly to 79% and the longline share slightly increased to 9%.

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 are described in the sections below and previous amendments with detailed descriptions of the 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.

Although fishing for dolphin-wahoo and coastal migratory pelagic species may occur in areas that could be impacted by the proposed actions of this amendment, fishermen for these species should not be impacted by the actions in this amendment.

This amendment includes proposed changes for the 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 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 commercial and/or recreational working waterfronts. The rapid disappearance of these types of waterfronts has important implications for 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 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** 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 in 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

Some historical fishing areas or anchoring areas for snapper grouper could be impacted by the proposed actions in this amendment. 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 3-14 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 3-14** were those with Pounds RQ larger than 3%. 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, North Carolina, or golden tilefish in Port Orange, Florida.

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

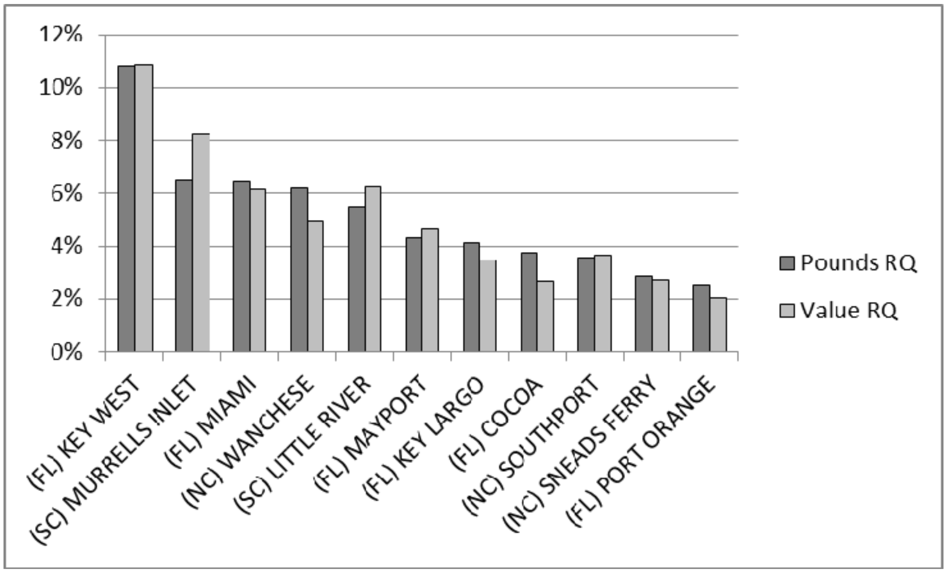


Figure 3-14. The top eleven South Atlantic communities ranked by Pounds and Value Regional Quotient (RQ) of Snapper Grouper species. Only communities with Pounds RQ larger than 3% were included.
Source: ALS 2010

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 3-10**). 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 3-10. 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**

Source: SERO Permits Office (2012)

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 **Figures S-4, S-6,** and **S-9** for deepwater shrimp VMS points). Transit areas for these deepwater shrimp fisheries might also be impacted by actions in this amendment. In addition, some shrimp vessels may need to upgrade their VMS units (to maintain a ping rate that is acceptable by law enforcement while transiting through the HAPC) to comply with actions in this amendment. A detailed description of these fisheries is included in the CE-BA 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 although they must comply with the bottom tending gear requirements.

Rock shrimp and royal red shrimp fishermen use the same vessels and gear (the fishing practices, vessels, and gear for rock shrimp and royal red shrimp are described in detail in **Section 3.3.1.2.1**). Royal red shrimp are primarily caught by fishermen targeting rock shrimp. **Table 3-11** and **Table 3-12** 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 3-11. 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

Source: ALS 2011

For rock shrimp, the communities with the highest amount of landings are located in Florida in Brevard and Duval Counties (**Table 3-11**). The top four communities of Titusville, Mayport, Jacksonville, and Cocoa Beach made up approximately 95% of rock shrimp landings in 2011. As seen in **Figure 3-15**, fishing communities with the majority of South Atlantic rock shrimp permits are not confined to 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 done 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 located in North Carolina (59 permits) and Florida (54 permits).

Table 3-12. 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

Source: ALS 2011

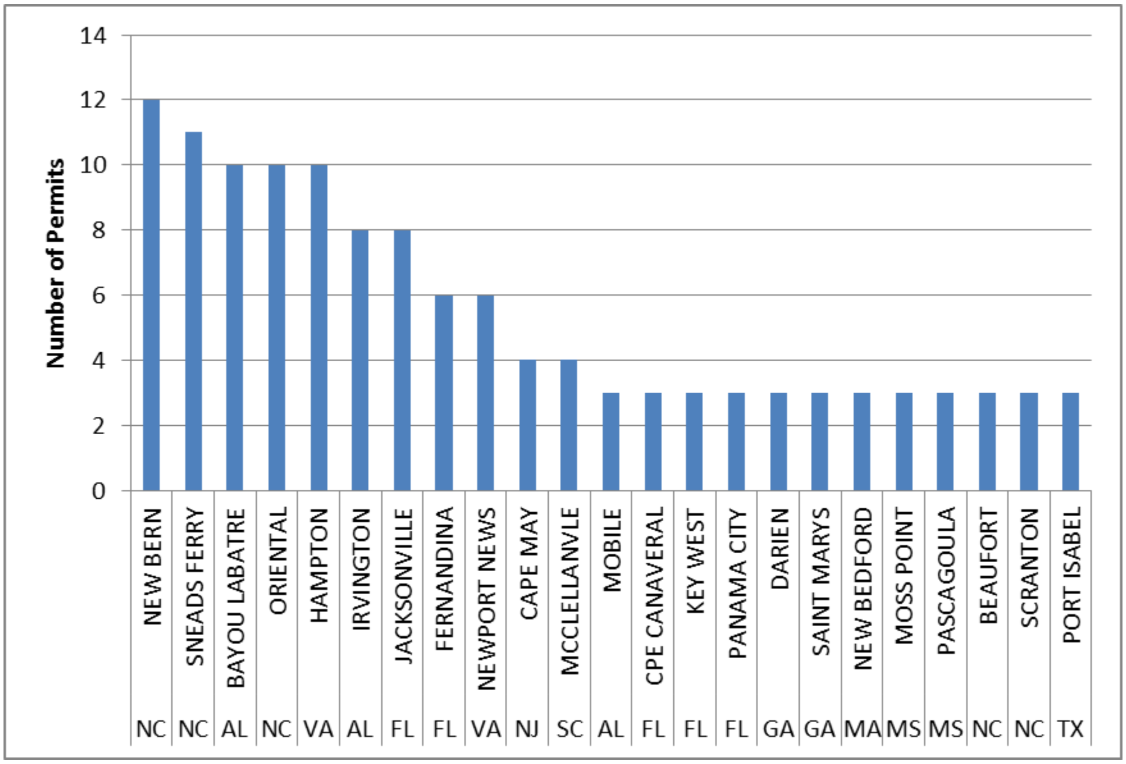


Figure 3-15. Top fishing communities with South Atlantic rock shrimp permits. Only communities with three or more permits were included.
Source: SERO FOIA, permit list as of November 7, 2012.

For royal red shrimp, four South Atlantic communities along the east coast of Florida received commercial landings in the year 2011 **(Table 3-12)**. 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 3-16)**. 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 Council.

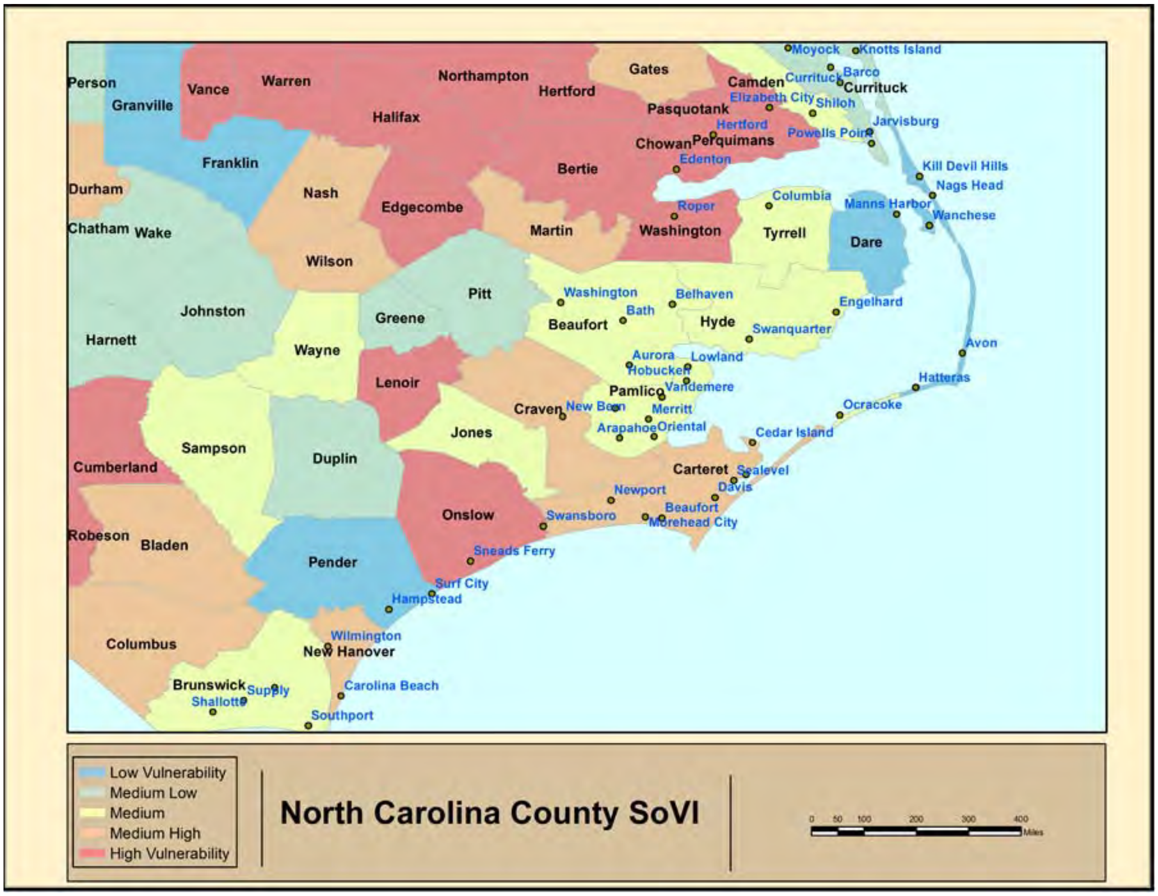


Figure 3-16. The Social Vulnerability Index applied to North Carolina Coastal Counties**.**

Commercial Fishing

There has been a steady decline in the number of federal commercial permits in North Carolina. In 2012, there were 1,194 permits to fish commercial species **(Table 3-13)**. 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 3-13. 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.
Source: SERO Permits Office (2012)

Most dealer permits are associated with Carteret, Dare, and New Hanover Counties (**Table 3-14**). Almost all of the dealer permits are snapper grouper and dolphin-wahoo permits.

Table 3-14. 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.
Source: SERO Permits Office (2012)

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 3-15)**.

Table 3-15. 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 3-16)**. 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 3-16. 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.
Source: SERO Permits Office (2012)

3.4.5 South Carolina

Coastal South Carolina had no counties that were either medium or highly vulnerable (**Figure 3-17**). 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 is important.

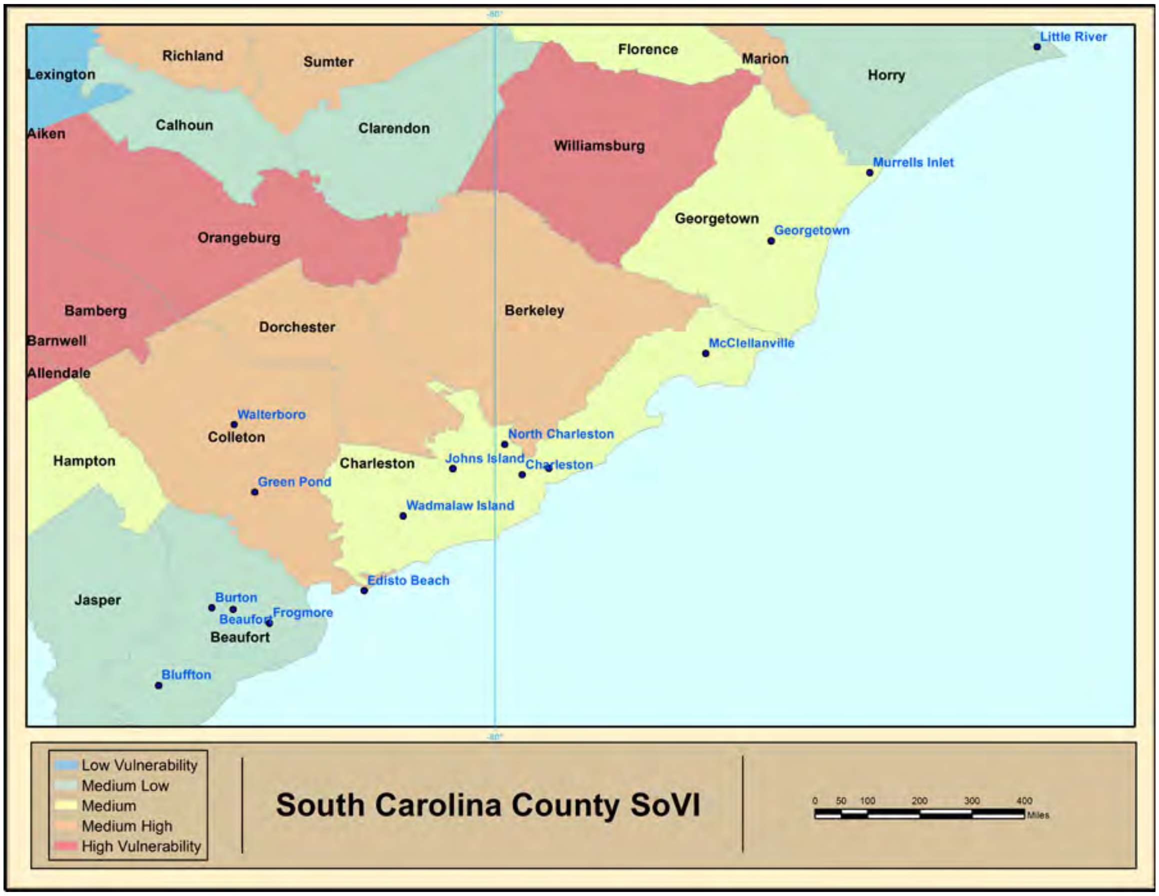


Figure 3-17. The Social Vulnerability Index applied to South Carolina Coastal Counties.

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 3-17(a) and Table 3-17(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 3-17(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**

Source: SERO Permits Office (2012)

Table 3-17(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.
Source: SERO Permits Office (2012)

There are 27 dealer permits registered to South Carolina coastal counties **(Table 3-18)**. Most are in Charleston County. There are no federal dealer permits in Beaufort or Berkeley Counties.

Table 3-18. 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.
Source: SERO Permits Office (2012)

Recreational Fishing

Many areas that were 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 3-19)**. It is common for charter vessels to have all three federal charter permits.

Table 3-19. 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.
Source: SERO Permits Office (2012)

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 3-20)**.

Table 3-20. 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

There were two counties in Georgia with medium high vulnerability and those were Liberty and Chatham **(Figure 3-18)**. The fishing communities located in those counties are Savannah, Thunderbolt, Tybee Island, and Skidaway Island in Chatham County, and Midway in Liberty County.

Overview

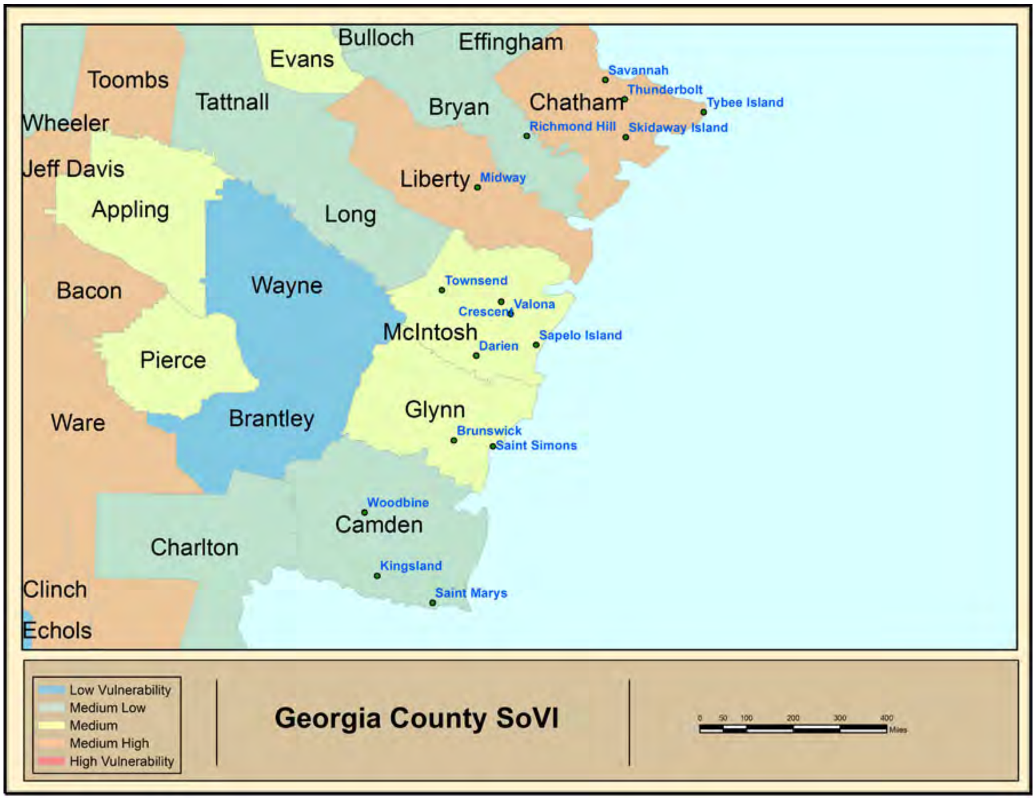


Figure 3-18. The Social Vulnerability Index applied to Georgia Coastal Counties.

Commercial Fishing

Overall, Georgia has fewer permits than other states. McIntosh County has the most permits **(Table 3-21)**. Many Georgia fishermen target shrimp or hold state commercial fishing permits.

Table 3-21. 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.
Source: SERO Permits Office (2012)

There are only seven federal dealer permits associated with Georgia coastal communities, and only in Glynn and McIntosh County **(Table 3-22)**.

Table 3-22. 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.
Source: SERO Permits Office (2012)

Recreational Fishing

Most federal charter permits are associated with Chatham and Glynn County **(Table 3-23)**. 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 3-24)** 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 3-23. 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.
Source: SERO Permits Office (2012)

Table 3-24. 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

A good portion of Florida's east coast **(Figure 3-19)** 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, Florida.

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

Figure 3-19. The Social Vulnerability Index applied to South Atlantic Florida Counties.

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 Florida 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 3-25(a)** and **Table 3-25(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. 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 3-25(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**

Source: SERO Permits Office (2012)

Table 3-25(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.
Source: SERO Permits Office (2012)

Florida is the only state that has permit holders for all federal dealer permits. Most dealers are associated with Monroe, Miami-Dade, and Broward Counties **(Table 3-26)**.

Table 3-26. 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.
Source: SERO Permits Office (2012)

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 3-27)**, but there are at least 20 permits in each coastal county.

Table 3-27. 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.
Source: SERO Permits Office (2012)

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 2011).

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 were used. Estimates of the state minority and poverty rates, associated thresholds, and community rates are provided in **Table 3-28**; note that only communities exceeding 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 3-28. Environmental Justice thresholds 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
	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.

Source: U.S. Census Data 2010

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 possible need to upgrade some VMS units in order to be able to ping at a more frequent rate), 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) provided 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 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 NMFS.

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 South Atlantic Council Committees have full voting rights at the Committee level but not at the full South Atlantic Council level. South Atlantic Council members serve three-year terms and are recommended by State Governors and appointed by the Secretary 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 legal and 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 South Atlantic Council level is to ensure state participation in Federal fishery management decision-making and to promote the development of compatible regulations in state and Federal waters.

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

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

3.5.1.3 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.

The NOAA Office of General Counsel Penalty Policy and Penalty Schedules can be found at www.gc.noaa.gov/enforce-office3.html.

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 close to the 70 meter and 100 meter depth contour lines, respectively, while annexing hard bottom features, as represented in the simplified polygon **(Figures 4-1** and **4-2)**. **Sub-Alternative 2a** = 329 square miles. Coordinates for **Sub-Alternative 2a** are found in **Appendix M**, **Table 1**.
>
> **Preferred Sub-Alternative 2b.** Modify the Oculina Bank HAPC to move the northern boundary to 29° 43.5’ N. The western boundary would follow close to the 70 meter contour while annexing hard bottom features with two coordinates replaced in the southern portion of the boundary to reduce rock shrimp fishing tracks impacted. The eastern boundary line of the proposed Oculina Bank HAPC northern extension identified in **Sub-Alternative 2a** would be shifted west to further reduce rock shrimp fishing tracks impacted. The alternative is represented in the simplified polygons **Figures 4-3** and **4-4**. **Preferred Sub-Alternative 2b** = 267 square miles. Coordinates for **Preferred Sub-Alternative 2b** are found in **Appendix M**, **Table 2**.

Preferred 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 **(Figures 4-5** and **4-6)**. **Preferred Alternative 3** = 76 square miles. Coordinates for **Preferred Alternative 3** are found in **Appendix M**, **Table 3**.

<u>Background</u>

Recommendations for boundary modifications to the Coral Habitat Areas of Particular Concern (CHAPCs) were brought forward by the South Atlantic Fishery Management Council’s (South Atlantic Council) Coral Advisory Panel (AP) in October 2011. Reed and Farrington (2011) and Reed et al. (in press) show that NOAA regional charts are accurate in depicting high-relief features off eastern and southern Florida. Reed and Farrington (2011) (**Appendix J**) used these charts to select areas to be further mapped with higher resolution multibeam sonar and then ground-truthed with video/photo surveys with manned submersibles or remotely operated vehicle (ROV). The bathymetric charts were employed by the Coral AP to identify where coral mounds are likely to occur, and areas that should be protected through an expansion of the existing HAPC.

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 associated 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, Florida (off Daytona, Florida and Titusville, Florida areas) to further map with high resolution multibeam sonar and ground-truth with a 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 South Atlantic Council for consideration of a northern and western expansion of the Oculina Bank HAPC.

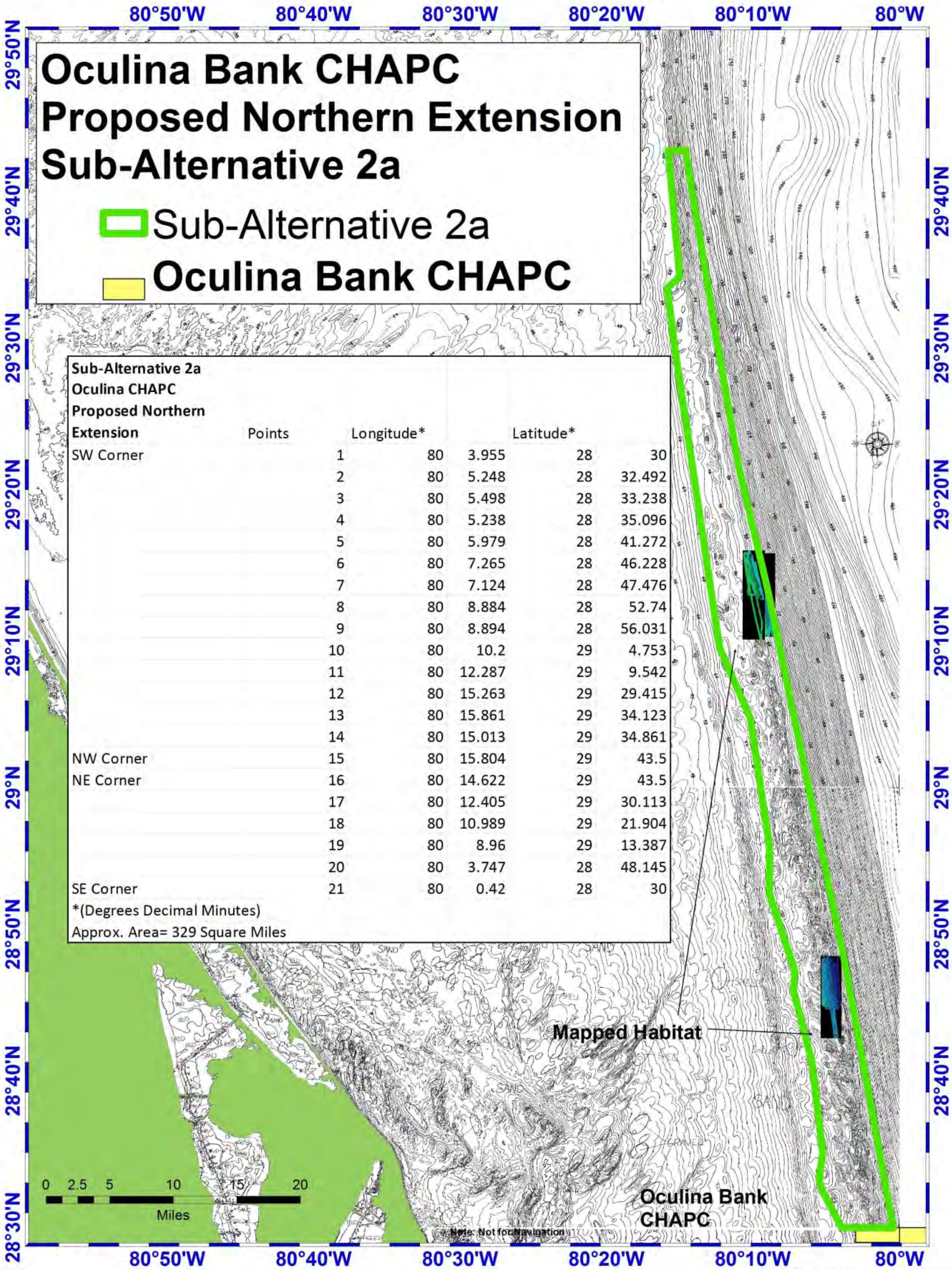
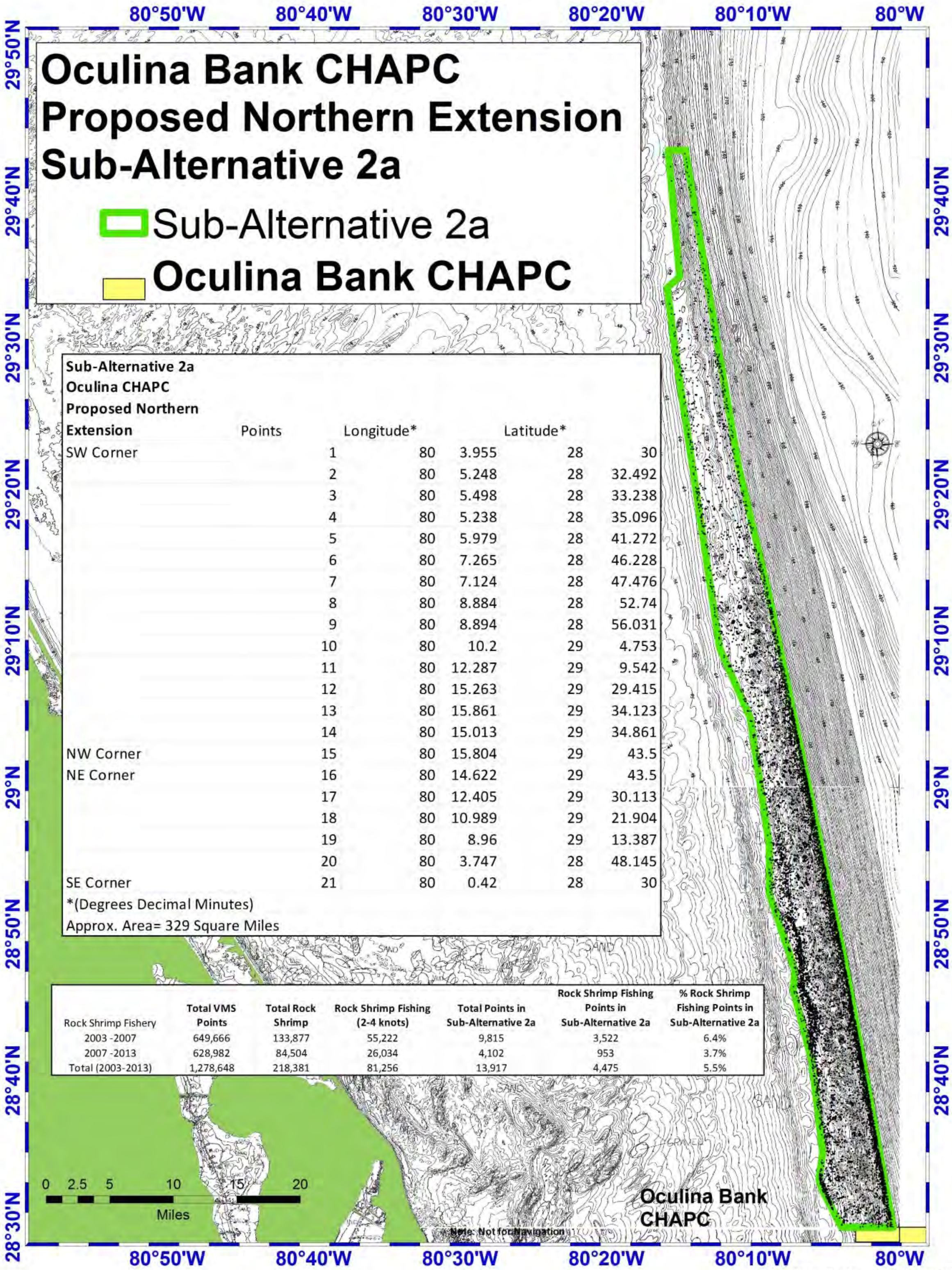


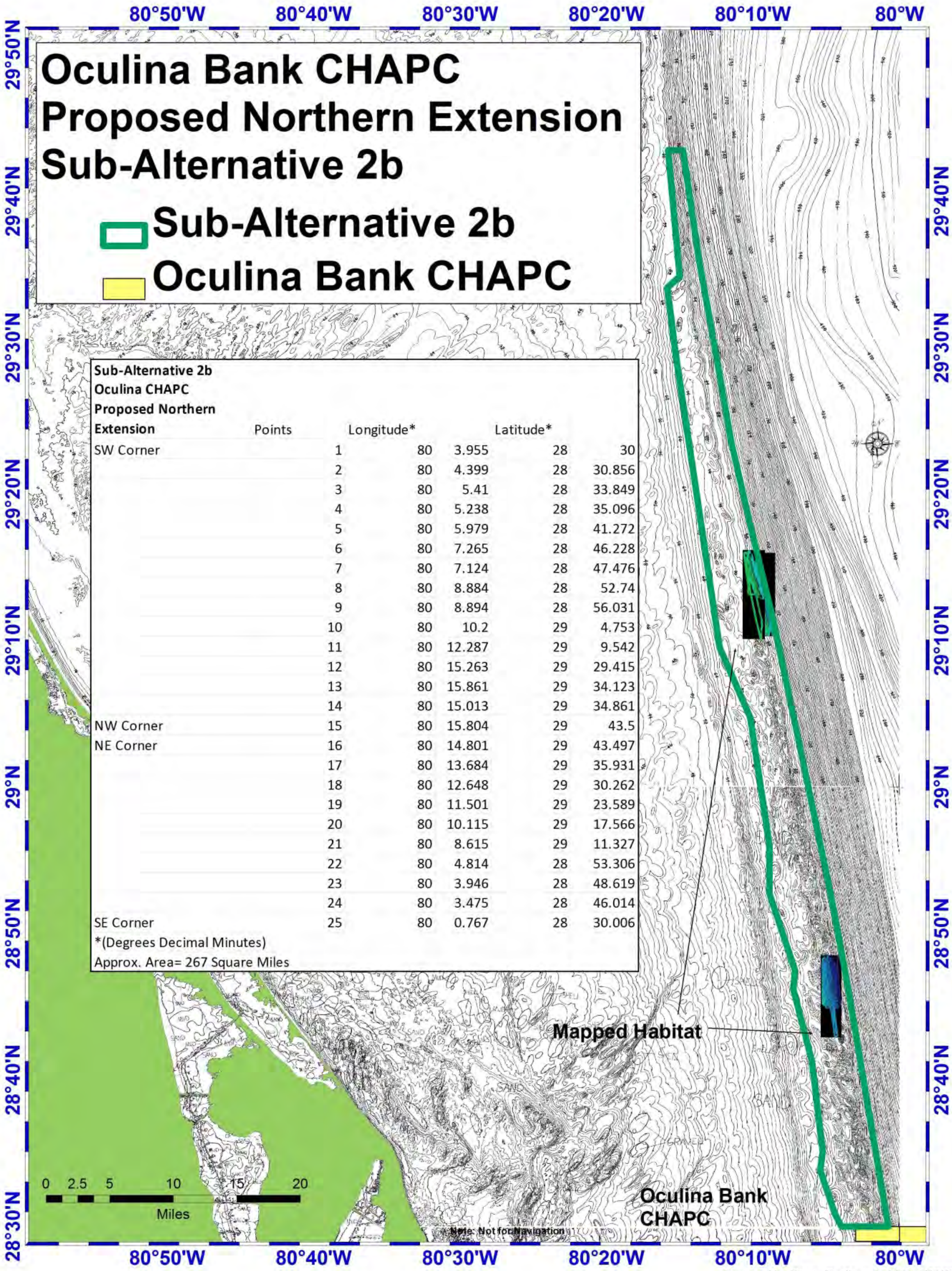
Figure 4-1. Action 1, Sub-Alternative 2a. Oculina Bank HAPC Proposed Northern Extension and Associated Habitat Mapping and Bathymetry.



Sub-Alternative 2a 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					

Rock Shrimp Fishery	Total VMS Points	Total Rock Shrimp	Rock Shrimp Fishing (2-4 knots)	Total Points in Sub-Alternative 2a	Rock Shrimp Fishing Points in Sub-Alternative 2a	% Rock Shrimp Fishing Points in Sub-Alternative 2a
2003 -2007	649,666	133,877	55,222	9,815	3,522	6.4%
2007 -2013	628,982	84,504	26,034	4,102	953	3.7%
Total (2003-2013)	1,278,648	218,381	81,256	13,917	4,475	5.5%

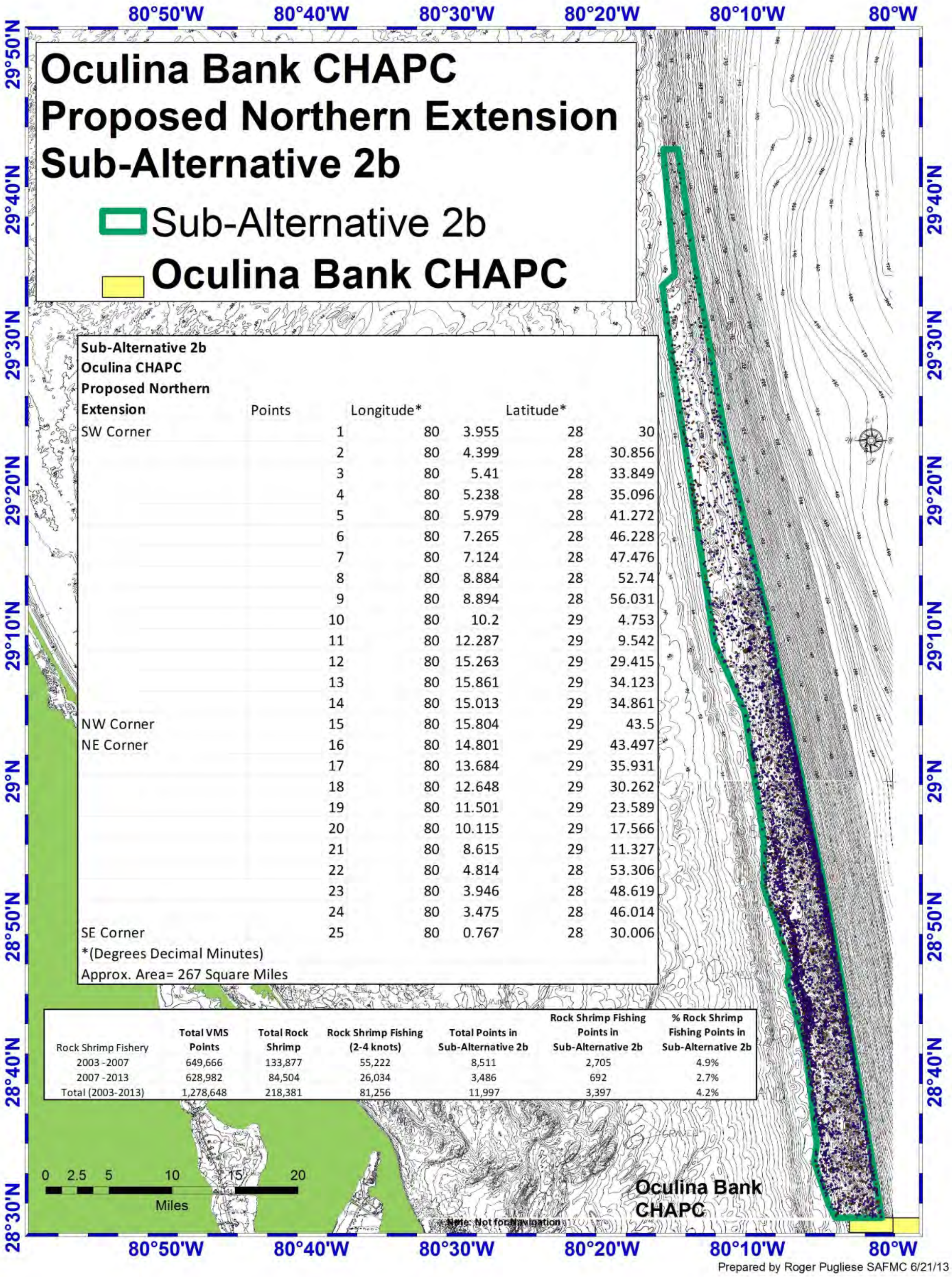
Figure 4-2. Action 1, Sub-Alternative 2a. Oculina Bank HAPC Proposed Northern Extension and VMS (2003-2013).



Sub-Alternative 2b Oculina CHAPC Proposed Northern Extension	Points	Longitude*		Latitude*	
SW Corner	1	80	3.955	28	30
	2	80	4.399	28	30.856
	3	80	5.41	28	33.849
	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	14.801	29	43.497
	17	80	13.684	29	35.931
	18	80	12.648	29	30.262
	19	80	11.501	29	23.589
	20	80	10.115	29	17.566
	21	80	8.615	29	11.327
	22	80	4.814	28	53.306
	23	80	3.946	28	48.619
	24	80	3.475	28	46.014
SE Corner	25	80	0.767	28	30.006

*(Degrees Decimal Minutes)
Approx. Area= 267 Square Miles

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



Sub-Alternative 2b Oculina CHAPC Proposed Northern Extension	Points	Longitude*		Latitude*	
SW Corner	1	80	3.955	28	30
	2	80	4.399	28	30.856
	3	80	5.41	28	33.849
	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	14.801	29	43.497
	17	80	13.684	29	35.931
	18	80	12.648	29	30.262
	19	80	11.501	29	23.589
	20	80	10.115	29	17.566
	21	80	8.615	29	11.327
	22	80	4.814	28	53.306
	23	80	3.946	28	48.619
	24	80	3.475	28	46.014
SE Corner	25	80	0.767	28	30.006

*(Degrees Decimal Minutes)

Approx. Area= 267 Square Miles

Rock Shrimp Fishery	Total VMS Points	Total Rock Shrimp	Rock Shrimp Fishing (2-4 knots)	Total Points in Sub-Alternative 2b	Rock Shrimp Fishing Points in Sub-Alternative 2b	% Rock Shrimp Fishing Points in Sub-Alternative 2b
2003 -2007	649,666	133,877	55,222	8,511	2,705	4.9%
2007 -2013	628,982	84,504	26,034	3,486	692	2.7%
Total (2003-2013)	1,278,648	218,381	81,256	11,997	3,397	4.2%

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

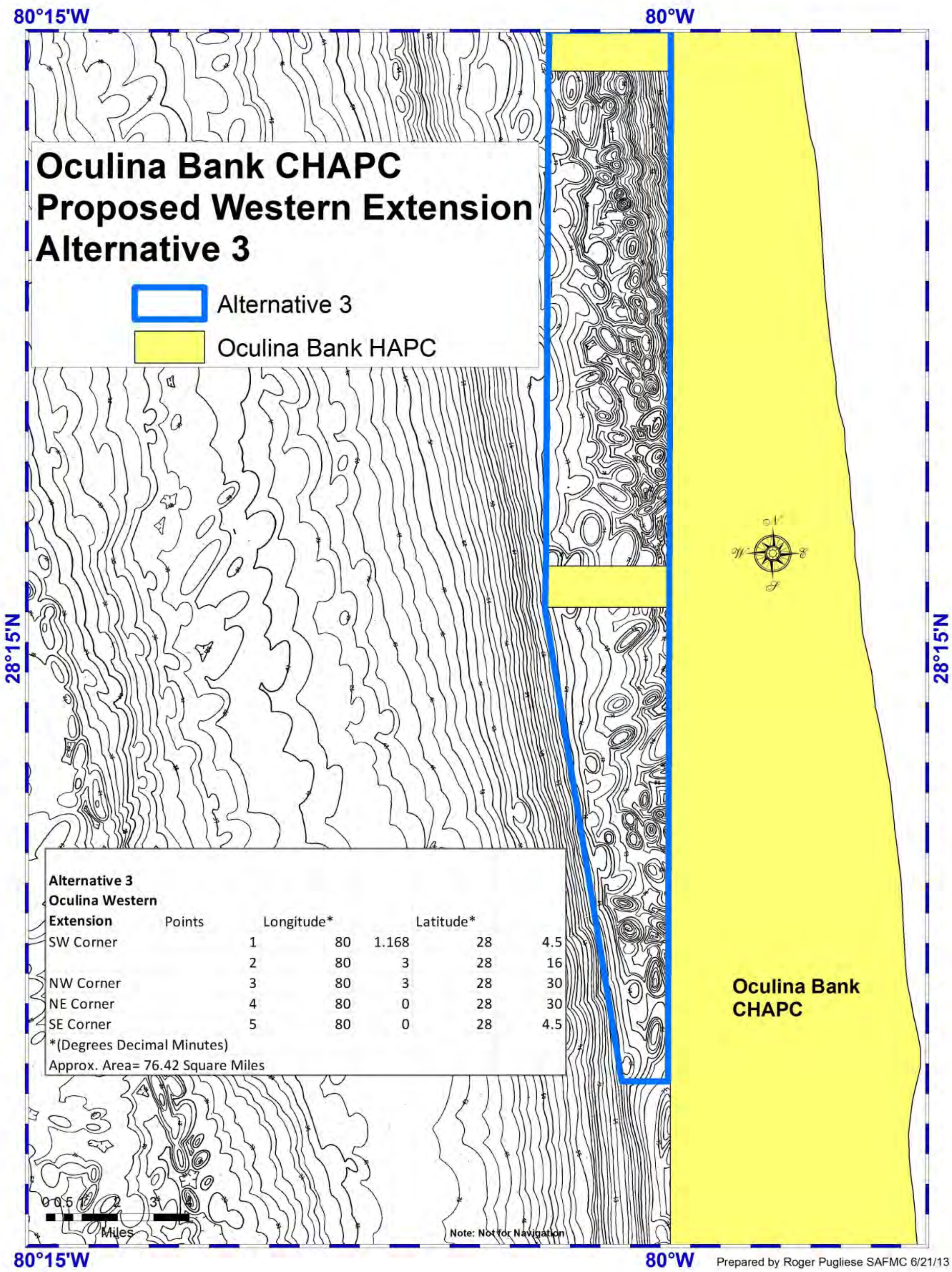


Figure 4-5. Action 3, Preferred Alternative 3. Oculina Bank HAPC Proposed Western Extension and Associated Habitat and Bathymetry.

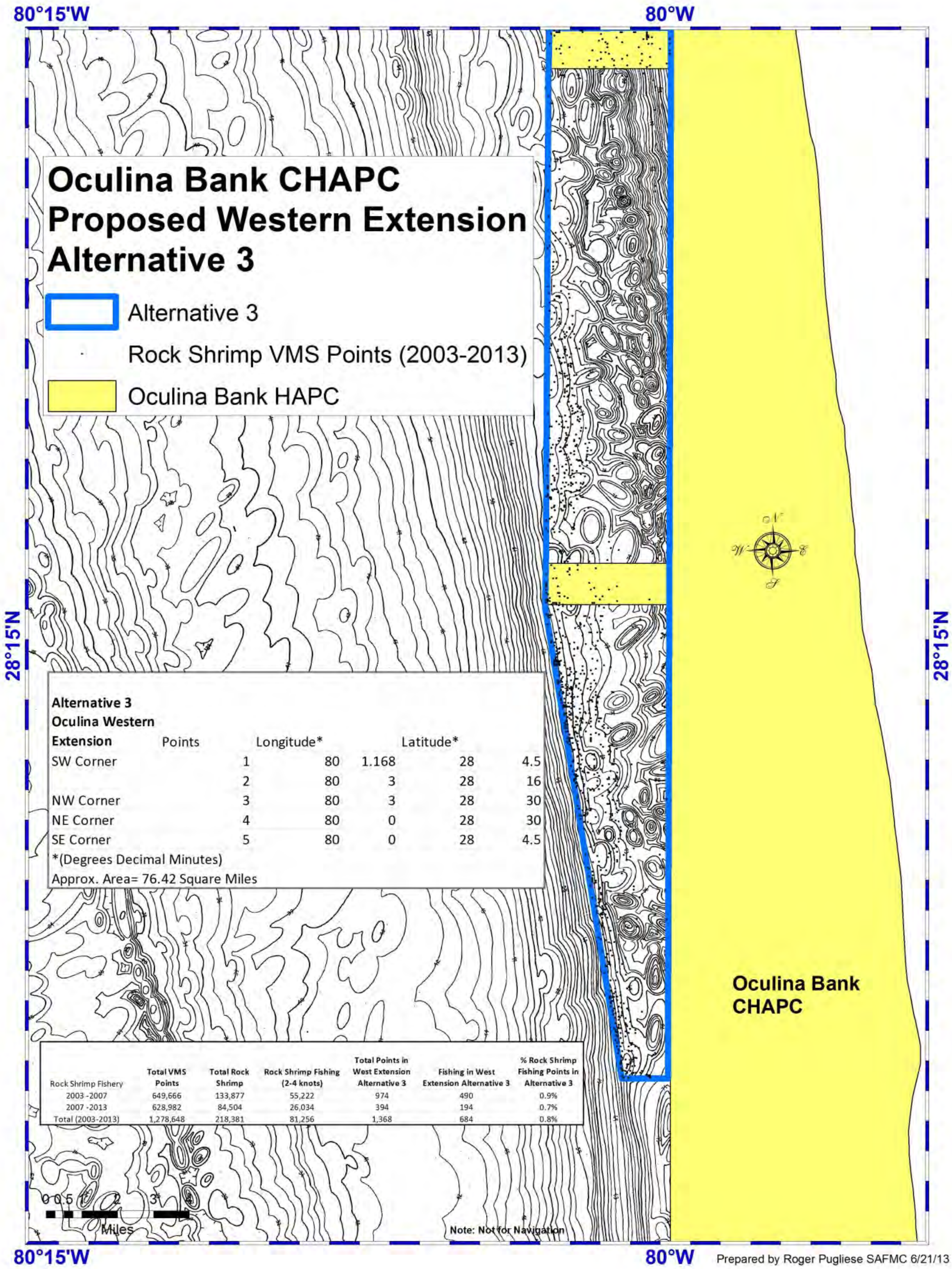


Figure 4-6. Action 1, Preferred Alternative 3. Oculina Bank HAPC Proposed Western Extension and Rock Shrimp VMS (2003-2013).

4.1.1 Biological Effects

The Oculina Bank HAPC is found at 50 CFR §622.224(b)(1). Currently within the 289 square mile Oculina Bank HAPC, prohibited gear includes bottom longline, trawl, dredge, pot or trap as well as the use of an anchor, anchor and chain, or grapple and chain. **Sub-Alternative 2a, Preferred Sub-Alternative 2b**, and **Preferred Alternative 3** propose increasing the size of the Oculina Bank HAPC and extending the gear prohibitions to the expanded area. Therefore, as the size of the Oculina Bank HAPC is increased, there would be increased biological benefits for coral, including *Oculina*, as well as species that use the bottom substrate as habitat, and rock shrimp. Increasing the size of the Oculina Bank HAPC may provide a refuge for other important species in the area, such as snapper grouper species, by prohibiting bottom longline activity as well as anchoring.

Fishing gear that comes in contact with the seafloor inevitably disturbs the seabed and poses the most immediate direct threat to deepwater coral ecosystems. Fishing gear that impacts the seafloor include trawls, bottom longline, 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 can 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 hard bottom resources but extends to disruption of the balanced and highly productive nature of the coral and live/hard bottom ecosystems.

Bottom and mid-water trawl

Bottom trawling is considered the most ecologically destructive fishing method (Chuenpagdee et al. 2003; Morgan and Chuenpagdee 2003). This gear type, used to target shrimp species in the South Atlantic living on or just above the seafloor, has been shown to severely impact deepwater coral ecosystems (Fosså et al. 2002; Puglise et al. 2005). In addition, Amendment 1 to the Fishery Management Plan (FMP) for the Snapper Grouper Fishery of the South Atlantic Region (Snapper Grouper FMP) prohibited the retention of snapper grouper species caught by roller rig trawls and their use on live/hard bottom habitat north of 28° 35' N latitude (SAFMC 1988). Furthermore, Amendment 1 to the Fishery Management Plan for the Shrimp Fishery of the South Atlantic Region (SAFMC 1996a) prohibited trawling in the area east of 80° 00' W longitude between 27° 30' N latitude and 28° 30' N latitude shoreward of the 183-meter (600-foot) depth contour.

Bottom trawls can weigh several tons and the footrope is further weighted to keep the net in close contact with the bottom. The footrope is usually a chain or cable and sometimes includes large, heavy rollers (rockhopper gear) that ride over obstructions and keep the net from snagging and tearing. Bottom trawling is widespread throughout the world's oceans and there are many international examples of coral damage caused by this fishing method. In Norway, trawling has severely impacted 30% to 50% of existing *Lophelia pertusa* reefs (Fosså et al. 2002) and significant trawl damage to *Lophelia pertusa* reefs has also been documented in Irish waters (Hall-Spencer et al. 2002). In the Canadian Atlantic, bottom trawling dislodges deepwater corals, which inevitably end up in fishing nets (Mortensen 2000). Koslow et al. (2000) reported that trawling reduced coral cover on a Tasmanian seamount from 90% to 5%, and Anderson and Clark (2003) reported that 1 hour of trawling for orange roughy (*Hoplostethus atlanticus*) off New Zealand removed 1.6 tons of corals. In the U.S., between 1997 and 2001, an average of 81.5 tons of coral was removed every year by commercial fishing in the North Pacific region; 97% of this was attributed to bottom trawls (NPFMC 2003).

A mid-water trawl is a cone-shaped net, normally made of four panels, ending in a codend and the net has lateral wings extending forward from the opening. The horizontal opening is maintained by otter boards. Floats and/or sail kites on the headline and weights on the groundline provide for the vertical opening. Large modern midwater trawls are rigged in such a way that the weights in front of and along the groundline provide for the vertical opening of the trawl (FAO 2009). Evidence indicates that the use of mid-water trawls can also cause damage to seamount habitats, including deepwater coral (Auster and Langton 1999; Clark et al. 2005). Mid-water trawls fished with weights in the footrope and chaffing gear in the cod end of the trawls will remove or significantly damage coral and live bottom habitat (Auster and Langton 1999; P. Auster 2009 pers. comm.) Midwater trawls have been documented to impact benthic habitat (NRC 2002) and are more effective when fished very close to, or even lightly touching, the bottom (Clark et al 2005). Especially vulnerable to these impacts in the proposed deepwater CHAPCs, are the coral pinnacles, which rise in some areas to over 500 feet off the ocean floor.

Prohibiting use of any bottom tending gear including trawls in the proposed HAPC expansion areas under Actions 1, 3, and 4 is a precautionary step to avoid damage to the most vulnerable *Lophelia* and *Enallopsammia* coral-topped mounds occurring on almost all the pinnacles explored to date with submersibles or ROVs (Reed et. al 2006, Lumsden et. al 2007). Fisheries for orange roughy and alfonsino in the South Pacific and other fisheries on seamounts have resulted in significant damage to seamount habitats and deepwater corals (P. Auster 2009 pers. comm.; NRC 2002). While no specific research has examined the impact of mid-water trawls on the South Atlantic coral mounds within the proposed CHAPC expansions (Actions 1, 3, and 4), Vierros (2006) indicated that a lack of scientific data should not be used as an excuse for inactivity and should also be balanced by the application of the precautionary principle through ecosystem-based management practices (WWF 2006).

Bottom Longline

Bottom longlines consist of a single mainline to which hundreds of shorter lines with baited hooks are attached. Anchors attached to the longline secure the gear to the ocean floor. Habitat damage from bottom longline depends on the gear configuration including weights, number of hooks, and type of line as well as hauling speed and technique. Habitat damage is also dependent on bottom type, with documentation of damage to corals and sponges.

Mortensen (2000) reported that 4% of corals along a transect off Nova Scotia had been damaged by bottom longlines.

In the South Atlantic, the use of bottom longline gear for snapper grouper species is restricted to depths greater than 50 fathoms and is prohibited south of 27°10' N (due east of St. Lucie Inlet, Florida). Landings with this gear type are dominated by golden tilefish, which occurs in mud habitat. Most bottom longline for snapper grouper species is set at depths ranging from 180 to 300 meters (591 to 984 feet), which includes the depth range in which golden tilefish most commonly occur (Low and Ulrich 1983).

Bottom longline gear is also used to target shark species. Shark bottom longline observer program data from 1994 to 2006 were examined to evaluate the impact of the shark bottom longline on the snapper grouper complex within the marine protected areas (MPAs) implemented through Amendment 14 to the Snapper Grouper FMP (SAFMC 2007). Analysis from Amendment 14 to the Snapper Grouper FMP showed that most sets were shoreward of the 200 meter (656 foot) depth contour. Since the proposed HAPC expansion areas in Actions 1, 3, and 4 are deeper than the MPAs implemented through Amendment 14 to the Snapper Grouper FMP, the actions in Coral Amendment 8 are not expected to impact shark bottom longline fishermen. Furthermore, Amendment 2 to the Atlantic Highly Migratory Species FMP (73 FR 35778), which includes management measures designed to rebuild overfished species and prevent overfishing of Atlantic sharks, is expected to reduce effort and harvest of shark species.

Dredge

Most dredges are rake-like devices that use bags to collect the catch. They are typically used to remove shellfish from the seabed, but can also be used to harvest crustaceans, finfish, and echinoderms. The design details of the gear depend on the species they are intended to collect. On soft bottoms, a dredge disturbs the micro-relief (wave ripples) of bottom habitat and re-suspends fine sediments. On hard bottoms, the dredge can scrape off epibenthic fauna and disturb the substrate.

Large dredges are used offshore to harvest sea scallops. Because scallops sense and retreat from a slow-moving dredge, scallop dredges are towed at speeds up to 2.5 m/s. The scallop dredge has a steel frame with a tongue with an eye, a blade with no teeth, and a bag. The mouth opening of the dredge ranges from 3 to 4.5 meters (10 to 15 feet) to and dredge weight ranges from 1102 to 2205 lbs (500 to 1,000 kg). The largest scallop dredge vessels (~ 60 m (197 feet) long) drag two 4.5-meter (15 foot) dredges, one from each side of the vessel, and use winches and navigational electronics to maintain high efficiency. Scallop dredges disturb the seabed, which is necessary to dislodge scallops for capture in the net (NRC 2002). Calico scallops are harvested sporadically in the South Atlantic using dredge; however, harvest generally occurs well inshore of the proposed HAPC expansions in Action 1, 3, and 4 (SAFMC 2009).

Pots and Traps

Habitat damage from pots and traps can depend on many factors: size, weight, and material of the trap; hauling speed and ocean conditions; depth of haul; number of traps set; and the substrate where the trap is placed. When traps make contact with the seafloor, they cause benthic disturbance, especially during hauling when they may be dragged over the seafloor. Fish traps, which are prohibited in the South Atlantic, are often larger and heavier than invertebrate traps and can cause more damage than lighter gear such as inshore lobster pots and black sea bass pots (Fuller et al. 2008).

In addition to the prohibition on the use of any bottom tending gear within the Oculina Bank HAPC, fishing for or possessing rock shrimp or *Oculina* coral is prohibited under **Alternative 1 (No Action)**. **Sub-Alternative 2a**, **Preferred Sub-Alternative 2b**, and **Preferred Alternative 3** propose to increase the size of the Oculina Bank HAPC and extend the prohibitions to a larger area. Therefore, as the size of the Oculina Bank HAPC is increased, the moderate biological benefits would be expected to increase for corals, including *Oculina*, and for the rock shrimp populations. Further, biological benefits would be expected for snapper grouper species in the proposed HAPC expansions since fishing for snapper grouper species while at anchor or with bottom longline would be prohibited. In order of most to least expected biological benefits, **Sub-Alternative 2a** would be expected to have the greatest effect by closing an additional 329 square miles, followed by **Preferred Sub-Alternative 2b** (267 square miles), and **Preferred Alternative 3** (76 square miles).

The use of vertical gear (e.g., hook and line, bandit gear) in the snapper grouper fishery would not be prohibited by the expanded Oculina Bank HAPC. As evidenced in **Tables 4-1** and **4-2** recreational and commercial fishing for snapper grouper species is taking place in the proposed Oculina Bank HAPC expansion area; however, the level of harvest is minimal. The use of vertical gear to target snapper grouper species has the potential to adversely impact coral. Sinkers, which transport bait to the bottom, particularly the heavier weights used in the high current environment typically experienced on the Oculina Bank, can impact and break off branches of Oculina coral and other fragile coral species. Additionally, fishing line can become entangled amongst its coral branches (SAFMC 2007). This gear would not be prohibited by the expanded Oculina Bank HAPC.

Hook and line fishing commonly referred to as deep drop fishing is conducted by recreational anglers targeting species such as snowy grouper, yellowedge grouper, warsaw grouper, queen snapper, blueline tilefish, golden tilefish, blackbelly rosefish, and other species in depths of 500-1,200 feet (152 to 366 meters). Deep drop fishing is done by the recreational sector primarily with an electric fishing reel. Weights used range from 3 pounds to 6 pounds or more depending on the current and depth. In contrast to the wreckfish portion of the snapper grouper fishery, where fishermen attempt to maintain a constant position relative to the bottom, fishermen in the deep drop recreational sector typically drift to catch snapper grouper species.

Tables 4-1 and **4-2** show estimated percent reductions in overall harvest of snapper grouper species assuming no snapper grouper species are caught in the proposed expanded Oculina CHAPC for the headboat and commercial sector, respectively. **Table 4-1** assumes harvest is distributed within 1/6° latitude by 5-fathom area-depth headboat reporting grids, with no effort redistribution. **Table 4-2** assumes harvest is uniformly distributed within 1° latitude by 5-fathom area-depth commercial logbook reporting grids and no effort redistribution. As such, if the harvest occurs specifically within the area proposed for closure, rather than uniformly across the area-depth reporting grid, the harvest reduction might be greater than estimated. Similarly, if the harvest occurs outside the area proposed for closure, the harvest reduction might be lower than estimated. If the harvest is uniformly distributed within the area-depth reporting grid, the values in **Tables 4-1** and **4-2** represent an upper bound in harvest reduction since fishermen would still be able to target snapper grouper species in the area but would no longer be able to anchor, use bottom longline, or other bottom tending gear. If effort redistributes, impacts on total harvest could be less than estimated. If fishers are able to harvest some of these stocks with innovative techniques that do not require anchoring or bottom-tending gear, then impacts on total harvest would again be less than estimated.

Fifteen snapper grouper species have been commercially harvested in the area proposed under **Sub-Alternative 2a** since 2005, but average landings (2005-2012) are less than 500 pounds for all species except for blueline tilefish (661 pounds/year using longline), greater amberjack (897 pounds/year using vertical line only), snowy grouper (2,256 pounds/year using vertical line and 576 pounds/year using longline), and golden tilefish (8,514 pounds/year using longline). Seven snapper grouper species have been commercially harvested the area proposed under **Preferred Sub-Alternative 2b** since 2005, but average landings (2005-2012) are less than 500 pounds for all species except blueline tilefish (646 pounds/year using longline), snowy grouper (1,623 pounds/year using vertical line and 576 pounds/year using longline), and golden tilefish (8,514 pounds/year using longline).

Table 4-1. Estimated percent reductions in snapper grouper recreational headboat harvest from proposed HAPC extensions in Action 1, by species, based on mean harvest by area (2009-2011). A dash indicates no fish were caught in the proposed area.

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

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

Table 4-2. Estimated percent reductions in snapper grouper commercial harvest from proposed HAPC extensions in Action 1, by species, based on mean harvest by area (2009-2011).

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 NMFS logbook.

As made clear from **Table 4-1** and **Table 4-2**, the proposed action alternatives would not have a significant impact on snapper grouper harvest. The largest impact is on commercial vessels harvesting greater amberjack, which are often caught in the water column. **Sub-Alternative 2a** would have the greatest impact on commercial greater amberjack harvest at 5.809%. **Preferred**

Sub-Alternative 2b would have a reduction of 3.720%. The impacts on the headboat harvest is minimal, as most headboat effort occurs inshore of the proposed area.

These activities would not have a direct biological impact on dolphin, wahoo, or coastal migratory pelagic species as fishing for those species does not impact bottom habitat, and would still be allowed in the expanded area. The golden crab fishery operates within allowable gear areas, which are not located in the proposed extension areas of the Oculina Bank HAPC.

Alternative 1 (No Action) is likely to perpetuate the existing level of risk of interaction between protected species and the trawl, bottom longline, bottom gillnet, dredges, pots/traps, and grappling gears used in fisheries under SAFMC's jurisdiction. These gear types can capture protected species. Therefore, increasing the size of the area closed to these gears will likely be biological beneficial to protected species. A new HAPC created under **Sub-Alternative 2a** and **Preferred Alternative 3** would likely be the most beneficial to protected species because it would close the largest area to these gears (405 square miles). A new HAPC created under **Preferred Sub-Alternative 2b** and **Preferred Alternative 3** (343 square miles) would likely be less biologically beneficial to protected resources than under **Sub-Alternative 2a** but more biologically beneficial than **Alternative 1.**

4.1.2 Economic Effects

The general economic effects of CHAPC protection are outlined in CE-BA 1 (SAFMC 2010c) and are incorporated here by reference. The total economic value (TEV) of habitat protection is assessed by examining effects related to the direct loss of use by fishermen, potential economic benefits gained future improvements to the habitat and fish stocks, changes in economic impact on surrounding communities, and bio-economic linkages associated with the protected stock (Cesar 2000). Depending on the extent of habitat protection proposed and the amount of fishing affected, the economic effects could be very complex. For example, short-term negative economic effects can result in long-term positive economic effects as a result of promoting healthier ecosystems. **Figure 4-7** shows the basic organization of how TEV can be determined for coral habitat protection.

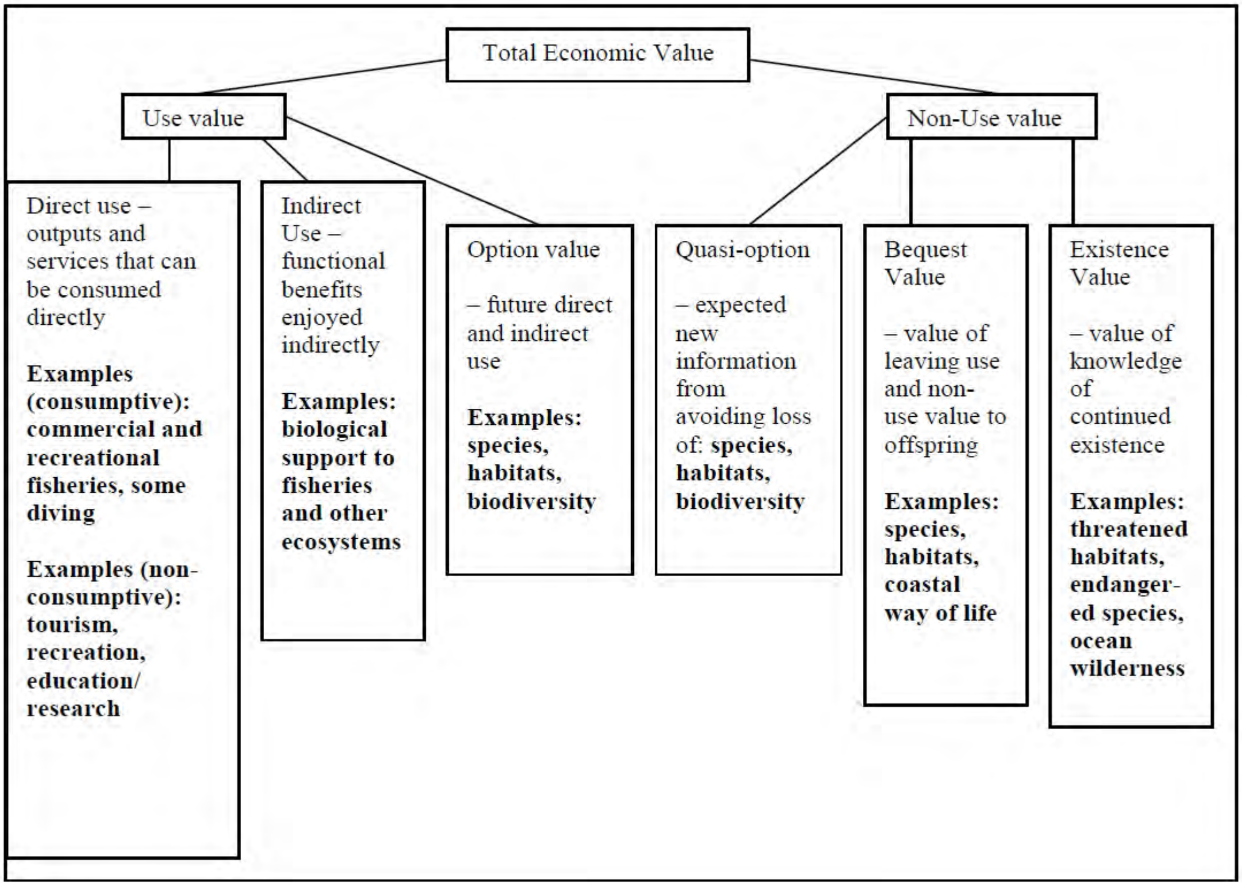


Figure 4-7. Flow chart depicting different economic values associated with protected areas (SAFMC 2009).

Direct use values can come from both removals from the coral systems (fishing, aquarium trade, pharmaceuticals, etc.) and non-removals (tourism, education, etc.). Indirect use values can come from fish habitat provided by corals. Option value is the potential future direct and indirect uses of the coral reef ecosystem. An example is the potential of deriving a cure for cancer from biological substances found on reefs. The quasi-option value is related to the option value in that avoiding irreversible destruction of a potential future use for corals gives value today. The bequest value is related to preserving the natural heritage for future generations. The existence value reflects the idea that there is a value of an ecosystem regardless of whether it is used or not (Cesar 2000).

4.1.2.1 Commercial Fishery Sector

Action 1, Alternative 1 (No Action) would not expand the boundaries of the Oculina Bank HAPC and, therefore would not be expected to have any direct or indirect positive economic effects associated with the expansion of the HAPC. However, failure to provide increased protection of this habitat and associated species could have both future direct and indirect negative economic effects that could be significant depending on the amount of HAPC that could otherwise be protected. Potential negative effects associated with **Alternative 1 (No Action)**

could be related to future loss of option value; fish stocks with lower abundance; or irreversible loss of coral habitat due to insufficient protection of this habitat. In the absence of expansion of this HAPC, the associated habitat 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 fishing vessels. As a result, various commercial fisheries could experience long-term direct negative effects from potential loss of habitat. The tradeoff for protecting additional habitat under the various sub-alternatives under **Alternative 2** (including **Preferred Sub-Alternative 2b**) and **Preferred Alternative 3** is that expansion of the Oculina Bank HAPC may result in short-term direct negative economic effects on the rock shrimp and snapper grouper fisheries. Stated in terms of TEV, the protection of additional habitat that would be expected to occur under **Alternatives 2** (including **Preferred Sub-Alternative 2b**) and **Preferred Alternative 3** would be expected to provide greater potential for the option value to be increased, but may result in negative short-term direct use effects through reduced opportunity to fish in this area.

Rock Shrimp

The rock shrimp and snapper grouper fisheries are known to operate in the proposed Oculina Bank HAPC expansion. The information provided in **Table 4-3** is based on the vessel monitoring system (VMS) tracking data points. The percent area affected in **Table 4-3** represents the percentage of VMS points on average that occur in area that would become closed to rock shrimp fishing should the closure for that alternative be in place **(Tables 4-3**, **4-4** and **4-5)**. It is assumed that the harvest of rock shrimp occurs uniformly across each data point. Therefore, the reduced pounds represent the percent affected area multiplied by the average annual pounds landed from 2007 through 2013. The ex-vessel value of rock shrimp landings used is $2.15 per pound in 2012 dollars **(Table 3-8)**.

Table 4-3. Percent of area affected, reduction in pounds harvested, and the loss of ex-vessel revenue (2012 $) due to reduced pounds harvest of rock shrimp based on VMS estimates (2007 – 2013) for Action 1 alternatives.

Action 1 alternatives	% Affected Area	Reduced lbs	Loss of Revenue
Sub-Alternative 2a	5.5%	96,935	$208,410
Pref Sub-Alternative 2b	4.2%	74,023	$159,149
Pref Alternative 3	0.8%	14,100	$30,315

Table 4-4. Rock shrimp fishing associated with the Oculina Bank HAPC Proposed Northern Extension Sub-Alternative 2a and Preferred Sub-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 Sub-Alternative 2a	Rock Shrimp Fishing Points in Sub-Alternative 2a	% Rock Shrimp Fishing Points in Sub-Alternative 2a
2003 -2007	649,666	133,877	55,222	9,815	3,522	6.4%
2007 -2013	628,982	84,504	26,034	4,102	953	3.7%
Total (2003-2013)	1,278,648	218,381	81,256	13,917	4,475	5.5%
Rock Shrimp Fishery	Total VMS Points	Total Rock Shrimp	Rock Shrimp Fishing (2-4 knots)	Total Points in Sub-Alternative 2b	Rock Shrimp Fishing Points in Sub-Alternative 2b	% Rock Shrimp Fishing Points in Sub-Alternative 2b
2003 -2007	649,666	133,877	55,222	8,511	2,705	4.9%
2007 -2013	628,982	84,504	26,034	3,486	692	2.7%
Total (2003-2013)	1,278,648	218,381	81,256	11,997	3,397	4.2%

Table 4-5. Rock shrimp fishing associated with the Oculina Bank HAPC Proposed Western Extension Preferred 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	% Rock Shrimp Fishing Points in Alternative 3
2003 -2007	649,666	133,877	55,222	974	490	0.9%
2007 -2013	628,982	84,504	26,034	394	194	0.7%
Total (2003-2013)	1,278,648	218,381	81,256	1,368	684	0.8%

The estimates of the change in ex-vessel value only measure the potential loss to the vessel. Although they are not estimates of the change in economic benefits, estimates of the potential economic effects of the proposed expansion of the Oculina Bank HAPC at other levels of the economy may be reflected by estimates of the changes in economic activity. Estimates of the average annual economic activity (impacts) associated with **Preferred Sub-Alternative 2b** and **Preferred Alternative 3** for the future harvest of rock shrimp were derived using the model developed by NMFS (NMFS 2011) and are provided in **Table 4-6**. Business activity for the commercial sector is characterized in the form of full-time equivalent jobs, income impacts (wages, salaries, and self-employed income), and output (sales) impacts (gross business sales). Income impacts should not be added to output (sales) impacts because this would result in double counting.

The estimates of economic activity include the direct effects (effects in the sector where an expenditure is actually made), indirect effects (effects in sectors providing goods and services to directly affected sectors), and induced effects (effects induced by the personal consumption expenditures of employees in the direct and indirectly affected sectors). The estimates in **Table 4-6** should be considered the maximum likely impacts, as this modeling assumes that revenues lost because of closed areas would not be made up by other fishing activities such as additional fishing for rock shrimp in other open areas, or targeting other species such as penaeid shrimp species. Additionally, this model incorporates information from all the different types of shrimp fishing, including rock, royal red, and penaeid species. As a result, a model that exclusively covers rock shrimp is not available and the results provided may over or under estimate the actual effects of the proposed changes in the boundaries of the Oculina Bank HAPC.

Table 4-6. Impact of lost revenue from the rock shrimp fishery associated with Sub-Alternative 2a, Preferred Sub-Alternative 2b and Preferred Alternative 3, based on average landings from 2008-2012.

Action 1 Alternatives	**Total Jobs**	**Harvester Jobs**	**Output (Sales) Impacts (millions)[1]**	**Income Impacts (millions)[1]**
Sub-Alternative 2a	48	4	$3.574	$1.502
Preferred Sub-Alternative 2b	36	3	$2.729	$1.147
Preferred Alternative 3	7	1	$0.520	$0.219

Some of the direct and indirect economic impacts for rock shrimp can be explained with information provided in an interview with a rock shrimp fishery participant (Pers. comm., Mike Merrifield, July 10, 2013). Based on the information provided, rock shrimp purchased from the fisherman will be processed and sold at $13.50 per pound (headed) by the dealer to a restaurant. Restaurants typically sell rock shrimp for $8 per dozen and there are approximately 4 dozen processed shrimp per pound, resulting in an effective revenue of $32 per pound. The price increases at the different transaction levels reflect the various costs and profit margins that occur.

For the rock shrimp fishery, **Sub-Alternative 2a** would be expected to result in the greatest short-term reduction in ex-vessel revenue, $208,410 (2012 dollars), followed by **Preferred Sub-Alternative 2b** ($159,149), and **Preferred Alternative 3** ($30,315) **(Table 4-3)**. **Sub-Alternative 2a** would have a greater direct negative economic effect than would **Preferred Sub-Alternative 2b** or **Preferred Alternative 3**. The combined direct short-term negative economic effect of **Preferred Sub-Alternative 2b** and **Preferred Alternative 3** would be an expected reduction in revenue of $189,464 (2012 dollars). In the short-term, these negative economic effects could be considered moderate. As previously discussed, however, over time, the habitat protected because of **Sub-Alternative 2a**, **Preferred Sub-Alternative 2b**, and **Preferred Alternative 3** would be expected to yield higher biomass of rock shrimp and other species. As a result, these alternatives would be expected to result in a net long-term increase in economic benefits compared to **Alternative 1 (No Action)**. The specific amount of these benefits, however, cannot be determined at this time, but could reasonably be expected to offset the short-term economic losses resulting in at least a moderate, overall long-term economic benefit.

Royal Red Shrimp

Sufficient data do not currently exist to estimate specifically the economic effects of the alternatives from **Action 1** on the royal red shrimp fishery. Royal red shrimp is not contained in the fishery management unit in any of the South Atlantic Council's fishery management plans. As a result, neither VMS units nor logbooks are required, however, all vessels that harvest royal red shrimp also harvest rock shrimp and thus have VMS. Therefore, the specific economic effects of the proposed alternatives for this action are unknown, but expected to be minor.

Snapper Grouper

The commercial landings of 10 snapper grouper species are expected to be affected by the alternatives in **Action 1** (see discussion in Section 4.1.1). Expected average annual landing percent reductions of the 10 species (2009-2011) from **Table 4-2** were used to calculate the average annual reduction in pounds and expected reduction in revenue (in 2012 dollars) shown in **Table 4-7**. For example, the 12 pounds of blueline tilefish is equal to 0.016% of total blueline tilefish average annual landings of 2009-2011. The values presented here may represent the maximum value of annual loss of revenue as a result of the proposed expansion of the Oculina Bank HAPC because fishermen may be able to make up some portion of these projected reductions through fishing in other open areas, or through targeting other species. Therefore, the direct negative economic effects discussed here are likely to be minor short-term effects. Further, as previously discussed, as more habitat is protected, there is a potential for increased snapper grouper stocks and improved harvests in open areas. Therefore, it is assumed that over time these economic effects will be reduced. Among all the potentially affected species, greater amberjack would be expected to be most affected by each of the proposed closed areas, followed by gag, snowy grouper, and vermilion snapper. The commercial snapper grouper fishery in general is expected to benefit in the long-term from an overall healthier ecosystem resulting from protection of corals and habitat and from increased stock levels.

Table 4-7. Average annual reduction of pounds and value (in 2012 dollars) of snapper grouper species expected from Action 1 from the commercial sector.

Species		Alt 2a	**Pref Sub-Alt 2b**	**Pref Alt 3**
Blueline Tilefish	% Expected Reduction	0.016%	0.009%	0.000%
	Reduced lbs	12	7	0
	Loss of Revenue	$18	$10	$0
Gag	% Expected Reduction	0.378%	0.115%	0.023%
	Reduced lbs	1,421	432	86
	Loss of Revenue	$6,997	$2,129	$426
Greater Amberjack	% Expected Reduction	5.809%	3.720%	1.143%
	Reduced lbs	51,955	33,271	10,223
	Loss of Revenue	$58,207	$37,275	$11,453
Red Grouper	% Expected Reduction	0.037%	0.003%	0.002%
	Reduced lbs	95	8	5
	Loss of Revenue	$353	$29	$19
Red Porgy	% Expected Reduction	0.027%	0.004%	0.001%

	Reduced lbs	38	6	1
	Loss of Revenue	$68	$10	$3
Scamp	% Expected Reduction	0.236%	0.153%	0.022%
	Reduced lbs	433	281	40
	Loss of Revenue	$987	$640	$92
Silk Snapper	% Expected Reduction	0.012%	0.000%	0.000%
	Reduced lbs	1	0	0
	Loss of Revenue	$2	$0	$0
Snowy Grouper	% Expected Reduction	1.839%	1.178%	0.280%
	Reduced lbs	1,078	691	164
	Loss of Revenue	$4,257	$2,727	$648
Vermilion Snapper	% Expected Reduction	0.066%	0.004%	0.001%
	Reduced lbs	558	34	8
	Loss of Revenue	$1,908	$116	$29
Yellowedge Grouper	% Expected Reduction	0.033%	0.016%	0.007%
	Reduced lbs	4	2	1
	Loss of Revenue	$12	$6	$2
Total	Reduced lbs	55,595	34,731	10,530
	Loss of Revenue	$72,809	$42,941	$12,672

Source: NMFS Logbook Data.

As was done for rock shrimp above, estimates of the average annual economic activity (impacts) associated with **Sub-Alternative 2a**, **Preferred Sub-Alternative 2b** and **Preferred Alternative 3** for the future harvest of the 10 snapper grouper species were derived using the model developed by the National Marine Fisheries Service (NMFS) and are provided in **Table 4-8**. Again, these economic impacts represent the short-term impacts and are expected to be less over time as fishermen adjust their fishing behavior to cope with the changes. Given the overall value of the snapper grouper fishery, the economic impacts of **Preferred Sub-Alternative 2b** and **Preferred Alternative 3** would be considered minor.

Table 4-8. Impact of lost revenue from the snapper grouper fishery associated with Sub-Alternative 2a, Preferred Sub-Alternative 2b, and Preferred Alternative 3, based on average landings from 2008-2012.

Action 1 Alternatives	Total Jobs	Harvester Jobs	Output (Sales) Impacts[1]	Income Impacts[1]
Sub-Alternative 2a	13	2	$958,334	$408,278
Preferred Sub-Alternative 2b	8	1	$564,980	$240,916
Preferred Alternative 3	2	0	$166,296	$ 71,422

[1]2012 dollars.
Source: NMFS (2011)

For the snapper grouper fishery, **Sub-Alternative 2a** would be expected to result in the greatest short-term reduction in ex-vessel revenue, $72,809 (2012 dollars), followed by **Preferred Sub-Alternative 2b** ($42,941), and **Preferred Alternative 3** ($12,672) **(Table 4-7)**. **Sub-Alternative 2a** would have a greater direct negative economic effect than would **Preferred Sub-Alternative 2b** or **Preferred Alternative 3**. The combined direct short-term negative economic effect of **Preferred Sub-Alternative 2b** and **Preferred Alternative 3** would be an expected reduction in revenue of $55,613 (2012 dollars). As previously discussed, however, over time, the habitat protected because of **Sub-Alternative 2a**, **Preferred Sub-Alternative 2b**, and **Preferred Alternative 3** would be expected to yield higher biomass of snapper grouper and other species. As a result, these alternatives would be expected to result in a net long-term increase in economic benefits compared to **Alternative 1 (No Action)**. The specific amount of these benefits, however, cannot be determined at this time. Overall, the economic effects of this action on the impacted commercial fisheries are expected to be minor.

4.1.2.2 Recreational Fishery Sector

Some of the snapper grouper species living in the areas slated for the HAPC expansion proposed in **Action 1** are commonly targeted by recreational fishermen. The species living in the proposed extension areas include blueline tilefish, gag, greater amberjack, red grouper, red porgy, scamp, silk snapper, snowy grouper, vermilion snapper, and yellowedge grouper.

In deepwater areas like those proposed for expansion under **Action 1**, recreational fishermen sometimes use "deep jigging" gear to target some of the above mentioned species. The most common method used to target members of the deepwater complex and wreckfish is "deep dropping", utilizing electric reels and terminal tackle similar to the commercial "bandit" fishery. However, according to recreational fishermen participating in this type of fishing, the vessels do not anchor (Gregg Debrango, July 11, 2013, pers. comm.). Furthermore, the gear they use is not prohibited under **Action 1**. Additionally, anecdotal information (Greg Debrango, July 11, 2013, pers. comm.) indicates that recreational deep dropping does not occur in the areas under consideration for HAPC expansion.

Because the existence or extent of habitat damage from wreckfish and snapper grouper deep dropping fishing is unknown, even if fishing is taking place in the proposed areas, the expected effects of the proposed alternatives under **Action 1** cannot be quantified at this time, but are expected to be minor, as deep dropping in the area does not involve anchoring nor does **Action 1** prohibit traditional recreational fishing activity.

Reliable estimates of the amount of effort or harvest by the recreational sector for the areas affected by **Sub-Alternative 2a**, **Preferred Sub-Alternative 2b**, or **Preferred Alternative 3** are not available. However, any potential reduction in fishing opportunities and harvest are likely to be small because any required change in fishing methods and any inconvenience recreational fishermen may experience from any of the proposed expansions of the Oculina Bank HAPC could likely be mitigated by fishing in other areas. Any losses experienced by recreational snapper grouper fishermen would not be expected to be proportionate with the differences in area affected because all areas are not equally accessible because of the required travel distance nor would all areas be expected to be equal in fishing quality.

Alternative 1 (No Action) would not be expected to have any direct short-term negative economic effects because it would not change the boundaries of the Oculina Bank HAPC. However, in the long-term, **Alternative 1 (No Action)** would be expected to result in a minor reduction in net economic benefits compared to the other alternatives considered because of the enhanced habitat protection that these other alternatives would provide. The short-term economic effects to the recreational fishery from **Sub-Alternative 2a**, **Preferred Sub-Alternative 2b**, and **Preferred Alternative 3** consist of the decrease in landings from the prohibition on anchoring and prohibition on the use of certain bottom tending gear, including bottom longlines. These short-term economic effects would be expected to be negative, but minor. The long-term economic effects to the recreational sector from **Sub-Alternative 2a**, **Preferred Sub-Alternative 2b**, and **Preferred Alternative 3** would be expected to result from increased stock levels of targeted species and other environmental benefits that would be expected to result from enhanced habitat protection. As a result, the long-term economic effects are expected to be positive and outweigh any negative short-term economic effects. Although the direct negative short-term effects may be slight, this assessment concludes that **Sub-Alternative 2a** would be expected to have the greatest potential for short-term direct negative economic effects, followed by **Preferred Sub-Alternative 2b,** and **Preferred Alternative 3** based on the total amount of area closed by each proposed alternative or sub-alternative. Overall, the economic effects of this action on the impacted recreational fisheries is expected to be minor.

4.1.3 Social Effects

Closed areas can have negative social effects on fishermen if any fishing grounds are no longer open to harvest. Fishermen would need to fish other areas 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.

For the proposed expansion of closed areas in this action, the primary communities with the highest regional landings of deepwater shrimp are all in Florida and include Titusville, Mayport, Jacksonville, Cocoa Beach, and Atlantic Beach (Section 3.4.3; **Tables 3-11** and **3-12**). The communities of Jacksonville and Cocoa Beach, Florida include residents and businesses associated with the royal red and rock shrimp fisheries, however these are relatively larger areas with other economically important industries (such as tourism or NASA) and changes to the deepwater shrimp fishery are not expected to result in impacts at the community level. However, the local economies of Titusville, Mayport, and Atlantic Beach, Florida are more engaged and reliant on commercial fishing, including participation in the royal red and rock shrimp fisheries. Impacts on fishermen and individual businesses due to expansion of closed areas would be expected to occur primarily in these five areas, and community-level impacts would be expected in Titusville, Mayport, and Atlantic Beach, Florida.

Alternative 1 (No Action) would likely result in minimal social effects because the fleet is already harvesting in open areas and prohibited from working in the closed areas. The economic costs of expanding closed areas that could impact the fleet would not occur under **Alternative 1 (No Action)** and changes in fishing behavior or fishing opportunities would not be expected. However, if maintaining the open areas where substantial deepwater coral exists or is likely to continue, any future impacts from fishing activities could have severe negative biological effects on the habitat, as discussed in **Section 4.1.1**. Impacts to the deepwater coral could eventually impact the fishing fleet through more restrictive management measures.

Sub-Alternative 2a, **Preferred Sub-Alternative 2b**, and **Preferred 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 expanded closed areas under **Sub-Alternative 2a**, **Preferred Sub-Alternative 2b**, and **Preferred Alternative 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 **Preferred Sub-Alternative 2b**) if the location is in an area where harvest is occurring.

4.1.4 Administrative Effects

Expansion of the Oculina Bank HAPC (**Sub-Alternative 2a**, **Preferred Sub-Alternative 2b**, and **Preferred 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 would 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 VMS and this reduces the level of at-sea enforcement.

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

Alternative 1 (No Action). Do not implement a transit provision through the 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 50 CFR Section 622.183(a)(1)(ii). 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.

Preferred Alternative 3. Allow for transit through the Oculina Bank HAPC with possession of rock shrimp on board. When transiting through the HAPC, vessels must maintain a minimum speed of not less than 5 knots, determined by a ping rate acceptable by law enforcement (i.e. 5 minutes), with gear appropriately stowed (stowed is defined as doors and nets out of water).

4.2.1 Biological Effects

Transit provisions have been established in the South Atlantic for other fisheries to allow for easier access to traditional fishing grounds through closed areas. As referenced in **Alternative 2**, the 50 Code of Federal Regulations (CFR) Section 622.183(a)(1)(ii) describes gear stowage requirements in place within the Marine Protected Areas (MPAs):

(ii) For the purpose of paragraph (a)(1)(i) of this section, transit means direct, non-stop progression through the MPA. Fishing gear appropriately stowed means—

(A) A longline may be left on the drum if all gangions and hooks are disconnected and stowed below deck. Hooks cannot be baited. All buoys must be disconnected from the gear; however, buoys may remain on deck.

(B) A trawl or try net may remain on deck, but trawl doors must be disconnected from such net and must be secured.

(C) A gillnet, stab net, or trammel net must be left on the drum. Any additional such nets not attached to the drum must be stowed below deck.

(D) Terminal gear (*i.e.*, hook, leader, sinker, flasher, or bait) used with an automatic reel, bandit gear, buoy gear, handline, or rod and reel must be disconnected and stowed separately from such fishing gear. A rod and reel must be removed from the rod holder and stowed securely on or below deck.

(E) A crustacean trap, golden crab trap, or sea bass pot cannot be baited. All buoys must be disconnected from the gear; however, buoys may remain on deck.

Establishing a transit provision through the Oculina Bank HAPC may have negative biological impacts for the rock shrimp stocks that are on the eastern side of Oculina Bank HAPC as fishing vessels would be able to access them more easily than they have in the past. Without a transit provision, the trip to those fishing grounds would be long and cost prohibitive to fishermen, providing an indirect protection to those shrimp populations. A transit provision for the dolphin and wahoo, coastal migratory pelagics, snapper grouper and golden crab fisheries is not needed as the regulations do not currently prevent them from transiting the area.

Alternative 1 (No Action) is likely to perpetuate the existing level of risk of interaction between protected species and rock shrimp trawl vessels. The risk of vessel strikes to protected species is generally a result of the relationship between number and/or duration of vessel transits and protected species abundance. **Alternative 2** and **Preferred Alternative 3** may both be more beneficial to protected species by shortening the total amount of time a vessel is on the water by not requiring long transits around closed areas, potentially reducing the likelihood of interactions.

4.2.2 Economic Effects

The intent of **Action 2** is to lessen the economic effects on rock shrimp fishermen by allowing transit through the Oculina Bank HAPC. **Alternative 1 (No Action)** would require rock shrimp fishermen to continue to travel around either the northern or southern boundary of the Oculina Bank HAPC to reach allowable fishing grounds on the east side. By not allowing shortest route of access, **Alternative 1 (No Action)** would be expected to result in increased fuel and other trip costs on vessels as they travel to and from the rock shrimp fishing grounds. These increased fuel costs and other economic effects cannot be quantified with available data but are not expected to be significant. However, these adverse effects would be expected to increase with an increase in the size of the Oculina Bank HAPC.

Alternative 2 and **Preferred Alternative 3** would allow fishermen to transit the Oculina Bank HAPC, thereby reducing the costs that would occur under **Alternative 1 (No Action)**. Therefore, both **Alternative 2** and **Preferred Alternative 3** would provide moderate positive, direct economic benefits to fishermen because fishermen would be able to use less fuel and take less time to get to their fishing grounds, assuming that stowing their gear is feasible and complying with VMS regulations are not prohibitive. **Alternative 2** would require the vessel to follow the gear stowage requirements of 50 CFR Section 622.183(a)(1)(ii), which requires trawl doors to be disconnected from the nets and secured. **Preferred Alternative 3** would require that the doors and nets be out of the water (not disconnected and secured), which would be less onerous than the stowing requirements of **Alternative 2.** However, **Preferred Alternative 3** would also require a higher VMS ping rate, which may result in increased costs to purchase a new VMS unit for vessels whose current VMS unit cannot ping at the higher rate. These costs are discussed below (**Tables 4-9** and **4-10**). Installation costs are approximately $300. Maintenance costs cannot be estimated with existing information. Communication costs for each of the models average from $35 to $80 per month, depending on owner data usage **(Table 4-10)**.

Currently, the 79 vessels participating in the rock shrimp fleet have a VMS unit. Of those vessels, 22 have older units purchased when the fishery was required to use VMS units in 2003. Those units would need to be upgraded under **Preferred Alternative 3**. None of these replacement units would be eligible for reimbursement by the NMFS Office of Law Enforcement VMS fund. The 22 vessels needing to upgrade their units would have to pay for the installation, maintenance and increased communications charges associated with having a VMS. Assuming all 22 vessels needing to upgrade their units choose the lowest priced Thrane unit at $2,495 each, the cost of the units is expected to be $54,890. The additional cost of installation would be approximately $6,600, for a total minimum cost of $61,490 to upgrade to the least expensive necessary hardware.

Table 4-9. NMFS-approved VMS units and cost.

Brand and Model	Cost
Boatracs FMCT-G	$3,095
Thrane and Thrane TT-3026D	$2,495
Faria Watchdog KTW304	$3,295
CLS America Thorium TST	$3,095

Source: Data provided by NMFS Office of Law Enforcement, July 2012.

Table 4-10. Communication costs associated with some NMFS-approved VMS units.

1. Qualcomm (for Boatracs units)
 $30/mo satellite fee, $.30/message, $.006 per character for messaging (average price estimated $35/month which includes 24/7 operations center support)

2. Telenor (for Thrane units)
 $.06 per position report or $1.44 per day for 1 hour reporting. If in the "In Harbor" mode, then $.36 per day. Messaging costs $.24 per e-mail. ($30/mo average)

3. Iridium/Cingular Wireless (for Faria units)
 $50.25 per month which includes 12,000 Iridium bytes and 35,000 GSM bytes for email and e-forms reporting.

4. Iridium (for CLS America units)
 $45 per month for hourly reporting, $1.75 per Kbyte for e-mail or forms submission.

Source: Data provided by NMFS Office of Law Enforcement, July 2012.

Currently, all rock shrimp vessels, regardless of whether they must upgrade their units, would be expected to experience an increase in costs under **Preferred Alternative 3**. Even the 57 units that do not need to be replaced would incur charges of approximately $150 to $250 per unit to reconfigure or upgrade hardware/software to implement the higher ping rate through the closed area. Reconfiguration or upgrading could include delays if the antenna must be transported to the vendor to perform upgrades. Not knowing exactly how much each upgrade will cost, the middle of the range, $200 multiplied by the 57 units that do not need to replace their hardware would incur a one-time cost of $11,400. The total cost of hardware and software upgrades required to allow transit under **Preferred Alternative 3** for all vessels in the fleet is estimated to be $72,890, representing a minor impact only for the season in which the upgrades must be made.

All vessels that wish to transit the Oculina Bank HAPC would be required to pay for increased communications charges. The exact amount of the increased communications charges cannot be determined because these costs would depend on how often the vessel crosses through the Oculina Bank HAPC.

Some, if not all, of the increased cost of upgrading hardware and software, plus increased communications charges in order to transit through the Oculina Bank HAPC, would be offset by not being required to transit around the HAPC to get to fishing grounds. Allowing transit should increase the amount of time on a trip available for fishing, and save on fuel and other vessel maintenance costs.

Alternative 1 (No Action) would cause a continued direct negative economic effect on the fishery by requiring vessels to travel around the Oculina Bank HAPC. Assuming complying with 50 CFR Section 622.183(a)(1)(ii) is feasible and not overly burdensome, **Alternative 2** would be expected to have the greatest positive direct economic effect on the rock shrimp fishery. If it is not feasible or is overly burdensome to comply with these gear stowing requirements, then the economic effects of **Alternative 2** would essentially be the same as **Alternative 1 (No Action)** because vessels would effectively be precluded from transiting through the Oculina Bank HAPC. **Preferred Alternative 3** would have the greatest positive direct economic benefit for those vessels that already possess a VMS unit that can ping at the higher rate. The cost of the increased ping rate would be expected to be offset by the fuel and other costs saved by transiting the Oculina Bank HAPC. These benefits would be reduced, however, for vessels that would need to buy a new VMS unit to comply with the higher ping rate.

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, as discussed in Section 4.1.3. The transit provision in **Alternative 2** would be beneficial to the shrimp 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. A transit provision would also be expected to enhance safety of fishermen when a vessel needs to return to port due to inclement weather. 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.

Preferred Alternative 3 would also be expected to continue coral protection and reduce some of the negative impacts on fishermen. By specifying that a transit provision is for rock shrimp vessels, 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. **Preferred Alternative 3** would be expected to help reduce negative impacts from Action 1 on individual fishermen, fishing businesses, and the communities of Mayport and Titusville, Florida (see Section 3.4.3).

4.2.4 Administrative Effects

There would be minor administrative impacts associated with a transit provision through the Oculina Bank HAPC. Administrative impacts associated with enforcement would be greatest for the action alternatives. If modifications are made to the transit regulations, administrative impacts would increase on the agency during the development and implementation phase. **Preferred Alternative 3** would require the vessel to maintain a speed of not less than 5 knots as indicated by an increased ping rate on the 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. There would be administrative impacts associated with ensuring that all VMS units are capable of an increased ping rate and supplying VMS units to those individuals who need replace their unit with one that has a higher ping rate.

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 50 CFR §622.224(c)(1)(iii).

Alternative 2. Modify the southern southeast boundary of the Stetson-Miami Terrace CHAPC western extension in a manner that maintains protection for the coral habitat but allows for bottom tending gear to be used in the flatbottom region. **(Figure 4-8)**. **Alternative 2** = 490 square miles. Coordinates for **Alternative 2** are found in **Appendix M**, **Table 4**.

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 4-9**). **Alternative 3** = 653 square miles. Coordinates for **Alternative 3** are found in **Appendix M**, **Table 5**.

Preferred Alternative 4. 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. Allow for a Shrimp Fishery Access Area to be used as a gear haul back/drift zone as shown in **Figure 4-10. Preferred Alternative 4** = 490 square miles. Coordinates for **Preferred Alternative 4** are found in **Appendix M**, **Tables 6** and **7**.

<u>Background</u>

Research conducted by Brooke and Ross (2012; **Appendix L**) was presented to the Coral AP in 2011 concerning 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, 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* 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*), 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 combined with bathymetric information, resulted in the AP's recommendation for modification of the western Stetson-Miami Terrace CHAPC boundary to include documented *Lophelia* sites as well as expected occurrences.

At the March 2013 South Atlantic Council meeting, the shrimp fishermen expressed concern about being able to haul back fishing gear without drifting into the CHAPC. **Preferred Alternative 4** was developed in response to their concerns. **Preferred Alternative 4** would essentially be the same as **Alternative 2** but would provide a haul back zone to reduce the risk of the shrimp fishermen being in violation.

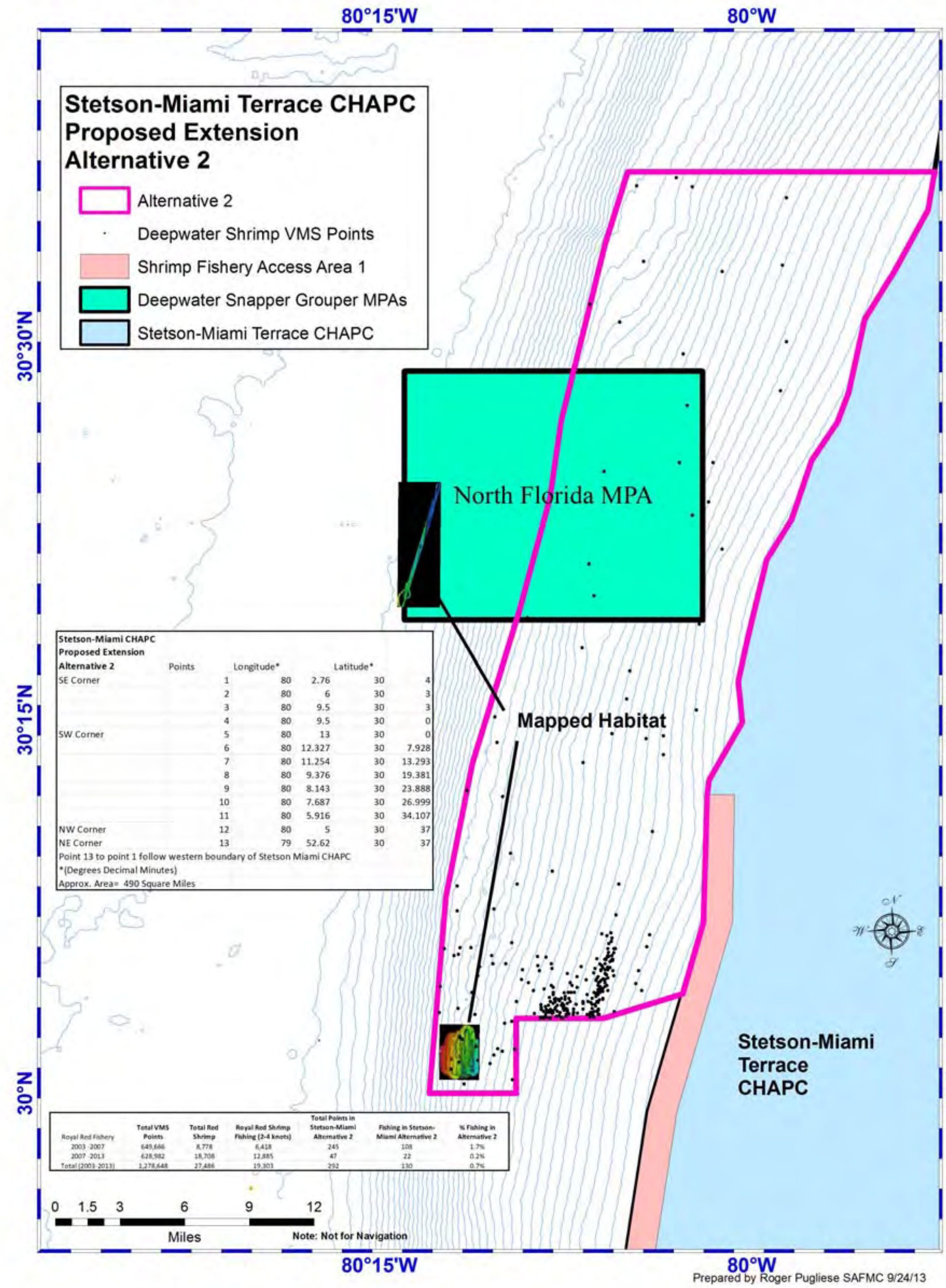


Figure 4-8. Action 3, Alternative 2. Proposed Western Extension of Stetson-Miami Terrace CHAPC Mapped Habitat and Rock Shrimp VMS pertaining to Royal Red Shrimp Fishery (2003-2013).

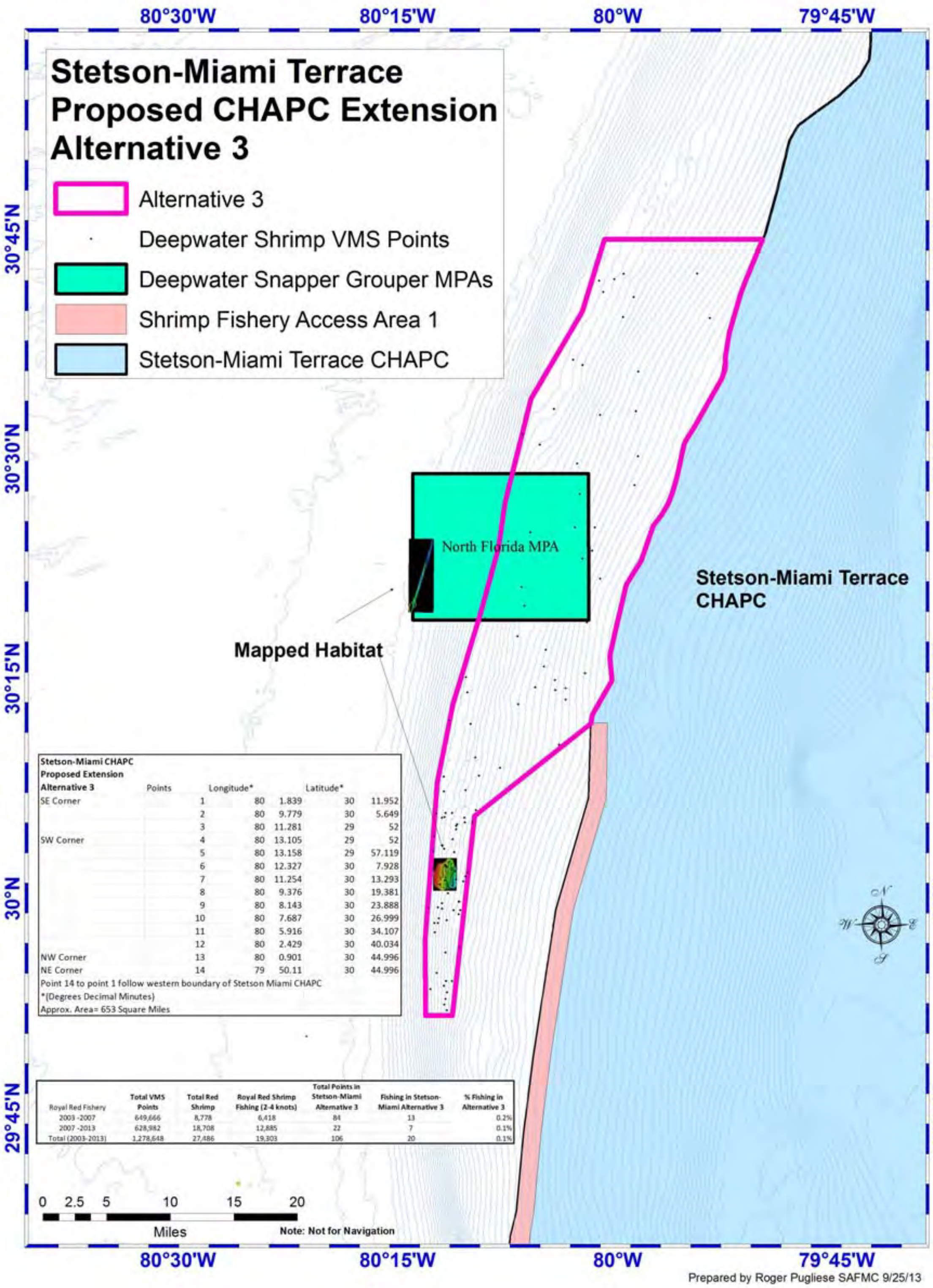


Figure 4-9. Action 3, Alternative 3. Proposed Western Extension of Stetson-Miami Terrace CHAPC Mapped Habitat and Rock Shrimp VMS pertaining to Royal Red Shrimp Fishery (2003-2013).

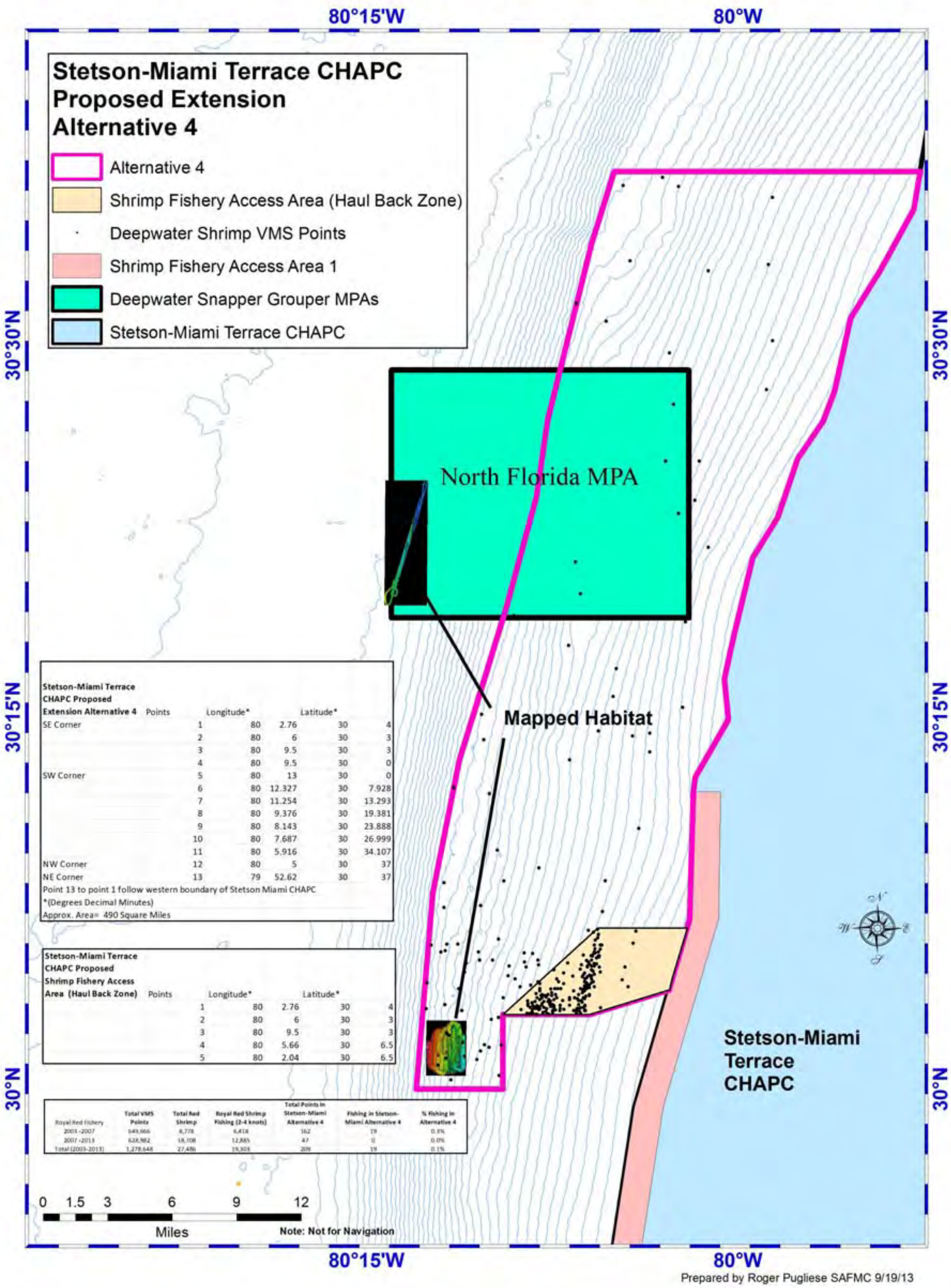


Figure 4-10. Action 3, Preferred Alternative 4. Proposed Extension of Stetson-Miami Terrace CHAPC Mapped Habitat and Rock Shrimp VMS pertaining to Royal Red Shrimp Fishery (2003-2013).

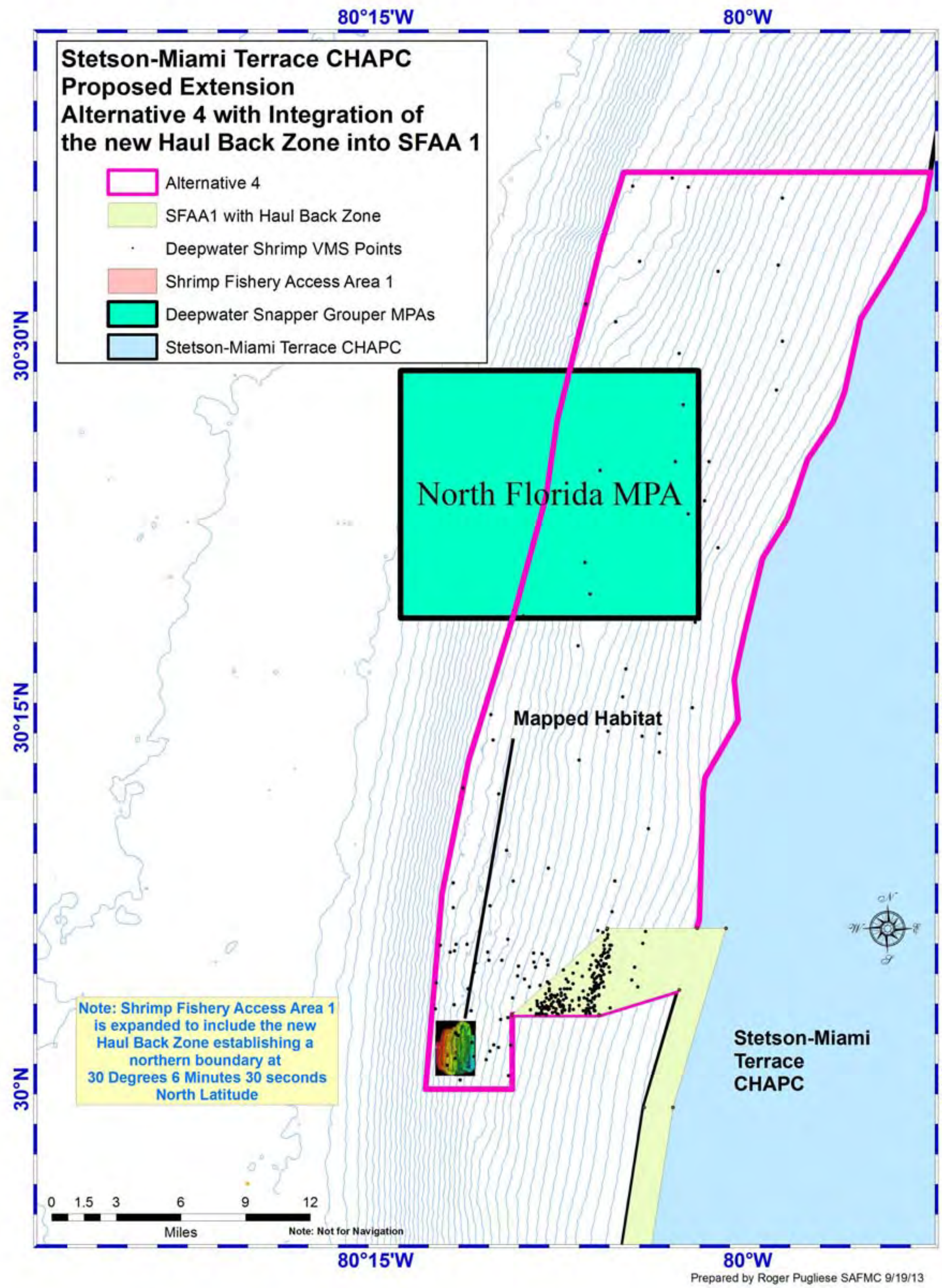


Figure 4-11. Under Action 3, Preferred Alternative 4, the existing Shrimp Fishery Access Area 1 is expanded to include a gear haul back drift zone.

4.3.1 Biological Effects

The Stetson-Miami Terrace CHAPC (23,528 square miles) is the largest of the five deepwater CHAPCs implemented through CE-BA 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 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 hard bottom 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.

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 can 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 hard bottom resources but extends to disruption of the balanced and highly productive nature of the coral and live/hard bottom ecosystems.

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. **Alternatives 2, 3,** and **Preferred Alternative 4** would extend these prohibitions to the expansion area of the Stetson-Miami Terrace CHAPC. Therefore, the larger the expansion of the Stetson-Miami Terrace HAPC, the greater the positive biological effects to species found in the area. **Alternative 2**, which would provide an expansion of 490 square miles to the Stetson-Miami Terrace HAPC, would provide greater biological benefits to species caught within the expanded area than **Alternative 1 (No Action)**. **Alternative 3** (653 square miles) would provide greater biological benefits to all species caught within the expanded area with the exception of royal red shrimp species. None of the alternatives would have any biological impact on dolphin wahoo or coastal migratory pelagic as the typical gear used for these species does not impact bottom habitat. Fishing for snapper grouper species would be allowed as long as there was no anchoring or use of bottom longline gear. However, fishing for snapper grouper species in the proposed expansion areas of the Stetson-Miami Terrace is uncommon and no biological impact on those species is expected. The golden crab fishery operates within allowable gear areas, which are not affected by the proposed expansion of the Stetson-Miami Terrace CHAPC. None of the alternatives are expected to result in positive or negative significant impacts.

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, anchoring, and trawling (bottom and mid-water), which would have positive biological impacts on the species in the area.

Preferred Alternative 4 is similar to **Alternative 2** in that it would modify the coordinates to expand the CHAPC by 490 square miles. It would also provide royal red shrimp fishermen a zone within which they can haul back gear without drifting into an area where their gear is prohibited. This haul back zone may encourage fishermen to fish in the area giving a slight negative impact on the royal red shrimp populations. However, fishing effort in the area is historically low and the impact is not expected to be significant.

Fishing impacts using the percentage of royal red fishing points included in the proposed alternatives are summarized below in **Table 4-11**.

Table 4-11. Royal red shrimp fishing associated with Stetson-Miami Terrace CHAPC (Action 3) Alternatives 2, 3 and 4 (Preferred) (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 -2013	628,982	18,708	12,885	47	22	0.2%
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 -2013	628,982	18,708	12,885	22	7	0.1%
Total (2003-2013)	1,278,648	27,486	19,303	106	20	0.1%
Royal Red Fishery	Total VMS Points	Total Red Shrimp	Royal Red Shrimp Fishing (2-4 knots)	Total Points in Stetson-Miami Alternative 4	Fishing in Stetson-Miami Alternative 4	% Fishing in Alternative 4
2003 -2007	649,666	8,778	6,418	162	19	0.3%
2007 -2013	628,982	18,708	12,885	47	0	0.0%
Total (2003-2013)	1,278,648	27,486	19,303	209	19	0.1%

Alternative 1 (No Action) is likely to perpetuate the existing level of risk of interaction between protected species and the trawl, bottom longline, bottom gillnet, dredges, pots/traps, and grappling gears used in fisheries under the SAFMC's jurisdiction. These gear types can capture protected species. Therefore, increasing the size of the area closed to these gears will likely be biologically beneficial to protected species. A new CHAPC created under **Alternative 3** would likely be the most beneficial to protected species because it would close the largest area to these gears (653 square miles). New CHAPCs created under **Alternative 2** and **Preferred Alternative 4** (490 square miles) would likely be less biologically beneficial than **Alternative 3** but more biologically beneficial than **Alternative 1.**

4.3.2 Economic Effects

The royal red shrimp fishery is known to operate in the proposed Stetson-Miami Terrace CHAPC expansion. **Table 4-12** is based on the VMS points as a percent of fishing that occurred in the areas proposed under **Alternatives 2**, **3**, and **Preferred Alternative 4**. The ex-vessel value (2012 dollars) of the reduction in royal red shrimp landings is based on the size of the proposed area expansion. Royal red shrimp are graded in 2 sizes – large and small. Large shrimp range in price from $3.25 to $4.00 per pound ($3.625 on average). Small shrimp range in price from $1.50 to $1.70 per pound ($1.60 on average). Approximately half of the royal red shrimp landed are categorized as large and half are small (Pers. comm., Mike Merrifield, July 9, 2013).

Table 4-12. Percent of area affected, estimated reduction in pounds harvested, and the value of the reduced pounds harvested of royal red shrimp based on VMS estimates (2007 – 2013) for Action 3 alternatives.

Action 3 Alternatives	% Affected Area	Reduced lbs	Value of Reduction
Alternative 2	0.171%	670	$1,752
Alternative 3	0.054%	213	$557
Pref Alternative 4	0.000%	0	$0

Alternative 1 (No Action) would not expand the boundaries of the Stetson-Miami Terrace CHAPC and, as a result, would not have any short-term direct negative economic effects on fishermen, or associated businesses or communities. However, failure to protect habitat known to provide protection for desired fish and shrimp stocks could have future option value implications resulting in long-term direct negative economic effects through lower future stock abundance. Future option value is the excess of the maximum willingness to pay over the expected consumer surplus, assuming the good or service will actually be supplied. The more critical habitat that is protected, the greater the potential future option value will be. **Alternative 3** would protect the largest area, including area not yet mapped, but assumed to be of similar habitat. **Alternative 2** and **Preferred Alternative 4** would protect the same amount of known habitat area, but protect less habitat than **Alternative 3.**

The proposed expansions of the Stetson-Miami Terrace CHAPC under **Action 3** would be expected to result in a minor loss of ex-vessel revenue to the royal red shrimp fleet. However, expansion of the Stetson-Miami Terrace CHAPC would be expected to provide additional habitat protection and an associated net increase in economic benefits. **Alternative 2** would be expected to result in an average annual loss of $1,752 in revenue to royal red shrimp fishermen. **Alternative 3** would be expected to result in an average annual loss of $557. **Preferred Alternative 4**, which would allow for a gear haul back and back drift zone, would not be expected to have any direct short-term economic effects **(Table 4-12)**, yet still affords enhanced protection for the Stetson-Miami Terrace CHAPC.

4.3.3 Social Effects

The broad potential social effects of establishing or expanding closed areas are discussed in Section 4.1.3, including specific communities that could experience negative impacts under the proposed action. **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 **Alternative 2** or **Alternative 3**. The proposed extension of the Stetson-Miami Terrace CHAPC without a specified fishing area for the deepwater shrimp fleet (**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. Specifically, the Florida communities of Mayport, Titusville, and Atlantic Beach could be negatively impacted due to these communities' local engagement in commercial fishing and the deepwater shrimp fisheries. Additionally, deepwater shrimp fishermen and fishing businesses in

Jacksonville and Cocoa Beach, Florida would likely experience negative impacts from the expansion.

Because **Preferred Alternative 4** would also establish the Shrimp Fishery Access Area based on information of fishing grounds of the royal red shrimp vessels, negative impacts on the deepwater shrimp fleets and associated businesses and communities could be reduced or removed. The expected economic impacts under **Alternatives 2** and **3** would likely be avoided with the establishment of the Shrimp Fishery Access Area in **Preferred Alternative 4** (see Section 4.3.2), which would also contribute to minimized impact on the fishermen, businesses and associated communities. Although future opportunities would be reduced with expansion of the Stetson-Miami Terrace CHAPC, negative impacts on the fleet would likely be reduced while still enhancing coral protection in the area.

4.3.4 Administrative Effects

The expansion of the Stetson Miami Terrace CHAPC (**Alternative 2**, **Alternative 3** and **Preferred Alternative 4**) 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 would 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, also found at 50 CFR §622.224(c)(1)(i):

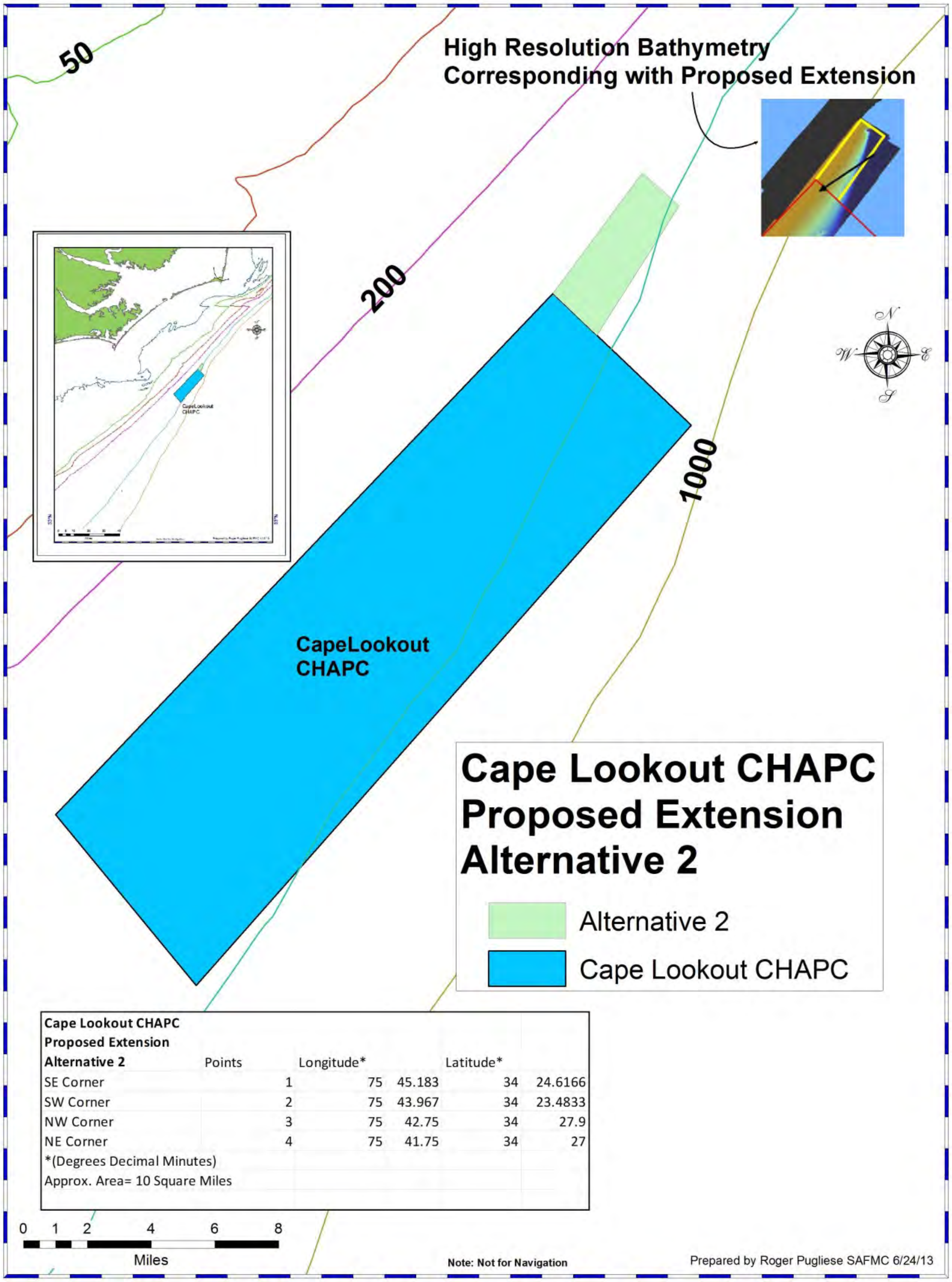
Latitude	Longitude
34°24’37”	75°45’11”
34°10’26”	75°58’44”
34°05’47”	75°54’54”
34°21’02”	75°41’25”

Preferred Alternative 2. Extend the northern boundary to encompass the area identified by the following coordinates (**Figure 4-12**) (**Preferred Alternative 2** = 10 square miles). Coordinates for **Preferred Alternative 2** are found in **Appendix M**, **Table 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’

Background

The Cape Lookout CHAPC was created to protect deepwater coral ecosystems and after review of recent studies it became apparent that the original coordinates did not include all of the deepwater coral. In a presentation to the Coral AP in 2011, Dr. Steve 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 3.1.1.4** 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 Coral AP recommended a northern extension of the Cape Lookout CHAPC to incorporate the newly discovered area of deepwater coral habitat. They recommended one alternative that would encompass the documented deepwater coral habitat. The South Atlantic Council adopted the AP’s recommendation and determined that it was not reasonable to include any additional alternatives because the one action alternative captured the only area of newly discovered deepwater coral habitat.



Cape Lookout CHAPC Proposed Extension Alternative 2	Points	Longitude*		Latitude*	
SE Corner	1	75	45.183	34	24.6166
SW Corner	2	75	43.967	34	23.4833
NW Corner	3	75	42.75	34	27.9
NE Corner	4	75	41.75	34	27
*(Degrees Decimal Minutes)					
Approx. Area= 10 Square Miles					

Figure 4-12. Action 4, Preferred Alternative 2. Cape Lookout CHAPC Proposed Extension and Mapped Habitat.

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)**, the same gear prohibitions within the CHAPC would apply in the expanded area. **Preferred Alternative 2** would expand the prohibitions of 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. **Preferred Alternative 2** would not have any biological impact on dolphin wahoo or coastal migratory pelagic as the typical gear used for these species does not impact bottom habitat. Fishing for snapper grouper species would be allowed as long as there was no anchoring or use of bottom longline gear. The size of the proposed expansion of the Cape Lookout CHAPC in **Preferred Alternative 2** is very small (roughly 8 square kilometers) and landings data are not available at a fine enough resolution to perform analysis (pers. comm., Nick Farmer, NMFS SERO, July 9, 2013). However, fishing for snapper grouper species in the proposed expansion area is uncommon and little biological impact on those species is expected. Fishing for deepwater shrimp species does not occur within the proposed area. The golden crab fishery operates within allowable gear areas, which are not affected by the proposed expansion of the Cape Lookout CHAPC.

Alternative 1 (No Action) is likely to perpetuate the existing level of risk of interaction between protected species and the trawl, bottom longline, bottom gillnet, dredges, pots/traps, and grappling gears used in fisheries under the SAFMC's jurisdiction. These gear types can capture protected species. Therefore, increasing the size of the area closed to these gears will likely be biological beneficial to protected species. A new CHAPC created under **Preferred Alternative 2** would likely be more biologically beneficial than **Alternative 1.**

4.4.2 Economic Effects

The size of the proposed closure from **Preferred Alternative 2** is relatively small and landings data are not available at a fine enough resolution to perform an analysis that would accurately characterize landings from the area (pers. comm., Nick Farmer, NOAA Fisheries SERO, July 9, 2013).

Alternative 1 (No Action) would likely have minimal short-term economic effects because this alternative would maintain access to all current harvest areas. However, failure to protect the recently identified deep-water coral ecosystems could decrease the option value of this resource and associated species by leaving this critical habitat open to potential damage and adversely affecting future fishing through reduced productivity. Because the proposed extension of the Cape Lookout CHAPC under **Preferred Alternative 2** is a relatively small area, the proposed expansion would be expected to have minimal direct negative economic effects particularly on the snapper grouper or other fleets. No information is available on fishing activity specifically in this area. Species from the deep water complex that tend to prefer this habitat and nearby environments include wreckfish. However, because the affected area is so small and there are other areas nearby where similar fishing activity is allowed, the direct negative economic effects of **Preferred Alternative 2** are expected to be minimal.

4.4.3 Social Effects

The broad potential social effects of establishing or expanding closed areas are discussed in Section 4.1.3. The communities that could be impacted by changes in the Cape Lookout CHAPC are expected to be areas closer to the CHAPC off the North Carolina coast. **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 **Preferred 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. However, because the affected area is so small and there are other areas nearby where similar fishing activity is allowed, the direct negative social effects of **Preferred Alternative 2** are expected to be minimal.

4.4.4 Administrative Effects

The expansion of the Cape Lookout CHAPC (**Preferred 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 would be needed. Most of the administrative impacts associated with these alternatives relate to at-sea enforcement.

Chapter 5. Reasoning for Council's Choice of Preferred Alternatives

Background and Timeline of Development

The management measures to expand boundaries of the Coral Habitat Areas of Particular Concern (CHAPCs) and implement a transit provision through Oculina Bank HAPC were first introduced to the South Atlantic Fishery Management Council (South Atlantic Council) during their December 2011 meeting in Raleigh, North Carolina. The Ecosystem-Based Management Committee reviewed recommendations from the Coral Advisory Panel (AP) October 2011 and Habitat AP November 2011. The AP reports contained several recommendations based on results of presentations on recent research observations of deepwater coral resources in the South Atlantic. An Options Paper for Comprehensive Ecosystem-Based Management 3 (CE-BA 3), including the Coral and Habitat APs' recommendations for expansion of CHAPCs, was also presented to the South Atlantic Council in December 2011 and approved for public scoping, initiating the amendment development process.

Public scoping meetings took place in January and February 2012 to gather input on proposed management measures considered in CE-BA 3 before the South Atlantic Council discussed the various options. The CHAPC options included in CE-BA 3 during the public scoping process:

a. Modify the Oculina Bank HAPC north and west boundaries following coordinates and depth contours recommended by the Coral and Habitat APs.
b. Expand the Stetson-Miami Terrace CHAPC to incorporate a *Lophelia* site off Jacksonville following depth contours recommended by the Coral and Habitat APs.
c. Expand the Cape Lookout CHAPC.

The South Atlantic Council reviewed public scoping comments on the CHAPC options in CE-BA 3 during their March 2012 meeting in Savannah, Georgia. The South Atlantic Council approved options for further development and analysis in CE-BA 3 including a range of alternatives recommended by the Interdisciplinary Planning Team for each area proposed for modification, and also an alternative to consider a transit provision through Oculina Bank HAPC as recommended by the Law Enforcement AP. The South Atlantic Council provided guidance to convene the Shrimp and Deepwater Shrimp, Coral and Habitat APs for recommendations on preferred alternatives prior to the June 2012 South Atlantic Council meeting. The Shrimp and Deepwater Shrimp APs met jointly in April 2012, the Coral AP met in May 2012 and the Habitat AP met via webinar in May 2012.

At the June 2012 South Atlantic Council meeting in Orlando, Florida, the South Atlantic Council received reports from the Deepwater Shrimp and Coral AP Chairs and was scheduled to select preferred alternatives for CHAPC actions and approve CE-BA 3 for public hearings. As a result of diverse recommendations from the APs on the CHAPC actions, the South Atlantic Council discussed the benefit of convening a joint meeting of the Coral and Deepwater Shrimp APs to discuss the alternatives and each AP's recommendations. Representatives from the Law

Enforcement and Habitat APs were also requested to participate in a joint AP meeting to inform the discussion based on their respective charges to the South Atlantic Council. Other actions pertaining to the snapper grouper fishery were included in CE-BA 3 and the South Atlantic Council did not want to interrupt development of other management measures as a result of delaying development of the CHAPC actions. Therefore, during the June 2012 South Atlantic Council meeting, actions to modify CHAPCs were split out from CE-BA 3 and guidance was provided to convene a joint AP meeting and develop the actions through a Coral Amendment/Environmental Assessment.

The joint meeting of the Coral and Deepwater Shrimp APs and representatives from the Habitat and Law Enforcement APs was held in October 2012 in Cape Canaveral, Florida. Discussion during the joint AP session focused on the fluctuating fishing patterns of the rock shrimp fleet and the importance of incorporating the entire Vessel Monitoring System (VMS) data into the analysis. During the joint AP meeting in October 2012, the VMS analysis in the document represented rock shrimp fishing activity from 2007-2011. A recommendation was carried forward to the South Atlantic Council to request and incorporate VMS data from 2003-2013, representing the full series of data since VMS was required for the rock shrimp fishery. The Habitat AP convened in November 2012 and reaffirmed the recommendations developed during the joint Coral and Deepwater Shrimp AP meeting.

The timing of Coral Amendment 8 was delayed during the December 2012 South Atlantic Council meeting and approval for public hearings was deferred until analysts could process the entire series of VMS data. The delayed timeline allowed for scheduling of AP meetings during spring 2013 to review the completed VMS analysis and revisions to the CHAPC alternatives based on the recommendations developed during the joint Coral and Deepwater Shrimp AP meeting in October 2012. The completed VMS data were received after the March 2013 South Atlantic Council meeting and AP meetings were then scheduled for final review in May 2013.

The Coral and Habitat APs met jointly in May 2013 to discuss actions and alternatives in Coral Amendment 8 and review the complete VMS analysis. The Deepwater Shrimp AP Chair participated in the joint meeting and representatives from the Snapper Grouper and Law Enforcement APs were also requested to participate. The Coral and Habitat APs reaffirmed their rationale for preferred alternatives for actions in Coral Amendment 8 developed during the joint AP meeting in October. At their May 2013 meeting, the Deepwater Shrimp AP revised their recommendations for preferred alternatives for all of the actions in Coral Amendment 8.

The South Atlantic Council reviewed AP input during their June 2013 meeting, selected preferred alternatives for all actions in Coral Amendment 8, and approved the document for public hearings. Public hearings were held August 5-15, 2013. The South Atlantic Council reviewed public hearing input and approved Coral Amendment 8 for Secretarial Review during their September 2013 meeting.

The following summarizes AP and South Atlantic Council discussion regarding Coral Amendment 8 Action preferred alternatives.

Action 1. Expand boundaries of the Oculina Bank Habitat Area of Particular Concern (HAPC)

Snapper Grouper Advisory Panel (AP) Comments and Recommendations
The Snapper Grouper AP discussed the measures in Coral Amendment 8 during their April and November 2012 meetings. Members of the AP expressed concern that a northern extension of the Oculina Bank HAPC may compromise historical snapper grouper fishing grounds. The AP discussed the common practice of hook and line fishermen anchoring and drifting in waters surrounding the steeples region in waters north of Ponce Inlet, Florida. The AP expressed concern that Action 1 alternatives that consider a northern expansion of the Oculina Bank HAPC's western boundary inshore of 60 meters would impact snapper grouper vessels anchoring in the area.

Coral and Habitat Advisory Panels (APs) Comments and Recommendations
The Coral and Habitat APs reaffirmed their recommendations for preferred alternatives during their joint AP session in May 2013. The Coral and Habitat APs recommend Sub-Alternative 2a as preferred for Action 1. The Coral AP noted that establishing a northern extension along the 70-100 meter boundaries, including a caveat that adjustments be made to annex obvious hard bottom features, would incorporate most of the known deepwater coral habitat presumed to occur in the region based on recent research observations. Sub-Alternative 2a was developed during the joint Coral and Deepwater Shrimp AP meeting in October 2012.

The APs also reaffirmed their original recommendation for a preferred alternative for a western extension of the Oculina Bank HAPC during their May 2013 meeting. Alternative 3 was recommended as a preferred under Action 1. The recommendation was based on recent discoveries that indicate *Oculina* coral mounds and hard bottom habitat exist to the west of the current boundary, primarily between the two existing Oculina Bank HAPC satellite areas.

Deepwater Shrimp (AP) Comments and Recommendations
The Deepwater Shrimp AP developed new recommendations for Action 1 during their May 2013 meeting that tweak the northern extension identified in Sub-Alternative 2a and also the western extension (Alternative 3) of the Oculina Bank HAPC. The revised recommendation (Sub-Alternative 2b) for a northern extension was developed to further exclude historical trawlable areas, thus reducing fishery impacts along the southeast and southwest boundaries in a proposed northern extension of the HAPC where traditional fishing activity occurs. The Deepwater Shrimp AP recommendation follows more closely the rock shrimp trawl track data and not a specific depth contour. The AP also discussed that updated VMS data indicate fishing activity occurred in more recent years within some of the proposed alternatives and as a result, they revised their recommendations for preferred alternatives.

Scientific and Statistical Committee (SSC) Comments and Recommendations
At their April 2013 meeting, the SSC reviewed Coral Amendment 8 and offered to be of any assistance in reviewing additional analyses (such as the Socio-Economic analysis) via e-mail or other practical means prior to the South Atlantic Council's final approval. By consensus, the SSC agreed that the proposed actions that modify the CHAPCs succeed in addressing the

purpose and need of Coral Amendment 8 and, therefore, actions in Coral Amendment 8 are warranted to protect coral in these areas.

South Atlantic Council's Choice for Preferred Alternative

The South Atlantic Council selected the Deepwater Shrimp AP recommendation as an alternative (Sub-Alternative 2b) under Action 1 at the June 2013 meeting and chose this as their preferred alternative for a northern expansion of the Oculina Bank HAPC. The South Atlantic Council discussed that areas that would be eliminated under Sub-Alternative 2b have been important fishing grounds in recent years to the rock shrimp fishery. The South Atlantic Council noted that with the VMS requirement on board rock shrimp vessels, fishery managers are aware of where the fishery is operating and therefore allowing them to fish closer to hard bottom habitat areas adjacent to the HAPC should be approved. The South Atlantic Council also discussed that Alternative 3 had been a preferred recommendation of the Coral and Habitat APs since the public scoping process, and concluded that a modification of the proposed western extension of the HAPC would move the boundary close to pinnacles in the area based on the bathymetric data. Further, the South Atlantic Council discussed that fishermen would not gain much trawlable fishing ground for the risk that would be taken in moving the proposed boundary identified in Alternative 3 further east in closer proximity to high relief features. As a result of these discussions, the South Atlantic Council selected Alternative 3 as the preferred alternative for a western expansion of the Oculina Bank HAPC during the June 2013 meeting.

The South Atlantic Council concluded **Preferred Alternatives 2b** and **3** best meet the purpose and need, the objectives of the FMP for Coral, Coral Reefs, and Live/Hard bottom Habitats of the South Atlantic Region, as amended, while complying with the requirements of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), and other applicable law.

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

Coral and Habitat Advisory Panels (APs) Comments and Recommendations

During the joint meeting with the Coral and Deepwater Shrimp APs in October 2012, the Coral AP did not have objections to the transit provision recommendation developed by the Deepwater Shrimp AP. At their November 2012 meeting, the Habitat AP followed suit with no objections to such a provision. The APs noted in their discussion that it was outside of the purview of their charge to the South Atlantic Council to discuss specifications identified in a transit provision.

Deepwater Shrimp (AP) Comments and Recommendations

At the joint Coral and Deepwater Shrimp AP meeting in October 2012, the Deepwater Shrimp AP developed specifications for a transit provision alternative, with guidance from Law Enforcement AP representatives. The specifications include allowance of possession of rock shrimp on board a vessel while within the HAPC, a minimum speed provision, an increase in ping rate, the definition of stowage of gear, and a call-in provision. At their December 2012 meeting, the South Atlantic Council selected the AP's recommendation for a new alternative under Action 2 based on the Deepwater Shrimp AP discussions during the joint AP meeting in

October 2012. The Deepwater Shrimp AP developed a revised recommendation during their May 2013 meeting for a transit provision through the Oculina Bank HAPC. Revisions to Alternative 3 were made during the meeting to reduce the minimum speed requirement from 6 to 5 knots and eliminate the call-in specification in the event of mechanical failure or emergency because the practice of vessels communicating to the appropriate contact when necessary currently exists in the regulations and an additional requirement stipulating this provision is not necessary. The AP noted that turbulent conditions can be present adjacent to and within the Oculina Bank HAPC and cited potential safety-at-sea concerns when transiting at minimum speeds greater than 5 knots through the area.

South Atlantic Council's Choice for Preferred Alternative

The South Atlantic Council indicated their intentions with Action 2 throughout the process of developing Coral Amendment 8. As a result of the area proposed for a northern extension of the Oculina Bank HAPC under Action 1, the South Atlantic Council discussed allowing rock shrimp fishermen to possess rock shrimp on board their vessel while transiting through the HAPC in order to access traditional fishing grounds off the eastern boundary. With a northern extension of the HAPC proposed under the Action 1 alternatives, the South Atlantic Council discussed that rock shrimp fishermen would potentially face safety-at-sea issues and economic hardship related to fuel costs traveling around the HAPC without a transit provision.

The South Atlantic Council revised Alternative 3 according to the Deepwater Shrimp AP recommendation, noting that all APs involved in providing input in the development of Coral Amendment 8 were in accord with the transit specifications identified in the alternative language. Further, the South Atlantic Council discussed that representatives from NOAA's Office of Law Enforcement participated in developing the transit provision identified in Alternative 3 during the Deepwater Shrimp AP meeting in May 2013. The NOAA Office of Law Enforcement representative advised that the call-in specification for vessels unable to sustain minimal speed (as indicated in Alternative 2) is a practice already in place and was not necessary to include in the transit provision language. Further, the U.S. Coast Guard representative indicated a clear understanding of the transit specifications identified in Alternative 3. With the representatives of federal law enforcement agencies as well as the Deepwater Shrimp AP in support of Alternative 3, the South Atlantic Council chose this as their preferred in June 2013.

The South Atlantic Council concluded **Preferred Alternative 3** best meets the purpose and need, the objectives of the FMP for Coral, Coral Reefs, and Live/Hard bottom Habitats of the South Atlantic Region, as amended, while complying with the requirements of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), and other applicable law.

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

Coral and Habitat Advisory Panels (AP) Comments and Recommendations

During their May 2013 joint AP session, the Coral and Habitat APs reaffirmed their recommendation for Alternative 2 under Action 3 as preferred. This alternative was developed during the joint Coral and Deepwater Shrimp AP meeting in October 2012. The Coral and

Deepwater Shrimp APs discussed the Coral AP's original recommendation for extending the western boundary of the Stetson-Miami Terrace CHAPC. The Deepwater Shrimp AP noted that a portion of the proposed southern extension is productive sand bottom for royal red shrimp. As a result of this discussion, the Coral AP recommended modifying their preferred option for this area to minimize this portion of the southern boundary that is productive royal red sandy bottom within their previously recommended extension. The Habitat AP reviewed the revised Alternative 2 during their November 2012 AP meeting and also endorsed this as a preferred alternative at that time.

Deepwater Shrimp (AP) Comments and Recommendations
At their May 2013 meeting, the Deepwater Shrimp AP discussed that modifications were needed to further exclude historical trawlable areas currently included in the action alternatives. The AP noted that updated VMS data indicate fishing activity occurred in more recent years within some of the proposed extensions and the AP revised their recommendations for preferred alternatives as a result.

Previously, the AP recommended Alternative 2 as a preferred alternative for the South Atlantic Council's consideration. As a result of discussions during their May 2013 meeting, the AP endorsed an additional alternative in the event the South Atlantic Council did not consider Alternative 3 as a preferred. The AP's secondary preferred recommendation is to modify Alternative 2 to include a Shrimp Fishery Access Area where the vessel monitoring system points are concentrated in the proposed southern extension (the access area would allow vessels the capability to drift into the CHAPC, haul-back their gear and turn around).

South Atlantic Council's Choice for Preferred Alternative
At the June 2013 meeting, the South Atlantic Council discussed the Deepwater Shrimp AP's recommendation for a modification of Alternative 2, however they selected this as a new alternative instead of a revision to Alternative 2, which is reflective in **Preferred Alternative 4**. The South Atlantic Council discussed that royal red shrimp fishery impacts associated with **Preferred Alternative 4** would be based on the entire time series of VMS data, (that is, approximately 0.1% of fishing activity would be eliminated) and the western extension identified in the alternative language incorporates the area of mapped *Lophelia* habitat. Based on fishermen input during the Deepwater Shrimp AP meeting in May 2013, the South Atlantic Council discussed that VMS points in the southeast corner of the proposed western extension of the Stetson-Miami Terrace CHAPC represent haul back of royal red shrimp vessel gear deployed in deep waters and not fishing points. The South Atlantic Council indicated no objection to allowing a fishery access area to allow vessels an opportunity to haul back their gear while inside the access area within the extended CHAPC.

The South Atlantic Council concluded **Preferred Alternative 4** best meets the purpose and need, the objectives of the FMP for Coral, Coral Reefs, and Live/Hard bottom Habitats of the South Atlantic Region, as amended, while complying with the requirements of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), and other applicable law.

Action 4. Expand Boundaries of the Cape Lookout CHAPC

Coral and Habitat Advisory Panels (AP) Comments and Recommendations
The Coral and Habitat APs have recommended Alternative 2 as preferred. During their May 2013 joint AP meeting, they reaffirmed their recommendation for this alternative as preferred. This recommendation was developed during the Coral AP meeting in October 2011 as a result of recent multibeam data and observations of *Lophelia* habitat in an area north of the existing CHAPC.

Deepwater Shrimp (AP) Comments and Recommendations
The Deepwater Shrimp AP did not provide a recommendation for the region identified in Action 4.

South Atlantic Council's Choice for Preferred Alternative
The South Atlantic Council selected Alternative 2 as preferred during their June 2013 meeting. The South Atlantic Council discussed that minimal fishery impacts are associated with the Action 4 alternative, and noted no other scenarios for extension of the CHAPC are warranted at this time. **Preferred Alternative 2** is based on area of observed *Lophelia* habitat north of the CHAPC boundary as recommended by the Coral and Habitat APs. The South Atlantic Council discussed that no opposition to the proposed CHAPC modification exists, and indicated their interest in conserving known deepwater coral habitat in this region.

The South Atlantic Council concluded **Preferred Alternative 2** best meets the purpose and need, the objectives of the FMP for Coral, Coral Reefs, and Live/Hard bottom Habitats of the South Atlantic Region, as amended, while complying with the requirements of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), and other applicable law.

Chapter 6. Cumulative Effects

As directed by the South Atlantic Council on Environmental Quality (CEQ) regulations, federal agencies are mandated to assess not only the indirect and direct impacts, but also the cumulative impacts of actions. The CEQ regulations define defines a cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). Cumulative effects can either be additive or synergistic. A synergistic effect occurs when the combined effects are greater than the sum of the individual effects.

Bass et al. (2001) presents a five step process for the analysis of cumulative impacts in an Environmental Assessment in which the following criteria must be identified:

- The area in which the effects of the proposed action will occur.
- The impacts that are expected in that area from the proposed action.
- Other past, present, and reasonably foreseeable actions that have or are expected to have impacts in the area.
- The impacts or expected impacts from these other actions.
- The overall impact that can be expected if the individual impacts are allowed to accumulate.

The area in which the effects of the proposed action will occur.
The area in which the effects of the proposed action would occur include the federal 200-nautical mile limit of the Atlantic off the coasts of North Carolina, South Carolina, Georgia, and east Florida to Key West; specifically, deepwater coral ecosystems identified in Section 3.1.1of Coral Amendment 8. Maps depicting the affected area are presented in the Summary Section and Section 4.

The impacts that are expected in that area from the proposed action.
Actions proposed in Coral Amendment 8 address modifications to Habitat Areas of Particular Concern (CHAPC) in the South Atlantic to increase protections for deepwater coral, and transit through the Oculina Bank HAPC. The expected impacts to the affected areas are described in Sections 2 and 4. Actions 1, 3, and 4 consider expansions of existing HAPCs to increase protection of deepwater coral species. Within an HAPC, the use of bottom longline, trawl, dredge, pot or trap as well as the use of an anchor, anchor and chain, or grapple and chain is prohibited. Therefore, as the size of the Oculina Bank HAPC is increased, the biological benefits would increase for coral, including *Oculina*, species that use the bottom substrate as habitat, and rock shrimp. Increasing the size of the Oculina Bank HAPC may provide a refuge for other important species in the area, such as snapper grouper species by prohibiting bottom longline activity as well as anchoring. Action 2 considers a provision that would allow rock shrimp fishermen to transit the Oculina Bank HAPC with gear properly stowed. Action 2 could result in slightly negative biological effects to rock shrimp species as it would allow greater access to the resource on the east side of the Oculina Bank HAPC. However, Action 2 would result in

positive social and economic effects to rock shrimp fishermen, as they would not have to travel around the Oculina Bank HAPC, particularly if the size of the HAPC is expanded (Action 1). The ability of shrimp fishermen to transit the Oculina Bank HAPC would also enhance safety at sea when inclement weather conditions necessitates that a vessel quickly return to port. Coral Amendment 8 would not have a direct biological impact on dolphin, wahoo, or coastal migratory pelagic species as fishing for those species does not impact bottom habitat, and would still be allowed in the expanded HAPC area. The golden crab fishery operates within allowable gear areas, which are not located in the proposed expansion areas of the CHAPCs.

Other past, present, and reasonably foreseeable actions that have or are expected to have impacts in the area, and the impacts or expected impacts from these other actions.

Corals

Coral reefs and live hard bottom habitat have been managed since 1982 (GMFMC and SAFMC 1982). The reader is referred to **Appendix H History of Management** for past regulatory activity for the Coral FMP. For the Coral FMP, recent regulatory activity includes the establishment of deepwater Coral HAPCs (CHAPCs) through CE-BA 1(SAFMC 2010c), prohibition the use of bottom tending gear in these CHAPCs, creation of a "Shrimp Fishery Access Area" within the Stetson-Miami Terrace CHAPC, and creation of "Allowable Golden Crab Fishing Areas" within the Stetson-Miami Terrace and Pourtalés Terrace CHAPCs. Present actions affecting coral include those in Coral Amendment 8. Measures in the amendment would be expected to have moderate positive impacts on deepwater coral ecosystems and there are currently no known future amendments to the Coral FMP that would affect coral species.

Although the measures in the amendment would only modify the Coral FMP, it sets in place provisions that would have slight impacts on the shrimp and snapper grouper fisheries.

Shrimp Fishery

For the shrimp fishery, past actions include prohibitions on trawling to limit the impact of the rock shrimp fishery on the Oculina Bank HAPC, defining essential fish habitat (EFH) for the South Atlantic shrimp resource, reporting requirements, the establishment of the rock shrimp limited access program, and the establishment of rock shrimp access areas to protect deepwater coral. The reader is referred to **Appendix H History of Management** of Amendment 9 to the FMP for the Shrimp Fishery of the South Atlantic Region (Shrimp Amendment 9; SAFMC 2012a) for past regulatory activity for the shrimp fishery. The most recent regulatory action was implemented on July 15, 2013, through Shrimp Amendment 9, which revised the criteria and procedures by which South Atlantic states may request a concurrent closure of the penaeid shrimp (brown, pink, and white shrimp) commercial sector in the exclusive economic zone (EEZ) to protect overwintering white shrimp and also update the current overfished and overfishing status determination criteria for pink shrimp. The cumulative effects to the shrimp fishery with respect to restricting rock shrimp allowable fishing areas were analyzed in CE-BA 1 (SAFMC 2010c). The actions proposed in Coral Amendment 8 would have some limited effect on the shrimp fishery. As the size of an HAPC is increased, the biological benefit would increase for shrimp populations and other species contained within the HAPCs. There are no future actions being considered for the shrimp fishery by the South Atlantic Fishery Management Council (South Atlantic Council). The actions proposed in this amendment combined with past and reasonably foreseeable actions will not lead to significant cumulative impacts.

Snapper Grouper Fishery

The snapper grouper fishery has been highly managed and subject to many regulatory changes. The reader is referred to **Appendix B History of Management** of Regulatory Amendment 18B to the Snapper Grouper FMP (SAFMC 2012b) for past regulatory activity for the snapper grouper fishery. Past regulatory activities that relate to actions contained within Coral Amendment 8 include: the prohibition on the use of trawl gear (SAFMC 1988); prohibition on the use of traps, and bottom longline gear inshore of 50 fathoms (SAFMC 1991); creation of the Oculina Bank Experimental Closed Area (SAFMC 1993b); identification of essential fish habitat and HAPCs for snapper grouper species (SAFMC 1998d); extension of the prohibitions within the Oculina Bank Experimental Closed Area (SAFMC 2005); establishment of 8 marine protected areas (MPAs; SAFMC 2007); and the establishment of the CHAPCs (SAFMC 2010c). All of these amendments provided protection to coral habitat and species associated with that habitat.

Present actions approved by the South Atlantic Council and being implemented by the National Marine Fisheries Service (NMFS) include changes to the annual catch limits for vermilion snapper, red porgy, yellowtail snapper, and black sea bass based on recent assessments.

Reasonable foreseeable actions related to the snapper grouper fishery and coral species addressed in Coral Amendment 8 include the development of Regulatory Amendment 17 to the Snapper Grouper FMP. Regulatory Amendment 17 considers modification of existing marine protected areas (MPAs), or implementation of new MPAs to enhance protection for speckled hind and warsaw grouper. MPAs implemented through Amendment 14 to the Snapper Grouper FMP, overlap spatially to some extent with the CHAPCs implemented through CE-BA 1. Therefore, the proposed actions in Regulatory Amendment 17 could possibly provide additional protections to coral species. The South Atlantic Council is developing many other snapper grouper amendments (see Appendix B of Regulatory Amendment 18), which are likely to mainly affect species management, and have little direct effect on coral species addressed by Coral Amendment 8.

<u>Stressors outside of South Atlantic Council Management</u>

Deepwater Horizon
On April 20, 2010, an explosion occurred on the Deepwater Horizon MC252 oil rig, resulting in the release of an estimated 4.9 million barrels of oil into the Gulf of Mexico. In addition, 1.84 million gallons of Corexit 9500A dispersant were applied as part of the effort to constrain the spill. The oil from the spill site has not been detected in the South Atlantic region, and does not likely pose a threat to the South Atlantic species addressed in this amendment.

Climate Change
Global climate change can affect marine ecosystems through ocean warming by increased thermal stratification, reduced upwelling, sea level rise, and through increases in wave height and frequency, loss of sea ice, and increased risk of diseases in marine biota. Decreases in surface ocean pH due to absorption of anthropogenic carbon dioxide emissions may impact a wide range

of organisms and ecosystems, particularly organisms that absorb calcium from waters, such as corals (IPCC 2007, and references therein). Climate change and ocean acidification is linked to the collapse of coral reefs due to carbon sequestration; however, at this time, the level of impacts on deepwater coral reefs cannot be quantified, nor is the time frame known in which these impacts would occur. Furthermore, studies suggest that some deepwater corals may not tolerate temperatures above 12°C (SAFMC 2010c). Because deepwater corals are stationary entities they are subjected to ongoing environmental conditions, which they cannot escape and may only endure.

The overall impact that can be expected if the individual impacts are allowed to accumulate.

The analyses in Coral Amendment 8 found the proposed actions to expand the CHAPCs would have a positive effect on the biological environment because they would enhance protection to deepwater coral ecosystems, including coral as well as the species that utilize them. Measures to expand the Oculina Bank HAPC, Stetson-Miami Terrace CHAPC, and the Cape Lookout CHAPC would have minimal negative social or economic impacts as the measures do not prevent all fishing from those areas; only those using bottom tending gear, which is limited in those areas.

Deepwater corals are susceptible to various negative influences and are unable to adapt quickly enough to withstand external stressors such as increasing water temperatures, sediment loading, and other toxic depositions. In addition, because of their very slow growth and delicate framework, deepwater corals are particularly vulnerable to physical impacts from fishing gear. It is very likely that a severely impacted deepwater coral community would never recover. Human communities, which may benefit from potentially targeted species associated with deepwater corals may be able to adapt to changing environmental conditions by shifting effort to other species that are not dependent upon deepwater corals for sustained health and abundance.

There may be slight negative biological impacts on rock shrimp populations as the transit provision would allow easier access to the fishing grounds on the offshore side of Oculina. The economic and social impacts for all actions are expected to be minimal, mostly related to the purchasing of new vessel monitoring systems to comply with the need for increased ping rates while transiting through the Oculina Bank HAPC. The cumulative impacts of the actions in the Coral Amendment 8 in conjunction with past, present and reasonably foreseeable management, as well as other documented stressors are not expected to be significant.

The proposed actions would not adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places as these are not in the South Atlantic EEZ. This action is not likely to result in direct, indirect, or cumulative effects to unique areas, such as significant scientific cultural, or historical resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas as the proposed action is not expected to substantially increase fishing effort or the spatial and/or temporal distribution of current fishing effort within the South Atlantic region. The U.S. Monitor, Gray's Reef, and Florida Keys National Marine Sanctuaries are within the boundaries of the South Atlantic EEZ. The proposed actions are not likely to cause loss or destruction of these national marine sanctuaries because the actions are not expected to result in appreciable changes to current fishing practices.

Monitoring

The effects of the proposed action are, and will continue to be, monitored through collection of data by NMFS, life history studies, economic and social analyses, and other scientific observations. There is currently no fishery dependent data collection or monitoring programs on deepwater coral in the South Atlantic. Fishery independent monitoring and research is ongoing.

Chapter 7. 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 8. List of Preparers

Table 8-1. 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 Biologist
Jocelyn Karazsia	NMFS/HC	Fishery Biologist
Andy Herndon	NMFS/PR	Biologist
Roger Pugliese	SAFMC	Fishery 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
Gregg Waugh	SAFMC	Deputy Executive Director
Anne Marie Eich	NMFS/SF	Regulations Writer
David Keys	NMFS/SER	Regional NEPA Coordinator
Juan Agar	SEFSC	Economist

Chapter 9. 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.

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

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

Alabama Sea Grant. 1987. Extension Bulletin MASGP-87-017 Royal Red Shrimp. Auburn University.

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.

Anderson, W. W. and M. J. Lindner. 1971. Contributions to the biology of the royal red shrimp, *Hymenopenaeus robustus* Smith. Fishery Bulletin, U.S. 69 (2):313-336.

Anderson, O.F. and M.R. Clark. 2003. Analysis of bycatch in the fishery for orange roughy, *Hoplostethus atlanticus*, on the South Tasman Rise. *Marine and Freshwater Research* 54:643–652.

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

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.

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

Balcom, N., J. Leamon, and W. Bomster. 1996. Royal Red Shrimp: An Emerging Deep-Sea Fishery in the Northeast. A Report on the results of a federal Fishing Industry Grant project awarded to Clinton Fisheries, Inc.

Bass, R.E., A.I. Herson, and K.M. Bogdan. 2001. The NEPA Book. A step-by-step guide on how to comply with the National Environmental Policy Act. Solano Press Books. 475 pp.

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, editors. 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.

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

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, and 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.

Cajun Steamer Bar and Grill. 2005. General Information. Available at: www.cajunsteamer.com.

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.

Carpenter K.E.ed. 2002. The living marine resources of the Western Central Atlantic. Vol I: Introduction, molluscs, crustaceans, hagfishes, sharks, batoid fishes and chimaeras. Special Publication No. 5. FAO and American Society of Ichthyologists and Herpetologists, Rome. FAO Species Identification Guide for Fishery Purposes. 600.

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.

Cesar H.S.J. 2000. Coral Reefs: Their Functions, Threats and Economic Value. In: H.S.J. Cesar (ed). Collected Essays on the Economics of Coral Reefs. CORDIO, Kalmar University, Sweden. p.14-39.

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.

Clark, M. R., A. A. Rowden, and S. O'Shea. 2005. Effects of fishing on the benthic habitat and fauna of seamounts on the Chatham Rise, New Zealand. In Barnes, P. W. and J. P. Thomas, editors. Benthic habitats and the effects of fishing. American Fisheries Society Symposium 41. Bethesda, MD.

Cobb, S. P., C.R. Futch, 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, editors. 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.

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.

EPA. 1999. Interim Policy to Identify and Address Potential Environmental Justice Areas. Environmental Accountability Divison, EPA-904-R-99-004.

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., P. Eckert, 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.

Food and Agriculture Organization. 2009. Fishing Gear Types. Midwater otter trawls. In FAO Fisheries and Aquaculture Department [online]. Rome. Updated 21 October 2008. [Cited 11 June 2009].

Florida Department of Agriculture and Consumer Services, Division of Marketing and Development. Accessed 2006. Wild Florida Royal Red Shrimp. Available at: http://app2.fl-seafood.com/pubs/pubform/pdf/English_Brochure_Royal_Red_Shrimp.pdf.

Florida Fish and Wildlife Conservation Commission. 2012. The economic impact of saltwater fishing in Florida. Online: http://myfwc.com/conservation/value/saltwater-fishing/

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.

Fuller, S. D., C. Picco, J. Ford, C. Tsao, L. Morgan, D. Hangaard, and R. Chuenpagdee. 2008. How We Fish Matters: Addressing the Ecological Impacts of Canadian Fishing Gear. Ecology Action Centre, Living Oceans Society, and Marine Conservation Biology Institute. 28 p.

GMFMC (Gulf of Mexico Fishery Management Council) and SAFMC (South Atlantic Fishery Management Council). 1982. Fishery Management Plan and Final Environmental Impact Statement for Coral and Coral Reefs of the Gulf of Mexico and South Atlantic. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, S.C. 29407-4699. 316 p.

GMFMC (Gulf of Mexico Fishery Management Council). 1995. Amendment 8 to the fishery management plan for the shrimp fishery of the Gulf of Mexico. Gulf of Mexico Fishery Management Council, 5401 West Kennedy Boulevard, Suite 881, Tampa, Florida.

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.

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

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.

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

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

Grunwald, C., L. Maceda, J. Waldman, J. Stabile, and 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, editors. 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.

Hall-Spencer, J., V. Allain, and J. H. Fosså. 2002. Trawling damage to Northeast Atlantic ancient coral reefs. Proceedings of the Royal Society of Biological Sciences 269:507–511.

Harter, S.L, M.M. Ribera, A.N. Shepard, and 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.

Hill, K. 2005. *Sicyonia brevirostris* (Rock Shrimp) Species Report, Smithsonian Marine Station at Fort Pierce. Available at: http://www.sms.si.edu/IRLSpec/Sicyon_brevir.htm

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.

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.

IPCC. 2007. Summary for policymakers. Page 23 In M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. Van Der Linden, and C.E. Hanson, editors. Climate change 2007: Impacts, adaptation, and vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge.

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.

Keiser, R. K. 1976. Distribution of the Rock Shrimp (*Sycionia brevirostris*) in coastal waters of the southeastern United States. South Carolina Marine Resources Research Institute, Charleston, SC. 19 p.

Kennedy, F.S., J.J. Crane, R.A. Schlieder, 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.

Koslow, J. A., G. W. Boehlert, J. D. M. Gordon, R. L. Haedrich, P. Lorance, and N. Parin. 2000. Continental slope and deep-sea fisheries: implications for a fragile ecosystem. ICES Journal of Marine Science 57: 548–557.

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, editors) 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, editors. Biology of Seagrasses. Elsevier, Amsterdam, 610.

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

Lewis, J. B. 1977. Suspension feeding in Atlantic reef corals and the importance of suspended particulate matter as a food source. Proceedings of the 3rd International Coral Reef Symposium 1:405-408.

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

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

Low, R. N. and G. F. Ulrich. 1983. Deep-water demersal finfish resources and fisheries off South Carolina. S.C. Mar. Resour. Cent. Tech. Rep. No. 57, 24 p.

Lumsden S. E, T. F. Hourigan, A. W. Bruckner, and G. Dorr, editors. 2007. The State of Deep Coral Ecosystems of the United States. NOAA Technical Memorandum CRCP-3. Silver Spring, MD.

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

Lutz, P.L., J.A. Musick, and J. Wyneken, editors. 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.

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.

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

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.

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

Meylan, A. 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.

Mortensen, P. B. 2000. *Lophelia pertusa* in Norwegian waters: distribution, growth an associated fauna. Ph.D. Dissertation, University of Bergen, Department of Fisheries and Marine Biology.

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., D. Hatin, J. E. Hightower, K. McKown, K. J. Sulak, A. W. Kahnle, and F. Caron, editors. 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.

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.

NMFS. 2011. Fisheries Economics of the United States, 2009. U.S. Department of Commerce, NOAA Technical Memorandum. National Marine Fisheries Service-F/SPO-118. Available at: http://www.st.nmfs.noaa.gov/st5/publication/fisheries_economics_2009.html.

NOAA (National Oceanic and Atmospheric Administration). 2004a. Historical Highlights, 1950s. Available at: http://www.nefs.noaa.gov/history/timeline/1950.html

NOAA (National Oceanic and Atmospheric Administration). 2004b. Historical Highlights, 1960s. Available at: http://nefs.noaa.gov/history/timeline/1960.html

NOAA (National Oceanic and Atmospheric Administration). 2004c. Baird's Legacy; Progress and Change 1947-1971. Available at: http://www.nefsc.noaa.gov/history/stories/legacy/1947-71.html

NPFMC (North Pacific Fishery Management Council). 2003. Stock assessment and fishery evaluation report for the groundfish resources of the Bering Sea/ Aleutian Islands region. North Pacific Fishery Management Council, Anchorage, AK.

NRC (National Research Council). 2002. Effects of Trawling and Dredging on Seafloor Habitat: Phase 1. National Research Council, National Research Council Committee on Ecosystem Effects of Fishing. National Academies Press, Washington, DC.

National Shrimp Festival. 2004. Shrimp Info. Available at: http://www.gulf-shores-shrimp-festival.com/shrimp-info-recipies.html

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.

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

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., editors. 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.

Perry, H. and K. Larsen. 2004. Picture Guide to Shelf Invertebrates of the Northern Gulf of Mexico. NOAA/NMFS. Available at: http://www.gsmfc.org/seamap/picture_guide/main.htm

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.

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

Puglise, K. A., R. J. Brock, and J. J. McDonough. 2005. Identifying critical information needs and developing institutional partnerships to further the understanding of Atlantic deep-sea coral ecosystems. In Freiwald, A. and J. M. Roberts, editors. Cold-water corals and ecosystems. Springer-Verlag, Berlin.

Reed, J.K. 1980. Distribution and structure of deep-water *Oculina varicosa* coral reefs off central eastern Florida. Bull. 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. and S.W. Ross. 2005a. 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. 2005b. Mapping, habitat characterization, and fish surveys of the deep-water *Oculina* coral reef marine protected area: a review of historical and current research. Pages 443-465 in R. A. Freiwald and J. M. Roberts, editors. 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.

Rezak, R., T. J. Bright, and D. W. McGrail. 1985. Reefs and Banks of the Northwestern Gulf of Mexico. New York: John Wiley and Sons.

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.

Rylaarsdam, K.W. 1983. Life histories and abundance patterns of colonial corals on Jamaican reefs. Mar Ecol Prog Ser 13:249-260.

SAFMC (South Atlantic Fishery Management Council). 1988. Amendment 1 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). 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). 1991. Amendment 4 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). 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). 1994. 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). 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). 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). 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). 2005. Amendment 13A 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). 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. Amendment 14 to the Snapper Grouper Fishery Management Plan. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201; North Charleston, SC 29405.

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

SAFMC (South Atlantic Fishery Management Council). 2009. 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). 2012a. Amendment 9 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.

SAFMC (South Atlantic Fishery Management Council). 2012b. Regulatory Amendment 18B to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201; North Charleston, SC 29405.

SAFMC (South Atlantic Fishery Management Council). 2013a. Regulatory Amendment 13 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). 2013b. Regulatory Amendment 18 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 4055 Faber Place, Ste 201, North Charleston, S.C. 29405.

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

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.

Sea Grant Louisiana. 2006. Rock Shrimp. Lagniappe Vol.30, No.9

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

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.

Shrimp Lady (Accessed 2007). Available at: http://www.shrimplady.com/default.htm.

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., 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.

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.

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

Soong, K. and J. C. Lang. 1992. Reproductive integration in coral reefs. Biol. Bull. 183:418 431.

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.

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

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

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

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.

Vierros, M. 2006.The Convention on Biological Diversity in oceans and coasts: Moving from policy to implementation. Sustainable Development Law & Policy. Fall 2006, pp.17-20.

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 oxyrinchu 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, editors. 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.

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

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.

Witherington, B. S. Hirama, and R. Hardy. 2012. Young sea turtles of the pelagic Sargassum-dominated drift community: habitat use, population density and threats. MEPS (463):1-22.

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

WWF (World Wildlife Fund). 2006. Policy proposals and operational guidance for ecosystem based management of marine capture fisheries. WWF International, Gland, Switzerland, 80pp.