System Management Plan for Deepwater Marine Protected Areas

A Blueprint for Research, Monitoring, Outreach, Administration, and Evaluation of Deepwater Marine Protected Areas Created in Amendment 14 to the Snapper Grouper Fishery Management Plan in the South Atlantic Region

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The South Atlantic Fishery Management Council
4055 Faber Place Dr. Charleston, SC 29407-4699
(843) 571-4366/ Fax (843) 769-4520
Toll Free: (866)-SAFMC-10

INTRODUCTION SYSTEM MANAGEMENT PLAN FOR THE AMENDMENT 14 DEEPWATER MPAs

The South Atlantic Fishery Management Council is preparing a System Management Plan (SMP) for the Marine Protected Areas (MPAs) established through Snapper Grouper Amendment 14 in January 2009. The Deepwater MPAs are designed to protect a portion of the population and habitat of long-lived species (speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, and blueline tilefish) from directed fishing pressure. The Council recognizes that complete funding for enforcement, research/ monitoring, outreach, and evaluation will be a challenge if the proposed Spawning SMZs are implemented. Therefore, the Council, along with state and Federal partners, has drafted this SMP for the Deepwater MPAs to serve as a blueprint for future research and management. The SMP, by outlining data gaps, research needs, and estimated project costs, will serve as a guide for researchers applying for project funding. In turn, the management action items and evaluation metrics included in the SMP will serve as a tool to guide managers in evaluating whether the goals and objectives of Deepwater MPAs are being met.

The Council is committed to using tools such as community outreach networks, citizen science programs, and traditional fishery independent surveys to measure the effectiveness of the Deepwater MPAS. The Council recognizes that the SMP may be modified as management needs change.

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1 Executive Summary

The South Atlantic Fishery Management Council (Council) implemented Deepwater Marine
Protected Areas (MPAs) in eight areas off Florida, Georgia, North Carolina, and South Carolina.
The areas are known as Snowy Wreck (NC), Northern South Carolina (SC), Edisto (SC),
Charleston Deep Artificial Reef (SC), Georgia (GA), North Florida (FL), St. Lucie Hump (FL), and
East Hump (FL). The Council and its partners have developed this System Management Plan
(SMP) for the Deepwater MPAs. The SMP serves as the framework for resource protection,
research and monitoring, outreach, administration, and evaluation of the proposed areas. The intent
is for researchers and managers, using the SMP as a guide, to employ adaptive-management
techniques in studying and managing these sites; that is, a decision-making process that evolves
over time with the goal to improve management through system monitoring.

The Council intended to protect protect a portion of the population and habitat of long-lived species
(speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden
tilefish, and blueline tilefish) from directed fishing pressure. The protection should enable the
deepwater species achieve a more natural sex ratio, size structure, and age structure. The Council
recommended that, within the Deepwater MPAs, fishing for, possession of, and retention of 59
species of snappers and groupers be prohibited; however, harvest and possession of other species,
such as dolphin, mackerel, and tuna, would be allowed. By prohibiting fishing for all snapper and
grouper species in the area, bycatch and potential release mortality would be reduced.

The SMP includes goals and objectives to guide researchers and managers, background on
Deepwater MPAs and existing knowledge gaps, management action items with strategies, potential
methods to evaluate management effective, financial plan, timeline, and site characterizations for
each proposed Deepwater MPA as well as data collected in the area.

Management Action Items
The SMP contains management action items and strategies to achieve those items. These items are
actions that can be taken by partners such as managers, law enforcement personnel, scientists, and
education and outreach specialists to achieve goals and objectives of the Deepwater MPAs. Action
items were created and separated into four different groups: research and monitoring, outreach and
education, resource protection, and administrative. The Research and Monitoring Action Items
were developed to describe population demographics, compare densities of deepwater snapper
grouper species inside and outside MPAs, map with multibeam the Deepwater MPAs, and gather
socioeconomic information. The Outreach and Education Action Items were developed to inform
the public on the regulations and purpose for the protected areas and promote compliance,
partnership, and ownership of the Deepwater MPAs. The Resource Protection Action Items were
developed to monitor compliance with Deepwater MPA regulations, train officers, coordinate and
improve enforcement, and report enforcement activities. Finally, Administrative Action Items were
created for the development of the SMP and an advisory panel to review draft evaluation reports.
Management Effectiveness Evaluation
The output from the completed and on-going action items will be included in regular evaluations of
the Deepwater MPAs, which are needed to ensure effective management. The evaluation of

management effectiveness is separated into three categories: biophysical, socioeconomic, and governance indicators. The biophysical indicators of management effectiveness include potential metrics that could be used to evaluate the biological aspects of Deepwater MPAs including number of fish observed, size and age of fish observed, and amount of area mapped using multibeam. The socioeconomic indicators include potential metrics to evaluate the social and economic aspects including collect social and economic data and initiate a citizen science program. The governance indicators include potential metrics to evaluate the Deepwater MPAs through the SMP and enforcement. Through evaluation of the indicators, partners can shift efforts to actions items that will best ensure protection of important spawning habitats and, if needed, changes to management of Deepwater MPAs can be recommended by the SMP Advisory Panel, which will be appointed by the Council. The SMP Advisory Panel will be responsible for reviewing a rough draft of the Deepwater MPAs Evaluation Plan and will provide suggestions to the Council regarding management recommendations.

Financial Plan and Timeline
A financial plan and timeline was developed for documenting estimated costs and tracking progress to accomplish action items.

Site Characterization
The SMP contains detailed information about the Deepwater MPAs. The Deepwater MPA encompass approximately 529 square miles of hard-bottom, live bottom, and artificial reefs located in federal waters. Fishery-independent research has been conducted in the most of the proposed areas and collected biological and bathymetric data are included. Speckled hind, snowy grouper, warsaw grouper, and blueline tilefish have been observed in the Snowy Wreck MPA. Speckled hind, yellowedge grouper, snowy grouper, and blueline tilefish have been observed in the North South Carolina MPA. Speckled hind, snowy grouper, and warsaw grouper have been observed in the Edisto MPA. Two months after the Charleston Deep Artificial Reef was created, one snowy grouper was observed in the MPA. Speckled hind and snowy grouper have been observed in the North Florida MPA. Snowy grouper and blueline tilefish have been observed in the East Hump MPA. Fishery-independent biological data have not been collected for Georgia MPA.

2 Amendment 14 Overview

2.1.1 Overview

The Deepwater MPAs were created to protect a portion of the population and habitat of long-lived species (speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, and blueline tilefish) from directed fishing pressure. The decreased fishing pressure should enable the stocks to have a more natural sex ratio, age structure, and size structure. Type 2 MPAs were thought to be the best management approach given that discard mortality would likely be high for these deepwater species while minimizing the economic impact of closed areas. After reviewing comments from the MPA Expert Working Group, Advisory Panels (APs) to the SAFMC, the SAFMC Science and Statistical Committee, and public comments, eight MPAs were created in deepwater areas where one or multiple deepwater species were likely or known to occur. MPAs were placed throughout the South Atlantic region to provide connectivity through egg and larval dispersal and reduce the potential for high economic impacts to occur in a small area. The Council also considered Law Enforcement AP's recommendations for creating protected areas (SAFMC 2005).

The Council chose the Snowy Wreck MPA off North Carolina; Northern South Carolina, Edisto, Charleston Deep Artificial Reef MPAs off South Carolina, Georgia MPA off Georgia; and North Florida, St. Lucie Hump, and East Hump MPAs off Florida. The MPAs encompass approximately 529 square nautical miles. The smallest MPA is St. Lucie Hump MPA, which is approximately 8 square nautical miles. The largest MPA is the Snowy Wreck MPA, which is approximately 150 square nautical miles.

2.1.2 Legislative Authority

The authority to create MPAs comes from the Magnuson-Stevens Act (MSA), which enables National Marine Fisheries Service (NMFS) to enact area-based management. Amendment 14 was reviewed and found to meet the requirements of the MSA.

The authority to enforce MPA regulations comes from the MSA and is granted to the United States Coast Guard (USCG) and NMFS (**Table 2.2.1**). State agencies can enforce federal law through Joint Enforcement Agreements (JEAs). Currently North Carolina is the only state in the southeast without a JEA. Although North Carolina does not have a JEA, they can enforce MPA regulations if a North Carolina licensed vessel is found in violation of the federal regulations.

Table 2.2.1. Natural resource enforcement agencies' role and authority for enforcement of regulations for Deepwater MPAs in the South Atlantic.

Agency	Agency Role and Authority
U.S. Coast Guard	The U.S. Coast Guard District Seven and District Five have a primary role in protecting natural resources under the Magnuson-Stevens Act Managed Areas Act (Deepwater Marine Protected Area Network *50 CFR 622.35i*, Deepwater Coral Habitat Areas of Particular Concern *50 CFR 622.35n* and Bottom Line Prohibition Zone *50 CFR 622.25b*), National Marine Sanctuaries Act, and Endangered Species Act. They also provide support to state and federal fisheries enforcement.
NMFS	NMFS has a primary role in protecting natural resources under the

	Magnuson-Stevens Act Managed Areas Act and has Joint Enforcement Agreements with state agencies to assist in the enforcement of federal regulations in nearshore ocean state waters, federal offshore waters, and inshore waters.
FWC	Florida Fish and Wildlife Commission (FWC) has a JEA with NMFS which provides funding to the state to enforce federal regulations. FWC re-organized their fleet in 2014.
GADNR	Georgia Department of Natural Resources (GADNR) has a JEA with NMFS which provides funding to the state to enforce federal regulations. However GADNR does not have any patrol assets capable of enforcing Deepwater MPA's regulations due to their distance from shore.
SCDNR	South Carolina Department of Natural Resources (SCDNR) has a JEA with NMFS which provides funding to the state to enforce federal regulations. However SCDNR does not have any patrol assets capable of enforcing Deepwater MPAs' regulations due to their distance from shore.
NCDEQ	North Carolina Department of Environmental Quality (NCDEQ) does not have a JEA with NMFS. The state currently has one vessel that could patrol the Deepwater MPA off North Carolina but funding for the vessel is uncertain.

2.2 Regulations

Fishing for, possession, and retention of 59 species of snappers and groupers is prohibited in the deepwater MPAs. Harvest and trolling for other species, such as dolphin, mackerel, marlin, tuna, and wahoo, is allowed as other regulations dictate. A transit provision for the MPA allows fishermen with snapper grouper species onboard their vessel to traverse the MPA if their fishing gear is stowed according to regulations. Properly stowed means:

- Terminal gear (i.e., hook, leader, sinker, flasher, or bait) must be disconnected and stowed separately from automatic reel, bandit gear, buoy gear, hand-line, or rod and reel. Rod and reel must be removed from the rod holder and stowed securely on or below deck.

- 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 can remain on deck.

- A trawl or try net may remain on deck, but trawl doors must be disconnected from the net and must be secured. Note: This regulation may vary among MPAs and habitat areas of particular concern.

- A gill net, 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.

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

Stowage requirements may change through the normal amendment process, and requirements should be reviewed before traversing MPAs with snapper grouper species.

3 System Management Plan

The SMP was created to develop a framework for the Council to use adaptive management for the Deepwater MPAs. The SMP provides guidance on action items to be completed in the Deepwater MPAs and potential methods for evaluation of management effectiveness. If changes in size, configuration, or regulations are recommended for the Deepwater MPAs, the Council will develop an amendment to the Snapper-Grouper Fishery Management Plan.

3.1   Goals and Objectives

The following goals and objectives were developed for the SMP for the Deepwater MPA sites and to specify the research, monitoring, evaluation, enforcement, and communication action items. The goals and objectives will be reviewed periodically by the SMP Advisory Panel (AP) to determine if the goals and objectives should be modified to more appropriately address current and future management needs. The recommendations from the SMP AP will be reviewed by stakeholders, other APs, and the Council. The Council will approve the final goals and objectives of the SMP.

Goal 1:   Adopt and utilize an effective process to evaluate and refine management of Deepwater MPAs.
  Obj. A: Utilize public input from scientists, fishermen, APs, and the public to evaluate and refine management of Deepwater MPAs.
  Obj. B: Ensure a management system that is efficient and representative of fishery stakeholders.

Goal 2:   Maximize biological benefits of the Deepwater MPAs.
  Obj. C: Restore or maintain populations of speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, and blueline tilefish at sustainable levels within Deepwater MPAs.
  Obj. D: Prevent exploitation of deepwater species within Deepwater MPAs.
  Obj. E: Protect populations of deepwater species from harvest in some nursery areas and habitats from fishing/human impact through creation of Deepwater MPAs.
  Obj. F: Increase or sustain replenishment rate of fishery stocks outside of Deepwater MPAs.

Goal 3:   Minimize adverse social and economic effects of Deepwater MPAs.
  Obj. G: Minimize economic impact of Deepwater MPAs to stakeholders targeting species other than snapper-grouper species.
  Obj. H: Enhance respect for understanding of local knowledge.
  Obj. I: Prevent compromise of boater safety due to the placement of and regulations in Deepwater MPAs.

Goal 4:   Enhance enforceability and compliance within Deepwater MPAs.
  Obj. J: Consider the seven criteria from the Law Enforcement AP's report when determining suitable Deepwater MPA sites.
  Obj. K: Ensure enforceability of regulations for the Deepwater MPAs.
  Obj. L: Improve surveillance and monitoring of Deepwater MPAs.
  Obj. M: Maintain or improve application of law and regulations for Deepwater MPAs.
  Obj. N: Increase user participation in surveillance, monitoring, and enforcement of Deepwater MPAs.

Goal 5:   Maximize research and monitoring capabilities in Deepwater MPAs.
  Obj. O: Utilize fishery-independent and fishery-dependent data to increase scientific

knowledge and understanding of Deepwater MPAs.

Obj. P: Enhance information collected on the biological, socioeconomic, and governance metrics for Deeepwater MPAs through a Citizen Science Program.

Goal 6: Enhance research and monitor impact of invasive species in Deepwater MPAs.

Obj. Q: Maintain or enhance a program to reduce or eliminate invasive lionfish in Deepwater MPAs.

Obj. R: Increase scientific knowledge on lionfish and ecosystem impacts in Deepwater MPAs.

Goal 7: Improve environmental awareness and public knowledge about the Deepwater MPAs.

Obj. S: Increase level of public's knowledge about the purpose of, importance of, and regulations in Deepwater MPAs.

Obj. T: Strengthen and enhance stakeholder participation in management of Deepwater MPAs.

Obj. U: Enhance or maintain existence value of Deepwater MPAs.

3.2 Connectivity Within and Among MPAs

The Deepwater MPAs are connected by oceanographic features, which can facilitate larval dispersal within and among snapper-grouper spawning sites in or outside of these MPAs (Sedberry et al. 2006, Lesher 2008). Additionally, satellite-tracked drifters can assist in the identification of oceanographic features that can connect settlement and nursery habitats to Deepwater MPAs and spawning sites (M.M. Tishler and G.R. Sedberry unpublished). Protecting essential fish habitat (e.g., spawning and nursery habitats) through the use of MPAs facilitates the potential for both the advection and retention of larval snapper-grouper species to settlement sites associated with the MPAs (Lindeman et al. 2000, Burke et al. 2003, Paris et al. 2005, Hare and Walsh 2007). Post-settlement recruitment is important for replenishment of reef fish populations at multiple regional scales in the southeast U.S.

3.3 Existing Knowledge Gaps

3.3.1 Target Resource

Many of the focal species for Amendment 14 lack a complete description of their life history traits including when and where they spawn, whether they aggregate to spawn, home range, migration patterns, and nursery habitats. Spawning season and spawning location(s) are two key pieces of data that are needed to improve the timing and siting of potential closed areas. Further life history research could assist in better placement or refinement of closed area boundaries. Information on movement (e.g., home range size) and migration patterns during and outside of spawning season is needed to determine if the MPA size is adequate to protect focal species.

3.3.2 Habitat

Characterization of both benthic and pelagic habitats associated with spawning focal species in the snapper grouper complex is limited. In order to understand the complexity of areas associated with spawning, research must be conducted to document the species use of all habitat types. This effort entails mapping and verification of the distribution of benthic habitats associated and documentation of species use by life stage. In addition, research to characterize year round or seasonal oceanographic conditions is critical in making the link between benthic and pelagic habitats and in spawning and the conditions which are associated with pre-spawning, spawning and

post spawning activity of focal species or species associated with the benthic ecosystem. Understanding the nature of the oceanographic conditions and features will also provide a more effective understanding of the linkage of protected areas as well as the physical dynamics associated with egg distribution, larval transport and settlement as well as use of habitats and growth from juvenile to mature adults in spawning condition.

3.3.3 Use of MPAs

Traditionally, a comparison of the benefits and costs associated with each proposed Type 2 MPA would have been evaluated quantitatively. However, empirical data typically used to conduct empirical analyses was at a coarser spatial scale than that of the MPA sites in Amendment 14. Thus, it was not possible to produce the robust quantitative analysis. As a result, a Delphi approach was adopted to provide a semiquantitative analysis of the social and economic consequences associated with implementation of MPAs in deepwater regions of the South Atlantic snapper grouper fishery.

Compliance with the regulations of the MPAs remains a concern. Florida FWC has rearranged their assets to better patrol the Deepwater MPAs off Florida but Georgia, North Carolina, and South Carolina have limited assets available to monitor the Deepwater MPAs. The USCG is the primary agency that monitors Deepwater MPAs from Georgia through North Carolina. Information on the non-compliance is needed to determine if illegal fishing is preventing or delaying the recovery of the deepwater species in the managed areas.

3.4   Management Action Items

The final SMP will detail strategies to achieve proposed management action items. The purpose and needs detailed in Amendment 14 sections (SAFMC 2007, Appendix IV) will be revisited along with identifying additional needs and strategies through a participatory process with affected users. The following information under the four categories of proposed action items includes brief summaries and examples.

NOTE: This document is for information purposes only; nothing in this document commits agencies to supply any specific resources or creates any financial obligations. This document does not change any statutory authority or create any new responsibilities.

3.4.1 Resource Protection Action Items

Because the Council chose to allow certain fishing activities (Type 2 protected area) and transit through Deepwater MPAs, enforcement will be very challenging. The LEAP advised the Council throughout the entire process of developing MPAs and created a list of recommendations (SAFMC 2005). The Council followed those recommendations as closely as possible while balancing the biological, social, and economic objectives and impacts of MPAs.

Law enforcement partners provided information on the enforceability of Spawning SMZs and available assets that could be used to monitor them in 2015. Two very large obstacles continue to limit enforcement of some Deepwater MPAs: (1) distance from shore for the majority of Deepwater MPAs and (2) Type 2 designation, which allows certain fishing activities to take place. Consequently, occasional flyovers by enforcement aircraft, drone, or satellite are not effective for enforcing regulations; therefore, an on-site enforcement presence is necessary in order to determine whether the fishing activity is lawful or not. Despite obstacles, FWC revised the enforceability rating of the Deepwater MPAs off Florida from a Low rating (in Amendment 14) to a High rating

(**Table 3.4.1**). Off North Carolina, the Snowy Grouper Wreck MPA was rated as Moderate by the USCG. The remaining MPAs continue to have a Low enforceability rating as originally considered in Amendment 14. The current ratings were based on the same criteria as in Amendment 14:

> *"A **"HIGH"** rating means that the area is easily accessible with the assets and personnel already in place. Such an area may already be patrolled and would not require additional assets. Additional funding **may** be required to maintain adequate enforcement patrols.*
>
> *"A **"MODERATE"** rating indicates that with some additional assets, or the relocation of existing assets, patrols could be conducted from time to time and during targeted details. Additional funding **will likely** be required to increase the ability rating to "HIGH".*
>
> *"A **"LOW"** rating means that patrols of the area would only occur during an organized enforcement detail with Federal partners such as NMFS or USCG. The States do not have the assets or personnel with the proper training to patrol the area. Additional funding will be **essential** to increase the ability rating."* (SAFMC 2007)

The available assets to monitor Deepwater MPAs vary by state and agency. NCDEQ currently has one vessel capable of traveling to the Snowy Wreck; however funding for that vessel is currently under review. FWC has five high-speed offshore vessels on the east coast ranging in size from 33 to 40 foot and aircraft for offshore patrols. The recent acquisition of new vessels with soft collars allows FWC to cover a larger offshore area and to conduct inspections in various sea states. NOAA OLE has a 24 foot Rigid Hull Inflatable Boat (RHIB) for available surge operations. The USCG has several types of vessels available (**Table 3.4.2**).

Table 3.4.1.1. The enforceability rating of the Deepwater MPAs in the South Atlantic. State ratings were developed by state enforcement agency in the closest state.

MPA	Closest State	Amendment 14 Rating	State Rating (2015)	USCG Rating (2015)
North Florida	Florida	Low	High	Low
St. Lucie Hump	Florida	Moderate	High	Low
East Hump	Florida	Moderate	High	Low
Georgia	Georgia	Low	Low	Low
Northern South Carolina	South Carolina	Low	Low	Low
Edisto	South Carolina	Low	Low	Low
Charleston Deep Artificial Reef	South Carolina	Low	Low	Low
Snowy Grouper Wreck	North Carolina	Low	Low	Moderate

Table 3.4.1.2. USCG enforcement assets available for monitoring Deepwater MPAs.

Surveillance Type	Asset
On-Water	Coastal Patrol Boats (CPB)
	Fast Response Cutters (FRC)
	Medium Endurance Cutters (MEC)
	High Endurance Cutters (HEC)
Aerial	Helicopters (HH-60)
	Aircrafts (C-130)

As of June 2015, three Notices of Violation and Assessments (NOVA) were issued for violating regulations established for the other protected areas in the South Atlantic. The cases were either settled out of court or uncontested. In the uncontested case, the Administrative Law Judge used several pieces of evidence to support the default judgement that the fishermen violated the MSA including: the vessel was anchored inside an MPA, the fishing gear was not properly stowed, the fisherman was in possession of snapper-grouper species while inside a MPA, and the fishermen was liable for violating fishing regulations under the MSA. If NOVAs are issued for violations within Deepwater MPAs, the regulations established for Deepwater MPAs might be challenged and changes to the regulations may be needed to improve adjudication.

The resource protection action items aim to address the following goals and objectives of the SMP:

Goal 4: Enhance enforceability and compliance within Deepwater MPAs.
    Obj. O: Consider the seven criteria from the Law Enforcement AP's report when determining suitable Deepwater MPA sites.
    Obj. P: Ensure enforceability of regulations for the Deepwater MPAs.
    Obj. Q: Improve surveillance and monitoring of Deepwater MPAs.
    Obj. R: Maintain or improve application of law and regulations for Deepwater MPAs.
    Obj. S: Increase user participation in surveillance, monitoring, and enforcement of Deepwater MPAs.

The following action items would be initiated by either Council staff and/or by potential partners:

Action Item 1: *Develop cooperative enforcement via intelligence and asset sharing, meetings, and training to encourage coordination of Deepwater MPA patrols and investigations.*
    Task: Schedule Deepwater MPA enforcement activities and challenges to be reported at LEAP annual meeting to coordinate Deepwater MPA patrols and investigations.
    Justification: Coordination among enforcement agencies can help to minimize duplicative effort and provide better coverage with limited resources.
    Deliverables: Oral report at LEAP meeting
    Schedule: Yearly in March
    Budget: OLE partners' time, meeting cost done in conjunction with yearly LEAP meeting
    Potential Partners/roles: USCG, NOAA OLE, FWC, GADNR, NCDEQ, SCDNR

    Tasks: Continue to have officers train at the USCG Southeast Regional Fisheries Training

Center.
Justification: The Southeast Regional Fisheries Training Center has been a valuable asset for training officers in enforcement of fisheries regulations, including those pertaining to Deepwater MPAs.
Deliverables: Trained officers
Schedule: Annually
Budget:
Potential Partners/roles: USCG, NOAA OLE, FWC, GADNR, NCDENR, SCDNR

Tasks: Develop a patrol/sortie reporting form and database for determining compliance in MPAs and develop centralized database for information access.
Justification: A standardized reporting form developed by the law enforcement partners would help collect data to improve frequency and effectiveness of enforcement patrols. A centralized database would assist in reporting of data to requesting agencies such as NMFS or SAFMC.
Deliverables: Form and database to calculate compliance.
Schedule:
Budget:
Potential Partners/roles: USCG, NOAA OLE, FWC, GADNR, NCDEQ, SCDNR

Action Item 2: *Maintain the "high" enforceability rating for the Florida Deepwater MPAs and increase the enforceability rating to at least "moderate" for the other Deepwater MPAs.*
   Tasks: Purchase and maintain vessels capable of conducting offshore patrols and increase enforcement capacity to monitor the Deepwater MPAs
   Justification: Protection of the Deepwater MPAs is crucial to their success. Fishing incursions into MPAs could remove individuals from the population and prevent maintenance of a natural sex ratio, age structure, and size structure. Having enforcement assets to monitor Deepwater MPAs is critical for preventing incursions into the area. If new vessels are needed for enforcement of Deepwater MPAs off each of the states, a vessel costs approximately $150,000 for a large center console vessel with two outboard engines. Some states may require more than one vessel.
   Deliverables: Vessels available for offshore patrol
   Schedule: Med/Long-term (with funding)
   Budget: $200,000/ year
   Potential Partners/roles: USCG, NOAA OLE, FWC, GADNR, NCDEQ, SCDNR

Action Item 3: *Patrol Deepwater MPAs with aerial and at-sea assets.*
   Tasks: Provide a deterrent presence within Deepwater MPAs through routine aerial and at-sea patrols and schedule and conduct dedicated surge operations.
   Justification: A deterrent presence is needed in Deepwater MPAs to reduce incursions into the areas. Fishing incursions may prevent attaining the stated biological goals of the MPAs. To monitor the Deepwater MPAs, it was estimated to have three patrol officers per trip. The trip would last approximately 12 hours. The cost per officer was approximately $40 per hour and includes all fringe values. The vessel operating cost is approximately $100 per hour. This adds up to approximately $2,600 per monitoring event. The budget is estimated assuming five monitoring events per MPA and 8 MPAs.
   Deliverables: Patrols are conducted in the MPAs

Schedule: Long-term (dependent on Action Item 2)
Budget: $105,000
Potential Partners/roles: USCG, NOAA OLE, FWC, GADNR, NCDEQ, SCDNR

Action Item 4: *Initiate a remote monitoring program for the Deepwater MPAs.*
   Tasks: Review methods for remote monitoring in offshore areas.
   Justification: Patrols in Deepwater MPA are expensive and can occupy an entire day for officers involved in the patrol. Frequently when patrols occur in protected areas, no vessels are sighted. Remote monitoring methods can provide information to enforcement agencies on dates or times when incursions are more likely to occur.
   Deliverables: Report on remote monitoring methods.
   Schedule: Report- Short/Med-term
   Budget: Staff Time
   Potential Partners/roles: NMFS MPA Center, NMFS Southeast Fishery Science Center (SEFSC), Southeast Coastal Ocean Observing Regional Association, National Ocean Service, SAFMC Staff

   Tasks: Seek funding for remotely monitoring Deepwater MPAs and implement program.
   Justification: Funding is limited in the SE for remote monitoring offshore areas. Additional funding will be required if a remote monitoring program is to be developed. The cost estimate is based on ten monitoring events for the eight Deepwater MPAs at an estimated cost of $2,000 per event.
   Deliverables: Grant/Funding requests for monitoring offshore areas.
   Schedule: Long-term
   Budget: $160,000
   Potential Partners/roles: NMFS, SAFMC Staff

Action Item 5: *Develop a citizen science/research science program and database for reporting data collected in Deepwater MPAs.*
   Tasks: Identify potential partners (federal and state resource agencies, non-governmental organizations (NGOs), academic institutions) to seek funding for a citizen science/cooperative research program focusing on Spawning SMZ compliance; conduct a review of existing citizen science and cooperative research programs to aid in the development of a citizen science program for the South Atlantic; and identify and develop a database to enter data collected in the Spawning SMZs through a citizen science/cooperative research program.
   Justification: Citizen science/cooperative research program would promote buy-in from the public and contribute to voluntary compliance over the long-term. Such programs also enhance education and outreach opportunities and promote resource stewardship.
   Deliverables: A report on citizen science/cooperative research including potential partners, review of existing citizen science/cooperative research programs, and identifies potential a database to store data collected in Spawning SMZs through citizen science.
   Schedule: Short-term/ongoing
   Budget:
   Potential Partners/roles: SAFMC, NMFS, FWC, GADNR, NCDEQ, SCDNR

Action Item 6: *Report enforcement and compliance activities to the South Atlantic Fishery Management Council.*

Tasks: Annually report enforcement and compliance activities at SAFMC Meetings
Justification: Reporting on enforcement activities enables the enforcement agencies to review the patrolling of Deepwater MPAs to determine if sufficient patrols have been conducted and keeps management informed of law enforcement activities.
Deliverables: Annual enforcement reports (at Council meetings)
Schedule: Short-term
Budget: Law enforcement partners staff time
Potential Partners/roles: USCG, NOAA OLE, FWC, GADNR, NCDEQ, SCDNR

Action Item 7: *Provide compliance assistance to user groups through outreach and education.*
Tasks: Communicate to the public about Deepwater MPAs while on patrol in the vicinity of Deepwater MPAs and at outreach and education events.
Justification: Communication by patrol officers can help to educate and increase the public's understanding of the importance of Deepwater MPAs and regulations and increase compliance.
Deliverables: Increased public awareness.
Schedule: Ongoing
Budget: Law enforcement partners staff time
Potential Partners/roles: USCG, NOAA OLE, FWC, GADNR, NCDEQ, SCDNR

Action Item 8: *Encourage North Carolina to commit to a JEA with NOAA.*
Tasks: Have SAFMC Chair send a letter encouraging North Carolina to commit to the JEA with NOAA.
Justification: Currently North Carolina is the only state in the South Atlantic region without a JEA. This limits their ability to enforce federal regulations for all vessels in federal waters. The JEA could also provide funds for purchasing assets or maintaining current assets for patrols in federal waters.
Deliverables: Letter sent to NCDEQ
Schedule: Long-term
Budget: $0
Potential Partners: SAFMC

Action Item 9: *Monitor/Improve adjudication of MPA regulations.*
Tasks: Monitor court decisions and orders to track adjudication of Notices of Violation and Assessment in Deepwater MPAs and, if needed, recommend modifications to regulations or other actions to improve adjudication in favor of enforcement agencies.
Justification: Regulations must be enforceable, and monitoring enforcement decisions and orders provides an opportunity to determine if the current regulations should be altered or if other actions by the Council are needed.
Deliverables: Annual oral updates at LEAP meeting.
Schedule: Short-term
Budget: Law enforcement partners staff time
Potential Partners/roles: SAFMC, USCG, NOAA OLE, FWC, GADNR, NCDEQ, SCDNR, NOAA General Counsel Enforcement Section

3.4.2 Research and Monitoring Action Items
Scientific research and stakeholder collaboration was heavily incorporated into the decision-making process for selecting the eight Deepwater MPAs created by Amendment 14 (SAFMC

2007). This research, along with new research and monitoring, will continue to inform decision-makers during consideration of the existing and potential new protected areas (MPA Expert Workgroup 2012, 2013), and Spawning Special Management Zones (Amendment 36).

The purpose of the Research and Monitoring Action Items is to provide a guide for data collection and research activities inside Deepwater MPAs and throughout the region that will improve management and preservation of the protected areas. The Research and Monitoring Action Items describes strategies to achieve SMP goals and objectives through proposed natural resource and socioeconomic research and monitoring action items

The Research and Monitoring Action Items includes several components under the general headings of monitoring, assessment, and mapping. Considerable efforts were made to balance the benefits of each component against its cost and feasibility. As a result several items were not included the plan. This is not to imply these items do not have merit and would provide a benefit to management; however their costs and/or feasibility make them impractical. Examples of items intentionally omitted from this plan include mapping of nursery and settlement habitats, trophodynamics in habitats in and adjacent to Deepwater MPAs and environmental stressors in habitats in and adjacent to Deepwater MPAs. There are finite resources available to execute the Research and Monitoring Items; the best returns for both scientific and financial considerations are included below.

The priority ranking for research and monitoring was assigned by the Interdisciplinary Plan Team (IPT). If the assigned priority ranking was below four, then the rank was given a categorical ranking of medium or low priority based on IPT recommendations. The IPT ranked the socioeconomic subsection separately from the resource monitoring, assessment, and mapping subsections.

3.4.2.1   Resource Monitoring

The main objective of the SMP is to monitor and determine the effect of Deepwater MPAs on deepwater snapper grouper species' distribution and abundance. The anticipated benefit of Deepwater MPAs is to enhance fisheries through recovery of populations resulting from protection of juveniles and adults in important habitats and subsequent spillover into adjacent fishing grounds. This benefit can take a long time to develop and will be difficult to attribute to the Deepwater MPAs; therefore, other approaches are needed to monitor the effect of Deepwater MPAs including changes in distribution, abundance, sex ratio, age, and size structure. A variety of approaches are needed to assess fish populations synoptically in and outside the Deepwater MPAs with the first step being analysis of baseline data to compare to subsequent assessments.

The following goals would be achieved by completing the action items for resource monitoring.

  Goal 1:   Maximize biological benefits of the Deepwater MPAs.
    Obj. G: Restore or maintain populations of speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, and blueline tilefish at sustainable levels within Deepwater MPAs.
    Obj. H: Prevent exploitation of deepwater species within Deepwater MPAs.
    Obj. I: Protect populations of deepwater species from harvest in some nursery areas and habitats from fishing/human impact through creation of Deepwater MPAs.
    Obj. J: Increase or sustain replenishment rate of fishery stocks outside of Deepwater MPAs.

Goal 6:   Enhance research and monitor impact of invasive species in Deepwater MPAs.
    Obj. S: Maintain or enhance a program to reduce or eliminate invasive lionfish in Deepwater MPAs.
    Obj. T: Increase scientific knowledge on lionfish and ecosystem impacts in Deepwater MPAs.

There are twelve actions items for the resource monitoring section.

Action Item 1: *Identify fish population demographics (e.g. size and age structure, sex ratio, etc.) within and adjacent to Deepwater MPAs.*
    Priority Ranking: 1
    Task: Collect biological information on speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, and blueline tilefish including size, age, sex, and reproductive stage within and adjacent to Deepwater MPAs.
    Justification: A major objective of the Deepwater MPAs is to provide areas where fish population demographics can recover to levels that are capable of providing a reproductive haven and contribute to recruitment outside the protected areas. Evaluation of size and age structure of fishery species inside vs. outside MPAs provides an indication of whether or not the MPA is protecting reproductively active individuals, particularly larger and older fish that are the most productive spawners.
    Deliverables: Demographic data on fishery species.
    Schedule: Ongoing
    Budget:
    Potential Partners: NMFS, Marine Resources Monitoring, Assessment, and Prediction (MARMAP)
    Potential Methods: Fish size can be measured underwater with stereo cameras or lasers attached to submersibles and Remotely Operated Vehicles (ROVs). Age must be determined from captured fish using either otoliths or spines and rays. Sex ratios can be determined from gonad biopsies unless the species has sexually dimorphic characteristics.
    Projects Completed or Underway:
- MARMAP has been collecting size, age and reproductive data from trap surveys inside and outside several of Deepwater MPAs since 1987 including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, North Florida, and St. Lucie Hump.
- NOAA Southeast Fishery-Independent Survey (SEFIS) has been collecting size, age and reproductive data from trap surveys inside and outside several of the MPAs since 2010 including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, and North Florida (Bacheler et al. 2013).

Action Item 2: *Maintain an annual monitoring program to collect data inside and outside Deepwater MPAs. Data collected should include: distribution, abundance, size and age structure, and sex ratios of dominant harvested species in and outside Deepwater MPAs.*
    Priority Ranking: 2
    Task: An annual monitoring program is funded and maintained to collect data on focal species in the South Atlantic region and collects data in Deepwater MPAs.
    Justification: An annual monitoring program needs continued funding to track long-term changes to assess the effectiveness of the MPAs. Since many of snapper-grouper species that are protected by these MPAs are long-lived species with a late onset of maturity, the

effect of protecting Deepwater MPAs may take many years to detect a change in abundance.
Deliverables: Distribution, abundance, and demographic data on focal species with which spatial and temporal changes inside and outside Deepwater MPAs can be determined.
Schedule: Short-term/ongoing
Budget:
Potential Partners: NMFS, MARMAP
Projects Completed or Underway:
- NMFS, SEFSC, Panama City Lab has been collecting data on distribution and abundance of all fish species from ROV surveys inside and outside several of the Deepwater MPAs including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, North Florida, and East Hump.
- Southeast Reef Fish Survey (SERFS), which is a collaboration of SEFIS and MARMAP, has been collecting distribution, abundance, size and age structure, and sex ratio data from trap and stationary camera surveys inside and outside several of the Deepwater MPAs including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, North Florida, and St. Lucie Hump.

Action Item 3: *Determine pre-closure distribution and abundance of dominant harvested species inside and outside Deepwater MPAs, in order to provide historical context for subsequent assessments.*
Priority Ranking: Medium
Task: Compile data collected in and around Deepwater MPAs on the distribution and abundance of speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, and blueline tilefish.
Justification: In order to differentiate changes in key resources that occur naturally from those which are caused by human influence, a baseline set of criteria must be established and monitored over subsequent years. These data can assist scientists and managers to more precisely determine the natural variability inherent in the system and changes resulting from anthropogenic influences.
Deliverables: Baseline density and distribution data for focal species with which to compare future data.
Schedule: Short-term
Budget: Staff-time
Potential Partners: NMFS, MARMAP, SAFMC
Projects Completed or Underway:
- A collaborative NOAA project (SEFSC, Panama City and Beaufort labs, and Gray's Reef National Marine Sanctuary) titled, "Assessing the efficacy of South Atlantic Deepwater MPAs" includes density and distribution data for all fish species from 1985-2014.
- NMFS, SEFSC, Panama City Lab has been collecting data on distribution and abundance of all fish species from ROV surveys inside and outside several of the MPAs since 2004 including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, North Florida, and East Hump.
- MARMAP has been collecting data on distribution and abundance from trap surveys inside and outside several of Deepwater MPAs since 1987 including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, North Florida, and St. Lucie Hump.
- NOAA Ocean Exploration conducted video surveys of fish species composition from

submersible dives on shelf edge reefs at North Florida MPA and Northern South Carolina MPA from 2001-2003 (Schobernd and Sedberry 2009, Fraser and Sedberry 2008).

- North Carolina Sea Grant conducted acoustic surveys to measure reef fish relative abundance at Snowy Wreck MPA between 2007 and 2008 (Rudershausen et al. 2010).

Action Item 4: *Locate spawning areas of deepwater snapper and grouper species.*

Priority Ranking: Medium

Task: Conduct studies to identify spawning areas for speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, and blueline tilefish.

Justification: Spawning areas are valuable habitats for populations. Protecting these areas is important for sustaining fisheries and building resilience into marine populations. In order to maintain fish stocks at proper levels for a healthy, profitable fishery, spawning areas need to be protected from exploitation.

Deliverables: Locations of focal species spawning areas.

Schedule: Ongoing for NMFS and MARMAP

Budget: $50,000 per site per year – Independent Researchers

Potential Partners: NMFS, MARMAP, Citizen Science Program, independent researchers

Potential Methods: A variety of gear types could be used to locate spawning aggregations including manned submersibles, ROVs, and drop cameras. Unless gamete release is observed, spawning condition of the fish needs to be verified via histology.

Projects Completed or Underway:

- LGL Ecological Research Associates, Inc. (Will Heyman) has been conducting a study using geomorphology to predict spawning aggregation sites since 2014 (Heyman 2015).
- NMFS, Southeast Regional Office, Southeast Fisheries Science Center has produced a geographic distribution model which includes potential spawning habitats of snapper grouper species (SAFMC MPA Expert Workgroup, 2012 & 2013).

Action Item 5: *Develop and apply coupled biological and physical models to locate potential nursery sites.*

Priority Ranking: Low

Task: Model potential nursery sites of speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, and blueline tilefish using biological and physical distribution models.

Justification: Locating potential nursery sites would identify areas to monitor for increased recruitment that could be attributed to increased spawning activity.

Deliverables: Physical models

Schedule: Long-term

Budget:

Potential Partners: NFMS and independent researchers

Projects Completed or Underway:

- NMFS, SERO and SEFSC, has produced a geographic distribution model for speckled hind and warsaw grouper that incorporates a hydrographic model to evaluate the relative utility and benefits of the MPAs for fisheries management (SAFMC MPA Expert Workgroup, 2012 & 2013).

- North Carolina State University (Ruoying He) has produced a Coastal Circulation and Ecosystem Nowcast/Forecast System for the South Atlantic Bight and Gulf of Mexico (Xue et al. 2015)
- NOAA, SEFSC has a proposal titled "Use of a biophysical modeling framework to develop a recruitment index for inclusion in stock assessment in the Gulf of Mexico and South Atlantic".
- Other sources of models to predict nursery sites include ROMS, Ichthyop, and HYCOM.

Action Item 6: *Track movement of adult fish.*

    Priority Ranking: Low

    Task: Tag adult speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, and blueline tilefish with conventional and/or acoustic tags to track movements in and around Deepwater MPAs.

    Justification: Having knowledge of the temporal and spatial movements of key fishery species makes it easier to protect them. If fish readily move in and out of the closed areas, protection of fish populations will be minimal. Although this information would be extremely useful, it is ranked low in priority because it will be difficult and expensive to obtain. Some of the species being protected (e.g. speckled hind and warsaw grouper) may be too rare to be able to tag or track enough individuals to decipher movement patterns.

    Deliverables: Migration patterns of adult fish within and adjacent to Deepwater MPAs.

    Schedule: Long-term

    Budget: Telemetry >$2,500,000/ Tag and Recapture >$1,000,000

    Potential Partners: State Agencies, NMFS, independent researchers, Citizen Science Program

    Potential methods: Telemetry or tag and recapture.

    Projects Completed or Underway:
- McGovern et al. 2005. This was a tag and recapture study of gag grouper in the south Atlantic completed during 1995-1999.

3.4.2.2 Assessment Needs

The purpose of monitoring is to establish a baseline of information on demographics and abundance within the Deepwater MPAs. Monitoring studies have the potential to detect significant changes in natural resources that result from management actions or from other causes. The finding of research projects should help mangers and scientists identify cause and effect relationships that generate ecological patterns and trends, stressors, and other factors that threaten the health of reef ecosystems.

Action Item 7: *Characterize deepwater snapper grouper species within the Deepwater MPAs compared to reference sites. This includes distribution, abundance patterns, size structure, age structure, sex ratio, and reproductive stage.*

    Priority Ranking: 3 (Ongoing)

    Task: Speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, and blueline tilefish are sampled in Spawning SMZs to characterize distribution, abundance, size structure, age structure, sex ratio, and reproductive stage.

    Justification: Characterization of these parameters for deepwater snapper grouper species inside vs. outside the Deepwater MPAs provides a means to evaluate the efficacy of the protected areas. Ideally, a higher abundance of focal species would be observed inside the

protected areas given enough time following implementation of fishing restrictions. Evaluation of size and age structure of focal species inside vs. outside the Deepwater MPAs provides an indication of whether or not the protected area is protecting reproductively active individuals, particularly larger and older fish that are the most productive spawners.

Deliverables: Comparison of variables such as distribution, densities, size and age structure, sex ratios, and reproductive stage for snapper grouper species inside Deepwater MPAs vs. reference areas outside the protected areas.

Schedule: Ongoing

Budget:

Potential Partners: MARMAP, NMFS

Potential Methods: Since there have been surveys conducted prior to implementation of the MPAs, a BACI (before/after, control/impact) sampling design should be used when examining MPA effectiveness.

Projects Completed or Underway:
- A collaborative NOAA project (SEFSC's Panama City and Beaufort labs and Gray's Reef National Marine Sanctuary) titled, "Assessing the efficacy of South Atlantic deepwater MPAs" includes density and distribution data for all fish species from 1985-2014.
- MARMAP has been collecting distribution, abundance, size, age and reproductive data from trap surveys inside and outside several of the MPAs since 1987 including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, North Florida, and St. Lucie Hump.
- NMFS SEFIS has been collecting distribution, abundance, size, age and reproductive data from trap surveys inside and outside several of the MPAs since 2010 including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, and North Florida.
- NMFS, SEFSC, Panama City Lab has been collecting data on distribution and abundance of all fish species from ROV surveys inside and outside several of the Deepwater MPAs since 2004 including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, North Florida, and East Hump.
- NOAA's SE-DSCTP project collected data on distribution and abundance of all fish species from ROV dives conducted in 2011 inside and around the North Florida and East Hump MPAs (Reed et al. 2014).

Action Item 8: *Characterize fish communities, inside and outside of Deepwater MPAs, including habitat utilization patterns, trophic interactions, ontogenetic changes, and predator prey relationships.*

Priority Ranking: Medium

Task: Focal species are sampled in and around Deepwater MPAs to characterize habitat utilization patterns, trophic interactions, ontogenetic changes, and predator prey relationships.

Justification: Detailed characterization of fish communities allows a much greater understanding of the dynamics of the ecosystem. This information significantly increases the confidence of predictive exercises when forecasting how changes in one part of the system will affect other parts. The different components which parameterize this characterization process vary tremendously in cost, difficulty, and time to complete. However synergism with other ongoing field collections and laboratory analyses allow many of the components to be evaluated in a cost effective manner.

Deliverables: Comparison of fish communities inside Deepwater MPAs to reference areas outside the protected areas.
Schedule: Ongoing
Budget:
Potential Partners: NMFS, MARMAP
Potential Methods: Since there have been surveys conducted prior to implementation of the MPAs, a BACI (before/after, control/impact) sampling design should be used when examining MPA effectiveness.
Projects Completed or Underway:
- A collaborative NOAA project (SEFSC's Panama City and Beaufort labs and Gray's Reef National Marine Sanctuary) titled, "Assessing the efficacy of South Atlantic Deepwater MPAs" includes density and distribution data for all fish species from 1985-2014.
- NMFS, SEFSC, Panama City Lab has been collecting data on habitat utilization patterns of all fish species from ROV surveys inside and outside several of the MPAs since 2004 including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, North Florida, and East Hump.
- MARMAP has been collecting information on habitat utilization patterns from trap surveys inside and outside several of the MPAs since 1987 including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, North Florida, and St. Lucie Hump.
- NMFS SEFIS has been collecting information on habitat utilization patterns from trap surveys inside and outside several of the MPAs since 2010 including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, and North Florida.
- NOAA's SE-DSCTP project collected data on habitat utilization patterns of all fish species from ROV dives conducted in 2011 inside and around the North Florida and East Hump MPAs (Reed et al. 2014).

3.4.2.3 Habitat Monitoring

Action Item 9: *Complete multibeam surveys of the Deepwater MPAs.*
   Priority Ranking: 4 (Ongoing)
   Task: Deepwater MPAs are surveyed with multibeam and analyzed to develop high resolution bathymetric maps.
   Justification: Comprehensive, high-resolution bathymetry surveys are a priority to determine the extent of biological and geological habitat and emergent features which may serve as essential fish habitat inside the Deepwater MPAs.
   - Note: Low resolution mapping has been completed for the majority of the Deepwater MPAs.
   Deliverables: High resolution GeoTIFFs included in Site Characterization (**Section 4**).
   Schedule: Ongoing
   Budget:
   Potential Partners: NMFS and independent researchers
   Projects Completed or Underway:
   - NMFS, SEFSC, Panama City Lab has been collecting multibeam data inside several of the MPAs since 2004 including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, North Florida, and East Hump.
   - NMFS SEFIS has collected multibeam data inside the North Florida MPA since 2010.

- NOAA Ocean Exploration conducted sonar surveys between 2001 and 2003 in the North Florida and Northern South Carolina MPAs (Schobernd and Sedberry 2009, Fraser and Sedberry 2008).
- The US Navy contracted for a large multibeam survey off NE Florida in 2010. The areas covered encompass the entire North Florida MPA. These areas are used for anti-submarine warfare training and encompass areas containing essential fish habitat (EFH) and deep reefs.
- NOAA's SE-DSCTP project completed mapping in 2011 at the North Florida and East Hump MPAs (Reed et al. 2014).

Action Item 10: *Complete multibeam surveys of areas adjacent to, but outside Deepwater MPAs (within a 5 nautical mile radius of the Deepwater MPAs).*

    Priority Ranking: Medium
    Task: Multibeam surveys are completed in areas adjacent to Deepwater MPAs and analyzed to produce high resolution bathymetric maps.
    Justification: Comprehensive, high-resolution bathymetry surveys are a priority to determine the extent of biological and geological habitat and emergent features which may serve as essential fish habitat adjacent to Deepwater MPAs. Mapping these areas will support comparisons inside vs. outside the Deepwater MPAs.
    Deliverables: High resolution GeoTIFFs
    Schedule: Ongoing
    Budget:
    Potential Partners: NMFS and independent researchers
    Projects Completed or Underway:
- NMFS, SEFSC, Panama City Lab has been collecting multibeam data adjacent to several of the MPAs since 2004 including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, North Florida, and East Hump.
- NMFS SEFIS has been collecting multibeam data outside several of the MPAs since 2010 including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, and North Florida.
- NOAA Ocean Exploration conducted sonar surveys between 2001 and 2003 adjacent to the North Florida and Northern South Carolina MPAs (Schobernd and Sedberry 2009, Fraser and Sedberry 2008).
- The US Navy contracted for a large multibeam survey off NE Florida in 2010. The locations mapped include surrounding areas north and south of the North Florida MPA. These areas are used for anti-submarine warfare training and encompass areas containing EFH and deep reefs.
- NOAA's SE-DSCTP project completed mapping in 2011 outside the North Florida and East Hump MPAs (Reed et al. 2014).

Action Item 11: *Ground truth bathymetric data for habitat classification.*

    Priority Ranking: Medium
    Task: Acoustic bathymetric and backscatter data are verified using ROVs or automated underwater vehicles (AUVs).
    Justification: Acoustic bathymetry and backscatter data is useful for detecting features which may provide habitat for targeted reef fish, however visual data is required to confirm habitat suitability. Ground truthing using ROVs or AUVs provides a cost-effective method

for collecting visual data of representative features showing similar bathymetric profiles and backscatter reflectance patterns.

Projects Completed or Underway:
- NMFS, SEFSC, Panama City Lab has been collecting multibeam data with ROV ground truthing inside and outside several of the MPAs since 2004 including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, North Florida, and East Hump.
- SERFS, which is a collaboration of SEFIS and MARMAP, has been collecting multibeam data with trap and stationary camera ground truthing inside and outside several of the MPAs since 2010 including: Snowy Wreck, Northern South Carolina, Edisto, Georgia, North Florida, and St. Lucie Hump.
- NOAA Ocean Exploration conducted sonar surveys with submersible ground truthing between 2001 and 2003 in and around North Florida and Northern South Carolina MPAs (Schobernd and Sedberry 2009, Fraser and Sedberry 2008).
- The US Navy contracted for a large multibeam survey off NE Florida in 2010. The areas covered are the Undersea Warfare Training Range and the CC Box which encompass the entire North Florida MPA and includes surrounding areas north and south of the MPA. Both areas are used for anti-submarine warfare training and encompass areas containing EFH and deep reefs. They also conducted ROV ground truthing throughout the mapped area.
- NOAA's SE-DSCTP project completed mapping in 2011 inside and around the North Florida and East Hump MPAs (Reed et al. 2014).

Deliverables: High resolution video and digital stills from ROV, AUV, or submersible surveys depicting habitat type (rugosity, relief, geomorphology, and substrate).
Schedule: Long-term
Budget:
Potential Partners: NMFS and independent researchers

Action Item 12: *Generate habitat classification maps for the Deepwater MPAs.*
Priority Ranking: Low
Task: High resolution habitat maps are generated for Deepwater MPAs and adjacent areas.
Justification: Habitat classification maps are the penultimate goal of most mapping programs. This process allows tremendous predictive capabilities over very large areas, once the areas have been acoustically mapped and ground truthing of representative areas has been completed. This procedure does not require field work, yet it requires skilled technicians to yield high quality results. Habitat classification is relatively low cost, but it does require inputs of acoustic and visual data which themselves are acquired at relatively high cost.
Deliverables: GIS map displaying the distribution of habitat types for Deepwater MPAs and other areas where multibeam surveys have been conducted.
Schedule: Long-term
Budget:
Potential Partners: NMFS, state agencies, and independent researchers
Projects Completed or Underway: None

3.4.2.4 Socioeconomic monitoring

The purpose of socioeconomic monitoring is to develop a better understand of the social and economic impacts of the Deepwater MPAs and monitor stakeholder knowledge and perception about MPAs. As monitoring studies gather data, they have the potential to detect significant

changes in stakeholder perceptions and knowledge about MPAs. Research findings can help mangers and scientists improve or adapt management of protected areas. The priority rankings for the socioeconomic monitoring are separate from resource monitoring, assessment, and habitat mapping rankings.

Action Item 13: *Collect baseline social and economic data on resource users groups in different areas to understand the social and economic effects of prohibiting access to Deepwater MPAs.*
> **Priority Ranking: 1**
> **Task:** Social and economic data are collected to determine effects of Deepwater MPAs on different user groups.
> **Justification:** Understanding social and economic effects of area closures can help managers compare biological benefits to social and economic costs of establishing closed areas**.** Additionally, detailed information on different user groups in different areas will allow analysis of cumulative effects on fishermen and communities when a closed area is implemented. Collection of baseline data will allow for comparison of future data to better understand how fishing behavior changed, and how fishing businesses and recreational anglers adapted to restricted access.
> **Deliverables:** Report
> **Schedule:** Long-term
> **Budget:** $300,000
> **Potential Partners:** NMFS and academic scientist
> **Projects Completed or Underway:**
> - A socioeconomic study of the impacts of the *Oculina* Bank has been conducted (Helies et al. 2011).

Action Item 14: *Engage stakeholders in a citizen science program to collect data to evaluate the performance of the Deepwater MPAs.*
> **Priority Ranking: 2**
> **Task:** A citizen science program is initiated and engages stakeholders in the collection of data to evaluate the effectiveness of Deepwater MPAs.
> **Justification:** Due to a limited budget, a Citizen Science Program is needed to gather data to assist in the evaluation of the Deepwater MPA to determine if the area is a spawning area for snapper grouper species. Additionally, cooperative research and involvement of resource users in data collection will increase buy-in for area-based management as a management tool and foster a better understanding of the purpose of Deepwater MPAs.
> **Deliverables:** Information to be included in the Deepwater MPA Evaluation Report
> **Schedule:** Short-term
> **Budget:**
> **Potential Partners:** NMFS, SAFMC Staff, fishermen, and academic scientist
> **Projects Completed or Underway:**
> - SAFMC is developing a Citizen Science Program.

Action Item 15: *Develop techniques to track the public's knowledge and perception regarding the purpose of, importance of, and regulations in Deepwater MPAs.*
> **Priority Ranking: 3**
> **Task:** Techniques are developed to track the public's knowledge and perception of Deepwater MPAs.

Justification: Data are needed to evaluate stakeholders' knowledge and perception of Deepwater MPAs. The data could be collected via online survey to evaluate communication and outreach strategies.
Deliverables: Report
Schedule: Long-term
Budget: $10,000
Potential Partners: NMFS, SAFMC Staff, and academic scientist
Projects Completed or Underway: None

Action Item 16: *Monitor stakeholder perception of Deepwater MPAs as a management tool.*
Priority Ranking: 4
Task: Stakeholder perception of Deepwater MPAs is monitored through a survey.
Justification: Data are needed to evaluate stakeholder's knowledge and perception of MPAs. Data could be collected via online survey, or during public meetings. The outcomes could be used to evaluate communication and outreach strategies.
Deliverables: Report
Schedule: Long-term
Budget: $10,000
Potential Partners: NMFS, SAFMC Staff, and academic scientist
Projects Completed or Underway: None

3.4.3 Outreach and Education Action Items

Outreach and education are essential components of effective fisheries and spatial management. Outreach activities help managers communicate with the public on the purpose and regulations of protected areas and increase the level of awareness and understanding while promoting public participation, ownership, and compliance. The desired outreach action items in this section are listed as projects and are modified from the outreach component of the Amendment 14 to the Snapper Grouper FMP (SAFMC 2007) and the Council's *Oculina* Experimental Closed Area (OECA) Evaluation Plan (SAFMC 2005).

The Snapper Grouper Fishery Management Plan stated:
"*The Council will solicit input from its Information and Education Advisory Panel and the Information and Education Committee in reviewing these needs and possibly developing further recommendations. As with the outreach component of the Oculina Experimental Closed Area Evaluation Plan, the Council acknowledges the need to work closely through partnerships to achieve these outreach needs. Possible partners in outreach efforts include, but are not limited to: Sea Grant, NOAA Fisheries, NOAA National Undersea Research Center at the University of North Carolina – Wilmington (NURC/UNCW), NOAA Office for Law Enforcement, individual state marine resources and law enforcement agencies, NOAA National Marine Sanctuary Program, Harbor Branch Oceanographic Institution, Centers for Ocean Sciences Education Excellence (COSEE) in South Carolina and Florida, Project Oceanica, and others*" (SAFMC 2007).

As of 2015, the SAFMC in collaboration with project partners produced the following outreach items:
- Deepwater MPA Regulation brochures with updated Type 2 MPA content, in

collaboration with the S.C. Sea Grant Extension Program (SAFMC 2009).
- Information about MPAs and Deepwater MPAs on the SAFMC website (http://www.safmc.net/managed-areas/marine-protected-areas).

The outreach action items aim to address the following goals and objectives of the SMP:

Goal 1: <u>Adopt and utilize an effective process to evaluate and refine management of Deepwater MPAs.</u>
Obj. A: Utilize public input from scientists, fishermen, APs, and the public to evaluate and refine management of Deepwater MPAs.
Obj. B: Ensure a management system that is efficient and representative of fishery stakeholders.

Goal 7: <u>Improve environmental awareness and public knowledge about the Deepwater MPAs.</u>
Obj. S: Increase level of public's knowledge about the purpose of, importance of, and regulations in Deepwater MPAs.
Obj. T: Strengthen and enhance stakeholder participation in management of Deepwater MPAs.
Obj. U: Enhance or maintain existence value of Deepwater MPAs.

The management plan will be enhanced through effective communication developed during outreach efforts. Specific communications targets for outreach include:
- Communication products accessible to the public in various formats.
- Management plan development delivered through transparent and open process.
- Compliance with the management plan is fostered through targeted communication.

The following ten outreach action items would be initiated by either Council staff and/or by potential partners and are sorted in order of priority rankings of the Information and Education Advisory Panel.

Action Item 1: *Work with fishing chart manufacturers (both printed and electronic) and/or vendors to improve available information for Deepwater MPAs.*
  Tasks: Identify manufacturers of more commonly used fishing charts in South Atlantic, contact manufacturers and coordinate methods to update products.
  Justification: Fishermen have expressed concerns that charts commonly used do not currently portray the coordinates and restrictions for Deepwater MPAs.
  Deliverables: Add information to electronic and printed charts, possible labels to apply to existing printed charts available at retail outlets.
  Schedule: Year 1: Identify manufacturers and assess best method to modify information currently available. Year 2: Work with cooperating manufacturers to modify electronic data for products. Due to publishing constraints, outcomes of this project may not be immediately evident but will have long-reaching effects.
  Budget: Staff time is the primary expected cost for working with electronic chart manufacturers; dependent upon the number of printed fishing charts currently available (including those in storage), cost of creating and printing additional labels for existing printed charts.
  Potential Partners/Roles: SAFMC staff will work with NOAA's Marine Charting Division

to investigate if OECA, HAPC, and Deepwater MPA boundaries and regulations can be included in a new proposed digital overlay of marine protection boundaries.

Action Item 2: *Develop files for managed area boundaries that can downloaded onto a SD card from the website for various GPS units and have directions on how to use the file.*
> **Tasks:** Create files that have boundaries with regulations for managed areas in the South Atlantic. Identify manufacturers of commonly used fishing charts in South Atlantic, contact manufacturers and coordinate methods to update products.
> **Justification:** Fishermen have requested to have the boundaries of the Deepwater MPAs available for download onto SD cards for use in their GPS units.
> **Deliverables:** Files available on the website.
> **Schedule:** Year 1: Identify manufacturers and file types for use in GPS units. Year 2: Files available for download on the website.
> **Budget:** Staff time is the primary expected cost for working with electronic chart manufacturers; dependent upon the number of printed fishing charts currently available (including those in storage), cost of creating and printing additional labels for existing printed charts.
> **Potential Partners/Roles:** SAFMC staff will work with GPS manufacturers to investigate if Deepwater MPA boundaries and regulations can be included in a new proposed digital overlay of marine protection boundaries.

Action Item 3: *Develop video presentations and power point presentations about the deepwater Type 2 MPAs; distribute on CD, post on the Web site, and disseminate to fishing clubs, environmental groups, state Sea Grant programs, local governments, etc.*
> **Tasks:** Design and create video and PowerPoint presentations using existing photos, video, maps, and other information to highlight Type 2 MPAs, history of management, research and monitoring activities, law enforcement, etc.
> **Justification:** Provides a quick method to distribute information for use by various audiences that can be readily updated.
> **Deliverables:** Video and PowerPoint presentations on CD and Web site.
> **Schedule:** Year 1: Produce and distribute presentations. Years 2-5: Update as necessary with current news and information on research and monitoring.
> **Budget:** Years 1-5: staff time.
> **Potential Partners/roles:** Council outreach staff, NOAA SEFSC, FWC, Sea Grant, and NURC.

Action Item 4: *Expand the Council's Deepwater MPA web pages to provide comprehensive education and outreach products (e.g., regulations, publications, research and monitoring information, law enforcement activities, news releases, high-resolution video and photographs, maps, etc.). Publicize availability of information by having links posted on other fishing/NGO/tourism related web sites.*
> **Tasks:** Enhance the Council's MPA web pages and integrate materials, including links to other relevant sites. Publicize the availability of web-based information.
> **Justification:** The website is the best media for maintaining comprehensive, dynamic content and imagery. The availability of this information can be publicized from other existing high profile websites.
> **Deliverables:** Website and promotion.

Schedule: Year 1: Develop expanded content with feedback from the Council's I&E AP and program partners. Years 2-5: Implement expanded web pages, promote availability, and update quarterly.
Budget: Year 1: staff time. Years 2-5: Dependent on expansion of web page content and use of multi-media.
Potential Partners/roles: Council outreach staff, NURC, NMFS SEFSC, FWC, US Geological Service, and NOAA OLE.

Action Item 5: *Incorporate new rack cards (Northern and Southern MPAs) into the Council's mobile application, SA Fishing Regulations.*
Tasks: New area specific rack cards – one for the Northern MPAs and one for the Southern MPAs – will be developed under Action Item 2. These new rack cards would be incorporated and made available on the SAFMC's website and the SAFMC's mobile app for fishing regulations, SA Fishing Regulations.
Justification: Area specific rack cards with a concise summary of regulations can be used for targeted outreach efforts in the Carolinas/Georgia (Northern) and Florida (Southern). Using the Council's website and mobile app are ideal platforms for making the information readily available to the public and easy to update in electronic form.
Deliverables: Rack cards available for electronic download on the Council's website and mobile app.
Schedule: Year 1: Design and development of rack cards. Year 2: Rack cards made available on the Council's website and mobile app. Years 3-5: Update rack cards as needed.
Budget: Year 1: Staff time designing rack cards: Year 2: Cost of incorporating rack cards into mobile app and staff time to upload to the Council's website. Years 3-5: Staff time to update as needed.
Potential Partners/roles: SAFMC outreach staff, mobile app developer (Verona Solutions), and website management company (Nassau Web Design).

Action Item 6: *Develop a delegate a point of contact to coordinate and share news and activities within the Deepwater MPA sites (research, monitoring, educators, and law enforcement) with Council staff for use in outreach and media events (e.g., social media, blogs, newsletters, etc.) and connect with key contacts in each area.*
Tasks: Enhance communication efforts regarding news and activities within Deepwater MPAs through a communication portal (either a web portal or points of contact) and personal contact.
Justification: To date, there has not been a point person or host site to share information about activities and news from Deepwater MPA sites. Establishing this portal mechanism would ensure that information is gathered and shared in a timely manner among all partners involved in MPA research, monitoring, enforcement and outreach.
Deliverables: Portal (web-based forum or web page) and point of contact for communicating and sharing news and activities.
Schedule: Year 1: Work with partners and Councils I&E AP to identify appropriate strategy and mechanism for an MPA portal. Year 2: Develop and implement portal and quarterly information exchange with designated point of contact.
Budget: Year 1: Staff time. Year 2: Dependent on approach to the MPA portal.
Potential Partners/roles: SAFMC outreach staff, NURC, NMFS SEFSC, FWC, US Geological Service, and NOAA OLE.

Action Item 7: *Collaborate with agencies and organizations that specialize in developing and conducting teacher workshops/materials on outreach aimed at highlighting the Council's managed areas (MPAs, Oculina, SMZs, etc.).*

    Tasks: Identify educational partners and suitable workshops for incorporating curriculum on all existing protected areas designated by the SAFMC (including current MPAs, SMZs, HAPCs, etc.) to disseminate to the public and to potential partners to collaborate on conducting outreach workshops. Identify and develop education materials for children.

    Justification: Identified as a need at both *Oculina* constituent meetings and determined a priority item by the Information and Education Advisory Panel for *Oculina*. Initial groundwork will be needed to identify local education needs.

    Deliverables: Education materials as identified.

    Schedule: Year 1: Identify key partnership opportunities through targeted discussions with educational partners (agencies and existing workshop programs). Years 2-5: Work with partners to develop and deliver MPA-related materials for workshops.

    Budget: Year 1: Staff time. Years 2-5: Staff time and also dependent on approach and number of materials produced.

    Potential Partners/roles: COSEE in South Carolina and Florida, Sea Grant, Project Oceanica, and local school systems and teacher partners.

Action Item 8: *Develop area-specific rack cards (Northern and Southern MPAs) to distribute at area bait and tackle shops, marinas, fish houses, boating stores, fishing tournaments, boat shows, etc.*

    Tasks: New area specific rack cards – one for the Northern MPAs (Carolinas/Georgia) and one for the Southern MPAs (Florida) in the region – will be developed and distributed to targeted businesses and fishing tournament directors.

    Justification: Effectively designed rack cards would draw attention to the Deepwater MPAs and provide quick access to general information about habitat, fish species, maps, regulations, and law enforcement contacts.

    Deliverables: Rack cards

    Schedule: Year 1: Design two rack cards – one for the Northern MPAs (Carolinas/Georgia) and one for the Southern MPAs (Florida) in the region – and receive input from the Council's I&E AP, Year 2: Print and distribute rack cards, Years 3-5: Edit and reprint rack cards as needed.

    Budget: Year 1: Staff time. Year 2: Printing and mailing costs for distributing rack cards. Years 3-5: Printing and mailing costs for distribution, as needed.

    Potential Partners/roles: SAFMC I&E AP, Harbor Branch Oceanographic Institute, NURC, USCG, FWC, NMFS, and Sea Grant.

Action Item 9: *Provide SAFMC Deepwater MPA regulation brochures to area fishermen.*

    Tasks: Reprint a limited number of updated Deepwater MPA Regulation brochures to include the new content regarding *Oculina* and distribute to federal, state, and local law enforcement offices for distribution.

    Justification: The regulations brochure will provide a summary of regulations and information for the Deepwater MPAs as well as an information on changes to the *Oculina* HAPC (once Coral Amendment 8 is implemented), and identification chart for snapper-grouper species found in the area. The brochure will also be available on the SAFMC

website and the mobile application, SA Fishing Regulations.
Deliverables: Updated Deepwater MPA SAFMC regulation brochures.
Schedule: Year 1: Revise existing MPA brochure and receive input from the Council's I&E AP. Year 2: Print and distribute MPA brochure. Years 3-5: Reprint as necessary.
Budget: Year 1: Staff time. Year 2: Printing and mailing costs for distribution. Year 3-5: Reprinting and mailing costs for distribution, as needed.
Potential Partners/roles: SAFMC Outreach staff, I & E AP, NMFS SEFSC, FWC, and possible contractual graphic designer (if not produced in-house).

Action Item 10: *Develop and distribute news releases (coordinating with local contacts) to focus on research and monitoring projects, and the ecological importance of the Deepwater MPAs.*
Tasks: Create science-based news releases relevant to ongoing research and monitoring activities with focus on habitat, snapper grouper species, and links to ecosystem-based management. Coordinate releases with ongoing activities and strive to provide high-resolution photos and graphics to media.
Justification: Increase awareness of all activities in the Deepwater MPAs.
Deliverables: News releases; outlets may include NOAA News, local/national media, and ENN. Coordinate releases with ongoing activities and strive to provide high-resolution photos and graphics to media.
Schedule: Years 1-5: Produce at least one feature news release/year; research cruises provide good opportunities for releases and events (e.g., port days, at-sea visits).
Budget: Years 1-5: Staff time.
Potential Partners/roles: NMFS SEFSC and SERO, NURC, Sea Grant, Harbor Branch Oceanographic Institution, NOAA OLE, and FWC.

3.4.4 Administrative Action Items

The Deepwater MPAs were developed through the fishery management plan amendment process, which involved a series of public meetings including an expert working group meeting as well as public scoping and public hearings.

An evaluation of Deepwater MPA effectiveness will be conducted every 5 years with yearly updates on accomplishments and tracking of action items. The evaluation will be conducted by a SMP AP, which will consist of representatives from law enforcement, research scientists, commercial fishermen, recreational fishermen, outreach experts, non-governmental organizations, and NMFS staff. A report will be written by the SMP Interdisciplinary Plan Team (IPT), similar to the development of amendments. Council staff will be the lead for compiling the document with assistance from NMFS. The SMP AP will first review the Deepwater MPA Evaluation Report. After review by the SMP AP, other relevant Advisory Panels (Habitat and Environmental Protection, Snapper Grouper, Information and Education, Law Enforcement, and Coral) and the Council's Science and Statistical Committee will review and comment on the document. The recommendations from these groups will be forwarded to the Council. Any changes to the regulations or re-configuration of the Deepwater MPAs will require action by the Council, which will be done through an amendment to the Snapper Grouper FMP.

Meetings
The SMP AP will meet annually to discuss the action items and review the results of completed tasks at annual meetings. Decisions regarding the SMP will be completed through consensus. Updates on the action items will be reported to the Council. The SMP AP will be tasked

reviewing the Deepwater MPA Evaluation Report developed by the SMP IPT based on a deadline provided by the Council. The Habitat and Environmental Protection, Snapper Grouper, Information and Education, Law Enforcement, and Coral APs will review the evaluation report in conjunction with regularly scheduled AP meetings. The reviews will be conducted either through in-person or web-based meetings

Membership
An SMP AP will be appointed by the Council through the AP Selection Committee. Membership will follow the standard operating procedures developed by the AP Selection Committee.

The administrative action items are designed to fulfill Goal 1.

Goal 1:   Adopt and utilize an effective process to evaluate and refine management of Deepwater MPAs.
   Obj. A: Utilize public input from scientists, fishermen, APs, and the public to evaluate and refine management of Deepwater MPAs.
   Obj. B: Ensure a management system that is efficient and representative of fishery stakeholders.

Action Item 1: *Develop a SMP for the evaluation of Deepwater MPAs through a public process.*
   Tasks: Develop a SMP for the Deepwater MPAs
   Justification: The SMP will be used to develop the goals and objectives for management of the deepwater MPAs and provide a process for review of the outcomes and adaptive management.
   Deliverables: SMP.
   Schedule: 2015, Develop the SMP for the Deepwater MPA .
   Budget: $9,587.50
   Potential Partners/roles: SAFMC, Contractors (Michelle Tishler and Ken Lindeman), and NMFS.

   Tasks: Form Advisory Panel for the SMP with representativeness based on fisheries, areas, and expertise.
   Justification: The SMP AP is needed to advise the Council on developing managed areas and reviewing the evaluation report.
   Deliverables: SMP AP.
   Schedule: Year 1: Form SMP AP.
   Budget: (within Council's administrative budget)
   Potential Partners/roles: SAFMC and APs.

   Tasks: SMP AP review and provide recommendations based on information collected from Deepwater MPAs and review and provide recommendations on the evaluation report.
   Justification: The SMP AP review will provide advice to the Council on Deepwater MPAs and improvements for the evaluation report.
   Deliverables: Yearly meetings and xx year review.
   Schedule: Year 2-4: Review information collected in Deepwater MPAs. Year 5. Review and provide comments on the evaluation report.
   Budget: $5,000 for annual review and $15,000 for five (or other time frame) year review

Potential Partners/roles: SAFMC, NMFS, and APs.

3.5 Management Effectiveness Evaluation

The effectiveness and management of the SMP and eight Deepwater MPAs will be evaluated at various levels, both continuously and periodically, to ensure fruition of desired goals and objectives. Multiple frameworks and examples exist for assessing management effectiveness of protected areas (E.g., Ervin 2003, Pomeroy et al. 2004, Hockings et al. 2006 (**Figure 3.5.1**), NOAA 2007, Leverington et al. 2010, Coastal Conservation and Education Foundation 2011, Commission for Environmental Cooperation 2011, NOAA 2011, Gleason et al. 2013).

This section describes methods for evaluation focusing on Design/Planning, Adequacy/ Appropriateness, and Delivery. This SMP was constructed after the initial designing and planning phase, but management is an adaptive process that can and should change over time. The Deepwater SMP focuses on rebuilding or maintaining populations of deepwater species including: speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, and blueline tilefish (**Table 3.5.1**). Based on the purpose and need of Amendment14, the MPAs were designed to "prevent overfishing and provide refugia for the deepwater species where the population structure is not impacted by fishing while minimizing the socio-economic impact on fishery, following enforceability recommendations, and preventing safety issues for fishermen." (SAFMC 2007)

An evaluation should include (1) a design and planning component; (2) a review of the adequacy and appropriateness of the current rules and regulation, science, outreach, and enforcement to achieve the goals and objectives of Amendment 36; and (3) a review of the outputs of science, outreach, and governance and the outcomes of the efforts (Hockings et al. 2006). The designing and planning phases of the MPAs were conducted through the amendment process that included a special working group to assist in the selection of appropriate MPA sites, solicitation of public comments, review and comments by advisory panels and SSC review, and final MPA selection by the Council. Any changes to the MPA will be required to follow the Council's FMP Amendment Process; therefore, the design and planning will not be a focus of the evaluation of effectiveness unless the SMP AP indicates this is needed for more effective management. At that time, the new method for design and planning will be added to the SMP. The outputs of science, outreach, and governance and the outcomes of the efforts will be updated annually to assist with planning of future monitoring, outreach, and enforcement, discuss potential attributes and lessons learned of past work, and potential improvements of future work. Adequacy and appropriateness of rules and regulation, science, outreach, and enforcement to achieve the goals and objectives of Amendment 14 will be reviewed through an evaluation report provided to the Council to adapt management based on comments from the SMP AP and public comment. The metrics used to evaluate the adequacy and appropriateness were separated into biophysical, socioeconomic, and governance and based on Pomeroy et al. (2004).
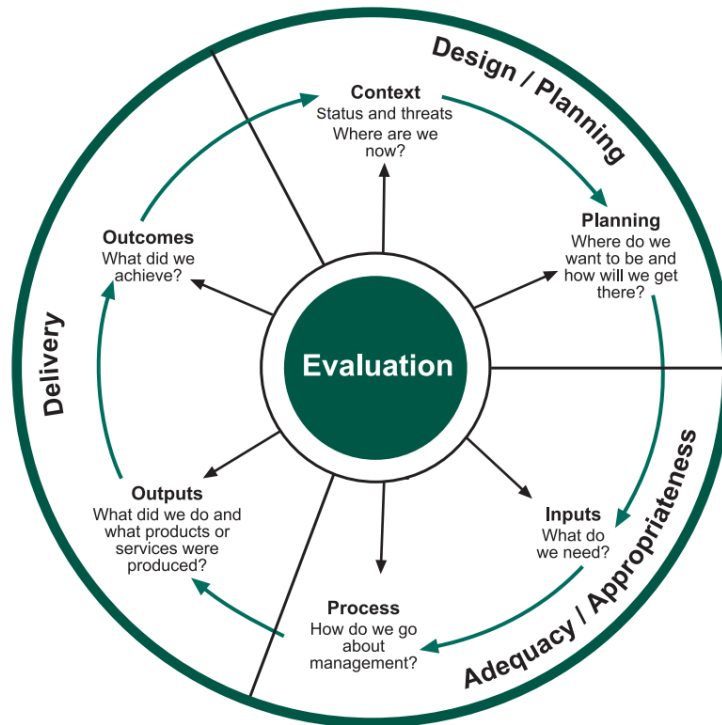
Figure 3.5.1. Management effectiveness framework for protected areas (Hockings et al. 2006).

3.5.1 Goals and Objectives

The overall goal of the Deepwater MPAs is to provide deepwater snapper grouper species with an area where deepwater species have refugia from harvest pressure. With the reduced fishing effort in the area, the snapper grouper species should have a more natural sex ration, size structure and age structure. During the development of Amendment 14, all species with known statuses in **Table 3.5.1** were overfished or experiencing overfishing. Since Amendment 14, snowy grouper and golden tilefish stock statuses have improved; however, snowy grouper remains overfished. Improving the deepwater stocks to sustainable levels will remain a primary goal of the Deepwater MPA. The goals and objectives of the SMP will need to be reviewed periodically to adapt management to management and objectives from the fishery management planc. The following sections contain metrics for evaluating the Deepwater MPAs and accomplish SMP Goals and Objectives:

Goal 1:   Adopt and utilize an effective process to evaluate and refine management of Deepwater MPAs.
  Obj. A: Utilize public input from scientists, fishermen, APs, and the public to evaluate and refine management of Deepwater MPAs.
  Obj. B: Ensure a management system that is efficient and representative of fishery stakeholders.

Goal 2:   Maximize biological benefits of the Deepwater MPAs.
  Obj. C: Restore or maintain populations of speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, and blueline tilefish at sustainable levels within Deepwater MPAs.
  Obj. D: Prevent exploitation of deepwater species within Deepwater MPAs.

Obj. E: Protect populations of deepwater species from harvest in some nursery areas and habitats from fishing/human impact through creation of Deepwater MPAs.

Obj. F: Increase or sustain replenishment rate of fishery stocks outside of Deepwater MPAs.

Goal 3:   Minimize adverse social and economic effects of Deepwater MPAs.

Obj. G: Minimize economic impact of Deepwater MPAs to stakeholders targeting species other than snapper-grouper species.

Obj. H: Enhance respect for understanding of local knowledge.

Obj. I: Prevent compromise of boater safety due to the placement of and regulations in Deepwater MPAs.

Goal 4:   Enhance enforceability and compliance within Deepwater MPAs.

Obj. J: Consider the seven criteria from the Law Enforcement AP's report when determining suitable Deepwater MPA sites.

Obj. K: Ensure enforceability of regulations for the Deepwater MPAs.

Obj. L: Improve surveillance and monitoring of Deepwater MPAs.

Obj. M: Maintain or improve application of law and regulations for Deepwater MPAs.

Obj. N: Increase user participation in surveillance, monitoring, and enforcement of Deepwater MPAs.

Goal 5:   Maximize research and monitoring capabilities in Deepwater MPAs.

Obj. O: Utilize fishery-independent and fishery-dependent data to increase scientific knowledge and understanding of Deepwater MPAs.

Obj. P: Enhance information collected on the biological, socioeconomic, and governance metrics for Deeepwater MPAs through a Citizen Science Program.

Goal 6:   Enhance research and monitor impact of invasive species in Deepwater MPAs.

Obj. Q: Maintain or enhance a program to reduce or eliminate invasive lionfish in Deepwater MPAs.

Obj. R: Increase scientific knowledge on lionfish and ecosystem impacts in Deepwater MPAs.

Goal 7:   Improve environmental awareness and public knowledge about the Deepwater MPAs.

Obj. S: Increase level of public's knowledge about the purpose of, importance of, and regulations in Deepwater MPAs.

Obj. T: Strengthen and enhance stakeholder participation in management of Deepwater MPAs.

Obj. U: Enhance or maintain existence value of Deepwater MPAs.

Table 3.5.1. Stock status of focal species for Deepwater MPAs in the South Atlantic region.

Species	Assessment	Year	Overfished	Overfishing
Speckled Hind	Potts and Brennan	2001	Unknown	Yes*
Snowy Grouper	SEDAR 36	2014	Yes	No
Warsaw Grouper	Huntsman et al	1992	Unknown	Yes*
Yellowedge Grouper	N/A		Unknown	Unknown
Misty Grouper	N/A		Unknown	Unknown
Golden Tilefish	SEDAR 25	2011	No	No
Blueline Tilefish	SEDAR 32	2013	No	Yes

*Current overfishing status was based on NMFS Stock Status Report
http://www.fisheries.noaa.gov/sfa/fisheries_eco/status_of_fisheries/archive/2014/fourth/mapoverfishingstockscy_q4_2014.pdf

Metrics
The metrics below are designed to evaluate the effectiveness of the MPA and the associated regulations. Similar to the goals, the metrics are divided into biophysical, socioeconomic, and governance. Some the metrics may cover multiple goals. Combining the number of goals accomplished, the priority of the goal, and cost of the metric, a ranking system of the metrics could be used to recommend the greatest number and highest ranked goals with limited funding.

3.5.2 Biophysical Indicators

The Deepwater MPAs were designed to increase abundance of deepwater snapper grouper species and enable the population structure to rebuild to a more natural state. Some of the biophysical indicators were included in Amendment 14 including sex ratio, size distribution, and age distribution (SMP Goal 2). Additionally the deepwater MPAs were designed to protect nursery areas for deepwater snapper grouper species. Monitoring of the population, biological samples collected from target species, and an inventory of the habitat are needed to quantify/qualify the effectiveness of the Deepwater MPA. The MPAs should be rated as an overall group and individually. The metrics are separated into abundance metrics, population structure metrics, and habitat mapping metrics. The abundance metrics will focus on the number of individuals or percent of sampled individuals in spawning condition. The abundance metric could include density of focal species within the MPA, comparing the number of individuals from focal species inside and outside MPA, and density of focal species inside the MPA. Example tables are provided to compare the appropriate abundance metric or metrics over time (**Tables 3.5.2.1-3.5.2.4**). The population structure metrics should focus on reproductive attributes, size, and age as described in Amendment 14. The population structure metrics could include percent of individuals that are males for hermaphroditic species, a healthy sex ratio for non-hermaphroditic species, percent of the individuals greater than 75% of the maximum length, percent of individuals greater than the size of maturity, or percent of individuals greater than the age of maturity. It was noted that some of the sampling methods needed to confirm sex or age require harvesting the individual. If the population is very small or can be sampled without harvesting the individual, metrics that avoid harvesting the animal are preferred. The habitat mapping metrics are used to track efforts to complete the mapping of the MPA. The mapping metrics could include area mapped within and outside the MPA and percent of area with habitat

characterized. The lists of metrics are examples and should not be considered as the only metrics used to evaluate the performance of the MPAs or efforts to complete research in the MPAs.

Potential Metrics for abundance (consider items below)
A. Evaluate species stock status.
B. Density of the focal species in Deepwater MPA.
C. Number/percentage of samples with sightings within Deepwater MPA.
D. Compare densities inside and outside Deepwater MPAs.

Potential Metric for Population Structure (consider items below).
A. Have percentages varied over time as expected by growth rates.
B. For groupers, males are xx% of the population within Deepwater MPAs.
C. For tilefish, sex ratio is xx females: xx males within Deepwater MPAs.
D. For size structure, xx% of the population is 75% of the maximum length in Deepwater MPAs.
E. For size structure, xx% of the population is greater than the size of maturity in Deepwater MPAs.
F. For age structure, xx% of the population is greater than the age of maturity in Deepwater MPAs.

Potential Metric for Habitat Mapping (consider items below).
A. X% of Deepwater MPAs mapped.
B. X% of the area outside Deepwater MPAs mapped (5 mile radius).
C. Habitat type characterized inside Deepwater MPAs.
D. Deepwater nursery area described inside Deepwater MPAs.

Table 3.5.2.1. Example table for potential abundance metric from list above.

Species	Pre-Closure	2009-2013	2014-2018	2019-2023
Speckled Hind				
Snowy Grouper				
Warsaw Grouper				
Yellowedge Grouper				
Misty Grouper				
Golden Tilefish				
Blueline Tilefish				

Table 3.5.2.2. Life history values to potential monitor metrics in population structure.

Species	max (cm)	75% Max Size	max age	Size of Maturity	Age of Maturity
Speckled Hind	110	82.5	15/25	81	
Snowy Grouper	122	91.5	27/40	54.1	5
Warsaw Grouper	230	172.5	41		
Yellowedge Grouper	114	85.5	85	22.4/81	
Misty Grouper	160	120		81	
Golden Tilefish	125	93.75	40/50		
Blueline Tilefish	90	67.5	42		

Table 3.5.2.2 Cont

Species	Preclosure	2009-2013	2014-2018	2019-2023
Speckled Hind				
Snowy Grouper				
Warsaw Grouper				
Yellowedge Grouper				
Misty Grouper				
Golden Tilefish				
Blueline Tilefish				

Table 3.5.2.3. Example table of habitat mapping metrics for MPA area mapped.

MPA	Total Area	Area Mapped	% Mapped	% Likely SG Habitat Mapped w/in MPA
Snowy Grouper Wreck MPA				
Northern South Carolina MPA				
Edisto MPA				
Charleston Deep Artificial Reef MPA				
Georgia MPA				
North Florida MPA				
St. Lucie Hump MPA				
East Hump MPA				

Table 3.5.2.4. Example of habitat mapping metrics for area mapped within 5 miles of MPA

MPA	Total Area	Area Mapped	% Mapped	% Likely SG Habitat Mapped Outside MPA
Snowy Grouper Wreck MPA				
Northern South Carolina MPA				
Edisto MPA				
Charleston Deep Artificial Reef MPA				
Georgia MPA				
North Florida MPA				
St. Lucie Hump MPA				
East Hump MPA				

3.5.3 Socioeconomic Indicators

When the Council selected the Deepwater MPAs, they considered several factors beyond biological and habitat data. The Council wanted to select areas and a management strategy that would minimize impacts to fishermen and other fisheries and minimize potential safety issues. Metrics were selected by the IPT to rate the effectiveness of the MPAs based on the socioeconomic indicators (**Table 3.5.3.1**).

Table 3.5.3.1. Socioeconomic metrics for the Deepwater MPA System Management Plan.

Metric	Yes/No
Study developed to collect baseline social and economic data to understand effects of MPA	
Fishermen targeting species outside the snapper grouper complex are not impacted by the MPA	
Data on stakeholder's knowledge of the Deepwater MPAs are collected	
Data on perception of the Deepwater MPAs are collected	
Citizen Science Program Initiated	
Citizen Science Program assisting in the monitoring of the Deepwater MPAs	

3.5.4 Governance Indicators

The governance indicators of the Deepwater MPA focuses on the SMP after the MPAs were selected. The selection of the MPA is a management decision for the Council and need to be considered in the Amendment Process. The governance indicators cover important aspects of the managing Deepwater MPAs including review of the MPAs, development of the SMP, outreach, compliance with rules and regulations, and enforcement of regulations. Indicators should be addressed on a site specific basis if possible.

Table 3.5.4.1. Governance metrics for establishing and utilizing the SMP for the Deepwater MPA.

Metric	Yes/No
SMP formed Evaluation conducted SMP AP met	

Table 3.5.4.2. Governance outreach metrics for evaluating the Deepwater MPAs.

Metric	Yes/No
Short-term outreach action items created Outreach items updated with new management regulations POC Designated for MPA in SAFMC, SERO, SEFSC List of key contacts created SAFMC communicate with key contacts 1 time per year Collaboration with agencies and organizations for teacher workshops initiated/maintained	

Table 3.5.4.3. Governance law enforcement metrics for evaluating the Deepwater MPAs.

Enforcement	Yes/No
Number of patrols exceeds 10 patrols/year/MPA Enforcement vessels in adjacent state increased or maintained Updates on enforcement and adjudication provided Ratings maintained/increased for MPA	

Table 3.5.4.4. Governance compliance metrics for evaluating the Deepwater MPAs.

Metric	Yes/No
Number of citations < 2/year Percent of patrols with violation < 20%/year Remote monitoring methods reviewed Remote monitoring method recommended Citizen Science Program developed	

3.6 Financial Plan

Estimated costs in the tables below were based on cost estimates in 2015. The costs will need to be updated over time as the SMP is modified to match the goals and objectives and reflect current prices.

Table 3.6 1. Estimated costs of Resource Protection Action Items.

Resource Protection Action Items (AI)	Estimate Annual Cost					Total Estimated Cost Over 5 Years
	Year 1	Cost Over 5 Years	Year 3	Year 4	Year 5	
AI 1: Cooperative Enforcement	$0	$0	$0	$0	$0	*In conjunction with LEAP meeting*
AI 2: Maintain/Increase Enforceability	$250,000	$250,000	$250,000	$250,000	$250,000	*$1,250,000*
AI 3: Patrol MPAs	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	*$800,000*
AI 4: Remote Monitoring Program	$0	$160,000	$160,000	$160,000	$160,000	*$640,000*
AI 5: Citizen Science Program for Estimating Effort and Database						
AI 6: Report Enforcement and Compliance Activities to SAFMC	$0	$0	$0	$0	$0	*$0*
AI 7: Compliance Assistance Provided to User Groups	$0	$0	$0	$0	$0	*$0*
AI 8: Encourage NC to commit to JEA with NOAA	$0	$0	$0	$0	$0	*$0*
AI 9: Monitor/Improve Adjudication	$0	$0	$0	$0	$0	*$0*
TOTAL Budget:	**$410,000**	**$570,000**	**$570,000**	**$570,000**	**$570,000**	*$2,690,000*

Table 3.6 2. Estimated costs of Research and Monitoring Action Items.

Research and Monitoring Action Items (AI)	Estimate Annual Cost					Total Estimated Cost Over 5 Years
	Year 1	Cost Over 5 Years	Year 3	Year 4	Year 5	
AI 1: Identify fish demographics inside and adjacent to MPAs						
AI 2: Maintain annual monitoring program						
AI 3: Determine pre-closure distribution and abundance	$0	$0	$0	$0	$0	*Staff Time*
AI 4: Locate spawning aggregations	$50,000 per site	$50,000 per site	$50,000 per site	$50,000 per site	$50,000 per site	*$250,000*
AI 5: Develop and apply models to locate nursery sites						
AI 6: Track movement of adult fish	>$1,000,000	>$500,000	>$500,000	>$500,000	>$500,000	*>$3,000,000*
AI 7: Characterize species within the MPA compared to reference sites						
AI 8: Characterize fish communities						
AI 9: Complete multibeam surveys of the MPAs						
AI 10: Complete multibeam surveys of areas adjacent to MPAs						
AI 11: Ground truth bathymetric data for habitat classification						
AI 12: Generate habitat classification maps						
AI 13: Collect baseline social and economic data	$0	$0	$0	$300,000	$0	$300,000
AI 14: Stakeholder engaged in citizen science program						
AI 15: Develop techniques to track stakeholder knowledge about MPAs	$0	$0	$0	$10,000	$0	$10,000
AI 16: Monitor stakeholder perception of MPAs	$0	$0	$0	$10,000	$0	$10,000
TOTAL Budget:						

Table 3.6 3. Estimated costs of Outreach and Education Action Items.

Outreach Action Items (AI)	Estimated Annual Cost					Total Estimated Cost Over 5 Years
	Year 1	Year 2	Year 3	Year 4	Year 5	
AI 1: Work with fishing chart manufacturers to improve paper and electronic charts	TBD	$1,000	TBD	TBD	TBD	*$1000 but dependent on manufacturer approached*
AI 2: Develop MPA boundary map files for GPS units	$1,000	$1,500				*$2,500*
AI 2: Develop area specific rack cards	$1,000	$1,500	$500	$250	$250	*$3,500*
AI 3: Develop video and PowerPoint presentation	$10,000	$0	$0	$0	$0	*$10,000*
AI 4: Expand webpages and mobile apps for the Deepwater MPAs	$1,000	$1,500	$500	$250	$250	*$3,500*
AI 5: Develop area specific rank cards for the website and apps	$0	$5,000	$0	$2,000	$0	*$7,000*
AI 6: Designate a point of contact for the Deepwater MPA for distribution of news and contact with key stakeholders	$0	$0	$0	$0	$0	*$0*
AI 7: Collaborate with agencies and organizations that specialize in developing and conducting teacher workshops/materials aimed at highlighting the Council's managed areas (MPAs, Oculina, SMZs, etc.).	$0	$2,000	$500	$0	$0	*$2,500*
AI 8: Develop area specific rack cards	$1,000	$1,500	$500	$250	$250	*$3,500*
AI 9: Produce and print regulation brochure for the protected areas (MPAs, Oculina, SMZs, etc.) and include on the website (too large for website).	$1,000	$1,500	$500	$250	$250	*$3,500*
AI 10: Produce news releases about Deepwater MPAs	$0	$0	$0	$0	$0	*$0*
TOTAL Budget:	**$15,000**	**$15,500**	**$2,500**	**$3,000**	**$1,000**	*$37,000*

Table 3.6 4. Estimated costs of Administrative Action Items. All Administrative action items are a high priority.

Administrative Action Items (AI)	Estimated Annual Cost					Total Estimated Cost Over 5 Years
	Year 1	Year 2	Year 3	Year 4	Year 5	
AI 1a: Develop SMP for Deepwater MPAs	$10,000	$0	$0	$0	$0	*$10,000*
AI 1b: SMP Review by SMP AP at Annual Meeting	$0	$5,000	$5,000	$5,000	$0	*$15,000*
AI 1c: Five Year Review	$0	$0	$0	$0	$15,000	*$15,000*
TOTAL Budget:	**$10,000**	**$5,000**	**$5,000**	**$5,000**	**$15,000**	**$40,000**

3.7 Timelines

The first Deepwater MPA Evaluation Report will be submitted by a Council-specified date. The SMP IPT will provide data for the Deepwater MPA Evaluation Report and the SMP AP should evaluate the size, configuration, and regulations of the MPAs, as well as objectives, goals, tasks, and metrics. Each subsequent review of the Deepwater MPAs should be conducted based on terms of reference developed through the Council. The SMP IPT should convene well before the report due date to allow sufficient time for compilation of material, construction of the report, preliminary evaluation and recommendations from the SMP AP, reviews by each of the committees, and final review of the report by the SMP AP prior to submission to the Council.

Within the SMP, each action item has a schedule associated with it or is listed as short-term, medium-term, long-term, or ongoing. Short-term action items could be initiated or completed within two years. Medium-term action items could be initiated or completed within five years. Long-term action items are not likely to be completed within ten years. Some projects once initiated will be moved to ongoing projects.

4 Site Characterization

Overall

The eight Deepwater MPAs are located in deepwater in the South Atlantic region, consisting of live bottom, hard bottom, and artificial habitats from low relief to high relief. Additionally, these sites range from 165 to 984 feet in depth, approximately 9 to 69 nautical miles off the coasts of North Carolina to south Florida from latitudes 33°35´N to 24°27.5´N (SAFMC 2007, 2009). The total area encompassed by the Deepwater MPAs is approximately 529 square nautical miles (nm^2) with at least 100 nm^2 of protected area each state's coast. The largest amount of protected area occurs off Florida (158 nm^2), followed by North Carolina (150 nm^2), South Carolina (121 nm^2), and Georgia (100 nm^2). The largest Deepwater MPA is the Snowy Wreck MPA off North Carolina, which is approximately 150 nm^2. The smallest Deepwater MPA is St. Lucie Hump MPA off Florida, which is approximately 8 nm^2.

Essential Fish Habitat Considerations of the Sites

The Council has established that MPAs are identified at a high level of conservation with their designation as Essential Fish Habitat - Habitat Areas of Particular Concern. Fully characterizing Deepwater MPAs will refine our understanding of the linkages of benthic and pelagic habitats associated with spawning activity to aid in the conservation of habitats for all life stages of the focal species. Characterizing spawning habitat will also enhance our understanding of the complexity of snapper grouper essential fish habitats in the South Atlantic and connectivity of Deepwater MPAs with pelagic currents, gyres, and water column habitat that transport focal species eggs and larvae to a wide variety of benthic offshore, nearshore and inshore habitats for growth to maturity.

Affected Users

The social effects of restricting access to fishing are discussed in detail in Amendment 14 to the Snapper Grouper FMP (SAFMC 2007) and are incorporated here as a reference. In general, the benefits to fishermen and coastal communities would be associated with the biological benefits that result from prohibiting or restricting harvest in the designated area. If there is improvement

in a stock and over time, more fish available, this could benefit fishermen due to the expected spillover effect of closed areas. Additionally, improved stock health that fishermen observe first hand would also help improve buy-in for closed areas.

However, in most cases there would be expected negative effects from closed areas on fishermen and fishing communities if access to fishing grounds is prohibited or restricted. For commercial fishermen and for-hire businesses that use the fishing grounds, this could negatively affect business profits. For private recreational anglers, restricted access could negatively affect fishing opportunities and trip satisfaction.

Designating an area as a Deepwater MPA and prohibiting fishing for snapper grouper species would require compliance via buy-in from the public and enforcement. If these are lacking, the MPA may not generate the expected biological benefits, which would negatively affect fishermen and communities. **Amendment 14 Section 3.3.3** describes the communities and fishermen who may be affected by establishment of MPAs.

4.1 Snowy Grouper Wreck MPA

The Snowy Grouper Wreck MPA is located about 55 nautical miles southeast of Southport and Cape Fear, NC and spans approximately 150 nm^2 (15 x 10 nautical miles) in size (**Figure 4.1.1**; SAFMC 2007, 2009).

*Northwest corner at **33°25′N, 77°4.75′W**   Northeast corner at **33°34.75′N, 76°51.3′W**
Southwest corner at **33°15.75′N, 77°W**   Southeast corner at **33°25.5′N, 76°46.5′W***
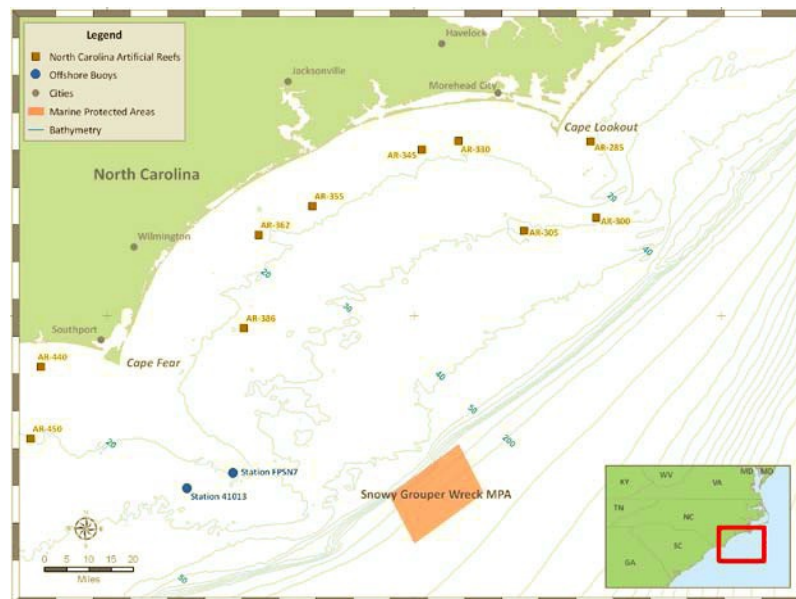(SAFMC 2007, 2009)

Figure 4.1.1. Snowy Grouper Wreck MPA, positioned southeast of Cape Fear, NC (SAFMC 2009).

Habitat and Managed Species Characterization
The Snowy-Grouper Wreck MPA is comprised of hard-bottom habitats, one primary wreck, and possible additional smaller wrecks, ranging in depth from 197 feet to 984 feet (**Figure 4.1.2**; SAFMC 2007).

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Managed Species Resource Characterization

The prominent Snapper-Grouper species targeted at this site consist of include snowy grouper, speckled hind, gag grouper, and red porgy (SAFMC 2007). In the late 1990s, a population of spawning snowy grouper were targeted and fished down over the wreck area encompassed within this MPA (SAFMC 2007, 2009). SEFSC ROV Survey and Southeast Reef Fish Survey (SERFS) sampling has occurred within the Snowy-Grouper Wreck MPA. The SEFSC ROV survey has observed 58 different taxa within the MPA (Note: Some are listed at family or genus level) including speckled hind, a target species (**Table 4.1.1**). The SERFS data include information on rock hind, speckled hind, red grouper, snowy grouper, warsaw grouper, gag, scamp, greater amberjack, red porgy, silk snapper, lionfish, and blueline tilefish (**Table 4.1.2**). Red porgy was the only species analyzed by SERFS that was reported in spawning condition.

Table 4.1.1. Species observed during ROV dives within the Snowy Wreck MPA. Species in bold are target species.

Common Name	Scientific Name	Common Name	Scientific Name
Reticulate Moray	*Muraena retifera*	Porgy	*Calamus sp.*
Squirrelfish	*Holocentridae sp.*	Red Porgy	*Pagrus pagrus*
Blackbar Soldierfish	*Myripristis jacobus*	Jack-knife Fish	*Equetus lanceolatus*
Cardinal Soldierfish	*Plectrypops retrospinis*	Cubbyu	*Pareques umbrosus*
Scorpionfish	*Scorpaenidae*	Spotted Goatfish	*Pseudupeneus maculatus*
Lionfish	*Pterois volitans*	Longsnout Butterflyfish	*Prognathodes aculeatus*
Rock Hind	*Epinephelus adscensionis*	Spotfin Butterflyfish	*Chaetodon ocellatus*
Speckled Hind	***Epinephelus drummondhayi***	Reef Butterflyfish	*Chaetodon sedentarius*
Red Grouper	*Epinephelus morio*	Bank Butterflyfish	*Prognathodes aya*
Gag	*Mycteroperca microlepis*	French Butterflyfish	*Prognathodes guyanensis*
Scamp	*Mycteroperca phenax*	Cherubfish	*Centropyge argi*
Unidentified Anthiid	*Anthiinae*	Blue Angelfish	*Holacanthus bermudensis*
Creolefish	*Paranthias furcifer*	Rock Beauty	*Holacanthus tricolor*
Wrasse Bass	*Liopropoma eukrines*	Blue Chromis	*Chromis cyaneus*
Graysby	*Cephalopholis cruentata*	Yellowtail Reeffish	*Chromis enchrysura*
Orangeback Bass	*Serranus annularis*	Sunshinefish	*Chromis insolata*
Snow Bass	*Serranus chionaraia*	Purple Reeffish	*Chromis scotti*
Tattler	*Serranus phoebe*	Bicolor Damselfish	*Stegastes partitus*
Roughtongue Bass	*Pronotogrammus martinicensis*	Creole Wrasse	*Clepticus parrae*
Greater Soapfish	*Rypticus saponaceus*	Spotfin Hogfish	*Bodianus pulchellus*
Bigeye	*Priacanthus arenatus*	Red Hogfish	*Decodon puellaris*
Short Bigeye	*Pristigenys alta*	Yellowhead Wrasse	*Halichoeres garnoti*
Unidentified Jack	*Carangidae*	Wrasse	*Halichoeres sp.*
Greater Amberjack	*Seriola dumerili*	Hogfish	*Lachnolaimus maximus*
Almaco Jack	*Seriola rivoliana*	Greenblotch Parrotfish	*Sparisoma atomarium*
Blackfin Snapper	*Lutjanus buccanella*	Doctorfish	*Acanthurus sp.*
Vermilion Snapper	*Rhomboplites aurorubens*	Gray Triggerfish	*Balistes capriscus*
Tomtate	*Haemulon aurolineatum*	Sharpnose Puffer	*Canthigaster rostrata*
Striped Grunt	*Haemulon striatum*		

Table 4.1.2. Target species number caught and average length of individuals collected through the SERFS within the Snowy Wreck MPA and size of maturity for reference. Other species were provided as additional information. Avg TL= Average total length.

Target Species	Number Caught	Avg TL (cm)	Size of Maturity (cm)
Speckled Hind	8	51	81
Snowy Grouper	14	51	54
Warsaw Grouper	3	104	~115
Blueline Tilefish	3	66	~40

Other Species	Number Caught	Avg TL (cm)
Rock Hind	1	44
Red Grouper	14	74
Gag	5	88
Scamp	22	67
Greater Soapfish	1	31
Greater Amberjack	2	122
Red Porgy	19	45
Silk Snapper	7	50
Lionfish	1	30
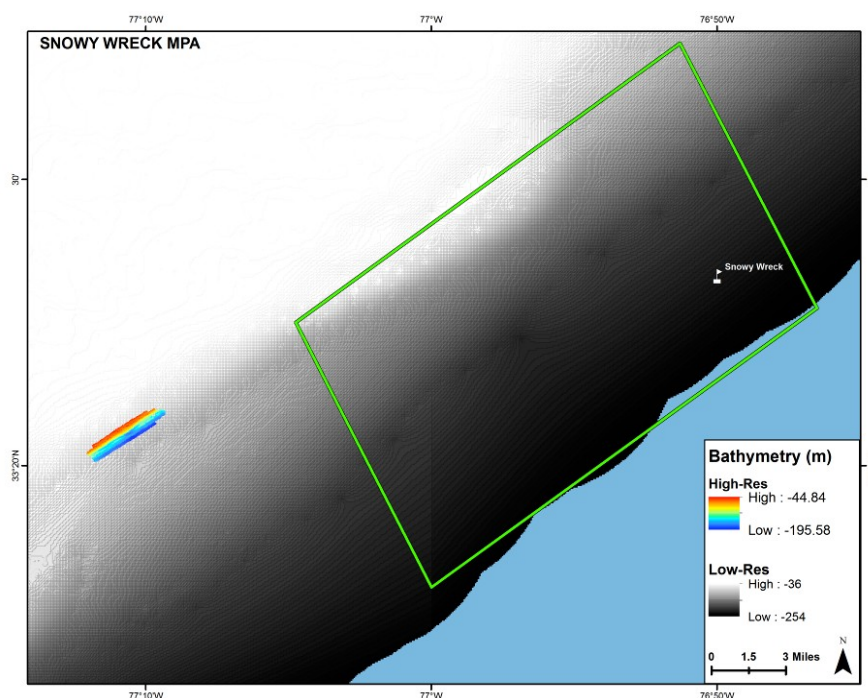
Figure 4.1.2. Bathymetry of the Snowy Grouper Wreck MPA (N. Farmer, 2014).

4.2   Northern South Carolina MPA

The Northern South Carolina MPA is located about 54 nautical miles southeast of Murrells Inlet, SC and spans approximately 50 nm^2 (10 x 5 nautical miles) in size (**Figure 4.2.1**; SAFMC 2007, 2009).

*Northwest corner at **32°53.5′N, 78°16.75′W**   Northeast corner at **32°53.5′N, 78°4.75′W***
*Southwest corner at **32°48.5′N, 78°16.75′W**   Southeast corner at **32°48.5′N, 78°4.75′W***
(SAFMC 2007; 2009)

Figure 4.2.1. Northern South Carolina MPA, located southeast of Murrells Inlet, SC (SAFMC 2007).

Habitat and Managed Species Characterization
This MPA is comprised of "hard-bottom habitat consisting of eroded rock in shelf- edge" at depths from 164 to 561 feet (SAFMC 2007; **Figure 4.2.2**).

In reference to the Northern South Carolina MPA,
> *"Fishermen refer to the area as "smurfville" because it holds many small vermilion snapper. Information received during the public input process indicated that this area is fished mostly in the winter and that it holds deepwater species like snowy grouper, yellowedge grouper, and speckled hind, as well as red porgy, triggerfish, and gag."* (SAFMC 2007)

SEFSC ROV Survey and Southeast Reef Fish Survey (SERFS) sampling has occurred within the Northern South Carolina MPA. The SEFSC ROV Survey has observed 110 different taxa (Note: Some are listed at family or genus level due to difficulty identifying through video) including speckled hind, yellowedge grouper, snowy grouper, and blueline tilefish, which are focal species.

The SERFS data include information on red grouper, tomtate, white grunt, knobbed porgy, red porgy, and blueline tilefish (**Table 4.2.2**). Tomtate, white grunt, and red porgy have been collected in spawning condition within the MPA boundaries.

Table 4.2.1. Species observed during ROV dives within the Northern South Carolina MPA. Species in bold are target species. (Data provided by SEFSC)

Common Name	Scientific Name	Common Name	Scientific Name
Bignose Shark	*Carcharhinus altimus*	**Blueline Tilefish**	***Caulolatilus microps***
Spotted Moray	*Gymnothorax moringa*	Sand Tilefish	*Malacanthus plumieri*
Unidentified Moray	*Muraenidae*	Greater Amberjack	*Seriola dumerili*
Reticulate Moray	*Muraena retifera*	Almaco Jack	*Seriola rivoliana*
Stout Moray	*Muraena robusta*	Unidentified Jack	*Decapterus sp.*
Sharptail Eel	*Myrichthys acuminatus*	Unidentified Snapper	*Lutjanus sp.*
Goldspotted Eel	*Myrichthys oculatus*	Vermilion Snapper	*Rhomboplites aurorubens*
Unidentified Lizardfish	*Synodus sp.*	Tomtate	*Haemulon aurolineatum*
Sand Diver	*Synodus intermedius*	White Grunt	*Haemulon plumierii*
Goosefish	*Lophius americanus*	Striped Grunt	*Haemulon striatum*
Mora Cod	*Laemonema sp.*	Porgy	*Calamus sp.*
Carolina Hake	*Urophycis earllii*	Red Porgy	*Pagrus pagrus*
Big Roughy	*Gephyroberyx darwinii*	Jack-knife Fish	*Equetus lanceolatus*
Squirrelfish	*Holocentridae sp.*	Cubbyu	*Pareques umbrosus*
Blackbar Soldierfish	*Myripristis jacobus*	Blackbar Drum	*Pareques iwamotoi*
Bigeye Soldierfish	*Ostichthys trachypoma*	Spotted Goatfish	*Pseudupeneus maculatus*
Deepbody Boarfish	*Antigonia capros*	Longsnout Butterflyfish	*Prognathodes aculeatus*
Unidentified Cornetfish	*Fistularia sp.*	Spotfin Butterflyfish	*Chaetodon ocellatus*
Bluespotted Cornetfish	*Fistularia tabacaria*	Reef Butterflyfish	*Chaetodon sedentarius*
Trumpetfish	*Aulostomus maculatus*	Bank Butterflyfish	*Prognathodes aya*
Longspine Snipefish	*Macrorhamphosus scolopax*	French Butterflyfish	*Prognathodes guyanensis*
Scorpionfish	*Scorpaenidae*	Cherubfish	*Centropyge argi*
Lionfish	*Pterois volitans*	Blue Angelfish	*Holacanthus bermudensis*
Flying Gurnard	*Dactylopterus volitans*	Rock Beauty	*Holacanthus tricolor*
Bank Sea Bass	*Centropristis ocyurus*	Gray Angelfish	*Pomacanthus arcuatus*
Black Sea Bass	*Centropristis striata*	French Angelfish	*Pomacanthus paru*
Rock Hind	*Epinephelus adscensionis*	Blue Chromis	*Chromis cyaneus*
Speckled Hind	***Epinephelus drummondhayi***	Yellowtail Reeffish	*Chromis enchrysura*
Red Hind	*Epinehphelus guttatus*	Sunshinefish	*Chromis insolata*
Red Grouper	*Epinephelus morio*	Purple Reeffish	*Chromis scotti*
Yellowedge Grouper	***Hyporthodus flavolimbatus***	Bicolor Damselfish	*Stegastes partitus*
Snowy Grouper	***Hyporthodus niveatus***	Barracuda	*Sphyraena barracuda*
Gag	*Mycteroperca microlepis*	Spotfin Hogfish	*Bodianus pulchellus*
Scamp	*Mycteroperca phenax*	Red Hogfish	*Decodon puellaris*
Coney Grouper	*Cephalopholis fulva*	Spanish Hogfish	*Bodianus rufus*
Red Barbier	*Hemanthias vivanus*	Greenband Wrasse	*Halichoeres bathyphilus*
Unidentified Anthiid	*Anthiinae*	Yellowhead Wrasse	*Halichoeres garnoti*
Apricot Bass	*Plectranthias garrupellus*	Wrasse	*Halichoeres sp.*
Yellowfin Bass	*Anthias nicholsi*	Hogfish	*Lachnolaimus maximus*
Swallowtail Bass	*Anthias woodsi*	Greenblotch Parrotfish	*Sparisoma atomarium*
Bladefin Bass	*Jeboehklia gladifer*	Unidentified Parrotfish	*Sparisoma sp.*
Creolefish	*Paranthias furcifer*	Blue Goby	*Ptereleotris calliura*
Wrasse Bass	*Liopropoma eukrines*	Doctorfish	*Acanthurus sp.*
Graysby	*Cephalopholis cruentata*	Flounder	*Bothidae*
Orangeback Bass	*Serranus annularis*	Filefish	*Aluterus sp.*

Table 4.2.1 Cont

Common Name	Scientific Name	Common Name	Scientific Name
Saddle Bass	*Serranus notospilus*	Gray Triggerfish	*Balistes capriscus*
Tattler	*Serranus phoebe*	Queen Triggerfish	*Balistes vetula*
Roughtongue Bass	*Pronotogrammus martinicensis*	Unidentified Trunkfish	*Lactophrys sp.*
Unidentified Soapfish	*Rypticus sp.*	Spotted Trunkfish	*Lactophrys bicaudalis*
Greater Soapfish	*Rypticus saponaceus*	Honeycomb Cowfish	*Acanthostracion polygonius*
Bigeye	*Priacanthus arenatus*	Scrawled Cowfish	*Acanthostracion quadricornis*
Short Bigeye	*Pristigenys alta*	Sharpnose Puffer	*Canthigaster rostrata*
Bulleye	*Cookeolus boops*	Bandtail Puffer	*Sphoeroides spengleri*
Unidentified Cardinalfish	*Apogon sp.*	Puffer	*Diodon sp.*
Twospot Cardinalfish	*Apogon pseudomaculatus*		

Table 4.2.2. Target species number caught and average length of individuals collected through the SERFS within the Northern South Carolina MPA and size of maturity for reference. Other species were provided as additional information. Avg TL = Average total length (Data provided by SCDNR)

Target Species	Number Caught	Avg TL (cm)	Size of Maturity (cm)
Blueline Tilefish	7	45	~40

Other Species	Number Caught	Avg TL (cm)
Red Grouper	1	73
Tomtate	2	18
White Grunt	1	40
Knobbed Porgy	2	34
Red Porgy	37	31
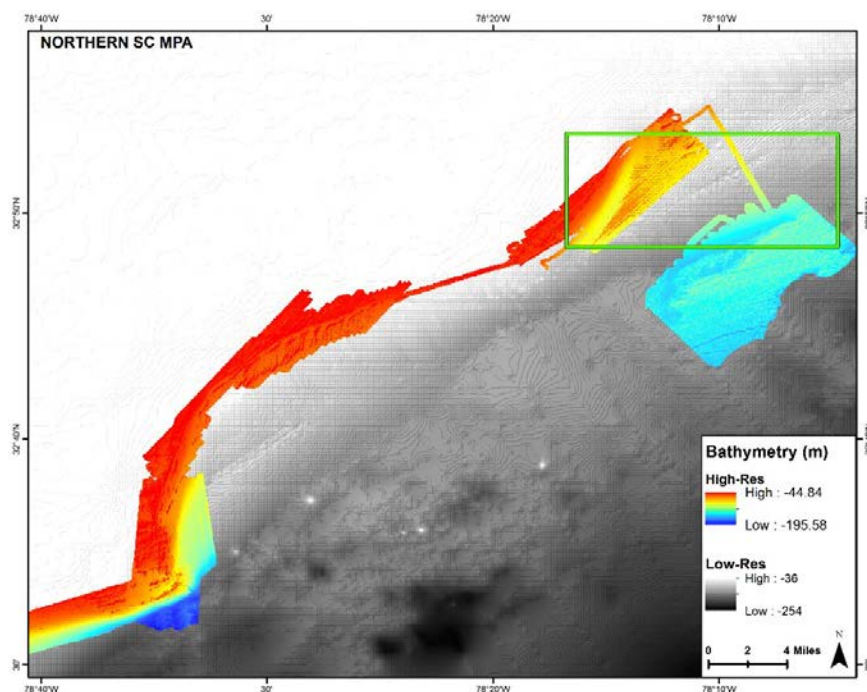
Figure 4.2.2. Low- and high-resolution bathymetry within and outside of the Northern South Carolina MPA (Provided by N. Farmer).

4.3 Edisto MPA

The Edisto MPA is located about 45 nautical miles southeast of Charleston, SC and spans approximately 50 nm^2 (10 x 5 nautical miles) in size (**Figure 4.3.1**; SAFMC 2007).

Northwest corner at 32°24′N, 79°6′W   Northeast corner at 32°24′N, 78°54′W Southwest corner at 32°18.5′N, 79°6′W   Southeast corner at 32°18.5′N, 78°54′W
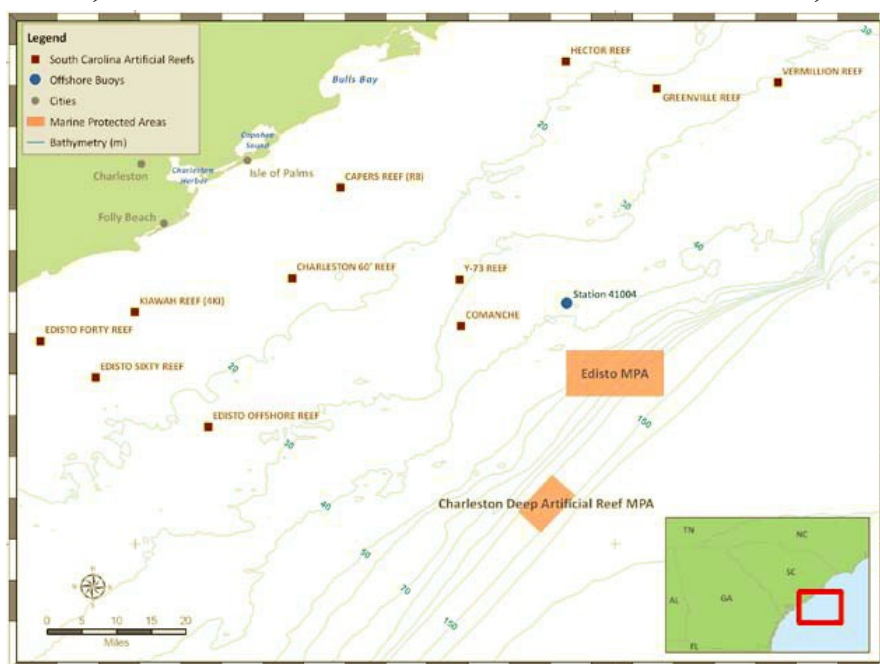
Figure 4.3.1. The Edisto and Charleston Deep Artificial Reef MPAs, located east of Charleston and Charleston Harbor, SC (SAFMC 2007).

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Habitat and Managed Species Characterization
The Edisto Deep MPA is:

> *"oriented perpendicular to and southeast of the Charleston, SC coastline and the area is heavily fished by both commercial and recreational fishermen. Water depths range from 262 ft. to 459 ft., with shallower areas from 148 ft. to 262 ft. The area includes shelf-edge habitat, home to species such as vermilion snapper, red porgy, gag, scamp, and black sea bass. Other deepwater species include: juvenile snowy grouper, speckled hind, and blueline tilefish. The large number of species found in this area may be related to regional circulation patterns: the MPA lies in an area where the Gulf Stream deflects, or bounces off, the "Charleston Bump," a deepwater bank made up of a series of steep scarps with rocky cliffs, overhangs, and caves. This deflection creates a series of persistent clockwise swirls and upwelling currents referred to as the "Charleston Gyre," resulting in nutrient rich water beneficial to early life stages of fishes. Furthermore, the Charleston Gyre may serve to retain larvae offshore, as well as transport the larvae of some species such as gag and snowy grouper toward nursery areas in estuarine waters. Thus, the area may serve both as a source of larvae for surrounding regions and a sink to retain young fish that need to remain offshore to complete their development."* (SAFMC 2007; **Figure 4.3.2**)

SEFSC ROV Survey and Southeast Reef Fish Survey (SERFS) sampling has occurred within the Edisto MPA. The SEFSC ROV Survey has observed 108 different taxa (Note: Some are listed at family or genus level due to difficulty identifying through video) including speckled hind and snowy grouper, which are target species (**Table 4.3.1**). The SERFS data include information on scamp, warsaw grouper, and red porgy (**Table 4.3.2**). Scamp have been collected in spawning condition within the MPA boundaries.

Table 4.3.1. Species observed during ROV dives within the Edisto MPA. Species in bold are target species. (Data provided by SEFSC)

| Common Name	Scientific Name	Common Name	Scientific Name
Unidentified Shark	*Carcharhinidae*	Vermilion Snapper	*Rhomboplites aurorubens*
Moray Eel	*Muraenidae*	Tomtate	*Haemulon aurolineatum*
Spotted Moray	*Gymnothorax moringa*	White Grunt	*Haemulon plumierii*
Reticulate Moray	*Muraena retifera*	Striped Grunt	*Haemulon striatum*
Snake Eel	*Ophichthidae*	Spottail Pinfish	*Diplodus holbrookii*
Lizardfish	*Synodus sp.*	Porgy	*Calamus sp.*
Sand Diver	*Synodus intermedius*	Red Porgy	*Pagrus pagrus*
Toadfish	*Opsanus sp.*	Jack-knife Fish	*Equetus lanceolatus*
Squirrelfish	*Holocentridae sp.*	Cubbyu	*Pareques umbrosus*
Blackbar Soldierfish	*Myripristis jacobus*	Yellow Goatfish	*Mulloidichthys martinicus*
Cardinal Soldierfish	*Plectrypops retrospinis*	Spotted Goatfish	*Pseudupeneus maculatus*
Cornetfish	*Fistularia sp.*	Longsnout Butterflyfish	*Prognathodes aculeatus*
Bluespotted Cornetfish	*Fistularia tabacaria*	Spotfin Butterflyfish	*Chaetodon ocellatus*
Trumpetfish	*Aulostomus maculatus*	Reef Butterflyfish	*Chaetodon sedentarius*
Pipefish	*Syngnathus sp.*	Bank Butterflyfish	*Prognathodes aya*
Scorpionfish	*Scorpaenidae*	Banded Butterflyfish	*Chaetodon striatus*

Table 4.3.1. cont

Common Name	Scientific Name	Common Name	Scientific Name
Spotted Scorpionfish	*Scorpaena plumieri*	Cherubfish	*Centropyge argi*
Lionfish	*Pterois volitans*	Blue Angelfish	*Holacanthus bermudensis*
Flying Gurnard	*Dactylopterus volitans*	Rock Beauty	*Holacanthus tricolor*
Bank Sea Bass	*Centropristis ocyurus*	Gray Angelfish	*Pomacanthus arcuatus*
Rock Hind	*Epinephelus adscensionis*	French Angelfish	*Pomacanthus paru*
Speckled Hind	***Epinephelus drummondhayi***	Blue Chromis	*Chromis cyaneus*
Red Grouper	*Epinephelus morio*	Yellowtail Reeffish	*Chromis enchrysura*
Snowy Grouper	***Hyporthodus niveatus***	Sunshinefish	*Chromis insolata*
Gag	*Mycteroperca microlepis*	Purple Reeffish	*Chromis scotti*
Black Grouper	*Mycteroperca bonaci*	Bicolor Damselfish	*Stegastes partitus*
Scamp	*Mycteroperca phenax*	Barracuda	*Sphyraena barracuda*
Yellowmouth Grouper	*Mycteroperca interstitialis*	Creole Wrasse	*Clepticus parrae*
Coney Grouper	*Cephalopholis fulva*	Spotfin Hogfish	*Bodianus pulchellus*
Unidentified Anthiid	*Anthiinae*	Red Hogfish	*Decodon puellaris*
Creolefish	*Paranthias furcifer*	Spanish Hogfish	*Bodianus rufus*
Wrasse Bass	*Liopropoma eukrines*	Yellowhead Wrasse	*Halichoeres garnoti*
Graysby	*Cephalopholis cruentata*	Wrasse	*Halichoeres sp.*
Orangeback Bass	*Serranus annularis*	Hogfish	*Lachnolaimus maximus*
Lantern Bass	*Serranus baldwini*	Bluehead Wrasse	*Thalassoma bifasciatum*
Saddle Bass	*Serranus notospilus*	Greenblotch Parrotfish	*Sparisoma atomarium*
Tattler	*Serranus phoebe*	Parrotfish	*Sparisoma sp.*
Whitespotted Soapfish	*Rypticus maculatus*	Doctorfish	*Acanthurus sp.*
Soapfish	*Rypticus sp.*	Unicorn Filefish	*Aluterus monoceros*
Bigeye	*Priacanthus arenatus*	Scrawled Filefish	*Aluterus scriptus*
Short Bigeye	*Pristigenys alta*	Gray Triggerfish	*Balistes capriscus*
Cardinalfish	*Apogon sp.*	Queen Triggerfish	*Balistes vetula*
Twospot Cardinalfish	*Apogon pseudomaculatus*	Planehead Filefish	*Stephanolepis hispida*
Sand Tilefish	*Malacanthus plumieri*	Filefish	*Monacanthidae*
Cobia	*Rachycentron canadum*	Trunkfish	*Lactophrys sp.*
Jack	*Carangidae*	Honeycomb Cowfish	*Acanthostracion polygonius*
Black Jack	*Caranx lugubris*	Scrawled Cowfish	*Acanthostracion quadricornis*
Greater Amberjack	*Seriola dumerili*	Sharpnose Puffer	*Canthigaster rostrata*
Almaco Jack	*Seriola rivoliana*	Bandtail Puffer	*Sphoeroides spengleri*
Banded Rudderfish	*Seriola zonata*	Unidentified Burrfish	*Chilomycterus sp.*
Bluntnose Jack	*Hemicaranx amblyrhynchus*	Striped Burrfish	*Chilomycterus schoepfi*
Snapper	*Lutjanus sp.*	Spot-fin Porcupinefish	*Diodon hystrix*
Gray Snapper	*Lutjanus griseus*	Long-spine Porcupinefish	*Diodon holocanthus*
Dog Snapper	*Lutjanus jocu*	Ocean Sunfish	*Mola mola*

Table 4.3.2. Target species number caught and average length of individuals collected through the SERFS within the Edisto MPA and size of maturity for reference. Other species were provided as additional information. (Data provided by SCDNR)

Target Species	Number Caught	Avg TL (cm)	Size of Maturity (cm)
Warsaw Grouper	1	78	~115

Other Species	Number Caught	Avg TL (cm)
Scamp	2	60
Red Porgy	3	42
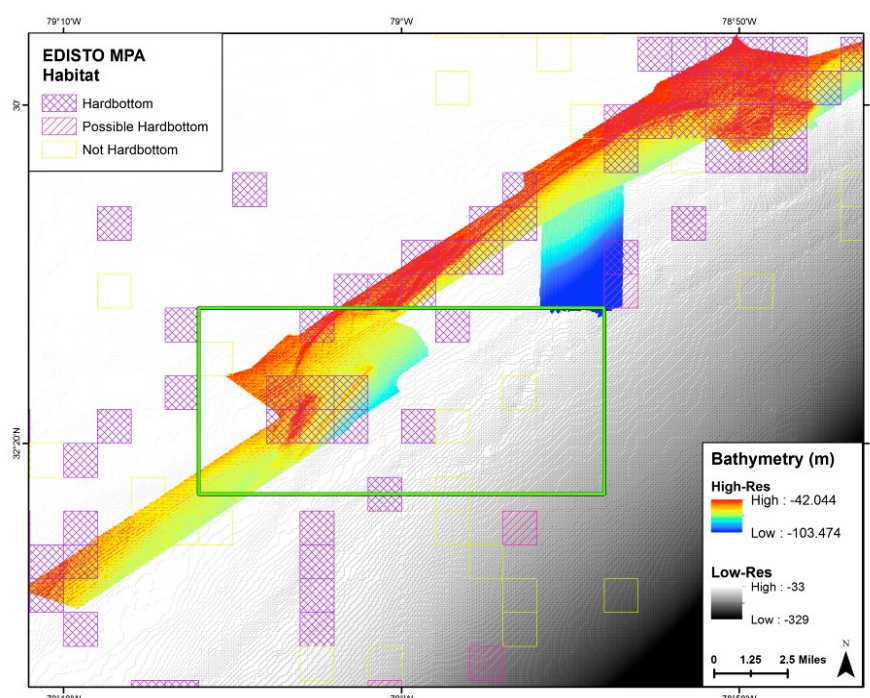
Figure 4.3.2. Low- and high-resolution bathymetry and habitat characterization within and outside of the Edisto MPA (Provided by N. Farmer).

4.4 Charleston Deep Artificial Reef MPA

The Charleston Deep Artificial Reef MPA is located about 50 nautical miles southeast of Charleston Harbor, SC and spans approximately 21 nm^2 (3.5 x 6 nautical miles) in size (**Figure 4.3.1**; SAFMC 2007).

*Northwest corner at **32°04′ N, 79°12′W***   *Northeast corner at **32°8.5′N, 79°7.5′W***
*Southwest corner at **32°1.5′N, 79°9.3′W***   *Southeast corner at **32°6′N, 79°5′W***

Habitat Characterization
The Charleston Deep Artificial Reef MPA is:
      "proposed as an experimental artificial reef site as a result of public comment

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and support for creating artificial reefs. The area ranges in depth from 328 ft. to 492 ft. There is no hard bottom in the area. Any biological benefits to deepwater species would accrue after artificial reef material (such as sunken ships, tanks, or highway materials) is added to improve habitat and attract fish. Study of this site in the long-term may provide important biological information about deepwater snapper grouper species and the effectiveness of deepwater artificial reefs." (SAFMC 2007; **Figure 4.4.1**)

The reef was sampled by SEFSC with ROVs in 2014 two months after the barges were sunk. Amberjack were present on both barges and one snowy grouper was observed on one barge. The artificial reef is not sampled by SERFS.
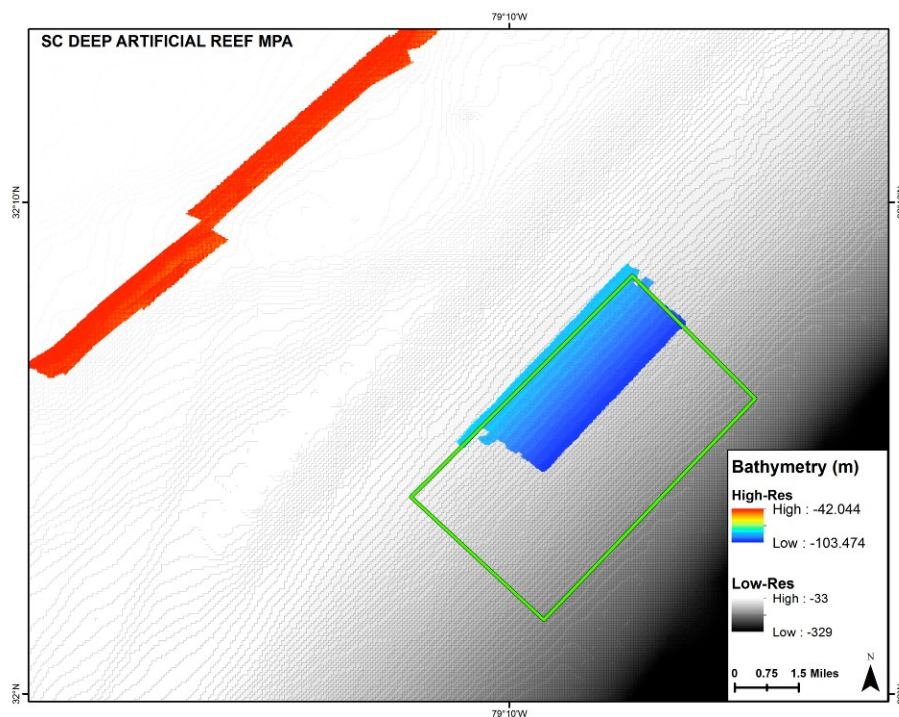
Figure 4.4.1. Low- and high-resolution bathymetry within and outside of the Charleston Deep Artificial Reef MPA (Provided by N. Farmer).

4.5 Georgia MPA

The Georgia MPA is located about 69 nautical miles southeast of Wassaw Sound, GA and spans approximately 100 square nautical miles (10 x 10 nautical miles) in size (**Figure 4.5.1**; SAFMC 2007).

*Northwest corner at **31°43′N, 79°31′W***   *Northeast corner at **31°43′N, 79°21′W***
*Southwest corner at **31°34′N, 79°39′W***   *Southeast corner at **31°34′N, 79°29′W***
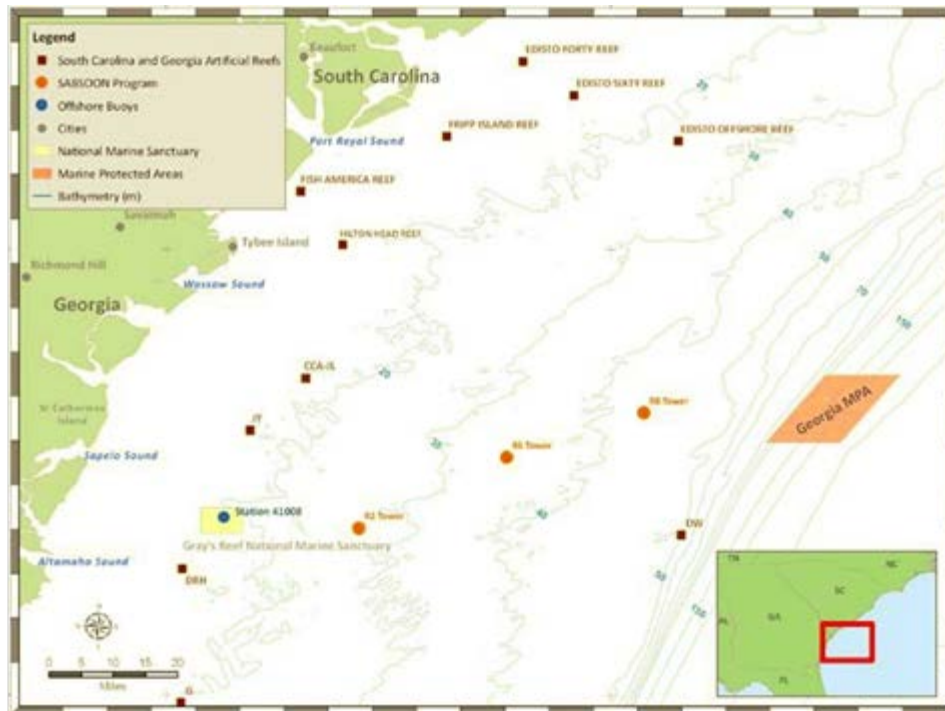
Figure 4.5.1. The Georgia MPA, located east of Wassaw Sound, GA (SAFMC 2009).

Habitat and Managed Species Characterization
The Georgia MPA habitat was described as:

> *"The area consists of a mud-bottom habitat in waters 295 ft. to 984 ft. deep.*
> *Species such as snowy grouper and golden tilefish are often caught within*
> *the area, although most fishing is for pelagic species such as tuna and*
> *dolphin. This area is occasionally fished commercially for snapper grouper*
> *species but lies east of an area called the "Triple Ledge" that is an*
> *important area for commercial fishermen. Oriented parallel to the coast*
> *and shelf break, the area encompasses additional deepwater habitat."*
> (SAFMC 2007; **Figure 4.5.2**)
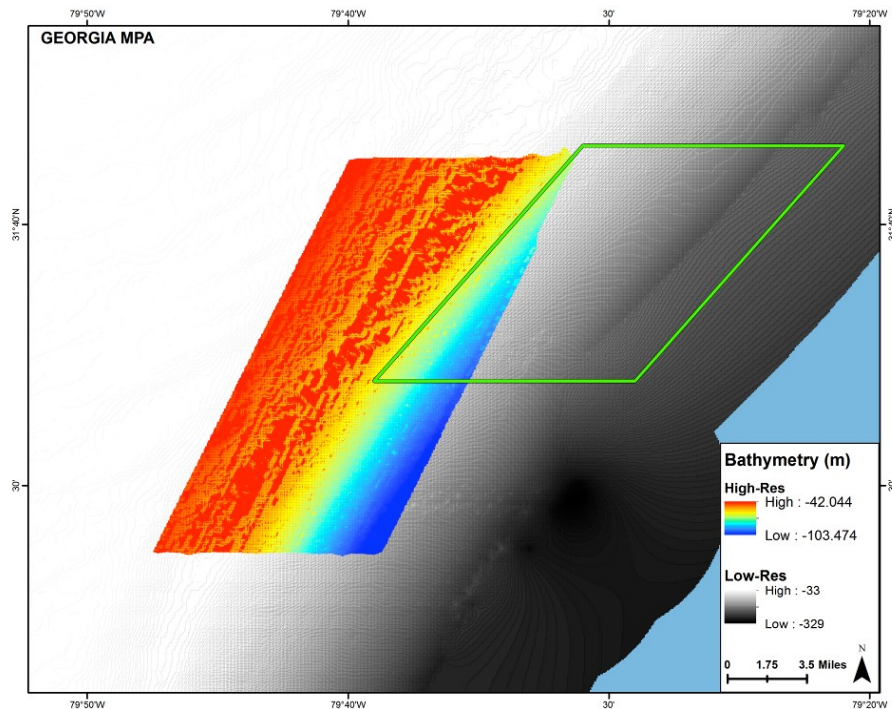
Figure 4.5.2. Low- and high-resolution bathymetry within and outside of the Georgia MPA (Provided by N. Farmer).

4.6 North Florida MPA

The North Florida MPA is located about 60 nautical miles off the St. John's River in Jacksonville, FL and spans approximately 100 square nautical miles (10 x 10 nautical miles) in size (**Fig. 4.6.1**; SAFMC 2007).

Northwest corner at 30°29′N, 80°14′W   *Northeast corner at 30°29′N, 80°2′ W Southwest corner at 30°19′N, 80°14′W*   *Southeast corner at 30°19′N, 80°2′W*

Habitat and Managed Species Characterization
The North Florida MPA consists of:

> *"varying water depths ranging from 197 ft. to 656 ft., with a deeper area up to 1,247 ft. The bottom habitat comprises some mud bottom habitat and shelf-edge reef of slab pavement, blocked boulders, and buried blocked boulders."*

> *"Snowy grouper and speckled hind have been caught in the area and the mud bottom may also be habitat for golden tilefish. Some mid-shelf species that are also likely to inhabit the area include vermilion snapper, hogfish, scamp, red porgy, and tomtate. The location of this MPA represents a compromise between fishermen and the Habitat Advisory Panel in order to balance biological benefits with social and economic impacts."* (SAFMC 2007; ***Figures 4.6.2** and **4.6.3***)
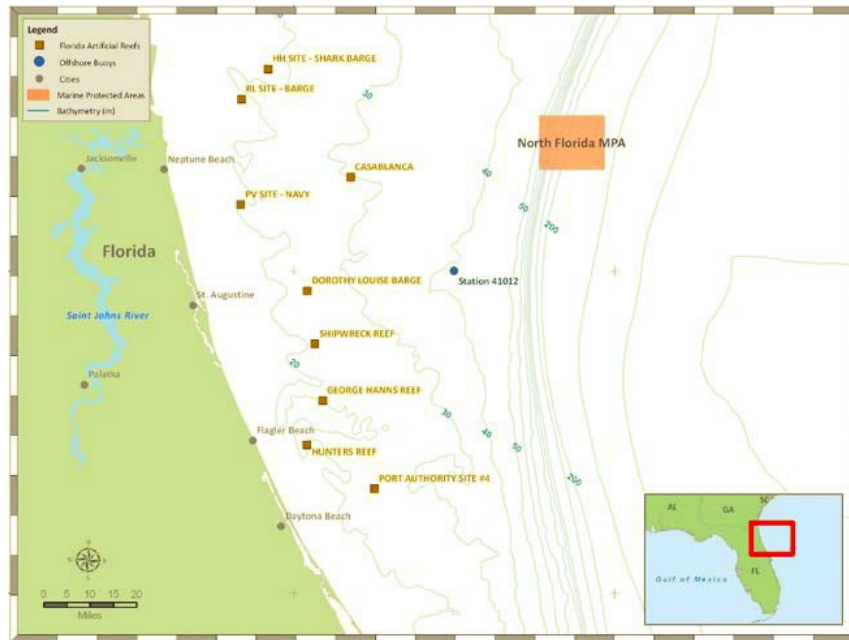
Figure 4.6.1. North Florida MPA located east of Neptune Beach, FL.

SEFSC ROV Survey and Southeast Reef Fish Survey (SERFS) sampling has occurred within the North Florida MPA. The SEFSC ROV Survey has observed 82 different taxa (Note: Some are listed at family or genus level due to difficulty identifying through video) including speckled hind and snowy grouper, which are target species (**Table 4.6.1**). The SERFS data include information on speckled hind, red grouper, scamp, vermilion snapper, red porgy, and gray triggerfish (**Table 4.6.2**). Red porgy have been collected in spawning condition within the MPA boundaries.
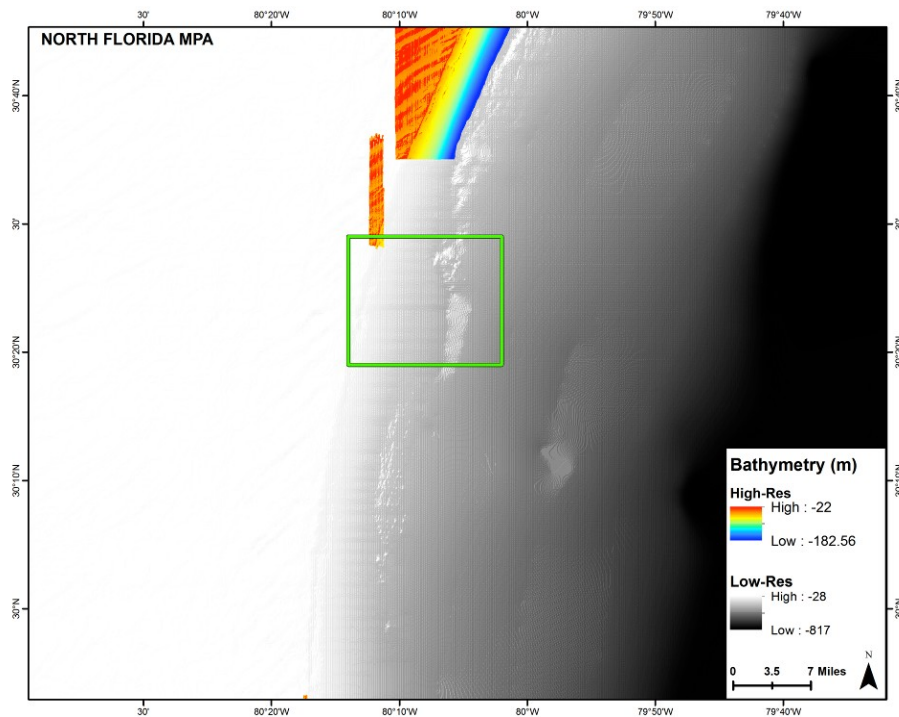
Figure 4.6.2. Low- and high-resolution bathymetry within and outside of the North Florida MPA (Provided by N. Farmer).
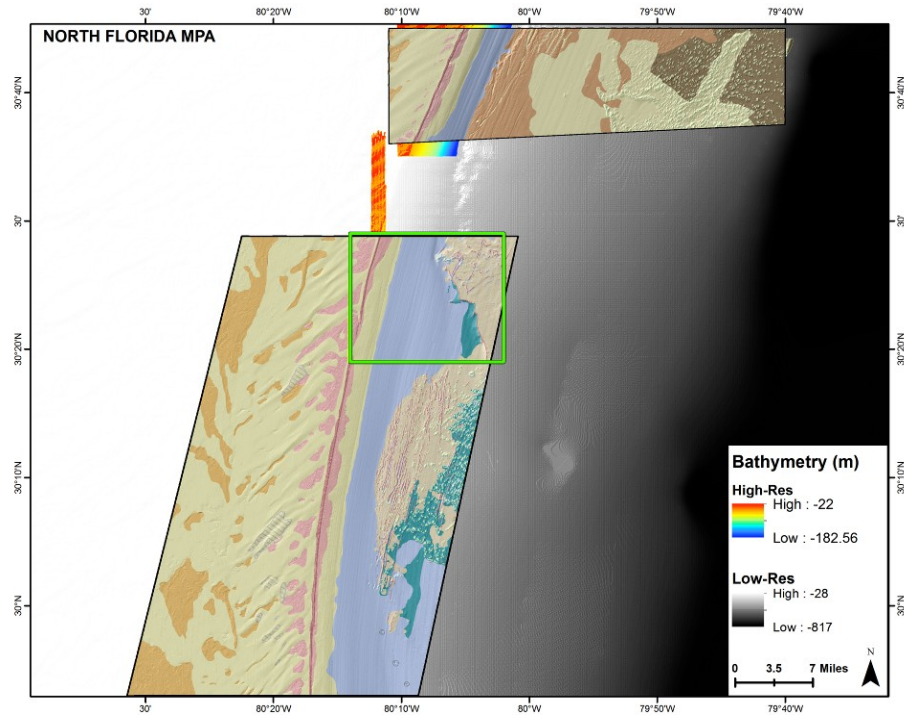
Figure 4.6.3. High-resolution habitat characterization within and outside of the North Florida MPA (Provided by N. Farmer).

Table 4.6.1. Species observed during ROV dives within the North Florida MPA. Species in bold are target species. (Data provided by SEFSC)

Common Name	Scientific Name	Common Name	Scientific Name
Moray Eel	*Muraenidae*	Yellowtail Snapper	*Ocyurus chrysurus*
Purplemouth Moray	*Gymnothorax vicinus*	Vermilion Snapper	*Rhomboplites aurorubens*
Spotted Moray	*Gymnothorax moringa*	Tomtate	*Haemulon aurolineatum*
Reticulate Moray	*Muraena retifera*	Striped Grunt	*Haemulon striatum*
Stout Moray	*Muraena robusta*	Porgy	*Calamus sp.*
Lizardfish	*Synodus sp.*	Red Porgy	*Pagrus pagrus*
Toadfish	*Opsanus sp.*	Jack-knife Fish	*Equetus lanceolatus*
Squirrelfish	*Holocentridae sp.*	Cubbyu	*Pareques umbrosus*
Blackbar Soldierfish	*Myripristis jacobus*	Blackbar Drum	*Pareques iwamotoi*
Cornetfish	*Fistularia sp.*	Spotted Goatfish	*Pseudupeneus maculatus*
Bluespotted Cornetfish	*Fistularia tabacaria*	Spotfin Butterflyfish	*Chaetodon ocellatus*
Scorpionfish	*Scorpaenidae*	Reef Butterflyfish	*Chaetodon sedentarius*
Lionfish	*Pterois volitans*	Bank Butterflyfish	*Prognathodes aya*
Flying Gurnard	*Dactylopterus volitans*	Blue Angelfish	*Holacanthus bermudensis*
Bank Sea Bass	*Centropristis ocyurus*	Gray Angelfish	*Pomacanthus arcuatus*
Speckled Hind	*Epinephelus drummondhayi*	French Angelfish	*Pomacanthus paru*
Goliath Grouper	*Epinephelus itajara*	Yellowtail Reeffish	*Chromis enchrysura*
Snowy Grouper	***Hyporthodus niveatus***	Sunshinefish	*Chromis insolata*
Gag	*Mycteroperca microlepis*	Purple Reeffish	*Chromis scotti*
Scamp	*Mycteroperca phenax*	Bicolor Damselfish	*Stegastes partitus*
Anthiid	*Anthiinae*	Barracuda	*Sphyraena barracuda*
Creolefish	*Paranthias furcifer*	Spotfin Hogfish	*Bodianus pulchellus*
Wrasse Bass	*Liopropoma eukrines*	Greenband wrasse	*Halichoeres bathyphilus*
Graysby	*Cephalopholis cruentata*	Yellowhead Wrasse	*Halichoeres garnoti*
Orangeback Bass	*Serranus annularis*	Wrasse	*Halichoeres sp.*
Lantern Bass	*Serranus baldwini*	Hogfish	*Lachnolaimus maximus*
Snow Bass	*Serranus chionaraia*	Parrotfish	*Sparisoma sp.*
Saddle Bass	*Serranus notospilus*	Doctorfish	*Acanthurus sp.*
Tattler	*Serranus phoebe*	Flounder	*Bothidae*
Soapfish	*Rypticus sp.*	Gray Triggerfish	*Balistes capriscus*
Greater Soapfish	*Rypticus saponaceus*	Queen triggerfish	*Balistes vetula*
Bigeye	*Priacanthus arenatus*	Slender Filefish	*Monacanthus tuckeri*
Short Bigeye	*Pristigenys alta*	Trunkfish	*Lactophrys sp.*
		Honeycomb Cowfish	*Acanthostracion polygonius*
Sand Tilefish	*Malacanthus plumieri*	Scrawled Cowfish	*Acanthostracion quadricornis*
Greater Amberjack	*Seriola dumerili*	Trunkfish	*Acanthostracion quadricornis*
Almaco Jack	*Seriola rivoliana*	Sharpnose Puffer	*Canthigaster rostrata*
Jack	*Decapterus sp.*	Bandtail Puffer	*Sphoeroides spengleri*
Snapper	*Lutjanus sp.*	Burrfish	*Chilomycterus sp.*
Mutton Snapper	*Lutjanus analis*	Striped Burrfish	*Chilomycterus schoepfi*
Gray Snapper	*Lutjanus griseus*	Puffer	*Diodon sp.*
Red Snapper	*Lutjanus campechanus*		

Table 4.6.2. Target species number caught and average length of individuals collected through the SERFS within the North Florida MPA and size of maturity for reference. Other species were provided as additional information. (Data provided by SCDNR)

Target Species	Number Caught	Avg TL (cm)	Size of Maturity (cm)
Speckled Hind	1	54	81

Other Species	Number Caught	Avg TL (cm)
Red Grouper	1	77
Scamp	1	76
Vermilion Snapper	11	36
Red Porgy	64	40
Gray Triggerfish	3	52

4.7   St. Lucie Hump MPA

The St. Lucie MPA is located about 9 nautical miles southeast of the St. Lucie Inlet, FL and spans approximately 8 square nautical miles (4 x 2 nautical miles) in size (**Figure 4.7.1**; SAFMC 2007).

Northwest corner at 27°8′N, 80°W   *Northeast corner at 27°8′N, 79°58′W*
Southwest corner at 27°4′N, 80°W   *Southeast corner at 27°4′N, 79°58′W*
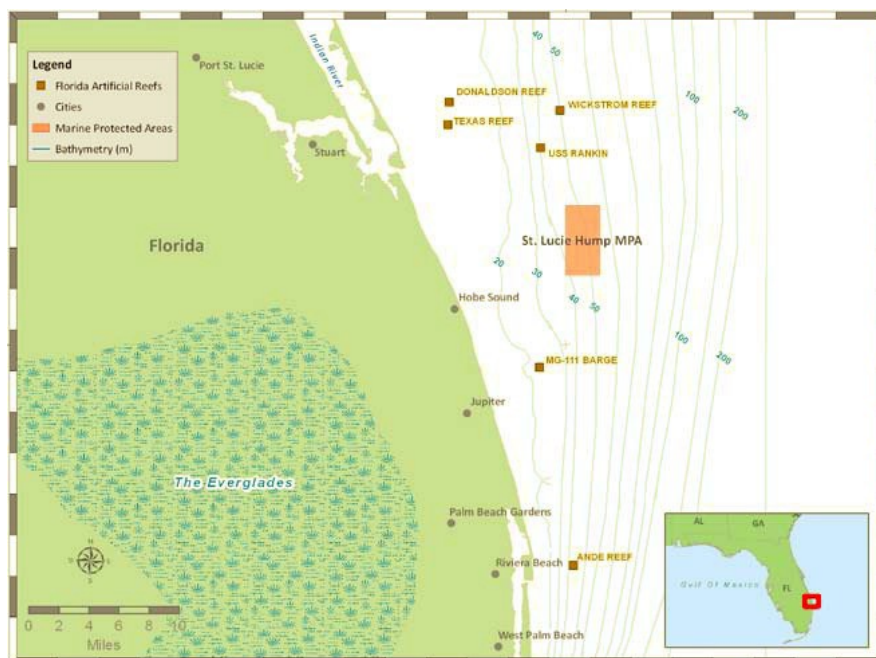
Figure 4.7.1. St. Lucie Hump MPA, located east of the St. Lucie Inlet, FL (SAFMC 2009).

Habitat and Managed Species Characterization

The St. Lucie Hump MPA is:

> *" habitat-rich and harbors speckled hind, juvenile snowy grouper, warsaw grouper, and mid-shelf species such as sea bass, red porgy, and red snapper. Water depths range from 216 ft. to 234 ft."* (SAFMC 2009; **Figure 4.7.2***)*

> *"The area is heavily targeted by fishermen trolling for pelagic species and experiences a high level of vessel traffic. This MPA is located between fishing areas to the north and south that are more popular or just as popular; it is anticipated this will help reduce the potential socio-economic impacts to fishermen. The area has high potential for protecting deepwater snapper grouper species as well as some mid-shelf species."* (SAFMC 2007)
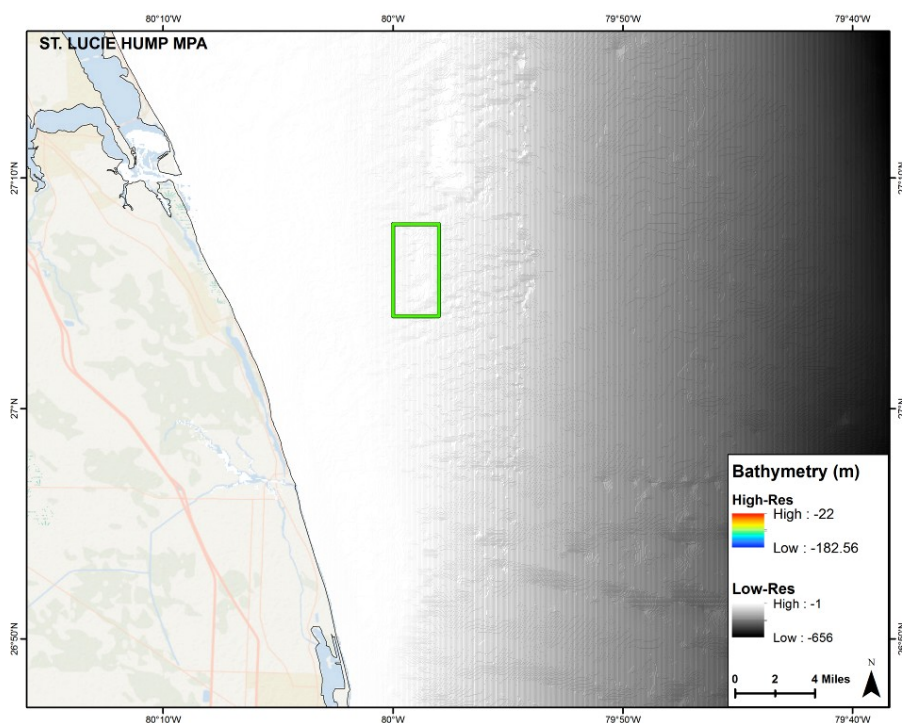
Figure 4.7.2. Low-resolution bathymetry of the St. Lucie Hump MPA (Provided by N. Farmer).

4.8   East Hump MPA

The East Hump MPA is located about 13 nautical miles southeast of Long Key, FL and spans approximately 50 square nautical miles (5 x 10 nautical miles) in size (**Figure 4.8.1**; SAFMC 2007, 2009).

*Northwest corner at **24°36.5′N, 80°45.5′W***   *Northeast corner at **24°32′N, 80°36′W***
*Southwest corner at **24°32.5′N, 80°48′W***   *Southeast corner at **24°27.5′N, 80°38.5′W***

Habitat and Managed Species Characterization
The East Hump MPA is:

> *"Located near the popular fishing spot called the "Islamorada Hump," this site is*

located in waters ranging from 636 ft. to 971 ft. deep, with the tops of the "humps" at 509 ft. to 541 ft. The humps are pinnacle-like formations that consist primarily of hardened layers of sandy carbonate sediments and support a diverse array of marine plants and animals, including deepwater corals. The area contains abundant habitat for snapper grouper species, such as snowy grouper, golden tilefish, and warsaw grouper." (SAFMC 2007; **Figure 4.8.2**)

SEFSC ROV Survey sampling has occurred within the East Hump MPA. The SEFSC ROV Survey has observed 30 different taxa (Note: Some are listed at family or genus level due to difficulty identifying through video) including snowy grouper and blueline tilefish, which are target species (**Table 4.8.1**).
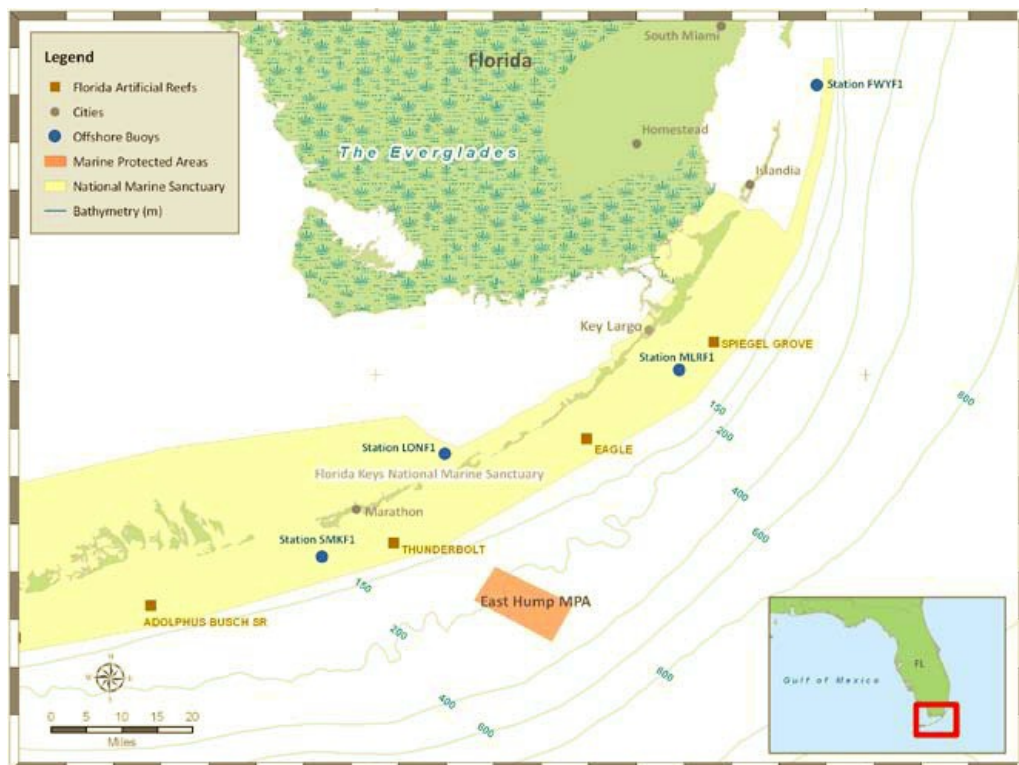
Figure 4.8.1. East Hump MPA, located southeast of Long Key, FL (SAFMC 2007).

Table 4.8.1. Species observed during ROV dives within the North Florida MPA. Species in bold are target species. (Data provided by SEFSC)

Common Name	Scientific Name	Common Name	Scientific Name
Moray Eel	*Muraenidae*	Yellowfin Bass	*Anthias nicholsi*
Green Moray	*Gymnothorax funebris*	Bladefin Bass	*Jeboehklia gladifer*
Shortnose Greeneye	*Chloropthalmus agassiz*	Roughtongue Bass	*Pronotogrammus martinicensis*
Shortbeard Codling	*Laemonema barbatulum*	Bigeye	*Priacanthus arenatus*
Mora Cod	*Laemonema sp.*	**Blueline Tilefish**	***Caulolatilus microps***
Big Roughy	*Gephyroberyx darwinii*	Greater Amberjack	*Seriola dumerili*
Deepbody Boarfish	*Antigonia capros*	Almaco Jack	*Seriola rivoliana*
Dragonet	*Foetorepus sp.*	Silk Snapper	*Lutjanus vivanus*
Longspine Snipefish	*Macrorhamphosus scolopax*	Queen Snapper	*Etelis oculatus*

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Blackbelly Rosefish	*Helicolenus dactylopterus*	Reef Butterflyfish	*Chaetodon sedentarius*
Rover	*Emmelichthyidae*	Bank Butterflyfish	*Prognathodes aya*
Snowy Grouper	***Hyporthodus niveatus***	French Butterflyfish	*Prognathodes guyanensis*
Red Barbier	*Hemanthias vivanus*	Red Hogfish	*Decodon puellaris*
Anthiid	*Anthiinae*	Barrelfish	*Hyperoglyphe perciformis*
Apricot Bass	*Plectranthias garrupellus*	Spiny Puffer	*Didontidae*
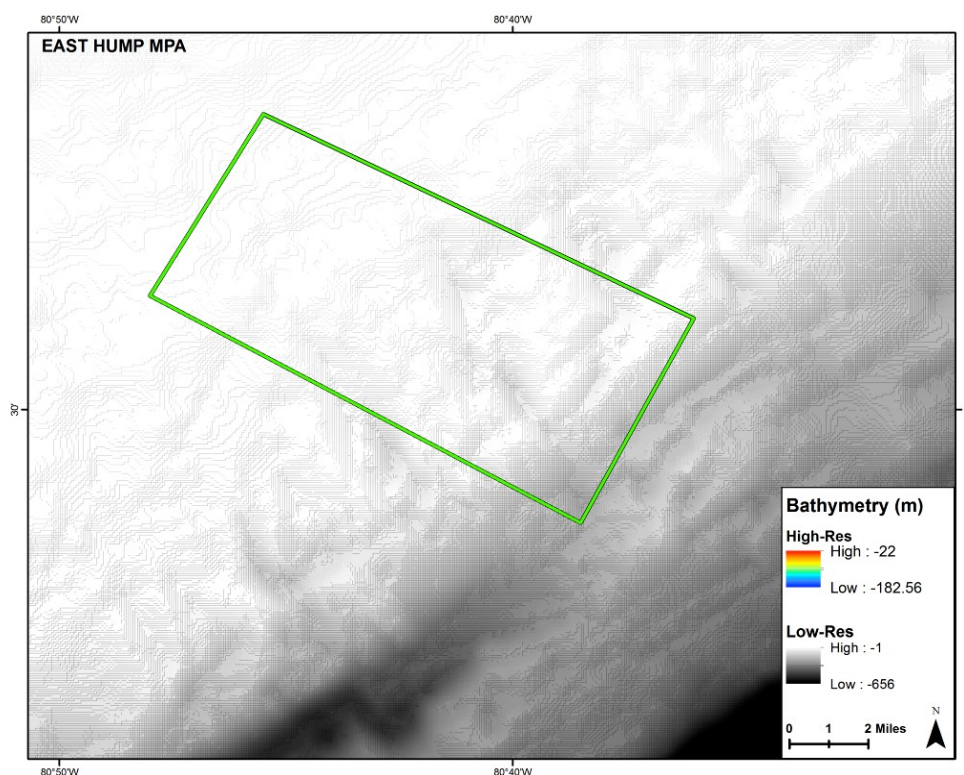
Figure 4.8.2. Low-resolution bathymetry of the East Hump MPA (Provided by N. Farmer).

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Appendix I.   List of Acronyms

EFH   Essential Fish Habitat
EFH-HAPC   Essential Fish Habitat- Habitat Areas of Particular Concern
HAPC   Habitat Areas of Particular Concern
MARMAP   Marine Resources Monitoring, Assessment, and Prediction
MPA   Marine Protected Area
NOAA   National Oceanic and Atmospheric Administration
S-G   Snapper-Grouper
SAFMC   South Atlantic Fishery Management Council
SEFIS   Southeast Fishery-Independent Survey
SEFSC   Southeast Fisheries Science Center
SERO   Southeast Regional Office
SMP   System Management Plan

Appendix II. Purpose and Need (Amendment 14 2009)

The following are the goals and objectives from Amendment 14 for choosing the MPA sites (SAFMC 2009).

Purpose and Need
Recent stock assessments indicate snowy grouper, golden tilefish, vermilion snapper, and black sea bass are experiencing overfishing (NMFS 2005b). Snowy grouper, black sea bass, and red porgy are overfished (NMFS 2005b). While we do not know the status of all snapper grouper species, it is a safe presumption based on the data we do have that the size, age, and genetic structure of many snapper grouper species has been altered by fishing pressure. Amendment 13C included management measures that end overfishing of snowy grouper, golden tilefish, vermilion snapper, and black sea bass. Amendment 15 will specify rebuilding plans for snowy grouper, black sea bass, and red porgy. Many snapper grouper species are vulnerable to overfishing because they are long-lived (e.g., snowy grouper, golden tilefish, red snapper, gag, scamp, red grouper, and red porgy), protogynous, i.e., change sex usually from female to males as they grow older/larger (e.g., snowy grouper, speckled hind, warsaw grouper, yellowedge grouper, gag, scamp, red porgy, and black sea bass), form spawning aggregations (e.g., snowy grouper, gag, scamp, and red snapper), and suffer high release mortality in deepwater. Deepwater species (snowy grouper, golden tilefish, speckled hind, Warsaw grouper, blueline tilefish, and misty grouper) are most vulnerable to overfishing because they live for longer than 50 years, do not survive the trauma of capture, and are protogynous (groupers) or exhibit sexual dimorphism, i.e., males and females grow at different rates (tilefishes). Data deficiencies make it difficult for fishery scientists and managers to develop management measures that can be trusted to sustain stocks over time, particularly for those species that are very vulnerable to overfishing while attempting to minimize, to the extent practicable, the adverse socioeconomic impacts of management measures on fishing communities.

"The primary purpose of these actions is to employ a collaborative approach to identify MPA sites with the potential to protect a portion of the population (including spawning aggregations) and habitat of long-lived, slow growing, deepwater snapper grouper species (speckled hind, snowy grouper, Warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, and blueline tilefish) from directed fishing pressure to achieve a more natural sex ratio, age, and size structure within the proposed Type 2 MPAs, while minimizing adverse social and economic effects. The proposed Type 2 MPAs are the most effective fishery management tool that allows deepwater snapper grouper species to reach their natural size and age, protect spawning locations, and provide a refuge for early developmental stages of fish species. To determine alternatives for the location, size, and orientation of the MPAs, the Council considered the specific goals of: (1) Utilizing a collaborative process to select MPAs; (2) Maximizing the

biological benefits; (3) Minimizing the adverse social and economic effects;
(4) Maximizing MPA enforceability; and (5) Maximizing monitoring
capabilities. The goals are statements of a desired outcome in terms of
MPA location, size, and orientation from biological, social, economic, and
enforcement perspectives. Objectives include criteria the Council
considered when trying to achieve these goals. The goals and objectives
were developed through discussions among various interest groups, Council
committees, Advisory Panels (e.g., snapper grouper, law enforcement),
scientific committees, and the public. The alternative comparison summaries
in Section 2 of this amendment summarize the degree that each proposed
site meets each goal."

Appendix III. Goals and Objectives (Amendment 14 2009)

The following are the goals and objectives from Amendment 14 for choosing the MPA sites (2009).

"Goals and Objectives

"Goal 1: Utilize a collaborative process to select MPAs
Objective A. Utilize input from scientists, fishermen, and the public to select proposed MPAs.
During the selection of the proposed Type 2 MPAs, a process was employed that involved scientists, fishermen, and the public. An Advisory Panel, consisting of scientists and fishermen, assembled known data to identify locations that would provide the greatest biological benefit to snapper grouper species. Experts on MPAs traveled throughout the southeast coast and discussed the benefits of MPAs with the public.
Public input during the scoping process and the informational public hearings revealed that closure of certain sites would generate intense public disapproval. The Council realized implementation of those sites would create a degree of controversy that could impede implementation of the MPAs and compliance. Following public input, the Council employed a "bottom up" process where stakeholders proposed sites that could still achieve the biological objectives. As an example, the Council worked with fishermen in the Florida Keys following the Council's proposed placement of an MPA on the popular location referred to as the "Islamorada Hump". This proposal generated intense controversy due to the popularity of fishing for such fish as billfish, dolphin, wahoo, and mackerel at this site. The Council worked with the local fishing community to propose a nearby site that would achieve the biological objectives (of the MPA designation) but would not have the degree of impact and controversy as the original proposal.

"Goal 2: Maximize biological benefits
Objective B. Protect some habitat known to support deepwater snapper and grouper species. Utilize hardbottom locations to provide locations suitable to satisfy the need for these MPAs.
The Southeast Area Monitoring and Assessment Program (SEAMAP) has surveyed bottom habitat type and obtained additional data from numerous sources. This information, in part, was used to site the Type 2 MPAs to maximize the biological benefits. Submersible work and fishery-independent surveys have documented habitat in some proposed Type 2 MPAs that hold species such as vermilion snapper, red porgy, gag, scamp, and others. Therefore, additional benefits include: protecting the size and age structure of species that suffer high release mortality at depths greater than 165 feet (50 meters) (e.g., vermilion snapper, red porgy, gag, scamp, red snapper, red grouper, gray triggerfish, black sea bass, and others) and protecting areas where commercially important reef fish species are known to spawn

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(e.g., red porgy, vermilion snapper, gray triggerfish, red snapper, scamp, gag, red grouper, gray triggerfish, and others).

"Objective C. Protect some areas where spawning activity of snapper grouper has been recorded.
The Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP) has noted locations where fish (e.g., snowy grouper, golden tilefish, speckled hind, red porgy, vermilion snapper, gray triggerfish, red snapper, scamp, gag, red grouper, gray triggerfish, and others) were caught in spawning condition. This information, in part, was used to site the MPAs to maximize the biological benefits.

"Objective D. Protect some areas known to be nursery areas for deepwater species. Submersible work has documented the presence of age-0 snowy grouper in shelf edge (170 to 220 feet) habitat in many of the proposed Type 2 MPAs. Fishery-independent data, fishery-dependent data, and submersible work have documented the presence of juvenile speckled hind and Warsaw grouper in the same shelf edge habitat. The greatest abundance of speckled hind is currently in shelf edge habitat. This information, in part, was used to site the Type 2 MPAs to maximize the biological benefits to deepwater species.

"Goal 3: Minimize adverse social and economic effects
Objective E. Minimize impact on fishermen in MPAs that do not target snapper grouper species. Many of the locations appropriate for protecting snapper grouper species are also popular fishing sites for pelagic species such as dolphin, wahoo, and mackerel. The Council felt it important to minimize the negative social and economic impacts MPAs could have on individuals fishing for non-snapper grouper species and promote stakeholder buy-in, while providing protection to the species most vulnerable to overfishing (deepwater snapper grouper species). Therefore, the alternatives proposed in this amendment are Type 2 MPAs where the harvest and possession of snapper species are prohibited within their borders (however, the prohibition on possession does not apply to a person aboard a vessel that is in transit with fishing gear appropriately stowed as defined in Appendix F).

"Objective F. Orient the MPAs in a manner that provides consideration to the way that fishermen fish. Many commercial fishermen fish along the continental shelf break, which is parallel to the shoreline. Alternatives are provided that include closed areas parallel to the shelf break to minimize disruption to fishing activity when undergoing transit to different locations.

"Objective G. Consider boater safety when designating proposed closed areas. The Council avoided detailed consideration of sites that would significantly affect boater safety. Overly large sites and the placement of sites adjacent to major fishing ports were avoided, as both would hinder a

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vessel's return to port during adverse weather.

"Goal 4: Maximize MPA enforceability
Objective H. Consider the seven criteria from the Law Enforcement AP's report when determining suitable MPA sites. The Council's Law Enforcement Advisory Panel, in 1998, submitted a report (Appendix B) that outlined criteria that should be considering when determining attributes of MPA. These included: (1) a marine reserve should be configured in a square or rectangle; (2) the bigger the better; (3) the boundaries should be delineated in latitude and longitude; (4) must be in an acceptable format to be included and identified on NOAA charts; (5) allowable activities in the marine reserve should be limited; (6) locate marine reserves away from highly populated areas; and (7) provide for on-site enforcement capability. To maximize the efforts of law enforcement and fishermen compliance, the Council considered these criteria when developing the Type 2 MPAs.

"Goal 5: Maximize research and monitoring capabilities
Objective I. Utilize available fishery-independent and fishery-dependent data to provide locations suitable to satisfy the need for MPAs. Closing areas to snapper grouper fishing is expected to result in changes in the community structure, species composition, sex ratio, reproductive potential, and size/age structure of species within the closed areas.

"Some proposed Type 2 MPAs have been sampled annually by fishery-independent surveys. More recently, additional baseline data from within proposed Type 2 MPAs have been collected using ROVs, submersible, and from commercial fishermen through cooperative funding.

"Documented information on the presence of snapper grouper species was considered when siting the Type 2 MPAs to maximize the biological benefits. It is anticipated that existing, long-term fishery independent surveys will continue in the proposed Type 2 MPAs to document any changes that occur.

"Objective J. Utilize traditional knowledge, in part, to provide locations suitable to satisfy the need for MPAs. As fishery independent data are often scarce and fishery dependent information is collected on a large spatial scale, the Council frequently relied on local knowledge of fishermen and state agency personnel to propose suitable locations.

"Information on spawning locations of deepwater snapper and grouper species is also limited and utilization of anecdotal knowledge is appropriate. While data has been collected in most of the proposed Type 2 MPAs, the extent of available habitat, particularly for deep-water species, is not known. It is anticipated that additional sampling will be conducted to better map available habitat and document species composition within the proposed Type 2 MPAs so that changes in community structure, sex ratio,

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and size/age structure can be documented. This effort would include commercial fishermen who may have knowledge of hard bottom locations. Through cooperative research, fishermen and scientists would work together to map available habitat within the proposed Type 2 MPAs and identify species composition. It is anticipated that additional funding would be provided to map the Type 2 MPAs with side scan sonar and visit potential hardbottom locations with ROV and submersible. Once additional hardbottom habitat is located, it would be monitored through fishery independent and fishery-dependent efforts."

Appendix IV. Research, Outreach, and Enforcement Needs (Amendment 14 2009)

The following are the Research, Outreach, and Enforcement needs from Sections 4.11-4.13 in Amendment 14 (2009).

"Research and monitoring needs
Model coupled biological and physical properties as well as relevant chemical/nutrient and physiological characteristics.
Determine and monitor the effect of the Type 2 MPAs on deepwater snapper grouper species' distribution and status.
Assess spawning aggregations of deepwater snapper grouper species.
Track fish movement.
Identify fish population demographics (e.g., size and age structure, sex ratio, etc.) within the Type 2 MPAs.
Determine pre-closure distribution of dominant harvested species in and outside the Type 2 MPAs, in order to provide historical context for subsequent assessments.
Determine age distribution, nursery grounds, migratory patterns, and mortality rates for dominant harvested fish stocks.
Identify stressors affecting the Deepwater Type 2 MPAs.
Identify natural and anthropogenic stressors (i.e., disease, gear impacts, poaching, enforcement, etc.)
Identify key trophodynamic functional groups.
Identify food web structure and dynamics.
Determine impact of lionfish invasion on recovery potential of deepwater snapper grouper species within the Type 2 MPAs.

"Assessment needs
Determine the effect of management measures in the Type 2 MPAs on the status of deepwater snapper grouper fishery stocks:
Characterize deepwater snapper grouper species within the Type 2 MPAs compared to reference sites (including distribution and abundance patterns, size and age distribution, spawning aggregation presence, sex ratios, etc.).
Characterize fish communities, inside and out, including habitat utilization patterns, trophic interactions, ontogenetic changes, predator prey relationships, etc.
Connectivity to the broader seascape (larval sources and sinks, spill-over effects).
Determine how oceanographic conditions and episodic events affect fish stock condition, reproduction, and growth:
Quantify the extent, intensity, and frequency of episodic events (upwelling, storms, etc).
Assess the impact of episodic events (upwelling, storms, etc).

"Outreach Needs
The list of outreach needs included in this section is modified from the outreach component of the Council's 2005 Oculina Experimental Closed

Area (OECA) Evaluation Plan. For additional information about the OECA Evaluation Plan and efforts used to develop the outreach component of the plan, visit:
http://www.safmc.net/HabitatManagement/DeepwaterCorals/Oculina/tabid/ 246/Default.aspx.
The Council will solicit input from its Information and Education Advisory Panel and the Information and Education Committee in reviewing these needs and possibly developing further recommendations. As with the outreach component of the Oculina Experimental Closed Area Evaluation Plan, the Council acknowledges the need to work closely through partnerships to achieve these outreach needs. Possible partners in outreach efforts include, but are not limited to: Sea Grant, NOAA Fisheries, NOAA National Undersea Research Center at the University of North Carolina – Wilmington (NURC/UNCW), NOAA Office for Law Enforcement, individual state marine resources and law enforcement agencies, NOAA National Marine Sanctuary Program, Harbor Branch Oceanographic Institution, Centers for Ocean Sciences Education Excellence (COSEE) in South Carolina and Florida, Project Oceanica, and others.

*"**GOAL: Increase awareness and understanding of the Deepwater Type 2 MPAs among fishermen, citizens, and visitors in the South Atlantic region and the U.S. public.***
Project 1: Provide SAFMC regulation brochures to area fishermen.
Tasks: reprint updated federal regulation brochure to include the Type 2 MPAs and distribute to federal, state, and local law enforcement offices for distribution.
Project 2: Work with fishing chart manufacturers (both printed and electronic) and/or vendors to improve available information for the Deepwater Type 2 MPAs
Tasks: identify manufacturers of more commonly used fishing charts in South Atlantic, contact manufacturers and coordinate methods to update products.
Project 3: Develop and distribute news releases (coordinating with local contacts) to focus on law enforcement activities, research and monitoring projects, and the ecological importance of the Type 2 MPAs.
Tasks: work closely with law enforcement agencies (state and federal) to highlight law enforcement activities and cases; create science-based news releases relevant to ongoing research and monitoring activities with focus on habitat, snapper grouper species, and links to ecosystem- based management. Coordinate releases with ongoing activities and strive to provide high resolution photos and graphics to media.
Project 4: Develop Powerpoint presentations about Deepwater Type 2 MPAs; distribute on CD, post at Web site, and present to fishing clubs, environmental groups, local governments, etc.
Tasks: design and create a PowerPoint presentation using existing photos, video, maps, and other information to highlight Type 2 MPAs, history of management, research and monitoring activities, law enforcement, etc.

Project 5: Develop and distribute posters and rack cards/informational brochures at area bait and tackle shops, marinas, fish houses, boating stores, fishing tournaments, boat shows, etc.
Tasks: contract design layout and printing for poster and complimentary rack cards and/or brochure, distribute to targeted businesses and fishing tournament directors.
Project 6: Expand the Council's web site to provide comprehensive education and outreach products (e.g., regulations, publications, research and monitoring information, law enforcement activities, news releases, high resolution video and photographs, maps, etc.). Publicize availability of information by having links posted on other fishing/Non-Governmental Organizations/tourism related web sites.
Tasks: enhance the Council website and integrate materials, including links to other relevant sites. Publicize the availability of web-based information.
Project 7: Develop education products for teachers (K-12) and informal educators, post on SAFMC Web site, and develop packet for distribution to science teachers.
Tasks: Identify, develop, and produce education products
Project 8: Develop TV documentaries working with environmental TV outlets (e.g., Discovery Channel, Public TV, and independent media contractors).
Tasks: produce documentaries for television that feature the Type 2 MPAs; possibly tie in with interest in the proposed Deepwater Coral Habitat Areas of Particular Concern and the Council's approach to ecosystem-based management through the Fishery Ecosystem Plan and Comprehensive Amendment.

"Enforcement Needs
There are two very large obstacles facing enforcement of these proposed Type 2 MPAs.
The first is the great distance that the majority of these Type 2 MPAs are located from shore. The second is the fact that these are Type 2 areas which allow certain fishing activities to exist.
Consequently, occasional flyovers by enforcement aircraft would not be an effective tool; therefore, an on-site enforcement presence will be necessary in order to determine whether the fishing activity is lawful or not.
*Law Enforcement Advisory Panel Members representing the member States have evaluated their assets and categorized their ability to effectively patrol each MPA as either HIGH, MODERATE, or LOW. **This rating is based solely on the individual states assets and does not include the assets that their Federal partners may or may not have.***

*A **"HIGH"** rating means that the area is easily accessible with the assets and personnel already in place. Such an area may already be patrolled and would not require additional assets. Additional funding **may** be required to maintain adequate enforcement patrols.*

A **"MODERATE"** rating indicates that with some additional assets, or the relocation of existing assets, patrols could be conducted from time to time and during targeted details. Additional funding **will likely** be required to increase the ability rating to "HIGH".

A **"LOW"** rating means that patrols of the area would only occur during an organized enforcement detail with Federal partners such as NMFS or USCG. The States do not have the assets or personnel with the proper training to patrol the area. Additional funding will be **essential** to increase the ability rating.

"Each proposed Type 2 MPA is listed below by State. Comments on location options are listed as well as the ability of patrol rating.

Florida
North Florida: *No option preference. Enforceability:*   **LOW**
Sea Bass Rocks: *No location option. Enforceability:* **MODERATE**
East Hump: *No location option. Enforceability:*   **MODERATE**

Georgia
Georgia MPA: *No option preference. Enforceability:* **LOW**

South Carolina
South Carolina A: *Location option #3. Enforceability:* **LOW**
South Carolina B: *Location option #2. Enforceability:* **LOW**
Deep Reef: *No location option. Enforceability:*   **LOW**

North Carolina
Snowy Wreck: *No location option Enforceability:*   **LOW**

"Meeting even the LOW rating will only be accomplished at the expense of some other enforcement priority. To accomplish any increase in the enforcement rating/presence would require a substantial funding increase to include:
Hire, train, and equip additional law enforcement personnel
Administrative support
Personnel and Equipment
Acquire several fully equipped large offshore patrol vessels
Recurring operational costs for Fuel
Maintenance for Dockage
Etc.
Aircraft surveillance support costs"

Appendix V. The IUCN Management Effectiveness Framework

(Box 3 Pomeroy et al. 2004)

Box 3

THE IUCN MANAGEMENT EFFECTIVENESS FRAMEWORK

The IUCN management effectiveness framework (Hockings *et al.*, 2000) presents an iterative protected area management cycle of design, management, monitoring, evaluation and adaptation.

Through this process, managers are empowered with the ability to diagnose and adaptively improve their management actions. To begin the evaluation process in this management cycle three sets of simple questions must be answered:

Context: status and threats
Where are we now?

Vision
Where do we want to be?

Outcome
What did we achieve?

Planning
How are we going to get there?

Evaluation

Output
What did we do and what products or services were produced?

Inputs
What do we need?

Management processes
How do we go about it?

1. In terms of the design of the protected area:

   What is the *context* in which the protected area is designated?

   What is the desired result and how will *planning* enable its achievement?

2. In terms of how appropriate are the management system and process:

   What *inputs* are required to designate the protected area?

   What is the *process* used to go about defining it?

3. In terms of the achievement of desired objectives:

   What activities were undertaken and what were the *outputs* (products) of this?

   What *outcomes* (impacts) were achieved based on the outputs and their application?

These questions identify six categories of potential indicators for measuring management effectiveness:

- Context indicators
- Planning indicators
- Input indicators
- Process indicators
- Output indicators
- Outcome indicators

Using this general framework allows protected area managers to customize a set of appropriate indicators to be used on relevant scales. It serves as a foundation from which to further investigate a specific category of indicators (e.g. outcomes) or to determine which indicators are most appropriate based on the use of a specific protected area tool. The framework provides a common language and an important structure from which to improve protected area learning, efficacy and achievement. As a tool for designing an evaluation approach – rather than providing a specific set of indicators and methodologies to measure them – it helps to explain variations in the context, available resources, evaluative purpose and specific management objectives across protected areas.

Appendix VI. Biophysical Goals and Objectives

(Figure 2 Pomeroy et al. 2004)

GOAL 1	Marine resources sustained or protected
1A	Populations of target species for extractive or non-extractive use restored to or maintained at desired reference points
1B	Losses to biodiversity and ecosystem functioning and structure prevented
1C	Populations of target species for extractive or non-extractive use protected from harvest at sites and/or life history stages where they become vulnerable
1D	Over-exploitation of living and/or non-living marine resources minimized, prevented or prohibited entirely
1E	Catch yields improved or sustained in fishing areas adjacent to the MPA
1F	Replenishment rate of fishery stocks increased or sustained within the MPA

GOAL 2	Biological diversity protected
2A	Resident ecosystems, communities, habitats, species, and gene pools adequately represented and protected
2B	Ecosystem functions maintained
2C	Rare, localized or endemic species protected
2D	Areas protected that are essential for life history phases of species
2E	Unnatural threats and human impacts eliminated or minimized inside and/or outside the MPA
2F	Risk from unmanageable disturbances adequately spread across the MPA
2G	Alien and invasive species and genotypes removed or prevented from becoming established

GOAL 3	Individual species protected
3A	Focal species abundance increased or maintained
3B	Habitat and ecosystem functions required for focal species' survival restored or maintained
3C	Unnatural threats and human impacts eliminated or minimized inside and/or outside the MPA
3D	Alien and invasive species and genotypes removed from area or prevented from becoming established

GOAL 4	Habitat protected
4A	Habitat quality and/or quantity restored or maintained
4B	Ecological processes essential to habitat existence protected
4C	Unnatural threats and human impacts eliminated or minimized inside and/or outside the MPA
4D	Alien and invasive species and genotypes removed or prevented from becoming established

GOAL 5	Degraded areas restored
5A	Populations of native species restored to desired reference points
5B	Ecosystem functions restored
5C	Habitat quality and/or quantity restored or rehabilitated
5D	Unnatural threats and human impacts eliminated or minimized inside and/or outside the MPA
5E	Alien and invasive species and genotypes removed or prevented from becoming established

How the biophysical indicators relate to the common goals and objectives

Biophysical indicators:
- B1: Focal species abundance
- B2: Focal species population structure
- B3: Habitat distribution and complexity
- B4: Composition and structure of the community
- B5: Recruitment success within the community
- B6: Food web integrity
- B7: Type, level and return on fishing effort
- B8: Water quality
- B9: Area showing signs of recovery
- B10: Area under no or reduced human impact

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
GOAL 1										
1A	●	●				●	●			
1B			●	●	●			●		
1C	●	●		●		●	●		●	●
1D	●	●		●		●	●			●
1E	●				●		●		●	●
1F	●	●					●		●	
GOAL 2										
2A				●	●		●		●	●
2B						●		●	●	
2C	●	●		●						
2D		●	●				●	●		●
2E				●				●		●
2F										
2G	●			●						
GOAL 3										
3A	●	●	●			●	●		●	
3B			●	●		●	●	●	●	
3C							●	●		●
3D	●	●		●						
GOAL 4										
4A			●	●	●			●	●	
4B			●	●	●			●	●	
4C			●	●	●			●		●
4D	●		●	●				●		
GOAL 5										
5A	●					●	●		●	
5B	●	●		●				●	●	
5C		●	●	●				●	●	
5D	●			●				●	●	●
5E	●		●	●					●	

Appendix VII. Socioeconomic Goals and Objectives

(Figure 3 Pomeroy et al. 2004)

GOAL 1	**Food security enhanced or maintained**
1A	*Nutritional needs of coastal residents met or improved*
1B	*Improved availability of locally caught seafood for public consumption*
GOAL 2	**Livelihoods enhanced or maintained**
2A	*Economic status and relative wealth of coastal residents and/or resource users improved*
2B	*Household occupational and income structure stabilized or diversified through reduced marine resource dependency*
2C	*Local access to markets and capital improved*
2D	*Health of coastal residents and/or resource users improved*
GOAL 3	**Non-monetary benefits to society enhanced or maintained**
3A	*Aesthetic value enhanced or maintained*
3B	*Existence value enhanced or maintained*
3C	*Wilderness value enhanced or maintained*
3D	*Recreation opportunities enhanced or maintained*
3E	*Cultural value enhanced or maintained*
3F	*Ecological services values enhanced or maintained*
GOAL 4	**Benefits from the MPA equitably distributed**
4A	*Monetary benefits distributed equitably to and through coastal communities*
4B	*Non-monetary benefits distributed equitably to and through coastal communities*
4C	*Equity within social structures and between social groups improved and fair*
GOAL 5	**Compatibility between management and local culture maximized**
5A	*Adverse effects on traditional practices and relationships or social systems avoided or minimized*
5B	*Cultural features or historical sites and monuments linked to coastal resources protected*
GOAL 6	**Environmental awareness and knowledge enhanced**
6A	*Respect for and/or understanding of local knowledge enhanced*
6B	*Public's understanding of environmental and social 'sustainability' improved*
6C	*Level of scientific knowledge held by the public increased*
6D	*Scientific understanding expanded through research and monitoring*

How the socio-economic indicators relate to the common goals and objectives

Column labels (S1–S16):
- S1 — Local marine resource use patterns
- S2 — Local values and beliefs about marine resources
- S3 — Level of understanding of human impacts on resources
- S4 — Perceptions of seafood availability
- S5 — Perceptions of local resource harvest
- S6 — Perceptions of non-market and non-use value
- S7 — Material style of life
- S8 — Quality of human health
- S9 — Household income distribution by source
- S10 — Household occupational structure
- S11 — Community infrastructure and business
- S12 — Number and nature of markets
- S13 — Stakeholder knowledge of natural history
- S14 — Distribution of formal knowledge to community
- S15 — Percentage of stakeholder group in leadership positions
- S16 — Changes in conditions of ancestral and historical sites/features/monuments

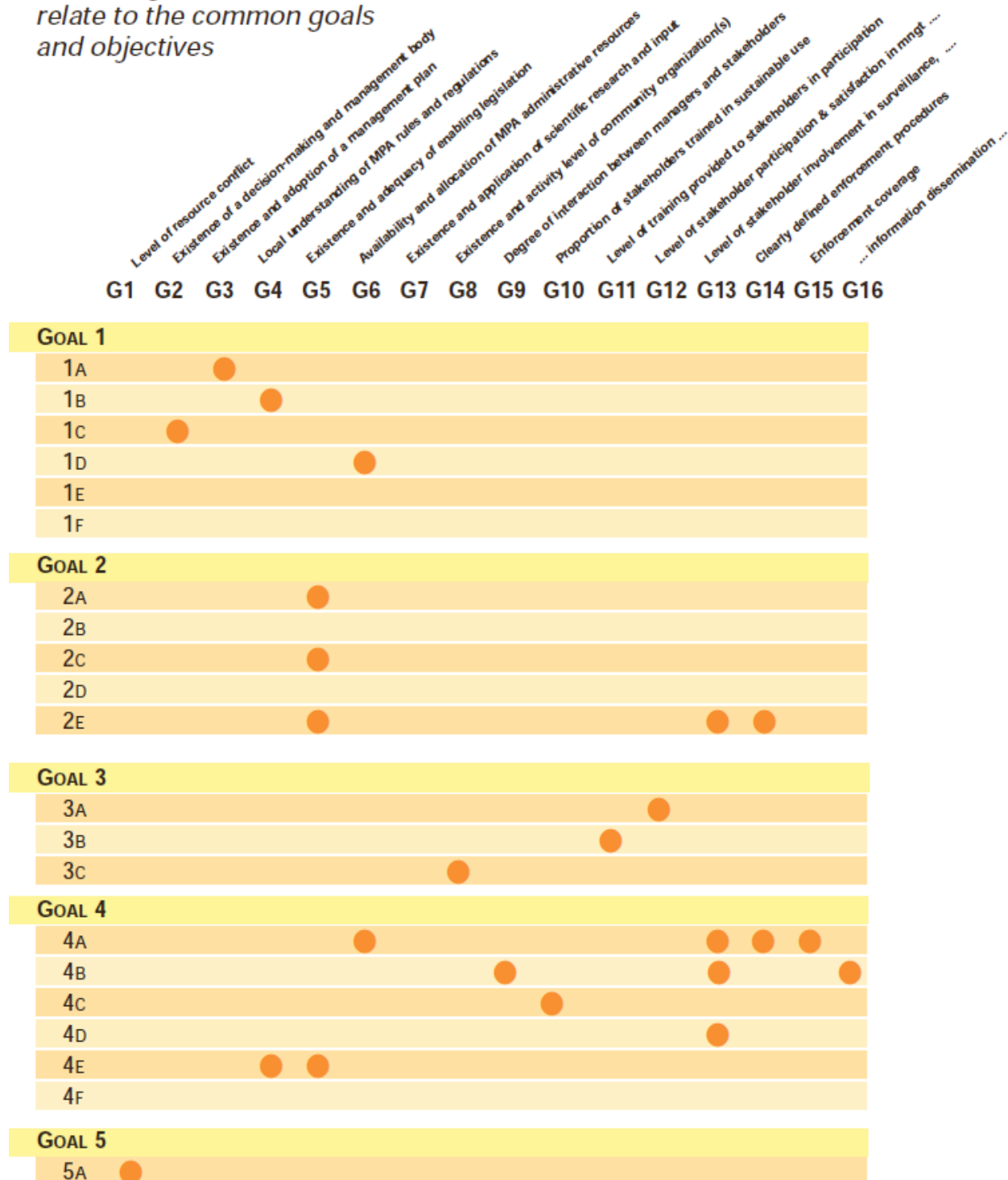|	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16
GOAL 1																
1A				●												
1B				●	●											
GOAL 2																
2A	●						●		●		●					
2B	●								●	●		●				
2C											●	●				
2D				●				●			●					
GOAL 3																
3A						●										
3B						●										
3C						●										
3D						●										
3E						●										
3F						●										
GOAL 4																
4A							●			●						
4B				●		●		●			●				●	
4C															●	
GOAL 5																
5A	●	●														
5B		●														●
GOAL 6																
6A		●											●			
6B		●	●											●		
6C		●												●		
6D		●												●		

Appendix VIII. Governance Goals and Objectives

(Figure 4 Pomeroy et al. 2004)

GOAL 1	Effective management structures and strategies maintained
1A	Management planning implemented and process effective
1B	Rules for resource use and access clearly defined and socially acceptable
1C	Decision-making and management bodies present, effective, and accountable
1D	Human and financial resources sufficient and used efficiently and effectively
1E	Local and/or informal governance system recognised and strategically incorporated into management planning
1F	Periodic monitoring, evaluation, and effective adaptation of management plan ensured

GOAL 2	Effective legal structures and strategies for management maintained
2A	Existence of adequate legislation ensured
2B	Compatibility between legal (formal) and local (informal) arrangements maximized or ensured
2C	National and/or local legislation effectively incorporates rights and obligations set out in international legal instruments
2D	Compatibility between international, national, state, and local rights and obligations maximized or ensured
2E	Enforceability of arrangements ensured

GOAL 3	Effective stakeholder participation and representation ensured
3A	Representativeness, equity, and efficacy of collaborative management systems ensured
3B	Resource user capacity effectively built to participate in co-management
3C	Community organizing and participation strengthened and enhanced

GOAL 4	Management plan compliance by resource users enhanced
4A	Surveillance and monitoring of coastal areas improved
4B	Willingness and acceptance of people increased to behave in ways that allow for sustainable management
4C	Local ability and capacity built to use resources sustainably
4D	User participation in surveillance, monitoring, and enforcement increased
4E	Application of law and regulations adequately maintained or improved
4F	Access to and transparency and simplicity of management plan ensured and compliance fostered

GOAL 5	Resource use conflicts managed and reduced
5A	User conflicts managed and/or reduced: 1) within and between user groups, and/or 2) between user groups and the local community or between the community and people outside it

How the governance indicators relate to the common goals and objectives

Column labels (G1–G16):
- G1: Level of resource conflict
- G2: Existence of a decision-making and management body
- G3: Existence and adoption of a management plan
- G4: Local understanding of MPA rules and regulations
- G5: Existence and adequacy of enabling legislation
- G6: Availability and allocation of MPA administrative resources
- G7: Existence and application of scientific research and input
- G8: Existence and activity level of community organization(s)
- G9: Degree of interaction between managers and stakeholders
- G10: Proportion of stakeholders trained in sustainable use
- G11: Level of training provided to stakeholders in participation
- G12: Level of stakeholder participation & satisfaction in participation
- G13: Level of stakeholder involvement in surveillance, ...
- G14: Clearly defined enforcement procedures
- G15: Enforcement coverage
- G16: ... information dissemination ...

Appendix IX: Interdisciplinary Planning Team

John Carmichael, SEDAR
Brian Cheuvront, SAFMC
Chip Collier, SAFMC
David Dale, NMFS SERO
Andy David, NMFS SEFSC
Rick DeVictor, NMFS SERO
Mike Errigo, SAFMC
Nick Farmer, NMFS SERO
Stacey Harter, NMFS SEFSC
Andrew Herndon, NMFS SERO
Stephen Holiman, NMFS SERO
Michael Jepson, NMFS SERO
Todd Kellison, NMFS SEFSC
Jennifer Lee, NMFS SERO
Ken Lindeman, PhD, Florida Institute of Technology (Member, MPA Expert Working Group)
Kari MacLauchlin, SAFMC
John McGovern, NMFS SERO
Michelle Tishler, Meadows Ecological, LLC
Roger Pugliese, SAFMC
Jeff Radonski, NMFS OLE
Monica Smit-Brunello, NMFS SERO
Amber Von Harten, SAFMC
Gregg Waugh, SAFMC