

SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL



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FINAL REPORT COOPERATIVE AGREEMENT NA05NMF4411047 October 1, 2005 – March 31, 2008

The original award covered the period October 1, 2005 to March 31, 2007. However, more time was needed to complete tasks under Project 1 (below) and a no-cost extension was requested and granted to carry the award through March 31, 2008. This report summarizes activities for the entire period of the grant award.

Project 1: NOAA CRG 2005. Support and Maintenance for Serving Maps of Coral and Live/Hard Bottom EFH and EFH-HAPCs via the Internet.

This project has provided a solid base for the SAFMC to move forward with ecosystem-based management of fishery resources, especially coral and coral reefs, in the South Atlantic region. In order to effectively manage regional coral, coral reef and live/hard bottom resources requires the availability of accurate and current spatial information on the distribution of the coral resources themselves and that of other managed resources and habitats that form part of the ecosystem within which coral resources exist. The partnership that the SAFMC began with the Florida Fish and Wildlife Research Institute (FWRI) through previous grants from the Coral Reef Conservation Program, and that has continued to grow and solidify through subsequent awards, is of critical importance to the SAFMC's success in managing the coral and other fishery resources under its jurisdiction. In recent years the SAFMC has shifted to a more holistic approach to management by applying ecosystem-based management principles and this project has become a critical component of that approach.

Portal Solution: FWRI facilitated the transfer of the original Habitat and Ecosystem webpages (later becoming part of the SAFMC website) to Dot Net Nuke, an open-source portal product. This became a valuable tool as the SAFMC embarked on the development of its Fishery Ecosystem Plan (FEP). Development of the FEP has been a monumental task involving contributions from many regional experts. During the initial phase of FEP development, the SAFMC's portal established through this project was used as a platform to facilitate the development of various sections of the document. Writing Teams were created and given the task of building on the information in the Council's Habitat Plan (SAFMC 1998a) to create new sections that would eventually be comprised in the FEP document. Many webpages were created that were only accessible via the portal to a particular writing team and were used as a means of sharing and refining contributed sections. Similarly, the SAFMC's Deepwater Coral Research and Monitoring Plan and the SAFMC's updated EFH policy on energy development (SAFMC 2005) were partly developed using the web portal.

Home Page Improvements and Mapping Enhancements: The prototype “home page” developed by FWRI quickly grew to eventually becoming a large portion of the current SAFMC website. This award allowed FWRI to improve many aspects of the site to improve navigation as well as implementing a framework for downloading spatial data and metadata served in the South Atlantic Habitat and Ecosystem IMS application. The Nautical Charts for the IMS background display were updated during February and March of 2006. The charts were organized by resolution and were downloaded directly from NOAA’s website. The various scales and charts for the South Atlantic Region were downloaded, projected, and color-recoded so that images matched between different data sets.

To take full advantage of GeoPDF technology, the Adobe Acrobat and ArcGIS Map2PDF bundle were purchased. The GeoPDF format provides a complementary avenue to distribute the vast amount of GIS data compiled for SAFMC’s jurisdictional area. This approach has proven invaluable in obtaining information directly from fishermen by drawing polygons directly in Adobe Reader. These polygons and any comments the fishermen provide can then be exported and processed as shapefiles. This approach was recently utilized to determine whether fishing activities for golden crab and royal red shrimp were within the proposed boundaries of the largest of the five proposed deepwater Coral HAPCs.

Map Wizard: Through this award, the SAFMC tasked FWRI with developing a customized map wizard application that would allow users unfamiliar with GIS to access the information served on the South Atlantic Habitat and Ecosystem IMS application. Thus, FWRI developed a prototype ASP application that would provide users with an alternative method to produce maps. Unfortunately this code sample proved difficult to customize to suit the purposes of a map wizard interface and an alternative approach was proposed involving the .NET framework, components and languages to produce a completely customized viewer from scratch. This map wizard application contained a VisualBasic.NET project with specific MapNet components. The application requires an ArcIMS image service and feature service to provide enhance query functionalities. The application was posted and an internal review of the functionality and performance was conducted. Further refinement of the Wizard is being conducted with oversight from the Council’s Senior Fishery Biologist to ensure the tool meets multiple levels of information dissemination before it is operational online.

EcoSpecies Database Programmer/Application Developer

While numerous species are managed under the Coral, Coral Reef and Live/Hard Bottom Fishery Management Plan (Coral FMP), no listing and description of these species currently exists. The EcoSpecies database that this project has continued to develop will provide a venue for managers and the general public to obtain biological information on species managed under the Coral FMP and other SAFMC Fishery Management Plans.

This project funded a Database Programmer to accomplish tasks under this portion of the project. That position, unfortunately, was only temporarily filled from April through June 2007. Since then, FWRI tasked experienced staff from the Center for Spatial Analysis group to lead the development of the EcoSpecies database.

FWRI began development of the EcoSpecies Database by modeling the effort after their existing Florida Estuarine and Marine Living Resources (FLEMLR) database. First, a personal geodatabase for importing spatial and non-spatial data related to the FLEMLR database was

created and the non-spatial tables in the FLEMLR database were loaded. Several datasets for the FLEMLR project were also clipped for inclusion in the geodatabase including hydrographic polygons and lines, federal lands and cities. Then, new relationship classes for the FLEMLR geodatabase to relate the spatial estuary dataset with the non-spatial tables of FLEMLR were created. Coded-value domains were created for all estuaries and species of the FLEMLR geodatabase. Once the domains were established, the estuary and species fields for each table of the geodatabase were assigned to the domains. Before the estuary codes could be related to the spatial estuary datasets, however, the latter had to be standardized to remove inconsistencies in naming across datasets. The geodatabase now relates tables of species' abundance, attributes, habitats, reproductions, and value status. FWRI will continue testing and development of the EcoSpecies database under grant NA06NMF4410081 and explore how it can be used in providing information for Southeast Data, Assessment and Review (SEDAR) process which contributes directly to the regional management process.

Transfer of SEAGeoFISH database

The South Carolina Department of Natural Resources (SCDNR) approached the SAFMC in fall 2006 to explore transfer the SEAGeoFISH database to the SAFMC. The SEAGeoFISH database already contains numerous GIS layers pertaining to fishery-independent surveys conducted in the South Atlantic region (mainly MARMAP). Some of these data are sensitive and not appropriate for public dissemination (i.e. point location for spawning sites of snapper grouper species). In addition, collaborating researchers in the region had expressed concerns regarding public dissemination of detailed bottom maps showing deepwater coral distribution in the South Atlantic region. Because these data are invaluable for the SAFMC's success in conserving and managing coral and other resources, a restricted interface for the current South Atlantic Habitat and Ecosystem IMS system was needed. Thus FWRI was tasked to transfer of the SEAGeoFISH database and to enable it as a restricted interface, via the existing IMS, for the dissemination of spatial data to the scientific and resource management communities in the region.

The SEAGeoFISH database was hosted at NOAA's Coastal Service Center (CSC), thus FWRI staff initially met in spring 2007 with CSC and SCDNR personnel to discuss the transfer of the SeaGeoFish IMS application. The CSC provided all of the code for the SeaGeoFISH project and its associated data. It was determined that, while the SeaGeoFISH application was similar to the South Atlantic Habitat and Ecosystem ArcIMS application hosted at FWRI there were several distinct differences to recode to suit FWRI's hosting platform. First, the SeaGeoFISH IMS required an ArcMap Image Service instead of the more generic Image Map Service format. Second, the SeaGeoFISH application required its GIS data to be stored in ArcSDE instead of locally stored shapefiles. ArcSDE technology serves as a gateway between GIS clients and a Relational Database Management System (RDBMS). The CSC provided the GIS data in a personal geodatabase format which was eventually loaded into ArcSDE successfully. The SCDNR provided metadata text files for MARMAP Gear and Species data, which were also imported into ArcSDE. Third, it was determined that RDBMS for GIS data stored in ArcSDE varies between the two hosting centers, FWRI and CSC. The CSC coded several scripts for their RDBMS, SQL Server. FWRI revised all necessary code and scripts to work with an Oracle RDBMS instead. Once the script conversion was complete, the resultant views required for customized queries were loaded directly in the

Oracle RDBMS. The structure of the new database (formerly SEAGeoFISH), is available upon request from the Council Office.

EFH GIS Layers

FWRI compiled or created EFH GIS data layers for the SAFMC’s jurisdictional area. **Figures 1 – 7** provide updated maps of Essential Fish Habitat for the following species: Coral, Snapper Grouper, Shrimp, Red Drum, Spiny Lobster, Coastal Migratory Pelagics, and Golden Crab. These maps provide the best possible estimates of EFH in SAFMC’s jurisdictional area at this time. The maps will be updated as new datasets are identified or created for inclusion. All GIS and metadata representing EFH data once finalized will be available in multiple formats through the SAFMC Habitat and Ecosystem IMS <http://www.safmc.net/EcosystemManagement/EcosystemBoundaries/MappingandGISData/tabid/62/Default.aspx> .

Table 1 below contains an update of all EFH GIS data availability. Most of EFH layers in the SAFMC’s jurisdictional area now have a spatial representation. However, some data sets are still being developed. FWRI will continue to consult with SAFMC to determine the best approach for creating new data sources for those that are lacking. FWRI provided SAFMC with an overview for the newly compiled EFH data layers. This overview is not included in this progress report but is available upon request.

Table 1. Update for Essential Fish Habitat GIS data creation.

Habitat Type	FMP	Shapefile	Comments
Tidal freshwater (palustrine)	Shrimp, Red drum	SE_palforwtld.shp	Reclassified CCAP
Estuarine and marine emergent wetlands (e.g., intertidal marshes)	Shrimp, Red drum, Snapper grouper	SE_EstEmgWtld.shp	Reclassified CCAP
Tidal palustrine forested areas	Shrimp	SE_PalAqBed.shp	Reclassified CCAP
Estuarine scrub/shrub (mangroves and mangrove fringe)	Shrimp, Red drum, Snapper grouper, Spiny lobster	mangrove_coastal_esi_poly.shp :SE_EstAqBed.shp	Reclassified CCAP
Estuarine and marine submerged aquatic vegetation (e.g., seagrass)	Shrimp, Red drum, Snapper Grouper, Spiny lobster	seagrass_fl_1987to2007_poly.shp	NC seagrass data exists ...seeking shapefile
Subtidal and intertidal non-vegetated flats	Shrimp	fl_tidal_flats.shp	Existing IMS layer
Oyster reefs and shell banks	Red drum, Snapper grouper	sc_shellfish.shp; sga.shp for NC	Existing IMS layer for SC, but need to find data for other states
Unconsolidated bottom	Red drum, Snapper grouper, Spiny lobster	conmapsg.shp	Very generalized dataset

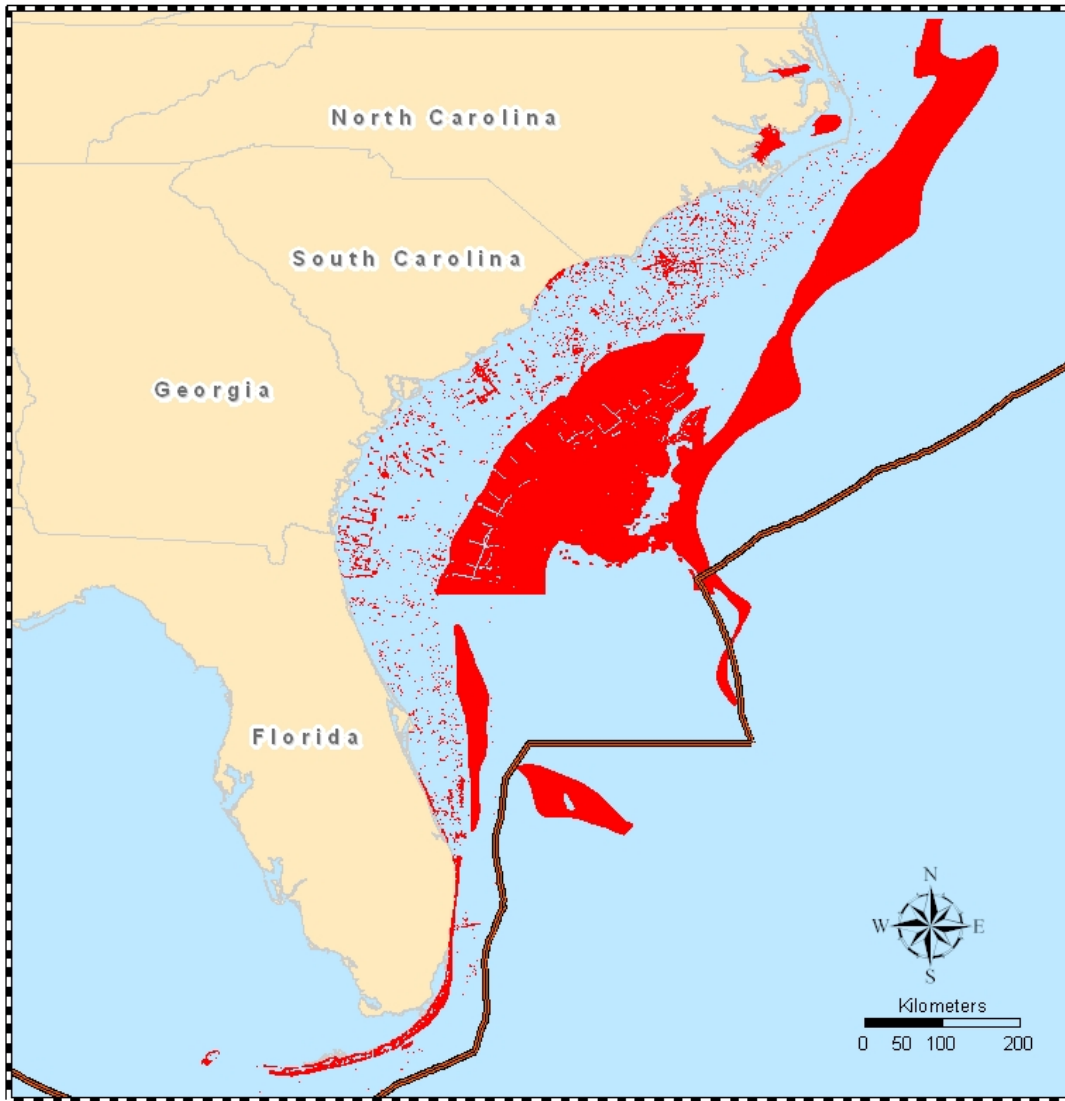
Offshore marine habitats used for spawning and growth to maturity	Shrimp		Unable to determine from Habitat Plan description
All interconnecting water bodies as described in the Habitat Plan	Shrimp	SA_bays.shp	all inshore bays, sounds and harbors of the southeast
Offshore terrigenous and biogenic sand bottom habitats from 18 to 182 meters	for rock shrimp in Shrimp FMP	In progress	terrigenous sediment is in the interp.shp file but does not fall within the depth contours specified. interp.shp; conmapsg.shp
Shelf current systems near Cape Canaveral, Florida	for rock shrimp in Shrimp FMP	In progress	Florida current; loop current, mid-shelf and inner-shelf fronts or create a polygon showing boundaries of coastward front of gulf stream to the state/federal waters from 28 to 29 degrees
Gulf Stream	Shrimp, Snapper grouper, Coastal Migratory Pelagics, Golden crab, Spiny lobster, Dolphin wahoo , ROYAL Red Shrimp	GulfStream.shp	Line shapefile representing the front and mean boundaries of the Gulf Stream
Upper regions of the continental slope from 180 meters (590 feet) to about 730 meters (2,395 feet) over blue/black mud, sand, muddy sand, or white calcareous mud	for royal red shrimp in Shrimp FMP	In progress	digitize the depth contours from NC to FL keys; use the conmap.shp to determine generalized bottom sediments (i.e. sand)
Ocean high salinity surf zones	Red drum, Coastal Migratory Pelagics	In progress	coastline file and buffer 50m out
Artificial reefs	Red drum, Snapper grouper	artificialreef_fl_point.shp ; artreef_GA_SC.shp ; artreef_NC.shp	√
Coral reefs	Snapper grouper, Spiny lobster	coralp.shp	√
Live/hardbottom	Snapper grouper, Spiny lobster	snapper grouper and spiny lobster efh_hapc layers	√

Medium-to-high profile outcroppings on/around shelf break zone from shore-600' (at least 2000' for wreckfish) where annual water temp range is sufficiently warm to maintain adult pops of members of this largely tropical complex	Snapper grouper	In progress	√
Spawning area in the water column above the adult habitat and the additional pelagic environment, including Sargassum	Snapper grouper	MARMAP spawning locations for SG - 1 mile buffered points	√
Sandy shoals of capes and offshore bars	Coastal Migratory Pelagics	shoals_danger_biscayne_poly.shp	still searching for others
High profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone, but from the Gulf stream shoreward, including Sargassum	Coastal Migratory Pelagics	mig_pel_EFH,	SEAMAP hard bottom from the shelf break in, (continental shelf from SEAMAP CD)
All coastal inlets	Coastal Migratory Pelagics	inlets_fl_point.shp ; Inlets_GA.shp ; Inlets_NC.shp ; Inlets_SC.shp	√
All state-designated nursery habitats of particular importance (for example, in North Carolina this would include all Primary Nursery Areas and all Secondary Nursery Areas)	Coastal Migratory Pelagics	Primary and Secondary Nurseries are served on the IMS; NC_oysterSanc.shp	
High salinity bays, estuaries, and seagrass habitat	for cobia in Coastal Migratory PelagicsFMP		Used existing bays and seagrass layers
U.S. Continental Shelf from Chesapeake Bay south through the Florida Straits (and	Golden crab	part of existing EFH IMS	√

into the Gulf of Mexico)			
Nearshore shelf/oceanic waters	Spiny lobster	background layer	√
Shallow subtidal bottom	Spiny lobster	spin_lobster_efh	3 ft contour associated with SEAMAP hard bottom as outward bound
Sponges	Spiny lobster		no concise collection of all marine sponges distribution found at this time
Algal communities (Laurencia)	Spiny lobster	reviewing the Estuarine Aquatic Beds CCAP imagery	no concise laurencia distribution dataset found at this time
Rough, hard, exposed, stable substrate in subtidal to outer shelf depths, subtropical (15°-35° C), within a wide range of salinity and turbidity levels sufficiently low enough to provide algal symbionts adequate sunlight penetration for photosynthesis	Coral	Shallow and Deepwater SEAMAP bottom habitats; Popenoe Geology map	May be able to refine using seasonal sea surface temperature (SST) averages. The seasons for the SST datasets are January-March (sst001i4km.tif), April-June (sst002i4km.tif), July-September (sst003i4km.tif), and October-December (sst004i4km.tif).
Defined hard substrate in subtidal to outer shelf depths throughout the management area	Coral	Shallow and Deepwater SEAMAP bottom habitats; interp.shp	√
Muddy, silty bottoms in subtidal to outer shelf depths within a wide range of salinity and light penetration	Coral	conmapsg.shp	√
Charleston Gyre	Dolphin wahoo FMP	CharlestonGyre.shp	√
Florida Current	Dolphin wahoo	FloridaCurrent.shp	√
Pelagic Sargassum	for dolphin under Coastal Migratory Pelagics FMP	SargassumFieldsForever.shp	Boundary of regular occurrence; > 5% probability of encounter within 1° square; and possible center of distribution (Source: Dooley 1972). Shapefile does not fall within SAFMC jurisdictional boundary. Seeking additional

			sources.
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Coral Essential Fish Habitat

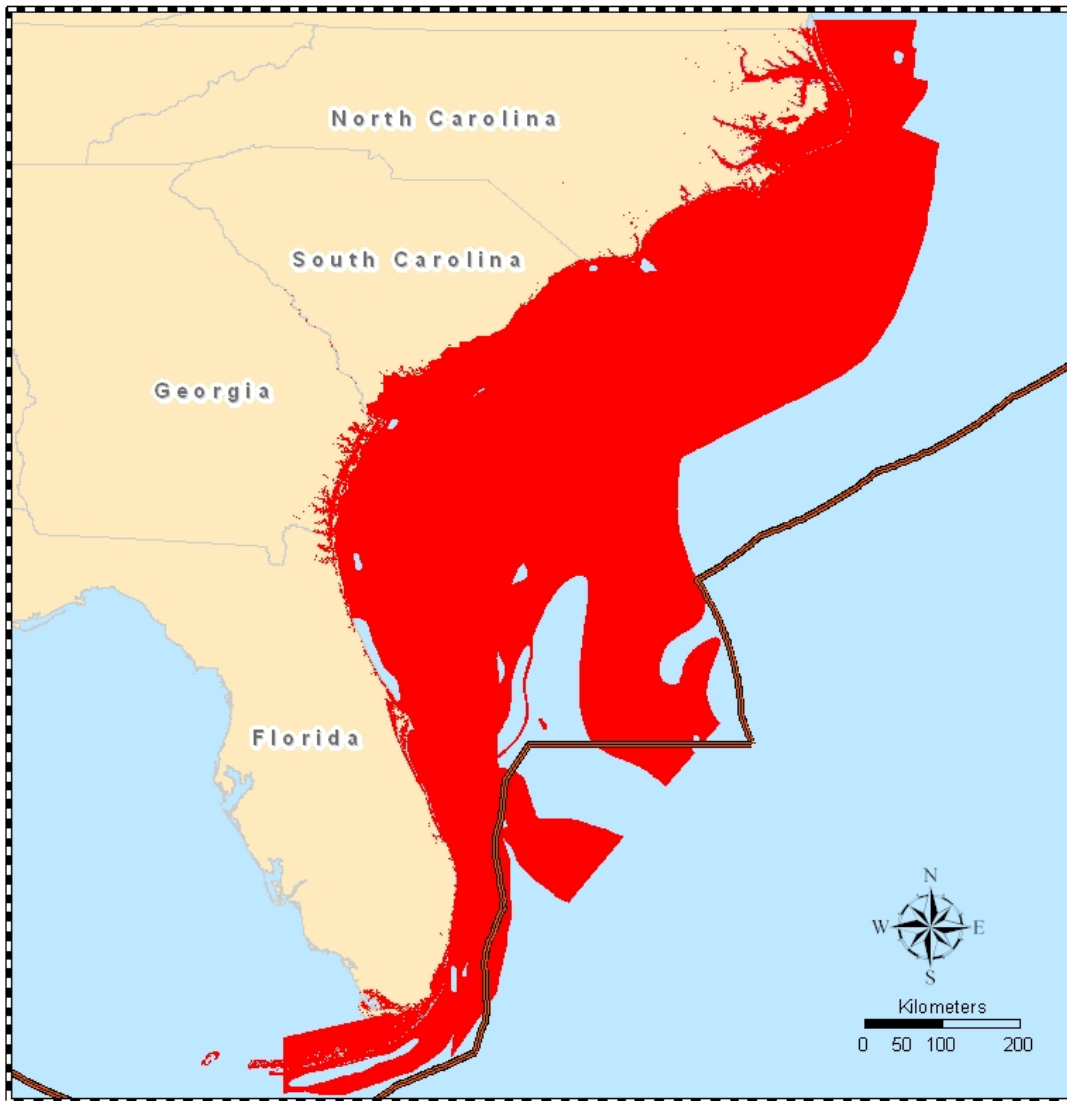


Rough, hard, exposed, stable substrate in subtidal to outer shelf depths, subtropical (15°-35° C), within a wide range of salinity and turbidity levels sufficiently low enough to provide algal symbionts adequate sunlight penetration for photosynthesis
Defined hard substrate in subtidal to outer shelf depths throughout the management area
Muddy, silty bottoms in subtidal to outer shelf depths within a wide range of salinity and light penetration



Figure 1. Combined Essential Fish Habitat for Coral.

Snapper Grouper Essential Fish Habitat

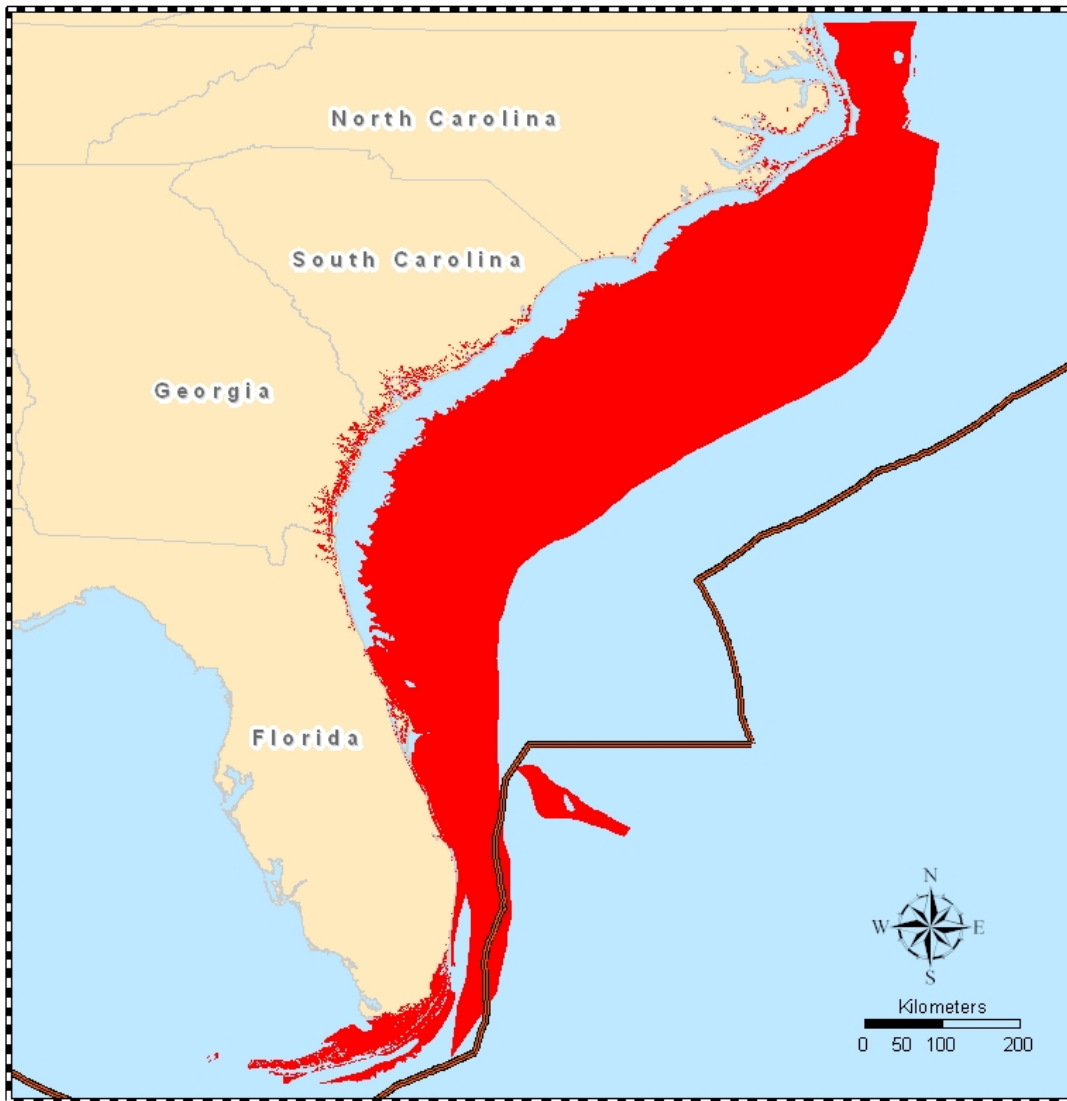


- Estuarine and marine emergent wetlands (e.g., intertidal marshes)
- Estuarine scrub/shrub (mangroves and mangrove fringe)
- Estuarine and marine submerged aquatic vegetation (e.g., eagrass)
- Oyster reefs and shell banks
- Unconsolidated bottom (inshore of the 100-foot contour)
- Gulf Stream
- Artificial reefs
- Coral reefs
- Live/hardbottom
- Spawning areas



Figure 2. Combined Essential Fish Habitat for Snapper Grouper.

Shrimp Essential Fish Habitat

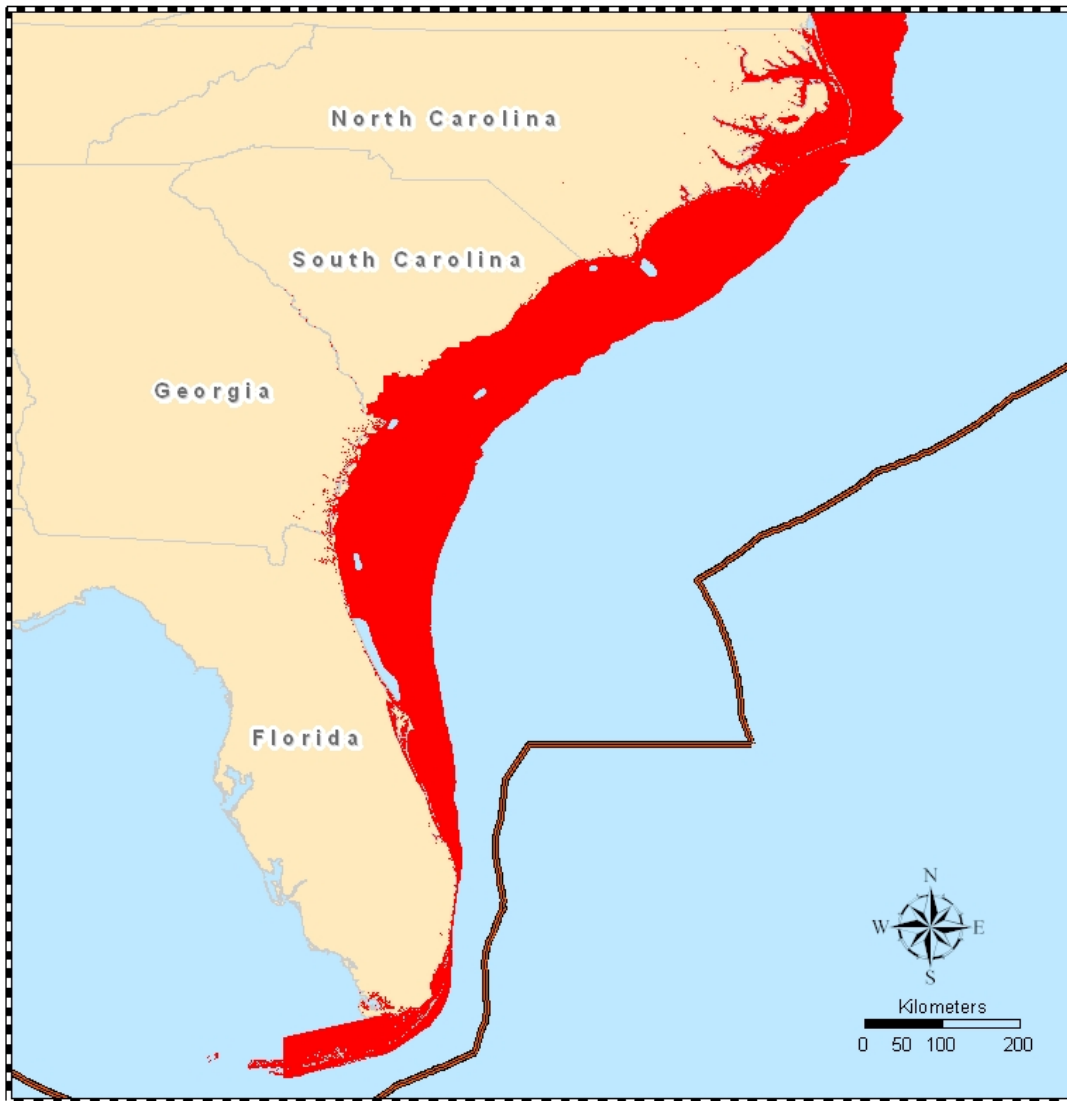


- Estuarine scrub/shrub
- Estuarine and marine submerged aquatic vegetation
- Subtidal and intertidal non-vegetated flats
- Offshore marine habitats used for spawning and growth to maturity (in progress)
- All interconnecting water bodies as described in the Habitat Plan
- Offshore terrigenous and biogenic sand bottom habitats from 18 to 182 meters (in progress)
- Shelf current systems near Cape Canaveral, Florida (in progress)
- Gulf Stream
- Upper regions of the continental slope from 180 meters (590 feet) to about 730 meters (2,395 feet) over blue/black mud, sand, muddy sand, or white calcareous mud (in progress)



Figure 3. Combined Essential Fish Habitat for Shrimp.

Red Drum Essential Fish Habitat

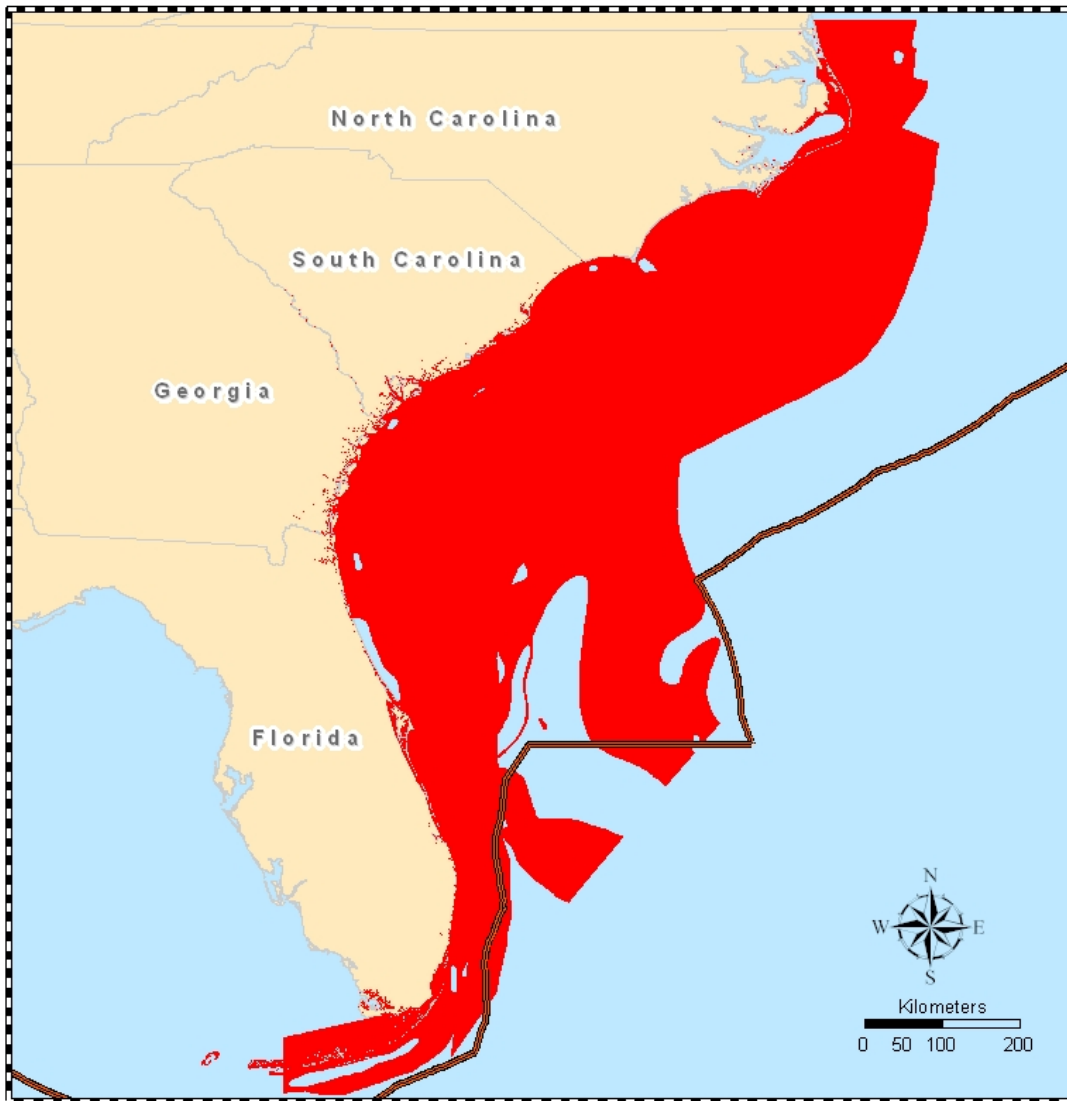


- Tidal freshwater (palustrine)
- Estuarine and marine emergent wetlands
- Estuarine scrub/shrub
- Estuarine and marine submerged aquatic vegetation
- Oyster reefs and shell banks
- Unconsolidated bottom
- Ocean high salinity surf zones (in progress)
- Artificial reefs



Figure 4. Combined Essential Fish Habitat for Red Drum.

Spiny Lobster Essential Fish Habitat

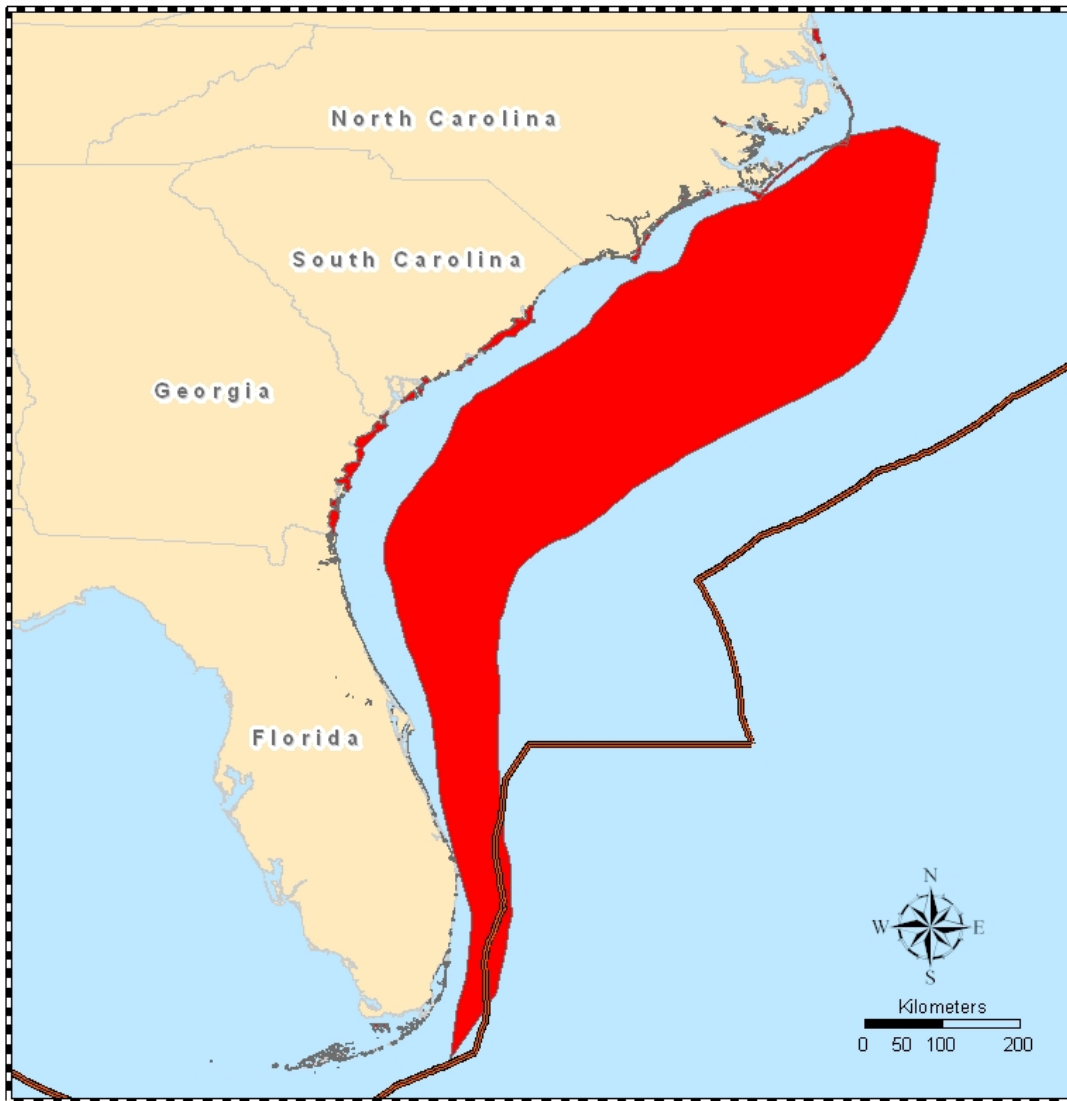


- Estuarine scrub/shrub
- Estuarine and marine submerged aquatic vegetation
- Unconsolidated bottom
- Gulf Stream
- Coral reefs
- Live/hardbottom
- Nearshore shelf/oceanic waters (in progress)
- Shallow subtidal bottom (in progress)
- Sponges (searching for data sources)
- Algal communities- Laurencia (searching for data sources)



Figure 5. Combined Essential Fish Habitat for Spiny Lobster.

Coastal Migratory Pelagics Essential Fish Habitat

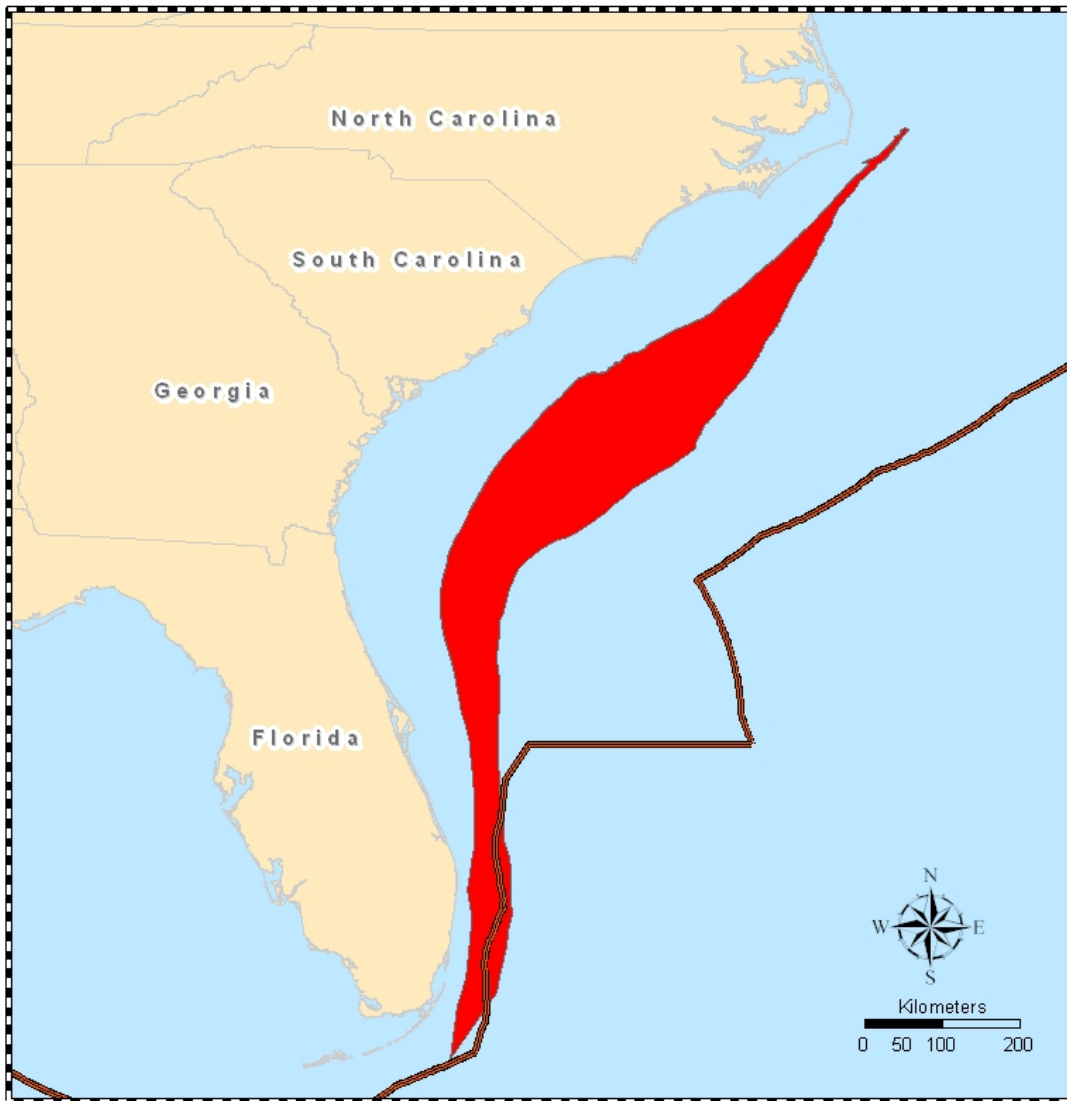


- Gulf Stream
- Ocean high salinity surf zones (in progress)
- Sandy shoals of capes and offshore bars (in progress)
- High profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone, but from the Gulf stream shoreward, including Sargassum
- All coastal inlets
- All state-designated nursery habitats of particular importance
- High salinity bays, estuaries, and seagrass habitat
- Pelagic Sargassum (seeking additional data sources)



Figure 6. Combined Essential Fish Habitat for Coastal Migratory Pelagics.

Golden Crab Essential Fish Habitat



Essential fish habitat for golden crab includes the U.S. Continental Shelf from Chesapeake Bay south through the Florida Straits (and into the Gulf of Mexico). In addition, the Gulf Stream is an essential fish habitat because it provides a mechanism to disperse golden crab larvae.



Figure 7. Combined Essential Fish Habitat for Golden Crab.

Project 2: NOAA CRG 2005 Maintenance of Council GIS Capabilities.

The maintenance fee for ArcGIS software was paid in March 2008.

Project 3: NOAA CRG 2005 Workshop to Develop Habitat Assessment, Research and Monitoring Plan for Deepwater Coral Habitat Areas of Particular Concern.

This development workshop took place in March 2006 in St. Petersburg, FL. The workshop brought together individuals from throughout the region with interest and expertise in aspects of deepwater coral biology, ecology and management as well as mapping and modeling. The plan was developed through direct collaboration from these individuals using the SAFMC's portal as an initial platform to share information and revise drafts of the developing document. The SAFMC approved the Deepwater Coral Research and Monitoring Plan at their March 2007 meeting in Jekyll Island, GA. The plan has been incorporated into the SAFMC's Fishery Ecosystem Plan, which will constitute the source document the SAFMC will utilize as they move forward with an ecosystem approach to the management of fisheries in the South Atlantic region. The Deepwater Coral Research and Monitoring Plan is available on the Habitat and Ecosystem Section of the SAFMC's website

<http://www.safmc.net/ecosystem/HabitatManagement/DeepwaterCorals/tabid/229/Default.aspx> .

Project 4: NOAA CRG 2005 Continue Support of Fisheries Scientist to provide Additional Technical Assistance for Council Coral Conservation and Management Activities.

The coral fisheries scientist provided direct support to the Council during the period of the award as follows:

- Reviewed existing and developed new coral, habitat and ecosystem information for the evolving Fishery Ecosystem Plan (FEP) for the region.
- Assisted in coordinating the August 2006 meeting of the Oculina Evaluation Team and provided guidance to the team for subsequent report development.
- Assisted in the development of the SAFMC's Deepwater Coral Research and Monitoring Plan including workshop planning and coordination and subsequent follow-up and editing of document drafts.
- Provided support in the coordination of Coral Advisory Panel and Coral Technical Advisors Workshop.
- Reviewed early warning reports provided by NMFS HCD on activities or projects potentially impacting shallow and deepwater coral resources (i.e. Calypso LNG pipeline) and Habitat Areas of Particular Concern in the South Atlantic region. The Coral scientist has drafted comment letters on behalf of the Council on permit applications necessitating Essential Fish Habitat Consultation.
- Served as contract monitor for assigned projects funded through the NOAA Coral Reef Conservation Grant Program. Responsible for development of associated progress reports to support funded projects.

- Maintained and updated the Council's Ecosystem web portal including establishing new user accounts, adding new pages and uploading documents and photographs. The coral scientist worked closely with Mapwise staff to enhance performance of the site and conduct general troubleshooting.
- Provided follow-up in data and GIS requests supporting FWRI's development of the SAFMC's Internet Mapping Server.

Project 5: NOAA CRG 2005 Coral Technical Advisors Workshop

The Coral Technical Advisors meeting was held in conjunction with the Habitat and Coral Advisory Panels' joint meeting in June 2006. Advisors reviewed the most recent data on status and distribution of deepwater corals in the South Atlantic region (presented by J. Reed and S. Ross) and formulated recommendations on siting of deepwater coral HAPCs. Advisors reviewed the proposed areas and, based on the new information, recommended consolidation and expansion to five areas instead of the original six. The public hearing draft of the Comprehensive Ecosystem Amendment that proposes the establishment of the new Deepwater CHAPCs is included in documents available for the Councils' June 2008 meeting which is posted under the Ecosystem Committee Briefing Material at <http://www.safmc.net/Meetings/CouncilMeetings/June8132008Councilmeeting/June8132008BriefingBook/tabid/568/Default.aspx>

A description of the sites may be found at

<http://www.safmc.net/ecosystem/HabitatManagement/DeepwaterCorals/LopheliaCommunities/tabid/247/Default.aspx>.

Final Coral Report 2005

Prepared by:

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June 30, 2008

Date