System Management Plan for Spawning Special Management Zones

A Blueprint for Monitoring, Research, Outreach, Administration, and Evaluation of Spawning Special Management Zones that are Proposed in Amendment 36 to the Snapper Grouper Fishery Management Plan in the South Atlantic Region

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SYSTEM MANAGEMENT PLAN FOR THE AMENDMENT 36 SPAWNING SPECIAL MANAGEMENT ZONES

The South Atlantic Fishery Management Council (Council) is preparing a System Management Plan (SMP) for the Spawning Special Management Zones (SMZs) proposed in Snapper Grouper Amendment 36 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (Amendment 36). The Spawning SMZs are designed to protect areas important for spawning, such as areas where spawning has been observed or likely to occur in the South Atlantic Region. The Council recognizes that complete funding for enforcement, research and 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 proposed Spawning SMZs 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 proposed Spawning SMZs are being met.

The goal is to complete the SMP after the Council approves submitting Amendment 36 to the National Marine Fisheries Service for final review (scheduled for March 2016). If the Spawning SMZs are implemented, 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 Spawning SMZs. The Council recognizes that the SMP may be modified as management needs change.

1 Executive Summary

The South Atlantic Fishery Management Council (Council) is proposing the implementation of Spawning Special Management Zones (Spawning SMZs) in five areas off Florida, North Carolina, and South Carolina. The areas are known as South Cape Lookout (NC), Areas 51 and 53 (SC), Devil's Hole/Georgetown Hole (SC), and Warsaw Hole (FL). The Council and its partners have developed this System Management Plan (SMP) for the proposed Spawning SMZs. 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 wants to protect important spawning areas to enhance spawning through proposed Spawning SMZs. A spawning area is defined as a location where fish have been observed spawning or histology confirms a fish was in spawning condition. The Council proposes that, within the Spawning SMZs, 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 Spawning SMZs and existing knowledge gaps, management action items with strategies, potential methods to evaluate management effective, financial plan, timeline, and site characterizations for each proposed Spawning SMZ 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 Spawning SMZs. 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 locate spawning areas, characterize spawning areas, map with multibeam the proposed Spawning SMZs, 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 Spawning SMZs. The Resource Protection Action Items were developed to monitor compliance with Spawning SMZ 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 Spawning SMZs evaluations, 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 Spawning SMZs including number of fish observed in spawning condition 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 Spawning SMZs 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 Spawning SMZs 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 Spawning SMZs 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 areas under consideration to be designated as Spawning SMZs. As currently proposed, the Spawning SMZs encompass 18.1 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. Additionally, citizen science was conducted by a commercial fisherman and a researcher in Devil's Hole to document spawning. Greater amberjack, speckled hind, red hind, red grouper, gag, scamp, graysby, silk snapper, and blueline tilefish have been collected in the proposed South of Cape Lookout Spawning SMZ. On proposed Area 51 and 53 Spawning SMZs (combined), greater amberjack, red grouper, scamp, gag, warsaw grouper, and red snapper have been observed. Greater amberjack, speckled hind, snowy grouper, warsaw grouper, scamp, and blueline tilefish have been collected in the proposed Devil's Hole Spawning SMZ. Fishery-independent biological data have not been collected for the proposed Warsaw Hole Spawning SMZ.

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2 Proposed Spawning Special Management Zones in Amendment 36

2.1 Overview

The goal of the Spawning SMZs being proposed in Amendment 36 is to protect important areas for spawning for snapper grouper species to enhance spawning (see **Table 3.1.1** for a species list). In Amendment 36, the Council defines a spawning area as a location where fish have been observed spawning or histology confirms a fish was in spawning condition. By protecting the spawning area, spawning could increase and lead to increased recruitment. An additional goal is to reduce bycatch and bycatch mortality of snapper grouper species, including speckled hind and warsaw grouper (SAFMC 2016).

The Council and NMFS have implemented species prohibitions in specific areas in the past to protect snapper grouper species. In 1994, Federal regulations were implemented that prohibited fishing for and retention of snapper grouper species within the *Oculina* Experimental Closed Area. In 2009, eight marine protected areas (MPAs) were established in the South Atlantic, through the final rule implementing Amendment 14, in which possession, retention, and fishing for all of the species in the FMP, including speckled hind and warsaw grouper, is prohibited (74 FR 1621, January 13, 2009). Amendment 17B and its implementing final rule prohibited all fishing for and possession of six deep-water snapper-grouper species (snowy grouper, blueline tilefish, yellowedge grouper, misty grouper, queen snapper, and silk snapper) beyond a depth of 240 ft (73 m), beginning January 31, 2011. The goal of the prohibition was to reduce the anticipated bycatch mortality of speckled hind and warsaw grouper. Amendment 17B also prohibited harvest of speckled hind and warsaw grouper throughout the entire South Atlantic Region.

Regulatory Amendment 11 (SAFMC 2011) eliminated the restriction on the possession or harvest of some deep-water snapper grouper species in waters greater than 240 feet deep because data indicated that the closure likely did not significantly reduce bycatch of these species while the socieoeconomic impacts of the closure were significant in some areas. Regulatory Amendment 11 became effective on May 10, 2012. As stated in the final rule for Regulatory Amendment 11, the Council and NMFS plan to develop area and species prohibitions that would most effectively reduce encounters with speckled hind and warsaw grouper while minimizing, to the extent practicable, socio-economic effects to the fishing industry.

The Council formed a group of MPA experts composed of scientists and fishermen with experience studying snapper grouper species or observing spawning in the Council's area. The group was requested to review scientific data on spawning sites, habitat mapping, and species occurrence and to provide recommendations on potential areas. The group met twice and provided a report that is available from the Council's website (See: http://www.safmc.net/managed-areas/marine-protected-areas). The Council reviewed the areas recommended by the group and decided to move forward with Spawning SMZs rather than additional MPAs. The Council used the data compiled by the group and input during public hearings when determining Spawning SMZ areas to evaluate. Many of the sites being considered for Spawning SMZs in Amendment 36 were identified by the MPA Working Group.

The current preferred Spawning SMZ locations are off the states of North Carolina, South Carolina, and Florida in sites referred to as: South of Cape Lookout, Area 51, Area 53, Devil's Hole, and Warsaw Hole (**Figure 2.1.1**). South of Cape Lookout, Devil's Hole, and Warsaw Hole either have documented spawning or anecdotal evidence of spawning of focal species (See **Chapter 4: Site Characterization** for more information). Area 51 and Area 53 are artificial reefs established by the SCDNR as research areas to test the feasibility of artificial reefs as marine protected areas. The locations of the two artificial reefs have not been released by SCDNR and are not included in **Figure 2.1.1**. This SMP will provide guidance on the evaluation the Spawning SMZs and a timetable for the review.

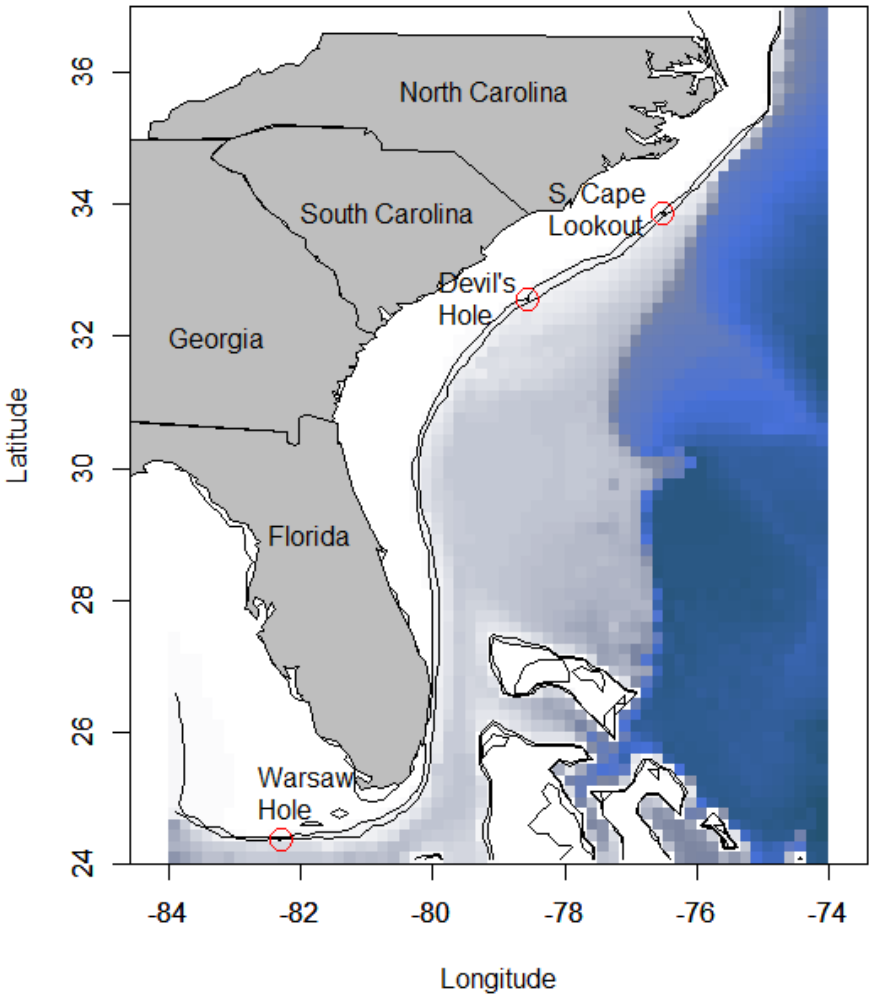

Figure 2.1.1. Map of the proposed Spawning Special Management Zones: South of Cape Lookout, Devil's Hole, and Warsaw Hole. The red circles are an aid to find the proposed area and the black dot in the middle of the circle is the proposed location with relative size. Area 51 and Area 53 are not currently on the map. Note: Map is for illustrative purposes only.

2.2 Legislative Authority

The authority to create Spawning SMZs comes from the Magnuson-Stevens Fishery Conservation and Management Act (MSA), which enables National Marine Fisheries Service (NMFS) to enact area-based management. Amendment 36 will be reviewed by NMFS to determine if it meets the requirements of the MSA.

The authority to enforce Spawning SMZ regulations also 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 Spawning SMZ 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 authorities for enforcement of regulations for the Spawning SMZs 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 Spawning SMZs 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 Spawning SMZs 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 Spawning SMZs off North Carolina but funding for the vessel is uncertain.

2.3 Proposed Regulations

The Council is proposing that fishing for, possession, and retention of 59 species of snappers and groupers be prohibited in the Spawning SMZs. Harvest and possession of other species, such as dolphin, mackerel, and tuna, would be allowed as other regulations dictate. The Council is also proposing that fishermen be allowed to transit with snapper grouper species onboard their vessel 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 protected areas 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 Spawning SMZs with snapper-grouper species.

The Council is also proposing that the Spawning SMZs (all except for Areas 51 and 53) sunset 10 years after implementation if not reauthorized.

3 System Management Plan

The SMP was created to develop a framework for the Council to use adaptive management for the Spawning SMZs. The SMP provides guidance on action items to be completed in the Spawning SMZs and potential methods for evaluation of management effectiveness. If changes in size, configuration, or regulations are recommended for the Spawning SMZs, the Council will develop an amendment to the Snapper-Grouper Fishery Management Plan or through framework action if approved in Amendment 36.

3.1 Goals and Objectives

The following goals and objectives were developed for the SMP for the Spawning SMZ 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 and the focal species (**Table 3.1.1**) for the Spawning SMZs.

Goal 1: <u>Develop and adopt an effective process to evaluate and refine management of Spawning SMZs</u>

Obj. A: Develop a SMP for Spawning SMZs to enhance or improve management of habitats where spawning of multiple snapper grouper species is likely to occur or documented based on input from scientists, fishermen, and the public.

Obj. B: Implement the SMP.

Obj. C: Ensure a co-management system that is efficient and representative of fishery stakeholders.

Obj. D: Develop, increase, or maintain co-management support from fishermen through cooperative research and citizen science projects within the Spawning SMZs.

Obj. E: Conduct evaluations on the knowledge regarding spawning within and near each site at Council approved intervals.

Goal 2: Increase or maintain knowledge and protection of important spawning locations through research and monitoring

Obj. F: Acquire and deploy resources to enhance knowledge on the spawning locations in the South Atlantic for the focal species.

Obj. G: Increase habitat characterization of potential or selected Spawning SMZs.

Obj. H: Protect habitats where spawning is likely to occur or is documented for multiple snapper grouper species from anthropogenic impacts.

Goal 3: Improve public's environmental awareness and knowledge about Spawning SMZs

Obj. I: Increase public's level of knowledge about the purpose for, importance of, and regulations in Spawning SMZs.

Obj. J: Enhance and strengthen stakeholder participation in co-management of Spawning SMZs.

Obj. K: Enhance or maintain the existence values of the Spawning SMZs.

Goal 4: Enhance enforceability and compliance within the Spawning SMZs

Obj. L: Increase user participation in surveillance and monitoring.

Obj. M: Maintain or improve surveillance and monitoring of Spawning SMZs via satellites, drones, research vessels, etc.

Obj. N: Increase or maintain compliance with regulations within the Spawning SMZs through targeted communication.

Obj. O: Improve or maintain application of law and regulations within the Spawning SMZs.

Obj. P: Consider Law Enforcement AP recommendations for protected areas when developing, designating, and managing Spawning SMZs.

Goal 5: Research and monitor impact of invasive species

Obj. Q: Improve understanding of invasive lionfish ingress into and near Spawning SMZs.

Obj. R: Identify if lionfish have impacts on fish communities in or near Spawning SMZs.

Table 3.1.1. Focal species considered for establishment and evaluation of the Spawning SMZs.

Family	Common Name	Scientific Name
Amberjack	Greater Amberjack	*Seriola dumerili*
Groupers	Coney	*Cephalopholis fulvus*
	Graysby	*C. cruentata*
	Goliath Grouper	*Epinephelus itajara*
	Nassau Grouper	*E. striatus*
	Red Grouper	*E. morio*
	Red Hind	*E. guttatus*
	Rock Hind	*E. adscensionis*
	Speckled Hind	*E. drummondhayi*
	Snowy Grouper	*Hyporthodus niveatus* formerly *E. niveatus*
	Warsaw Grouper	*H. nigritus* formerly *E. nigritus*
	Yellowedge Grouper	*H. flavolimbatus* formerly *E. flavolimbatus*
	Black Grouper	*Mycteroperca bonaci*
	Gag	*M. microlepis*
	Scamp	*M. phenax*
Snappers	Blackfin Snapper	*Lutjanus buccanella*
	Cubera Snapper	*Lutjanus cyanopterus*
	Mutton Snapper	*L. analis*
	Red Snapper	*L. campechanus*
	Silk Snapper	*L. vivanus*
	Yellowtail Snapper	*Ocyurus chrysurus*
Tilefishes	Golden Tilefish	*Lopholatilus chamaeleonticeps*
	Blueline Tilefish	*Caulolatilus microps*

3.2 Connectivity Within and Among Spawning SMZs

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

3.3 Existing Knowledge Gaps

3.3.1 Target Resource

Many of the focal species for Amendment 36 lack a complete description of their life history traits including when and where they spawn and whether they aggregate to spawn. Spawning seasons and spawning locations are two key pieces of data that are needed to improve the siting and timing

of potential closed areas. Focal species have been observed either through direct observation or anecdotal reports spawning in South of Cape Lookout, Devil's Hole, and Warsaw Hole preferred Spawning SMZs. Further life history research could assist in better placement or timing of closed areas. Information on movement (e.g., home range size) and migration patterns during and outside of spawning seasons is also needed to determine if the size of the Spawning SMZ 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 Spawning SMZs

Fishermen have stated they fish in the South of Cape Lookout, Devil's Hole, and Warsaw Hole proposed Spawning SMZs. It is not known if fishermen use Areas 51 and 53 proposed Spawning SMZs. Site-specific fishing location data are lacking for the snapper grouper fishery. Therefore estimating use by fishermen of the area is difficult. Description of economic and social impacts could be improved with more detailed information on fishing locations for both recreational and commercial fishermen.

3.4 Management Action Items

The final SMP will detail strategies to achieve proposed management action items. The purpose and need detailed in Amendment 36 sections will be revisited and strategies will be identified through a process that involves affected users. The following information under the four sections of proposed action items includes brief summaries and examples.

NOTE: This document is for information purposes only; nothing in this document commits any agency 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 is proposing to allow certain fishing activities in the proposed Spawning SMZs (Type 2 protected area) and transit through the Spawning SMZs, enforcement of the areas will be challenging. The Law Enforcement Advisory Panel (LEAP) has advised the Council throughout the development of Amendment 36. The LEAP has developed recommendations for MPAs (SAFMC 2005) and the Spawning SMZs (SAFMC 2016). The Council followed those

recommendations as closely as possible while balancing the biological, social, and economic objectives of Spawning SMZs.

Law enforcement partners were requested to provide information on the enforceability of Spawning SMZs and available assets that could be used to monitor them. State agencies and USCG are scheduled to provide enforceability rating for the Spawning SMZs at the March 2016 LEAP Meeting (**Table 3.4.1**). Two very large obstacles continue hinder enforcement of some Spawning SMZs: (1) distance from shore for the majority of Spawning SMZs 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, on the water enforcement presence is necessary in order to determine whether the fishing activity is lawful or not.

The enforceability ratings will be based on the same criteria used in Snapper Grouper Amendment 14 (SAFMC 2007):

> "*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.*"

Table 3.4.1. The enforceability rating of the Spawning SMZs in the South Atlantic. State ratings were developed by state enforcement agency in the closest state.

Spawning SMZ	Closest State	State Rating	USCG Rating (2015)
South of Cape Lookout	North Carolina		
Area 51	South Carolina		
Area 53	South Carolina		
Devil's Hole	South Carolina		
Warsaw Hole	Florida		

The available assets to monitor the Spawning SMZs vary by state and agency. NCDEQ currently has one vessel capable of traveling to the South of Cape Lookout Spawning SMZ; 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 3.4.2. USCG enforcement assets available for monitoring the Spawning SMZs.

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 violation within Spawning SMZs, the regulations established for Spawning SMZs might be challenged and changes to the regulations may be needed to improve adjudication.

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

Goal 4: <u>Enhance enforceability and compliance within the Spawning SMZs</u>

Obj. L: Increase user participation in surveillance and monitoring.
Obj. M: Maintain or improve surveillance and monitoring of Spawning SMZs via satellites, drones, research vessels, etc.
Obj. N: Increase or maintain compliance with regulations within the Spawning SMZs through targeted communication.
Obj. O: Improve or maintain application of law and regulations within the Spawning SMZs.
Obj. P: Consider Law Enforcement AP recommendations for protected areas when developing, designating, and managing Spawning SMZs.

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 patrols and investigations.*

Task: Schedule Spawning SMZ enforcement activities and challenges to be reported at LEAP

annual meeting to coordinate 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: Ongoing—yearly
Budget: Office of Law Enforcement (OLE) partners' time, meeting cost done in conjunction with yearly LEAP meeting
Potential Partners/roles: USCG, NOAA OLE, FWC, GADNR, NCDEQ, SCDNR

Task: Continue officer training at the USCG Southeast Regional Fisheries Training Center.
Justification: The Southeast Regional Fisheries Training Center has been a valuable asset for training state and federal resource officers in enforcement of fisheries regulations, including those pertaining to Spawning SMZs.
Deliverables: Trained officers
Schedule: Ongoing—yearly
Budget:
Potential Partners/roles: USCG, NOAA OLE, FWC, GADNR, NCDEQ, SCDNR

Tasks: Develop a patrol/sortie reporting form and database for determining compliance in Spawning SMZs 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: Long-term
Budget:
Potential Partners/roles: USCG, NOAA OLE, FWC, GADNR, NCDEQ, SCDNR

Action Item 2: Ensure a *"high" enforceability rating for the Warsaw Hole Spawning SMZ and at least "moderate" enforceability rating for the other Spawning SMZs.*
Tasks: Purchase and maintain vessels capable of conducting offshore patrols and increase enforcement capacity to monitor Spawning SMZs.
Justification: Protection of Spawning SMZs is crucial to their success. Fishing incursions into the area could remove individuals from the population and prevent spawning enhancement and increased recruitment. Having enforcement assets to monitor Spawning SMZs is critical for preventing incursions into the area. If new vessels are needed for enforcement of Spawning SMZs off each of the states, a vessel costs approximately $150,000 for a large center console vessel two outboard engines. Some states may require more than one vessel. Additional funds are needed to maintain current vessels.
Deliverables: Vessels available for offshore patrol.
Schedule: Medium-/long-term (with funding)
Budget: $200,000 per year
Potential Partners/roles: USCG, NOAA OLE, FWC, GADNR, NCDEQ, SCDNR

Action Item 3: *Patrol Spawning SMZs with aerial and at-sea assets.*
Tasks: Provide a deterrent presence within Spawning SMZs through routine aerial and at-sea

patrols and schedule and conduct dedicated surge operations.
Justification: A deterrent presence is needed in Spawning SMZs to reduce incursions into the areas. Fishing incursions may prevent attainment of the stated biological goals of the Spawning SMZs. The estimate to the cost of a monitoring event for a Spawning SMZ included three patrol officers per event and each event lasted 12 hours. Cost per officer is approximately $40 per hour, including all fringe values. The vessel operating cost is approximately $100 per hour. This adds up to approximately $2,640 per monitoring event. The budget is estimated assuming five monitoring events per Spawning SMZ and five Spawning SMZs.
Deliverables: Patrols conducted in Spawning SMZs.
Schedule: Long-term (dependent on Action Item 2)
Budget: $66,000
Potential Partners/roles: USCG, NOAA OLE, FWC, GADNR, NCDEQ, SCDNR

Action Item 4: *Initiate a remote monitoring program for Spawning SMZs.*
Task: Review methods for remote monitoring in offshore areas.
Justification: Patrols in Spawning SMZs 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: Short/medium-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

Task: Seek funding for remote monitoring of Spawning SMZs and implement program.
Justification: Funding is limited in the South Atlantic Region for remote monitoring offshore areas. Additional funding will be required if a remote monitoring program is to be developed. The budget estimate is based on ten monitoring events for the five Spawning SMZs at an estimated cost of $2,500 per event.
Deliverables: Grant/funding requests for monitoring offshore areas.
Schedule: Long-term
Budget: $125,000 per year
Potential Partners/roles: NMFS, SAFMC Staff

Action Item 5: *Develop a citizen science/cooperative research program and database for reporting data collected in Spawning SMZs.*
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.*
Task: Annually report enforcement and compliance activities at SAFMC Meetings.
Justification: Reporting on enforcement activities enables enforcement agencies to collaboratively review the patrolling of Spawning SMZs 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/ongoing
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.*
Task: Communicate to the public about Spawning SMZs while on patrol in the vicinity of Spawning SMZs and at outreach and education events.
Justification: Communication by patrol officers can help to educate and increase the public's understanding on the importance of Spawning SMZs 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.*
Task: Have the 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 and improve adjudication of Spawning SMZ regulations.*
Tasks: Monitor court decisions and orders to track adjudication of Notices of Violation and Assessment in the Spawning SMZs 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 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: 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 Spawning SMZs established by Amendment 36. New research and monitoring will continue to inform decision–makers during consideration of existing and potential new protected areas. The Council is proposing a sunset provision in Amendment 36 that would remove the Spawning SMZs automatically after implementation if not reauthorized. The Council will evaluate research conducted in the Spawning SMZs, as outlined in annual status reports and evaluation reports, before deciding whether to remove the sunset provision.

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

The Research and Monitoring Action Plan 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 in the plan. This is not to imply these items do not have merit and would not 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 Spawning SMZs, and environmental stressors in habitats in and adjacent to Spawning SMZs. There are finite resources available to execute the Research and Monitoring Action Items; the best returns for both scientific and financial considerations are included below. The priority ranking for research and monitoring was assigned by the SMP 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 Spawning SMZs on snapper grouper species' spawning. The anticipated benefit of Spawning SMZs is to enhance fisheries through recovery of populations resulting from protection of fish at spawning 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 Spawning SMZs; therefore, other approaches are needed to monitor the effect of the Spawning SMZs. A variety of approaches will be needed to assess fish populations synoptically in and outside the Spawning SMZs with the first step being collection of baseline data to compare to subsequent assessments. The second approach is to collect biological data on the spawning condition of snapper grouper species to determine if the

Spawning SMZs are protecting fish in spawning condition.

Action Item 1: *Locate spawning areas of snapper and grouper species.*

Priority Ranking: 1

Task: Conduct studies to identify spawning areas for focal species.

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 fishery species' spawning areas.

Schedule: Ongoing for NMFS and Marine Resources Monitoring, Assessment, and Prediction (MARMAP)/short-term for independent researchers

Budget: $50,000 per site per year by independent researchers

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

Potential Methods: A variety of gear types could be used to locate spawning areas including manned submersibles, remotely operated vehicles (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. has been conducting a study using geomorphology to predict spawning aggregation sites since 2014 (Heyman 2015).
- NMFS SERO and SEFSC have produced a geographic distribution model, which includes potential spawning habitats of snapper grouper species (SAFMC MPA Expert Workgroup, 2012 & 2013).

Action Item 2: *Determine pre-closure distribution and abundance of focal species inside and outside Spawning SMZs, in order to provide context for subsequent assessments.*

Priority Ranking: 4

Task: Compile data collected in and around Spawning SMZs on the distribution and abundance of focal species.

Justification: In order to differentiate changes in key resources, 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 against.

Schedule: Short-term

Budget: Staff-time

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 ROVs within the South Atlantic Region
- MARMAP has been collecting data on distribution and abundance from trap surveys from Cape Hatteras, North Carolina to Cape Canaveral, Florida.
- NOAA Ocean Exploration conducted video surveys of fish species composition from submersible dives on shelf edge reefs within the South Atlantic Region (Schobernd and Sedberry 2009, Fraser and Sedberry 2008).

Action Item 3: *Develop and apply coupled biological and physical models to locate potential nursery sites.*

Priority Ranking: Medium

Task: Model potential nursery sites of focal species 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: NMFS and independent researchers

Projects Completed or Underway:

- NOAA, 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 protected areas for fisheries management (SAFMC MPA Expert Workgroup, 2012 & 2013).
- North Carolina State University 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".

Action Item 4: *Use satellite drifters or ichthyoplankton modelling to improve the understanding of the connectivity of Spawning SMZs and other managed areas.*

Priority Ranking: Medium

Task: Model connectivity of Spawning SMZs and other managed areas based on **s**atellite drifters or ichthyoplankton models.

Justification: Understanding the larval dispersal patterns of reef fish can help to improve the placement of Spawning SMZs.

Deliverables: Larval dispersal models

Schedule: Long-term

Budget:

Potential Partners:

Projects Completed or Underway:

- There are several models that can be used to predict larval dispersal patterns including ROMS, Ichthyop, and Hycom.
- Satellite drifters released from protected areas were used to identify potential dispersal patterns for the South Atlantic region (Hare and Walsh 2007).

Action Item 5: *Maintain an annual monitoring program to collect data inside and outside the Spawning SMZs. Data collected should include: distribution, abundance, size and spawning condition of focal species inside and outside the Spawning SMZs.*

Priority Ranking: Low

Task: Fund and maintain an annual monitoring program to collect data on focal species in the South Atlantic region and collects data in Spawning SMZs.

Justification: An annual monitoring program needs continued funding to track long-term changes in the spawning population at Spawning SMZs. Since many of snapper-grouper species that are protected by these Spawning SMZs are long-lived species with a late onset of maturity, the effect of protecting the Spawning SMZs 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 Spawning SMZs 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 within the South Atlantic region.
- Southeast Reef Fish Survey (SERFS), which is a collaboration of SEFIS and MARMAP has been collecting data on distribution, abundance, size, and spawning condition from Cape Hatteras, North Carolina to Cape Canaveral, Florida.
- SCDNR has been collecting data at Area 51 and 53 and plans to continue to monitor the area.

Action Item 6: *Track movement of adult fish.*
Priority Ranking: Low
Task: Tag adults of focal species with conventional and/or acoustic tags to track movements in and around Spawning SMZs.
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. Many 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 the Spawning SMZs.
Schedule: Long-term
Budget: Telemetry >$2,500,000/ tag and recapture >$1,000,000
Potential Partners: FWC, GADNR, NCDEQ, SCDNR, NMFS, independent researchers, Citizen Science Program
Potential methods: Telemetry or tag and recapture.
Projects Completed or Underway:

- A tag and recapture study of gag grouper has been completed in the South Atlantic region (McGovern et al. 2005).

3.4.2.2 Assessment Needs

The purpose of monitoring is first to determine if spawning occurs within the boundary of the Spawning SMZ. If spawning is observed, then monitoring can collect baseline information on natural resources and other components of the ecosystem so that changes can be detected and assessed. Monitoring studies have the potential to detect significant changes in natural resources that result from management actions or from other causes. The findings of research projects may also 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 spawning indicators of snapper grouper species within the Spawning SMZs. This includes: distribution and abundance patterns, spawning areas, and histology.*

Priority Ranking: 2

Task: Focal species are sampled in Spawning SMZs to characterize distribution, abundance, and spawning.

Justification: Characterization of these parameters for snapper grouper species inside vs. outside the Spawning SMZs provides a means to evaluate the efficacy of the protected areas. Ideally, a higher abundance of reproductively active focal species would be observed inside the Spawning SMZs given enough time following implementation of fishing restrictions. Evaluation of distribution and abundance patterns inside vs. outside the Spawning SMZs provides an indication of whether or not the Spawning SMZ is protecting important habitats for spawning. Evaluation of gonad stage through histology will confirm if fish in the Spawning SMZ are reproducing.

Deliverables: Comparison of variables such as distribution, density, and reproductive stage focal species inside the Spawning SMZs vs. reference areas outside Spawning SMZs.

Schedule: Short-term/ongoing

Budget:

Potential Partners: MARMAP, NMFS

Potential Methods: If there have been surveys conducted prior to implementation of the Spawning SMZs, a BACI (before/after, control/impact) sampling design could be used when examining Spawning SMZ effectiveness.

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 deep-water 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 since 1987 from Cape Hatteras, North Carolina and Cape Canaveral, Florida.
- NMFS SEFIS has been collecting distribution, abundance, size, age, and reproductive data from trap surveys since 2010 from Cape Hatteras, North Carolina and Cape Canaveral, Florida.
- NMFS, SEFSC, Panama City Lab has been collecting data on distribution and abundance of all fish species from ROV surveys since 2004 in the South Atlantic region.

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

Priority Ranking: Low

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

Justification: Detailed characterization of fish communities provides an 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 the Spawning SMZs to reference areas outside Spawning SMZs.

Schedule: Short-term/ongoing

Budget:

Potential Partners: NMFS, MARMAP

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

Projects Completed or Underway:

- NMFS, SEFSC, Panama City Lab has been collecting data on habitat utilization patterns of all fish species from ROV surveys. Some of the dives occurred within the preferred Spawning SMZs.
- MARMAP has been collecting information on habitat utilization patterns from trap surveys since 1987 from Cape Hatteras, North Carolina to Cape Canaveral, Florida.
- NMFS SEFIS has been collecting information on habitat utilization patterns from trap surveys inside and outside several of Spawning SMZs from Cape Hatteras, North Carolina to Cape Canaveral, Florida.
- SCDNR has been collecting data at Area 51 and 53 and plans to continue to monitor the areas.

3.4.2.3 Habitat Monitoring

The habitat monitoring action items are ordered according to the IPT's recommendations.

Action Item 9: *Complete multibeam surveys of the Spawning SMZs.*

Priority Ranking: 3

Task: Multibeam surveys are completed in the Spawning SMZs.

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 Spawning SMZs. The preferred alternatives total 18.1 miles^2 (46.9 km^2). Two of the locations are artificial reefs that were mapped prior to the deployment of the material, leaving 12.1 miles^2 (31.3 km^2) to be mapped. Based on a rate of 16 km^2 mapped per evening, Spawning SMZs could be mapped in two days with additional time needed for travel among areas.

Deliverables: High resolution GeoTIFFs

Schedule: Ongoing

Budget:

Potential Partners: NMFS, independent researchers

Projects Completed or Underway:

- NMFS, SEFSC, Panama City Lab has been collecting multibeam data in the South Atlantic region.

- NMFS SEFIS group has collected multibeam data.
- A multibeam map is included in the Site Characterization for Warsaw Hole (**Section 4.5**).
- Area 51 and 53 were mapped prior to deployment of artificial reef and the habitat was described as sand.

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

Priority Ranking: Low

Task: Multibeam surveys are completed in areas adjacent to Spawning SMZs.

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 the Spawning SMZs. Mapping these areas will be used to determine if Spawning SMZs boundaries should be altered. Based on a rate of 16km^2 mapped per evening, the area around the five Spawning SMZs, which totals 539 km^2, could be mapped in 34 days plus travel time among areas.

Deliverables: High resolution GeoTIFFs

Schedule: Ongoing

Budget:

Potential Partners: NMFS, independent researchers

Projects Completed or Underway:

- NMFS, SEFSC, Panama City Lab has been collecting multibeam data along the South Atlantic near the Deepwater MPAs.
- NMFS SEFIS has been collecting multibeam data in the South Atlantic region.
- NOAA Ocean Exploration conducted sonar surveys between 2001 and 2003 in the South Atlantic region (Schobernd and Sedberry, 2009; Fraser and Sedberry, 2008).
- The US Navy contracted a large multibeam survey off NE Florida in 2010. The areas covered are the Under Sea Warfare Training Range and the CC Box. These areas are used for anti-submarine warfare training and encompass areas containing EFH and deep reefs.
- NOAA's Southeast-Deep Sea Coral Technology Program (SE–DSCTP) project completed mapping in 2011 off North Florida (Reed et al. 2014).

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

Priority Ranking: Low

Task: Acoustic bathymetric and backscatter data are verified using ROVs or automated underwater vehicles (AUVs).

Justification: Acoustic bathymetry and backscatter data are useful for detecting features, which may provide habitat for focal reef fish; however, visual data are 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.

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, independent researchers
Projects Completed or Underway:

- NMFS, SEFSC, Panama City Lab has been collecting multibeam data with ROV surveys.
- SERFS, which is a collaboration of SEFIS and MARMAP, has been collecting multibeam data with trap and stationary cameras since 2010.
- NOAA Ocean Exploration conducted sonar surveys with submersible ground truthing between 2001 and 2003 (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 Under Sea Warfare Training Range and the CC Box. 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 (Reed et al. 2014).

Action Item 12: *Generate habitat classification maps.*

Priority Ranking: Low

Task: Habitat maps are generated for Spawning SMZs 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 all areas where multibeam surveys have been conducted.
Schedule: Long-term
Budget:
Potential Partners: NMFS, FWC, GADNR, NCDEQ, SCDNR, 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 Spawning SMZs and monitor stakeholder knowledge and perception about Spawning SMZs. As monitoring studies gather data, they have the potential to detect significant changes in stakeholder perceptions and knowledge about Spawning SMZs. Research findings can help mangers and scientists improve or adapt management of the Spawning SMZs. 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 user groups in different areas to understand the social and economic effects of prohibiting access to the Spawning SMZs.*

Priority Ranking: 1

Task: Social and economic data are collected to determine effects of Spawning SMZs 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

Priority: Medium

Schedule: Long-term

Budget: $300,000

Potential Partners: NMFS and academic scientists

Projects Completed or Underway:

- A socioeconomic study of the impacts of the *Oculina* Bank has been conducted (Helies et al. 2011).

Action Item 14: *Develop techniques to track the public's knowledge and perception regarding the purpose of, importance of, and regulations in Spawning SMZs.*

Priority Ranking: 2

Task: Techniques are developed to track the public's knowledge and perception of Spawning SMZs.

Justification: Data are needed to evaluate public's knowledge and perception of Spawning SMZs. The data could be collected via online survey to evaluate communication and outreach strategies.

Deliverables: Report

Priority: Medium

Schedule: Long-term

Budget: $10,000

Potential Partners: NMFS, SAFMC, and academic scientists

Projects Completed or Underway: None.

Action Item 15: *Monitor stakeholder perception of Spawning SMZ as a management tool.*

Priority Ranking: 3

Task: Stakeholder perception of Spawning SMZs is monitored through a survey.

Justification: Data are needed to evaluate stakeholder knowledge and perception of Spawning SMZs. Data could be collected via online survey, or during public meetings. The outcomes could be used to evaluate communication and outreach strategies.

Deliverables: Report

Priority: Medium

Schedule: Long-term

Budget: $10,000

Potential Partners: NMFS, SAFMC, and academic scientists

Projects Completed or Underway: None.

Action Item 16: *Engage stakeholders in a citizen science program to collect data used to evaluate the effectiveness of Spawning SMZs.*

Priority Ranking: 4

Task: A citizen science program is initiated and engages stakeholders in the collection of data to evaluate the effectiveness of Spawning SMZs.

Justification: Due to a limited budget, a Citizen Science Program is needed to gather data to assist in the evaluation of the Spawning SMZs 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 Spawning SMZs.

Deliverables: Information to be included in the Spawning SMZ Evaluation Report

Priority: Medium

Schedule: Short-term

Budget:

Potential Partners: NMFS, SAFMC, fishermen, and academic scientists

Projects Completed or Underway:

- SAFMC is developing a Citizen Science Program.

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 similar to the outreach component of the Amendment 14 to the Snapper Grouper Fishery Management Plan (SAFMC 2007), the Council's *Oculina* Experimental Closed Area (OECA) Evaluation Plan (2005), and the Deepwater MPAs SMP.

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, NMFS, 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).

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

Goal 3: <u>Improve public's environmental awareness and knowledge about Spawning SMZs</u>

Obj. I: Increase public's level of knowledge about the purpose for, importance of, and

regulations in Spawning SMZs.

Obj. J: Enhance and strengthen stakeholder participation in co-management of Spawning SMZs.

Obj. K: Enhance or maintain existence value of Spawning SMZs.

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.
- SMP developed through transparent and open process.
- Compliance with the Spawning SMZ regulations is fostered through targeted communication.

The following eight outreach action items would be initiated by either Council staff and/or 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 the Spawning SMZs.*

Tasks: Identify manufacturers of commonly used fishing charts in the South Atlantic, contact manufacturers and coordinate methods to update products.

Justification: Fishermen have expressed concerns that commonly used charts do not currently portray the coordinates and restrictions for new Spawning SMZs.

Deliverables: Add information to electronic and printed charts. Labels would apply to 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.

Potential Partners/Roles: SAFMC staff will work with NOAA's Marine Charting Division to investigate if Spawning SMZ 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 SAFMC 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 the South Atlantic, contact manufacturers and coordinate methods to update products.

Justification: Fishermen have requested to have the boundaries of Spawning SMZs be 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: Have 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 will work with GPS manufacturers to investigate if Spawning SMZ boundaries and regulations can be included in a new proposed digital overlay of marine protection boundaries.

Action Item 3: *Incorporate new information about Spawning SMZs and rack cards (Northern and Southern SMZs) into the Council's mobile application, SA Fishing Regulations.*

Tasks: Develop new area specific rack cards – one for the Northern Spawning SMZs (Carolinas/Georgia) and one for the Southern Spawning SMZs (Florida). These new rack cards would be incorporated and made available on the Council's website and the Council'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), website management company (Nassau Web Design).

Action Item 4: *Develop a video presentation about Spawning SMZs; post on the SAFMC website and You Tube, and disseminate to fishing clubs, environmental groups, state Sea Grant programs, local governments, etc.*

Tasks: Design and create a video to highlight information on spawning fish and habitat, Spawning SMZs locations and regulations, etc.

Justification: Creation of a video presentation and online publishing provides a quick method to distribute information for use by various audiences that can be readily updated.

Deliverables: PowerPoint presentation on SAFMC website and You Tube.

Schedule: Year 1: Produce and distribute PowerPoint; Years 2-5: update as necessary with current news and information on research and monitoring.

Budget: $10,000

Potential Partners/roles: SAFMC Outreach Staff.

Action Item 5: *Expand the SAFMC's existing Managed Areas web pages to provide comprehensive education and outreach products about Spawning SMZs. Publicize availability of information by having links posted on other fishing, NGO, and tourism related websites.*

Tasks: Enhance the SAFMC's Managed Areas web pages and integrate materials such as a PowerPoint Presentation and links to other relevant sites. Publicize the availability of web-based information.

Justification: The SAFMC website is the best medium for maintaining comprehensive, dynamic content and imagery. The availability of this information can be publicized from other existing high profile websites.

Deliverables: New material for website, App, and promotions.
Schedule: Year 1: Develop expanded content with feedback from the Council's Information and Education 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: SAFMC Outreach Staff, state marine resource agencies, NMFS SEFSC and SERO, NOAA OLE, and Sea Grant.

Action Item 6: *Develop a list of key contacts (tackle shops, state parks, county government offices, outreach staff in other agencies, etc.) in port communities near Spawning SMZ sites for targeted outreach efforts and materials.*

Tasks: Enhance targeted communication and outreach efforts about Spawning SMZs through development of a database of key contacts in coastal communities in close proximity to Spawning SMZ sites. Working with partners to identify key contacts will be critical to developing the contacts database.
Justification: Identifying key contacts that facilitate information exchange within their local communities (tackle shops, state parks, county government offices, outreach staff in other agencies, etc.) will help streamline outreach efforts about specific Spawning SMZ sites.
Deliverables: Database of key contacts in coastal communities.
Schedule: Year 1, work with program partners to develop database by state; Years 2-5, update database as needed.
Budget: Years 1-5, staff time.
Potential Partners/roles: SAFMC Outreach Staff, state marine resource agencies, NMFS SEFSC, and Sea Grant.

Action Item 7: *Develop area-specific rack cards of Spawning SMZs (NC/SC/GA and FL) for print, website, and mobile application.*

Tasks: New area specific rack cards – one for the Northern Spawning SMZs (Carolinas/Georgia) and one for the Southern Spawning SMZs (Florida) in the region – will be developed and distributed to targeted businesses and fishing tournament directors and webpage and mobile application will be developed.
Justification: Effectively designed rack cards would draw attention to the Spawning SMZs 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 Spawning SMZs (Carolinas/Georgia) and one for the Southern Spawning SMZs (Florida) in the region – and receive input from the SAFMC's Information and Education 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 Outreach Staff, SAFMC Information and Education AP, state marine resource agencies, NMFS SEFSC, and Sea Grant.

Action Item 8: *Develop a SAFMC Spawning SMZs informational brochure designed for fishermen to be added to SAFMC website.*

Tasks: Develop an informational brochure about spawning fish and habitats, the purpose of Spawning SMZs and regulations within Spawning SMZs for distribution to fishery stakeholders.
Justification: The informational brochure will provide a summary of regulations and information for the Spawning SMZs as well as an identification chart for snapper/grouper species found in the region. The brochure will be available on the SAFMC website.
Deliverables: SAFMC informational Spawning SMZs brochures.
Schedule: Year 1: Develop brochure and receive input from the Council's I&E AP; Year 2: develop webpage for Spawning SMZ brochure; Years 3-5: update as necessary.
Budget: Year 1: Staff time; Year 2: webpage development.
Potential Partners/roles: SAFMC Outreach Staff, state marine resource agencies, SAFMC Information & Education Advisory Panel, NMFS SEFSC, and possible contractual graphic designer (if not produced in-house).

Action Item 9: *Develop and distribute news releases (coordinating with local contacts) to describe research and monitoring projects and the ecological importance of the Spawning SMZs.*

Tasks: Create science-based news releases relevant to ongoing research and monitoring activities in Spawning SMZs with a focus on habitat, snapper grouper species, and ecosystem-based management. Coordinate releases with ongoing activities and strive to provide high-resolution photos and graphics to media.
Justification: The news releases will increase awareness of all activities in the Spawning SMZs.
Deliverables: News releases; outlets may include NOAA News, local and national media, and Environmental News Network. The news releases will be coordinated with ongoing activities and include high-resolution photos and graphics.
Schedule: 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: Staff time.
Potential Partners/roles: SAFMC Outreach Staff, state marine resource agencies, NMFS SEFSC and SERO, NOAA OLE, and Sea Grant.

3.4.4 Administrative Action Items

The Council is developing the proposed Spawning SMZs through the FMP amendment process. The process involves public meetings such as expert working group meetings, scoping meetings, and public hearings.

An evaluation of whether the proposed Spawning SMZs are meeting the Council's goals will be conducted periodically with updates on accomplishments and tracking of action items. Amendment 36 proposes a sunset provision that will remove the Spawning SMZ designation for the South of Cape Lookout, Devil's Hole, and Warsaw Hole Spawning SMZs after implementation if not reauthorized. The SCDNR intended Areas 51 and 53, which are artificial reefs, to be reefs with no snapper grouper fishing. The evaluation of the Spawning SMZs will be conducted by a SMP AP, which could consist of representatives from law enforcement, research scientists, commercial fishermen, recreational fishermen, outreach experts, NGOs, and NMFS staff. A report will be written by the SMP IPT, similar to the development of amendments. Council staff will be the lead for compiling the document with assistance from the NMFS. The SMP AP will first

review the Spawning SMZ 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 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 Spawning SMZs will require action by the Council, which can be done through a framework procedure if approved in Amendment 36.

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 Spawning SMZ 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
A 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.

Action Item 1: *Develop a SMP for evaluation of Spawning SMZs through a public process.*

Tasks: Develop a SMP for Spawning SMZs.
Justification: The SMP will be used to develop the goals and objectives for management of Spawning SMZs and provide a process for review of the Spawning SMZ management.
Deliverables: SMP Evaluation Report.
Schedule: Year 1: Develop the SMP for the Spawning SMZs.
Budget: $9,587.50 (Note: This is the same cost from the Deepwater MPA SMP)
Potential Partners/roles: SAFMC, contractors (Michelle Tishler and Ken Lindeman), and NMFS.

Tasks: Form Advisory Panel for the SMP.
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.

Tasks: SMP AP review and provide recommendations based on data collected from Spawning SMZs and review and provide recommendations on the evaluation report.
Justification: The SMP AP review will provide advice to the Council on Spawning SMZs and improvements for the evaluation report.
Deliverables: Yearly meetings and Evaluation Report.
Schedule: Year 2: Review information collected in Spawning SMZs. The year for Evaluation Report will be determined by Council. The SMP AP will review and provide comments on

the evaluation report.
Budget: $5,000 for annual review and $15,000 for evaluation report
Potential Partners/roles: SAFMC, NMFS, and APs.

3.5 Management Effectiveness Evaluation

The effectiveness and management of the SMP and the five proposed Amendment 36 Spawning SMZs will be evaluated, 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, NOAA 2007, Leverington et al. 2010, Commission for Environmental Cooperation 2011, NOAA 2011, Coastal Conservation and Education Foundation 2011, Gleason et al. 2013).

This section describes methods for evaluation focusing on Design/Planning, Adequacy/ Appropriateness, and Delivery (**Figure 3.5.1**). This SMP was constructed after the initial designing and planning phase for Amendment 36, but management is an adaptive process that can and should change over time. A goal for the Amendment 36 is to identify and protect spawning habitats and spawning fish for multiple reef fish species including speckled hind and warsaw grouper through Spawning SMZs.

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 Spawning SMZs were conducted through the amendment process that included a special working group to assist in the selection of appropriate potential Spawning SMZ sites, solicitation of public comments, review and comments by APs and SSC, and Spawning SMZ selection by the Council. Any changes to the Spawning SMZs will be required to follow the Council's FMP amendment or framework process; therefore, the designing 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 designing 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 36 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).

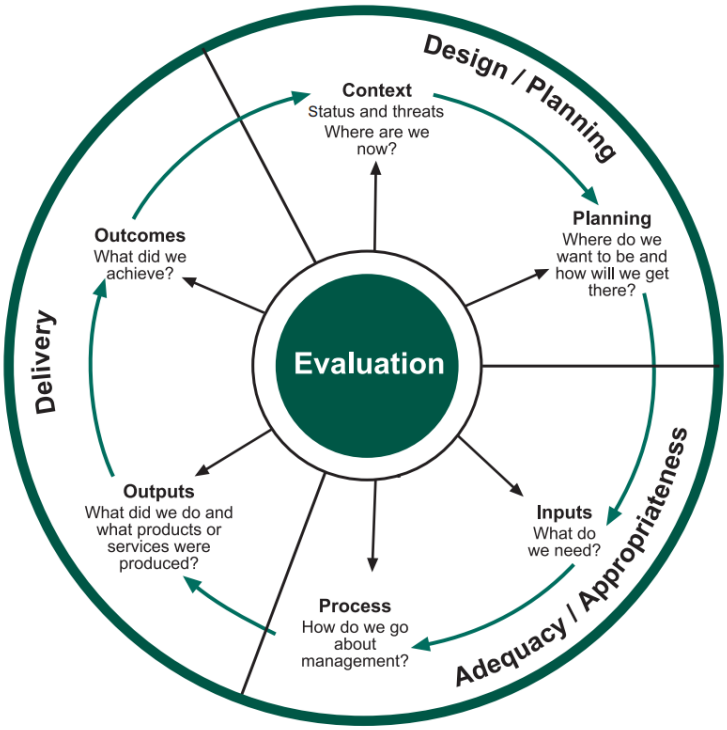

Figure 3.5.1. Management effectiveness framework for protected areas (Hockings et al. 2006).

3.5.1 Goals and Objectives

The goal of Spawning SMZs is to protect habitat important for spawning of snapper-grouper species. With the increased protection in the Spawning SMZ, the number of spawning individuals should increase and lead to spillover of snapper grouper species outside of Spawning SMZs. During the development of Amendment 36, a list of species was developed to define the species of interest for creating and evaluating the Spawning SMZs and their stock statuses are in **Table 3.5.1**. The goals and objectives developed for the SMP will need to be reviewed periodically to adapt to management goals and objectives from the fishery management plan. The following sections contain metrics for evaluating Spawning SMZs and accomplishing SMP Goals and Objectives. The SMP Goals and Objectives are:

Goal 1: <u>Develop and adopt an effective process to evaluate and refine management of Spawning SMZs</u>

- Obj. A: Develop a SMP for Spawning SMZs to enhance or improve management of habitats where spawning of multiple snapper grouper species is likely to occur or documented based on input from scientists, fishermen, and the public.
- Obj. B: Implement the SMP.
- Obj. C: Ensure a co-management system that is efficient and representative of fishery stakeholders.
- Obj. D: Develop, increase, or maintain co-management support from fishermen through cooperative research and citizen science projects within the Spawning SMZs.
- Obj. E: Conduct evaluations on the knowledge regarding spawning within each site at Council approved intervals.

Goal 2: Increase or maintain knowledge and protection of important spawning locations through research and monitoring

- Obj. F: Acquire and deploy resources to enhance knowledge on the spawning locations in the South Atlantic for the focal species.
- Obj. G: Increase habitat characterization of potential or selected Spawning SMZs.
- Obj. H: Protect habitats where spawning is likely to occur or is documented for multiple snapper grouper species from anthropogenic impacts.

Goal 3: Improve public's environmental awareness and knowledge about Spawning SMZs

- Obj. I: Increase public's level of knowledge about the purpose for, importance of, and regulations in Spawning SMZs.
- Obj. J: Enhance and strengthen stakeholder participation in co-management of Spawning SMZs.
- Obj. K: Enhance or maintain the existence values of Spawning SMZs.

Goal 4: Enhance enforceability and compliance within the Spawning SMZs

- Obj. L: Increase user participation in surveillance and monitoring.
- Obj. M: Maintain or improve surveillance and monitoring of Spawning SMZs via satellites, drones, research vessels, etc.
- Obj. N: Increase or maintain compliance with regulations within the Spawning SMZs through targeted communication.
- Obj. O: Improve or maintain application of law and regulations within the Spawning SMZs.
- Obj. P: Consider Law Enforcement AP recommendations for protected areas when developing, designating, and managing Spawning SMZs.

Goal 5: Research and monitor impact of invasive species

- Obj. Q: Improve understanding of invasive lionfish ingress into and near Spawning SMZs.
- Obj. R: Identify if lionfish have impacts on fish communities in or near Spawning SMZs.

Table 3.5.1. Stock status of Spawning SMZ focal species in the South Atlantic. The stock status is based on the most recent SEDAR assessment if conducted or the NMFS stock status report.

Species	Assessment	Year	Overfished	Overfishing
Greater amberjack	SEDAR 15	2008	No	No
Coney			Unknown	Unknown
Graysby			Unknown	Unknown
Goliath grouper	SEDAR 23	2011	Unknown	Unknown
Nassau grouper			Proposed ESA[+]	Unknown
Red grouper	SEDAR 19a	2010	Yes	Yes
Red hind			Unknown	Unknown
Rock hind			Unknown	Unknown
Speckled hind	Potts and Brennan	2001	Unknown	Yes*
Snowy grouper	SEDAR 36	2013	Yes	No
Warsaw grouper	Huntsman et al.	1992	Unknown	Yes*
Black grouper	SEDAR 19b	2010	No	No
Gag	SEDAR 10 Update	2014	No	Yes
Scamp			Unknown	Unknown
Blackfin snapper			Unknown	Unknown
Cubera snapper			Unknown	Unknown
Mutton snapper	SEDAR 15 Update	2015	No	No
Red snapper	SEDAR 24	2010	Yes	Yes
Silk snapper			Unknown	Unknown
Yellowtail snapper	SEDAR 27A	2012	No	No
Golden tilefish	SEDAR 25	2011	No	No
Blueline tilefish	SEDAR 32	2013	No	Yes

*Current overfishing status was based on NMFS Stock Status Report 2015 http://www.nmfs.noaa.gov/sfa/fisheries_eco/status_of_fisheries/archive/2015/second/overfished_overfishing_stocks_q2_2015.pdf

[+]Nassau grouper was proposed as an ESA listed species indicating the population is at low levels.

Metrics

The metrics below are designed to evaluate the effectiveness of Spawning SMZs 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

Since a goal of the Spawning SMZs is to identify and protect important habitat for spawning snapper grouper species, the biophysical indicators of the Spawning SMZs include metrics related to spawning, population structure, and habitat. The SMP IPT developed the indicators to rate the effectiveness of proposed Spawning SMZs. The Spawning SMZs 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 number or percentage of individuals collected during spawning season within the Spawning SMZ that are in spawning condition, comparing the number of spawning individuals inside and outside Spawning SMZs, and the number of individuals identified in spawning condition. 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 or proxies of spawning. 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 mapping of Spawning SMZs. The mapping metrics could include area mapped within and outside Spawning SMZs 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 Spawning SMZs or efforts to complete research in Spawning SMZs.

Potential Metrics for abundance (consider items below).

A. Number of samples in spawning condition within Spawning SMZ.
B. Compare number of spawning individuals inside and outside of Spawning SMZ.
C. The number of spawning individuals identified by method of determination.

Potential Metric for Population Structure (consider items below).

A. For groupers, males are xx% of the population.
B. For tilefish, sex ratio is xx females: xx males.
C. For size structure, xx% of the population is 75% of the maximum length.
D. For size structure, xx% of the population is greater than the size of maturity.
E. For age structure, xx% of the population is greater than the age of maturity.
F. Compare expected growth rates from assessment model or population model with observed growth rates.

Potential Metric for Habitat Mapping (consider items below).

A. X% of Spawning SMZs mapped.
B. X% of the area outside Spawning SMZs mapped (5 mile radius).
C. Habitat type characterized inside Spawning SMZs.

Table 3.5.2.1. Example table for abundance metric. The metric could include number or percent of individuals in spawning condition, a comparison of spawning individuals inside and outside a Spawning SMZ.

Species	Pre-Closure	2016-2020	2021-2025
Greater Amberjack			
Coney			
Graysby			
Goliath grouper			
Nassau grouper			
Red grouper			
Red hind			
Rock hind			
Speckled hind			
Snowy grouper			
Warsaw grouper			
Yellowedge grouper			
Black grouper			
Gag			
Scamp			
Blackfin snapper			
Cubera snapper			
Mutton snapper			
Red snapper			
Silk snapper			
Yellowtail snapper			
Golden tilefish			
Blueline tilefish			

Table 3.5.2.2. Life history examples that could be used to compare size or age structure in the Spawning SMZs pre- and post-closure.

Species	Predicted max (cm)	75% Max Size	Maximum Age	Size of Maturity	Age of Maturity	Source	Preclosure	2016-2020
Greater amberjack	119	89	17	73	1	SEDAR 2008		
Coney	38	29	19			Burton et al. 2015		
Graysby	45	34	13			Potts and Manooch 1999		
Goliath grouper	250	187.5	37	110-120	5-6	SEDAR 2011a		
Nassau grouper	122	91.5	29	44-50	4-5	U.S. OFR 2014		
Red grouper	85	63.75	26	49	2-3	SEDAR 2010b		
Red hind	57	43	11 to 22	24	2	Williams and Carmichael 2009, Cushion 2010		
Rock hind	50	37.5	12			Potts and Manooch 1995		
Speckled hind	110	82.5	35	81	4-7	Williams and Carmichael 2009		
Snowy grouper	122	91.5	27/40	54.1	5	SEDAR 2013b		
Warsaw grouper	230	172.5	41			Williams and Carmichael 2009		
Yellowedge grouper	97	73	85	51	7	Cook 2007		
Black grouper	133	99.75	33	86	6-7	SEDAR 2010a		
Gag	91	68.25	30	65	3	SEDAR 2014		
Scamp	107	80.25	30	35	1-2	Harris et al. 2002		
Blackfin snapper	62-73					Ault et al. 2008		
Cubera snapper	130	98		70		Martinez-Andrade 2003		
Mutton snapper	86	65	40	35	2	O'Hop et al. 2015		
Red snapper	90	68	54	37	2	SEDAR 2010c		
Silk snapper	83	62.25	33	45	5	Martinez-Andrade 2003		
Yellowtail snapper	62	47	23	23	2	O'Hop et al. 2012		
Golden tilefish	125	93.75	40/50	<61	3	SEDAR 2011b		
Blueline tilefish	90	67.5	43	~36	3	SEDAR 2013a		

U.S. OFR=U.S. Office of Federal Register.

Table 3.5.2.3. Habitat mapping metrics for Spawning SMZ area mapped**.**

MPA	Total Area	Area Mapped	% Likely Spawning Habitat
South Cape Lookout			
Devil's Hole			
Warsaw Hole			

Table 3.5.2.4. Habitat mapping metrics for area mapped within 5 miles of Spawning SMZs.

MPA	Total Area	Area Mapped	% Likely Spawning Habitat
South Cape Lookout			
Area 51			
Area 53			
Devil's Hole			
Warsaw Hole			

3.5.3 Socioeconomic Indicators

When the Council selected the preferred Spawning SMZs, 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. Metrics were selected by the SMP IPT to rate the effectiveness of the Spawning SMZs based on the socioeconomic indicators.

Table 3.5.3.1. Socioeconomic metrics for the Spawning SMZ System Management Plan.

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

3.5.4 Governance Indicators

The governance indicators of Spawning SMZs focuses on the SMP after the Spawning SMZs have

been created. Selection of Spawning SMZs is a management decision for the Council and needs to be considered in the amendment or framework process. The governance indicators cover important aspects of managing Spawning SMZs including review of Spawning SMZs, 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 Spawning SMZs.

Metric	Yes/No
SMP formed. Evaluation conducted. SMP AP met.	

Table 3.5.4.2. Governance outreach metrics for evaluating Spawning SMZs.

Metric	Yes/No
Short-term outreach action items created. Outreach items updated and web page developed with new management regulations. Point of Contact (POC) designated for Spawning SMZs in SAFMC, SERO, and SEFSC. List of key contacts created. SAFMC communicate with key contacts 2 times per year. Collaboration with agencies and organizations for teacher workshops initiated and maintained. Download of boundary files for use with GPS units tracked. Polls developed to track stakeholder's knowledge of Spawning SMZs. Questions added regarding Spawning SMZs during interviews with fishermen.	

Table 3.5.4.3. Governance law enforcement metrics for evaluating Spawning SMZs.

Enforcement	Yes/No
Number of patrols exceeds 5 patrols/year/ Spawning SMZ. Enforcement vessels in state adjacent to Spawning SMZ increased or maintained. Updates on enforcement and adjudication provided to the Council regarding Spawning SMZs. Enforceability ratings maintained or increased for Spawning SMZs.	

Table 3.5.4.4. Governance compliance metrics for evaluating Spawning SMZs.

Metric	Yes/No
Number of citations is greater than 2/year.	
Percent of patrols with violation is less than 20%/year.	
Remote monitoring methods for Spawning SMZs reviewed.	
Remote monitoring method for Spawning SMZs 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					
	Year 1	Year 2	Year 3	Year 4	Year 5	
AI 1: Establish cooperative enforcement	$0	$0	$0	$0	$0	*In conjunction with LEAP meeting*
AI 2: Maintain or increase enforceability	$200,000	$200,000	$200,000	$200,000	$200,000	*$1,000,000*
AI 3: Patrol Spawning SMZs	$ 66,000	$ 66,000	$ 66,000	$ 66,000	$ 66,000	*$330,000*
AI 4: Establish Remote Monitoring Program	$0	$125,000	$125,000	$125,000	$125,000	*$500,000*
AI 5: Establish Citizen Science Program for estimating enforcement effort and database						
AI 6: Report enforcement and compliance activities to SAFMC	$0	$0	$0	$0	$0	*$0*
AI 7: Provide compliance assistance to stakeholders	$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 or improve adjudication	$0	$0	$0	$0	$0	*$0*
TOTAL Budget:	**$266,000**	**$391,000**	**$391,000**	**$391,000**	**$391,000**	***$1,830,000***

Table 3.6.2. Estimated costs of Research and Monitoring Action Items.

Research and Monitoring Action Items (AI)	Estimated Annual Cost					Total Estimated Cost Over 5 Years
	Year 1	Year 2	Year 3	Year 4	Year 5	
AI 1: Locate spawning areas (cost per site)	$50,000 per site	$50,000 per site	$50,000 per site	$50,000 per site	$50,000 per site	*$250,000*
AI 2: Determine pre-closure species distribution	Staff Time	Staff Time				*Staff time*
AI 3: Locate nursery sites						
AI 4: Model larval dispersal						
AI 5: Monitor Spawning SMZs						
AI6: Track fish within Spawning SMZs	>$1,000,000	>$500,000	>$500,000	>$500,000	>$500,000	*>$3,000,000*
AI 7: Characterize spawning indicators						
AI 8: Characterize fish communities within Spawning SMZs						
AI 9: Mapping of the Spawning SMZs with multibeam						
AI 10: Mapping of the area around Spawning SMZs with multibeam						
AI 11: Ground truth the habitat classification						
AI 12: Develop habitat classification maps						
AI 13: Develop socioeconomic study						
AI 14: Track stakeholder knowledge about Spawning SMZs						
AI 15: Monitor stakeholder perceptions about Spawning SMZs						
AI 16: Engagement of stakeholders in Citizen Science Program						
TOTAL Budget:						

Table 3.6.3. Estimated costs of Outreach and Education Action Items. Action items are listed in ranked order.

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 include Spawning SMZs on paper and electronic charts	TBD	$1,000	TBD	TBD	TBD	*$1000 but dependent on manufacturer approached*
AI 2: Develop Spawning SMZ boundary map files for GPS units	$1,000	$1,500	$500	$250	$250	*$3,500*
AI 3: Develop new rack cards into mobile app, SA Fishing Regulations	$200	$0	$0	$0	$0	*$200*
AI 4: Develop video presentation	$0	$10,000	$0	$0	$0	*$10,000*
AI 5: Expand the Managed Areas web pages with new products on Spawning SMZs	$0	$2,000	$0	$0	$0	*$2,000*
AI 6: Develop list of key contacts for outreach efforts and materials	$0	$0	$0	$0	$0	*$0*
AI 7: Develop area-specific rack cards for Spawning SMZs	$1,000	$1,500	$500	$250	$250	*$3,500*
AI 8: Develop SAFMC Spawning SMZ brochure (website only)	$0	$2,000	$0	$0	$0	*$2,000*
AI 9: Develop and distribute news releases	$0	$0	$0	$0	$0	*$0*
TOTAL Budget:	**$2,200**	**$18,000**	**$1,000**	**$500**	**$500**	***$22,200***

Table 3.6.4. Estimated costs of Administrative Action Items. All 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 Spawning SMZs	$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 Spawning SMZ Evaluation Report will be submitted by a Council-specified date. The SMP IPT will provide data for the Spawning SMZ Evaluation Report and the SMP AP should evaluate the size, configuration, and regulations of the Spawning SMZs, as well as objectives, goals, tasks, and metrics. Each subsequent review of the Spawning SMZs 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. The timeline for submission to the Council should also consider the rule-making process if a sunset provision is retained for South of Cape Lookout, Devil's Hole, and Warsaw Hole Spawning SMZs.

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 five Spawning SMZs are located in federal waters 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 70 to 453 feet in depth off the coasts of North Carolina to south Florida from latitudes 33°35´N to 24°20´N. Two maps are provided with the location of the proposed sites and along with relative size. The first map includes North Carolina and South Carolina with South of Cape Lookout and Devil's Hole Spawning SMZs (**Figure 4.1**). The second map includes Florida with the Warsaw Hole proposed Spawning SMZ (**Figure 4.2**). Also included on the maps are the Deepwater MPAs created in Amendment 14 to the Snapper Grouper Fishery Management Plan for the South Atlantic Region. Area 51 and 53, which are artificial reefs, are not currently mapped and will be added to the maps when regulations become effective to prevent snapper-grouper fishing on these reefs.

Essential Fish Habitat Considerations of the Sites

The Council has established that SMZs are identified at a high level of conservation with their designation as Essential Fish Habitat - Habitat Areas of Particular Concern. Spawning SMZs in combination with existing Deepwater MPAs provide a network of protected areas. Fully characterizing Spawning SMZs 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 Spawning SMZs 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

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,

benefits to fishermen and coastal communities would be associated with biological benefits that result from prohibiting or restricting harvest in the designated area. If there is improvement in a stock over time, more fish available, this could benefit fishermen due to the expected spillover effect from closed areas. Additionally, improved fish stock health that fishermen observe first hand would also help improve buy-in for closed areas.

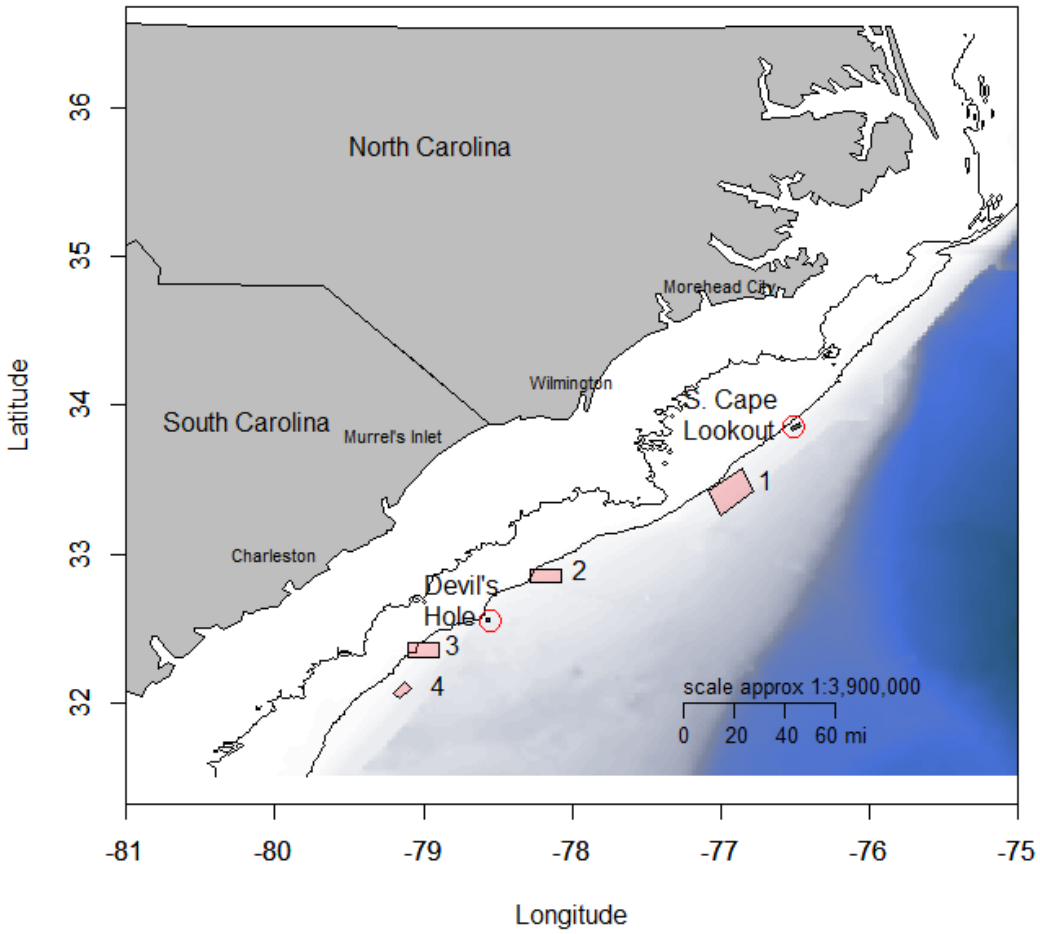

Figure 4. 1 Map of preferred Spawning SMZs off the Carolinas: South of Cape Lookout and Devil's Hole. The preferred Spawning SMZs are the black dot within the red circle (used to assist in locating on map). The Deepwater MPAs (red boxes) are included for reference along with two depth contour lines at 100 and 200 feet. 1=Snowy Wreck MPA, 2=Northern South Carolina MPA, 3=Edisto MPA, 4=Charleston Deep Artificial Reef MPA. Map is for illustrative purposes only.

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, closing an area could negatively affect business profits in the short-term. For private recreational anglers, restricted access could negatively affect fishing opportunities and trip satisfaction. Additionally, Spawning SMZs are specifically designed to protect spawning habitat, and this could be detrimental for fishermen who target a particular species at certain locations where fish are aggregating.

Designating an area as a Spawning SMZ and prohibiting fishing for snapper grouper species would require compliance via buy-in from the public and enforcement. If these are lacking, the Spawning

SMZ may not generate the expected biological benefits, which would negatively affect fishermen and communities. **Amendment 36 Section 3.3.3** describes the communities and fishermen who may be affected by establishment of Spawning SMZs.

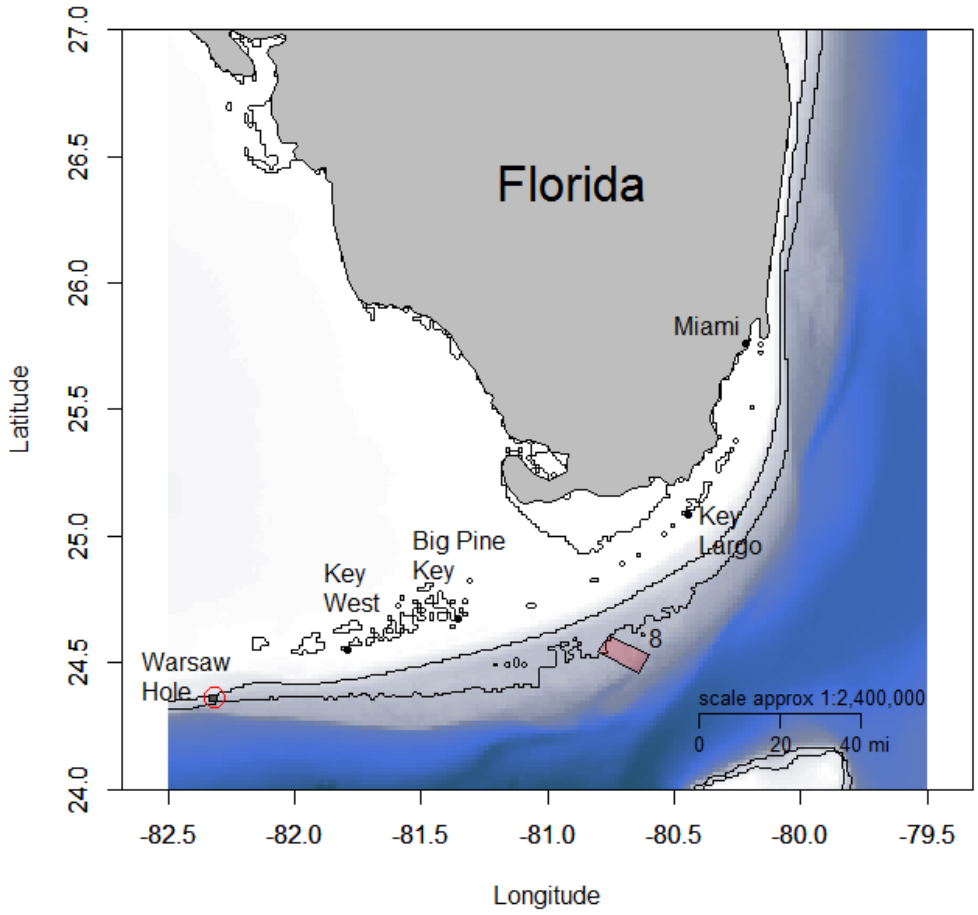

Figure 4. 2 Map of preferred Spawning SMZ off Florida: Warsaw Hole. The preferred Spawning SMZ is the black dot within the red circle (used to assist in locating on map). A Deepwater MPA (red boxes) is included for reference along with two depth contour lines at 100 and 200 feet. 8=East Hump MPA. Map is for illustrative purposes only.

4.1 South of Cape Lookout

Location and Zoning

The South of Cape Lookout Spawning SMZ is 64 miles from South Inlet in North Carolina and encompasses 5 square miles. The depth on the inshore side of the Spawning SMZ is 246 feet and on the offshore side is 453 feet.

The coordinates are:

Latitude	Longitude
33° 53.040’	76° 28.617’
33° 52.019’	76° 27.798’
33° 49.946’	76° 30.627’
33° 51.041’	76° 31.424’

Source: Roger Pugliese, SAFMC Staff

Habitat and Managed Species Characterization

The South of Cape Lookout location has been sampled during a NMFS ROV study and by SERFS. The habitat was observed in 2004 and the hardbottom habitat was described as pavement with numerous cracks and crevices and nearby the Spawning SMZ the habitat included hard bottom habitat consisting of Scleractinia hard coral, octocoral, and sponges. The ROV reported twenty-three species on one dive (**Table 4.1.1**) including graysby, which is a focal species for Spawning SMZs. SERFS has sampled the proposed Spawning SMZ and collected data on rock hind, speckled hind, red grouper, yellowmouth grouper, gag, scamp, greater amberjack, red porgy, gray triggerfish, silk snapper, and blueline tilefish (**Table 4.1.2**). Red grouper and scamp, which are both focal species, have been collected in spawning condition along with one red porgy in spawning condition.

Table 4.1.1. List of fish observed by the NMFS ROV dive in 2004 in the preferred South of Cape Lookout Spawning SMZ. Species in bold indicate focal species.

Common Name	Scientific Name	Common Name	Scientific Name
Moray Eel	*Muraenidae*	Reef Butterflyfish	*Chaetodon sedentarius*
Squirrelfish	*Holocentridae*	Blue Angelfish	*Holacanthus bermudensis*
Lionfish	*Pterois volitans*	Rock Beauty	*Holacanthus tricolor*
Creolefish	*Paranthias furcifer*	French Angelfish	*Pomacanthus paru*
Graysby	***Cephalopholis cruentata***	Yellowtail Reeffish	*Chromis enchrysura*
Tattler	*Serranus phoebe*	Sunshinefish	*Chromis insolata*
Bigeye	*Priacanthus arenatus*	Unidentified damselfish	*Chromis sp.*
Short Bigeye	*Pristigenys alta*	Spotfin Hogfish	*Bodianus pulchellus*
Twospot Cardinalfish	*Apogon pseudomaculatus*	Unidentified wrasse	*Halichoeres sp.*
Sand Tilefish	*Malacanthus plumieri*	Doctorfish	*Acanthurus sp.*
Unidentified amberjack	*Seriola sp.*	Sharpnose Puffer	*Canthigaster rostrata*
Spotfin Butterflyfish	*Chaetodon ocellatus*		

Table 4.1.2. List of focal species and select other fish collected by Southeast Reef Fish Survey in the preferred South of Cape Lookout Spawning SMZ. Size of Maturity references in Table 3.5.2.2. Avg TL= Average Total Length.

Focal Species	Number Caught	Avg TL (cm)	Size of Maturity (cm)	Number in Spawning Condition	Avg TL in Spawning Condition
Greater Amberjack	1	115	73		
Speckled Hind	5	55	81		
Red Hind	1	37	24		
Red Grouper	18	69	49	2	73
Gag	2	77	65		
Scamp	5	69	35	2	71
Silk Snapper	9	51	50		
Blueline Tilefish	1	48	~36		

Other Species	Number Caught	Avg TL (cm)
Yellowmouth Grouper	1	59
Red Porgy	3	47
Gray Triggerfish	1	53

4.2 Area 51

The SCDNR experimental artificial reef site designated as Area 51 was established April 24, 1998 to investigate the feasibility of using artificial reef materials as an experimental MPA. The preferred Spawning SMZ for Area 51 encompasses 1.5 mile X 1.5 miles of the permitted artificial reef site located in approximately 70 feet of water off the South Carolina coast on sandy bottom.

Location and Zoning

Coordinates will be added to the SMP when the Final Rule publishes.

Habitat and Managed Species Characterization

The bottom composition of Area 51 is sandy bottom enhanced with artificial reef materials that were placed in the area beginning in 1998. SCDNR has been sampling this artificial reef site through the Artificial Reef Program. Forty-three species have been observed by SCDNR on the artificial reef including greater amberjack, red grouper, scamp, gag, warsaw grouper, and red snapper, which are focal species of the Spawning SMZs (**Table 4.2.1**). Neither the NMFS ROV study nor the SERFS has sampled this location.

Table 4.2.1. Species observed at Area 51 since the material has been placed in the area by SCDNR. Bolded species are focal species identified in Amendment 36. Source: Robert Martore, SCDNR.

Common Name	Scientific Name	Common Name	Scientific Name
Black Sea Bass	*Centropristis striata*	Southern Hake	*Urophycis floridana*
Bank Sea Bass	*C. ocyurus*	Barracuda	*Sphyraena barracuda*
Gray Triggerfish	*Balistes capriscus*	Remora	*Remora remora*
Red Grouper	***Epinephelus morio***	Cubbyu	*Pareques acuminatus*
Scamp	***Mycteroperca phenax***	Gulf Flounder	*Paralichthys albigutta*
Gag	***M. microlepsis***	Slippery Dick	*Halichoeres bivittatus*
Warsaw Grouper	***Hyporthodus nigritus***	Pearly Razor	*Xyrichtys novacula*
Red Snapper	***Lutjanus campechanus***	Tautog	*Tautoga onitis*
Vermillion Snapper	*Rhomboplites aurorubens*	Surgeonfish	*Acanthurus sp.*
Cobia	*Rachycentron canadum*	Spotted Goatfish	*Pseudupeneus maculatus*
Whitebone Porgy	*Calamus leucosteus*	Inshore Lizardfish	*Synodus foetens*
Sheepshead	*Archosargus probatocephalus*	Oyster Toadfish	*Opsanus tau*
Greater Amberjack	***Seriola dumerili***	Batfish	*Ogcocephalus sp.*
Spot	*Leiostomus xanthurus*	Southern Stingray	*Dasyatis americana*
White Grunt	*Haemulon plumierii*	Nurse Shark	*Ginglymostoma cirratum*
Pigfish	*Orthopristis chrysoptera*	Sandbar Shark	*Carcharhinus plumbeus*
Blue Angelfish	*Holacanthus bermudensis*	Spotted Moray	*Gymnothorax moringa*
Atlantic Spadefish	*Chaetodipterus faber*	Round Scad	*Decapterus punctatus*
Spottail Pinfish	*Diplodus holbrooki*	Scup	*Stenotomus chrysops*
Pinfish	*Lagodon rhomboides*	Reef Butterflyfish	*Chaetodon sedentarius*
Tomtate	*Haemulon aurolineatum*	Loggerhead Sea Turtle	*Caretta caretta*
Planehead Filefish	*Stephanolepis hispidus*		

4.3 Area 53

Due in part to the results obtained from work on the Area 51 reef site, the SAFMC provided funding to replicate the study design of Area 51 in deeper water in order to specifically target a wider range of snapper-grouper species. The permitting process and all reef parameters for the new site, designated Area 53, were identical to Area 51 except that water depth for this site was 105 feet. The preferred Spawning SMZ for Area 53 encompasses 1.5 mile X 1.5 miles of the permitted artificial reef site.

Location and Zoning

Coordinates will be added to the SMP when the Final Rule publishes.

Habitat and Managed Species Characterization

The bottom composition of Area 53 is sandy bottom enhanced with artificial reef materials that were placed in the area beginning in 2003. Forty-two species have been recorded on the artificial reef including greater amberjack, scamp, gag, warsaw grouper, and red snapper, which are focal species of the Spawning SMZs (**Table 4.3.1**). Neither the NMFS ROV study nor the SERFS has sampled this location.

Table 4.3.1. Species observed at Area 53 since the material has been placed in the area by SCDNR. Bolded species are focal species identified in Amendment 36. Source: Robert Martore, SCDNR.

Common Name	Scientific Name	Common Name	Scientific Name
Black Sea Bass	*Centropristis striata*	Southern Hake	*Urophycis floridana*
Bank Sea Bass	*C. ocyurus*	Barracuda	*Sphyraena barracuda*
Gray Triggerfish	*Balistes capriscus*	Sand Perch	*Diplectrum formosum*
Queen Triggerfish	*B. vetula*	Cubbyu	*Pareques acuminatus*
Scamp	***Mycteroperca phenax***	Honeycomb Cowfish	*Acanthostracion polygonius*
Gag	***M. microlepsis***	Pearly Razor	*Xyrichtys novacula*
Warsaw Grouper	***Hyporthodus nigritus***	Sand Tilefish	*Malacanthus plumieri*
Red Snapper	*Lutjanus campechanus*	Blue Runner	*Caranx crysos*
Vermillion Snapper	*Rhomboplites aurorubens*	Jacknifefish	*Equetus lanceolatus*
Red Porgy	*Pagrus pagrus*	Spanish Hogfish	*Bodianus rufus*
Whitebone Porgy	*Calamus leucosteus*	Loggerhead Turtle	*Caretta caretta*
Banded Rudderfish	*Seriola zonata*	Frogfish	*Antennarius Sp.*
Greater Amberjack	***S. dumerili***	Nurse Shark	*Ginglymostoma cirratum*
Almaco Jack	*Seriola rivoliana*	Spotted Moray	*Gymnothorax moringa*
White Grunt	*Haemulon plumierii*	Lionfish	*Pterois volitans*
Blue Angelfish	*Holacanthus bermudensis*	Greater Soapfish	*Rypticus saponaceus*
Atlantic Spadefish	*Chaetodipterus faber*	Round Scad	*Decapterus punctatus*
Spottail Pinfish	*Diplodus holbrooki*	Scup	*Stenotomus chrysops*
Planehead Filefish	*Stephanolepis hispidus*	Reef Butterflyfish	*Chaetodon sedentarius*
Tomtate	*Haemulon aurolineatum*	Blenny	*Blenniidae Sp.*
Margate	*H. album*	Ocean Sunfish	*Mola mola*

4.4 Devil's Hole

The Devil's Hole was described in the MPA Expert Working Report (SAFMC 2013) as an area where warsaw grouper had been caught. The preferred Spawning SMZ includes prominent bathymetric feature that sticks out into the Gulf Stream. Features such as this have been described as potential multi-species spawning site (Kobara et al. 2013). Protecting Riley's Hump. A bathymetric site, has led to increased numbers of individuals returning to a spawning site for mutton snapper (Burton et al. 2005).

Location and Zoning

The Devil's Hole is approximate 55 to 60 miles from Georgetown and the preferred alternative encompasses 3.1 square miles. The depth on the inshore side is 180 feet and offshore 591 feet.

The coordinates are:

Latitude	Longitude
32° 34.311'	78° 33.220'
32° 34.311'	78° 34.996'
32° 32.748'	78° 34.996'
32° 32.748'	78° 33.220'

Source: Roger Pugliese, SAFMC Staff

Habitat and Managed Species Characterization

The Devil's Hole includes an "elbow" where there is a drastic change in depth which has been described as a characteristic feature for spawning for snapper grouper species in other areas. In the area where the proposed Spawning SMZ is located, warsaw grouper, scamp, and grey triggerfish have been observed in spawning condition (Heyman 2015). Additionally three snowy grouper have been collected by the SERFS when sampling in the proposed Spawning SMZ (average total length 48 cm).

Research by an independent scientist and a commercial fishermen have sampled within the proposed Spawning SMZ. Catch information was recorded for 42 stops of varying lengths lasting 2 minutes up to 84 minutes. Focal species for the Spawning SMZs were caught on 25 of the stops including: greater amberjack, speckled hind, snowy grouper, warsaw grouper, scamp, and blueline tilefish (**Table 4.4.1**). The sex and spawning condition were reported for snowy and all were early developing females.

Two NMFS ROV dives occurred in the area of the Devil's Hole and the habitat varied depending on the location of the dive in the Spawning SMZ. One dive was done on a ledge with 60m overall relief (depth of 105-165m), but there was not a prominent vertical wall. The ledge was best described as a gradual slope with low relief outcrops on it. The other dive was done in shallower water (about 63m) and consisted of a low relief ledge where relief was about 1m. On the two dives, a total of 50 species were observed including: greater amberjack, speckled hind, snowy grouper, and scamp (**Table 4.4.2**), which are focal species.

Table 4.4.1. List of focal species and select other fish collected by an independent researcher and commercial fishermen in the preferred Devil's Hole Spawning SMZ. Size of Maturity references are in **Table 3.5.2.2**. The number in spawning condition is the total number of fish in spawning condition and the number is parenthesis is the number of fish that were sampled for reproductive stage. Avg TL=Average Total Length.

Focal Species	Number Caught	Avg TL (cm)	Size of Maturity (cm)	Number in Spawning Condition	Avg TL in Spawning Condition
Greater Amberjack	1	97	73		
Speckled Hind	1	61	81		
Snowy Grouper	35	53	54	0 (7)	
Warsaw Grouper	3				
Scamp	22	61	35		
Blueline Tilefish	2		~36		

Other Species	Number Caught
Almaco Jack	12
Lesser Amberjack	1
Vermilion Snapper	21
Jolthead Porgy	1
Red Porgy	119
Gray Triggerfish	1

Table 4.4.2. List of fish observed by the NMFS ROV in 2013 and 2014 in the area of Devil's Hole Spawning SMZ. Species in bold are focal species for the Spawning SMZs.

Common Name	Scientific Name	Common Name	Scientific Name
Southern Stingray	*Dasyatis americana*	Red Porgy	*Pagrus pagrus*
Moray Eel	*Muraenidae*	Jack-knife Fish	*Equetus lanceolatus*
Batfish	*Ogcocephalus sp.*	Cubbyu	*Pareques umbrosus*
Squirrelfish	*Holocentridae*	Blackbar Drum	*P. iwamotoi*
Scorpionfish	*Scorpaenidae*	Reef Butterflyfish	*Chaetodon sedentarius*
Lionfish	*Pterois volitans*	Bank Butterflyfish	*Prognathodes aya*
Speckled Hind	***Epinephelus drummondhayi***	Spotfin Butterflyfish	*Chaetodon ocellatus*
Snowy Grouper	***Hyporthodus niveatus***	Cherubfish	*Centropyge argi*
Scamp	***Mycteroperca phenax***	Blue Angelfish	*Holacanthus bermudensis*
Unidentified anthiid	*Anthiinae*	Rock Beauty	*H. tricolor*
Apricot Bass	*Plectranthias garrupellus*	Yellowtail reeffish	*Chromis enchrysura*
Creolefish	*Paranthias furcifer*	Sunshinefish	*C. insolata*
Wrasse Bass	*Liopropoma eukrines*	Purple Reeffish	*C. scotti*
Orangeback Bass	*Serranus annularis*	Unidentified damselfish	*Chromis sp.*
Snow Bass	*S. chionaraia*	Bicolor Damselfish	*Stegastes partitus*
Tattler	*S. phoebe*	Red Hogfish	*Decodon puellaris*
Roughtongue Bass	*Pronotogrammus martinicensis*	Spotfin Hogfish	*Bodianus pulchellus*
Bigeye	*Priacanthus arenatus*	Wrasse	*Halichoeres sp.*
Short Bigeye	*Pristigenys alta*	Yellowhead Wrasse	*H. garnoti*
Bulleye	*Cookeolus boops*	Hogfish	*Lachnolaimus maximus*
Twospot Cardinalfish	*Apogon pseudomaculatus*	Greenblotch Parrotfish	*Sparisoma atomarium*
Greater Amberjack	***Seriola dumerili***	Flounder	*Bothidae*
Almaco Jack	*S. rivoliana*	Sargassum Triggerfish	*Xanthichthys ringens*
Tomtate	*Haemulon aurolineatum*	Sharpnose Puffer	*Canthigaster rostrata*
Porgy	*Calamus sp.*	Bandtail Puffer	*Sphoeroides spengleri*

4.5 Warsaw Hole

The Warsaw Hole Spawning SMZ was described in the MPA Expert Working Report as an area where warsaw grouper had been seen in higher than normal abundance compared to other areas and at least one female was caught with obvious roe (SAFMC 2013). Greater amberjack may also spawn at Warsaw Hole.

Location and Zoning

The Warsaw Hole is 35 miles from Key West, and the preferred size of the protected area is 4 square miles. The depth on the inshore side of the Spawning SMZ is 230 feet and on the offshore side is 443 feet. In the middle of the proposed Spawning SMZ is a deep hole (**Figure 4.5.1**).

The coordinates are:

Latitude	Longitude
24° 22.277'	82° 20.417'
24° 22.277'	82° 18.215'
24° 20.932'	82° 18.215'
24° 20.932'	82° 20.417'

Source: Roger Pugliese, SAFMC Staff

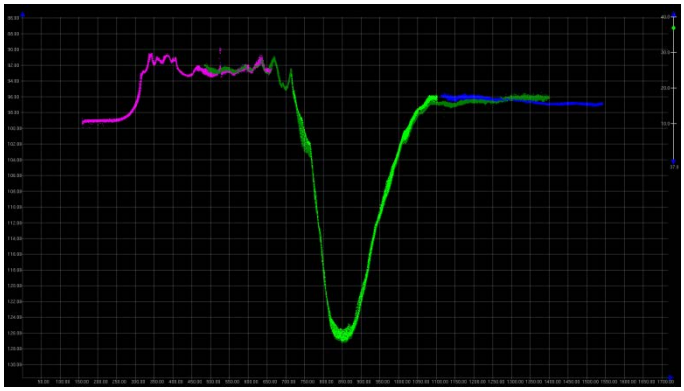

Figure 4.5.1. Elevation profiles for a cross section of the Warsaw Hole. Source: NOAA - Multi-beam mapping of Warsaw Hole by the Nancy Foster Associated with NF 15-04 FKNMS Ecological Assessment

Habitat and Managed Species Characterization

Black grouper, scamp, silk snapper, blackfin snapper, and red snapper have been reported being caught in the vicinity of the hole in addition to warsaw grouper. The Warsaw Hole is a distinct geographic feature and this feature may serve as a multi-species spawning area. The Warsaw Hole is out of the range for the SERFS and no ROV dives have been conducted in the vicinity of the proposed Spawning SMZ. The Florida Fish and Wildlife Commission indicated they are willing to collect data from Warsaw Hole Spawning SMZ (L. Barbieri, FWC, personal communication).

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Appendices

Appendix I. List of Acronyms

AP	Advisory Panel
AUV	Automated Underwater Vehicle
BACI	Before/After, Control/Impact
CEBA	Comprehensive Ecosystem Based Amendment
EFH	Essential Fish Habitat
EFH-HAPC	Essential Fish Habitat- Habitat Areas of Particular Concern
FWC	Florida Fish and Wildlife Commission
GADNR	Georgia Department of Natural Resources
HAPC	Habitat Areas of Particular Concern
IPT	Interdisciplinary Plan Team
JEA	Joint Enforcement Agreement
LEAP	Law Enforcement Advisory Panel
MARMAP	Marine Resources Monitoring, Assessment, and Prediction
MPA	Marine Protected Area
MSA	Magnuson-Stevens Act
NCDEQ	North Carolina Department of Environmental Quality
NGO	Non-Governmental Organization
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOVA	Notice of Violation and Assessment
OLE	Office of Law Enforcement
RHIB	Rigid Hull Inflatable Boat
ROV	Remote Operated Vehicle
S-G	Snapper-Grouper
SAFMC	South Atlantic Fishery Management Council
SCDNR	South Carolina Department of Natural Resources
SE-DSCTP	Southeast Deep Sea Coral Technology Program
SEFIS	Southeast Fishery-Independent Survey
SEFSC	Southeast Fisheries Science Center
SERFS	Southeast Reef Fish Survey
SERO	Southeast Regional Office
SMP	System Management Plan
SMZ	Special Management Zone
USCG	United States Coast Guard

Appendix II. 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:

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

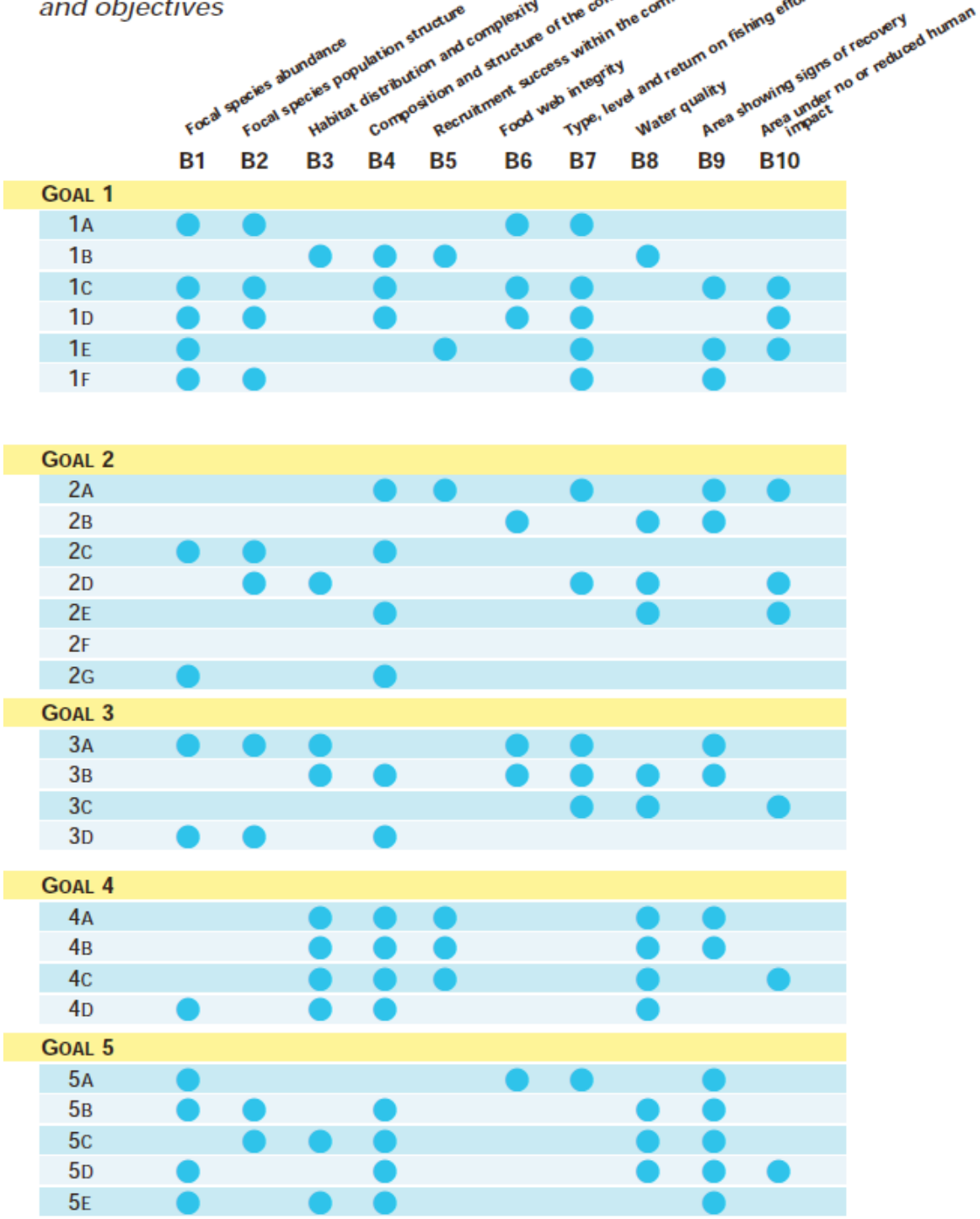
Using this general framework allows protected area managers to customize a set of appropriate indicators to be used on relevant scales. It serves as a foundation from which to further investigate a specific category of indicators (e.g. outcomes) or to determine which indicators are most appropriate based 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 III. 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

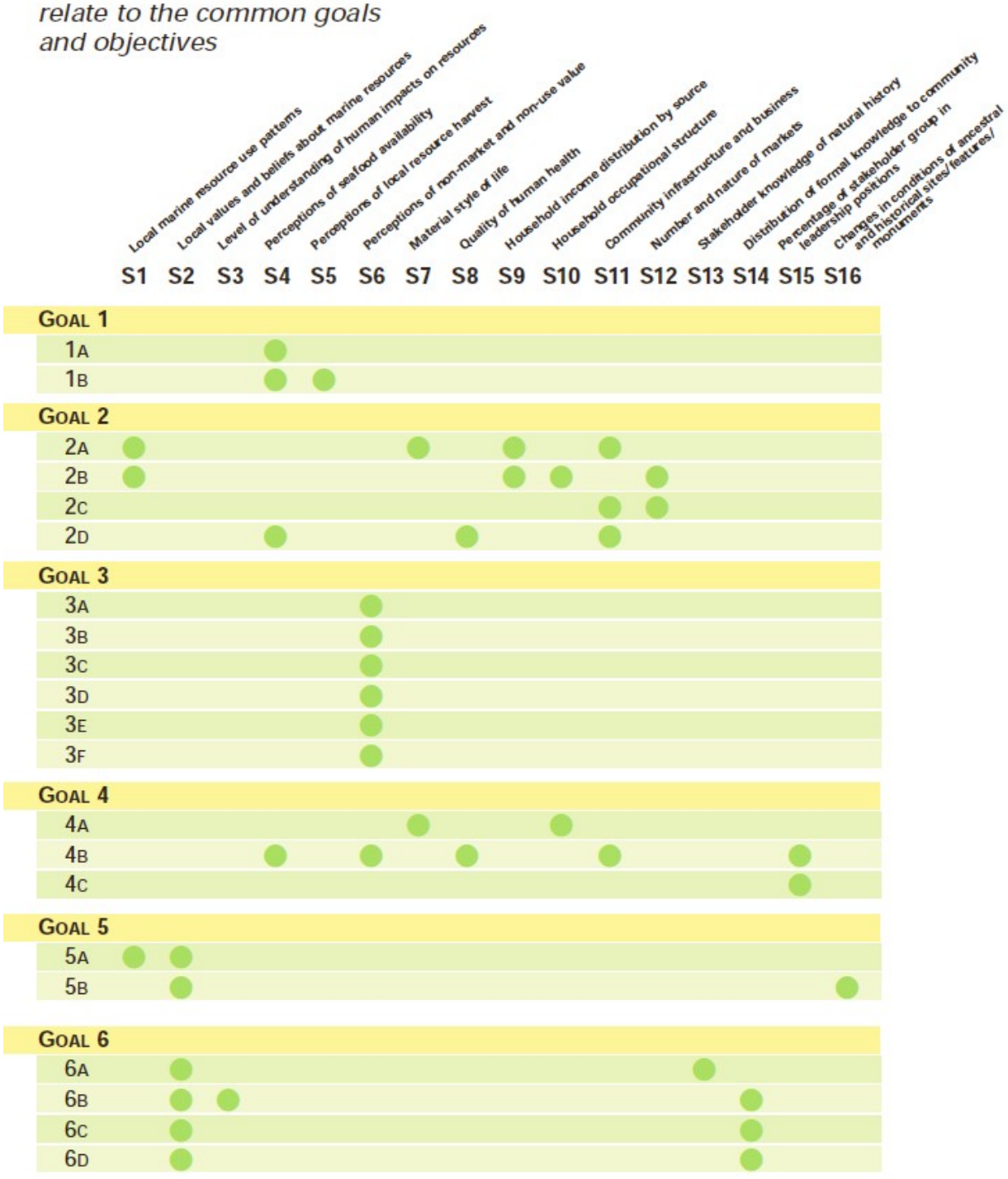


Appendix IV. Socioeconomic Goals and Objectives

(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

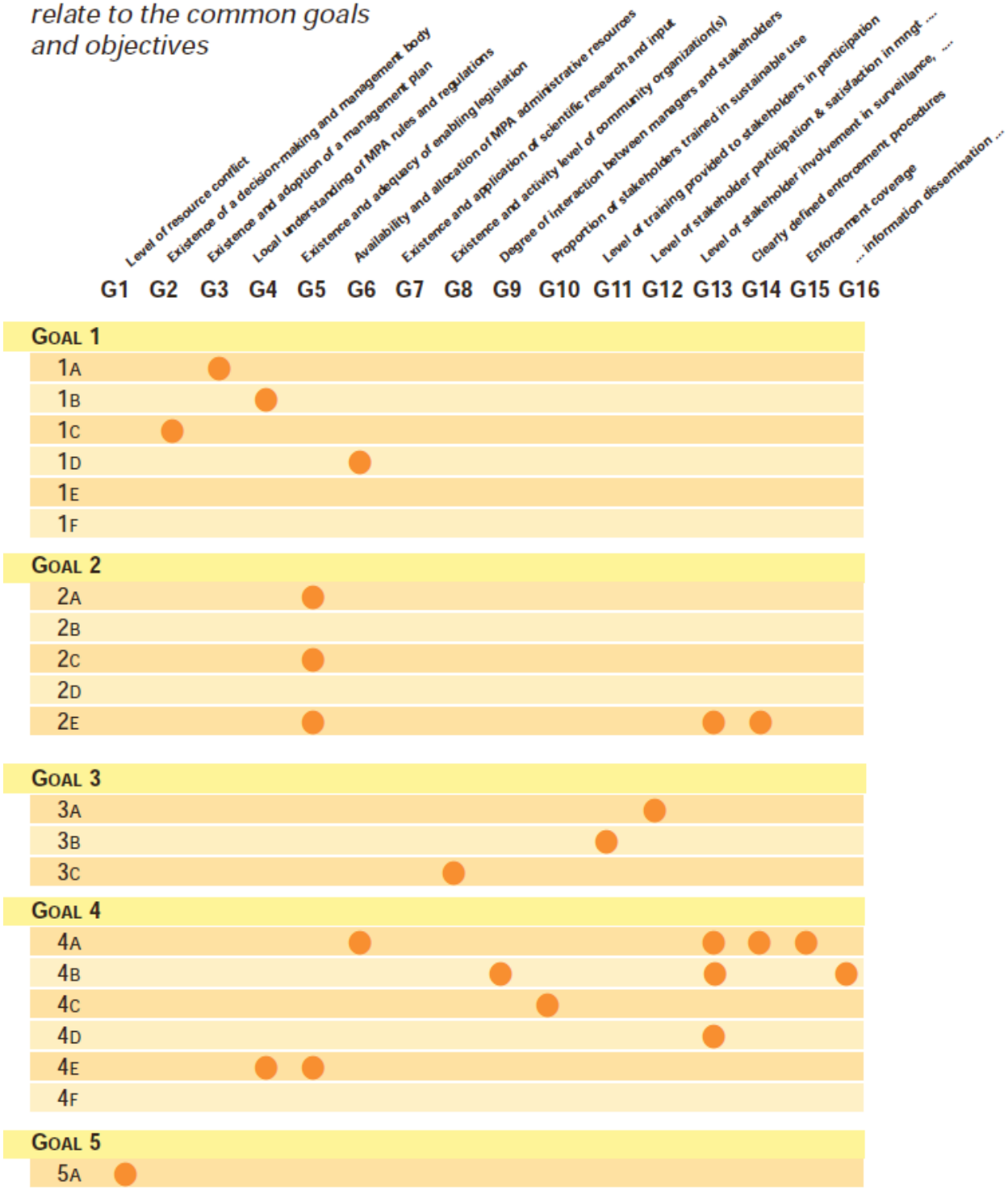


Appendix V. Governance Goals and Objectives

(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



Appendix VI: System Management Plan IPT

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