

# GRAY'S REEF NATIONAL MARINE SANCTUARY

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## DRAFT ENVIRONMENTAL ASSESSMENT

### ON THE REGULATION OF SPEARFISHING GEAR



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OFFICE OF NATIONAL MARINE SANCTUARIES  
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## INTRODUCTION

This document presents an analysis of actions pertaining to the use of spearfishing gear and spearfishing activities in Gray's Reef National Marine Sanctuary (GRNMS). The preferred alternative analyzed in this draft environmental assessment (EA) is to prohibit the use of all spearfishing gear in the sanctuary. The other alternative considered and analyzed in this document is a "no action" alternative. Two other alternatives are considered and eliminated because they do not meet the purpose and need of the proposed action.

Spearfishing is an activity which involves using spearguns, including such devices known as Hawaiian slings, pole spears, pneumatic and spring-loaded spearguns, bows and arrows, bang sticks, or any similar device designed to harvest fish. Powerheads are generally attachments to spearfishing gear that allow the use of ammunition cartridges to harvest fish.

The action is being considered in order to better protect sanctuary resources as required by the National Marine Sanctuaries Act (NMSA) of 1972, as amended (16 USC §1431 *et seq.*), and the GRNMS Management Plan. This draft EA tiers from the Gray's Reef National Marine Sanctuary Final Management Plan/Final Environmental Impact Statement, July 2006, and incorporates by reference the Affected Environment. Although spearfishing with a powerhead is currently prohibited under GRNMS regulations, powerhead cartridges found on site indicate that this gear has been used within GRNMS. Because of the similarities in gear types, law enforcement officials have expressed the need to prohibit all spearfishing to enable them to more effectively enforce the existing powerhead prohibition, thereby protecting sanctuary resources being taken by this gear.

NOAA anticipates that the preferred alternative action to prohibit all spearfishing gear in GRNMS will provide needed protection to the fishes and overall natural live-bottom community for which the sanctuary was designated. In addition, the combination of the absence of recent charter spearfishing activity at GRNMS and the abundant substitution opportunities nearby lead to the conclusion that a prohibition on spearfishing at GRNMS would result in no measurable economic impact. NOAA anticipates a Finding of No Significant Impact for this action.

NOAA prepared this EA in accordance with the National Environmental Policy Act of 1969 (NEPA; 42 USC §4321 *et seq.*) as implemented by the Council on Environmental Quality regulations (40 CFR Parts 1500-1508), and National Oceanic and Atmospheric Administration (NOAA) Administrative Order (NAO) 216-6, which describes NOAA policies, requirements, and procedures for implementing NEPA.

## BACKGROUND

Gray's Reef National Marine Sanctuary

GRNMS protects 16.68 square nautical miles of open ocean and submerged lands of particularly dense and nearshore patches of productive live bottom habitat. The sanctuary is influenced by complex ocean currents and serves as a mixing zone for temperate (colder water) and sub-tropical species. The series of rock ledges and sand expanses has produced a complex habitat of caves, burrows, troughs, and overhangs that provide a solid base upon which a rich carpet of temperate and tropical marine flora and fauna attach and grow (NMSP 2006).

This flourishing ecosystem attracts mackerel, grouper, black sea bass, angelfish, and a host of other fishes. An estimated 180 species of fish, encompassing a wide variety of sizes, forms, and ecological roles, have been recorded at GRNMS. Loggerhead sea turtles, a threatened species, use GRNMS year-round for foraging and resting, and the highly endangered northern right whales are occasionally seen within the sanctuary. GRNMS is one of the most popular sportfishing areas along the Georgia coast.

#### Previous Action on the Use of Spearfishing Gear

Spearfishing was considered for regulation during the 1981 designation of GRNMS, but only spearfishing with powerheads was prohibited at the time. A complete spearfishing prohibition was again considered during the review and revision of the GRNMS Management Plan beginning in 1999. Along with the fact that visitor use (primarily recreational fishing; Ehler and Leeworthy 2002) had increased, evidence of powerhead use despite the ban created a growing concern.

NOAA proposed to prohibit all spearfishing activities in the 2003 Draft Environmental Impact Statement/Draft Management Plan (DEIS/DMP) and an associated proposed rule. However, after consideration of public comments on the DEIS/DMP, NOAA concluded that additional socioeconomic information was needed and NOAA deferred any regulatory action on spearfishing. The 2006 Final EIS/MP instead included a commitment to gather additional socioeconomic information on spearfishing in GRNMS and stated an intention to review the issue again in two years (NMSP 2006).

The additional socioeconomic information was collected, analyzed and presented to the Sanctuary Advisory Council in September 2007. That information indicated no charter spearfishing activity and a very small amount of private spearfishing activity at GRNMS. Abundant substitution opportunities were also identified in the event that the final action by NOAA prohibits spearfishing at GRNMS.

#### Interactions with the South Atlantic Fishery Management Council (SAFMC)

Section 304(a)(5) of the NMSA states that:

*The Secretary shall provide the appropriate Regional Fishery Management Council with the opportunity to prepare draft regulations for fishing within the Exclusive Economic Zone, as the Council may deem necessary to implement the proposed designation. Draft regulations prepared by the Council, or a Council determination that regulations are not necessary pursuant to this paragraph, shall be accepted and issued as proposed regulations by the Secretary unless the*

*Secretary finds that the Council's action fails to fulfill the purposes and policies of this chapter and the goals and objectives of the proposed designation. In preparing the draft regulations, a Regional Fishery Management Council shall use as guidance the national standards of section 301(a) of the Magnuson-Stevens Act (16 U.S.C. 1851) to the extent that the standards are consistent and compatible with the goals and objectives of the proposed designation. The Secretary shall prepare the fishing regulations, if the Council declines to make a determination with respect to the need for regulations, makes a determination which is rejected by the Secretary, or fails to prepare the draft regulations in a timely manner. Any amendments to the fishing regulations shall be drafted, approved, and issued in the same manner as the original regulations. The Secretary shall also cooperate with other appropriate fishery management authorities with rights or responsibilities within a proposed sanctuary at the earliest practicable stage in drafting any sanctuary fishing regulations.*

In 2003, the SAFMC prepared draft regulations, including a prohibition on spearfishing, for the proposed rule associated with the GRNMS DEIS/DMP. However, after consideration of public comments, the final rule did not include a spearfishing ban. GRNMS staff presented an update of this issue at the October 2007 meeting of the Joint Habitat/Ecosystem Based Management Advisory Panel of the SAFMC and again at the December 2007 and March 2008 SAFMC meetings.

In June 2008, NOAA provided the SAFMC with the opportunity to prepare draft sanctuary fishing regulations concerning spearfishing activities for GRNMS. The SAFMC concurred with the proposed ban on spearfishing, but requested that NOAA prepare the draft regulations. This EA supports NOAA's consideration of such regulations.

## **PURPOSE OF AND NEED FOR ACTION**

### Need

The need for this action is to protect and maintain the biological integrity of GRNMS as required by the NMSA, the GRNMS designation document, and the GRNMS Final Management Plan (NMSP 2006).

### *National Marine Sanctuaries Act*

The National Marine Sanctuary System, of which GRNMS is a part, is managed pursuant to provisions of the NMSA of 1972, as amended (16 USC §1431 *et seq.*). Under the NMSA, the Secretary of Commerce is authorized to designate and manage areas of the marine environment as national marine sanctuaries. Such designation is based on attributes of special national significance, including conservation, recreational, ecological, historical, scientific, cultural, archaeological, educational, or aesthetic qualities.

Sanctuaries are managed to protect and conserve their resources and to allow uses that are compatible with resource protection, the primary goal of the National Marine Sanctuary System. The mission of NOAA's Office of National Marine Sanctuaries is to serve as the trustee for the nation's system of marine protected areas, to conserve, protect, and enhance their biodiversity, ecological integrity and cultural legacy.

*Gray's Reef National Marine Sanctuary Designation, Goals and Objectives*

GRNMS was designated as this nation's fourth national marine sanctuary in 1981 for the purposes of:

- Protecting the quality of the unique and fragile ecological community;
- Promoting scientific understanding of the live bottom ecosystem; and
- Enhancing public awareness and wise use of the significant regional resource (OCRM 1983).

The GRNMS Goals and Objectives were developed with the Sanctuary Advisory Council in 2000 and are consistent with the directives set forth by the NMSA. Goals 1 and 4 pertain more specifically to the proposed action:

Goal 1: Protect, maintain, restore, and enhance the natural habitats, populations, and ecological processes in the Sanctuary.

*Objectives*

- a. Develop, implement, and periodically evaluate a comprehensive resource protection plan tailored to Sanctuary resources and uses that provides direction for resource management and protection.
- b. Develop, implement, and maintain an on-site management capability that reviews and assesses resource conditions and human activities, and recommends action if problems arise.
- c. Develop, implement, and maintain the surveillance and enforcement presence needed to ensure compliance with Sanctuary regulations and adequate protection of Sanctuary resources.
- d. Inform and educate the public users on the sensitive nature of the Sanctuary resources, the purpose of Sanctuary designation, and the need for Sanctuary regulations with enforcement.

Goal 4: Facilitate, to the extent compatible with the primary objective of resource protection, all public and private uses of the Sanctuary not prohibited pursuant to other authorities.

*Objectives*

- a. Facilitate uses of the Sanctuary that are consistent with the primary objective of resource protection.
- b. Establish a means to monitor Sanctuary use and resource quality over time to minimize potential user conflicts and environmental degradation.

## Purpose

The purpose of this action is to better protect the resources of the sanctuary threatened by spearfishing while facilitating enforcement of the existing prohibition against the use of powerheads.

Although the use of powerheads is prohibited at GRNMS, powerhead spear tips and spent shells found in the sanctuary indicate that this gear has been used since the ban went into place (Figure 3). Powerheads are so closely associated with spearguns that it is difficult to determine from a distance whether a speargun has a powerhead. Because the powerhead may be removed without detection upon approach by enforcement, there may be difficulties proving that a speargun with a powerhead was in the sanctuary. And, proof may not be self-evident from the fish itself, which may require forensic testing to determine, if possible, the method or injury or harvest sufficient for evidentiary purposes. Law enforcement officials have expressed the need to prohibit the use of all spearguns in order to effectively ban powerheads.



Figure 1: Powerhead and shells found at GRNMS.

In addition to aiding enforcement, any action taken to regulate spearfishing has the potential to better protect resources within the sanctuary. While the number of recreational divers spearfishing within GRNMS appears to be small, spearfishing is a highly efficient harvesting gear that selectively targets larger fish relative to other fishing gears and can significantly alter abundance and size structure of targeted species toward fewer and smaller fish. Some fish populations that are present within GRNMS are regionally overfished, approaching overfished status and/or undergoing overfishing. Researchers have commented on the lack of large individuals of snappers and groupers at GRNMS.

Any alternative considered to further this purpose, then, must consider both the effects on sanctuary resources and the potential enforceability of any spearfishing regulation.



## AFFECTED ENVIRONMENT

The affected environment for this action was extensively described in the Gray's Reef National Marine Sanctuary Final Management Plan/Final Environmental Impact Statement (NMSP 2006). That description is incorporated by reference, and is summarized and supplemented below.

### *Overview*

Gray's Reef National Marine Sanctuary is one of the largest nearshore live-bottom reefs in the southeastern United States. The sanctuary is a marine protected area in federal waters (U.S. Exclusive Economic Zone) in the South Atlantic Bight (SAB), an area of continental shelf stretching from Cape Hatteras, N.C. to Cape Canaveral, Fla. It is the only marine protected area in the region that focuses on protection and conservation of all marine natural resources. Located 17.5 nautical miles offshore of Sapelo Island, Ga. (Figure 1), the 16.68-square-nautical-mile sanctuary contains rocky ledges and sandy flats. Unlike reefs built by corals, GRNMS comprises scattered limestone rock outcroppings that stand above the sandy substrate of the nearly flat continental shelf. The reef also supports soft corals, non-reef-building hard corals, bivalves and sponges, as well as associated fishes and sea turtles.

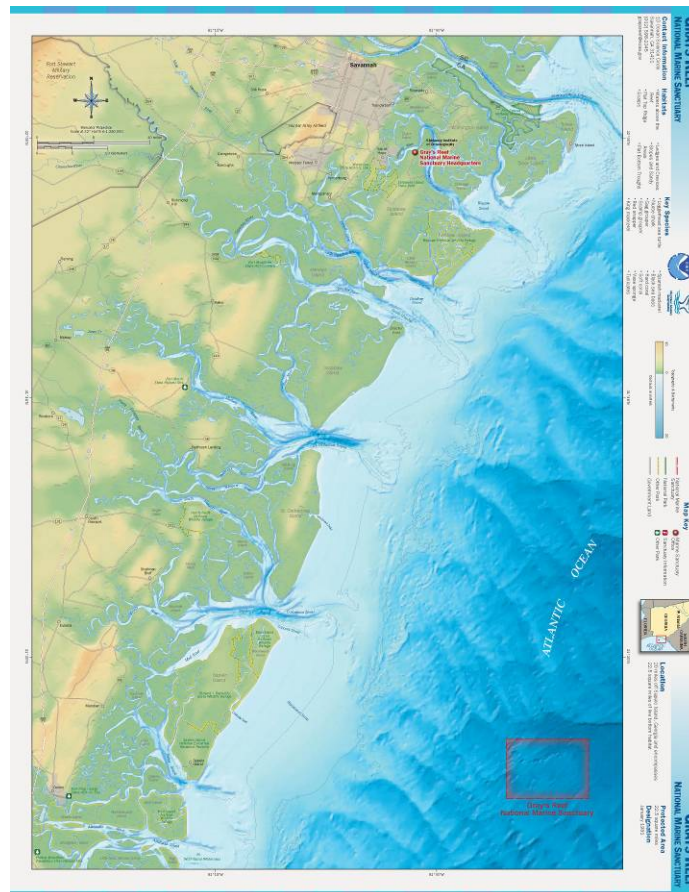


Figure 2. Location of GRNMS.

The sanctuary is one of the most popular recreational fishing destinations along the Georgia coast. Sportfishing occurs year-round but at different levels of intensity. Fishing for pelagic species, such as king mackerel, is one of the most popular activities. For divers, access to the reef itself requires experience in open-ocean diving; currents can be strong and visibility varies greatly. For those who do not scuba dive, the staff at GRNMS engages the public through extensive land-based education and outreach programs. For scientists, the sanctuary is a living laboratory for a variety of marine research and monitoring projects (NMSP 2006).

### *Living Resources*

The live-bottom habitat of GRNMS is of particular biological importance, given the extensive sands that cover most of the broad continental shelf. The sanctuary contains biological assemblages consisting of sessile invertebrates such as sea fans, sea whips, hydroids, anemones, ascidians, sponges, bryozoans and corals living upon and attached to naturally occurring hard or rocky formations with rough, broken or smooth topography, and whose structural complexity favors the aggregation of turtles, fishes and other fauna (McFall and LaRoche 1998).

GRNMS attracts reef-associated fishes including bottom-dwelling and mid-water fish species such as sea bass, snapper, grouper and mackerel, as well as their prey. An estimated 180 species of fish, encompassing a wide variety of sizes, forms and ecological roles, have been recorded at the sanctuary. Some fish species are dependent upon the reef for food and shelter, and rarely venture away from it during their life. Many of these fishes are nocturnal, seeking refuge within the structure of the reef during the day and emerging at night to feed. Some species of reef-dwelling fish disperse to sandy habitats or to other reef areas north and south or offshore for feeding and spawning. Other reef residents, such as gag and black sea bass, rely on the inshore areas and estuaries in early life stages.

According to NOAA's National Marine Fisheries Service (2008), some reef-associated fish species are regionally overfished (snowy grouper, black sea bass and red porgy), approaching overfished status (gag) and/or undergoing overfishing (vermillion snapper, red snapper, snowy grouper, red grouper, black sea bass, gag, speckled hind, warsaw grouper, tilefish and black grouper). Gag and scamp have decreased in abundance in visual census transects at GRNMS, and length-frequency measurements of black sea bass, gag and scamp (from trap and visual census data) indicate that a large portion of the population is removed upon reaching minimum size, either by fishing or by migration out of the sanctuary. The reduced abundance of selected key species may inhibit full community development and function in GRNMS (ONMS 2008).

In addition to reef-associated fishes, GRNMS serves as habitat for a number of other fish species. King mackerel, Spanish mackerel, great barracuda, Atlantic spadefish and cobia make up the majority of pelagic species that are targeted for recreational angling. The high abundance of schooling baitfishes, such as Spanish sardine and round scad, likely attract these pelagic predators to sanctuary waters. There is considerable but unmeasured fishing effort on coastal pelagic species (king and Spanish mackerel) during mackerel

tournaments and at other times. Federal management of coastal pelagic species has resulted in sustainable fisheries for king mackerel and the stock is not currently overfished (SEDAR 16 2008).

Approximately 30 species spawn in the vicinity of the sanctuary and only a third of these are reef-associated (Walsh et al. 2006, Sedberry et al. 2006). The large areas of sandy habitat in the sanctuary form another habitat that is not as rich in fish species, and is not targeted by recreational fishermen. These sandy areas support a number of species including flounders, tonguefishes, cusk eels, stargazers, and lizardfishes (Gilligan 1989, Walsh et al. 2006).

Sea turtles known to occur in the South Atlantic Bight include the Kemp's ridley, hawksbill, leatherback, green and loggerhead. Except for the loggerhead, all these species are federally listed as endangered. The loggerhead sea turtle is the most abundant sea turtle in the South Atlantic Bight and is federally-listed as threatened. GRNMS is an important area for loggerheads to rest and forage throughout the year, especially during the summer nesting season when females may nest two to four times on area beaches laying approximately 120 eggs per nest.

Marine mammals on the southeastern United States continental shelf include cetaceans, occasional pinnipeds (harbor seals and sea lions) and sirenians (West Indian manatees). Atlantic spotted dolphins and bottlenose dolphins are the most common marine mammals at the sanctuary. Both species have been designated as depleted under the Marine Mammal Protection Act. There are four species of federally-listed endangered whales in the region: northern right, humpback, sperm and fin. Of these, only the highly endangered northern right whale - whose only known calving grounds are off coastal Georgia and northern Florida - has been observed in sanctuary during the winter.

Pelagic birds, many of which are seasonal migratory species, occur on the middle and outer shelf regions of the South Atlantic Bight, particularly along the western edge of the Gulf Stream. More than 30 species of marine birds occur off the southeastern coast of the United States. Seabirds observed in the sanctuary area include gulls, petrels, shearwaters, Northern Gannet, phalaropes, jaegers and terns (NMSP 2006).

### *Geology*

GRNMS is a consolidation of marine and terrestrial sediments (sand, shell and mud) that was laid down as loose aggregate between 6 and 2 million years ago. Some of these sediments were likely brought down by coastal rivers draining into the Atlantic and others were delivered by currents from other areas. These sediments continued to accumulate until a dramatic change began to take place on Earth during the Pleistocene Epoch, between 2 million and 10,000 years ago. During this time, the area that is now GRNMS was periodically exposed land and the shoreline was at times as much as 70 nautical miles east of its present location as sea levels rose and fell at least seven times. As the glacial ice melted for the last time starting 18,000 years ago, the meltwater flowed back into the sea, filling the ocean basins back to their previous levels.

### *Water and Climate*

GRNMS is a small but very important part of the SAB. The outer reaches of the SAB are dominated by the Gulf Stream flowing northeastward. The inner area is defined by the cusped curves of the coastline between Cape Canaveral and Cape Hatteras and is dominated by tidal currents, river runoff, local winds, seasonal storms, hurricanes and seasonal atmospheric changes. GRNMS lies at the break between the inner- and mid-shelf zone of the SAB and is subject to seasonal variations in temperature, salinity and water clarity. It is also influenced by the Gulf Stream, which draws deep, nutrient-rich water to the region, and carries and supports many of the tropical fish species and other animals found seasonally in the sanctuary. Ocean currents and eddies also transport fish and invertebrate eggs and larvae from other areas, linking this special place to reefs north and south (NMSP 2006; Hare and Walsh 2007).

### *Habitat*

GRNMS is underlain by aragonitic limestone. These rocky features vary from flat, smooth surfaces to exposed vertical scarps and ledges with numerous overhangs, crevices and slopes (Riggs et al. 1996). The irregularities of the bathymetry can be attributed to the easily erodable limestone that has dissolved and pitted, creating the appearance of isolated ledges and patches of hard bottom. Exposed surfaces are colonized to varying extents by algae and sessile and burrowing invertebrates, which in turn provide shelter, foraging habitat and nursery areas for a large diversity of fish. Percent cover of benthic species, with the exception of gorgonians, is significantly greater on ledges in comparison to the sparse live bottom. In addition, total percent cover and cover of macroalgae, sponges and other organisms is significantly lower on short ledges (<58.5 cm height) in comparison to medium (58.5-89.2 cm) and tall ledges (>89.2 cm) (Kendall et al. 2007). The series of rock ledges and sand expanses has produced a complex habitat of caves, burrows, troughs and overhangs that provide a solid base upon which temperate and tropical marine flora and fauna attach and grow. This rocky platform, with its rich carpet of attached invertebrate and plant organisms, is known locally as a "live-bottom" habitat (NMSP 2006).

Live-bottom habitats are structurally complex and provide a number of microhabitats. Although GRNMS is the most intensely surveyed live-bottom feature in the region, diver-focused survey methods have provided only basic information on the extent and distribution of the live-bottom areas within the sanctuary. Video transects, coupled with side-scan and multi-beam sonar mapping suggest that sand habitats (rippled sand and flat sand) dominate, accounting for 75 percent of the sanctuary area. Approximately 24 percent of the sanctuary is sparsely or moderately colonized live bottom, and less than 1 percent of the sanctuary is considered densely colonized live bottom (Kendall et al. 2005).

Sediments covering the vast areas of sand in the sanctuary are probably re-suspended and redistributed during times of high wave action that accompanies winter and tropical storms. These shifting sands can uncover barely emergent limestone rock areas or, conversely, cover areas that were previously exposed. The effect of storm-suspended

sediments has even been observed to scour entire low-relief ledges, removing all but the hardiest of attached marine organisms (McFall pers. comm.).

## DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

### Alternative A: Prohibit the use, and restrict the possession, of all spearfishing gear in Gray's Reef National Marine Sanctuary (Preferred Alternative).

Under this alternative existing regulations would be altered eliminating “spearfishing gear without powerheads” from the list of allowable gear. In addition, language will be added allowing transit through the sanctuary, but with no stopping (interruption) for boats with spearfishing gear on board, and spearfishing gear would need to be stowed and not available for use.

Gray's Reef National Marine Sanctuary regulations (15 CFR Part 922, Subpart I) would be amended to read as follows:

#### § 922.92(a)

*(5)(i) Injuring, catching, harvesting, or collecting, or attempting to injure, catch, harvest, or collect, any marine organism, or any part thereof, living or dead, within the Sanctuary by any means except by use of rod and reel, and handline gear; (ii) There shall be a rebuttable presumption that any marine organism or part thereof referenced in this paragraph found in the possession of a person within the Sanctuary has been collected from the Sanctuary.*

*(6) Except for possessing fishing gear or means for fishing stowed and not available for immediate use while passing through the Sanctuary without interruption or for valid law enforcement purposes, possessing, carrying, or using within the Sanctuary any fishing gear or means for fishing except rod and reel, and handline gear.*

### Alternative B: No Action

Under this alternative, the current regulations relating to fishing within GRNMS would remain unchanged, and NOAA would take no action to alter current spearfishing activities in GRNMS. Individuals could continue to both possess and use spearfishing gear without powerheads in the sanctuary in addition to rod and reel and handline gear.

### Alternatives Considered and Eliminated

*Prohibit the use of all spearfishing gear in GRNMS and allow transit with stopping if spearfishing gear is stowed and unavailable for use.*

Under this alternative, existing regulations would be altered eliminating “spearfishing gear without powerheads” from the list of allowable gear, but language would be added to allow transit through the sanctuary *with* stopping. Spearfishing gear on board would have to be stowed and unavailable for use.

The ability to more effectively enforce GRNMS regulations, one of the purposes of this action, would be further compromised under this alternative. Law enforcement officials have expressed problems with enforcing a provision that would allow stopping when spearfishing gear is on board even if stowed. Therefore, NOAA found that this alternative does not meet the purpose and need for this proposed action.

*Allow spearfishing without powerheads and without scuba gear in GRNMS.*

Under this alternative, spearfishing would continue to be allowed in the sanctuary without powerheads, but users would only be permitted to free dive (no scuba gear) in order to conduct spearing activities. Again, the ability to more effectively enforce the regulations, one of the purposes of this action, would be further compromised. Therefore, NOAA found that this alternative does not meet the purpose and need for this proposed action.

## ENVIRONMENTAL CONSEQUENCES

Alternative A. Prohibit the use, and restrict the possession, of all spearfishing gear in Gray's Reef National Marine Sanctuary (Preferred Alternative).

### *Biological Impacts and Analysis*

Spearfishing is a highly efficient harvesting gear that selectively targets larger fish relative to other fishing gears and can significantly alter abundance and size structure of target species toward fewer and smaller fish (Chapman and Kramer 1999, Matos-Caraballo et al. 2006). In areas that are spearfished, that activity is believed to be the likely cause of lower fish density and size compared to areas that are not spearfished (Jouvenel and Pollard 2001). Research has shown significantly reduced populations of larger predatory fishes such as snapper and grouper where spearfishing occurs (Bohnsack 1982; Chapman and Kramer 1999; Jouvenel and Pollard 2001). Spearfishing has been shown to have a greater overall impact on reef fishes than hook-and-line fishing, relative to effort expended (Meyer 2007). Overall, spearfishermen remove larger fish and more biomass per outing than fishermen using other recreational modes (Morales-Nin et al. 2005; Meyer 2007; Frisch et al. 2008). Although bycatch, gear loss (hence, increased debris), and removal of fish biomass as bait are higher with hook-and-line fishing than with spearfishing, the effectiveness and efficiency of spearfishing has resulted in overharvest and restrictions on the fishery, including a ban on spearfishing using scuba, in many other parts of the world (e.g., Coll et al. 2004; Frisch et al. 2008).

Larger predators are favored targets of spearfishermen (Sadovy et al. 1994; Morales-Nin et al. 2005; Meyer 2007), selectively removing males of protogynous (sex-changing) species. Selective removal of males can make the population susceptible to sperm limitation, especially for species like gag that form small spawning aggregations (Alonzo and Mangel 2004). Vulnerable pre-spawning aggregations of gag occur at GRNMS. Spearfishing also removes the largest females, which are those with the highest potential spawning output.

Reduction in the larger predatory fishes can have a “top-down” effect on fish assemblages by allowing other fish populations to increase, altering the composition of the overall natural community of species, including invertebrates. The largest fish are important as predators in maintaining a balanced and complete ecosystem; their selective removal causes ecological imbalance (McClanahan and Muthiga 1988; Dulvy et al.

2002). Spearfishing is also known to alter fish behavior, causing fish to move to different (and perhaps less favorable) habitats (Jouvenel and Pollard 2001). And, finally, there is effectively no catch-and-release spearfishing, as regulatory discards are often dead. Discard rates of dead fish by spearfisherman (3 percent of all fish speared) are three times what they are for hook-and-line fishermen (1 percent of their catch) (Frisch et al. 2008).

Because of these known effects, prohibiting the use of spearfishing gear (and the associated restrictions on possessing such gear in the sanctuary) is expected to result in beneficial biological impacts and may result in an increase in the number of fish in the sanctuary, especially larger predator species. This may in turn have a positive effect on the larger ecosystem as a whole by reducing mortality on large predatory fishes that are important in maintaining a balanced ecosystem.

The proposed action will better protect resources within the sanctuary by facilitating enforcement of the existing prohibition against the use of powerheads. Although the use of powerheads is prohibited at GRNMS, powerhead spear tips and spent shells found in the sanctuary indicate that this gear has been used since the ban went into place. Powerheads are so closely associated with spearguns that it is difficult to determine from a distance whether a speargun has a powerhead. Because the powerhead may be removed without detection upon approach by enforcement, there may be difficulties proving that a speargun with a powerhead was in the sanctuary. Proof may not be self-evident from the fish itself, which may require forensic testing to determine, if possible, the method of injury or harvest sufficient for evidentiary purposes. Law enforcement officials have expressed the desire to prohibit the use of all spearguns in order to effectively enforce the powerhead prohibition.

As described above, NOAA anticipates that the preferred alternative action to prohibit all spearfishing gear within GRNMS would enhance resource protection by improving enforcement and providing needed protection to the fishes and overall natural live-bottom community for which the sanctuary was designated. The elimination of spearfishing in the sanctuary is expected to improve, measurably but not significantly, the natural habitats, populations, and ecological processes in GRNMS.

#### *Socioeconomic Impacts and Analysis*

In September 2007, in-person interviews were conducted with all businesses and organizations offering scuba diving trips along the Georgia coast (Ehler 2007). Four charter scuba diving operations and one scuba diving club were identified and interviewed. The interviews gathered information that included operating profiles, preferred diving locations and methods, detailed business data (revenue and costs), and general opinions of the current state of scuba diving and spearfishing off the Georgia coast. A total of ten businesses offering scuba diving charter trips at some point during the past five years off the Georgia coast were identified. Of these, only four currently remain in business. Three are associated with dive shops and one is charter boat only. The six others have either gone out of business, moved away from the area, or are dive shops that no longer operate charter trips.



## Findings

### *Person-Days of Scuba Diving:*

Dive charters reported a total of 1,747 person-days of scuba diving off the Georgia coast in 2007. Approximately 55 percent of these person-days were non-consumptive (no spearfishing) person-days, 44 percent were consumptive (spearfishing) person-days, and the remaining one percent was sightseeing/sportfishing. None of these person-days occurred at GRNMS. One scuba club reported a total of 24 person-days of scuba diving off the Georgia coast with six of these person-days spent at GRNMS. A person-day is defined as one person undertaking an activity for any part of a day or a whole day.

### *Revenue and Operating Costs:*

The table below summarizes the revenue and operating costs of the Georgia offshore scuba diving charter fleet as of 2007. Charter operations appear to be a break even business with most stating that they use it to get customers in the dive shop. It is important to note that major variable and unexpected costs are not factored in to the table. These variable costs typically include major engine repair or replacement and equipment repair or replacement.

*Table 1. Revenue and Operating Costs of the Georgia Offshore Scuba Diving Charter Fleet, 2007*

<b>Gross Revenue from Charter Diving</b>	<b>100,000</b>
<b>Operating Costs</b>	
Wages, Salaries and Benefits	3,500
Fuel	21,180
Repair & Maintenance	6,200
Equipment Rental and Leasing	41,920
Dock	7,200
Insurance	6,800
Interest Payments	15,600
<b>Total Operating Costs</b>	<b>101,800</b>
<b>Loss from Charter Diving</b>	<b>(1,800)</b>

### *Preferred Spearfishing Locations:*

Figure 3 below is a map of Georgia's offshore artificial reefs, U.S. Navy towers and GRNMS (small circle). The spearfishing locations mentioned during the interviews are indicated with ovals, the percentage of reported visitation is indicated with red numbers. The map demonstrates the extensive substitution opportunities for scuba diving and spearfishing that exist off the Georgia coast. Even if there were significant levels of spearfishing activity reported at GRNMS, the network of other locations would significantly decrease any economic impact. The single most popular site is J Reef. "Unmarked wrecks" are where the majority of trips are made.

Gray's Reef's location, 17.5 nautical miles off Sapelo Island and more than 30 nautical miles from Savannah and Brunswick, makes accessing the sanctuary difficult. The map

below demonstrates the multitude of spearfishing opportunities that exist closer to the primary access points of Savannah and Brunswick.

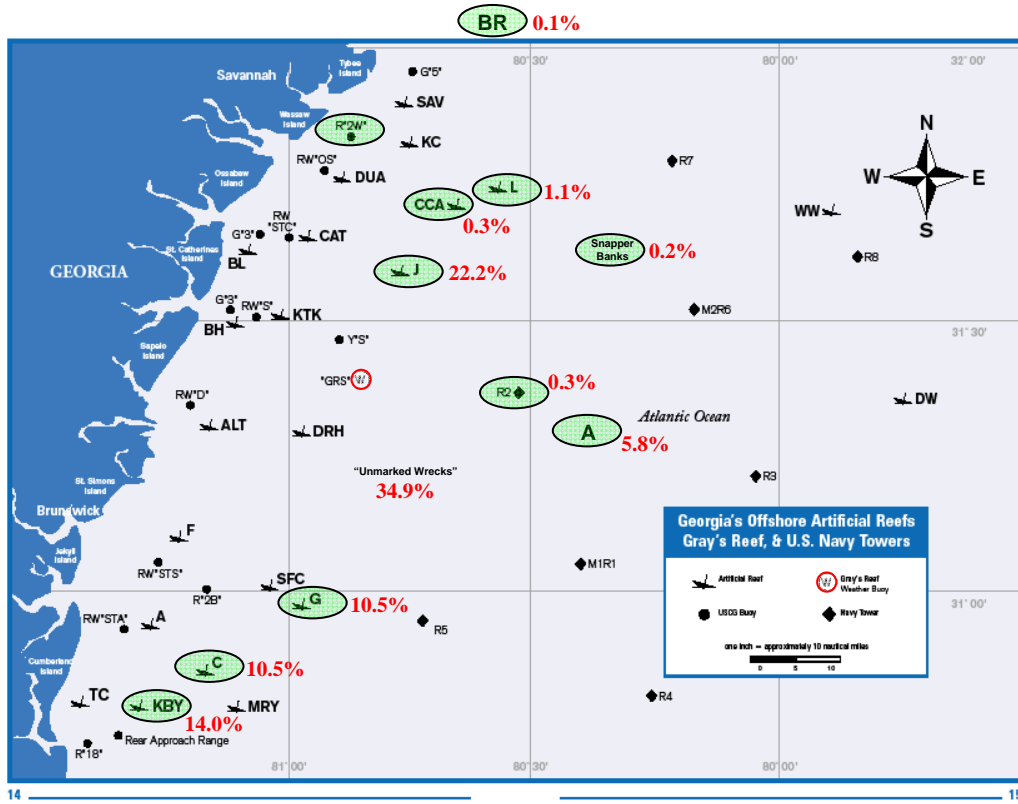


Figure 3. Georgia Preferred Scuba Diving Locations as Reported by Dive Charter. Percentages in red indicate percent of dive trips to each location

### Private Boat Based Spearfishing at GRNMS:

A formal study of private boat based spearfishing at GRNMS has not been undertaken and would be difficult and cost-prohibitive to complete. A telephone survey is not considered feasible due to the extremely high number of calls that would be required to identify spearfishers who visit GRNMS; further, a statistically valid sample would be difficult to obtain because of the very small and widely-scattered sampling universe. On-water surveys are also not feasible due to the open ocean weather conditions, and the extremely small probability of encountering a spearfisher even when conditions are good. Opportunistic surveys during other visits (enforcement, research, monitoring) to the sanctuary would not result in a large enough sample size or valid sampling regime.

Despite the lack of such a formal study, on-water observations from fishermen, scuba divers, and researchers allow us to assume with some confidence that only a small amount (likely no more than one percent of all fishing) of spearfishing within the sanctuary occurs from private boats. As mentioned above, any potential economic cost would likely be absorbed by the multiple substitution opportunities off the Georgia coast.

Given that there is (1) presently no charter spearfishing activity within GRNMS and (2) abundant substitution opportunity in the region, a prohibition on spearfishing at GRNMS would not have a measurable or significant economic impact.

#### *Cumulative Effects Analysis*

The past, present, and reasonably foreseeable actions regarding GRNMS that may contribute to cumulative effects when considered in conjunction with the proposed action include:

Implementation of revised regulations and management strategies (NMSP 2006) - New regulations went into effect in February 2007 after adoption of a revised sanctuary management plan. New regulations included a prohibition on anchoring and a rule for allowable gear (rod and reel, handline, and spearfishing gear without powerheads). Socioeconomic surveys (NMSP 2006; Ehler and Leeworthy 2000) indicate that the economic burden to fishermen and divers from the anchoring prohibition would be nominal because the majority of users do not anchor for fishing or diving. Instead, users troll and drift fish or drift dive due to strong currents. In addition, the vast majority of sanctuary visitors are fishermen using rod and reel gear, which is allowed. Coupled with the conclusion that a spearfishing ban would have no measureable economic effect on users, cumulative economic effects should not be significant. Given the multiple substitution opportunities for spearfishing, the social effects should not be significant. The cumulative effects of the preferred alternative on biological resources of GRNMS, in addition to the incremental effects of other actions to protect resources, are expected to be beneficial but not significant.

Potential for future designation of a research area in the sanctuary - NOAA is currently developing a proposal to designate a research area in a portion of the sanctuary. Designation of a research area may result in restrictions on fishing and diving inside the research area. The boundary options are being considered with various criteria including user displacement, which has also been evaluated in a socioeconomic assessment (Ehler 2008). That assessment analyzes the potential social and economic impacts of a research area and estimates that the economic impact on Georgia recreational fishing may be between 0.11 percent and 0.86 percent of statewide saltwater fishing expenditures. The impact is estimated as the maximum potential impact. In other words, if users choose to fish in no other offshore location if they cannot fish in the area designated as a research area, the maximum potential impact is expected to be less than one percent of total fishing expenditures in Georgia. Again, in combination with the conclusion that a spearfishing ban would have no measureable economic effect on users, cumulative economic effects with potential designation of a research area should not be significant. Given the multiple substitution opportunities for spearfishing, the social effects should not be significant. The cumulative effects of the preferred alternative on biological resources of GRNMS, in addition to the incremental effects of other actions to protect resources, are expected to be beneficial but not significant.

SAFMC actions addressing declines in grouper and snapper fisheries - On a regional basis, the SAFMC is implementing and considering numerous actions to address the overfished and/or overfishing status of several fishes in the snapper-grouper complex. SAFMC actions, however, address all forms of recreational and commercial fishing and do not target spearfishing activities. The specific cumulative biological or socioeconomic effects of SAFMC actions on top of the proposed action in this DEA are difficult to calculate due to the large portion of the U.S. Exclusive Economic Zone under the jurisdiction of the SAFMC compared to the 16.68 square nautical miles of GRNMS. Given, however, that the sanctuary is just a small part of the SAFMC managed area, the cumulative effects are not expected to reach any level of significance.

### *Conclusions*

Prohibiting the use of all spearfishing in GRNMS would afford better protection of the resources by enhancing enforcement and simplifying spearfishing regulations to enhance compliance. Additional protection may be provided to the large fish of GRNMS that tend to be selectively targeted by spearfishing. Protecting the large fish population of GRNMS would result in a balanced ecosystem and enhance reproductive output of large fishes that are not removed.

The socioeconomic impact of the preferred alternative would not be significant. The combination of no charter spearfishing activity at GRNMS and the abundant substitution opportunities lead to the conclusion that a prohibition on spearfishing at GRNMS would result in no measurable economic impact.

Given the evidence of biological impacts from spearfishing, the concerns regarding enforceability of fish harvest with powerheads, the negligible socioeconomic effects, and the abundant substitution opportunities, eliminating all spearfishing in the sanctuary is expected to improve the natural habitats, populations, and ecological processes in GRNMS. This alternative is preferred and would meet the purpose and need as well as allow NOAA to move toward reaching its goal to protect, maintain, restore, and enhance the natural habitats, populations, and ecological processes of Gray's Reef National Marine Sanctuary.

### B. No Action

#### *Biological Impacts and Analysis*

Under this alternative there would be no increased resource protection because law enforcement of the powerhead prohibition would continue to be problematic. Spearfishing without powerheads would continue indefinitely. Given the concerns regarding enforceability of the ban on fish harvest with powerheads, and the evidence of biological impacts from spearfishing at other locations, it is expected that the natural habitats, living marine resources and ecological processes in GRNMS would be negatively impacted by continued spearfishing in the sanctuary.

#### *Socioeconomic Impacts and Analysis*

As described in alternative "A" above, because there is (1) no charter spearfishing activity within GRNMS and (2) abundant substitution opportunities in the region, a

continuation of spearfishing within GRNMS as presently allowed under current regulations would not have a measurable positive economic impact.

#### *Cumulative Effects Analysis*

Cumulative effects with the no action alternative including past, present, and reasonably foreseeable future actions regarding biological resources within GRNMS are not expected to be beneficial or significant because no action will be taken to improve protection or enhancement of sanctuary resources. Socioeconomic effects are not expected to be measurable as described in the analysis for the no action alternative and above in the cumulative effects for the preferred alternative.

#### *Conclusion*

This alternative presents a number of concerns, including the fact that law enforcement of the powerhead prohibition will continue to be problematic. While continued spearfishing would have no economic benefit to users, the adverse impacts to living marine resources, habitat and ecological processes would continue along with the law enforcement challenges. This alternative is not preferred.

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