

Executive Summary

The Gulf of Mexico and South Atlantic Fishery Management Councils (Councils) jointly manage the Fishery Management Plan for the Spiny Lobster Fishery in the Gulf of Mexico and South Atlantic (Spiny Lobster FMP). The purpose of this amendment is to consider changes to the Spiny Lobster FMP to address the requirements of a biological opinion prepared under the Endangered Species Act. The regulations are expected to be implemented in 2012.

BACKGROUND

What Actions Are Being Proposed?

The Councils considered the following:

- Closing areas to either all spiny lobster fishing or lobster trap fishing to protect threatened corals.
- Requiring markings for spiny lobster trap lines to allow identification of trap lines entangling protected species.

Where is the Project Located?

Management of the federal spiny lobster fishery is located in the South Atlantic and Gulf of Mexico in the U.S. Exclusive Economic Zone (EEZ). The EEZ is 3-200 nautical miles off most states, but 9-200 nautical miles off Florida's west coast and Texas.

Who is Proposing the Action?

The Councils are proposing the actions. The Councils develop amendments and submit them to NOAA Fisheries Service who ultimately approves, disapproves, or partially approves the actions in the amendment on behalf of the Secretary of

Gulf of Mexico & South Atlantic Fishery Management Councils

- Responsible for conservation and management of fish stocks
- Consist of 13-17 voting members who are appointed by the Secretary of Commerce
- Responsible for developing fishery management plans and recommend regulations to NOAA Fisheries Service for implementation

NOAA Fisheries Service

- Responsible for preventing overfishing while achieving optimum yield
- Approves, disapproves, or partially approves recommendations of the Councils
- Implements regulations

Commerce. NOAA Fisheries Service is an agency in the National Oceanic and Atmospheric Administration.

Why did the Councils Consider Action?

- The purpose of this amendment is to implement conservation measures to help protect threatened and endangered species in a manner that complies with measures established in the 2009 biological opinion on the spiny lobster fishery.
- The need for the proposed actions is to aid in the protection and recovery of endangered and threatened species.

There are two actions in Amendment 11 to address the purpose and need.

MANAGEMENT MEASURES

Action 1: Limit Spiny Lobster Fishing in Certain Areas in the Exclusive Economic Zone (EEZ) off the Florida Keys to Protect Threatened Staghorn (*Acropora cervicornis*) and Elkhorn (*Acropora palmata*) Corals

Alternative 1: No Action – do not limit spiny lobster fishing in the EEZ off the Florida Keys in areas where threatened staghorn and elkhorn corals (*Acropora* spp.) occur.

Alternative 2: Close all known hardbottom in the EEZ off the Florida Keys where *Acropora* spp. occur and in water depths less than 30 meters (approximately 98 feet).

Option a. In the closed areas, spiny lobster trapping would be prohibited.

Option b. In the closed areas, all spiny lobster fishing would be prohibited.

Preferred Alternative 3: Create new closed areas in the EEZ off the Florida Keys with identified *Acropora* spp. colonies inside straight-line boundaries.

Preferred Option a. In the closed areas, spiny lobster trapping would be prohibited.

Option b. In the closed areas, all spiny lobster fishing would be prohibited.

Note: Areas under Alternatives 2 and 3 are all south of US 1, between Key Biscayne and Key West. See Figures 2.1.1-13 for maps of the locations of proposed and existing closed areas and Appendix A for coordinates of each proposed closed area in Alternative 3. Transit would be allowed for vessels traveling through a closed area. The term "transit" is defined as on a direct and continuous course through a closed area.

Overview

The Endangered Species Act (ESA) requires analyses to determine whether, and to what extent, fishing operations impact threatened species including threatened staghorn and elkhorn corals (*Acropora* spp.). The 2009 ESA biological opinion on the spiny lobster fishery requires NOAA Fisheries Service and the Councils to work together to protect areas of staghorn and elkhorn coral by expanding existing or creating new closed areas for lobster trap fishing where colonies of these threatened species are present. Closure of areas to lobster fishing using all gear would further protect coral colonies from damage.

Traps are generally not set directly on corals; instead, they are frequently placed on seagrass and sand bottom. For this reason, movement of traps during storms poses the greatest threat to corals. Therefore, some buffer is needed between the coral colonies and placement of traps. Staff from the Councils and NOAA Fisheries Service worked with various stakeholders to develop the proposed closed areas in **Preferred Alternative 3** of this action. Areas were chosen to protect colonies with high conservation value and areas of high coral density.

Biological Impacts

Alternative 1 would not provide any additional biological benefit to *Acropora spp.* because it would perpetuate the existing level of risk of interaction between these species and the fishery. **Alternative 2** would provide the greatest biological benefit to *Acropora spp.*, other coral species, and attached organisms associated with hardbottom habitat. **Preferred Alternative 3, Option a** would reduce the risk of trap damage to *Acropora spp.* by prohibiting the use of traps near areas of high *Acropora spp.* density, established areas used to raise coral for restoration purposes (i.e., coral nurseries), or coral colonies with high conservation value. **Option b** under each alternative would provide greater benefits to the biological environment than **Preferred Option a** because all potential damage from fishing would be reduced.

Economic Impacts

The Atlantic EEZ off Florida (Key Biscayne to Key West) encompasses approximately 60 mi² which could support threatened *Acropora spp.*, and this area is being considered for closure to fishing for spiny lobster under **Alternative 2**. **Alternative 2, Option b**, would reduce commercial landings of spiny lobster of 274,000 lbs (landings by all gear) and trip gross revenue for spiny lobster (\$1.629 million) by 15% to 28%. **Alternative 2, Option a**, is estimated to reduce commercial landings of spiny lobster of 269,000 lbs (landings by traps only) and trip gross revenue (\$1.585 million) by 15% to 28%. The reductions in trip gross revenue for either option represent the economic impacts, approximately 1.9% to 3.6% of total gross revenue for all species landed by affected vessels, not enough to change their economic behavior.

Preferred Alternative 3 would create smaller closed areas bound by straight-line boundaries of 5.9 mi², which contain identified *Acropora spp.* colonies. This is 9.8% of the area for **Alternative 2** (60 mi²), and the 9.8% can be applied to the pounds and value data for **Alternative 2** to estimate the economic effect of **Preferred Alternative 3**.

Alternative 3, Option b (all gear), would reduce commercial landings of spiny lobster by 4,042 lbs to 7,544 lbs, and reduce trip gross revenue by \$94,482, which represents 0.18% - 0.34% of the vessel gross revenue of \$13.0 million for 152 affected vessels. **Preferred Alternative 3, Option a** (trap gear only), would reduce spiny lobster landings by 3,968 lbs - 7,406 lbs, and reduce trip gross revenue for spiny lobster by \$23,379 - \$43,379. The foregone trip gross revenue represents 0.19% - 0.35% of the vessel gross revenue of \$12.511 million for 128 affected vessels.

Social Impacts

In general, positive social benefits from the proposed closed areas under **Alternative 2** and **Preferred Alternative 3** are associated with the biological benefits of protecting the elkhorn and staghorn coral. Corals are part of the ecosystem in which spiny lobster live and are important components of the marine environment. Protection of the corals is expected to contribute to an overall healthy ecosystem and would also contribute to a healthy spiny lobster stock, which would be expected to result in positive social effects for the commercial fishermen as well as broader positive social effects (in terms of the general public) associated with healthy marine ecosystems.

Some general negative social impacts from spatial closures come from limiting or removing fishing opportunities within the

closed areas, which may impact income for commercial fishermen who use the closed areas for harvest. In regards to the options under **Alternative 2** and **Preferred Alternative 3**, prohibiting all fishing, **Option b**, would be expected to impact more fishermen than **Option a**, which would impact only trap fishermen.

Administrative Impacts

Alternatives that create new closed areas would increase the administrative burden over the current level due to changes in maps, outreach and education, and greater enforcement needs. **Alternative 2** would require enforcement over the largest area. **Preferred Alternative 3** would require specification of coordinates because most areas would not be marked. Law enforcement officials have stated **Option b** would be easier to enforce than **Preferred Option a** because any boat in a closed area with lobster on board would be in violation of regulations.

Action 2: Require Gear Markings for Spiny Lobster Trap Lines in the EEZ off Florida

Preferred Alternative 1: No Action – do not require markings for spiny lobster trap lines.

Alternative 2: Require all spiny lobster trap lines in the EEZ off Florida to have a white marking along its entire length, such as an all white line or a white tracer throughout the line. The marking must be visible at all times when traps are in use. All gear must comply with marking requirements no later than August 6, 2017.

Alternative 3: Require all spiny lobster trap lines in the EEZ off Florida to have a permanently affixed white marking at least 4-inch wide spaced at least every 15 ft along the trap line, or at the midpoint if the line is less than 15 ft. The marking must be visible at all times when traps are in use. All gear must comply with marking requirements no later than August 6, 2017.

Note: The white line or line with white tracer proposed under Alternative 2 would also be valid under Alternative 3.

Overview

Trap lines or rope are consistently found as marine debris and most frequently recovered without the buoys or traps still attached. These conditions cause significant difficulty when determining if line found in the environment, or entangling protected species, originated from the spiny lobster trap fishery. A lack of uniquely identifiable markings also makes monitoring incidental take in the fishery, as required by the ESA, difficult. Trap line marking requirements would allow greater accuracy in identifying fishery interaction impacts to benthic habitats and protected species, leading to more targeted measures to reduce the level and severity of those impacts.

Biological Impacts

Preferred Alternative 1 would not provide any additional biological benefit for protected species. **Alternative 2** could have more of an indirect biological benefit than **Alternative 3**, because it requires markings along the entire length of trap lines, minimizing the likelihood that a portion of a

spiny lobster trap line is recovered without an identifiable mark. Trap marking requirements would provide better understanding of the frequency of interactions between these species and the fishery. This information could benefit protected species by providing for more targeted management of fishing activities that have the greatest impact on their protection. These requirements could also help rule out the spiny lobster fishery as a potential source of entanglement with protected species.

Economic Impacts

Alternative 2 and **Alternative 3** would have an upper-end economic impact of \$383,465, though the economic impact could be much lower, perhaps closer to zero. More information and research is needed to refine this estimate and differentiate the effect of the two alternatives. The upper-end estimate of economic impact, \$383,465, represents 8.5% of the trip gross revenue for 271 vessels that land spiny lobster from the EEZ off Florida. This represents the

increase in cost of trap rope replacement, which goes from \$510,835 (13.1% of trip gross) to \$894,300 (22.9% of trip gross), excluding the cost of labor and other components to make traps usable (traps, buoys, bridles) and it excludes any change in on-vessel equipment. This translates into a 15-year cost of \$5.75 million for the EEZ off Florida.

Social Impacts

Overall, **Preferred Alternative 1** would likely have fewer social impacts than **Alternatives 2 and 3**. **Alternatives 2 and 3** would require some type of marking on trap lines which could resolve any future problems with identification of trap lines interacting with protected species. Marking

trap lines could have significant effects on the social environment as it may impose substantial costs to modify the gear compared to **Preferred Alternative 1**. Additionally, the proposed measures under **Alternatives 2 and 3** may generate negative public perception of coral conservation.

Administrative Impacts

Alternatives 2 and 3 would increase the need for enforcement to check if trap lines are properly colored or marked compared to **Preferred Alternative 1**. However, impacts may increase under **Preferred Alternative 1** if new regulations must be imposed on the spiny lobster fishery because of the inability to assign interactions with protected species to another fishery.



Chapter 1. Introduction

This Final Supplemental Environmental Impact Statement (FSEIS) for Amendment 11 to the Fishery Management Plan for Spiny Lobster in the Gulf of Mexico and South Atlantic (Spiny Lobster FMP) would implement measures to protect threatened and endangered species. The Gulf of Mexico (Gulf) and South Atlantic Fishery Management Councils (Councils) jointly manage the Spiny Lobster FMP.

The Councils and NOAA Fisheries Service considered alternatives to address the requirements of the biological opinion (Bi Op) in Amendment 10 to the Spiny Lobster FMP; however, they chose to take no action at that time to allow for additional stakeholder input. The Councils and NOAA Fisheries Service made clear they intend to quickly develop Amendment 11 to put these measures into place as required by the Bi Op on the continued authorization of the Gulf of Mexico and South Atlantic spiny lobster fishery (NMFS 2009, http://sero.nmfs.noaa.gov/sf/pdfs/Spiny_Lobster_10_Appendix%20I.pdf).

1.1 Background

The Endangered Species Act (ESA) of 1973 (16 U.S.C. Section 1531 et seq.) requires that federal agencies ensure actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of threatened or endangered species, or the habitat designated as critical to their survival and recovery. The ESA requires NOAA Fisheries Service to consult with the appropriate administrative agency (itself for most marine species and the U.S. Fish and Wildlife Service for all remaining species) when proposing an action that may affect threatened or endangered species or adversely modify critical habitat. Consultations are necessary to determine the potential impacts of the proposed action. Formal consultations are required when proposed actions may affect and are “likely to adversely affect” threatened or endangered species or adversely modify designated critical habitat. The result of a formal consultation is a Bi Op.

To satisfy the ESA consultation requirements, NOAA Fisheries Service completed a formal consultation and resulting Bi Op on the spiny lobster fishery in 2009. When making determinations on FMP actions, not only are the effects of the specific proposed actions analyzed, but also the effects of all discretionary fishing activity under the affected FMPs. Thus, the Bi Op analyzed the potential impacts to ESA-listed species from the continued authorization of the federal spiny lobster fishery. The species considered included: ESA-listed marine mammals, Gulf sturgeon, sea turtles, smalltooth sawfish, and elkhorn and staghorn coral. Potential impacts to the designated critical habitat for elkhorn and staghorn corals were also

Who's Who?

- NOAA Fisheries Service Protected Resources Division – analyzed data and drafted the biological opinion (Bi Op)
- NOAA Fisheries Service and Council staffs – developed alternatives based on guidance from the Councils, and analyzed the environmental impacts of those alternatives
- Gulf and South Atlantic Councils – determined the range of actions and alternatives, and recommends action to NOAA Fisheries Service
- Secretary of Commerce – Will approve, disapprove, or partially approve the amendment as recommended by the Councils

Purpose for Action

The purpose of this amendment is to implement conservation measures to help protect endangered and threatened species in a manner that complies with measures established in the 2009 biological opinion on the spiny lobster fishery.

Need for Action

The need for the proposed actions is to aid in the protection and recovery of endangered and threatened species.

considered. The Bi Op conducted a step-wise analysis of the fishery and its potential to adversely affect these species. Below is a summary of those steps; the 2009 Bi Op discusses in far greater detail these steps and the how conclusions were reached. During the first step, the Bi Op evaluated whether interactions between federal spiny lobster fishing gear and protected species were likely based on parameters such as species' range and areas of fishery operation. Following the first analysis, the Bi Op concluded that no spiny lobster gear type (i.e., traps, bully nets, or commercial/recreational diving) was likely to adversely affect ESA-listed marine mammals, Gulf sturgeon, or elkhorn and staghorn critical habitat, and they were not discussed further in the Bi Op.

The second step of the analysis identified those species that would likely be adversely affected by the continued authorization of the fishery. The Bi Op concluded that interactions between spiny

lobster trap gear and sea turtles, smalltooth sawfish, and elkhorn or staghorn coral were possible. After identifying those species potentially affected, the Bi Op evaluated the likelihood of interactions between these species and each fishing gear/technique (i.e., traps, bully nets, or commercial/recreational diving) based on a number of factors. At the conclusion of the first two analyses, the Bi Op ultimately concluded that only commercial trap gear was likely to adversely affect and "take" sea turtles, smalltooth sawfish, and elkhorn and staghorn corals. However, those adverse affects were not likely to jeopardize the continued existence of those species.

To "take" a listed species means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage" in any of those activities [ESA Section 3(19)]. Under the ESA, takes of most listed species are prohibited by law. Some take of ESA-listed species can be authorized following the completion of a Bi Op, which issues an incidental take statement (ITS). An ITS allows a specific number of takes to lawfully occur if the takes are incidental to otherwise legal fishing, and if certain measures meant to minimize the impacts from and monitor the frequency of those incidental takes are followed.

The 2009 Bi Op issued an ITS authorizing a specific number of incidental takes of green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles, smalltooth sawfish, and elkhorn and staghorn coral. Reasonable and prudent measures to minimize and monitor the impact of these incidental takes were specified, along with terms and conditions to implement them. Specific terms and conditions required to implement the prescribed reasonable and prudent measures include, but are not limited to, creating new or expanding existing closed areas to protect coral and implementing trap line-marking requirements. The actions proposed in this amendment are being considered to implement the terms and conditions of the Bi Op.

Once considered dominant reef building species, elkhorn and staghorn corals underwent precipitous declines in the early 1980s throughout their ranges and this decline has continued (*Acropora* BRT 2005). Because of their once vast abundance on Caribbean reefs prior to the early 1980s, researchers/divers rarely took time to collect information on such a common species. As a result little quantitative data on changes to distribution and abundance are currently available. However, in the few locations where quantitative data are available (e.g., Florida Keys, Dry Tortugas, Belize, Jamaica, and the U.S.V.I.), declines in abundance (coverage and colony numbers) are estimated at approximately 97% of historic levels (*Acropora* BRT 2005). Although this decline has been documented as on-going during the late 1990s, and even in the past five years in some locations, local extinctions (i.e., at the island or country scale) have not been rigorously documented (*Acropora* BRT 2005).

The branching morphology of elkhorn and staghorn corals causes colonies of any size to be susceptible to fragmentation/breakage and abrasion from fishing activity. Creating closed areas would reduce the likelihood of commercial spiny lobster traps coming into contact with colonies even if they are moved by storms. Trap line marking requirements would allow greater accuracy in identifying fishery interactions with protected species and improve the capability for monitoring incidental take as required under the ESA.

1.2 Management History

The [Fishery Management Plan for Spiny Lobster in the Gulf of Mexico and the South Atlantic](#) largely extended Florida's rules regulating the fishery to the exclusive economic zone (EEZ) throughout the range of the fishery, i.e., North Carolina to Texas. The FMP regulations were effective on July 2, 1982 (47 FR 29203). A complete history of amendments to the FMP can be found in Amendment 10 to the FMP.

[Amendment 10](#), with Environmental Impact Statement, effective January 3, 2012, made the following changes in the management regime:

- Removed four species of lobster from federal management
- Established an annual catch limit, annual catch target, and accountability measure for Caribbean spiny lobster
- Required fishermen with tailing permits to land spiny lobster all whole or all tailed, and requires applicants for a tailing permit to possess either a federal spiny lobster permit or the Florida permits required for commercial lobster fishermen
- Allows retention of up to 50 Caribbean spiny lobsters under the minimum size limit and one per trap
- Provides authority to Florida to remove derelict spiny lobster traps in federal waters under the state trap clean-up program
- Revises the protocol for cooperation with Florida and the framework procedure
- Revises how maximum sustainable yield, overfishing threshold and overfished threshold are calculated

The actions in this amendment were also in Amendment 10; however, the Councils decided to develop Amendment 11 to allow more time for stakeholder input. Scoping for Amendment 10

covered these issues. Summaries of the scoping and public hearing meetings can be found in Appendix F of Amendment 10 (<http://sero.nmfs.noaa.gov/sf/SpinyLobsterAmendment.htm>). The following is a list of the changes made to the two actions originally contained in Amendment 10.

- For Action 1, **Alternatives 1 and 2** cover the range of alternatives, from no additional closures to closing all hardbottom, and are the same in this amendment as Amendment 10.
- For Action 1, **Alternative 3** is based on additional data and stakeholder input not available during the development of Amendment 10. The alternatives no longer include small, medium, and large closed areas because the alternative results in an adequate buffer between the corals and fishing activity.
- For Action 1, **Option a** and **Option b** are the same in this amendment as Amendment 10.
- For Action 2, the alternatives are essentially the same except the phase-in period has been extended from 2014 to 2017 and the rope color has been designated as white.

The Secretary of Commerce approved Amendment 10 on November 17, 2011. The final rule published in the *Federal Register* on December 2, 2011, and was effective January 3, 2012.

Chapter 2. Management Alternatives

2.1 Action 1: Limit Spiny Lobster Fishing in Certain Areas in the Exclusive Economic Zone (EEZ) off the Florida Keys to Protect Threatened Staghorn (*Acropora cervicornis*) and Elkhorn (*Acropora palmata*) Corals

Alternative 1: No Action – do not limit spiny lobster fishing in the EEZ off the Florida Keys in areas where threatened staghorn and elkhorn corals (*Acropora* spp.) occur.

Alternative 2: Close all known hardbottom in the EEZ off the Florida Keys where *Acropora* spp. occur and in water depths less than 30 meters (approximately 98 feet).

Option a. In the closed areas, spiny lobster trapping would be prohibited.

Option b. In the closed areas, all spiny lobster fishing would be prohibited.

Preferred Alternative 3: Create new closed areas in the EEZ off the Florida Keys with identified *Acropora* spp. colonies inside straight-line boundaries.

Preferred Option a. In the closed areas, spiny lobster trapping would be prohibited.

Option b. In the closed areas, all spiny lobster fishing would be prohibited.

Note: Areas under Alternatives 2 and 3 are all south of US 1, between Key Biscayne and Key West. See Figures 2.1.1-13 for maps of the locations of proposed and existing closed areas and Appendix A for coordinates of each proposed closed area in Alternative 3. Transit would be allowed for vessels traveling through a closed area. The term "transit" is defined as on a direct and continuous course through a closed area.

Discussion: The 2009 biological opinion on the spiny lobster fishery (Bi Op) requires NOAA Fisheries Service and the Gulf of Mexico (Gulf) and South Atlantic Councils (Councils) to work together to protect areas with staghorn and elkhorn corals (*Acropora* spp.) by expanding existing or creating new closed areas for lobster trap fishing where colonies of these threatened species are present (NMFS 2009,

http://sero.nmfs.noaa.gov/sf/pdfs/Spiny_Lobster_10_Appendix%20I.pdf).

During the development of this amendment, maps with the locations of hardbottom habitat and threatened coral colonies (i.e., elkhorn and staghorn) were developed with help from state and federal agencies as well as other groups including: Florida Fish and Wildlife Research Institute, Florida Keys National Marine Sanctuary, Mote Marine Laboratory, The Nature Conservancy, University of North Carolina at Wilmington, and the Coral Restoration Foundation. Data from individual research scientists were also included. More information about the methods used to establish the baseline maps can be found in Appendix G. The resulting dataset used in this amendment contained 6,853 identified *Acropora* spp. colonies.

After the baseline maps were created, the following six general criteria (in no particular order) were used as guidance to develop the proposed areas for closure in this amendment: 1) protect all

elkhorn coral because of their relative rarity in the Florida Keys; 2) protect areas where elkhorn and staghorn corals co-occur; 3) distribute areas throughout the Florida Keys (to the greatest extent practicable); 4) select areas that not only protect elkhorn and staghorn coral, but may also protect seven species of corals currently proposed for listing under the Endangered Species Act (ESA); 5) include *Acropora* coral nurseries¹ if possible; and 6) protect the largest colonies with the greatest sexual reproductive potential (i.e., –super colonies”).

The general criteria used for site selection were developed with stakeholder input. Protection of all elkhorn corals was recommended because the species is relatively rare in the Florida Keys, and recovery of the species in the area will require protection of the remaining colonies. Providing protection for areas where elkhorn and staghorn corals co-occur was recommended because such areas are relatively rare in the Florida Keys and the conservation benefits of such area closures are maximized by providing protection for both species. Distributing area closures throughout the Florida Keys was recommended to reduce disproportionate effects to the industry, particularly in the Upper Keys where bathymetry and existing area closures have already reduced fishable habitat. Stakeholders also recommended trying to select areas for potential closure that may also provide protection to seven species of coral currently being reviewed by NOAA Fisheries Service for listing under the ESA. However, point location data were not available for all species proposed for listing. The species for which point location data were available did not co-occur with elkhorn and staghorn corals. Therefore, protecting all seven species of coral proposed for listing would require the creation of additional closed areas and would be outside the scope of this amendment.

Stakeholders also recommended considering area closures for *Acropora* coral nurseries because these areas are susceptible to the same trap impacts.¹ Based on that input, five coral nurseries are proposed for inclusion in area closures. These nurseries are areas whose sole purpose is to legally collect *Acropora* spp. coral fragments, raise them to a transplantable size, and then use these colonies in restoration efforts throughout the Florida Keys. All coral nursery operators working with *Acropora* spp. in the Florida Keys have a permit from the Florida Keys National Marine Sanctuary (FKNMS) to collect and grow *Acropora* spp. and their activities have undergone ESA consultation through NOAA Fisheries Service. The nursery areas are sited on sandy bottom areas approved by FKNMS staff.

Protecting the largest colonies was also recommended because of their reproductive value. Elkhorn and staghorn corals can reproduce both sexual and asexually (Aronson and Precht 2001), but successful sexual reproduction will likely need to play a major role in elkhorn and staghorn coral recovery (Bruckner 2002). Because the sizes of elkhorn and staghorn corals are directly proportional to their fecundity, large –super colonies” represent an essential source of gamete production. Elkhorn corals with a living tissue surface area of 1,000 cm² could be considered –super colonies” (M. Chiappone, pers. comm.). A similar distinction could be made for staghorn corals with a living tissue surface area of 500 cm² (M. Chiappone pers. comm.). Some researchers have suggested colony dimensions would be a better metric for defining a

¹ *Acropora* spp. coral nurseries are permitted locations used for proactive conservation activities. At these field sites, small fragments of *Acropora* spp. colonies are grown to sizes large enough to be transplanted safely in support of restoration/recovery activities. For further discussion of *Acropora* spp. nurseries in the Florida Keys, see http://coralrestoration.org/CRF/index.php?option=com_content&view=category&layout=blog&id=49&Itemid=91.

–super colony” rather than the area of live tissue. Given the information available at the time of the development of this amendment, super colonies were defined based on the live tissue approach described previously.

The FKNMS has designated 15 Research Only (RO) and Sanctuary Preservation Areas (SPAs) in federal waters where all fishing is prohibited [15 CFR 922.164(d)(iii)]. *Acropora* spp. occur at relatively high densities in many of these areas. Of the 6,853 colonies identified, 3,747 are already protected by these areas. However, a number of *Acropora* spp. colonies, some in high density with great conservation value, exist outside these closed areas. Creating new closed areas would reduce the likelihood of interactions between spiny lobster traps and coral colonies not currently inside an existing closed area. If all lobster fishing is prohibited, even greater protection to coral colonies could be realized.

The areas proposed in this amendment do not include the already existing FKNMS areas. Creating buffers around the FKNMS SPAs or ROs would not include many additional colonies of high density and great conservation value. Further, law enforcement officials have indicated buffers are difficult to enforce because buffers by definition are not closed areas, but areas to protect closed areas. Therefore, fishing in buffer areas may not be viewed as a violation. Concurrent to the development of this amendment, FKNMS is

More information about the Florida Keys National Marine Sanctuary can be found at <http://floridakeys.noaa.gov/regs/welcome.html>

conducting an independent evaluation of its existing management areas and the activities authorized or prohibited in those zones (i.e., commercial fishing, recreational fishing/diving, research, etc.). After that evaluation is complete, FKNMS may choose to implement new regulations or modify the existing regulations on the activities allowed or prohibited in those management areas. One possible outcome could be a prohibition of all diving and trapping for spiny lobster inside some or all management zones. Regardless of the actions taken by the Councils, FKNMS is likely to proceed with the independent evaluation of their existing management zones.

Any actions taken by the Councils will not affect existing FKNMS regulations or management zones. Once FKNMS’ comprehensive review and re-zoning is complete, NOAA Fisheries Service and the Councils may work with FKNMS to review all areas closed to lobster fishing to determine if the existing closed areas are still meeting the conservation goals, or whether changes should be recommended. The ESA requires the status of each listed species be reviewed periodically; reviews are generally conducted every five years. A five-year review is an assessment using the most recent information on a listed species to determine whether its status has changed since the time of its listing such that it should be delisted or reclassified. Because five-year reviews consider the most recent information on a species, NOAA Fisheries Service and the Councils may wish to conduct periodic reviews of proposed closed areas to coincide with the five-year status reviews for *Acropora* spp.

Transit would be allowed through lobster closed areas under the same conditions as for other closed areas. Transit is defined as on a direct and continuous course through a closed area. This transit provision is necessary because most lobster fishermen set traps seaward of the reef tract

and vessels must cross the reef tract to return to port. In some areas, avoiding closed areas would require vessels to travel miles out of their way, potentially compromising safety at sea. Thus, fishers would be allowed to possess spiny lobster when transiting a closed area.

The Councils chose to take no action on this issue in Amendment 10 to consider additional data and to allow more time for input from stakeholders regarding which areas to close.

The intent was to provide the greatest protection to *Acropora* spp. while leaving as much area open to fishing as possible. The Councils and NOAA Fisheries Service indicated they would quickly develop Amendment 11 to address this issue. On July 12-13, 2011, the Florida Keys Commercial Fishermen's Association held a meeting to provide stakeholder input on the location of the proposed closed areas to protect *Acropora* spp. Entities involved in this meeting included experts from the FKNMS, the Florida Fish and Wildlife Conservation Commission, the Florida Keys Commercial Fishermen's Association, the FKNMS Sanctuary Advisory Council (SAC), and environmental organizations.

From the Bi Op: NMFS, in cooperation with the Florida Keys National Marine Sanctuary, Gulf of Mexico and South Atlantic Fishery Management Councils, must work to establish new closed areas or expand the size of existing closed areas in waters under their jurisdiction where *Acropora* spp. are present to prohibit spiny lobster trap fishing. This will reduce the likelihood of spiny lobster traps affecting *Acropora* spp.

Alternative 1 would not meet the requirement established under the Bi Op. If the Councils had decided to take no action, NOAA Fisheries Service would have determined if implementing these measures under Magnuson-Stevens Fishery Conservation and Management Act or ESA authority was necessary. **Alternative 1** would not provide any additional biological benefit to *Acropora* spp., because it would perpetuate the existing level of risk of interaction between these species and the fishery. **Alternative 1** would not close any new areas; therefore, it would not have any near-term economic impact, but it could have an economic impact over the long term, if more extensive closures than in **Alternative 2** and **Preferred Alternative 3** were required in the future.

Alternative 2 would provide the greatest biological benefit to *Acropora* spp., other coral species, and attached organisms on hardbottom habitat. **Alternative 2** would prohibit spiny lobster trapping (**Option a**) or all spiny lobster fishing (**Option b**) on all hardbottom areas in the Florida EEZ south of US 1, from Key Biscayne to Key West, that support *Acropora* spp. Essentially, every identified threatened coral colony on the map would be protected under this alternative², as well as those that have not been identified. This alternative would reduce the likelihood of interactions between spiny lobster gear in this area and *Acropora* spp. **Alternative 2** would close approximately 60 mi² of the Florida EEZ from approximately Key West to Key Biscayne. Closing all hardbottom areas to trapping would reduce the area available to trapping and may make trapping impractical and would result in negative social and economic impacts. Although spiny lobster fishermen do not deliberately set traps on corals, they do set them very near the colonies.

² Some identified colonies in Figures 2.1.1-13 may appear to be sited outside the hardbottom areas due to a lack of resolution during the mapping of the hardbottom. However, these colonies are by definition on hardbottom and would be protected under regulations prohibiting lobster fishing on all known hardbottom."

The primary challenge with selecting closed areas is balancing benefits to the fishery and impacts to the environment. Relative to **Alternative 2, Preferred Alternative 3** would be less biologically beneficial to *Acropora* spp. colonies, but would be less restrictive to fishermen. This alternative provides a reasonable buffer around *Acropora* spp. colonies without closing large areas of bottom suitable for lobster trapping. The amount of area is based on protecting colonies from movement of traps. Non-tropical storm systems can move traps 100 ft from their original locations (Lewis et al. 2009). However, stronger storms (i.e., tropical systems) can move traps many times farther.

Preferred Alternative 3 would establish straight-line boxes around identified *Acropora* spp. colonies or groups of colonies that includes approximately 500 ft of area between the colonies and where traps could be set. The boundaries of all the closed areas usually form right angles to improve compliance and support enforcement. In general, boxes were drawn around clusters of colonies, and oriented along the reef tract to reduce the amount of non-hardbottom (fishable) areas closed to fishing (see Appendix G for more detailed discussion of methods). Originally, 56 closed areas were created covering 6.7 mi²; however, in response to an industry request, three of those areas were split into smaller areas to reduce the amount of fishable bottom that would be closed. As a result, **Preferred Alternative 3** would close 60 areas covering approximately 5.9 mi², approximately 2.4 mi² of which is anticipated to be fishable (i.e., non-hardbottom) habitat.


This alternative would encompass 3,044 identified colonies; combined with colonies already protected by FKNMS closed areas, approximately 6,791 of the identified *Acropora* spp. colonies (99%) would be protected in the Florida Keys. It is important to note that identified colonies are colonies that have been visually identified during sampling. Colony density estimates by site and habitat, together with mapping information on the total amount of habitat available, can be used to derive estimates of total colony abundance. This approach was used to estimate the number of colonies for the entire Florida Keys, even in locations where no sampling had been conducted. Because the assessment was able to estimate colonies in non-sampled locations, it concluded a far greater number of colonies may exist than those identified during sampling. Specifically, the assessment estimated up to 13 million staghorn colonies, and as many as 1.6 million elkhorn colonies may exist in the region. However, the assessment estimated most staghorn colonies (approximately 75%) were small, between 0.1 in² and 5 in² (0-150 cm²) (Miller et al. 2008a). Elkhorn colonies were far less common, but slightly larger. The majority of elkhorn colonies (approximately 69%) ranged in size from 0.1 in² to 9 in² (0-500 cm²) (Miller et al. 2008a).³ In corals, the chance of survival is closely related to colony size; the smaller the colony, the less likely it is to survive (Hughes and Jackson 1985; Babcock 1991; Vermeij and Sandin 2008; Albright et al. 2010). The stock assessment (i.e., Miller et al. 2008) indicates the majority of the colonies that may occur in the Florida Keys are small with a lower chance of survival.



Option b under each alternative would provide slightly more biological benefit to *Acropora* spp. colonies than **Preferred Option a** because it would prohibit all fishing for spiny lobster in the proposed closed areas. Although the impacts to *Acropora* spp. from diving for spiny lobster are unknown, various studies throughout the Caribbean and Indo-Pacific show that other types of diving and associated anchoring adversely affect corals. This literature indicates that

³ For reference, a U.S. dollar bill is approximately 15 in² (101 cm²).

recreational divers targeting spiny lobster and commercial lobster divers could have negative impacts to coral and the surrounding habitat; therefore, **Option b** would provide additional benefits because it would reduce the likelihood that adverse effects from diving and anchoring could occur. The overall size of the proposed closed areas is less relevant when discussing the impacts from diving because divers must be in very close proximity to colonies to impact them. Thus, simply prohibiting the practice of diving for spiny lobster inside the proposed closed areas would help minimize any potential threat. However, the Bi Op concluded that only commercial trap gear was likely to adversely affect and “take” sea turtles, smalltooth sawfish, and elkhorn and staghorn corals. Therefore, **Option a** meets the recommendations of the Bi Op.

Although the FKNMS management zone review is unrelated to this amendment, the FKNMS SAC is aware of the actions proposed here, and has discussed this amendment during SAC meetings. As a result of those discussions, the SAC passed a resolution on August 16, 2011, regarding their preference on which alternative they would like to see selected for this action. Specifically, the resolution asked the FKNMS Superintendent to convey to the Councils and NOAA Fisheries Service that the SAC would prefer the alternative that creates new or expands existing closed areas in which all spiny lobster fishing is prohibited (**Option b**). The SAC is an advisory body to the FKNMS superintendent, and the opinions and findings of the resolution do not necessarily reflect the position of FKNMS or NOAA Fisheries Service.

Figures 2.1.1-13 show the proposed closed areas for **Preferred Alternative 3** from west to east. Blue dots ● represent identified *Acropora* spp. colonies; hash-marked boxes  show the proposed straight-line closed areas. In addition, hardbottom areas that would be closed under **Alternative 2** are shown on each map. Coordinates for the proposed closed areas under **Preferred Alternative 3** are in Appendix A. The maps can also be viewed at http://gulfcouncil.org/resources/Spiny_Maps.php

FKNMS SPAs  and RO areas  are shown in the figures. These areas are not being created by this amendment, but are existing areas that provide protection to *Acropora* spp.

With certain exceptions, the following activities are prohibited in [SPAs](#):

- Discharging any matter except cooling water or engine exhaust.
- Fishing by any means; removing, harvesting, or possessing any marine life. Catch and release fishing by trolling is allowed in Conch Reef, Alligator Reef, Sombrero Reef, and Sand Key SPAs only.
- Touching or standing on living or dead coral.
- Anchoring on living or dead coral or any attached organism.
- Anchoring when a mooring buoy is available.
- [Bait fishing](#) is allowed in SPAs by Florida Keys National Marine Sanctuary permit.

Similarly the following activities are prohibited in [RO Areas](#):

- Entry or activity without a [Florida Keys National Marine Sanctuary permit](#).
- Discharging any matter except cooling water or engine exhaust.
- Fishing by any means; removing, harvesting, or possessing any marine life.
- Touching or standing on living or dead coral.
- Anchoring on living or dead coral, or any attached organism.

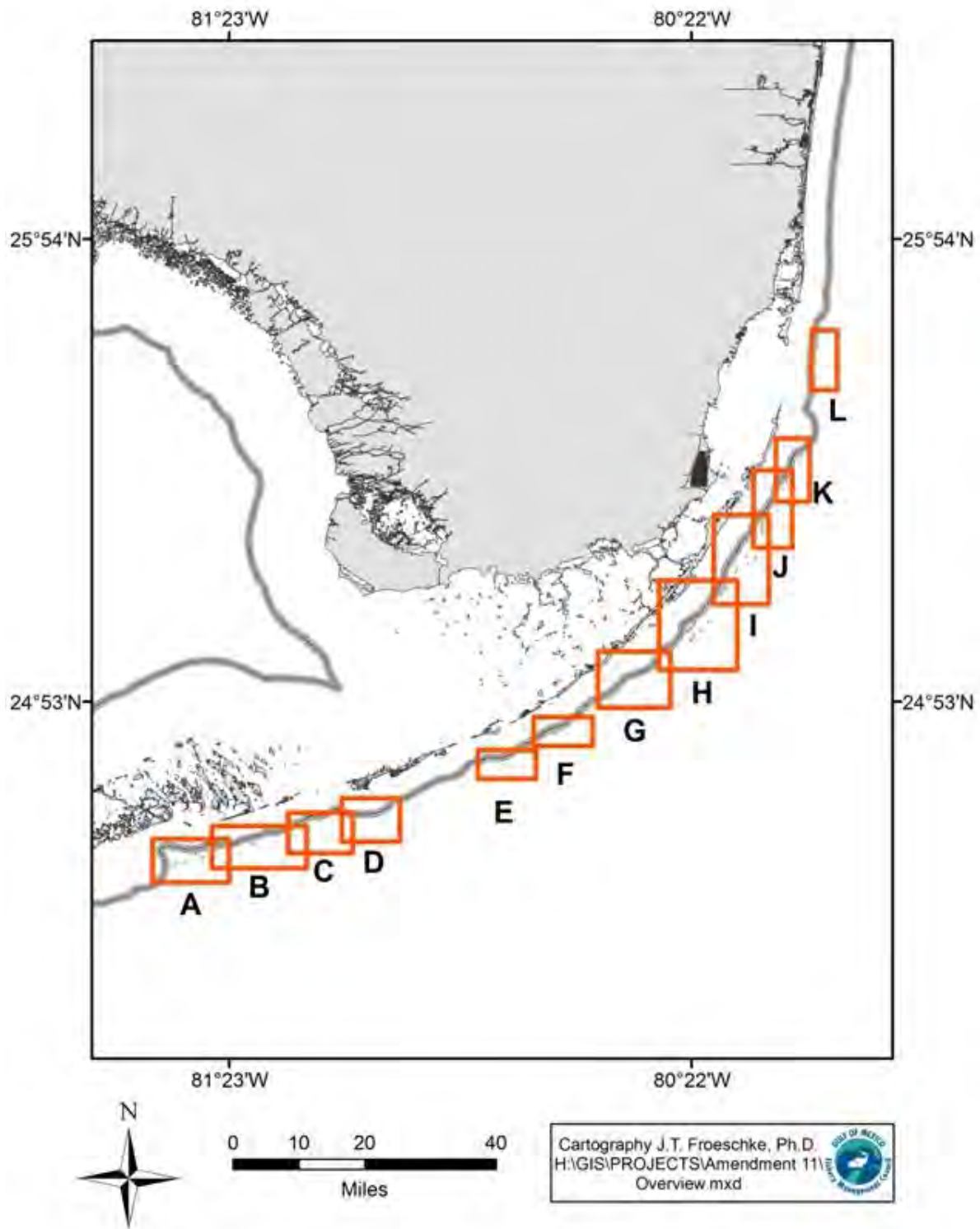


Figure 2.1.1. Overview of Florida Keys and maps showing proposed closed areas.

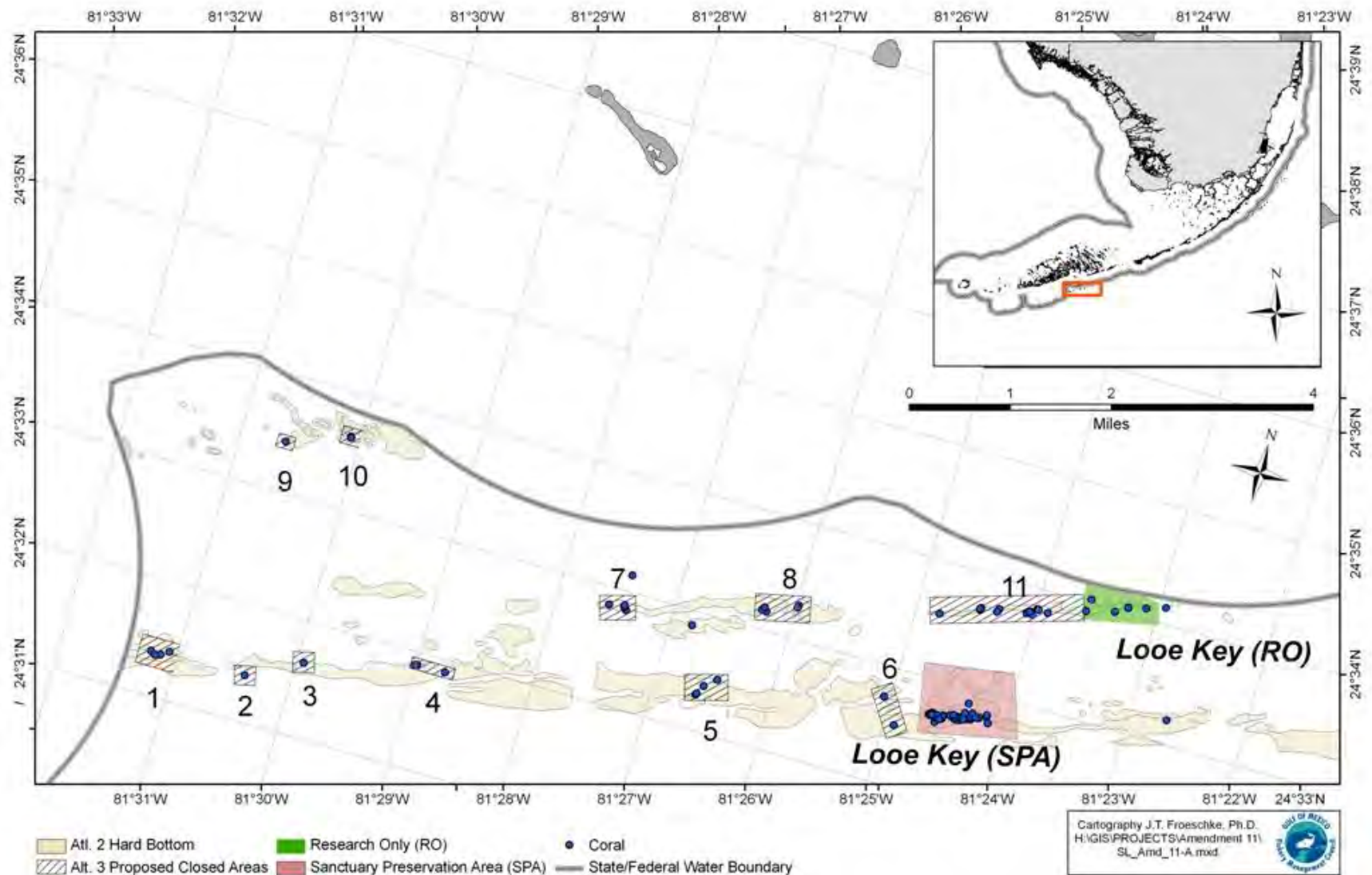


Figure 2.1.2. Map A showing proposed closed areas.

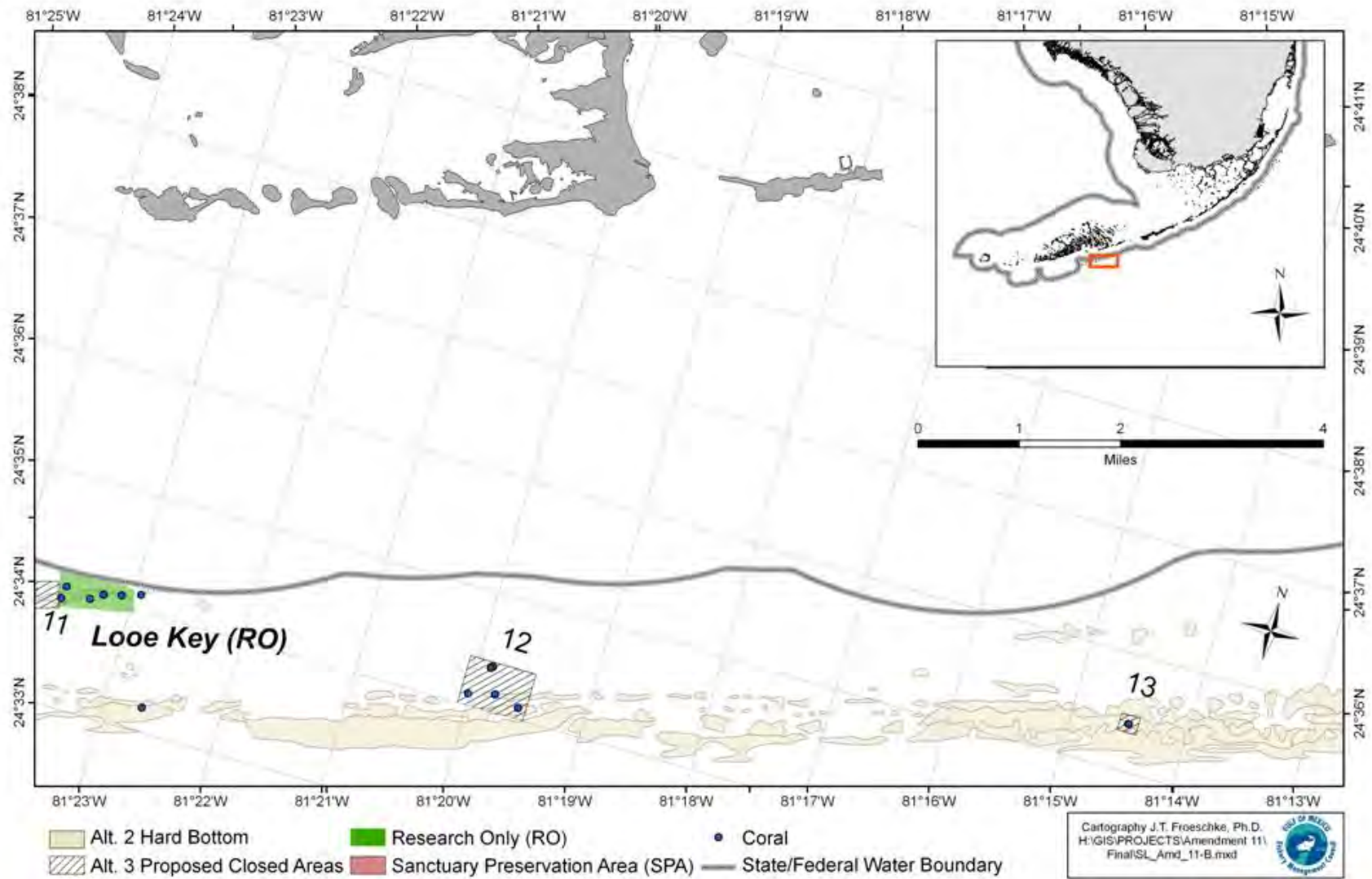


Figure 2.1.3. Map B showing proposed closed areas.

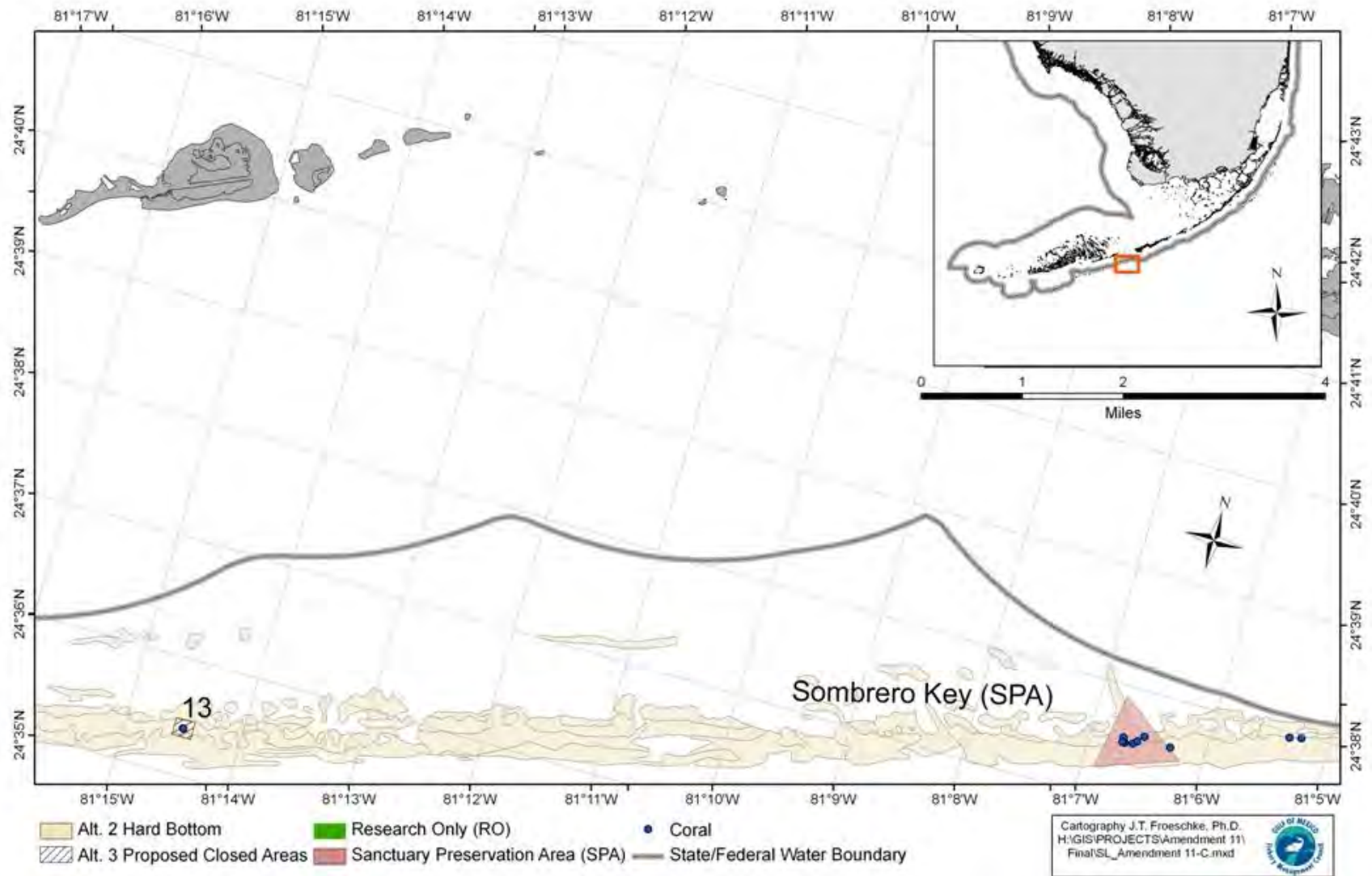


Figure 2.1.4. Map C showing proposed closed areas.

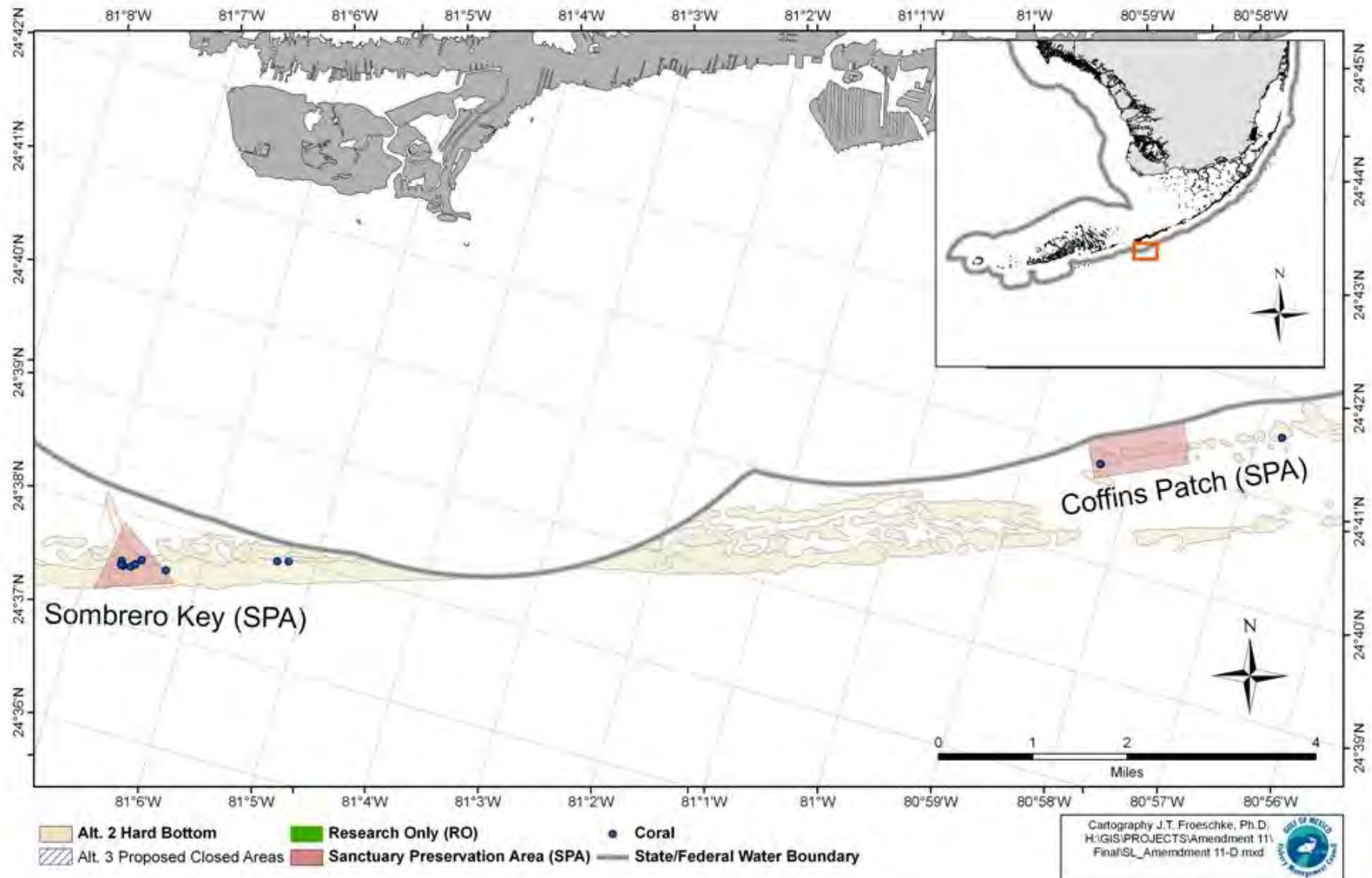


Figure 2.1.5. Map D showing proposed closed areas.

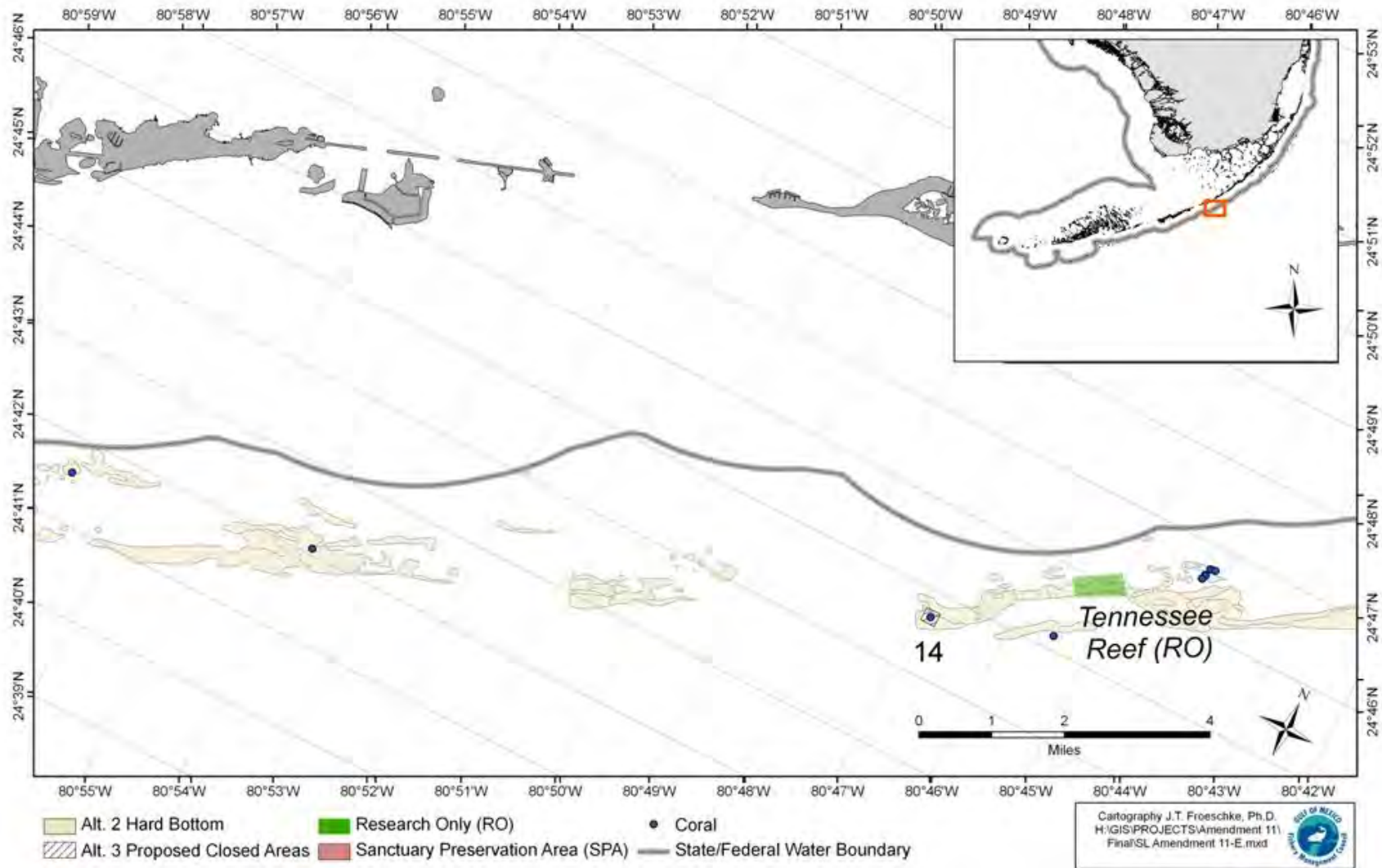


Figure 2.1.6. Map E showing proposed closed areas.

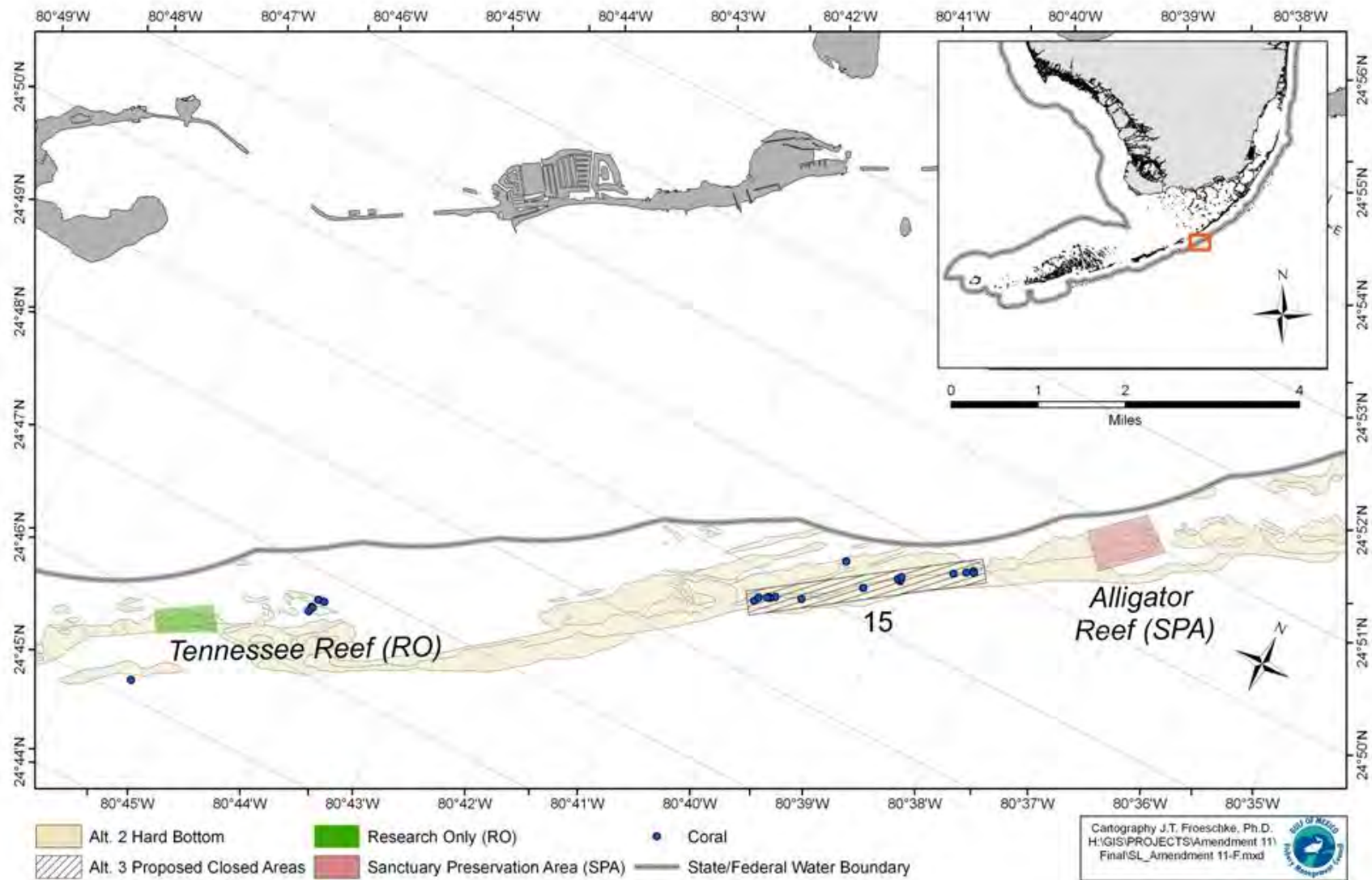


Figure 2.1.7. Map F showing proposed closed areas.

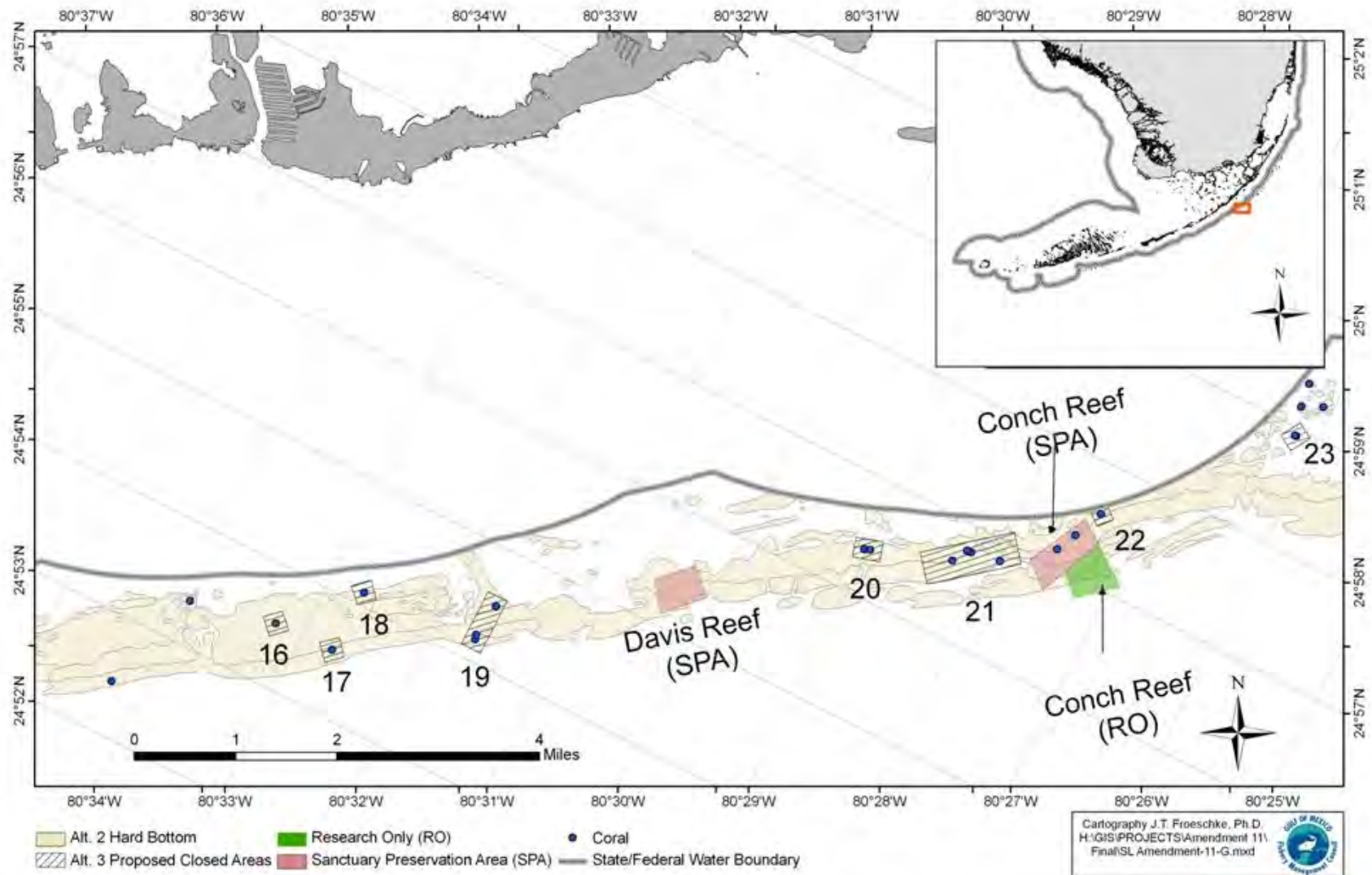


Figure 2.1.8. Map G showing proposed closed areas.

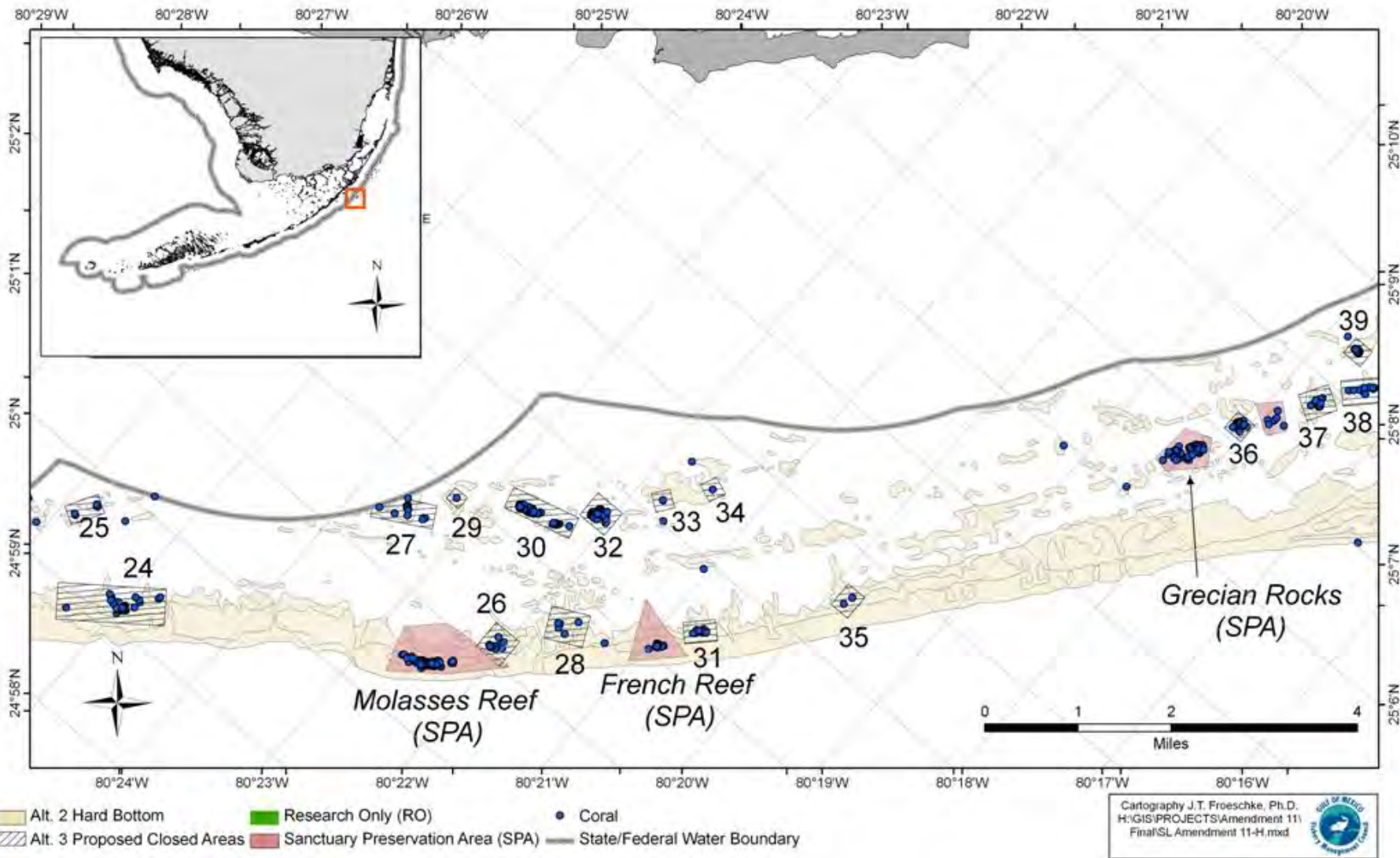


Figure 2.1.9. Map H showing proposed closed areas.

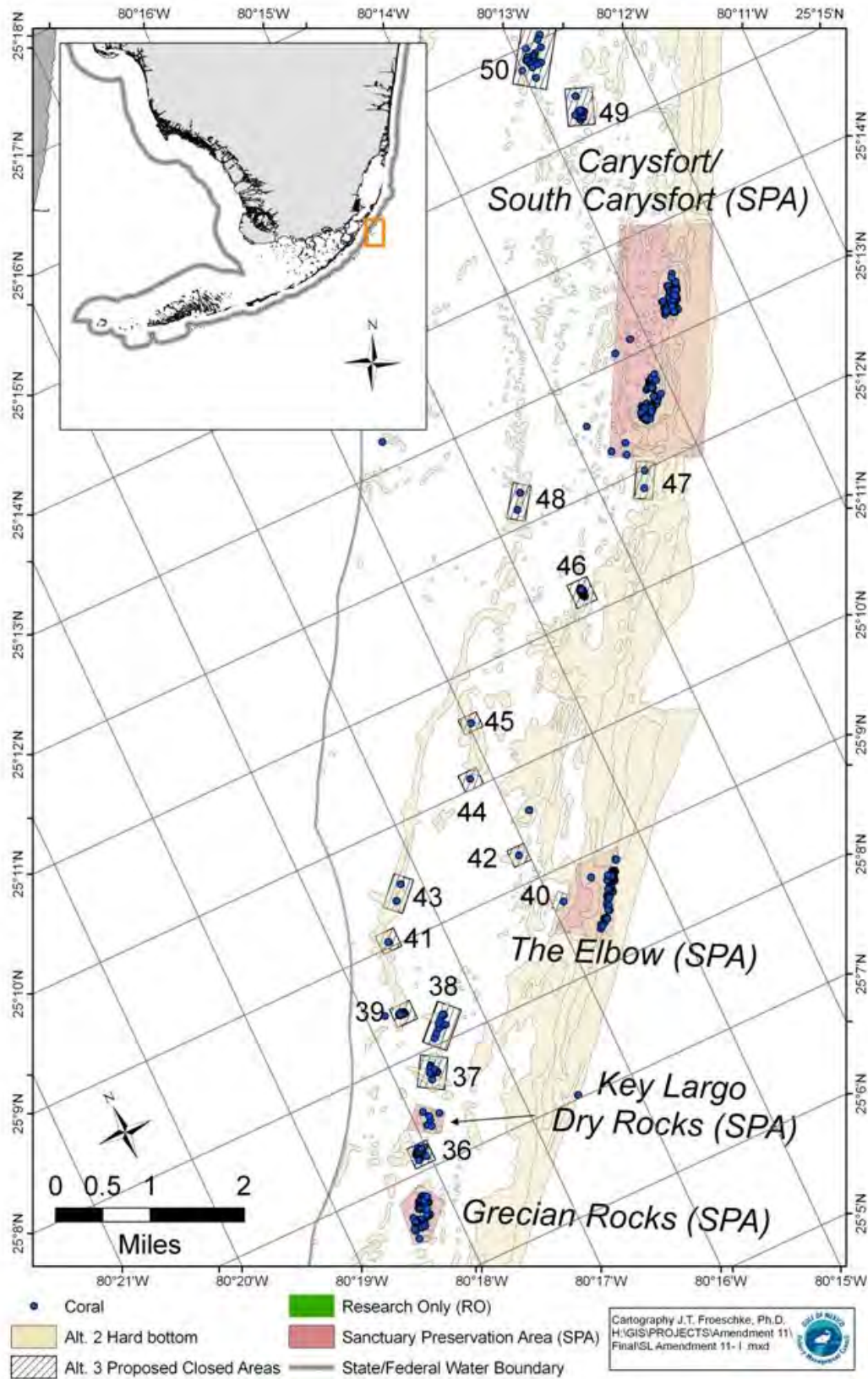


Figure 2.1.10. Map I showing proposed closed areas.

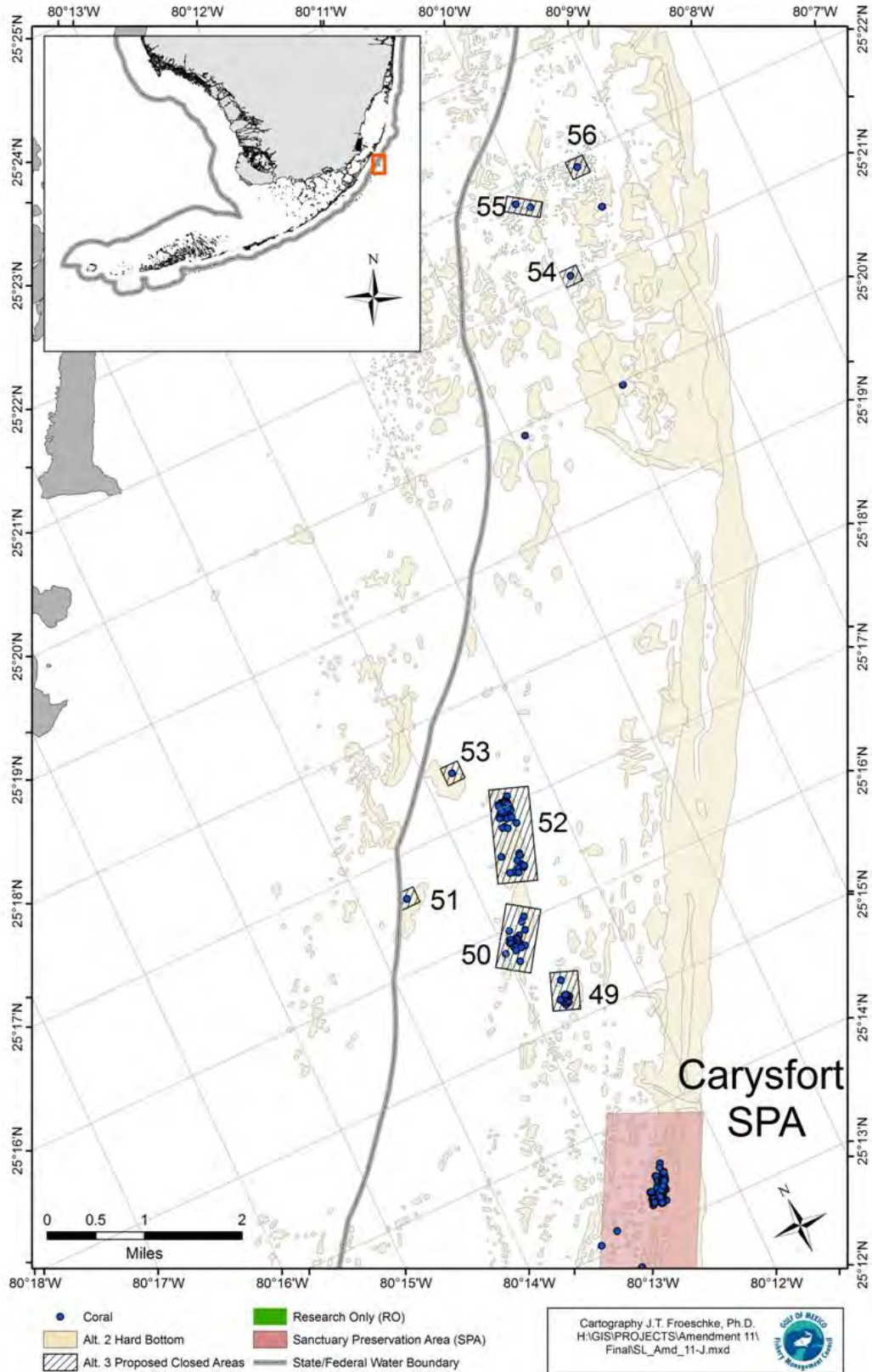


Figure 2.1.11. Map J showing proposed closed areas.

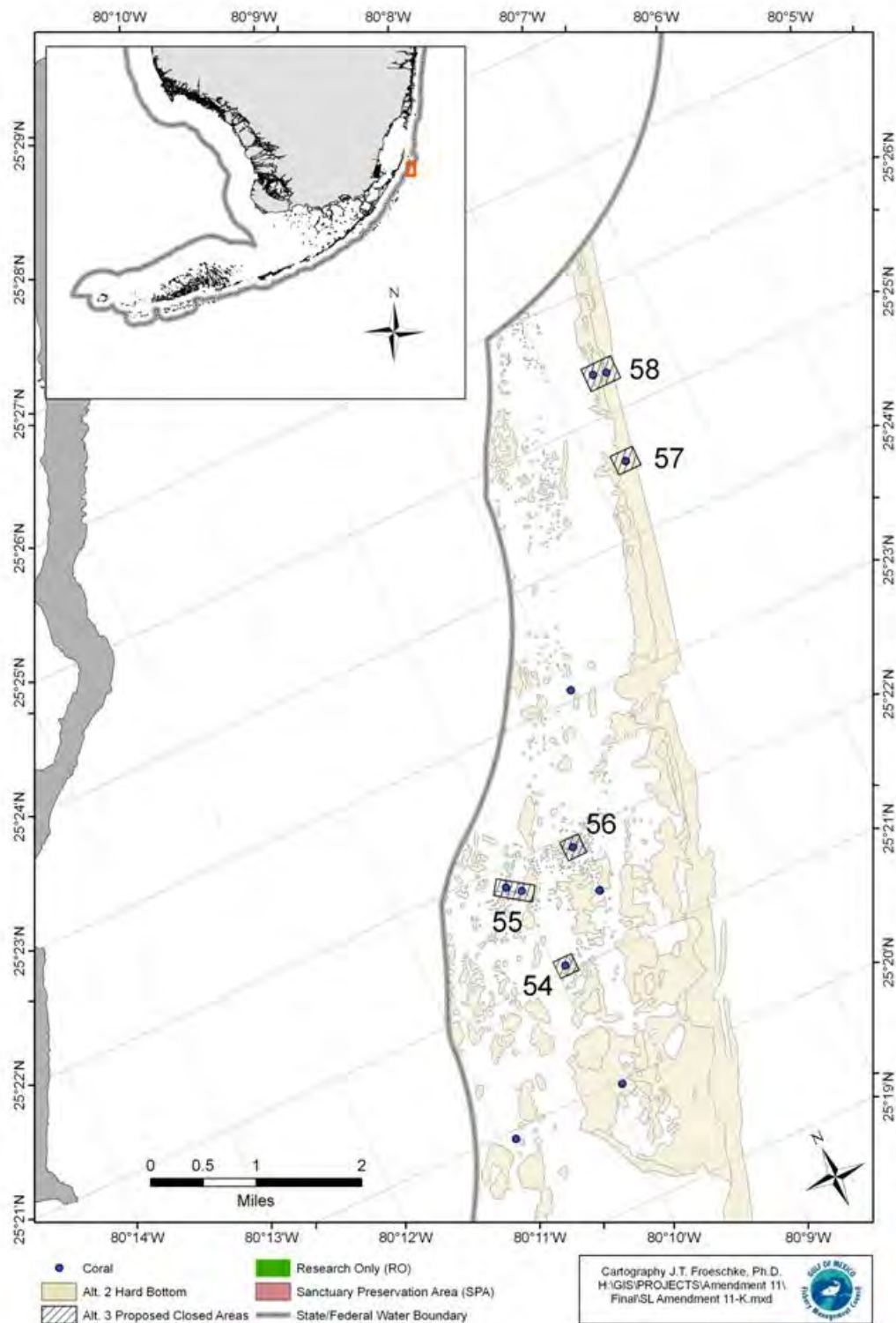


Figure 2.1.12. Map K showing proposed closed areas.

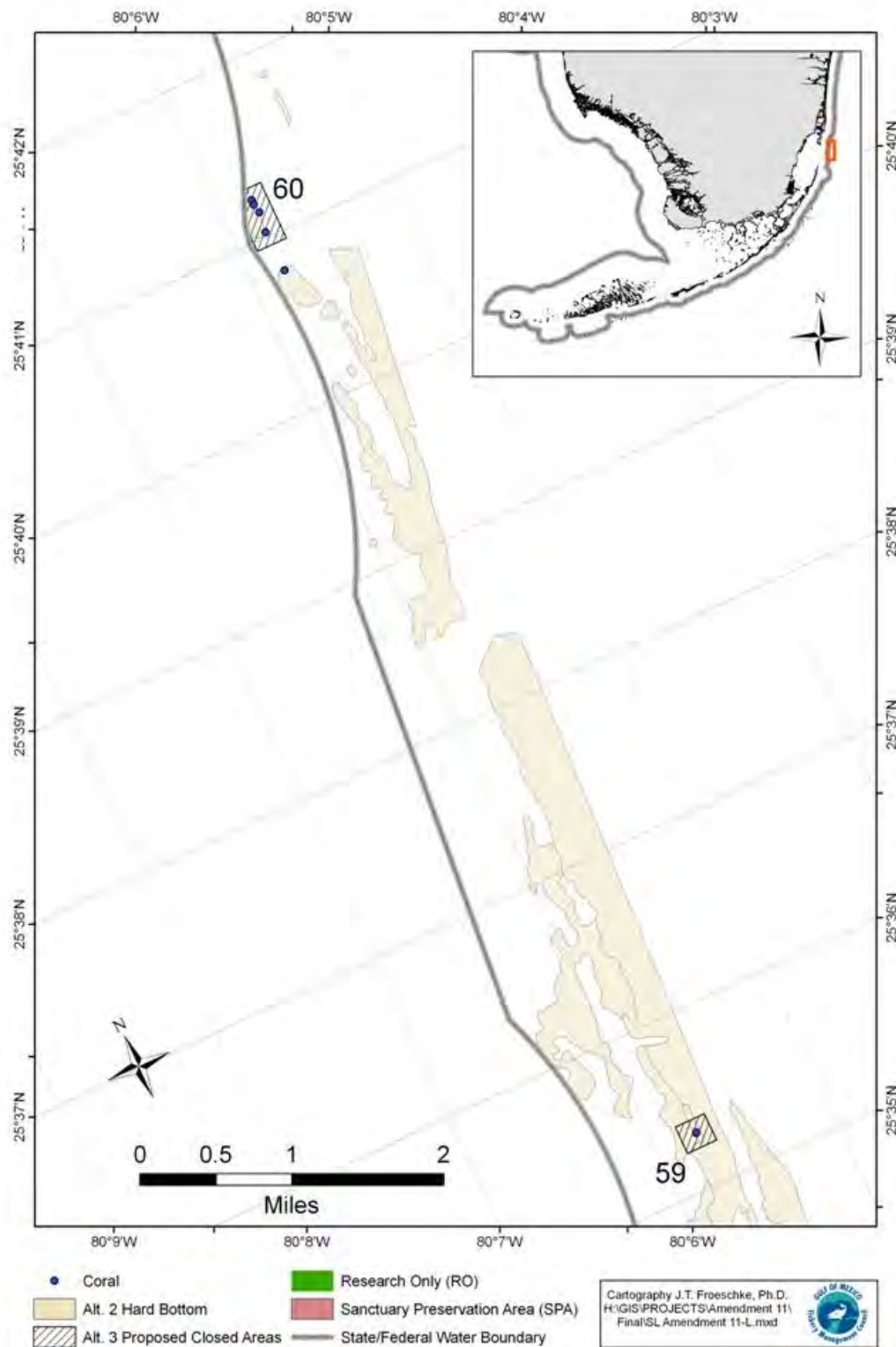


Figure 2.1.13. Map L showing proposed closed areas.

2.2 Action 2: Require Gear Markings for Spiny Lobster Trap Lines in the EEZ off Florida

Preferred Alternative 1: No Action – do not require markings for spiny lobster trap lines.

Alternative 2: Require all spiny lobster trap lines in the EEZ off Florida to have a white marking along its entire length, such as an all white line or a white tracer throughout the line. The marking must be visible at all times when traps are in use. All gear must comply with marking requirements no later than August 6, 2017.

Alternative 3: Require all spiny lobster trap lines in the EEZ off Florida to have a permanently affixed white marking at least 4-inch wide spaced at least every 15 ft along the trap line, or at the midpoint if the line is less than 15 ft. The marking must be visible at all times when traps are in use. All gear must comply with marking requirements no later than August 6, 2017.

Note: The white line or line with white tracer proposed under Alternative 2 would also be valid under Alternative 3.

Discussion: Currently, all spiny lobster traps fished in the EEZ off Florida must follow the gear marking requirements established by Florida at 68B-24 in the Florida Administrative Code (FAC). Those regulations require a buoy or a time-release buoy to be attached to each spiny lobster trap or at each end of a weighted trap trotline. Each buoy must be a minimum of six inches in diameter and constructed of Styrofoam, cork, molded polyvinyl chloride, or molded polystyrene [FAC 68B-24.006(3)]. Additionally, each trap and buoy used must have the fishers' current lobster license or trap number permanently affixed in legible figures. On each buoy, the affixed lobster license or trap number shall be at least two inches high [FAC 68B-24.006(4)].

Lines are consistently found as marine debris and most frequently recovered without the buoys or traps still attached. Miller et al. (2008b) reported lost pot/trap gear was the second most prevalent type of marine debris in the Florida Keys and the most damaging to benthic habitat. In all cases, lines were without buoys. Buoys are frequently dislodged from lines and the lines used in the spiny lobster trap fishery are also used in other fisheries, often for other purposes. These conditions cause extreme difficulty when determining if line found in the environment, or entangling protected species, originated from the spiny lobster trap fishery. A lack of uniquely identifiable markings also makes monitoring incidental take in the fishery, as required by the ESA, difficult. Trap line marking requirements would allow greater accuracy in identifying fishery interaction impacts to benthic habitats and protected species, leading to more targeted measures to reduce the frequency and/or severity of those impacts.

From the Bi Op: NMFS must work with the Gulf of Mexico and South Atlantic Fishery Management Councils, and the State of Florida, to implement measures requiring that all spiny lobster trap rope be a specific color or have easily identifiable patterns/markings, not currently in use in other fisheries, along its entire length. This will ensure any trap rope affects can be attributed to the appropriate fishery (e.g., stone crab, spiny lobster, or blue crab fisheries). Easily identifiable ropes must be phased into the federal fishery no later than five years after the finalization of this biological opinion.

The Bi Op on the spiny lobster fishery mandated the establishment of trap line marking requirements no later than five years after its completion, which was August 2014. In a memo dated September 2, 2011, the Regional Administrator for the Southeast Region of NOAA Fisheries Service amended the terms and conditions of the Bi Op to extend that deadline to August 6, 2017. This new date was based on the presumption that a rule to implement management measures in this amendment would be in place by the beginning of the 2012 fishing year. August 6, 2017, would be five years from the expected

implementation of the requirement. Fishermen have indicated trap lines last five to seven years before needing to be replaced. The five-year time line would allow fishermen to replace worn trap lines with marked lines as they wear out, and thereby spread the cost and labor of compliance across multiple years.

The federal South Atlantic/Gulf of Mexico spiny lobster fishery has three management areas: the EEZ off Gulf states other than Florida (Texas, Louisiana, Mississippi and Alabama), the EEZ off Florida, and the EEZ off southern Atlantic states other than Florida (Georgia, South Carolina, and North Carolina). Because little spiny lobster trap fishing occurs outside Florida, the Bi Op determined trap impacts were extremely unlikely to occur to protected species anywhere else. Therefore, all measures required under the Bi Op only apply to spiny lobster trap fishing occurring in the EEZ off Florida.

Other fisheries in other regions have trap line marking requirements. Under the Atlantic Large Whale Take Reduction Plan, trap/pot fisheries in the Northeast and Mid-Atlantic regions must use red, orange, or black markings on their gear depending on the fishery. The spiny lobster Bi Op requires that trap line markings —“not currently in use in other fisheries” be implemented. As with other trap line marking requirements, the intention of the requirement in the Bi Op is to ensure that any marking scheme selected will improve the accuracy of distinguishing similar looking gears from one another. Because color marking schemes using red, orange, and black are currently in use, those colors are not considered in this amendment. Additionally, the color black is also not considered here because black lines are used in other trap fisheries, such as the stone crab fishery. It is not clear how implementing a requirement to use black line for spiny lobster traps would improve the accuracy of differentiating between other trap fisheries.



Figure 2.2.1. Example of a color tracer line (orange) woven along the entire length of a black trap line. In the image, the trap line is coiled.

Requiring a white line or a colored tracer in the line (**Alternative 2**) would meet the requirements of the Bi Op (see Figure 2.2.1 for an example of a tracer). Spiny lobster industry representatives have indicated that the use of colors other than black, or the use of a line with a tracer, would significantly reduce trap -line life in the spiny lobster fishery, given the effect of ultraviolet light (UV) degradation in waters off Florida. Red and yellow may be the worst colors in terms of trap rope life (Ornitz 2011).

Spiny lobster industry members requested colors that were not likely to attract sea turtles be considered for gear marking requirements. Most sea turtles appear to have at least some color vision and most are able to see a color spectrum similar to what humans observe (Liebman and Granda 1971; Granda and O'Shea 1972; Liebman and Granda 1975; Levenson et al. 2004; Mähger et al. 2007). Limited research has not yet identified any particular color that would be less likely to attract sea turtles. A study of loggerhead sea turtles in the Adriatic Sea looked at the type and color of marine debris in the stomachs of stranded turtles and turtles that were incidentally caught and were dead (Lazar and Gračan 2011). Stomach analysis showed turtles did not seem to discriminate among different colored objects. Anecdotal evidence from sea turtle rehabilitation suggests that bright colors such as pinks, yellows, and bright greens can capture their attention (S. Schaf, Florida FWC, pers. comm.). Scientific literature and sea turtles experts indicated that white is unlikely to be any more attractive to sea turtles than black.

Public comments received during the development of Amendment 10 and from the South Atlantic Spiny Lobster Advisory Panel recommended black for the line marking requirements (but only as a second choice to no marking requirement); however, other fisheries use black line. The second most available line is white which is used in the spiny lobster “~~rawl~~” fishery. The term “~~rawl~~” refers to a string of traps attached to one another, with a vertical line and buoy on each end of the line. One supplier indicated that the “~~sinking~~” trap line they sell to fishermen for trawl lines is white, contains dealer-specific additional coloring, and costs more per foot than “~~floating~~” black vertical line. Black line is more likely to be used in shallower water, such as are under state jurisdiction, whereas heavier and more expensive white line is more likely to be used in deeper water in the EEZ.

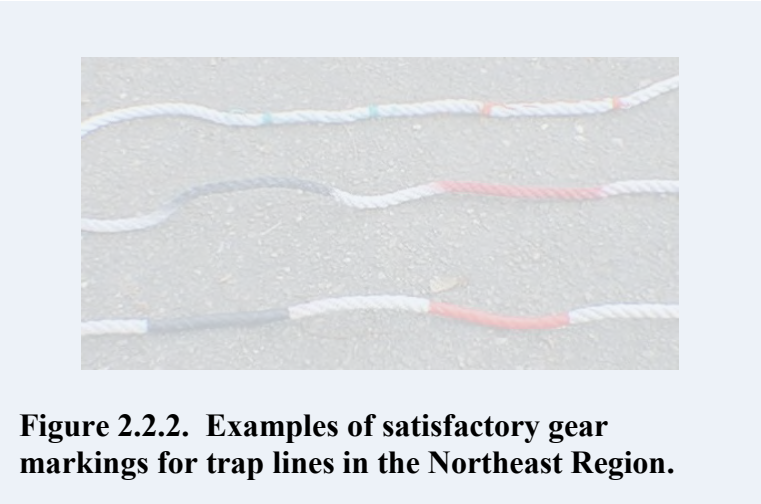


Figure 2.2.2. Examples of satisfactory gear markings for trap lines in the Northeast Region.

Alternative 3 does not specify a particular method for marking trap lines, only the minimum specifications for the markings. The intent under **Alternative 3** is to allow the greatest flexibility to fishermen in terms of determining which method would be best for each of them. Three methods for marking gear were tested and found to work satisfactorily in the Northeast Region under normal conditions (e.g., water temperature, trap weight, etc). However, they have not

been tested in the spiny lobster fishery, which involves warmer water and more exposure to damaging UV light. At the top of Figure 2.2.2, colored twine is seized around the line and woven between the strands. In the center, the line was spray-painted; this method requires that the line be dry. At the bottom, colored electrical tape was wrapped in one direction and then back over itself to form two layers. These marking techniques are simply examples of those used successfully in other fisheries that would also meet the requirements proposed in **Alternative 3**. However, they have not been tested in the spiny lobster fishery, which involves warmer water, more exposure to damaging UV light, and hydraulic trap retrieval equipment that is expected to remove surface paint and tape. Other techniques not specifically mentioned here would also be acceptable under **Alternative 3** so long as they meet the specific marking requirements. Further, all white line or line with a white tracer, as required under **Alternative 2**, would also be allowed under **Alternative 3** because both would meet the minimum requirements.

Florida could greatly improve the efficacy of gear marking requirements for spiny lobster gear fished in the EEZ off Florida by creating compatible gear marking requirements for spiny lobster trap gear in state waters. The selection of a gear marking scheme does not preclude non-spiny lobster fishers from using the same color. Florida could further improve the efficacy of gear marking requirements proposed under this action by instituting gear marking requirements for other state water trap fisheries (i.e., blue crab and stone crab).

Preferred Alternative 1 would provide no additional benefit to protected species and would not satisfy the trap line marking requirements of the Bi Op. This alternative is unlikely to have any social or economic impact. The Councils chose to take no action on this issue in Amendment 10 to allow more time for input from stakeholders on the most appropriate and cost-effective ways to mark lines. However, the Councils indicated they would quickly develop Amendment 11 to address this issue. The Councils again chose **Alternative 1** as the preferred alternative after the Florida Fish and Wildlife Conservation Commission (Florida FWC) indicated they would not implement compatible regulations in state waters. Further, no markings are required for stone crab trap lines, and many spiny lobster fishermen also participate in that fishery and exchange gear. The Councils were concerned that if stone crab fishermen used gear with markings similar to those required in the spiny lobster fishery then the ability to differentiate between the gear types would be lost, and the objective of the Bi Op would not be met. Another major concern was that marking techniques have not been tested, and it is unclear if any of those used in other fisheries would be appropriate in the spiny lobster fishery, given line fouling and retrieval methods. For this reason, the Councils decided requiring trap line markings in the spiny lobster fishery at this time would impose an excessive financial and labor burden on fishermen with little assurance that spiny lobster trap line could be distinguished from other trap lines when entangling protected species. Staff from Florida FWC have started a study on line marking methods for spiny lobster traps (see Appendix K). The Councils intend to revisit this issue when the results of that study are available.

On July 12-13, 2011, the Florida Keys Commercial Fishermen's Association held a meeting to provide stakeholder input on the location of closed areas proposed in Action 1. Although some discussion was held on line marking techniques, no specific recommendations were made. Some participants did indicate they would prefer white line or line markings under **Alternatives 2** and

3, if black was not an option. In a letter to the South Atlantic Council dated September 11, 2011, the association stated that white line is the second most preferable color to black because of its similar life expectancy and availability. However, because white lines are frequently used in deeper water, the similar life expectancies may be a result of less UV exposure.

Industry provided information indicating that most commercial spiny lobster fishermen use black polyethylene rope for lobster trap lines because it is most resistant to UV degradation (W. Kelly, FKCFCA, pers.comm.). The addition of pigment to black rope keeps UV light from penetrating very deep into the fibers and restricts degradation to the surface of the rope. White rope is currently used by ~~trawl~~ fishermen who string multiple lobster traps together, generally in deeper water, therefore federal waters. Because white line is used in deeper waters (< 100 ft) there is typically less UV light exposure. It is unclear what the degradation rate and durability of white rope would be relative to black rope if it received more UV exposure. Polyester rope is generally clear, so both black and white rope require the addition of pigment, making white rope ~~almost as good as black rope for long-term use~~ (see All About Rope, <http://www.mapability.com/ei8ic/contest/rope.php>).

Marine debris surveys in the Florida Keys documented that 21% of trap lines found were less than 15 ft long, approximately 53% were between 15 and 45 ft in length, and the remainder were longer than 50 ft (Miller et al. 2008b). The average length of line encountered was approximately 35 ft (Miller et al. 2008b). Requiring marks along the entire length of the line (**Alternative 2**) or at least every 15 ft (**Alternative 3**) improves the likelihood that line found in the environment can be identified properly.

The costs associated with **Alternative 2** would depend on how many fishermen fishing in the EEZ currently use white line. White line is used by trawl fishermen, who fish in the deeper water of the EEZ. Trip ticket data do not distinguish landings between vertical lines and ~~trawl~~ trap lines; therefore, **Alternative 2** and **Alternative 3** would have an upper-end economic impact of \$383,465 for vessels fishing for spiny lobster in the EEZ, though the economic could be much lower, perhaps closer to zero. More information and research is needed to refine this estimate and differentiate the effect of the two alternatives. The upper-end estimate of economic impact, \$383,465, represents 8.5% of the trip gross revenue for 271 vessels that land spiny lobster from the EEZ off Florida. This represents the increase in cost of trap rope replacement, which goes from \$510,835 (13.1% of trip gross) to \$894,300 (22.9% of trip gross), excluding the cost of labor and other components to make traps usable (traps, buoys, bridles) and it excludes any change in on-vessel equipment. This translates into a 15-year cost of \$5.75 million for the EEZ off Florida.

An assessment of the financial implications of trap line replacement (Adams 2011) was based on the use of a blue tracer in black line. This is similar to **Alternative 2**, which requires the use of a white tracer. Adams (2011) indicates that because the tracer would degrade quicker than the rest of the line, the life expectancy of the line would be only around three years. In addition, the line with a blue tracer costs more than solid black line. Cost estimates to the entire fishery (i.e., state and federal waters) over a 15-year period were \$8,577,000 (\$571,800 annually) more for the line with the blue tracer than the solid black line, due to a higher line price and more frequent replacement. Adams (2011) based the calculations on the total number of traps owned by

fishermen in Florida. This amendment only addresses trap line markings for traps fished in the EEZ, which is less than half of the traps. As noted above, the Florida FWC has indicated they are opposed to trap line markings at this time.

Both labor and costs could be less under **Alternative 3** than **Alternative 2**. **Alternative 3** would allow fishermen to keep using the black polyethylene trap line, but would require a white mark be applied to lines. Markings could be made in a number of ways, based on what would work best for the individual fisher. Trap lines marked under the Atlantic Large Whale Take Reduction Plan are coiled and then spray-painted over a section. This method is quick and economical as it does not require the purchase of a different color solid rope or rope with a tracer, but the durability of the marking may be less under spiny lobster fishing conditions. Markings must be spaced at least every 15 ft, but could be closer, so exact measurements would not be necessary. Likewise each mark must be at least four inches, but could be larger. Because of this, any line marking viable under **Alternative 2** would also be viable under **Alternative 3**. The Councils have suggested research on the labor, costs, and durability of various line markings could take place during the five-year implementation period.

The economic assessment in Section 4.2.2 incorporates data from Adams (2011) and other sources, including Florida Trip Ticket data; it shows estimates on an annual basis for vessels fishing in the EEZ off Florida. Analysis in Section 4 is based on the number of traps ~~that could be fished~~ in the EEZ, and the estimated effect of different assumptions about the price of trap lines, replacement intervals, numbers of traps, and line length. Assuming a five-year replacement interval for 1,320 traps per vessel and 113 ft lines at 9¢ / ft, the estimated annual cost of trap replacement would be \$2,685 per vessel for 271 vessels or \$462,055 total (see Tables 4.2.1.1 and 4.2.1.2) for **Preferred Alternative 1**. Based on data in Adams (2011) and deducting the estimated annual cost of trap line replacement for **Preferred Alternative 1** (\$462,055), the annual economic impact of **Alternative 2** would be \$265,580 for vessels in the EEZ off Florida. If current line can be marked under **Alternative 3**, there may be a relatively small economic impact from this alternative.